



Stephanie A. Cuello
SENIOR COUNSEL

July 22, 2024

VIA ELECTRONIC FILING

Adam J. Teitzman, Commission Clerk
Florida Public Service Commission
2540 Shumard Oak Boulevard
Tallahassee, Florida 32399-0850

Re: *Commission Review of Numeric Conservation Goals (Duke Energy Florida, LLC);
Docket 20240013-EG*

Dear Mr. Teitzman:

Please find enclosed for electronic filing, Duke Energy Florida, LLC's ("DEF") Updated Petition for Approval of Conservation Goals, along with the Updated Direct Testimony and Exhibits TD-1 through TD-8 of Mr. Timothy J. Duff and the Direct Testimony and Exhibits JH-1 through JH-16 of Mr. Jim Herndon, to be filed in the above-referenced Docket. This Updated Petition and Updated Testimony and Exhibits are being filed to capture the following:

- To update the proposed Recommend Residential DSM Goals and projected program costs;
- To update the Non-Residential Demand Response Programs: Interruptible (IS), Curtailable (CS) and Stand-by Generation (GSLM-2) credit levels;
- To provide a clear data representation including costs, impacts, and cost-effectiveness on the Multi-Family New Builder Construction program; and
- Updated Exhibits T-1 through T-3 and T-5 through T-8.

Thank you for your assistance in this matter. Please feel free to call me at (850) 521-1425 should you have any questions concerning this filing.

Sincerely,

/s/ Stephanie A. Cuello

Stephanie A. Cuello

SAC/clg
Attachments

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Commission Review of Numeric
Conservation Goals (Duke Energy
Florida, LLC).

Docket No. 20240013-EG

Filed: July 22, 2024

**DUKE ENERGY FLORIDA, LLC'S
UPDATED PETITION FOR APPROVAL OF CONSERVATION GOALS**

Pursuant to Sections 366.81 and 366.82, Florida Statutes, and Rule 25-17.0021, Florida Administrative Code (“F.A.C.”), Duke Energy Florida, LLC (“DEF”) petitions the Florida Public Service Commission (“Commission”) for approval of DEF’s updated proposed conservation goals for the period 2025-2034. In support of this amended petition, DEF states:

1. The name and address of the affected agency is:

Florida Public Service Commission
2540 Shumard Oak Boulevard
Tallahassee, Florida 32399-0850

2. The name and address of the petitioner is:

Duke Energy Florida, LLC
299 First Avenue North
St. Petersburg, Florida 33701

3. Notices, orders, pleadings, and correspondence to be served upon DEF in this proceeding should be directed to:

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4. Pursuant to Section 366.81, Florida Statutes, the Commission requires each utility to develop plans and implement programs for increasing energy efficiency and conservation and demand-side renewable energy systems within its service area, subject to the approval of the Commission. DEF is a public utility within the meaning of Section 366.02(1), Florida Statutes, and is subject to the Commission's jurisdiction under Chapter 366, Florida Statutes. The establishment of DEF's conservation goals will affect the need for and selection of resource alternatives by DEF, and the goals will be the target for DEF to meet in its filing of a demand side management plan; therefore, DEF's substantial interests will be determined in this proceeding.

5. This docket and separate dockets for each of the other five FEECA utilities in Florida were established for the purpose of developing and prescribing numeric conservation or DSM goals for each of the six Florida FEECA utilities to be applicable during the period 2025-2034. The six separate dockets were consolidated in Order No. PSC-2024-0022-PCO-EG for the purpose of conducting Staff workshops and for hearing.

6. . On July 15th, 2024, a Joint Motion for Approval of Settlement Agreement was filed in Docket No. 20240025, Duke Energy Florida, LLC 's Petition for Rate Increase by Duke Energy Florida, LLC, which contained changes to DSM program measures that necessitated an update to

this petition in accordance with the Settlement Agreement .¹ Those changes include updates to the non-residential credit levels, residential Neighborhood Energy Saver program participation levels and clear data representation on the Multi-Family New Builder Construction program. DEF's programs, assumptions, and evaluation methodology in the updated proposed conservation goals are reasonable and are developed based upon the criteria set forth in Rule 25-17.0021, F.A.C.

The Commission should approve the DSM updated proposed goals by DEF for the 2025 through 2034 time period.

7. For this DSM goal-setting proceeding, the FEECA utilities formed a collaborative effort and worked with an independent company, Resource Innovations, Inc. ("Resource Innovations"), to develop a comprehensive evaluation to assess the technical potential for reducing electricity use and peak demand by implementing a wide range of end-use energy efficiency and demand response measures, as well as customer-scale solar photovoltaic and solar thermal installations in the service territories of the six collaborative utilities. Resource Innovation's Technical Potential Study served as the foundation for economic analysis screening and adoption forecasts for each collaborative utility, i.e., the Technical Potential Study, as described in the testimony of Jim Herndon and as shown for DEF in Exhibit No. JH-3. The Technical Potential Study developed by Resource Innovation identified the theoretical limit of electric peak demand and energy reductions in Florida. Mr. Herndon's testimony and exhibits (to the extent they pertain to DEF)² are filed with this Petition.

¹ See document no. 07553 in *Duke Energy Florida, LLC's Petition for Rate Increase by Duke Energy Florida, LLC*; Docket No. 20240025

² Mr. Herndon's exhibits pertaining to DEF are Exhibit No. JH-3; Exhibit No. JH-9; and Exhibit No. JH-10.

8. DEF is simultaneously filing the prepared updated direct testimony and updated exhibits of Tim Duff. Mr. Duff's updated testimony, along with the updated exhibits contained therein, set forth the changes to the proposed conservation goals for the ten-year period 2025-2034 as set forth in the Settlement Agreement, and summarize DEF's ten-year projections based upon DEF's most recent planning process of the total, cost-effective, winter and summer peak demand (MW) and annual energy (GWH) savings reasonably achievable in the residential and commercial/industrial classes through demand side management. DEF's updated goals are delineated in Mr. Duff's direct testimony.

9. Projections of summer and winter demand savings and annual energy savings are identified in Mr. Duff's updated testimony and presented in Exhibit No. TD-1, also appended to Mr. Duff's testimony filed together with this Petition. DEF's projections reflect consideration of overlapping measures, rebound effects, free riders, interactions with building codes and appliance efficiency standards, and DEF's latest monitoring and evaluation of conservation programs and measures. The Commission should approve DEF's updated overall Residential MW and GWH goals and updated overall Commercial/Industrial MW and GWH goals set forth in this filing. These goals reflect the reasonably achievable demand side management potential in DEF's service territory over the ten-year period 2025-2034 developed in DEF's planning process.

10. DEF is entitled to relief pursuant to Sections 366.81 and 366.82, Florida Statutes and Rule 25-17.0021, F.A.C. DEF's updated proposed goals reflect the reasonably achievable demand side management potential in DEF's service territory over the ten-year period 2025-2034 developed in DEF's planning process. The Commission should approve the updated proposed recommended goals set forth in DEF's recommended portfolio as set forth in this filing.

WHEREFORE, DEF respectfully requests that the Commission enter an order approving and establishing DEF's proposed numeric conservation goals pursuant to Rule 25-17.0021, F.A.C., as set forth in this filing.

Respectfully submitted,

/s/ Stephanie A. Cuello _____

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Attorneys for Duke Energy Florida, LLC

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that a true and correct copy of the foregoing has been furnished to the following by electronic mail this 22nd day of July, 2024, to all parties of record as indicated below.

/s/ Stephanie A. Cuello
Attorney

<p>Jacob Imig / Jonathan Rubottom Office of General Counsel Florida Public Service Commission 2540 Shumard Oak Blvd. Tallahassee, FL 32399-0850 jimig@psc.state.fl.us JRubotto@psc.state.fl.us</p> <p>James W. Brew / Laura Wynn Baker / Sarah B. Newman Stone Mattheis Xenopoulos & Brew, PC PCS Phosphate – White Springs 1025 Thomas Jefferson Street, NW Suite 800 West Washington, DC 20007-5201 jbrew@smxblaw.com lwb@smxblaw.com sbn@smxblaw.com</p> <p>Jon C. Moyle, Jr. Karen A. Putnal Moyle Law Firm, P.A. FIPUG 118 North Gadsden Street Tallahassee, Florida 32301 jmoyle@moylelaw.com kputnal@moylelaw.com</p> <p>Bradley Marshall Jordan Luebke Earthjustice LULAC and Florida Rising 111 S. Martin Luther King Jr. Blvd. Tallahassee, Florida 32301 bmarshall@earthjustice.org jluebke@earthjustice.org flcaseupdates@earthjustice.org</p> <p>Steven W. Lee SPILMAN THOMAS & BATTLE, PLLC Walmart 1100 Bent Creek Boulevard, Suite 101 Mechanicsburg, PA 17050 slee@spilmanlaw.com</p>	<p>Erik Sayler / Brooks Rumenik / Kelly Wright Florida Department of Agriculture and Consumer Services 407 S Calhoun St The Mayo Bldg, Suite 520 Tallahassee FL 32399 Erik.Sayler@FDACS.gov Brooks.Rumenik@fdacs.gov kelly.wright@fdacs.gov</p> <p>Peter J. Mattheis / Michael K. Lavanga Joseph R. Briscar Stone Mattheis Xenopoulos & Brew, PC NUCOR 1025 Thomas Jefferson Street, NW Suite 800 West Washington, DC 20007-5201 pjm@smxblaw.com mkl@smxblaw.com jrb@smxblaw.com</p> <p>William C. Garner Law Office of William C. Garner, PLLC SACE 3425 Bannerman Road Unit 105, No. 414 Tallahassee, FL 32312 bgarner@wcglawoffice.com</p> <p>Stephanie U. Eaton SPILMAN THOMAS & BATTLE, PLLC Walmart 110 Oakwood Drive, Suite 500 Winston-Salem, NC 27103 seaton@spilmanlaw.com</p>
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DUKE ENERGY FLORIDA
DOCKET NO. 20240013-EG
UPDATED DIRECT TESTIMONY OF
TIM DUFF

INTRODUCTION AND QUALIFICATIONS

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Q. Please state your name and business address.

A. My name is Timothy J. Duff. My business address is 525 South Tyron Street, Charlotte, NC 28201.

Q. By whom are you employed and in what capacity?

A. I am employed by Duke Energy Florida, LLC (“Duke Energy Florida,” “DEF,” “the Company,” or “the utility”) as General Manager, Grid Strategy Enablement, in the Pricing and Customer Solutions Department.

Q. Please describe the duties and responsibilities of your position with the Company.

A. I am responsible for the development of strategies, policies, regulatory planning, and compliance related to the implementation of Customer Solutions retail products and offerings that are designed to create customer and utility system value including Demand-Side Management (“DSM”) programs. By DSM, I mean both dispatchable (demand response or direct load control) and

1 non-dispatchable (energy efficiency) types of programs. I also oversee the
2 analytics functions associated with evaluating and tracking the performance of
3 Customer's Solutions retail products and services. My responsibilities cover all
4 of Duke Energy's utility operating companies, including DEF.

5

6 **Q. Please summarize your educational background and professional**
7 **experience.**

8 A. I graduated from Michigan State University with a Bachelor of Arts in Political
9 Economics and a Bachelor of Arts in Business Administration and received a
10 Master of Business Administration degree from Stephen M. Ross School of
11 Business at the University of Michigan.

12

13 **Q. Have you previously testified before the Florida Public Service**
14 **Commission?**

15 A. Yes. I have provided both written and oral testimony to the Florida Public
16 Service Commission ("FPSC" or the "Commission") on behalf of the Company
17 on numerous occasions in support of the Company's DSM programs and
18 Energy Conservation Cost Recovery clause filings.

19

20 **Q. What is the purpose of your testimony?**

21 A. The purpose of my testimony is to present an update to Duke Energy Florida's
22 proposed numerical DSM goals ("Recommended goals") for 2025-2034 for

1 Commission review and approval. On July 15th, 2024, a Joint Motion for
2 Approval of Settlement Agreement was filed in Docket No. 20240025, which
3 contained changes to DSM program measures that necessitated an update to
4 this petition, testimony, and exhibits in accordance with the Settlement
5 Agreement. Those changes include updates to the non-residential credit levels,
6 residential Neighborhood Energy Saver program participation levels and clear
7 data representation on the Multi-Family New Builder Construction program.
8 DEF's Updated proposed Recommended goals are based upon the analysis
9 completed by the Company in accordance with the requirements set forth by
10 Commission Staff in the Order Establishing Procedure (OEP) in this docket and
11 Fla. Admin. Code Rule 25-17.0021 ("Rule 25-17.0021"). Additionally, the
12 Updated proposed Recommended goals proposed in this proceeding are
13 supported by the results of a new Technical Potential ("TP") study completed
14 by Resource Innovations, Inc. ("RI") as outlined by Witness Jim Herndon's
15 testimony in Exhibit JH-3.

16

17 **Q. Please describe how the Company conducted the analysis on the cost-**
18 **effectiveness of the portfolios responsive to the Rulemaking change**
19 **effective June 6, 2023, for Rule 25-17.0021?**

20 A. Rule 25-17.0021 was amended effective June 6, 2023. Rule 25-17.0021(3)
21 states that "each utility must file its proposed demand-side management goals.
22 Each utility must also file demand-side management goals developed under

1 two scenarios: one scenario that includes **potential demand-side**
2 **management programs** that pass the Participant and Rate Impact Measure
3 Tests, and one scenario that includes **potential demand-side management**
4 **programs** that pass the Participant and Total Resource Costs Tests.”
5 (emphasis added). As such, in compliance with Rule 25-17.0021, the Company
6 assessed the respective cost-effectiveness test of the portfolio at the program
7 level and not at the measure level as done in prior goals setting proceedings.
8 DEF also provides an Updated proposed Recommended Portfolio evaluation,
9 Rate Impact Measure (“RIM”) portfolio evaluation and a Total Resource Cost
10 Test (“TRC”) portfolio evaluation.

11

12 **Q. Are you sponsoring any Exhibits to your testimony?**

13 A. Yes, I have prepared or supervised the preparation of the following exhibits to
14 my direct testimony:

15 1. Exhibit TD-1: Duke Energy Florida's Updated Residential and Non-
16 Residential Annual Potential RIM Portfolio Evaluation for 2025-2034 at the
17 generator.

18 2. Exhibit TD-2: Duke Energy Florida's Updated Residential and Non-
19 Residential Annual Potential TRC Portfolio Evaluation for 2025-2034 at the
20 generator.

- 1 3. Exhibit TD-3: Duke Energy Florida Updated Residential and Non-
2 Residential Annual Potential Recommended Portfolio Evaluation for 2025-
3 2034 at the generator.
- 4 4. Exhibit TD-4: Duke Energy Florida's Avoided Cost Assumptions.
- 5 5. Exhibit TD-5: Updated Projected Costs of implementing the RIM, TRC and
6 Recommended Portfolio and the associated Projected Residential
7 Customer Rate Impacts.
- 8 6. Exhibit TD-6: The Updated RIM, TRC and Participant Tests benefits and
9 cost analysis for all programs for all Portfolios.
- 10 7. Exhibit TD-7: The Updated cost-effectiveness tests for all programs in the
11 RIM Portfolio.
- 12 8. Exhibit TD-8: The Updated cost-effectiveness test for all programs in the
13 TRC Portfolio.

14 These exhibits are true and accurate.

15

16 **Q. Please summarize your testimony.**

17 A. My testimony presents the Company's Updated proposed Recommended
18 goals for the 2025-2034 period for Commission review. I describe the process
19 that was used to develop the three potential portfolios for proposed DSM goals
20 and provide a summary of those results. My testimony includes the estimated
21 average residential customer bill impacts for the RIM Portfolio evaluation, the
22 TRC Portfolio evaluation, and a Recommended Portfolio evaluation that

1 includes measures that passed RIM, TRC or both, as well as measures
2 included in programs targeting low-income customers. I will also discuss the
3 current DSM programs and provide an explanation for the differences in the
4 Updated proposed Recommended goals and the current goals.

5

6 **Q. Are the utility's proposed goals based on an adequate assessment of the**
7 **full Technical Potential of all available demand-side and supply-side**
8 **conservation and efficiency measures, including demand-side renewable**
9 **energy systems?**

10 A. Yes, the TP, which is the basis for the Updated proposed Recommended goals,
11 includes an evaluation of all potential demand-side conservation and efficiency
12 measures and demand-side renewable energy systems available in the DEF
13 Service territory. Demand-side renewable energy systems were evaluated
14 based on the same cost-effectiveness standards that were used to evaluate
15 other energy efficiency measures. No renewable measures were found to be
16 cost-effective and therefore, none are included in the measure adoption
17 forecasts results.

18

19 **Q. Do the utility's proposed goals adequately reflect the costs and benefits**
20 **to customers participating?**

21 A. Yes. The Updated proposed Recommended goals are based on measures that
22 pass the Participant Cost Test (PCT). The PCT compares the incremental cost

1 to participants to the participant benefits (bill savings). This ensures that the
2 measures provide net benefits to participants.

3

4 **Q. Do the utility's proposed goals adequately reflect the costs and benefits**
5 **to the general body of ratepayers as a whole, including utility incentives**
6 **and participant contributions?**

7 A. Yes, the Updated proposed Recommended goals adequately reflect the total
8 costs and benefits to the general body of ratepayers as a whole because the
9 Recommended goals are based on measures that pass RIM, TRC and PCT,
10 except for a few measures included in programs targeting low-income
11 customers. The RIM, TRC and PCT tests, altogether, effectively ensure both
12 participants and non-participants benefit.

13

14 **Q. Do the utility's proposed goals adequately reflect the need for incentives**
15 **to promote both customer-owned and utility-owned energy efficiency and**
16 **demand-side renewable energy systems?**

17 A. Yes. DEF does not believe there is currently a need for incentives to promote
18 demand-side renewable energy systems as the demand-side renewable
19 market has continued to mature and there has been significant growth in
20 customer sited demand-side renewable energy systems. DEF continues to see
21 significant growth in the number of customers installing demand-side
22 renewable systems on their own, without incentives from the utility.

1

2 **Q. Do the utility's proposed goals adequately reflect the costs imposed by**
3 **state and federal regulations on the emissions of greenhouse gases?**

4 A. Yes. Given the uncertainty of future carbon regulation and the lack of any
5 formally established cost of carbon emissions, it is reasonable to exclude any
6 formal recognition of the cost of carbon emissions in this DSM goals setting
7 process. Any state and federal mandates pertaining to equipment efficiency
8 and availability in Florida related to the emissions of greenhouse gases have
9 been appropriately recognized in the development of the TP evaluation. The
10 Company believes that the utilization of a high fuel cost sensitivity in the
11 economic modeling performed by RI serves as an appropriate proxy for any
12 needed recognition of the cost of carbon emissions.

13

14 **Q. Do the utility's proposed goals adequately reflect consideration of free**
15 **riders?**

16 A. Yes, the Updated proposed Recommended goals are based on measures that
17 have greater than a two-year payback period. A two-year payback period is a
18 reasonable time period in which to limit measures and assume that customers
19 will adopt them absent a utility incentive. This time period has been recognized
20 by the Commission in past proceedings as a reasonable proxy to eliminate free
21 riders. Since 1991, a payback of two years or less has been recognized by the
22 Commission as an appropriate threshold to reduce free ridership, limit

1 unnecessary program incentive costs ultimately borne by customers, and
2 maximize cost-effectiveness.

3

4 **Q. What residential and commercial/industrial summer and winter Megawatt**
5 **(MW) and annual Gigawatt-hour (GWh) goals should be established for**
6 **the period of 2025-2034?**

7 A. DEF requests the Commission approve the Updated proposed Recommended
8 cumulative numeric goals for 2025-2034 presented in Table 1 below. The
9 annual goals that comprise the Updated proposed Recommended cumulative
10 goals are provided on Exhibit TD-1. Exhibit TD-2 and Exhibit TD-3 provide a
11 breakdown of the Updated proposed RIM and TRC annual goals, respectively,
12 into the energy efficiency and demand response components that reconcile to
13 the EE achievable potential and DR achievable potential presented in the TP.
14 These Updated proposed Recommended goals, at the program level, have
15 been developed in accordance with the requirements of Rule 25-17.0021(3),
16 which directs utilities to propose goals "... based upon the utility's most recent
17 planning process, and must reflect the annual (KW) and energy (KWH) savings,
18 over a ten-year period". These Updated Recommended goals are based on
19 programs that are cost-effective based on RIM, TRC, and PCT and exclude
20 measures that have a payback period of less than 2 years. The conjunction of
21 these tests captures all the relevant costs and benefits that should be evaluated
22 when considering an efficiency or load reduction program. Evaluating

1 measures with RIM ensures that non-participating customers will not subsidize
 2 participating customers and reasonably limits overall rate impacts to
 3 customers. Evaluating measures using TRC accounts for the total benefits of
 4 the program including both the participants and the overall value to the utility
 5 system. The PCT ensures that the energy efficiency measures provide benefits
 6 to participants. Updated proposed Recommended Goals based on RIM, TRC,
 7 and PCT ensure that the benefits and costs are considered from the
 8 perspective of participants as well as ratepayers to ensure the rate impact for
 9 non-participants is appropriately considered.

10 **Table 1**

DUKE ENERGY FLORIDA - UPDATED RECOMMENDED GOALS 2025-2034 @generator			
	Winter Peak MWs	Summer Peak MWs	GWH's
Residential	331	215	527
Non-Residential	42	84	55
Total	373	300	582

11
12
13 **Q. What goals, if any, should be established for increasing the development**
14 **of demand-side renewable energy systems?**

15 A. Given that renewable systems were not deemed cost-effective under the RIM
16 test, it would not be appropriate to establish goals for demand-side renewable
17 systems in this goals setting proceeding. Demand-side renewable systems
18 were evaluated using the same criteria as were used for other energy efficiency
19 measures. Programs that provide incentives to customers who install

1 renewable systems would result in cross subsidies between participants and
2 non-participants and increase rates to all customers.

3

4 **Q. Provide a description of how the utility's Technical Potential Study has**
5 **been updated and modified, including any measures eliminated or added**
6 **since the utility's last filed Technical Potential Study. Specifically identify**
7 **any changes associated with changes to building code or appliance**
8 **efficiency standards.**

9 A. DEF, along with the other FEECA utilities, contracted with RI to develop a new
10 comprehensive TP study of all available demand-side conservation and energy
11 efficiency measures, including renewable energy systems, to support this goals
12 setting process. To maintain modeling consistency, DEF also contracted with
13 RI to develop the economic analysis and measure adoption forecasts of these
14 measures for the utility.

15

16 The FEECA utilities worked collaboratively with RI and interested parties to
17 develop a list of measures and assumptions for potential demand and energy
18 impacts for each of the measures included in the TP. The results of that effort
19 and a discussion of that process are included in the TP presented in Exhibit
20 JH-3 to Mr. Herndon's testimony. This report includes a summary of the
21 measures eliminated or added compared to the 2019 TP study and discusses

1 changes associated with updated building codes and standards and are
2 presented in Exhibit JH-9.

3

4 RI then developed the avoided cost assumptions for the base case (no carbon
5 dioxide pricing) and the high and low fuel sensitivities and carbon sensitivity as
6 identified in the OEP. The assumptions that support each of these cases are
7 provided in Mr. Herndon's testimony.

8

9 RI collected the cost-effectiveness of each measure included in the TP study
10 based on both a RIM and TRC evaluation. RI evaluated the cost-effectiveness
11 for the base case, the fuel sensitivities, and the 1 and 3-year payback
12 sensitivities for free ridership. The list of passing measures for the base case
13 and each sensitivity for the RIM and TRC scenarios was developed by RI for
14 the Economic ("EA") analysis. The list of passing measures for the base case
15 and each sensitivity are provided in Exhibit JH-9.

16

17 RI then performed the economic screening and developed the EA for the base
18 case and each of the sensitivities utilizing the results of the RIM and TRC
19 scenarios. Next, RI developed the measure adoption forecasts for customer
20 adoption and current known market conditions for the base case for both a RIM
21 and TRC portfolio. A detailed discussion of the process to develop the

1 economic screening and measure adoption forecasts is included in RI's TP
2 report.

3

4 DEF reviewed the results of the measure adoption forecasts for
5 reasonableness by comparing the results to historical actual achievements and
6 analyzing the potential impacts of changes in savings and incentive levels on
7 future participation for similar measures. Consistent with the methodology used
8 to develop the currently approved goals, DEF is proposing that Recommended
9 goals are based on a portfolio of programs which include RIM measures, a
10 modest number of TRC measures to enhance the comprehensiveness of the
11 programs, and the Company's two existing programs that target low-income
12 customers, which primarily include measures that are not cost-effective under
13 RIM or TRC. It is important to note that the total costs and benefits associated
14 with the portfolio of programs underlying the Recommended goals are cost-
15 effective under both RIM and TRC.

16

17 **Q. Please provide a description of how the utility's Base Case with no**
18 **incremental demand-side management was developed. This should**
19 **include forecasts for generation resources, customer winter and summer**
20 **demand and annual energy for load, and fuel prices based on the utility's**
21 **most recent planning process, as well as a discussion of the impacts**
22 **related to changes in Federal and State efficiency standards.**

1 A. The Base Case was developed using the same integrated resource planning
2 model and assumptions for customer winter and summer demand, annual
3 energy for load, and fuel prices that were the basis for the 2023 Ten Year Site
4 Plan filing with two exceptions. The first exception is that the Base Case
5 assumes no new DSM after 2023 and the second exception is that the Base
6 Case also excludes any costs for carbon dioxide emissions. This process
7 identified a portfolio of potential units required to meet future capacity
8 requirements. The next combustion turbine unit in DEF's resource plan was
9 identified as the avoided unit for purposes of evaluating the cost-effectiveness
10 of potential DSM measures. Please see Exhibit TD-4 for a summary of the
11 avoided cost assumptions resulting from this process. Resource planning and
12 forecasting includes changes related to Federal and State efficiency standards.
13 A discussion of the process and impacts is included in the 2023 Ten Year Site
14 Plan.

15
16 **Q. The Base Case should not include estimated costs associated with**
17 **carbon dioxide emissions, but utilities may provide sensitivities**
18 **including these costs. If included, provide a detailed description of how**
19 **the sensitivity was developed and compares to the Base Case, including**
20 **forecasts for fuel prices and emissions costs.**

21 A. As mentioned previously, the Base Case excludes any costs for carbon dioxide
22 emissions.

1

2 **Q. Provide a description of the Base Case’s next avoidable generating unit**
3 **and describe the methodology used to determine it. Utilities may provide**
4 **sensitivities with a different avoided unit, and if so, should describe it and**
5 **methodology used to select it.**

6 A. The next avoidable generating unit is a combustion turbine unit in the resource
7 plan and was identified as the avoided unit for purposes of evaluating the cost-
8 effectiveness of potential DSM measures. Please see Exhibit TD-4 for a
9 summary of the assumptions resulting from this process.

10

11 **Q. For the utility’s proposed goals, as well as for the goals developed under**
12 **the two cost-effectiveness scenarios as required by Rule 25-17.0021(3),**
13 **F.A.C., provide the estimated rate impact on residential 1,000 kWh/month**
14 **bill and a breakdown at the program level with demand and energy**
15 **savings, program costs and benefits, cost-effectiveness test results, list**
16 **of measures included, and participation rates.**

17 A. The residential bill impacts for the Updated proposed RIM programs, Updated
18 TRC programs, and Updated Recommended programs portfolios are
19 presented in Tables 2, 3, and 4 below. These impacts include the normal
20 components that comprise a residential bill, namely, base rates, recovery
21 clauses, customer charges, gross receipts taxes, and regulatory assessment
22 fees. These costs also include the costs for maintaining the existing level of

1 load management on the system, as well as the costs of residential and
2 commercial energy audits. The results of these analyses show an estimated
3 total cost for a 1000 kWh/month residential bill for the ten-year period for the
4 Updated RIM portfolio of \$22,365, the Updated TRC portfolio of \$22,415, and
5 the Updated Recommended portfolio of \$22,383. These differences are due
6 entirely to the differences in incentives and program management costs for the
7 energy efficiency programs. The assumptions for incentives and program
8 management costs for the demand response programs are the same in the
9 RIM, TRC, and the Recommended analyses. The Updated TRC portfolio cost
10 is 11% higher on average on an annual basis than the Updated RIM portfolio
11 cost. The Updated Recommended portfolio is 4% higher on average on an
12 annual basis than the Updated RIM portfolio costs and the Updated TRC
13 portfolio is 7% higher on average on an annual basis than the Recommended
14 portfolio costs. The updated projected annual RIM, TRC, and Recommended
15 portfolio costs along with the projected energy conservation clause recovery
16 rate for a residential 1000 kwh bill are provided in Exhibit TD-5.

17

18 Additionally, a break down at the program level with demand and energy
19 savings, program costs and benefits, and cost-effectiveness test results are
20 also provided in Exhibit TD-6 for the Updated proposed Recommended
21 Portfolio, Exhibit TD-7 for the Updated RIM Portfolio, and Exhibit TD-8 for the
22 Updated TRC Portfolio.

1

TABLE 2 UPDATED RIM PORTFOLIO PROJECTED ANNUAL RESIDENTIAL BILL - MONTHLY USAGE OF 1000 KWH										
Total	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
\$ 22,365	\$ 2,126	\$ 2,151	\$ 2,152	\$ 2,199	\$ 2,217	\$ 2,235	\$ 2,262	\$ 2,303	\$ 2,346	\$ 2,374

2

3

TABLE 3 UPDATED TRC PORTFOLIO PROJECTED ANNUAL RESIDENTIAL BILL - MONTHLY USAGE OF 1000 KWH										
Total	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
\$ 22,415	\$ 2,129	\$ 2,154	\$ 2,156	\$ 2,203	\$ 2,222	\$ 2,240	\$ 2,268	\$ 2,309	\$ 2,353	\$ 2,380

4

5

TABLE 4 UPDATED RECOMMENDED PORTFOLIO PROJECTED ANNUAL RESIDENTIAL BILL - MONTHLY USAGE OF 1000 KWH										
Total	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
\$ 22,383	\$ 2,128	\$ 2,152	\$ 2,153	\$ 2,201	\$ 2,219	\$ 2,237	\$ 2,264	\$ 2,304	\$ 2,348	\$ 2,376

6

7

8 **Q. Provide a description of the program development process and identify**
9 **measures excluded during each stage of the process and why. As part of**
10 **this description, identify restrictions, if any, on program design due to**
11 **current settlements, such as rebate amounts.**

12 A. The program development process and identification of measures excluded
13 during each stage are provided in the TP presented in Exhibit JH-10 to Mr.
14 Herndon's testimony.

15

16 **Q. For the utility's proposed goals, as well as for the goals developed under**
17 **the two cost-effectiveness scenarios as required by Rule 25-17.0021(3),**

1 **F.A.C., provide a description of how free ridership is addressed. If the**
2 **utility elects to use a payback period for free-ridership screening, provide**
3 **sensitivities on the payback period.**

4 A. The Updated proposed Recommended portfolio, as well as the RIM and TRC
5 portfolios, are based on measures that have greater than a two-year payback
6 period. A two-year payback period is a reasonable time period in which to limit
7 measures and assume that customers will adopt them absent a utility incentive.
8 As explained above, RI completed 1 and 3-year payback sensitivities for free
9 ridership.

10

11 **Q. Please provide a description on how supply-side efficiencies are**
12 **incorporated in the utility's most recent planning process and how**
13 **supply-side efficiencies impact demand-side management programs.**

14 A. DEF evaluates supply-side alternatives and develops the optimal plan as an
15 integral part of its Integrated Resource Planning ("IRP") process. DEF employs
16 the IRP process to determine the most cost-effective mix of supply and
17 demand-side alternatives that will reliably satisfy customers' future demand
18 and energy needs. DEF's IRP process evaluates a wide range of future
19 generation alternatives and cost-effective conservation and dispatchable
20 demand-side management programs on a consistent and integrated basis.
21 DEF develops projects that will contribute to the overall fleet efficiency and
22 screens these projects in the IRP process. DEF's IRP process includes

1 modeling for both capital optimization and production cost impacts. The
2 selected plans are identified based on the lowest overall life cycle costs
3 including operational efficiencies. The cost of demand-side projects is
4 measured against the avoided supply-side costs in determining program
5 measures that will achieve the most cost-effective integrated demand and
6 supply-side portfolio.

7

8 **Q. Provide a description of the efforts made to address customers who rent**
9 **in program development, including a list of programs they would be**
10 **eligible to participate in.**

11 A. Customers who rent are eligible to participate in all existing residential energy
12 efficiency programs and demand response programs offered by DEF.

13

14 The following is a list of DEF's Residential DSM programs that customers who
15 rent are eligible to participate in:

16

17 Home Energy Check - This residential energy audit program provides
18 customers with an analysis of their energy consumption as well as educational
19 information on how to save money by reducing energy usage. The program
20 offers a variety of options to customers for home energy audits including walk-
21 through, phone assisted, and online audits. At the completion of the audit, DEF

1 provides kits that contain energy saving measures that can be easily installed
2 by the customer.

3

4 Residential Incentive Program - This program provides incentives on a variety
5 of cost-effective measures designed to provide energy savings across different
6 housing types. It also provides customers with energy savings and demand
7 reduction through installation of energy efficient equipment.

8

9 Multi-Family New Builder Construction - DEF is proposing a new builder
10 construction bundle offering that would allow bundling of multi-family measures
11 through this program. This additional offering will allow builders to install energy
12 efficiency measures and provide them an opportunity to participate in
13 incentives.

14

15 Residential Load Management - This program is a direct load control program
16 that is designed to reduce DEF's demand during peak or emergency conditions
17 by temporarily interrupting service to selected customer electrical equipment.

18

19 Additionally, low-income/income qualified customers who rent are eligible to
20 participate in our Neighborhood Energy Saver and Low-Income Weatherization
21 Assistance Program programs.

22

1 In 2021, the Commission approved program modifications, and DEF increased
2 targeted low-income residential customers through its Neighborhood Energy
3 Saver (NES) program by 5% above the 2020 DSM Plan levels for calendar
4 years 2022-2024 (or an additional 250 customers). Also in 2021, DEF began
5 to provide Assistance Kits to low-income customers through its Home Energy
6 Check program. The Assistance Kits are available for up to 20,000 qualifying
7 low-income customers for calendar years 2022-2025. The kits contain a
8 number of measures that fail the two-year payback screen but provide energy
9 efficiency savings to low-income customers. These changes increased the
10 savings opportunity for low-income customers at no cost to program
11 participants.

12
13 Additionally, DEF's Updated Recommend Goals reflect a 10% increase in the
14 forecasted participation for the NES program and reflect an increase in the
15 forecasted installation rate of smart thermostats for NES participants from 10%
16 to 40%.

17
18 **Q. Provide a comparison of the programs used to determine the utility's**
19 **proposed Recommended goals to its current demand-side management**
20 **program offerings.**

21 A. The comparison of programs included in the utility's updated proposed
22 Recommended goals to its current demand-side management program

1 offerings is provided in the table below. As shown, DEF has dropped measures
 2 that no longer meet efficiency standards or have not been successful in the
 3 market, added measures that were needed and created a new bundling of
 4 measures targeting the multi-family sector to increase participation and the
 5 focus on efficiency opportunities available to tenants/landlords. The Multi
 6 Family New Builder Construction program seeks to avoid the split incentive
 7 barrier that has traditionally negatively impacted efforts to reach renters in
 8 multi-family properties by providing incentives to property managers and
 9 landlords to install efficiency on the front-end that will allow the energy savings
 10 to be realized by the renter population over time.

11

PROGRAMS	MEASURE COUNT		
EXISTING	EXISTING/KEEP	NEW	DROP
Business Energy Check	3		
Home Energy Check	13	1	
Low Income Weatherization	15	1	4
Neighborhood Energy Saver	18	3	3
Residential Incentive Program	14	3	3
Residential Load Management	3	2	
Smart \$aver Business	13	17	9
Smart \$aver Custom	2		
	81	27	19
ADDITIONAL	EXISTING/KEEP	NEW	DROP
New Builder Construction-MF	2	2	0
TOTAL	83	29	19

12

13

1 Additionally, DEF is proposing changes to the Interruptible General Service (IS)
 2 credit rate for IS-2 and IST-2 rate schedules, the Curtailable General Service
 3 (CS) credit rate for the CS-2, CS-3, CST-2, and CST-3 rate schedules, and the
 4 Standby Generation General Service (SBG) credit rate for the GSLM-2 rate
 5 schedule. These changes shall be in effect beginning with the first billing cycle
 6 of 2025 and will allow DEF to cost-effectively offer these important programs.

<u>Customer Type</u>	<u>Credit Level</u>
<u>IS</u>	<u>\$8.00/kw-month</u>
<u>CS</u>	<u>\$8.00/kw-month</u>
<u>GSLM-2</u>	<u>\$8.11 x C + \$0.10 x kwh monthly</u>

7
8
9
10
11
12

CONCLUSION

Q. What are the proposed Updated Recommended DSM goals that are reasonably achievable during the 2025-2034 period?

DUKE ENERGY FLORIDA - UPDATED RECOMMENDED GOALS 2025-2034 @generator			
	Winter Peak MWs	Summer Peak MWs	GWH's
Residential	331	215	527
Non-Residential	42	84	55
Total	373	300	582

13
14
15

1 **Q. Have these goals been determined through a sound and reasonable**
2 **process?**

3 A. Yes. These Updated proposed Recommended goals were determined after a
4 comprehensive analysis of the TP of all available demand-side and supply-side
5 conservation and efficiency measures, including demand-side renewable
6 energy systems, pursuant to Section 366.82.

7

8 **Q. Should Duke Energy Florida's proposed goals for 2025-2034 be**
9 **approved?**

10 A. Yes. Duke Energy Florida's Updated proposed Recommended goals were
11 developed consistent with the requirements of both the rules and the statute,
12 are cost-effective, and are reasonably achievable.

13

14 **Q. Does this conclude your testimony?**

15 A. Yes, this concludes my testimony.

**DUKE ENERGY FLORIDA'S
UPDATED RESIDENTIAL AND NON-RESIDENTIAL ANNUAL POTENTIAL
RIM PORTFOLIO EVALUATION FOR 2025-2034 AT THE GENERATOR**

2025-2034 Annual Goals									
RIM Annual Goals (values at the generator)									
	Residential			Non-Residential			Total		
	WMW	SMW	GWH'S	WMW	SMW	GWH'S	WMW	SMW	GWH'S
2025	21	12	28	4	7	5	25	19	33
2026	22	12	28	3	7	5	25	19	33
2027	22	12	29	4	9	6	27	21	34
2028	23	12	29	4	9	6	27	21	35
2029	23	12	30	4	10	7	28	22	37
2030	22	12	29	4	9	6	26	21	36
2031	22	12	30	4	8	6	26	21	35
2032	22	12	30	5	8	5	27	21	35
2033	22	12	30	5	8	4	27	20	35
2034	22	12	31	5	8	4	27	20	35
TOTAL	221	121	294	42	84	55	263	205	349

RIM ANNUAL GOALS EE AND DR @ Generator																		
	RES EE			RES DR			RES TOTAL			NON-RES EE			NON-RES DR			NON-RES TOTAL		
	WMW	SMW	GWH'S	WMW	SMW	GWH'S	WMW	SMW	GWH'S	WMW	SMW	GWH'S	WMW	SMW	GWH'S	WMW	SMW	GWH'S
2025	16	8	28	5	4	0	21	12	28	0	4	5	3	4	0	4	7	5
2026	16	8	28	5	4	0	22	12	28	0	4	5	3	3	0	3	7	5
2027	17	8	29	5	4	0	22	12	29	0	4	6	4	5	0	4	9	6
2028	17	8	29	5	4	0	23	12	29	0	5	6	4	4	0	4	9	6
2029	18	9	30	5	4	0	23	12	30	0	5	7	4	5	0	4	10	7
2030	17	8	29	5	4	0	22	12	29	0	4	6	4	5	0	4	9	6
2031	17	8	30	5	4	0	22	12	30	0	4	6	4	5	0	4	8	6
2032	17	8	30	5	4	0	22	12	30	0	3	5	4	5	0	5	8	5
2033	17	9	30	5	4	0	22	12	30	0	3	4	4	5	0	5	8	4
2034	17	9	31	5	4	0	22	12	31	0	2	4	4	5	0	5	8	4
TOTAL	168	84	294	53	37	0	221	121	294	3	39	55	39	46	0	42	84	55

**DUKE ENERGY FLORIDA'S
UPDATED RESIDENTIAL AND NON-RESIDENTIAL ANNUAL POTENTIAL
TRC PORTFOLIO EVALUATION FOR 2025-2034 AT THE GENERATOR**

2025-2034 Annual Goals									
TRC Annual Goals (values at the generator)									
	Residential			Non-Residential			Total		
	WMW	SMW	GWH'S	WMW	SMW	GWH'S	WMW	SMW	GWH'S
2025	32	16	40	7	11	17	39	27	57
2026	35	17	43	7	11	17	41	27	59
2027	37	18	45	8	12	17	45	30	62
2028	39	19	48	7	12	18	47	31	65
2029	42	20	51	8	13	18	50	33	69
2030	45	21	54	7	13	18	52	34	72
2031	47	22	57	7	12	17	54	34	74
2032	48	23	59	8	13	17	56	35	76
2033	49	23	60	8	12	17	56	35	77
2034	49	23	59	8	12	17	56	35	76
TOTAL	422	200	514	74	122	173	496	322	688

TRC ANNUAL GOALS EE AND DR																		
	RES EE			RES DR			RES TOTAL			NON-RES EE			NON-RES DR			NON-RES TOTAL		
	WMW	SMW	GWH'S	WMW	SMW	GWH'S	WMW	SMW	GWH'S	WMW	SMW	GWH'S	WMW	SMW	GWH'S	WMW	SMW	GWH'S
2025	27	12	40	5	4	0	32	16	40	4	7	17	3	4	0	7	11	17
2026	29	13	43	5	4	0	35	17	43	4	7	17	3	3	0	7	11	17
2027	32	14	45	5	4	0	37	18	45	4	8	17	4	5	0	8	12	17
2028	34	15	48	5	4	0	39	19	48	4	8	18	4	4	0	7	12	18
2029	37	16	51	5	4	0	42	20	51	4	8	18	4	5	0	8	13	18
2030	40	17	54	5	4	0	45	21	54	3	8	18	4	5	0	7	13	18
2031	42	18	57	5	4	0	47	22	57	3	8	17	4	5	0	7	12	17
2032	43	19	59	5	4	0	49	23	59	3	7	17	4	5	0	8	13	17
2033	44	19	60	5	4	0	49	23	60	3	7	17	4	5	0	8	12	17
2034	43	19	59	5	4	0	48	23	59	3	7	17	4	5	0	8	12	17
TOTAL	370	163	514	53	37	0	424	200	514	35	76	173	39	46	0	74	122	173

**DUKE ENERGY FLORIDA
UPDATED RESIDENTIAL AND NON-RESIDENTIAL ANNUAL POTENTIAL
RECOMMENDED PORTFOLIO EVALUATION FOR 2025-2034 AT THE
GENERATOR**

2025-2034 Annual Goals									
Recommended Annual Goals (values at the generator)									
	Residential			Non-Residential			Total		
	WMW	SMW	GWH'S	WMW	SMW	GWH'S	WMW	SMW	GWH'S
2025	32	21	50	4	7	5	35	28	55
2026	32	21	51	3	7	5	35	28	56
2027	33	22	52	4	9	6	38	31	58
2028	34	22	53	4	9	6	38	31	59
2029	34	22	54	4	10	7	39	32	61
2030	33	22	53	4	9	6	37	31	59
2031	33	22	53	4	8	6	37	30	59
2032	33	22	54	5	8	5	38	30	59
2033	33	22	54	5	8	4	38	30	58
2034	33	22	54	5	8	4	38	29	58
TOTAL	331	215	527	42	84	55	373	300	582

RECOMMENDED ANNUAL GOALS EE AND DR (values at generator)																		
	RES EE			RES DR			RES TOTAL			NON-RES EE			NON-RES DR			NON-RES TOTAL		
	WMW	SMW	GWH'S	WMW	SMW	GWH'S	WMW	SMW	GWH'S	WMW	SMW	GWH'S	WMW	SMW	GWH'S	WMW	SMW	GWH'S
2025	27	17	50	5	4	0	32	21	50	0	4	5	3	4	0	4	7	5
2026	27	17	51	5	4	0	32	21	51	0	4	5	3	3	0	3	7	5
2027	28	18	52	5	4	0	33	22	52	0	4	6	4	5	0	4	9	6
2028	28	18	53	5	4	0	34	22	53	0	5	6	4	4	0	4	9	6
2029	29	18	54	5	4	0	34	22	54	0	5	7	4	5	0	4	10	7
2030	28	18	53	5	4	0	33	22	53	0	4	6	4	5	0	4	9	6
2031	28	18	53	5	4	0	33	22	53	0	4	6	4	5	0	4	8	6
2032	28	18	54	5	4	0	33	22	54	0	3	5	4	5	0	5	8	5
2033	28	18	54	5	4	0	33	22	54	0	3	4	4	5	0	5	8	4
2034	28	18	54	5	4	0	33	22	54	0	2	4	4	5	0	5	8	4
TOTAL	277	179	527	53	37	0	331	215	527	3	39	55	39	46	0	42	84	55

**DUKE ENERGY FLORIDA'S
AVOIDED GENERATION ASSUMPTIONS**

GT Brownfield- COMBUSTION TURBINE		Unit 1
(1) Base Year		2023
(2) In Service Year for Avoided Generation Unit		1-Jun-2029
(3) Winter Capacity	MW	234.6
(4) Base Year Avoided Generating Unit Cost (including transmission upgrade cost)	\$/KW	735.2
(5) Generator Cost Escalation Rate - 2023 to 2032		-1.09%
(5) Generator Cost Escalation Rate - 2033 to 2042		1.78%
(6) Generator Fixed O&M Cost (including non-escalating gas pipeline reservation cost)	\$/kw-year	77.3
(7) Generator Fixed O&M Cost Escalation Rate		2.50%
(8) Avoided Gen Unit Variable O&M Cost	c/Kwh	0.45
(9) Generator Variable O&M Cost Escalation Rate		2.50%
(10) Generator Capacity Factor		2.32%
(11) Avoided Generating Unit Fuel Cost	c/Kwh	5.82
(12) Avoided Generating Unit Fuel Escalation Rate		0.60%

GT Brownfield- COMBUSTION TURBINE		Unit 2
(1) Base Year		2023
(2) In Service Year for Avoided Generation Unit		1-Jun-2032
(3) Winter Capacity	MW	234.6
(4) Base Year Avoided Generating Unit Cost (including transmission upgrade cost)	\$/KW	735.2
(5) Generator Cost Escalation Rate - 2023 to 2032		-1.09%
(5) Generator Cost Escalation Rate - 2033 to 2042		1.78%
(6) Generator Fixed O&M Cost (including non-escalating gas pipeline reservation cost)	\$/kw-year	83.3
(7) Generator Fixed O&M Cost Escalation Rate		2.50%
(8) Avoided Gen Unit Variable O&M Cost	c/Kwh	0.48
(9) Generator Variable O&M Cost Escalation Rate		2.50%
(10) Generator Capacity Factor		2.32%
(11) Avoided Generating Unit Fuel Cost	c/Kwh	5.87
(12) Avoided Generating Unit Fuel Escalation Rate		0.60%

GT Avg- COMBUSTION TURBINE		Units 3 and 4
(1) Base Year		2023
(2) In Service Year for Avoided Generation Unit		1-Jun-2034
(3) Winter Capacity	MW	234.6
(4) Base Year Avoided Generating Unit Cost (including transmission upgrade cost)	\$/KW	949.4
(5) Generator Cost Escalation Rate - 2023 to 2032		-1.09%
(5) Generator Cost Escalation Rate - 2033 to 2042		1.78%
(6) Generator Fixed O&M Cost (including non-escalating gas pipeline reservation cost)	\$/kw-year	89.5
(7) Generator Fixed O&M Cost Escalation Rate		2.50%
(8) Avoided Gen Unit Variable O&M Cost	c/Kwh	0.52
(9) Generator Variable O&M Cost Escalation Rate		2.50%
(10) Generator Capacity Factor		2.32%
(11) Avoided Generating Unit Fuel Cost	c/Kwh	6.22
(12) Avoided Generating Unit Fuel Escalation Rate		0.60%

Note: all the fixed cost, variable and fuel costs are nominal dollar value in the first year when Unit is in service

**DUKE ENERGY FLORIDA'S
UPDATED PROJECTED TOTAL PORTFOLIO COSTS AND
RESIDENTIAL RATE IMPACTS**

UPDATED PROJECTED TOTAL PORTFOLIO COSTS AND RESIDENTIAL RATE IMPACTS - RIM, TRC, RECOMMENDED											
	\$/Millions										
	TOTAL	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
RIM Projected Total Costs	\$ 1,427.9	\$ 137.9	\$ 147.9	\$ 156.3	\$ 158.4	\$ 137.7	\$ 137.2	\$ 137.5	\$ 137.9	\$ 138.3	\$ 138.8
Residential Rate \$/1000 kWh	-	\$ 3.79	\$ 4.08	\$ 4.31	\$ 4.33	\$ 3.74	\$ 3.69	\$ 3.66	\$ 3.62	\$ 3.59	\$ 3.55
TRC Projected Total Costs	\$ 1,583.8	\$ 146.3	\$ 158.9	\$ 168.2	\$ 172.1	\$ 152.7	\$ 154.1	\$ 156.0	\$ 157.9	\$ 158.8	\$ 158.8
Residential Rate \$/1000 kWh	-	\$ 4.02	\$ 4.38	\$ 4.64	\$ 4.71	\$ 4.15	\$ 4.15	\$ 4.16	\$ 4.15	\$ 4.12	\$ 4.06
Difference in Total Costs	\$ 155.9	\$ 8.4	\$ 11.0	\$ 11.9	\$ 13.7	\$ 15.0	\$ 16.9	\$ 18.6	\$ 20.0	\$ 20.5	\$ 19.9
Difference in Res Rate \$/1000 kWh		0.23	0.30	0.33	0.38	0.41	0.46	0.49	0.53	0.53	0.51
Percent Difference TRC vs RIM	11%	6%	7%	8%	9%	11%	12%	14%	15%	15%	14%
RECOMMENDED Projected Total Costs	\$ 1,483.5	\$ 143.0	\$ 153.4	\$ 161.5	\$ 164.1	\$ 143.4	\$ 142.9	\$ 143.2	\$ 143.6	\$ 144.0	\$ 144.5
Residential Rate \$/1000 kWh		\$ 3.93	\$ 4.23	\$ 4.46	\$ 4.49	\$ 3.90	\$ 3.85	\$ 3.81	\$ 3.77	\$ 3.74	\$ 3.70
Difference in Total Costs	\$ 55.6	\$ 5.1	\$ 5.5	\$ 5.2	\$ 5.7	\$ 5.7	\$ 5.7	\$ 5.7	\$ 5.7	\$ 5.7	\$ 5.7
Difference in Res Rate \$/1000 kWh		0.14	0.15	0.14	0.16	0.15	0.15	0.15	0.15	0.15	0.14
Percent Difference RECOMMENDED vs RIM	4%	4%	4%	3%	4%	4%	4%	4%	4%	4%	4%
Difference in Total Costs	\$ 100.3	\$ 3.3	\$ 5.6	\$ 6.7	\$ 8.0	\$ 9.3	\$ 11.2	\$ 12.9	\$ 14.3	\$ 14.8	\$ 14.3
Difference in Res Rate \$/1000 kWh		0.09	0.15	0.18	0.22	0.25	0.30	0.34	0.38	0.38	0.37
Percent Difference TRC vs RECOMMENDED	7%	2%	4%	4%	5%	6%	8%	9%	10%	10%	10%

UPDATED RIM, TRC & PARTICIPANT TESTS BENEFITS & COST ANALYSIS FOR ALL PROGRAMS FOR ALL PORTFOLIOS

PROGRAM: Residential Incentive Program RIP									
Rate Impact Measure (RIM) Test									
	BENEFITS				COSTS				(9)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
	TOTAL	AVOIDED	AVOIDED		UTILITY				
	FUEL & O&M	T&D CAP.	GEN. CAP.	TOTAL	PROGRAM	INCENTIVE	REVENUE	TOTAL	NET
	SAVINGS	COSTS	COSTS	BENEFITS	COSTS	PAYMENTS	LOSSES	COSTS	BENEFITS
YEAR	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)
2025	401	1,236	0	1,637	1,290	5,337	1,211	7,837	-6,200
2026	804	2,579	0	3,382	1,314	5,423	2,461	9,199	-5,817
2027	1,204	4,037	0	5,241	1,343	5,525	3,715	10,583	-5,342
2028	1,706	5,624	0	7,330	1,378	5,645	5,135	12,158	-4,828
2029	2,107	7,346	8,733	18,185	1,413	5,774	6,581	13,768	4,417
2030	2,391	8,838	10,238	21,466	1,188	4,776	7,813	13,777	7,689
2031	2,641	10,333	11,665	24,638	1,129	4,537	9,049	14,715	9,923
2032	2,877	11,832	11,742	26,451	1,072	4,310	10,325	15,708	10,743
2033	3,302	13,335	13,016	29,653	1,019	4,095	11,606	16,719	12,934
2034	3,767	14,845	16,618	35,230	968	3,890	12,782	17,639	17,590
2035	3,992	15,216	16,772	35,980	0	0	12,949	12,949	23,031
2036	4,280	15,597	16,929	36,805	0	0	13,309	13,309	23,496
2037	4,464	15,986	17,089	37,539	0	0	13,766	13,766	23,773
2038	4,682	16,386	17,252	38,320	0	0	13,980	13,980	24,340
2039	4,946	16,796	17,418	39,160	0	0	14,319	14,319	24,840
2040	4,996	17,209	17,580	39,785	0	0	14,555	14,555	25,230
2041	4,867	16,718	16,825	38,411	0	0	14,496	14,496	23,914
2042	5,008	16,155	16,018	37,181	0	0	14,505	14,505	22,676
2043	5,020	15,504	15,146	35,670	0	0	14,387	14,387	21,283
2044	5,023	14,765	14,213	34,001	0	0	14,249	14,249	19,752
2045	4,840	13,384	12,696	30,921	0	0	13,591	13,591	17,329
2046	4,657	12,152	11,361	28,170	0	0	12,944	12,944	15,225
2047	4,451	10,868	10,013	25,331	0	0	12,248	12,248	13,083
2048	4,222	9,527	8,652	22,401	0	0	11,503	11,503	10,898
2049	3,966	8,124	7,271	19,361	0	0	10,699	10,699	8,662
2050	3,762	6,868	6,059	16,689	0	0	10,048	10,048	6,641
2051	3,692	6,459	5,617	15,769	0	0	9,765	9,765	6,003
2052	3,623	6,056	5,190	14,869	0	0	9,489	9,489	5,380
2053	3,560	5,664	4,785	14,009	0	0	9,231	9,231	4,778
2054	3,498	5,276	4,394	13,168	0	0	8,979	8,979	4,188
2055	3,235	4,826	3,962	12,023	0	0	8,221	8,221	3,802
2056	2,946	4,349	3,519	10,815	0	0	7,414	7,414	3,401
2057	2,630	3,841	3,064	9,534	0	0	6,552	6,552	2,982
2058	2,280	3,294	2,591	8,165	0	0	5,624	5,624	2,541
2059	1,896	2,712	2,102	6,710	0	0	4,632	4,632	2,079
2060	1,531	2,165	1,655	5,351	0	0	3,701	3,701	1,649
2061	1,158	1,621	1,221	4,001	0	0	2,774	2,774	1,227
2062	780	1,079	801	2,660	0	0	1,848	1,848	812
2063	394	539	395	1,327	0	0	924	924	403
2064	0	0	0	0	0	0	0	0	0
NOMINAL	125,597	349,141	332,600	807,337	12,114	49,311	361,380	422,805	384,532
NPV	43,044	137,766	129,836	310,646	9,335	38,076	130,024	177,435	133,211
Utility Discount Rate = 6.83%									
Benefit Cost Ratio = 1.751									

PROGRAM:	Residential Incentive Program			RIP					
Total Resource Cost (TRC) Test									
	BENEFITS				COSTS				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
	TOTAL	AVOIDED	AVOIDED		UTILITY				
	FUEL & O&M	T&D CAP.	GEN. CAP.	TOTAL	PROGRAM	PARTICIPANTS	TOTAL	NET	
	SAVINGS	COSTS	COSTS	BENEFITS	COSTS	COST	COSTS	BENEFITS	
YEAR	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	
2025	401	1,236	0	1,637	1,290	9,886	11,176	-9,538	
2026	804	2,579	0	3,382	1,314	10,001	11,315	-7,933	
2027	1,204	4,037	0	5,241	1,343	10,144	11,487	-6,246	
2028	1,706	5,624	0	7,330	1,378	10,321	11,699	-4,369	
2029	2,107	7,346	8,733	18,185	1,413	10,514	11,927	6,258	
2030	2,391	8,838	10,238	21,466	1,188	8,773	9,961	11,506	
2031	2,641	10,333	11,665	24,638	1,129	8,334	9,463	15,175	
2032	2,877	11,832	11,742	26,451	1,072	7,917	8,990	17,461	
2033	3,302	13,335	13,016	29,653	1,019	7,521	8,540	21,113	
2034	3,767	14,845	16,618	35,230	968	7,145	8,113	27,116	
2035	3,992	15,216	16,772	35,980	0	0	0	35,980	
2036	4,280	15,597	16,929	36,805	0	0	0	36,805	
2037	4,464	15,986	17,089	37,539	0	0	0	37,539	
2038	4,682	16,386	17,252	38,320	0	0	0	38,320	
2039	4,946	16,796	17,418	39,160	0	0	0	39,160	
2040	4,996	17,209	17,580	39,785	0	0	0	39,785	
2041	4,867	16,718	16,825	38,411	0	0	0	38,411	
2042	5,008	16,155	16,018	37,181	0	0	0	37,181	
2043	5,020	15,504	15,146	35,670	0	0	0	35,670	
2044	5,023	14,765	14,213	34,001	0	0	0	34,001	
2045	4,840	13,384	12,696	30,921	0	0	0	30,921	
2046	4,657	12,152	11,361	28,170	0	0	0	28,170	
2047	4,451	10,868	10,013	25,331	0	0	0	25,331	
2048	4,222	9,527	8,652	22,401	0	0	0	22,401	
2049	3,966	8,124	7,271	19,361	0	0	0	19,361	
2050	3,762	6,868	6,059	16,689	0	0	0	16,689	
2051	3,692	6,459	5,617	15,769	0	0	0	15,769	
2052	3,623	6,056	5,190	14,869	0	0	0	14,869	
2053	3,560	5,664	4,785	14,009	0	0	0	14,009	
2054	3,498	5,276	4,394	13,168	0	0	0	13,168	
2055	3,235	4,826	3,962	12,023	0	0	0	12,023	
2056	2,946	4,349	3,519	10,815	0	0	0	10,815	
2057	2,630	3,841	3,064	9,534	0	0	0	9,534	
2058	2,280	3,294	2,591	8,165	0	0	0	8,165	
2059	1,896	2,712	2,102	6,710	0	0	0	6,710	
2060	1,531	2,165	1,655	5,351	0	0	0	5,351	
2061	1,158	1,621	1,221	4,001	0	0	0	4,001	
2062	780	1,079	801	2,660	0	0	0	2,660	
2063	394	539	395	1,327	0	0	0	1,327	
2064	0	0	0	0	0	0	0	0	
NOMINAL	125,597	349,141	332,600	807,337	12,114	90,557	102,671	704,666	
NPV	43,044	137,766	129,836	310,646	9,335	69,947	79,282	231,364	
Utility Discount Rate = 6.83%									
Benefit Cost Ratio = 3.918									

PROGRAM:	Residential Incentive Program			RIP				
Participant Test								
	BENEFITS				COSTS			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
	SAVINGS IN		OTHER					
	PARTICIPANT'S	INCENTIVE	PARTICIPANT'S	TOTAL	PARTICIPANT'S	TOTAL	NET	
	BILL	PAYMENTS	BENEFITS	BENEFITS	COST	COSTS	BENEFITS	
YEAR	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	
2025	1,211	5,337	0	6,548	9,886	9,886	-3,338	
2026	2,461	5,423	0	7,885	10,001	10,001	-2,116	
2027	3,715	5,525	0	9,240	10,144	10,144	-904	
2028	5,135	5,645	0	10,780	10,321	10,321	459	
2029	6,581	5,774	0	12,355	10,514	10,514	1,841	
2030	7,813	4,776	0	12,589	8,773	8,773	3,816	
2031	9,049	4,537	0	13,586	8,334	8,334	5,252	
2032	10,325	4,310	0	14,635	7,917	7,917	6,718	
2033	11,606	4,095	0	15,700	7,521	7,521	8,179	
2034	12,782	3,890	0	16,671	7,145	7,145	9,526	
2035	12,949	0	0	12,949	0	0	12,949	
2036	13,309	0	0	13,309	0	0	13,309	
2037	13,766	0	0	13,766	0	0	13,766	
2038	13,980	0	0	13,980	0	0	13,980	
2039	14,319	0	0	14,319	0	0	14,319	
2040	14,555	0	0	14,555	0	0	14,555	
2041	14,496	0	0	14,496	0	0	14,496	
2042	14,505	0	0	14,505	0	0	14,505	
2043	14,387	0	0	14,387	0	0	14,387	
2044	14,249	0	0	14,249	0	0	14,249	
2045	13,591	0	0	13,591	0	0	13,591	
2046	12,944	0	0	12,944	0	0	12,944	
2047	12,248	0	0	12,248	0	0	12,248	
2048	11,503	0	0	11,503	0	0	11,503	
2049	10,699	0	0	10,699	0	0	10,699	
2050	10,048	0	0	10,048	0	0	10,048	
2051	9,765	0	0	9,765	0	0	9,765	
2052	9,489	0	0	9,489	0	0	9,489	
2053	9,231	0	0	9,231	0	0	9,231	
2054	8,979	0	0	8,979	0	0	8,979	
2055	8,221	0	0	8,221	0	0	8,221	
2056	7,414	0	0	7,414	0	0	7,414	
2057	6,552	0	0	6,552	0	0	6,552	
2058	5,624	0	0	5,624	0	0	5,624	
2059	4,632	0	0	4,632	0	0	4,632	
2060	3,701	0	0	3,701	0	0	3,701	
2061	2,774	0	0	2,774	0	0	2,774	
2062	1,848	0	0	1,848	0	0	1,848	
2063	924	0	0	924	0	0	924	
2064	0	0	0	0	0	0	0	
NOMINAL	361,380	49,311	0	410,691	90,557	90,557	320,134	
NPV	130,024	38,076	0	168,100	69,947	69,947	98,154	
Utility Discount Rate = 6.83%								
Benefit Cost Ratio = 2.403								

PROGRAM: New Builder Construction-MF MFNBC									
Rate Impact Measure (RIM) Test									
	BENEFITS				COSTS				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
	TOTAL	AVOIDED	AVOIDED		UTILITY				
	FUEL & O&M	T&D CAP.	GEN. CAP.	TOTAL	PROGRAM	INCENTIVE	REVENUE	TOTAL	NET
	SAVINGS	COSTS	COSTS	BENEFITS	COSTS	PAYMENTS	LOSSES	COSTS	BENEFITS
YEAR	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)
2025	168	268	0	436	542	537	508	1,587	-1,151
2026	361	593	0	955	552	627	1,108	2,286	-1,332
2027	575	974	0	1,549	562	704	1,774	3,040	-1,491
2028	855	1,406	0	2,260	573	754	2,573	3,900	-1,640
2029	1,123	1,922	2,286	5,331	584	854	3,508	4,946	385
2030	1,403	2,525	2,926	6,854	595	941	4,585	6,121	733
2031	1,704	3,220	3,636	8,561	606	1,029	5,843	7,478	1,083
2032	2,039	4,013	3,984	10,035	618	1,118	7,319	9,054	981
2033	2,560	4,910	4,794	12,264	629	1,207	9,003	10,839	1,425
2034	3,186	5,918	6,627	15,732	641	1,296	10,817	12,754	2,977
2035	3,376	6,066	6,689	16,131	0	0	10,958	10,958	5,173
2036	3,620	6,218	6,751	16,589	0	0	11,263	11,263	5,326
2037	3,776	6,373	6,815	16,964	0	0	11,650	11,650	5,314
2038	3,960	6,532	6,880	17,373	0	0	11,831	11,831	5,542
2039	4,184	6,696	6,946	17,826	0	0	12,118	12,118	5,708
2040	4,233	6,863	7,014	18,110	0	0	12,337	12,337	5,773
2041	4,241	6,963	7,011	18,215	0	0	12,638	12,638	5,577
2042	4,493	7,056	6,999	18,549	0	0	13,018	13,018	5,530
2043	4,646	7,145	6,984	18,775	0	0	13,321	13,321	5,453
2044	4,804	7,234	6,967	19,005	0	0	13,633	13,633	5,372
2045	4,727	6,989	6,633	18,348	0	0	13,279	13,279	5,069
2046	4,604	6,681	6,250	17,535	0	0	12,801	12,801	4,733
2047	4,429	6,309	5,816	16,554	0	0	12,192	12,192	4,362
2048	4,198	5,866	5,331	15,396	0	0	11,441	11,441	3,955
2049	3,866	5,297	4,745	13,908	0	0	10,432	10,432	3,476
2050	3,423	4,591	4,054	12,068	0	0	9,145	9,145	2,923
2051	2,869	3,818	3,323	10,009	0	0	7,587	7,587	2,422
2052	2,181	2,889	2,479	7,549	0	0	5,712	5,712	1,837
2053	1,350	1,795	1,518	4,663	0	0	3,499	3,499	1,164
2054	360	525	437	1,323	0	0	925	925	398
2055	350	506	415	1,271	0	0	890	890	381
2056	327	467	378	1,172	0	0	823	823	350
2057	292	413	330	1,035	0	0	728	728	307
2058	255	356	280	891	0	0	629	629	263
2059	214	296	230	740	0	0	523	523	217
2060	173	237	181	590	0	0	418	418	172
2061	131	177	133	441	0	0	313	313	128
2062	88	118	88	294	0	0	209	209	85
2063	44	59	43	146	0	0	104	104	42
2064	0	0	0	0	0	0	0	0	0
NOMINAL	89,188	140,286	135,975	365,449	5,901	9,066	261,459	276,426	89,023
NPV	32,285	53,011	51,360	136,656	4,418	6,513	97,886	108,816	27,839
Utility Discount Rate = 6.83%									
Benefit Cost Ratio = 1.256									

PROGRAM:	New Builder Construction-MF			MFNBC					
Total Resource Cost (TRC) Test									
	BENEFITS				COSTS				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
	TOTAL	AVOIDED	AVOIDED		UTILITY				
	FUEL & O&M	T&D CAP.	GEN. CAP.	TOTAL	PROGRAM	PARTICIPANTS	TOTAL	NET	
	SAVINGS	COSTS	COSTS	BENEFITS	COSTS	COST	COSTS	BENEFITS	
YEAR	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)
2025	168	268	0	436	542	1,281	1,823	-1,386	
2026	361	593	0	955	552	1,483	2,035	-1,080	
2027	575	974	0	1,549	562	1,667	2,229	-680	
2028	855	1,406	0	2,260	573	1,814	2,387	-127	
2029	1,123	1,922	2,286	5,331	584	2,110	2,693	2,637	
2030	1,403	2,525	2,926	6,854	595	2,388	2,982	3,871	
2031	1,704	3,220	3,636	8,561	606	2,667	3,273	5,288	
2032	2,039	4,013	3,984	10,035	618	2,946	3,564	6,471	
2033	2,560	4,910	4,794	12,264	629	3,227	3,856	8,408	
2034	3,186	5,918	6,627	15,732	641	3,508	4,149	11,582	
2035	3,376	6,066	6,689	16,131	0	0	0	16,131	
2036	3,620	6,218	6,751	16,589	0	0	0	16,589	
2037	3,776	6,373	6,815	16,964	0	0	0	16,964	
2038	3,960	6,532	6,880	17,373	0	0	0	17,373	
2039	4,184	6,696	6,946	17,826	0	0	0	17,826	
2040	4,233	6,863	7,014	18,110	0	0	0	18,110	
2041	4,241	6,963	7,011	18,215	0	0	0	18,215	
2042	4,493	7,056	6,999	18,549	0	0	0	18,549	
2043	4,646	7,145	6,984	18,775	0	0	0	18,775	
2044	4,804	7,234	6,967	19,005	0	0	0	19,005	
2045	4,727	6,989	6,633	18,348	0	0	0	18,348	
2046	4,604	6,681	6,250	17,535	0	0	0	17,535	
2047	4,429	6,309	5,816	16,554	0	0	0	16,554	
2048	4,198	5,866	5,331	15,396	0	0	0	15,396	
2049	3,866	5,297	4,745	13,908	0	0	0	13,908	
2050	3,423	4,591	4,054	12,068	0	0	0	12,068	
2051	2,869	3,818	3,323	10,009	0	0	0	10,009	
2052	2,181	2,889	2,479	7,549	0	0	0	7,549	
2053	1,350	1,795	1,518	4,663	0	0	0	4,663	
2054	360	525	437	1,323	0	0	0	1,323	
2055	350	506	415	1,271	0	0	0	1,271	
2056	327	467	378	1,172	0	0	0	1,172	
2057	292	413	330	1,035	0	0	0	1,035	
2058	255	356	280	891	0	0	0	891	
2059	214	296	230	740	0	0	0	740	
2060	173	237	181	590	0	0	0	590	
2061	131	177	133	441	0	0	0	441	
2062	88	118	88	294	0	0	0	294	
2063	44	59	43	146	0	0	0	146	
2064	0	0	0	0	0	0	0	0	
NOMINAL	89,188	140,286	135,975	365,449	5,901	23,091	28,992	336,457	
NPV	32,285	53,011	51,360	136,656	4,418	16,441	20,859	115,797	
Utility Discount Rate = 6.83%									
Benefit Cost Ratio = 6.551									

PROGRAM:	New Builder Construction-MF			MFNBC				
Participant Test								
BENEFITS					COSTS			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
	SAVINGS IN		OTHER					
	PARTICIPANT'S	INCENTIVE	PARTICIPANT'S	TOTAL	PARTICIPANT'S	TOTAL	NET	
	BILL	PAYMENTS	BENEFITS	BENEFITS	COST	COSTS	BENEFITS	
YEAR	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)
2025	508	537	0	1,046	1,281	1,281	-236	
2026	1,108	627	0	1,735	1,483	1,483	252	
2027	1,774	704	0	2,478	1,667	1,667	811	
2028	2,573	754	0	3,327	1,814	1,814	1,512	
2029	3,508	854	0	4,362	2,110	2,110	2,253	
2030	4,585	941	0	5,526	2,388	2,388	3,139	
2031	5,843	1,029	0	6,872	2,667	2,667	4,205	
2032	7,319	1,118	0	8,436	2,946	2,946	5,490	
2033	9,003	1,207	0	10,210	3,227	3,227	6,983	
2034	10,817	1,296	0	12,113	3,508	3,508	8,605	
2035	10,958	0	0	10,958	0	0	10,958	
2036	11,263	0	0	11,263	0	0	11,263	
2037	11,650	0	0	11,650	0	0	11,650	
2038	11,831	0	0	11,831	0	0	11,831	
2039	12,118	0	0	12,118	0	0	12,118	
2040	12,337	0	0	12,337	0	0	12,337	
2041	12,638	0	0	12,638	0	0	12,638	
2042	13,018	0	0	13,018	0	0	13,018	
2043	13,321	0	0	13,321	0	0	13,321	
2044	13,633	0	0	13,633	0	0	13,633	
2045	13,279	0	0	13,279	0	0	13,279	
2046	12,801	0	0	12,801	0	0	12,801	
2047	12,192	0	0	12,192	0	0	12,192	
2048	11,441	0	0	11,441	0	0	11,441	
2049	10,432	0	0	10,432	0	0	10,432	
2050	9,145	0	0	9,145	0	0	9,145	
2051	7,587	0	0	7,587	0	0	7,587	
2052	5,712	0	0	5,712	0	0	5,712	
2053	3,499	0	0	3,499	0	0	3,499	
2054	925	0	0	925	0	0	925	
2055	890	0	0	890	0	0	890	
2056	823	0	0	823	0	0	823	
2057	728	0	0	728	0	0	728	
2058	629	0	0	629	0	0	629	
2059	523	0	0	523	0	0	523	
2060	418	0	0	418	0	0	418	
2061	313	0	0	313	0	0	313	
2062	209	0	0	209	0	0	209	
2063	104	0	0	104	0	0	104	
2064	0	0	0	0	0	0	0	
NOMINAL	261,459	9,066	0	270,525	23,091	23,091	247,434	
NPV	97,886	6,513	0	104,399	16,441	16,441	87,958	
Utility Discount Rate = 6.83%								
Benefit Cost Ratio = 6.350								

PROGRAM: Neighborhood Energy Saver NES									
Rate Impact Measure (RIM) Test									
	BENEFITS				COSTS				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	TOTAL	AVOIDED	AVOIDED		UTILITY				
	FUEL & O&M	T&D CAP.	GEN. CAP.	TOTAL	PROGRAM	INCENTIVE	REVENUE	TOTAL	NET
	SAVINGS	COSTS	COSTS	BENEFITS	COSTS	PAYMENTS	LOSSES	COSTS	BENEFITS
YEAR	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)
2025	1,055	1,983	0	3,038	923	4,108	3,186	8,218	-5,179
2026	2,094	4,065	0	6,159	923	4,108	6,417	11,448	-5,290
2027	3,152	6,347	0	9,499	965	4,287	9,730	14,983	-5,483
2028	4,362	8,586	0	12,948	965	4,287	13,137	18,390	-5,441
2029	5,284	10,933	12,993	29,209	965	4,287	16,516	21,768	7,441
2030	6,072	13,374	15,488	34,933	965	4,287	19,850	25,103	9,830
2031	6,811	15,930	17,978	40,720	965	4,288	23,349	28,602	12,117
2032	7,533	18,597	18,450	44,579	965	4,288	27,043	32,297	12,283
2033	8,789	21,386	20,868	51,044	965	4,288	30,909	36,163	14,881
2034	10,209	24,304	27,198	61,711	965	4,288	34,657	39,910	21,801
2035	10,540	24,483	26,978	62,001	0	0	34,207	34,207	27,794
2036	10,978	24,573	26,665	62,216	0	0	34,155	34,155	28,062
2037	11,104	24,640	26,332	62,076	0	0	34,259	34,259	27,817
2038	11,384	24,892	26,199	62,475	0	0	34,007	34,007	28,468
2039	11,750	25,141	26,063	62,954	0	0	34,031	34,031	28,922
2040	11,616	25,394	25,933	62,942	0	0	33,854	33,854	29,088
2041	11,386	25,644	25,799	62,828	0	0	33,928	33,928	28,900
2042	11,824	25,900	25,672	63,396	0	0	34,259	34,259	29,137
2043	11,980	26,154	25,543	63,676	0	0	34,352	34,352	29,325
2044	12,131	26,404	25,410	63,946	0	0	34,430	34,430	29,516
2045	12,057	25,607	24,284	61,949	0	0	33,870	33,870	28,079
2046	12,000	24,864	23,238	60,101	0	0	33,367	33,367	26,734
2047	11,899	23,999	22,106	58,004	0	0	32,754	32,754	25,250
2048	11,775	23,076	20,951	55,802	0	0	32,091	32,091	23,711
2049	11,627	22,091	19,771	53,489	0	0	31,373	31,373	22,116
2050	11,477	21,062	18,580	51,119	0	0	30,659	30,659	20,459
2051	11,300	19,967	17,363	48,630	0	0	29,888	29,888	18,742
2052	11,095	18,805	16,118	46,018	0	0	29,056	29,056	16,962
2053	10,861	17,572	14,845	43,278	0	0	28,161	28,161	15,117
2054	10,596	16,265	13,544	40,405	0	0	27,201	27,201	13,205
2055	9,923	15,069	12,370	37,362	0	0	25,221	25,221	12,141
2056	9,188	13,802	11,169	34,160	0	0	23,122	23,122	11,038
2057	8,330	12,379	9,875	30,585	0	0	20,755	20,755	9,830
2058	7,399	10,876	8,553	26,827	0	0	18,251	18,251	8,577
2059	6,388	9,290	7,202	22,880	0	0	15,602	15,602	7,278
2060	5,295	7,618	5,822	18,735	0	0	12,805	12,805	5,930
2061	4,115	5,856	4,412	14,383	0	0	9,852	9,852	4,531
2062	2,843	4,002	2,972	9,816	0	0	6,738	6,738	3,078
2063	1,473	2,051	1,502	5,025	0	0	3,456	3,456	1,569
2064	0	0	0	0	0	0	0	0	0
NOMINAL	339,695	672,979	628,246	1,640,921	9,569	42,516	970,502	1,022,587	618,333
NPV	112,046	236,815	221,489	570,350	7,219	32,077	337,625	376,921	193,429
Utility Discount Rate = 6.83%									
Benefit Cost Ratio = 1.513									

PROGRAM: Neighborhood Energy Saver		NES							
Total Resource Cost (TRC) Test									
	BENEFITS				COSTS				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)
	TOTAL	AVOIDED	AVOIDED		UTILITY				
	FUEL & O&M	T&D CAP.	GEN. CAP.	TOTAL	PROGRAM	PARTICIPANTS	TOTAL	NET	
	SAVINGS	COSTS	COSTS	BENEFITS	COSTS	COST	COSTS	BENEFITS	
YEAR	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	
2025	1,055	1,983	0	3,038	923	11,008	11,931	-8,893	
2026	2,094	4,065	0	6,159	923	11,008	11,931	-5,773	
2027	3,152	6,347	0	9,499	965	11,526	12,491	-2,992	
2028	4,362	8,586	0	12,948	965	11,526	12,491	457	
2029	5,284	10,933	12,993	29,209	965	11,526	12,491	16,718	
2030	6,072	13,374	15,488	34,933	965	11,526	12,491	22,442	
2031	6,811	15,930	17,978	40,720	965	11,526	12,492	28,228	
2032	7,533	18,597	18,450	44,579	965	11,527	12,492	32,087	
2033	8,789	21,386	20,868	51,044	965	11,527	12,492	38,551	
2034	10,209	24,304	27,198	61,711	965	11,527	12,493	49,219	
2035	10,540	24,483	26,978	62,001	0	0	0	62,001	
2036	10,978	24,573	26,665	62,216	0	0	0	62,216	
2037	11,104	24,640	26,332	62,076	0	0	0	62,076	
2038	11,384	24,892	26,199	62,475	0	0	0	62,475	
2039	11,750	25,141	26,063	62,954	0	0	0	62,954	
2040	11,616	25,394	25,933	62,942	0	0	0	62,942	
2041	11,386	25,644	25,799	62,828	0	0	0	62,828	
2042	11,824	25,900	25,672	63,396	0	0	0	63,396	
2043	11,980	26,154	25,543	63,676	0	0	0	63,676	
2044	12,131	26,404	25,410	63,946	0	0	0	63,946	
2045	12,057	25,607	24,284	61,949	0	0	0	61,949	
2046	12,000	24,864	23,238	60,101	0	0	0	60,101	
2047	11,899	23,999	22,106	58,004	0	0	0	58,004	
2048	11,775	23,076	20,951	55,802	0	0	0	55,802	
2049	11,627	22,091	19,771	53,489	0	0	0	53,489	
2050	11,477	21,062	18,580	51,119	0	0	0	51,119	
2051	11,300	19,967	17,363	48,630	0	0	0	48,630	
2052	11,095	18,805	16,118	46,018	0	0	0	46,018	
2053	10,861	17,572	14,845	43,278	0	0	0	43,278	
2054	10,596	16,265	13,544	40,405	0	0	0	40,405	
2055	9,923	15,069	12,370	37,362	0	0	0	37,362	
2056	9,188	13,802	11,169	34,160	0	0	0	34,160	
2057	8,330	12,379	9,875	30,585	0	0	0	30,585	
2058	7,399	10,876	8,553	26,827	0	0	0	26,827	
2059	6,388	9,290	7,202	22,880	0	0	0	22,880	
2060	5,295	7,618	5,822	18,735	0	0	0	18,735	
2061	4,115	5,856	4,412	14,383	0	0	0	14,383	
2062	2,843	4,002	2,972	9,816	0	0	0	9,816	
2063	1,473	2,051	1,502	5,025	0	0	0	5,025	
2064	0	0	0	0	0	0	0	0	
NOMINAL	339,695	672,979	628,246	1,640,921	9,569	114,227	123,796	1,517,124	
NPV	112,046	236,815	221,489	570,350	7,219	86,165	93,385	476,965	
Utility Discount Rate = 6.83%									
Benefit Cost Ratio = 6.108									

PROGRAM: Neighborhood Energy Saver				NES				
Participant Test								
	BENEFITS				COSTS			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
	SAVINGS IN		OTHER					
	PARTICIPANT'S	INCENTIVE	PARTICIPANT'S	TOTAL	PARTICIPANT'S	TOTAL	NET	
	BILL	PAYMENTS	BENEFITS	BENEFITS	COST	COSTS	BENEFITS	
YEAR	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	
2025	3,186	4,108	0	7,294	11,008	11,008	-3,714	
2026	6,417	4,108	0	10,525	11,008	11,008	-483	
2027	9,730	4,287	0	14,017	11,526	11,526	2,491	
2028	13,137	4,287	0	17,424	11,526	11,526	5,898	
2029	16,516	4,287	0	20,803	11,526	11,526	9,277	
2030	19,850	4,287	0	24,138	11,526	11,526	12,612	
2031	23,349	4,288	0	27,637	11,526	11,526	16,111	
2032	27,043	4,288	0	31,331	11,527	11,527	19,805	
2033	30,909	4,288	0	35,197	11,527	11,527	23,671	
2034	34,657	4,288	0	38,945	11,527	11,527	27,418	
2035	34,207	0	0	34,207	0	0	34,207	
2036	34,155	0	0	34,155	0	0	34,155	
2037	34,259	0	0	34,259	0	0	34,259	
2038	34,007	0	0	34,007	0	0	34,007	
2039	34,031	0	0	34,031	0	0	34,031	
2040	33,854	0	0	33,854	0	0	33,854	
2041	33,928	0	0	33,928	0	0	33,928	
2042	34,259	0	0	34,259	0	0	34,259	
2043	34,352	0	0	34,352	0	0	34,352	
2044	34,430	0	0	34,430	0	0	34,430	
2045	33,870	0	0	33,870	0	0	33,870	
2046	33,367	0	0	33,367	0	0	33,367	
2047	32,754	0	0	32,754	0	0	32,754	
2048	32,091	0	0	32,091	0	0	32,091	
2049	31,373	0	0	31,373	0	0	31,373	
2050	30,659	0	0	30,659	0	0	30,659	
2051	29,888	0	0	29,888	0	0	29,888	
2052	29,056	0	0	29,056	0	0	29,056	
2053	28,161	0	0	28,161	0	0	28,161	
2054	27,201	0	0	27,201	0	0	27,201	
2055	25,221	0	0	25,221	0	0	25,221	
2056	23,122	0	0	23,122	0	0	23,122	
2057	20,755	0	0	20,755	0	0	20,755	
2058	18,251	0	0	18,251	0	0	18,251	
2059	15,602	0	0	15,602	0	0	15,602	
2060	12,805	0	0	12,805	0	0	12,805	
2061	9,852	0	0	9,852	0	0	9,852	
2062	6,738	0	0	6,738	0	0	6,738	
2063	3,456	0	0	3,456	0	0	3,456	
2064	0	0	0	0	0	0	0	
NOMINAL	970,502	42,516	0	1,013,018	114,227	114,227	898,791	
NPV	337,625	32,077	0	369,702	86,165	86,165	283,536	
Utility Discount Rate = 6.83%								
Benefit Cost Ratio = 4.291								

PROGRAM: Low Income Weatherization Assistance					LIWAP				
Rate Impact Measure (RIM) Test									
	BENEFITS				COSTS				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
	TOTAL	AVOIDED	AVOIDED		UTILITY				
	FUEL & O&M	T&D CAP.	GEN. CAP.	TOTAL	PROGRAM	INCENTIVE	REVENUE	TOTAL	NET
	SAVINGS	COSTS	COSTS	BENEFITS	COSTS	PAYMENTS	LOSSES	COSTS	BENEFITS
YEAR	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)
2025	82	130	0	213	162	267	248	677	-464
2026	163	267	0	431	162	267	500	929	-498
2027	243	412	0	655	163	268	749	1,181	-526
2028	337	558	0	895	163	268	1,015	1,446	-551
2029	409	711	845	1,966	163	268	1,278	1,710	256
2030	472	871	1,008	2,352	164	279	1,542	1,985	367
2031	531	1,039	1,172	2,741	164	279	1,818	2,261	480
2032	589	1,214	1,203	3,006	164	279	2,112	2,555	451
2033	684	1,382	1,347	3,413	155	263	2,405	2,823	590
2034	792	1,557	1,741	4,090	155	263	2,688	3,107	984
2035	828	1,583	1,743	4,154	0	0	2,686	2,686	1,468
2036	876	1,610	1,745	4,231	0	0	2,723	2,723	1,507
2037	900	1,636	1,747	4,282	0	0	2,776	2,776	1,506
2038	934	1,669	1,755	4,358	0	0	2,789	2,789	1,569
2039	976	1,703	1,764	4,443	0	0	2,826	2,826	1,617
2040	976	1,737	1,773	4,486	0	0	2,844	2,844	1,642
2041	968	1,772	1,781	4,522	0	0	2,884	2,884	1,637
2042	1,017	1,808	1,791	4,615	0	0	2,946	2,946	1,670
2043	1,042	1,845	1,800	4,687	0	0	2,988	2,988	1,699
2044	1,068	1,882	1,810	4,760	0	0	3,031	3,031	1,728
2045	1,098	1,907	1,807	4,811	0	0	3,083	3,083	1,728
2046	1,128	1,932	1,804	4,863	0	0	3,136	3,136	1,728
2047	1,158	1,956	1,801	4,915	0	0	3,187	3,187	1,727
2048	1,189	1,981	1,797	4,967	0	0	3,240	3,240	1,727
2049	1,220	2,005	1,794	5,019	0	0	3,293	3,293	1,726
2050	1,255	2,032	1,791	5,078	0	0	3,353	3,353	1,725
2051	1,291	2,058	1,789	5,138	0	0	3,414	3,414	1,723
2052	1,329	2,085	1,786	5,200	0	0	3,479	3,479	1,721
2053	1,377	2,137	1,805	5,319	0	0	3,569	3,569	1,749
2054	1,426	2,190	1,824	5,440	0	0	3,661	3,661	1,779
2055	1,330	2,021	1,659	5,009	0	0	3,381	3,381	1,629
2056	1,225	1,841	1,490	4,556	0	0	3,083	3,083	1,473
2057	1,111	1,651	1,317	4,079	0	0	2,767	2,767	1,312
2058	986	1,451	1,141	3,578	0	0	2,433	2,433	1,145
2059	852	1,239	961	3,051	0	0	2,080	2,080	971
2060	706	1,016	777	2,499	0	0	1,707	1,707	791
2061	549	781	588	1,918	0	0	1,314	1,314	605
2062	379	534	396	1,309	0	0	898	898	411
2063	196	274	200	670	0	0	461	461	209
2064	0	0	0	0	0	0	0	0	0
NOMINAL	33,690	56,476	51,552	141,719	1,618	2,701	94,390	98,709	43,010
NPV	9,961	17,486	16,199	43,646	1,226	2,041	29,574	32,841	10,805
Utility Discount Rate = 6.83%									
Benefit Cost Ratio = 1.329									

PROGRAM: Low Income Weatherization Assistance					LIWAP			
Total Resource Cost (TRC) Test								
	BENEFITS				COSTS			(8)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
	TOTAL	AVOIDED	AVOIDED		UTILITY			
	FUEL & O&M	T&D CAP.	GEN. CAP.	TOTAL	PROGRAM	PARTICIPANTS	TOTAL	NET
	SAVINGS	COSTS	COSTS	BENEFITS	COSTS	COST	COSTS	BENEFITS
YEAR	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)
2025	82	130	0	213	162	577	739	-526
2026	163	267	0	431	162	577	739	-308
2027	243	412	0	655	163	581	744	-89
2028	337	558	0	895	163	581	744	151
2029	409	711	845	1,966	163	581	744	1,221
2030	472	871	1,008	2,352	164	591	756	1,596
2031	531	1,039	1,172	2,741	164	591	756	1,986
2032	589	1,214	1,203	3,006	164	591	756	2,250
2033	684	1,382	1,347	3,413	155	529	685	2,728
2034	792	1,557	1,741	4,090	155	529	685	3,405
2035	828	1,583	1,743	4,154	0	0	0	4,154
2036	876	1,610	1,745	4,231	0	0	0	4,231
2037	900	1,636	1,747	4,282	0	0	0	4,282
2038	934	1,669	1,755	4,358	0	0	0	4,358
2039	976	1,703	1,764	4,443	0	0	0	4,443
2040	976	1,737	1,773	4,486	0	0	0	4,486
2041	968	1,772	1,781	4,522	0	0	0	4,522
2042	1,017	1,808	1,791	4,615	0	0	0	4,615
2043	1,042	1,845	1,800	4,687	0	0	0	4,687
2044	1,068	1,882	1,810	4,760	0	0	0	4,760
2045	1,098	1,907	1,807	4,811	0	0	0	4,811
2046	1,128	1,932	1,804	4,863	0	0	0	4,863
2047	1,158	1,956	1,801	4,915	0	0	0	4,915
2048	1,189	1,981	1,797	4,967	0	0	0	4,967
2049	1,220	2,005	1,794	5,019	0	0	0	5,019
2050	1,255	2,032	1,791	5,078	0	0	0	5,078
2051	1,291	2,058	1,789	5,138	0	0	0	5,138
2052	1,329	2,085	1,786	5,200	0	0	0	5,200
2053	1,377	2,137	1,805	5,319	0	0	0	5,319
2054	1,426	2,190	1,824	5,440	0	0	0	5,440
2055	1,330	2,021	1,659	5,009	0	0	0	5,009
2056	1,225	1,841	1,490	4,556	0	0	0	4,556
2057	1,111	1,651	1,317	4,079	0	0	0	4,079
2058	986	1,451	1,141	3,578	0	0	0	3,578
2059	852	1,239	961	3,051	0	0	0	3,051
2060	706	1,016	777	2,499	0	0	0	2,499
2061	549	781	588	1,918	0	0	0	1,918
2062	379	534	396	1,309	0	0	0	1,309
2063	196	274	200	670	0	0	0	670
2064	0	0	0	0	0	0	0	0
NOMINAL	33,690	56,476	51,552	141,719	1,618	5,728	7,346	134,372
NPV	9,961	17,486	16,199	43,646	1,226	4,346	5,573	38,073
Utility Discount Rate = 6.83%								
Benefit Cost Ratio = 7.832								

PROGRAM: Low Income Weatherization Assistance					LIWAP		
Participant Test							
	BENEFITS				COSTS		(7)
	(1)	(2)	(3)	(4)	(5)	(6)	
	SAVINGS IN PARTICIPANT'S BILL	INCENTIVE PAYMENTS	OTHER PARTICIPANT'S BENEFITS	TOTAL BENEFITS	PARTICIPANT'S COST	TOTAL COSTS	NET BENEFITS
YEAR	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)
2025	248	267	0	515	577	577	-61
2026	500	267	0	767	577	577	190
2027	749	268	0	1,017	581	581	437
2028	1,015	268	0	1,283	581	581	702
2029	1,278	268	0	1,546	581	581	966
2030	1,542	279	0	1,821	591	591	1,229
2031	1,818	279	0	2,097	591	591	1,506
2032	2,112	279	0	2,391	591	591	1,800
2033	2,405	263	0	2,668	529	529	2,139
2034	2,688	263	0	2,951	529	529	2,422
2035	2,686	0	0	2,686	0	0	2,686
2036	2,723	0	0	2,723	0	0	2,723
2037	2,776	0	0	2,776	0	0	2,776
2038	2,789	0	0	2,789	0	0	2,789
2039	2,826	0	0	2,826	0	0	2,826
2040	2,844	0	0	2,844	0	0	2,844
2041	2,884	0	0	2,884	0	0	2,884
2042	2,946	0	0	2,946	0	0	2,946
2043	2,988	0	0	2,988	0	0	2,988
2044	3,031	0	0	3,031	0	0	3,031
2045	3,083	0	0	3,083	0	0	3,083
2046	3,136	0	0	3,136	0	0	3,136
2047	3,187	0	0	3,187	0	0	3,187
2048	3,240	0	0	3,240	0	0	3,240
2049	3,293	0	0	3,293	0	0	3,293
2050	3,353	0	0	3,353	0	0	3,353
2051	3,414	0	0	3,414	0	0	3,414
2052	3,479	0	0	3,479	0	0	3,479
2053	3,569	0	0	3,569	0	0	3,569
2054	3,661	0	0	3,661	0	0	3,661
2055	3,381	0	0	3,381	0	0	3,381
2056	3,083	0	0	3,083	0	0	3,083
2057	2,767	0	0	2,767	0	0	2,767
2058	2,433	0	0	2,433	0	0	2,433
2059	2,080	0	0	2,080	0	0	2,080
2060	1,707	0	0	1,707	0	0	1,707
2061	1,314	0	0	1,314	0	0	1,314
2062	898	0	0	898	0	0	898
2063	461	0	0	461	0	0	461
2064	0	0	0	0	0	0	0
NOMINAL	94,390	2,701	0	97,091	5,728	5,728	91,363
NPV	29,574	2,041	0	31,615	4,346	4,346	27,268
Utility Discount Rate = 6.83%							
Benefit Cost Ratio = 7.274							

PROGRAM: Better Business				BB						
Rate Impact Measure (RIM) Test										
BENEFITS					COSTS					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
	TOTAL	AVOIDED	AVOIDED		UTILITY					
	FUEL & O&M	T&D CAP.	GEN. CAP.	TOTAL	PROGRAM	INCENTIVE	REVENUE	TOTAL	NET	
	SAVINGS	COSTS	COSTS	BENEFITS	COSTS	PAYMENTS	LOSSES	COSTS	BENEFITS	
YEAR	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)
2025	208	518	0	726	1,234	577	560	2,370		-1,645
2026	431	1,110	0	1,541	1,338	594	1,168	3,099		-1,558
2027	667	1,787	0	2,454	1,455	615	1,816	3,886		-1,432
2028	976	2,560	0	3,537	1,585	642	2,574	4,801		-1,264
2029	1,247	3,442	4,087	8,776	1,729	674	3,374	5,777		2,999
2030	1,467	4,245	4,911	10,623	1,603	641	4,098	6,341		4,281
2031	1,640	4,955	5,587	12,182	1,390	606	4,746	6,741		5,440
2032	1,786	5,594	5,545	12,925	1,215	572	5,362	7,149		5,775
2033	2,036	6,177	6,022	14,235	1,071	542	5,929	7,543		6,692
2034	2,299	6,718	7,511	16,528	952	519	6,382	7,852		8,676
2035	2,345	6,451	7,101	15,897	0	0	6,137	6,137		9,759
2036	2,408	6,123	6,638	15,170	0	0	5,994	5,994		9,176
2037	2,392	5,727	6,115	14,234	0	0	5,870	5,870		8,364
2038	2,372	5,254	5,525	13,151	0	0	5,557	5,557		7,594
2039	2,349	4,692	4,860	11,902	0	0	5,278	5,278		6,624
2040	2,101	4,029	4,111	10,240	0	0	4,685	4,685		5,555
2041	1,846	3,442	3,459	8,747	0	0	4,169	4,169		4,578
2042	1,687	2,901	2,872	7,460	0	0	3,680	3,680		3,780
2043	1,465	2,381	2,324	6,170	0	0	3,130	3,130		3,040
2044	1,218	1,865	1,793	4,877	0	0	2,550	2,550		2,327
2045	991	1,501	1,422	3,913	0	0	2,034	2,034		1,879
2046	770	1,155	1,078	3,003	0	0	1,551	1,551		1,452
2047	554	824	758	2,136	0	0	1,094	1,094		1,042
2048	332	491	446	1,269	0	0	643	643		627
2049	113	169	151	433	0	0	211	211		222
2050	103	153	135	390	0	0	189	189		202
2051	90	134	116	341	0	0	163	163		178
2052	76	112	96	283	0	0	134	134		149
2053	62	90	76	228	0	0	107	107		121
2054	47	69	58	174	0	0	81	81		93
2055	32	48	39	119	0	0	54	54		65
2056	17	26	21	64	0	0	29	29		36
2057	2	4	4	10	0	0	3	3		7
2058	2	4	3	9	0	0	3	3		6
2059	1	4	3	8	0	0	2	2		5
2060	1	3	2	7	0	0	2	2		5
2061	1	3	2	6	0	0	1	1		4
2062	1	2	2	5	0	0	1	1		4
2063	0	2	1	4	0	0	0	0		3
2064	0	0	0	0	0	0	0	0		0
NOMINAL	36,133	84,766	82,874	203,773	13,571	5,982	89,359	108,912		94,861
NPV	17,617	44,115	41,452	103,183	10,397	4,550	45,210	60,157		43,026
Utility Discount Rate = 6.83%										
Benefit Cost Ratio = 1.715										

PROGRAM: Better Business		BB						
Total Resource Cost (TRC) Test								
	BENEFITS				COSTS			(8)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
	TOTAL	AVOIDED	AVOIDED		UTILITY			
	FUEL & O&M	T&D CAP.	GEN. CAP.	TOTAL	PROGRAM	PARTICIPANT'S	TOTAL	NET
	SAVINGS	COSTS	COSTS	BENEFITS	COSTS	COST	COSTS	BENEFITS
YEAR	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)
2025	208	518	0	726	1,234	4,190	5,423	-4,697
2026	431	1,110	0	1,541	1,338	4,477	5,815	-4,274
2027	667	1,787	0	2,454	1,455	4,803	6,258	-3,804
2028	976	2,560	0	3,537	1,585	5,172	6,757	-3,220
2029	1,247	3,442	4,087	8,776	1,729	5,589	7,318	1,458
2030	1,467	4,245	4,911	10,623	1,603	5,800	7,403	3,219
2031	1,640	4,955	5,587	12,182	1,390	5,316	6,706	5,476
2032	1,786	5,594	5,545	12,925	1,215	4,877	6,092	6,832
2033	2,036	6,177	6,022	14,235	1,071	4,479	5,550	8,684
2034	2,299	6,718	7,511	16,528	952	4,126	5,078	11,450
2035	2,345	6,451	7,101	15,897	0	0	0	15,897
2036	2,408	6,123	6,638	15,170	0	0	0	15,170
2037	2,392	5,727	6,115	14,234	0	0	0	14,234
2038	2,372	5,254	5,525	13,151	0	0	0	13,151
2039	2,349	4,692	4,860	11,902	0	0	0	11,902
2040	2,101	4,029	4,111	10,240	0	0	0	10,240
2041	1,846	3,442	3,459	8,747	0	0	0	8,747
2042	1,687	2,901	2,872	7,460	0	0	0	7,460
2043	1,465	2,381	2,324	6,170	0	0	0	6,170
2044	1,218	1,865	1,793	4,877	0	0	0	4,877
2045	991	1,501	1,422	3,913	0	0	0	3,913
2046	770	1,155	1,078	3,003	0	0	0	3,003
2047	554	824	758	2,136	0	0	0	2,136
2048	332	491	446	1,269	0	0	0	1,269
2049	113	169	151	433	0	0	0	433
2050	103	153	135	390	0	0	0	390
2051	90	134	116	341	0	0	0	341
2052	76	112	96	283	0	0	0	283
2053	62	90	76	228	0	0	0	228
2054	47	69	58	174	0	0	0	174
2055	32	48	39	119	0	0	0	119
2056	17	26	21	64	0	0	0	64
2057	2	4	4	10	0	0	0	10
2058	2	4	3	9	0	0	0	9
2059	1	4	3	8	0	0	0	8
2060	1	3	2	7	0	0	0	7
2061	1	3	2	6	0	0	0	6
2062	1	2	2	5	0	0	0	5
2063	0	2	1	4	0	0	0	4
2064	0	0	0	0	0	0	0	0
NOMINAL	36,133	84,766	82,874	203,773	13,571	48,829	62,400	141,373
NPV	17,617	44,115	41,452	103,183	10,397	36,855	47,252	55,931
Utility Discount Rate = 6.83%								
Benefit Cost Ratio = 2.184								

PROGRAM: Better Business				BB			
Participant Test							
	BENEFITS				COSTS		
	(1)	(2)	(3)	(4)	(5)	(6)	
	SAVINGS IN		OTHER				
	PARTICIPANT'S	INCENTIVE	PARTICIPANT'S	TOTAL	PARTICIPANT'S	TOTAL	NET
	BILL	PAYMENTS	BENEFITS	BENEFITS	COST	COSTS	BENEFITS
YEAR	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)
2025	560	577	0	1,137	4,190	4,190	-3,053
2026	1,168	594	0	1,761	4,477	4,477	-2,716
2027	1,816	615	0	2,431	4,803	4,803	-2,372
2028	2,574	642	0	3,216	5,172	5,172	-1,956
2029	3,374	674	0	4,048	5,589	5,589	-1,541
2030	4,098	641	0	4,739	5,800	5,800	-1,062
2031	4,746	606	0	5,352	5,316	5,316	35
2032	5,362	572	0	5,934	4,877	4,877	1,057
2033	5,929	542	0	6,471	4,479	4,479	1,992
2034	6,382	519	0	6,901	4,126	4,126	2,774
2035	6,137	0	0	6,137	0	0	6,137
2036	5,994	0	0	5,994	0	0	5,994
2037	5,870	0	0	5,870	0	0	5,870
2038	5,557	0	0	5,557	0	0	5,557
2039	5,278	0	0	5,278	0	0	5,278
2040	4,685	0	0	4,685	0	0	4,685
2041	4,169	0	0	4,169	0	0	4,169
2042	3,680	0	0	3,680	0	0	3,680
2043	3,130	0	0	3,130	0	0	3,130
2044	2,550	0	0	2,550	0	0	2,550
2045	2,034	0	0	2,034	0	0	2,034
2046	1,551	0	0	1,551	0	0	1,551
2047	1,094	0	0	1,094	0	0	1,094
2048	643	0	0	643	0	0	643
2049	211	0	0	211	0	0	211
2050	189	0	0	189	0	0	189
2051	163	0	0	163	0	0	163
2052	134	0	0	134	0	0	134
2053	107	0	0	107	0	0	107
2054	81	0	0	81	0	0	81
2055	54	0	0	54	0	0	54
2056	29	0	0	29	0	0	29
2057	3	0	0	3	0	0	3
2058	3	0	0	3	0	0	3
2059	2	0	0	2	0	0	2
2060	2	0	0	2	0	0	2
2061	1	0	0	1	0	0	1
2062	1	0	0	1	0	0	1
2063	0	0	0	0	0	0	0
2064	0	0	0	0	0	0	0
NOMINAL	89,359	5,982	0	95,341	48,829	48,829	46,512
NPV	45,210	4,550	0	49,760	36,855	36,855	12,905
Utility Discount Rate = 6.83%							
Benefit Cost Ratio = 1.350							

PROGRAM: Residential Load Management					EWH				
Rate Impact Measure (RIM) Test									
	BENEFITS				COSTS				(9)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
	TOTAL	AVOIDED	AVOIDED		UTILITY				
	FUEL & O&M	T&D CAP.	GEN. CAP.	TOTAL	PROGRAM	INCENTIVE	REVENUE	TOTAL	NET
	SAVINGS	COSTS	COSTS	BENEFITS	COSTS	PAYMENTS	LOSSES	COSTS	BENEFITS
YEAR	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)
2025	0	0	0	0	739	182	0	922	-922
2026	0	0	0	0	1,023	365	0	1,388	-1,388
2027	0	0	0	0	1,321	547	0	1,868	-1,868
2028	0	0	0	0	1,633	729	0	2,362	-2,362
2029	0	0	5,338	5,338	1,960	911	0	2,871	2,467
2030	0	0	6,398	6,398	2,302	1,094	0	3,396	3,003
2031	0	0	7,456	7,456	2,660	1,276	0	3,936	3,520
2032	0	0	7,678	7,678	3,034	1,458	0	4,493	3,186
2033	0	0	8,708	8,708	3,426	1,641	0	5,066	3,642
2034	0	0	11,375	11,375	3,835	1,823	0	5,658	5,717
2035	0	0	11,480	11,480	3,316	1,823	0	5,139	6,341
2036	0	0	11,588	11,588	3,399	1,823	0	5,222	6,366
2037	0	0	11,697	11,697	3,484	1,823	0	5,307	6,390
2038	0	0	11,809	11,809	3,571	1,823	0	5,394	6,415
2039	0	0	11,922	11,922	3,661	1,823	0	5,483	6,439
2040	0	0	12,038	12,038	3,752	1,823	0	5,575	6,463
2041	0	0	12,156	12,156	3,846	1,823	0	5,669	6,487
2042	0	0	12,276	12,276	3,942	1,823	0	5,765	6,511
2043	0	0	12,398	12,398	4,041	1,823	0	5,863	6,534
2044	0	0	12,522	12,522	4,142	1,823	0	5,964	6,558
2045	0	0	12,649	12,649	4,245	1,823	0	6,068	6,581
2046	0	0	12,778	12,778	4,351	1,823	0	6,174	6,604
2047	0	0	12,909	12,909	4,460	1,823	0	6,283	6,626
2048	0	0	13,043	13,043	4,572	1,823	0	6,394	6,649
2049	0	0	13,179	13,179	4,686	1,823	0	6,509	6,671
2050	0	0	11,985	11,985	4,323	1,641	0	5,963	6,022
2051	0	0	10,765	10,765	3,938	1,458	0	5,397	5,368
2052	0	0	9,518	9,518	3,532	1,276	0	4,808	4,709
2053	0	0	8,243	8,243	3,103	1,094	0	4,197	4,046
2054	0	0	6,941	6,941	2,651	911	0	3,562	3,379
2055	0	0	5,611	5,611	2,174	729	0	2,903	2,708
2056	0	0	4,252	4,252	1,671	547	0	2,218	2,034
2057	0	0	2,864	2,864	1,142	365	0	1,506	1,358
2058	0	0	1,447	1,447	585	182	0	767	680
2059	0	0	0	0	0	0	0	0	0
2060	0	0	0	0	0	0	0	0	0
2061	0	0	0	0	0	0	0	0	0
2062	0	0	0	0	0	0	0	0	0
2063	0	0	0	0	0	0	0	0	0
2064	0	0	0	0	0	0	0	0	0
NOMINAL	0	0	293,024	293,024	104,521	45,571	0	150,093	142,931
NPV	0	0	101,654	101,654	38,456	17,428	0	55,884	45,770
Utility Discount Rate = 6.83%									
Benefit Cost Ratio = 1.819									

PROGRAM: Residential Load Management					EWH			
Total Resource Cost (TRC) Test								
	BENEFITS				COSTS			(8)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
	TOTAL	AVOIDED	AVOIDED		UTILITY			
	FUEL & O&M	T&D CAP.	GEN. CAP.	TOTAL	PROGRAM	PARTICIPANTS	TOTAL	NET
	SAVINGS	COSTS	COSTS	BENEFITS	COSTS	COST	COSTS	BENEFITS
YEAR	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)
2025	0	0	0	0	739	0	739	-739
2026	0	0	0	0	1,023	0	1,023	-1,023
2027	0	0	0	0	1,321	0	1,321	-1,321
2028	0	0	0	0	1,633	0	1,633	-1,633
2029	0	0	5,338	5,338	1,960	0	1,960	3,378
2030	0	0	6,398	6,398	2,302	0	2,302	4,096
2031	0	0	7,456	7,456	2,660	0	2,660	4,796
2032	0	0	7,678	7,678	3,034	0	3,034	4,644
2033	0	0	8,708	8,708	3,426	0	3,426	5,282
2034	0	0	11,375	11,375	3,835	0	3,835	7,539
2035	0	0	11,480	11,480	3,316	0	3,316	8,164
2036	0	0	11,588	11,588	3,399	0	3,399	8,188
2037	0	0	11,697	11,697	3,484	0	3,484	8,213
2038	0	0	11,809	11,809	3,571	0	3,571	8,237
2039	0	0	11,922	11,922	3,661	0	3,661	8,262
2040	0	0	12,038	12,038	3,752	0	3,752	8,286
2041	0	0	12,156	12,156	3,846	0	3,846	8,310
2042	0	0	12,276	12,276	3,942	0	3,942	8,334
2043	0	0	12,398	12,398	4,041	0	4,041	8,357
2044	0	0	12,522	12,522	4,142	0	4,142	8,380
2045	0	0	12,649	12,649	4,245	0	4,245	8,404
2046	0	0	12,778	12,778	4,351	0	4,351	8,427
2047	0	0	12,909	12,909	4,460	0	4,460	8,449
2048	0	0	13,043	13,043	4,572	0	4,572	8,471
2049	0	0	13,179	13,179	4,686	0	4,686	8,493
2050	0	0	11,985	11,985	4,323	0	4,323	7,663
2051	0	0	10,765	10,765	3,938	0	3,938	6,826
2052	0	0	9,518	9,518	3,532	0	3,532	5,985
2053	0	0	8,243	8,243	3,103	0	3,103	5,140
2054	0	0	6,941	6,941	2,651	0	2,651	4,290
2055	0	0	5,611	5,611	2,174	0	2,174	3,437
2056	0	0	4,252	4,252	1,671	0	1,671	2,581
2057	0	0	2,864	2,864	1,142	0	1,142	1,723
2058	0	0	1,447	1,447	585	0	585	862
2059	0	0	0	0	0	0	0	0
2060	0	0	0	0	0	0	0	0
2061	0	0	0	0	0	0	0	0
2062	0	0	0	0	0	0	0	0
2063	0	0	0	0	0	0	0	0
2064	0	0	0	0	0	0	0	0
NOMINAL	0	0	293,024	293,024	104,521	0	104,521	188,503
NPV	0	0	101,654	101,654	38,456	0	38,456	63,198
Utility Discount Rate = 6.83%								
Benefit Cost Ratio = 2.643								

PROGRAM: Residential Load Management					EWH		
Participant Test							
	BENEFITS				COSTS		(7)
	(1)	(2)	(3)	(4)	(5)	(6)	
	SAVINGS IN PARTICIPANT'S BILL	INCENTIVE PAYMENTS	OTHER PARTICIPANT'S BENEFITS	TOTAL BENEFITS	PARTICIPANT'S COST	TOTAL COSTS	NET BENEFITS
YEAR	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)
2025	0	182	0	182	0	0	182
2026	0	365	0	365	0	0	365
2027	0	547	0	547	0	0	547
2028	0	729	0	729	0	0	729
2029	0	911	0	911	0	0	911
2030	0	1,094	0	1,094	0	0	1,094
2031	0	1,276	0	1,276	0	0	1,276
2032	0	1,458	0	1,458	0	0	1,458
2033	0	1,641	0	1,641	0	0	1,641
2034	0	1,823	0	1,823	0	0	1,823
2035	0	1,823	0	1,823	0	0	1,823
2036	0	1,823	0	1,823	0	0	1,823
2037	0	1,823	0	1,823	0	0	1,823
2038	0	1,823	0	1,823	0	0	1,823
2039	0	1,823	0	1,823	0	0	1,823
2040	0	1,823	0	1,823	0	0	1,823
2041	0	1,823	0	1,823	0	0	1,823
2042	0	1,823	0	1,823	0	0	1,823
2043	0	1,823	0	1,823	0	0	1,823
2044	0	1,823	0	1,823	0	0	1,823
2045	0	1,823	0	1,823	0	0	1,823
2046	0	1,823	0	1,823	0	0	1,823
2047	0	1,823	0	1,823	0	0	1,823
2048	0	1,823	0	1,823	0	0	1,823
2049	0	1,823	0	1,823	0	0	1,823
2050	0	1,641	0	1,641	0	0	1,641
2051	0	1,458	0	1,458	0	0	1,458
2052	0	1,276	0	1,276	0	0	1,276
2053	0	1,094	0	1,094	0	0	1,094
2054	0	911	0	911	0	0	911
2055	0	729	0	729	0	0	729
2056	0	547	0	547	0	0	547
2057	0	365	0	365	0	0	365
2058	0	182	0	182	0	0	182
2059	0	0	0	0	0	0	0
2060	0	0	0	0	0	0	0
2061	0	0	0	0	0	0	0
2062	0	0	0	0	0	0	0
2063	0	0	0	0	0	0	0
2064	0	0	0	0	0	0	0
NOMINAL	0	45,571	0	45,571	0	0	45,571
NPV	0	17,428	0	17,428	0	0	17,428

Utility Discount Rate = 6.83%
Benefit Cost Ratio = 9999

PROGRAM:	Interruptible Service DR			IS						
Rate Impact Measure (RIM) Test										
	BENEFITS				COSTS				(9)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)		
	TOTAL	AVOIDED	AVOIDED		UTILITY					
	FUEL & O&M	T&D CAP.	GEN. CAP.	TOTAL	PROGRAM	INCENTIVE	REVENUE	TOTAL	NET	
	SAVINGS	COSTS	COSTS	BENEFITS	COSTS	PAYMENTS	LOSSES	COSTS	BENEFITS	
YEAR	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	
2025	0	0	0	0	37	150	0	187	-187	
2026	0	0	0	0	46	301	0	346	-346	
2027	0	0	0	0	55	451	0	506	-506	
2028	0	0	0	0	65	601	0	667	-667	
2029	0	0	1,115	1,115	76	752	0	827	288	
2030	0	0	1,337	1,337	87	902	0	989	348	
2031	0	0	1,558	1,558	98	1,053	0	1,151	407	
2032	0	0	1,604	1,604	110	1,203	0	1,313	291	
2033	0	0	1,819	1,819	122	1,353	0	1,476	344	
2034	0	0	2,376	2,376	135	1,504	0	1,639	737	
2035	0	0	2,398	2,398	102	1,504	0	1,606	793	
2036	0	0	2,421	2,421	105	1,504	0	1,608	812	
2037	0	0	2,444	2,444	107	1,504	0	1,611	833	
2038	0	0	2,467	2,467	110	1,504	0	1,614	853	
2039	0	0	2,491	2,491	113	1,504	0	1,616	874	
2040	0	0	2,515	2,515	116	1,504	0	1,619	896	
2041	0	0	2,539	2,539	118	1,504	0	1,622	917	
2042	0	0	2,564	2,564	121	1,504	0	1,625	939	
2043	0	0	2,590	2,590	124	1,504	0	1,628	962	
2044	0	0	2,616	2,616	128	1,504	0	1,631	985	
2045	0	0	2,642	2,642	131	1,504	0	1,634	1,008	
2046	0	0	2,669	2,669	134	1,504	0	1,638	1,032	
2047	0	0	2,697	2,697	137	1,504	0	1,641	1,056	
2048	0	0	2,725	2,725	141	1,504	0	1,644	1,080	
2049	0	0	2,753	2,753	144	1,504	0	1,648	1,105	
2050	0	0	2,504	2,504	133	1,353	0	1,486	1,017	
2051	0	0	2,249	2,249	121	1,203	0	1,324	925	
2052	0	0	1,988	1,988	109	1,053	0	1,161	827	
2053	0	0	1,722	1,722	96	902	0	998	724	
2054	0	0	1,450	1,450	82	752	0	833	617	
2055	0	0	1,172	1,172	67	601	0	668	504	
2056	0	0	888	888	51	451	0	503	386	
2057	0	0	598	598	35	301	0	336	263	
2058	0	0	302	302	18	150	0	168	134	
2059	0	0	0	0	0	0	0	0	0	
2060	0	0	0	0	0	0	0	0	0	
2061	0	0	0	0	0	0	0	0	0	
2062	0	0	0	0	0	0	0	0	0	
2063	0	0	0	0	0	0	0	0	0	
2064	0	0	0	0	0	0	0	0	0	
NOMINAL	0	0	61,214	61,214	3,374	37,590	0	40,964	20,250	
NPV	0	0	21,236	21,236	1,300	14,376	0	15,676	5,560	
Utility Discount Rate = 6.83%										
Benefit Cost Ratio = 1.355										

PROGRAM:	Interruptible Service DR			IS					
Total Resource Cost (TRC) Test									
	BENEFITS				COSTS				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
	TOTAL	AVOIDED	AVOIDED		UTILITY				
	FUEL & O&M	T&D CAP.	GEN. CAP.	TOTAL	PROGRAM	PARTICIPANT'S	TOTAL	NET	
	SAVINGS	COSTS	COSTS	BENEFITS	COSTS	COST	COSTS	BENEFITS	
YEAR	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	
2025	0	0	0	0	37	0	37	-37	
2026	0	0	0	0	46	0	46	-46	
2027	0	0	0	0	55	0	55	-55	
2028	0	0	0	0	65	0	65	-65	
2029	0	0	1,115	1,115	76	0	76	1,039	
2030	0	0	1,337	1,337	87	0	87	1,250	
2031	0	0	1,558	1,558	98	0	98	1,460	
2032	0	0	1,604	1,604	110	0	110	1,494	
2033	0	0	1,819	1,819	122	0	122	1,697	
2034	0	0	2,376	2,376	135	0	135	2,241	
2035	0	0	2,398	2,398	102	0	102	2,296	
2036	0	0	2,421	2,421	105	0	105	2,316	
2037	0	0	2,444	2,444	107	0	107	2,336	
2038	0	0	2,467	2,467	110	0	110	2,357	
2039	0	0	2,491	2,491	113	0	113	2,378	
2040	0	0	2,515	2,515	116	0	116	2,399	
2041	0	0	2,539	2,539	118	0	118	2,421	
2042	0	0	2,564	2,564	121	0	121	2,443	
2043	0	0	2,590	2,590	124	0	124	2,466	
2044	0	0	2,616	2,616	128	0	128	2,488	
2045	0	0	2,642	2,642	131	0	131	2,512	
2046	0	0	2,669	2,669	134	0	134	2,535	
2047	0	0	2,697	2,697	137	0	137	2,559	
2048	0	0	2,725	2,725	141	0	141	2,584	
2049	0	0	2,753	2,753	144	0	144	2,609	
2050	0	0	2,504	2,504	133	0	133	2,371	
2051	0	0	2,249	2,249	121	0	121	2,128	
2052	0	0	1,988	1,988	109	0	109	1,880	
2053	0	0	1,722	1,722	96	0	96	1,627	
2054	0	0	1,450	1,450	82	0	82	1,368	
2055	0	0	1,172	1,172	67	0	67	1,105	
2056	0	0	888	888	51	0	51	837	
2057	0	0	598	598	35	0	35	563	
2058	0	0	302	302	18	0	18	284	
2059	0	0	0	0	0	0	0	0	
2060	0	0	0	0	0	0	0	0	
2061	0	0	0	0	0	0	0	0	
2062	0	0	0	0	0	0	0	0	
2063	0	0	0	0	0	0	0	0	
2064	0	0	0	0	0	0	0	0	
NOMINAL	0	0	61,214	61,214	3,374	0	3,374	57,840	
NPV	0	0	21,236	21,236	1,300	0	1,300	19,936	
Utility Discount Rate = 6.83%									
Benefit Cost Ratio = 16.332									

PROGRAM:	Interruptible Service DR			IS				
Participant Test								
	BENEFITS				COSTS			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
	SAVINGS IN		OTHER					
	PARTICIPANT'S	INCENTIVE	PARTICIPANT'S	TOTAL	PARTICIPANT'S	TOTAL	NET	
	BILL	PAYMENTS	BENEFITS	BENEFITS	COST	COSTS	BENEFITS	
YEAR	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	
2025	0	150	0	150	0	0	150	
2026	0	301	0	301	0	0	301	
2027	0	451	0	451	0	0	451	
2028	0	601	0	601	0	0	601	
2029	0	752	0	752	0	0	752	
2030	0	902	0	902	0	0	902	
2031	0	1,053	0	1,053	0	0	1,053	
2032	0	1,203	0	1,203	0	0	1,203	
2033	0	1,353	0	1,353	0	0	1,353	
2034	0	1,504	0	1,504	0	0	1,504	
2035	0	1,504	0	1,504	0	0	1,504	
2036	0	1,504	0	1,504	0	0	1,504	
2037	0	1,504	0	1,504	0	0	1,504	
2038	0	1,504	0	1,504	0	0	1,504	
2039	0	1,504	0	1,504	0	0	1,504	
2040	0	1,504	0	1,504	0	0	1,504	
2041	0	1,504	0	1,504	0	0	1,504	
2042	0	1,504	0	1,504	0	0	1,504	
2043	0	1,504	0	1,504	0	0	1,504	
2044	0	1,504	0	1,504	0	0	1,504	
2045	0	1,504	0	1,504	0	0	1,504	
2046	0	1,504	0	1,504	0	0	1,504	
2047	0	1,504	0	1,504	0	0	1,504	
2048	0	1,504	0	1,504	0	0	1,504	
2049	0	1,504	0	1,504	0	0	1,504	
2050	0	1,353	0	1,353	0	0	1,353	
2051	0	1,203	0	1,203	0	0	1,203	
2052	0	1,053	0	1,053	0	0	1,053	
2053	0	902	0	902	0	0	902	
2054	0	752	0	752	0	0	752	
2055	0	601	0	601	0	0	601	
2056	0	451	0	451	0	0	451	
2057	0	301	0	301	0	0	301	
2058	0	150	0	150	0	0	150	
2059	0	0	0	0	0	0	0	
2060	0	0	0	0	0	0	0	
2061	0	0	0	0	0	0	0	
2062	0	0	0	0	0	0	0	
2063	0	0	0	0	0	0	0	
2064	0	0	0	0	0	0	0	
NOMINAL	0	37,590	0	37,590	0	0	37,590	
NPV	0	14,376	0	14,376	0	0	14,376	
Utility Discount Rate = 6.83%								
Benefit Cost Ratio: 9999								

PROGRAM:	Curtable Service DR			CS						
Rate Impact Measure (RIM) Test										
	BENEFITS				COSTS				(9)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)		
	TOTAL	AVOIDED	AVOIDED		UTILITY					
	FUEL & O&M	T&D CAP.	GEN. CAP.	TOTAL	PROGRAM	INCENTIVE	REVENUE	TOTAL	NET	
	SAVINGS	COSTS	COSTS	BENEFITS	COSTS	PAYMENTS	LOSSES	COSTS	BENEFITS	
YEAR	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	
2025	0	0	0	0	3	63	0	67	-67	
2026	0	0	0	0	2	63	0	66	-66	
2027	0	0	0	0	6	127	0	132	-132	
2028	0	0	0	0	5	127	0	131	-131	
2029	0	0	335	335	8	190	0	198	136	
2030	0	0	334	334	7	190	0	197	137	
2031	0	0	334	334	7	190	0	197	136	
2032	0	0	301	301	8	190	0	198	103	
2033	0	0	303	303	8	190	0	198	105	
2034	0	0	356	356	8	190	0	198	158	
2035	0	0	360	360	8	190	0	198	162	
2036	0	0	363	363	8	190	0	198	165	
2037	0	0	367	367	9	190	0	199	168	
2038	0	0	370	370	9	190	0	199	171	
2039	0	0	374	374	9	190	0	199	175	
2040	0	0	377	377	9	190	0	199	178	
2041	0	0	381	381	9	190	0	200	181	
2042	0	0	385	385	10	190	0	200	185	
2043	0	0	388	388	10	190	0	200	189	
2044	0	0	392	392	10	190	0	200	192	
2045	0	0	396	396	10	190	0	200	196	
2046	0	0	400	400	11	190	0	201	200	
2047	0	0	405	405	11	190	0	201	204	
2048	0	0	409	409	11	190	0	201	207	
2049	0	0	413	413	11	190	0	202	211	
2050	0	0	278	278	8	127	0	135	144	
2051	0	0	281	281	8	127	0	135	146	
2052	0	0	142	142	4	63	0	67	75	
2053	0	0	144	144	4	63	0	68	76	
2054	0	0	0	0	0	0	0	0	0	
2055	0	0	0	0	0	0	0	0	0	
2056	0	0	0	0	0	0	0	0	0	
2057	0	0	0	0	0	0	0	0	0	
2058	0	0	0	0	0	0	0	0	0	
2059	0	0	0	0	0	0	0	0	0	
2060	0	0	0	0	0	0	0	0	0	
2061	0	0	0	0	0	0	0	0	0	
2062	0	0	0	0	0	0	0	0	0	
2063	0	0	0	0	0	0	0	0	0	
2064	0	0	0	0	0	0	0	0	0	
NOMINAL	0	0	8,587	8,587	231	4,752	0	4,983	3,604	
NPV	0	0	3,371	3,371	96	2,118	0	2,214	1,157	
Utility Discount Rate = 6.83%										
Benefit Cost Ratio = 1.522										

PROGRAM:	Curtable Service DR			CS				
Total Resource Cost (TRC) Test								
	BENEFITS				COSTS			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	TOTAL	AVOIDED	AVOIDED		UTILITY			
	FUEL & O&M	T&D CAP.	GEN. CAP.	TOTAL	PROGRAM	PARTICIPANTS	TOTAL	NET
	SAVINGS	COSTS	COSTS	BENEFITS	COSTS	COST	COSTS	BENEFITS
YEAR	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)
2025	0	0	0	0	3	0	3	-3
2026	0	0	0	0	2	0	2	-2
2027	0	0	0	0	6	0	6	-6
2028	0	0	0	0	5	0	5	-5
2029	0	0	335	335	8	0	8	326
2030	0	0	334	334	7	0	7	327
2031	0	0	334	334	7	0	7	326
2032	0	0	301	301	8	0	8	293
2033	0	0	303	303	8	0	8	295
2034	0	0	356	356	8	0	8	349
2035	0	0	360	360	8	0	8	352
2036	0	0	363	363	8	0	8	355
2037	0	0	367	367	9	0	9	358
2038	0	0	370	370	9	0	9	361
2039	0	0	374	374	9	0	9	365
2040	0	0	377	377	9	0	9	368
2041	0	0	381	381	9	0	9	371
2042	0	0	385	385	10	0	10	375
2043	0	0	388	388	10	0	10	379
2044	0	0	392	392	10	0	10	382
2045	0	0	396	396	10	0	10	386
2046	0	0	400	400	11	0	11	390
2047	0	0	405	405	11	0	11	394
2048	0	0	409	409	11	0	11	398
2049	0	0	413	413	11	0	11	402
2050	0	0	278	278	8	0	8	270
2051	0	0	281	281	8	0	8	273
2052	0	0	142	142	4	0	4	138
2053	0	0	144	144	4	0	4	139
2054	0	0	0	0	0	0	0	0
2055	0	0	0	0	0	0	0	0
2056	0	0	0	0	0	0	0	0
2057	0	0	0	0	0	0	0	0
2058	0	0	0	0	0	0	0	0
2059	0	0	0	0	0	0	0	0
2060	0	0	0	0	0	0	0	0
2061	0	0	0	0	0	0	0	0
2062	0	0	0	0	0	0	0	0
2063	0	0	0	0	0	0	0	0
2064	0	0	0	0	0	0	0	0
NOMINAL	0	0	8,587	8,587	231	0	231	8,356
NPV	0	0	3,371	3,371	96	0	96	3,275
Utility Discount Rate = 6.83%								
Benefit Cost Ratio = 35.120								

PROGRAM:	Curtable Service DR			CS					
Participant Test									
	BENEFITS				COSTS				
	(1)	(2)	(3)	(4)	(5)	(6)		(7)	
	SAVINGS IN		OTHER						
	PARTICIPANT'S	INCENTIVE	PARTICIPANT'S	TOTAL	PARTICIPANT'S	TOTAL		NET	
	BILL	PAYMENTS	BENEFITS	BENEFITS	COST	COSTS		BENEFITS	
YEAR	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	
2025	0	63	0	63	0	0		63	
2026	0	63	0	63	0	0		63	
2027	0	127	0	127	0	0		127	
2028	0	127	0	127	0	0		127	
2029	0	190	0	190	0	0		190	
2030	0	190	0	190	0	0		190	
2031	0	190	0	190	0	0		190	
2032	0	190	0	190	0	0		190	
2033	0	190	0	190	0	0		190	
2034	0	190	0	190	0	0		190	
2035	0	190	0	190	0	0		190	
2036	0	190	0	190	0	0		190	
2037	0	190	0	190	0	0		190	
2038	0	190	0	190	0	0		190	
2039	0	190	0	190	0	0		190	
2040	0	190	0	190	0	0		190	
2041	0	190	0	190	0	0		190	
2042	0	190	0	190	0	0		190	
2043	0	190	0	190	0	0		190	
2044	0	190	0	190	0	0		190	
2045	0	190	0	190	0	0		190	
2046	0	190	0	190	0	0		190	
2047	0	190	0	190	0	0		190	
2048	0	190	0	190	0	0		190	
2049	0	190	0	190	0	0		190	
2050	0	127	0	127	0	0		127	
2051	0	127	0	127	0	0		127	
2052	0	63	0	63	0	0		63	
2053	0	63	0	63	0	0		63	
2054	0	0	0	0	0	0		0	
2055	0	0	0	0	0	0		0	
2056	0	0	0	0	0	0		0	
2057	0	0	0	0	0	0		0	
2058	0	0	0	0	0	0		0	
2059	0	0	0	0	0	0		0	
2060	0	0	0	0	0	0		0	
2061	0	0	0	0	0	0		0	
2062	0	0	0	0	0	0		0	
2063	0	0	0	0	0	0		0	
2064	0	0	0	0	0	0		0	
NOMINAL	0	4,752	0	4,752	0	0		4,752	
NPV	0	2,118	0	2,118	0	0		2,118	
Utility Discount Rate = 6.83%									
Benefit Cost Ratio: 9999									

PROGRAM:	Standby Generation DR			SBG						
Rate Impact Measure (RIM) Test										
	BENEFITS				COSTS					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
	TOTAL	AVOIDED	AVOIDED		UTILITY					
	FUEL & O&M	T&D CAP.	GEN. CAP.	TOTAL	PROGRAM	INCENTIVE	REVENUE	TOTAL	NET	
	SAVINGS	COSTS	COSTS	BENEFITS	COSTS	PAYMENTS	LOSSES	COSTS	BENEFITS	
YEAR	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	
2025	0	0	0	0	39	169	0	208	-208	
2026	0	0	0	0	54	338	0	392	-392	
2027	0	0	0	0	90	592	0	682	-682	
2028	0	0	0	0	114	846	0	960	-960	
2029	0	0	2,899	2,899	139	1,099	0	1,239	1,661	
2030	0	0	3,676	3,676	177	1,395	0	1,572	2,104	
2031	0	0	4,450	4,450	209	1,691	0	1,900	2,551	
2032	0	0	4,812	4,812	254	2,029	0	2,283	2,529	
2033	0	0	5,660	5,660	293	2,367	0	2,661	2,999	
2034	0	0	7,604	7,604	334	2,706	0	3,040	4,564	
2035	0	0	7,674	7,674	277	2,706	0	2,983	4,692	
2036	0	0	7,746	7,746	284	2,706	0	2,990	4,757	
2037	0	0	7,819	7,819	291	2,706	0	2,997	4,823	
2038	0	0	7,894	7,894	298	2,706	0	3,004	4,890	
2039	0	0	7,970	7,970	306	2,706	0	3,011	4,958	
2040	0	0	8,047	8,047	313	2,706	0	3,019	5,028	
2041	0	0	8,126	8,126	321	2,706	0	3,027	5,099	
2042	0	0	8,206	8,206	329	2,706	0	3,035	5,171	
2043	0	0	8,288	8,288	338	2,706	0	3,043	5,245	
2044	0	0	8,371	8,371	346	2,706	0	3,052	5,319	
2045	0	0	8,456	8,456	355	2,706	0	3,060	5,395	
2046	0	0	8,542	8,542	364	2,706	0	3,069	5,473	
2047	0	0	8,630	8,630	373	2,706	0	3,078	5,551	
2048	0	0	8,719	8,719	382	2,706	0	3,088	5,632	
2049	0	0	8,810	8,810	391	2,706	0	3,097	5,713	
2050	0	0	8,346	8,346	376	2,537	0	2,913	5,433	
2051	0	0	7,871	7,871	360	2,367	0	2,727	5,144	
2052	0	0	7,101	7,101	329	2,114	0	2,443	4,658	
2053	0	0	6,314	6,314	297	1,860	0	2,157	4,157	
2054	0	0	5,510	5,510	263	1,606	0	1,869	3,641	
2055	0	0	4,542	4,542	220	1,311	0	1,530	3,012	
2056	0	0	3,553	3,553	175	1,015	0	1,189	2,364	
2057	0	0	2,394	2,394	119	676	0	796	1,598	
2058	0	0	1,209	1,209	61	338	0	399	810	
2059	0	0	0	0	0	0	0	0	0	
2060	0	0	0	0	0	0	0	0	0	
2061	0	0	0	0	0	0	0	0	0	
2062	0	0	0	0	0	0	0	0	0	
2063	0	0	0	0	0	0	0	0	0	
2064	0	0	0	0	0	0	0	0	0	
NOMINAL	0	0	199,240	199,240	8,873	67,642	0	76,515	122,725	
NPV	0	0	67,202	67,202	3,139	24,819	0	27,958	39,244	
Utility Discount Rate = 6.83%										
Benefit Cost Ratio = 2.404										

PROGRAM:	Standby Generation DR			SBG					
Total Resource Cost (TRC) Test									
	BENEFITS				COSTS				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
	TOTAL	AVOIDED	AVOIDED		UTILITY				
	FUEL & O&M	T&D CAP.	GEN. CAP.	TOTAL	PROGRAM	PARTICIPANT'S	TOTAL	NET	
	SAVINGS	COSTS	COSTS	BENEFITS	COSTS	COST	COSTS	BENEFITS	
YEAR	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	
2025	0	0	0	0	39	0	39	-39	
2026	0	0	0	0	54	0	54	-54	
2027	0	0	0	0	90	0	90	-90	
2028	0	0	0	0	114	0	114	-114	
2029	0	0	2,899	2,899	139	0	139	2,760	
2030	0	0	3,676	3,676	177	0	177	3,499	
2031	0	0	4,450	4,450	209	0	209	4,242	
2032	0	0	4,812	4,812	254	0	254	4,558	
2033	0	0	5,660	5,660	293	0	293	5,366	
2034	0	0	7,604	7,604	334	0	334	7,269	
2035	0	0	7,674	7,674	277	0	277	7,397	
2036	0	0	7,746	7,746	284	0	284	7,462	
2037	0	0	7,819	7,819	291	0	291	7,528	
2038	0	0	7,894	7,894	298	0	298	7,596	
2039	0	0	7,970	7,970	306	0	306	7,664	
2040	0	0	8,047	8,047	313	0	313	7,734	
2041	0	0	8,126	8,126	321	0	321	7,805	
2042	0	0	8,206	8,206	329	0	329	7,877	
2043	0	0	8,288	8,288	338	0	338	7,950	
2044	0	0	8,371	8,371	346	0	346	8,025	
2045	0	0	8,456	8,456	355	0	355	8,101	
2046	0	0	8,542	8,542	364	0	364	8,178	
2047	0	0	8,630	8,630	373	0	373	8,257	
2048	0	0	8,719	8,719	382	0	382	8,337	
2049	0	0	8,810	8,810	391	0	391	8,419	
2050	0	0	8,346	8,346	376	0	376	7,970	
2051	0	0	7,871	7,871	360	0	360	7,511	
2052	0	0	7,101	7,101	329	0	329	6,772	
2053	0	0	6,314	6,314	297	0	297	6,017	
2054	0	0	5,510	5,510	263	0	263	5,247	
2055	0	0	4,542	4,542	220	0	220	4,322	
2056	0	0	3,553	3,553	175	0	175	3,379	
2057	0	0	2,394	2,394	119	0	119	2,274	
2058	0	0	1,209	1,209	61	0	61	1,148	
2059	0	0	0	0	0	0	0	0	
2060	0	0	0	0	0	0	0	0	
2061	0	0	0	0	0	0	0	0	
2062	0	0	0	0	0	0	0	0	
2063	0	0	0	0	0	0	0	0	
2064	0	0	0	0	0	0	0	0	
NOMINAL	0	0	199,240	199,240	8,873	0	8,873	190,367	
NPV	0	0	67,202	67,202	3,139	0	3,139	64,063	
Utility Discount Rate = 6.83%									
Benefit Cost Ratio = 21.412									

PROGRAM:	Standby Generation DR			SBG				
Participant Test								
BENEFITS					COSTS			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
	SAVINGS IN		OTHER					
	PARTICIPANT'S	INCENTIVE	PARTICIPANT'S	TOTAL	PARTICIPANT'S	TOTAL	NET	
	BILL	PAYMENTS	BENEFITS	BENEFITS	COST	COSTS	BENEFITS	
YEAR	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	\$(000)	
2025	0	169	0	169	0	0	169	
2026	0	338	0	338	0	0	338	
2027	0	592	0	592	0	0	592	
2028	0	846	0	846	0	0	846	
2029	0	1,099	0	1,099	0	0	1,099	
2030	0	1,395	0	1,395	0	0	1,395	
2031	0	1,691	0	1,691	0	0	1,691	
2032	0	2,029	0	2,029	0	0	2,029	
2033	0	2,367	0	2,367	0	0	2,367	
2034	0	2,706	0	2,706	0	0	2,706	
2035	0	2,706	0	2,706	0	0	2,706	
2036	0	2,706	0	2,706	0	0	2,706	
2037	0	2,706	0	2,706	0	0	2,706	
2038	0	2,706	0	2,706	0	0	2,706	
2039	0	2,706	0	2,706	0	0	2,706	
2040	0	2,706	0	2,706	0	0	2,706	
2041	0	2,706	0	2,706	0	0	2,706	
2042	0	2,706	0	2,706	0	0	2,706	
2043	0	2,706	0	2,706	0	0	2,706	
2044	0	2,706	0	2,706	0	0	2,706	
2045	0	2,706	0	2,706	0	0	2,706	
2046	0	2,706	0	2,706	0	0	2,706	
2047	0	2,706	0	2,706	0	0	2,706	
2048	0	2,706	0	2,706	0	0	2,706	
2049	0	2,706	0	2,706	0	0	2,706	
2050	0	2,537	0	2,537	0	0	2,537	
2051	0	2,367	0	2,367	0	0	2,367	
2052	0	2,114	0	2,114	0	0	2,114	
2053	0	1,860	0	1,860	0	0	1,860	
2054	0	1,606	0	1,606	0	0	1,606	
2055	0	1,311	0	1,311	0	0	1,311	
2056	0	1,015	0	1,015	0	0	1,015	
2057	0	676	0	676	0	0	676	
2058	0	338	0	338	0	0	338	
2059	0	0	0	0	0	0	0	
2060	0	0	0	0	0	0	0	
2061	0	0	0	0	0	0	0	
2062	0	0	0	0	0	0	0	
2063	0	0	0	0	0	0	0	
2064	0	0	0	0	0	0	0	
NOMINAL	0	67,642	0	67,642	0	0	67,642	
NPV	0	24,819	0	24,819	0	0	24,819	
Utility Discount Rate = 6.83%								
Benefit Cost Ratio: 9999								

**DUKE ENERGY FLORIDA'S
UPDATED COST-EFFECTIVENESS TESTS FOR ALL DSM PROGRAMS
IN RIM PORTFOLIO**

Residential Incentive Program:

Cost Effectiveness Tests				
Cost-Effectiveness Test	NPV Benefits \$(000)	NPV Costs \$ (000)	NPV Net Benefits \$(000)	B/C Ratio
Rate Impact Measure	\$310,645,933	\$177,435,171	\$133,210,762	1.75
Participant	\$168,100,142	\$69,946,560	\$98,153,582	2.40
Total Resource Cost	\$310,645,933	\$79,281,589	\$231,364,344	3.92

Multi Family New Builder Construction:

Cost Effectiveness Tests				
Cost-Effectiveness Test	NPV Benefits \$(000)	NPV Costs \$ (000)	NPV Net Benefits \$(000)	B/C Ratio
Rate Impact Measure	\$136,655,754	\$111,662,288	\$24,993,466	1.22
Participant	\$104,398,823	\$16,441,200	\$87,957,623	6.35
Total Resource Cost	\$136,655,754	\$23,704,664	\$112,951,089	5.76

Smart Saver Better Business Program:

Cost Effectiveness Tests				
Cost-Effectiveness Test	NPV Benefits \$(000)	NPV Costs \$ (000)	NPV Net Benefits \$(000)	B/C Ratio
Rate Impact Measure	\$103,079,064	\$60,004,416	\$43,074,648	1.72
Participant	\$49,595,225	\$36,811,802	\$12,783,423	1.35
Total Resource Cost	\$103,079,064	\$47,220,993	\$55,858,071	2.18

Residential Load Management Program:

Cost Effectiveness Tests				
Cost-Effectiveness Test	NPV Benefits \$(000)	NPV Costs \$ (000)	NPV Net Benefits \$(000)	B/C Ratio
Rate Impact Measure	\$101,654,332	\$55,884,408	\$45,769,925	1.82
Participant	\$17,428,322	\$0	\$17,428,322	9999
Total Resource Cost	\$101,654,332	\$38,456,086	\$63,198,246	2.64

Interruptible Services Program:

Cost Effectiveness Tests				
Cost-Effectiveness Test	NPV Benefits \$(000)	NPV Costs \$ (000)	NPV Net Benefits \$(000)	B/C Ratio
Rate Impact Measure	\$21,235,988	\$15,676,287	\$5,559,701	1.35
Participant	\$14,375,999	\$0	\$14,375,999	9999
Total Resource Cost	\$21,235,988	\$1,300,288	\$19,935,700	16.33

Curtable Services Program:

Cost Effectiveness Tests				
Cost-Effectiveness Test	NPV Benefits \$(000)	NPV Costs \$ (000)	NPV Net Benefits \$(000)	B/C Ratio
Rate Impact Measure	\$3,370,558	\$2,213,883	\$1,156,675	1.52
Participant	\$2,117,912	\$0	\$2,117,912	9999
Total Resource Cost	\$3,370,558	\$95,972	\$3,274,587	35.12

Standby Generation Program:

Cost Effectiveness Tests				
Cost-Effectiveness Test	NPV Benefits \$(000)	NPV Costs \$ (000)	NPV Net Benefits \$(000)	B/C Ratio
Rate Impact Measure	\$67,201,940	\$27,957,929	\$39,244,010	2.40
Participant	\$24,819,358	\$0	\$24,819,358	9999.00
Total Resource Cost	\$67,201,940	\$3,138,571	\$64,063,369	21.41

**DUKE ENERGY FLORIDA'S
UPDATED COST-EFFECTIVENESS TESTS FOR ALL DSM PROGRAMS
IN TRC PORTFOLIO**

Residential Incentive Program:

Cost Effectiveness Tests				
Cost-Effectiveness Test	NPV Benefits \$(000)	NPV Costs \$ (000)	NPV Net Benefits \$(000)	B/C Ratio
Rate Impact Measure	\$1,048,953,486	\$547,694,427	\$501,259,059	1.92
Participant	\$527,369,378	\$217,224,042	\$310,145,336	2.43
Total Resource Cost	\$1,048,953,486	\$237,549,091	\$811,404,395	4.42

Multi Family New Builder Construction:

Cost Effectiveness Tests				
Cost-Effectiveness Test	NPV Benefits \$(000)	NPV Costs \$ (000)	NPV Net Benefits \$(000)	B/C Ratio
Rate Impact Measure	\$136,655,754	\$111,662,288	\$24,993,466	1.22
Participant	\$104,398,823	\$16,441,200	\$87,957,623	6.35
Total Resource Cost	\$136,655,754	\$23,704,664	\$112,951,089	5.76

Smart Saver Better Business Program:

Cost Effectiveness Tests				
Cost-Effectiveness Test	NPV Benefits \$(000)	NPV Costs \$ (000)	NPV Net Benefits \$(000)	B/C Ratio
Rate Impact Measure	\$273,459,792	\$196,965,099	\$76,494,693	1.39
Participant	\$187,239,274	\$97,734,689	\$89,504,585	1.92
Total Resource Cost	\$273,459,792	\$107,460,514	\$165,999,278	2.54

Residential Load Management Program:

Cost Effectiveness Tests				
Cost-Effectiveness Test	NPV Benefits \$(000)	NPV Costs \$ (000)	NPV Net Benefits \$(000)	B/C Ratio
Rate Impact Measure	\$101,654,332	\$55,884,408	\$45,769,925	1.82
Participant	\$17,428,322	\$0	\$17,428,322	9999
Total Resource Cost	\$101,654,332	\$38,456,086	\$63,198,246	2.64

Interruptible Services Program:

Cost Effectiveness Tests				
Cost-Effectiveness Test	NPV Benefits \$(000)	NPV Costs \$ (000)	NPV Net Benefits \$(000)	B/C Ratio
Rate Impact Measure	\$21,235,988	\$15,676,287	\$5,559,701	1.35
Participant	\$14,375,999	\$0	\$14,375,999	9999
Total Resource Cost	\$21,235,988	\$1,300,288	\$19,935,700	16.33

Curtable Services Program:

Cost Effectiveness Tests				
Cost-Effectiveness Test	NPV Benefits \$(000)	NPV Costs \$ (000)	NPV Net Benefits \$(000)	B/C Ratio
Rate Impact Measure	\$3,370,558	\$2,213,883	\$1,156,675	1.52
Participant	\$2,117,912	\$0	\$2,117,912	9999
Total Resource Cost	\$3,370,558	\$95,972	\$3,274,587	35.12

Standby Generation Program:

Cost Effectiveness Tests				
Cost-Effectiveness Test	NPV Benefits \$(000)	NPV Costs \$ (000)	NPV Net Benefits \$(000)	B/C Ratio
Rate Impact Measure	\$67,201,940	\$27,957,929	\$39,244,010	2.40
Participant	\$24,819,358	\$0	\$24,819,358	9999.00
Total Resource Cost	\$67,201,940	\$3,138,571	\$64,063,369	21.41

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BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION
IN RE: COMMISSION REVIEW OF NUMERIC CONSERVATION GOALS

DIRECT TESTIMONY OF JIM HERNDON

DOCKET NO. 20240012-EG (Florida Power & Light Company)

DOCKET NO. 20240013-EG (Duke Energy Florida, LLC)

DOCKET NO. 20240014-EG (Tampa Electric Company)

DOCKET NO. 20240015-EG (Florida Public Utilities Company)

DOCKET NO. 20240016-EG (JEA)

DOCKET NO. 20240017-EG (Orlando Utilities Commission)

APRIL 2, 2024

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1 **I. INTRODUCTION**

2

3 **Q. Please state your name, position of employment, and business address.**

4 A. My name is Jim Herndon. I am Vice President in the Advisory Services Practice
5 within the Utility Services business unit of Resource Innovations, Inc. (RI). My
6 business address is 2500 Regency Parkway, Suite 220, Cary, North Carolina
7 27518. A statement of my background and qualifications is attached as Exhibit
8 No. JH-1.

9 **Q. Please discuss your areas of responsibility.**

10 A. I am responsible for providing consulting services for RI clients in the field of
11 Demand-Side Management (DSM) initiatives, which include energy efficiency
12 (EE), demand response (DR), and demand-side renewable energy (DSRE). In
13 this capacity, I primarily focus on DSM planning, including analysis of DSM
14 market impacts, and assisting utilities in the identification of DSM opportunities
15 and the development and design of DSM program initiatives. This includes the
16 development of market baseline and potential studies, cost-benefit analyses, and
17 design of comprehensive DSM programs and portfolios.

18 **Q. Please describe RI including its history, organization, and services provided.**

19 A. RI was founded in 2016, and is a globally recognized consulting, software, and
20 services firm that provides innovative DSM solutions to utilities, energy
21 enterprises, and government entities worldwide. RI merged with Nexant, Inc.,
22 in 2021, which provided similar DSM consulting services since its founding in
23 2000. RI's Utility Services business unit provides DSM engineering and

1 consulting services to government agencies and utilities, and helps residential,
2 commercial, and industrial facility owners manage energy consumption and
3 reduce costs in their facilities. RI also conducts development and
4 implementation services of DSM programs for public and investor-owned
5 utilities, governments, and end-use customers. Our range of experience in the
6 field of EE includes, but is not limited to:

- 7 • Market potential studies
- 8 • Program design
- 9 • Program implementation
- 10 • Marketing
- 11 • Vendor outreach, education, and training
- 12 • Incentive processing and fulfillment
- 13 • Turnkey customer service
- 14 • Online program tracking and reporting
- 15 • Evaluation, measurement and verification (EM&V)

16 **Q. What specific projects or studies has RI done to assess DSM potential?**

17 A. RI has conducted over 50 Market Potential Studies (MPS) to identify
18 opportunities for DSM in the United States and Canada. Examples of recent
19 clients include New York Power Authority (NYPA), Duke Energy (Indiana,
20 North Carolina, and South Carolina), Santee Cooper, El Paso Electric, the
21 Independent Electricity System Operator (IESO) of Ontario, Canada, and
22 Sacramento Municipal Utility District (SMUD). In addition, Nexant performed
23 the market potential study for the Florida Energy Efficiency and Conservation

1 Act (FEECA) utilities in the DSM goals proceeding conducted in 2019 before
2 this Commission.

3 **Q. Please summarize your experience with studies assessing DSM potential.**

4 A. I have been involved in conducting or managing over 30 DSM potential studies
5 over the past 17 years. In addition to these studies, I have led the development
6 of numerous DSM programs and portfolios, managed implementation of
7 residential, commercial, and industrial DSM programs, and conducted third-
8 party evaluations of utility DSM programs, providing extensive experience and
9 expertise regarding market analyses, DSM measures and technologies, and
10 utility program structures and best practices that inform the assessment of DSM
11 potential.

12 **Q. Have you previously testified before the Florida Public Service
13 Commission or in other state regulatory proceedings?**

14 A. Yes, I provided testimony in the 2019 DSM goals proceeding before this
15 Commission in support of our market potential studies for each FEECA utility
16 in that case. I have also submitted testimony before the Virginia State
17 Corporation Commission, the North Carolina Utilities Commission, the South
18 Carolina Public Service Commission, the Public Utilities Commission of Ohio,
19 and the New Jersey Board of Public Utilities.

20 **Q. What is the purpose of your testimony in this proceeding?**

21 A. The purpose of my testimony is to introduce and summarize the methodology
22 and findings of the Technical Potential Study (TPS) we conducted for each of
23 the six utilities subject to the requirements of FEECA, collectively the FEECA

1 Utilities, as well as the additional DSM planning support we provided for a
2 subset of the FEECA Utilities.

3 **Q. Please describe your role and responsibilities with respect to RI's work for**
4 **this proceeding.**

5 A. I served as the project manager for RI's work, directly overseeing all phases of
6 our analysis.

7 **Q. Are you sponsoring any exhibits in this case?**

8 A. Yes. I am sponsoring Exhibits No. JH-1 through No. JH-16, which are attached
9 to my testimony:

- 10 • Exhibit No. JH-1 – Herndon Background and Qualifications
- 11 • Exhibit No. JH-2 – TPS for Florida Power & Light
- 12 • Exhibit No. JH-3 – TPS for Duke Energy Florida
- 13 • Exhibit No. JH-4 – TPS for Tampa Electric Company
- 14 • Exhibit No. JH-5 – TPS for Florida Public Utilities Company
- 15 • Exhibit No. JH-6 – TPS for JEA
- 16 • Exhibit No. JH-7 – TPS for Orlando Utilities Commission
- 17 • Exhibit No. JH-8 – 2024 Measure Lists
- 18 • Exhibit No. JH-9 – Comparison of Comprehensive 2019 Measure Lists
19 to the 2024 Comprehensive Measure Lists
- 20 • Exhibit No. JH-10 – DEF Measure Screening and Economic
21 Sensitivities
- 22 • Exhibit No. JH-11 – FPUC Measure Screening and Economic
23 Sensitivities

- 1 • Exhibit No. JH-12 – JEA Measure Screening and Economic
- 2 Sensitivities
- 3 • Exhibit No. JH-13 – OUC Measure Screening and Economic
- 4 Sensitivities
- 5 • Exhibit No. JH-14 – FPUC Program Development Summary
- 6 • Exhibit No. JH-15 – JEA Program Development Summary
- 7 • Exhibit No. JH-16 – OUC Program Development Summary

8 **Q. What was the scope of work for which RI was retained?**

9 A. As described in Section 2 of RI’s TPS report for each utility, RI was retained
10 by the FEECA Utilities to independently analyze the Technical Potential (TP)
11 for EE, DR, and DSRE across their residential, commercial, and industrial retail
12 customer classes. This work included disaggregation of the current utility load
13 forecasts into their constituent customer-class and end-use components,
14 development of a comprehensive set of DSM measures and quantification of
15 the measures’ impacts, and calculation of potential energy and demand savings
16 at the technology, end-use, customer class, and system levels.

17 In addition, RI was retained by four of the six utilities to conduct an
18 economic analysis of EE, DR, and DSRE measures, designed to determine
19 which measures are cost-effective from different test perspectives and to
20 develop estimates of potential impacts if these measures were adopted in each
21 of these four utility service areas. RI also supported three of the six utilities in
22 developing DSM proposed goals through bundling individual DSM measures

1 into preliminary program concepts and estimating the impacts, including
2 participation, savings, and utility budgets, for these programs.

3 **Q. How, if at all, did the work performed by RI differ across the six FEECA**
4 **Utilities?**

5 A. The assessment of TP, including the utility forecast disaggregation and
6 customer segmentation, and development of a DSM measure list, was the same
7 for all six FEECA Utilities. The subsequent economic analysis, measure
8 adoption forecasts and development of proposed DSM goals varied in the work
9 RI conducted for individual FEECA Utilities, as follows:

- 10 • Tampa Electric Company (TECO) conducted their own economic
11 analysis and DSM goal development.
- 12 • Florida Power & Light (FPL) conducted their own economic analysis
13 and provided RI with the results. RI then developed measure adoption
14 estimates, and FPL conducted their own DSM goal development.
- 15 • Duke Energy Florida (DEF) contracted with RI to conduct the economic
16 analysis and measure adoption forecast, and DEF conducted its own
17 DSM goal development.
- 18 • JEA, Orlando Utilities Commission (OUC), and Florida Public Utilities
19 Company (FPUC) contracted with RI to conduct the economic analysis
20 and measure adoption forecast, and RI worked collaboratively with each
21 utility to develop the proposed DSM goals.

1 **Q. What reports have been produced in the scope of RI's work?**

2 A. RI has produced six separate TPS reports, one for each FEECA Utility under
3 this scope of work.

4 **Q. What were the major steps in the analytical work RI performed?**

5 A. The two major steps in RI's scope of work included development of technical
6 potential and, for applicable utilities, creation of proposed DSM goals that
7 aligned with utility program concepts. These steps included the following
8 tasks:

9 Step 1: Technical Potential. The TP analysis established the basis for the
10 development of proposed DSM goals. As summarized in Section 2 of each
11 utility's TPS report, and illustrated in Figure 1 of each report, the key tasks
12 in assessing the technical potential consisted of the following:

- 13 • *Load Forecast Disaggregation.* To disaggregate the load forecast,
14 RI collected utility load forecast data, relevant customer
15 segmentation and end-use consumption data, and supplemented this
16 with existing secondary data to create a disaggregated utility load
17 forecast broken out by customer sector and segment as well as by
18 end-use and equipment type, and calibrated to the overall utility
19 forecast.
- 20 • *Comprehensive Measure Development.* RI worked collaboratively
21 with the FEECA Utilities, who also sought input from various
22 external stakeholders, to develop a comprehensive list of DSM
23 technologies that are currently commercially available in Florida.

1 For all measures included in the study, RI developed estimates of
2 energy and demand savings, useful life, and incremental cost.

- 3 • *TP Analysis.* Using the disaggregated utility load forecast and the
4 DSM measure impacts, RI analyzed the TP for the application of all
5 measures to each utility’s retail customers.

6 Step 2: Development of Proposed DSM Goals. The development of
7 proposed goals built on the TP analysis, and included several interim steps,
8 as follows:

- 9 • *Economic Analysis.* For a subset of the FEECA Utilities, RI
10 conducted an economic analysis to determine which measures and
11 technologies were preliminarily cost-effective under a Rate Impact
12 Measure (RIM) test scenario or the Total Resource Cost (TRC) test
13 scenario. This step produced a set of measures, and associated energy
14 and demand savings, for each scenario before applying program
15 costs and adoption rates. Key tasks included the following:
 - 16 ○ Collect utility economic forecast data: RI received current
17 and forecasted avoided energy and avoided capacity costs
18 from each utility.
 - 19 ○ Apply measure impacts: including energy savings, summer
20 and winter demand savings, incremental cost, and measure
21 useful life to determine total avoided cost benefits, measure
22 costs, and lost revenues.

- 1 ○ Determine measures passing RIM test scenario and TRC test
- 2 scenario: measures with a benefit/cost ratio of less than 1.0
- 3 were screened from the economic analysis.
- 4 ○ RI also performed this economic screening analysis using a
- 5 set of economic sensitivities.
- 6 • *Measure adoption forecasts.* For a subset of the FEECA Utilities,
- 7 RI updated the economic analysis and developed market adoption
- 8 estimates for passing measures under each cost-effectiveness test
- 9 scenario. This step produced an updated “RIM Scenario” and a “TRC
- 10 Scenario” of passing measures and associated energy and demand
- 11 savings. Key tasks included:
- 12 ○ Applying estimated representative program costs, based on
- 13 current FEECA program data and other secondary sources,
- 14 and rerunning the economic analysis for both the TRC and
- 15 RIM scenarios, including screening these passing measures
- 16 from the Participant Cost Test (PCT) perspective for each
- 17 scenario.
- 18 ○ Incorporating free ridership screening based on payback
- 19 analysis, removing measures with a payback of less than two
- 20 years.
- 21 ○ Applying estimated market adoption rates for passing
- 22 measures for each scenario, based on economic and market

1 parameters, including payback acceptance, maturity of DSM
2 technology, and current utility offerings.

3 • *Measure bundling and program development.* For a subset of
4 utilities, RI supported the development of program concepts that
5 formed the basis for proposed DSM goals. Key tasks included:

6 ○ Measure bundling: RI worked collaboratively with the
7 FEECA Utilities to identify measures that aligned with
8 current programs or logically made sense to offer as a
9 program.

10 ○ Estimating program metrics, including annual participation,
11 savings, and utility budgets.

12

13 **II. MEASURE IDENTIFICATION AND SELECTION**

14

15 **Q. Please explain the process by which DSM measures were identified.**

16 A. The starting point for measure identification was the list of measures included
17 in the 2019 Florida TP Studies. Using this set of measures, the FEECA Utilities
18 initially reviewed and added proposed measures, and provided the combined
19 list to RI. RI compared the preliminary list to its DSM measure library,
20 compiled from similar studies conducted in recent years, as well as from other
21 utility DSM programs that RI has designed, implemented, or evaluated. The
22 FEECA Utilities also reached out to interested parties and received input with
23 recommendations on measure additions to the 2019 measure list. Their measure

1 suggestions were reviewed and incorporated into the study, as appropriate, as
2 detailed in Appendix D of each TPS report.

3 Through months of rigorous discussion with the FEECA Utilities, the
4 parameters for measures to be considered were established. The evaluation of
5 measures to include examined whether the measure was technically feasible and
6 currently commercially available in Florida; additionally, behavioral measures
7 without accompanying physical changes or utility-provided products and tools
8 were excluded, as were fuel-switching measures, other than in the context of
9 DSRE measures. The process to identify DSM measures is more fully described
10 in Section 4 of each TPS report.

11 **Q. Was the process of measure identification and selection appropriate for the**
12 **objectives of the study?**

13 A. Yes. The measure identification process was robust, comprehensive, and
14 appropriate for the objectives of the study. The final measure list was
15 developed to account for DSM measures that had been considered in prior
16 Florida studies and took full account of current Florida Building Code and
17 federal equipment standards, current FEECA Utilities' program offerings, and
18 the incorporation of DSM measures considered in other potential study reports
19 and other utility DSM program offerings around the country.

20 **Q. Did the process allow for the assessment of the full TP for FEECA Utilities?**

21 A. Yes. The thorough process for developing the list resulted in a comprehensive
22 set of over 400 unique EE, DR, and DSRE measures that fully addressed DSM
23 opportunities across all electric energy-consuming end-uses at residential,

1 commercial, and industrial facilities in the FEECA Utilities’ service areas. The
2 final measure list is provided in Exhibit No. JH-8.

3 **Q. How does the final DSM measure list compare with the measures included**
4 **in the 2019 TP Study?**

5 A. Exhibit No. JH-9 compares the comprehensive measure list for 2024 to the
6 measure list for the Florida Public Service Commission (Commission) 2019
7 Goals Dockets (Docket Nos. 20190015-EG – 20190021-EG). Compared to the
8 2019 TP, the 2024 TP update added 191 unique measures and eliminated 24
9 unique measures.

10 **Q. What changes to the measure list were associated with changes to building**
11 **code or appliance standards?**

12 A. The following measures changes were included in the 2024 TP study based on
13 Florida Building Code and federal equipment standards updates:

- 14 • Residential central air conditioner and heat pump baseline efficiency
15 was updated based on current U.S. Department of Energy, Energy
16 Conservation Standards for Residential Central Air Conditioners and
17 Heat Pumps
- 18 • Residential room air conditioner baseline efficiency was updated based
19 on current U.S. Department of Energy, Energy Conservation Standards
20 for Room Air Conditioners
- 21 • Two speed pool pump and variable speed pool pump measures were
22 eliminated based on current Florida Building Code and U.S. Department

1 of Energy, Energy Conservation Standards for Dedicated-Purpose Pool
2 Pump Motors.

3 **Q. Once measures were selected, what was the next step in RI’s analysis?**

4 A. Once measures were selected, the next step in RI’s analysis was to develop
5 individual impacts for each measure. These impacts included quantifying
6 summer demand (kW), winter demand (kW), and energy savings (kWh),
7 equipment useful life, and incremental costs of the measure. The measure
8 impacts were subsequently applied to the disaggregated utility load forecasts to
9 estimate TP in each utility service area.

10

11 **III. TECHNICAL POTENTIAL**

12

13 **Q. Please define Technical Potential.**

14 A. Section 366.82(3) of FEECA requires the Commission to “...evaluate the full
15 technical potential of all available demand-side and supply-side conservation
16 and efficiency measures, including demand-side renewable energy systems.”
17 Therefore, a TP analysis is the first in a series of steps in the DSM Goals
18 development process. Its purpose is to identify the theoretical limit to reducing
19 summer and winter electric peak demand and energy. The TP assumes every
20 identified potential end-use measure is installed everywhere it is “technically”
21 feasible to do so from an engineering standpoint, regardless of cost, customer
22 acceptance, or any other real-world constraints (such as product availability,

1 contractor/vendor capacity, cost-effectiveness, normal equipment replacement
2 rates, or customer preferences).

3 Therefore, the TP does not reflect the MW and GWh savings that may
4 be potentially achievable through real-world voluntary utility programs, but
5 rather it establishes the theoretical upper bound for DSM potential.

6 **Q. Do RI's TPS reports provide a detailed description of RI's methodology,
7 data, and assumptions for estimating TP?**

8 A. Yes. As stated earlier, RI developed individual TPS reports for each of the six
9 FEECA Utilities. The reports described RI's overall methodology, data, and
10 assumptions for disaggregating each utility's baseline load forecast,
11 development of DSM measures, and determination of TP.

12 **Q. Do these TPS reports identify the full TP for the FEECA Utilities?**

13 A. Yes. Each utility report identifies the full TP for the DSM measures analyzed
14 against the utility's baseline load forecast.

15 **Q. Please summarize the methodology, source of data, and assumptions used
16 to develop the TP for EE measures for the FEECA Utilities.**

17 A. As stated above, TP ignores all non-technical constraints on electricity savings,
18 such as cost-effectiveness and customer willingness to adopt EE. RI's
19 methodology for estimating EE TP begins with the disaggregated utility load
20 forecast. For the current analysis, RI used the 2023 load forecast from each
21 FEECA Utility, which, for all except FPUC, was based on the most recent Ten-
22 Year Site Plan available at the time the MPS was initiated, which were the 2023
23 Ten-Year Site Plans.

1 Next, all technically feasible measures are assigned to the appropriate
2 customer segments and end-uses. The measure kW and kWh impact data
3 collected during DSM measure development are then applied to the baseline
4 forecast, as illustrated in the following equation for the residential sector:



6
7 The savings factor, or percentage reduction in electricity consumption
8 resulting from application of the efficient technology, is applied to the baseline
9 energy use intensity to determine the per-home impact, and the other factors
10 listed in the equation above inform the total number of households where the
11 measure is applicable, technically feasible, and has not already been installed.
12 The result of this equation is the total TP for an EE measure or technology.

13 The final component of estimating overall TP is to account for the
14 interaction between measures. In some situations, measures compete with each
15 other, such as a 16 SEER air source heat pump and an 18 SEER air source heat
16 pump. For TP, the measure with the highest savings factor is prioritized. The
17 other interaction is measure overlap, where the impacts of one measure may
18 affect the savings for a subsequent measure. An example of measure overlap
19 would be the installation of an 18 SEER air source heat pump as well as a smart
20 thermostat that optimizes the operation of the heat pump. To account for
21 overlapping impacts, RI’s model ranks measures that interact with one another
22 and reduces the baseline consumption for the subsequent measure based on

1 savings achieved by the preceding measure. For TP, interactive measures are
2 ranked based on the total end-use energy savings percentage, with the measures
3 having a greater savings treated as being implemented first.

4 **Q. Please summarize the methodology, source of data, and assumptions used**
5 **to develop TP for DR measures for the FEECA Utilities.**

6 A. TP for DR is effectively the total of customer loads that could be curtailed
7 during conditions when utilities need capacity reductions. Therefore, RI's
8 approach to estimating DR TP focuses on the curtailable load available within
9 the time period of interest. In particular, the analysis focuses on end-uses
10 available for curtailment during peak periods and the magnitude of load within
11 each of these end-uses, beyond that of existing DR enrollment for each utility.

12 Similar to the estimation of EE TP, the DR analysis begins with a
13 disaggregation of the utility load forecast. RI's approach for load
14 disaggregation to identify DR opportunities is more advanced than that used for
15 most potential studies. Instead of disaggregating annual consumption or peak
16 demand, RI produced end-use load disaggregation for all 8,760 hours of the
17 year. This was needed because customer loads available at times when utility
18 system needs arise can vary substantially. For this study, curtailable load
19 opportunities, coincident with both the summer system peak and winter system
20 peak, were analyzed. Additionally, instead of producing disaggregated loads for
21 the average customer, the study produced loads for several customer segments.
22 RI examined three residential segments based on customer housing type, four

1 different small commercial and industrial (C&I) segments, and four different
2 large C&I customer segments, for a total of 11 different customer segments.
3 Next, RI identified the available load for the appropriate end-uses that can be
4 curtailed. RI's approach assumed that large C&I customers would forego
5 virtually all electric demand temporarily if the financial incentive was large
6 enough. For residential and small C&I customers, TP for DR is limited by loads
7 that can be controlled remotely at scale. For this study, it was assumed that
8 summer DR capacity for residential customers was comprised of air
9 conditioning (A/C), pool pumps, water heaters, and electric vehicle charging.
10 For small C&I customers, summer capacity was based on A/C load and electric
11 vehicle charging.

12 For winter capacity, residential DR capacity was based on electric
13 heating loads, pool pumps, water heaters, and electric vehicle charging. For
14 small C&I customers, winter capacity was based on heating load and electric
15 vehicle charging. For eligible loads within these end-uses, the TP was defined
16 as the amount coincident with system peak hours for each season. System peak
17 hours were identified using 2023 system load data. For DR TP, no measure
18 breakout was necessary because all measures targeted the end-uses estimated
19 for TP.

20 Finally, RI accounted for existing DR by assuming that all customers
21 currently enrolled in a DR program did not have additional load that could be
22 curtailed. As a result, all currently-enrolled DR customers were excluded from
23 the analysis.

1 **Q. Please summarize the methodology, source of data, and assumptions used**
2 **to develop TP for DSRE measures for the FEECA Utilities.**

3 A. TP for DSRE measures was developed using three separate models for each
4 category of DSRE: rooftop photovoltaic (PV); battery storage systems charged
5 from PV systems; and combined heat and power (CHP).

6 For PV systems, RI's approach estimated the square footage of residential and
7 commercial rooftops in the FEECA Utilities' service areas suitable for hosting
8 PV technology, and applied the following formula to estimate overall TP:



10 The analysis was conducted in five steps, as follows:

11 Step 1: Building stock characterization: Output of data from the forecast
12 disaggregation conducted for the EE and DR TP analysis were used to
13 characterize residential, commercial, and industrial building stocks.

14 Step 2: Estimate of feasible roof area: Total available roof area feasible
15 for installing PV systems was calculated using relevant parameters, such
16 as unusable area due to other rooftop equipment and setback
17 requirements, shading from trees, and limitations of roof orientation.

18 Step 3: Expected power density: A power density of 200 watts per
19 square meter (W/m^2) was assumed for estimating technical potential,
20 which corresponds to a panel with roughly 20 percent conversion
21 efficiency, a typical value for current PV installations.

1 Step 4: Hourly PV generation profile: Hourly generation profiles were
2 estimated using the U.S. Department of Energy National Renewal
3 Energy Laboratory’s solar estimation calculator, PVWatts©.

4 Step 5: Calculate total energy and coincident peak demand potential:
5 RI’s Spatial Penetration and Integration of Distributed Energy
6 Resources (SPIDER) Model was used to estimate total annual energy
7 and summer and winter peak demand potential by sector.

8 For battery storage systems, the TP analysis considered the fact that battery
9 systems on their own do not generate power or create efficiency improvements;
10 they simply store energy for use at different times. Therefore, battery systems
11 energized directly from the grid do not produce additional energy savings, but
12 may be used to shift or curtail load from one period for use in another. Because
13 the DR potential analysis focused on curtailable load opportunities, RI
14 concluded that no additional TP should be claimed. Similarly, battery systems
15 connected to rooftop PV systems do not produce additional energy savings;
16 they do, however, create the opportunity to store excess PV-generated energy
17 during hours where the PV system generates more than the home or business
18 consumes, then uses the stored power during peak periods.

19 Therefore, to determine additional peak demand reduction available
20 from PV-connected battery storage systems, RI used the following
21 methodology:

- 22 • Assumed that every PV system included in the PV TP analysis was
23 installed with a paired storage system.

- 1 • Sized the storage system to peak PV generation and assumed energy
2 storage duration of three hours.
- 3 • Applied RI's hourly dispatch optimization model in SPIDER to create
4 an hourly storage dispatch profile that flattened the individual
5 customer's load profile to the greatest extent possible, accounting for
6 (a) a customer's hourly load profile; (b) hourly PV generation profile;
7 and (c) battery peak demand, energy capacity, and roundtrip
8 charge/discharge efficiency.
- 9 • Calculated the effective hourly impact for the utility using the above
10 storage dispatch profile, aligned with the utility's peak hour (calculated
11 separately for summer and winter).

12 TP for CHP systems was based on identifying non-residential customer
13 segments with thermal load profiles that allow for the application of CHP,
14 where the waste heat generated can be fully utilized. First, minimum size
15 thresholds were determined for each non-residential segment using a segment-
16 specific thermal factor that considered the power-to-heat ratio of a typical
17 facility in each segment. Next, utility customers were segmented into industry
18 classifications and screened against the size thresholds. Premises with annual
19 kWh consumption that met or exceeded the thresholds were retained in the
20 analysis. Finally, facilities of sufficient size were matched with the
21 appropriately sized CHP technology. RI assigned CHP technologies to
22 customers in a top-down fashion, starting with the largest CHP generators,
23 which yielded the estimated quantity of CHP TP in each utility's service area.

1 **Q. Did your TP analysis account for interaction among EE, DR, and DSRE**
2 **technologies?**

3 A. Yes. While TP was estimated using separate models for EE, DR, and DSRE,
4 RI did recognize that interaction occurs among the TP for each, similar to the
5 interactions between EE measures applied to the same end-use. For example,
6 the installation of more efficient A/C would reduce the peak consumption
7 available for DR curtailment. Therefore, to account for this interaction, RI
8 incorporated the following assumptions and adjustments to the identified TP:

- 9 • EE TP was assumed to be implemented first, and therefore was not
10 adjusted for interaction with DR and DSRE.
- 11 • DR TP was applied next, and to account for the impact of EE TP, the
12 baseline load forecast for applicable end-uses was adjusted by the EE
13 TP, reducing the available load for curtailment.
- 14 • DSRE technologies were applied last and incorporated EE TP and DR
15 TP. For PV systems, the EE potential and DR potential did not impact
16 the amount of PV TP. However, for PV-connected battery systems, the
17 reduced baseline due to EE TP resulted in more PV-generated power
18 available from storage and usable during peak periods. For CHP
19 systems, the reduced baseline, as a result of EE, resulted in a reduction
20 in the number of facilities that met the annual energy threshold for CHP.
21 Installed DR capacity was assumed to not impact CHP potential as CHP
22 system feasibility was determined based on the energy consumption and
23 thermal parameters at the facility.

1 **Q. Once TP estimates were developed, what was the next step in your**
2 **analysis?**

3 A. Upon completion of the TP estimates, the next analysis step for a subset of the
4 utilities was to apply the measure economics (incremental cost) and utility
5 system economics (avoided supply cost, utility electric revenues, and customer
6 bill impacts) to conduct the economic analysis.

7

8 **IV. ECONOMIC ANALYSIS**

9

10 **Q. For which FEECA Utilities did RI conduct economic analyses?**

11 A. RI worked collaboratively with DEF, OUC, JEA, and FPUC on the economic
12 analysis, as follows:

13 Each utility provided RI with utility-specific economic forecast data, including
14 avoided supply costs and retail rate forecasts. RI incorporated these data into
15 our economic screening module to analyze the cost-effectiveness for individual
16 measures under the cost-effectiveness tests required by the Commission's
17 Order Consolidating Dockets and Establishing Procedure (Order No. PSC-
18 2024-0022-PCO-EG).

19 **Q. What cost-effectiveness tests were included in the economic analysis?**

20 A. When analyzing DSM measures, different cost-effectiveness tests are
21 considered to reflect the perspectives of different stakeholders. The Ratepayer
22 Impact Measure (RIM) test addresses an electric utility customer perspective,
23 which considers the net impact on electric utility rates associated with a

1 measure or program. The Total Resource Cost (TRC) test addresses a societal
 2 perspective, which considers costs of a DSM measure or program relative to the
 3 benefits of avoided utility supply costs. The Participant Cost Test (PCT)
 4 addresses a participant perspective, which considers net benefits to those
 5 participating in a DSM program.

6 The calculations were conducted consistent with the Cost Effectiveness
 7 Manual for Demand Side Management and Self Service Wheeling Proposals;
 8 Florida Public Service Commission, Tallahassee, FL; adopted June 11, 1991.
 9 Specific costs and benefits allocated within each cost-effectiveness test (RIM,
 10 TRC, and PCT), include the following:

11

Ratepayer Impact Measure (RIM) Test	
Component	Definition
Benefit	Increase in utility electric revenues Decrease in avoided electric utility supply costs
Cost	Decrease in utility electric revenues Increase in avoided electric utility supply costs Utility program costs, if applicable Utility incentives, if applicable

12

1

Total Resource Cost (TRC) Test	
Component	Definition
Benefit	Decrease in avoided electric utility supply costs
Cost	Increase in avoided electric utility supply costs Customer incremental costs (less any tax incentives) Utility program costs, if applicable

2

Participant Cost Test (PCT)	
Component	Definition
Benefit	Decrease in electric bill Utility incentives, if applicable
Cost	Increase in electric bill Customer incremental costs (less any tax incentives)

3

4 **Q. What economic screening criteria were applied for this study?**

5 A. For this study, economic screening was conducted for two Base Case scenarios:
6 the RIM Scenario and TRC Scenario. In both scenarios, all measures that
7 achieved a cost-effectiveness ratio of 1.0 or higher were considered cost-
8 effective from that test’s perspective.

9 For RI’s cost-effectiveness screening for DEF, JEA, OUC, and FPUC,
10 additional considerations included the following:

- 11 • Individual measures did not include any utility program costs (program
12 administrative or incentive costs), and therefore were evaluated on the
13 basis of measure cost-effectiveness without any utility intervention.

1 • Both scenarios required the measures to pass the PCT. Similar to the
2 TRC and RIM perspectives, the PCT screening was conducted without
3 any utility’s incentive costs applied to the measure.

4 **Q. What was the next step in the economic analysis?**

5 A. Once the list of passing measures was identified under each Base Case scenario,
6 the measures were reanalyzed in RI’s TEA-POT model to estimate demand and
7 energy savings for each utility. The updated modeling included updated
8 measure rankings to account for changes in measure interaction and overlap.
9 For the economic analysis, the ranking was based on the applicable test
10 perspective in each scenario (RIM or TRC), with the more cost-effective
11 measures being ranked first.

12 **Q. Were any additional economic sensitivities considered?**

13 A. Yes. As specified in Appendix B of the Order Consolidating Dockets and
14 Establishing Procedure (Order No. PSC-2024-0022-PCO-EG) in this docket,
15 economic sensitivities were performed as follows:

- 16 • Avoided fuel cost sensitivity, analyzing the number of measures passing
17 the economic screening based on higher and lower fuel prices.
- 18 • Payback period sensitivity, analyzing the number of measures passing
19 the economic screening based on shorter (one year) and longer (three
20 year) free ridership exclusion periods.
- 21 • For OUC, RI performed an additional sensitivity that reflected the
22 number of measures passing the economic screening when including
23 costs associated with carbon dioxide emissions.

1 The methodology for each sensitivity was consistent with the analysis of the
2 Base Case scenarios. DEF, JEA, OUC, and FPUC provided RI with avoided
3 supply cost forecasts for the higher and lower fuel price scenarios. The results
4 of these sensitivities are provided in Exhibits No. JH-10 through No. JH-13.

5 **Q. After these additional screenings were performed, what was the next major**
6 **activity?**

7 A. After the economic screening was conducted for the Base Case scenarios and
8 the sensitivities for each utility, the next step in the study was to develop
9 measure adoption estimates for a subset of the utilities.

10

11 V. MEASURE ADOPTION FORECASTS

12

13 **Q. Were any additional economic screening criteria applied for estimating**
14 **measure adoption forecasts?**

15 A. Yes. The associated program costs, including program administrative costs and
16 customer incentives, were included in the economic analysis used for
17 estimating measure adoption forecasts. Because this step occurred prior to each
18 utility developing specific programs aligned with their proposed goals,
19 representative administrative costs were developed using average FEECA
20 Utility program cost data, where available from current programs, and
21 supplemented with other utility program cost data where needed. In order to
22 evenly apply these representative costs to measures with a variety of savings
23 impacts, typical costs were estimated on a variable basis per kWh saved.

1 In addition, consistent with prior DSM analyses in Florida, free
2 ridership was addressed by applying a two-year payback criterion, which
3 eliminated measures having a simple payback of less than two years.

4 All measures were rescreened for the RIM Scenario and TRC Scenario
5 with the inclusion of these parameters.

6 **Q. How were measure incentives determined for this study?**

7 A. Measure incentives were developed for both the RIM Scenario and TRC
8 Scenario. Under each of these scenarios, the maximum incentive that could be
9 applied while remaining cost-effective was calculated for each measure.

10 • For the RIM Scenario, the RIM net benefit for each measure was
11 calculated based on total RIM benefits minus total RIM costs. Next, the
12 amount required to result in a simple payback period of two years for
13 each measure was calculated. The maximum incentive was based on
14 the lower of these two values.

15 • For the TRC Scenario, since the TRC test does not include utility
16 incentives as a cost or benefit, the maximum incentive was based on the
17 amount required to result in a simple payback period of two years for
18 each measure.

19 **Q. Please explain the methodology used by RI to develop measure adoption
20 forecast estimates for the cost-effective EE measures.**

21 A. RI's methodology consisted of applying estimates of market adoption, based on
22 utility-sponsored program incentives for all cost-effective EE measures in each
23 Base Case scenario. RI's market adoption estimates used a payback acceptance

1 criterion to estimate long-run market shares for measures as a function of
2 measure incremental costs and expected bill savings over the measures'
3 effective useful life (inclusive of utility incentives). Incremental adoption
4 estimates were based on the Bass Diffusion Model, which is a mathematical
5 description of how the rate of new product diffusion changes over time. For
6 this study, adoption curve input parameters were developed for each measure
7 based on specific criteria, including measure maturity in the market, overall
8 measure cost, and whether the measure was currently offered through a utility
9 program. RI's TEA-POT model then calculated demand and energy savings by
10 applying these adoption curves to each cost-effective measure.

11 **Q. Please explain the methodology used by RI to develop adoption forecast**
12 **estimates for the cost-effective DR measures.**

13 A. Similar to EE measures, RI's methodology for DR included calculating market
14 adoption as a function of the incentives offered to each customer group. For
15 DR measures currently offered by each utility, RI used the current incentive
16 level offered to estimate market adoption. For measures not currently offered
17 by a utility, RI used representative incentive levels offered for similar measures
18 in other markets to estimate market adoption. The utility-specific incentive
19 rates for each DR measure, along with participation rates collected by RI for
20 DR programs around the country, were used to calibrate DR market adoption
21 curves for each technology and customer segment. The calibrated adoption
22 rates were applied to the baseline load forecast to estimate the forecasted
23 adoption estimates for cost-effective DR technologies.

1 **Q. Please explain the methodology used by RI to develop adoption forecast**
2 **estimates for the cost-effective DSRE measures.**

3 A. RI did not produce estimates of adoption forecasts for DSRE measures as none
4 of the measures passed the cost-effectiveness screening for either the RIM or
5 TRC scenarios.

6 **Q. After estimating measure adoption forecasts, what was the next major**
7 **activity?**

8 A. The next step in the study was to develop proposed DSM goals for a subset of
9 the utilities.

10

11

VI. DSM GOAL DEVELOPMENT

12

13 **Q. What additional support did RI provide in development of proposed DSM**
14 **goals?**

15 A. For JEA, OUC, and FPUC, RI assisted with the development of three scenarios:
16 1) potential DSM programs that contribute to proposed DSM goals (Proposed
17 Goals Scenario), 2) potential DSM programs that pass the Participant and Rate
18 Impact Measure Tests (RIM Scenario), and 3) potential DSM programs that
19 pass the Participant and Total Resource Cost Tests (TRC Scenario). The
20 proposed DSM goal development process and results for each scenario is
21 described in more detail in Exhibit No. JH-14, No. JH-15, and No. JH-16, and
22 consisted of the following steps:

1 Step 1: Program Review and Measure Bundling. For each scenario,
2 Resource Innovations identified cost-effective measures from the
3 economic analysis described above and reviewed existing utility
4 program offerings to identify and align measures included in the TP
5 study analysis with current programs. Measures included in existing
6 programs but not part of the TRC Scenario or RIM Scenario determined
7 in the economic analysis were identified. In addition, measures that
8 were cost-effective for the TRC Scenario or RIM Scenario but were not
9 currently offered in a utility program were also identified. Based on the
10 program review and measure alignment, measures in each scenario were
11 bundled into preliminary program concepts that might align with current
12 programs or become new program offerings for the utility.

13 Step 2: Program Refinement and Modeling. Preliminary program
14 concepts and measure bundles were refined into proposed program
15 offerings and incentive and non-incentive budgets, participation
16 estimates, and impacts were developed using RI's TEA-POT model.
17 The modeling results were exported into RI's Program Planner
18 workbook that aggregated the program and portfolio impacts for each
19 scenario. For the TRC Scenario and RIM Scenario no further
20 refinements to the programs were made. For the Proposed Goals
21 scenario, RI continued to work collaboratively with each utility to
22 identify the measures and program concepts that comprise the proposed
23 DSM goals.

1 **Q. Was the DSM program development process limited to measures passing**
2 **the economic screening?**

3 A. No. In addition to measures that passed the TRC Scenario or RIM Scenario
4 screening, the measure bundling and program development process for the
5 Proposed Goals Scenario included additional measures, such as measures that
6 may be included in current programs or could be complementary additions to
7 current programs.

8 **Q. For measures currently offered by each utility, was the analysis limited to**
9 **the continuation of current programs?**

10 A. No. While continuity in program offerings is typically beneficial for customer
11 and contractor awareness and education, RI and each utility (JEA, OUC, and
12 FPUC) worked collaboratively to identify programs that are of interest to
13 continue and those that may need refinement. RI also provided our expertise in
14 utility program design from around the country to help guide the program
15 development process.

16

17 **VII. REASONABLENESS OF RI'S ANALYSES**

18

19 **Q. Are the methodology and models RI employed to develop TP estimates,**
20 **economic analysis, measure adoption forecasts, and proposed DSM goals**
21 **for the FEECA Utilities analytically sound?**

22 A. Yes. RI's approach is aligned with industry-standard methods and has been
23 applied and externally reviewed in numerous regulated jurisdictions. RI's

1 TEA-POT and SPIDER modeling tools have been specifically developed to
2 accommodate and calibrate to individual utility load forecast data, and they
3 enable the application of individual DSM measures and analysis of market
4 potential at a high resolution—by segment, end-use, equipment type, measure,
5 vintage, and year for each scenario analyzed.

6 The methodology and rigor of the measure development, technical
7 potential, and economic analysis is also consistent with the analysis conducted
8 for the 2019 energy conservation goals proceedings before this Commission.

9 **Q. Have these methodologies and models been relied upon by other**
10 **commissions or governmental agencies?**

11 A. Yes. RI’s methodology and the TEA-POT and SPIDER modeling tools have
12 been used in numerous studies in the United States and Canada. RI’s tools and
13 results have undergone extensive regulatory review and have been used for the
14 establishment of utility DSM targets in multiple jurisdictions, including North
15 Carolina, South Carolina, Georgia, California, Pennsylvania, Texas, and
16 Ontario.

17 **Q. Are the estimates of the TP developed by RI analytically sound and**
18 **reasonable?**

19 A. Yes. The TP was performed under my direction and resulted in a thorough and
20 wide-ranging analysis of DSM opportunities technically feasible in the FEECA
21 Utilities’ service areas. The TP process aligned with industry standards and
22 included a greater level of analytic detail than that of comparable models and
23 methodologies.

1 The process included extensive iterative analytical work and continuous
2 collaboration with the FEECA Utilities to ensure that it was comprehensive and
3 aligned with the characteristics of their service areas and forecasted loads.

4 **Q. Is the economic analysis conducted by RI analytically sound and**
5 **reasonable?**

6 A. Yes. The economic analysis was based on applying defined economic screening
7 metrics to each TP measure to determine cost-effectiveness. The analysis
8 included utility-provided economic forecasts to ensure alignment with other
9 aspects of utility resource planning and to determine an accurate assessment of
10 cost-effective DSM measures for each utility.

11 **Q. Are the proposed DSM goals that RI helped develop based on reasonable**
12 **and appropriate analysis of DSM measures and programs?**

13 A. Yes. RI's estimated measure adoption forecasts identified cost-effective DSM
14 opportunities for FEECA Utilities, based on the test perspectives included in
15 each scenario analyzed. These forecasts provided the foundation of the DSM
16 planning process that included a robust analysis of current utility programs,
17 bundling, and alignment of measures analyzed in the potential study as well as
18 the development of cost-effective programs. These programs collectively sum
19 to the sector-level and overall proposed DSM goals for each utility. This process
20 represents a reasonable and appropriate approach to the development of utility
21 DSM goals.

22 **Q. Does this conclude your direct testimony?**

23 A. Yes.



Jim Herndon

Vice President

Jim Herndon is a Vice President in the Advisory Services group, focusing on strategic planning and program design to more effectively implement demand-side management (DSM) programs. His work is informed by 22 years of experience performing market assessments, planning portfolios, managing program design and implementation, conducting technical project reviews and analyses, and delivering third-party program evaluations across a variety of sectors. Jim leads potential and market characterization studies, program portfolio development and cost-effectiveness analyses, and provides regulatory support and expert witness testimony for program filings and integrated resource planning (IRP) activities. In these capacities, he serves many electric and natural gas utilities, including Duke Energy, Dominion Energy, Georgia Power Company, Florida Power and Light, Santee Cooper, Columbia Gas of Virginia, and Washington Gas. In each consulting engagement, Jim strives to understand his client's objectives and tailor his team's analyses to leverage best practices, while providing strategic insights with the client's specific needs in mind.

EXPERIENCE

Vice President | Principal Consultant, Resource Innovations / Nexant (2013 - Present)

As an account executive and team leader in the Advisory Services Group, Jim ensures compliance with regulatory and energy program rules and coordinates staff workload and budgets. He works directly with clients, service providers, and customers to provide quality assurance on projects. Jim also manages regional and national client planning and benchmarking studies, as well as third-party impact and process evaluations.

Sr. Project Manager | Project Manager, Resource Innovations / Nexant (2007 - 2012)

As a Senior Project Manager and Southeast regional lead, Jim oversaw design and implementation of utility-sponsored DSM programs, including management of program design, administration, engineering, trade ally, and marketing program teams in NC and SC.

Sr. Project Engineer | Project Engineer, Resource Innovations / Nexant (2002 - 2006)

As a Project Engineer, Jim performed energy audits and analyses on facilities to identify, provide implementation support for, and verify the effectiveness of energy efficiency improvements. He was a Certified Home Energy Report (HERS) rater and supported the implementation of publicly funded energy efficiency and load management programs, including due diligence reviews of energy efficiency projects installed in California, New York, and Utah.

EDUCATION, CERTIFICATIONS, AND LICENSING

M.S. in Engineering Management - Duke University

B.S. in Civil and Environmental Engineering - Duke University

AFFILIATIONS

Southeast Energy Efficiency Alliance (SEEA) - Former Member of the Board of Directors (2014 - 2019)

AREAS OF EXPERTISE

Integrated Resource Planning (IRP) Support • Energy Analysis and Market Characterization • DSM & DER Market Potential Studies • Portfolio Planning, Program Design, and Evaluation • Regulatory Support and Expert Witness • Program Management



REPRESENTATIVE PROJECTS

Florida Power & Light Company - Florida Statewide DSM Technical Potential Study (2017 - 2019, and 2022 - Present)

Jim is leading the Resource Innovations team that was retained by Florida Power & Light in the state of Florida to complete technical potential studies of Demand Side Management (DSM) measures and renewable energy systems on behalf of six utilities. The six electric utilities subject to the Florida Energy Efficiency and Conservation Act (FEECA) include four Florida investor-owned utilities (IOUs): Florida Power & Light Company (FPL), Duke Energy Florida, LLC (DEF), Tampa Electric Company (TECO), and Florida Public Utilities Company (FPUC) that are regulated by the Florida Public Service Commission (FPSC) and two municipal utilities: JEA and Orlando Utilities Commission (OUC) that are not regulated by the FPSC. The FPSC establishes goals for the FEECA utilities to reduce the growth of Florida's peak electric demand and energy consumption and reviews the progress towards those goals frequently (every five years at a minimum). The scope of the studies includes Energy Efficiency (EE), Demand Response (DR), and Distributed Energy Resources (DER) opportunities across the residential, commercial, and industrial sectors, including interaction between these categories of DSM to account for overlapping impacts. In addition to the technical potential analysis, Jim and his team are assessing the economic and achievable opportunities for a subset of the six utilities. The results of this study will be used as the basis of the utilities' DSM goal-setting process for 2025-2034 in the 2024 Florida Goals Proceeding. Following the completion of the studies, Jim will provide regulatory support for these proceedings, including the preparation of direct written testimony, deposition, and support for the discovery process by preparing required responses to data requests and regulatory interrogatories.

Jim also led Resource Innovations' team that conducted the technical potential study and provided regulatory support for the 2019 FEECA goalsetting proceedings.

Duke Energy - Market Potential Studies (2015 - Present)

Jim has directed multiple DSM market potential studies for Duke Energy's North Carolina, South Carolina, Indiana, and Ohio service territories. The studies for each service territory integrated both energy efficiency and demand response opportunities across Duke Energy's residential, commercial, and industrial customer classes; and determined the technical, economic, and program potential. Resource Innovations conducts the studies in close coordination with Duke Energy's IRP team, as well as program design and delivery teams, to provide an accurate assessment of market potential that can be directly applied to Duke Energy's current and future DSM planning efforts.

Duke Energy - Program Evaluations (2014 - Present)

Jim currently serves as the Project Manager for the evaluation, measurement, and verification (EM&V) of six DSM program offerings, which include Duke Energy's Residential HVAC program, MyHER program, EE Education program, Save Energy & Water Kits program, Non-Residential Custom program, and Power Manager program. The evaluation activities include separate impact and process evaluations across Duke Energy's five service territories to assess program performance, adherence to best practices, and opportunities for program improvements. Jim provides daily project management oversight of project staff, coordination of resources, and quality control oversight of project deliverables.

Santee Cooper - Market Assessment, DSM Program Design, and Implementation (2009 - Present)

Jim provides strategic program design support activities for Santee Cooper's suite of energy efficiency programs across the residential and commercial market segments, as well as strategic program advisory services for Santee Cooper's long-term energy reduction goals. Jim also led the market assessment and market potential study that Resource Innovations conducted for Santee Cooper's service territory in 2019 and updated in 2023. The study included primary data collection to



Jim Herndon, Vice President

benchmark equipment efficiency and saturation in the service territory and incorporate this data into the development of future market potential. Previously, Jim managed the initial development, rollout, and management of Santee Cooper's commercial energy efficiency programs.

Columbia Gas of Virginia (CVA) - DSM Program Design, Cost-Benefit Analysis, and Implementation (2010 - Present)

Jim is the technical lead for the program design and regulatory support services team assisting CVA's WarmWise program offerings. This support includes portfolio planning and regulatory support for CVA's residential and commercial energy efficiency programs, as well as providing rebate processing and other support services to assist CVA in the implementation of their programs. Jim led portfolio planning efforts, including market characterization analysis, technical analysis of proposed programs and portfolio, development of annual program budgets and savings targets, and regulatory support of CVA's program filings with the Virginia State Corporation Commission, including providing written testimony supporting the analysis.

Dominion Energy - DSM Program Design and Implementation (2020 - Present)

Jim oversees DSM portfolio planning and program design projects for Dominion Energy's natural gas utilities in North Carolina, South Carolina, and Ohio. In each of these service territories, Jim and his team worked collaboratively with Dominion Energy to identify applicable DSM measures, quantify measure impacts, create logical program offerings, and analyze the cost-effectiveness of the offerings. Jim also supported the DSM regulatory process in each jurisdiction through the development of expert witness testimony and assistance with responses to regulatory data requests.

Virginia Natural Gas - DSM Program Design, Cost-Benefit Analysis, and Regulatory Support (2014 - Present)

On behalf of Virginia Natural Gas, Jim leads technical and regulatory support for the residential DSM portfolio. Support activities include program cost-effectiveness analysis and preparation of regulatory filings including annual status updates to the Virginia State Corporation Commission, and technical analysis and testimony for regulatory approval of program updates and modifications.

Georgia Power Company - DSM Program Analysis and IRP Support (2005 - 2019)

Jim provided technical and regulatory support for Georgia Power Company's DSM program analysis in the residential and commercial markets for their 2007, 2010, 2013, 2016, and 2019 IRP filings. The program analysis support included comprehensive compilation and assessment of applicable DSM measures and technologies across the residential, commercial, and industrial sectors, as well as the determination of the overall market potential through four separate technical potential studies (completed in 2007, 2012, 2015, and 2018). Jim also led the portfolio planning efforts that included developing preliminary program designs, savings targets, and budgets, along with supporting cost-effectiveness analysis to determine the feasibility of individual measures and program offerings for implementation.

Elizabethtown Gas - DSM Program Design and Regulatory Support (2016 - 2018)

In support of Elizabethtown Gas, Jim led technical and regulatory support to develop updated DSM program offerings for residential and commercial customers. He worked collaboratively with Elizabethtown Gas to develop cost-beneficial programs for eligible customers. Activities included program cost-effectiveness analysis and testimony preparation for regulatory program filing with the New Jersey Board of Public Utilities.

Dominion Virginia Power - Program Development and Regulatory Support (2014 - 2016)

Jim served as the program design lead and expert witness in support of Dominion Virginia Power's regulatory filing for three proposed DSM program offerings. He provided input on the delivery structure, eligibility criteria, and cost-effectiveness analysis in the development of program offerings.



Jim Herndon, Vice President

Additionally, Jim provided written and oral testimony on behalf of Dominion Virginia Power in support of the technical analysis on the feasibility and cost-effectiveness of the programs to the Virginia State Corporation Commission.

Los Angeles Department of Water and Power (LADWP) - Energy Efficiency Potential Study (2013 - 2015)

Jim managed the development of an energy efficiency potential study for the LADWP. Under his direction, his team quantified the energy efficiency potential for LADWP's service territory, including collection of primary data through facility auditing to determine the energy efficiency potential of facilities owned by the City of Los Angeles. The study followed industry best practices to determine energy efficiency potential and undertook unique approaches to aggregate and bundle measures into program delivery channels to identify all possible achievable savings. The study informed LADWP's short-term program planning, as well as updates to their 10-year program planning targets.

CPS Energy - Market Potential Study, DSM Program Design, and M&V (2008 - 2014)

Jim provided technical expertise and support for DSM services to CPS Energy, which included: developing an energy efficiency market potential study, designing, and implementing DSM programs, and performing program measurement and verification (M&V). The comprehensive market potential study analyzed the economic and achievable energy and demand impacts of cost-effective DSM measures across CPS Energy's residential, commercial, and industrial customer segments. The program design utilized the identified market potential to enhance CPS Energy's existing DSM programs and provided recommendations on new programs that target CPS Energy's long-term energy efficiency goals. Jim and his team also provided annual M&V of CPS Energy's DSM programs.

Danville Utilities - Residential Program Design and Implementation (2011 - 2013)

Jim led the initial development of Danville Utilities' Home\$ave program in Virginia. This residential program initiative included a suite of energy efficiency measures targeting Danville's residential customer base. Jim managed the rollout of the program offering that included rebate processing, trade ally outreach, marketing support, and verification of measure installation and achieved energy savings.

CONFERENCE PRESENTATIONS

Herndon, J. (2023). "Foundations of Energy Efficiency: Program Planning & Delivery", Southeast Energy Summit, October 2023, Atlanta, GA.

Herndon, J.; Jacot, D. (2015). "LADWP EE Potential Study: Innovative Approach to Achievable Potential," International Energy Program Evaluation Conference (IEPEC), August 2015, Long Beach, CA.



Technical Potential Study of Demand Side Management

Florida Power & Light Company

Date: 03.07.2024

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Executive Summary

In October 2022, the six electric utilities subject to the Florida Energy Efficiency and Conservation Act (FEECA Utilities) retained Resource Innovations, Inc. for the purpose of identifying and characterizing the market for demand-side management (DSM) opportunities, including energy efficiency (EE) improvement and building retrofits, peak load reductions from demand response (DR), and demand-side renewable energy (DSRE) systems.

The main objective of the study was to assess the technical potential of demand-side resources for reducing customer electric energy consumption and seasonal peak capacity demands.

This report provides the detailed methodology and results for the technical potential analysis of Florida Power & Light Company's (FPL) service area.

1.1 Methodology

Resource Innovations estimates DSM savings potential by applying an analytical framework that aligns baseline market conditions for energy consumption and demand with DSM opportunities. After describing the baseline condition, Resource Innovations applies estimated measure savings to disaggregated consumption and demand data. The approach varies slightly according to the type of DSM resources and available data; the specific approaches used for each type of DSM are described below.

1.1.1 EE Potential

This study utilized Resource Innovations' proprietary EE modeling tool, TEA-POT (Technical / Economic / Achievable POTential). This modeling tool was built on a platform that provides the ability to create and analyze multiple scenarios and recalculate potential savings based on variable inputs such as sales/load forecasts, electricity prices, discount rates, and actual program savings. The methodology for the EE potential assessment was based on a hybrid "top-down/bottom-up" approach, which started with the current utility load forecast, then disaggregated it into its constituent customer-class and end-use components. Our assessment examined the effect of the range of EE measures and practices on each end-use, taking into account current market saturations, and technical feasibility. These unique impacts were aggregated to produce estimates of potential at the end-use, customer class, and system levels for FPL.

1.1.2 DR Potential

The assessment of DR potential in FPL's service area was an analysis of mass market direct load control programs for residential and small commercial and industrial (C&I) customers, and an analysis of DR programs for large C&I customers. The direct load control program assessment focused on the potential for demand reduction through heating, ventilation, and air conditioning (HVAC), water heater, managed electric vehicle charging, and pool pump load control. These end-uses were of particular interest because of their large contribution to peak period system load. For this analysis, a range of direct load control measures were examined for each customer segment to highlight the range of potential. The assessment further accounted for existing DR programs for FPL when calculating the total DR potential.

1.1.3 DSRE Potential

The DSRE technologies included in this study are rooftop solar photovoltaic (PV) systems, battery storage systems charged from customers' PV systems, and combined heat and power (CHP) systems. The study leveraged the customer segmentation and load disaggregation data assembled for the EE and DR analyses, and applied our DSRE model, SPIDER™ (Spatial Penetration and Integration of Distributed Energy Resources), for economic and adoption analysis of solar and battery storage. This model dynamically responds to rapidly changing technologies and accounts for all key time-varying elements such as technology costs, incentives, tax credits, and electric rates. To estimate technical potential for CHP, the study utilized a series of unique distributed generation potential models for each primary market sector (commercial and industrial), calculating the average building consumption, assigning minimum facility size thresholds, and estimating building energy savings share percentage for each CHP technology based on its generation capacity.

1.2 Savings Potential

Technical potential for EE, DR, and DSRE are as follows:

1.2.1 EE Potential

EE technical potential describes the savings potential when all technically feasible EE measures are fully implemented, ignoring all non-technical constraints on electricity savings, such as cost-effectiveness and customer willingness to adopt EE.

The estimated EE technical potential results are summarized in Table 1.

Table 1. EE Technical Potential

	Savings Potential		
	Summer Peak Demand (MW)	Winter Peak Demand (MW)	Energy (GWh)
Residential	5,257	3,983	22,839
Non-Residential¹	2,831	2,493	15,299
Total	8,088	6,476	38,138

1.2.2 DR Potential

DR technical potential describes the magnitude of loads that can be managed during conditions when grid operators need peak capacity. For residential and small C&I customers where DR generally takes the form of direct utility control, technical potential for DR is limited by the loads that can be controlled remotely at scale such as heating, cooling, water heaters, managed electric vehicle charging, and pool pumps. For large C&I customers, this included their entire electric demand during a utility’s system peak, as many of these types of customers will forego virtually all electric demand temporarily if the financial incentive is large enough.

The estimated DR technical potential results are summarized in Table 2.

Table 2. DR Technical Potential

	Savings Potential	
	Summer Peak Demand (MW)	Winter Peak Demand (MW)
Residential	14,527	7,650
Non-Residential	8,741	8,460
Total	23,268	16,110

¹ Non-Residential results include all commercial and industrial customer segments.

1.2.3 DSRE Potential

DSRE technical potential estimates quantify all technically feasible distributed generation opportunities from PV systems, battery storage systems charged from PV, and CHP technologies based on the customer characteristics of FPL’s customer base.

The estimated DSRE technical potential results are summarized in Table 3.

Table 3. DSRE Technical Potential²

	Savings Potential		
	Summer Peak Demand (MW)	Winter Peak Demand (MW)	Energy (GWh)
PV Systems			
Residential	9,142	1,438	71,354
Non-Residential	2,699	196	18,926
Total	11,841	1,634	90,280
Battery Storage charged from PV Systems			
Residential	1,456	4,811	0
Non-Residential	379	1,013	0
Total	1,835	5,824	0
CHP Systems			
Total	1,857	979	8,171

² PV systems and CHP systems were independently analyzed for technical potential without consideration of the competition between technologies or customer preference for DSRE system.

2 Introduction

In October, 2022, the six electric utilities subject to the Florida Energy Efficiency and Conservation Act (FEECA Utilities) retained Resource Innovations, Inc. for the purpose of identifying and characterizing the market for demand-side management (DSM) opportunities, including energy efficiency (EE) improvement and building retrofits, peak load reductions from demand response (DR), and demand-side renewable energy (DSRE) systems. The main objective of the study was:

- Assessing the technical potential of demand-side resources for reducing customer electric energy consumption and seasonal peak capacity demands.

This report provides the detailed methodology and results for the technical potential analysis of FPL's service territory.

The following deliverables were developed by Resource Innovations as part of the project and are addressed in this report:

- DSM measure list and detailed assumption workbooks
- Disaggregated baseline demand and energy use by year, sector, and end-use
- Baseline technology saturations, energy consumption, and demand
- Technical potential demand and energy savings
- Supporting calculation spreadsheets

2.1 Technical Potential Study Approach

Resource Innovations estimates technical potential according to the industry standard categorization, as follows:

Technical Potential is the theoretical maximum amount of energy and capacity that could be displaced by DSM, regardless of cost and other barriers that may prevent the installation or adoption of a DSM measure.

For this study, technical potential included full application of commercially available DSM technologies to all residential, commercial, and industrial customers in the utility's service territory.

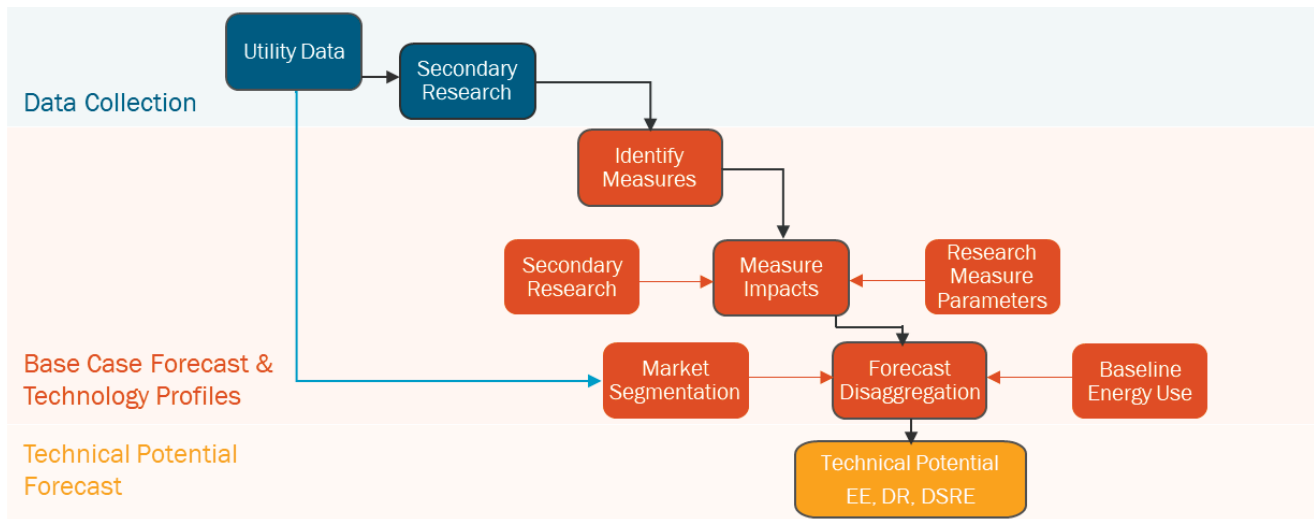
Quantifying DSM technical potential is the result of an analytical process that refines DSM opportunities that align with FPL's customers' electric consumption patterns. Resource Innovations' general methodology for estimating technical potential is a hybrid "top-

down/bottom-up” approach, which is described in detail in Sections 3 through 5 of this report and includes the following steps:

- Develop a baseline forecast: the study began with a disaggregation of the utility’s official electric energy forecast to create a baseline electric energy forecast. This forecast does not include any utility-specific assumptions around DSM performance. Resource Innovations applied customer segmentation and consumption data from each utility and data from secondary sources to describe baseline customer-class and end-use components. Additional details on the forecast disaggregation are included in Section 3.
- Identify DSM opportunities: A comprehensive set of DSM opportunities applicable to FPL’s climate and customers were analyzed to best depict DSM technical potential. Effects for a range of DSM technologies for each end-use could then be examined while accounting for current market saturations, technical feasibility, and impacts.
- Collect cost and impact data for measures: For those measures applicable to FPL’s customers, Resource Innovations conducted primary and secondary research and estimated costs, energy savings, measure life, and demand savings. We differentiated between the type of cost (capital, installation labor, maintenance, etc.) to separately evaluate different implementation modes: retrofit (capital plus installation labor plus incremental maintenance); new construction (incremental capital and incremental maintenance); and burnout costs (incremental capital and incremental maintenance costs for replacement of appliances and equipment that has reached the end of its useful life). Additional details on measure development are included in Section 4.

Figure 1 provides an illustration of the technical potential modeling process conducted for FPL, with the assessment starting with the current utility load forecast, disaggregated into its constituent customer-class and end-use components, and calibrated to ensure consistency with the overall forecast. Resource Innovations considered the range of DSM measures and practices application to each end-use, accounting for current market saturations, and technical feasibility. These unique impacts were aggregated to produce estimates of potential at the technology, end-use, customer class, and system levels.

Figure 1. Approach to Technical Potential Modeling



Resource Innovations estimated DSM technical potential based on a combination of market research, utility load forecasts and customer data, and measure impact analysis, all in coordination with FPL. Resource Innovations examined the technical potential for EE, DR, and DSRE opportunities; this report is organized to offer detail on each DSM category, with additional details on technical potential methodology presented in Section 5.

2.2 EE Potential Overview

To estimate EE potential, this study utilized Resource Innovations' modeling tool, TEA-POT (Technical / Economic / Achievable POTential). This modeling tool was built on a platform that provides the ability to create and analyze multiple scenarios and recalculate potential savings based on variable inputs such as sales/load forecasts, electricity prices, discount rates, and actual utility program savings, as described in Section 5.1.1 below. While the analysis estimates the impacts of individual EE measures, the model accounts for interactions and overlap of individual measure impacts within an end-use or equipment type. The model provides transparency into the assumptions and calculations for estimating EE potential.

2.3 DR Potential Overview

To estimate DR market potential, Resource Innovations considered customer demand during utility peaking conditions and projected customer response to DR measures. Customer demand was determined by looking at account-level interval data for a sample of customers within each segment. For each segment, Resource Innovations determined the portion of a customer's load that could be curtailed during the system peak.

2.4 DSRE Potential Overview

The DSRE technologies included in this study are rooftop solar photovoltaic (PV) systems, battery storage systems charged from PV, and combined heat and power (CHP) systems. The study leveraged the customer segmentation and load disaggregation data assembled for the EE and DR analyses, and applied our DSRE model, SPIDER™ (Spatial Penetration and Integration of Distributed Energy Resources), for economic and adoption analysis of solar and battery storage. This model dynamically responds to rapidly changing technologies and accounts for all key time-varying elements such as technology costs, incentives, tax credits, and electric rates. To estimate technical potential for CHP, the study utilized a series of unique distributed generation potential models for each primary market sector (commercial and industrial), calculating the average building consumption, assigning minimum facility size thresholds, and estimating building energy savings share percentage for each CHP technology based on its generation capacity.

3 Baseline Forecast Development

3.1 Market Characterization

The FPL base year energy use and sales forecast provided the reference point to determine potential savings. The end-use market characterization of the base year energy use and reference case forecast included customer segmentation and load forecast disaggregation. The characterization is described in this section, while the subsequent section addresses the measures and market potential energy and demand savings scenarios.

3.1.1 Customer Segmentation

In order to estimate EE, DR, and DSRE potential, the sales forecast and peak load forecasts were segmented by customer characteristics. As electricity consumption patterns vary by customer type, Resource Innovations segmented customers into homogenous groups to identify which customer groups are eligible to adopt specific DSM technologies, have similar building characteristics and load profiles, or are able to provide DSM grid services.

Resource Innovations segmented customers according to the following:

- 1) By Sector - how much of FPL's energy sales, summer and winter peak demand forecast is attributable to the residential, commercial, and industrial sectors?
- 2) By Customer - how much electricity does each customer typically consume annually and during system peaking conditions?
- 3) By End-Use - within a home or business, what equipment is using electricity during the system peak? How much energy does this end-use consume over the course of a year?

Table 4 summarizes the segmentation within each sector. In addition to the segmentation described here for the EE and DSRE analyses, the residential customer segments were further segmented by heating type (electric heat, gas heat, or unknown) and by annual consumption bins within each sub-segment for the DR analysis.

Table 4. Customer Segmentation

Residential	Commercial		Industrial	
Single Family	Assembly	Miscellaneous	Agriculture and Assembly	Primary Resources Industries
Multi-Family	College and University	Offices	Chemicals and Plastics	Stone/Glass/Clay/Concrete
Manufactured Homes	Grocery	Restaurant	Construction	Textiles and Leather
	Healthcare	Retail	Electrical and Electronic Equipment	Transportation Equipment
	Hospitals	Schools K-12	Lumber/Furniture/Pulp/Paper	Water and Wastewater
	Institutional	Warehouse	Metal Products and Machinery	Other
	Lodging/Hospitality		Miscellaneous Manufacturing	

From an equipment and energy use perspective, each segment has variation within each building type or sub-sector. For example, the energy consuming equipment in a convenience store will vary significantly from the equipment found in a supermarket. To account for this variation, the selected end-uses describe energy consumption patterns that are consistent with those typically studied in national or regional surveys, such as the U.S. Energy Information Administration’s (EIA) Residential Energy Consumption Survey (RECS), Commercial Building Energy Consumption Survey (CBECS) and Manufacturing Energy Consumption Survey (MECS), among others. The end-uses selected for this study are listed in Table 5.

Table 5. End-Uses

Residential End-Uses	Commercial End-Uses	Industrial End-Uses
Space heating ³	Space heating ³	Process heating
Space cooling ³	Space cooling ³	Process cooling
Domestic hot water	Domestic hot water	Compressed air
Ventilation and circulation	Ventilation and circulation	Motors/pumps

³ Includes the contribution of building envelope measures and efficiencies.

Residential End-Uses	Commercial End-Uses	Industrial End-Uses
Lighting	Interior lighting	Fan, blower motors
Cooking	Exterior lighting	Process-specific
Appliances	Cooking	Industrial lighting
Electronics	Refrigeration	Exterior lighting
Miscellaneous	Office equipment	HVAC ³
	Miscellaneous	Other

For DR, the end-uses targeted were those with controllable load for residential customers (*i.e.*, HVAC, water heaters, pool pumps, and electric vehicles) and small C&I customers (HVAC and electric vehicles). For large C&I customers, all load during peak hours was included assuming these customers would potentially be willing to reduce electricity consumption for a limited time if offered a large enough incentive during temporary system peak demand conditions.

3.1.2 Forecast Disaggregation

A common understanding of the assumptions and granularity in the baseline load forecast was developed with input from FPL. Key discussion topics reviewed included:

- How current DSM offerings are reflected in the energy and demand forecast.
- Assumed weather conditions and hour(s) of the day when the system is projected to peak.
- Are there portions of the load forecast attributable to customers or equipment not eligible for DSM programs?
- How are projections of population increase, changes in appliance efficiency, and evolving distribution of end-use load shares accounted for in the peak demand forecast?

3.1.2.1 Electricity Consumption (kWh) Forecast

Resource Innovations segmented FPL’s electricity consumption forecast into electricity consumption load shares by customer class and end-use. The baseline customer segmentation represents the electricity market by describing how electricity was consumed within the service territory. Resource Innovations developed the forecast for the year 2025, and based it on data provided by FPL, primarily their 2023 Ten-Year Site Plan, which was the most recent plan available at the time the studies were initiated. The data addressed current baseline consumption, system load, and sales forecasts.

3.1.2.2 Peak Demand (kW) Forecast

A fundamental component of DR potential was establishing a baseline forecast of what loads or operational requirements would be absent due to existing dispatchable DR or time varying rates. This baseline was necessary to assess how DR can assist in meeting specific planning and operational requirements. We utilized FPL's summer and winter peak demand forecast, which was developed for system planning purposes.

3.1.2.3 Estimating Consumption by End-Use Technology

As part of the forecast disaggregation, Resource Innovations developed a list of electricity end-uses by sector (Table 5). To develop this list, Resource Innovations began with FPL's estimates of average end-use consumption by customer and sector. Resource Innovations combined these data with other information, such as utility residential appliance saturation surveys, as available, to develop estimates of customers' baseline consumption. Resource Innovations calibrated the utility-provided data with data available from public sources, such as the EIA's recurring data-collection efforts that describe energy end-use consumption for the residential, commercial, and manufacturing sectors.

To develop estimates of end-use electricity consumption by customer segment and end-use, Resource Innovations applied estimates of end-use and equipment-type saturation to the average energy consumption for each sector. The following data sources and adjustments were used in developing the base year 2025 sales by end-use:

Residential Sector:

- The disaggregation was based on FPL's rate class load shares and intensities.
- Baseline intensity was calibrated to account for differences in end-use saturation, fuel source, and equipment saturation as follows:
 - FPL rate class load share is based on average per customer.
 - Resource Innovations made conversions to usage estimates generated by applying EIA RECS data, residential end-use study data received from other FEECA utilities, and EIA's Annual Energy Outlook (AEO) 2023.

Commercial Sector:

- The disaggregation was based on FPL's rate class load shares, intensities, and EIA CBECS data.
- Segment data from EIA and FPL.
- Baseline intensity was calibrated to account for differences in end-use saturation, fuel source, and equipment saturation as follows:

- Rate class load share based on EIA CBECS and end-use forecasts from FPL.

Industrial Sector:

- The disaggregation was based on rate class load shares, intensities, and EIA MECS data.
- Segment data from EIA and FPL.
- Baseline intensity was calibrated to account for differences in end-use saturation, fuel source, and equipment saturation as follows:
 - Rate class load share based on EIA MECS and end-use forecasts from FPL.

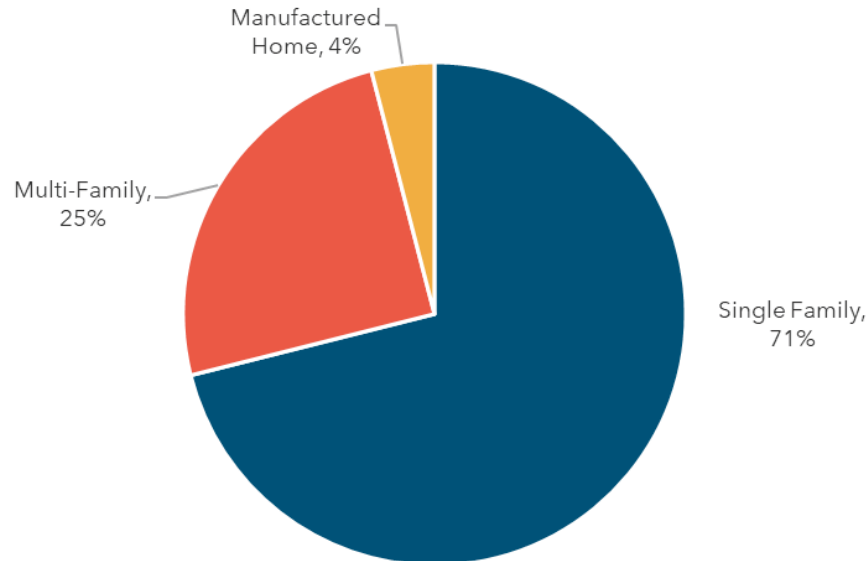
3.2 Analysis of Customer Segmentation

Customer segmentation is important to ensuring that a MPS examines DSM measure savings potential in a manner that reflects the diversity of energy savings opportunities existing across the utility's customer base. FPL provided Resource Innovations with data concerning the premise type and loads characteristics for all customers for the MPS analysis. Resource Innovations examined the provided data from multiple perspectives to identify customer segments. Resource Innovations' approach to segmentation varied slightly for non-residential and residential accounts, but the overall logic was consistent with the concept of expressing the accounts in terms that were relevant to DSM opportunities.

3.2.1 Residential Customers (EE, DR, and DSRE Analysis)

Segmentation of residential customer accounts enabled Resource Innovations to align DSM opportunities with appropriate DSM measures. Resource Innovations used utility customer data, supplemented with EIA data, to segment the residential sector by customer dwelling type (single family, multi-family, or manufactured home). The resulting distribution of customers according to dwelling unit type is presented in Figure 2.

Figure 2. Residential Customer Segmentation



3.2.2 Non-Residential (Commercial and Industrial) Customers (EE and DSRE Analysis)

For the EE and DSRE analysis, Resource Innovations segmented C&I accounts using the utility's North American Industry Classification System (NAICS) or Standard Industrial Classification (SIC) codes, supplemented by data produced by the EIA's CBECS and MECS. Resource Innovations classified the customers in this group as either commercial or industrial, on the basis of DSM measure information available and applicable to each. For example, agriculture and forestry DSM measures are commonly considered industrial savings opportunities. Resource Innovations based this classification on the types of DSM measures applicable by segment, rather than on the annual energy consumption or maximum instantaneous demand from the segment as a whole. The estimated energy sales distributions Resource Innovations applied are shown below in Figure 3 and Figure 4.

Figure 3. Commercial Customer Segmentation

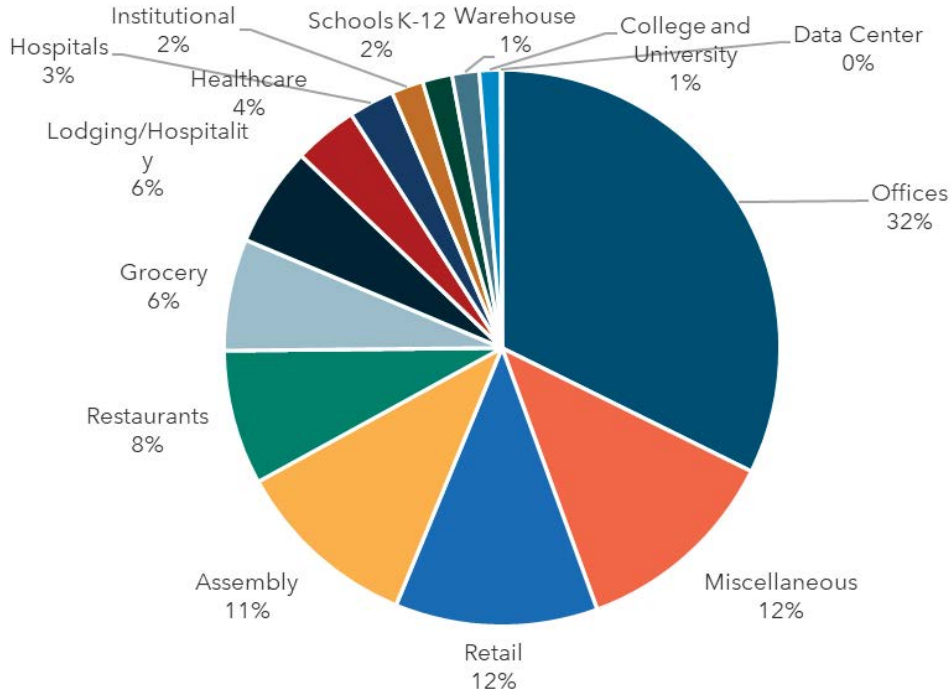
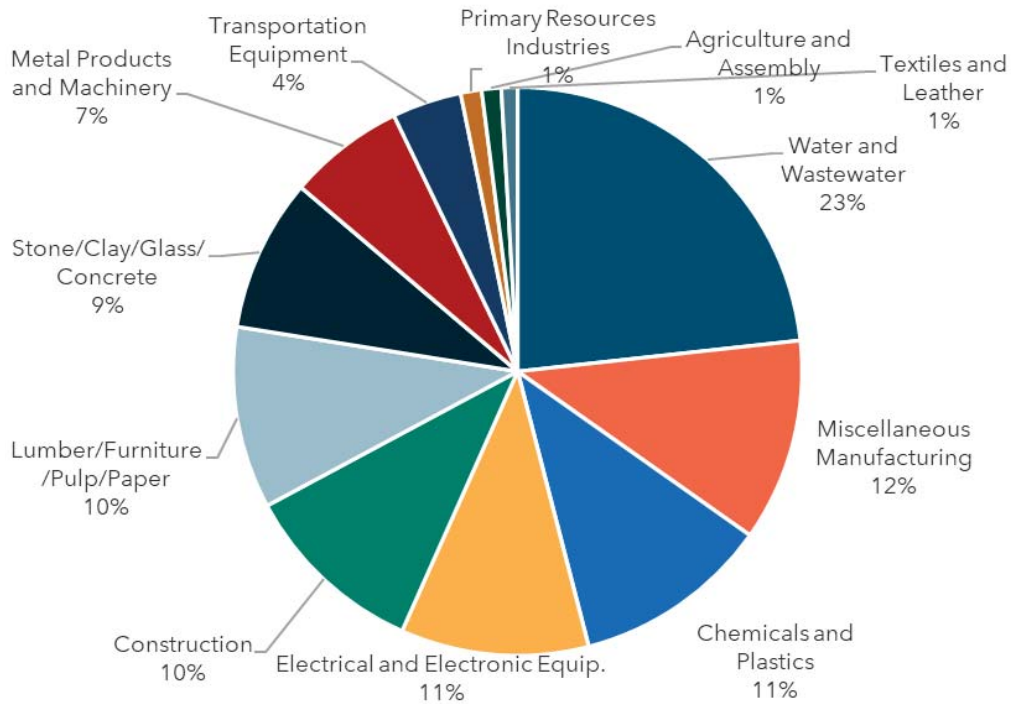


Figure 4. Industrial Customer Segmentation



3.2.3 Commercial and Industrial Accounts (DR Analysis)

For the DR analysis, Resource Innovations divided the non-residential customers into the two customer classes of small C&I and large C&I using rate class and annual consumption. For the purposes of this analysis, small C&I customers are those on the General Service (GS) tariff. Large C&I customers are all customers on the General Service Demand (GSD) tariff or on the General Service Large Demand (GSLD) tariff. Resource Innovations further segmented these two groups based on customer size. For small C&I, segmentation was determined using annual customer consumption and for large C&I the customer’s maximum demand was used. Both customer maximum demand and customer annual consumption were calculated using billing data provided by FPL.

Table 6 shows the account breakout between small C&I and large C&I.

Table 6. Summary of Customer Classes for DR Analysis

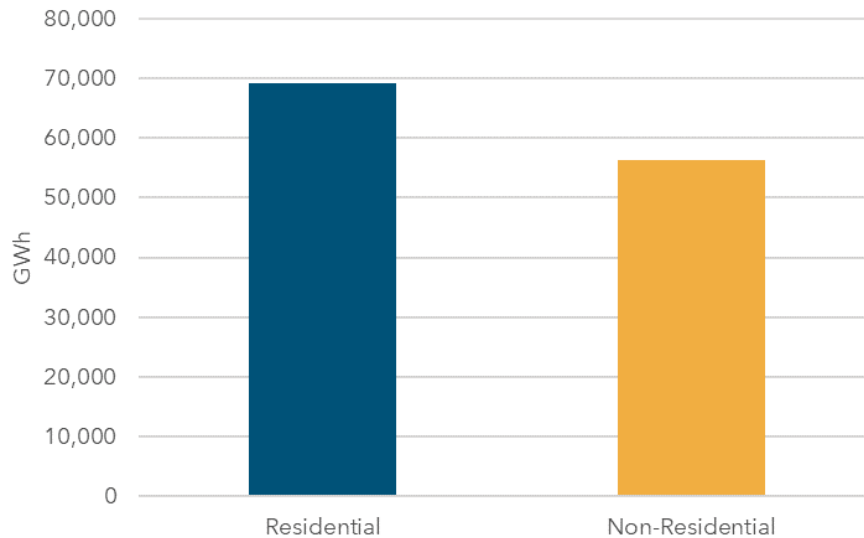
Customer Class	Annual kWh	Estimated Number of Accounts
Small C&I	0-15,000 kWh	360,182
	15,001-25,000 kWh	81,685
	25,001-50,000 kWh	78,842
	50,001 kWh +	36,567
	Total	557,276
Large C&I	0-50 kW	64,699
	51-300 kW	49,692
	301-500 kW	5,141
	501 kW +	4,332
	Total	123,864

3.3 Analysis of System Load

3.3.1 System Energy Sales

Technical potential is based on FPL’s load forecast for the year 2025 from their 2023 Ten Year Site Plan, which is illustrated in Figure 5.

Figure 5. 2025 Electricity Sales Forecast by Sector



3.3.2 System Demand

To determine the technical potential for DR, Resource Innovations first established peaking conditions for each utility by looking at when each utility historically experienced its maximum demand. The primary data source used to determine when maximum DR impact was the historical system load for FPL. The data provided contained the system loads for all 8,760 hours of the most recent five years leading up to the study (2016-2021). The utility summer and winter peaks were then identified within the utility-defined peaking conditions. For FPL the summer peaking conditions were defined as August from 4:00-5:00 PM and the winter peaking conditions were defined as January from 7:00-8:00 AM. The seasonal peaks were then selected as the maximum demand during utility peaking conditions.

3.3.3 Load Disaggregation

The disaggregated annual electric loads⁴ for the base year 2025 by sector and end-use are summarized in Figure 6, Figure 7, and Figure 8.

⁴ Full disaggregation of system demand by end-use was not conducted, as DR potential for residential and small C&I customers focused on specific end-uses of particular interest because of their large contribution to peak period system load, and was not end-use specific for large C&I customers. A description of the end-use analysis for residential and small C&I customers is included in Section 5.1.2

Figure 6. Residential Baseline (2025) Energy Sales by End-Use

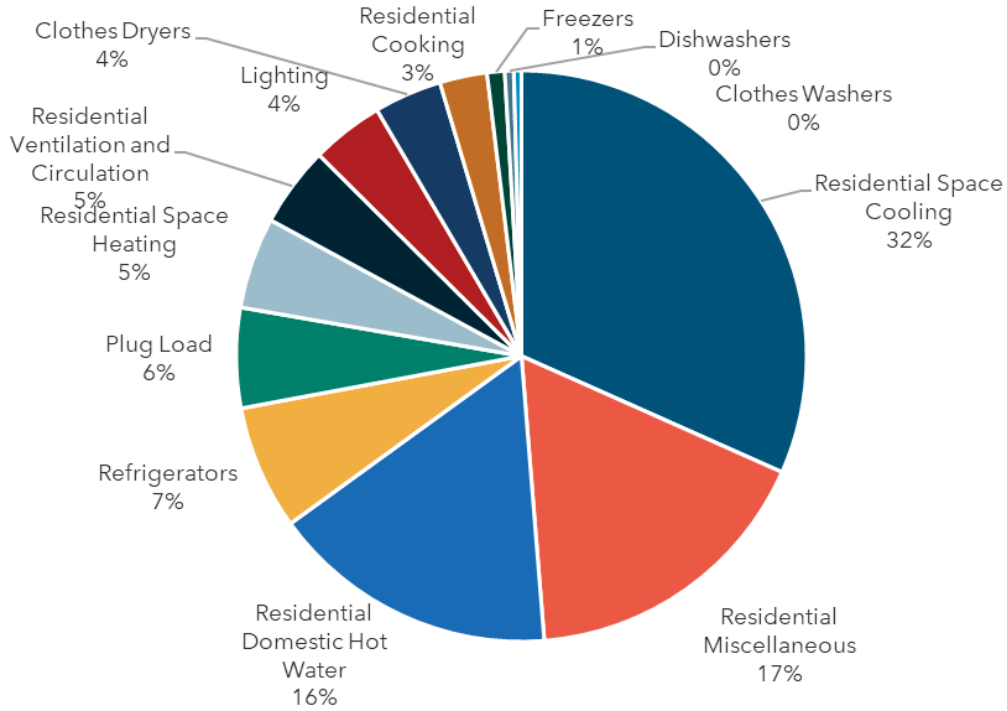


Figure 7. Commercial Baseline (2025) Energy Sales by End-Use

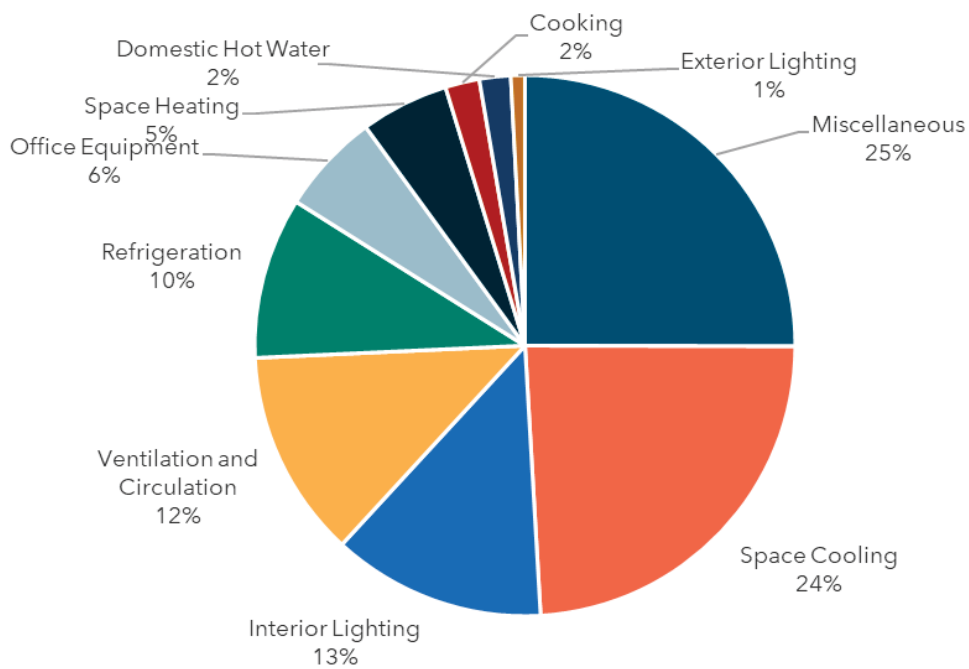
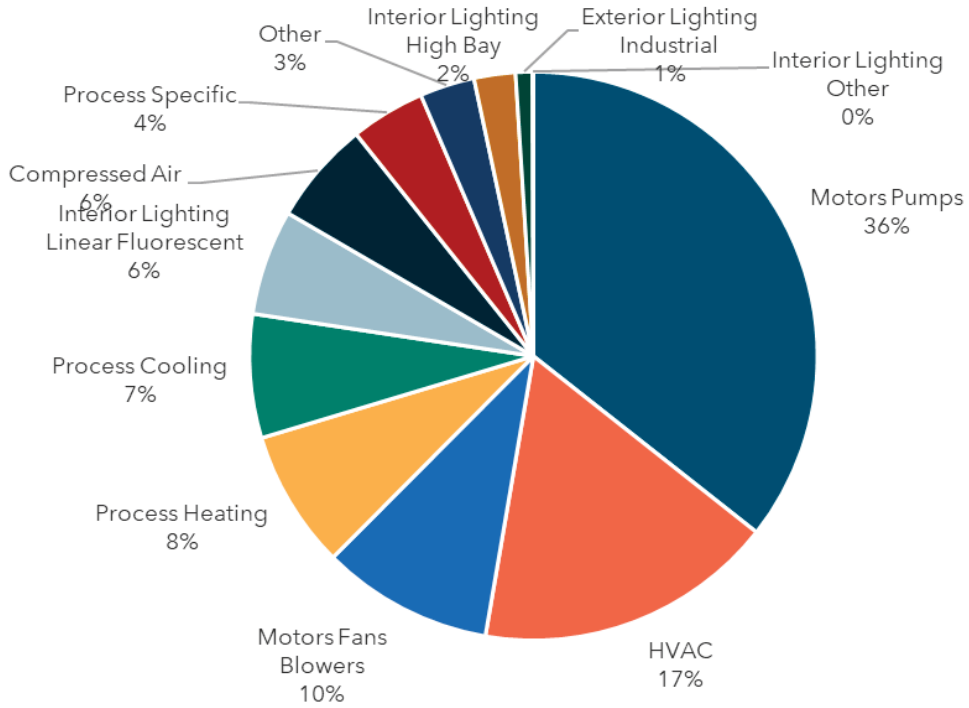


Figure 8. Industrial Baseline (2025) Energy Sales by End-Use



4 DSM Measure Development

DSM potential is described by comparing baseline market consumption with opportunities for savings. Describing these individual savings opportunities results in a list of DSM measures to analyze. This section presents the methodology to develop the EE, DR, and DSRE measure lists.

4.1 Methodology

Resource Innovations identified a comprehensive catalog of DSM measures for the study. The measure list is the same for all FEECA Utilities. The iterative vetting process with the utilities to develop the measure list began by initially examining the list of measures included in the 2019 Goals docket. This list was then adjusted based on proposed measure additions and revisions provided by the FEECA Utilities. Resource Innovations further refined the measure list based on reviews of Resource Innovations' DSM measure library, compiled from similar market potential studies conducted in recent years throughout the United States, as well as measures included in other utility programs where Resource Innovations is involved with program design, implementation, or evaluation. The FEECA Utilities also reached out to interested parties and received input with recommendations on measure additions to the 2019 measure list. Their measure suggestions were reviewed and incorporated into the study as appropriate. External measure suggestions and actions are summarized in Appendix D. The extensive, iterative review process involving multiple parties has ensured that the study included a robust and comprehensive set of DSM measures.

See Appendix A for the list of EE measures, Appendix B for the list of DR measures, and Appendix C for the list of DSRE measures analyzed in the study.

4.2 EE Measures

EE measures represent technologies applicable to the residential, commercial, and industrial customers in the FEECA Utilities' service territories. The development of EE measures included consideration of:

- EE technologies that are applicable to Florida and commercially available: Measures that are not applicable due to climate or customer characteristics were excluded, as were "emerging" technologies that are not currently commercially available to FEECA utility customers.
- Current and planned Florida Building Codes and Federal equipment standards (Codes & Standards) for baseline equipment: Measures included from prior studies

were adjusted to reflect current Codes & Standards as well as updated efficiency tiers, as appropriate.

- Eligibility for utility DSM offerings in Florida: For example, behavioral measures were excluded from consideration, as they historically have not been allowed to count towards utility DSM goals. Behavioral measures are intended to motivate customers to operate in a more energy-efficient manner (e.g., setting an air-conditioner thermostat to a higher temperature) without accompanying: a) physical changes to more efficient end-use equipment or to their building envelope, b) utility-provided products and tools to facilitate the efficiency improvements, or c) permanent operational changes that improve efficiency which are not easily revertible to prior conditions. These types of behavioral measures were excluded because of the variability in forecasting the magnitude and persistence of energy and demand savings from the utility's perspective. Additionally, decoupling behavioral measure savings from the installation of certain EE technologies like smart thermostats can be challenging and could result in overlapping potential with other EE measures included in the study.

Upon development of the final EE measure list, utility-specific measure details were developed. RI maintains a proprietary online database of energy efficiency measures for MPS studies, which was used as a starting point for measure development for this study. Measures are added or updated at the request of project stakeholders or because of changes to the EE marketplace (for example, new codes and standards, or current practice in the market). Measure data are refined as new data or algorithms are developed for estimating measure impacts, and updated for each study to incorporate inputs parameters specific to the service territory being analyzed. The database contains the following information for each of the measures:

- Measure description: measure classification by type, end-use, and subsector, and description of the base-case and the efficient-case scenarios.
- kWh savings: Energy savings associated with each measure were developed through engineering algorithms or building simulation modeling, taking climate data and customer segments into consideration as appropriate. Reference sources used for developing residential, commercial, and industrial measure savings included a variety of Florida-specific, as well as regional and national sources, such as utility-specific measurement & verification (M&V) data, technical reference manuals (TRM) from other jurisdictions, ENERGY STAR calculators, and manufacturer or retailer specifications for particular products.
- Energy savings were applied in RI's TEA-POT model as a percentage of total baseline consumption. Peak demand savings were determined using utility-specific load shapes or coincidence factors.

- Measure Expected Useful Lifetime: Sources included the Database for Energy Efficient Resources (DEER), the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Handbook, TRMs, and other regional and national measure databases and EE program evaluations.
- Measure Costs: Per-unit costs (full or incremental, depending on the application) associated with measure installations. Sources included: TRMs, ENERGY STAR calculator, online market research, FEECA utility program data, and other secondary sources.

The measure details from the online measure library are exported for use in RI’s TEA-POT model, accompanied by utility-specific estimates of measure applicability. Measure applicability is a general term encompassing an array of factors, including technical feasibility of installation, and the measure’s current saturation as well as factors to allocate savings associated with competing measures. Information used was primarily derived from data in current regional and national databases, as well as FPL’s program tracking data. These factors are described in Table 7.

Table 7. Measure Applicability Factors

Measure Impact	Explanation	Sources
Technical Feasibility	The percentage of buildings that can have the measure physically installed. Various factors may affect this, including, but not limited to, whether the building already has the baseline measure (e.g., dishwasher), and limitations on installation (e.g., size of unit and space available to install the unit).	Various secondary sources and engineering experience.
Measure Incomplete Factor	The percentage of buildings without the specific measure currently installed.	Utility RASS; EIA RECS, CBECS; MECS; ENERGY STAR sales figures; and engineering experience.
Measure Share	Used to distribute the percentage of market shares for competing measures (e.g., only blown-in ceiling insulation or spray foam insulation, not both would be installed in an attic).	Utility customer data, Various secondary sources and engineering experience.

As shown in Table 8, the measure list includes 400 unique energy-efficiency measures. Expanding the measures to account for all appropriate installation scenarios resulted in

9,683 measure permutations, which are the application of individual measures to various customer segments, construction types, and end-uses (*i.e.*, a single air-source heat pump “measure” can be installed in single family, multi-family, and manufactured homes, as well as new and existing vintages of each home type, and impacts both space cooling and space heating end-uses, resulting in twelve separate measure “permutations” analyzed).

Table 8. EE Measure Counts by Sector

Sector	Unique Measures	Permutations
Residential	122	1,209
Commercial	166	5,910
Industrial	112	2,564

4.3 DR Measures

The DR measures included in the measure list utilize the following DR strategies:

- **Direct Load Control.** Utility control of selected equipment at the customer’s home or business, such as HVAC or water heaters.
- **Critical Peak Pricing (CPP) with Technology.** Electricity rate structures that vary based on time of day. Includes CPP when the rate is substantially higher for a limited number of hours or days per year (customers receive advance notification of CPP event) coupled with technology that enables customer to lower their usage in a specific end-use in response to the event (e.g., HVAC via smart thermostat).
- **Contractual DR.** Customers receive incentive payments or a rate discount for committing to reduce load by a pre-determined amount or to a pre-determined firm service level upon utility request.
- **Automated DR.** Utility dispatched control of specific end-uses at a customer facility.

DR initiatives that do not rely on the installation of a specific device or technology to implement (such as a voluntary curtailment program or time of use rates) were not included.

A workbook was developed for each measure which included the same measure inputs as previously described for the EE measures. In addition, the DR workbook included expected load reduction from the measure, based on utility technical potential, existing utility DR programs, and other nationwide DR programs if needed.

For technical potential, Resource Innovations did not break out results by specific measure or control technology because all of the developed measures target the end-uses estimated

for technical potential (*i.e.*, potential is reported for space cooling end-use and not allocated to switches, smart thermostats, etc.).

4.4 DSRE Measures

The DSRE measure list includes rooftop PV systems, battery storage systems charged from PV systems, and CHP systems.

PV Systems

PV systems utilize solar panels (a packaged collection of PV cells) to convert sunlight into electricity. A system is constructed with multiple solar panels, a DC/AC inverter, a racking system to hold the panels, and electrical system interconnections. These systems are often roof-mounted systems that face south-west, south, and/or, south-east. The potential associated with roof-mounted systems installed on residential and commercial buildings was analyzed.

Battery Storage Systems Charged from PV Systems

Distributed battery storage systems included in this study consist of behind-the-meter battery systems installed in conjunction with an appropriately-sized PV system at residential and commercial customer facilities. These battery systems typically consist of a DC-charged battery, a DC/AC inverter, and electrical system interconnections to a PV system. On their own battery storage systems do not generate or conserve energy, but can collect and store excess PV generation to provide power during particular time periods, which for DSM purposes would be to offset customer demand during the utility's system peak.

CHP Systems

In most CHP applications, a heat engine creates shaft power that drives an electrical generator (fuel cells can produce electrical power directly from electrochemical reactions). The waste heat from the engine is then recovered to provide other on-site needs. Common prime mover technologies used in CHP applications and explored in this study include:

- Steam turbines
- Gas turbines
- Micro turbines
- Fuel Cells
- Internal combustion engines

A workbook was developed for each measure which included the inputs previously described for EE measures and prime mover operating parameters.

5 Technical Potential

In the previous sections, the approach for DSM measure development was summarized, and the 2025 base year load shares and reference-case load forecast were described. The outputs from these tasks provided the input for estimating the technical potential scenario, which is discussed in this section.

The technical potential scenario estimates the potential energy and demand savings when all technically feasible and commercially available DSM measures are implemented without regard for cost-effectiveness and customer willingness to adopt the most impactful EE, DR, or DSRE technologies. Since the technical potential does not consider the costs or time required to achieve these savings, the estimates provide a theoretical upper limit on electricity savings potential. Technical potential is only constrained by factors such as technical feasibility and applicability of measures. For this study, technical potential included full application of the commercially available DSM measures to all residential, commercial, and industrial customers in the utility's service territory.

5.1 Methodology

5.1.1 EE Technical Potential

EE technical potential refers to delivering less electricity to the same end-uses. In other words, technical potential might be summarized as “doing the same thing with less energy, regardless of the cost.”

DSM measures were applied to the disaggregated utility electricity sales forecasts to estimate technical potential. This involved applying estimated energy savings from equipment and non-equipment measures to all electricity end-uses and customers. Technical potential consists of the total energy and demand that can be saved in the market which Resource Innovations reported as single numerical values for each utility's service territory.

The core equation used in the residential sector EE technical potential analysis for each individual efficiency measure is shown in Equation 1 below, while the core equation used in the nonresidential sector technical potential analysis for each individual efficiency measure is shown in Equation 2.

Equation 1: Core Equation for Residential Sector EE Technical Potential



Where:

- **Baseline Equipment Energy Use Intensity** = the electricity used per customer per year by each baseline technology in each market segment. In other words, the baseline equipment energy-use intensity is the consumption of the electrical energy using equipment that the efficient technology replaces or affects.
- **Saturation Share** = the fraction of the end-use electrical energy that is applicable for the efficient technology in a given market segment. For example, for residential cooling, the saturation share would be the fraction of all residential electric customers that have central air conditioners in their household.
- **Percent Incomplete** = the fraction of equipment that is not considered to already be energy efficient. To extend the example above, the fraction of central air conditioners that is not already energy efficient.
- **Feasibility Factor** = the fraction of units that is technically feasible for conversion to the most efficient available technology from an engineering perspective (*i.e.*, it may not be possible to install LEDs in all light sockets in a home because the available styles may not fit in every socket).
- **Savings Factor** = the percentage reduction in electricity consumption resulting from the application of the efficient technology.

Equation 2: Core Equation for Non-Residential Sector EE Technical Potential



Where:

- **Total Stock Square Footage by Segment** = the forecasted square footage level for a given building type (*e.g.*, square feet of office buildings).
- **Baseline Equipment Energy Use Intensity** = the electricity used per square foot per year by each baseline equipment type in each market segment.

- **Saturation Shares** = the fraction of total end-use energy consumption associated with the efficient technology in a given market segment. For example, for packaged terminal air-conditioner (PTAC), the saturation share would be the fraction of all space cooling kWh in a given market segment that is associated with PTAC equipment.
- **Percent Incomplete** = the fraction of equipment that is not considered to already be energy efficient.
- **Feasibility Factor** = the fraction of the equipment or practice that is technically feasible for conversion to the efficient technology from an engineering perspective (*i.e.*, it may not be possible to install Variable Frequency Drives (VFD) on all motors in a given market segment).
- **Savings Factor** = the percentage reduction in electricity consumption resulting from the application of the efficient technology.

It is important to note that the technical potential estimate represents electricity savings potential at a specific point in time. In other words, the technical potential estimate is based on data describing status quo customer electricity use and technologies known to exist today. As technology and electricity consumption patterns evolve over time, the baseline electricity consumption will also change accordingly. For this reason, technical potential is a discrete estimate of a dynamic market. Resource Innovations reported the technical potential for 2025, based on currently known DSM measures and observed electricity consumption patterns.

Measure Interaction and Competition (Overlap)

While the technical potential equations listed above focus on the technical potential of a single measure or technology, Resource Innovations' modeling approach does recognize the overlap of individual measure impacts within an end-use or equipment type, and accounts for the following interactive effects:

- **Measure interaction:** Installing high-efficiency equipment could reduce energy savings in absolute terms (kWh) associated with non-equipment measures that impact the same end-use. For example, installing a high-efficiency heat pump will reduce heating and cooling consumption which will reduce the baseline against which attic insulation would be applied, thus reducing savings associated with installing insulation. To account for this interaction, Resource Innovations' TEA-POT model ranks measures that interact with one another and reduces the baseline consumption for the subsequent measure based on the savings achieved by the preceding measure. For technical potential, interactive measures are ranked based on total end-use energy savings percentage.
- **Measure competition (overlap):** The "measure share"—as defined above—accounted for competing measures, ensuring savings were not double-counted. This interaction

occurred when two or more measures “competed” for the same end-use. For example, a T-12 lamp could be replaced with a T-8 or linear LED lamp.

Addressing Naturally-Occurring EE

Naturally occurring energy efficiency includes actions taken by customers to improve the efficiency of their homes and businesses in the absence of utility program intervention. For the analysis of technical potential, Resource Innovations verified with FPL’s forecasting group that the baseline sales forecasts incorporated two known sources of naturally-occurring efficiency:

- Codes and Standards: The sales forecasts already incorporated the impacts of known Code & standards changes.
- Baseline Measure Adoption: The sales forecast excluded the projected impacts of future DSM efforts but included already implemented DSM penetration.

By properly accounting for these factors, the technical potential analysis estimated the additional EE opportunities beyond what is already included in the utility sales forecast.

5.1.2 DR Technical Potential

The concept of technical potential applies differently to DR than for EE. Technical potential for DR is effectively the magnitude of loads that can be curtailed during conditions when utilities need peak capacity reductions. In evaluating this potential at peak capacity, the following were considered: which customers are consuming electricity at those times? What end-uses are in play? Can those end-use loads be managed? Large C&I accounts generally do not provide the utility with direct control over particular end-uses. Instead, many of these customers will forego electric demand temporarily if the financial incentive is large enough. For residential and small C&I customers where DR generally takes the form of direct utility control, technical potential for DR is limited by the loads that can be controlled remotely at scale.

This framework makes end-use disaggregation an important element for understanding DR potential, particularly in the residential and small C&I sectors. When done properly, end-use disaggregation not only provides insights into which loads are on and off when specific grid services are needed, it also provides insight concerning how key loads and end-uses, such as air conditioning use, vary across customers. Resource Innovations’ approach used for load disaggregation is more advanced than what is used for most potential studies. Instead of disaggregating annual consumption or peak demand, Resource Innovations produced end-use load disaggregation for all 8,760 hours. This was needed because the loads available at times when different grid applications are needed can vary substantially. Instead

of producing disaggregated loads for the average customer, the study was produced for several customer segments. For FPL, Resource Innovations examined three residential segments based on customer housing type, four different small C&I segments based on customer size, and four different large C&I segments based on customer size, for a total of 11 different customer segments.

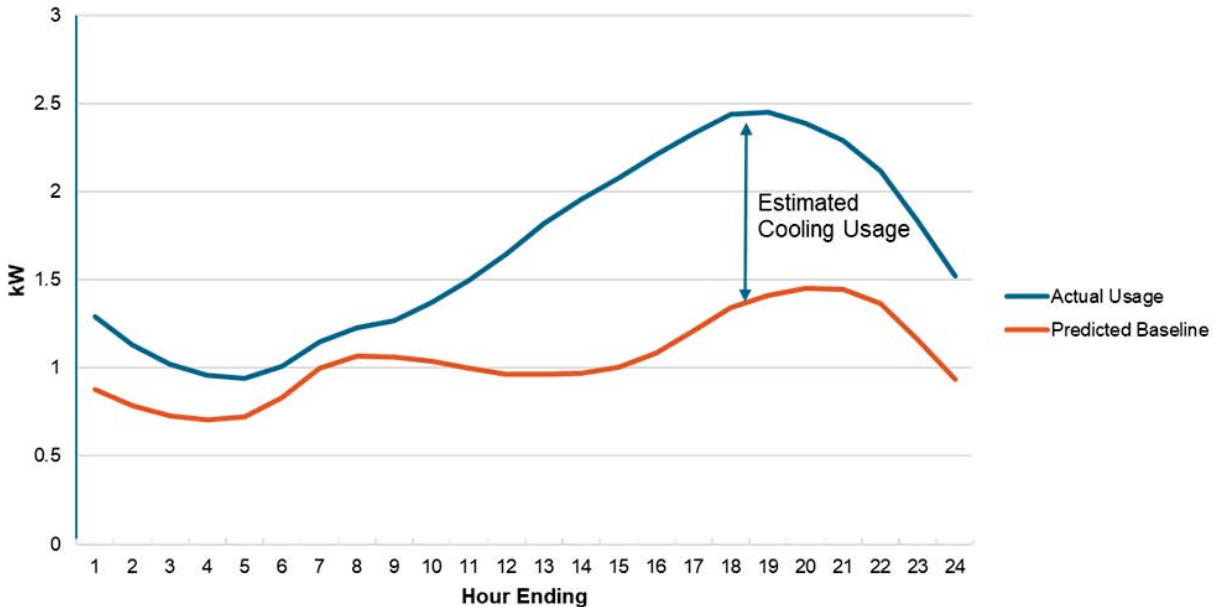
Technical potential, in the context of DR, is defined as the total amount of load available for reduction that is coincident with the period of interest; in this case, the system peak hour for the summer and winter seasons. Thus, two sets of capacity values are estimated: a summer capacity and a winter capacity.

As previously mentioned, for technical potential purposes, all coincident large C&I load is considered dispatchable, while residential and small C&I DR capacity is based on specific end-uses. Summer DR capacity for residential customers was comprised of air-conditioning (AC), pool pumps, water heaters, and managed electric vehicle charging. For small C&I customers, summer capacity was based on AC load. For winter DR capacity, residential was based on electric heating, pool pumps, and water heaters. For small C&I customers, winter capacity was based on electric heating.

AC and heating load profiles were generated for residential and small C&I customers using a sample of customer interval data provided by FPL. This sample included a customer breakout based on housing type for residential customers and size for small C&I customers. Resource Innovations then used the interval data from these customers to create an average load profile for each customer segment.

The average load profile for each customer segment was combined with historical weather data, and used to estimate hourly load as a function of weather conditions. AC and heating loads were estimated by first calculating the baseline load on days when cooling degree days (CDD) and heating degree days (HDD) were equal to zero, and then subtracting this baseline load. This methodology is illustrated by Figure 9 (a similar methodology was used to predict heating loads).

Figure 9: Methodology for Estimating Cooling Loads



This method was able to produce estimates for average AC/heating load profiles for the seven different customer segments within the residential and small C&I sectors.

Profiles for residential water heater and pool pump loads were estimated by utilizing end-use load data from NREL's residential end-use load profile database.

For all eligible loads, the technical potential was defined as the amount that was coincident with system peak hours for each season, which are August from 4:00-5:00 PM for summer, and January from 7:00-8:00 AM for winter. As mentioned in Section 4, for technical potential there was also no measure breakout needed, because all measures will target the end-uses' estimated total loads.

5.1.3 DSRE Technical Potential

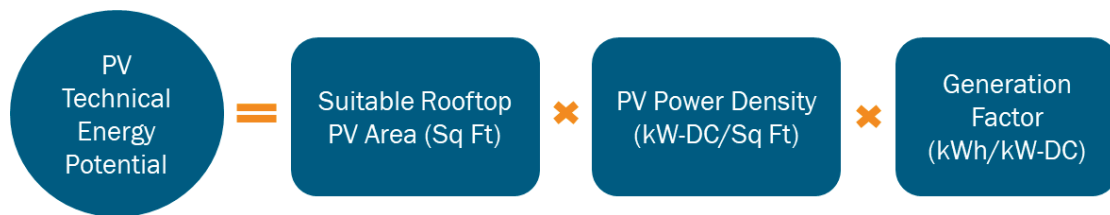
5.1.3.1 PV Systems

To determine technical potential for PV systems, RI estimated the percentage of rooftop square footage in Florida that is suitable for hosting PV technology. Our estimate of technical potential for PV systems in this report is based in part on the available roof area and consisted of the following steps:

- Step 1: Outcomes from the forecast disaggregation analysis were used to characterize the existing and new residential, commercial, and industrial building stocks.
 - To calculate the total roof area for residential buildings, the average roof area per household is multiplied by the number of households.
 - For commercial and industrial buildings, RI calculated the total roof area by first dividing the load forecast by the energy usage intensity, which provides an estimate of the total building square footage. This result is then divided by the average number of floors to derive the total roof area.
- Step 2: The total available roof area feasible for installing PV systems was calculated. Relevant parameters included unusable area due to other rooftop equipment and setback requirements, in addition to possible shading from trees and limitations of roof orientation (factored into a “technical suitability” multiplier).
- Step 3: Estimated the expected power density (kW per square foot of roof area).
- Step 4: Estimated the hourly PV generation profile using NREL’s PV Watts Calculator
- Step 5: Calculated total energy and coincident peak demand potential by applying RI’s Spatial Penetration and Integration of Distributed Energy Resources (SPIDER) Model.

The methodology presented in this report uses the following formula to estimate overall technical potential of PVs:

Equation 3: Core Equation for Solar DSRE Technical Energy Potential



Where:

- **Suitable Rooftop PV Area for Residential [Square Feet]:** Number of Residential Buildings x Average Roof Area Per Building x Technical Suitability Factor
- **Suitable Rooftop PV Area for Commercial [Square Feet] :** Energy Consumption [kWh] / Energy Intensity [kWh / Square Feet] / Average No. of Stories Per Building x Technical Suitability Factor
- **PV Power Density [kW-DC/Square Feet]:** Maximum power generated in Watts per square foot of solar panel.
- **Generation Factor:** Annual Energy Generation Factor for PV, from PV Watts (dependent on local solar irradiance)

5.1.3.2 Battery Storage Systems Charged from PV Systems

Battery storage systems on their own do not generate power or create efficiency improvements, but store power for use at different times. Therefore, in analyzing the technical potential for battery storage systems, the source of the stored power and overlap with technical potential identified in other categories was considered.

Battery storage systems that are powered directly from the grid do not produce annual energy savings but may be used to shift or curtail load during particular time periods. As the DR technical potential analyzes curtailment opportunities for the summer and winter peak period, and battery storage systems can be used as a DR technology, the study concluded that no additional technical potential should be claimed for grid-powered battery systems beyond that already attributed to DR.

Battery storage systems that are connected to on-site PV systems also do not produce additional energy savings beyond the energy produced from the PV system⁵. However, PV-connected battery systems do create the opportunity to store energy during period when the PV system is generating more than the home or business is consuming and use that stored power during utility system peak periods.

To determine the additional technical potential peak demand savings for “solar plus storage” systems, our methodology consisted of the following steps:

- Assume that every PV system included in PV Technical Potential is installed with a paired storage system.
- Size the storage system assuming peak storage power is equal to peak PV generation and energy storage duration is three hours.
- Apply RI’s hourly dispatch optimization module in SPIDER to create an hourly storage dispatch profile that flattens the individual customer’s load profile to the greatest extent possible accounting for a) customer hourly load profile, b) hourly PV generation profile, and c) battery peak demand, energy capacity, and roundtrip charge/discharge efficiency.
- Calculate the effective hourly impact for the utility using the above storage dispatch profile, aligned with the utility’s peak hour (calculated separately for summer and winter)
- Report the output storage kW impact on utility coincident peak demand in summer and winter.

⁵ PV-connected battery systems experience some efficiency loss due to storage, charging, and discharging. However, for this study, these losses were not quantified.

5.1.3.3 CHP Systems

The CHP analysis created a series of unique distributed generation potential models for each primary market sector (commercial and industrial).

Only non-residential customer segments whose electric and thermal load profiles allow for the application of CHP were considered. The technical potential analysis followed a three-step process. First, minimum facilities size thresholds were determined for each non-residential customer segment. Next, the full population of non-residential customers were segmented and screened based on the size threshold established for that segment. Finally, the facilities that were of sufficient size were matched with the appropriately sized CHP technology.

To determine the minimum threshold for CHP suitability, a thermal factor was applied to potential candidate customer loads to reflect thermal load considerations in CHP sizing. In most cases, on-site thermal energy demand is smaller than electrical demand. Thus, CHP size is usually dictated by the thermal load in order to achieve improved efficiencies.

The study collected electric and thermal intensity data from other recent CHP studies. For industrial customers, Resource Innovations assumed that the thermal load would primarily be used for process operations and was not modified from the secondary data sources for Florida climate conditions. For commercial customers, the thermal load is more commonly made up of water heating, space heating, and space cooling (through the use of an absorption chiller). Therefore, to account for the hot and humid climate in Florida, which traditionally limits weather-dependent internal heating loads, commercial customers' thermal loads were adjusted to incorporate a higher proportion of space cooling to space heating as available opportunities for waste heat recovery.

After determination of minimum kWh thresholds by segment, Resource Innovations used the utility-provided customer data with NAICS or SIC codes as well as annual consumption data. Non-residential customers were then categorized by segment and size. Customers with annual loads below the kWh thresholds are not expected to have the consistent electric and thermal loads necessary to support CHP and were eliminated from consideration.

In general, internal combustion engines are the prime mover for systems under 500kW with gas turbines becoming progressively more popular as system size increases above that. Based on the available load by customer, adjusted by the estimated thermal factor for each segment, CHP technologies were assigned to utility customers in a top-down fashion (*i.e.*, starting with the largest CHP generators).

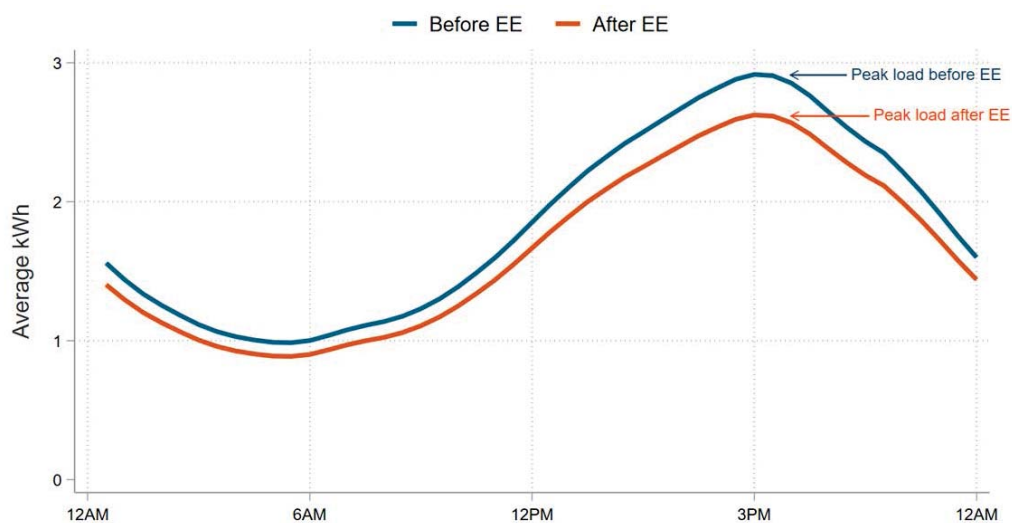
Measure Interaction

PV systems and battery storage charged from PV systems were analyzed collectively due to their common power generation source; and therefore, the identified technical potential for these systems is additive. However, CHP systems were independently analyzed for technical potential without consideration of the competition between DSRE technologies or customer preference for a particular DSRE system. Therefore, results for CHP technical potential should not be combined with PV systems or battery storage systems for overall DSRE potential but used as independent estimates.

5.1.4 Interaction of Technical Potential Impacts

As described above, the technical potential was estimated using separate models for EE, DR, and DSRE systems. However, there is interaction between these technologies; for example, a more efficient HVAC system would result in a reduced peak demand available for DR curtailment, as illustrated in Figure 10.

Figure 10: Illustration of EE Impacts on HVAC System Load Shape



Therefore, after development of the independent models, the interaction between EE, DR, and DSRE was incorporated as follows:

- The EE technical potential was assumed to be implemented first, followed by DR technical potential and DSRE technical potential.

- To account for the impact of EE technical potential on DR, the baseline load forecast for the applicable end-uses was adjusted by the EE technical potential, resulting in a reduction in baseline load available for curtailment.
- For DSRE systems, the EE and DR technical potential was incorporated in a similar fashion, adjusting the baseline load used to estimate DSRE potential.
 - For the PV analysis, this did not impact the results as the EE and DR technical potential did not affect the amount of PV that could be installed on available rooftops.
 - For the battery storage charged from PV systems, the reduced baseline load from EE resulted in additional PV-generated energy being available for the battery systems and for use during peak periods. The impact of DR events during the assumed curtailment hours was incorporated into the modeling of available battery storage and discharge loads.
- For CHP systems, the reduced baseline load from EE resulted in a reduction in the number of facilities that met the annual energy threshold needed for CHP installations. Installed DR capacity was assumed to not impact CHP potential as the CHP system feasibility was determined based on energy and thermal consumption at the facility. It should be noted that CHP systems not connected to the grid could impact the amount of load available for curtailment with utility-sponsored DR. Therefore, CHP technical potential should not be combined with DR potential but used as independent estimates.

5.2 EE Technical Potential

5.2.1 Summary

Table 9 summarizes the EE technical potential by sector:

Table 9. EE Technical Potential

	Savings Potential		
	Summer Peak Demand (MW)	Winter Peak Demand (MW)	Energy (GWh)
Residential	5,257	3,983	22,839
Non-Residential ⁶	2,831	2,493	15,299
Total	8,088	6,476	38,138

⁶ Non-Residential results include all commercial and industrial customer segments.

5.2.2 Residential

Figure 11, Figure 12, and Figure 13 summarize the residential sector EE technical potential by end-use.

Figure 11: Residential EE Technical Potential by End-Use (Summer Peak Savings)

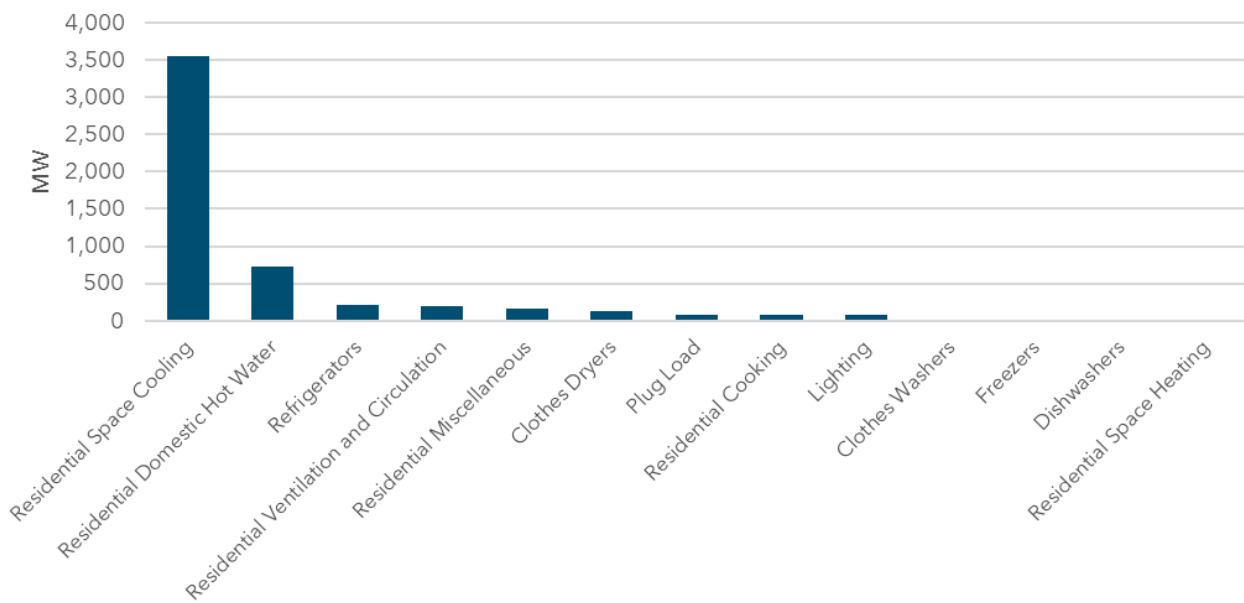


Figure 12: Residential EE Technical Potential by End-Use (Winter Peak Savings)

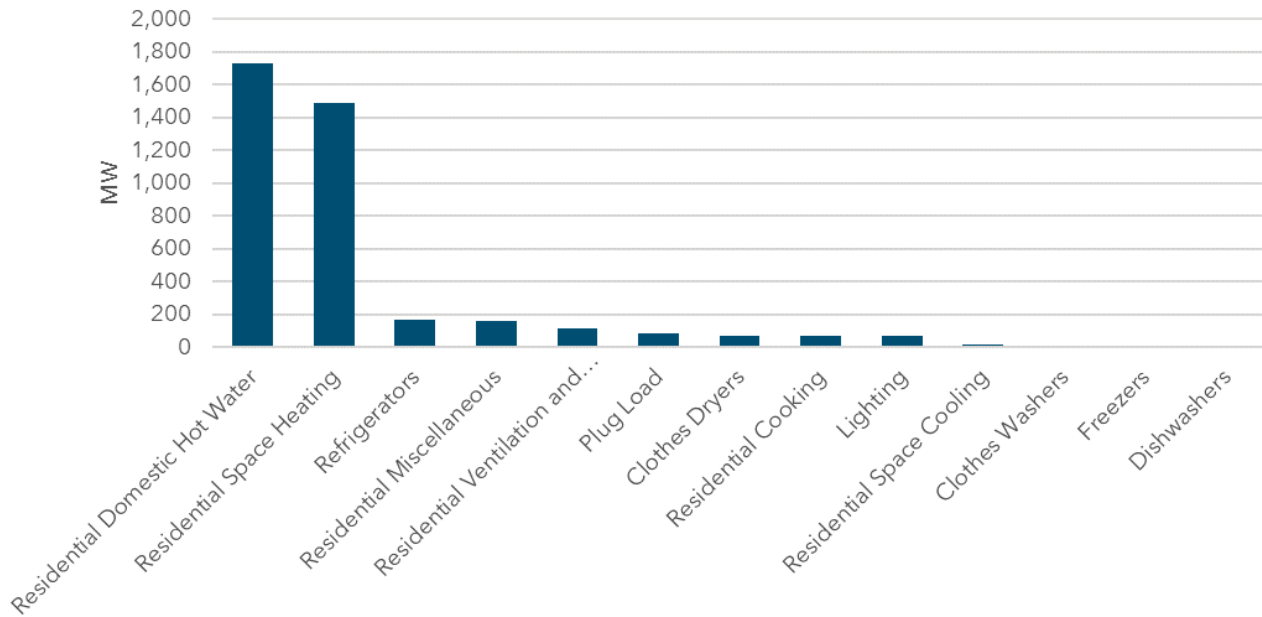
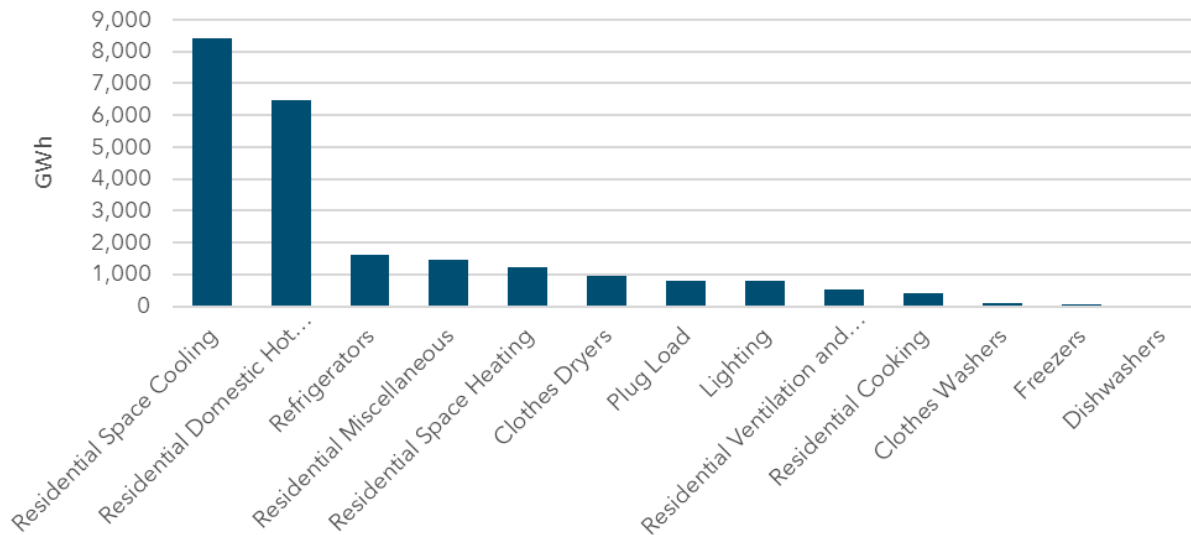


Figure 13: Residential EE Technical Potential by End-Use (Energy Savings)



5.2.3 Non-Residential

5.2.3.1 Commercial Segments

Figure 14, Figure 15, and Figure 16 summarize the commercial sector EE technical potential by end-use.

Figure 14: Commercial EE Technical Potential by End-Use (Summer Peak Savings)

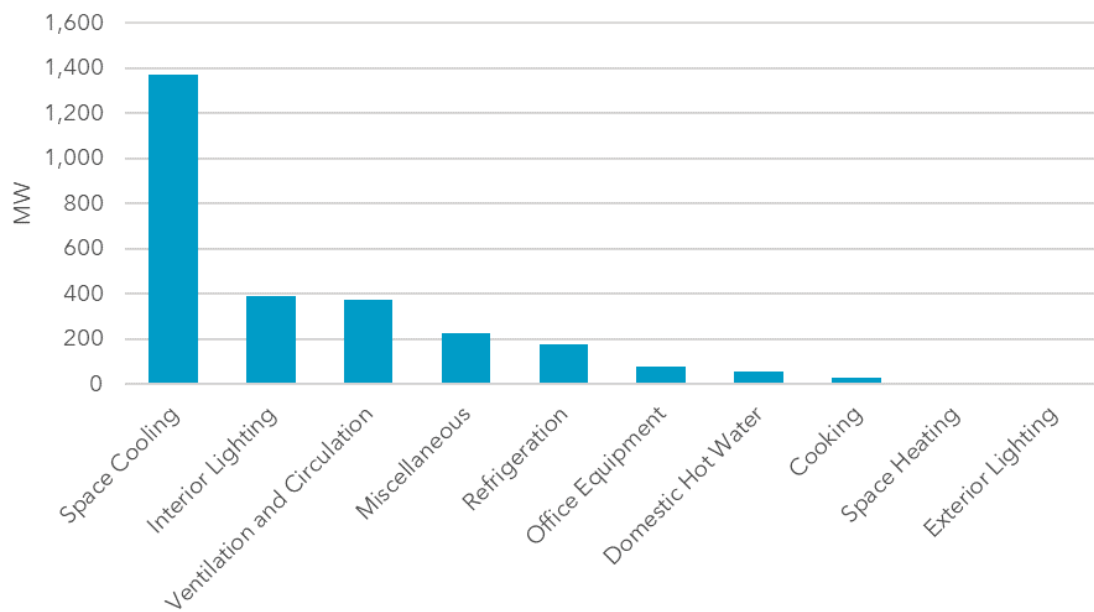


Figure 15: Commercial EE Technical Potential by End-Use (Winter Peak Savings)

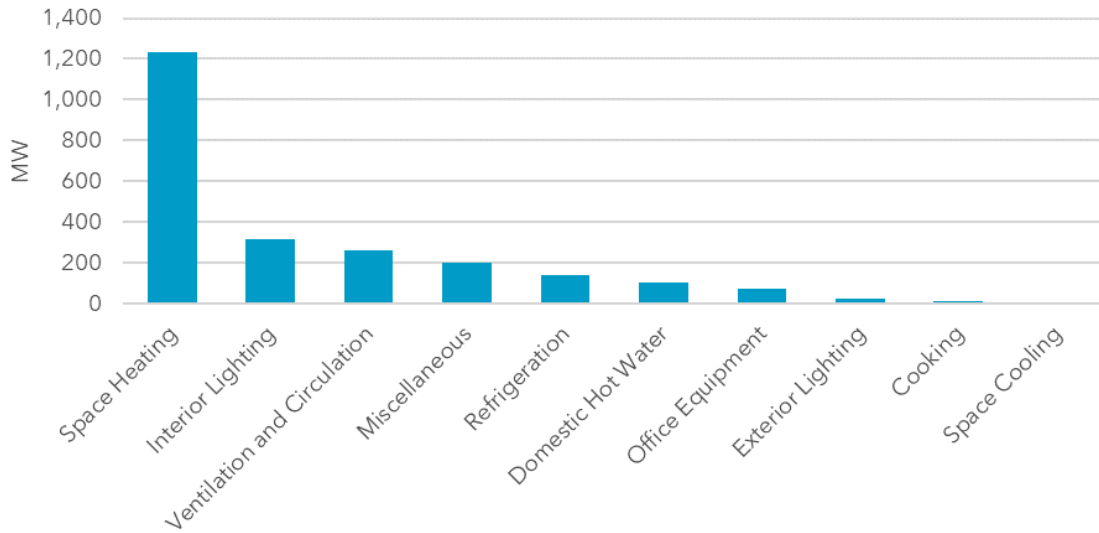
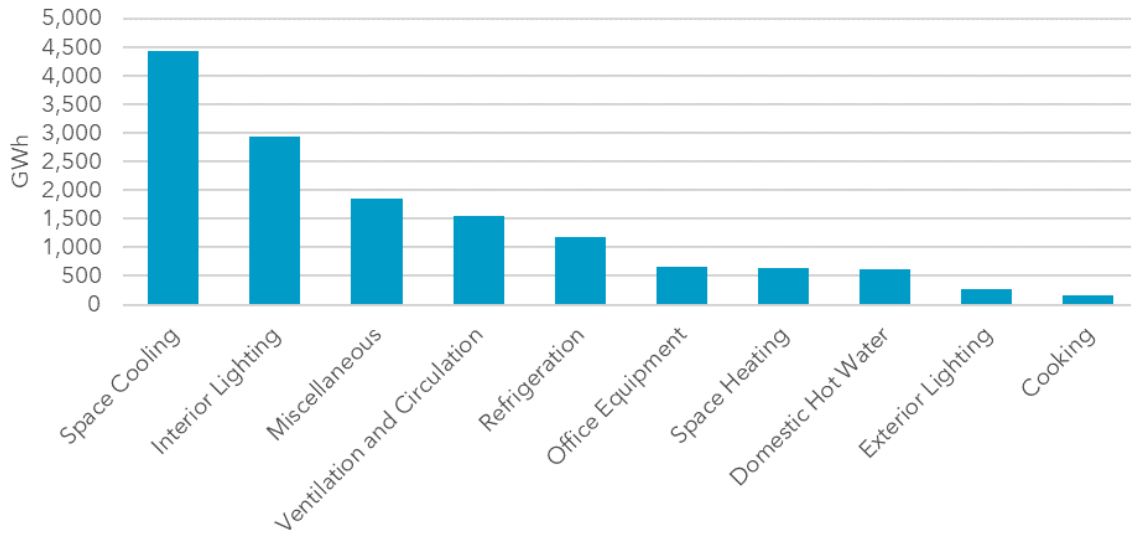


Figure 16: Commercial EE Technical Potential by End-Use (Energy Savings)



5.2.3.2 Industrial Segments

Figure 17, Figure 18, and Figure 19 summarize the industrial sector EE technical potential by end-use.

Figure 17: Industrial EE Technical Potential by End-Use (Summer Peak Savings)

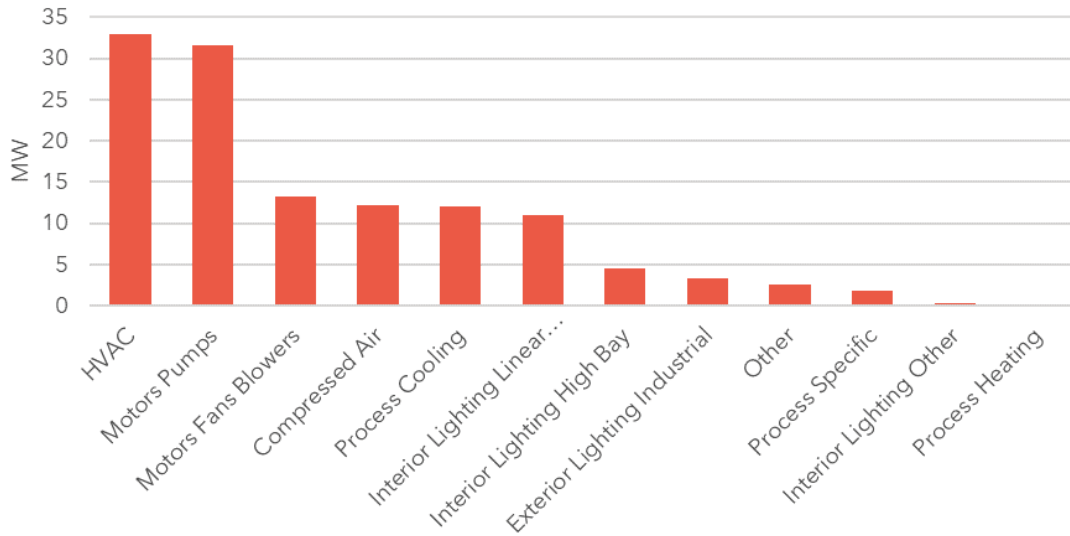


Figure 18: Industrial EE Technical Potential by End-Use (Winter Peak Savings)

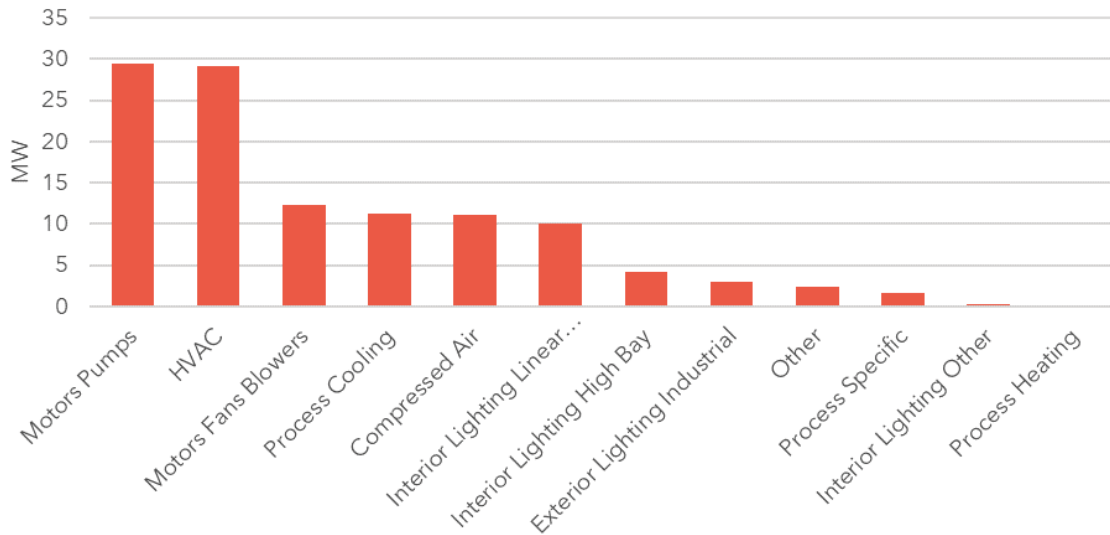
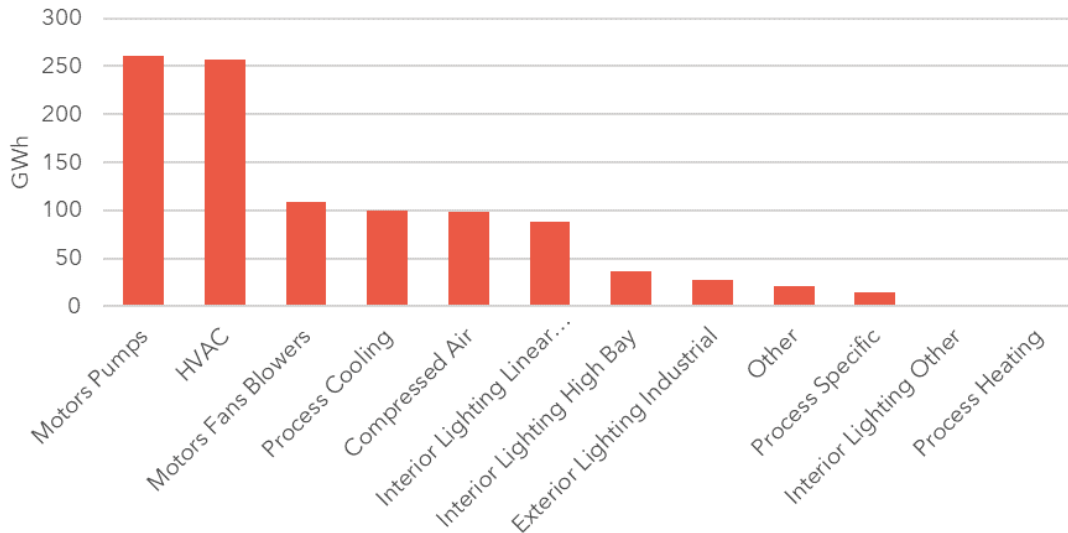


Figure 19: Industrial EE Technical Potential by End-Use (Energy Savings)



5.3 DR Technical Potential

Technical potential for DR is defined for each class of customers as follows:

- Residential & Small C&I customers – Technical potential is equal to the aggregate load for all end-uses that can participate in FPL’s current programs plus DR measures not currently offered in which the utility uses specialized devices to control loads (*i.e.*, direct load control programs). This includes cooling and heating loads for residential and small C&I customers and water heater and pool pump loads for residential customers. Not all demand reductions are delivered via direct load control of end-uses. The magnitude of demand reductions from non-direct load control such as time varying pricing, peak time rebates and targeted notifications is linked to cooling and heating loads.
- Large C&I customers – Technical potential is equal to the total amount of load for each customer segment (*i.e.*, that customers reduce their total load to zero when called upon).

Table 10 summarizes the seasonal DR technical potential by sector:

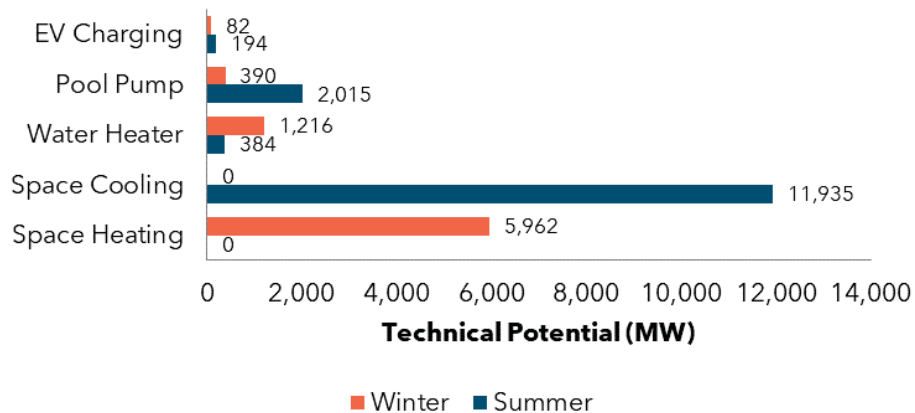
Table 10. DR Technical Potential

	Savings Potential	
	Summer Peak Demand (MW)	Winter Peak Demand (MW)
Residential	14,527	7,650
Non-Residential	8,741	8,460
Total	23,268	16,110

5.3.1 Residential

Residential technical potential is summarized in Figure 20.

Figure 20: Residential DR Technical Potential by End-Use

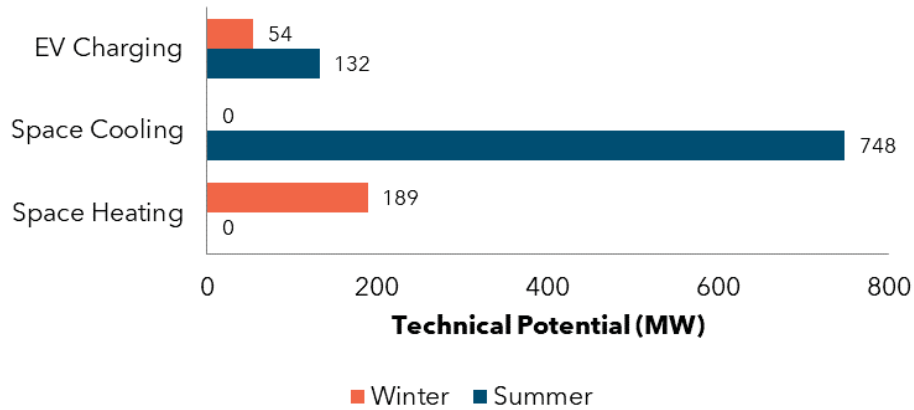


5.3.2 Non-Residential

5.3.2.1 Small C&I Customers

For small C&I technical potential, Resource Innovations looked at cooling and heating loads only. Small C&I technical potential is provided in Figure 21.

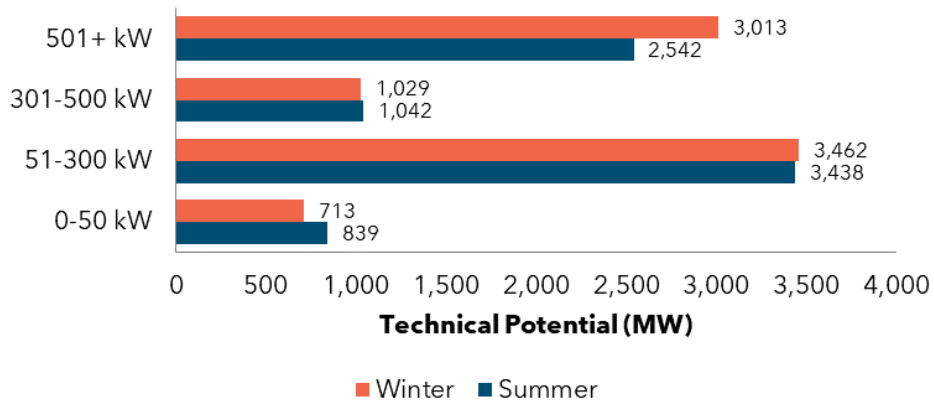
Figure 21: Small C&I DR Technical Potential by End-Use



5.3.2.2 Large C&I Customers

Figure 22 provides the technical potential for large C&I customers, broken down by customer size.

Figure 22: Large C&I DR Technical Potential by Segment



5.4 DSRE Technical Potential

Table 11 provides the results of the DSRE technical potential for each customer segment:

Table 11. DSRE Technical Potential⁷

	Savings Potential		
	Summer Peak Demand (MW)	Winter Peak Demand (MW)	Energy (GWh)
PV Systems			
Residential	9,142	1,438	71,354
Non-Residential	2,699	196	18,926
Total	11,841	1,634	90,280
Battery Storage charged from PV Systems			
Residential	1,456	4,811	0
Non-Residential	379	1,013	0
Total	1,835	5,824	0
CHP Systems			
Total	1,857	979	8,171

⁷ PV systems and CHP systems were independently analyzed for technical potential without consideration of the competition between technologies or customer preference for DSRE system.

Appendix A EE Measure List

For information on how Resource Innovations developed this list, please see Section 4.

Table 12: Residential EE Measures

Measure	End-Use	Description	Baseline
120v Heat Pump Water Heater 50 Gallons	Residential Domestic Hot Water	120v Heat Pump Water Heater 50 Gallons	Code-Compliant 50 Gallon Electric Resistance Water Heater
Air Sealing-Infiltration Control	Residential Space Cooling, Residential Space Heating	Standard Heating and Cooling System with Improved Infiltration Control	Standard Heating and Cooling System with Standard Infiltration Control
Air-to-Water Heat Pump	Residential Space Cooling, Residential Space Heating	Energy Star Air-to-Water Heat Pump, 25 SEER, 13 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
ASHP - 15 SEER/14.3 SEER2 from base electric resistance	Residential Space Cooling, Residential Space Heating	ASHP 15 SEER from base electric resistance	Base AC, 15 SEER, Electric resistance heating
ASHP - 24 SEER/22.9 SEER2 (from elec resistance)	Residential Space Cooling, Residential Space Heating	ASHP: 24/22.9 SEER/SEER2, 10.5 HSPF	Base AC, 15 SEER, Electric resistance heating
ASHP - 24 SEER/22.9 SEER2, 10.5 HSPF	Residential Space Cooling, Residential Space Heating	ASHP: 24/22.9 SEER/SEER2, 10.5 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
ASHP - CEE Advanced Tier: 17.8 SEER/17 SEER2; 10.0 HSPF	Residential Space Cooling, Residential Space Heating	CEE Advanced Tier ASHP: 17.8/17 SEER/SEER2; 10.0 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
ASHP - CEE Advanced Tier: 17.8 SEER/17 SEER2; 10.0 HSPF (from elec resistance)	Residential Space Cooling, Residential Space Heating	CEE Advanced Tier ASHP: 17.8/17 SEER/SEER2; 10.0 HSPF	Base AC, 15 SEER, Electric resistance heating
ASHP - CEE Tier 2: 16.8 SEER/16 SEER2; 9.0 HSPF	Residential Space Cooling, Residential Space Heating	CEE Tier 2 ASHP: 16.8/16 SEER/SEER2; 9.0 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
ASHP - CEE Tier 2: 16.8 SEER/16 SEER2; 9.0 HSPF	Residential Space Cooling,	CEE Tier 2 ASHP: 16.8/16 SEER/SEER2; 9.0 HSPF	Base AC, 15 SEER, Electric resistance heating

Measure	End-Use	Description	Baseline
(from elec resistance)	Residential Space Heating		
ASHP - ENERGY STAR/CEE Tier 1: 16 SEER/15.2 SEER2 (from elect resistance)	Residential Space Cooling, Residential Space Heating	ENERGY STAR/CEE Tier 1 ASHP: 16/15.2 SEER/SEER2, 9.0 HSPF	Base AC, 15 SEER, Electric resistance heating
ASHP - ENERGY STAR/CEE Tier 1: 16 SEER/15.2 SEER2, 9.0 HSPF	Residential Space Cooling, Residential Space Heating	ENERGY STAR/CEE Tier 1 ASHP: 16/15.2 SEER/SEER2, 9.0 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
Basement or Crawlspace Wall Insulation R-15	Residential Space Cooling, Residential Space Heating	Increased Basement or Crawlspace Wall Insulation (R-15)	Code-Compliant Exterior Below-Grade Wall Insulation (R-10)
Bathroom Faucet Aerators	Residential Domestic Hot Water	Low-Flow Faucet Aerator with Flow Rate of 1.5 gpm	Faucet Aerator with Federal Standard Flow Rate of 2.2 gpm
CEE Advanced Tier Clothes Dryer	Clothes Dryers	CEE Advanced Tier Clothes Dryer	One Clothes Dryer meeting Federal Standard
CEE Advanced Tier Clothes Washer	Clothes Washers	Tier 3 CEE Clothes washer	One Clothes Washer meeting Federal Standard
CEE Tier 3 Refrigerator	Refrigerators	Residential Tier 3 Refrigerator	One Refrigerator meeting Federal Standard
Ceiling Insulation (R11 to R30)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1982-1985) homes, bring to current code	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R11 to R38)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1982-1985) homes	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R11 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1982-1985) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R19 to R30)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1982-2020) homes, bring to current code	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R19 to R38)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1982-2020) homes	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R19 to R49)	Residential Space Cooling,	Blown-in insulation in ceiling cavity/attic, existing (1982-2020) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction

Measure	End-Use	Description	Baseline
	Residential Space Heating		
Ceiling Insulation (R2 to R30)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, older (pre-1982) homes, bring to current code	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R2 to R38)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, older (pre-1982) homes	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R2 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, older (pre-1982) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R30 to R38)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1986-2020) homes	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R30 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1986-2020) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R38 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1986-2020) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction
Central AC - CEE Tier 2: 16.8 SEER/16 SEER2	Residential Space Cooling	Central AC - CEE Tier 2: 16.8 SEER/16 SEER2	Code-Compliant Central AC, 15 SEER (updated)
Central AC - 24 SEER/22.9 SEER2	Residential Space Cooling	Central AC - 24 SEER/22.9 SEER2	Code-Compliant Central AC, 15 SEER (updated)
Central AC - CEE Advanced Tier: 17.8 SEER/17 SEER2	Residential Space Cooling	Central AC - CEE Advanced Tier: 17.8 SEER/17 SEER2	Code-Compliant Central AC, 15 SEER (updated)
Central AC - ENERGY STAR/CEE Tier 1: 16 SEER/15.2 SEER2	Residential Space Cooling	Central AC - ENERGY STAR/CEE Tier 1: 16 SEER/15.2 SEER2	Code-Compliant Central AC, 15 SEER (updated)
Central AC Tune Up	Residential Space Cooling	System tune-up, including coil cleaning, refrigerant charging, and other diagnostics	Existing Typical Central AC without Regular Maintenance/tune-up
Dehumidifier Recycling	Plug Load	No dehumidifier	One Dehumidifier meeting Federal Standard

Measure	End-Use	Description	Baseline
Drain Water Heat Recovery	Residential Domestic Hot Water	50 Gallon Electric Resistance Heater and Drain Water Heat Exchanger	50 Gallon Electric Resistance Heater, No Drain Water Heat Recovery
Duct Insulation	Residential Space Cooling, Residential Space Heating	Standard Electric Heating and Central AC with Insulated Ductwork	Standard Electric Heating and Central AC with Uninsulated Ductwork
Duct Repair	Residential Space Cooling, Residential Space Heating	Duct Repair to eliminate/minimize leaks, includes testing and sealing	Standard Electric Heating and Central AC with typical duct leakage
ECM Circulator Pump	Residential Miscellaneous	Install ECM Circulator Pump	Install Standard Circulator Pump
Energy Star Air Purifier	Plug Load	One Air Purifier meeting ENERGY STAR 2.0 Standards	One Standard Conventional Air Purifier
Energy Star Audio-Video Equipment	Plug Load	One DVD/Blu-Ray Player meeting current ENERGY STAR Standards	One Market Average DVD/Blu-Ray Player
Energy Star Bathroom Ventilating Fan	Residential Ventilation and Circulation	Bathroom Exhaust Fan meeting current ENERGY STAR Standards	Bathroom Exhaust Fan meeting Federal Standard
Energy Star Ceiling Fan	Residential Miscellaneous	60" Ceiling Fan Meeting ENERGY STAR 3.1 Standards	Standard 60" Ceiling Fan
Energy Star Clothes Dryer	Clothes Dryers	One Electric Resistance Clothes Dryer meeting ENERGY STAR 1.1 Standards	One Clothes Dryer meeting Federal Standard
Energy Star Clothes Washer	Clothes Washers	One Clothes Washer meeting ENERGY STAR 8.1 Standards	One Clothes Washer meeting Federal Standard
Energy Star Dehumidifier	Plug Load	One Dehumidifier meeting ENERGY STAR 5.0 Standards	One Dehumidifier meeting Federal Standard
Energy Star Dishwasher	Dishwashers	One Dishwasher meeting ENERGY STAR 7.0 Requirements (effective on July 19, 2023), electric water heating	One Dishwasher meeting Federal Standard
Energy Star Dishwasher (Gas Water Heating)	Dishwashers	One Dishwasher meeting ENERGY STAR 7.0 Requirements, gas water heating	One Dishwasher meeting Federal Standard; gas water heating
Energy Star Door	Residential Space Cooling, Residential Space Heating	100ft ² of Opaque Door meeting Energy Star Version 6.0 Requirements (U-Value: 0.17)	100ft ² of Opaque Door meeting current FL Code Requirements
ENERGY STAR EV supply equipment (level 2 charger)	Residential Miscellaneous	Level 2 Electric Vehicle Supply Equipment (EVSE)	Level 1 Electric Vehicle Supply Equipment (EVSE)

Measure	End-Use	Description	Baseline
Energy Star Freezer	Freezers	One Freezer meeting current ENERGY STAR 5.1 Standards	One Freezer meeting Federal Standard
Energy Star Ground Source Heat Pump	Residential Space Cooling, Residential Space Heating	Energy Star GSHP, 17.1 SEER, 12 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF
Energy Star Imaging Equipment	Plug Load	One imaging device meeting current ENERGY STAR Standards	One non-ENERGY STAR imaging device
Energy Star Monitor	Plug Load	One Monitor meeting ENERGY STAR 8.0 Standards	One Standard Monitor
Energy Star Personal Computer	Plug Load	One Personal Computer meeting ENERGY STAR 8.0 Standards	One Personal Computer meeting ENERGY STAR® 3.0 Standards
Energy Star Refrigerator	Refrigerators	One Refrigerator/Freezer meeting ENERGY STAR 5.1 Standards	One Refrigerator/Freezer meeting Federal Standard
Energy Star Room AC	Residential Space Cooling	Room AC meeting current ENERGY STAR standards	Code-Compliant Room AC
Energy Star Set-Top Receiver	Plug Load	One Set-top Box meeting ENERGY STAR 4.1 Standards	One Market Average Set-top Box
Energy Star TV	Plug Load	One Television meeting ENERGY STAR 9.0 Standards	One non-ENERGY STAR Television
Energy Star Windows	Residential Space Cooling, Residential Space Heating	100ft ² of Window meeting Energy Star Version 6.0 Requirements (U-Value: 0.27, SHGC: 0.21)	100ft ² of Window current FL energy code requirements
Exterior Wall Insulation	Residential Space Cooling, Residential Space Heating	Increased Exterior Above-Grade Wall Insulation (R-13)	Market Average Existing Exterior Above-Grade Wall Insulation
Filter Whistle	Residential Ventilation and Circulation	Install the Furnace Filter Alarm	No Furnace Filter Alarm on a Central Forced-Air Furnace
Floor Insulation	Residential Space Heating	Increased Floor Insulation (R-30)	Code-Compliant Floor Insulation
Freezer Recycling	Freezers	No Freezer	Current Market Freezer
Green Roof	Residential Space Cooling	Vegetated Roof Surface on top of Standard Roof	Standard Black Roof
Heat Pump Clothes Dryer	Clothes Dryers	One Heat Pump Clothes Dryer	One Clothes Dryer meeting Federal Standard
Heat Pump Pool Heater	Residential Miscellaneous	Heat Pump Swimming Pool Heater	Electric Resistance Swimming Pool Heater
Heat Pump Tune Up	Residential Space Cooling, Residential Space Heating	System tune-up, including coil cleaning, refrigerant charging, and other diagnostics	Standard Heating and Cooling System without Regular Maintenance/tune-up

Measure	End-Use	Description	Baseline
Heat Pump Water Heater 50 Gallons-CEE Advanced Tier	Residential Domestic Hot Water	CEE Advanced Tier Heat Pump Water Heater 50 Gallons	Code-Compliant 50 Gallon Electric Resistance Water Heater
Heat Pump Water Heater 50 Gallons-ENERGY STAR	Residential Domestic Hot Water	Heat Pump Water Heater 50 Gallons	Code-Compliant 50 Gallon Electric Resistance Water Heater
Heat Pump Water Heater 80 Gallons-ENERGY STAR	Residential Domestic Hot Water	Energy Star Heat Pump Water Heater 80 Gallons	Code-Compliant 80 Gallon Electric Resistance Water Heater
Heat Trap	Residential Domestic Hot Water	Heat Trap	Existing Water Heater without heat trap
High Efficiency Convection Oven	Residential Cooking	One Full-Size Convection Oven meeting ENERGY STAR 3.0 Standards	One Standard Economy-Grade Full-Size Oven
High Efficiency Induction Cooktop	Residential Cooking	One residential induction cooktop	One standard residential electric cooktop
Home Energy Management System	Lighting, Plug Load, Residential Space Cooling, Residential Space Heating	Typical HVAC by Building Type Controlled by Energy Management System	Typical HVAC by Building Type, Manually Controlled
Hot Water Pipe Insulation	Residential Domestic Hot Water	1' of Insulated Pipe in Unconditioned Spaces, Insulation of R-5	1' of Pipe in Unconditioned Spaces with Code Minimum of 1"of Insulation
HVAC ECM Motor	Residential Ventilation and Circulation	A brushless permanent magnet (ECM) blower motor for electric furnace	Permanent Split Capacitor Motor for Electric Furnace
HVAC Economizer	Residential Space Cooling	Install residential economizer	No economizer
HVAC Zoning System	Residential Space Cooling, Residential Space Heating	Install dampers in the ducts, dividing home into multiple zones, each controlled by its own thermostat	Single zone HVAC system
Indoor Daylight Sensor	Lighting	Install Indoor Daylight Sensors, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Induction Range	Residential Cooking	Residential induction range	Electric range
Instantaneous Hot Water System	Residential Domestic Hot Water	Instantaneous Hot Water System	Standard Efficiency Storage Tank Water Heater
Kitchen Faucet Aerators	Residential Domestic Hot Water	Low-Flow Faucet Aerator with Flow Rate of 1.5 gpm	Faucet Aerator with Federal Standard Flow Rate of 2.2 gpm
LED - 9W_CFL Baseline	Lighting	LED (assume 9W) replacing CFL baseline lamp	14W CFL (60W equivalent)

Measure	End-Use	Description	Baseline
LED - 9W_Halogen Baseline	Lighting	LED (assume 9W) replacing EISA-2020 compliant baseline lamp	EISA-2020 compliant baseline lamp (60W equivalent)
LED Specialty Lamps-5W Chandelier	Lighting	5 W Chandelier LED	Standard incandescent chandelier lamp
Linear LED	Lighting	Linear LED Lamps in Linear Fluorescent Fixture	Standard (32w) T8 lamps in Linear Fluorescent Fixture
Low Flow Showerhead	Residential Domestic Hot Water	Low-Flow Handheld Showerhead, Flow Rate: 1.60 gpm	Standard Handheld Showerhead, Flow Rate: 2.50 gpm
New Construction - Whole Home Improvements - Tier 1	Whole Home	Performance-based improvements in new homes - 20% savings	Residential New Construction (Baseline Efficiency)
New Construction - Whole Home Improvements - Tier 2	Whole Home	Performance-based improvements in new homes - 35% savings	Residential New Construction (Baseline Efficiency)
Occupancy Sensors Switch Mounted	Lighting	Switch Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor Lighting Timer	Lighting	Timer on Outdoor Lighting, Controlling 120 Watts	120 Watts of Lighting, Manually Controlled
Outdoor Motion Sensor	Lighting	Motion Sensor on Outdoor Lighting, Controlling 120 Watts	120 Watts of Lighting, Manually Controlled
Ozone Laundry	Clothes Washers	Add a New, Single-Unit Ozone Laundry System to the Clothes Washer	One Clothes Washer meeting Federal Standard
Programmable Thermostat	Residential Space Cooling, Residential Space Heating	Standard Heating and Cooling System with Programmable Thermostat	Standard Heating and Cooling System with Manual Thermostat
Properly Sized CAC	Residential Space Cooling	Properly Sized Central Air Conditioning	Standard Central Air Conditioning, Oversized
Radiant Barrier	Residential Space Cooling	Radiant Barrier	No radiant barrier
Reflective Roof	Residential Space Cooling	Reflective Roof Treatment	Standard dark shingle
Refrigerator Coil Cleaning	Refrigerators	Refrigerator Coil Cleaning	
Refrigerator Recycling	Refrigerators	No Refrigerator	Current Market Average Refrigerator
Residential Whole House Fan	Residential Space Cooling	Standard Central Air Conditioning with Whole House Fan	Standard Central Air Conditioning, No Whole House Fan

Measure	End-Use	Description	Baseline
Sealed crawlspace	Residential Space Cooling, Residential Space Heating	Encapsulated and semi-conditioned crawlspace	Naturally vented, unconditioned crawlspace
Smart Breaker	Whole Home	Smart Breaker	standard electric breakers
Smart Panel	Whole Home	Multi-channel device that attaches to customer's circuit breaker to enable monitoring and control of major end-use appliances by customer	standard electric panel
Smart Power Strip	Plug Load	Smart plug strips for entertainment centers and home office	Standard entertainment center or home office usage, no smart strip controls
Smart Thermostat	Residential Space Cooling, Residential Space Heating	Standard Heating and Cooling System with Smart Thermostat	Standard Heating and Cooling System with Manual Thermostat
Solar Attic Fan	Residential Space Cooling	Standard Central Air Conditioning with Solar Attic Fan	Standard Central Air Conditioning, No Solar Attic Fan
Solar Pool Heater	Residential Miscellaneous	Solar Swimming Pool Heater	Electric Resistance Swimming Pool Heater
Solar Powered Pool Pumps	Residential Miscellaneous	Solar Powered Pool Pump	Variable Speed Pool Pump Motor
Solar Thermal Water Heating System	Residential Domestic Hot Water	Solar Thermal System with Electric Backup	Code-Compliant 50 Gallon Electric Resistance Water Heater
Spray Foam Insulation (Base R11)	Residential Space Cooling, Residential Space Heating	Open cell spray foam along roofline in existing (1982-1985) homes	Existing ceiling insulation based on building code at time of construction
Spray Foam Insulation (Base R19)	Residential Space Cooling, Residential Space Heating	Open cell spray foam along roofline in existing (1982-1985) homes	Existing ceiling insulation based on building code at time of construction
Spray Foam Insulation (Base R2)	Residential Space Cooling, Residential Space Heating	Open cell spray foam along roofline in older (pre-1982) homes	Existing ceiling insulation based on building code at time of construction
Spray Foam Insulation (Base R30)	Residential Space Cooling, Residential Space Heating	Open cell spray foam along roofline in existing (1986-2020) homes	Existing ceiling insulation based on building code at time of construction
Thermostatic Shower Restriction Valve	Residential Domestic Hot Water	50 Gallon Electric Resistance Heater and Thermostatic Shower Valves	50 Gallon Electric Resistance Heater and Standard Shower Valves

Measure	End-Use	Description	Baseline
Variable Refrigerant Flow (VRF) HVAC Systems	Residential Space Cooling, Residential Space Heating	Variable Refrigerant Flow (VRF) HVAC Systems	Code-Compliant ASHP, 15 SEER, 8.8 HSPF
Water Heater Blanket	Residential Domestic Hot Water	50 Gallon Electric Resistance Water Heater with Insulated Tank Wrap	Code-Compliant 50 Gallon Electric Resistance Water Heater, No Tank Wrap
Water Heater Thermostat Setback	Residential Domestic Hot Water	50 Gallon Electric Resistance Water Heater with Temperature Setpoint of 119°F	Code-Compliant 50 Gallon Electric Resistance Water Heater (Temp. Setpoint = 130°F)
Water Heater Timeclock	Residential Domestic Hot Water	Water Heater Timeclock	Existing Water Heater without time clock
Weather stripping	Residential Space Cooling, Residential Space Heating	Specific quantity of weather stripping to seal	
Window Caulking	Residential Space Cooling, Residential Space Heating	Window caulking	
Window Sun Protection	Residential Space Cooling	Window Film Applied to Standard Window	Standard Window with below Code Required Minimum SHGC

Table 13: Commercial EE Measures

Measure	End-Use	Description	Baseline
1.5HP Open Drip-Proof (ODP) Motor	Ventilation and Circulation	High Efficiency 1.5 HP Open-Drip Proof Motor	1.5HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency
10HP Open Drip-Proof (ODP) Motor	Ventilation and Circulation	High Efficiency 10 HP Open-Drip Proof Motor	10HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency
20HP Open Drip-Proof (ODP) Motor	Ventilation and Circulation	High Efficiency 20 HP Open-Drip Proof Motor	20HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency
Advanced Rooftop Controller	Ventilation and Circulation	Advanced Rooftop Controller	Without Advanced Rooftop Controller
Air Compressor Optimization	Miscellaneous	Performing Routine Maintenance on 20HP Inlet Modulation Fixed-Speed Compressor	20 HP Inlet Modulation Fixed-Speed Compressor

Measure	End-Use	Description	Baseline
Air Curtains	Space Cooling, Space Heating	Air Curtain across door opening	Door opening with no air curtain
Airside Economizer	Space Cooling	Airside Economizer	No economizer
Anti-Sweat Controls	Refrigeration	One Medium Temperature Reach-In Case with Anti-Sweat Heater Controls	One Medium Temperature Reach-In Case without Anti-Sweat Heater Controls
Auto Off Time Switch	Interior Lighting	Auto-Off Time Switch on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Automatic Door Closer for Walk-in Coolers and Freezers	Refrigeration	One Medium Temperature Walk-In Refrigerator Door with Auto-Closer	One Medium Temperature Walk-In Refrigerator Door without Auto-Closer
Beverage Vending Machine Controls	Refrigeration	One non-ENERGY STAR beverage vending machine equipped with infrared occupancy sensing controls	One non-ENERGY STAR beverage vending machine, no controls
Bi-Level Lighting Control (Exterior)	Exterior Lighting	Bi-Level Controls on Exterior Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Bi-Level Lighting Control (Interior)	Interior Lighting	Bi-Level Controls on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Ceiling Insulation (R19 to R30)	Space Cooling, Space Heating	Blown-in insulation in ceiling cavity/attic	Market Average Existing Ceiling Insulation in older steep slope, residential style commercial building
Ceiling Insulation (R19 to R38)	Space Cooling, Space Heating	Blown-in insulation in ceiling cavity/attic	Market Average Existing Ceiling Insulation in older steep slope, residential style commercial building
Ceiling Insulation (R19 to R49)	Space Cooling, Space Heating	Blown-in insulation in ceiling cavity/attic - Beyond Code	Market Average Existing Ceiling Insulation in older steep slope, residential style commercial building
Ceiling Insulation (R2 to R30)	Space Cooling, Space Heating	Blown-in insulation in ceiling cavity/attic	Market Average Existing Ceiling Insulation in older steep slope, residential style commercial building
Ceiling Insulation (R2 to R38)	Space Cooling, Space Heating	Blown-in insulation in ceiling cavity/attic	Market Average Existing Ceiling Insulation in older steep slope, residential style commercial building
Ceiling Insulation (R2 to R49)	Space Cooling, Space Heating	Blown-in insulation in ceiling cavity/attic - Beyond Code	Market Average Existing Ceiling Insulation in older steep slope, residential style commercial building
Chilled Water Reset	Space Cooling	One Chiller with Reset of Chilled Water Temperature Setpoint	One Chiller with Fixed Chilled Water Temperature

Measure	End-Use	Description	Baseline
Chiller maintenance	Space Cooling	O&M improvements to restore chiller performance	
CO Sensors for Parking Garage Exhaust	Miscellaneous	Enclosed Parking Garage Exhaust with CO Control	Constant Volume Enclosed Parking Garage Exhaust
Commercial Duct Sealing	Space Cooling, Space Heating	Standard Electric Heating and Central AC with Improved Duct Sealing	Standard Electric Heating and Central AC, Standard Duct Sealing
Commercial Strategic Energy Management	Whole Building	Commercial Strategic Energy Management	No active energy management
Custom measure - Non-lighting	Space Cooling, Space Heating	Custom Improvement to Facility's Operations	Baseline Technology/Process
Data Center Hot Cold Aisle	Office Equipment	Equipment configuration that saves HVAC	No hot, cold aisle containment
Dedicated Outside Air System (DOAS)	Space Cooling, Space Heating	Install Dedicated Outside Air System (DOAS)	Typical HVAC by Building Type
Demand Controlled Circulating Systems	Domestic Hot Water	Recirculation Pump with Demand Control Mechanism	Uncontrolled Recirculation Pump
Demand Controlled Ventilation	Ventilation and Circulation	Return Air System with CO2 Sensors	Standard Return Air System, No Sensors
Demand Defrost	Refrigeration	Walk-In Freezer System with Demand-Controlled Electric Defrost Cycle	Walk-In Freezer System with Timer-Controlled Electric Defrost Cycle
Destratification Fans	Space Heating	Destratification Fans improve temperature distribution by circulating warmer air from the ceiling back down to the floor level	No destratification fan
Door Gasket (Cooler)	Refrigeration	New Door Gasket on One-Door Medium Temperature Reach-In Case	Worn or Damaged Door Gasket on One-Door Medium Temperature Reach-In Case
Door Gasket (Freezer)	Refrigeration	New Door Gasket on One-Door Medium Temperature Reach-In Case	Worn or Damaged Door Gasket on One-Door Medium Temperature Reach-In Case
Drain water heat recovery	Domestic Hot Water	Hot Water Loop with 50 Gallon Electric Resistance Heater and Drain Water Heat Exchanger	Standard Hot Water Loop with 50 Gallon Electric Resistance Heater, No Drain Water Heat Recovery
Dual Enthalpy Economizer	Ventilation and Circulation	Standard HVAC Unit with an economizer and dual enthalpy differential control	HVAC unit with no economizer or with a non-functional disabled economizer
Duct Insulation	Space Cooling, Space Heating	Standard Electric Heating and Central AC with Insulated Ductwork (R-8)	Standard Electric Heating and Central AC with Uninsulated Ductwork (R-4)

Measure	End-Use	Description	Baseline
Ductless Mini-Split AC	Space Cooling	Ductless Mini-Split AC, 4 Ton, 16 SEER	Code-Compliant AC Unit, 4 Ton, 15 SEER
Ductless Mini-Split HP	Space Cooling, Space Heating	Ductless Mini-Split HP, 17 SEER, 9.5 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF
DX Coil Cleaning	Space Cooling	DX Coil Cleaning	DX Coil Not Cleaned
ECM Motors on Furnaces	Space Heating	Variable Speed Electronically Commutated Motor for an Electric Furnace	Permanent Split Capacitor Motor for Electric Furnace
Efficient Battery Charger	Miscellaneous	Efficient Battery Charger	FR or SCR charging stations with power conversion efficiency < 89% or > 10 W
Efficient Exhaust Hood	Cooking	Kitchen ventilation with automatically adjusting fan controls	Kitchen ventilation with constant speed ventilation motor
Efficient Motor Belts	Miscellaneous	Synchronous belt, 98% efficiency	Standard V-belt drive
Efficient New Construction Lighting	Interior Lighting	Efficient New Construction Lighting, 15% Better than Code	New Construction with Lighting Power Density meeting Code Minimum
Energy Recovery Ventilation System (ERV)	Space Cooling	Unitary Cooling Equipment that Incorporates Energy Recovery	Current Market Packaged or Split DX Unit
Energy Star Combination Oven	Cooking	Energy Star Combination Oven meeting ENERGY STAR Version 3.0 Standards	One Standard Economy-Grade 10-Pan Combination Oven
Energy Star Commercial Clothes Washer	Miscellaneous	One Commercial Clothes Washer meeting current ENERGY STAR Version 8.1 Standards	One Commercial Clothes Washer meeting Federal Standard
Energy Star Commercial Dishwasher	Domestic Hot Water	One Commercial Dishwasher meeting ENERGY STAR Version 3.0 Standards	One Dishwasher meeting Federal Standard
Energy Star Commercial Glass Door Freezer	Refrigeration	One Glass Door Freezer meeting ENERGY STAR Version 5.0 Standards	One Glass Door Freezer meeting Federal Standards
Energy Star Commercial Glass Door Refrigerator	Refrigeration	One Glass Door Refrigerator meeting ENERGY STAR Version 5.0 Standards	One Glass Door Refrigerator meeting Federal Standards
Energy Star Commercial Solid Door Freezer	Refrigeration	One Solid Door Freezer meeting ENERGY STAR Version 5.0 Standards	One Solid Door Freezer meeting Federal Standards
Energy Star Commercial Solid Door Refrigerator	Refrigeration	One Solid Door Refrigerator meeting ENERGY STAR Version 5.0 Standards	One Solid Door Refrigerator meeting Federal Standards
Energy Star convection oven	Cooking	Energy Star convection oven meeting ENERGY STAR Version 3.0 Standards	One Standard Economy-Grade Full-Size Convection Oven

Measure	End-Use	Description	Baseline
Energy Star EV Chargers	Miscellaneous	Level 2 Electric Vehicle Supply Equipment (EVSE)	Level 1 Electric Vehicle Supply Equipment (EVSE)
Energy Star Fryer	Cooking	One Standard Vat Electric Fryer meeting ENERGY STAR Version 3.0 Standards	One Standard Economy-Grade Standard Vat Electric Fryer
Energy Star Griddle	Cooking	One Griddle meeting current ENERGY STAR Version 1.2 Standards	One Conventional Griddle
Energy Star Hot Food Holding Cabinet	Cooking	One Hot Food Holding Cabinet meeting current ENERGY STAR Version 2.0 Standards	One Standard Hot Food Holding Cabinet
Energy Star Ice Maker	Refrigeration	One Continuous Self-Contained Ice Maker meeting ENERGY STAR Version 3.0 Standards	One Continuous Self-Contained Ice Maker meeting Federal Standard
ENERGY STAR Imaging Equipment	Office Equipment	One imaging device meeting current ENERGY STAR Standards	One non-ENERGY STAR imaging device
Energy Star LED Directional Lamp	Interior Lighting	Energy Star 7.6W Directional LED lamp	50W Incandescent lamp
Energy Star Monitors	Office Equipment	One Monitor meeting ENERGY STAR 8.0 Standards	One Standard Monitor
Energy Star PCs	Office Equipment	One Personal Computer (desktop or laptop) meeting current ENERGY STAR® Standards	One non-ENERGY STAR® Personal Computer
Energy Star room AC	Space Cooling	Room AC meeting current ENERGY STAR standards	Code-Compliant Room AC, 1 Ton, 10.9 CEER
Energy Star Servers	Office Equipment	One Server meeting ENERGY STAR 2.0 Standards	One Standard Server
Energy Star Steamer	Cooking	One 4-Pan Electric Steamer meeting ENERGY STAR® 2.0 Standards	One Standard Economy-Grade 4-Pan Steamer
Energy Star Uninterruptable Power Supply	Office Equipment	Standard Desktop Plugged into Energy Star Uninterruptable Power Supply at 25% Load	Standard Desktop Plugged into Average Rotary Uninterruptable Power Supply at 25% Load
Energy Star Vending Machine	Refrigeration	One Refrigerated Vending Machine meeting ENERGY STAR Version 4.0 Standards	One Refrigerated Vending Machine meeting ENERGY STAR® 1.0 Standards
ENERGY STAR Water Cooler	Miscellaneous	One Storage Type Hot/Cold Water Cooler Unit meeting ENERGY STAR Version 3.0 Standards	One Standard Storage Type Hot/Cold Water Cooler Unit
Energy Star windows	Space Cooling, Space Heating	100ft ² of Window meeting Energy Star Version 6.0 Requirements (U-Value: 0.27, SHGC: 0.21)	100ft ² of Window meeting Energy Star Version 5.0 Requirements (U-Value: 0.3, SHGC: 0.3)

Measure	End-Use	Description	Baseline
Engine Block Timer	Miscellaneous	Plug-in timer that activates engine block timer to reduce unnecessary run time	Engine block heater (typically used for backup generators) running continuously
Escalator Motor Efficiency Controller	Miscellaneous	Install Escalator Motor Efficiency Controller	Escalator without Motor Efficiency Controller
Facility Commissioning	Space Cooling, Space Heating, Ventilation and Circulation	Perform facility commissioning to optimize building operations in new facilities	Standard new construction facility with no commissioning
Facility Energy Management System	Space Cooling, Space Heating, Ventilation and Circulation	Typical HVAC by Building Type Controlled by Energy Management System	Standard/manual facility equipment controls
Faucet Aerator	Domestic Hot Water	Low-flow lavatory faucet aerator, flow rate: 1.0 gpm	Federal lavatory flow rate standard, 1994, flow rate: 2.2 gpm
Floating Head Pressure Controls	Refrigeration	Medium-Temperature Refrigeration System with 5HP Compressor and Adjustable Condenser Head Pressure Control Valve	Medium-Temperature Refrigeration System with 5 HP Compressor without Adjustable Condenser Head Pressure Control Valve
Floor Insulation	Space Cooling, Space Heating	Increased Floor Insulation (R-19)	Market Average Existing Floor Insulation
Geothermal Heat Pump	Space Cooling, Space Heating	Geothermal Heat Pump	Code-Compliant Air Source Heat Pump
Green roof	Space Cooling, Space Heating	Vegetated Roof Surface on top of Standard Roof	Standard Black Roof
HE Air Cooled Chiller - All Compressor Types - 100 Tons	Space Cooling	HE Air Cooled Chiller - Air Compressor Types - 100 Tons	Code-Compliant Air Cooled Positive Displacement Chiller, 100 Tons
HE DX 11.25-20.0 Tons Elec Heat	Space Cooling, Space Heating	High Efficiency Packaged or Split DX Unit, 15 Tons, 11.5 SEER	Code-Compliant Packaged or Split DX Unit, 15 Tons, 11 SEER
HE DX 11.25-20.0 Tons Other Heat	Space Cooling	High Efficiency Packaged or Split DX Unit, 15 Tons, 11.5 SEER	Code-Compliant Packaged or Split DX Unit, 15 Tons, 11 SEER
HE DX 5.4-11.25 Tons Elect Heat	Space Cooling, Space Heating	High Efficiency Packaged or Split DX Unit, 7.5 Tons, 12 SEER	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11 SEER
HE DX 5.4-11.25 Tons Other Heat	Space Cooling	High Efficiency Packaged or Split DX Unit, 7.5 Tons, 12 SEER	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11 SEER
HE DX Less than 5.4 Tons Elect Heat	Space Cooling, Space Heating	High Efficiency Packaged or Split DX Unit, 5 Tons, 14.5 SEER	Code-Compliant Packaged or Split DX Unit, 5 Tons, 13 SEER

Measure	End-Use	Description	Baseline
HE DX Less than 5.4 Tons Other Heat	Space Cooling	High Efficiency Packaged or Split DX Unit, 5 Tons, 14.5 SEER	Code-Compliant Packaged or Split DX Unit, 5 Tons, 13 SEER
HE Water Cooled Chiller - Centrifugal Compressor - 200 Tons	Space Cooling	Water Cooled Centrifugal Chiller with Integral VFD, 200 Tons	Code-Compliant Water Cooled Centrifugal Chiller, 200 Tons
HE Water Cooled Chiller - Centrifugal Compressor - 500 Tons	Space Cooling	Water Cooled Centrifugal Chiller with Integral VFD, 500 Tons	Code-Compliant Water Cooled Centrifugal Chiller, 500 Tons
HE Water Cooled Chiller - Rotary or Screw Compressor - 175 Tons	Space Cooling	Water Cooled Positive Displacement Chiller with Integral VFD, 175 Tons	Code-Compliant Water Cooled Positive Displacement Chiller, 175 Tons
HE Water Cooled Chiller - Rotary or Screw Compressor - 50 Tons	Space Cooling	Water Cooled Positive Displacement Chiller with Integral VFD, 50 Tons	Code-Compliant Water Cooled Positive Displacement Chiller, 50 Tons
Heat Pump Pool Heater Commercial	Miscellaneous	High Efficiency Pool Heater Eff. >=84%	Standard Efficiency Pool Heater 78% Eff.
Heat Pump Water Heater	Domestic Hot Water	Efficient 50 Gallon Electric Heat Pump Water Heater	Code-Compliant 50 Gallon Electric Heat Pump Water Heater
High Efficiency Air Compressor	Miscellaneous	20 HP VFD Air Compressor	20 HP Inlet Modulation Fixed-Speed Compressor
High Efficiency Data Center Cooling	Space Cooling	High Efficiency CRAC (computer room air conditioner)	Standard Efficiency CRAC
High Efficiency PTAC	Space Cooling	High Efficiency PTAC	Code-Compliant PTAC
High Efficiency PTHP	Space Cooling, Space Heating	High Efficiency PTHP	Code-Compliant PTHP
High Efficiency Refrigeration Compressor_Discus	Refrigeration	High Efficiency Refrigeration Compressors	Standard Compressor
High Efficiency Refrigeration Compressor_Scroll	Refrigeration	High Efficiency Refrigeration Compressors	Standard Compressor
High Speed Fans	Ventilation and Circulation	High Speed Fan, 24" - 35" Blade Diameter	Standard Speed Fan, 24" - 35" Blade Diameter
Hot water pipe insulation	Domestic Hot Water	1' of Insulated Pipe in Unconditioned Spaces, Insulation of R-4	1' of Pipe in Unconditioned Spaces with Code Minimum of 1" of Insulation
Hotel Card Energy Control Systems	Space Cooling, Space Heating	Guest Room HVAC Unit Controlled by Hotel-Key-Card	Guest Room HVAC Unit, Manually Controlled by Guest

Measure	End-Use	Description	Baseline
		Activated Energy Control System	
Indoor daylight sensor	Interior Lighting	Install Indoor Daylight Sensors, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Induction Cooktops	Cooking	Efficient Induction Cooktop	One Standard Electric Cooktop
Infiltration Reduction - Air Sealing	Space Cooling, Space Heating	Reduced leakage through caulking, weather-stripping	Standard Heating and Cooling System with Moderate Infiltration
Instantaneous Hot Water System Commercial	Domestic Hot Water	Instantaneous Hot Water System	Code-Compliant Electric Storage Water Heater
LED - 14W_CFL Baseline	Interior Lighting	LED (assume 14W) replacing CFL	100W equivalent CFL
LED - 9W Flood_CFL Baseline	Exterior Lighting	LED (assume 9W) replacing CFL	14W CFL
LED Canopy Lighting (Exterior)	Exterior Lighting	One 67.2W LED Canopy Light	Average Lumen Equivalent Exterior Incandescent Area Lighting
LED Display Lighting (Exterior)	Exterior Lighting	One Letter of LED Signage, < 2ft in Height	One Letter of Neon or Argon-mercury Signage, < 2ft in Height
LED Display Lighting (Interior)	Interior Lighting	One Letter of LED Signage, < 2ft in Height	One Letter of Neon or Argon-mercury Signage, < 2ft in Height
LED Exit Sign	Interior Lighting	One 5W Single-Sided LED Exit Sign	One 9W Single-Sided CFL Exit Sign
LED Exterior Wall Packs	Exterior Lighting	One 35W LED Wall Pack	Average Lumen Equivalent Exterior Incandescent Area Lighting
LED High Bay_HID Baseline	Interior Lighting	One 140W High Bay LED Fixture	Lumen-Equivalent HID High Bay Fixture
LED High Bay_LF Baseline	Interior Lighting	One 140W High Bay LED Fixture	Lumen-Equivalent Linear Fluorescent High Bay Fixture
LED Linear - Fixture Replacement	Interior Lighting	2x4 LED Troffer	Lumen-Equivalent 32-Watt T8 Lamp
LED Linear - Lamp Replacement	Interior Lighting	Linear LED (16W)	Lumen-Equivalent 32-Watt T8 Lamp
LED Parking Lighting	Exterior Lighting	One 160W LED Area Light	Average Lumen Equivalent Exterior HID Area Lighting
LEED New Construction Whole Building	Space Cooling, Space Heating	LEED New Construction Whole Building	Comparable facility, code-compliance construction
Light Tube	Interior Lighting	One 14" Light Tube, Delivering light to 250 S.F. of Commercial Space	250 S.F. of Commercial Space Lit by Typical Lighting Strategies

Measure	End-Use	Description	Baseline
Low Flow Shower Head	Domestic Hot Water	Low-Flow Handheld Showerhead, Flow Rate: 1.50 gpm	Standard Handheld Showerhead, Flow Rate: 2.50 gpm
Low-Flow Pre-Rinse Sprayers	Domestic Hot Water	Low-Flow Pre-Rinse Sprayer with Flow Rate of 1.6 gpm	Pre-Rinse Sprayer with Federal Standard Flow Rate of 2.25 gpm
Network PC Power Management	Office Equipment	One computer and monitor attached to centralized energy management system that controls when desktop computers and monitors plugged into a n	One computer and monitor, manually controlled
Networked Lighting Controls	Interior Lighting	Install Networked Lighting Controls System on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Controlled either Manually or by Sensor as Specified by Code
Night Covers for Display Cases	Refrigeration	One Open Vertical Case with Night Covers	One Existing Open Vertical Case, No Night Covers
Occupancy Sensors, Ceiling Mounted	Interior Lighting	Ceiling Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Occupancy Sensors, Switch Mounted	Interior Lighting	Switch Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor Lighting Controls	Exterior Lighting	Install Exterior Photocell Dimming Controls, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor motion sensor	Exterior Lighting	Install Exterior Motion Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Ozone Laundry Commercial	Miscellaneous	Add a new ozone laundry system onto a commercial clothes washer	One commercial clothes washer without ozone laundry system
Programmable thermostat	Space Cooling, Space Heating	Pre-set programmable thermostat that replaces manual thermostat	Standard Heating and Cooling System with Manual Thermostat
PSC to ECM Evaporator Fan Motor (Reach-In)	Refrigeration	Medium Temperature Reach-In Case with equivalent size Electronically Commutated Evaporator Fan Motor	Medium Temperature Reach-In Case with Permanent Split Capacitor Evaporator Fan Motor
PSC to ECM Evaporator Fan Motor (Walk-In, Refrigerator)	Refrigeration	Medium Temperature Walk-In Case with Electronically Commutated Evaporator Fan Motor	Medium Temperature Walk-In Case with Permanent Split Capacitor Evaporator Fan Motor
Q-Sync Evaporator Fan Motor	Refrigeration	Medium Temperature Reach-In Case with equivalent size Q-Sync Evaporator Fan Motor	Medium Temperature Reach-In Case with 20W Permanent Split Capacitor Fan Motor

Measure	End-Use	Description	Baseline
Reflective Roof Treatment	Space Cooling	Reflective Roof Treatment	Standard Black Roof
Refrigerated Display Case LED Lighting	Refrigeration	60" Refrigerated Case LED Strip	Lumen-Equivalent 32-Watt T8 Fixture
Refrigerated Display Case Lighting Controls	Refrigeration	Occupancy Sensors for Refrigerated Case Lighting to reduce run time	Market-Share Weighted Existing Linear Fluorescent Fixture
Refrigeration Commissioning	Refrigeration	Commissioned Refrigeration System	Non-Commissioned Refrigeration System
Refrigeration Economizer	Refrigeration	Walk-in refrigerator with economizer	Walk-in refrigerator without economizer
Regenerative Drive Elevator Motor	Miscellaneous	Regenerative drive produced energy when motor in overhaul condition	Standard motor
Retro-Commissioning (Existing Construction)	Space Cooling, Space Heating, Ventilation and Circulation	Perform facility retro-commissioning, including assessment, process improvements, and optimization of energy-consuming equipment and systems	
Roof Insulation	Space Cooling, Space Heating	Roof Insulation (built-up roof applicable to flat/low slope roofs)	Code-Compliant Flat Roof
Server Virtualization	Office Equipment	2 Virtual Host Server	20 Single Application Servers
Smart Strip Plug Outlet	Office Equipment	One Smart Strip Plug Outlet	One Standard plug strip/outlet
Smart thermostat	Space Cooling, Space Heating	Thermostats that include "smart" features such as occupancy sensors, geo-fencing, multi-zone sensors	Standard Heating and Cooling System with Manual Thermostat
Solar Pool Heater Commercial	Miscellaneous	Solar Swimming Pool Heater	Electric Resistance Swimming Pool Heater
Solar Powered Pool Pump	Miscellaneous	Solar Powered Pool Pump Motor	Variable Speed Pool Pump Motor
Solar Thermal Water Heating System Commercial	Domestic Hot Water	Solar Thermal System with Electric Backup	Code-Compliant 50 Gallon Electric Resistance Water Heater
Strip Curtains - Freezers	Refrigeration	Walk-in freezer with strip curtains at least 0.06 inches thick covering the entire area of the doorway	Walk-in freezer without strip curtains
Strip Curtains - Refrigerators	Refrigeration	Walk-in cooler with strip curtains at least 0.06 inches	Walk-in cooler without strip curtains

Measure	End-Use	Description	Baseline
		thick covering the entire area of the doorway	
Suction Pipe Insulation - Freezers	Refrigeration	Suction Pipe Insulation - Freezers	Uninsulated freezer suction lines
Suction Pipe Insulation - Refrigerators	Refrigeration	Suction Pipe Insulation - Refrigerators	Uninsulated refrigeration suction lines
Thermal Energy Storage	Space Cooling	Deploy thermal energy storage technology (ice harvester, etc.) to shift load	Code compliant chiller
Thermostatic Shower Restriction Valve Commercial	Domestic Hot Water	Hot Water Loop with 50 Gallon Electric Resistance Heater and Pressure Balance Shower Valves	Standard Hot Water Loop with 50 Gallon Electric Resistance Heater and Standard Shower Valves
Time Clock Control	Interior Lighting	Time Clock Controlled Lighting, 500 Watts Controlled	500 Watts of Lighting, Controlled either Manually or by Sensor as Specified by Code
Variable Refrigerant Flow (VRF) HVAC Systems	Space Cooling, Space Heating	Variable Refrigerant Flow (VRF) HVAC Systems	Code-Compliant PTHP
VAV System	Ventilation and Circulation	Variable Air Volume Distribution System	Constant Air Volume Distribution System
VFD on Cooling Tower Fans	Space Cooling	Cooling Tower Fans with VFD Control	Cooling Tower Fans without VFD Control
VFD on HVAC Pump	Space Cooling, Space Heating	VFD on HVAC Pump	7.5 HP HVAC Pump Motor, no VFD Control
VSD Controlled Compressor	Refrigeration	Refrigeration System with VSD Control	Refrigeration System with Standard Slide-Valve Control System
Wall Insulation	Space Cooling, Space Heating	Increased Exterior Above-Grade Wall Insulation	Market Average Existing Exterior Above-Grade Wall Insulation
Warehouse Loading Dock Seals	Space Cooling, Space Heating	Seals to reduce infiltration losses at loading dock	Loading dock with no seals
Water Cooled Refrigeration Heat Recovery	Domestic Hot Water	The heat reclaim system transfers waste heat from refrigeration system to space heating or hot water	No heat recovery
Water Heater Setback	Domestic Hot Water	A 50 gallon electric hot water tank with a thermostat setting reduced to no lower than 120 degrees.	A 50 gallon electric hot water tank with a thermostat setting that is higher than 120 degrees, typically hot water tanks with settings of 130 degrees or higher.
Water source heat pump	Space Cooling, Space Heating	Water Source Heat Pump, 2.5 Tons, 17.4 EER, 4.4 COP	Code-Compliant ASHP

Measure	End-Use	Description	Baseline
Waterside Economizer	Space Cooling	Waterside Economizer	No economizer
Window shade film	Space Cooling	Window Film with SHGC of 0.35 Applied to Standard Window	Standard Window with below Code Required Minimum SHGC
Zero Energy Doors	Refrigeration	Install zero energy doors for a reach-in refrigerated cooler or freezer	Standard vertical reach-in refrigerated cooler or freezer with anti-sweat heaters on the glass surface of the doors

Table 14: Industrial EE Measures

Measure	End-Use	Description	Baseline
1.5HP Open Drip-Proof (ODP) Motor	Motors Pumps	High Efficiency 1.5 HP Open-Drip Proof Motor	1.5HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency
10HP Open Drip-Proof (ODP) Motor	Motors Pumps	High Efficiency 10 HP Open-Drip Proof Motor	10HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency
20HP Open Drip-Proof (ODP) Motor	Motors Pumps	High Efficiency 20 HP Open-Drip Proof Motor	20HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency
3-phase High Frequency Battery Charger - 1 shift	Other	3-phase High Frequency Battery Charger	Standard Charger
Advanced Rooftop Controller	HVAC	Advanced Rooftop Controller	Without Advanced Rooftop Controller
Air Compressor Optimization	Compressed Air	Performing Routine Maintenance on 20HP Inlet Modulation Fixed-Speed Compressor	20 HP Inlet Modulation Fixed-Speed Compressor
Air curtains	HVAC	Air Curtain across door opening	Door opening with no air curtain
Airside economizer	HVAC	Airside Economizer	No economizer
Auto Closer on Refrigerator Door	Process Cooling	One Medium Temperature Walk-In Refrigerator Door with Auto-Closer	One Medium Temperature Walk-In Refrigerator Door without Auto-Closer
Auto Off Time Switch	Interior Lighting High Bay	Auto-Off Time Switch on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled

Measure	End-Use	Description	Baseline
Bi-Level Lighting Control (Exterior)	Exterior Lighting Industrial	Install Exterior Bi-Level Lighting Control, 500 Watts Controlled	500 Watts of Lighting, No Dim Setting
Bi-Level Lighting Control (Interior)	Interior Lighting High Bay	Bi-Level Controls on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, No Dim Setting
Chilled Water Reset	HVAC	One Chiller with Reset of Chilled Water Temperature Setpoint	One Chiller with Fixed Chilled Water Temperature
Cogged Belt on 15hp ODP Motor	Motors Pumps	15HP ODP Motor with Cogged Belts Installed on Supply and/or Return Air Fans	15HP ODP Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Cogged Belt on 40hp ODP Motor	Motors Pumps	40HP ODP Motor with Cogged Belts Installed on Supply and/or Return Air Fans	40HP ODP Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Compressed Air Desiccant Dryer	Process Specific	heated regenerative desiccant dryer without dew point demand controls	heatless regenerative desiccant dryer without dew point demand controls
Compressed Air No-Loss Condensate Drains	Process Specific	Install no-loss condensate drains	Install standard condensate drains
Compressed Air Storage Tank	Compressed Air	20 HP Inlet Modulation Fixed-Speed Compressor with Receiver Tank	20 HP Inlet Modulation Fixed-Speed Compressor, No Receiver Tank
Custom Measure - Non-Lighting	HVAC	Custom Improvement to Facility's Operations	Baseline Technology/Process
Dairy Refrigeration Heat Recovery	Other	refrigeration equipment with refrigeration heat recovery tank installed	existing dairy farm with refrigeration equipment and a water heater unit without an RHR unit
Dedicated Outside Air System (DOAS)	HVAC	Install Dedicated Outside Air System (DOAS)	Typical HVAC by Building Type
Demand Controlled Ventilation	HVAC	Return Air System with CO2 Sensors	Standard Return Air System, No Sensors
Demand Defrost	Process Cooling	Walk-In Freezer System with Demand-Controlled Electric Defrost Cycle	Walk-In Freezer System with Timer-Controlled Electric Defrost Cycle
Dew Point Sensor Control for Dessicant CA Dryer	Compressed Air	1000 CFM Heated Desiccant Air Dryer with Dew Point Controls	1000 CFM Modulating Heated Desiccant Air Dryer
Drip Irrigation Nozzles	Other	Flow Control Nozzles	Standard Irrigation Nozzles

Measure	End-Use	Description	Baseline
Dual Enthalpy Economizer	Process Cooling	Standard HVAC Unit with an economizer and dual enthalpy differential control	HVAC unit with no economizer or with a non-functional disabled economizer
DX Coil Cleaning	HVAC	DX Coil Cleaning	DX Coil Not Cleaned
Efficient Compressed Air Nozzles	Compressed Air	1/4" Engineered Air Nozzle	1/4" Open-End Air Nozzle
Efficient New Construction Lighting	Interior Lighting High Bay	Efficient New Construction Lighting, 15% Better than Code	New Construction with Lighting Power Density meeting Code Minimum
Electric Actuators	Other	Electric Actuator	Pneumatic Actuator
Energy Efficient Laboratory Fume Hood	HVAC	Variable Air Volume High Performance Fume Hood	Constant Volume Conventional Bypass Fume Hood
Energy Efficient Transformers	Other	Energy Efficient Dry Type Transformer (CSL-3)	Standard Transformer (TP-1)
Energy Recovery Ventilation System	HVAC	Unitary Cooling Equipment that Incorporates Energy Recovery	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11.2 EER
Energy Star LED Directional Lamp	Interior Lighting Other	Energy Star 7.6W Directional LED lamp	50W Incandescent lamp
Energy Star room ac	HVAC	Room AC meeting current ENERGY STAR standards	Code-Compliant Room AC
Energy Star windows	HVAC	100ft2 of Window meeting Energy Star Version 6.0 Requirements (U-Value: 0.27, SHGC: 0.21)	100ft2 of Window meeting Energy Star Version 5.0 Requirements (U-Value: 0.3, SHGC: 0.3)
Engine Block Timer	Other	An engine block heater operated by an outdoor plug-in timer	An engine block heater that is manually plugged in
Facility Commissioning	HVAC	Perform facility commissioning	Comparable facility, no commissioning
Facility Energy Management System	HVAC	Typical HVAC by Building Type Controlled by Energy Management System	Typical HVAC by Building Type, Manually Controlled
Fan Thermostat Controller	HVAC	Typical HVAC by Building Type with Fan Thermostat Controller Installed	Typical HVAC by Building Type with Programmable Thermostat
Floating Head Pressure Controller	Process Cooling	Medium-Temperature Refrigeration System with 5HP Compressor and Adjustable Condenser Head Pressure Control Valve	Medium-Temperature Refrigeration System with 5 HP Compressor without Adjustable Condenser Head Pressure Control Valve
Grain Bin Aeration Control System	Process Specific	Grain Storage Fan System with Automatic Controls	Grain Storage Fan System with Manual Controls

Measure	End-Use	Description	Baseline
HE Air Cooled Chiller - All Compressor Types - 100 Tons	HVAC	HE Air Cooled Chiller - All Compressor Types - 100 Tons	Code-Compliant Air Cooled Positive Displacement Chiller, 100 Tons
HE Air Cooled Chiller - All Compressor Types - 300 Tons	HVAC	Air Cooled Positive Displacement Chiller with Integral VFD, 300 Tons, 13.7 EER	Code-Compliant Air Cooled Positive Displacement Chiller, 300 Tons, 12.5 EER
HE DX 11.25-20.0 Tons Elec Heat	HVAC	High Efficiency Packaged or Split DX Unit, 15 Tons, 11.5 SEER	Code-Compliant Packaged or Split DX Unit, 15 Tons, 11 SEER
HE DX 11.25-20.0 Tons Other Heat	HVAC	High Efficiency Packaged or Split DX Unit, 15 Tons, 11.5 SEER	Code-Compliant Packaged or Split DX Unit, 15 Tons, 11 SEER
HE DX 5.4-11.25 Tons Elect Heat	HVAC	High Efficiency Packaged or Split DX Unit, 7.5 Tons, 12 SEER	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11 SEER
HE DX 5.4-11.25 Tons Other Heat	HVAC	High Efficiency Packaged or Split DX Unit, 7.5 Tons, 12 SEER	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11 SEER
HE DX Less than 5.4 Tons Elect Heat	HVAC	High Efficiency Packaged or Split DX Unit, 5 Tons, 14.5 SEER	Code-Compliant Packaged or Split DX Unit, 5 Tons, 13 SEER
HE DX Less than 5.4 Tons Other Heat	HVAC	High Efficiency Packaged or Split DX Unit, 5 Tons, 14.5 SEER	Code-Compliant Packaged or Split DX Unit, 5 Tons, 13 SEER
HE Water Cooled Chiller - Centrifugal Compressor - 200 Tons	HVAC	Water Cooled Centrifugal Chiller with Integral VFD, 200 Tons	Code-Compliant Water Cooled Centrifugal Chiller, 200 Tons
HE Water Cooled Chiller - Centrifugal Compressor - 500 Tons	HVAC	Water Cooled Centrifugal Chiller with Integral VFD, 500 Tons	Code-Compliant Water Cooled Centrifugal Chiller, 500 Tons
HE Water Cooled Chiller - Rotary or Screw Compressor - 175 Tons	HVAC	Water Cooled Positive Displacement Chiller with Integral VFD, 175 Tons	Code-Compliant Water Cooled Positive Displacement Chiller, 175 Tons
HE Water Cooled Chiller - Rotary or Screw Compressor - 50 Tons	HVAC	Water Cooled Positive Displacement Chiller with Integral VFD, 50 Tons	Code-Compliant Water Cooled Positive Displacement Chiller, 50 Tons
High Bay Occupancy	Interior Lighting High Bay	Ceiling Mounted Occupancy Sensor, 800 Watts Controlled	800 Watts of Lighting, Manually Controlled

Measure	End-Use	Description	Baseline
Sensors, Ceiling Mounted			
High Efficiency Air Compressor	Compressed Air	20 HP VFD Air Compressor	20 HP Inlet Modulation Fixed-Speed Compressor
High Efficiency Refrigeration Compressor - Discus	Process Cooling	High Efficiency Refrigeration Compressors	Standard Compressor
High Efficiency Refrigeration Compressor - Scroll	Process Cooling	High Efficiency Refrigeration Compressors	Standard Compressor
High Efficiency Welder	Process Specific	High Efficiency Welder	Standard Welding Practices
High Speed Fans	HVAC	High Speed Fan, 24" - 35" Blade Diameter	Standard Speed Fan, 24" - 35" Blade Diameter
High Volume Low Speed Fan (HVLS)	Motors Fans Blowers	20' High Volume Low Speed Fan	Conventional Circulating Fan
Indoor Agriculture - LED Grow Lights	Interior Lighting High Bay	LED grow light	1000W High Pressure Sodium
Indoor daylight sensor	Interior Lighting High Bay	Install Indoor Daylight Sensors, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Industrial Duct Sealing	HVAC	Standard Electric Heating and Central AC with Improved Duct Sealing	Standard Electric Heating and Central AC, Standard Duct Sealing
Injection Mold and Extruder Barrel Wraps	Other	2' Diameter, 20' Long Machine Barrel with 1" Insulation	2' Diameter, 20' Long Machine Barrel with no Insulation
Insulated Pellet Dryer Tanks and Ducts	Process Heating	Insulation for Pellet Tank and Duct	Uninsulated Pellet Tank and Duct
LED - 14W_CFL Baseline	Interior Lighting Other	LED (assume 14W) replacing CFL	100W equivalent CFL
LED Canopy Lighting (Exterior)	Exterior Lighting Industrial	One 67.2W LED Canopy Light	Average Lumen Equivalent Exterior Incandescent Area Lighting
LED Display Lighting (Exterior)	Exterior Lighting Industrial	One Letter of LED Signage, < 2ft in Height	One Letter of Neon or Argon-mercury Signage, < 2ft in Height
LED Display Lighting (Interior)	Interior Lighting Other	One Letter of LED Signage, < 2ft in Height	One Letter of Neon or Argon-mercury Signage, < 2ft in Height
LED exit sign	Interior Lighting Other	One 5W Single-Sided LED Exit Sign	One 9W Single-Sided CFL Exit Sign
LED Exterior Wall Packs	Exterior Lighting Industrial	One 35W LED Wall Pack	Average Lumen Equivalent Exterior Incandescent Area Lighting

Measure	End-Use	Description	Baseline
LED High Bay_HID Baseline	Interior Lighting High Bay	One 140W High Bay LED Fixture	Lumen-Equivalent HID High Bay Fixture
LED High Bay_LF Baseline	Interior Lighting High Bay	One 140W High Bay LED Fixture	Lumen-Equivalent Linear Fluorescent High Bay Fixture
LED Linear - Fixture Replacement	Interior Lighting Linear Fluorescent	2x4 LED Troffer Fixture	Lumen-Equivalent 32-Watt T8 Fixture
LED Linear - Lamp Replacement	Interior Lighting Linear Fluorescent	Linear LED	Lumen-Equivalent 32-Watt T8 Lamp
LED Parking Lighting	Exterior Lighting Industrial	One 160W LED Area Light	Average Lumen Equivalent Exterior HID Area Lighting
LEED New Construction Whole Building	HVAC	LEED Qualifying New Construction	Comparable facility, code-compliance construction
Light Tube	Interior Lighting Other	One 14" Light Tube, Delivering light to 250 S.F. of Industrial Space	250 S.F. of Industrial Space Lit by Typical Lighting Strategies
Low Energy Livestock Waterer	Motors Pumps	Install Thermostatically Controlled Livestock Watering System	Standard Livestock Watering System
Low Pressure Sprinkler Nozzles	Motors Pumps	Low Pressure Irrigation Nozzles operate at 35 psi or lower	Standard high pressure irrigation nozzles that operate at 50 psi or greater
Low Pressure-drop Filters	Compressed Air	20 HP Inlet Modulation Fixed-Speed Compressor with Low Pressure Drop Filter	20 HP Inlet Modulation Fixed-Speed Compressor, No Particulate Removal
Milk Pre-Cooler	Other	Installed pre-cooler heat exchanger	no pre-cooler heat exchanger installed
Networked Lighting Controls	Interior Lighting Linear Fluorescent	Install Networked Lighting Controls System on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Controlled either Manually or by Sensor as Specified by Code
Occupancy Sensors, Ceiling Mounted	Interior Lighting High Bay	Ceiling Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Occupancy sensors, switch mounted	Interior Lighting Linear Fluorescent	Switch Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor Lighting Controls	Exterior Lighting Industrial	Install Exterior Photocell Dimming Controls, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor motion sensor	Exterior Lighting Industrial	Install Exterior Motion Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Packaged Terminal AC	HVAC	High Efficiency Packaged Terminal AC	Code-Compliant PTAC, 10.9 EER

Measure	End-Use	Description	Baseline
Process Cooling Ventilation Reduction	Process Cooling	Standard Process Cooling with Reduced Ventilation	Standard Process Cooling
Programmable thermostat	HVAC	Standard Heating and Cooling System with Programmable Thermostat	Standard Heating and Cooling System with Manual Thermostat
Reflective Roof Treatment	HVAC	Reflective Roof Treatment	Standard Black Roof
Refrigeration Commissioning	Process Cooling	Commissioned Refrigeration System	Non-Commissioned Refrigeration System
Retro-Commissioning (Existing Construction)	HVAC	Perform Facility Retro-commissioning	
Roof insulation	HVAC	Roof Insulation (built-up roof applicable to flat/low slope roofs)	Code-Compliant Flat Roof
Smart thermostat	HVAC	Standard Heating and Cooling System with Smart Thermostat	Standard Heating and Cooling System with Manual Thermostat
Strategic Energy Management	HVAC	SEM goal setting and tracking	No active energy management
Synchronous Belt on 15hp ODP Motor	Motors Pumps	15 HP Open-Drip Proof Motor with Synchronous Belts Installed on Supply and/or Return Air Fans	15 HP Open-Drip Proof Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Synchronous Belt on 5hp ODP Motor	Motors Pumps	5 HP Open-Drip Proof Motor with Synchronous Belts Installed on Supply and/or Return Air Fans	5 HP Open-Drip Proof Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Synchronous Belt on 75hp ODP Motor	Motors Pumps	75 HP Open-Drip Proof Motor with Synchronous Belts Installed on Supply and/or Return Air Fans	75 HP Open-Drip Proof Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Thermal energy storage	HVAC	Deploy thermal energy storage technology (ice harvester, etc.) to shift load	Code compliant chiller
Time Clock Control	Interior Lighting High Bay	Time Clock Controlled Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
VAV System	HVAC	Variable Air Volume Distribution System	Constant Air Volume Distribution System
VFD on Air Compressor	Compressed Air	20 HP VFD Air Compressor	20 HP Inlet Modulation Fixed-Speed Compressor
VFD on Cooling Tower Fans	Process Cooling	Cooling Tower Fans with VFD Control	Cooling Tower Fans without VFD Control

Measure	End-Use	Description	Baseline
VFD on HVAC Fan	Motors Fans Blowers	5 HP HVAC Fan Motor, with VFD Control	5 HP HVAC Fan Motor, no VFD Control
VFD on HVAC Pump	Motors Pumps	VFD on HVAC Pump	7.5 HP HVAC Pump Motor, no VFD Control
VFD on process pump	Motors Pumps	20 HP Process Pump Equipped with VFD Control	20 HP Process Pump, Constant Speed
VSD Controlled Compressor	Process Cooling	Refrigeration System with VSD Control	Refrigeration System with Standard Slide-Valve Control System
Water source heat pump	HVAC	Water Source Heat Pump, 2.5 Tons, 17.4 EER, 4.4 COP	Code-Compliant ASHP
Waterside economizer	HVAC	Waterside Economizer	No economizer
Window shade film	HVAC	Window Film with SHGC of 0.35 Applied to Standard Window	Standard Window with below Code Required Minimum SHGC

The following EE measures from the 2019 Technical Potential Study were eliminated from the current study⁸:

Table 15: 2019 EE Measures Eliminated from Current Study

Sector	Measure	End-Use	Reason for Removal
Residential	CFL - 15W Flood	Lighting	Better technology (LED) available
Residential	CFL - 15W Flood (Exterior)	Lighting	Better technology (LED) available
Residential	CFL - 13W	Lighting	Better technology (LED) available
Residential	CFL - 23W	Lighting	Better technology (LED) available
Residential	Low Wattage T8 Fixture	Lighting	Better technology (LED) available
Residential	15 SEER Central AC	Space Cooling	Updated Federal Standard
Residential	15 SEER Air Source Heat Pump	Space Cooling, Space Heating	Updated Federal Standard
Residential	14 SEER ASHP from base electric resistance heating	Space Cooling, Space Heating	Updated Federal Standard

⁸ Additional measures from the 2019 study were updated to reflect current vintage/technology for the current study.

Sector	Measure	End-Use	Reason for Removal
Residential	Two Speed Pool Pump	Miscellaneous	Updated Florida Energy Code
Residential	Variable Speed Pool Pump	Miscellaneous	Updated Florida Energy Code
Residential	Storm Door	Space Cooling, Space Heating	Minimal/uncertain energy savings
Commercial	CFL - 15W Flood	Exterior Lighting	Better technology (LED) available
Commercial	High Efficiency HID Lighting	Exterior Lighting	Better technology (LED) available
Commercial	LED Street Lights	Exterior Lighting	Market standard
Commercial	LED Traffic and Crosswalk Lighting	Exterior Lighting	Market standard
Commercial	CFL-23W	Interior Lighting	Better technology (LED) available
Commercial	High Bay Fluorescent (T5)	Interior Lighting	Better technology (LED) available
Commercial	Premium T8 - Fixture Replacement	Interior Lighting	Better technology (LED) available
Commercial	Premium T8 - Lamp Replacement	Interior Lighting	Better technology (LED) available
Commercial	Two Speed Pool Pump	Miscellaneous	Updated Florida Energy Code
Commercial	Variable Speed Pool Pump	Miscellaneous	Updated Florida Energy Code
Commercial	Tank Wrap on Water Heater	Domestic Hot Water	Limited applicability
Commercial	Ceiling Insulation (R12 to R38)	Space Cooling, Space Heating	Consolidated measure baseline assumptions
Commercial	Ceiling Insulation (R30 to R38)	Miscellaneous	Consolidated measure baseline assumptions

Appendix B DR Measure List

Table 16: Residential DR Measures

Measure	Type	Season	Description
Central air conditioner - Load Shed	Direct load control	Summer	Direct load control program where utility provides day ahead notification that it will send remote signal to shed AC unit load during peak usage period.
Central Heating - Load Shed	Direct load control	Winter	Direct load control program where utility provides day ahead notification that it will send remote signal to shed AC unit load during peak usage period.
Central air conditioner - 50% cycling	Direct load control	Summer	Direct load control program where utility provides day ahead notification that it will send remote signal to cycle AC unit during peak usage period
Central Heating - 50% cycling	Direct load control	Winter	Direct load control program where utility provides day ahead notification that it will send remote signal to cycle AC unit during peak usage period
Smart thermostats - Utility Installation	Direct load control	Summer and Winter	Similar to AC load control program, but allows customers to participate using a compatible smart thermostat rather than an AC switch
Smart thermostats - BYOT	Direct load control	Summer and Winter	Similar to AC load control program, but allows customers to participate using a compatible smart thermostat rather than an AC switch
CPP + Tech	Pricing	Summer and Winter	Electricity rate that varies based on time of day. Can be same rate schedule for every day during a given season (time of use, or TOU) and with critical peak pricing (CPP) days when peak period rates are substantially higher for a limited number of days per year (customers receive advance notification of CPP event). Customers also receive technology that they can pre-program to curtail load when an event is called.
Water heater control	Direct load control	Summer and Winter	Load control installed on a water heater (integrated or external switch)
Pool pump switches	Direct load control	Summer and Winter	Load control program with switch installed on pool pump
Room AC	Direct load control	Summer	Load control program that is focused on room AC units rather than central AC
Managed EV Charging - switch	Direct load control	Summer and Winter	Load control switch that is installed on an EV charger
Managed EV Charging - telematics	Direct load control	Summer and Winter	Direct load control program leveraging EV smart charging software
Battery Storage with PV	Pricing/Direct load control	Summer and Winter	PV charges battery and battery discharges to grid

Table 17: Small C&I DR Measures

Measure	Type	Season	Description
Central air conditioner - Load Shed	Direct load control	Summer	Direct load control program where utility provides day ahead notification that it will send remote signal to shed AC unit load during peak usage period.
Central Heating - Load Shed*	Direct load control	Winter	Direct load control program where utility provides day ahead notification that it will send remote signal to shed AC unit load during peak usage period.
Central air conditioner - 50% cycling	Direct load control	Summer	Direct load control program where utility provides day ahead notification that it will send remote signal to cycle AC unit during peak usage period
Central Heating - 50% cycling*	Direct load control	Winter	Direct load control program where utility provides day ahead notification that it will send remote signal to cycle AC unit during peak usage period
Smart thermostats - Utility Installation*	Direct load control	Summer and Winter	Similar to AC load control program, but allows customers to participate using a compatible smart thermostat rather than an AC switch
Smart thermostats - BYOT*	Direct load control	Summer and Winter	Similar to AC load control program, but allows customers to participate using a compatible smart thermostat rather than an AC switch
CPP + Tech	Pricing	Summer and Winter	Electricity rate that varies based on time of day. Can be same rate schedule for every day during a given season (time of use, or TOU) and with critical peak pricing (CPP) days when peak period rates are substantially higher for a limited number of days per year (customers receive advance notification of CPP event). Customers also receive technology that they can pre-program to curtail load when an event is called.
Managed EV Charging - switch	Direct load control	Summer and Winter	Load control switch that is installed on an EV charger
Managed EV Charging - telematics	Direct load control	Summer and Winter	Direct load control program leveraging EV smart charging software
Battery Storage with PV	Pricing/Direct load control	Summer and Winter	PV charges battery and battery discharges to grid

Table 18: Large C&I DR Measures

Measure	Type	Season	Description
CPP + Tech	Pricing	Summer and Winter	Electricity rate that varies based on time of day. Can be same rate schedule for every day during a given season (time of use, or TOU) and with critical peak pricing (CPP) days when peak period rates are substantially higher for a limited number of days per year (customers receive advance notification of

Measure	Type	Season	Description
			CPP event). Customers also receive technology that they can pre-program to curtail load when an event is called.
Auto DR	Utility-controlled loads	Summer and Winter	Custom load control of specific end-uses/processes that is triggered by utility signal to building management system; customer can sometimes opt-out of specific events
Firm Service Level	Contractual	Summer and Winter	Customer commits to a maximum usage level during peak periods and, when notified by the utility, agrees to cut usage to that level.
Guaranteed Load Drop	Contractual	Summer and Winter	Customer agrees to reduce usage by an agreed upon amount when notified

No DR measures from the 2019 Technical Potential Study were eliminated from the current study.

Appendix C DSRE Measure List

Table 19: Residential DSRE Measures

Measure	Description
PV System	Roof-mounted system, including multiple panels, AC/DC inverter, racking system, and electrical system interconnections
Battery Storage from PV System	Lithium-ion battery system designed to integrate with an on-site PV system to store and discharge excess energy from PV generation

Table 20: Non-Residential DSRE Measures

Measure	Description
PV System	Roof-mounted system, including multiple panels, AC/DC inverter, racking system, and electrical system interconnections
Battery Storage from PV System	Lithium-ion battery system designed to integrate with an on-site PV system to store and discharge excess energy from PV generation
CHP - Fuel Cell	An electrochemical cell-based generator that reacts hydrogen fuel with oxygen
CHP - Micro Turbine	Small combustion turbine that burns gaseous or liquid fuel to drive a generator
CHP - Gas Turbine	A combustion turbine that burns gaseous or liquid fuel to drive a generator
CHP - Reciprocating Engine	An engine that uses one or more pistons to convert pressure into rotational motion
CHP - Steam Turbine	A turbine that extracts thermal energy from pressured steam to drive a generator

No DSRE measures from the 2019 Technical Potential Study were eliminated from the current study.

Appendix D External Measure Suggestions

Table 21: External Measure Suggestions and Actions

Measure Suggestion	Stakeholder Comments	Action taken for FEECA Study
Efficient Electrification Measures	<p>All measures that can produce substantial site energy savings by converting from natural gas or other fossil fuels should be included in the Florida electric utilities' next efficiency potential study. Key examples include efficient heat pumps to displace gas furnaces and efficient heat pump water heaters to displace gas water heaters. It is important to note that these electrification measures provide not only heating energy savings and water heating energy savings, but can also potentially provide cooling efficiency benefits as well. In the case of heat pumps, that can occur because efficient heat pumps can operate in cooling mode more efficiently than standard central air conditioners. In the case of heat pump water heaters, cooling and dehumidification benefits can occur when/if the water heater is in conditioned space because they transfer heat (particularly latent heat) from the air around them to the water they are heating. A growing number of jurisdictions - including Illinois, Minnesota and some northeastern states - have begun to include efficient electrification measures in their efficiency programs portfolios.</p>	<p>Fuel-switching and electrification are outside the scope of this study</p>
Networked Lighting Controls	<p>LED lighting technology has become increasingly accepted and installed in commercial buildings. The next big efficiency opportunity in commercial lighting efficiency is in sophisticated controls integrated into the light fixtures themselves - both luminaire level lighting controls and networked lighting controls. For example, a 2017 report for both the Northwest Energy Efficiency Alliance and the Design Lights Consortium, a non-profit that works with utilities and manufacturers of lighting products (and which many utilities across the country reference for determination of eligibility of lighting products for efficiency program rebates), found that networked lighting controls can provide on the order of 50% additional savings after LED conversion. Other studies have also found the national savings potential from such products to be enormous. Moreover, these products can be designed to provide not only lighting energy savings but also a number of other non-energy benefits (e.g., asset tracking, such as the ability of hospitals to know the location of all wheel chairs). Numerous utilities across the country now actively promote this technology through their efficiency programs. For example, Commonwealth Edison, the utility serving Chicago and other parts of northern Illinois, is currently getting a significant portion of its commercial lighting savings from promotion of networked lighting controls</p>	<p>Added to measure list for 2024 study</p>

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External Measure Suggestions

Measure Suggestion	Stakeholder Comments	Action taken for FEECA Study
Ductless mini-split heat pumps to displace inefficient electric baseboard heating	While most Florida residential buildings with electric heat provide that heat with heat pumps, at least some (perhaps most likely being older multi-family rental buildings) still use inefficient electric resistance heat. Ductless mini- split heat pump retrofits can very efficiently displace such inefficient electric heat and should be added to the residential measure list.	Added to measure list for 2024 study
Air Source Heat Pump baseline assumptions	<p>There are seven air source heat pump (ASHP) measures included in the residential measure list. Two of them - one at SEER 14 and a second at SEER 21 - are listed as relative to an electric resistance baseline. Five of them - SEER 15, SEER 16, SEER 17, SEER 18 and SEER 21 - appear to be relative to a baseline of a standard new ASHP. Are we interpreting this correctly? If so, we have a couple of comments/questions/suggestions:</p> <ul style="list-style-type: none"> • The efficiency standards assessed need to be modified to be consistent with new federal standards, including new testing procedures. • For cases where the baseline is "electric resistance", why only assessing two efficiency tiers (i.e., fewer than for standard ASHP baselines)? The same number of efficiency tiers should be assessed for both baselines. 	Incorporated suggestions into 2024 study, including updated baseline standard and assessing same efficiency tiers for both baselines
Heat Pump Water Heater Efficiency	The Res EE tab of the utilities draft measure list suggests that the efficiency of a heat pump water heater is an EF of 2.50. That is unrealistically low. In fact, of the 222 products listed on the Energy Star website, none had UEFs less than 2.80 and only 29 (13%) had UEFs that were less than 3.4; the average was 3.57. Indeed, the first product listed on a search of heat pump water heaters on Home Depot's website is a 50 gallon, Rheem (Pro Terra) product with a UEF of 3.75 and a cost of \$1699.	Incorporated suggestion into 2024 study
New Construction Measure Packages	The measures lists did not appear to include packages of measures for building new residential and/or new commercial buildings to levels of efficiency beyond those required by code. Utilities in many jurisdictions run new construction efficiency programs supporting such measure packages. In the residential sector, many base their programs on the long-standing Federal Energy Star standard. However, increasingly utility programs are promoting additional efficiency tiers - often as part of all-electric new construction program offerings - that go well beyond the Energy Star standard. For example, Consumers Energy (Michigan) offers \$1000 rebates to builders who construct Energy Star single family homes	Incorporated suggestion into 2024 study with 2 tiers of residential new construction whole-home improvement measures.

External Measure Suggestions

Measure Suggestion	Stakeholder Comments	Action taken for FEECA Study
	with a Home Energy Rating (HERS) score of 57 or less, but offer higher rebates for more efficient buildings - up to \$4000 for all electric homes with a HERS score of 40 or less. The Florida utilities potential study should assess savings potential for both the Energy Star level and a tier or two of additional efficiency beyond that level. Similar assessments of new commercial building savings potential should also be assessed.	
Custom Industrial Measures	The utilities' list of industrial efficiency measures addresses common industrial efficiency opportunities. However, it does not address efficiency opportunities that may be unique to individual industries or even to individual industrial facilities. That can include such things as changes in types of materials used in manufacturing, reductions in waste streams, improved use of water delivered by agricultural irrigation systems, and/or other things that are not directly related to energy using equipment or controls of such equipment. It is obviously not possible to list all such measures. However, a potential study will understate savings potential if it does not include a way of capturing such potential in its estimates. One potential way to get a sense of such potential is to review results of comprehensive industrial efficiency programs run by other utilities to identify the portion of actual program savings from such unique custom measures - and then assume that portion of custom savings could be added to the savings estimated in the study for named measures.	Added to measure list for 2024 study
Electric Vehicle measures	Some EV chargers are more efficient than others. The Federal Energy Star program has a standard for them. Savings potential may not be huge, but should be considered in the study. With a growing number of EV sales, the study should also consider the potential savings from promoting the most efficient EVs within different size/style categories	Added to measure list for 2024 study
Removing screw-based LEDs	The screw-based LEDs on both the Residential and Commercial measure lists should now be considered baseline due to federal efficiency standards adopted earlier this year. Utility load forecasts for IRPs should reflect resulting improvements in end use efficiency.	Screw-based LEDs were included in the study but with limited applicability to reflect current market
Removing Commercial fluorescent lighting	LED technology - for both fixtures and lamps - has advanced significantly in recent years, to the point where it should be the only technology considered for commercial lighting. Measures such as high performance T-8 fluorescent fixtures and high bay T-5 fluorescent fixtures should be replaced with LED alternatives in the study.	Updated measure list for 2024 study to only include LED-based lamps for linear fluorescent replacements

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External Measure Suggestions

Measure Suggestion	Stakeholder Comments	Action taken for FEECA Study
Removing fossil-gas fueled CHP	Fossil-fuel fired CHP systems should not be considered “renewable” and have questionable benefits if electric generation is expected to get increasingly more renewable and clean. Biogas-fueled CHP - such as systems installed in wastewater treatment facilities that use methane byproducts of processing waste - should be included in the study.	2024 study will continue to assess all CHP options
Adding livestock methane power generation to renewables list	For example, see the “cow power” program currently being run by Green Mountain Power, Vermont’s largest electric utility	2024 study will continue to assess DSRE options consistent with prior study, including customer-sited solar, solar plus storage, and CHP
Adding EV managed charging to DR list	With national market shares for EVs growing, it is important that utilities consider programs for managing when charging occurs. Numerous utilities are currently running managed charging programs. This does not currently appear to be on the measure list and should be added to the Florida utilities’ potential study.	Added to measure list for 2024 study
Residential “smart thermostat” measure can provide both efficiency savings and demand response potential	This is recognized in the inclusion of smart thermostats in both the Res EE and DR tabs of the measure list spreadsheet. We simply want to flag that it is important when assessing cost-effectiveness of this measure that these two potential benefits are considered together. In other words, the cost should be considered compared to the combined efficiency and DR potential rather than separately considered relative to just EE savings and then separately again compared to just DR potential	2024 study will include interactive impacts of EE and DR opportunities
Emerging Technologies	The efficiency potential study measure list appears to be somewhat outdated. It does not include a number of new and emerging technologies. The potential list of such technologies is long. We suggest reviewing the attached list of emerging technologies developed almost two years ago by Consumers Energy (Michigan) and including them in the study.	Consumers Energy study was reviewed and commercially available measures were added to measure list for 2024 study, including heat pump water heaters - CEE advanced tier, heat pump clothes dryers, ozone laundry systems, and 21+ SEER HVAC units

External Measure Suggestions

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Technical Potential Study of Demand Side Management

Duke Energy Florida

Date: 03.07.2024

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Executive Summary

In October 2022, the six electric utilities subject to the Florida Energy Efficiency and Conservation Act (FEECA Utilities) retained Resource Innovations, Inc. for the purpose of identifying and characterizing the market for demand-side management (DSM) opportunities, including energy efficiency (EE) improvement and building retrofits, peak load reductions from demand response (DR), and demand-side renewable energy (DSRE) systems.

The main objective of the study was to assess the technical potential of demand-side resources for reducing customer electric energy consumption and seasonal peak capacity demands.

This report provides the detailed methodology and results for the technical potential analysis of Duke Energy Florida's (DEF) service territory.

1.1 Methodology

Resource Innovations estimates DSM savings potential by applying an analytical framework that aligns baseline market conditions for energy consumption and demand with DSM opportunities. After describing the baseline condition, Resource Innovations applies estimated measure savings to disaggregated consumption and demand data. The approach varies slightly according to the type of DSM resources and available data; the specific approaches used for each type of DSM are described below.

1.1.1 EE Potential

This study utilized Resource Innovations' proprietary EE modeling tool, TEA-POT (Technical / Economic / Achievable POTential). This modeling tool was built on a platform that provides the ability to create and analyze multiple scenarios and recalculate potential savings based on variable inputs such as sales/load forecasts, electricity prices, discount rates, and actual program savings. The methodology for the EE potential assessment was based on a hybrid "top-down/bottom-up" approach, which started with the current utility load forecast, then disaggregated it into its constituent customer-class and end-use components. Our assessment examined the effect of the range of EE measures and practices on each end-use, taking into account current market saturations, and technical feasibility. These unique impacts were aggregated to produce estimates of potential at the end-use, customer class, and system levels for DEF.

1.1.2 DR Potential

The assessment of DR potential in DEF's service territory was an analysis of mass market direct load control programs for residential and small commercial and industrial (C&I) customers, and an analysis of DR programs for large C&I customers. The direct load control program assessment focused on the potential for demand reduction through heating, ventilation, and air conditioning (HVAC), water heater, managed electric vehicle charging, and pool pump load control. These end-uses were of particular interest because of their large contribution to peak period system load. For this analysis, a range of direct load control measures were examined for each customer segment to highlight the range of potential. The assessment further accounted for existing DR programs for DEF when calculating the total DR potential.

1.1.3 DSRE Potential

The DSRE technologies included in this study are rooftop solar photovoltaic (PV) systems, battery storage systems charged from customers' PV systems, and combined heat and power (CHP) systems. The study leveraged the customer segmentation and load disaggregation data assembled for the EE and DR analyses, and applied our DSRE model, SPIDER™ (Spatial Penetration and Integration of Distributed Energy Resources), for economic and adoption analysis of solar and battery storage. This model dynamically responds to rapidly changing technologies and accounts for all key time-varying elements such as technology costs, incentives, tax credits, and electric rates. To estimate technical potential for CHP, the study utilized a series of unique distributed generation potential models for each primary market sector (commercial and industrial), calculating the average building consumption, assigning minimum facility size thresholds, and estimating building energy savings share percentage for each CHP technology based on its generation capacity.

1.2 Savings Potential

Technical potential for EE, DR, and DSRE are as follows:

1.2.1 EE Potential

EE technical potential describes the savings potential when all technically feasible EE measures are fully implemented, ignoring all non-technical constraints on electricity savings, such as cost-effectiveness and customer willingness to adopt EE.

The estimated EE technical potential results are summarized in Table 1.

Table 1. EE Technical Potential

	Savings Potential		
	Summer Peak Demand (MW)	Winter Peak Demand (MW)	Energy (GWh)
Residential	2,217	2,423	7,599
Non-Residential¹	669	450	3,591
Total	2,886	2,873	11,190

1.2.2 DR Potential

DR technical potential describes the magnitude of loads that can be managed during conditions when grid operators need peak capacity. For residential and small C&I customers where DR generally takes the form of direct utility control, technical potential for DR is limited by the loads that can be controlled remotely at scale such as heating, cooling, water heaters, managed electric vehicle charging, and pool pumps. For large C&I customers, this included their entire electric demand during a utility’s system peak, as many of these types of customers will forego virtually all electric demand temporarily if the financial incentive is large enough.

The estimated DR technical potential results are summarized in Table 2.

Table 2. DR Technical Potential

	Savings Potential	
	Summer Peak Demand (MW)	Winter Peak Demand (MW)
Residential	3,147	3,218
Non-Residential	2,631	2,391
Total	5,778	5,609

¹ Non-Residential results include all commercial and industrial customer segments.

1.2.3 DSRE Potential

DSRE technical potential estimates quantify all technically feasible distributed generation opportunities from PV systems, battery storage systems charged from PV, and CHP technologies based on the customer characteristics of DEF’s customer base.

The estimated DSRE technical potential results are summarized in Table 3.

Table 3. DSRE Technical Potential²

	Savings Potential		
	Summer Peak Demand (MW)	Winter Peak Demand (MW)	Energy (GWh)
PV Systems			
Residential	1,761	152	17,637
Non-Residential	444	15	4,164
Total	2,205	167	21,801
Battery Storage charged from PV Systems			
Residential	2,016	2,176	0
Non-Residential	240	315	0
Total	2,256	2,491	0
CHP Systems			
Total	773	811	3,553

² PV systems and CHP systems were independently analyzed for technical potential without consideration of the competition between technologies or customer preference for DSRE system.

2 Introduction

In October, 2022, the six electric utilities subject to the Florida Energy Efficiency and Conservation Act (FEECA Utilities) retained Resource Innovations, Inc. for the purpose of identifying and characterizing the market for demand-side management (DSM) opportunities, including energy efficiency (EE) improvement and building retrofits, peak load reductions from demand response (DR), and demand-side renewable energy (DSRE) systems. The main objective of the study was:

- Assessing the technical potential of demand-side resources for reducing customer electric energy consumption and seasonal peak capacity demands.

This report provides the detailed methodology and results for the technical potential analysis of DEF's service territory.

The following deliverables were developed by Resource Innovations as part of the project and are addressed in this report:

- DSM measure list and detailed assumption workbooks
- Disaggregated baseline demand and energy use by year, sector, and end-use
- Baseline technology saturations, energy consumption, and demand
- Technical potential demand and energy savings
- Supporting calculation spreadsheets

2.1 Technical Potential Study Approach

Resource Innovations estimates technical potential according to the industry standard categorization, as follows:

Technical Potential is the theoretical maximum amount of energy and capacity that could be displaced by DSM, regardless of cost and other barriers that may prevent the installation or adoption of a DSM measure.

For this study, technical potential included full application of commercially available DSM technologies to all residential, commercial, and industrial customers in the utility's service territory.

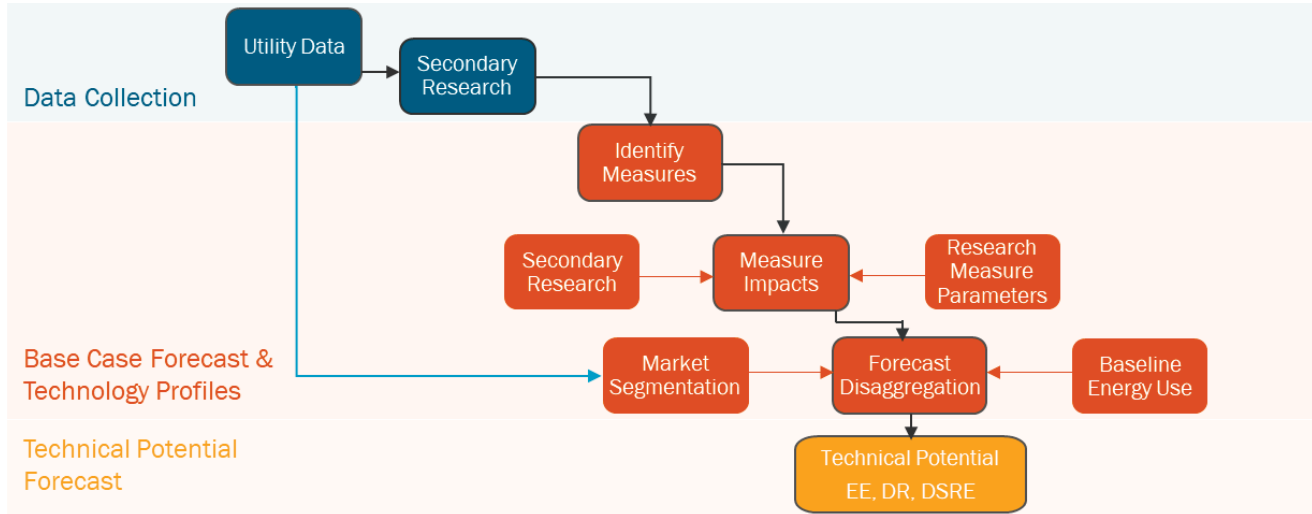
Quantifying DSM technical potential is the result of an analytical process that refines DSM opportunities that align with DEF's customers' electric consumption patterns. Resource Innovations' general methodology for estimating technical potential is a hybrid "top-

down/bottom-up” approach, which is described in detail in Sections 3 through 5 of this report and includes the following steps:

- Develop a baseline forecast: the study began with a disaggregation of the utility’s official electric energy forecast to create a baseline electric energy forecast. This forecast does not include any utility-specific assumptions around DSM performance. Resource Innovations applied customer segmentation and consumption data from each utility and data from secondary sources to describe baseline customer-class and end-use components. Additional details on the forecast disaggregation are included in Section 3.
- Identify DSM opportunities: A comprehensive set of DSM opportunities applicable to DEF’s climate and customers were analyzed to best depict DSM technical potential. Effects for a range of DSM technologies for each end-use could then be examined while accounting for current market saturations, technical feasibility, and impacts.
- Collect cost and impact data for measures: For those measures applicable to DEF’s customers, Resource Innovations conducted primary and secondary research and estimated costs, energy savings, measure life, and demand savings. We differentiated between the type of cost (capital, installation labor, maintenance, etc.) to separately evaluate different implementation modes: retrofit (capital plus installation labor plus incremental maintenance); new construction (incremental capital and incremental maintenance); and burnout costs (incremental capital and incremental maintenance costs for replacement of appliances and equipment that has reached the end of its useful life). Additional details on measure development are included in Section 4.

Figure 1 provides an illustration of the technical potential modeling process conducted for DEF, with the assessment starting with the current utility load forecast, disaggregated into its constituent customer-class and end-use components, and calibrated to ensure consistency with the overall forecast. Resource Innovations considered the range of DSM measures and practices application to each end-use, accounting for current market saturations, and technical feasibility. These unique impacts were aggregated to produce estimates of potential at the technology, end-use, customer class, and system levels.

Figure 1. Approach to Technical Potential Modeling



Resource Innovations estimated DSM technical potential based on a combination of market research, utility load forecasts and customer data, and measure impact analysis, all in coordination with DEF. Resource Innovations examined the technical potential for EE, DR, and DSRE opportunities; this report is organized to offer detail on each DSM category, with additional details on technical potential methodology presented in Section 5.

2.2 EE Potential Overview

To estimate EE potential, this study utilized Resource Innovations' modeling tool, TEA-POT (Technical / Economic / Achievable POTential). This modeling tool was built on a platform that provides the ability to create and analyze multiple scenarios and recalculate potential savings based on variable inputs such as sales/load forecasts, electricity prices, discount rates, and actual utility program savings, as described in Section 5.1.1 below. While the analysis estimates the impacts of individual EE measures, the model accounts for interactions and overlap of individual measure impacts within an end-use or equipment type. The model provides transparency into the assumptions and calculations for estimating EE potential.

2.3 DR Potential Overview

To estimate DR market potential, Resource Innovations considered customer demand during utility peaking conditions and projected customer response to DR measures. Customer demand was determined by looking at account-level interval data for a sample of customers within each segment. For each segment, Resource Innovations determined the portion of a customer's load that could be curtailed during the system peak.

2.4 DSRE Potential Overview

The DSRE technologies included in this study are rooftop solar photovoltaic (PV) systems, battery storage systems charged from PV, and combined heat and power (CHP) systems. The study leveraged the customer segmentation and load disaggregation data assembled for the EE and DR analyses, and applied our DSRE model, SPIDER™ (Spatial Penetration and Integration of Distributed Energy Resources), for economic and adoption analysis of solar and battery storage. This model dynamically responds to rapidly changing technologies and accounts for all key time-varying elements such as technology costs, incentives, tax credits, and electric rates. To estimate technical potential for CHP, the study utilized a series of unique distributed generation potential models for each primary market sector (commercial and industrial), calculating the average building consumption, assigning minimum facility size thresholds, and estimating building energy savings share percentage for each CHP technology based on its generation capacity.

3 Baseline Forecast Development

3.1 Market Characterization

The DEF base year energy use and sales forecast provided the reference point to determine potential savings. The end-use market characterization of the base year energy use and reference case forecast included customer segmentation and load forecast disaggregation. The characterization is described in this section, while the subsequent section addresses the measures and market potential energy and demand savings scenarios.

3.1.1 Customer Segmentation

In order to estimate EE, DR, and DSRE potential, the sales forecast and peak load forecasts were segmented by customer characteristics. As electricity consumption patterns vary by customer type, Resource Innovations segmented customers into homogenous groups to identify which customer groups are eligible to adopt specific DSM technologies, have similar building characteristics and load profiles, or are able to provide DSM grid services.

Resource Innovations segmented customers according to the following:

- 1) By Sector - how much of DEF's energy sales, summer and winter peak demand forecast is attributable to the residential, commercial, and industrial sectors?
- 2) By Customer - how much electricity does each customer typically consume annually and during system peaking conditions?
- 3) By End-Use - within a home or business, what equipment is using electricity during the system peak? How much energy does this end-use consume over the course of a year?

Table 4 summarizes the segmentation within each sector. In addition to the segmentation described here for the EE and DSRE analyses, the residential customer segments were further segmented by heating type (electric heat, gas heat, or unknown) and by annual consumption bins within each sub-segment for the DR analysis.

Table 4. Customer Segmentation

Residential	Commercial		Industrial	
Single Family	Assembly	Miscellaneous	Agriculture and Assembly	Primary Resources Industries
Multi-Family	College and University	Offices	Chemicals and Plastics	Stone/Glass/Clay/Concrete
Manufactured Homes	Grocery	Restaurant	Construction	Textiles and Leather
	Healthcare	Retail	Electrical and Electronic Equipment	Transportation Equipment
	Hospitals	Schools K-12	Lumber/Furniture/Pulp/Paper	Water and Wastewater
	Institutional	Warehouse	Metal Products and Machinery	Other
	Lodging/Hospitality		Miscellaneous Manufacturing	

From an equipment and energy use perspective, each segment has variation within each building type or sub-sector. For example, the energy consuming equipment in a convenience store will vary significantly from the equipment found in a supermarket. To account for this variation, the selected end-uses describe energy consumption patterns that are consistent with those typically studied in national or regional surveys, such as the U.S. Energy Information Administration’s (EIA) Residential Energy Consumption Survey (RECS), Commercial Building Energy Consumption Survey (CBECS) and Manufacturing Energy Consumption Survey (MECS), among others. The end-uses selected for this study are listed in Table 5.

Table 5. End-Uses

Residential End-Uses	Commercial End-Uses	Industrial End-Uses
Space heating ³	Space heating ³	Process heating
Space cooling ³	Space cooling ³	Process cooling
Domestic hot water	Domestic hot water	Compressed air
Ventilation and circulation	Ventilation and circulation	Motors/pumps

³ Includes the contribution of building envelope measures and efficiencies.

Residential End-Uses	Commercial End-Uses	Industrial End-Uses
Lighting	Interior lighting	Fan, blower motors
Cooking	Exterior lighting	Process-specific
Appliances	Cooking	Industrial lighting
Electronics	Refrigeration	Exterior lighting
Miscellaneous	Office equipment	HVAC ³
	Miscellaneous	Other

For DR, the end-uses targeted were those with controllable load for residential customers (*i.e.*, HVAC, water heaters, pool pumps, and electric vehicles) and small C&I customers (HVAC and electric vehicles). For large C&I customers, all load during peak hours was included assuming these customers would potentially be willing to reduce electricity consumption for a limited time if offered a large enough incentive during temporary system peak demand conditions.

3.1.2 Forecast Disaggregation

A common understanding of the assumptions and granularity in the baseline load forecast was developed with input from DEF. Key discussion topics reviewed included:

- How current DSM offerings are reflected in the energy and demand forecast.
- Assumed weather conditions and hour(s) of the day when the system is projected to peak.
- Are there portions of the load forecast attributable to customers or equipment not eligible for DSM programs?
- How are projections of population increase, changes in appliance efficiency, and evolving distribution of end-use load shares accounted for in the peak demand forecast?

3.1.2.1 Electricity Consumption (kWh) Forecast

Resource Innovations segmented DEF's electricity consumption forecast into electricity consumption load shares by customer class and end-use. The baseline customer segmentation represents the electricity market by describing how electricity was consumed within the service territory. Resource Innovations developed the forecast for the year 2025, and based it on data provided by DEF, primarily their 2023 Ten-Year Site Plan, which was the most recent plan available at the time the studies were initiated. The data addressed current baseline consumption, system load, and sales forecasts.

3.1.2.2 Peak Demand (kW) Forecast

A fundamental component of DR potential was establishing a baseline forecast of what loads or operational requirements would be absent due to existing dispatchable DR or time varying rates. This baseline was necessary to assess how DR can assist in meeting specific planning and operational requirements. We utilized DEF's summer and winter peak demand forecast, which was developed for system planning purposes.

3.1.2.3 Estimating Consumption by End-Use Technology

As part of the forecast disaggregation, Resource Innovations developed a list of electricity end-uses by sector (Table 5). To develop this list, Resource Innovations began with DEF's estimates of average end-use consumption by customer and sector. Resource Innovations combined these data with other information, such as utility residential appliance saturation surveys, as available, to develop estimates of customers' baseline consumption. Resource Innovations calibrated the utility-provided data with data available from public sources, such as the EIA's recurring data-collection efforts that describe energy end-use consumption for the residential, commercial, and manufacturing sectors.

To develop estimates of end-use electricity consumption by customer segment and end-use, Resource Innovations applied estimates of end-use and equipment-type saturation to the average energy consumption for each sector. The following data sources and adjustments were used in developing the base year 2025 sales by end-use:

Residential Sector:

- The disaggregation was based on DEF's rate class load shares and intensities.
- Baseline intensity was calibrated to account for differences in end-use saturation, fuel source, and equipment saturation as follows:
 - DEF rate class load share is based on average per customer.
 - Resource Innovations made conversions to usage estimates generated by applying Duke Energy's 2022 Residential End-Use Appliance Study, EIA RECS data, and EIA's Annual Energy Outlook (AEO) 2023.

Commercial Sector:

- The disaggregation was based on DEF's rate class load shares, intensities, and EIA CBECS data.
- Segment data from EIA and DEF.
- Baseline intensity was calibrated to account for differences in end-use saturation, fuel source, and equipment saturation as follows:

- Rate class load share based on EIA CBECS and end-use forecasts from DEF.

Industrial Sector:

- The disaggregation was based on rate class load shares, intensities, and EIA MECS data.
- Segment data from EIA and DEF.
- Baseline intensity was calibrated to account for differences in end-use saturation, fuel source, and equipment saturation as follows:
 - Rate class load share based on EIA MECS and end-use forecasts from DEF.

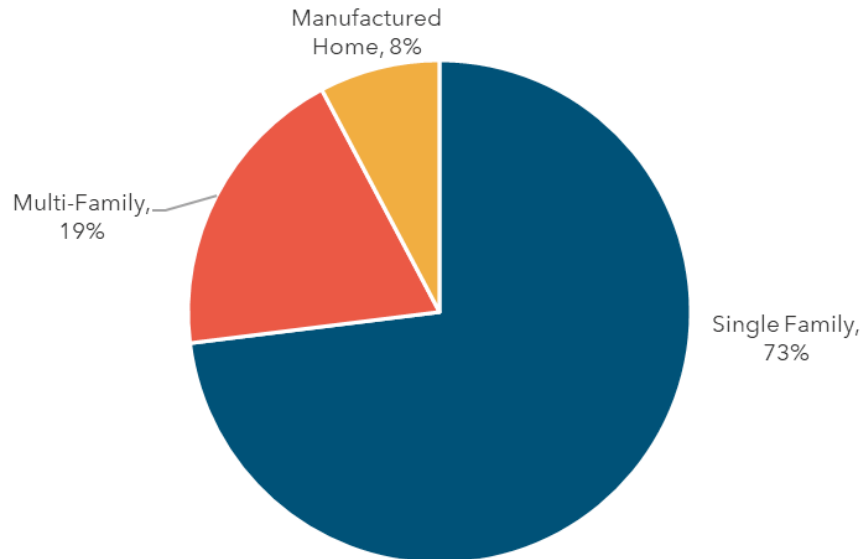
3.2 Analysis of Customer Segmentation

Customer segmentation is important to ensuring that a MPS examines DSM measure savings potential in a manner that reflects the diversity of energy savings opportunities existing across the utility's customer base. DEF provided Resource Innovations with data concerning the premise type and loads characteristics for all customers for the MPS analysis. Resource Innovations examined the provided data from multiple perspectives to identify customer segments. Resource Innovations' approach to segmentation varied slightly for non-residential and residential accounts, but the overall logic was consistent with the concept of expressing the accounts in terms that were relevant to DSM opportunities.

3.2.1 Residential Customers (EE, DR, and DSRE Analysis)

Segmentation of residential customer accounts enabled Resource Innovations to align DSM opportunities with appropriate DSM measures. Resource Innovations used utility customer data, supplemented with EIA data, to segment the residential sector by customer dwelling type (single family, multi-family, or manufactured home). The resulting distribution of customers according to dwelling unit type is presented in Figure 2.

Figure 2. Residential Customer Segmentation



3.2.2 Non-Residential (Commercial and Industrial) Customers (EE and DSRE Analysis)

For the EE and DSRE analysis, Resource Innovations segmented C&I accounts using the utility's North American Industry Classification System (NAICS) or Standard Industrial Classification (SIC) codes, supplemented by data produced by the EIA's CBECS and MECS. Resource Innovations classified the customers in this group as either commercial or industrial, on the basis of DSM measure information available and applicable to each. For example, agriculture and forestry DSM measures are commonly considered industrial savings opportunities. Resource Innovations based this classification on the types of DSM measures applicable by segment, rather than on the annual energy consumption or maximum instantaneous demand from the segment as a whole. The estimated energy sales distributions Resource Innovations applied are shown below in Figure 3 and Figure 4.

Figure 3. Commercial Customer Segmentation

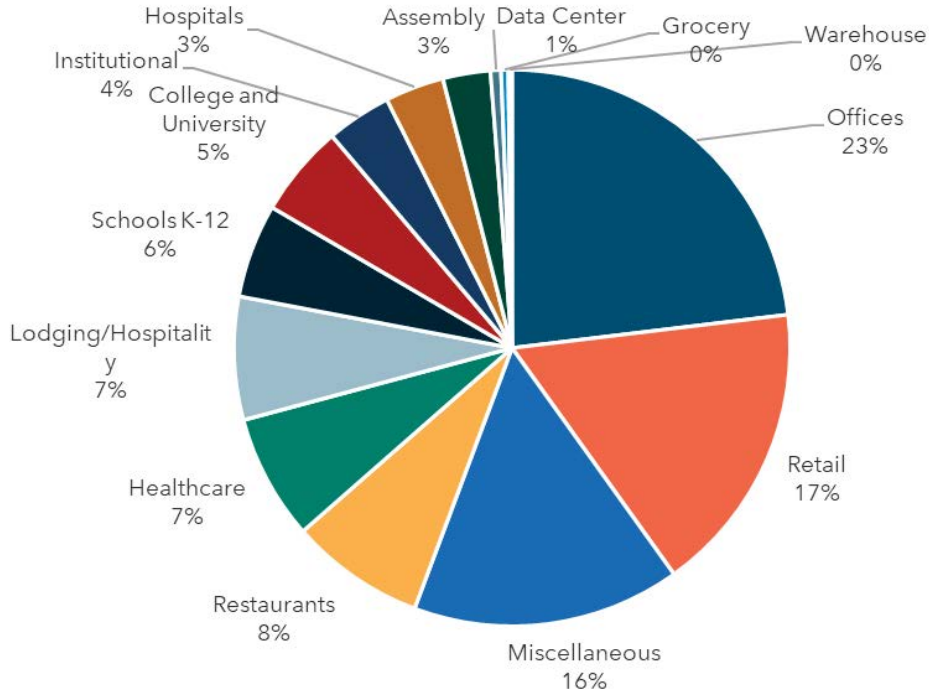
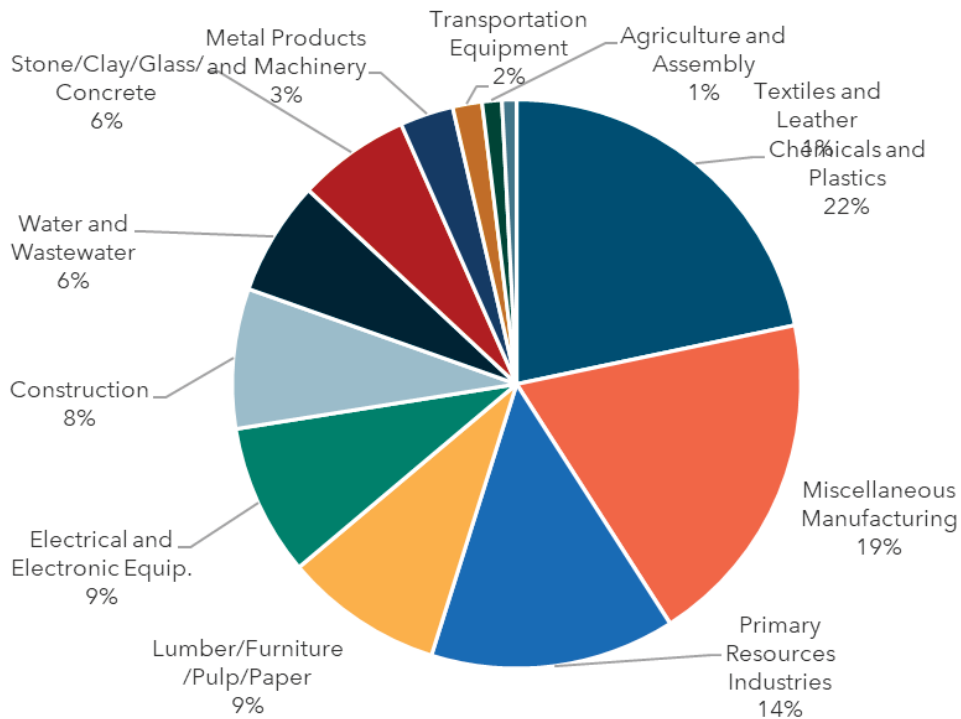


Figure 4. Industrial Customer Segmentation



3.2.3 Commercial and Industrial Accounts (DR Analysis)

For the DR analysis, Resource Innovations divided the non-residential customers into the two customer classes of small C&I and large C&I using rate class and annual consumption. For the purposes of this analysis, small C&I customers are those on the General Service (GS) tariff. Large C&I customers are all customers on the General Service Demand (GSD) tariff or on the General Service Large Demand (GSLD) tariff. Resource Innovations further segmented these two groups based on customer size. For small C&I, segmentation was determined using annual customer consumption and for large C&I the customer’s maximum demand was used. Both customer maximum demand and customer annual consumption were calculated using billing data provided by DEF.

Table 6 shows the account breakout between small C&I and large C&I.

Table 6. Summary of Customer Classes for DR Analysis

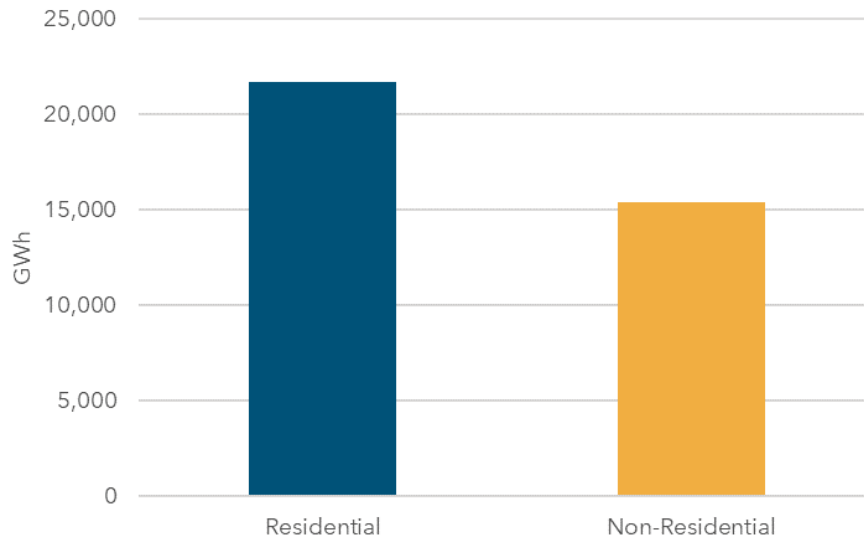
Customer Class	Annual kWh	Estimated Number of Accounts
Small C&I	0-15,000 kWh	113,449
	15,001-25,000 kWh	15,600
	25,001-50,000 kWh	10,446
	50,001 kWh +	7,403
	Total	146,898
Large C&I	0-50 kW	35,795
	51-300 kW	8,700
	301-500 kW	850
	501 kW +	924
	Total	46,269

3.3 Analysis of System Load

3.3.1 System Energy Sales

Technical potential is based on DEF’s load forecast for the year 2025 from their 2023 Ten Year Site Plan, which is illustrated in Figure 5.

Figure 5. 2025 Electricity Sales Forecast by Sector



3.3.2 System Demand

To determine the technical potential for DR, Resource Innovations first established peaking conditions for each utility by looking at when each utility historically experienced its maximum demand. The primary data source used to determine when maximum DR impact was the historical system load for DEF. The data provided contained the system loads for all 8,760 hours of the most recent five years leading up to the study (2016-2021). The utility summer and winter peaks were then identified within the utility-defined peaking conditions. For DEF the summer peaking conditions were defined as August from 4:00-5:00 PM and the winter peaking conditions were defined as January from 7:00-8:00 AM. The seasonal peaks were then selected as the maximum demand during utility peaking conditions.

3.3.3 Load Disaggregation

The disaggregated annual electric loads⁴ for the base year 2025 by sector and end-use are summarized in Figure 6, Figure 7, and Figure 8.

⁴ Full disaggregation of system demand by end-use was not conducted, as DR potential for residential and small C&I customers focused on specific end-uses of particular interest because of their large contribution to peak period system load, and was not end-use specific for large C&I customers. A description of the end-use analysis for residential and small C&I customers is included in Section 5.1.2

Figure 6. Residential Baseline (2025) Energy Sales by End-Use

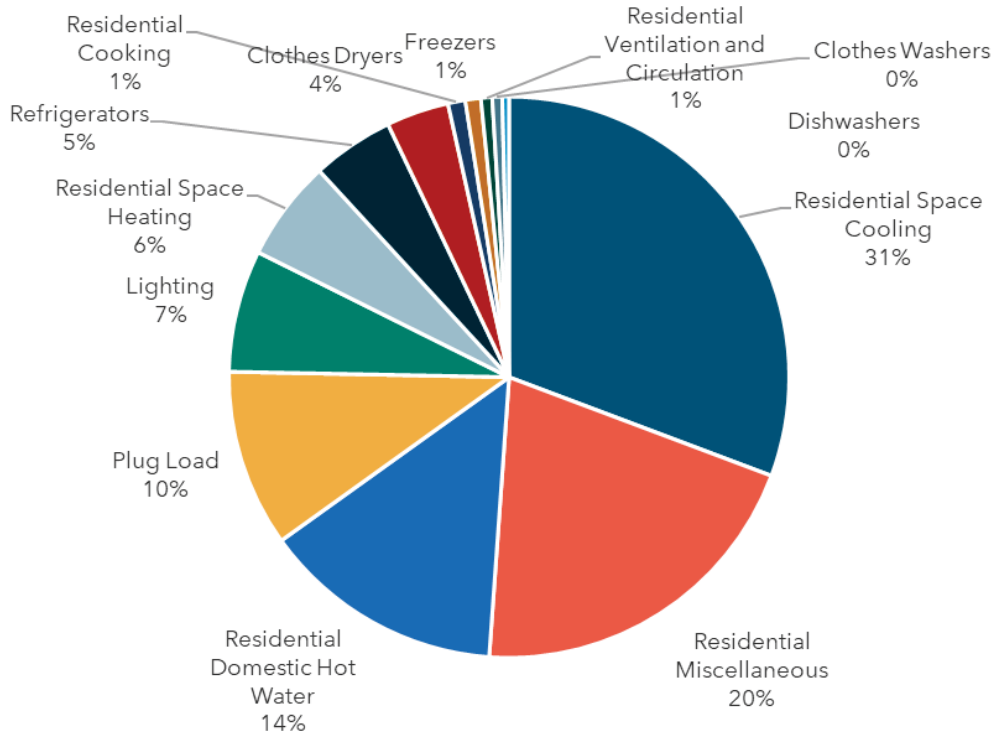


Figure 7. Commercial Baseline (2025) Energy Sales by End-Use

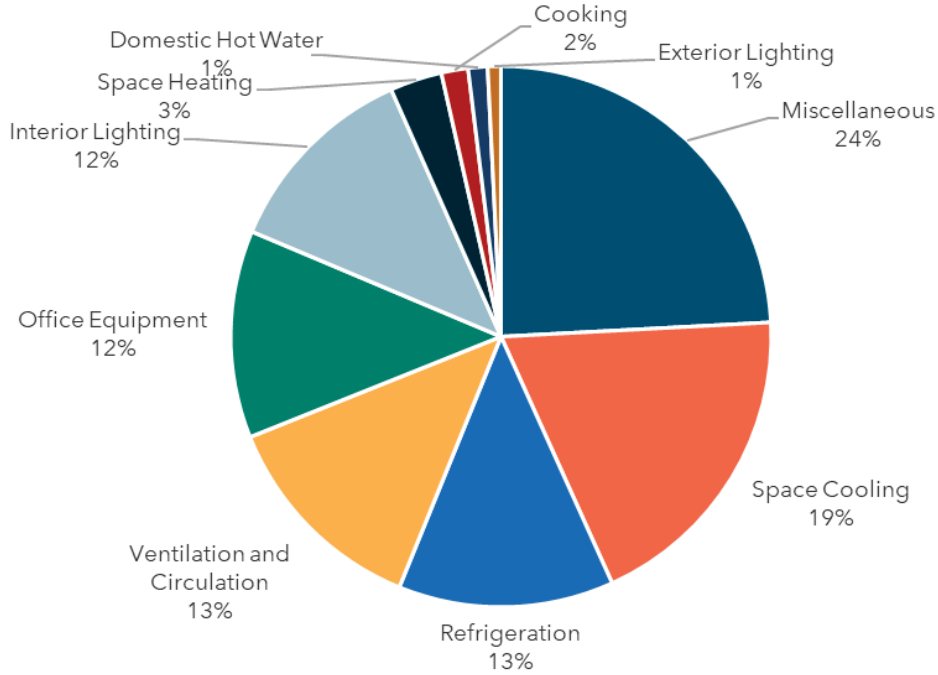
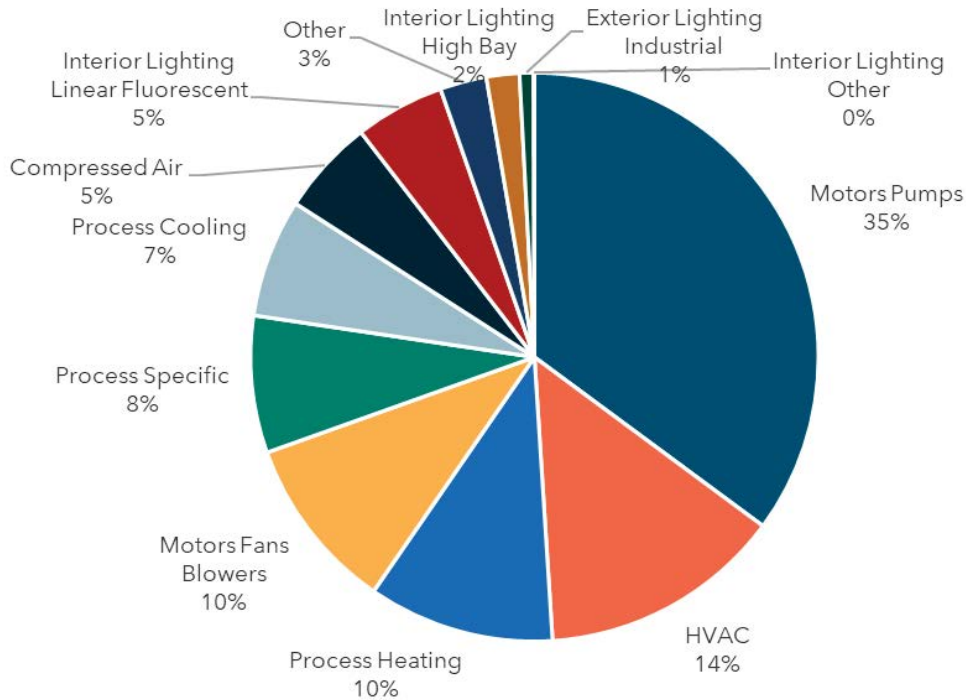


Figure 8. Industrial Baseline (2025) Energy Sales by End-Use



4 DSM Measure Development

DSM potential is described by comparing baseline market consumption with opportunities for savings. Describing these individual savings opportunities results in a list of DSM measures to analyze. This section presents the methodology to develop the EE, DR, and DSRE measure lists.

4.1 Methodology

Resource Innovations identified a comprehensive catalog of DSM measures for the study. The measure list is the same for all FEECA Utilities. The iterative vetting process with the utilities to develop the measure list began by initially examining the list of measures included in the 2019 Goals docket. This list was then adjusted based on proposed measure additions and revisions provided by the FEECA Utilities. Resource Innovations further refined the measure list based on reviews of Resource Innovations' DSM measure library, compiled from similar market potential studies conducted in recent years throughout the United States, as well as measures included in other utility programs where Resource Innovations is involved with program design, implementation, or evaluation. The FEECA Utilities also reached out to interested parties and received input with recommendations on measure additions to the 2019 measure list. Their measure suggestions were reviewed and incorporated into the study as appropriate. External measure suggestions and actions are summarized in Appendix D. The extensive, iterative review process involving multiple parties has ensured that the study included a robust and comprehensive set of DSM measures.

See Appendix A for the list of EE measures, Appendix B for the list of DR measures, and Appendix C for the list of DSRE measures analyzed in the study.

4.2 EE Measures

EE measures represent technologies applicable to the residential, commercial, and industrial customers in the FEECA Utilities' service territories. The development of EE measures included consideration of:

- EE technologies that are applicable to Florida and commercially available: Measures that are not applicable due to climate or customer characteristics were excluded, as were "emerging" technologies that are not currently commercially available to FEECA utility customers.
- Current and planned Florida Building Codes and Federal equipment standards (Codes & Standards) for baseline equipment: Measures included from prior studies

were adjusted to reflect current Codes & Standards as well as updated efficiency tiers, as appropriate.

- Eligibility for utility DSM offerings in Florida: For example, behavioral measures were excluded from consideration, as they historically have not been allowed to count towards utility DSM goals. Behavioral measures are intended to motivate customers to operate in a more energy-efficient manner (e.g., setting an air-conditioner thermostat to a higher temperature) without accompanying: a) physical changes to more efficient end-use equipment or to their building envelope, b) utility-provided products and tools to facilitate the efficiency improvements, or c) permanent operational changes that improve efficiency which are not easily revertible to prior conditions. These types of behavioral measures were excluded because of the variability in forecasting the magnitude and persistence of energy and demand savings from the utility's perspective. Additionally, decoupling behavioral measure savings from the installation of certain EE technologies like smart thermostats can be challenging and could result in overlapping potential with other EE measures included in the study.

Upon development of the final EE measure list, utility-specific measure details were developed. RI maintains a proprietary online database of energy efficiency measures for MPS studies, which was used as a starting point for measure development for this study. Measures are added or updated at the request of project stakeholders or because of changes to the EE marketplace (for example, new codes and standards, or current practice in the market). Measure data are refined as new data or algorithms are developed for estimating measure impacts and updated for each study to incorporate inputs parameters specific to the service territory being analyzed. The database contains the following information for each of the measures:

- Measure description: measure classification by type, end-use, and subsector, and description of the base-case and the efficient-case scenarios.
- kWh savings: Energy savings associated with each measure were developed through engineering algorithms or building simulation modeling, taking climate data and customer segments into consideration as appropriate. Reference sources used for developing residential, commercial, and industrial measure savings included a variety of Florida-specific, as well as regional and national sources, such as utility-specific measurement & verification (M&V) data, technical reference manuals (TRM) from other jurisdictions, ENERGY STAR calculators, and manufacturer or retailer specifications for particular products.
- Energy savings were applied in RI's TEA-POT model as a percentage of total baseline consumption. Peak demand savings were determined using utility-specific load shapes or coincidence factors.

- Measure Expected Useful Lifetime: Sources included the Database for Energy Efficient Resources (DEER), the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Handbook, TRMs, and other regional and national measure databases and EE program evaluations.
- Measure Costs: Per-unit costs (full or incremental, depending on the application) associated with measure installations. Sources included: TRMs, ENERGY STAR calculator, online market research, FEECA utility program data, and other secondary sources.

The measure details from the online measure library are exported for use in RI’s TEA-POT model, accompanied by utility-specific estimates of measure applicability. Measure applicability is a general term encompassing an array of factors, including technical feasibility of installation, and the measure’s current saturation as well as factors to allocate savings associated with competing measures. Information used was primarily derived from data in current regional and national databases, as well as DEF’s program tracking data. These factors are described in Table 7.

Table 7. Measure Applicability Factors

Measure Impact	Explanation	Sources
Technical Feasibility	The percentage of buildings that can have the measure physically installed. Various factors may affect this, including, but not limited to, whether the building already has the baseline measure (e.g., dishwasher), and limitations on installation (e.g., size of unit and space available to install the unit).	Various secondary sources and engineering experience.
Measure Incomplete Factor	The percentage of buildings without the specific measure currently installed.	Utility RASS; EIA RECS, CBECS; MECS; ENERGY STAR sales figures; and engineering experience.
Measure Share	Used to distribute the percentage of market shares for competing measures (e.g., only blown-in ceiling insulation or spray foam insulation, not both would be installed in an attic).	Utility customer data, Various secondary sources and engineering experience.

As shown in Table 8, the measure list includes 395 unique energy-efficiency measures. Expanding the measures to account for all appropriate installation scenarios resulted in

9,535 measure permutations, which are the application of individual measures to various customer segments, construction types, and end-uses (*i.e.*, a single air-source heat pump “measure” can be installed in single family, multi-family, and manufactured homes, as well as new and existing vintages of each home type, and impacts both space cooling and space heating end-uses, resulting in twelve separate measure “permutations” analyzed).

Table 8. EE Measure Counts by Sector

Sector	Unique Measures	Permutations
Residential	119	1,173
Commercial	164	5,798
Industrial	112	2,564

4.3 DR Measures

The DR measures included in the measure list utilize the following DR strategies:

- **Direct Load Control.** Utility control of selected equipment at the customer’s home or business, such as HVAC or water heaters.
- **Critical Peak Pricing (CPP) with Technology.** Electricity rate structures that vary based on time of day. Includes CPP when the rate is substantially higher for a limited number of hours or days per year (customers receive advance notification of CPP event) coupled with technology that enables customer to lower their usage in a specific end-use in response to the event (e.g., HVAC via smart thermostat).
- **Contractual DR.** Customers receive incentive payments or a rate discount for committing to reduce load by a pre-determined amount or to a pre-determined firm service level upon utility request.
- **Automated DR.** Utility dispatched control of specific end-uses at a customer facility.

DR initiatives that do not rely on the installation of a specific device or technology to implement (such as a voluntary curtailment program or time of use rates) were not included.

A workbook was developed for each measure which included the same measure inputs as previously described for the EE measures. In addition, the DR workbook included expected load reduction from the measure, based on utility technical potential, existing utility DR programs, and other nationwide DR programs if needed.

For technical potential, Resource Innovations did not break out results by specific measure or control technology because all of the developed measures target the end-uses estimated

for technical potential (*i.e.*, potential is reported for space cooling end-use and not allocated to switches, smart thermostats, etc.).

4.4 DSRE Measures

The DSRE measure list includes rooftop PV systems, battery storage systems charged from PV systems, and CHP systems.

PV Systems

PV systems utilize solar panels (a packaged collection of PV cells) to convert sunlight into electricity. A system is constructed with multiple solar panels, a DC/AC inverter, a racking system to hold the panels, and electrical system interconnections. These systems are often roof-mounted systems that face south-west, south, and/or, south-east. The potential associated with roof-mounted systems installed on residential and commercial buildings was analyzed.

Battery Storage Systems Charged from PV Systems

Distributed battery storage systems included in this study consist of behind-the-meter battery systems installed in conjunction with an appropriately-sized PV system at residential and commercial customer facilities. These battery systems typically consist of a DC-charged battery, a DC/AC inverter, and electrical system interconnections to a PV system. On their own battery storage systems do not generate or conserve energy, but can collect and store excess PV generation to provide power during particular time periods, which for DSM purposes would be to offset customer demand during the utility's system peak.

CHP Systems

In most CHP applications, a heat engine creates shaft power that drives an electrical generator (fuel cells can produce electrical power directly from electrochemical reactions). The waste heat from the engine is then recovered to provide other on-site needs. Common prime mover technologies used in CHP applications and explored in this study include:

- Steam turbines
- Gas turbines
- Micro turbines
- Fuel Cells
- Internal combustion engines

A workbook was developed for each measure which included the inputs previously described for EE measures and prime mover operating parameters.

5 Technical Potential

In the previous sections, the approach for DSM measure development was summarized, and the 2025 base year load shares and reference-case load forecast were described. The outputs from these tasks provided the input for estimating the technical potential scenario, which is discussed in this section.

The technical potential scenario estimates the potential energy and demand savings when all technically feasible and commercially available DSM measures are implemented without regard for cost-effectiveness and customer willingness to adopt the most impactful EE, DR, or DSRE technologies. Since the technical potential does not consider the costs or time required to achieve these savings, the estimates provide a theoretical upper limit on electricity savings potential. Technical potential is only constrained by factors such as technical feasibility and applicability of measures. For this study, technical potential included full application of the commercially available DSM measures to all residential, commercial, and industrial customers in the utility's service territory.

5.1 Methodology

5.1.1 EE Technical Potential

EE technical potential refers to delivering less electricity to the same end-uses. In other words, technical potential might be summarized as "doing the same thing with less energy, regardless of the cost."

DSM measures were applied to the disaggregated utility electricity sales forecasts to estimate technical potential. This involved applying estimated energy savings from equipment and non-equipment measures to all electricity end-uses and customers. Technical potential consists of the total energy and demand that can be saved in the market which Resource Innovations reported as single numerical values for each utility's service territory.

The core equation used in the residential sector EE technical potential analysis for each individual efficiency measure is shown in Equation 1 below, while the core equation used in the nonresidential sector technical potential analysis for each individual efficiency measure is shown in Equation 2.

Equation 1: Core Equation for Residential Sector EE Technical Potential



Where:

- **Baseline Equipment Energy Use Intensity** = the electricity used per customer per year by each baseline technology in each market segment. In other words, the baseline equipment energy-use intensity is the consumption of the electrical energy using equipment that the efficient technology replaces or affects.
- **Saturation Share** = the fraction of the end-use electrical energy that is applicable for the efficient technology in a given market segment. For example, for residential cooling, the saturation share would be the fraction of all residential electric customers that have central air conditioners in their household.
- **Percent Incomplete** = the fraction of equipment that is not considered to already be energy efficient. To extend the example above, the fraction of central air conditioners that is not already energy efficient.
- **Feasibility Factor** = the fraction of units that is technically feasible for conversion to the most efficient available technology from an engineering perspective (*i.e.*, it may not be possible to install LEDs in all light sockets in a home because the available styles may not fit in every socket).
- **Savings Factor** = the percentage reduction in electricity consumption resulting from the application of the efficient technology.

Equation 2: Core Equation for Non-Residential Sector EE Technical Potential



Where:

- **Total Stock Square Footage by Segment** = the forecasted square footage level for a given building type (*e.g.*, square feet of office buildings).
- **Baseline Equipment Energy Use Intensity** = the electricity used per square foot per year by each baseline equipment type in each market segment.

- **Saturation Shares** = the fraction of total end-use energy consumption associated with the efficient technology in a given market segment. For example, for packaged terminal air-conditioner (PTAC), the saturation share would be the fraction of all space cooling kWh in a given market segment that is associated with PTAC equipment.
- **Percent Incomplete** = the fraction of equipment that is not considered to already be energy efficient.
- **Feasibility Factor** = the fraction of the equipment or practice that is technically feasible for conversion to the efficient technology from an engineering perspective (*i.e.*, it may not be possible to install Variable Frequency Drives (VFD) on all motors in a given market segment).
- **Savings Factor** = the percentage reduction in electricity consumption resulting from the application of the efficient technology.

It is important to note that the technical potential estimate represents electricity savings potential at a specific point in time. In other words, the technical potential estimate is based on data describing status quo customer electricity use and technologies known to exist today. As technology and electricity consumption patterns evolve over time, the baseline electricity consumption will also change accordingly. For this reason, technical potential is a discrete estimate of a dynamic market. Resource Innovations reported the technical potential for 2025, based on currently known DSM measures and observed electricity consumption patterns.

Measure Interaction and Competition (Overlap)

While the technical potential equations listed above focus on the technical potential of a single measure or technology, Resource Innovations' modeling approach does recognize the overlap of individual measure impacts within an end-use or equipment type, and accounts for the following interactive effects:

- **Measure interaction:** Installing high-efficiency equipment could reduce energy savings in absolute terms (kWh) associated with non-equipment measures that impact the same end-use. For example, installing a high-efficiency heat pump will reduce heating and cooling consumption which will reduce the baseline against which attic insulation would be applied, thus reducing savings associated with installing insulation. To account for this interaction, Resource Innovations' TEA-POT model ranks measures that interact with one another and reduces the baseline consumption for the subsequent measure based on the savings achieved by the preceding measure. For technical potential, interactive measures are ranked based on total end-use energy savings percentage.
- **Measure competition (overlap):** The "measure share"—as defined above—accounted for competing measures, ensuring savings were not double-counted. This interaction

occurred when two or more measures “competed” for the same end-use. For example, a T-12 lamp could be replaced with a T-8 or linear LED lamp.

Addressing Naturally-Occurring EE

Naturally occurring energy efficiency includes actions taken by customers to improve the efficiency of their homes and businesses in the absence of utility program intervention. For the analysis of technical potential, Resource Innovations verified with DEF’s forecasting group that the baseline sales forecasts incorporated two known sources of naturally-occurring efficiency:

- Codes and Standards: The sales forecasts already incorporated the impacts of known Code & standards changes.
- Baseline Measure Adoption: The sales forecast excluded the projected impacts of future DSM efforts but included already implemented DSM penetration.

By properly accounting for these factors, the technical potential analysis estimated the additional EE opportunities beyond what is already included in the utility sales forecast.

5.1.2 DR Technical Potential

The concept of technical potential applies differently to DR than for EE. Technical potential for DR is effectively the magnitude of loads that can be curtailed during conditions when utilities need peak capacity reductions. In evaluating this potential at peak capacity, the following were considered: which customers are consuming electricity at those times? What end-uses are in play? Can those end-use loads be managed? Large C&I accounts generally do not provide the utility with direct control over particular end-uses. Instead, many of these customers will forego electric demand temporarily if the financial incentive is large enough. For residential and small C&I customers where DR generally takes the form of direct utility control, technical potential for DR is limited by the loads that can be controlled remotely at scale.

This framework makes end-use disaggregation an important element for understanding DR potential, particularly in the residential and small C&I sectors. When done properly, end-use disaggregation not only provides insights into which loads are on and off when specific grid services are needed, it also provides insight concerning how key loads and end-uses, such as air conditioning use, vary across customers. Resource Innovations’ approach used for load disaggregation is more advanced than what is used for most potential studies. Instead of disaggregating annual consumption or peak demand, Resource Innovations produced end-use load disaggregation for all 8,760 hours. This was needed because the loads available at times when different grid applications are needed can vary substantially. Instead

of producing disaggregated loads for the average customer, the study was produced for several customer segments. For DEF, Resource Innovations examined three residential segments based on customer housing type, four different small C&I segments based on customer size, and four different large C&I segments based on customer size, for a total of 11 different customer segments.

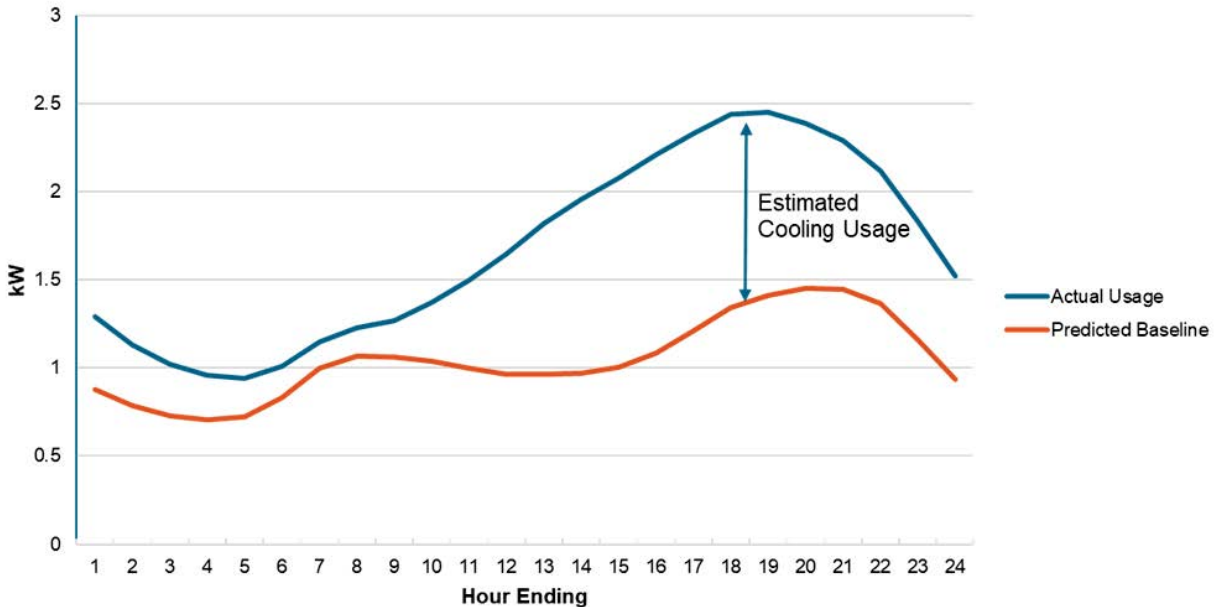
Technical potential, in the context of DR, is defined as the total amount of load available for reduction that is coincident with the period of interest; in this case, the system peak hour for the summer and winter seasons. Thus, two sets of capacity values are estimated: a summer capacity and a winter capacity.

As previously mentioned, for technical potential purposes, all coincident large C&I load is considered dispatchable, while residential and small C&I DR capacity is based on specific end-uses. Summer DR capacity for residential customers was comprised of air-conditioning (AC), pool pumps, water heaters, and managed electric vehicle charging. For small C&I customers, summer capacity was based on AC load. For winter DR capacity, residential was based on electric heating, pool pumps, and water heaters. For small C&I customers, winter capacity was based on electric heating.

AC and heating load profiles were generated for residential and small C&I customers using a sample of customer interval data provided by DEF. This sample included a customer breakout based on housing type for residential customers and size for small C&I customers. Resource Innovations then used the interval data from these customers to create an average load profile for each customer segment.

The average load profile for each customer segment was combined with historical weather data, and used to estimate hourly load as a function of weather conditions. AC and heating loads were estimated by first calculating the baseline load on days when cooling degree days (CDD) and heating degree days (HDD) were equal to zero, and then subtracting this baseline load. This methodology is illustrated by Figure 9 (a similar methodology was used to predict heating loads).

Figure 9: Methodology for Estimating Cooling Loads



This method was able to produce estimates for average AC/heating load profiles for the seven different customer segments within the residential and small C&I sectors.

Profiles for residential pool pump loads were estimated by utilizing utility-specific end-use load data provided by DEF. Profiles for residential water heater loads were estimated by using NREL's end-use load profile database.

For all eligible loads, the technical potential was defined as the amount that was coincident with system peak hours for each season, which are August from 4:00-5:00 PM for summer, and January from 7:00-8:00 AM for winter. As mentioned in Section 4, for technical potential there was also no measure breakout needed, because all measures will target the end-uses' estimated total loads.

5.1.3 DSRE Technical Potential

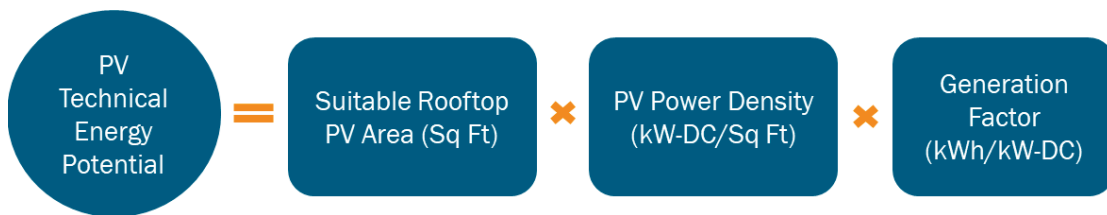
5.1.3.1 PV Systems

To determine technical potential for PV systems, RI estimated the percentage of rooftop square footage in Florida that is suitable for hosting PV technology. Our estimate of technical potential for PV systems in this report is based in part on the available roof area and consisted of the following steps:

- Step 1: Outcomes from the forecast disaggregation analysis were used to characterize the existing and new residential, commercial, and industrial building stocks.
 - To calculate the total roof area for residential buildings, the average roof area per household is multiplied by the number of households.
 - For commercial and industrial buildings, RI calculated the total roof area by first dividing the load forecast by the energy usage intensity, which provides an estimate of the total building square footage. This result is then divided by the average number of floors to derive the total roof area.
- Step 2: The total available roof area feasible for installing PV systems was calculated. Relevant parameters included unusable area due to other rooftop equipment and setback requirements, in addition to possible shading from trees and limitations of roof orientation (factored into a “technical suitability” multiplier).
- Step 3: Estimated the expected power density (kW per square foot of roof area).
- Step 4: Estimated the hourly PV generation profile using NREL’s PV Watts Calculator
- Step 5: Calculated total energy and coincident peak demand potential by applying RI’s Spatial Penetration and Integration of Distributed Energy Resources (SPIDER) Model.

The methodology presented in this report uses the following formula to estimate overall technical potential of PVs:

Equation 3: Core Equation for Solar DSRE Technical Energy Potential



Where:

- **Suitable Rooftop PV Area for Residential [Square Feet]:** Number of Residential Buildings x Average Roof Area Per Building x Technical Suitability Factor
- **Suitable Rooftop PV Area for Commercial [Square Feet] :** Energy Consumption [kWh] / Energy Intensity [kWh / Square Feet] / Average No. of Stories Per Building x Technical Suitability Factor
- **PV Power Density [kW-DC/Square Feet]:** Maximum power generated in Watts per square foot of solar panel.
- **Generation Factor:** Annual Energy Generation Factor for PV, from PV Watts (dependent on local solar irradiance)

5.1.3.2 Battery Storage Systems Charged from PV Systems

Battery storage systems on their own do not generate power or create efficiency improvements, but store power for use at different times. Therefore, in analyzing the technical potential for battery storage systems, the source of the stored power and overlap with technical potential identified in other categories was considered.

Battery storage systems that are powered directly from the grid do not produce annual energy savings but may be used to shift or curtail load during particular time periods. As the DR technical potential analyzes curtailment opportunities for the summer and winter peak period, and battery storage systems can be used as a DR technology, the study concluded that no additional technical potential should be claimed for grid-powered battery systems beyond that already attributed to DR.

Battery storage systems that are connected to on-site PV systems also do not produce additional energy savings beyond the energy produced from the PV system⁵. However, PV-connected battery systems do create the opportunity to store energy during period when the PV system is generating more than the home or business is consuming and use that stored power during utility system peak periods.

To determine the additional technical potential peak demand savings for “solar plus storage” systems, our methodology consisted of the following steps:

- Assume that every PV system included in PV Technical Potential is installed with a paired storage system.
- Size the storage system assuming peak storage power is equal to peak PV generation and energy storage duration is three hours.
- Apply RI’s hourly dispatch optimization module in SPIDER to create an hourly storage dispatch profile that flattens the individual customer’s load profile to the greatest extent possible accounting for a) customer hourly load profile, b) hourly PV generation profile, and c) battery peak demand, energy capacity, and roundtrip charge/discharge efficiency.
- Calculate the effective hourly impact for the utility using the above storage dispatch profile, aligned with the utility’s peak hour (calculated separately for summer and winter)
- Report the output storage kW impact on utility coincident peak demand in summer and winter.

⁵ PV-connected battery systems experience some efficiency loss due to storage, charging, and discharging. However, for this study, these losses were not quantified.

5.1.3.3 CHP Systems

The CHP analysis created a series of unique distributed generation potential models for each primary market sector (commercial and industrial).

Only non-residential customer segments whose electric and thermal load profiles allow for the application of CHP were considered. The technical potential analysis followed a three-step process. First, minimum facilities size thresholds were determined for each non-residential customer segment. Next, the full population of non-residential customers were segmented and screened based on the size threshold established for that segment. Finally, the facilities that were of sufficient size were matched with the appropriately sized CHP technology.

To determine the minimum threshold for CHP suitability, a thermal factor was applied to potential candidate customer loads to reflect thermal load considerations in CHP sizing. In most cases, on-site thermal energy demand is smaller than electrical demand. Thus, CHP size is usually dictated by the thermal load in order to achieve improved efficiencies.

The study collected electric and thermal intensity data from other recent CHP studies. For industrial customers, Resource Innovations assumed that the thermal load would primarily be used for process operations and was not modified from the secondary data sources for Florida climate conditions. For commercial customers, the thermal load is more commonly made up of water heating, space heating, and space cooling (through the use of an absorption chiller). Therefore, to account for the hot and humid climate in Florida, which traditionally limits weather-dependent internal heating loads, commercial customers' thermal loads were adjusted to incorporate a higher proportion of space cooling to space heating as available opportunities for waste heat recovery.

After determination of minimum kWh thresholds by segment, Resource Innovations used the utility-provided customer data with NAICS or SIC codes as well as annual consumption data. Non-residential customers were then categorized by segment and size. Customers with annual loads below the kWh thresholds are not expected to have the consistent electric and thermal loads necessary to support CHP and were eliminated from consideration.

In general, internal combustion engines are the prime mover for systems under 500kW with gas turbines becoming progressively more popular as system size increases above that. Based on the available load by customer, adjusted by the estimated thermal factor for each segment, CHP technologies were assigned to utility customers in a top-down fashion (*i.e.*, starting with the largest CHP generators).

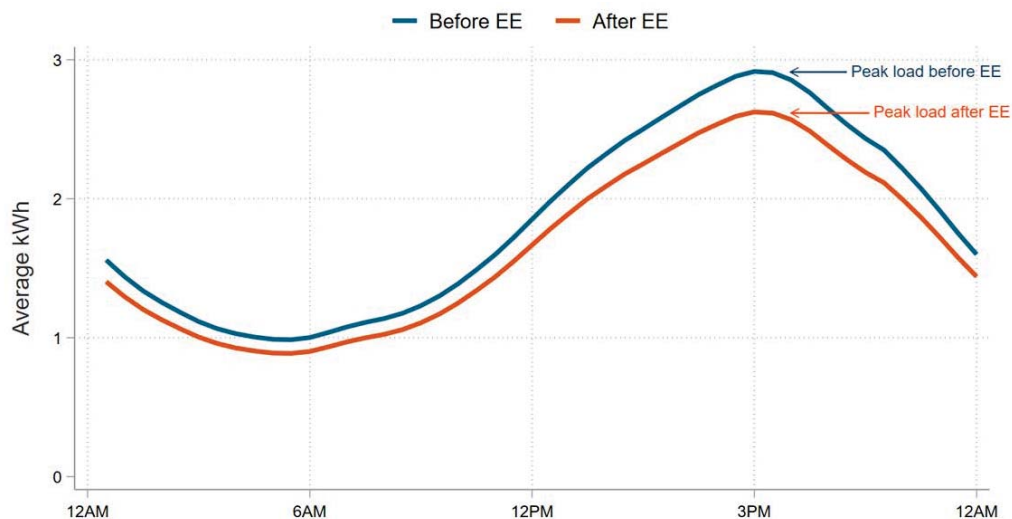
Measure Interaction

PV systems and battery storage charged from PV systems were analyzed collectively due to their common power generation source; and therefore, the identified technical potential for these systems is additive. However, CHP systems were independently analyzed for technical potential without consideration of the competition between DSRE technologies or customer preference for a particular DSRE system. Therefore, results for CHP technical potential should not be combined with PV systems or battery storage systems for overall DSRE potential but used as independent estimates.

5.1.4 Interaction of Technical Potential Impacts

As described above, the technical potential was estimated using separate models for EE, DR, and DSRE systems. However, there is interaction between these technologies; for example, a more efficient HVAC system would result in a reduced peak demand available for DR curtailment, as illustrated in Figure 10.

Figure 10: Illustration of EE Impacts on HVAC System Load Shape



Therefore, after development of the independent models, the interaction between EE, DR, and DSRE was incorporated as follows:

- The EE technical potential was assumed to be implemented first, followed by DR technical potential and DSRE technical potential.

- To account for the impact of EE technical potential on DR, the baseline load forecast for the applicable end-uses was adjusted by the EE technical potential, resulting in a reduction in baseline load available for curtailment.
- For DSRE systems, the EE and DR technical potential was incorporated in a similar fashion, adjusting the baseline load used to estimate DSRE potential.
 - For the PV analysis, this did not impact the results as the EE and DR technical potential did not affect the amount of PV that could be installed on available rooftops.
 - For the battery storage charged from PV systems, the reduced baseline load from EE resulted in additional PV-generated energy being available for the battery systems and for use during peak periods. The impact of DR events during the assumed curtailment hours was incorporated into the modeling of available battery storage and discharge loads.
- For CHP systems, the reduced baseline load from EE resulted in a reduction in the number of facilities that met the annual energy threshold needed for CHP installations. Installed DR capacity was assumed to not impact CHP potential as the CHP system feasibility was determined based on energy and thermal consumption at the facility. It should be noted that CHP systems not connected to the grid could impact the amount of load available for curtailment with utility-sponsored DR. Therefore, CHP technical potential should not be combined with DR potential but used as independent estimates.

5.2 EE Technical Potential

5.2.1 Summary

Table 9 summarizes the EE technical potential by sector:

Table 9. EE Technical Potential

	Savings Potential		
	Summer Peak Demand (MW)	Winter Peak Demand (MW)	Energy (GWh)
Residential	2,217	2,423	7,599
Non-Residential ⁶	669	450	3,591
Total	2,886	2,873	11,190

⁶ Non-Residential results include all commercial and industrial customer segments.

5.2.2 Residential

Figure 11, Figure 12, and Figure 13 summarize the residential sector EE technical potential by end-use.

Figure 11: Residential EE Technical Potential by End-Use (Summer Peak Savings)

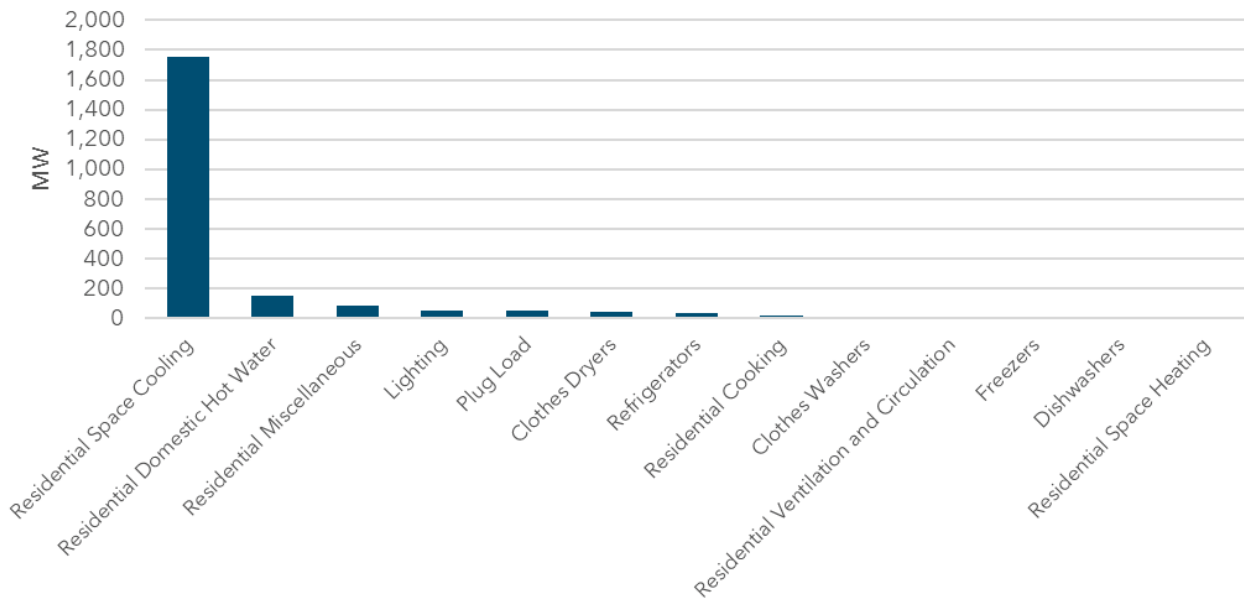


Figure 12: Residential EE Technical Potential by End-Use (Winter Peak Savings)

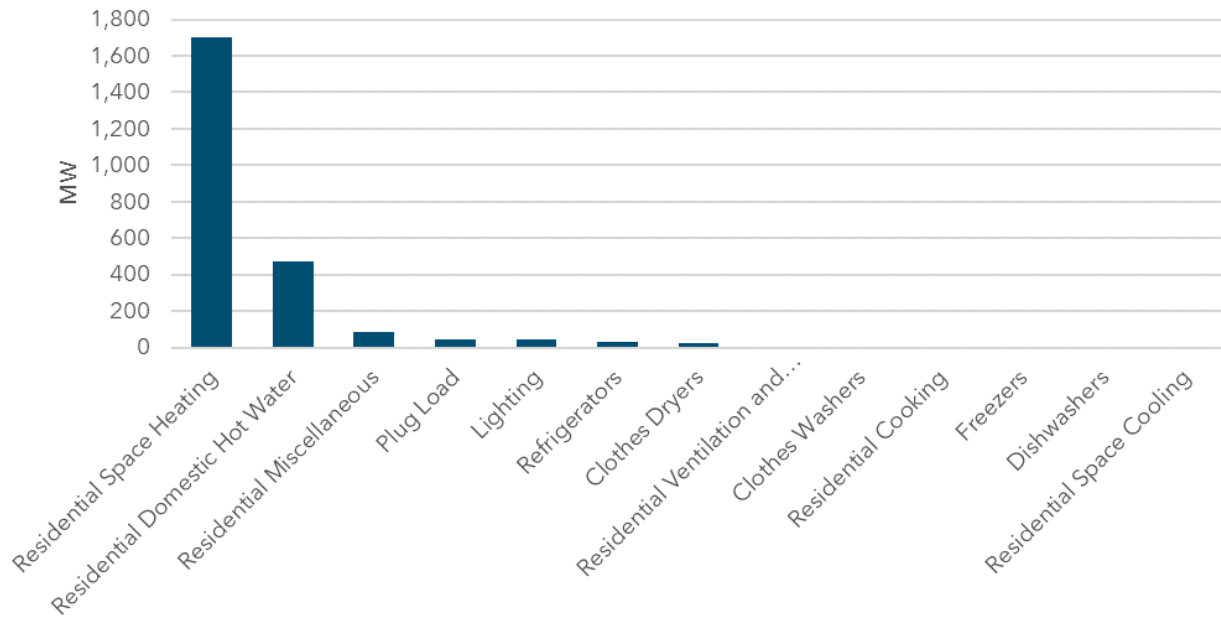
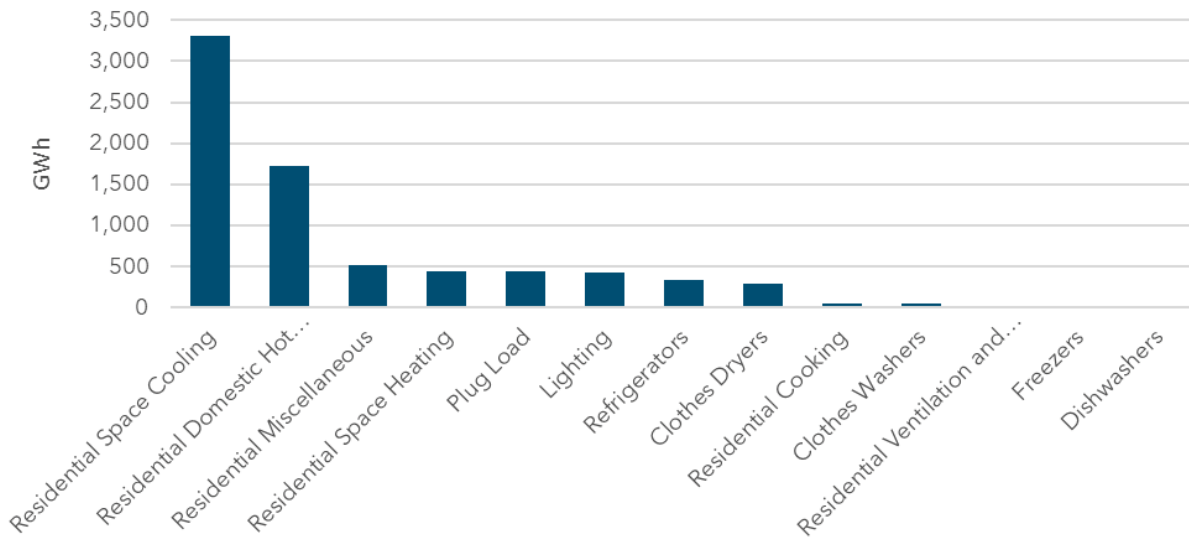


Figure 13: Residential EE Technical Potential by End-Use (Energy Savings)



5.2.3 Non-Residential

5.2.3.1 Commercial Segments

Figure 14, Figure 15, and Figure 16 summarize the commercial sector EE technical potential by end-use.

Figure 14: Commercial EE Technical Potential by End-Use (Summer Peak Savings)

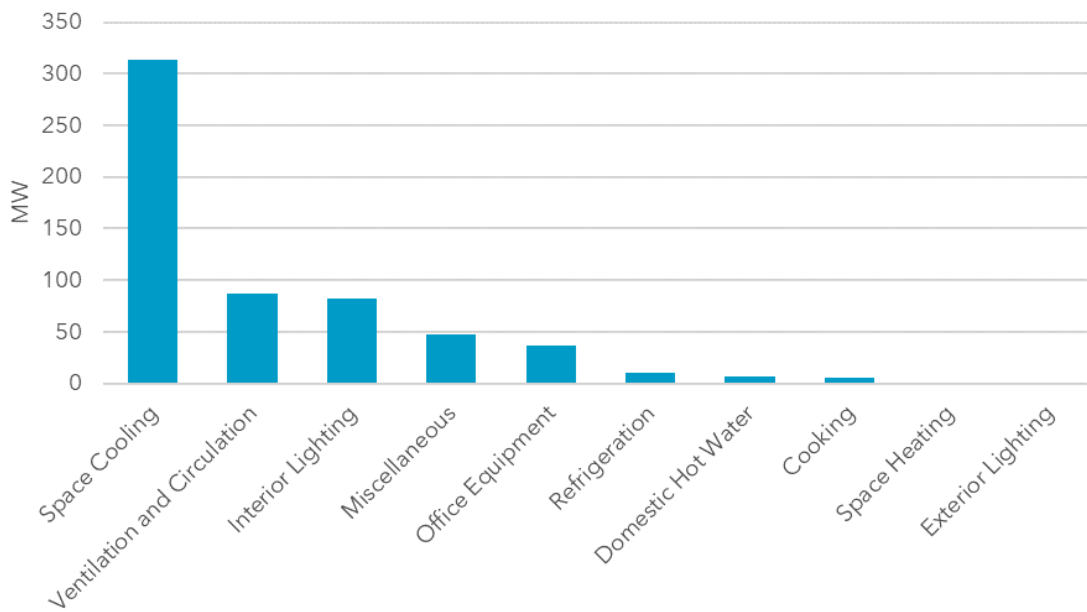


Figure 15: Commercial EE Technical Potential by End-Use (Winter Peak Savings)

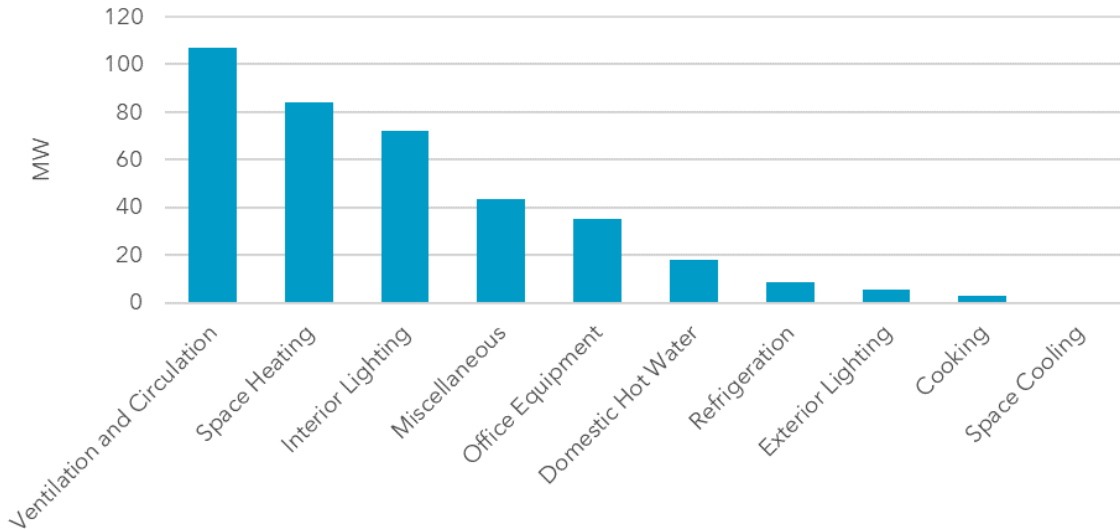
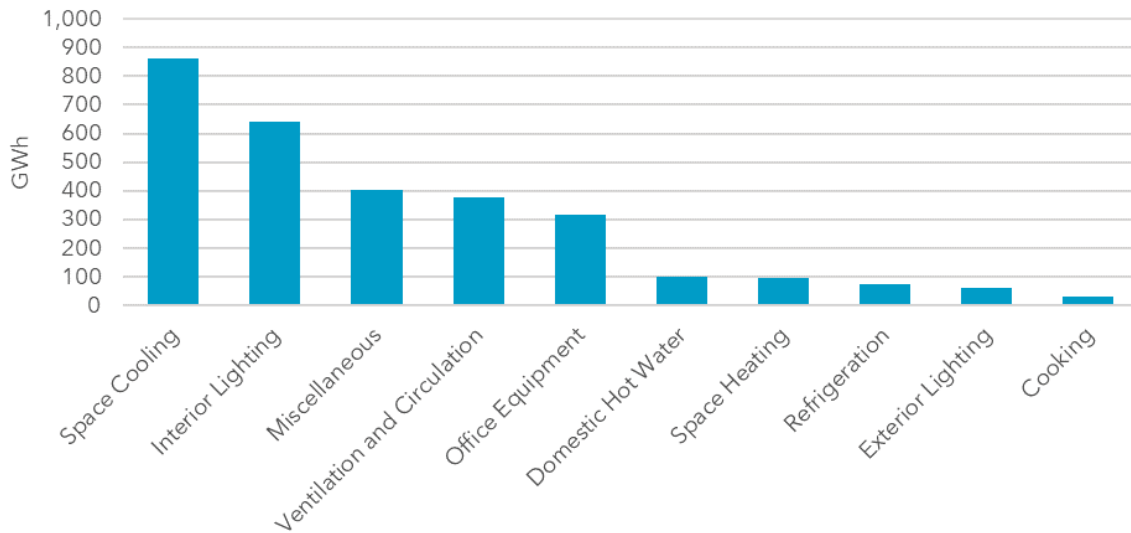


Figure 16: Commercial EE Technical Potential by End-Use (Energy Savings)



5.2.3.2 Industrial Segments

Figure 17, Figure 18, and Figure 19 summarize the industrial sector EE technical potential by end-use.

Figure 17: Industrial EE Technical Potential by End-Use (Summer Peak Savings)

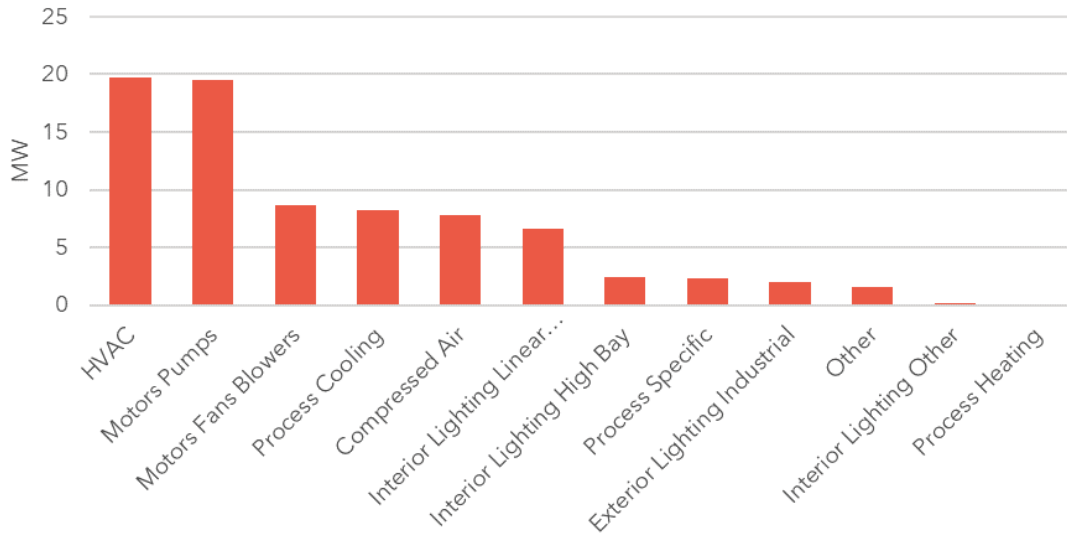


Figure 18: Industrial EE Technical Potential by End-Use (Winter Peak Savings)

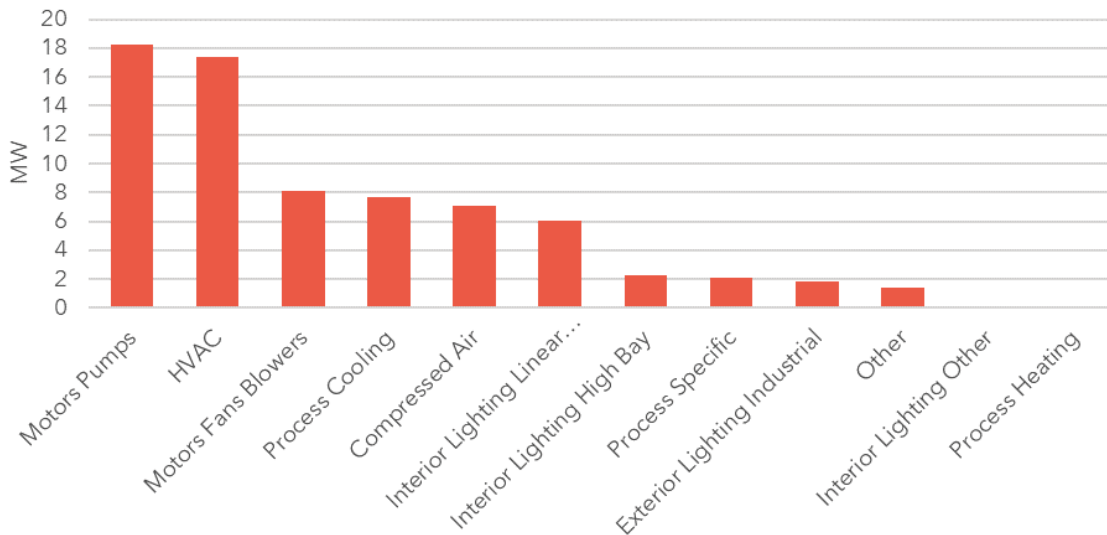
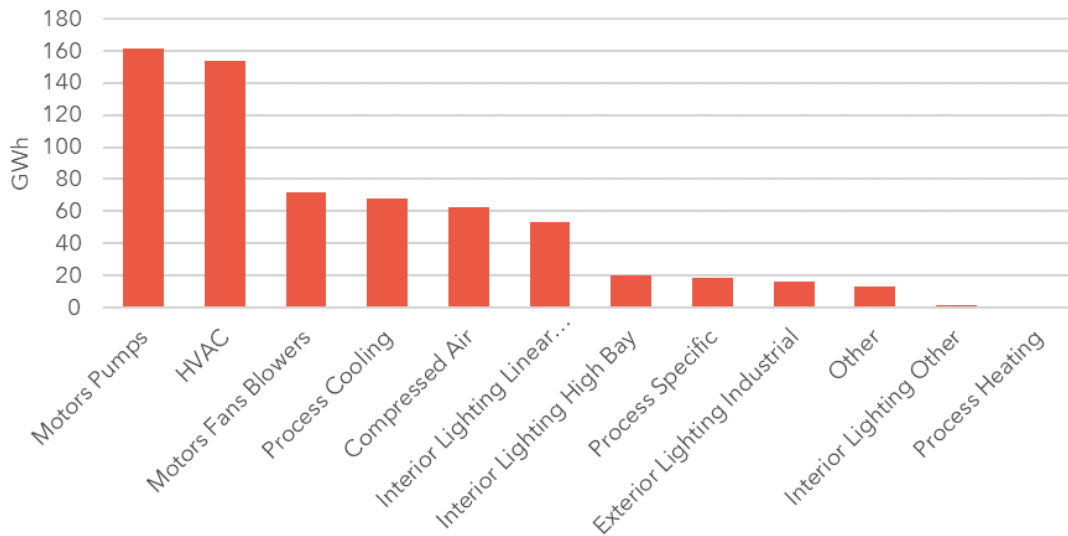


Figure 19: Industrial EE Technical Potential by End-Use (Energy Savings)



5.3 DR Technical Potential

Technical potential for DR is defined for each class of customers as follows:

- Residential & Small C&I customers - Technical potential is equal to the aggregate load for all end-uses that can participate in DEF's current programs plus DR measures not currently offered in which the utility uses specialized devices to control loads (*i.e.*, direct load control programs). This includes cooling and heating loads for residential and small C&I customers and water heater and pool pump loads for residential customers. Not all demand reductions are delivered via direct load control of end-uses. The magnitude of demand reductions from non-direct load control such as time varying pricing, peak time rebates and targeted notifications is linked to cooling and heating loads.
- Large C&I customers - Technical potential is equal to the total amount of load for each customer segment (*i.e.*, that customers reduce their total load to zero when called upon).

Table 10 summarizes the seasonal DR technical potential by sector:

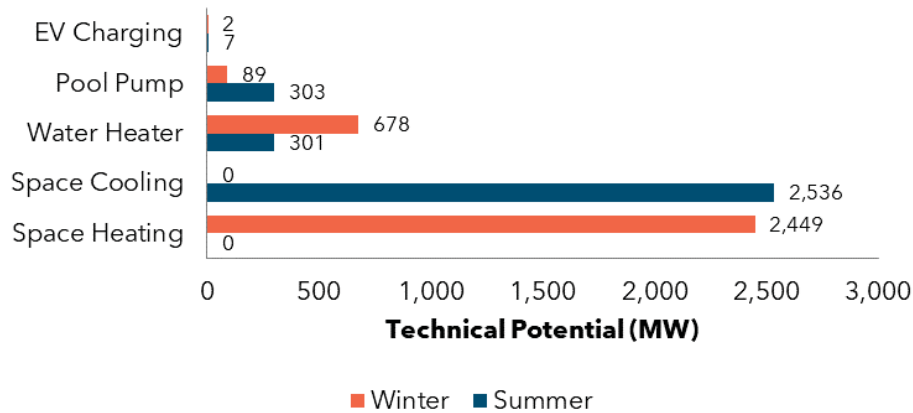
Table 10. DR Technical Potential

	Savings Potential	
	Summer Peak Demand (MW)	Winter Peak Demand (MW)
Residential	3,147	3,218
Non-Residential	2,631	2,391
Total	5,778	5,609

5.3.1 Residential

Residential technical potential is summarized in Figure 20.

Figure 20: Residential DR Technical Potential by End-Use

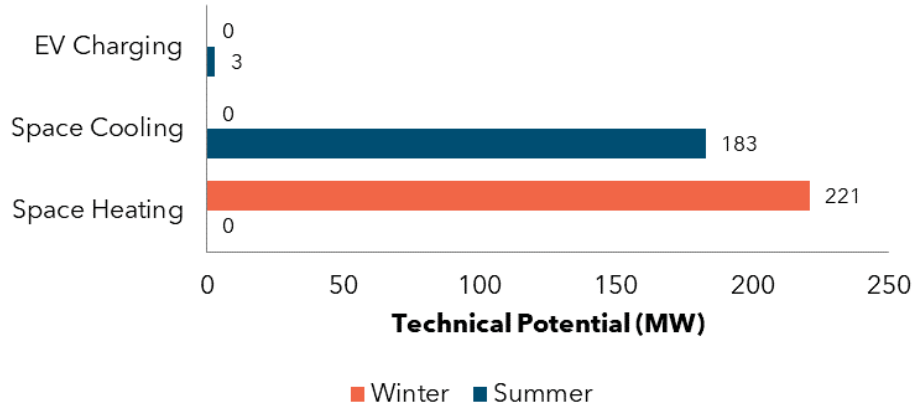


5.3.2 Non-Residential

5.3.2.1 Small C&I Customers

For small C&I technical potential, Resource Innovations looked at cooling and heating loads only. Small C&I technical potential is provided in Figure 21.

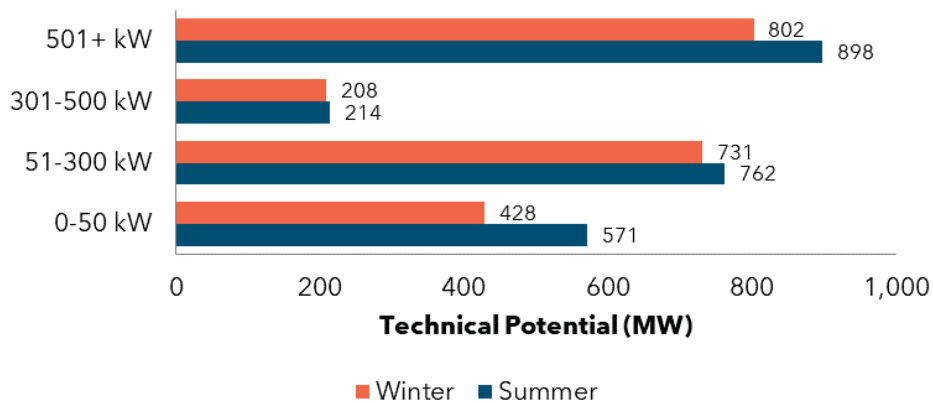
Figure 21: Small C&I DR Technical Potential by End-Use



5.3.2.2 Large C&I Customers

Figure 22 provides the technical potential for large C&I customers, broken down by customer size.

Figure 22: Large C&I DR Technical Potential by Segment



5.4 DSRE Technical Potential

Table 11 provides the results of the DSRE technical potential for each customer segment:

Table 11. DSRE Technical Potential⁷

	Savings Potential		
	Summer Peak Demand (MW)	Winter Peak Demand (MW)	Energy (GWh)
PV Systems			
Residential	1,761	152	17,637
Non-Residential	444	15	4,164
Total	2,205	167	21,801
Battery Storage charged from PV Systems			
Residential	2,016	2,176	0
Non-Residential	240	315	0
Total	2,256	2,491	0
CHP Systems			
Total	773	811	3,553

⁷ PV systems and CHP systems were independently analyzed for technical potential without consideration of the competition between technologies or customer preference for DSRE system.

Appendix A EE Measure List

For information on how Resource Innovations developed this list, please see Section 4.

Table 12: Residential EE Measures

Measure	End-Use	Description	Baseline
120v Heat Pump Water Heater 50 Gallons	Residential Domestic Hot Water	120v Heat Pump Water Heater 50 Gallons	Code-Compliant 50 Gallon Electric Resistance Water Heater
Air Sealing-Infiltration Control	Residential Space Cooling, Residential Space Heating	Standard Heating and Cooling System with Improved Infiltration Control	Standard Heating and Cooling System with Standard Infiltration Control
Air-to-Water Heat Pump	Residential Space Cooling, Residential Space Heating	Energy Star Air-to-Water Heat Pump, 25 SEER, 13 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
ASHP - 15 SEER/14.3 SEER2 from base electric resistance	Residential Space Cooling, Residential Space Heating	ASHP 15 SEER from base electric resistance	Base AC, 15 SEER, Electric resistance heating
ASHP - 24 SEER/22.9 SEER2 (from elec resistance)	Residential Space Cooling, Residential Space Heating	ASHP: 24/22.9 SEER/SEER2, 10.5 HSPF	Base AC, 15 SEER, Electric resistance heating
ASHP - 24 SEER/22.9 SEER2, 10.5 HSPF	Residential Space Cooling, Residential Space Heating	ASHP: 24/22.9 SEER/SEER2, 10.5 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
ASHP - CEE Advanced Tier: 17.8 SEER/17 SEER2; 10.0 HSPF	Residential Space Cooling, Residential Space Heating	CEE Advanced Tier ASHP: 17.8/17 SEER/SEER2; 10.0 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
ASHP - CEE Advanced Tier: 17.8 SEER/17 SEER2; 10.0 HSPF (from elec resistance)	Residential Space Cooling, Residential Space Heating	CEE Advanced Tier ASHP: 17.8/17 SEER/SEER2; 10.0 HSPF	Base AC, 15 SEER, Electric resistance heating
ASHP - CEE Tier 2: 16.8 SEER/16 SEER2; 9.0 HSPF	Residential Space Cooling, Residential Space Heating	CEE Tier 2 ASHP: 16.8/16 SEER/SEER2; 9.0 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
ASHP - CEE Tier 2: 16.8 SEER/16 SEER2; 9.0 HSPF (from elec resistance)	Residential Space Cooling, Residential Space Heating	CEE Tier 2 ASHP: 16.8/16 SEER/SEER2; 9.0 HSPF	Base AC, 15 SEER, Electric resistance heating

Measure	End-Use	Description	Baseline
ASHP - ENERGY STAR/CEE Tier 1: 16 SEER/15.2 SEER2 (from elect resistance)	Residential Space Cooling, Residential Space Heating	ENERGY STAR/CEE Tier 1 ASHP: 16/15.2 SEER/SEER2, 9.0 HSPF	Base AC, 15 SEER, Electric resistance heating
ASHP - ENERGY STAR/CEE Tier 1: 16 SEER/15.2 SEER2, 9.0 HSPF	Residential Space Cooling, Residential Space Heating	ENERGY STAR/CEE Tier 1 ASHP: 16/15.2 SEER/SEER2, 9.0 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
Basement or Crawlspace Wall Insulation R-15	Residential Space Cooling, Residential Space Heating	Increased Basement or Crawlspace Wall Insulation (R-15)	Code-Compliant Exterior Below-Grade Wall Insulation (R-10)
Bathroom Faucet Aerators	Residential Domestic Hot Water	Low-Flow Faucet Aerator with Flow Rate of 1.5 gpm	Faucet Aerator with Federal Standard Flow Rate of 2.2 gpm
CEE Advanced Tier Clothes Dryer	Clothes Dryers	CEE Advanced Tier Clothes Dryer	One Clothes Dryer meeting Federal Standard
CEE Advanced Tier Clothes Washer	Clothes Washers	Tier 3 CEE Clothes washer	One Clothes Washer meeting Federal Standard
CEE Tier 3 Refrigerator	Refrigerators	Residential Tier 3 Refrigerator	One Refrigerator meeting Federal Standard
Ceiling Insulation (R11 to R38)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1982-1985) homes	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R11 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1982-1985) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R19 to R38)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1982-2020) homes	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R19 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1982-2020) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R2 to R38)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, older (pre-1982) homes	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R2 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, older (pre-1982) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R30 to R38)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1986-2020) homes	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R30 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1986-2020) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction

Measure	End-Use	Description	Baseline
Ceiling Insulation (R38 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1986-2020) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction
Central AC - CEE Tier 2: 16.8 SEER/16 SEER2	Residential Space Cooling	Central AC - CEE Tier 2: 16.8 SEER/16 SEER2	Code-Compliant Central AC, 15 SEER (updated)
Central AC - 24 SEER/22.9 SEER2	Residential Space Cooling	Central AC - 24 SEER/22.9 SEER2	Code-Compliant Central AC, 15 SEER (updated)
Central AC - CEE Advanced Tier: 17.8 SEER/17 SEER2	Residential Space Cooling	Central AC - CEE Advanced Tier: 17.8 SEER/17 SEER2	Code-Compliant Central AC, 15 SEER (updated)
Central AC - ENERGY STAR/ CEE Tier 1: 16 SEER/15.2 SEER2	Residential Space Cooling	Central AC - ENERGY STAR/CEE Tier 1: 16 SEER/15.2 SEER2	Code-Compliant Central AC, 15 SEER (updated)
Central AC Tune Up	Residential Space Cooling	System tune-up, including coil cleaning, refrigerant charging, and other diagnostics	Existing Typical Central AC without Regular Maintenance/tune-up
Dehumidifier Recycling	Plug Load	No dehumidifier	One Dehumidifier meeting Federal Standard
Drain Water Heat Recovery	Residential Domestic Hot Water	50 Gallon Electric Resistance Heater and Drain Water Heat Exchanger	50 Gallon Electric Resistance Heater, No Drain Water Heat Recovery
Duct Insulation	Residential Space Cooling, Residential Space Heating	Standard Electric Heating and Central AC with Insulated Ductwork	Standard Electric Heating and Central AC with Uninsulated Ductwork
Duct Repair	Residential Space Cooling, Residential Space Heating	Duct Repair to eliminate/minimize leaks, includes testing and sealing	Standard Electric Heating and Central AC with typical duct leakage
ECM Circulator Pump	Residential Miscellaneous	Install ECM Circulator Pump	Install Standard Circulator Pump
Energy Star Air Purifier	Plug Load	One Air Purifier meeting ENERGY STAR 2.0 Standards	One Standard Conventional Air Purifier
Energy Star Audio-Video Equipment	Plug Load	One DVD/Blu-Ray Player meeting current ENERGY STAR Standards	One Market Average DVD/Blu-Ray Player
Energy Star Bathroom Ventilating Fan	Residential Ventilation and Circulation	Bathroom Exhaust Fan meeting current ENERGY STAR Standards	Bathroom Exhaust Fan meeting Federal Standard
Energy Star Ceiling Fan	Residential Miscellaneous	60" Ceiling Fan Meeting ENERGY STAR 3.1 Standards	Standard 60" Ceiling Fan
Energy Star Clothes Dryer	Clothes Dryers	One Electric Resistance Clothes Dryer meeting ENERGY STAR 1.1 Standards	One Clothes Dryer meeting Federal Standard

Measure	End-Use	Description	Baseline
Energy Star Clothes Washer	Clothes Washers	One Clothes Washer meeting ENERGY STAR 8.1 Standards	One Clothes Washer meeting Federal Standard
Energy Star Dehumidifier	Plug Load	One Dehumidifier meeting ENERGY STAR 5.0 Standards	One Dehumidifier meeting Federal Standard
Energy Star Dishwasher	Dishwashers	One Dishwasher meeting ENERGY STAR 7.0 Requirements (effective on July 19, 2023), electric water heating	One Dishwasher meeting Federal Standard
Energy Star Dishwasher (Gas Water Heating)	Dishwashers	One Dishwasher meeting ENERGY STAR 7.0 Requirements, gas water heating	One Dishwasher meeting Federal Standard; gas water heating
Energy Star Door	Residential Space Cooling, Residential Space Heating	100ft ² of Opaque Door meeting Energy Star Version 6.0 Requirements (U-Value: 0.17)	100ft ² of Opaque Door meeting current FL Code Requirements
ENERGY STAR EV supply equipment (level 2 charger)	Residential Miscellaneous	Level 2 Electric Vehicle Supply Equipment (EVSE)	Level 1 Electric Vehicle Supply Equipment (EVSE)
Energy Star Freezer	Freezers	One Freezer meeting current ENERGY STAR 5.1 Standards	One Freezer meeting Federal Standard
Energy Star Ground Source Heat Pump	Residential Space Cooling, Residential Space Heating	Energy Star GSHP, 17.1 SEER, 12 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF
Energy Star Imaging Equipment	Plug Load	One imaging device meeting current ENERGY STAR Standards	One non-ENERGY STAR imaging device
Energy Star Monitor	Plug Load	One Monitor meeting ENERGY STAR 8.0 Standards	One Standard Monitor
Energy Star Personal Computer	Plug Load	One Personal Computer meeting ENERGY STAR 8.0 Standards	One Personal Computer meeting ENERGY STAR® 3.0 Standards
Energy Star Refrigerator	Refrigerators	One Refrigerator/Freezer meeting ENERGY STAR 5.1 Standards	One Refrigerator/Freezer meeting Federal Standard
Energy Star Room AC	Residential Space Cooling	Room AC meeting current ENERGY STAR standards	Code-Compliant Room AC
Energy Star Set-Top Receiver	Plug Load	One Set-top Box meeting ENERGY STAR 4.1 Standards	One Market Average Set-top Box
Energy Star TV	Plug Load	One Television meeting ENERGY STAR 9.0 Standards	One non-ENERGY STAR Television
Energy Star Windows	Residential Space Cooling, Residential Space Heating	100ft ² of Window meeting Energy Star Version 6.0 Requirements (U-Value: 0.27, SHGC: 0.21)	100ft ² of Window current FL energy code requirements

Measure	End-Use	Description	Baseline
Exterior Wall Insulation	Residential Space Cooling, Residential Space Heating	Increased Exterior Above-Grade Wall Insulation (R-13)	Market Average Existing Exterior Above-Grade Wall Insulation
Filter Whistle	Residential Ventilation and Circulation	Install the Furnace Filter Alarm	No Furnace Filter Alarm on a Central Forced-Air Furnace
Floor Insulation	Residential Space Heating	Increased Floor Insulation (R-30)	Code-Compliant Floor Insulation
Freezer Recycling	Freezers	No Freezer	Current Market Freezer
Green Roof	Residential Space Cooling	Vegetated Roof Surface on top of Standard Roof	Standard Black Roof
Heat Pump Clothes Dryer	Clothes Dryers	One Heat Pump Clothes Dryer	One Clothes Dryer meeting Federal Standard
Heat Pump Pool Heater	Residential Miscellaneous	Heat Pump Swimming Pool Heater	Electric Resistance Swimming Pool Heater
Heat Pump Tune Up	Residential Space Cooling, Residential Space Heating	System tune-up, including coil cleaning, refrigerant charging, and other diagnostics	Standard Heating and Cooling System without Regular Maintenance/tune-up
Heat Pump Water Heater 50 Gallons-CEE Advanced Tier	Residential Domestic Hot Water	CEE Advanced Tier Heat Pump Water Heater 50 Gallons	Code-Compliant 50 Gallon Electric Resistance Water Heater
Heat Pump Water Heater 50 Gallons-ENERGY STAR	Residential Domestic Hot Water	Heat Pump Water Heater 50 Gallons	Code-Compliant 50 Gallon Electric Resistance Water Heater
Heat Pump Water Heater 80 Gallons-ENERGY STAR	Residential Domestic Hot Water	Energy Star Heat Pump Water Heater 80 Gallons	Code-Compliant 80 Gallon Electric Resistance Water Heater
Heat Trap	Residential Domestic Hot Water	Heat Trap	Existing Water Heater without heat trap
High Efficiency Convection Oven	Residential Cooking	One Full-Size Convection Oven meeting ENERGY STAR 3.0 Standards	One Standard Economy-Grade Full-Size Oven
High Efficiency Induction Cooktop	Residential Cooking	One residential induction cooktop	One standard residential electric cooktop
Home Energy Management System	Lighting, Plug Load, Residential Space Cooling, Residential Space Heating	Typical HVAC by Building Type Controlled by Energy Management System	Typical HVAC by Building Type, Manually Controlled
Hot Water Pipe Insulation	Residential Domestic Hot Water	1' of Insulated Pipe in Unconditioned Spaces, Insulation of R-5	1' of Pipe in Unconditioned Spaces with Code Minimum of 1" of Insulation
HVAC ECM Motor	Residential Ventilation and Circulation	A brushless permanent magnet (ECM) blower motor for electric furnace	Permanent Split Capacitor Motor for Electric Furnace
HVAC Economizer	Residential Space Cooling	Install residential economizer	No economizer

Measure	End-Use	Description	Baseline
HVAC Zoning System	Residential Space Cooling, Residential Space Heating	Install dampers in the ducts, dividing home into multiple zones, each controlled by its own thermostat	Single zone HVAC system
Indoor Daylight Sensor	Lighting	Install Indoor Daylight Sensors, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Induction Range	Residential Cooking	Residential induction range	Electric range
Instantaneous Hot Water System	Residential Domestic Hot Water	Instantaneous Hot Water System	Standard Efficiency Storage Tank Water Heater
Kitchen Faucet Aerators	Residential Domestic Hot Water	Low-Flow Faucet Aerator with Flow Rate of 1.5 gpm	Faucet Aerator with Federal Standard Flow Rate of 2.2 gpm
LED - 9W_CFL Baseline	Lighting	LED (assume 9W) replacing CFL baseline lamp	14W CFL (60W equivalent)
LED - 9W_Halogen Baseline	Lighting	LED (assume 9W) replacing EISA-2020 compliant baseline lamp	EISA-2020 compliant baseline lamp (60W equivalent)
LED Specialty Lamps-5W Chandelier	Lighting	5 W Chandelier LED	Standard incandescent chandelier lamp
Linear LED	Lighting	Linear LED Lamps in Linear Fluorescent Fixture	Standard (32w) T8 lamps in Linear Fluorescent Fixture
Low Flow Showerhead	Residential Domestic Hot Water	Low-Flow Handheld Showerhead, Flow Rate: 1.60 gpm	Standard Handheld Showerhead, Flow Rate: 2.50 gpm
New Construction - Whole Home Improvements - Tier 1	Whole Home	Performance-based improvements in new homes - 20% savings	Residential New Construction (Baseline Efficiency)
New Construction - Whole Home Improvements - Tier 2	Whole Home	Performance-based improvements in new homes - 35% savings	Residential New Construction (Baseline Efficiency)
Occupancy Sensors Switch Mounted	Lighting	Switch Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor Lighting Timer	Lighting	Timer on Outdoor Lighting, Controlling 120 Watts	120 Watts of Lighting, Manually Controlled
Outdoor Motion Sensor	Lighting	Motion Sensor on Outdoor Lighting, Controlling 120 Watts	120 Watts of Lighting, Manually Controlled
Ozone Laundry	Clothes Washers	Add a New, Single-Unit Ozone Laundry System to the Clothes Washer	One Clothes Washer meeting Federal Standard

Measure	End-Use	Description	Baseline
Programmable Thermostat	Residential Space Cooling, Residential Space Heating	Standard Heating and Cooling System with Programmable Thermostat	Standard Heating and Cooling System with Manual Thermostat
Properly Sized CAC	Residential Space Cooling	Properly Sized Central Air Conditioning	Standard Central Air Conditioning, Oversized
Radiant Barrier	Residential Space Cooling	Radiant Barrier	No radiant barrier
Reflective Roof	Residential Space Cooling	Reflective Roof Treatment	Standard dark shingle
Refrigerator Coil Cleaning	Refrigerators	Refrigerator Coil Cleaning	
Refrigerator Recycling	Refrigerators	No Refrigerator	Current Market Average Refrigerator
Residential Whole House Fan	Residential Space Cooling	Standard Central Air Conditioning with Whole House Fan	Standard Central Air Conditioning, No Whole House Fan
Sealed crawlspace	Residential Space Cooling, Residential Space Heating	Encapsulated and semi-conditioned crawlspace	Naturally vented, unconditioned crawlspace
Smart Breaker	Whole Home	Smart Breaker	standard electric breakers
Smart Panel	Whole Home	Multi-channel device that attaches to customer's circuit breaker to enable monitoring and control of major end-use appliances by customer	standard electric panel
Smart Power Strip	Plug Load	Smart plug strips for entertainment centers and home office	Standard entertainment center or home office usage, no smart strip controls
Smart Thermostat	Residential Space Cooling, Residential Space Heating	Standard Heating and Cooling System with Smart Thermostat	Standard Heating and Cooling System with Manual Thermostat
Solar Attic Fan	Residential Space Cooling	Standard Central Air Conditioning with Solar Attic Fan	Standard Central Air Conditioning, No Solar Attic Fan
Solar Pool Heater	Residential Miscellaneous	Solar Swimming Pool Heater	Electric Resistance Swimming Pool Heater
Solar Powered Pool Pumps	Residential Miscellaneous	Solar Powered Pool Pump	Variable Speed Pool Pump Motor
Solar Thermal Water Heating System	Residential Domestic Hot Water	Solar Thermal System with Electric Backup	Code-Compliant 50 Gallon Electric Resistance Water Heater
Spray Foam Insulation (Base R11)	Residential Space Cooling, Residential Space Heating	Open cell spray foam along roofline in existing (1982-1985) homes	Existing ceiling insulation based on building code at time of construction
Spray Foam Insulation (Base R19)	Residential Space Cooling, Residential Space Heating	Open cell spray foam along roofline in existing (1982-1985) homes	Existing ceiling insulation based on building code at time of construction

Measure	End-Use	Description	Baseline
Spray Foam Insulation (Base R2)	Residential Space Cooling, Residential Space Heating	Open cell spray foam along roofline in older (pre-1982) homes	Existing ceiling insulation based on building code at time of construction
Spray Foam Insulation(Base R30)	Residential Space Cooling, Residential Space Heating	Open cell spray foam along roofline in existing (1986-2020) homes	Existing ceiling insulation based on building code at time of construction
Thermostatic Shower Restriction Valve	Residential Domestic Hot Water	50 Gallon Electric Resistance Heater and Thermostatic Shower Valves	50 Gallon Electric Resistance Heater and Standard Shower Valves
Variable Refrigerant Flow (VRF) HVAC Systems	Residential Space Cooling, Residential Space Heating	Variable Refrigerant Flow (VRF) HVAC Systems	Code-Compliant ASHP, 15 SEER, 8.8 HSPF
Water Heater Blanket	Residential Domestic Hot Water	50 Gallon Electric Resistance Water Heater with Insulated Tank Wrap	Code-Compliant 50 Gallon Electric Resistance Water Heater, No Tank Wrap
Water Heater Thermostat Setback	Residential Domestic Hot Water	50 Gallon Electric Resistance Water Heater with Temperature Setpoint of 119°F	Code-Compliant 50 Gallon Electric Resistance Water Heater (Temp. Setpoint = 130°F)
Water Heater Timeclock	Residential Domestic Hot Water	Water Heater Timeclock	Existing Water Heater without time clock
Weather stripping	Residential Space Cooling, Residential Space Heating	Specific quantity of weather stripping to seal	
Window Caulking	Residential Space Cooling, Residential Space Heating	Window caulking	
Window Sun Protection	Residential Space Cooling	Window Film Applied to Standard Window	Standard Window with below Code Required Minimum SHGC

Table 13: Commercial EE Measures

Measure	End-Use	Description	Baseline
1.5HP Open Drip-Proof (ODP) Motor	Ventilation and Circulation	High Efficiency 1.5 HP Open-Drip Proof Motor	1.5HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency
10HP Open Drip-Proof (ODP) Motor	Ventilation and Circulation	High Efficiency 10 HP Open-Drip Proof Motor	10HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency
20HP Open Drip-Proof (ODP) Motor	Ventilation and Circulation	High Efficiency 20 HP Open-Drip Proof Motor	20HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency

Measure	End-Use	Description	Baseline
Advanced Rooftop Controller	Ventilation and Circulation	Advanced Rooftop Controller	Without Advanced Rooftop Controller
Air Compressor Optimization	Miscellaneous	Performing Routine Maintenance on 20HP Inlet Modulation Fixed-Speed Compressor	20 HP Inlet Modulation Fixed-Speed Compressor
Air Curtains	Space Cooling, Space Heating	Air Curtain across door opening	Door opening with no air curtain
Airside Economizer	Space Cooling	Airside Economizer	No economizer
Anti-Sweat Controls	Refrigeration	One Medium Temperature Reach-In Case with Anti-Sweat Heater Controls	One Medium Temperature Reach-In Case without Anti-Sweat Heater Controls
Auto Off Time Switch	Interior Lighting	Auto-Off Time Switch on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Automatic Door Closer for Walk-in Coolers and Freezers	Refrigeration	One Medium Temperature Walk-In Refrigerator Door with Auto-Closer	One Medium Temperature Walk-In Refrigerator Door without Auto-Closer
Beverage Vending Machine Controls	Refrigeration	One non-ENERGY STAR beverage vending machine equipped with infrared occupancy sensing controls	One non-ENERGY STAR beverage vending machine, no controls
Bi-Level Lighting Control (Exterior)	Exterior Lighting	Bi-Level Controls on Exterior Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Bi-Level Lighting Control (Interior)	Interior Lighting	Bi-Level Controls on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Ceiling Insulation (R19 to R38)	Space Cooling, Space Heating	Blown-in insulation in ceiling cavity/attic	Market Average Existing Ceiling Insulation in older steep slope, residential style commercial building
Ceiling Insulation (R19 to R49)	Space Cooling, Space Heating	Blown-in insulation in ceiling cavity/attic - Beyond Code	Market Average Existing Ceiling Insulation in older steep slope, residential style commercial building
Ceiling Insulation (R2 to R38)	Space Cooling, Space Heating	Blown-in insulation in ceiling cavity/attic	Market Average Existing Ceiling Insulation in older steep slope, residential style commercial building
Ceiling Insulation (R2 to R49)	Space Cooling, Space Heating	Blown-in insulation in ceiling cavity/attic - Beyond Code	Market Average Existing Ceiling Insulation in older steep slope, residential style commercial building
Chilled Water Reset	Space Cooling	One Chiller with Reset of Chilled Water Temperature Setpoint	One Chiller with Fixed Chilled Water Temperature

Measure	End-Use	Description	Baseline
Chiller maintenance	Space Cooling	O&M improvements to restore chiller performance	
CO Sensors for Parking Garage Exhaust	Miscellaneous	Enclosed Parking Garage Exhaust with CO Control	Constant Volume Enclosed Parking Garage Exhaust
Commercial Duct Sealing	Space Cooling, Space Heating	Standard Electric Heating and Central AC with Improved Duct Sealing	Standard Electric Heating and Central AC, Standard Duct Sealing
Commercial Strategic Energy Management	Whole Building	Commercial Strategic Energy Management	No active energy management
Custom measure - Non-lighting	Space Cooling, Space Heating	Custom Improvement to Facility's Operations	Baseline Technology/Process
Data Center Hot Cold Aisle	Office Equipment	Equipment configuration that saves HVAC	No hot, cold aisle containment
Dedicated Outside Air System (DOAS)	Space Cooling, Space Heating	Install Dedicated Outside Air System (DOAS)	Typical HVAC by Building Type
Demand Controlled Circulating Systems	Domestic Hot Water	Recirculation Pump with Demand Control Mechanism	Uncontrolled Recirculation Pump
Demand Controlled Ventilation	Ventilation and Circulation	Return Air System with CO2 Sensors	Standard Return Air System, No Sensors
Demand Defrost	Refrigeration	Walk-In Freezer System with Demand-Controlled Electric Defrost Cycle	Walk-In Freezer System with Timer-Controlled Electric Defrost Cycle
Destratification Fans	Space Heating	Destratification Fans improve temperature distribution by circulating warmer air from the ceiling back down to the floor level	No destratification fan
Door Gasket (Cooler)	Refrigeration	New Door Gasket on One-Door Medium Temperature Reach-In Case	Worn or Damaged Door Gasket on One-Door Medium Temperature Reach-In Case
Door Gasket (Freezer)	Refrigeration	New Door Gasket on One-Door Medium Temperature Reach-In Case	Worn or Damaged Door Gasket on One-Door Medium Temperature Reach-In Case
Drain water heat recovery	Domestic Hot Water	Hot Water Loop with 50 Gallon Electric Resistance Heater and Drain Water Heat Exchanger	Standard Hot Water Loop with 50 Gallon Electric Resistance Heater, No Drain Water Heat Recovery
Dual Enthalpy Economizer	Ventilation and Circulation	Standard HVAC Unit with an economizer and dual enthalpy differential control	HVAC unit with no economizer or with a non-functional disabled economizer
Duct Insulation	Space Cooling, Space Heating	Standard Electric Heating and Central AC with Insulated Ductwork (R-8)	Standard Electric Heating and Central AC with Uninsulated Ductwork (R-4)
Ductless Mini-Split AC	Space Cooling	Ductless Mini-Split AC, 4 Ton, 16 SEER	Code-Compliant AC Unit, 4 Ton, 15 SEER

Measure	End-Use	Description	Baseline
Ductless Mini-Split HP	Space Cooling, Space Heating	Ductless Mini-Split HP, 17 SEER, 9.5 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF
DX Coil Cleaning	Space Cooling	DX Coil Cleaning	DX Coil Not Cleaned
ECM Motors on Furnaces	Space Heating	Variable Speed Electronically Commutated Motor for an Electric Furnace	Permanent Split Capacitor Motor for Electric Furnace
Efficient Battery Charger	Miscellaneous	Efficient Battery Charger	FR or SCR charging stations with power conversion efficiency < 89% or > 10 W
Efficient Exhaust Hood	Cooking	Kitchen ventilation with automatically adjusting fan controls	Kitchen ventilation with constant speed ventilation motor
Efficient Motor Belts	Miscellaneous	Synchronous belt, 98% efficiency	Standard V-belt drive
Efficient New Construction Lighting	Interior Lighting	Efficient New Construction Lighting, 15% Better than Code	New Construction with Lighting Power Density meeting Code Minimum
Energy Recovery Ventilation System (ERV)	Space Cooling	Unitary Cooling Equipment that Incorporates Energy Recovery	Current Market Packaged or Split DX Unit
Energy Star Combination Oven	Cooking	Energy Star Combination Oven meeting ENERGY STAR Version 3.0 Standards	One Standard Economy-Grade 10-Pan Combination Oven
Energy Star Commercial Clothes Washer	Miscellaneous	One Commercial Clothes Washer meeting current ENERGY STAR Version 8.1 Standards	One Commercial Clothes Washer meeting Federal Standard
Energy Star Commercial Dishwasher	Domestic Hot Water	One Commercial Dishwasher meeting ENERGY STAR Version 3.0 Standards	One Dishwasher meeting Federal Standard
Energy Star Commercial Glass Door Freezer	Refrigeration	One Glass Door Freezer meeting ENERGY STAR Version 5.0 Standards	One Glass Door Freezer meeting Federal Standards
Energy Star Commercial Glass Door Refrigerator	Refrigeration	One Glass Door Refrigerator meeting ENERGY STAR Version 5.0 Standards	One Glass Door Refrigerator meeting Federal Standards
Energy Star Commercial Solid Door Freezer	Refrigeration	One Solid Door Freezer meeting ENERGY STAR Version 5.0 Standards	One Solid Door Freezer meeting Federal Standards
Energy Star Commercial Solid Door Refrigerator	Refrigeration	One Solid Door Refrigerator meeting ENERGY STAR Version 5.0 Standards	One Solid Door Refrigerator meeting Federal Standards
Energy Star convection oven	Cooking	Energy Star convection oven meeting ENERGY STAR Version 3.0 Standards	One Standard Economy-Grade Full-Size Convection Oven
Energy Star EV Chargers	Miscellaneous	Level 2 Electric Vehicle Supply Equipment (EVSE)	Level 1 Electric Vehicle Supply Equipment (EVSE)

Measure	End-Use	Description	Baseline
Energy Star Fryer	Cooking	One Standard Vat Electric Fryer meeting ENERGY STAR Version 3.0 Standards	One Standard Economy-Grade Standard Vat Electric Fryer
Energy Star Griddle	Cooking	One Griddle meeting current ENERGY STAR Version 1.2 Standards	One Conventional Griddle
Energy Star Hot Food Holding Cabinet	Cooking	One Hot Food Holding Cabinet meeting current ENERGY STAR Version 2.0 Standards	One Standard Hot Food Holding Cabinet
Energy Star Ice Maker	Refrigeration	One Continuous Self-Contained Ice Maker meeting ENERGY STAR Version 3.0 Standards	One Continuous Self-Contained Ice Maker meeting Federal Standard
ENERGY STAR Imaging Equipment	Office Equipment	One imaging device meeting current ENERGY STAR Standards	One non-ENERGY STAR imaging device
Energy Star LED Directional Lamp	Interior Lighting	Energy Star 7.6W Directional LED lamp	50W Incandescent lamp
Energy Star Monitors	Office Equipment	One Monitor meeting ENERGY STAR 8.0 Standards	One Standard Monitor
Energy Star PCs	Office Equipment	One Personal Computer (desktop or laptop) meeting current ENERGY STAR® Standards	One non-ENERGY STAR® Personal Computer
Energy Star room AC	Space Cooling	Room AC meeting current ENERGY STAR standards	Code-Compliant Room AC, 1 Ton, 10.9 CEER
Energy Star Servers	Office Equipment	One Server meeting ENERGY STAR 2.0 Standards	One Standard Server
Energy Star Steamer	Cooking	One 4-Pan Electric Steamer meeting ENERGY STAR® 2.0 Standards	One Standard Economy-Grade 4-Pan Steamer
Energy Star Uninterruptable Power Supply	Office Equipment	Standard Desktop Plugged into Energy Star Uninterruptable Power Supply at 25% Load	Standard Desktop Plugged into Average Rotary Uninterruptable Power Supply at 25% Load
Energy Star Vending Machine	Refrigeration	One Refrigerated Vending Machine meeting ENERGY STAR Version 4.0 Standards	One Refrigerated Vending Machine meeting ENERGY STAR® 1.0 Standards
ENERGY STAR Water Cooler	Miscellaneous	One Storage Type Hot/Cold Water Cooler Unit meeting ENERGY STAR Version 3.0 Standards	One Standard Storage Type Hot/Cold Water Cooler Unit
Energy Star windows	Space Cooling, Space Heating	100ft2 of Window meeting Energy Star Version 6.0 Requirements (U-Value: 0.27, SHGC: 0.21)	100ft2 of Window meeting Energy Star Version 5.0 Requirements (U-Value: 0.3, SHGC: 0.3)

Measure	End-Use	Description	Baseline
Engine Block Timer	Miscellaneous	Plug-in timer that activates engine block timer to reduce unnecessary run time	Engine block heater (typically used for backup generators) running continuously
Escalator Motor Efficiency Controller	Miscellaneous	Install Escalator Motor Efficiency Controller	Escalator without Motor Efficiency Controller
Facility Commissioning	Space Cooling, Space Heating, Ventilation and Circulation	Perform facility commissioning to optimize building operations in new facilities	Standard new construction facility with no commissioning
Facility Energy Management System	Space Cooling, Space Heating, Ventilation and Circulation	Typical HVAC by Building Type Controlled by Energy Management System	Standard/manual facility equipment controls
Faucet Aerator	Domestic Hot Water	Low-flow lavatory faucet aerator, flow rate: 1.0 gpm	Federal lavatory flow rate standard, 1994, flow rate: 2.2 gpm
Floating Head Pressure Controls	Refrigeration	Medium-Temperature Refrigeration System with 5HP Compressor and Adjustable Condenser Head Pressure Control Valve	Medium-Temperature Refrigeration System with 5 HP Compressor without Adjustable Condenser Head Pressure Control Valve
Floor Insulation	Space Cooling, Space Heating	Increased Floor Insulation (R-19)	Market Average Existing Floor Insulation
Geothermal Heat Pump	Space Cooling, Space Heating	Geothermal Heat Pump	Code-Compliant Air Source Heat Pump
Green roof	Space Cooling, Space Heating	Vegetated Roof Surface on top of Standard Roof	Standard Black Roof
HE Air Cooled Chiller - All Compressor Types - 100 Tons	Space Cooling	HE Air Cooled Chiller - Air Compressor Types - 100 Tons	Code-Compliant Air Cooled Positive Displacement Chiller, 100 Tons
HE DX 11.25-20.0 Tons Elec Heat	Space Cooling, Space Heating	High Efficiency Packaged or Split DX Unit, 15 Tons, 11.5 SEER	Code-Compliant Packaged or Split DX Unit, 15 Tons, 11 SEER
HE DX 11.25-20.0 Tons Other Heat	Space Cooling	High Efficiency Packaged or Split DX Unit, 15 Tons, 11.5 SEER	Code-Compliant Packaged or Split DX Unit, 15 Tons, 11 SEER
HE DX 5.4-11.25 Tons Elect Heat	Space Cooling, Space Heating	High Efficiency Packaged or Split DX Unit, 7.5 Tons, 12 SEER	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11 SEER
HE DX 5.4-11.25 Tons Other Heat	Space Cooling	High Efficiency Packaged or Split DX Unit, 7.5 Tons, 12 SEER	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11 SEER
HE DX Less than 5.4 Tons Elect Heat	Space Cooling, Space Heating	High Efficiency Packaged or Split DX Unit, 5 Tons, 14.5 SEER	Code-Compliant Packaged or Split DX Unit, 5 Tons, 13 SEER

Measure	End-Use	Description	Baseline
HE DX Less than 5.4 Tons Other Heat	Space Cooling	High Efficiency Packaged or Split DX Unit, 5 Tons, 14.5 SEER	Code-Compliant Packaged or Split DX Unit, 5 Tons, 13 SEER
HE Water Cooled Chiller - Centrifugal Compressor - 200 Tons	Space Cooling	Water Cooled Centrifugal Chiller with Integral VFD, 200 Tons	Code-Compliant Water Cooled Centrifugal Chiller, 200 Tons
HE Water Cooled Chiller - Centrifugal Compressor - 500 Tons	Space Cooling	Water Cooled Centrifugal Chiller with Integral VFD, 500 Tons	Code-Compliant Water Cooled Centrifugal Chiller, 500 Tons
HE Water Cooled Chiller - Rotary or Screw Compressor - 175 Tons	Space Cooling	Water Cooled Positive Displacement Chiller with Integral VFD, 175 Tons	Code-Compliant Water Cooled Positive Displacement Chiller, 175 Tons
HE Water Cooled Chiller - Rotary or Screw Compressor - 50 Tons	Space Cooling	Water Cooled Positive Displacement Chiller with Integral VFD, 50 Tons	Code-Compliant Water Cooled Positive Displacement Chiller, 50 Tons
Heat Pump Pool Heater Commercial	Miscellaneous	High Efficiency Pool Heater Eff. $\geq 84\%$	Standard Efficiency Pool Heater 78% Eff.
Heat Pump Water Heater	Domestic Hot Water	Efficient 50 Gallon Electric Heat Pump Water Heater	Code-Compliant 50 Gallon Electric Heat Pump Water Heater
High Efficiency Air Compressor	Miscellaneous	20 HP VFD Air Compressor	20 HP Inlet Modulation Fixed-Speed Compressor
High Efficiency Data Center Cooling	Space Cooling	High Efficiency CRAC (computer room air conditioner)	Standard Efficiency CRAC
High Efficiency PTAC	Space Cooling	High Efficiency PTAC	Code-Compliant PTAC
High Efficiency PTHP	Space Cooling, Space Heating	High Efficiency PTHP	Code-Compliant PTHP
High Efficiency Refrigeration Compressor_Discus	Refrigeration	High Efficiency Refrigeration Compressors	Standard Compressor
High Efficiency Refrigeration Compressor_Scroll	Refrigeration	High Efficiency Refrigeration Compressors	Standard Compressor
High Speed Fans	Ventilation and Circulation	High Speed Fan, 24" - 35" Blade Diameter	Standard Speed Fan, 24" - 35" Blade Diameter
Hot water pipe insulation	Domestic Hot Water	1' of Insulated Pipe in Unconditioned Spaces, Insulation of R-4	1' of Pipe in Unconditioned Spaces with Code Minimum of 1" of Insulation
Hotel Card Energy Control Systems	Space Cooling, Space Heating	Guest Room HVAC Unit Controlled by Hotel-Key-Card Activated Energy Control System	Guest Room HVAC Unit, Manually Controlled by Guest

Measure	End-Use	Description	Baseline
Indoor daylight sensor	Interior Lighting	Install Indoor Daylight Sensors, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Induction Cooktops	Cooking	Efficient Induction Cooktop	One Standard Electric Cooktop
Infiltration Reduction - Air Sealing	Space Cooling, Space Heating	Reduced leakage through caulking, weather-stripping	Standard Heating and Cooling System with Moderate Infiltration
Instantaneous Hot Water System Commercial	Domestic Hot Water	Instantaneous Hot Water System	Code-Compliant Electric Storage Water Heater
LED - 14W_CFL Baseline	Interior Lighting	LED (assume 14W) replacing CFL	100W equivalent CFL
LED - 9W Flood_CFL Baseline	Exterior Lighting	LED (assume 9W) replacing CFL	14W CFL
LED Canopy Lighting (Exterior)	Exterior Lighting	One 67.2W LED Canopy Light	Average Lumen Equivalent Exterior Incandescent Area Lighting
LED Display Lighting (Exterior)	Exterior Lighting	One Letter of LED Signage, < 2ft in Height	One Letter of Neon or Argon-mercury Signage, < 2ft in Height
LED Display Lighting (Interior)	Interior Lighting	One Letter of LED Signage, < 2ft in Height	One Letter of Neon or Argon-mercury Signage, < 2ft in Height
LED Exit Sign	Interior Lighting	One 5W Single-Sided LED Exit Sign	One 9W Single-Sided CFL Exit Sign
LED Exterior Wall Packs	Exterior Lighting	One 35W LED Wall Pack	Average Lumen Equivalent Exterior Incandescent Area Lighting
LED High Bay_HID Baseline	Interior Lighting	One 140W High Bay LED Fixture	Lumen-Equivalent HID High Bay Fixture
LED High Bay_LF Baseline	Interior Lighting	One 140W High Bay LED Fixture	Lumen-Equivalent Linear Fluorescent High Bay Fixture
LED Linear - Fixture Replacement	Interior Lighting	2x4 LED Troffer	Lumen-Equivalent 32-Watt T8 Lamp
LED Linear - Lamp Replacement	Interior Lighting	Linear LED (16W)	Lumen-Equivalent 32-Watt T8 Lamp
LED Parking Lighting	Exterior Lighting	One 160W LED Area Light	Average Lumen Equivalent Exterior HID Area Lighting
LEED New Construction Whole Building	Space Cooling, Space Heating	LEED New Construction Whole Building	Comparable facility, code-compliance construction
Light Tube	Interior Lighting	One 14" Light Tube, Delivering light to 250 S.F. of Commercial Space	250 S.F. of Commercial Space Lit by Typical Lighting Strategies

Measure	End-Use	Description	Baseline
Low Flow Shower Head	Domestic Hot Water	Low-Flow Handheld Showerhead, Flow Rate: 1.50 gpm	Standard Handheld Showerhead, Flow Rate: 2.50 gpm
Low-Flow Pre-Rinse Sprayers	Domestic Hot Water	Low-Flow Pre-Rinse Sprayer with Flow Rate of 1.6 gpm	Pre-Rinse Sprayer with Federal Standard Flow Rate of 2.25 gpm
Network PC Power Management	Office Equipment	One computer and monitor attached to centralized energy management system that controls when desktop computers and monitors plugged into a n	One computer and monitor, manually controlled
Networked Lighting Controls	Interior Lighting	Install Networked Lighting Controls System on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Controlled either Manually or by Sensor as Specified by Code
Night Covers for Display Cases	Refrigeration	One Open Vertical Case with Night Covers	One Existing Open Vertical Case, No Night Covers
Occupancy Sensors, Ceiling Mounted	Interior Lighting	Ceiling Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Occupancy Sensors, Switch Mounted	Interior Lighting	Switch Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor Lighting Controls	Exterior Lighting	Install Exterior Photocell Dimming Controls, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor motion sensor	Exterior Lighting	Install Exterior Motion Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Ozone Laundry Commercial	Miscellaneous	Add a new ozone laundry system onto a commercial clothes washer	One commercial clothes washer without ozone laundry system
Programmable thermostat	Space Cooling, Space Heating	Pre-set programmable thermostat that replaces manual thermostat	Standard Heating and Cooling System with Manual Thermostat
PSC to ECM Evaporator Fan Motor (Reach-In)	Refrigeration	Medium Temperature Reach-In Case with equivalent size Electronically Commutated Evaporator Fan Motor	Medium Temperature Reach-In Case with Permanent Split Capacitor Evaporator Fan Motor
PSC to ECM Evaporator Fan Motor (Walk-In, Refrigerator)	Refrigeration	Medium Temperature Walk-In Case with Electronically Commutated Evaporator Fan Motor	Medium Temperature Walk-In Case with Permanent Split Capacitor Evaporator Fan Motor

Measure	End-Use	Description	Baseline
Q-Sync Evaporator Fan Motor	Refrigeration	Medium Temperature Reach-In Case with equivalent size Q-Sync Evaporator Fan Motor	Medium Temperature Reach-In Case with 20W Permanent Split Capacitor Fan Motor
Reflective Roof Treatment	Space Cooling	Reflective Roof Treatment	Standard Black Roof
Refrigerated Display Case LED Lighting	Refrigeration	60" Refrigerated Case LED Strip	Lumen-Equivalent 32-Watt T8 Fixture
Refrigerated Display Case Lighting Controls	Refrigeration	Occupancy Sensors for Refrigerated Case Lighting to reduce run time	Market-Share Weighted Existing Linear Fluorescent Fixture
Refrigeration Commissioning	Refrigeration	Commissioned Refrigeration System	Non-Commissioned Refrigeration System
Refrigeration Economizer	Refrigeration	Walk-in refrigerator with economizer	Walk-in refrigerator without economizer
Regenerative Drive Elevator Motor	Miscellaneous	Regenerative drive produced energy when motor in overhaul condition	Standard motor
Retro-Commissioning (Existing Construction)	Space Cooling, Space Heating, Ventilation and Circulation	Perform facility retro-commissioning, including assessment, process improvements, and optimization of energy-consuming equipment and systems	
Retro-Commissioning (Existing Construction)_VT	Ventilation and Circulation	Perform facility retro-commissioning, including assessment, process improvements, and optimization of energy-consuming equipment and systems	
Roof Insulation	Space Cooling, Space Heating	Roof Insulation (built-up roof applicable to flat/low slope roofs)	Code-Compliant Flat Roof
Server Virtualization	Office Equipment	2 Virtual Host Server	20 Single Application Servers
Smart Strip Plug Outlet	Office Equipment	One Smart Strip Plug Outlet	One Standard plug strip/outlet
Smart thermostat	Space Cooling, Space Heating	Thermostats that include "smart" features such as occupancy sensors, geo-fencing, multi-zone sensors	Standard Heating and Cooling System with Manual Thermostat
Solar Pool Heater Commercial	Miscellaneous	Solar Swimming Pool Heater	Electric Resistance Swimming Pool Heater
Solar Powered Pool Pump	Miscellaneous	Solar Powered Pool Pump Motor	Variable Speed Pool Pump Motor

Measure	End-Use	Description	Baseline
Solar Thermal Water Heating System Commercial	Domestic Hot Water	Solar Thermal System with Electric Backup	Code-Compliant 50 Gallon Electric Resistance Water Heater
Strip Curtains - Freezers	Refrigeration	Walk-in freezer with strip curtains at least 0.06 inches thick covering the entire area of the doorway	Walk-in freezer without strip curtains
Strip Curtains - Refrigerators	Refrigeration	Walk-in cooler with strip curtains at least 0.06 inches thick covering the entire area of the doorway	Walk-in cooler without strip curtains
Suction Pipe Insulation - Freezers	Refrigeration	Suction Pipe Insulation - Freezers	Uninsulated freezer suction lines
Suction Pipe Insulation - Refrigerators	Refrigeration	Suction Pipe Insulation - Refrigerators	Uninsulated refrigeration suction lines
Thermal Energy Storage	Space Cooling	Deploy thermal energy storage technology (ice harvester, etc.) to shift load	Code compliant chiller
Thermostatic Shower Restriction Valve Commercial	Domestic Hot Water	Hot Water Loop with 50 Gallon Electric Resistance Heater and Pressure Balance Shower Valves	Standard Hot Water Loop with 50 Gallon Electric Resistance Heater and Standard Shower Valves
Time Clock Control	Interior Lighting	Time Clock Controlled Lighting, 500 Watts Controlled	500 Watts of Lighting, Controlled either Manually or by Sensor as Specified by Code
Variable Refrigerant Flow (VRF) HVAC Systems	Space Cooling, Space Heating	Variable Refrigerant Flow (VRF) HVAC Systems	Code-Compliant PTHP
VAV System	Ventilation and Circulation	Variable Air Volume Distribution System	Constant Air Volume Distribution System
VFD on Cooling Tower Fans	Space Cooling	Cooling Tower Fans with VFD Control	Cooling Tower Fans without VFD Control
VFD on HVAC Pump	Space Cooling, Space Heating	VFD on HVAC Pump	7.5 HP HVAC Pump Motor, no VFD Control
VSD Controlled Compressor	Refrigeration	Refrigeration System with VSD Control	Refrigeration System with Standard Slide-Valve Control System
Wall Insulation	Space Cooling, Space Heating	Increased Exterior Above-Grade Wall Insulation	Market Average Existing Exterior Above-Grade Wall Insulation
Warehouse Loading Dock Seals	Space Cooling, Space Heating	Seals to reduce infiltration losses at loading dock	Loading dock with no seals
Water Cooled Refrigeration Heat Recovery	Domestic Hot Water	The heat reclaim system transfers waste heat from	No heat recovery

Measure	End-Use	Description	Baseline
		refrigeration system to space heating or hot water	
Water Heater Setback	Domestic Hot Water	A 50 gallon electric hot water tank with a thermostat setting reduced to no lower than 120 degrees.	A 50 gallon electric hot water tank with a thermostat setting that is higher than 120 degrees, typically hot water tanks with settings of 130 degrees or higher.
Water source heat pump	Space Cooling, Space Heating	Water Source Heat Pump, 2.5 Tons, 17.4 EER, 4.4 COP	Code-Compliant ASHP
Waterside Economizer	Space Cooling	Waterside Economizer	No economizer
Window shade film	Space Cooling	Window Film with SHGC of 0.35 Applied to Standard Window	Standard Window with below Code Required Minimum SHGC
Zero Energy Doors	Refrigeration	Install zero energy doors for a reach-in refrigerated cooler or freezer	Standard vertical reach-in refrigerated cooler or freezer with anti-sweat heaters on the glass surface of the doors

Table 14: Industrial EE Measures

Measure	End-Use	Description	Baseline
1.5HP Open Drip-Proof (ODP) Motor	Motors Pumps	High Efficiency 1.5 HP Open-Drip Proof Motor	1.5HP Open-Drip Proof Motor with Current Minimum EPACK Efficiency
10HP Open Drip-Proof (ODP) Motor	Motors Pumps	High Efficiency 10 HP Open-Drip Proof Motor	10HP Open-Drip Proof Motor with Current Minimum EPACK Efficiency
20HP Open Drip-Proof (ODP) Motor	Motors Pumps	High Efficiency 20 HP Open-Drip Proof Motor	20HP Open-Drip Proof Motor with Current Minimum EPACK Efficiency
3-phase High Frequency Battery Charger - 1 shift	Other	3-phase High Frequency Battery Charger	Standard Charger
Advanced Rooftop Controller	HVAC	Advanced Rooftop Controller	Without Advanced Rooftop Controller
Air Compressor Optimization	Compressed Air	Performing Routine Maintenance on 20HP Inlet Modulation Fixed-Speed Compressor	20 HP Inlet Modulation Fixed-Speed Compressor
Air curtains	HVAC	Air Curtain across door opening	Door opening with no air curtain
Airside economizer	HVAC	Airside Economizer	No economizer

Measure	End-Use	Description	Baseline
Auto Closer on Refrigerator Door	Process Cooling	One Medium Temperature Walk-In Refrigerator Door with Auto-Closer	One Medium Temperature Walk-In Refrigerator Door without Auto-Closer
Auto Off Time Switch	Interior Lighting High Bay	Auto-Off Time Switch on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Bi-Level Lighting Control (Exterior)	Exterior Lighting Industrial	Install Exterior Bi-Level Lighting Control, 500 Watts Controlled	500 Watts of Lighting, No Dim Setting
Bi-Level Lighting Control (Interior)	Interior Lighting High Bay	Bi-Level Controls on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, No Dim Setting
Chilled Water Reset	HVAC	One Chiller with Reset of Chilled Water Temperature Setpoint	One Chiller with Fixed Chilled Water Temperature
Cogged Belt on 15hp ODP Motor	Motors Pumps	15HP ODP Motor with Cogged Belts Installed on Supply and/or Return Air Fans	15HP ODP Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Cogged Belt on 40hp ODP Motor	Motors Pumps	40HP ODP Motor with Cogged Belts Installed on Supply and/or Return Air Fans	40HP ODP Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Compressed Air Desiccant Dryer	Process Specific	heated regenerative desiccant dryer without dew point demand controls	heatless regenerative desiccant dryer without dew point demand controls
Compressed Air No-Loss Condensate Drains	Process Specific	Install no-loss condensate drains	Install standard condensate drains
Compressed Air Storage Tank	Compressed Air	20 HP Inlet Modulation Fixed-Speed Compressor with Receiver Tank	20 HP Inlet Modulation Fixed-Speed Compressor, No Receiver Tank
Custom Measure - Non-Lighting	HVAC	Custom Improvement to Facility's Operations	Baseline Technology/Process
Dairy Refrigeration Heat Recovery	Other	refrigeration equipment with refrigeration heat recovery tank installed	existing dairy farm with refrigeration equipment and a water heater unit without an RHR unit
Dedicated Outside Air System (DOAS)	HVAC	Install Dedicated Outside Air System (DOAS)	Typical HVAC by Building Type
Demand Controlled Ventilation	HVAC	Return Air System with CO2 Sensors	Standard Return Air System, No Sensors
Demand Defrost	Process Cooling	Walk-In Freezer System with Demand-Controlled Electric Defrost Cycle	Walk-In Freezer System with Timer-Controlled Electric Defrost Cycle

Measure	End-Use	Description	Baseline
Dew Point Sensor Control for Dessicant CA Dryer	Compressed Air	1000 CFM Heated Desiccant Air Dryer with Dew Point Controls	1000 CFM Modulating Heated Desiccant Air Dryer
Drip Irrigation Nozzles	Other	Flow Control Nozzles	Standard Irrigation Nozzles
Dual Enthalpy Economizer	Process Cooling	Standard HVAC Unit with an economizer and dual enthalpy differential control	HVAC unit with no economizer or with a non-functional disabled economizer
DX Coil Cleaning	HVAC	DX Coil Cleaning	DX Coil Not Cleaned
Efficient Compressed Air Nozzles	Compressed Air	1/4" Engineered Air Nozzle	1/4" Open-End Air Nozzle
Efficient New Construction Lighting	Interior Lighting High Bay	Efficient New Construction Lighting, 15% Better than Code	New Construction with Lighting Power Density meeting Code Minimum
Electric Actuators	Other	Electric Actuator	Pneumatic Actuator
Energy Efficient Laboratory Fume Hood	HVAC	Variable Air Volume High Performance Fume Hood	Constant Volume Conventional Bypass Fume Hood
Energy Efficient Transformers	Other	Energy Efficient Dry Type Transformer (CSL-3)	Standard Transformer (TP-1)
Energy Recovery Ventilation System	HVAC	Unitary Cooling Equipment that Incorporates Energy Recovery	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11.2 EER
Energy Star LED Directional Lamp	Interior Lighting Other	Energy Star 7.6W Directional LED lamp	50W Incandescent lamp
Energy Star room ac	HVAC	Room AC meeting current ENERGY STAR standards	Code-Compliant Room AC
Energy Star windows	HVAC	100ft2 of Window meeting Energy Star Version 6.0 Requirements (U-Value: 0.27, SHGC: 0.21)	100ft2 of Window meeting Energy Star Version 5.0 Requirements (U-Value: 0.3, SHGC: 0.3)
Engine Block Timer	Other	An engine block heater operated by an outdoor plug-in timer	An engine block heater that is manually plugged in
Facility Commissioning	HVAC	Perform facility commissioning	Comparable facility, no commissioning
Facility Energy Management System	HVAC	Typical HVAC by Building Type Controlled by Energy Management System	Typical HVAC by Building Type, Manually Controlled
Fan Thermostat Controller	HVAC	Typical HVAC by Building Type with Fan Thermostat Controller Installed	Typical HVAC by Building Type with Programmable Thermostat

Measure	End-Use	Description	Baseline
Floating Head Pressure Controller	Process Cooling	Medium-Temperature Refrigeration System with 5HP Compressor and Adjustable Condenser Head Pressure Control Valve	Medium-Temperature Refrigeration System with 5 HP Compressor without Adjustable Condenser Head Pressure Control Valve
Grain Bin Aeration Control System	Process Specific	Grain Storage Fan System with Automatic Controls	Grain Storage Fan System with Manual Controls
HE Air Cooled Chiller - All Compressor Types - 100 Tons	HVAC	HE Air Cooled Chiller - All Compressor Types - 100 Tons	Code-Compliant Air Cooled Positive Displacement Chiller, 100 Tons
HE Air Cooled Chiller - All Compressor Types - 300 Tons	HVAC	Air Cooled Positive Displacement Chiller with Integral VFD, 300 Tons, 13.7 EER	Code-Compliant Air Cooled Positive Displacement Chiller, 300 Tons, 12.5 EER
HE DX 11.25-20.0 Tons Elec Heat	HVAC	High Efficiency Packaged or Split DX Unit, 15 Tons, 11.5 SEER	Code-Compliant Packaged or Split DX Unit, 15 Tons, 11 SEER
HE DX 11.25-20.0 Tons Other Heat	HVAC	High Efficiency Packaged or Split DX Unit, 15 Tons, 11.5 SEER	Code-Compliant Packaged or Split DX Unit, 15 Tons, 11 SEER
HE DX 5.4-11.25 Tons Elect Heat	HVAC	High Efficiency Packaged or Split DX Unit, 7.5 Tons, 12 SEER	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11 SEER
HE DX 5.4-11.25 Tons Other Heat	HVAC	High Efficiency Packaged or Split DX Unit, 7.5 Tons, 12 SEER	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11 SEER
HE DX Less than 5.4 Tons Elect Heat	HVAC	High Efficiency Packaged or Split DX Unit, 5 Tons, 14.5 SEER	Code-Compliant Packaged or Split DX Unit, 5 Tons, 13 SEER
HE DX Less than 5.4 Tons Other Heat	HVAC	High Efficiency Packaged or Split DX Unit, 5 Tons, 14.5 SEER	Code-Compliant Packaged or Split DX Unit, 5 Tons, 13 SEER
HE Water Cooled Chiller - Centrifugal Compressor - 200 Tons	HVAC	Water Cooled Centrifugal Chiller with Integral VFD, 200 Tons	Code-Compliant Water Cooled Centrifugal Chiller, 200 Tons
HE Water Cooled Chiller - Centrifugal Compressor - 500 Tons	HVAC	Water Cooled Centrifugal Chiller with Integral VFD, 500 Tons	Code-Compliant Water Cooled Centrifugal Chiller, 500 Tons
HE Water Cooled Chiller - Rotary or Screw Compressor - 175 Tons	HVAC	Water Cooled Positive Displacement Chiller with Integral VFD, 175 Tons	Code-Compliant Water Cooled Positive Displacement Chiller, 175 Tons

Measure	End-Use	Description	Baseline
HE Water Cooled Chiller - Rotary or Screw Compressor - 50 Tons	HVAC	Water Cooled Positive Displacement Chiller with Integral VFD, 50 Tons	Code-Compliant Water Cooled Positive Displacement Chiller, 50 Tons
High Bay Occupancy Sensors, Ceiling Mounted	Interior Lighting High Bay	Ceiling Mounted Occupancy Sensor, 800 Watts Controlled	800 Watts of Lighting, Manually Controlled
High Efficiency Air Compressor	Compressed Air	20 HP VFD Air Compressor	20 HP Inlet Modulation Fixed-Speed Compressor
High Efficiency Refrigeration Compressor - Discus	Process Cooling	High Efficiency Refrigeration Compressors	Standard Compressor
High Efficiency Refrigeration Compressor - Scroll	Process Cooling	High Efficiency Refrigeration Compressors	Standard Compressor
High Efficiency Welder	Process Specific	High Efficiency Welder	Standard Welding Practices
High Speed Fans	HVAC	High Speed Fan, 24" - 35" Blade Diameter	Standard Speed Fan, 24" - 35" Blade Diameter
High Volume Low Speed Fan (HVLS)	Motors Fans Blowers	20' High Volume Low Speed Fan	Conventional Circulating Fan
Indoor Agriculture - LED Grow Lights	Interior Lighting High Bay	LED grow light	1000W High Pressure Sodium
Indoor daylight sensor	Interior Lighting High Bay	Install Indoor Daylight Sensors, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Industrial Duct Sealing	HVAC	Standard Electric Heating and Central AC with Improved Duct Sealing	Standard Electric Heating and Central AC, Standard Duct Sealing
Injection Mold and Extruder Barrel Wraps	Other	2' Diameter, 20' Long Machine Barrel with 1" Insulation	2' Diameter, 20' Long Machine Barrel with no Insulation
Insulated Pellet Dryer Tanks and Ducts	Process Heating	Insulation for Pellet Tank and Duct	Uninsulated Pellet Tank and Duct
LED - 14W_CFL Baseline	Interior Lighting Other	LED (assume 14W) replacing CFL	100W equivalent CFL
LED Canopy Lighting (Exterior)	Exterior Lighting Industrial	One 67.2W LED Canopy Light	Average Lumen Equivalent Exterior Incandescent Area Lighting
LED Display Lighting (Exterior)	Exterior Lighting Industrial	One Letter of LED Signage, < 2ft in Height	One Letter of Neon or Argon-mercury Signage, < 2ft in Height

Measure	End-Use	Description	Baseline
LED Display Lighting (Interior)	Interior Lighting Other	One Letter of LED Signage, < 2ft in Height	One Letter of Neon or Argon-mercury Signage, < 2ft in Height
LED exit sign	Interior Lighting Other	One 5W Single-Sided LED Exit Sign	One 9W Single-Sided CFL Exit Sign
LED Exterior Wall Packs	Exterior Lighting Industrial	One 35W LED Wall Pack	Average Lumen Equivalent Exterior Incandescent Area Lighting
LED High Bay_HID Baseline	Interior Lighting High Bay	One 140W High Bay LED Fixture	Lumen-Equivalent HID High Bay Fixture
LED High Bay_LF Baseline	Interior Lighting High Bay	One 140W High Bay LED Fixture	Lumen-Equivalent Linear Fluorescent High Bay Fixture
LED Linear - Fixture Replacement	Interior Lighting Linear Fluorescent	2x4 LED Troffer Fixture	Lumen-Equivalent 32-Watt T8 Fixture
LED Linear - Lamp Replacement	Interior Lighting Linear Fluorescent	Linear LED	Lumen-Equivalent 32-Watt T8 Lamp
LED Parking Lighting	Exterior Lighting Industrial	One 160W LED Area Light	Average Lumen Equivalent Exterior HID Area Lighting
LEED New Construction Whole Building	HVAC	LEED Qualifying New Construction	Comparable facility, code-compliance construction
Light Tube	Interior Lighting Other	One 14" Light Tube, Delivering light to 250 S.F. of Industrial Space	250 S.F. of Industrial Space Lit by Typical Lighting Strategies
Low Energy Livestock Waterer	Motors Pumps	Install Thermostatically Controlled Livestock Watering System	Standard Livestock Watering System
Low Pressure Sprinkler Nozzles	Motors Pumps	Low Pressure Irrigation Nozzles operate at 35 psi or lower	Standard high pressure irrigation nozzles that operate at 50 psi or greater
Low Pressure-drop Filters	Compressed Air	20 HP Inlet Modulation Fixed-Speed Compressor with Low Pressure Drop Filter	20 HP Inlet Modulation Fixed-Speed Compressor, No Particulate Removal
Milk Pre-Cooler	Other	Installed pre-cooler heat exchanger	no pre-cooler heat exchanger installed
Networked Lighting Controls	Interior Lighting Linear Fluorescent	Install Networked Lighting Controls System on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Controlled either Manually or by Sensor as Specified by Code
Occupancy Sensors, Ceiling Mounted	Interior Lighting High Bay	Ceiling Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Occupancy sensors, switch mounted	Interior Lighting Linear Fluorescent	Switch Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled

Measure	End-Use	Description	Baseline
Outdoor Lighting Controls	Exterior Lighting Industrial	Install Exterior Photocell Dimming Controls, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor motion sensor	Exterior Lighting Industrial	Install Exterior Motion Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Packaged Terminal AC	HVAC	High Efficiency Packaged Terminal AC	Code-Compliant PTAC, 10.9 EER
Process Cooling Ventilation Reduction	Process Cooling	Standard Process Cooling with Reduced Ventilation	Standard Process Cooling
Programmable thermostat	HVAC	Standard Heating and Cooling System with Programmable Thermostat	Standard Heating and Cooling System with Manual Thermostat
Reflective Roof Treatment	HVAC	Reflective Roof Treatment	Standard Black Roof
Refrigeration Commissioning	Process Cooling	Commissioned Refrigeration System	Non-Commissioned Refrigeration System
Retro-Commissioning (Existing Construction)	HVAC	Perform Facility Retro-commissioning	
Roof insulation	HVAC	Roof Insulation (built-up roof applicable to flat/low slope roofs)	Code-Compliant Flat Roof
Smart thermostat	HVAC	Standard Heating and Cooling System with Smart Thermostat	Standard Heating and Cooling System with Manual Thermostat
Strategic Energy Management	HVAC	SEM goal setting and tracking	No active energy management
Synchronous Belt on 15hp ODP Motor	Motors Pumps	15 HP Open-Drip Proof Motor with Synchronous Belts Installed on Supply and/or Return Air Fans	15 HP Open-Drip Proof Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Synchronous Belt on 5hp ODP Motor	Motors Pumps	5 HP Open-Drip Proof Motor with Synchronous Belts Installed on Supply and/or Return Air Fans	5 HP Open-Drip Proof Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Synchronous Belt on 75hp ODP Motor	Motors Pumps	75 HP Open-Drip Proof Motor with Synchronous Belts Installed on Supply and/or Return Air Fans	75 HP Open-Drip Proof Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Thermal energy storage	HVAC	Deploy thermal energy storage technology (ice harvester, etc.) to shift load	Code compliant chiller
Time Clock Control	Interior Lighting High Bay	Time Clock Controlled Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled

Measure	End-Use	Description	Baseline
VAV System	HVAC	Variable Air Volume Distribution System	Constant Air Volume Distribution System
VFD on Air Compressor	Compressed Air	20 HP VFD Air Compressor	20 HP Inlet Modulation Fixed-Speed Compressor
VFD on Cooling Tower Fans	Process Cooling	Cooling Tower Fans with VFD Control	Cooling Tower Fans without VFD Control
VFD on HVAC Fan	Motors Fans Blowers	5 HP HVAC Fan Motor, with VFD Control	5 HP HVAC Fan Motor, no VFD Control
VFD on HVAC Pump	Motors Pumps	VFD on HVAC Pump	7.5 HP HVAC Pump Motor, no VFD Control
VFD on process pump	Motors Pumps	20 HP Process Pump Equipped with VFD Control	20 HP Process Pump, Constant Speed
VSD Controlled Compressor	Process Cooling	Refrigeration System with VSD Control	Refrigeration System with Standard Slide-Valve Control System
Water source heat pump	HVAC	Water Source Heat Pump, 2.5 Tons, 17.4 EER, 4.4 COP	Code-Compliant ASHP
Waterside economizer	HVAC	Waterside Economizer	No economizer
Window shade film	HVAC	Window Film with SHGC of 0.35 Applied to Standard Window	Standard Window with below Code Required Minimum SHGC

The following EE measures from the 2019 Technical Potential Study were eliminated from the current study⁸:

Table 15: 2019 EE Measures Eliminated from Current Study

Sector	Measure	End-Use	Reason for Removal
Residential	CFL - 15W Flood	Lighting	Better technology (LED) available
Residential	CFL - 15W Flood (Exterior)	Lighting	Better technology (LED) available
Residential	CFL - 13W	Lighting	Better technology (LED) available
Residential	CFL - 23W	Lighting	Better technology (LED) available
Residential	Low Wattage T8 Fixture	Lighting	Better technology (LED) available

⁸ Additional measures from the 2019 study were updated to reflect current vintage/technology for the current study.

Sector	Measure	End-Use	Reason for Removal
Residential	15 SEER Central AC	Space Cooling	Updated Federal Standard
Residential	15 SEER Air Source Heat Pump	Space Cooling, Space Heating	Updated Federal Standard
Residential	14 SEER ASHP from base electric resistance heating	Space Cooling, Space Heating	Updated Federal Standard
Residential	Two Speed Pool Pump	Miscellaneous	Updated Florida Energy Code
Residential	Variable Speed Pool Pump	Miscellaneous	Updated Florida Energy Code
Residential	Storm Door	Space Cooling, Space Heating	Minimal/uncertain energy savings
Commercial	CFL - 15W Flood	Exterior Lighting	Better technology (LED) available
Commercial	High Efficiency HID Lighting	Exterior Lighting	Better technology (LED) available
Commercial	LED Street Lights	Exterior Lighting	Market standard
Commercial	LED Traffic and Crosswalk Lighting	Exterior Lighting	Market standard
Commercial	High Efficiency HID Lighting	Exterior Lighting	Market standard
Commercial	CFL-23W	Interior Lighting	Better technology (LED) available
Commercial	High Bay Fluorescent (T5)	Interior Lighting	Better technology (LED) available
Commercial	Premium T8 - Fixture Replacement	Interior Lighting	Better technology (LED) available
Commercial	Premium T8 - Lamp Replacement	Interior Lighting	Better technology (LED) available
Commercial	Two Speed Pool Pump	Miscellaneous	Updated Florida Energy Code
Commercial	Variable Speed Pool Pump	Miscellaneous	Updated Florida Energy Code
Commercial	Tank Wrap on Water Heater	Domestic Hot Water	Limited applicability
Commercial	Ceiling Insulation (R12 to R38)	Space Cooling, Space Heating	Consolidated measure baseline assumptions
Commercial	Ceiling Insulation (R30 to R38)	Miscellaneous	Consolidated measure baseline assumptions

Appendix B DR Measure List

Table 16: Residential DR Measures

Measure	Type	Season	Description
Central air conditioner - Load Shed	Direct load control	Summer	Direct load control program where utility provides day ahead notification that it will send remote signal to shed AC unit load during peak usage period.
Central Heating - Load Shed	Direct load control	Winter	Direct load control program where utility provides day ahead notification that it will send remote signal to shed AC unit load during peak usage period.
Central air conditioner - 50% cycling	Direct load control	Summer	Direct load control program where utility provides day ahead notification that it will send remote signal to cycle AC unit during peak usage period
Central Heating - 50% cycling	Direct load control	Winter	Direct load control program where utility provides day ahead notification that it will send remote signal to cycle AC unit during peak usage period
Smart thermostats - Utility Installation	Direct load control	Summer and Winter	Similar to AC load control program, but allows customers to participate using a compatible smart thermostat rather than an AC switch
Smart thermostats - BYOT	Direct load control	Summer and Winter	Similar to AC load control program, but allows customers to participate using a compatible smart thermostat rather than an AC switch
CPP + Tech	Pricing	Summer and Winter	Electricity rate that varies based on time of day. Can be same rate schedule for every day during a given season (time of use, or TOU) and with critical peak pricing (CPP) days when peak period rates are substantially higher for a limited number of days per year (customers receive advance notification of CPP event). Customers also receive technology that they can pre-program to curtail load when an event is called.
Water heater control	Direct load control	Summer and Winter	Load control installed on a water heater (integrated or external switch)
Pool pump switches	Direct load control	Summer and Winter	Load control program with switch installed on pool pump
Room AC	Direct load control	Summer	Load control program that is focused on room AC units rather than central AC
Managed EV Charging - switch	Direct load control	Summer and Winter	Load control switch that is installed on an EV charger
Managed EV Charging - telematics	Direct load control	Summer and Winter	Direct load control program leveraging EV smart charging software
Battery Storage with PV	Pricing/Direct load control	Summer and Winter	PV charges battery and battery discharges to grid

Table 17: Small C&I DR Measures

Measure	Type	Season	Description
Central air conditioner - Load Shed	Direct load control	Summer	Direct load control program where utility provides day ahead notification that it will send remote signal to shed AC unit load during peak usage period.
Central Heating - Load Shed*	Direct load control	Winter	Direct load control program where utility provides day ahead notification that it will send remote signal to shed AC unit load during peak usage period.
Central air conditioner - 50% cycling	Direct load control	Summer	Direct load control program where utility provides day ahead notification that it will send remote signal to cycle AC unit during peak usage period
Central Heating - 50% cycling*	Direct load control	Winter	Direct load control program where utility provides day ahead notification that it will send remote signal to cycle AC unit during peak usage period
Smart thermostats - Utility Installation*	Direct load control	Summer and Winter	Similar to AC load control program, but allows customers to participate using a compatible smart thermostat rather than an AC switch
Smart thermostats - BYOT*	Direct load control	Summer and Winter	Similar to AC load control program, but allows customers to participate using a compatible smart thermostat rather than an AC switch
CPP + Tech	Pricing	Summer and Winter	Electricity rate that varies based on time of day. Can be same rate schedule for every day during a given season (time of use, or TOU) and with critical peak pricing (CPP) days when peak period rates are substantially higher for a limited number of days per year (customers receive advance notification of CPP event). Customers also receive technology that they can pre-program to curtail load when an event is called.
Managed EV Charging - switch	Direct load control	Summer and Winter	Load control switch that is installed on an EV charger
Managed EV Charging - telematics	Direct load control	Summer and Winter	Direct load control program leveraging EV smart charging software
Battery Storage with PV	Pricing/Direct load control	Summer and Winter	PV charges battery and battery discharges to grid

Table 18: Large C&I DR Measures

Measure	Type	Season	Description
CPP + Tech	Pricing	Summer and Winter	Electricity rate that varies based on time of day. Can be same rate schedule for every day during a given season (time of use, or TOU) and with critical peak pricing (CPP) days when peak period rates are substantially higher for a limited number of days per year (customers receive advance notification of

Measure	Type	Season	Description
			CPP event). Customers also receive technology that they can pre-program to curtail load when an event is called.
Auto DR	Utility-controlled loads	Summer and Winter	Custom load control of specific end-uses/processes that is triggered by utility signal to building management system; customer can sometimes opt-out of specific events
Firm Service Level	Contractual	Summer and Winter	Customer commits to a maximum usage level during peak periods and, when notified by the utility, agrees to cut usage to that level.
Guaranteed Load Drop	Contractual	Summer and Winter	Customer agrees to reduce usage by an agreed upon amount when notified

No DR measures from the 2019 Technical Potential Study were eliminated from the current study.

Appendix C DSRE Measure List

Table 19: Residential DSRE Measures

Measure	Description
PV System	Roof-mounted system, including multiple panels, AC/DC inverter, racking system, and electrical system interconnections
Battery Storage from PV System	Lithium-ion battery system designed to integrate with an on-site PV system to store and discharge excess energy from PV generation

Table 20: Non-Residential DSRE Measures

Measure	Description
PV System	Roof-mounted system, including multiple panels, AC/DC inverter, racking system, and electrical system interconnections
Battery Storage from PV System	Lithium-ion battery system designed to integrate with an on-site PV system to store and discharge excess energy from PV generation
CHP - Fuel Cell	An electrochemical cell-based generator that reacts hydrogen fuel with oxygen
CHP - Micro Turbine	Small combustion turbine that burns gaseous or liquid fuel to drive a generator
CHP - Gas Turbine	A combustion turbine that burns gaseous or liquid fuel to drive a generator
CHP - Reciprocating Engine	An engine that uses one or more pistons to convert pressure into rotational motion
CHP - Steam Turbine	A turbine that extracts thermal energy from pressured steam to drive a generator

No DSRE measures from the 2019 Technical Potential Study were eliminated from the current study.

Appendix D External Measure Suggestions

Table 21: External Measure Suggestions and Actions

Measure Suggestion	Stakeholder Comments	Action taken for FEECA Study
Efficient Electrification Measures	All measures that can produce substantial site energy savings by converting from natural gas or other fossil fuels should be included in the Florida electric utilities' next efficiency potential study. Key examples include efficient heat pumps to displace gas furnaces and efficient heat pump water heaters to displace gas water heaters. It is important to note that these electrification measures provide not only heating energy savings and water heating energy savings, but can also potentially provide cooling efficiency benefits as well. In the case of heat pumps, that can occur because efficient heat pumps can operate in cooling mode more efficiently than standard central air conditioners. In the case of heat pump water heaters, cooling and dehumidification benefits can occur when/if the water heater is in conditioned space because they transfer heat (particularly latent heat) from the air around them to the water they are heating. A growing number of jurisdictions - including Illinois, Minnesota and some northeastern states - have begun to include efficient electrification measures in their efficiency programs portfolios.	Fuel-switching and electrification are outside the scope of this study
Networked Lighting Controls	LED lighting technology has become increasingly accepted and installed in commercial buildings. The next big efficiency opportunity in commercial lighting efficiency is in sophisticated controls integrated into the light fixtures themselves - both luminaire level lighting controls and networked lighting controls. For example, a 2017 report for both the Northwest Energy Efficiency Alliance and the Design Lights Consortium, a non-profit that works with utilities and manufacturers of lighting products (and which many utilities across the country reference for determination of eligibility of lighting products for efficiency program rebates), found that networked lighting controls can provide on the order of 50% additional savings after LED conversion. Other studies have also found the national savings potential from such products to be enormous. Moreover, these products can be designed to provide not only lighting energy savings but also a number of other non-energy benefits (e.g., asset tracking, such as the ability of hospitals to know the location of all wheel chairs). Numerous utilities across the country now actively promote this technology through their efficiency programs. For example, Commonwealth Edison, the utility serving Chicago and other parts of northern Illinois, is currently getting a significant portion of its commercial lighting savings from promotion of networked lighting controls	Added to measure list for 2024 study

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External Measure Suggestions

Measure Suggestion	Stakeholder Comments	Action taken for FEECA Study
Ductless mini-split heat pumps to displace inefficient electric baseboard heating	While most Florida residential buildings with electric heat provide that heat with heat pumps, at least some (perhaps most likely being older multi-family rental buildings) still use inefficient electric resistance heat. Ductless mini- split heat pump retrofits can very efficiently displace such inefficient electric heat and should be added to the residential measure list.	Added to measure list for 2024 study
Air Source Heat Pump baseline assumptions	<p>There are seven air source heat pump (ASHP) measures included in the residential measure list. Two of them - one at SEER 14 and a second at SEER 21 - are listed as relative to an electric resistance baseline. Five of them - SEER 15, SEER 16, SEER 17, SEER 18 and SEER 21 - appear to be relative to a baseline of a standard new ASHP. Are we interpreting this correctly? If so, we have a couple of comments/questions/suggestions:</p> <ul style="list-style-type: none"> • The efficiency standards assessed need to be modified to be consistent with new federal standards, including new testing procedures. • For cases where the baseline is “electric resistance”, why only assessing two efficiency tiers (i.e., fewer than for standard ASHP baselines)? The same number of efficiency tiers should be assessed for both baselines. 	Incorporated suggestions into 2024 study, including updated baseline standard and assessing same efficiency tiers for both baselines
Heat Pump Water Heater Efficiency	The Res EE tab of the utilities draft measure list suggests that the efficiency of a heat pump water heater is an EF of 2.50. That is unrealistically low. In fact, of the 222 products listed on the Energy Star website, none had UEFs less than 2.80 and only 29 (13%) had UEFs that were less than 3.4; the average was 3.57. Indeed, the first product listed on a search of heat pump water heaters on Home Depot’s website is a 50 gallon, Rheem (Pro Terra) product with a UEF of 3.75 and a cost of \$1699.	Incorporated suggestion into 2024 study
New Construction Measure Packages	The measures lists did not appear to include packages of measures for building new residential and/or new commercial buildings to levels of efficiency beyond those required by code. Utilities in many jurisdictions run new construction efficiency programs supporting such measure packages. In the residential sector, many base their programs on the long-standing Federal Energy Star standard. However, increasingly utility programs are promoting additional efficiency tiers - often as part of all-electric new construction program offerings - that go well beyond the Energy Star standard. For example, Consumers Energy (Michigan) offers \$1000 rebates to builders who construct Energy Star single family homes	Incorporated suggestion into 2024 study with 2 tiers of residential new construction whole-home improvement measures.

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External Measure Suggestions

Measure Suggestion	Stakeholder Comments	Action taken for FEECA Study
	with a Home Energy Rating (HERS) score of 57 or less, but offer higher rebates for more efficient buildings - up to \$4000 for all electric homes with a HERS score of 40 or less. The Florida utilities potential study should assess savings potential for both the Energy Star level and a tier or two of additional efficiency beyond that level. Similar assessments of new commercial building savings potential should also be assessed.	
Custom Industrial Measures	The utilities' list of industrial efficiency measures addresses common industrial efficiency opportunities. However, it does not address efficiency opportunities that may be unique to individual industries or even to individual industrial facilities. That can include such things as changes in types of materials used in manufacturing, reductions in waste streams, improved use of water delivered by agricultural irrigation systems, and/or other things that are not directly related to energy using equipment or controls of such equipment. It is obviously not possible to list all such measures. However, a potential study will understate savings potential if it does not include a way of capturing such potential in its estimates. One potential way to get a sense of such potential is to review results of comprehensive industrial efficiency programs run by other utilities to identify the portion of actual program savings from such unique custom measures - and then assume that portion of custom savings could be added to the savings estimated in the study for named measures.	Added to measure list for 2024 study
Electric Vehicle measures	Some EV chargers are more efficient than others. The Federal Energy Star program has a standard for them. Savings potential may not be huge, but should be considered in the study. With a growing number of EV sales, the study should also consider the potential savings from promoting the most efficient EVs within different size/style categories	Added to measure list for 2024 study
Removing screw-based LEDs	The screw-based LEDs on both the Residential and Commercial measure lists should now be considered baseline due to federal efficiency standards adopted earlier this year. Utility load forecasts for IRPs should reflect resulting improvements in end use efficiency.	Screw-based LEDs were included in the study but with limited applicability to reflect current market
Removing Commercial fluorescent lighting	LED technology - for both fixtures and lamps - has advanced significantly in recent years, to the point where it should be the only technology considered for commercial lighting. Measures such as high performance T-8 fluorescent fixtures and high bay T-5 fluorescent fixtures should be replaced with LED alternatives in the study.	Updated measure list for 2024 study to only include LED-based lamps for linear fluorescent replacements

External Measure Suggestions

Measure Suggestion	Stakeholder Comments	Action taken for FEECA Study
Removing fossil-gas fueled CHP	Fossil-fuel fired CHP systems should not be considered “renewable” and have questionable benefits if electric generation is expected to get increasingly more renewable and clean. Biogas-fueled CHP - such as systems installed in wastewater treatment facilities that use methane byproducts of processing waste - should be included in the study.	2024 study will continue to assess all CHP options
Adding livestock methane power generation to renewables list	For example, see the “cow power” program currently being run by Green Mountain Power, Vermont’s largest electric utility	2024 study will continue to assess DSRE options consistent with prior study, including customer-sited solar, solar plus storage, and CHP
Adding EV managed charging to DR list	With national market shares for EVs growing, it is important that utilities consider programs for managing when charging occurs. Numerous utilities are currently running managed charging programs. This does not currently appear to be on the measure list and should be added to the Florida utilities’ potential study.	Added to measure list for 2024 study
Residential “smart thermostat” measure can provide both efficiency savings and demand response potential	This is recognized in the inclusion of smart thermostats in both the Res EE and DR tabs of the measure list spreadsheet. We simply want to flag that it is important when assessing cost-effectiveness of this measure that these two potential benefits are considered together. In other words, the cost should be considered compared to the combined efficiency and DR potential rather than separately considered relative to just EE savings and then separately again compared to just DR potential	2024 study will include interactive impacts of EE and DR opportunities
Emerging Technologies	The efficiency potential study measure list appears to be somewhat outdated. It does not include a number of new and emerging technologies. The potential list of such technologies is long. We suggest reviewing the attached list of emerging technologies developed almost two years ago by Consumers Energy (Michigan) and including them in the study.	Consumers Energy study was reviewed and commercially available measures were added to measure list for 2024 study, including heat pump water heaters - CEE advanced tier, heat pump clothes dryers, ozone laundry systems, and 21+ SEER HVAC units

External Measure Suggestions



Technical Potential Study of Demand Side Management

Tampa Electric Company

Date: 03.07.2024

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Executive Summary

In October 2022, the six electric utilities subject to the Florida Energy Efficiency and Conservation Act (FEECA Utilities) retained Resource Innovations, Inc. for the purpose of identifying and characterizing the market for demand-side management (DSM) opportunities, including energy efficiency (EE) improvement and building retrofits, peak load reductions from demand response (DR), and demand-side renewable energy (DSRE) systems.

The main objective of the study was to assess the technical potential of demand-side resources for reducing customer electric energy consumption and seasonal peak capacity demands.

This report provides the detailed methodology and results for the technical potential analysis of Tampa Electric Company's (TECO) service territory.

1.1 Methodology

Resource Innovations estimates DSM savings potential by applying an analytical framework that aligns baseline market conditions for energy consumption and demand with DSM opportunities. After describing the baseline condition, Resource Innovations applies estimated measure savings to disaggregated consumption and demand data. The approach varies slightly according to the type of DSM resources and available data; the specific approaches used for each type of DSM are described below.

1.1.1 EE Potential

This study utilized Resource Innovations' proprietary EE modeling tool, TEA-POT (Technical / Economic / Achievable POTential). This modeling tool was built on a platform that provides the ability to create and analyze multiple scenarios and recalculate potential savings based on variable inputs such as sales/load forecasts, electricity prices, discount rates, and actual program savings. The methodology for the EE potential assessment was based on a hybrid "top-down/bottom-up" approach, which started with the current utility load forecast, then disaggregated it into its constituent customer-class and end-use components. Our assessment examined the effect of the range of EE measures and practices on each end-use, taking into account current market saturations, and technical feasibility. These unique impacts were aggregated to produce estimates of potential at the end-use, customer class, and system levels for TECO.

1.1.2 DR Potential

The assessment of DR potential in TECO's service territory was an analysis of mass market direct load control programs for residential and small commercial and industrial (C&I) customers, and an analysis of DR programs for large C&I customers. The direct load control program assessment focused on the potential for demand reduction through heating, ventilation, and air conditioning (HVAC), water heater, managed electric vehicle charging, and pool pump load control. These end-uses were of particular interest because of their large contribution to peak period system load. For this analysis, a range of direct load control measures were examined for each customer segment to highlight the range of potential. The assessment further accounted for existing DR programs for TECO when calculating the total DR potential.

1.1.3 DSRE Potential

The DSRE technologies included in this study are rooftop solar photovoltaic (PV) systems, battery storage systems charged from customers' PV systems, and combined heat and power (CHP) systems. The study leveraged the customer segmentation and load disaggregation data assembled for the EE and DR analyses, and applied our DSRE model, SPIDER™ (Spatial Penetration and Integration of Distributed Energy Resources), for economic and adoption analysis of solar and battery storage. This model dynamically responds to rapidly changing technologies and accounts for all key time-varying elements such as technology costs, incentives, tax credits, and electric rates. To estimate technical potential for CHP, the study utilized a series of unique distributed generation potential models for each primary market sector (commercial and industrial), calculating the average building consumption, assigning minimum facility size thresholds, and estimating building energy savings share percentage for each CHP technology based on its generation capacity.

1.2 Savings Potential

Technical potential for EE, DR, and DSRE are as follows:

1.2.1 EE Potential

EE technical potential describes the savings potential when all technically feasible EE measures are fully implemented, ignoring all non-technical constraints on electricity savings, such as cost-effectiveness and customer willingness to adopt EE.

The estimated EE technical potential results are summarized in Table 1.

Table 1. EE Technical Potential

	Savings Potential		
	Summer Peak Demand (MW)	Winter Peak Demand (MW)	Energy (GWh)
Residential	992	445	3,197
Non-Residential¹	398	334	2,272
Total	1,390	779	5,469

1.2.2 DR Potential

DR technical potential describes the magnitude of loads that can be managed during conditions when grid operators need peak capacity. For residential and small C&I customers where DR generally takes the form of direct utility control, technical potential for DR is limited by the loads that can be controlled remotely at scale such as heating, cooling, water heaters, managed electric vehicle charging, and pool pumps. For large C&I customers, this included their entire electric demand during a utility’s system peak, as many of these types of customers will forego virtually all electric demand temporarily if the financial incentive is large enough.

The estimated DR technical potential results are summarized in Table 2.

Table 2. DR Technical Potential

	Savings Potential	
	Summer Peak Demand (MW)	Winter Peak Demand (MW)
Residential	1,541	1,439
Non-Residential	1,571	1,691
Total	3,112	3,130

¹ Non-Residential results include all commercial and industrial customer segments.

1.2.3 DSRE Potential

DSRE technical potential estimates quantify all technically feasible distributed generation opportunities from PV systems, battery storage systems charged from PV, and CHP technologies based on the customer characteristics of TECO’s customer base.

The estimated DSRE technical potential results are summarized in Table 3.

Table 3. DSRE Technical Potential²

	Savings Potential		
	Summer Peak Demand (MW)	Winter Peak Demand (MW)	Energy (GWh)
PV Systems			
Residential	484	51	8,000
Non-Residential	165	6	2,236
Total	649	57	10,236
Battery Storage charged from PV Systems			
Residential	598	876	0
Non-Residential	120	205	0
Total	718	1081	0
CHP Systems			
Total	358	286	1,768

² PV systems and CHP systems were independently analyzed for technical potential without consideration of the competition between technologies or customer preference for DSRE system.

2 Introduction

In October 2022, the six electric utilities subject to the Florida Energy Efficiency and Conservation Act (FEECA Utilities) retained Resource Innovations, Inc. for the purpose of identifying and characterizing the market for demand-side management (DSM) opportunities, including energy efficiency (EE) improvement and building retrofits, peak load reductions from demand response (DR), and demand-side renewable energy (DSRE) systems. The main objective of the study was:

- Assessing the technical potential of demand-side resources for reducing customer electric energy consumption and seasonal peak capacity demands.

This report provides the detailed methodology and results for the technical potential analysis of TECO's service territory.

The following deliverables were developed by Resource Innovations as part of the project and are addressed in this report:

- DSM measure list and detailed assumption workbooks
- Disaggregated baseline demand and energy use by year, sector, and end-use
- Baseline technology saturations, energy consumption, and demand
- Technical potential demand and energy savings
- Supporting calculation spreadsheets

2.1 Technical Potential Study Approach

Resource Innovations estimates technical potential according to the industry standard categorization, as follows:

Technical Potential is the theoretical maximum amount of energy and capacity that could be displaced by DSM, regardless of cost and other barriers that may prevent the installation or adoption of a DSM measure.

For this study, technical potential included full application of commercially available DSM technologies to all residential, commercial, and industrial customers in the utility's service territory.

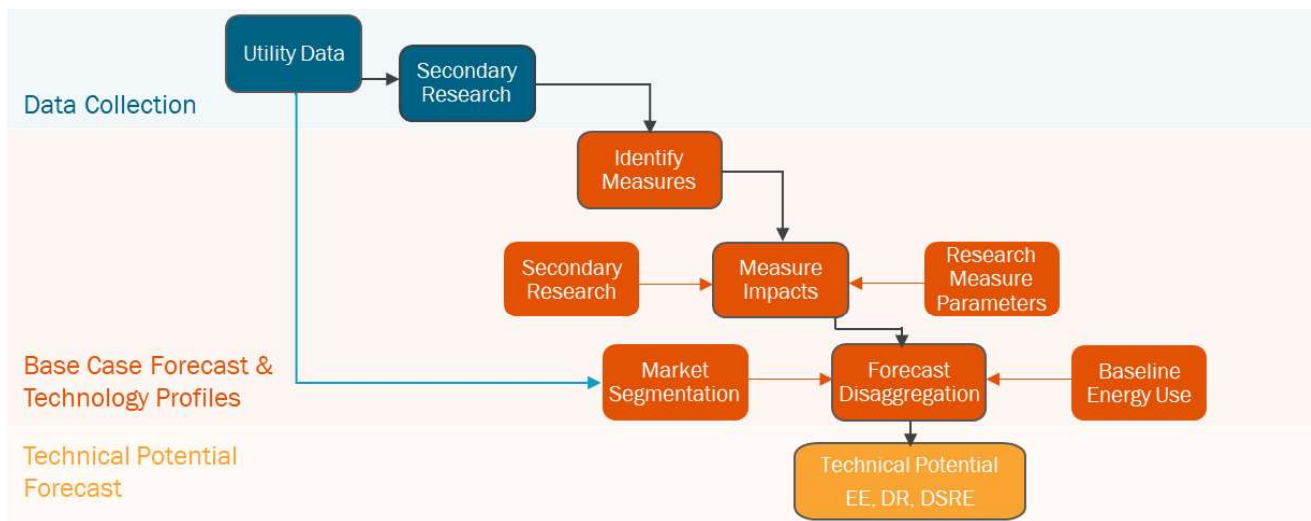
Quantifying DSM technical potential is the result of an analytical process that refines DSM opportunities that align with TECO's customers' electric consumption patterns. Resource Innovations' general methodology for estimating technical potential is a hybrid "top-

down/bottom-up” approach, which is described in detail in Sections 3 through 5 of this report and includes the following steps:

- Develop a baseline forecast: the study began with a disaggregation of the utility’s official electric energy forecast to create a baseline electric energy forecast. This forecast does not include any utility-specific assumptions around DSM performance. Resource Innovations applied customer segmentation and consumption data from each utility and data from secondary sources to describe baseline customer-class and end-use components. Additional details on the forecast disaggregation are included in Section 3.
- Identify DSM opportunities: A comprehensive set of DSM opportunities applicable to TECO’s climate and customers were analyzed to best depict DSM technical potential. Effects for a range of DSM technologies for each end-use could then be examined while accounting for current market saturations, technical feasibility, and impacts.
- Collect cost and impact data for measures: For those measures applicable to TECO’s customers, Resource Innovations conducted primary and secondary research and estimated costs, energy savings, measure life, and demand savings. We differentiated between the type of cost (capital, installation labor, maintenance, etc.) to separately evaluate different implementation modes: retrofit (capital plus installation labor plus incremental maintenance); new construction (incremental capital and incremental maintenance); and burnout costs (incremental capital and incremental maintenance costs for replacement of appliances and equipment that has reached the end of its useful life). Additional details on measure development are included in Section 4.

Figure 1 provides an illustration of the technical potential modeling process conducted for TECO, with the assessment starting with the current utility load forecast, disaggregated into its constituent customer-class and end-use components, and calibrated to ensure consistency with the overall forecast. Resource Innovations considered the range of DSM measures and practices application to each end-use, accounting for current market saturations, and technical feasibility. These unique impacts were aggregated to produce estimates of potential at the technology, end-use, customer class, and system levels.

Figure 1. Approach to Technical Potential Modeling



Resource Innovations estimated DSM technical potential based on a combination of market research, utility load forecasts and customer data, and measure impact analysis, all in coordination with TECO. Resource Innovations examined the technical potential for EE, DR, and DSRE opportunities; this report is organized to offer detail on each DSM category, with additional details on technical potential methodology presented in Section 5.

2.2 EE Potential Overview

To estimate EE potential, this study utilized Resource Innovations’ modeling tool, TEA-POT (Technical / Economic / Achievable POTential). This modeling tool was built on a platform that provides the ability to create and analyze multiple scenarios and recalculate potential savings based on variable inputs such as sales/load forecasts, electricity prices, discount rates, and actual utility program savings, as described in Section 5.1.1 below. While the analysis estimates the impacts of individual EE measures, the model accounts for interactions and overlap of individual measure impacts within an end-use or equipment type. The model provides transparency into the assumptions and calculations for estimating EE potential.

2.3 DR Potential Overview

To estimate DR market potential, Resource Innovations considered customer demand during utility peaking conditions and projected customer response to DR measures. Customer demand was determined by looking at account-level interval data for a sample of customers within each segment. For each segment, Resource Innovations determined the portion of a customer’s load that could be curtailed during the system peak.

2.4 DSRE Potential Overview

The DSRE technologies included in this study are rooftop solar photovoltaic (PV) systems, battery storage systems charged from PV, and combined heat and power (CHP) systems. The study leveraged the customer segmentation and load disaggregation data assembled for the EE and DR analyses, and applied our DSRE model, SPIDER™ (Spatial Penetration and Integration of Distributed Energy Resources), for economic and adoption analysis of solar and battery storage. This model dynamically responds to rapidly changing technologies and accounts for all key time-varying elements such as technology costs, incentives, tax credits, and electric rates. To estimate technical potential for CHP, the study utilized a series of unique distributed generation potential models for each primary market sector (commercial and industrial), calculating the average building consumption, assigning minimum facility size thresholds, and estimating building energy savings share percentage for each CHP technology based on its generation capacity.

3 Baseline Forecast Development

3.1 Market Characterization

The TECO base year energy use and sales forecast provided the reference point to determine potential savings. The end-use market characterization of the base year energy use and reference case forecast included customer segmentation and load forecast disaggregation. The characterization is described in this section, while the subsequent section addresses the measures and market potential energy and demand savings scenarios.

3.1.1 Customer Segmentation

In order to estimate EE, DR, and DSRE potential, the sales forecast and peak load forecasts were segmented by customer characteristics. As electricity consumption patterns vary by customer type, Resource Innovations segmented customers into homogenous groups to identify which customer groups are eligible to adopt specific DSM technologies, have similar building characteristics and load profiles, or are able to provide DSM grid services.

Resource Innovations segmented customers according to the following:

- 1) By Sector - how much of TECO's energy sales, summer and winter peak demand forecast is attributable to the residential, commercial, and industrial sectors?
- 2) By Customer - how much electricity does each customer typically consume annually and during system peaking conditions?
- 3) By End-Use - within a home or business, what equipment is using electricity during the system peak? How much energy does this end-use consume over the course of a year?

Table 4 summarizes the segmentation within each sector. In addition to the segmentation described here for the EE and DSRE analyses, the residential customer segments were further segmented by heating type (electric heat, gas heat, or unknown) and by annual consumption bins within each sub-segment for the DR analysis.

Table 4. Customer Segmentation

Residential	Commercial		Industrial	
Single Family	Assembly	Miscellaneous	Agriculture and Assembly	Primary Resources Industries
Multi-Family	College and University	Offices	Chemicals and Plastics	Stone/Glass/Clay/Concrete
Manufactured Homes	Grocery	Restaurant	Construction	Textiles and Leather
	Healthcare	Retail	Electrical and Electronic Equipment	Transportation Equipment
	Hospitals	Schools K-12	Lumber/Furniture/Pulp/Paper	Water and Wastewater
	Institutional	Warehouse	Metal Products and Machinery	Other
	Lodging/Hospitality		Miscellaneous Manufacturing	

From an equipment and energy use perspective, each segment has variation within each building type or sub-sector. For example, the energy consuming equipment in a convenience store will vary significantly from the equipment found in a supermarket. To account for this variation, the selected end-uses describe energy consumption patterns that are consistent with those typically studied in national or regional surveys, such as the U.S. Energy Information Administration’s (EIA) Residential Energy Consumption Survey (RECS), Commercial Building Energy Consumption Survey (CBECS) and Manufacturing Energy Consumption Survey (MECS), among others. The end-uses selected for this study are listed in Table 5.

Table 5. End-Uses

Residential End-Uses	Commercial End-Uses	Industrial End-Uses
Space heating ³	Space heating ³	Process heating
Space cooling ³	Space cooling ³	Process cooling
Domestic hot water	Domestic hot water	Compressed air
Ventilation and circulation	Ventilation and circulation	Motors/pumps

³ Includes the contribution of building envelope measures and efficiencies.

Residential End-Uses	Commercial End-Uses	Industrial End-Uses
Lighting	Interior lighting	Fan, blower motors
Cooking	Exterior lighting	Process-specific
Appliances	Cooking	Industrial lighting
Electronics	Refrigeration	Exterior lighting
Miscellaneous	Office equipment	HVAC ³
	Miscellaneous	Other

For DR, the end-uses targeted were those with controllable load for residential customers (i.e., HVAC, water heaters, pool pumps, and electric vehicles) and small C&I customers (HVAC and electric vehicles). For large C&I customers, all load during peak hours was included assuming these customers would potentially be willing to reduce electricity consumption for a limited time if offered a large enough incentive during temporary system peak demand conditions.

3.1.2 Forecast Disaggregation

A common understanding of the assumptions and granularity in the baseline load forecast was developed with input from TECO. Key discussion topics reviewed included:

- How current DSM offerings are reflected in the energy and demand forecast.
- Assumed weather conditions and hour(s) of the day when the system is projected to peak.
- Are there portions of the load forecast attributable to customers or equipment not eligible for DSM programs?
- How are projections of population increase, changes in appliance efficiency, and evolving distribution of end-use load shares accounted for in the peak demand forecast?

3.1.2.1 Electricity Consumption (kWh) Forecast

Resource Innovations segmented TECO’s electricity consumption forecast into electricity consumption load shares by customer class and end-use. The baseline customer segmentation represents the electricity market by describing how electricity was consumed within the service territory. Resource Innovations developed the forecast for the year 2025, and based it on data provided by TECO, primarily their 2023 Ten-Year Site Plan, which was the most recent plan available at the time the studies were initiated. The data addressed current baseline consumption, system load, and sales forecasts.

3.1.2.2 Peak Demand (kW) Forecast

A fundamental component of DR potential was establishing a baseline forecast of what loads or operational requirements would be absent due to existing dispatchable DR or time varying rates. This baseline was necessary to assess how DR can assist in meeting specific planning and operational requirements. We utilized TECO's summer and winter peak demand forecast, which was developed for system planning purposes.

3.1.2.3 Estimating Consumption by End-Use Technology

As part of the forecast disaggregation, Resource Innovations developed a list of electricity end-uses by sector (Table 5). To develop this list, Resource Innovations began with TECO's estimates of average end-use consumption by customer and sector. Resource Innovations combined these data with other information, such as utility residential appliance saturation surveys, as available, to develop estimates of customers' baseline consumption. Resource Innovations calibrated the utility-provided data with data available from public sources, such as the EIA's recurring data-collection efforts that describe energy end-use consumption for the residential, commercial, and manufacturing sectors.

To develop estimates of end-use electricity consumption by customer segment and end-use, Resource Innovations applied estimates of end-use and equipment-type saturation to the average energy consumption for each sector. The following data sources and adjustments were used in developing the base year 2025 sales by end-use:

Residential Sector:

- The disaggregation was based on TECO's rate class load shares and intensities.
- Baseline intensity was calibrated to account for differences in end-use saturation, fuel source, and equipment saturation as follows:
 - TECO rate class load share is based on average per customer.
 - Resource Innovations made conversions to usage estimates generated by applying TECO's customer audit & saturation survey, EIA RECS data, residential end-use study data received from other FEECA utilities, and EIA's Annual Energy Outlook (AEO) 2023.

Commercial Sector:

- The disaggregation was based on TECO's rate class load shares, intensities, and EIA CBECS data.
- Segment data from EIA and TECO.

- Baseline intensity was calibrated to account for differences in end-use saturation, fuel source, and equipment saturation as follows:
 - Rate class load share based on EIA CBECS and end-use forecasts from TECO.

Industrial Sector:

- The disaggregation was based on rate class load shares, intensities, and EIA MECS data.
- Segment data from EIA and TECO.
- Baseline intensity was calibrated to account for differences in end-use saturation, fuel source, and equipment saturation as follows:
 - Rate class load share based on EIA MECS and end-use forecasts from TECO.

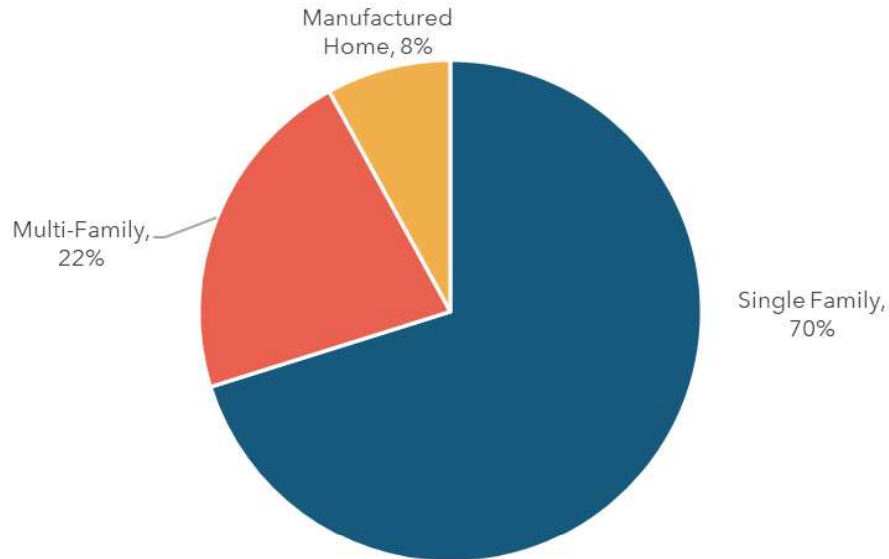
3.2 Analysis of Customer Segmentation

Customer segmentation is important to ensuring that a MPS examines DSM measure savings potential in a manner that reflects the diversity of energy savings opportunities existing across the utility's customer base. TECO provided Resource Innovations with data concerning the premise type and loads characteristics for all customers for the MPS analysis. Resource Innovations examined the provided data from multiple perspectives to identify customer segments. Resource Innovations' approach to segmentation varied slightly for non-residential and residential accounts, but the overall logic was consistent with the concept of expressing the accounts in terms that were relevant to DSM opportunities.

3.2.1 Residential Customers (EE, DR, and DSRE Analysis)

Segmentation of residential customer accounts enabled Resource Innovations to align DSM opportunities with appropriate DSM measures. Resource Innovations used utility customer data, supplemented with EIA data, to segment the residential sector by customer dwelling type (single family, multi-family, or manufactured home). The resulting distribution of customers according to dwelling unit type is presented in Figure 2.

Figure 2. Residential Customer Segmentation



3.2.2 Non-Residential (Commercial and Industrial) Customers (EE and DSRE Analysis)

For the EE and DSRE analysis, Resource Innovations segmented C&I accounts using the utility's North American Industry Classification System (NAICS) or Standard Industrial Classification (SIC) codes, supplemented by data produced by the EIA's CBECS and MECS. Resource Innovations classified the customers in this group as either commercial or industrial, on the basis of DSM measure information available and applicable to each. For example, agriculture and forestry DSM measures are commonly considered industrial savings opportunities. Resource Innovations based this classification on the types of DSM measures applicable by segment, rather than on the annual energy consumption or maximum instantaneous demand from the segment as a whole. The estimated energy sales distributions Resource Innovations applied are shown below in Figure 3 and Figure 4.

Figure 3. Commercial Customer Segmentation

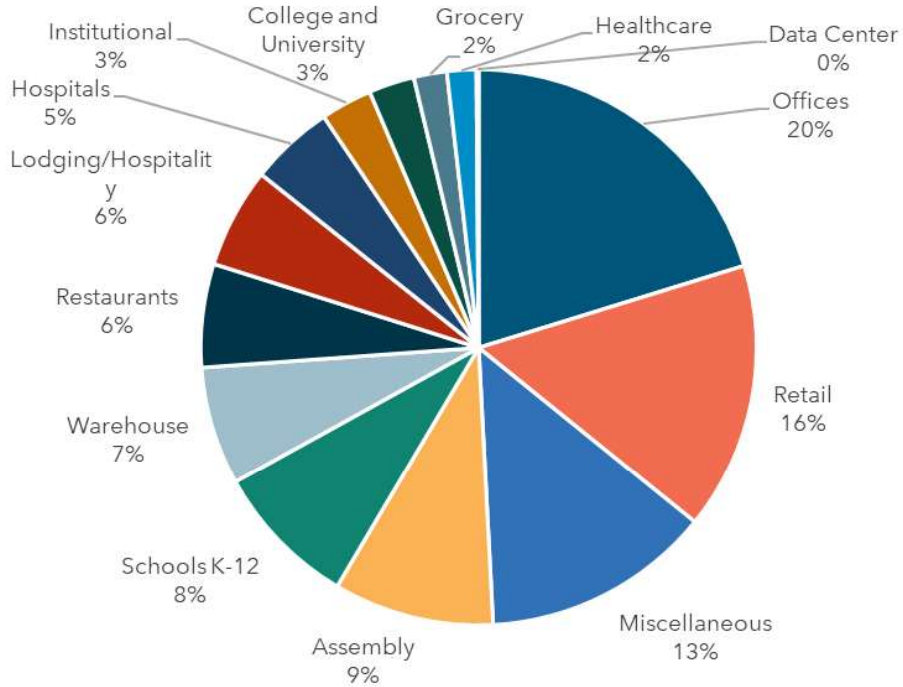
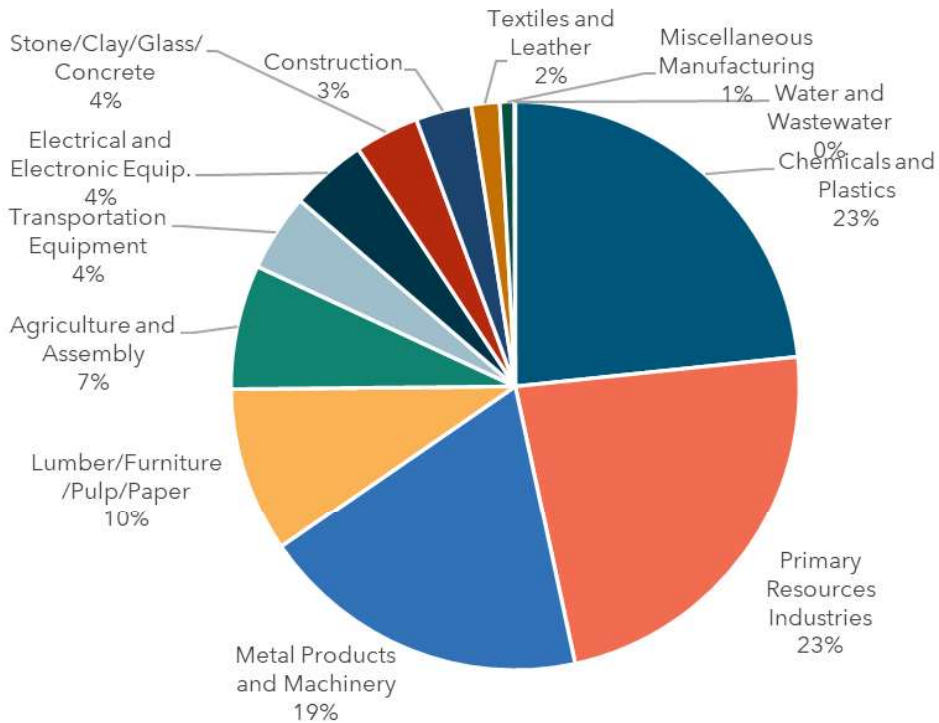


Figure 4. Industrial Customer Segmentation



3.2.3 Commercial and Industrial Accounts (DR Analysis)

For the DR analysis, Resource Innovations divided the non-residential customers into the two customer classes of small C&I and large C&I using rate class and annual consumption. For the purposes of this analysis, small C&I customers are those on the General Service (GS) tariff. Large C&I customers are all customers on the General Service Demand (GSD) tariff or on the General Service Large Demand (GSLD) tariff. Resource Innovations further segmented these two groups based on customer size. For small C&I, segmentation was determined using annual customer consumption and for large C&I the customer’s maximum demand was used. Both customer maximum demand and customer annual consumption were calculated using billing data provided by TECO.

Table 6 shows the account breakout between small C&I and large C&I.

Table 6. Summary of Customer Classes for DR Analysis

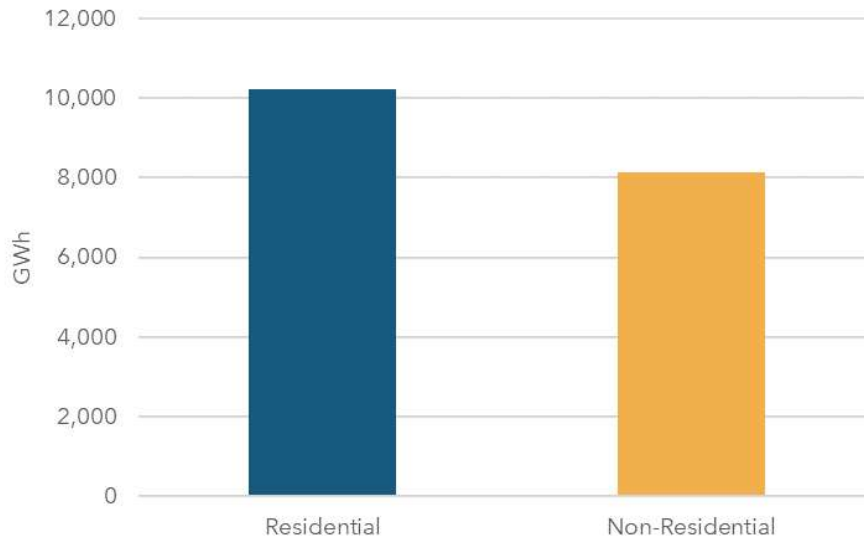
Customer Class	Annual kWh	Estimated Number of Accounts
Small C&I	0-15,000 kWh	43,294
	15,001-25,000 kWh	9,444
	25,001-50,000 kWh	9,104
	50,001 kWh +	3,304
	Total	65,146
Large C&I	0-50 kW	8,716
	51-300 kW	6,487
	301-500 kW	738
	501 kW +	738
	Total	16,679

3.3 Analysis of System Load

3.3.1 System Energy Sales

Technical potential is based on TECO’s load forecast for the year 2025 from their 2023 Ten Year Site Plan, which is illustrated in Figure 5.

Figure 5. 2025 Electricity Sales Forecast by Sector



3.3.2 System Demand

To determine the technical potential for DR, Resource Innovations first established peaking conditions for each utility by looking at when each utility historically experienced its maximum demand. The primary data source used to determine when maximum DR impact was the historical system load for TECO. The data provided contained the system loads for all 8,760 hours of the most recent five years leading up to the study (2016-2021). The utility summer and winter peaks were then identified within the utility-defined peaking conditions. For TECO the summer peaking conditions were defined as August from 5:00-6:00 PM and the winter peaking conditions were defined as January from 7:00-8:00 AM. The seasonal peaks were then selected as the maximum demand during utility peaking conditions.

3.3.3 Load Disaggregation

The disaggregated annual electric loads⁴ for the base year 2025 by sector and end-use are summarized in Figure 6, Figure 7, and Figure 8.

⁴ Full disaggregation of system demand by end-use was not conducted, as DR potential for residential and small C&I customers focused on specific end-uses of particular interest because of their large contribution to peak period system load, and was not end-use specific for large C&I customers. A description of the end-use analysis for residential and small C&I customers is included in Section 5.1.2

Figure 6. Residential Baseline (2025) Energy Sales by End-Use

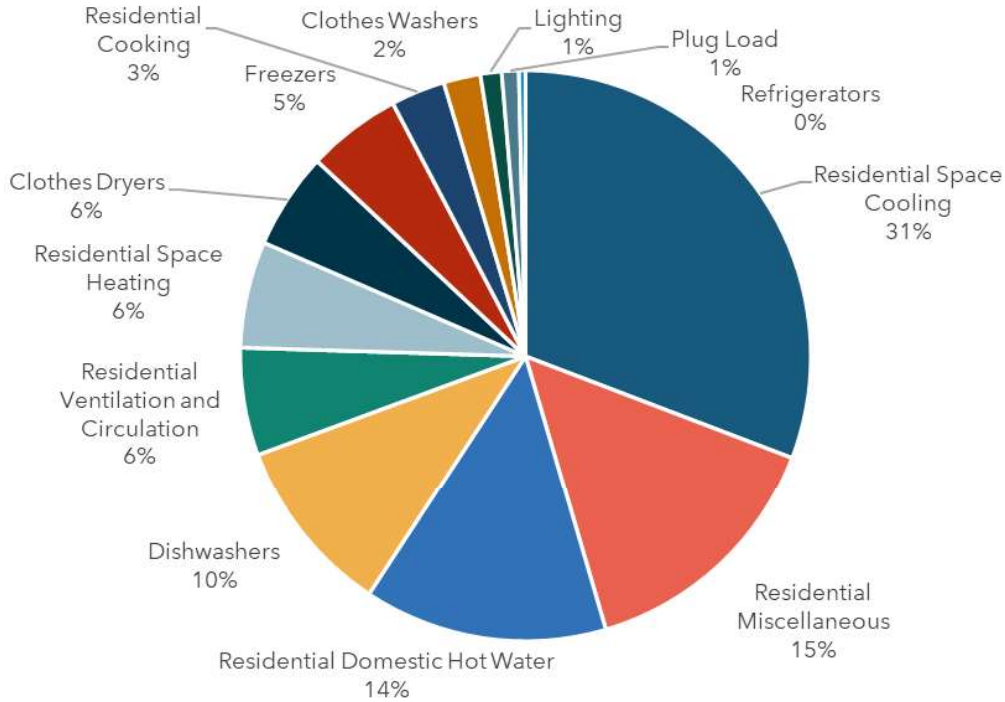


Figure 7. Commercial Baseline (2025) Energy Sales by End-Use

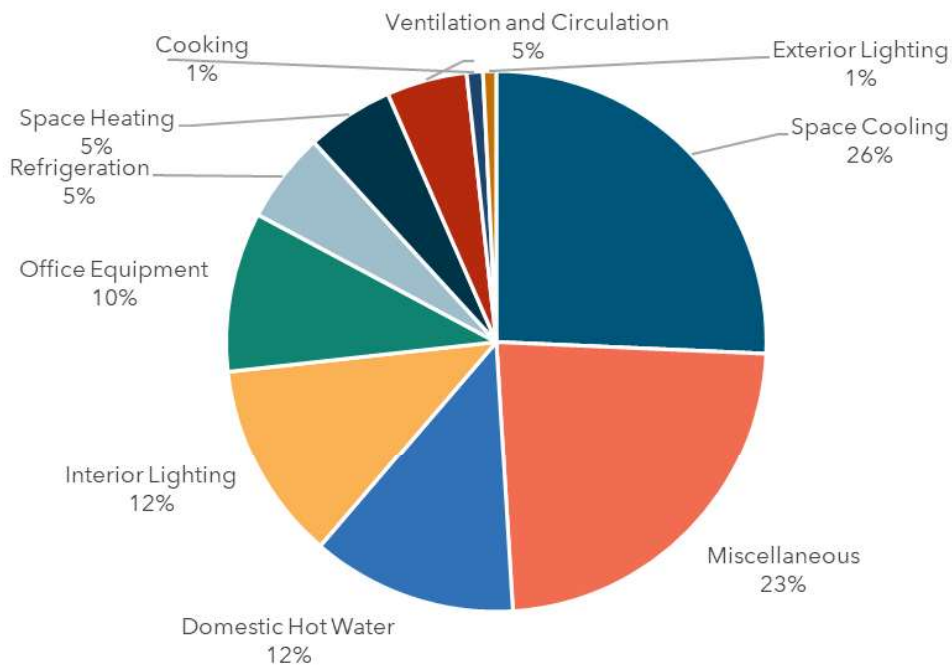
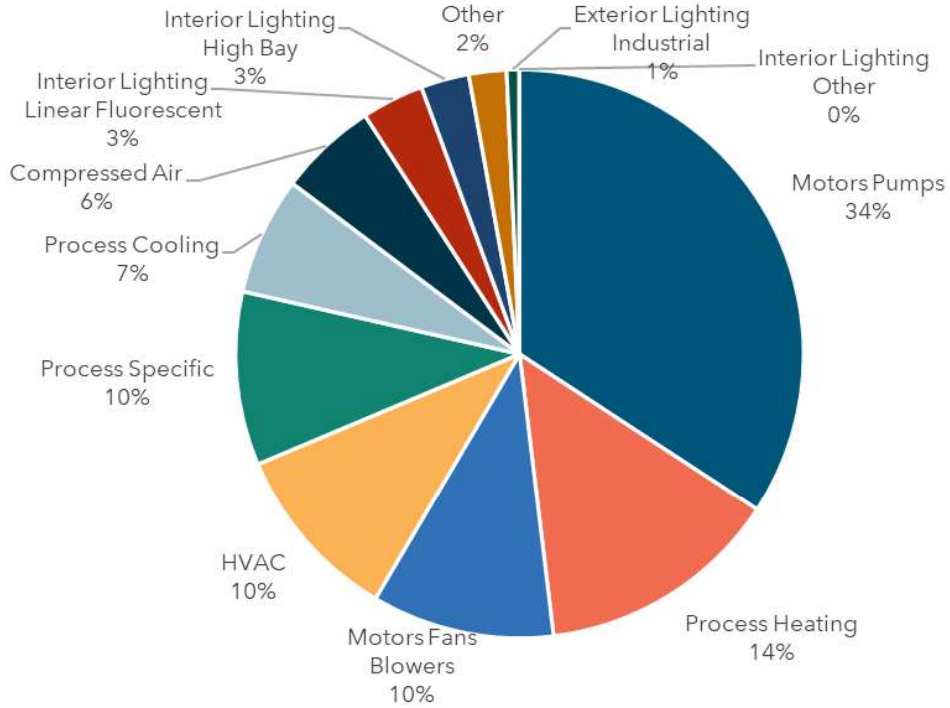


Figure 8. Industrial Baseline (2025) Energy Sales by End-Use



4 DSM Measure Development

DSM potential is described by comparing baseline market consumption with opportunities for savings. Describing these individual savings opportunities results in a list of DSM measures to analyze. This section presents the methodology to develop the EE, DR, and DSRE measure lists.

4.1 Methodology

Resource Innovations identified a comprehensive catalog of DSM measures for the study. The measure list is the same for all FEECA Utilities. The iterative vetting process with the utilities to develop the measure list began by initially examining the list of measures included in the 2019 Goals docket. This list was then adjusted based on proposed measure additions and revisions provided by the FEECA Utilities. Resource Innovations further refined the measure list based on reviews of Resource Innovations' DSM measure library, compiled from similar market potential studies conducted in recent years throughout the United States, as well as measures included in other utility programs where Resource Innovations is involved with program design, implementation, or evaluation. The FEECA Utilities also reached out to interested parties and received input with recommendations on measure additions to the 2019 measure list. Their measure suggestions were reviewed and incorporated into the study as appropriate. External measure suggestions and actions are summarized in Appendix D. The extensive, iterative review process involving multiple parties has ensured that the study included a robust and comprehensive set of DSM measures.

See Appendix A for the list of EE measures, Appendix B for the list of DR measures, and Appendix C for the list of DSRE measures analyzed in the study.

4.2 EE Measures

EE measures represent technologies applicable to the residential, commercial, and industrial customers in the FEECA Utilities' service territories. The development of EE measures included consideration of:

- EE technologies that are applicable to Florida and commercially available: Measures that are not applicable due to climate or customer characteristics were excluded, as were "emerging" technologies that are not currently commercially available to FEECA utility customers.
- Current and planned Florida Building Codes and Federal equipment standards (Codes & Standards) for baseline equipment: Measures included from prior studies

were adjusted to reflect current Codes & Standards as well as updated efficiency tiers, as appropriate.

- Eligibility for utility DSM offerings in Florida: For example, behavioral measures were excluded from consideration, as they historically have not been allowed to count towards utility DSM goals. Behavioral measures are intended to motivate customers to operate in a more energy-efficient manner (e.g., setting an air-conditioner thermostat to a higher temperature) without accompanying: a) physical changes to more efficient end-use equipment or to their building envelope, b) utility-provided products and tools to facilitate the efficiency improvements, or c) permanent operational changes that improve efficiency which are not easily revertible to prior conditions. These types of behavioral measures were excluded because of the variability in forecasting the magnitude and persistence of energy and demand savings from the utility's perspective. Additionally, decoupling behavioral measure savings from the installation of certain EE technologies like smart thermostats can be challenging and could result in overlapping potential with other EE measures included in the study.

Upon development of the final EE measure list, utility-specific measure details were developed. RI maintains a proprietary online database of energy efficiency measures for MPS studies, which was used as a starting point for measure development for this study. Measures are added or updated at the request of project stakeholders or because of changes to the EE marketplace (for example, new codes and standards, or current practice in the market). Measure data are refined as new data or algorithms are developed for estimating measure impacts, and updated for each study to incorporate inputs parameters specific to the service territory being analyzed. The database contains the following information for each of the measures:

- Measure description: measure classification by type, end-use, and subsector, and description of the base-case and the efficient-case scenarios.
- kWh savings: Energy savings associated with each measure were developed through engineering algorithms or building simulation modeling, taking climate data and customer segments into consideration as appropriate. Reference sources used for developing residential, commercial, and industrial measure savings included a variety of Florida-specific, as well as regional and national sources, such as utility-specific measurement & verification (M&V) data, technical reference manuals (TRM) from other jurisdictions, ENERGY STAR calculators, and manufacturer or retailer specifications for particular products.
- Energy savings were applied in RI's TEA-POT model as a percentage of total baseline consumption. Peak demand savings were determined using utility-specific load shapes or coincidence factors.

- Measure Expected Useful Lifetime: Sources included the Database for Energy Efficient Resources (DEER), the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Handbook, TRMs, and other regional and national measure databases and EE program evaluations.
- Measure Costs: Per-unit costs (full or incremental, depending on the application) associated with measure installations. Sources included: TRMs, ENERGY STAR calculator, online market research, FEECA utility program data, and other secondary sources.

The measure details from the online measure library are exported for use in RI’s TEA-POT model, accompanied by utility-specific estimates of measure applicability. Measure applicability is a general term encompassing an array of factors, including technical feasibility of installation, and the measure’s current saturation as well as factors to allocate savings associated with competing measures. Information used was primarily derived from data in current regional and national databases, as well as TECO’s program tracking data. These factors are described in Table 7.

Table 7. Measure Applicability Factors

Measure Impact	Explanation	Sources
Technical Feasibility	The percentage of buildings that can have the measure physically installed. Various factors may affect this, including, but not limited to, whether the building already has the baseline measure (e.g., dishwasher), and limitations on installation (e.g., size of unit and space available to install the unit).	Various secondary sources and engineering experience.
Measure Incomplete Factor	The percentage of buildings without the specific measure currently installed.	Utility RASS; EIA RECS, CBECS; MECS; ENERGY STAR sales figures; and engineering experience.
Measure Share	Used to distribute the percentage of market shares for competing measures (e.g., only blown-in ceiling insulation or spray foam insulation, not both would be installed in an attic).	Utility customer data, Various secondary sources and engineering experience.

As shown in Table 8, the measure list includes 395 unique energy-efficiency measures. Expanding the measures to account for all appropriate installation scenarios resulted in

9,535 measure permutations, which are the application of individual measures to various customer segments, construction types, and end-uses (i.e., a single air-source heat pump “measure” can be installed in single family, multi-family, and manufactured homes, as well as new and existing vintages of each home type, and impacts both space cooling and space heating end-uses, resulting in twelve separate measure “permutations” analyzed).

Table 8. EE Measure Counts by Sector

Sector	Unique Measures	Permutations
Residential	119	1,173
Commercial	164	5,798
Industrial	112	2,564

4.3 DR Measures

The DR measures included in the measure list utilize the following DR strategies:

- **Direct Load Control.** Utility control of selected equipment at the customer’s home or business, such as HVAC or water heaters.
- **Critical Peak Pricing (CPP) with Technology.** Electricity rate structures that vary based on time of day. Includes CPP when the rate is substantially higher for a limited number of hours or days per year (customers receive advance notification of CPP event) coupled with technology that enables customer to lower their usage in a specific end-use in response to the event (e.g., HVAC via smart thermostat).
- **Contractual DR.** Customers receive incentive payments or a rate discount for committing to reduce load by a pre-determined amount or to a pre-determined firm service level upon utility request.
- **Automated DR.** Utility dispatched control of specific end-uses at a customer facility.

DR initiatives that do not rely on the installation of a specific device or technology to implement (such as a voluntary curtailment program or time of use rates) were not included.

A workbook was developed for each measure which included the same measure inputs as previously described for the EE measures. In addition, the DR workbook included expected load reduction from the measure, based on utility technical potential, existing utility DR programs, and other nationwide DR programs if needed.

For technical potential, Resource Innovations did not break out results by specific measure or control technology because all of the developed measures target the end-uses estimated

for technical potential (i.e., potential is reported for space cooling end-use and not allocated to switches, smart thermostats, etc.).

4.4 DSRE Measures

The DSRE measure list includes rooftop PV systems, battery storage systems charged from PV systems, and CHP systems.

PV Systems

PV systems utilize solar panels (a packaged collection of PV cells) to convert sunlight into electricity. A system is constructed with multiple solar panels, a DC/AC inverter, a racking system to hold the panels, and electrical system interconnections. These systems are often roof-mounted systems that face south-west, south, and/or, south-east. The potential associated with roof-mounted systems installed on residential and commercial buildings was analyzed.

Battery Storage Systems Charged from PV Systems

Distributed battery storage systems included in this study consist of behind-the-meter battery systems installed in conjunction with an appropriately-sized PV system at residential and commercial customer facilities. These battery systems typically consist of a DC-charged battery, a DC/AC inverter, and electrical system interconnections to a PV system. On their own battery storage systems do not generate or conserve energy, but can collect and store excess PV generation to provide power during particular time periods, which for DSM purposes would be to offset customer demand during the utility's system peak.

CHP Systems

In most CHP applications, a heat engine creates shaft power that drives an electrical generator (fuel cells can produce electrical power directly from electrochemical reactions). The waste heat from the engine is then recovered to provide other on-site needs. Common prime mover technologies used in CHP applications and explored in this study include:

- Steam turbines
- Gas turbines
- Micro turbines
- Fuel Cells
- Internal combustion engines

A workbook was developed for each measure which included the inputs previously described for EE measures and prime mover operating parameters.

5 Technical Potential

In the previous sections, the approach for DSM measure development was summarized, and the 2025 base year load shares and reference-case load forecast were described. The outputs from these tasks provided the input for estimating the technical potential scenario, which is discussed in this section.

The technical potential scenario estimates the potential energy and demand savings when all technically feasible and commercially available DSM measures are implemented without regard for cost-effectiveness and customer willingness to adopt the most impactful EE, DR, or DSRE technologies. Since the technical potential does not consider the costs or time required to achieve these savings, the estimates provide a theoretical upper limit on electricity savings potential. Technical potential is only constrained by factors such as technical feasibility and applicability of measures. For this study, technical potential included full application of the commercially available DSM measures to all residential, commercial, and industrial customers in the utility's service territory.

5.1 Methodology

5.1.1 EE Technical Potential

EE technical potential refers to delivering less electricity to the same end-uses. In other words, technical potential might be summarized as “doing the same thing with less energy, regardless of the cost.”

DSM measures were applied to the disaggregated utility electricity sales forecasts to estimate technical potential. This involved applying estimated energy savings from equipment and non-equipment measures to all electricity end-uses and customers. Technical potential consists of the total energy and demand that can be saved in the market which Resource Innovations reported as single numerical values for each utility's service territory.

The core equation used in the residential sector EE technical potential analysis for each individual efficiency measure is shown in Equation 1 below, while the core equation used in the nonresidential sector technical potential analysis for each individual efficiency measure is shown in Equation 2.

Equation 1: Core Equation for Residential Sector EE Technical Potential



Where:

- **Baseline Equipment Energy Use Intensity** = the electricity used per customer per year by each baseline technology in each market segment. In other words, the baseline equipment energy-use intensity is the consumption of the electrical energy using equipment that the efficient technology replaces or affects.
- **Saturation Share** = the fraction of the end-use electrical energy that is applicable for the efficient technology in a given market segment. For example, for residential cooling, the saturation share would be the fraction of all residential electric customers that have central air conditioners in their household.
- **Percent Incomplete** = the fraction of equipment that is not considered to already be energy efficient. To extend the example above, the fraction of central air conditioners that is not already energy efficient.
- **Feasibility Factor** = the fraction of units that is technically feasible for conversion to the most efficient available technology from an engineering perspective (i.e., it may not be possible to install LEDs in all light sockets in a home because the available styles may not fit in every socket).
- **Savings Factor** = the percentage reduction in electricity consumption resulting from the application of the efficient technology.

Equation 2: Core Equation for Non-Residential Sector EE Technical Potential



Where:

- **Total Stock Square Footage by Segment** = the forecasted square footage level for a given building type (e.g., square feet of office buildings).
- **Baseline Equipment Energy Use Intensity** = the electricity used per square foot per year by each baseline equipment type in each market segment.

- **Saturation Shares** = the fraction of total end-use energy consumption associated with the efficient technology in a given market segment. For example, for packaged terminal air-conditioner (PTAC), the saturation share would be the fraction of all space cooling kWh in a given market segment that is associated with PTAC equipment.
- **Percent Incomplete** = the fraction of equipment that is not considered to already be energy efficient.
- **Feasibility Factor** = the fraction of the equipment or practice that is technically feasible for conversion to the efficient technology from an engineering perspective (i.e., it may not be possible to install Variable Frequency Drives (VFD) on all motors in a given market segment).
- **Savings Factor** = the percentage reduction in electricity consumption resulting from the application of the efficient technology.

It is important to note that the technical potential estimate represents electricity savings potential at a specific point in time. In other words, the technical potential estimate is based on data describing status quo customer electricity use and technologies known to exist today. As technology and electricity consumption patterns evolve over time, the baseline electricity consumption will also change accordingly. For this reason, technical potential is a discrete estimate of a dynamic market. Resource Innovations reported the technical potential for 2025, based on currently known DSM measures and observed electricity consumption patterns.

Measure Interaction and Competition (Overlap)

While the technical potential equations listed above focus on the technical potential of a single measure or technology, Resource Innovations' modeling approach does recognize the overlap of individual measure impacts within an end-use or equipment type, and accounts for the following interactive effects:

- **Measure interaction:** Installing high-efficiency equipment could reduce energy savings in absolute terms (kWh) associated with non-equipment measures that impact the same end-use. For example, installing a high-efficiency heat pump will reduce heating and cooling consumption which will reduce the baseline against which attic insulation would be applied, thus reducing savings associated with installing insulation. To account for this interaction, Resource Innovations' TEA-POT model ranks measures that interact with one another and reduces the baseline consumption for the subsequent measure based on the savings achieved by the preceding measure. For technical potential, interactive measures are ranked based on total end-use energy savings percentage.
- **Measure competition (overlap):** The "measure share"—as defined above—accounted for competing measures, ensuring savings were not double-counted. This interaction

occurred when two or more measures “competed” for the same end-use. For example, a T-12 lamp could be replaced with a T-8 or linear LED lamp.

Addressing Naturally-Occurring EE

Naturally occurring energy efficiency includes actions taken by customers to improve the efficiency of their homes and businesses in the absence of utility program intervention. For the analysis of technical potential, Resource Innovations verified with TECO’s forecasting group that the baseline sales forecasts incorporated two known sources of naturally-occurring efficiency:

- Codes and Standards: The sales forecasts already incorporated the impacts of known Code & standards changes.
- Baseline Measure Adoption: The sales forecast excluded the projected impacts of future DSM efforts but included already implemented DSM penetration.

By properly accounting for these factors, the technical potential analysis estimated the additional EE opportunities beyond what is already included in the utility sales forecast.

5.1.2 DR Technical Potential

The concept of technical potential applies differently to DR than for EE. Technical potential for DR is effectively the magnitude of loads that can be curtailed during conditions when utilities need peak capacity reductions. In evaluating this potential at peak capacity, the following were considered: which customers are consuming electricity at those times? What end-uses are in play? Can those end-use loads be managed? Large C&I accounts generally do not provide the utility with direct control over particular end-uses. Instead, many of these customers will forego electric demand temporarily if the financial incentive is large enough. For residential and small C&I customers where DR generally takes the form of direct utility control, technical potential for DR is limited by the loads that can be controlled remotely at scale.

This framework makes end-use disaggregation an important element for understanding DR potential, particularly in the residential and small C&I sectors. When done properly, end-use disaggregation not only provides insights into which loads are on and off when specific grid services are needed, it also provides insight concerning how key loads and end-uses, such as air conditioning use, vary across customers. Resource Innovations’ approach used for load disaggregation is more advanced than what is used for most potential studies. Instead of disaggregating annual consumption or peak demand, Resource Innovations produced end-use load disaggregation for all 8,760 hours. This was needed because the loads available at times when different grid applications are needed can vary substantially. Instead

of producing disaggregated loads for the average customer, the study was produced for several customer segments. For TECO, Resource Innovations examined three residential segments based on customer housing type, four different small C&I segments based on customer size, and four different large C&I segments based on customer size, for a total of 11 different customer segments.

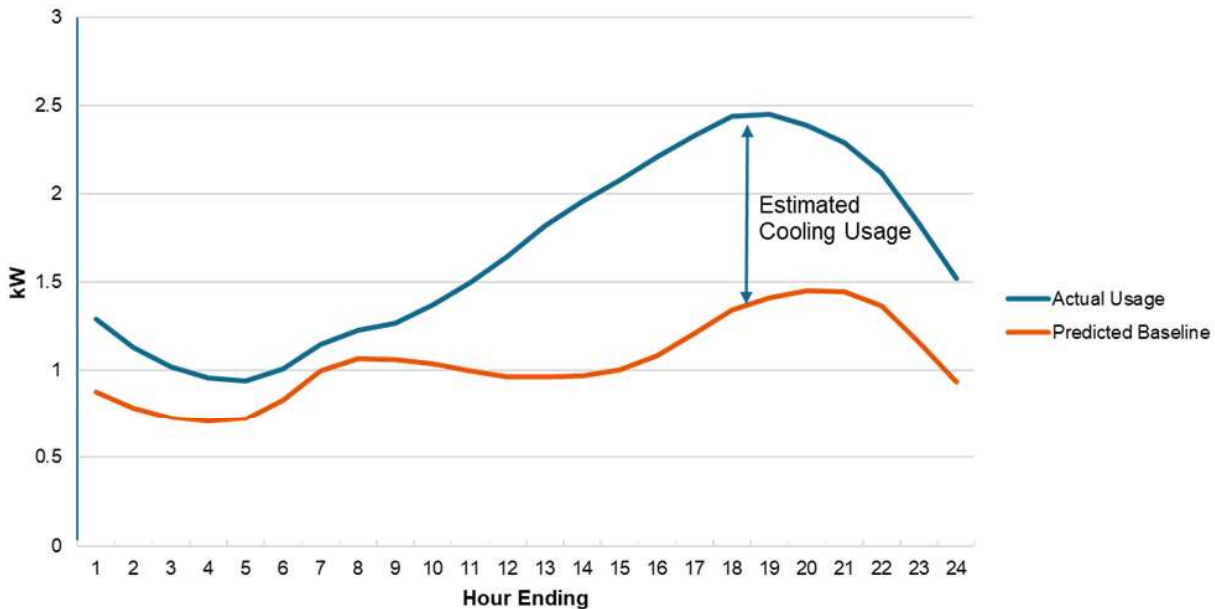
Technical potential, in the context of DR, is defined as the total amount of load available for reduction that is coincident with the period of interest; in this case, the system peak hour for the summer and winter seasons. Thus, two sets of capacity values are estimated: a summer capacity and a winter capacity.

As previously mentioned, for technical potential purposes, all coincident large C&I load is considered dispatchable, while residential and small C&I DR capacity is based on specific end-uses. Summer DR capacity for residential customers was comprised of air-conditioning (AC), pool pumps, water heaters, and managed electric vehicle charging. For small C&I customers, summer capacity was based on AC load. For winter DR capacity, residential was based on electric heating, pool pumps, and water heaters. For small C&I customers, winter capacity was based on electric heating.

AC and heating load profiles were generated for residential and small C&I customers using a sample of customers' interval data provided by TECO. This sample included a customer breakout based on housing type for residential customers and size for small C&I customers. Resource Innovations then used the interval data from these customers to create an average load profile for each customer segment.

The average load profile for each customer segment was combined with historical weather data, and used to estimate hourly load as a function of weather conditions. AC and heating loads were estimated by first calculating the baseline load on days when cooling degree days (CDD) and heating degree days (HDD) were equal to zero, and then subtracting this baseline load. This methodology is illustrated by Figure 9 (a similar methodology was used to predict heating loads).

Figure 9: Methodology for Estimating Cooling Loads



This method was able to produce estimates for average AC/heating load profiles for the seven different customer segments within the residential and small C&I sectors.

Profiles for residential water heater and pool pump loads were estimated by utilizing end-use load data from NREL’s residential end-use load profile database.

For all eligible loads, the technical potential was defined as the amount that was coincident with system peak hours for each season, which are August from 5:00-6:00 PM for summer, and January from 7:00-8:00 AM for winter. As mentioned in Section 4, for technical potential there was also no measure breakout needed, because all measures will target the end-uses’ estimated total loads.

5.1.3 DSRE Technical Potential

5.1.3.1 PV Systems

To determine technical potential for PV systems, RI estimated the percentage of rooftop square footage in Florida that is suitable for hosting PV technology. Our estimate of technical potential for PV systems in this report is based in part on the available roof area and consisted of the following steps:

- Step 1: Outcomes from the forecast disaggregation analysis were used to characterize the existing and new residential, commercial, and industrial building stocks.
 - To calculate the total roof area for residential buildings, the average roof area per household is multiplied by the number of households.
 - For commercial and industrial buildings, RI calculated the total roof area by first dividing the load forecast by the energy usage intensity, which provides an estimate of the total building square footage. This result is then divided by the average number of floors to derive the total roof area.
- Step 2: The total available roof area feasible for installing PV systems was calculated. Relevant parameters included unusable area due to other rooftop equipment and setback requirements, in addition to possible shading from trees and limitations of roof orientation (factored into a “technical suitability” multiplier).
- Step 3: Estimated the expected power density (kW per square foot of roof area).
- Step 4: Estimated the hourly PV generation profile using NREL’s PV Watts Calculator
- Step 5: Calculated total energy and coincident peak demand potential by applying RI’s Spatial Penetration and Integration of Distributed Energy Resources (SPIDER) Model.

The methodology presented in this report uses the following formula to estimate overall technical potential of PVs:

Equation 3: Core Equation for Solar DSRE Technical Energy Potential



Where:

- **Suitable Rooftop PV Area for Residential [Square Feet]:** Number of Residential Buildings x Average Roof Area Per Building x Technical Suitability Factor
- **Suitable Rooftop PV Area for Commercial [Square Feet] :** Energy Consumption [kWh] / Energy Intensity [kWh / Square Feet] / Average No. of Stories Per Building x Technical Suitability Factor
- **PV Power Density [kW-DC/Square Feet]:** Maximum power generated in Watts per square foot of solar panel.
- **Generation Factor:** Annual Energy Generation Factor for PV, from PV Watts (dependent on local solar irradiance)

5.1.3.2 Battery Storage Systems Charged from PV Systems

Battery storage systems on their own do not generate power or create efficiency improvements, but store power for use at different times. Therefore, in analyzing the technical potential for battery storage systems, the source of the stored power and overlap with technical potential identified in other categories was considered.

Battery storage systems that are powered directly from the grid do not produce annual energy savings but may be used to shift or curtail load during particular time periods. As the DR technical potential analyzes curtailment opportunities for the summer and winter peak period, and battery storage systems can be used as a DR technology, the study concluded that no additional technical potential should be claimed for grid-powered battery systems beyond that already attributed to DR.

Battery storage systems that are connected to on-site PV systems also do not produce additional energy savings beyond the energy produced from the PV system⁵. However, PV-connected battery systems do create the opportunity to store energy during period when the PV system is generating more than the home or business is consuming and use that stored power during utility system peak periods.

To determine the additional technical potential peak demand savings for “solar plus storage” systems, our methodology consisted of the following steps:

- Assume that every PV system included in PV Technical Potential is installed with a paired storage system.
- Size the storage system assuming peak storage power is equal to peak PV generation and energy storage duration is three hours.
- Apply RI’s hourly dispatch optimization module in SPIDER to create an hourly storage dispatch profile that flattens the individual customer’s load profile to the greatest extent possible accounting for a) customer hourly load profile, b) hourly PV generation profile, and c) battery peak demand, energy capacity, and roundtrip charge/discharge efficiency.
- Calculate the effective hourly impact for the utility using the above storage dispatch profile, aligned with the utility’s peak hour (calculated separately for summer and winter)
- Report the output storage kW impact on utility coincident peak demand in summer and winter.

⁵ PV-connected battery systems experience some efficiency loss due to storage, charging, and discharging. However, for this study, these losses were not quantified.

5.1.3.3 CHP Systems

The CHP analysis created a series of unique distributed generation potential models for each primary market sector (commercial and industrial).

Only non-residential customer segments whose electric and thermal load profiles allow for the application of CHP were considered. The technical potential analysis followed a three-step process. First, minimum facilities size thresholds were determined for each non-residential customer segment. Next, the full population of non-residential customers were segmented and screened based on the size threshold established for that segment. Finally, the facilities that were of sufficient size were matched with the appropriately sized CHP technology.

To determine the minimum threshold for CHP suitability, a thermal factor was applied to potential candidate customer loads to reflect thermal load considerations in CHP sizing. In most cases, on-site thermal energy demand is smaller than electrical demand. Thus, CHP size is usually dictated by the thermal load in order to achieve improved efficiencies.

The study collected electric and thermal intensity data from other recent CHP studies. For industrial customers, Resource Innovations assumed that the thermal load would primarily be used for process operations and was not modified from the secondary data sources for Florida climate conditions. For commercial customers, the thermal load is more commonly made up of water heating, space heating, and space cooling (through the use of an absorption chiller). Therefore, to account for the hot and humid climate in Florida, which traditionally limits weather-dependent internal heating loads, commercial customers' thermal loads were adjusted to incorporate a higher proportion of space cooling to space heating as available opportunities for waste heat recovery.

Resource Innovations worked with the utility-provided customer data, focusing on annual consumption due to the absence of NAICS or SIC codes for this utility data. Non-residential customers were subsequently classified based on annual consumption and size. Since NAICS or SIC codes were unavailable, no formal segmentation occurred. Instead, the analysis focused exclusively on annual utility usage. Facilities with annual loads below the kWh thresholds were deemed unlikely to possess the consistent electric and thermal loads necessary to support CHP and were consequently excluded from consideration. Conversely, those meeting the size criteria were aligned with the corresponding CHP technology.

In general, internal combustion engines are the prime mover for systems under 500kW with gas turbines becoming progressively more popular as system size increases above that. Based on the available load by customer, adjusted by the estimated thermal factor for each

segment, CHP technologies were assigned to utility customers in a top-down fashion (i.e., starting with the largest CHP generators).

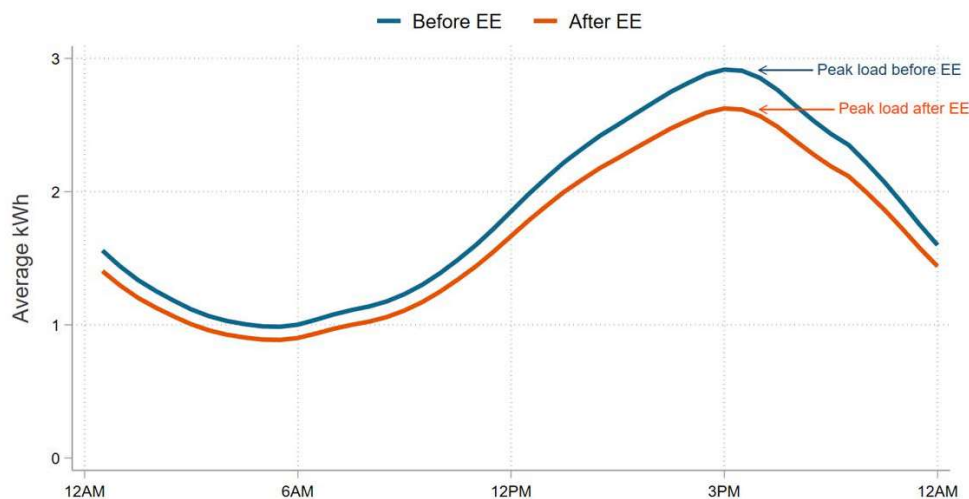
Measure Interaction

PV systems and battery storage charged from PV systems were analyzed collectively due to their common power generation source; and therefore, the identified technical potential for these systems is additive. However, CHP systems were independently analyzed for technical potential without consideration of the competition between DSRE technologies or customer preference for a particular DSRE system. Therefore, results for CHP technical potential should not be combined with PV systems or battery storage systems for overall DSRE potential but used as independent estimates.

5.1.4 Interaction of Technical Potential Impacts

As described above, the technical potential was estimated using separate models for EE, DR, and DSRE systems. However, there is interaction between these technologies; for example, a more efficient HVAC system would result in a reduced peak demand available for DR curtailment, as illustrated in Figure 10.

Figure 10: Illustration of EE Impacts on HVAC System Load Shape



Therefore, after development of the independent models, the interaction between EE, DR, and DSRE was incorporated as follows:

- The EE technical potential was assumed to be implemented first, followed by DR technical potential and DSRE technical potential.

- To account for the impact of EE technical potential on DR, the baseline load forecast for the applicable end-uses was adjusted by the EE technical potential, resulting in a reduction in baseline load available for curtailment.
- For DSRE systems, the EE and DR technical potential was incorporated in a similar fashion, adjusting the baseline load used to estimate DSRE potential.
 - For the PV analysis, this did not impact the results as the EE and DR technical potential did not affect the amount of PV that could be installed on available rooftops.
 - For the battery storage charged from PV systems, the reduced baseline load from EE resulted in additional PV-generated energy being available for the battery systems and for use during peak periods. The impact of DR events during the assumed curtailment hours was incorporated into the modeling of available battery storage and discharge loads.
- For CHP systems, the reduced baseline load from EE resulted in a reduction in the number of facilities that met the annual energy threshold needed for CHP installations. Installed DR capacity was assumed to not impact CHP potential as the CHP system feasibility was determined based on energy and thermal consumption at the facility. It should be noted that CHP systems not connected to the grid could impact the amount of load available for curtailment with utility-sponsored DR. Therefore, CHP technical potential should not be combined with DR potential but used as independent estimates.

5.2 EE Technical Potential

5.2.1 Summary

Table 9 summarizes the EE technical potential by sector:

Table 9. EE Technical Potential

	Savings Potential		
	Summer Peak Demand (MW)	Winter Peak Demand (MW)	Energy (GWh)
Residential	992	445	3,197
Non-Residential⁶	398	334	2,272
Total	1,390	779	5,469

⁶ Non-Residential results include all commercial and industrial customer segments.

5.2.2 Residential

Figure 11, Figure 12, and Figure 13 summarize the residential sector EE technical potential by end-use.

Figure 11: Residential EE Technical Potential by End-Use (Summer Peak Savings)

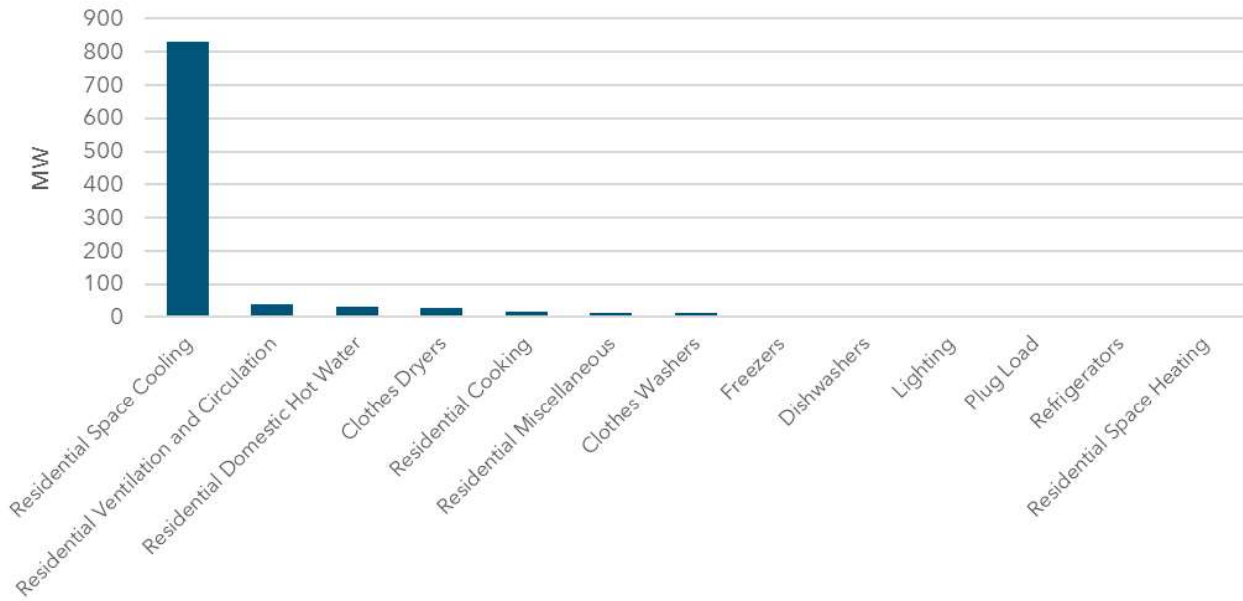


Figure 12: Residential EE Technical Potential by End-Use (Winter Peak Savings)

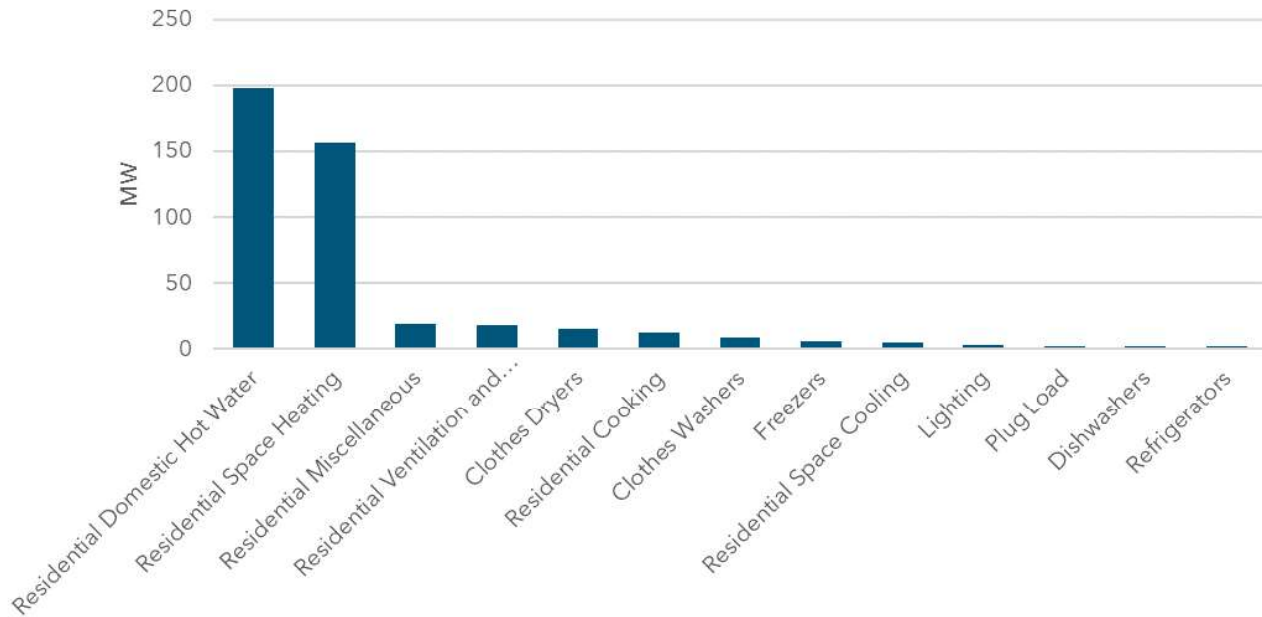
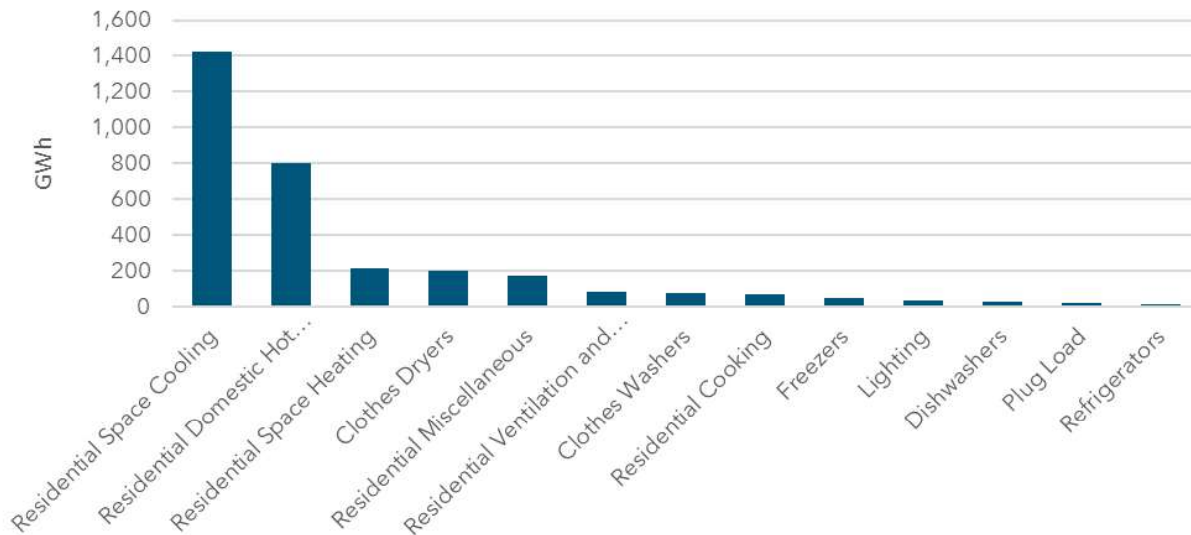


Figure 13: Residential EE Technical Potential by End-Use (Energy Savings)



5.2.3 Non-Residential

5.2.3.1 Commercial Segments

Figure 14, Figure 15, and Figure 16 summarize the commercial sector EE technical potential by end-use.

Figure 14: Commercial EE Technical Potential by End-Use (Summer Peak Savings)

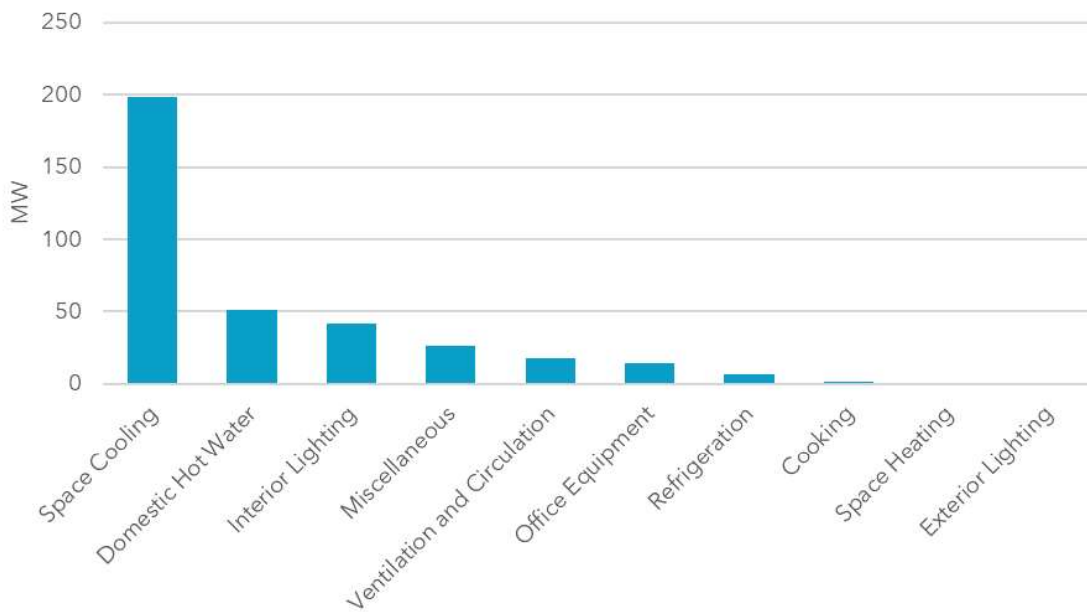


Figure 15: Commercial EE Technical Potential by End-Use (Winter Peak Savings)

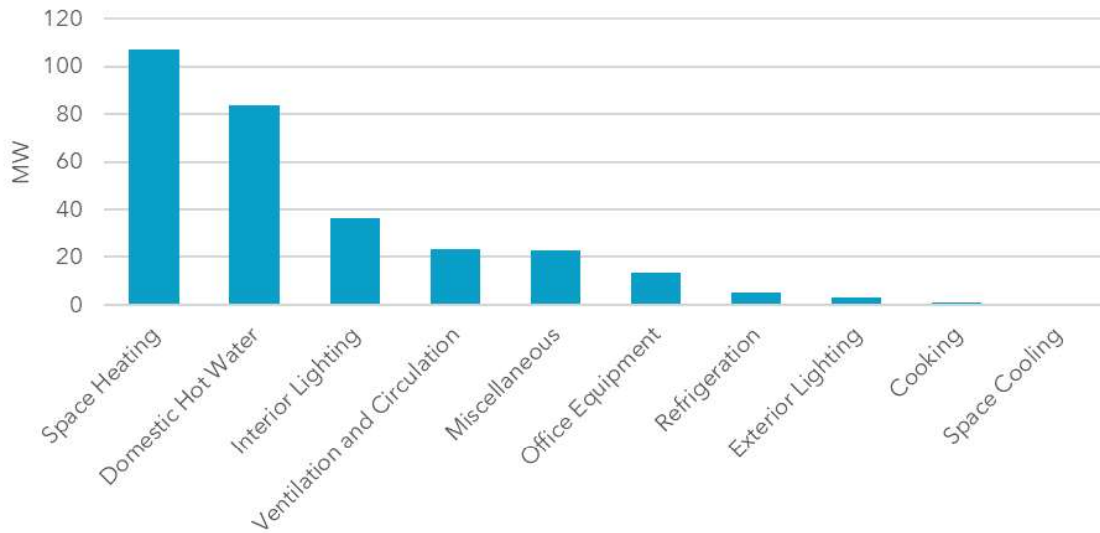
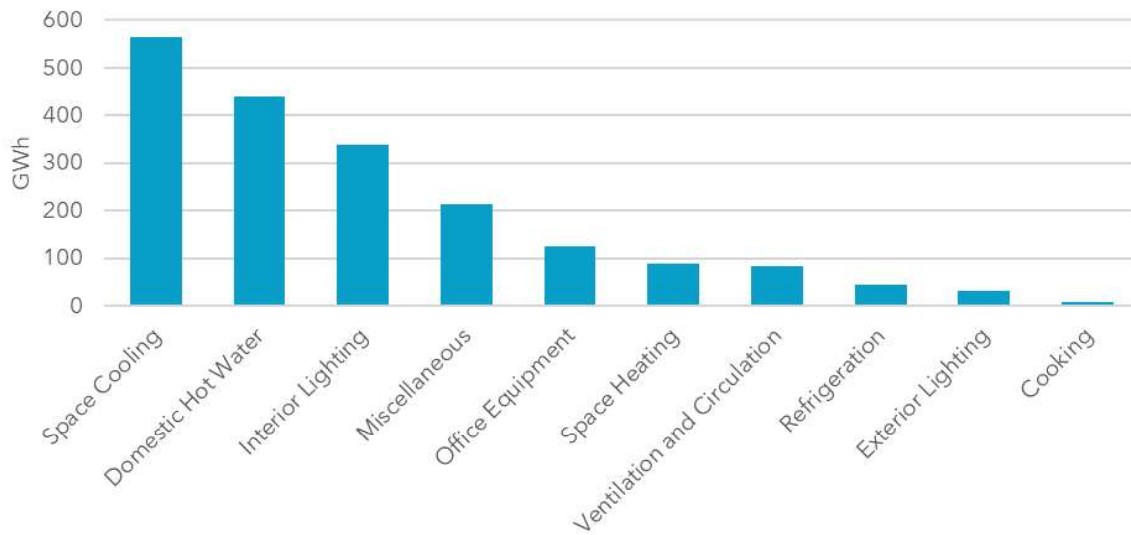


Figure 16: Commercial EE Technical Potential by End-Use (Energy Savings)



5.2.3.2 Industrial Segments

Figure 17, Figure 18, and Figure 19 summarize the industrial sector EE technical potential by end-use.

Figure 17: Industrial EE Technical Potential by End-Use (Summer Peak Savings)

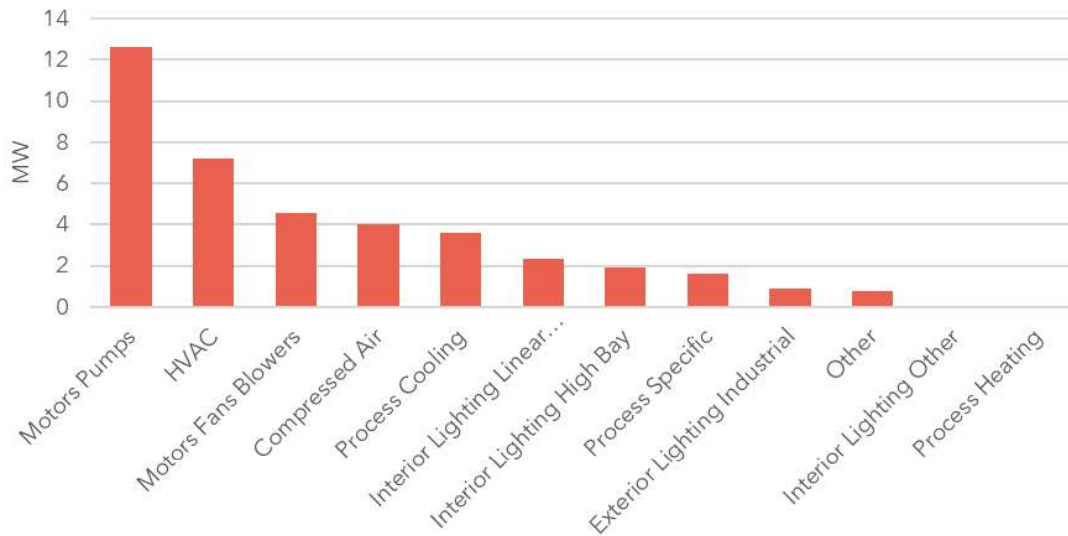


Figure 18: Industrial EE Technical Potential by End-Use (Winter Peak Savings)

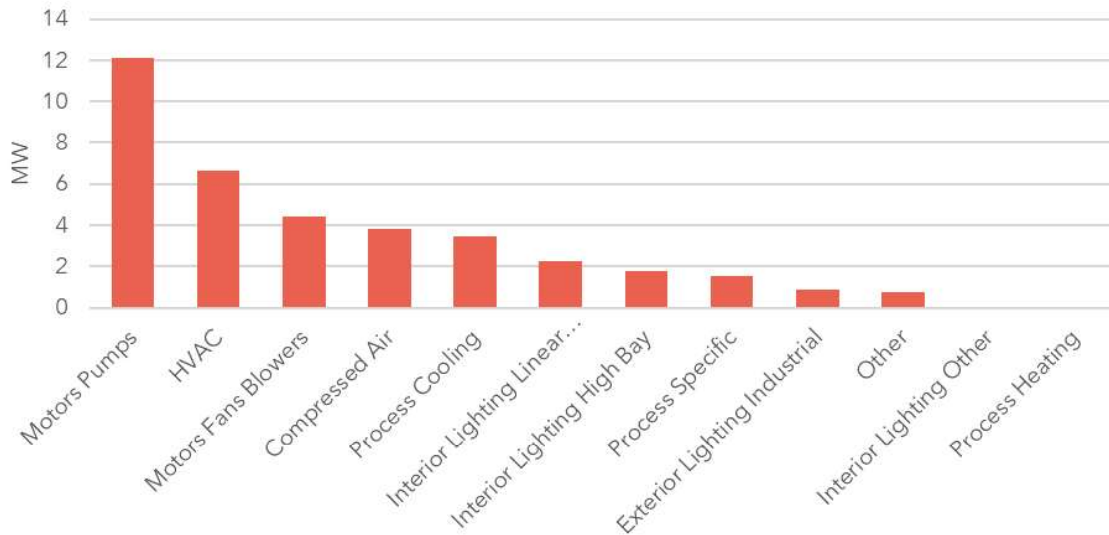
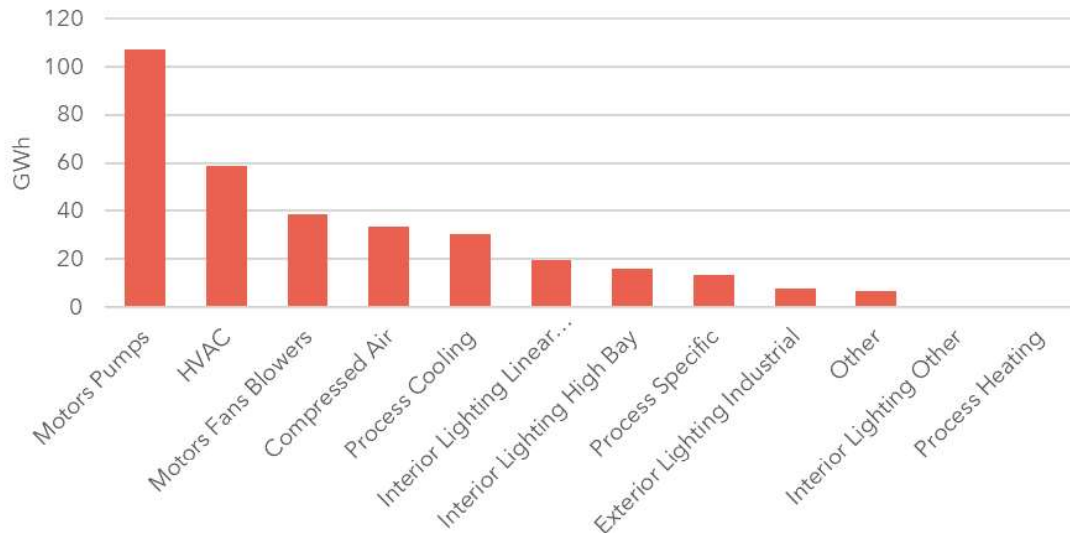


Figure 19: Industrial EE Technical Potential by End-Use (Energy Savings)



5.3 DR Technical Potential

Technical potential for DR is defined for each class of customers as follows:

- Residential & Small C&I customers - Technical potential is equal to the aggregate load for all end-uses that can participate in TECO's current programs plus DR measures not currently offered in which the utility uses specialized devices to control loads (i.e., direct load control programs). This includes cooling and heating loads for residential and small C&I customers and water heater and pool pump loads for residential customers. Not all demand reductions are delivered via direct load control of end-uses. The magnitude of demand reductions from non-direct load control such as time varying pricing, peak time rebates and targeted notifications is linked to cooling and heating loads.
- Large C&I customers - Technical potential is equal to the total amount of load for each customer segment (i.e., that customers reduce their total load to zero when called upon).

Table 10 summarizes the seasonal DR technical potential by sector:

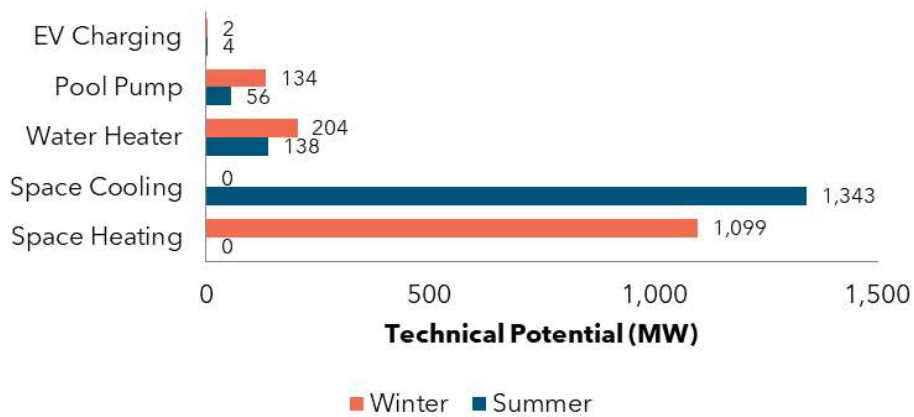
Table 10. DR Technical Potential

	Savings Potential	
	Summer Peak Demand (MW)	Winter Peak Demand (MW)
Residential	1,541	1,439
Non-Residential	1,571	1,691
Total	3,112	3,130

5.3.1 Residential

Residential technical potential is summarized in Figure 20.

Figure 20: Residential DR Technical Potential by End-Use

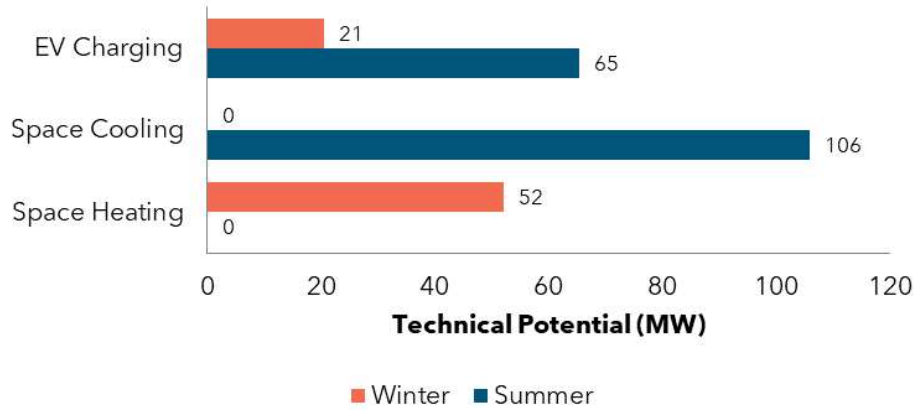


5.3.2 Non-Residential

5.3.2.1 Small C&I Customers

For small C&I technical potential, Resource Innovations looked at cooling and heating loads only. Small C&I technical potential is provided in Figure 21.

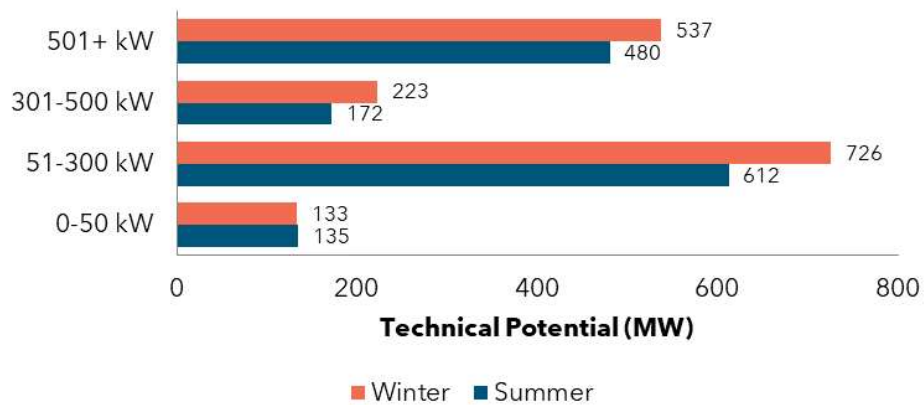
Figure 21: Small C&I DR Technical Potential by End-Use



5.3.2.2 Large C&I Customers

Figure 22 provides the technical potential for large C&I customers, broken down by customer size.

Figure 22: Large C&I DR Technical Potential by Segment



5.4 DSRE Technical Potential

Table 11 provides the results of the DSRE technical potential for each customer segment:

Table 11. DSRE Technical Potential⁷

	Savings Potential		
	Summer Peak Demand (MW)	Winter Peak Demand (MW)	Energy (GWh)
PV Systems			
Residential	484	51	8,000
Non-Residential	165	6	2,236
Total	649	57	10,236
Battery Storage charged from PV Systems			
Residential	598	876	0
Non-Residential	120	205	0
Total	718	1081	0
CHP Systems			
Total	358	286	1,768

⁷ PV systems and CHP systems were independently analyzed for technical potential without consideration of the competition between technologies or customer preference for DSRE system.

Appendix A EE Measure List

For information on how Resource Innovations developed this list, please see Section 4.

Table 12: Residential EE Measures

Measure	End-Use	Description	Baseline
120v Heat Pump Water Heater 50 Gallons	Residential Domestic Hot Water	120v Heat Pump Water Heater 50 Gallons	Code-Compliant 50 Gallon Electric Resistance Water Heater
Air Sealing-Infiltration Control	Residential Space Cooling, Residential Space Heating	Standard Heating and Cooling System with Improved Infiltration Control	Standard Heating and Cooling System with Standard Infiltration Control
Air-to-Water Heat Pump	Residential Space Cooling, Residential Space Heating	Energy Star Air-to-Water Heat Pump, 25 SEER, 13 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
ASHP - 15 SEER/14.3 SEER2 from base electric resistance	Residential Space Cooling, Residential Space Heating	ASHP 15 SEER from base electric resistance	Base AC, 15 SEER, Electric resistance heating
ASHP - 24 SEER/22.9 SEER2 (from elec resistance)	Residential Space Cooling, Residential Space Heating	ASHP: 24/22.9 SEER/SEER2, 10.5 HSPF	Base AC, 15 SEER, Electric resistance heating
ASHP - 24 SEER/22.9 SEER2, 10.5 HSPF	Residential Space Cooling, Residential Space Heating	ASHP: 24/22.9 SEER/SEER2, 10.5 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
ASHP - CEE Advanced Tier: 17.8 SEER/17 SEER2; 10.0 HSPF	Residential Space Cooling, Residential Space Heating	CEE Advanced Tier ASHP: 17.8/17 SEER/SEER2; 10.0 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
ASHP - CEE Advanced Tier: 17.8 SEER/17 SEER2; 10.0 HSPF (from elec resistance)	Residential Space Cooling, Residential Space Heating	CEE Advanced Tier ASHP: 17.8/17 SEER/SEER2; 10.0 HSPF	Base AC, 15 SEER, Electric resistance heating
ASHP - CEE Tier 2: 16.8 SEER/16 SEER2; 9.0 HSPF	Residential Space Cooling, Residential Space Heating	CEE Tier 2 ASHP: 16.8/16 SEER/SEER2; 9.0 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
ASHP - CEE Tier 2: 16.8 SEER/16 SEER2; 9.0 HSPF (from elec resistance)	Residential Space Cooling, Residential Space Heating	CEE Tier 2 ASHP: 16.8/16 SEER/SEER2; 9.0 HSPF	Base AC, 15 SEER, Electric resistance heating

Measure	End-Use	Description	Baseline
ASHP - ENERGY STAR/CEE Tier 1: 16 SEER/15.2 SEER2 (from elect resistance)	Residential Space Cooling, Residential Space Heating	ENERGY STAR/CEE Tier 1 ASHP: 16/15.2 SEER/SEER2, 9.0 HSPF	Base AC, 15 SEER, Electric resistance heating
ASHP - ENERGY STAR/CEE Tier 1: 16 SEER/15.2 SEER2, 9.0 HSPF	Residential Space Cooling, Residential Space Heating	ENERGY STAR/CEE Tier 1 ASHP: 16/15.2 SEER/SEER2, 9.0 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
Basement or Crawlspace Wall Insulation R-15	Residential Space Cooling, Residential Space Heating	Increased Basement or Crawlspace Wall Insulation (R-15)	Code-Compliant Exterior Below-Grade Wall Insulation (R-10)
Bathroom Faucet Aerators	Residential Domestic Hot Water	Low-Flow Faucet Aerator with Flow Rate of 1.5 gpm	Faucet Aerator with Federal Standard Flow Rate of 2.2 gpm
CEE Advanced Tier Clothes Dryer	Clothes Dryers	CEE Advanced Tier Clothes Dryer	One Clothes Dryer meeting Federal Standard
CEE Advanced Tier Clothes Washer	Clothes Washers	Tier 3 CEE Clothes washer	One Clothes Washer meeting Federal Standard
CEE Tier 3 Refrigerator	Refrigerators	Residential Tier 3 Refrigerator	One Refrigerator meeting Federal Standard
Ceiling Insulation (R11 to R38)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1982-1985) homes	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R11 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1982-1985) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R19 to R38)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1982-2020) homes	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R19 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1982-2020) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R2 to R38)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, older (pre-1982) homes	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R2 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, older (pre-1982) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R30 to R38)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1986-2020) homes	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R30 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1986-2020) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction

Measure	End-Use	Description	Baseline
Ceiling Insulation (R38 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1986-2020) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction
Central AC - CEE Tier 2: 16.8 SEER/16 SEER2	Residential Space Cooling	Central AC - CEE Tier 2: 16.8 SEER/16 SEER2	Code-Compliant Central AC, 15 SEER (updated)
Central AC - 24 SEER/22.9 SEER2	Residential Space Cooling	Central AC - 24 SEER/22.9 SEER2	Code-Compliant Central AC, 15 SEER (updated)
Central AC - CEE Advanced Tier: 17.8 SEER/17 SEER2	Residential Space Cooling	Central AC - CEE Advanced Tier: 17.8 SEER/17 SEER2	Code-Compliant Central AC, 15 SEER (updated)
Central AC - ENERGY STAR/CEE Tier 1: 16 SEER/15.2 SEER2	Residential Space Cooling	Central AC - ENERGY STAR/CEE Tier 1: 16 SEER/15.2 SEER2	Code-Compliant Central AC, 15 SEER (updated)
Central AC Tune Up	Residential Space Cooling	System tune-up, including coil cleaning, refrigerant charging, and other diagnostics	Existing Typical Central AC without Regular Maintenance/tune-up
Dehumidifier Recycling	Plug Load	No dehumidifier	One Dehumidifier meeting Federal Standard
Drain Water Heat Recovery	Residential Domestic Hot Water	50 Gallon Electric Resistance Heater and Drain Water Heat Exchanger	50 Gallon Electric Resistance Heater, No Drain Water Heat Recovery
Duct Insulation	Residential Space Cooling, Residential Space Heating	Standard Electric Heating and Central AC with Insulated Ductwork	Standard Electric Heating and Central AC with Uninsulated Ductwork
Duct Repair	Residential Space Cooling, Residential Space Heating	Duct Repair to eliminate/minimize leaks, includes testing and sealing	Standard Electric Heating and Central AC with typical duct leakage
ECM Circulator Pump	Residential Miscellaneous	Install ECM Circulator Pump	Install Standard Circulator Pump
Energy Star Air Purifier	Plug Load	One Air Purifier meeting ENERGY STAR 2.0 Standards	One Standard Conventional Air Purifier
Energy Star Audio-Video Equipment	Plug Load	One DVD/Blu-Ray Player meeting current ENERGY STAR Standards	One Market Average DVD/Blu-Ray Player
Energy Star Bathroom Ventilating Fan	Residential Ventilation and Circulation	Bathroom Exhaust Fan meeting current ENERGY STAR Standards	Bathroom Exhaust Fan meeting Federal Standard
Energy Star Ceiling Fan	Residential Miscellaneous	60" Ceiling Fan Meeting ENERGY STAR 3.1 Standards	Standard 60" Ceiling Fan
Energy Star Clothes Dryer	Clothes Dryers	One Electric Resistance Clothes Dryer meeting ENERGY STAR 1.1 Standards	One Clothes Dryer meeting Federal Standard

Measure	End-Use	Description	Baseline
Energy Star Clothes Washer	Clothes Washers	One Clothes Washer meeting ENERGY STAR 8.1 Standards	One Clothes Washer meeting Federal Standard
Energy Star Dehumidifier	Plug Load	One Dehumidifier meeting ENERGY STAR 5.0 Standards	One Dehumidifier meeting Federal Standard
Energy Star Dishwasher	Dishwashers	One Dishwasher meeting ENERGY STAR 7.0 Requirements (effective on July 19, 2023), electric water heating	One Dishwasher meeting Federal Standard
Energy Star Dishwasher (Gas Water Heating)	Dishwashers	One Dishwasher meeting ENERGY STAR 7.0 Requirements, gas water heating	One Dishwasher meeting Federal Standard; gas water heating
Energy Star Door	Residential Space Cooling, Residential Space Heating	100ft ² of Opaque Door meeting Energy Star Version 6.0 Requirements (U-Value: 0.17)	100ft ² of Opaque Door meeting current FL Code Requirements
ENERGY STAR EV supply equipment (level 2 charger)	Residential Miscellaneous	Level 2 Electric Vehicle Supply Equipment (EVSE)	Level 1 Electric Vehicle Supply Equipment (EVSE)
Energy Star Freezer	Freezers	One Freezer meeting current ENERGY STAR 5.1 Standards	One Freezer meeting Federal Standard
Energy Star Ground Source Heat Pump	Residential Space Cooling, Residential Space Heating	Energy Star GSHP, 17.1 SEER, 12 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF
Energy Star Imaging Equipment	Plug Load	One imaging device meeting current ENERGY STAR Standards	One non-ENERGY STAR imaging device
Energy Star Monitor	Plug Load	One Monitor meeting ENERGY STAR 8.0 Standards	One Standard Monitor
Energy Star Personal Computer	Plug Load	One Personal Computer meeting ENERGY STAR 8.0 Standards	One Personal Computer meeting ENERGY STAR® 3.0 Standards
Energy Star Refrigerator	Refrigerators	One Refrigerator/Freezer meeting ENERGY STAR 5.1 Standards	One Refrigerator/Freezer meeting Federal Standard
Energy Star Room AC	Residential Space Cooling	Room AC meeting current ENERGY STAR standards	Code-Compliant Room AC
Energy Star Set-Top Receiver	Plug Load	One Set-top Box meeting ENERGY STAR 4.1 Standards	One Market Average Set-top Box
Energy Star TV	Plug Load	One Television meeting ENERGY STAR 9.0 Standards	One non-ENERGY STAR Television
Energy Star Windows	Residential Space Cooling, Residential Space Heating	100ft ² of Window meeting Energy Star Version 6.0 Requirements (U-Value: 0.27, SHGC: 0.21)	100ft ² of Window current FL energy code requirements

Measure	End-Use	Description	Baseline
Exterior Wall Insulation	Residential Space Cooling, Residential Space Heating	Increased Exterior Above-Grade Wall Insulation (R-13)	Market Average Existing Exterior Above-Grade Wall Insulation
Filter Whistle	Residential Ventilation and Circulation	Install the Furnace Filter Alarm	No Furnace Filter Alarm on a Central Forced-Air Furnace
Floor Insulation	Residential Space Heating	Increased Floor Insulation (R-30)	Code-Compliant Floor Insulation
Freezer Recycling	Freezers	No Freezer	Current Market Freezer
Green Roof	Residential Space Cooling	Vegetated Roof Surface on top of Standard Roof	Standard Black Roof
Heat Pump Clothes Dryer	Clothes Dryers	One Heat Pump Clothes Dryer	One Clothes Dryer meeting Federal Standard
Heat Pump Pool Heater	Residential Miscellaneous	Heat Pump Swimming Pool Heater	Electric Resistance Swimming Pool Heater
Heat Pump Tune Up	Residential Space Cooling, Residential Space Heating	System tune-up, including coil cleaning, refrigerant charging, and other diagnostics	Standard Heating and Cooling System without Regular Maintenance/tune-up
Heat Pump Water Heater 50 Gallons-CEE Advanced Tier	Residential Domestic Hot Water	CEE Advanced Tier Heat Pump Water Heater 50 Gallons	Code-Compliant 50 Gallon Electric Resistance Water Heater
Heat Pump Water Heater 50 Gallons-ENERGY STAR	Residential Domestic Hot Water	Heat Pump Water Heater 50 Gallons	Code-Compliant 50 Gallon Electric Resistance Water Heater
Heat Pump Water Heater 80 Gallons-ENERGY STAR	Residential Domestic Hot Water	Energy Star Heat Pump Water Heater 80 Gallons	Code-Compliant 80 Gallon Electric Resistance Water Heater
Heat Trap	Residential Domestic Hot Water	Heat Trap	Existing Water Heater without heat trap
High Efficiency Convection Oven	Residential Cooking	One Full-Size Convection Oven meeting ENERGY STAR 3.0 Standards	One Standard Economy-Grade Full-Size Oven
High Efficiency Induction Cooktop	Residential Cooking	One residential induction cooktop	One standard residential electric cooktop
Home Energy Management System	Lighting, Plug Load, Residential Space Cooling, Residential Space Heating	Typical HVAC by Building Type Controlled by Energy Management System	Typical HVAC by Building Type, Manually Controlled
Hot Water Pipe Insulation	Residential Domestic Hot Water	1' of Insulated Pipe in Unconditioned Spaces, Insulation of R-5	1' of Pipe in Unconditioned Spaces with Code Minimum of 1" of Insulation
HVAC ECM Motor	Residential Ventilation and Circulation	A brushless permanent magnet (ECM) blower motor for electric furnace	Permanent Split Capacitor Motor for Electric Furnace
HVAC Economizer	Residential Space Cooling	Install residential economizer	No economizer

Measure	End-Use	Description	Baseline
HVAC Zoning System	Residential Space Cooling, Residential Space Heating	Install dampers in the ducts, dividing home into multiple zones, each controlled by its own thermostat	Single zone HVAC system
Indoor Daylight Sensor	Lighting	Install Indoor Daylight Sensors, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Induction Range	Residential Cooking	Residential induction range	Electric range
Instantaneous Hot Water System	Residential Domestic Hot Water	Instantaneous Hot Water System	Standard Efficiency Storage Tank Water Heater
Kitchen Faucet Aerators	Residential Domestic Hot Water	Low-Flow Faucet Aerator with Flow Rate of 1.5 gpm	Faucet Aerator with Federal Standard Flow Rate of 2.2 gpm
LED - 9W_CFL Baseline	Lighting	LED (assume 9W) replacing CFL baseline lamp	14W CFL (60W equivalent)
LED - 9W_Halogen Baseline	Lighting	LED (assume 9W) replacing EISA-2020 compliant baseline lamp	EISA-2020 compliant baseline lamp (60W equivalent)
LED Specialty Lamps-5W Chandelier	Lighting	5 W Chandelier LED	Standard incandescent chandelier lamp
Linear LED	Lighting	Linear LED Lamps in Linear Fluorescent Fixture	Standard (32w) T8 lamps in Linear Fluorescent Fixture
Low Flow Showerhead	Residential Domestic Hot Water	Low-Flow Handheld Showerhead, Flow Rate: 1.60 gpm	Standard Handheld Showerhead, Flow Rate: 2.50 gpm
New Construction - Whole Home Improvements - Tier 1	Whole Home	Performance-based improvements in new homes - 20% savings	Residential New Construction (Baseline Efficiency)
New Construction - Whole Home Improvements - Tier 2	Whole Home	Performance-based improvements in new homes - 35% savings	Residential New Construction (Baseline Efficiency)
Occupancy Sensors Switch Mounted	Lighting	Switch Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor Lighting Timer	Lighting	Timer on Outdoor Lighting, Controlling 120 Watts	120 Watts of Lighting, Manually Controlled
Outdoor Motion Sensor	Lighting	Motion Sensor on Outdoor Lighting, Controlling 120 Watts	120 Watts of Lighting, Manually Controlled
Ozone Laundry	Clothes Washers	Add a New, Single-Unit Ozone Laundry System to the Clothes Washer	One Clothes Washer meeting Federal Standard

Measure	End-Use	Description	Baseline
Programmable Thermostat	Residential Space Cooling, Residential Space Heating	Standard Heating and Cooling System with Programmable Thermostat	Standard Heating and Cooling System with Manual Thermostat
Properly Sized CAC	Residential Space Cooling	Properly Sized Central Air Conditioning	Standard Central Air Conditioning, Oversized
Radiant Barrier	Residential Space Cooling	Radiant Barrier	No radiant barrier
Reflective Roof	Residential Space Cooling	Reflective Roof Treatment	Standard dark shingle
Refrigerator Coil Cleaning	Refrigerators	Refrigerator Coil Cleaning	
Refrigerator Recycling	Refrigerators	No Refrigerator	Current Market Average Refrigerator
Residential Whole House Fan	Residential Space Cooling	Standard Central Air Conditioning with Whole House Fan	Standard Central Air Conditioning, No Whole House Fan
Sealed crawlspace	Residential Space Cooling, Residential Space Heating	Encapsulated and semi-conditioned crawlspace	Naturally vented, unconditioned crawlspace
Smart Breaker	Whole Home	Smart Breaker	standard electric breakers
Smart Panel	Whole Home	Multi-channel device that attaches to customer's circuit breaker to enable monitoring and control of major end-use appliances by customer	standard electric panel
Smart Power Strip	Plug Load	Smart plug strips for entertainment centers and home office	Standard entertainment center or home office usage, no smart strip controls
Smart Thermostat	Residential Space Cooling, Residential Space Heating	Standard Heating and Cooling System with Smart Thermostat	Standard Heating and Cooling System with Manual Thermostat
Solar Attic Fan	Residential Space Cooling	Standard Central Air Conditioning with Solar Attic Fan	Standard Central Air Conditioning, No Solar Attic Fan
Solar Pool Heater	Residential Miscellaneous	Solar Swimming Pool Heater	Electric Resistance Swimming Pool Heater
Solar Powered Pool Pumps	Residential Miscellaneous	Solar Powered Pool Pump	Variable Speed Pool Pump Motor
Solar Thermal Water Heating System	Residential Domestic Hot Water	Solar Thermal System with Electric Backup	Code-Compliant 50 Gallon Electric Resistance Water Heater
Spray Foam Insulation(Base R11)	Residential Space Cooling, Residential Space Heating	Open cell spray foam along roofline in existing (1982-1985) homes	Existing ceiling insulation based on building code at time of construction
Spray Foam Insulation(Base R19)	Residential Space Cooling, Residential Space Heating	Open cell spray foam along roofline in existing (1982-1985) homes	Existing ceiling insulation based on building code at time of construction

Measure	End-Use	Description	Baseline
Spray Foam Insulation(Base R2)	Residential Space Cooling, Residential Space Heating	Open cell spray foam along roofline in older (pre-1982) homes	Existing ceiling insulation based on building code at time of construction
Spray Foam Insulation(Base R30)	Residential Space Cooling, Residential Space Heating	Open cell spray foam along roofline in existing (1986-2020) homes	Existing ceiling insulation based on building code at time of construction
Thermostatic Shower Restriction Valve	Residential Domestic Hot Water	50 Gallon Electric Resistance Heater and Thermostatic Shower Valves	50 Gallon Electric Resistance Heater and Standard Shower Valves
Variable Refrigerant Flow (VRF) HVAC Systems	Residential Space Cooling, Residential Space Heating	Variable Refrigerant Flow (VRF) HVAC Systems	Code-Compliant ASHP, 15 SEER, 8.8 HSPF
Water Heater Blanket	Residential Domestic Hot Water	50 Gallon Electric Resistance Water Heater with Insulated Tank Wrap	Code-Compliant 50 Gallon Electric Resistance Water Heater, No Tank Wrap
Water Heater Thermostat Setback	Residential Domestic Hot Water	50 Gallon Electric Resistance Water Heater with Temperature Setpoint of 119°F	Code-Compliant 50 Gallon Electric Resistance Water Heater (Temp. Setpoint = 130°F)
Water Heater Timeclock	Residential Domestic Hot Water	Water Heater Timeclock	Existing Water Heater without time clock
Weather stripping	Residential Space Cooling, Residential Space Heating	Specific quantity of weather stripping to seal	
Window Caulking	Residential Space Cooling, Residential Space Heating	Window caulking	
Window Sun Protection	Residential Space Cooling	Window Film Applied to Standard Window	Standard Window with below Code Required Minimum SHGC

Table 13: Commercial EE Measures

Measure	End-Use	Description	Baseline
1.5HP Open Drip-Proof (ODP) Motor	Ventilation and Circulation	High Efficiency 1.5 HP Open-Drip Proof Motor	1.5HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency
10HP Open Drip-Proof (ODP) Motor	Ventilation and Circulation	High Efficiency 10 HP Open-Drip Proof Motor	10HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency
20HP Open Drip-Proof (ODP) Motor	Ventilation and Circulation	High Efficiency 20 HP Open-Drip Proof Motor	20HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency

Measure	End-Use	Description	Baseline
Advanced Rooftop Controller	Ventilation and Circulation	Advanced Rooftop Controller	Without Advanced Rooftop Controller
Air Compressor Optimization	Miscellaneous	Performing Routine Maintenance on 20HP Inlet Modulation Fixed-Speed Compressor	20 HP Inlet Modulation Fixed-Speed Compressor
Air Curtains	Space Cooling, Space Heating	Air Curtain across door opening	Door opening with no air curtain
Airside Economizer	Space Cooling	Airside Economizer	No economizer
Anti-Sweat Controls	Refrigeration	One Medium Temperature Reach-In Case with Anti-Sweat Heater Controls	One Medium Temperature Reach-In Case without Anti-Sweat Heater Controls
Auto Off Time Switch	Interior Lighting	Auto-Off Time Switch on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Automatic Door Closer for Walk-in Coolers and Freezers	Refrigeration	One Medium Temperature Walk-In Refrigerator Door with Auto-Closer	One Medium Temperature Walk-In Refrigerator Door without Auto-Closer
Beverage Vending Machine Controls	Refrigeration	One non-ENERGY STAR beverage vending machine equipped with infrared occupancy sensing controls	One non-ENERGY STAR beverage vending machine, no controls
Bi-Level Lighting Control (Exterior)	Exterior Lighting	Bi-Level Controls on Exterior Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Bi-Level Lighting Control (Interior)	Interior Lighting	Bi-Level Controls on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Ceiling Insulation(R19 to R38)	Space Cooling, Space Heating	Blown-in insulation in ceiling cavity/attic	Market Average Existing Ceiling Insulation in older steep slope, residential style commercial building
Ceiling Insulation(R19 to R49)	Space Cooling, Space Heating	Blown-in insulation in ceiling cavity/attic - Beyond Code	Market Average Existing Ceiling Insulation in older steep slope, residential style commercial building
Ceiling Insulation(R2 to R38)	Space Cooling, Space Heating	Blown-in insulation in ceiling cavity/attic	Market Average Existing Ceiling Insulation in older steep slope, residential style commercial building
Ceiling Insulation(R2 to R49)	Space Cooling, Space Heating	Blown-in insulation in ceiling cavity/attic - Beyond Code	Market Average Existing Ceiling Insulation in older steep slope, residential style commercial building

Measure	End-Use	Description	Baseline
Chilled Water Reset	Space Cooling	One Chiller with Reset of Chilled Water Temperature Setpoint	One Chiller with Fixed Chilled Water Temperature
Chiller maintenance	Space Cooling	O&M improvements to restore chiller performance	
CO Sensors for Parking Garage Exhaust	Miscellaneous	Enclosed Parking Garage Exhaust with CO Control	Constant Volume Enclosed Parking Garage Exhaust
Commercial Duct Sealing	Space Cooling, Space Heating	Standard Electric Heating and Central AC with Improved Duct Sealing	Standard Electric Heating and Central AC, Standard Duct Sealing
Commercial Strategic Energy Management	Whole Building	Commercial Strategic Energy Management	No active energy management
Custom measure - Non-lighting	Space Cooling, Space Heating	Custom Improvement to Facility's Operations	Baseline Technology/Process
Data Center Hot Cold Aisle	Office Equipment	Equipment configuration that saves HVAC	No hot, cold aisle containment
Dedicated Outside Air System (DOAS)	Space Cooling, Space Heating	Install Dedicated Outside Air System (DOAS)	Typical HVAC by Building Type
Demand Controlled Circulating Systems	Domestic Hot Water	Recirculation Pump with Demand Control Mechanism	Uncontrolled Recirculation Pump
Demand Controlled Ventilation	Ventilation and Circulation	Return Air System with CO2 Sensors	Standard Return Air System, No Sensors
Demand Defrost	Refrigeration	Walk-In Freezer System with Demand-Controlled Electric Defrost Cycle	Walk-In Freezer System with Timer-Controlled Electric Defrost Cycle
Destratification Fans	Space Heating	Destratification Fans improve temperature distribution by circulating warmer air from the ceiling back down to the floor level	No destratification fan
Door Gasket (Cooler)	Refrigeration	New Door Gasket on One-Door Medium Temperature Reach-In Case	Worn or Damaged Door Gasket on One-Door Medium Temperature Reach-In Case
Door Gasket (Freezer)	Refrigeration	New Door Gasket on One-Door Medium Temperature Reach-In Case	Worn or Damaged Door Gasket on One-Door Medium Temperature Reach-In Case
Drain water heat recovery	Domestic Hot Water	Hot Water Loop with 50 Gallon Electric Resistance Heater and Drain Water Heat Exchanger	Standard Hot Water Loop with 50 Gallon Electric Resistance Heater, No Drain Water Heat Recovery
Dual Enthalpy Economizer	Ventilation and Circulation	Standard HVAC Unit with an economizer and dual enthalpy differential control	HVAC unit with no economizer or with a non-functional disabled economizer

Measure	End-Use	Description	Baseline
Duct Insulation	Space Cooling, Space Heating	Standard Electric Heating and Central AC with Insulated Ductwork (R-8)	Standard Electric Heating and Central AC with Uninsulated Ductwork (R-4)
Ductless Mini-Split AC	Space Cooling	Ductless Mini-Split AC, 4 Ton, 16 SEER	Code-Compliant AC Unit, 4 Ton, 15 SEER
Ductless Mini-Split HP	Space Cooling, Space Heating	Ductless Mini-Split HP, 17 SEER, 9.5 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF
DX Coil Cleaning	Space Cooling	DX Coil Cleaning	DX Coil Not Cleaned
ECM Motors on Furnaces	Space Heating	Variable Speed Electronically Commutated Motor for an Electric Furnace	Permanent Split Capacitor Motor for Electric Furnace
Efficient Battery Charger	Miscellaneous	Efficient Battery Charger	FR or SCR charging stations with power conversion efficiency < 89% or > 10 W
Efficient Exhaust Hood	Cooking	Kitchen ventilation with automatically adjusting fan controls	Kitchen ventilation with constant speed ventilation motor
Efficient Motor Belts	Miscellaneous	Synchronous belt, 98% efficiency	Standard V-belt drive
Efficient New Construction Lighting	Interior Lighting	Efficient New Construction Lighting, 15% Better than Code	New Construction with Lighting Power Density meeting Code Minimum
Energy Recovery Ventilation System (ERV)	Space Cooling	Unitary Cooling Equipment that Incorporates Energy Recovery	Current Market Packaged or Split DX Unit
Energy Star Combination Oven	Cooking	Energy Star Combination Oven meeting ENERGY STAR Version 3.0 Standards	One Standard Economy-Grade 10-Pan Combination Oven
Energy Star Commercial Clothes Washer	Miscellaneous	One Commercial Clothes Washer meeting current ENERGY STAR Version 8.1 Standards	One Commercial Clothes Washer meeting Federal Standard
Energy Star Commercial Dishwasher	Domestic Hot Water	One Commercial Dishwasher meeting ENERGY STAR Version 3.0 Standards	One Dishwasher meeting Federal Standard
Energy Star Commercial Glass Door Freezer	Refrigeration	One Glass Door Freezer meeting ENERGY STAR Version 5.0 Standards	One Glass Door Freezer meeting Federal Standards
Energy Star Commercial Glass Door Refrigerator	Refrigeration	One Glass Door Refrigerator meeting ENERGY STAR Version 5.0 Standards	One Glass Door Refrigerator meeting Federal Standards
Energy Star Commercial Solid Door Freezer	Refrigeration	One Solid Door Freezer meeting ENERGY STAR Version 5.0 Standards	One Solid Door Freezer meeting Federal Standards
Energy Star Commercial Solid Door Refrigerator	Refrigeration	One Solid Door Refrigerator meeting ENERGY STAR Version 5.0 Standards	One Solid Door Refrigerator meeting Federal Standards

Measure	End-Use	Description	Baseline
Energy Star convection oven	Cooking	Energy Star convection oven meeting ENERGY STAR Version 3.0 Standards	One Standard Economy-Grade Full-Size Convection Oven
Energy Star EV Chargers	Miscellaneous	Level 2 Electric Vehicle Supply Equipment (EVSE)	Level 1 Electric Vehicle Supply Equipment (EVSE)
Energy Star Fryer	Cooking	One Standard Vat Electric Fryer meeting ENERGY STAR Version 3.0 Standards	One Standard Economy-Grade Standard Vat Electric Fryer
Energy Star Griddle	Cooking	One Griddle meeting current ENERGY STAR Version 1.2 Standards	One Conventional Griddle
Energy Star Hot Food Holding Cabinet	Cooking	One Hot Food Holding Cabinet meeting current ENERGY STAR Version 2.0 Standards	One Standard Hot Food Holding Cabinet
Energy Star Ice Maker	Refrigeration	One Continuous Self-Contained Ice Maker meeting ENERGY STAR Version 3.0 Standards	One Continuous Self-Contained Ice Maker meeting Federal Standard
ENERGY STAR Imaging Equipment	Office Equipment	One imaging device meeting current ENERGY STAR Standards	One non-ENERGY STAR imaging device
Energy Star LED Directional Lamp	Interior Lighting	Energy Star 7.6W Directional LED lamp	50W Incandescent lamp
Energy Star Monitors	Office Equipment	One Monitor meeting ENERGY STAR 8.0 Standards	One Standard Monitor
Energy Star PCs	Office Equipment	One Personal Computer (desktop or laptop) meeting current ENERGY STAR® Standards	One non-ENERGY STAR® Personal Computer
Energy Star room AC	Space Cooling	Room AC meeting current ENERGY STAR standards	Code-Compliant Room AC, 1 Ton, 10.9 CEER
Energy Star Servers	Office Equipment	One Server meeting ENERGY STAR 2.0 Standards	One Standard Server
Energy Star Steamer	Cooking	One 4-Pan Electric Steamer meeting ENERGY STAR® 2.0 Standards	One Standard Economy-Grade 4-Pan Steamer
Energy Star Uninterruptable Power Supply	Office Equipment	Standard Desktop Plugged into Energy Star Uninterruptable Power Supply at 25% Load	Standard Desktop Plugged into Average Rotary Uninterruptable Power Supply at 25% Load
Energy Star Vending Machine	Refrigeration	One Refrigerated Vending Machine meeting ENERGY STAR Version 4.0 Standards	One Refrigerated Vending Machine meeting ENERGY STAR® 1.0 Standards
ENERGY STAR Water Cooler	Miscellaneous	One Storage Type Hot/Cold Water Cooler Unit meeting	One Standard Storage Type Hot/Cold Water Cooler Unit

Measure	End-Use	Description	Baseline
		ENERGY STAR Version 3.0 Standards	
Energy Star windows	Space Cooling, Space Heating	100ft2 of Window meeting Energy Star Version 6.0 Requirements (U-Value: 0.27, SHGC: 0.21)	100ft2 of Window meeting Energy Star Version 5.0 Requirements (U-Value: 0.3, SHGC: 0.3)
Engine Block Timer	Miscellaneous	Plug-in timer that activates engine block timer to reduce unnecessary run time	Engine block heater (typically used for backup generators) running continuously
Escalator Motor Efficiency Controller	Miscellaneous	Install Escalator Motor Efficiency Controller	Escalator without Motor Efficiency Controller
Facility Commissioning	Space Cooling, Space Heating, Ventilation and Circulation	Perform facility commissioning to optimize building operations in new facilities	Standard new construction facility with no commissioning
Facility Energy Management System	Space Cooling, Space Heating, Ventilation and Circulation	Typical HVAC by Building Type Controlled by Energy Management System	Standard/manual facility equipment controls
Faucet Aerator	Domestic Hot Water	Low-flow lavatory faucet aerator, flow rate: 1.0 gpm	Federal lavatory flow rate standard, 1994, flow rate: 2.2 gpm
Floating Head Pressure Controls	Refrigeration	Medium-Temperature Refrigeration System with 5HP Compressor and Adjustable Condenser Head Pressure Control Valve	Medium-Temperature Refrigeration System with 5 HP Compressor without Adjustable Condenser Head Pressure Control Valve
Floor Insulation	Space Cooling, Space Heating	Increased Floor Insulation (R-19)	Market Average Existing Floor Insulation
Geothermal Heat Pump	Space Cooling, Space Heating	Geothermal Heat Pump	Code-Compliant Air Source Heat Pump
Green roof	Space Cooling, Space Heating	Vegetated Roof Surface on top of Standard Roof	Standard Black Roof
HE Air Cooled Chiller - All Compressor Types - 100 Tons	Space Cooling	HE Air Cooled Chiller - Air Compressor Types - 100 Tons	Code-Compliant Air Cooled Positive Displacement Chiller, 100 Tons
HE DX 11.25-20.0 Tons Elec Heat	Space Cooling, Space Heating	High Efficiency Packaged or Split DX Unit, 15 Tons, 11.5 SEER	Code-Compliant Packaged or Split DX Unit, 15 Tons, 11 SEER
HE DX 11.25-20.0 Tons Other Heat	Space Cooling	High Efficiency Packaged or Split DX Unit, 15 Tons, 11.5 SEER	Code-Compliant Packaged or Split DX Unit, 15 Tons, 11 SEER
HE DX 5.4-11.25 Tons Elect Heat	Space Cooling, Space Heating	High Efficiency Packaged or Split DX Unit, 7.5 Tons, 12 SEER	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11 SEER

Measure	End-Use	Description	Baseline
HE DX 5.4-11.25 Tons Other Heat	Space Cooling	High Efficiency Packaged or Split DX Unit, 7.5 Tons, 12 SEER	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11 SEER
HE DX Less than 5.4 Tons Elect Heat	Space Cooling, Space Heating	High Efficiency Packaged or Split DX Unit, 5 Tons, 14.5 SEER	Code-Compliant Packaged or Split DX Unit, 5 Tons, 13 SEER
HE DX Less than 5.4 Tons Other Heat	Space Cooling	High Efficiency Packaged or Split DX Unit, 5 Tons, 14.5 SEER	Code-Compliant Packaged or Split DX Unit, 5 Tons, 13 SEER
HE Water Cooled Chiller - Centrifugal Compressor - 200 Tons	Space Cooling	Water Cooled Centrifugal Chiller with Integral VFD, 200 Tons	Code-Compliant Water Cooled Centrifugal Chiller, 200 Tons
HE Water Cooled Chiller - Centrifugal Compressor - 500 Tons	Space Cooling	Water Cooled Centrifugal Chiller with Integral VFD, 500 Tons	Code-Compliant Water Cooled Centrifugal Chiller, 500 Tons
HE Water Cooled Chiller - Rotary or Screw Compressor - 175 Tons	Space Cooling	Water Cooled Positive Displacement Chiller with Integral VFD, 175 Tons	Code-Compliant Water Cooled Positive Displacement Chiller, 175 Tons
HE Water Cooled Chiller - Rotary or Screw Compressor - 50 Tons	Space Cooling	Water Cooled Positive Displacement Chiller with Integral VFD, 50 Tons	Code-Compliant Water Cooled Positive Displacement Chiller, 50 Tons
Heat Pump Pool Heater Commercial	Miscellaneous	High Efficiency Pool Heater Eff. \geq 84%	Standard Efficiency Pool Heater 78% Eff.
Heat Pump Water Heater	Domestic Hot Water	Efficient 50 Gallon Electric Heat Pump Water Heater	Code-Compliant 50 Gallon Electric Heat Pump Water Heater
High Efficiency Air Compressor	Miscellaneous	20 HP VFD Air Compressor	20 HP Inlet Modulation Fixed-Speed Compressor
High Efficiency Data Center Cooling	Space Cooling	High Efficiency CRAC (computer room air conditioner)	Standard Efficiency CRAC
High Efficiency PTAC	Space Cooling	High Efficiency PTAC	Code-Compliant PTAC
High Efficiency PTHP	Space Cooling, Space Heating	High Efficiency PTHP	Code-Compliant PTHP
High Efficiency Refrigeration Compressor_Discus	Refrigeration	High Efficiency Refrigeration Compressors	Standard Compressor
High Efficiency Refrigeration Compressor_Scroll	Refrigeration	High Efficiency Refrigeration Compressors	Standard Compressor
High Speed Fans	Ventilation and Circulation	High Speed Fan, 24" - 35" Blade Diameter	Standard Speed Fan, 24" - 35" Blade Diameter

Measure	End-Use	Description	Baseline
Hot water pipe insulation	Domestic Hot Water	1' of Insulated Pipe in Unconditioned Spaces, Insulation of R-4	1' of Pipe in Unconditioned Spaces with Code Minimum of 1"of Insulation
Hotel Card Energy Control Systems	Space Cooling, Space Heating	Guest Room HVAC Unit Controlled by Hotel-Key-Card Activated Energy Control System	Guest Room HVAC Unit, Manually Controlled by Guest
Indoor daylight sensor	Interior Lighting	Install Indoor Daylight Sensors, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Induction Cooktops	Cooking	Efficient Induction Cooktop	One Standard Electric Cooktop
Infiltration Reduction - Air Sealing	Space Cooling, Space Heating	Reduced leakage through caulking, weather-stripping	Standard Heating and Cooling System with Moderate Infiltration
Instantaneous Hot Water System Commercial	Domestic Hot Water	Instantaneous Hot Water System	Code-Compliant Electric Storage Water Heater
LED - 14W_CFL Baseline	Interior Lighting	LED (assume 14W) replacing CFL	100W equivalent CFL
LED - 9W Flood_CFL Baseline	Exterior Lighting	LED (assume 9W) replacing CFL	14W CFL
LED Canopy Lighting (Exterior)	Exterior Lighting	One 67.2W LED Canopy Light	Average Lumen Equivalent Exterior Incandescent Area Lighting
LED Display Lighting (Exterior)	Exterior Lighting	One Letter of LED Signage, < 2ft in Height	One Letter of Neon or Argon-mercury Signage, < 2ft in Height
LED Display Lighting (Interior)	Interior Lighting	One Letter of LED Signage, < 2ft in Height	One Letter of Neon or Argon-mercury Signage, < 2ft in Height
LED Exit Sign	Interior Lighting	One 5W Single-Sided LED Exit Sign	One 9W Single-Sided CFL Exit Sign
LED Exterior Wall Packs	Exterior Lighting	One 35W LED Wall Pack	Average Lumen Equivalent Exterior Incandescent Area Lighting
LED High Bay_HID Baseline	Interior Lighting	One 140W High Bay LED Fixture	Lumen-Equivalent HID High Bay Fixture
LED High Bay_LF Baseline	Interior Lighting	One 140W High Bay LED Fixture	Lumen-Equivalent Linear Fluorescent High Bay Fixture
LED Linear - Fixture Replacement	Interior Lighting	2x4 LED Troffer	Lumen-Equivalent 32-Watt T8 Lamp
LED Linear - Lamp Replacement	Interior Lighting	Linear LED (16W)	Lumen-Equivalent 32-Watt T8 Lamp
LED Parking Lighting	Exterior Lighting	One 160W LED Area Light	Average Lumen Equivalent Exterior HID Area Lighting
LEED New Construction Whole Building	Space Cooling, Space Heating	LEED New Construction Whole Building	Comparable facility, code-compliance construction

Measure	End-Use	Description	Baseline
Light Tube	Interior Lighting	One 14" Light Tube, Delivering light to 250 S.F. of Commercial Space	250 S.F. of Commercial Space Lit by Typical Lighting Strategies
Low Flow Shower Head	Domestic Hot Water	Low-Flow Handheld Showerhead, Flow Rate: 1.50 gpm	Standard Handheld Showerhead, Flow Rate: 2.50 gpm
Low-Flow Pre-Rinse Sprayers	Domestic Hot Water	Low-Flow Pre-Rinse Sprayer with Flow Rate of 1.6 gpm	Pre-Rinse Sprayer with Federal Standard Flow Rate of 2.25 gpm
Network PC Power Management	Office Equipment	One computer and monitor attached to centralized energy management system that controls when desktop computers and monitors plugged into a n	One computer and monitor, manually controlled
Networked Lighting Controls	Interior Lighting	Install Networked Lighting Controls System on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Controlled either Manually or by Sensor as Specified by Code
Night Covers for Display Cases	Refrigeration	One Open Vertical Case with Night Covers	One Existing Open Vertical Case, No Night Covers
Occupancy Sensors, Ceiling Mounted	Interior Lighting	Ceiling Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Occupancy Sensors, Switch Mounted	Interior Lighting	Switch Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor Lighting Controls	Exterior Lighting	Install Exterior Photocell Dimming Controls, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor motion sensor	Exterior Lighting	Install Exterior Motion Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Ozone Laundry Commercial	Miscellaneous	Add a new ozone laundry system onto a commercial clothes washer	One commercial clothes washer without ozone laundry system
Programmable thermostat	Space Cooling, Space Heating	Pre-set programmable thermostat that replaces manual thermostat	Standard Heating and Cooling System with Manual Thermostat
PSC to ECM Evaporator Fan Motor (Reach-In)	Refrigeration	Medium Temperature Reach-In Case with equivalent size Electronically Commutated Evaporator Fan Motor	Medium Temperature Reach-In Case with Permanent Split Capacitor Evaporator Fan Motor
PSC to ECM Evaporator Fan Motor (Walk-In, Refrigerator)	Refrigeration	Medium Temperature Walk-In Case with Electronically Commutated Evaporator Fan Motor	Medium Temperature Walk-In Case with Permanent Split Capacitor Evaporator Fan Motor

Measure	End-Use	Description	Baseline
Q-Sync Evaporator Fan Motor	Refrigeration	Medium Temperature Reach-In Case with equivalent size Q-Sync Evaporator Fan Motor	Medium Temperature Reach-In Case with 20W Permanent Split Capacitor Fan Motor
Reflective Roof Treatment	Space Cooling	Reflective Roof Treatment	Standard Black Roof
Refrigerated Display Case LED Lighting	Refrigeration	60" Refrigerated Case LED Strip	Lumen-Equivalent 32-Watt T8 Fixture
Refrigerated Display Case Lighting Controls	Refrigeration	Occupancy Sensors for Refrigerated Case Lighting to reduce run time	Market-Share Weighted Existing Linear Fluorescent Fixture
Refrigeration Commissioning	Refrigeration	Commissioned Refrigeration System	Non-Commissioned Refrigeration System
Refrigeration Economizer	Refrigeration	Walk-in refrigerator with economizer	Walk-in refrigerator without economizer
Regenerative Drive Elevator Motor	Miscellaneous	Regenerative drive produced energy when motor in overhaul condition	Standard motor
Retro-Commissioning (Existing Construction)	Space Cooling, Space Heating, Ventilation and Circulation	Perform facility retro-commissioning, including assessment, process improvements, and optimization of energy-consuming equipment and systems	
Roof Insulation	Space Cooling, Space Heating	Roof Insulation (built-up roof applicable to flat/low slope roofs)	Code-Compliant Flat Roof
Server Virtualization	Office Equipment	2 Virtual Host Server	20 Single Application Servers
Smart Strip Plug Outlet	Office Equipment	One Smart Strip Plug Outlet	One Standard plug strip/outlet
Smart thermostat	Space Cooling, Space Heating	Thermostats that include "smart" features such as occupancy sensors, ge-fencing, multi-zone sensors	Standard Heating and Cooling System with Manual Thermostat
Solar Pool Heater Commercial	Miscellaneous	Solar Swimming Pool Heater	Electric Resistance Swimming Pool Heater
Solar Powered Pool Pump	Miscellaneous	Solar Powered Pool Pump Motor	Variable Speed Pool Pump Motor
Solar Thermal Water Heating System Commercial	Domestic Hot Water	Solar Thermal System with Electric Backup	Code-Compliant 50 Gallon Electric Resistance Water Heater
Strip Curtains - Freezers	Refrigeration	Walk-in freezer with strip curtains at least 0.06 inches thick covering the entire area of the doorway	Walk-in freezer without strip curtains

Measure	End-Use	Description	Baseline
Strip Curtains - Refrigerators	Refrigeration	Walk-in cooler with strip curtains at least 0.06 inches thick covering the entire area of the doorway	Walk-in cooler without strip curtains
Suction Pipe Insulation - Freezers	Refrigeration	Suction Pipe Insulation - Freezers	Uninsulated freezer suction lines
Suction Pipe Insulation - Refrigerators	Refrigeration	Suction Pipe Insulation - Refrigerators	Uninsulated refrigeration suction lines
Thermal Energy Storage	Space Cooling	Deploy thermal energy storage technology (ice harvester, etc.) to shift load	Code compliant chiller
Thermostatic Shower Restriction Valve Commercial	Domestic Hot Water	Hot Water Loop with 50 Gallon Electric Resistance Heater and Pressure Balance Shower Valves	Standard Hot Water Loop with 50 Gallon Electric Resistance Heater and Standard Shower Valves
Time Clock Control	Interior Lighting	Time Clock Controlled Lighting, 500 Watts Controlled	500 Watts of Lighting, Controlled either Manually or by Sensor as Specified by Code
Variable Refrigerant Flow (VRF) HVAC Systems	Space Cooling, Space Heating	Variable Refrigerant Flow (VRF) HVAC Systems	Code-Compliant PTHP
VAV System	Ventilation and Circulation	Variable Air Volume Distribution System	Constant Air Volume Distribution System
VFD on Cooling Tower Fans	Space Cooling	Cooling Tower Fans with VFD Control	Cooling Tower Fans without VFD Control
VFD on HVAC Pump	Space Cooling, Space Heating	VFD on HVAC Pump	7.5 HP HVAC Pump Motor, no VFD Control
VSD Controlled Compressor	Refrigeration	Refrigeration System with VSD Control	Refrigeration System with Standard Slide-Valve Control System
Wall Insulation	Space Cooling, Space Heating	Increased Exterior Above-Grade Wall Insulation	Market Average Existing Exterior Above-Grade Wall Insulation
Warehouse Loading Dock Seals	Space Cooling, Space Heating	Seals to reduce infiltration losses at loading dock	Loading dock with no seals
Water Cooled Refrigeration Heat Recovery	Domestic Hot Water	The heat reclaim system transfers waste heat from refrigeration system to space heating or hot water	No heat recovery
Water Heater Setback	Domestic Hot Water	A 50 gallon electric hot water tank with a thermostat setting reduced to no lower than 120 degrees.	A 50 gallon electric hot water tank with a thermostat setting that is higher than 120 degrees, typically hot water tanks with settings of 130 degrees or higher.
Water source heat pump	Space Cooling, Space Heating	Water Source Heat Pump, 2.5 Tons, 17.4 EER, 4.4 COP	Code-Compliant ASHP

Measure	End-Use	Description	Baseline
Waterside Economizer	Space Cooling	Waterside Economizer	No economizer
Window shade film	Space Cooling	Window Film with SHGC of 0.35 Applied to Standard Window	Standard Window with below Code Required Minimum SHGC
Zero Energy Doors	Refrigeration	Install zero energy doors for a reach-in refrigerated cooler or freezer	Standard vertical reach-in refrigerated cooler or freezer with anti-sweat heaters on the glass surface of the doors

Table 14: Industrial EE Measures

Measure	End-Use	Description	Baseline
1.5HP Open Drip-Proof (ODP) Motor	Motors Pumps	High Efficiency 1.5 HP Open-Drip Proof Motor	1.5HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency
10HP Open Drip-Proof (ODP) Motor	Motors Pumps	High Efficiency 10 HP Open-Drip Proof Motor	10HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency
20HP Open Drip-Proof (ODP) Motor	Motors Pumps	High Efficiency 20 HP Open-Drip Proof Motor	20HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency
3-phase High Frequency Battery Charger - 1 shift	Other	3-phase High Frequency Battery Charger	Standard Charger
Advanced Rooftop Controller	HVAC	Advanced Rooftop Controller	Without Advanced Rooftop Controller
Air Compressor Optimization	Compressed Air	Performing Routine Maintenance on 20HP Inlet Modulation Fixed-Speed Compressor	20 HP Inlet Modulation Fixed-Speed Compressor
Air curtains	HVAC	Air Curtain across door opening	Door opening with no air curtain
Airside economizer	HVAC	Airside Economizer	No economizer
Auto Closer on Refrigerator Door	Process Cooling	One Medium Temperature Walk-In Refrigerator Door with Auto-Closer	One Medium Temperature Walk-In Refrigerator Door without Auto-Closer
Auto Off Time Switch	Interior Lighting High Bay	Auto-Off Time Switch on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Bi-Level Lighting Control (Exterior)	Exterior Lighting Industrial	Install Exterior Bi-Level Lighting Control, 500 Watts Controlled	500 Watts of Lighting, No Dim Setting

Measure	End-Use	Description	Baseline
Bi-Level Lighting Control (Interior)	Interior Lighting High Bay	Bi-Level Controls on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, No Dim Setting
Chilled Water Reset	HVAC	One Chiller with Reset of Chilled Water Temperature Setpoint	One Chiller with Fixed Chilled Water Temperature
Cogged Belt on 15hp ODP Motor	Motors Pumps	15HP ODP Motor with Cogged Belts Installed on Supply and/or Return Air Fans	15HP ODP Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Cogged Belt on 40hp ODP Motor	Motors Pumps	40HP ODP Motor with Cogged Belts Installed on Supply and/or Return Air Fans	40HP ODP Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Compressed Air Desiccant Dryer	Process Specific	heated regenerative desiccant dryer without dew point demand controls	heatless regenerative desiccant dryer without dew point demand controls
Compressed Air No-Loss Condensate Drains	Process Specific	Install no-loss condensate drains	Install standard condensate drains
Compressed Air Storage Tank	Compressed Air	20 HP Inlet Modulation Fixed-Speed Compressor with Receiver Tank	20 HP Inlet Modulation Fixed-Speed Compressor, No Receiver Tank
Custom Measure - Non-Lighting	HVAC	Custom Improvement to Facility's Operations	Baseline Technology/Process
Dairy Refrigeration Heat Recovery	Other	refrigeration equipment with refrigeration heat recovery tank installed	existing dairy farm with refrigeration equipment and a water heater unit without an RHR unit
Dedicated Outside Air System (DOAS)	HVAC	Install Dedicated Outside Air System (DOAS)	Typical HVAC by Building Type
Demand Controlled Ventilation	HVAC	Return Air System with CO2 Sensors	Standard Return Air System, No Sensors
Demand Defrost	Process Cooling	Walk-In Freezer System with Demand-Controlled Electric Defrost Cycle	Walk-In Freezer System with Timer-Controlled Electric Defrost Cycle
Dew Point Sensor Control for Dessicant CA Dryer	Compressed Air	1000 CFM Heated Desiccant Air Dryer with Dew Point Controls	1000 CFM Modulating Heated Desiccant Air Dryer
Drip Irrigation Nozzles	Other	Flow Control Nozzles	Standard Irrigation Nozzles
Dual Enthalpy Economizer	Process Cooling	Standard HVAC Unit with an economizer and dual enthalpy differential control	HVAC unit with no economizer or with a non-functional disabled economizer
DX Coil Cleaning	HVAC	DX Coil Cleaning	DX Coil Not Cleaned
Efficient Compressed Air Nozzles	Compressed Air	1/4" Engineered Air Nozzle	1/4" Open-End Air Nozzle

Measure	End-Use	Description	Baseline
Efficient New Construction Lighting	Interior Lighting High Bay	Efficient New Construction Lighting, 15% Better than Code	New Construction with Lighting Power Density meeting Code Minimum
Electric Actuators	Other	Electric Actuator	Pneumatic Actuator
Energy Efficient Laboratory Fume Hood	HVAC	Variable Air Volume High Performance Fume Hood	Constant Volume Conventional Bypass Fume Hood
Energy Efficient Transformers	Other	Energy Efficient Dry Type Transformer (CSL-3)	Standard Transformer (TP-1)
Energy Recovery Ventilation System	HVAC	Unitary Cooling Equipment that Incorporates Energy Recovery	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11.2 EER
Energy Star LED Directional Lamp	Interior Lighting Other	Energy Star 7.6W Directional LED lamp	50W Incandescent lamp
Energy Star room ac	HVAC	Room AC meeting current ENERGY STAR standards	Code-Compliant Room AC
Energy Star windows	HVAC	100ft2 of Window meeting Energy Star Version 6.0 Requirements (U-Value: 0.27, SHGC: 0.21)	100ft2 of Window meeting Energy Star Version 5.0 Requirements (U-Value: 0.3, SHGC: 0.3)
Engine Block Timer	Other	An engine block heater operated by an outdoor plug-in timer	An engine block heater that is manually plugged in
Facility Commissioning	HVAC	Perform facility commissioning	Comparable facility, no commissioning
Facility Energy Management System	HVAC	Typical HVAC by Building Type Controlled by Energy Management System	Typical HVAC by Building Type, Manually Controlled
Fan Thermostat Controller	HVAC	Typical HVAC by Building Type with Fan Thermostat Controller Installed	Typical HVAC by Building Type with Programmable Thermostat
Floating Head Pressure Controller	Process Cooling	Medium-Temperature Refrigeration System with 5HP Compressor and Adjustable Condenser Head Pressure Control Valve	Medium-Temperature Refrigeration System with 5 HP Compressor without Adjustable Condenser Head Pressure Control Valve
Grain Bin Aeration Control System	Process Specific	Grain Storage Fan System with Automatic Controls	Grain Storage Fan System with Manual Controls
HE Air Cooled Chiller - All Compressor Types - 100 Tons	HVAC	HE Air Cooled Chiller - All Compressor Types - 100 Tons	Code-Compliant Air Cooled Positive Displacement Chiller, 100 Tons
HE Air Cooled Chiller - All Compressor Types - 300 Tons	HVAC	Air Cooled Positive Displacement Chiller with Integral VFD, 300 Tons, 13.7 EER	Code-Compliant Air Cooled Positive Displacement Chiller, 300 Tons, 12.5 EER

Measure	End-Use	Description	Baseline
HE DX 11.25-20.0 Tons Elec Heat	HVAC	High Efficiency Packaged or Split DX Unit, 15 Tons, 11.5 SEER	Code-Compliant Packaged or Split DX Unit, 15 Tons, 11 SEER
HE DX 11.25-20.0 Tons Other Heat	HVAC	High Efficiency Packaged or Split DX Unit, 15 Tons, 11.5 SEER	Code-Compliant Packaged or Split DX Unit, 15 Tons, 11 SEER
HE DX 5.4-11.25 Tons Elect Heat	HVAC	High Efficiency Packaged or Split DX Unit, 7.5 Tons, 12 SEER	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11 SEER
HE DX 5.4-11.25 Tons Other Heat	HVAC	High Efficiency Packaged or Split DX Unit, 7.5 Tons, 12 SEER	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11 SEER
HE DX Less than 5.4 Tons Elect Heat	HVAC	High Efficiency Packaged or Split DX Unit, 5 Tons, 14.5 SEER	Code-Compliant Packaged or Split DX Unit, 5 Tons, 13 SEER
HE DX Less than 5.4 Tons Other Heat	HVAC	High Efficiency Packaged or Split DX Unit, 5 Tons, 14.5 SEER	Code-Compliant Packaged or Split DX Unit, 5 Tons, 13 SEER
HE Water Cooled Chiller - Centrifugal Compressor - 200 Tons	HVAC	Water Cooled Centrifugal Chiller with Integral VFD, 200 Tons	Code-Compliant Water Cooled Centrifugal Chiller, 200 Tons
HE Water Cooled Chiller - Centrifugal Compressor - 500 Tons	HVAC	Water Cooled Centrifugal Chiller with Integral VFD, 500 Tons	Code-Compliant Water Cooled Centrifugal Chiller, 500 Tons
HE Water Cooled Chiller - Rotary or Screw Compressor - 175 Tons	HVAC	Water Cooled Positive Displacement Chiller with Integral VFD, 175 Tons	Code-Compliant Water Cooled Positive Displacement Chiller, 175 Tons
HE Water Cooled Chiller - Rotary or Screw Compressor - 50 Tons	HVAC	Water Cooled Positive Displacement Chiller with Integral VFD, 50 Tons	Code-Compliant Water Cooled Positive Displacement Chiller, 50 Tons
High Bay Occupancy Sensors, Ceiling Mounted	Interior Lighting High Bay	Ceiling Mounted Occupancy Sensor, 800 Watts Controlled	800 Watts of Lighting, Manually Controlled
High Efficiency Air Compressor	Compressed Air	20 HP VFD Air Compressor	20 HP Inlet Modulation Fixed-Speed Compressor
High Efficiency Refrigeration Compressor - Discus	Process Cooling	High Efficiency Refrigeration Compressors	Standard Compressor
High Efficiency Refrigeration Compressor - Scroll	Process Cooling	High Efficiency Refrigeration Compressors	Standard Compressor

Measure	End-Use	Description	Baseline
High Efficiency Welder	Process Specific	High Efficiency Welder	Standard Welding Practices
High Speed Fans	HVAC	High Speed Fan, 24" - 35" Blade Diameter	Standard Speed Fan, 24" - 35" Blade Diameter
High Volume Low Speed Fan (HVLS)	Motors Fans Blowers	20' High Volume Low Speed Fan	Conventional Circulating Fan
Indoor Agriculture - LED Grow Lights	Interior Lighting High Bay	LED grow light	1000W High Pressure Sodium
Indoor daylight sensor	Interior Lighting High Bay	Install Indoor Daylight Sensors, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Industrial Duct Sealing	HVAC	Standard Electric Heating and Central AC with Improved Duct Sealing	Standard Electric Heating and Central AC, Standard Duct Sealing
Injection Mold and Extruder Barrel Wraps	Other	2' Diameter, 20' Long Machine Barrel with 1" Insulation	2' Diameter, 20' Long Machine Barrel with no Insulation
Insulated Pellet Dryer Tanks and Ducts	Process Heating	Insulation for Pellet Tank and Duct	Uninsulated Pellet Tank and Duct
LED - 14W_CFL Baseline	Interior Lighting Other	LED (assume 14W) replacing CFL	100W equivalent CFL
LED Canopy Lighting (Exterior)	Exterior Lighting Industrial	One 67.2W LED Canopy Light	Average Lumen Equivalent Exterior Incandescent Area Lighting
LED Display Lighting (Exterior)	Exterior Lighting Industrial	One Letter of LED Signage, < 2ft in Height	One Letter of Neon or Argon-mercury Signage, < 2ft in Height
LED Display Lighting (Interior)	Interior Lighting Other	One Letter of LED Signage, < 2ft in Height	One Letter of Neon or Argon-mercury Signage, < 2ft in Height
LED exit sign	Interior Lighting Other	One 5W Single-Sided LED Exit Sign	One 9W Single-Sided CFL Exit Sign
LED Exterior Wall Packs	Exterior Lighting Industrial	One 35W LED Wall Pack	Average Lumen Equivalent Exterior Incandescent Area Lighting
LED High Bay_HID Baseline	Interior Lighting High Bay	One 140W High Bay LED Fixture	Lumen-Equivalent HID High Bay Fixture
LED High Bay_LF Baseline	Interior Lighting High Bay	One 140W High Bay LED Fixture	Lumen-Equivalent Linear Fluorescent High Bay Fixture
LED Linear - Fixture Replacement	Interior Lighting Linear Fluorescent	2x4 LED Troffer Fixture	Lumen-Equivalent 32-Watt T8 Fixture
LED Linear - Lamp Replacement	Interior Lighting Linear Fluorescent	Linear LED	Lumen-Equivalent 32-Watt T8 Lamp

Measure	End-Use	Description	Baseline
LED Parking Lighting	Exterior Lighting Industrial	One 160W LED Area Light	Average Lumen Equivalent Exterior HID Area Lighting
LEED New Construction Whole Building	HVAC	LEED Qualifying New Construction	Comparable facility, code-compliance construction
Light Tube	Interior Lighting Other	One 14" Light Tube, Delivering light to 250 S.F. of Industrial Space	250 S.F. of Industrial Space Lit by Typical Lighting Strategies
Low Energy Livestock Waterer	Motors Pumps	Install Thermostatically Controlled Livestock Watering System	Standard Livestock Watering System
Low Pressure Sprinkler Nozzles	Motors Pumps	Low Pressure Irrigation Nozzles operate at 35 psi or lower	Standard high pressure irrigation nozzles that operate at 50 psi or greater
Low Pressure-drop Filters	Compressed Air	20 HP Inlet Modulation Fixed-Speed Compressor with Low Pressure Drop Filter	20 HP Inlet Modulation Fixed-Speed Compressor, No Particulate Removal
Milk Pre-Cooler	Other	Installed pre-cooler heat exchanger	no pre-cooler heat exchanger installed
Networked Lighting Controls	Interior Lighting Linear Fluorescent	Install Networked Lighting Controls System on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Controlled either Manually or by Sensor as Specified by Code
Occupancy Sensors, Ceiling Mounted	Interior Lighting High Bay	Ceiling Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Occupancy sensors, switch mounted	Interior Lighting Linear Fluorescent	Switch Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor Lighting Controls	Exterior Lighting Industrial	Install Exterior Photocell Dimming Controls, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor motion sensor	Exterior Lighting Industrial	Install Exterior Motion Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Packaged Terminal AC	HVAC	High Efficiency Packaged Terminal AC	Code-Compliant PTAC, 10.9 EER
Process Cooling Ventilation Reduction	Process Cooling	Standard Process Cooling with Reduced Ventilation	Standard Process Cooling
Programmable thermostat	HVAC	Standard Heating and Cooling System with Programmable Thermostat	Standard Heating and Cooling System with Manual Thermostat
Reflective Roof Treatment	HVAC	Reflective Roof Treatment	Standard Black Roof

Measure	End-Use	Description	Baseline
Refrigeration Commissioning	Process Cooling	Commissioned Refrigeration System	Non-Commissioned Refrigeration System
Retro-Commissioning (Existing Construction)	HVAC	Perform Facility Retro-commissioning	
Roof insulation	HVAC	Roof Insulation (built-up roof applicable to flat/low slope roofs)	Code-Compliant Flat Roof
Smart thermostat	HVAC	Standard Heating and Cooling System with Smart Thermostat	Standard Heating and Cooling System with Manual Thermostat
Strategic Energy Management	HVAC	SEM goal setting and tracking	No active energy management
Synchronous Belt on 15hp ODP Motor	Motors Pumps	15 HP Open-Drip Proof Motor with Synchronous Belts Installed on Supply and/or Return Air Fans	15 HP Open-Drip Proof Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Synchronous Belt on 5hp ODP Motor	Motors Pumps	5 HP Open-Drip Proof Motor with Synchronous Belts Installed on Supply and/or Return Air Fans	5 HP Open-Drip Proof Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Synchronous Belt on 75hp ODP Motor	Motors Pumps	75 HP Open-Drip Proof Motor with Synchronous Belts Installed on Supply and/or Return Air Fans	75 HP Open-Drip Proof Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Thermal energy storage	HVAC	Deploy thermal energy storage technology (ice harvester, etc.) to shift load	Code compliant chiller
Time Clock Control	Interior Lighting High Bay	Time Clock Controlled Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
VAV System	HVAC	Variable Air Volume Distribution System	Constant Air Volume Distribution System
VFD on Air Compressor	Compressed Air	20 HP VFD Air Compressor	20 HP Inlet Modulation Fixed-Speed Compressor
VFD on Cooling Tower Fans	Process Cooling	Cooling Tower Fans with VFD Control	Cooling Tower Fans without VFD Control
VFD on HVAC Fan	Motors Fans Blowers	5 HP HVAC Fan Motor, with VFD Control	5 HP HVAC Fan Motor, no VFD Control
VFD on HVAC Pump	Motors Pumps	VFD on HVAC Pump	7.5 HP HVAC Pump Motor, no VFD Control
VFD on process pump	Motors Pumps	20 HP Process Pump Equipped with VFD Control	20 HP Process Pump, Constant Speed
VSD Controlled Compressor	Process Cooling	Refrigeration System with VSD Control	Refrigeration System with Standard Slide-Valve Control System

Measure	End-Use	Description	Baseline
Water source heat pump	HVAC	Water Source Heat Pump, 2.5 Tons, 17.4 EER, 4.4 COP	Code-Compliant ASHP
Waterside economizer	HVAC	Waterside Economizer	No economizer
Window shade film	HVAC	Window Film with SHGC of 0.35 Applied to Standard Window	Standard Window with below Code Required Minimum SHGC

The following EE measures from the 2019 Technical Potential Study were eliminated from the current study⁸:

Table 15: 2019 EE Measures Eliminated from Current Study

Sector	Measure	End-Use	Reason for Removal
Residential	CFL - 15W Flood	Lighting	Better technology (LED) available
Residential	CFL - 15W Flood (Exterior)	Lighting	Better technology (LED) available
Residential	CFL - 13W	Lighting	Better technology (LED) available
Residential	CFL - 23W	Lighting	Better technology (LED) available
Residential	Low Wattage T8 Fixture	Lighting	Better technology (LED) available
Residential	15 SEER Central AC	Space Cooling	Updated Federal Standard
Residential	15 SEER Air Source Heat Pump	Space Cooling, Space Heating	Updated Federal Standard
Residential	14 SEER ASHP from base electric resistance heating	Space Cooling, Space Heating	Updated Federal Standard
Residential	Two Speed Pool Pump	Miscellaneous	Updated Florida Energy Code
Residential	Variable Speed Pool Pump	Miscellaneous	Updated Florida Energy Code
Residential	Storm Door	Space Cooling, Space Heating	Minimal/uncertain energy savings
Commercial	CFL - 15W Flood	Exterior Lighting	Better technology (LED) available
Commercial	High Efficiency HID Lighting	Exterior Lighting	Better technology (LED) available

⁸ Additional measures from the 2019 study were updated to reflect current vintage/technology for the current study.

Sector	Measure	End-Use	Reason for Removal
Commercial	LED Street Lights	Exterior Lighting	Market standard
Commercial	LED Traffic and Crosswalk Lighting	Exterior Lighting	Market standard
Commercial	CFL-23W	Interior Lighting	Better technology (LED) available
Commercial	High Bay Fluorescent (T5)	Interior Lighting	Better technology (LED) available
Commercial	Premium T8 - Fixture Replacement	Interior Lighting	Better technology (LED) available
Commercial	Premium T8 - Lamp Replacement	Interior Lighting	Better technology (LED) available
Commercial	Two Speed Pool Pump	Miscellaneous	Updated Florida Energy Code
Commercial	Variable Speed Pool Pump	Miscellaneous	Updated Florida Energy Code
Commercial	Tank Wrap on Water Heater	Domestic Hot Water	Limited applicability
Commercial	Ceiling Insulation (R12 to R38)	Space Cooling, Space Heating	Consolidated measure baseline assumptions
Commercial	Ceiling Insulation (R30 to R38)	Miscellaneous	Consolidated measure baseline assumptions

Appendix B DR Measure List

Table 16: Residential DR Measures

Measure	Type	Season	Description
Central air conditioner - Load Shed	Direct load control	Summer	Direct load control program where utility provides day ahead notification that it will send remote signal to shed AC unit load during peak usage period.
Central Heating - Load Shed	Direct load control	Winter	Direct load control program where utility provides day ahead notification that it will send remote signal to shed AC unit load during peak usage period.
Central air conditioner - 50% cycling	Direct load control	Summer	Direct load control program where utility provides day ahead notification that it will send remote signal to cycle AC unit during peak usage period
Central Heating - 50% cycling	Direct load control	Winter	Direct load control program where utility provides day ahead notification that it will send remote signal to cycle AC unit during peak usage period
Smart thermostats - Utility Installation	Direct load control	Summer and Winter	Similar to AC load control program, but allows customers to participate using a compatible smart thermostat rather than an AC switch
Smart thermostats - BYOT	Direct load control	Summer and Winter	Similar to AC load control program, but allows customers to participate using a compatible smart thermostat rather than an AC switch
CPP + Tech	Pricing	Summer and Winter	Electricity rate that varies based on time of day. Can be same rate schedule for every day during a given season (time of use, or TOU) and with critical peak pricing (CPP) days when peak period rates are substantially higher for a limited number of days per year (customers receive advance notification of CPP event). Customers also receive technology that they can pre-program to curtail load when an event is called.
Water heater control	Direct load control	Summer and Winter	Load control installed on a water heater (integrated or external switch)
Pool pump switches	Direct load control	Summer and Winter	Load control program with switch installed on pool pump
Room AC	Direct load control	Summer	Load control program that is focused on room AC units rather than central AC
Managed EV Charging - switch	Direct load control	Summer and Winter	Load control switch that is installed on an EV charger
Managed EV Charging - telematics	Direct load control	Summer and Winter	Direct load control program leveraging EV smart charging software
Battery Storage with PV	Pricing/Direct load control	Summer and Winter	PV charges battery and battery discharges to grid

Table 17: Small C&I DR Measures

Measure	Type	Season	Description
Central air conditioner - Load Shed	Direct load control	Summer	Direct load control program where utility provides day ahead notification that it will send remote signal to shed AC unit load during peak usage period.
Central Heating - Load Shed*	Direct load control	Winter	Direct load control program where utility provides day ahead notification that it will send remote signal to shed AC unit load during peak usage period.
Central air conditioner - 50% cycling	Direct load control	Summer	Direct load control program where utility provides day ahead notification that it will send remote signal to cycle AC unit during peak usage period
Central Heating - 50% cycling*	Direct load control	Winter	Direct load control program where utility provides day ahead notification that it will send remote signal to cycle AC unit during peak usage period
Smart thermostats - Utility Installation*	Direct load control	Summer and Winter	Similar to AC load control program, but allows customers to participate using a compatible smart thermostat rather than an AC switch
Smart thermostats - BYOT*	Direct load control	Summer and Winter	Similar to AC load control program, but allows customers to participate using a compatible smart thermostat rather than an AC switch
CPP + Tech	Pricing	Summer and Winter	Electricity rate that varies based on time of day. Can be same rate schedule for every day during a given season (time of use, or TOU) and with critical peak pricing (CPP) days when peak period rates are substantially higher for a limited number of days per year (customers receive advance notification of CPP event). Customers also receive technology that they can pre-program to curtail load when an event is called.
Managed EV Charging - switch	Direct load control	Summer and Winter	Load control switch that is installed on an EV charger
Managed EV Charging - telematics	Direct load control	Summer and Winter	Direct load control program leveraging EV smart charging software
Battery Storage with PV	Pricing/Direct load control	Summer and Winter	PV charges battery and battery discharges to grid

Table 18: Large C&I DR Measures

Measure	Type	Season	Description
CPP + Tech	Pricing	Summer and Winter	Electricity rate that varies based on time of day. Can be same rate schedule for every day during a given season (time of use, or TOU) and with critical peak pricing (CPP) days when peak period rates are substantially higher for a limited number of days per year (customers receive advance notification of

Measure	Type	Season	Description
			CPP event). Customers also receive technology that they can pre-program to curtail load when an event is called.
Auto DR	Utility-controlled loads	Summer and Winter	Custom load control of specific end-uses/processes that is triggered by utility signal to building management system; customer can sometimes opt-out of specific events
Firm Service Level	Contractual	Summer and Winter	Customer commits to a maximum usage level during peak periods and, when notified by the utility, agrees to cut usage to that level.
Guaranteed Load Drop	Contractual	Summer and Winter	Customer agrees to reduce usage by an agreed upon amount when notified

No DR measures from the 2019 Technical Potential Study were eliminated from the current study.

Appendix C DSRE Measure List

Table 19: Residential DSRE Measures

Measure	Description
PV System	Roof-mounted system, including multiple panels, AC/DC inverter, racking system, and electrical system interconnections
Battery Storage from PV System	Lithium-ion battery system designed to integrate with an on-site PV system to store and discharge excess energy from PV generation

Table 20: Non-Residential DSRE Measures

Measure	Description
PV System	Roof-mounted system, including multiple panels, AC/DC inverter, racking system, and electrical system interconnections
Battery Storage from PV System	Lithium-ion battery system designed to integrate with an on-site PV system to store and discharge excess energy from PV generation
CHP - Fuel Cell	An electrochemical cell-based generator that reacts hydrogen fuel with oxygen
CHP - Micro Turbine	Small combustion turbine that burns gaseous or liquid fuel to drive a generator
CHP - Gas Turbine	A combustion turbine that burns gaseous or liquid fuel to drive a generator
CHP - Reciprocating Engine	An engine that uses one or more pistons to convert pressure into rotational motion
CHP - Steam Turbine	A turbine that extracts thermal energy from pressured steam to drive a generator

No DSRE measures from the 2019 Technical Potential Study were eliminated from the current study.

Appendix D External Measure Suggestions

Table 21: External Measure Suggestions and Actions

Measure Suggestion	Stakeholder Comments	Action taken for FEECA Study
Efficient Electrification Measures	All measures that can produce substantial site energy savings by converting from natural gas or other fossil fuels should be included in the Florida electric utilities' next efficiency potential study. Key examples include efficient heat pumps to displace gas furnaces and efficient heat pump water heaters to displace gas water heaters. It is important to note that these electrification measures provide not only heating energy savings and water heating energy savings, but can also potentially provide cooling efficiency benefits as well. In the case of heat pumps, that can occur because efficient heat pumps can operate in cooling mode more efficiently than standard central air conditioners. In the case of heat pump water heaters, cooling and dehumidification benefits can occur when/if the water heater is in conditioned space because they transfer heat (particularly latent heat) from the air around them to the water they are heating. A growing number of jurisdictions - including Illinois, Minnesota and some northeastern states - have begun to include efficient electrification measures in their efficiency programs portfolios.	Fuel-switching and electrification are outside the scope of this study
Networked Lighting Controls	LED lighting technology has become increasingly accepted and installed in commercial buildings. The next big efficiency opportunity in commercial lighting efficiency is in sophisticated controls integrated into the light fixtures themselves - both luminaire level lighting controls and networked lighting controls. For example, a 2017 report for both the Northwest Energy Efficiency Alliance and the Design Lights Consortium, a non-profit that works with utilities and manufacturers of lighting products (and which many utilities across the country reference for determination of eligibility of lighting products for efficiency program rebates), found that networked lighting controls can provide on the order of 50% additional savings after LED conversion. Other studies have also found the national savings potential from such products to be enormous. Moreover, these products can be designed to provide not only lighting energy savings but also a number of other non-energy benefits (e.g., asset tracking, such as the ability of hospitals to know the location of all wheel chairs). Numerous utilities across the country now actively promote this technology through their efficiency programs. For example, Commonwealth Edison, the utility serving Chicago and other parts of northern Illinois, is currently getting a significant portion of its commercial lighting savings from promotion of networked lighting controls	Added to measure list for 2024 study

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External Measure Suggestions

Measure Suggestion	Stakeholder Comments	Action taken for FEECA Study
Ductless mini-split heat pumps to displace inefficient electric baseboard heating	While most Florida residential buildings with electric heat provide that heat with heat pumps, at least some (perhaps most likely being older multi-family rental buildings) still use inefficient electric resistance heat. Ductless mini- split heat pump retrofits can very efficiently displace such inefficient electric heat and should be added to the residential measure list.	Added to measure list for 2024 study
Air Source Heat Pump baseline assumptions	<p>There are seven air source heat pump (ASHP) measures included in the residential measure list. Two of them - one at SEER 14 and a second at SEER 21 - are listed as relative to an electric resistance baseline. Five of them - SEER 15, SEER 16, SEER 17, SEER 18 and SEER 21 - appear to be relative to a baseline of a standard new ASHP. Are we interpreting this correctly? If so, we have a couple of comments/questions/suggestions:</p> <ul style="list-style-type: none"> • The efficiency standards assessed need to be modified to be consistent with new federal standards, including new testing procedures. • For cases where the baseline is “electric resistance”, why only assessing two efficiency tiers (i.e., fewer than for standard ASHP baselines)? The same number of efficiency tiers should be assessed for both baselines. 	Incorporated suggestions into 2024 study, including updated baseline standard and assessing same efficiency tiers for both baselines
Heat Pump Water Heater Efficiency	The Res EE tab of the utilities draft measure list suggests that the efficiency of a heat pump water heater is an EF of 2.50. That is unrealistically low. In fact, of the 222 products listed on the Energy Star website, none had UEFs less than 2.80 and only 29 (13%) had UEFs that were less than 3.4; the average was 3.57. Indeed, the first product listed on a search of heat pump water heaters on Home Depot’s website is a 50 gallon, Rheem (Pro Terra) product with a UEF of 3.75 and a cost of \$1699.	Incorporated suggestion into 2024 study
New Construction Measure Packages	The measures lists did not appear to include packages of measures for building new residential and/or new commercial buildings to levels of efficiency beyond those required by code. Utilities in many jurisdictions run new construction efficiency programs supporting such measure packages. In the residential sector, many base their programs on the long-standing Federal Energy Star standard. However, increasingly utility programs are promoting additional efficiency tiers - often as part of all-electric new construction program offerings - that go well beyond the Energy Star standard. For example, Consumers Energy (Michigan) offers \$1000 rebates to builders who construct Energy Star single family homes	Incorporated suggestion into 2024 study with 2 tiers of residential new construction whole-home improvement measures.

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External Measure Suggestions

Measure Suggestion	Stakeholder Comments	Action taken for FEECA Study
	with a Home Energy Rating (HERS) score of 57 or less, but offer higher rebates for more efficient buildings - up to \$4000 for all electric homes with a HERS score of 40 or less. The Florida utilities potential study should assess savings potential for both the Energy Star level and a tier or two of additional efficiency beyond that level. Similar assessments of new commercial building savings potential should also be assessed.	
Custom Industrial Measures	The utilities' list of industrial efficiency measures addresses common industrial efficiency opportunities. However, it does not address efficiency opportunities that may be unique to individual industries or even to individual industrial facilities. That can include such things as changes in types of materials used in manufacturing, reductions in waste streams, improved use of water delivered by agricultural irrigation systems, and/or other things that are not directly related to energy using equipment or controls of such equipment. It is obviously not possible to list all such measures. However, a potential study will understate savings potential if it does not include a way of capturing such potential in its estimates. One potential way to get a sense of such potential is to review results of comprehensive industrial efficiency programs run by other utilities to identify the portion of actual program savings from such unique custom measures - and then assume that portion of custom savings could be added to the savings estimated in the study for named measures.	Added to measure list for 2024 study
Electric Vehicle measures	Some EV chargers are more efficient than others. The Federal Energy Star program has a standard for them. Savings potential may not be huge, but should be considered in the study. With a growing number of EV sales, the study should also consider the potential savings from promoting the most efficient EVs within different size/style categories	Added to measure list for 2024 study
Removing screw-based LEDs	The screw-based LEDs on both the Residential and Commercial measure lists should now be considered baseline due to federal efficiency standards adopted earlier this year. Utility load forecasts for IRPs should reflect resulting improvements in end use efficiency.	Screw-based LEDs were included in the study but with limited applicability to reflect current market
Removing Commercial fluorescent lighting	LED technology - for both fixtures and lamps - has advanced significantly in recent years, to the point where it should be the only technology considered for commercial lighting. Measures such as high performance T-8 fluorescent fixtures and high bay T-5 fluorescent fixtures should be replaced with LED alternatives in the study.	Updated measure list for 2024 study to only include LED-based lamps for linear fluorescent replacements

External Measure Suggestions

Measure Suggestion	Stakeholder Comments	Action taken for FEECA Study
Removing fossil-gas fueled CHP	Fossil-fuel fired CHP systems should not be considered “renewable” and have questionable benefits if electric generation is expected to get increasingly more renewable and clean. Biogas-fueled CHP - such as systems installed in wastewater treatment facilities that use methane byproducts of processing waste - should be included in the study.	2024 study will continue to assess all CHP options
Adding livestock methane power generation to renewables list	For example, see the “cow power” program currently being run by Green Mountain Power, Vermont’s largest electric utility	2024 study will continue to assess DSRE options consistent with prior study, including customer-sited solar, solar plus storage, and CHP
Adding EV managed charging to DR list	With national market shares for EVs growing, it is important that utilities consider programs for managing when charging occurs. Numerous utilities are currently running managed charging programs. This does not currently appear to be on the measure list and should be added to the Florida utilities’ potential study.	Added to measure list for 2024 study
Residential “smart thermostat” measure can provide both efficiency savings and demand response potential	This is recognized in the inclusion of smart thermostats in both the Res EE and DR tabs of the measure list spreadsheet. We simply want to flag that it is important when assessing cost-effectiveness of this measure that these two potential benefits are considered together. In other words, the cost should be considered compared to the combined efficiency and DR potential rather than separately considered relative to just EE savings and then separately again compared to just DR potential	2024 study will include interactive impacts of EE and DR opportunities
Emerging Technologies	The efficiency potential study measure list appears to be somewhat outdated. It does not include a number of new and emerging technologies. The potential list of such technologies is long. We suggest reviewing the attached list of emerging technologies developed almost two years ago by Consumers Energy (Michigan) and including them in the study.	Consumers Energy study was reviewed and commercially available measures were added to measure list for 2024 study, including heat pump water heaters - CEE advanced tier, heat pump clothes dryers, ozone laundry systems, and 21+ SEER HVAC units

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Technical Potential Study of Demand Side Management

Florida Public Utilities Company

Date: 03.07.2024

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Executive Summary

In October 2022, the six electric utilities subject to the Florida Energy Efficiency and Conservation Act (FEECA Utilities) retained Resource Innovations, Inc. for the purpose of identifying and characterizing the market for demand-side management (DSM) opportunities, including energy efficiency (EE) improvement and building retrofits, peak load reductions from demand response (DR), and demand-side renewable energy (DSRE) systems.

The main objective of the study was to assess the technical potential of demand-side resources for reducing customer electric energy consumption and seasonal peak capacity demands.

This report provides the detailed methodology and results for the technical potential analysis of Florida Public Utilities Company's (FPUC) service territory.

1.1 Methodology

Resource Innovations estimates DSM savings potential by applying an analytical framework that aligns baseline market conditions for energy consumption and demand with DSM opportunities. After describing the baseline condition, Resource Innovations applies estimated measure savings to disaggregated consumption and demand data. The approach varies slightly according to the type of DSM resources and available data; the specific approaches used for each type of DSM are described below.

1.1.1 EE Potential

This study utilized Resource Innovations' proprietary EE modeling tool, TEA-POT (Technical / Economic / Achievable POTential). This modeling tool was built on a platform that provides the ability to create and analyze multiple scenarios and recalculate potential savings based on variable inputs such as sales/load forecasts, electricity prices, discount rates, and actual program savings. The methodology for the EE potential assessment was based on a hybrid "top-down/bottom-up" approach, which started with the current utility load forecast, then disaggregated it into its constituent customer-class and end-use components. Our assessment examined the effect of the range of EE measures and practices on each end-use, taking into account current market saturations, and technical feasibility. These unique impacts were aggregated to produce estimates of potential at the end-use, customer class, and system levels for FPUC.

1.1.2 DR Potential

The assessment of DR potential in FPUC's service territory was an analysis of mass market direct load control programs for residential and small commercial and industrial (C&I) customers, and an analysis of DR programs for large C&I customers. The direct load control program assessment focused on the potential for demand reduction through heating, ventilation, and air conditioning (HVAC), water heater, managed electric vehicle charging, and pool pump load control. These end-uses were of particular interest because of their large contribution to peak period system load. For this analysis, a range of direct load control measures were examined for each customer segment to highlight the range of potential. The assessment further accounted for existing DR programs for FPUC when calculating the total DR potential.

1.1.3 DSRE Potential

The DSRE technologies included in this study are rooftop solar photovoltaic (PV) systems, battery storage systems charged from customers' PV systems, and combined heat and power (CHP) systems. The study leveraged the customer segmentation and load disaggregation data assembled for the EE and DR analyses, and applied our DSRE model, SPIDER™ (Spatial Penetration and Integration of Distributed Energy Resources), for economic and adoption analysis of solar and battery storage. This model dynamically responds to rapidly changing technologies and accounts for all key time-varying elements such as technology costs, incentives, tax credits, and electric rates. To estimate technical potential for CHP, the study utilized a series of unique distributed generation potential models for each primary market sector (commercial and industrial), calculating the average building consumption, assigning minimum facility size thresholds, and estimating building energy savings share percentage for each CHP technology based on its generation capacity.

1.2 Savings Potential

Technical potential for EE, DR, and DSRE are as follows:

1.2.1 EE Potential

EE technical potential describes the savings potential when all technically feasible EE measures are fully implemented, ignoring all non-technical constraints on electricity savings, such as cost-effectiveness and customer willingness to adopt EE.

The estimated EE technical potential results are summarized in Table 1.

Table 1. EE Technical Potential

	Savings Potential		
	Summer Peak Demand (MW)	Winter Peak Demand (MW)	Energy (GWh)
Residential	26	15	97
Non-Residential¹	14	12	71
Total	40	27	168

1.2.2 DR Potential

DR technical potential describes the magnitude of loads that can be managed during conditions when grid operators need peak capacity. For residential and small C&I customers where DR generally takes the form of direct utility control, technical potential for DR is limited by the loads that can be controlled remotely at scale such as heating, cooling, water heaters, managed electric vehicle charging, and pool pumps. For large C&I customers, this included their entire electric demand during a utility’s system peak, as many of these types of customers will forego virtually all electric demand temporarily if the financial incentive is large enough.

The estimated DR technical potential results are summarized in Table 2.

Table 2. DR Technical Potential

	Savings Potential	
	Summer Peak Demand (MW)	Winter Peak Demand (MW)
Residential	41	65
Non-Residential	27	24
Total	68	89

¹ Non-Residential results include all commercial and industrial customer segments.

1.2.3 DSRE Potential

DSRE technical potential estimates quantify all technically feasible distributed generation opportunities from PV systems, battery storage systems charged from PV, and CHP technologies based on the customer characteristics of FPUC’s customer base.

The estimated DSRE technical potential results are summarized in Table 3.

Table 3. DSRE Technical Potential²

	Savings Potential		
	Summer Peak Demand (MW)	Winter Peak Demand (MW)	Energy (GWh)
PV Systems			
Residential	17	10	152
Non-Residential	9	3	70
Total	26	13	222
Battery Storage charged from PV Systems			
Residential	5	2	0
Non-Residential	0	1	0
Total	5	3	0
CHP Systems			
Total	23	13	108

² PV systems and CHP systems were independently analyzed for technical potential without consideration of the competition between technologies or customer preference for DSRE system.

2 Introduction

In October, 2022, the six electric utilities subject to the Florida Energy Efficiency and Conservation Act (FEECA Utilities) retained Resource Innovations, Inc. for the purpose of identifying and characterizing the market for demand-side management (DSM) opportunities, including energy efficiency (EE) improvement and building retrofits, peak load reductions from demand response (DR), and demand-side renewable energy (DSRE) systems. The main objective of the study was:

- Assessing the technical potential of demand-side resources for reducing customer electric energy consumption and seasonal peak capacity demands.

This report provides the detailed methodology and results for the technical potential analysis of FPUC's service territory.

The following deliverables were developed by Resource Innovations as part of the project and are addressed in this report:

- DSM measure list and detailed assumption workbooks
- Disaggregated baseline demand and energy use by year, sector, and end-use
- Baseline technology saturations, energy consumption, and demand
- Technical potential demand and energy savings
- Supporting calculation spreadsheets

2.1 Technical Potential Study Approach

Resource Innovations estimates technical potential according to the industry standard categorization, as follows:

Technical Potential is the theoretical maximum amount of energy and capacity that could be displaced by DSM, regardless of cost and other barriers that may prevent the installation or adoption of a DSM measure.

For this study, technical potential included full application of commercially available DSM technologies to all residential, commercial, and industrial customers in the utility's service territory.

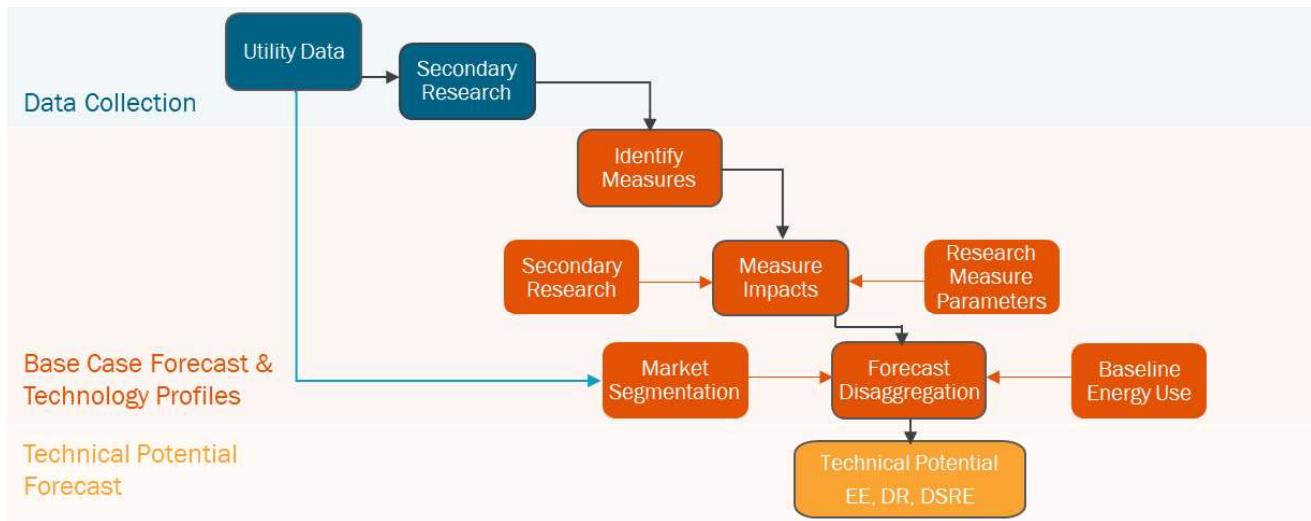
Quantifying DSM technical potential is the result of an analytical process that refines DSM opportunities that align with FPUC's customers' electric consumption patterns. Resource Innovations' general methodology for estimating technical potential is a hybrid "top-

down/bottom-up” approach, which is described in detail in Sections 3 through 5 of this report and includes the following steps:

- Develop a baseline forecast: the study began with a disaggregation of the utility’s official electric energy forecast to create a baseline electric energy forecast. This forecast does not include any utility-specific assumptions around DSM performance. Resource Innovations applied customer segmentation and consumption data from each utility and data from secondary sources to describe baseline customer-class and end-use components. Additional details on the forecast disaggregation are included in Section 3.
- Identify DSM opportunities: A comprehensive set of DSM opportunities applicable to FPUC’s climate and customers were analyzed to best depict DSM technical potential. Effects for a range of DSM technologies for each end-use could then be examined while accounting for current market saturations, technical feasibility, and impacts.
- Collect cost and impact data for measures: For those measures applicable to FPUC’s customers, Resource Innovations conducted primary and secondary research and estimated costs, energy savings, measure life, and demand savings. We differentiated between the type of cost (capital, installation labor, maintenance, etc.) to separately evaluate different implementation modes: retrofit (capital plus installation labor plus incremental maintenance); new construction (incremental capital and incremental maintenance); and burnout costs (incremental capital and incremental maintenance costs for replacement of appliances and equipment that has reached the end of its useful life). Additional details on measure development are included in Section 4.

Figure 1 provides an illustration of the technical potential modeling process conducted for FPUC, with the assessment starting with the current utility load forecast, disaggregated into its constituent customer-class and end-use components, and calibrated to ensure consistency with the overall forecast. Resource Innovations considered the range of DSM measures and practices application to each end-use, accounting for current market saturations, and technical feasibility. These unique impacts were aggregated to produce estimates of potential at the technology, end-use, customer class, and system levels.

Figure 1. Approach to Technical Potential Modeling



Resource Innovations estimated DSM technical potential based on a combination of market research, utility load forecasts and customer data, and measure impact analysis, all in coordination with FPUC. Resource Innovations examined the technical potential for EE, DR, and DSRE opportunities; this report is organized to offer detail on each DSM category, with additional details on technical potential methodology presented in Section 5.

2.2 EE Potential Overview

To estimate EE potential, this study utilized Resource Innovations’ modeling tool, TEA-POT (Technical / Economic / Achievable POTential). This modeling tool was built on a platform that provides the ability to create and analyze multiple scenarios and recalculate potential savings based on variable inputs such as sales/load forecasts, electricity prices, discount rates, and actual utility program savings, as described in Section 5.1.1 below. While the analysis estimates the impacts of individual EE measures, the model accounts for interactions and overlap of individual measure impacts within an end-use or equipment type. The model provides transparency into the assumptions and calculations for estimating EE potential.

2.3 DR Potential Overview

To estimate DR market potential, Resource Innovations considered customer demand during utility peaking conditions and projected customer response to DR measures. Customer demand was determined by looking at account-level interval data for each customer segment. For each segment, Resource Innovations determined the portion of a customer’s load that could be curtailed during the system peak. FPUC customer interval

data was unavailable and therefore, a sample of FPL customers' load data was used as proxy to estimate peak load profiles and demand response potential.

2.4 DSRE Potential Overview

The DSRE technologies included in this study are rooftop solar photovoltaic (PV) systems, battery storage systems charged from PV, and combined heat and power (CHP) systems. The study leveraged the customer segmentation and load disaggregation data assembled for the EE and DR analyses, and applied our DSRE model, SPIDER™ (Spatial Penetration and Integration of Distributed Energy Resources), for economic and adoption analysis of solar and battery storage. This model dynamically responds to rapidly changing technologies and accounts for all key time-varying elements such as technology costs, incentives, tax credits, and electric rates. To estimate technical potential for CHP, the study utilized a series of unique distributed generation potential models for each primary market sector (commercial and industrial), calculating the average building consumption, assigning minimum facility size thresholds, and estimating building energy savings share percentage for each CHP technology based on its generation capacity.

3 Baseline Forecast Development

3.1 Market Characterization

The FPUC base year energy use and sales forecast provided the reference point to determine potential savings. The end-use market characterization of the base year energy use and reference case forecast included customer segmentation and load forecast disaggregation. The characterization is described in this section, while the subsequent section addresses the measures and market potential energy and demand savings scenarios.

3.1.1 Customer Segmentation

In order to estimate EE, DR, and DSRE potential, the sales forecast and peak load forecasts were segmented by customer characteristics. As electricity consumption patterns vary by customer type, Resource Innovations segmented customers into homogenous groups to identify which customer groups are eligible to adopt specific DSM technologies, have similar building characteristics and load profiles, or are able to provide DSM grid services.

Resource Innovations segmented customers according to the following:

- 1) By Sector - how much of FPUC's energy sales, summer and winter peak demand forecast is attributable to the residential, commercial, and industrial sectors?
- 2) By Customer - how much electricity does each customer typically consume annually and during system peaking conditions?
- 3) By End-Use - within a home or business, what equipment is using electricity during the system peak? How much energy does this end-use consume over the course of a year?

Table 4 summarizes the segmentation within each sector. In addition to the segmentation described here for the EE and DSRE analyses, the residential customer segments were further segmented by heating type (electric heat, gas heat, or unknown) and by annual consumption bins within each sub-segment for the DR analysis.

Table 4. Customer Segmentation

Residential	Commercial		Industrial	
Single Family	Assembly	Miscellaneous	Agriculture and Assembly	Primary Resources Industries
Multi-Family	College and University	Offices	Chemicals and Plastics	Stone/Glass/Clay/Concrete
Manufactured Homes	Grocery	Restaurant	Construction	Textiles and Leather
	Healthcare	Retail	Electrical and Electronic Equipment	Transportation Equipment
	Hospitals	Schools K-12	Lumber/Furniture/Pulp/Paper	Water and Wastewater
	Institutional	Warehouse	Metal Products and Machinery	Other
	Lodging/Hospitality		Miscellaneous Manufacturing	

From an equipment and energy use perspective, each segment has variation within each building type or sub-sector. For example, the energy consuming equipment in a convenience store will vary significantly from the equipment found in a supermarket. To account for this variation, the selected end-uses describe energy consumption patterns that are consistent with those typically studied in national or regional surveys, such as the U.S. Energy Information Administration’s (EIA) Residential Energy Consumption Survey (RECS), Commercial Building Energy Consumption Survey (CBECS) and Manufacturing Energy Consumption Survey (MECS), among others. The end-uses selected for this study are listed in Table 5.

Table 5. End-Uses

Residential End-Uses	Commercial End-Uses	Industrial End-Uses
Space heating ³	Space heating ³	Process heating
Space cooling ³	Space cooling ³	Process cooling
Domestic hot water	Domestic hot water	Compressed air
Ventilation and circulation	Ventilation and circulation	Motors/pumps

³ Includes the contribution of building envelope measures and efficiencies.

Residential End-Uses	Commercial End-Uses	Industrial End-Uses
Lighting	Interior lighting	Fan, blower motors
Cooking	Exterior lighting	Process-specific
Appliances	Cooking	Industrial lighting
Electronics	Refrigeration	Exterior lighting
Miscellaneous	Office equipment	HVAC ³
	Miscellaneous	Other

For DR, the end-uses targeted were those with controllable load for residential customers (i.e., HVAC, water heaters, pool pumps, and electric vehicles) and small C&I customers (HVAC and electric vehicles). For large C&I customers, all load during peak hours was included assuming these customers would potentially be willing to reduce electricity consumption for a limited time if offered a large enough incentive during temporary system peak demand conditions.

3.1.2 Forecast Disaggregation

A common understanding of the assumptions and granularity in the baseline load forecast was developed with input from FPUC. Key discussion topics reviewed included:

- How current DSM offerings are reflected in the energy and demand forecast.
- Assumed weather conditions and hour(s) of the day when the system is projected to peak.
- Are there portions of the load forecast attributable to customers or equipment not eligible for DSM programs?
- How are projections of population increase, changes in appliance efficiency, and evolving distribution of end-use load shares accounted for in the peak demand forecast?

3.1.2.1 Electricity Consumption (kWh) Forecast

Resource Innovations segmented FPUC’s electricity consumption forecast into electricity consumption load shares by customer class and end-use. The baseline customer segmentation represents the electricity market by describing how electricity was consumed within the service territory. Resource Innovations developed the forecast for the year 2025, and based it on data provided by FPUC, primarily their 2022 Long-Term Projections of Electricity Energy and Demand, which was the most recent plan available at the time the

studies were initiated. The data addressed current baseline consumption, system load, and sales forecasts.

3.1.2.2 Peak Demand (kW) Forecast

A fundamental component of DR potential was establishing a baseline forecast of what loads or operational requirements would be absent due to existing dispatchable DR or time varying rates. This baseline was necessary to assess how DR can assist in meeting specific planning and operational requirements. We utilized FPUC's summer and winter peak demand forecast, which was developed for system planning purposes.

3.1.2.3 Estimating Consumption by End-Use Technology

As part of the forecast disaggregation, Resource Innovations developed a list of electricity end-uses by sector (Table 5). To develop this list, Resource Innovations began with FPUC's estimates of average end-use consumption by customer and sector. Resource Innovations combined these data with other information, such as utility residential appliance saturation surveys, as available, to develop estimates of customers' baseline consumption. Resource Innovations calibrated the utility-provided data with data available from public sources, such as the EIA's recurring data-collection efforts that describe energy end-use consumption for the residential, commercial, and manufacturing sectors.

To develop estimates of end-use electricity consumption by customer segment and end-use, Resource Innovations applied estimates of end-use and equipment-type saturation to the average energy consumption for each sector. The following data sources and adjustments were used in developing the base year 2025 sales by end-use:

Residential Sector:

- The disaggregation was based on FPUC's rate class load shares and intensities.
- Baseline intensity was calibrated to account for differences in end-use saturation, fuel source, and equipment saturation as follows:
 - FPUC rate class load share is based on average per customer.
 - Resource Innovations made conversions to usage estimates generated by applying EIA RECS data, residential end-use study data from other FEECA utilities and EIA's Annual Energy Outlook (AEO) 2023.

Commercial Sector:

- The disaggregation was based on FPUC's rate class load shares, intensities, and EIA CBECS data.

- Segment data from EIA and FPUC.
- Baseline intensity was calibrated to account for differences in end-use saturation, fuel source, and equipment saturation as follows:
 - Rate class load share based on EIA CBECS and end-use forecasts from FPUC.

Industrial Sector:

- The disaggregation was based on rate class load shares, intensities, and EIA MECS data.
- Segment data from EIA and FPUC.
- Baseline intensity was calibrated to account for differences in end-use saturation, fuel source, and equipment saturation as follows:
 - Rate class load share based on EIA MECS and end-use forecasts from FPUC.

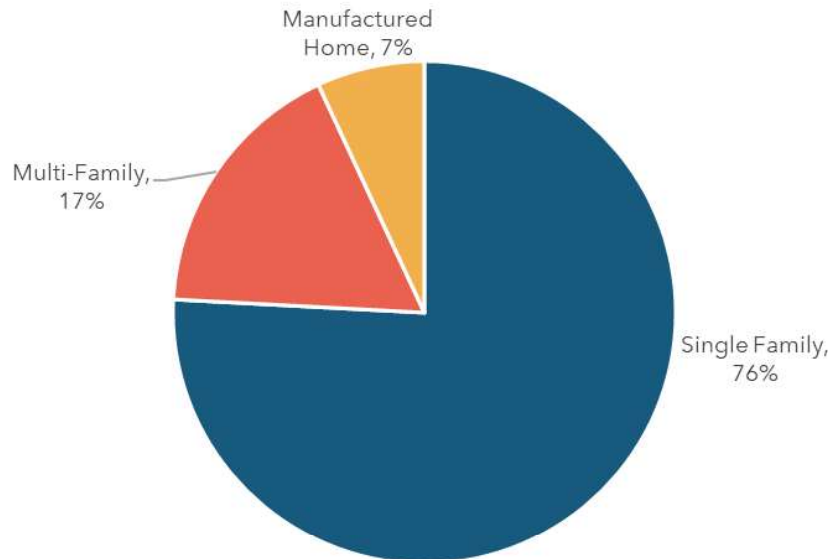
3.2 Analysis of Customer Segmentation

Customer segmentation is important to ensuring that a MPS examines DSM measure savings potential in a manner that reflects the diversity of energy savings opportunities existing across the utility's customer base. FPUC provided Resource Innovations with data concerning the premise type and loads characteristics for all customers for the MPS analysis. Resource Innovations examined the provided data from multiple perspectives to identify customer segments. Resource Innovations' approach to segmentation varied slightly for non-residential and residential accounts, but the overall logic was consistent with the concept of expressing the accounts in terms that were relevant to DSM opportunities.

3.2.1 Residential Customers (EE, DR, and DSRE Analysis)

Segmentation of residential customer accounts enabled Resource Innovations to align DSM opportunities with appropriate DSM measures. Resource Innovations used utility customer data, supplemented with EIA data, to segment the residential sector by customer dwelling type (single family, multi-family, or manufactured home). The resulting distribution of customers according to dwelling unit type is presented in Figure 2.

Figure 2. Residential Customer Segmentation



3.2.2 Non-Residential (Commercial and Industrial) Customers (EE and DSRE Analysis)

For the EE and DSRE analysis, Resource Innovations segmented C&I accounts using the utility's North American Industry Classification System (NAICS) or Standard Industrial Classification (SIC) codes, supplemented by data produced by the EIA's CBECS and MECS. Resource Innovations classified the customers in this group as either commercial or industrial, on the basis of DSM measure information available and applicable to each. For example, agriculture and forestry DSM measures are commonly considered industrial savings opportunities. Resource Innovations based this classification on the types of DSM measures applicable by segment, rather than on the annual energy consumption or maximum instantaneous demand from the segment as a whole. The estimated energy sales distributions Resource Innovations applied are shown below in Figure 3 and Figure 4.

Figure 3. Commercial Customer Segmentation

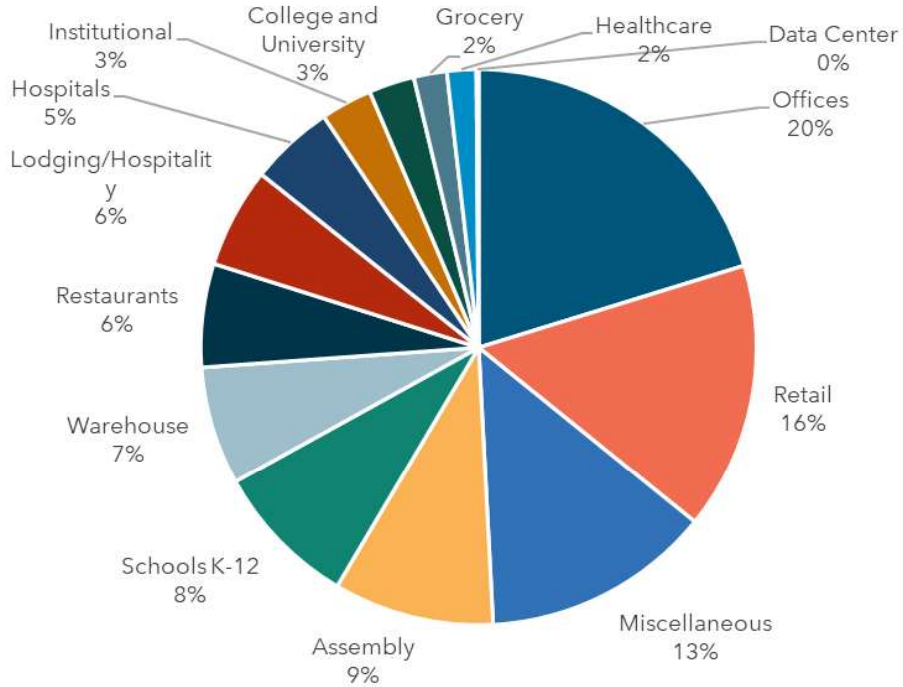
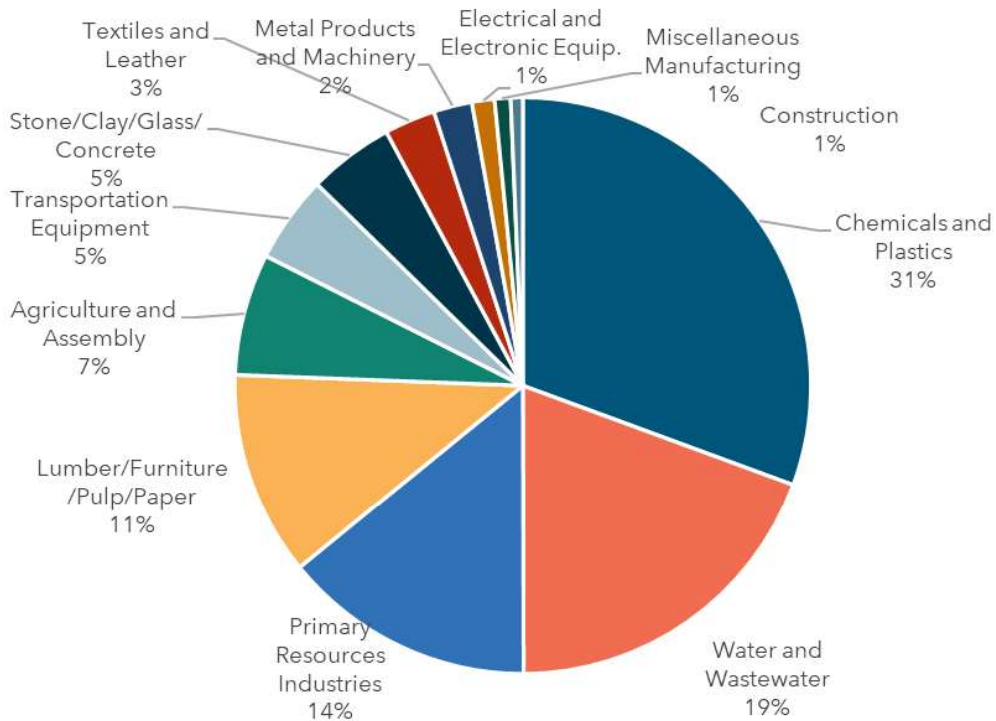


Figure 4. Industrial Customer Segmentation



3.2.3 Commercial and Industrial Accounts (DR Analysis)

For the DR analysis, Resource Innovations divided the non-residential customers into the two customer classes of small C&I and large C&I using rate class and annual consumption. For the purposes of this analysis, small C&I customers are those on the General Service (GS) tariff. Large C&I customers are all customers on the General Service Demand (GSD) tariff or on the General Service Large Demand (GSLD) tariff. Resource Innovations further segmented these two groups based on customer size. For small C&I, segmentation was determined using annual customer consumption and for large C&I the customer’s maximum demand was used. Both customer maximum demand and customer annual consumption were calculated using billing data provided by FPUC.

Table 6 shows the account breakout between small C&I and large C&I.

Table 6. Summary of Customer Classes for DR Analysis

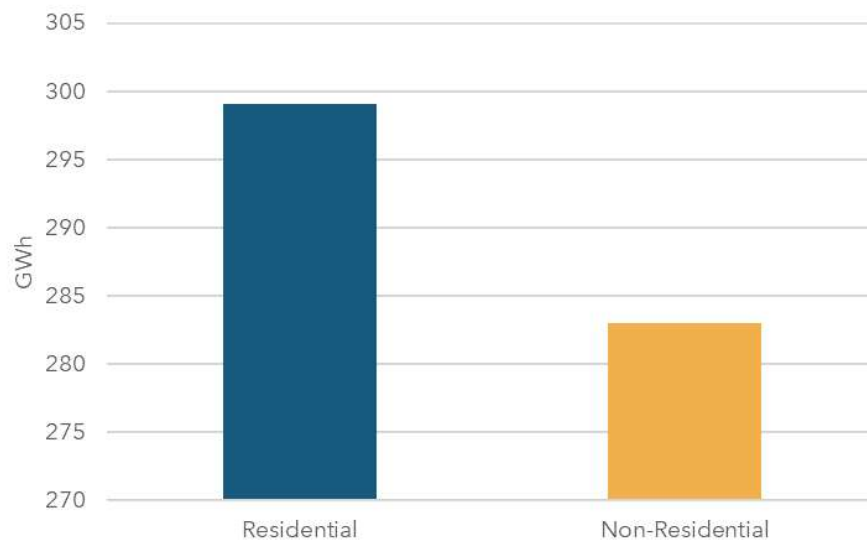
Customer Class	Annual kWh	Estimated Number of Accounts
Small C&I	0-15,000 kWh	2,559
	15,001-25,000 kWh	566
	25,001-50,000 kWh	457
	50,001 kWh +	246
	Total	3,828
Large C&I	0-50 kW	269
	51-300 kW	327
	301-500 kW	14
	501 kW +	8
	Total	618

3.3 Analysis of System Load

3.3.1 System Energy Sales

Technical potential is based on FPUC's load forecast for the year 2025 from their 2022 Long-Term Projections of Electricity Energy and Demand, which is illustrated in Figure 5.

Figure 5. 2025 Electricity Sales Forecast by Sector



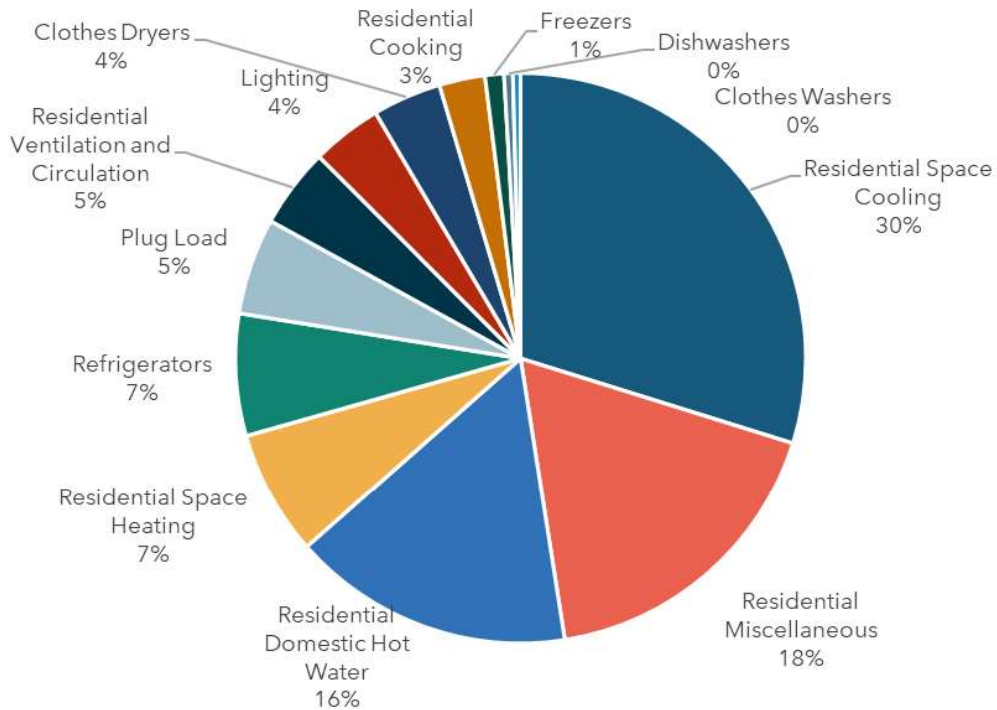
3.3.2 System Demand

To determine the technical potential for DR, Resource Innovations first established peaking conditions for each utility by looking at when each utility historically experienced its maximum demand. The primary data source used to determine when maximum DR impact was the historical system load for FPUC. The data provided contained the system loads for all 8,760 hours of the most recent five years leading up to the study (2016-2021). The utility summer and winter peaks were then identified within the utility-defined peaking conditions. For FPUC the summer peaking conditions were defined as August from 4:00-5:00 PM and the winter peaking conditions were defined as January from 7:00-8:00 AM. The seasonal peaks were then selected as the maximum demand during utility peaking conditions.

3.3.3 Load Disaggregation

The disaggregated annual electric loads⁴ for the base year 2025 by sector and end-use are summarized in Figure 6, Figure 7, and Figure 8.

Figure 6. Residential Baseline (2025) Energy Sales by End-Use



⁴ Full disaggregation of system demand by end-use was not conducted, as DR potential for residential and small C&I customers focused on specific end-uses of particular interest because of their large contribution to peak period system load, and was not end-use specific for large C&I customers. A description of the end-use analysis for residential and small C&I customers is included in Section 5.1.2

Figure 7. Commercial Baseline (2025) Energy Sales by End-Use

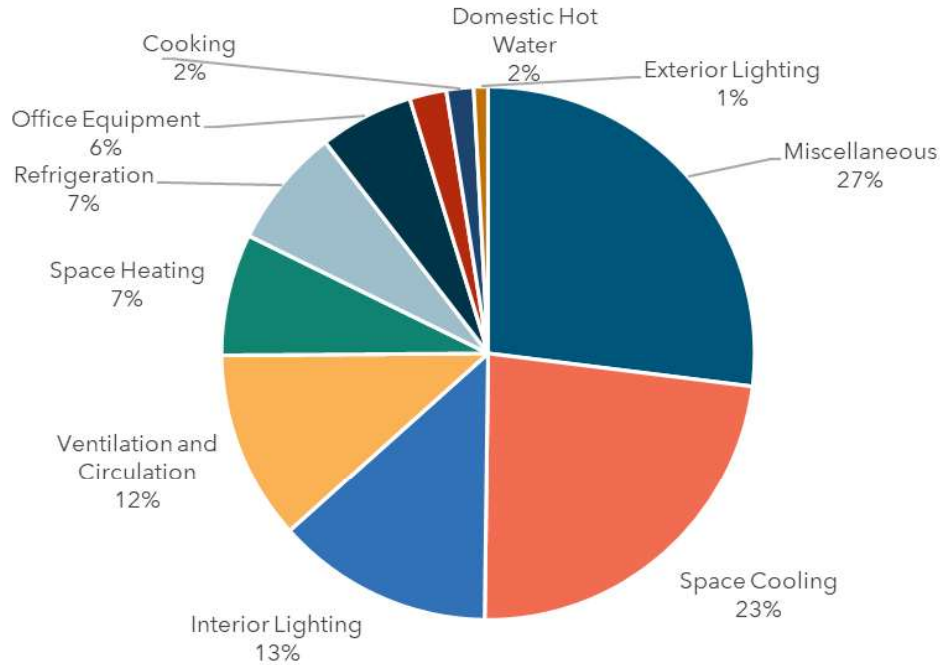
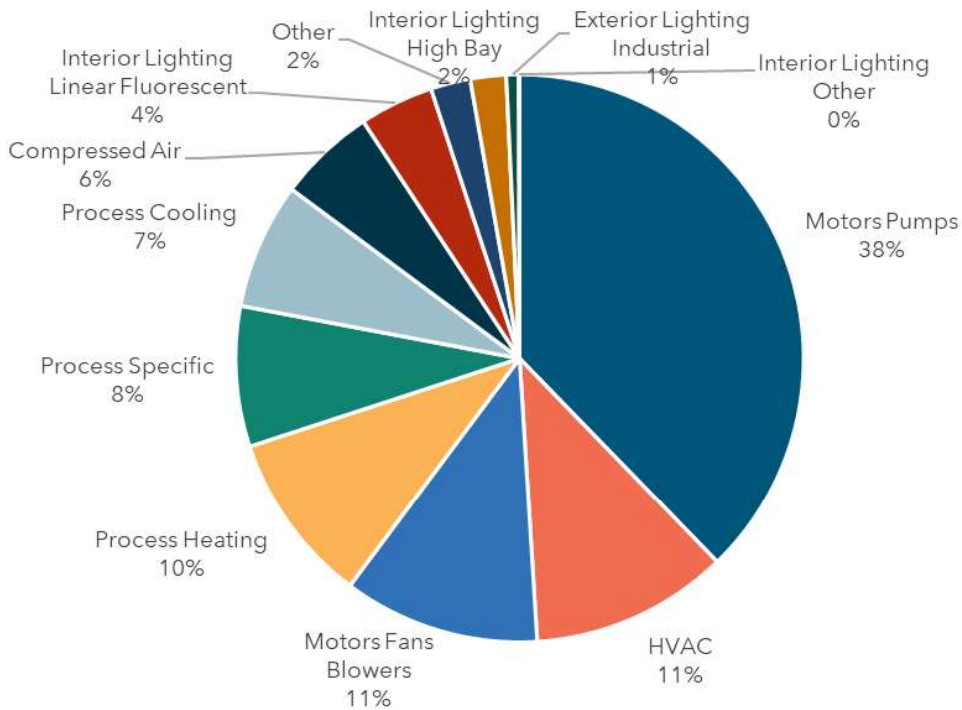


Figure 8. Industrial Baseline (2025) Energy Sales by End-Use



4 DSM Measure Development

DSM potential is described by comparing baseline market consumption with opportunities for savings. Describing these individual savings opportunities results in a list of DSM measures to analyze. This section presents the methodology to develop the EE, DR, and DSRE measure lists.

4.1 Methodology

Resource Innovations identified a comprehensive catalog of DSM measures for the study. The measure list is the same for all FEECA Utilities. The iterative vetting process with the utilities to develop the measure list began by initially examining the list of measures included in the 2019 Goals docket. This list was then adjusted based on proposed measure additions and revisions provided by the FEECA Utilities. Resource Innovations further refined the measure list based on reviews of Resource Innovations' DSM measure library, compiled from similar market potential studies conducted in recent years throughout the United States, as well as measures included in other utility programs where Resource Innovations is involved with program design, implementation, or evaluation. The FEECA Utilities also reached out to interested parties and received input with recommendations on measure additions to the 2019 measure list. Their measure suggestions were reviewed and incorporated into the study as appropriate. External measure suggestions and actions are summarized in Appendix D. The extensive, iterative review process involving multiple parties has ensured that the study included a robust and comprehensive set of DSM measures.

See Appendix A for the list of EE measures, Appendix B for the list of DR measures, and Appendix C for the list of DSRE measures analyzed in the study.

4.2 EE Measures

EE measures represent technologies applicable to the residential, commercial, and industrial customers in the FEECA Utilities' service territories. The development of EE measures included consideration of:

- EE technologies that are applicable to Florida and commercially available: Measures that are not applicable due to climate or customer characteristics were excluded, as were "emerging" technologies that are not currently commercially available to FEECA utility customers.
- Current and planned Florida Building Codes and Federal equipment standards (Codes & Standards) for baseline equipment: Measures included from prior studies

were adjusted to reflect current Codes & Standards as well as updated efficiency tiers, as appropriate.

- Eligibility for utility DSM offerings in Florida: For example, behavioral measures were excluded from consideration, as they historically have not been allowed to count towards utility DSM goals. Behavioral measures are intended to motivate customers to operate in a more energy-efficient manner (e.g., setting an air-conditioner thermostat to a higher temperature) without accompanying: a) physical changes to more efficient end-use equipment or to their building envelope, b) utility-provided products and tools to facilitate the efficiency improvements, or c) permanent operational changes that improve efficiency which are not easily revertible to prior conditions. These types of behavioral measures were excluded because of the variability in forecasting the magnitude and persistence of energy and demand savings from the utility's perspective. Additionally, decoupling behavioral measure savings from the installation of certain EE technologies like smart thermostats can be challenging and could result in overlapping potential with other EE measures included in the study.

Upon development of the final EE measure list, utility-specific measure details were developed. RI maintains a proprietary online database of energy efficiency measures for MPS studies, which was used as a starting point for measure development for this study. Measures are added or updated at the request of project stakeholders or because of changes to the EE marketplace (for example, new codes and standards, or current practice in the market). Measure data are refined as new data or algorithms are developed for estimating measure impacts, and updated for each study to incorporate inputs parameters specific to the service territory being analyzed. The database contains the following information for each of the measures:

- Measure description: measure classification by type, end-use, and subsector, and description of the base-case and the efficient-case scenarios.
- kWh savings: Energy savings associated with each measure were developed through engineering algorithms or building simulation modeling, taking climate data and customer segments into consideration as appropriate. Reference sources used for developing residential, commercial, and industrial measure savings included a variety of Florida-specific, as well as regional and national sources, such as utility-specific measurement & verification (M&V) data, technical reference manuals (TRM) from other jurisdictions, ENERGY STAR calculators, and manufacturer or retailer specifications for particular products.
- Energy savings were applied in RI's TEA-POT model as a percentage of total baseline consumption. Peak demand savings were determined using utility-specific load shapes or coincidence factors.

- Measure Expected Useful Lifetime: Sources included the Database for Energy Efficient Resources (DEER), the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Handbook, TRMs, and other regional and national measure databases and EE program evaluations.
- Measure Costs: Per-unit costs (full or incremental, depending on the application) associated with measure installations. Sources included: TRMs, ENERGY STAR calculator, online market research, FEECA utility program data, and other secondary sources.

The measure details from the online measure library are exported for use in RI’s TEA-POT model, accompanied by utility-specific estimates of measure applicability. Measure applicability is a general term encompassing an array of factors, including technical feasibility of installation, and the measure’s current saturation as well as factors to allocate savings associated with competing measures. Information used was primarily derived from data in current regional and national databases, as well as FPUC’s program tracking data. These factors are described in Table 7.

Table 7. Measure Applicability Factors

Measure Impact	Explanation	Sources
Technical Feasibility	The percentage of buildings that can have the measure physically installed. Various factors may affect this, including, but not limited to, whether the building already has the baseline measure (e.g., dishwasher), and limitations on installation (e.g., size of unit and space available to install the unit).	Various secondary sources and engineering experience.
Measure Incomplete Factor	The percentage of buildings without the specific measure currently installed.	Utility RASS; EIA RECS, CBECS; MECS; ENERGY STAR sales figures; and engineering experience.
Measure Share	Used to distribute the percentage of market shares for competing measures (e.g., only blown-in ceiling insulation or spray foam insulation, not both would be installed in an attic).	Utility customer data, Various secondary sources and engineering experience.

As shown in Table 8, the measure list includes 395 unique energy-efficiency measures. Expanding the measures to account for all appropriate installation scenarios resulted in

9,535 measure permutations, which are the application of individual measures to various customer segments, construction types, and end-uses (i.e., a single air-source heat pump “measure” can be installed in single family, multi-family, and manufactured homes, as well as new and existing vintages of each home type, and impacts both space cooling and space heating end-uses, resulting in twelve separate measure “permutations” analyzed).

Table 8. EE Measure Counts by Sector

Sector	Unique Measures	Permutations
Residential	119	1,173
Commercial	164	5,798
Industrial	112	2,564

4.3 DR Measures

The DR measures included in the measure list utilize the following DR strategies:

- **Direct Load Control.** Utility control of selected equipment at the customer’s home or business, such as HVAC or water heaters.
- **Critical Peak Pricing (CPP) with Technology.** Electricity rate structures that vary based on time of day. Includes CPP when the rate is substantially higher for a limited number of hours or days per year (customers receive advance notification of CPP event) coupled with technology that enables customer to lower their usage in a specific end-use in response to the event (e.g., HVAC via smart thermostat).
- **Contractual DR.** Customers receive incentive payments or a rate discount for committing to reduce load by a pre-determined amount or to a pre-determined firm service level upon utility request.
- **Automated DR.** Utility dispatched control of specific end-uses at a customer facility.

DR initiatives that do not rely on the installation of a specific device or technology to implement (such as a voluntary curtailment program or time of use rates) were not included.

A workbook was developed for each measure which included the same measure inputs as previously described for the EE measures. In addition, the DR workbook included expected load reduction from the measure, based on utility technical potential, existing utility DR programs, and other nationwide DR programs if needed.

For technical potential, Resource Innovations did not break out results by specific measure or control technology because all of the developed measures target the end-uses estimated

for technical potential (i.e., potential is reported for space cooling end-use and not allocated to switches, smart thermostats, etc.).

4.4 DSRE Measures

The DSRE measure list includes rooftop PV systems, battery storage systems charged from PV systems, and CHP systems.

PV Systems

PV systems utilize solar panels (a packaged collection of PV cells) to convert sunlight into electricity. A system is constructed with multiple solar panels, a DC/AC inverter, a racking system to hold the panels, and electrical system interconnections. These systems are often roof-mounted systems that face south-west, south, and/or, south-east. The potential associated with roof-mounted systems installed on residential and commercial buildings was analyzed.

Battery Storage Systems Charged from PV Systems

Distributed battery storage systems included in this study consist of behind-the-meter battery systems installed in conjunction with an appropriately-sized PV system at residential and commercial customer facilities. These battery systems typically consist of a DC-charged battery, a DC/AC inverter, and electrical system interconnections to a PV system. On their own battery storage systems do not generate or conserve energy, but can collect and store excess PV generation to provide power during particular time periods, which for DSM purposes would be to offset customer demand during the utility's system peak.

CHP Systems

In most CHP applications, a heat engine creates shaft power that drives an electrical generator (fuel cells can produce electrical power directly from electrochemical reactions). The waste heat from the engine is then recovered to provide other on-site needs. Common prime mover technologies used in CHP applications and explored in this study include:

- Steam turbines
- Gas turbines
- Micro turbines
- Fuel Cells
- Internal combustion engines

A workbook was developed for each measure which included the inputs previously described for EE measures and prime mover operating parameters.

5 Technical Potential

In the previous sections, the approach for DSM measure development was summarized, and the 2025 base year load shares and reference-case load forecast were described. The outputs from these tasks provided the input for estimating the technical potential scenario, which is discussed in this section.

The technical potential scenario estimates the potential energy and demand savings when all technically feasible and commercially available DSM measures are implemented without regard for cost-effectiveness and customer willingness to adopt the most impactful EE, DR, or DSRE technologies. Since the technical potential does not consider the costs or time required to achieve these savings, the estimates provide a theoretical upper limit on electricity savings potential. Technical potential is only constrained by factors such as technical feasibility and applicability of measures. For this study, technical potential included full application of the commercially available DSM measures to all residential, commercial, and industrial customers in the utility's service territory.

5.1 Methodology

5.1.1 EE Technical Potential

EE technical potential refers to delivering less electricity to the same end-uses. In other words, technical potential might be summarized as "doing the same thing with less energy, regardless of the cost."

DSM measures were applied to the disaggregated utility electricity sales forecasts to estimate technical potential. This involved applying estimated energy savings from equipment and non-equipment measures to all electricity end-uses and customers. Technical potential consists of the total energy and demand that can be saved in the market which Resource Innovations reported as single numerical values for each utility's service territory.

The core equation used in the residential sector EE technical potential analysis for each individual efficiency measure is shown in Equation 1 below, while the core equation used in the nonresidential sector technical potential analysis for each individual efficiency measure is shown in Equation 2.

Equation 1: Core Equation for Residential Sector EE Technical Potential



Where:

- **Baseline Equipment Energy Use Intensity** = the electricity used per customer per year by each baseline technology in each market segment. In other words, the baseline equipment energy-use intensity is the consumption of the electrical energy using equipment that the efficient technology replaces or affects.
- **Saturation Share** = the fraction of the end-use electrical energy that is applicable for the efficient technology in a given market segment. For example, for residential cooling, the saturation share would be the fraction of all residential electric customers that have central air conditioners in their household.
- **Percent Incomplete** = the fraction of equipment that is not considered to already be energy efficient. To extend the example above, the fraction of central air conditioners that is not already energy efficient.
- **Feasibility Factor** = the fraction of units that is technically feasible for conversion to the most efficient available technology from an engineering perspective (i.e., it may not be possible to install LEDs in all light sockets in a home because the available styles may not fit in every socket).
- **Savings Factor** = the percentage reduction in electricity consumption resulting from the application of the efficient technology.

Equation 2: Core Equation for Non-Residential Sector EE Technical Potential



Where:

- **Total Stock Square Footage by Segment** = the forecasted square footage level for a given building type (e.g., square feet of office buildings).
- **Baseline Equipment Energy Use Intensity** = the electricity used per square foot per year by each baseline equipment type in each market segment.

- **Saturation Shares** = the fraction of total end-use energy consumption associated with the efficient technology in a given market segment. For example, for packaged terminal air-conditioner (PTAC), the saturation share would be the fraction of all space cooling kWh in a given market segment that is associated with PTAC equipment.
- **Percent Incomplete** = the fraction of equipment that is not considered to already be energy efficient.
- **Feasibility Factor** = the fraction of the equipment or practice that is technically feasible for conversion to the efficient technology from an engineering perspective (i.e., it may not be possible to install Variable Frequency Drives (VFD) on all motors in a given market segment).
- **Savings Factor** = the percentage reduction in electricity consumption resulting from the application of the efficient technology.

It is important to note that the technical potential estimate represents electricity savings potential at a specific point in time. In other words, the technical potential estimate is based on data describing status quo customer electricity use and technologies known to exist today. As technology and electricity consumption patterns evolve over time, the baseline electricity consumption will also change accordingly. For this reason, technical potential is a discrete estimate of a dynamic market. Resource Innovations reported the technical potential for 2025, based on currently known DSM measures and observed electricity consumption patterns.

Measure Interaction and Competition (Overlap)

While the technical potential equations listed above focus on the technical potential of a single measure or technology, Resource Innovations' modeling approach does recognize the overlap of individual measure impacts within an end-use or equipment type, and accounts for the following interactive effects:

- **Measure interaction:** Installing high-efficiency equipment could reduce energy savings in absolute terms (kWh) associated with non-equipment measures that impact the same end-use. For example, installing a high-efficiency heat pump will reduce heating and cooling consumption which will reduce the baseline against which attic insulation would be applied, thus reducing savings associated with installing insulation. To account for this interaction, Resource Innovations' TEA-POT model ranks measures that interact with one another and reduces the baseline consumption for the subsequent measure based on the savings achieved by the preceding measure. For technical potential, interactive measures are ranked based on total end-use energy savings percentage.
- **Measure competition (overlap):** The "measure share"—as defined above—accounted for competing measures, ensuring savings were not double-counted. This interaction

occurred when two or more measures “competed” for the same end-use. For example, a T-12 lamp could be replaced with a T-8 or linear LED lamp.

Addressing Naturally-Occurring EE

Naturally occurring energy efficiency includes actions taken by customers to improve the efficiency of their homes and businesses in the absence of utility program intervention. For the analysis of technical potential, Resource Innovations verified with FPUC’s forecasting group that the baseline sales forecasts incorporated two known sources of naturally-occurring efficiency:

- Codes and Standards: The sales forecasts already incorporated the impacts of known Code & standards changes.
- Baseline Measure Adoption: The sales forecast excluded the projected impacts of future DSM efforts but included already implemented DSM penetration.

By properly accounting for these factors, the technical potential analysis estimated the additional EE opportunities beyond what is already included in the utility sales forecast.

5.1.2 DR Technical Potential

The concept of technical potential applies differently to DR than for EE. Technical potential for DR is effectively the magnitude of loads that can be curtailed during conditions when utilities need peak capacity reductions. In evaluating this potential at peak capacity, the following were considered: which customers are consuming electricity at those times? What end-uses are in play? Can those end-use loads be managed? Large C&I accounts generally do not provide the utility with direct control over particular end-uses. Instead, many of these customers will forego electric demand temporarily if the financial incentive is large enough. For residential and small C&I customers where DR generally takes the form of direct utility control, technical potential for DR is limited by the loads that can be controlled remotely at scale.

This framework makes end-use disaggregation an important element for understanding DR potential, particularly in the residential and small C&I sectors. When done properly, end-use disaggregation not only provides insights into which loads are on and off when specific grid services are needed, it also provides insight concerning how key loads and end-uses, such as air conditioning use, vary across customers. Resource Innovations’ approach used for load disaggregation is more advanced than what is used for most potential studies. Instead of disaggregating annual consumption or peak demand, Resource Innovations produced end-use load disaggregation for all 8,760 hours. This was needed because the loads available at times when different grid applications are needed can vary substantially. Instead

of producing disaggregated loads for the average customer, the study was produced for several customer segments. Because customer-level load data was not available for FPUC, this process relied on interval load data from FPL's load research samples for each customer segment as best proxy. Using FPL's load data, Resource Innovations examined three residential segments based on customer housing type, four different small C&I segments based on customer size, and four different large C&I segments based on customer size, for a total of 11 different customer segments.

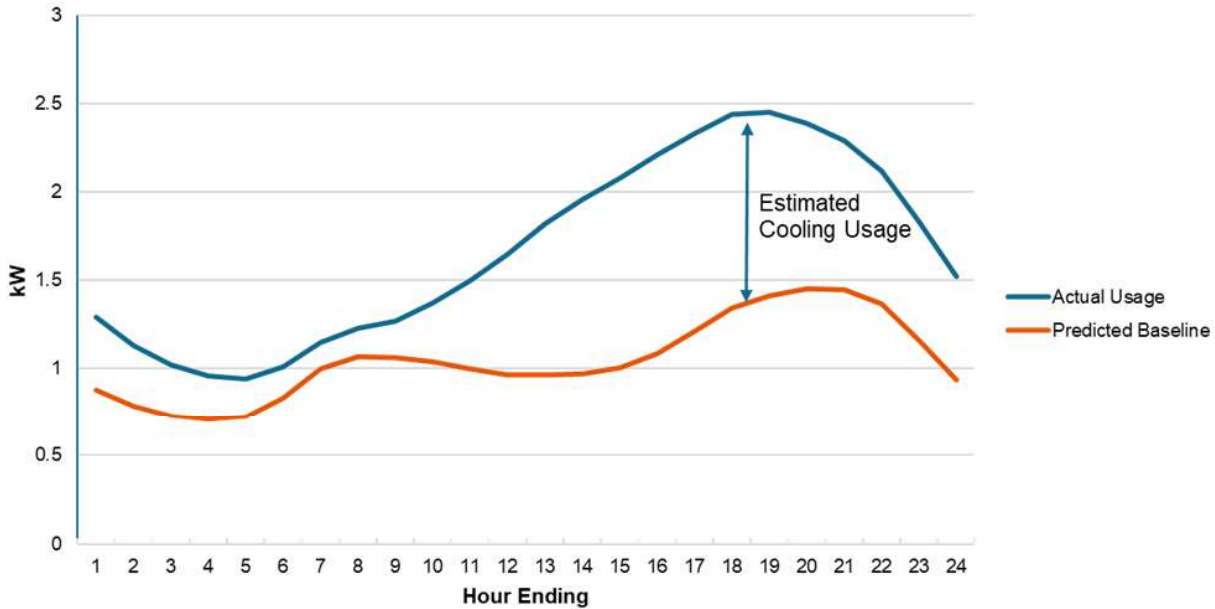
Technical potential, in the context of DR, is defined as the total amount of load available for reduction that is coincident with the period of interest; in this case, the system peak hour for the summer and winter seasons. Thus, two sets of capacity values are estimated: a summer capacity and a winter capacity.

As previously mentioned, for technical potential purposes, all coincident large C&I load is considered dispatchable, while residential and small C&I DR capacity is based on specific end-uses. Summer DR capacity for residential customers was comprised of air-conditioning (AC), pool pumps, water heaters, and managed electric vehicle charging. For small C&I customers, summer capacity was based on AC load. For winter DR capacity, residential was based on electric heating, pool pumps, and water heaters. For small C&I customers, winter capacity was based on electric heating.

AC and heating load profiles were generated for residential and small C&I customers using a sample customer interval data provided by FPL. This sample included a customer breakout based on housing type for residential customers and size for small C&I customers. Resource Innovations then used the interval data from these customers to create an average load profile for each customer segment.

The average load profile for each customer segment was combined with historical weather data, and used to estimate hourly load as a function of weather conditions. AC and heating loads were estimated by first calculating the baseline load on days when cooling degree days (CDD) and heating degree days (HDD) were equal to zero, and then subtracting this baseline load. This methodology is illustrated by Figure 9 (a similar methodology was used to predict heating loads).

Figure 9: Methodology for Estimating Cooling Loads



This method was able to produce estimates for average AC/heating load profiles for the seven different customer segments within the residential and small C&I sectors.

Profiles for residential water heater and pool pump loads were estimated by utilizing end-use load data from NREL's residential end-use load profile database.

For all eligible loads, the technical potential was defined as the amount that was coincident with system peak hours for each season, which are August from 4:00-5:00 PM for summer, and January from 7:00-8:00 AM for winter. As mentioned in Section 4, for technical potential there was also no measure breakout needed, because all measures will target the end-uses' estimated total loads.

5.1.3 DSRE Technical Potential

5.1.3.1 PV Systems

To determine technical potential for PV systems, RI estimated the percentage of rooftop square footage in Florida that is suitable for hosting PV technology. Our estimate of technical potential for PV systems in this report is based in part on the available roof area and consisted of the following steps:

- Step 1: Outcomes from the forecast disaggregation analysis were used to characterize the existing and new residential, commercial, and industrial building stocks.
 - To calculate the total roof area for residential buildings, the average roof area per household is multiplied by the number of households.
 - For commercial and industrial buildings, RI calculated the total roof area by first dividing the load forecast by the energy usage intensity, which provides an estimate of the total building square footage. This result is then divided by the average number of floors to derive the total roof area.
- Step 2: The total available roof area feasible for installing PV systems was calculated. Relevant parameters included unusable area due to other rooftop equipment and setback requirements, in addition to possible shading from trees and limitations of roof orientation (factored into a “technical suitability” multiplier).
- Step 3: Estimated the expected power density (kW per square foot of roof area).
- Step 4: Estimated the hourly PV generation profile using NREL’s PV Watts Calculator
- Step 5: Calculated total energy and coincident peak demand potential by applying RI’s Spatial Penetration and Integration of Distributed Energy Resources (SPIDER) Model.

The methodology presented in this report uses the following formula to estimate overall technical potential of PVs:

Equation 3: Core Equation for Solar DSRE Technical Energy Potential



Where:

- **Suitable Rooftop PV Area for Residential [Square Feet]:** Number of Residential Buildings x Average Roof Area Per Building x Technical Suitability Factor
- **Suitable Rooftop PV Area for Commercial [Square Feet] :** Energy Consumption [kWh] / Energy Intensity [kWh / Square Feet] / Average No. of Stories Per Building x Technical Suitability Factor
- **PV Power Density [kW-DC/Square Feet]:** Maximum power generated in Watts per square foot of solar panel.
- **Generation Factor:** Annual Energy Generation Factor for PV, from PV Watts (dependent on local solar irradiance)

5.1.3.2 Battery Storage Systems Charged from PV Systems

Battery storage systems on their own do not generate power or create efficiency improvements, but store power for use at different times. Therefore, in analyzing the technical potential for battery storage systems, the source of the stored power and overlap with technical potential identified in other categories was considered.

Battery storage systems that are powered directly from the grid do not produce annual energy savings but may be used to shift or curtail load during particular time periods. As the DR technical potential analyzes curtailment opportunities for the summer and winter peak period, and battery storage systems can be used as a DR technology, the study concluded that no additional technical potential should be claimed for grid-powered battery systems beyond that already attributed to DR.

Battery storage systems that are connected to on-site PV systems also do not produce additional energy savings beyond the energy produced from the PV system⁵. However, PV-connected battery systems do create the opportunity to store energy during period when the PV system is generating more than the home or business is consuming and use that stored power during utility system peak periods.

To determine the additional technical potential peak demand savings for “solar plus storage” systems, our methodology consisted of the following steps:

- Assume that every PV system included in PV Technical Potential is installed with a paired storage system.
- Size the storage system assuming peak storage power is equal to peak PV generation and energy storage duration is three hours.
- Apply RI’s hourly dispatch optimization module in SPIDER to create an hourly storage dispatch profile that flattens the individual customer’s load profile to the greatest extent possible accounting for a) customer hourly load profile, b) hourly PV generation profile, and c) battery peak demand, energy capacity, and roundtrip charge/discharge efficiency.
- Calculate the effective hourly impact for the utility using the above storage dispatch profile, aligned with the utility’s peak hour (calculated separately for summer and winter)
- Report the output storage kW impact on utility coincident peak demand in summer and winter.

⁵ PV-connected battery systems experience some efficiency loss due to storage, charging, and discharging. However, for this study, these losses were not quantified.

5.1.3.3 CHP Systems

The CHP analysis created a series of unique distributed generation potential models for each primary market sector (commercial and industrial).

Only non-residential customer segments whose electric and thermal load profiles allow for the application of CHP were considered. The technical potential analysis followed a three-step process. First, minimum facilities size thresholds were determined for each non-residential customer segment. Next, the full population of non-residential customers were segmented and screened based on the size threshold established for that segment. Finally, the facilities that were of sufficient size were matched with the appropriately sized CHP technology.

To determine the minimum threshold for CHP suitability, a thermal factor was applied to potential candidate customer loads to reflect thermal load considerations in CHP sizing. In most cases, on-site thermal energy demand is smaller than electrical demand. Thus, CHP size is usually dictated by the thermal load in order to achieve improved efficiencies.

The study collected electric and thermal intensity data from other recent CHP studies. For industrial customers, Resource Innovations assumed that the thermal load would primarily be used for process operations and was not modified from the secondary data sources for Florida climate conditions. For commercial customers, the thermal load is more commonly made up of water heating, space heating, and space cooling (through the use of an absorption chiller). Therefore, to account for the hot and humid climate in Florida, which traditionally limits weather-dependent internal heating loads, commercial customers' thermal loads were adjusted to incorporate a higher proportion of space cooling to space heating as available opportunities for waste heat recovery.

Resource Innovations worked with the utility-provided customer data, focusing on annual consumption due to the absence of NAICS or SIC codes for this utility data. Non-residential customers were subsequently classified based on annual consumption and size. Since NAICS or SIC codes were unavailable, no formal segmentation occurred. Instead, the analysis focused exclusively on annual utility usage. Facilities with annual loads below the kWh thresholds were deemed unlikely to possess the consistent electric and thermal loads necessary to support CHP and were consequently excluded from consideration. Conversely, those meeting the size criteria were aligned with the corresponding CHP technology.

In general, internal combustion engines are the prime mover for systems under 500kW with gas turbines becoming progressively more popular as system size increases above that. Based on the available load by customer, adjusted by the estimated thermal factor for each

segment, CHP technologies were assigned to utility customers in a top-down fashion (i.e., starting with the largest CHP generators).

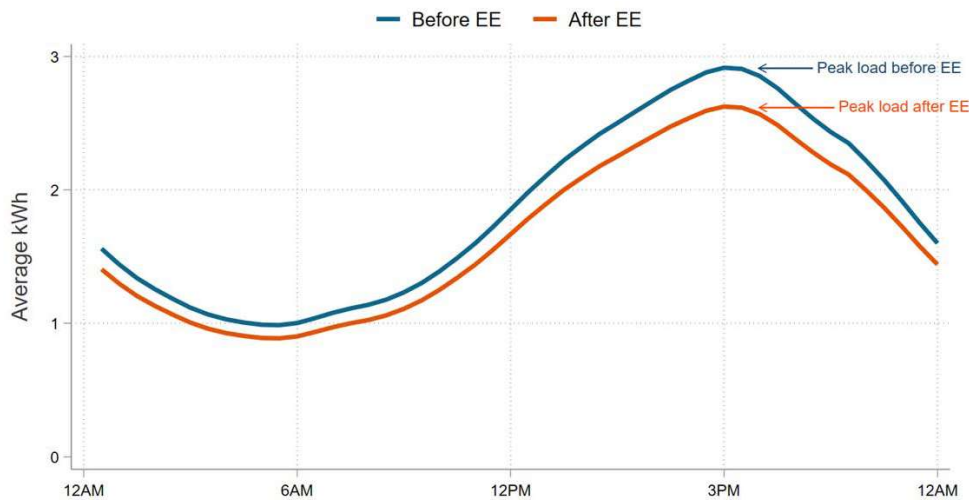
Measure Interaction

PV systems and battery storage charged from PV systems were analyzed collectively due to their common power generation source; and therefore, the identified technical potential for these systems is additive. However, CHP systems were independently analyzed for technical potential without consideration of the competition between DSRE technologies or customer preference for a particular DSRE system. Therefore, results for CHP technical potential should not be combined with PV systems or battery storage systems for overall DSRE potential but used as independent estimates.

5.1.4 Interaction of Technical Potential Impacts

As described above, the technical potential was estimated using separate models for EE, DR, and DSRE systems. However, there is interaction between these technologies; for example, a more efficient HVAC system would result in a reduced peak demand available for DR curtailment, as illustrated in Figure 10.

Figure 10: Illustration of EE Impacts on HVAC System Load Shape



Therefore, after development of the independent models, the interaction between EE, DR, and DSRE was incorporated as follows:

- The EE technical potential was assumed to be implemented first, followed by DR technical potential and DSRE technical potential.

- To account for the impact of EE technical potential on DR, the baseline load forecast for the applicable end-uses was adjusted by the EE technical potential, resulting in a reduction in baseline load available for curtailment.
- For DSRE systems, the EE and DR technical potential was incorporated in a similar fashion, adjusting the baseline load used to estimate DSRE potential.
 - For the PV analysis, this did not impact the results as the EE and DR technical potential did not affect the amount of PV that could be installed on available rooftops.
 - For the battery storage charged from PV systems, the reduced baseline load from EE resulted in additional PV-generated energy being available for the battery systems and for use during peak periods. The impact of DR events during the assumed curtailment hours was incorporated into the modeling of available battery storage and discharge loads.
- For CHP systems, the reduced baseline load from EE resulted in a reduction in the number of facilities that met the annual energy threshold needed for CHP installations. Installed DR capacity was assumed to not impact CHP potential as the CHP system feasibility was determined based on energy and thermal consumption at the facility. It should be noted that CHP systems not connected to the grid could impact the amount of load available for curtailment with utility-sponsored DR. Therefore, CHP technical potential should not be combined with DR potential but used as independent estimates.

5.2 EE Technical Potential

5.2.1 Summary

Table 9 summarizes the EE technical potential by sector:

Table 9. EE Technical Potential

	Savings Potential		
	Summer Peak Demand (MW)	Winter Peak Demand (MW)	Energy (GWh)
Residential	26	15	97
Non-Residential⁶	14	12	71
Total	40	27	168

⁶ Non-Residential results include all commercial and industrial customer segments.

5.2.2 Residential

Figure 11, Figure 12, and Figure 13 summarize the residential sector EE technical potential by end-use.

Figure 11: Residential EE Technical Potential by End-Use (Summer Peak Savings)

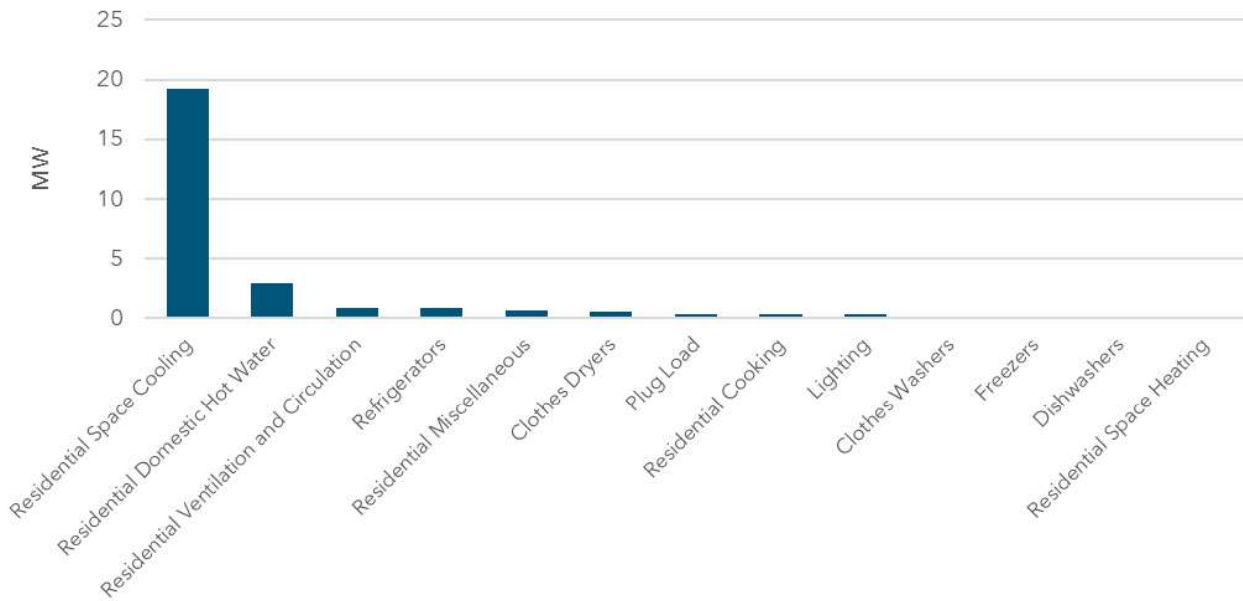


Figure 12: Residential EE Technical Potential by End-Use (Winter Peak Savings)

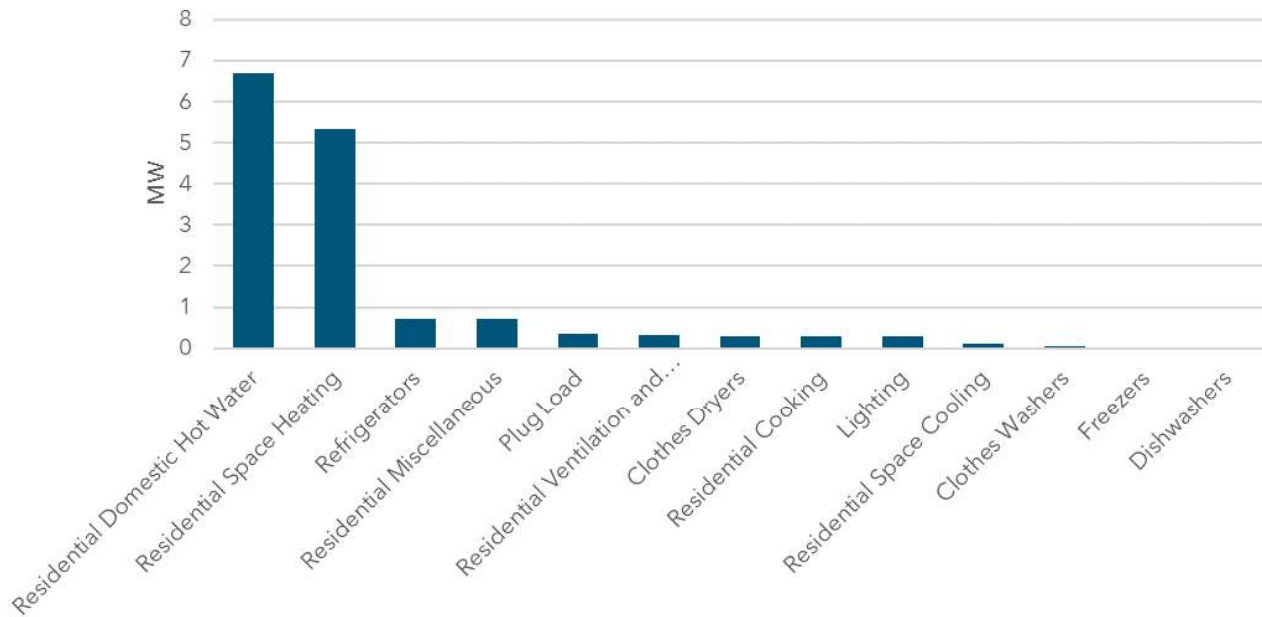
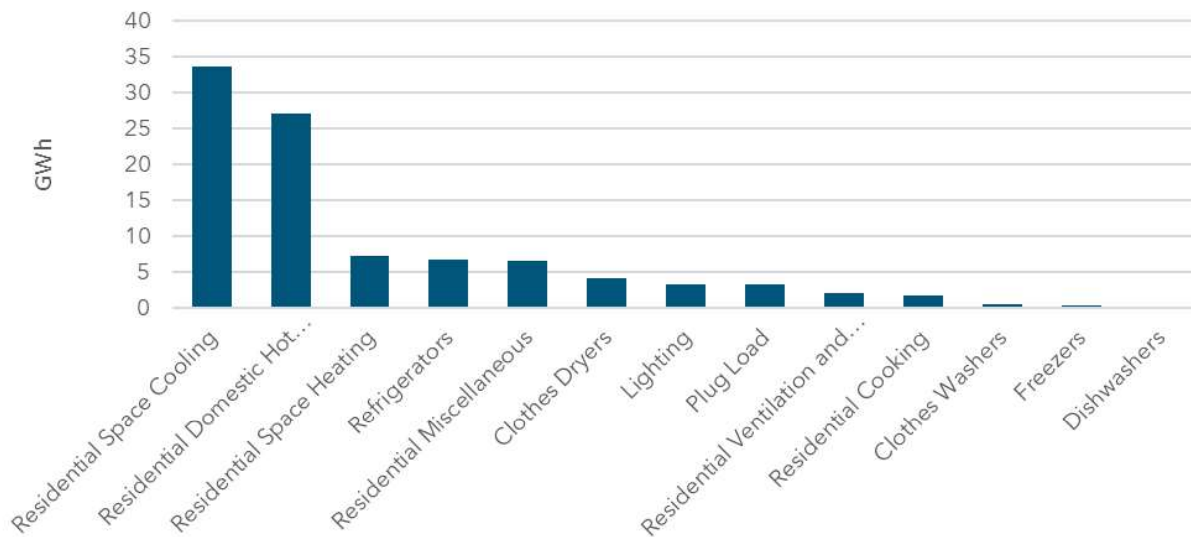


Figure 13: Residential EE Technical Potential by End-Use (Energy Savings)



5.2.3 Non-Residential

5.2.3.1 Commercial Segments

Figure 14, Figure 15, and Figure 16 summarize the commercial sector EE technical potential by end-use.

Figure 14: Commercial EE Technical Potential by End-Use (Summer Peak Savings)

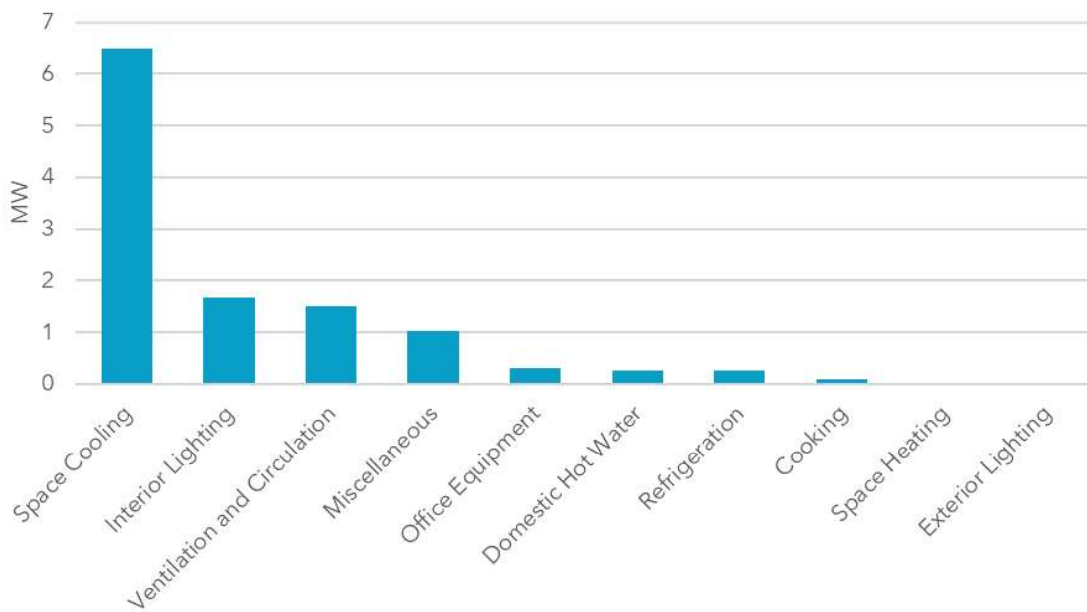


Figure 15: Commercial EE Technical Potential by End-Use (Winter Peak Savings)

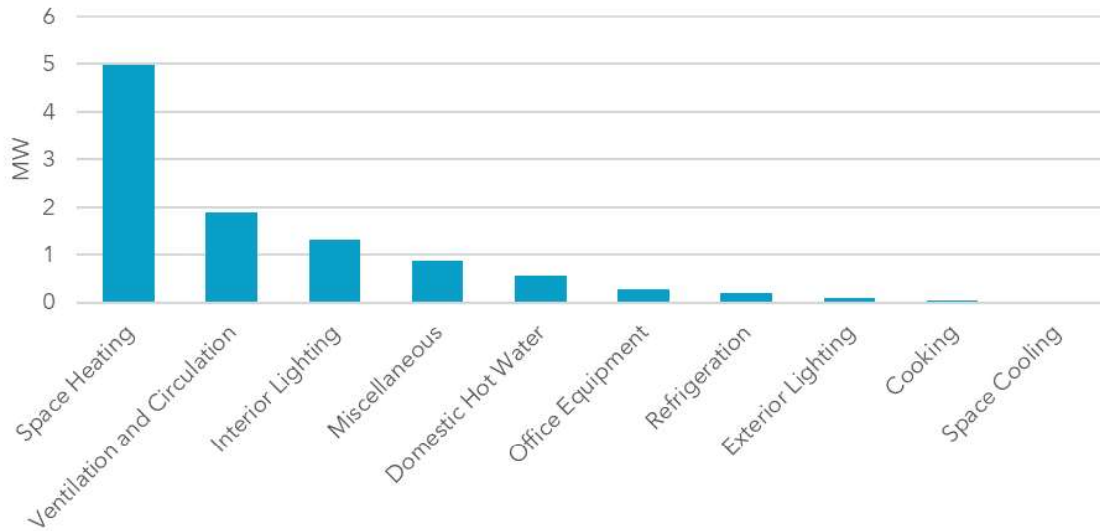
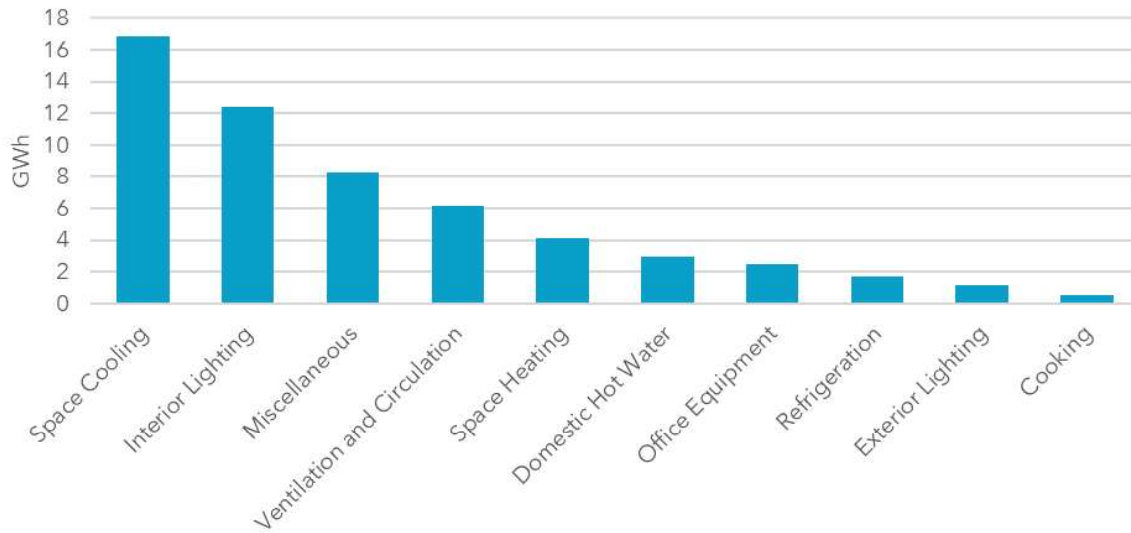


Figure 16: Commercial EE Technical Potential by End-Use (Energy Savings)



5.2.3.2 Industrial Segments

Figure 17, Figure 18, and Figure 19 summarize the industrial sector EE technical potential by end-use.

Figure 17: Industrial EE Technical Potential by End-Use (Summer Peak Savings)

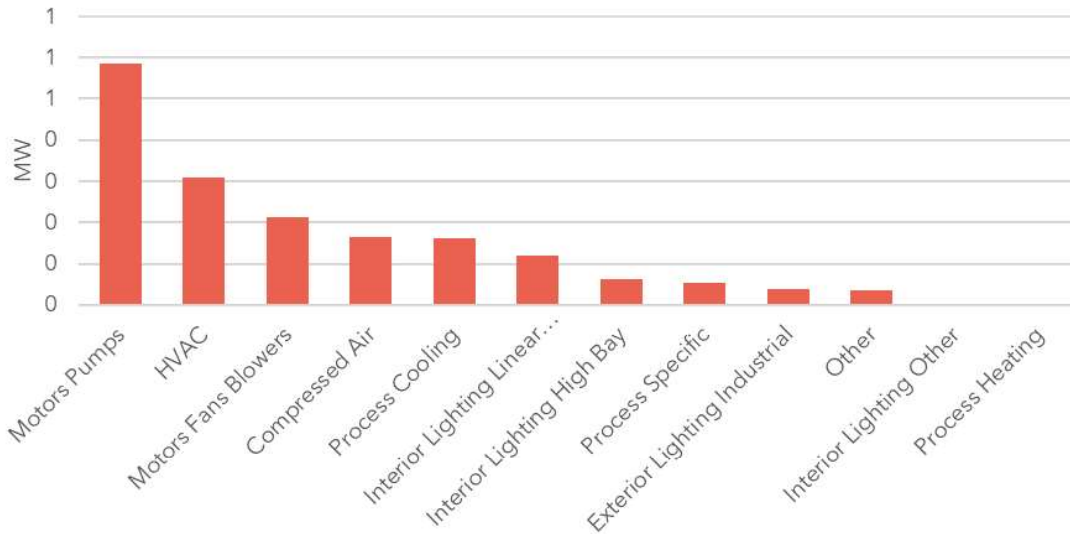


Figure 18: Industrial EE Technical Potential by End-Use (Winter Peak Savings)

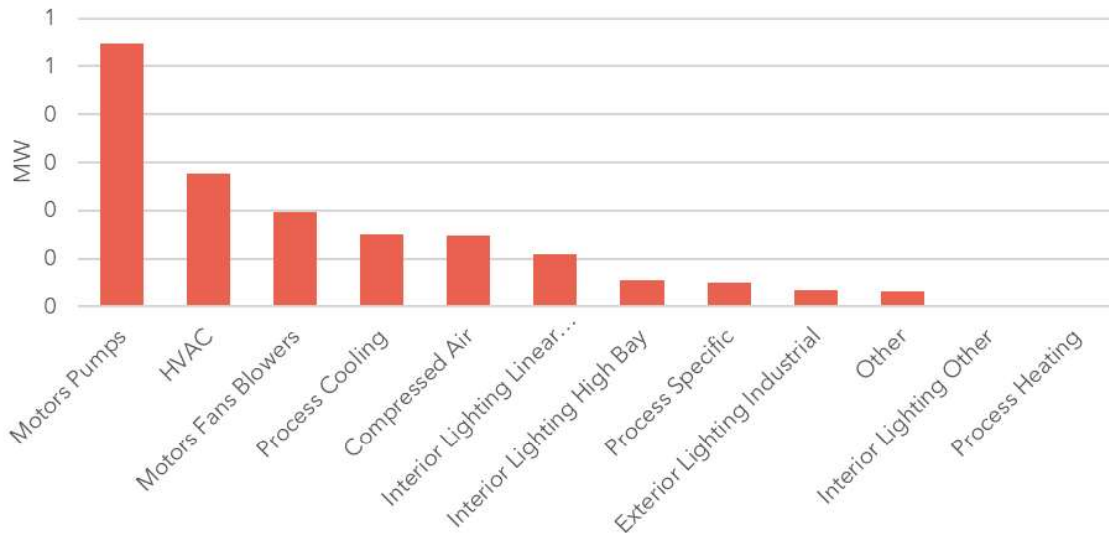
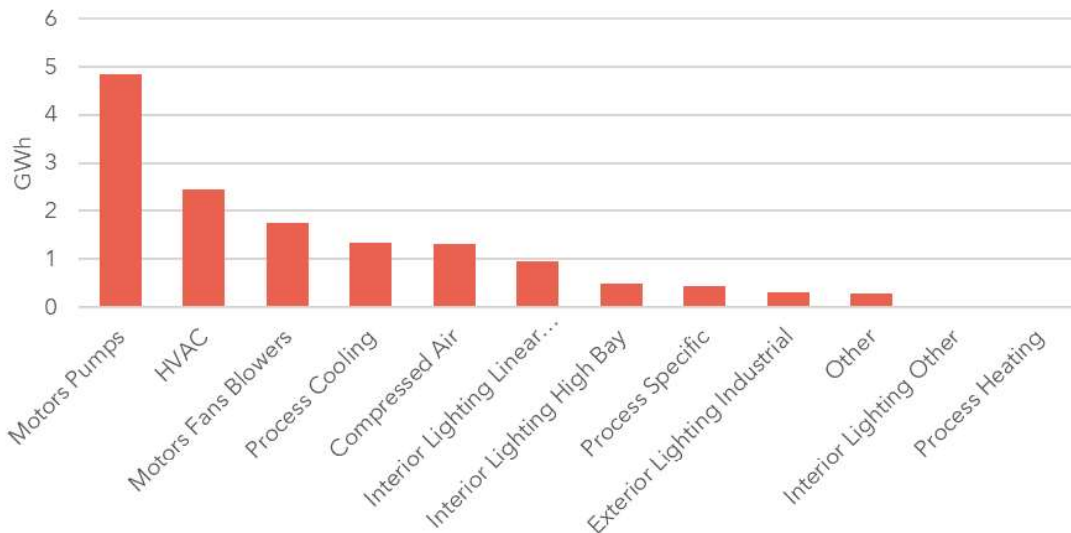


Figure 19: Industrial EE Technical Potential by End-Use (Energy Savings)



5.3 DR Technical Potential

Technical potential for DR is defined for each class of customers as follows:

- Residential & Small C&I customers - Technical potential is equal to the aggregate load for all end-uses that can participate in FPUC's current programs plus DR measures not currently offered in which the utility uses specialized devices to control loads (i.e., direct load control programs). This includes cooling and heating loads for residential and small C&I customers and water heater and pool pump loads for residential customers. Not all demand reductions are delivered via direct load control of end-uses. The magnitude of demand reductions from non-direct load control such as time varying pricing, peak time rebates and targeted notifications is linked to cooling and heating loads.
- Large C&I customers - Technical potential is equal to the total amount of load for each customer segment (i.e., that customers reduce their total load to zero when called upon).

Table 10 summarizes the seasonal DR technical potential by sector:

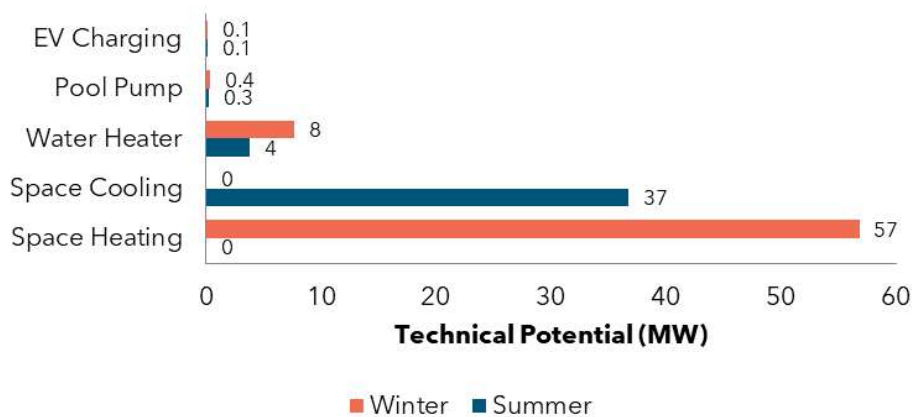
Table 10. DR Technical Potential

	Savings Potential	
	Summer Peak Demand (MW)	Winter Peak Demand (MW)
Residential	41	65
Non-Residential	27	24
Total	68	89

5.3.1 Residential

Residential technical potential is summarized in Figure 20.

Figure 20: Residential DR Technical Potential by End-Use

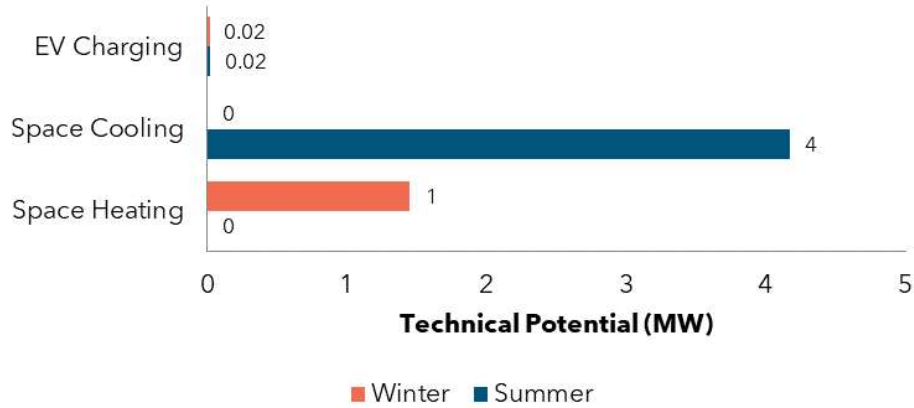


5.3.2 Non-Residential

5.3.2.1 Small C&I Customers

For small C&I technical potential, Resource Innovations looked at cooling and heating loads only. Small C&I technical potential is provided in Figure 21.

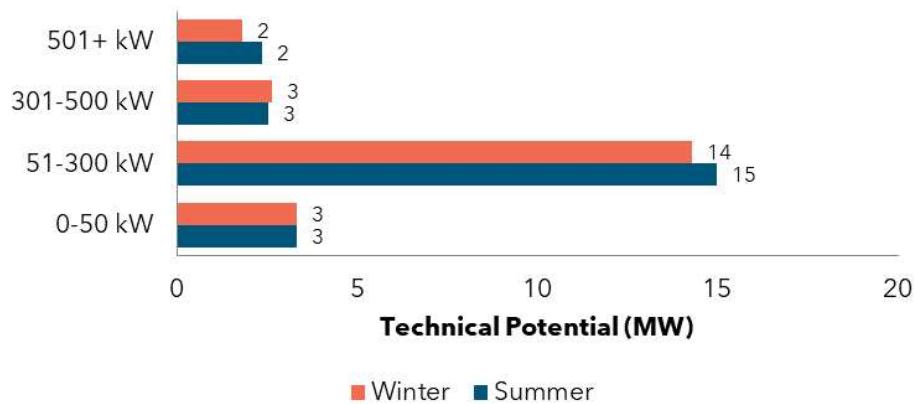
Figure 21: Small C&I DR Technical Potential by End-Use



5.3.2.2 Large C&I Customers

Figure 22 provides the technical potential for large C&I customers, broken down by customer size.

Figure 22: Large C&I DR Technical Potential by Segment



5.4 DSRE Technical Potential

Table 11 provides the results of the DSRE technical potential for each customer segment:

Table 11. DSRE Technical Potential⁷

	Savings Potential		
	Summer Peak Demand (MW)	Winter Peak Demand (MW)	Energy (GWh)
PV Systems			
Residential	17	10	152
Non-Residential	9	3	70
Total	26	13	222
Battery Storage charged from PV Systems			
Residential	5	2	0
Non-Residential	0	1	0
Total	5	3	0
CHP Systems			
Total	23	13	108

⁷ PV systems and CHP systems were independently analyzed for technical potential without consideration of the competition between technologies or customer preference for DSRE system.

Appendix A EE Measure List

For information on how Resource Innovations developed this list, please see Section 4.

Table 12: Residential EE Measures

Measure	End-Use	Description	Baseline
120v Heat Pump Water Heater 50 Gallons	Residential Domestic Hot Water	120v Heat Pump Water Heater 50 Gallons	Code-Compliant 50 Gallon Electric Resistance Water Heater
Air Sealing-Infiltration Control	Residential Space Cooling, Residential Space Heating	Standard Heating and Cooling System with Improved Infiltration Control	Standard Heating and Cooling System with Standard Infiltration Control
Air-to-Water Heat Pump	Residential Space Cooling, Residential Space Heating	Energy Star Air-to-Water Heat Pump, 25 SEER, 13 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
ASHP - 15 SEER/14.3 SEER2 from base electric resistance	Residential Space Cooling, Residential Space Heating	ASHP 15 SEER from base electric resistance	Base AC, 15 SEER, Electric resistance heating
ASHP - 24 SEER/22.9 SEER2 (from elec resistance)	Residential Space Cooling, Residential Space Heating	ASHP: 24/22.9 SEER/SEER2, 10.5 HSPF	Base AC, 15 SEER, Electric resistance heating
ASHP - 24 SEER/22.9 SEER2, 10.5 HSPF	Residential Space Cooling, Residential Space Heating	ASHP: 24/22.9 SEER/SEER2, 10.5 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
ASHP - CEE Advanced Tier: 17.8 SEER/17 SEER2; 10.0 HSPF	Residential Space Cooling, Residential Space Heating	CEE Advanced Tier ASHP: 17.8/17 SEER/SEER2; 10.0 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
ASHP - CEE Advanced Tier: 17.8 SEER/17 SEER2; 10.0 HSPF (from elec resistance)	Residential Space Cooling, Residential Space Heating	CEE Advanced Tier ASHP: 17.8/17 SEER/SEER2; 10.0 HSPF	Base AC, 15 SEER, Electric resistance heating
ASHP - CEE Tier 2: 16.8 SEER/16 SEER2; 9.0 HSPF	Residential Space Cooling, Residential Space Heating	CEE Tier 2 ASHP: 16.8/16 SEER/SEER2; 9.0 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
ASHP - CEE Tier 2: 16.8 SEER/16 SEER2; 9.0 HSPF (from elec resistance)	Residential Space Cooling, Residential Space Heating	CEE Tier 2 ASHP: 16.8/16 SEER/SEER2; 9.0 HSPF	Base AC, 15 SEER, Electric resistance heating

Measure	End-Use	Description	Baseline
ASHP - ENERGY STAR/CEE Tier 1: 16 SEER/15.2 SEER2 (from elect resistance)	Residential Space Cooling, Residential Space Heating	ENERGY STAR/CEE Tier 1 ASHP: 16/15.2 SEER/SEER2, 9.0 HSPF	Base AC, 15 SEER, Electric resistance heating
ASHP - ENERGY STAR/CEE Tier 1: 16 SEER/15.2 SEER2, 9.0 HSPF	Residential Space Cooling, Residential Space Heating	ENERGY STAR/CEE Tier 1 ASHP: 16/15.2 SEER/SEER2, 9.0 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
Basement or Crawlspace Wall Insulation R-15	Residential Space Cooling, Residential Space Heating	Increased Basement or Crawlspace Wall Insulation (R-15)	Code-Compliant Exterior Below-Grade Wall Insulation (R-10)
Bathroom Faucet Aerators	Residential Domestic Hot Water	Low-Flow Faucet Aerator with Flow Rate of 1.5 gpm	Faucet Aerator with Federal Standard Flow Rate of 2.2 gpm
CEE Advanced Tier Clothes Dryer	Clothes Dryers	CEE Advanced Tier Clothes Dryer	One Clothes Dryer meeting Federal Standard
CEE Advanced Tier Clothes Washer	Clothes Washers	Tier 3 CEE Clothes washer	One Clothes Washer meeting Federal Standard
CEE Tier 3 Refrigerator	Refrigerators	Residential Tier 3 Refrigerator	One Refrigerator meeting Federal Standard
Ceiling Insulation (R11 to R38)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1982-1985) homes	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R11 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1982-1985) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R19 to R38)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1982-2020) homes	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R19 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1982-2020) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R2 to R38)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, older (pre-1982) homes	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R2 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, older (pre-1982) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R30 to R38)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1986-2020) homes	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R30 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1986-2020) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction

Measure	End-Use	Description	Baseline
Ceiling Insulation (R38 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1986-2020) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction
Central AC - CEE Tier 2: 16.8 SEER/16 SEER2	Residential Space Cooling	Central AC - CEE Tier 2: 16.8 SEER/16 SEER2	Code-Compliant Central AC, 15 SEER (updated)
Central AC - 24 SEER/22.9 SEER2	Residential Space Cooling	Central AC - 24 SEER/22.9 SEER2	Code-Compliant Central AC, 15 SEER (updated)
Central AC - CEE Advanced Tier: 17.8 SEER/17 SEER2	Residential Space Cooling	Central AC - CEE Advanced Tier: 17.8 SEER/17 SEER2	Code-Compliant Central AC, 15 SEER (updated)
Central AC - ENERGY STAR/CEE Tier 1: 16 SEER/15.2 SEER2	Residential Space Cooling	Central AC - ENERGY STAR/CEE Tier 1: 16 SEER/15.2 SEER2	Code-Compliant Central AC, 15 SEER (updated)
Central AC Tune Up	Residential Space Cooling	System tune-up, including coil cleaning, refrigerant charging, and other diagnostics	Existing Typical Central AC without Regular Maintenance/tune-up
Dehumidifier Recycling	Plug Load	No dehumidifier	One Dehumidifier meeting Federal Standard
Drain Water Heat Recovery	Residential Domestic Hot Water	50 Gallon Electric Resistance Heater and Drain Water Heat Exchanger	50 Gallon Electric Resistance Heater, No Drain Water Heat Recovery
Duct Insulation	Residential Space Cooling, Residential Space Heating	Standard Electric Heating and Central AC with Insulated Ductwork	Standard Electric Heating and Central AC with Uninsulated Ductwork
Duct Repair	Residential Space Cooling, Residential Space Heating	Duct Repair to eliminate/minimize leaks, includes testing and sealing	Standard Electric Heating and Central AC with typical duct leakage
ECM Circulator Pump	Residential Miscellaneous	Install ECM Circulator Pump	Install Standard Circulator Pump
Energy Star Air Purifier	Plug Load	One Air Purifier meeting ENERGY STAR 2.0 Standards	One Standard Conventional Air Purifier
Energy Star Audio-Video Equipment	Plug Load	One DVD/Blu-Ray Player meeting current ENERGY STAR Standards	One Market Average DVD/Blu-Ray Player
Energy Star Bathroom Ventilating Fan	Residential Ventilation and Circulation	Bathroom Exhaust Fan meeting current ENERGY STAR Standards	Bathroom Exhaust Fan meeting Federal Standard
Energy Star Ceiling Fan	Residential Miscellaneous	60" Ceiling Fan Meeting ENERGY STAR 3.1 Standards	Standard 60" Ceiling Fan
Energy Star Clothes Dryer	Clothes Dryers	One Electric Resistance Clothes Dryer meeting ENERGY STAR 1.1 Standards	One Clothes Dryer meeting Federal Standard
Energy Star Clothes Washer	Clothes Washers	One Clothes Washer meeting ENERGY STAR 8.1 Standards	One Clothes Washer meeting Federal Standard

Measure	End-Use	Description	Baseline
Energy Star Dehumidifier	Plug Load	One Dehumidifier meeting ENERGY STAR 5.0 Standards	One Dehumidifier meeting Federal Standard
Energy Star Dishwasher	Dishwashers	One Dishwasher meeting ENERGY STAR 7.0 Requirements (effective on July 19, 2023), electric water heating	One Dishwasher meeting Federal Standard
Energy Star Dishwasher (Gas Water Heating)	Dishwashers	One Dishwasher meeting ENERGY STAR 7.0 Requirements, gas water heating	One Dishwasher meeting Federal Standard; gas water heating
Energy Star Door	Residential Space Cooling, Residential Space Heating	100ft ² of Opaque Door meeting Energy Star Version 6.0 Requirements (U-Value: 0.17)	100ft ² of Opaque Door meeting current FL Code Requirements
ENERGY STAR EV supply equipment (level 2 charger)	Residential Miscellaneous	Level 2 Electric Vehicle Supply Equipment (EVSE)	Level 1 Electric Vehicle Supply Equipment (EVSE)
Energy Star Freezer	Freezers	One Freezer meeting current ENERGY STAR 5.1 Standards	One Freezer meeting Federal Standard
Energy Star Ground Source Heat Pump	Residential Space Cooling, Residential Space Heating	Energy Star GSHP, 17.1 SEER, 12 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF
Energy Star Imaging Equipment	Plug Load	One imaging device meeting current ENERGY STAR Standards	One non-ENERGY STAR imaging device
Energy Star Monitor	Plug Load	One Monitor meeting ENERGY STAR 8.0 Standards	One Standard Monitor
Energy Star Personal Computer	Plug Load	One Personal Computer meeting ENERGY STAR 8.0 Standards	One Personal Computer meeting ENERGY STAR® 3.0 Standards
Energy Star Refrigerator	Refrigerators	One Refrigerator/Freezer meeting ENERGY STAR 5.1 Standards	One Refrigerator/Freezer meeting Federal Standard
Energy Star Room AC	Residential Space Cooling	Room AC meeting current ENERGY STAR standards	Code-Compliant Room AC
Energy Star Set-Top Receiver	Plug Load	One Set-top Box meeting ENERGY STAR 4.1 Standards	One Market Average Set-top Box
Energy Star TV	Plug Load	One Television meeting ENERGY STAR 9.0 Standards	One non-ENERGY STAR Television
Energy Star Windows	Residential Space Cooling, Residential Space Heating	100ft ² of Window meeting Energy Star Version 6.0 Requirements (U-Value: 0.27, SHGC: 0.21)	100ft ² of Window current FL energy code requirements
Exterior Wall Insulation	Residential Space Cooling, Residential Space Heating	Increased Exterior Above-Grade Wall Insulation (R-13)	Market Average Existing Exterior Above-Grade Wall Insulation

Measure	End-Use	Description	Baseline
Filter Whistle	Residential Ventilation and Circulation	Install the Furnace Filter Alarm	No Furnace Filter Alarm on a Central Forced-Air Furnace
Floor Insulation	Residential Space Heating	Increased Floor Insulation (R-30)	Code-Compliant Floor Insulation
Freezer Recycling	Freezers	No Freezer	Current Market Freezer
Green Roof	Residential Space Cooling	Vegetated Roof Surface on top of Standard Roof	Standard Black Roof
Heat Pump Clothes Dryer	Clothes Dryers	One Heat Pump Clothes Dryer	One Clothes Dryer meeting Federal Standard
Heat Pump Pool Heater	Residential Miscellaneous	Heat Pump Swimming Pool Heater	Electric Resistance Swimming Pool Heater
Heat Pump Tune Up	Residential Space Cooling, Residential Space Heating	System tune-up, including coil cleaning, refrigerant charging, and other diagnostics	Standard Heating and Cooling System without Regular Maintenance/tune-up
Heat Pump Water Heater 50 Gallons-CEE Advanced Tier	Residential Domestic Hot Water	CEE Advanced Tier Heat Pump Water Heater 50 Gallons	Code-Compliant 50 Gallon Electric Resistance Water Heater
Heat Pump Water Heater 50 Gallons-ENERGY STAR	Residential Domestic Hot Water	Heat Pump Water Heater 50 Gallons	Code-Compliant 50 Gallon Electric Resistance Water Heater
Heat Pump Water Heater 80 Gallons-ENERGY STAR	Residential Domestic Hot Water	Energy Star Heat Pump Water Heater 80 Gallons	Code-Compliant 80 Gallon Electric Resistance Water Heater
Heat Trap	Residential Domestic Hot Water	Heat Trap	Existing Water Heater without heat trap
High Efficiency Convection Oven	Residential Cooking	One Full-Size Convection Oven meeting ENERGY STAR 3.0 Standards	One Standard Economy-Grade Full-Size Oven
High Efficiency Induction Cooktop	Residential Cooking	One residential induction cooktop	One standard residential electric cooktop
Home Energy Management System	Lighting, Plug Load, Residential Space Cooling, Residential Space Heating	Typical HVAC by Building Type Controlled by Energy Management System	Typical HVAC by Building Type, Manually Controlled
Hot Water Pipe Insulation	Residential Domestic Hot Water	1' of Insulated Pipe in Unconditioned Spaces, Insulation of R-5	1' of Pipe in Unconditioned Spaces with Code Minimum of 1" of Insulation
HVAC ECM Motor	Residential Ventilation and Circulation	A brushless permanent magnet (ECM) blower motor for electric furnace	Permanent Split Capacitor Motor for Electric Furnace
HVAC Economizer	Residential Space Cooling	Install residential economizer	No economizer
HVAC Zoning System	Residential Space Cooling, Residential Space Heating	Install dampers in the ducts, dividing home into multiple	Single zone HVAC system

Measure	End-Use	Description	Baseline
		zones, each controlled by its own thermostat	
Indoor Daylight Sensor	Lighting	Install Indoor Daylight Sensors, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Induction Range	Residential Cooking	Residential induction range	Electric range
Instantaneous Hot Water System	Residential Domestic Hot Water	Instantaneous Hot Water System	Standard Efficiency Storage Tank Water Heater
Kitchen Faucet Aerators	Residential Domestic Hot Water	Low-Flow Faucet Aerator with Flow Rate of 1.5 gpm	Faucet Aerator with Federal Standard Flow Rate of 2.2 gpm
LED - 9W_CFL Baseline	Lighting	LED (assume 9W) replacing CFL baseline lamp	14W CFL (60W equivalent)
LED - 9W_Halogen Baseline	Lighting	LED (assume 9W) replacing EISA-2020 compliant baseline lamp	EISA-2020 compliant baseline lamp (60W equivalent)
LED Specialty Lamps-5W Chandelier	Lighting	5 W Chandelier LED	Standard incandescent chandelier lamp
Linear LED	Lighting	Linear LED Lamps in Linear Fluorescent Fixture	Standard (32w) T8 lamps in Linear Fluorescent Fixture
Low Flow Showerhead	Residential Domestic Hot Water	Low-Flow Handheld Showerhead, Flow Rate: 1.60 gpm	Standard Handheld Showerhead, Flow Rate: 2.50 gpm
New Construction - Whole Home Improvements - Tier 1	Whole Home	Performance-based improvements in new homes - 20% savings	Residential New Construction (Baseline Efficiency)
New Construction - Whole Home Improvements - Tier 2	Whole Home	Performance-based improvements in new homes - 35% savings	Residential New Construction (Baseline Efficiency)
Occupancy Sensors Switch Mounted	Lighting	Switch Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor Lighting Timer	Lighting	Timer on Outdoor Lighting, Controlling 120 Watts	120 Watts of Lighting, Manually Controlled
Outdoor Motion Sensor	Lighting	Motion Sensor on Outdoor Lighting, Controlling 120 Watts	120 Watts of Lighting, Manually Controlled
Ozone Laundry	Clothes Washers	Add a New, Single-Unit Ozone Laundry System to the Clothes Washer	One Clothes Washer meeting Federal Standard
Programmable Thermostat	Residential Space Cooling, Residential Space Heating	Standard Heating and Cooling System with Programmable Thermostat	Standard Heating and Cooling System with Manual Thermostat
Properly Sized CAC	Residential Space Cooling	Properly Sized Central Air Conditioning	Standard Central Air Conditioning, Oversized

Measure	End-Use	Description	Baseline
Radiant Barrier	Residential Space Cooling	Radiant Barrier	No radiant barrier
Reflective Roof	Residential Space Cooling	Reflective Roof Treatment	Standard dark shingle
Refrigerator Coil Cleaning	Refrigerators	Refrigerator Coil Cleaning	
Refrigerator Recycling	Refrigerators	No Refrigerator	Current Market Average Refrigerator
Residential Whole House Fan	Residential Space Cooling	Standard Central Air Conditioning with Whole House Fan	Standard Central Air Conditioning, No Whole House Fan
Sealed crawlspace	Residential Space Cooling, Residential Space Heating	Encapsulated and semi-conditioned crawlspace	Naturally vented, unconditioned crawlspace
Smart Breaker	Whole Home	Smart Breaker	standard electric breakers
Smart Panel	Whole Home	Multi-channel device that attaches to customer's circuit breaker to enable monitoring and control of major end-use appliances by customer	standard electric panel
Smart Power Strip	Plug Load	Smart plug strips for entertainment centers and home office	Standard entertainment center or home office usage, no smart strip controls
Smart Thermostat	Residential Space Cooling, Residential Space Heating	Standard Heating and Cooling System with Smart Thermostat	Standard Heating and Cooling System with Manual Thermostat
Solar Attic Fan	Residential Space Cooling	Standard Central Air Conditioning with Solar Attic Fan	Standard Central Air Conditioning, No Solar Attic Fan
Solar Pool Heater	Residential Miscellaneous	Solar Swimming Pool Heater	Electric Resistance Swimming Pool Heater
Solar Powered Pool Pumps	Residential Miscellaneous	Solar Powered Pool Pump	Variable Speed Pool Pump Motor
Solar Thermal Water Heating System	Residential Domestic Hot Water	Solar Thermal System with Electric Backup	Code-Compliant 50 Gallon Electric Resistance Water Heater
Spray Foam Insulation(Base R11)	Residential Space Cooling, Residential Space Heating	Open cell spray foam along roofline in existing (1982-1985) homes	Existing ceiling insulation based on building code at time of construction
Spray Foam Insulation(Base R19)	Residential Space Cooling, Residential Space Heating	Open cell spray foam along roofline in existing (1982-1985) homes	Existing ceiling insulation based on building code at time of construction
Spray Foam Insulation(Base R2)	Residential Space Cooling, Residential Space Heating	Open cell spray foam along roofline in older (pre-1982) homes	Existing ceiling insulation based on building code at time of construction

Measure	End-Use	Description	Baseline
Spray Foam Insulation(Base R30)	Residential Space Cooling, Residential Space Heating	Open cell spray foam along roofline in existing (1986-2020) homes	Existing ceiling insulation based on building code at time of construction
Thermostatic Shower Restriction Valve	Residential Domestic Hot Water	50 Gallon Electric Resistance Heater and Thermostatic Shower Valves	50 Gallon Electric Resistance Heater and Standard Shower Valves
Variable Refrigerant Flow (VRF) HVAC Systems	Residential Space Cooling, Residential Space Heating	Variable Refrigerant Flow (VRF) HVAC Systems	Code-Compliant ASHP, 15 SEER, 8.8 HSPF
Water Heater Blanket	Residential Domestic Hot Water	50 Gallon Electric Resistance Water Heater with Insulated Tank Wrap	Code-Compliant 50 Gallon Electric Resistance Water Heater, No Tank Wrap
Water Heater Thermostat Setback	Residential Domestic Hot Water	50 Gallon Electric Resistance Water Heater with Temperature Setpoint of 119°F	Code-Compliant 50 Gallon Electric Resistance Water Heater (Temp. Setpoint = 130°F)
Water Heater Timeclock	Residential Domestic Hot Water	Water Heater Timeclock	Existing Water Heater without time clock
Weather stripping	Residential Space Cooling, Residential Space Heating	Specific quantity of weather stripping to seal	
Window Caulking	Residential Space Cooling, Residential Space Heating	Window caulking	
Window Sun Protection	Residential Space Cooling	Window Film Applied to Standard Window	Standard Window with below Code Required Minimum SHGC

Table 13: Commercial EE Measures

Measure	End-Use	Description	Baseline
1.5HP Open Drip-Proof (ODP) Motor	Ventilation and Circulation	High Efficiency 1.5 HP Open-Drip Proof Motor	1.5HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency
10HP Open Drip-Proof (ODP) Motor	Ventilation and Circulation	High Efficiency 10 HP Open-Drip Proof Motor	10HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency
20HP Open Drip-Proof (ODP) Motor	Ventilation and Circulation	High Efficiency 20 HP Open-Drip Proof Motor	20HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency
Advanced Rooftop Controller	Ventilation and Circulation	Advanced Rooftop Controller	Without Advanced Rooftop Controller
Air Compressor Optimization	Miscellaneous	Performing Routine Maintenance on 20HP Inlet	20 HP Inlet Modulation Fixed-Speed Compressor

Measure	End-Use	Description	Baseline
		Modulation Fixed-Speed Compressor	
Air Curtains	Space Cooling, Space Heating	Air Curtain across door opening	Door opening with no air curtain
Airside Economizer	Space Cooling	Airside Economizer	No economizer
Anti-Sweat Controls	Refrigeration	One Medium Temperature Reach-In Case with Anti-Sweat Heater Controls	One Medium Temperature Reach-In Case without Anti-Sweat Heater Controls
Auto Off Time Switch	Interior Lighting	Auto-Off Time Switch on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Automatic Door Closer for Walk-in Coolers and Freezers	Refrigeration	One Medium Temperature Walk-In Refrigerator Door with Auto-Closer	One Medium Temperature Walk-In Refrigerator Door without Auto-Closer
Beverage Vending Machine Controls	Refrigeration	One non-ENERGY STAR beverage vending machine equipped with infrared occupancy sensing controls	One non-ENERGY STAR beverage vending machine, no controls
Bi-Level Lighting Control (Exterior)	Exterior Lighting	Bi-Level Controls on Exterior Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Bi-Level Lighting Control (Interior)	Interior Lighting	Bi-Level Controls on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Ceiling Insulation (R19 to R38)	Space Cooling, Space Heating	Blown-in insulation in ceiling cavity/attic	Market Average Existing Ceiling Insulation in older steep slope, residential style commercial building
Ceiling Insulation (R19 to R49)	Space Cooling, Space Heating	Blown-in insulation in ceiling cavity/attic - Beyond Code	Market Average Existing Ceiling Insulation in older steep slope, residential style commercial building
Ceiling Insulation (R2 to R38)	Space Cooling, Space Heating	Blown-in insulation in ceiling cavity/attic	Market Average Existing Ceiling Insulation in older steep slope, residential style commercial building
Ceiling Insulation (R2 to R49)	Space Cooling, Space Heating	Blown-in insulation in ceiling cavity/attic - Beyond Code	Market Average Existing Ceiling Insulation in older steep slope, residential style commercial building
Chilled Water Reset	Space Cooling	One Chiller with Reset of Chilled Water Temperature Setpoint	One Chiller with Fixed Chilled Water Temperature
Chiller maintenance	Space Cooling	O&M improvements to restore chiller performance	
CO Sensors for Parking Garage Exhaust	Miscellaneous	Enclosed Parking Garage Exhaust with CO Control	Constant Volume Enclosed Parking Garage Exhaust

Measure	End-Use	Description	Baseline
Commercial Duct Sealing	Space Cooling, Space Heating	Standard Electric Heating and Central AC with Improved Duct Sealing	Standard Electric Heating and Central AC, Standard Duct Sealing
Commercial Strategic Energy Management	Whole Building	Commercial Strategic Energy Management	No active energy management
Custom measure - Non-lighting	Space Cooling, Space Heating	Custom Improvement to Facility's Operations	Baseline Technology/Process
Data Center Hot Cold Aisle	Office Equipment	Equipment configuration that saves HVAC	No hot, cold aisle containment
Dedicated Outside Air System (DOAS)	Space Cooling, Space Heating	Install Dedicated Outside Air System (DOAS)	Typical HVAC by Building Type
Demand Controlled Circulating Systems	Domestic Hot Water	Recirculation Pump with Demand Control Mechanism	Uncontrolled Recirculation Pump
Demand Controlled Ventilation	Ventilation and Circulation	Return Air System with CO2 Sensors	Standard Return Air System, No Sensors
Demand Defrost	Refrigeration	Walk-In Freezer System with Demand-Controlled Electric Defrost Cycle	Walk-In Freezer System with Timer-Controlled Electric Defrost Cycle
Destratification Fans	Space Heating	Destratification Fans improve temperature distribution by circulating warmer air from the ceiling back down to the floor level	No destratification fan
Door Gasket (Cooler)	Refrigeration	New Door Gasket on One-Door Medium Temperature Reach-In Case	Worn or Damaged Door Gasket on One-Door Medium Temperature Reach-In Case
Door Gasket (Freezer)	Refrigeration	New Door Gasket on One-Door Medium Temperature Reach-In Case	Worn or Damaged Door Gasket on One-Door Medium Temperature Reach-In Case
Drain water heat recovery	Domestic Hot Water	Hot Water Loop with 50 Gallon Electric Resistance Heater and Drain Water Heat Exchanger	Standard Hot Water Loop with 50 Gallon Electric Resistance Heater, No Drain Water Heat Recovery
Dual Enthalpy Economizer	Ventilation and Circulation	Standard HVAC Unit with an economizer and dual enthalpy differential control	HVAC unit with no economizer or with a non-functional disabled economizer
Duct Insulation	Space Cooling, Space Heating	Standard Electric Heating and Central AC with Insulated Ductwork (R-8)	Standard Electric Heating and Central AC with Uninsulated Ductwork (R-4)
Ductless Mini-Split AC	Space Cooling	Ductless Mini-Split AC, 4 Ton, 16 SEER	Code-Compliant AC Unit, 4 Ton, 15 SEER
Ductless Mini-Split HP	Space Cooling, Space Heating	Ductless Mini-Split HP, 17 SEER, 9.5 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF
DX Coil Cleaning	Space Cooling	DX Coil Cleaning	DX Coil Not Cleaned

Measure	End-Use	Description	Baseline
ECM Motors on Furnaces	Space Heating	Variable Speed Electronically Commutated Motor for an Electric Furnace	Permanent Split Capacitor Motor for Electric Furnace
Efficient Battery Charger	Miscellaneous	Efficient Battery Charger	FR or SCR charging stations with power conversion efficiency < 89% or > 10 W
Efficient Exhaust Hood	Cooking	Kitchen ventilation with automatically adjusting fan controls	Kitchen ventilation with constant speed ventilation motor
Efficient Motor Belts	Miscellaneous	Synchronous belt, 98% efficiency	Standard V-belt drive
Efficient New Construction Lighting	Interior Lighting	Efficient New Construction Lighting, 15% Better than Code	New Construction with Lighting Power Density meeting Code Minimum
Energy Recovery Ventilation System (ERV)	Space Cooling	Unitary Cooling Equipment that Incorporates Energy Recovery	Current Market Packaged or Split DX Unit
Energy Star Combination Oven	Cooking	Energy Star Combination Oven meeting ENERGY STAR Version 3.0 Standards	One Standard Economy-Grade 10-Pan Combination Oven
Energy Star Commercial Clothes Washer	Miscellaneous	One Commercial Clothes Washer meeting current ENERGY STAR Version 8.1 Standards	One Commercial Clothes Washer meeting Federal Standard
Energy Star Commercial Dishwasher	Domestic Hot Water	One Commercial Dishwasher meeting ENERGY STAR Version 3.0 Standards	One Dishwasher meeting Federal Standard
Energy Star Commercial Glass Door Freezer	Refrigeration	One Glass Door Freezer meeting ENERGY STAR Version 5.0 Standards	One Glass Door Freezer meeting Federal Standards
Energy Star Commercial Glass Door Refrigerator	Refrigeration	One Glass Door Refrigerator meeting ENERGY STAR Version 5.0 Standards	One Glass Door Refrigerator meeting Federal Standards
Energy Star Commercial Solid Door Freezer	Refrigeration	One Solid Door Freezer meeting ENERGY STAR Version 5.0 Standards	One Solid Door Freezer meeting Federal Standards
Energy Star Commercial Solid Door Refrigerator	Refrigeration	One Solid Door Refrigerator meeting ENERGY STAR Version 5.0 Standards	One Solid Door Refrigerator meeting Federal Standards
Energy Star convection oven	Cooking	Energy Star convection oven meeting ENERGY STAR Version 3.0 Standards	One Standard Economy-Grade Full-Size Convection Oven
Energy Star EV Chargers	Miscellaneous	Level 2 Electric Vehicle Supply Equipment (EVSE)	Level 1 Electric Vehicle Supply Equipment (EVSE)
Energy Star Fryer	Cooking	One Standard Vat Electric Fryer meeting ENERGY STAR Version 3.0 Standards	One Standard Economy-Grade Standard Vat Electric Fryer

Measure	End-Use	Description	Baseline
Energy Star Griddle	Cooking	One Griddle meeting current ENERGY STAR Version 1.2 Standards	One Conventional Griddle
Energy Star Hot Food Holding Cabinet	Cooking	One Hot Food Holding Cabinet meeting current ENERGY STAR Version 2.0 Standards	One Standard Hot Food Holding Cabinet
Energy Star Ice Maker	Refrigeration	One Continuous Self-Contained Ice Maker meeting ENERGY STAR Version 3.0 Standards	One Continuous Self-Contained Ice Maker meeting Federal Standard
ENERGY STAR Imaging Equipment	Office Equipment	One imaging device meeting current ENERGY STAR Standards	One non-ENERGY STAR imaging device
Energy Star LED Directional Lamp	Interior Lighting	Energy Star 7.6W Directional LED lamp	50W Incandescent lamp
Energy Star Monitors	Office Equipment	One Monitor meeting ENERGY STAR 8.0 Standards	One Standard Monitor
Energy Star PCs	Office Equipment	One Personal Computer (desktop or laptop) meeting current ENERGY STAR® Standards	One non-ENERGY STAR® Personal Computer
Energy Star room AC	Space Cooling	Room AC meeting current ENERGY STAR standards	Code-Compliant Room AC, 1 Ton, 10.9 CEER
Energy Star Servers	Office Equipment	One Server meeting ENERGY STAR 2.0 Standards	One Standard Server
Energy Star Steamer	Cooking	One 4-Pan Electric Steamer meeting ENERGY STAR® 2.0 Standards	One Standard Economy-Grade 4-Pan Steamer
Energy Star Uninterruptable Power Supply	Office Equipment	Standard Desktop Plugged into Energy Star Uninterruptable Power Supply at 25% Load	Standard Desktop Plugged into Average Rotary Uninterruptable Power Supply at 25% Load
Energy Star Vending Machine	Refrigeration	One Refrigerated Vending Machine meeting ENERGY STAR Version 4.0 Standards	One Refrigerated Vending Machine meeting ENERGY STAR® 1.0 Standards
ENERGY STAR Water Cooler	Miscellaneous	One Storage Type Hot/Cold Water Cooler Unit meeting ENERGY STAR Version 3.0 Standards	One Standard Storage Type Hot/Cold Water Cooler Unit
Energy Star windows	Space Cooling, Space Heating	100ft2 of Window meeting Energy Star Version 6.0 Requirements (U-Value: 0.27, SHGC: 0.21)	100ft2 of Window meeting Energy Star Version 5.0 Requirements (U-Value: 0.3, SHGC: 0.3)
Engine Block Timer	Miscellaneous	Plug-in timer that activates engine block timer to reduce unnecessary run time	Engine block heater (typically used for backup generators) running continuously

Measure	End-Use	Description	Baseline
Escalator Motor Efficiency Controller	Miscellaneous	Install Escalator Motor Efficiency Controller	Escalator without Motor Efficiency Controller
Facility Commissioning	Space Cooling, Space Heating, Ventilation and Circulation	Perform facility commissioning to optimize building operations in new facilities	Standard new construction facility with no commissioning
Facility Energy Management System	Space Cooling, Space Heating, Ventilation and Circulation	Typical HVAC by Building Type Controlled by Energy Management System	Standard/manual facility equipment controls
Faucet Aerator	Domestic Hot Water	Low-flow lavatory faucet aerator, flow rate: 1.0 gpm	Federal lavatory flow rate standard, 1994, flow rate: 2.2 gpm
Floating Head Pressure Controls	Refrigeration	Medium-Temperature Refrigeration System with 5HP Compressor and Adjustable Condenser Head Pressure Control Valve	Medium-Temperature Refrigeration System with 5 HP Compressor without Adjustable Condenser Head Pressure Control Valve
Floor Insulation	Space Cooling, Space Heating	Increased Floor Insulation (R-19)	Market Average Existing Floor Insulation
Geothermal Heat Pump	Space Cooling, Space Heating	Geothermal Heat Pump	Code-Compliant Air Source Heat Pump
Green roof	Space Cooling, Space Heating	Vegetated Roof Surface on top of Standard Roof	Standard Black Roof
HE Air Cooled Chiller - All Compressor Types - 100 Tons	Space Cooling	HE Air Cooled Chiller - Air Compressor Types - 100 Tons	Code-Compliant Air Cooled Positive Displacement Chiller, 100 Tons
HE DX 11.25-20.0 Tons Elec Heat	Space Cooling, Space Heating	High Efficiency Packaged or Split DX Unit, 15 Tons, 11.5 SEER	Code-Compliant Packaged or Split DX Unit, 15 Tons, 11 SEER
HE DX 11.25-20.0 Tons Other Heat	Space Cooling	High Efficiency Packaged or Split DX Unit, 15 Tons, 11.5 SEER	Code-Compliant Packaged or Split DX Unit, 15 Tons, 11 SEER
HE DX 5.4-11.25 Tons Elect Heat	Space Cooling, Space Heating	High Efficiency Packaged or Split DX Unit, 7.5 Tons, 12 SEER	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11 SEER
HE DX 5.4-11.25 Tons Other Heat	Space Cooling	High Efficiency Packaged or Split DX Unit, 7.5 Tons, 12 SEER	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11 SEER
HE DX Less than 5.4 Tons Elect Heat	Space Cooling, Space Heating	High Efficiency Packaged or Split DX Unit, 5 Tons, 14.5 SEER	Code-Compliant Packaged or Split DX Unit, 5 Tons, 13 SEER
HE DX Less than 5.4 Tons Other Heat	Space Cooling	High Efficiency Packaged or Split DX Unit, 5 Tons, 14.5 SEER	Code-Compliant Packaged or Split DX Unit, 5 Tons, 13 SEER

Measure	End-Use	Description	Baseline
HE Water Cooled Chiller - Centrifugal Compressor - 200 Tons	Space Cooling	Water Cooled Centrifugal Chiller with Integral VFD, 200 Tons	Code-Compliant Water Cooled Centrifugal Chiller, 200 Tons
HE Water Cooled Chiller - Centrifugal Compressor - 500 Tons	Space Cooling	Water Cooled Centrifugal Chiller with Integral VFD, 500 Tons	Code-Compliant Water Cooled Centrifugal Chiller, 500 Tons
HE Water Cooled Chiller - Rotary or Screw Compressor - 175 Tons	Space Cooling	Water Cooled Positive Displacement Chiller with Integral VFD, 175 Tons	Code-Compliant Water Cooled Positive Displacement Chiller, 175 Tons
HE Water Cooled Chiller - Rotary or Screw Compressor - 50 Tons	Space Cooling	Water Cooled Positive Displacement Chiller with Integral VFD, 50 Tons	Code-Compliant Water Cooled Positive Displacement Chiller, 50 Tons
Heat Pump Pool Heater Commercial	Miscellaneous	High Efficiency Pool Heater Eff. $\geq 84\%$	Standard Efficiency Pool Heater 78% Eff.
Heat Pump Water Heater	Domestic Hot Water	Efficient 50 Gallon Electric Heat Pump Water Heater	Code-Compliant 50 Gallon Electric Heat Pump Water Heater
High Efficiency Air Compressor	Miscellaneous	20 HP VFD Air Compressor	20 HP Inlet Modulation Fixed-Speed Compressor
High Efficiency Data Center Cooling	Space Cooling	High Efficiency CRAC (computer room air conditioner)	Standard Efficiency CRAC
High Efficiency PTAC	Space Cooling	High Efficiency PTAC	Code-Compliant PTAC
High Efficiency PTHP	Space Cooling, Space Heating	High Efficiency PTHP	Code-Compliant PTHP
High Efficiency Refrigeration Compressor_Discus	Refrigeration	High Efficiency Refrigeration Compressors	Standard Compressor
High Efficiency Refrigeration Compressor_Scroll	Refrigeration	High Efficiency Refrigeration Compressors	Standard Compressor
High Speed Fans	Ventilation and Circulation	High Speed Fan, 24" - 35" Blade Diameter	Standard Speed Fan, 24" - 35" Blade Diameter
Hot water pipe insulation	Domestic Hot Water	1' of Insulated Pipe in Unconditioned Spaces, Insulation of R-4	1' of Pipe in Unconditioned Spaces with Code Minimum of 1" of Insulation
Hotel Card Energy Control Systems	Space Cooling, Space Heating	Guest Room HVAC Unit Controlled by Hotel-Key-Card Activated Energy Control System	Guest Room HVAC Unit, Manually Controlled by Guest
Indoor daylight sensor	Interior Lighting	Install Indoor Daylight Sensors, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Induction Cooktops	Cooking	Efficient Induction Cooktop	One Standard Electric Cooktop

Measure	End-Use	Description	Baseline
Infiltration Reduction - Air Sealing	Space Cooling, Space Heating	Reduced leakage through caulking, weather-stripping	Standard Heating and Cooling System with Moderate Infiltration
Instantaneous Hot Water System Commercial	Domestic Hot Water	Instantaneous Hot Water System	Code-Compliant Electric Storage Water Heater
LED - 14W_CFL Baseline	Interior Lighting	LED (assume 14W) replacing CFL	100W equivalent CFL
LED - 9W Flood_CFL Baseline	Exterior Lighting	LED (assume 9W) replacing CFL	14W CFL
LED Canopy Lighting (Exterior)	Exterior Lighting	One 67.2W LED Canopy Light	Average Lumen Equivalent Exterior Incandescent Area Lighting
LED Display Lighting (Exterior)	Exterior Lighting	One Letter of LED Signage, < 2ft in Height	One Letter of Neon or Argon-mercury Signage, < 2ft in Height
LED Display Lighting (Interior)	Interior Lighting	One Letter of LED Signage, < 2ft in Height	One Letter of Neon or Argon-mercury Signage, < 2ft in Height
LED Exit Sign	Interior Lighting	One 5W Single-Sided LED Exit Sign	One 9W Single-Sided CFL Exit Sign
LED Exterior Wall Packs	Exterior Lighting	One 35W LED Wall Pack	Average Lumen Equivalent Exterior Incandescent Area Lighting
LED High Bay_HID Baseline	Interior Lighting	One 140W High Bay LED Fixture	Lumen-Equivalent HID High Bay Fixture
LED High Bay_LF Baseline	Interior Lighting	One 140W High Bay LED Fixture	Lumen-Equivalent Linear Fluorescent High Bay Fixture
LED Linear - Fixture Replacement	Interior Lighting	2x4 LED Troffer	Lumen-Equivalent 32-Watt T8 Lamp
LED Linear - Lamp Replacement	Interior Lighting	Linear LED (16W)	Lumen-Equivalent 32-Watt T8 Lamp
LED Parking Lighting	Exterior Lighting	One 160W LED Area Light	Average Lumen Equivalent Exterior HID Area Lighting
LEED New Construction Whole Building	Space Cooling, Space Heating	LEED New Construction Whole Building	Comparable facility, code-compliance construction
Light Tube	Interior Lighting	One 14" Light Tube, Delivering light to 250 S.F. of Commercial Space	250 S.F. of Commercial Space Lit by Typical Lighting Strategies
Low Flow Shower Head	Domestic Hot Water	Low-Flow Handheld Showerhead, Flow Rate: 1.50 gpm	Standard Handheld Showerhead, Flow Rate: 2.50 gpm
Low-Flow Pre-Rinse Sprayers	Domestic Hot Water	Low-Flow Pre-Rinse Sprayer with Flow Rate of 1.6 gpm	Pre-Rinse Sprayer with Federal Standard Flow Rate of 2.25 gpm
Network PC Power Management	Office Equipment	One computer and monitor attached to centralized energy management system that controls when desktop	One computer and monitor, manually controlled

Measure	End-Use	Description	Baseline
		computers and monitors plugged into a n	
Networked Lighting Controls	Interior Lighting	Install Networked Lighting Controls System on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Controlled either Manually or by Sensor as Specified by Code
Night Covers for Display Cases	Refrigeration	One Open Vertical Case with Night Covers	One Existing Open Vertical Case, No Night Covers
Occupancy Sensors, Ceiling Mounted	Interior Lighting	Ceiling Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Occupancy Sensors, Switch Mounted	Interior Lighting	Switch Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor Lighting Controls	Exterior Lighting	Install Exterior Photocell Dimming Controls, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor motion sensor	Exterior Lighting	Install Exterior Motion Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Ozone Laundry Commercial	Miscellaneous	Add a new ozone laundry system onto a commercial clothes washer	One commercial clothes washer without ozone laundry system
Programmable thermostat	Space Cooling, Space Heating	Pre-set programmable thermostat that replaces manual thermostat	Standard Heating and Cooling System with Manual Thermostat
PSC to ECM Evaporator Fan Motor (Reach-In)	Refrigeration	Medium Temperature Reach-In Case with equivalent size Electronically Commutated Evaporator Fan Motor	Medium Temperature Reach-In Case with Permanent Split Capacitor Evaporator Fan Motor
PSC to ECM Evaporator Fan Motor (Walk-In, Refrigerator)	Refrigeration	Medium Temperature Walk-In Case with Electronically Commutated Evaporator Fan Motor	Medium Temperature Walk-In Case with Permanent Split Capacitor Evaporator Fan Motor
Q-Sync Evaporator Fan Motor	Refrigeration	Medium Temperature Reach-In Case with equivalent size Q-Sync Evaporator Fan Motor	Medium Temperature Reach-In Case with 20W Permanent Split Capacitor Fan Motor
Reflective Roof Treatment	Space Cooling	Reflective Roof Treatment	Standard Black Roof
Refrigerated Display Case LED Lighting	Refrigeration	60" Refrigerated Case LED Strip	Lumen-Equivalent 32-Watt T8 Fixture
Refrigerated Display Case Lighting Controls	Refrigeration	Occupancy Sensors for Refrigerated Case Lighting to reduce run time	Market-Share Weighted Existing Linear Fluorescent Fixture
Refrigeration Commissioning	Refrigeration	Commissioned Refrigeration System	Non-Commissioned Refrigeration System
Refrigeration Economizer	Refrigeration	Walk-in refrigerator with economizer	Walk-in refrigerator without economizer

Measure	End-Use	Description	Baseline
Regenerative Drive Elevator Motor	Miscellaneous	Regenerative drive produced energy when motor in overhaul condition	Standard motor
Retro-Commissioning (Existing Construction)	Space Cooling, Space Heating, Ventilation and Circulation	Perform facility retro-commissioning, including assessment, process improvements, and optimization of energy-consuming equipment and systems	
Roof Insulation	Space Cooling, Space Heating	Roof Insulation (built-up roof applicable to flat/low slope roofs)	Code-Compliant Flat Roof
Server Virtualization	Office Equipment	2 Virtual Host Server	20 Single Application Servers
Smart Strip Plug Outlet	Office Equipment	One Smart Strip Plug Outlet	One Standard plug strip/outlet
Smart thermostat	Space Cooling, Space Heating	Thermostats that include "smart" features such as occupancy sensors, geofencing, multi-zone sensors	Standard Heating and Cooling System with Manual Thermostat
Solar Pool Heater Commercial	Miscellaneous	Solar Swimming Pool Heater	Electric Resistance Swimming Pool Heater
Solar Powered Pool Pump	Miscellaneous	Solar Powered Pool Pump Motor	Variable Speed Pool Pump Motor
Solar Thermal Water Heating System Commercial	Domestic Hot Water	Solar Thermal System with Electric Backup	Code-Compliant 50 Gallon Electric Resistance Water Heater
Strip Curtains - Freezers	Refrigeration	Walk-in freezer with strip curtains at least 0.06 inches thick covering the entire area of the doorway	Walk-in freezer without strip curtains
Strip Curtains - Refrigerators	Refrigeration	Walk-in cooler with strip curtains at least 0.06 inches thick covering the entire area of the doorway	Walk-in cooler without strip curtains
Suction Pipe Insulation - Freezers	Refrigeration	Suction Pipe Insulation - Freezers	Uninsulated freezer suction lines
Suction Pipe Insulation - Refrigerators	Refrigeration	Suction Pipe Insulation - Refrigerators	Uninsulated refrigeration suction lines
Thermal Energy Storage	Space Cooling	Deploy thermal energy storage technology (ice harvester, etc.) to shift load	Code compliant chiller
Thermostatic Shower Restriction Valve Commercial	Domestic Hot Water	Hot Water Loop with 50 Gallon Electric Resistance Heater and	Standard Hot Water Loop with 50 Gallon Electric Resistance Heater and Standard Shower Valves

Measure	End-Use	Description	Baseline
		Pressure Balance Shower Valves	
Time Clock Control	Interior Lighting	Time Clock Controlled Lighting, 500 Watts Controlled	500 Watts of Lighting, Controlled either Manually or by Sensor as Specified by Code
Variable Refrigerant Flow (VRF) HVAC Systems	Space Cooling, Space Heating	Variable Refrigerant Flow (VRF) HVAC Systems	Code-Compliant PTHP
VAV System	Ventilation and Circulation	Variable Air Volume Distribution System	Constant Air Volume Distribution System
VFD on Cooling Tower Fans	Space Cooling	Cooling Tower Fans with VFD Control	Cooling Tower Fans without VFD Control
VFD on HVAC Pump	Space Cooling, Space Heating	VFD on HVAC Pump	7.5 HP HVAC Pump Motor, no VFD Control
VSD Controlled Compressor	Refrigeration	Refrigeration System with VSD Control	Refrigeration System with Standard Slide-Valve Control System
Wall Insulation	Space Cooling, Space Heating	Increased Exterior Above-Grade Wall Insulation	Market Average Existing Exterior Above-Grade Wall Insulation
Warehouse Loading Dock Seals	Space Cooling, Space Heating	Seals to reduce infiltration losses at loading dock	Loading dock with no seals
Water Cooled Refrigeration Heat Recovery	Domestic Hot Water	The heat reclaim system transfers waste heat from refrigeration system to space heating or hot water	No heat recovery
Water Heater Setback	Domestic Hot Water	A 50 gallon electric hot water tank with a thermostat setting reduced to no lower than 120 degrees.	A 50 gallon electric hot water tank with a thermostat setting that is higher than 120 degrees, typically hot water tanks with settings of 130 degrees or higher.
Water source heat pump	Space Cooling, Space Heating	Water Source Heat Pump, 2.5 Tons, 17.4 EER, 4.4 COP	Code-Compliant ASHP
Waterside Economizer	Space Cooling	Waterside Economizer	No economizer
Window shade film	Space Cooling	Window Film with SHGC of 0.35 Applied to Standard Window	Standard Window with below Code Required Minimum SHGC
Zero Energy Doors	Refrigeration	Install zero energy doors for a reach-in refrigerated cooler or freezer	Standard vertical reach-in refrigerated cooler or freezer with anti-sweat heaters on the glass surface of the doors

Table 14: Industrial EE Measures

Measure	End-Use	Description	Baseline
1.5HP Open Drip-Proof (ODP) Motor	Motors Pumps	High Efficiency 1.5 HP Open-Drip Proof Motor	1.5HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency
10HP Open Drip-Proof (ODP) Motor	Motors Pumps	High Efficiency 10 HP Open-Drip Proof Motor	10HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency
20HP Open Drip-Proof (ODP) Motor	Motors Pumps	High Efficiency 20 HP Open-Drip Proof Motor	20HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency
3-phase High Frequency Battery Charger - 1 shift	Other	3-phase High Frequency Battery Charger	Standard Charger
Advanced Rooftop Controller	HVAC	Advanced Rooftop Controller	Without Advanced Rooftop Controller
Air Compressor Optimization	Compressed Air	Performing Routine Maintenance on 20HP Inlet Modulation Fixed-Speed Compressor	20 HP Inlet Modulation Fixed-Speed Compressor
Air curtains	HVAC	Air Curtain across door opening	Door opening with no air curtain
Airside economizer	HVAC	Airside Economizer	No economizer
Auto Closer on Refrigerator Door	Process Cooling	One Medium Temperature Walk-In Refrigerator Door with Auto-Closer	One Medium Temperature Walk-In Refrigerator Door without Auto-Closer
Auto Off Time Switch	Interior Lighting High Bay	Auto-Off Time Switch on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Bi-Level Lighting Control (Exterior)	Exterior Lighting Industrial	Install Exterior Bi-Level Lighting Control, 500 Watts Controlled	500 Watts of Lighting, No Dim Setting
Bi-Level Lighting Control (Interior)	Interior Lighting High Bay	Bi-Level Controls on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, No Dim Setting
Chilled Water Reset	HVAC	One Chiller with Reset of Chilled Water Temperature Setpoint	One Chiller with Fixed Chilled Water Temperature
Cogged Belt on 15hp ODP Motor	Motors Pumps	15HP ODP Motor with Cogged Belts Installed on Supply and/or Return Air Fans	15HP ODP Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Cogged Belt on 40hp ODP Motor	Motors Pumps	40HP ODP Motor with Cogged Belts Installed on Supply and/or Return Air Fans	40HP ODP Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans

Measure	End-Use	Description	Baseline
Compressed Air Desiccant Dryer	Process Specific	heated regenerative desiccant dryer without dew point demand controls	heatless regenerative desiccant dryer without dew point demand controls
Compressed Air No-Loss Condensate Drains	Process Specific	Install no-loss condensate drains	Install standard condensate drains
Compressed Air Storage Tank	Compressed Air	20 HP Inlet Modulation Fixed-Speed Compressor with Receiver Tank	20 HP Inlet Modulation Fixed-Speed Compressor, No Receiver Tank
Custom Measure - Non-Lighting	HVAC	Custom Improvement to Facility's Operations	Baseline Technology/Process
Dairy Refrigeration Heat Recovery	Other	refrigeration equipment with refrigeration heat recovery tank installed	existing dairy farm with refrigeration equipment and a water heater unit without an RHR unit
Dedicated Outside Air System (DOAS)	HVAC	Install Dedicated Outside Air System (DOAS)	Typical HVAC by Building Type
Demand Controlled Ventilation	HVAC	Return Air System with CO2 Sensors	Standard Return Air System, No Sensors
Demand Defrost	Process Cooling	Walk-In Freezer System with Demand-Controlled Electric Defrost Cycle	Walk-In Freezer System with Timer-Controlled Electric Defrost Cycle
Dew Point Sensor Control for Dessicant CA Dryer	Compressed Air	1000 CFM Heated Desiccant Air Dryer with Dew Point Controls	1000 CFM Modulating Heated Desiccant Air Dryer
Drip Irrigation Nozzles	Other	Flow Control Nozzles	Standard Irrigation Nozzles
Dual Enthalpy Economizer	Process Cooling	Standard HVAC Unit with an economizer and dual enthalpy differential control	HVAC unit with no economizer or with a non-functional disabled economizer
DX Coil Cleaning	HVAC	DX Coil Cleaning	DX Coil Not Cleaned
Efficient Compressed Air Nozzles	Compressed Air	1/4" Engineered Air Nozzle	1/4" Open-End Air Nozzle
Efficient New Construction Lighting	Interior Lighting High Bay	Efficient New Construction Lighting, 15% Better than Code	New Construction with Lighting Power Density meeting Code Minimum
Electric Actuators	Other	Electric Actuator	Pneumatic Actuator
Energy Efficient Laboratory Fume Hood	HVAC	Variable Air Volume High Performance Fume Hood	Constant Volume Conventional Bypass Fume Hood
Energy Efficient Transformers	Other	Energy Efficient Dry Type Transformer (CSL-3)	Standard Transformer (TP-1)

Measure	End-Use	Description	Baseline
Energy Recovery Ventilation System	HVAC	Unitary Cooling Equipment that Incorporates Energy Recovery	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11.2 EER
Energy Star LED Directional Lamp	Interior Lighting Other	Energy Star 7.6W Directional LED lamp	50W Incandescent lamp
Energy Star room ac	HVAC	Room AC meeting current ENERGY STAR standards	Code-Compliant Room AC
Energy Star windows	HVAC	100ft2 of Window meeting Energy Star Version 6.0 Requirements (U-Value: 0.27, SHGC: 0.21)	100ft2 of Window meeting Energy Star Version 5.0 Requirements (U-Value: 0.3, SHGC: 0.3)
Engine Block Timer	Other	An engine block heater operated by an outdoor plug-in timer	An engine block heater that is manually plugged in
Facility Commissioning	HVAC	Perform facility commissioning	Comparable facility, no commissioning
Facility Energy Management System	HVAC	Typical HVAC by Building Type Controlled by Energy Management System	Typical HVAC by Building Type, Manually Controlled
Fan Thermostat Controller	HVAC	Typical HVAC by Building Type with Fan Thermostat Controller Installed	Typical HVAC by Building Type with Programmable Thermostat
Floating Head Pressure Controller	Process Cooling	Medium-Temperature Refrigeration System with 5HP Compressor and Adjustable Condenser Head Pressure Control Valve	Medium-Temperature Refrigeration System with 5 HP Compressor without Adjustable Condenser Head Pressure Control Valve
Grain Bin Aeration Control System	Process Specific	Grain Storage Fan System with Automatic Controls	Grain Storage Fan System with Manual Controls
HE Air Cooled Chiller - All Compressor Types - 100 Tons	HVAC	HE Air Cooled Chiller - All Compressor Types - 100 Tons	Code-Compliant Air Cooled Positive Displacement Chiller, 100 Tons
HE Air Cooled Chiller - All Compressor Types - 300 Tons	HVAC	Air Cooled Positive Displacement Chiller with Integral VFD, 300 Tons, 13.7 EER	Code-Compliant Air Cooled Positive Displacement Chiller, 300 Tons, 12.5 EER
HE DX 11.25-20.0 Tons Elec Heat	HVAC	High Efficiency Packaged or Split DX Unit, 15 Tons, 11.5 SEER	Code-Compliant Packaged or Split DX Unit, 15 Tons, 11 SEER
HE DX 11.25-20.0 Tons Other Heat	HVAC	High Efficiency Packaged or Split DX Unit, 15 Tons, 11.5 SEER	Code-Compliant Packaged or Split DX Unit, 15 Tons, 11 SEER
HE DX 5.4-11.25 Tons Elect Heat	HVAC	High Efficiency Packaged or Split DX Unit, 7.5 Tons, 12 SEER	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11 SEER

Measure	End-Use	Description	Baseline
HE DX 5.4-11.25 Tons Other Heat	HVAC	High Efficiency Packaged or Split DX Unit, 7.5 Tons, 12 SEER	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11 SEER
HE DX Less than 5.4 Tons Elect Heat	HVAC	High Efficiency Packaged or Split DX Unit, 5 Tons, 14.5 SEER	Code-Compliant Packaged or Split DX Unit, 5 Tons, 13 SEER
HE DX Less than 5.4 Tons Other Heat	HVAC	High Efficiency Packaged or Split DX Unit, 5 Tons, 14.5 SEER	Code-Compliant Packaged or Split DX Unit, 5 Tons, 13 SEER
HE Water Cooled Chiller - Centrifugal Compressor - 200 Tons	HVAC	Water Cooled Centrifugal Chiller with Integral VFD, 200 Tons	Code-Compliant Water Cooled Centrifugal Chiller, 200 Tons
HE Water Cooled Chiller - Centrifugal Compressor - 500 Tons	HVAC	Water Cooled Centrifugal Chiller with Integral VFD, 500 Tons	Code-Compliant Water Cooled Centrifugal Chiller, 500 Tons
HE Water Cooled Chiller - Rotary or Screw Compressor - 175 Tons	HVAC	Water Cooled Positive Displacement Chiller with Integral VFD, 175 Tons	Code-Compliant Water Cooled Positive Displacement Chiller, 175 Tons
HE Water Cooled Chiller - Rotary or Screw Compressor - 50 Tons	HVAC	Water Cooled Positive Displacement Chiller with Integral VFD, 50 Tons	Code-Compliant Water Cooled Positive Displacement Chiller, 50 Tons
High Bay Occupancy Sensors, Ceiling Mounted	Interior Lighting High Bay	Ceiling Mounted Occupancy Sensor, 800 Watts Controlled	800 Watts of Lighting, Manually Controlled
High Efficiency Air Compressor	Compressed Air	20 HP VFD Air Compressor	20 HP Inlet Modulation Fixed-Speed Compressor
High Efficiency Refrigeration Compressor - Discus	Process Cooling	High Efficiency Refrigeration Compressors	Standard Compressor
High Efficiency Refrigeration Compressor - Scroll	Process Cooling	High Efficiency Refrigeration Compressors	Standard Compressor
High Efficiency Welder	Process Specific	High Efficiency Welder	Standard Welding Practices
High Speed Fans	HVAC	High Speed Fan, 24" - 35" Blade Diameter	Standard Speed Fan, 24" - 35" Blade Diameter
High Volume Low Speed Fan (HVLS)	Motors Fans Blowers	20' High Volume Low Speed Fan	Conventional Circulating Fan

Measure	End-Use	Description	Baseline
Indoor Agriculture - LED Grow Lights	Interior Lighting High Bay	LED grow light	1000W High Pressure Sodium
Indoor daylight sensor	Interior Lighting High Bay	Install Indoor Daylight Sensors, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Industrial Duct Sealing	HVAC	Standard Electric Heating and Central AC with Improved Duct Sealing	Standard Electric Heating and Central AC, Standard Duct Sealing
Injection Mold and Extruder Barrel Wraps	Other	2' Diameter, 20' Long Machine Barrel with 1" Insulation	2' Diameter, 20' Long Machine Barrel with no Insulation
Insulated Pellet Dryer Tanks and Ducts	Process Heating	Insulation for Pellet Tank and Duct	Uninsulated Pellet Tank and Duct
LED - 14W_CFL Baseline	Interior Lighting Other	LED (assume 14W) replacing CFL	100W equivalent CFL
LED Canopy Lighting (Exterior)	Exterior Lighting Industrial	One 67.2W LED Canopy Light	Average Lumen Equivalent Exterior Incandescent Area Lighting
LED Display Lighting (Exterior)	Exterior Lighting Industrial	One Letter of LED Signage, < 2ft in Height	One Letter of Neon or Argon-mercury Signage, < 2ft in Height
LED Display Lighting (Interior)	Interior Lighting Other	One Letter of LED Signage, < 2ft in Height	One Letter of Neon or Argon-mercury Signage, < 2ft in Height
LED exit sign	Interior Lighting Other	One 5W Single-Sided LED Exit Sign	One 9W Single-Sided CFL Exit Sign
LED Exterior Wall Packs	Exterior Lighting Industrial	One 35W LED Wall Pack	Average Lumen Equivalent Exterior Incandescent Area Lighting
LED High Bay_HID Baseline	Interior Lighting High Bay	One 140W High Bay LED Fixture	Lumen-Equivalent HID High Bay Fixture
LED High Bay_LF Baseline	Interior Lighting High Bay	One 140W High Bay LED Fixture	Lumen-Equivalent Linear Fluorescent High Bay Fixture
LED Linear - Fixture Replacement	Interior Lighting Linear Fluorescent	2x4 LED Troffer Fixture	Lumen-Equivalent 32-Watt T8 Fixture
LED Linear - Lamp Replacement	Interior Lighting Linear Fluorescent	Linear LED	Lumen-Equivalent 32-Watt T8 Lamp
LED Parking Lighting	Exterior Lighting Industrial	One 160W LED Area Light	Average Lumen Equivalent Exterior HID Area Lighting

Measure	End-Use	Description	Baseline
LEED New Construction Whole Building	HVAC	LEED Qualifying New Construction	Comparable facility, code-compliance construction
Light Tube	Interior Lighting Other	One 14" Light Tube, Delivering light to 250 S.F. of Industrial Space	250 S.F. of Industrial Space Lit by Typical Lighting Strategies
Low Energy Livestock Waterer	Motors Pumps	Install Thermostatically Controlled Livestock Watering System	Standard Livestock Watering System
Low Pressure Sprinkler Nozzles	Motors Pumps	Low Pressure Irrigation Nozzles operate at 35 psi or lower	Standard high pressure irrigation nozzles that operate at 50 psi or greater
Low Pressure-drop Filters	Compressed Air	20 HP Inlet Modulation Fixed-Speed Compressor with Low Pressure Drop Filter	20 HP Inlet Modulation Fixed-Speed Compressor, No Particulate Removal
Milk Pre-Cooler	Other	Installed pre-cooler heat exchanger	no pre-cooler heat exchanger installed
Networked Lighting Controls	Interior Lighting Linear Fluorescent	Install Networked Lighting Controls System on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Controlled either Manually or by Sensor as Specified by Code
Occupancy Sensors, Ceiling Mounted	Interior Lighting High Bay	Ceiling Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Occupancy sensors, switch mounted	Interior Lighting Linear Fluorescent	Switch Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor Lighting Controls	Exterior Lighting Industrial	Install Exterior Photocell Dimming Controls, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor motion sensor	Exterior Lighting Industrial	Install Exterior Motion Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Packaged Terminal AC	HVAC	High Efficiency Packaged Terminal AC	Code-Compliant PTAC, 10.9 EER
Process Cooling Ventilation Reduction	Process Cooling	Standard Process Cooling with Reduced Ventilation	Standard Process Cooling
Programmable thermostat	HVAC	Standard Heating and Cooling System with Programmable Thermostat	Standard Heating and Cooling System with Manual Thermostat
Reflective Roof Treatment	HVAC	Reflective Roof Treatment	Standard Black Roof
Refrigeration Commissioning	Process Cooling	Commissioned Refrigeration System	Non-Commissioned Refrigeration System
Retro-Commissioning	HVAC	Perform Facility Retro-commissioning	

Measure	End-Use	Description	Baseline
(Existing Construction)			
Roof insulation	HVAC	Roof Insulation (built-up roof applicable to flat/low slope roofs)	Code-Compliant Flat Roof
Smart thermostat	HVAC	Standard Heating and Cooling System with Smart Thermostat	Standard Heating and Cooling System with Manual Thermostat
Strategic Energy Management	HVAC	SEM goal setting and tracking	No active energy management
Synchronous Belt on 15hp ODP Motor	Motors Pumps	15 HP Open-Drip Proof Motor with Synchronous Belts Installed on Supply and/or Return Air Fans	15 HP Open-Drip Proof Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Synchronous Belt on 5hp ODP Motor	Motors Pumps	5 HP Open-Drip Proof Motor with Synchronous Belts Installed on Supply and/or Return Air Fans	5 HP Open-Drip Proof Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Synchronous Belt on 75hp ODP Motor	Motors Pumps	75 HP Open-Drip Proof Motor with Synchronous Belts Installed on Supply and/or Return Air Fans	75 HP Open-Drip Proof Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Thermal energy storage	HVAC	Deploy thermal energy storage technology (ice harvester, etc.) to shift load	Code compliant chiller
Time Clock Control	Interior Lighting High Bay	Time Clock Controlled Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
VAV System	HVAC	Variable Air Volume Distribution System	Constant Air Volume Distribution System
VFD on Air Compressor	Compressed Air	20 HP VFD Air Compressor	20 HP Inlet Modulation Fixed-Speed Compressor
VFD on Cooling Tower Fans	Process Cooling	Cooling Tower Fans with VFD Control	Cooling Tower Fans without VFD Control
VFD on HVAC Fan	Motors Fans Blowers	5 HP HVAC Fan Motor, with VFD Control	5 HP HVAC Fan Motor, no VFD Control
VFD on HVAC Pump	Motors Pumps	VFD on HVAC Pump	7.5 HP HVAC Pump Motor, no VFD Control
VFD on process pump	Motors Pumps	20 HP Process Pump Equipped with VFD Control	20 HP Process Pump, Constant Speed
VSD Controlled Compressor	Process Cooling	Refrigeration System with VSD Control	Refrigeration System with Standard Slide-Valve Control System
Water source heat pump	HVAC	Water Source Heat Pump, 2.5 Tons, 17.4 EER, 4.4 COP	Code-Compliant ASHP
Waterside economizer	HVAC	Waterside Economizer	No economizer

Measure	End-Use	Description	Baseline
Window shade film	HVAC	Window Film with SHGC of 0.35 Applied to Standard Window	Standard Window with below Code Required Minimum SHGC

The following EE measures from the 2019 Technical Potential Study were eliminated from the current study⁸:

Table 15: 2019 EE Measures Eliminated from Current Study

Sector	Measure	End-Use	Reason for Removal
Residential	CFL - 15W Flood	Lighting	Better technology (LED) available
Residential	CFL - 15W Flood (Exterior)	Lighting	Better technology (LED) available
Residential	CFL - 13W	Lighting	Better technology (LED) available
Residential	CFL - 23W	Lighting	Better technology (LED) available
Residential	Low Wattage T8 Fixture	Lighting	Better technology (LED) available
Residential	15 SEER Central AC	Space Cooling	Updated Federal Standard
Residential	15 SEER Air Source Heat Pump	Space Cooling, Space Heating	Updated Federal Standard
Residential	14 SEER ASHP from base electric resistance heating	Space Cooling, Space Heating	Updated Federal Standard
Residential	Two Speed Pool Pump	Miscellaneous	Updated Florida Energy Code
Residential	Variable Speed Pool Pump	Miscellaneous	Updated Florida Energy Code
Residential	Storm Door	Space Cooling, Space Heating	Minimal/uncertain energy savings
Commercial	CFL - 15W Flood	Exterior Lighting	Better technology (LED) available
Commercial	High Efficiency HID Lighting	Exterior Lighting	Better technology (LED) available
Commercial	LED Street Lights	Exterior Lighting	Market standard
Commercial	LED Traffic and Crosswalk Lighting	Exterior Lighting	Market standard

⁸ Additional measures from the 2019 study were updated to reflect current vintage/technology for the current study.

Sector	Measure	End-Use	Reason for Removal
Commercial	CFL-23W	Interior Lighting	Better technology (LED) available
Commercial	High Bay Fluorescent (T5)	Interior Lighting	Better technology (LED) available
Commercial	Premium T8 - Fixture Replacement	Interior Lighting	Better technology (LED) available
Commercial	Premium T8 - Lamp Replacement	Interior Lighting	Better technology (LED) available
Commercial	Two Speed Pool Pump	Miscellaneous	Updated Florida Energy Code
Commercial	Variable Speed Pool Pump	Miscellaneous	Updated Florida Energy Code
Commercial	Tank Wrap on Water Heater	Domestic Hot Water	Limited applicability
Commercial	Ceiling Insulation (R12 to R38)	Space Cooling, Space Heating	Consolidated measure baseline assumptions
Commercial	Ceiling Insulation (R30 to R38)	Miscellaneous	Consolidated measure baseline assumptions

Appendix B DR Measure List

Table 16: Residential DR Measures

Measure	Type	Season	Description
Central air conditioner - Load Shed	Direct load control	Summer	Direct load control program where utility provides day ahead notification that it will send remote signal to shed AC unit load during peak usage period.
Central Heating - Load Shed	Direct load control	Winter	Direct load control program where utility provides day ahead notification that it will send remote signal to shed AC unit load during peak usage period.
Central air conditioner - 50% cycling	Direct load control	Summer	Direct load control program where utility provides day ahead notification that it will send remote signal to cycle AC unit during peak usage period
Central Heating - 50% cycling	Direct load control	Winter	Direct load control program where utility provides day ahead notification that it will send remote signal to cycle AC unit during peak usage period
Smart thermostats - Utility Installation	Direct load control	Summer and Winter	Similar to AC load control program, but allows customers to participate using a compatible smart thermostat rather than an AC switch
Smart thermostats - BYOT	Direct load control	Summer and Winter	Similar to AC load control program, but allows customers to participate using a compatible smart thermostat rather than an AC switch
CPP + Tech	Pricing	Summer and Winter	Electricity rate that varies based on time of day. Can be same rate schedule for every day during a given season (time of use, or TOU) and with critical peak pricing (CPP) days when peak period rates are substantially higher for a limited number of days per year (customers receive advance notification of CPP event). Customers also receive technology that they can pre-program to curtail load when an event is called.
Water heater control	Direct load control	Summer and Winter	Load control installed on a water heater (integrated or external switch)
Pool pump switches	Direct load control	Summer and Winter	Load control program with switch installed on pool pump
Room AC	Direct load control	Summer	Load control program that is focused on room AC units rather than central AC
Managed EV Charging - switch	Direct load control	Summer and Winter	Load control switch that is installed on an EV charger
Managed EV Charging - telematics	Direct load control	Summer and Winter	Direct load control program leveraging EV smart charging software
Battery Storage with PV	Pricing/Direct load control	Summer and Winter	PV charges battery and battery discharges to grid

Table 17: Small C&I DR Measures

Measure	Type	Season	Description
Central air conditioner - Load Shed	Direct load control	Summer	Direct load control program where utility provides day ahead notification that it will send remote signal to shed AC unit load during peak usage period.
Central Heating - Load Shed*	Direct load control	Winter	Direct load control program where utility provides day ahead notification that it will send remote signal to shed AC unit load during peak usage period.
Central air conditioner - 50% cycling	Direct load control	Summer	Direct load control program where utility provides day ahead notification that it will send remote signal to cycle AC unit during peak usage period
Central Heating - 50% cycling*	Direct load control	Winter	Direct load control program where utility provides day ahead notification that it will send remote signal to cycle AC unit during peak usage period
Smart thermostats - Utility Installation*	Direct load control	Summer and Winter	Similar to AC load control program, but allows customers to participate using a compatible smart thermostat rather than an AC switch
Smart thermostats - BYOT*	Direct load control	Summer and Winter	Similar to AC load control program, but allows customers to participate using a compatible smart thermostat rather than an AC switch
CPP + Tech	Pricing	Summer and Winter	Electricity rate that varies based on time of day. Can be same rate schedule for every day during a given season (time of use, or TOU) and with critical peak pricing (CPP) days when peak period rates are substantially higher for a limited number of days per year (customers receive advance notification of CPP event). Customers also receive technology that they can pre-program to curtail load when an event is called.
Managed EV Charging - switch	Direct load control	Summer and Winter	Load control switch that is installed on an EV charger
Managed EV Charging - telematics	Direct load control	Summer and Winter	Direct load control program leveraging EV smart charging software
Battery Storage with PV	Pricing/Direct load control	Summer and Winter	PV charges battery and battery discharges to grid

Table 18: Large C&I DR Measures

Measure	Type	Season	Description
CPP + Tech	Pricing	Summer and Winter	Electricity rate that varies based on time of day. Can be same rate schedule for every day during a given season (time of use, or TOU) and with critical peak pricing (CPP) days when peak period rates are substantially higher for a limited number of days per year (customers receive advance notification of

Measure	Type	Season	Description
			CPP event). Customers also receive technology that they can pre-program to curtail load when an event is called.
Auto DR	Utility-controlled loads	Summer and Winter	Custom load control of specific end-uses/processes that is triggered by utility signal to building management system; customer can sometimes opt-out of specific events
Firm Service Level	Contractual	Summer and Winter	Customer commits to a maximum usage level during peak periods and, when notified by the utility, agrees to cut usage to that level.
Guaranteed Load Drop	Contractual	Summer and Winter	Customer agrees to reduce usage by an agreed upon amount when notified

No DR measures from the 2019 Technical Potential Study were eliminated from the current study.

Appendix C DSRE Measure List

Table 19: Residential DSRE Measures

Measure	Description
PV System	Roof-mounted system, including multiple panels, AC/DC inverter, racking system, and electrical system interconnections
Battery Storage from PV System	Lithium-ion battery system designed to integrate with an on-site PV system to store and discharge excess energy from PV generation

Table 20: Non-Residential DSRE Measures

Measure	Description
PV System	Roof-mounted system, including multiple panels, AC/DC inverter, racking system, and electrical system interconnections
Battery Storage from PV System	Lithium-ion battery system designed to integrate with an on-site PV system to store and discharge excess energy from PV generation
CHP - Fuel Cell	An electrochemical cell-based generator that reacts hydrogen fuel with oxygen
CHP - Micro Turbine	Small combustion turbine that burns gaseous or liquid fuel to drive a generator
CHP - Gas Turbine	A combustion turbine that burns gaseous or liquid fuel to drive a generator
CHP - Reciprocating Engine	An engine that uses one or more pistons to convert pressure into rotational motion
CHP - Steam Turbine	A turbine that extracts thermal energy from pressured steam to drive a generator

No DSRE measures from the 2019 Technical Potential Study were eliminated from the current study.

Appendix D External Measure Suggestions

Table 21: External Measure Suggestions and Actions

Measure Suggestion	Stakeholder Comments	Action taken for FEECA Study
Efficient Electrification Measures	<p>All measures that can produce substantial site energy savings by converting from natural gas or other fossil fuels should be included in the Florida electric utilities' next efficiency potential study. Key examples include efficient heat pumps to displace gas furnaces and efficient heat pump water heaters to displace gas water heaters. It is important to note that these electrification measures provide not only heating energy savings and water heating energy savings, but can also potentially provide cooling efficiency benefits as well. In the case of heat pumps, that can occur because efficient heat pumps can operate in cooling mode more efficiently than standard central air conditioners. In the case of heat pump water heaters, cooling and dehumidification benefits can occur when/if the water heater is in conditioned space because they transfer heat (particularly latent heat) from the air around them to the water they are heating. A growing number of jurisdictions - including Illinois, Minnesota and some northeastern states - have begun to include efficient electrification measures in their efficiency programs portfolios.</p>	<p>Fuel-switching and electrification are outside the scope of this study</p>
Networked Lighting Controls	<p>LED lighting technology has become increasingly accepted and installed in commercial buildings. The next big efficiency opportunity in commercial lighting efficiency is in sophisticated controls integrated into the light fixtures themselves - both luminaire level lighting controls and networked lighting controls. For example, a 2017 report for both the Northwest Energy Efficiency Alliance and the Design Lights Consortium, a non-profit that works with utilities and manufacturers of lighting products (and which many utilities across the country reference for determination of eligibility of lighting products for efficiency program rebates), found that networked lighting controls can provide on the order of 50% additional savings after LED conversion. Other studies have also found the national savings potential from such products to be enormous. Moreover, these products can be designed to provide not only lighting energy savings but also a number of other non-energy benefits (e.g., asset tracking, such as the ability of hospitals to know the location of all wheel chairs). Numerous utilities across the country now actively promote this technology through their efficiency programs. For example, Commonwealth Edison, the utility serving Chicago and other parts of northern Illinois, is currently getting a significant portion of its commercial lighting savings from promotion of networked lighting controls</p>	<p>Added to measure list for 2024 study</p>

External Measure Suggestions

Measure Suggestion	Stakeholder Comments	Action taken for FEECA Study
Ductless mini-split heat pumps to displace inefficient electric baseboard heating	While most Florida residential buildings with electric heat provide that heat with heat pumps, at least some (perhaps most likely being older multi-family rental buildings) still use inefficient electric resistance heat. Ductless mini- split heat pump retrofits can very efficiently displace such inefficient electric heat and should be added to the residential measure list.	Added to measure list for 2024 study
Air Source Heat Pump baseline assumptions	<p>There are seven air source heat pump (ASHP) measures included in the residential measure list. Two of them - one at SEER 14 and a second at SEER 21 - are listed as relative to an electric resistance baseline. Five of them - SEER 15, SEER 16, SEER 17, SEER 18 and SEER 21 - appear to be relative to a baseline of a standard new ASHP. Are we interpreting this correctly? If so, we have a couple of comments/questions/suggestions:</p> <ul style="list-style-type: none"> • The efficiency standards assessed need to be modified to be consistent with new federal standards, including new testing procedures. • For cases where the baseline is "electric resistance", why only assessing two efficiency tiers (i.e., fewer than for standard ASHP baselines)? The same number of efficiency tiers should be assessed for both baselines. 	Incorporated suggestions into 2024 study, including updated baseline standard and assessing same efficiency tiers for both baselines
Heat Pump Water Heater Efficiency	The Res EE tab of the utilities draft measure list suggests that the efficiency of a heat pump water heater is an EF of 2.50. That is unrealistically low. In fact, of the 222 products listed on the Energy Star website, none had UEFs less than 2.80 and only 29 (13%) had UEFs that were less than 3.4; the average was 3.57. Indeed, the first product listed on a search of heat pump water heaters on Home Depot's website is a 50 gallon, Rheem (Pro Terra) product with a UEF of 3.75 and a cost of \$1699.	Incorporated suggestion into 2024 study
New Construction Measure Packages	The measures lists did not appear to include packages of measures for building new residential and/or new commercial buildings to levels of efficiency beyond those required by code. Utilities in many jurisdictions run new construction efficiency programs supporting such measure packages. In the residential sector, many base their programs on the long-standing Federal Energy Star standard. However, increasingly utility programs are promoting additional efficiency tiers - often as part of all-electric new construction program offerings - that go well beyond the Energy Star standard. For example, Consumers Energy (Michigan) offers \$1000 rebates to builders who construct Energy Star single family homes	Incorporated suggestion into 2024 study with 2 tiers of residential new construction whole-home improvement measures.

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External Measure Suggestions

Measure Suggestion	Stakeholder Comments	Action taken for FEECA Study
	with a Home Energy Rating (HERS) score of 57 or less, but offer higher rebates for more efficient buildings - up to \$4000 for all electric homes with a HERS score of 40 or less. The Florida utilities potential study should assess savings potential for both the Energy Star level and a tier or two of additional efficiency beyond that level. Similar assessments of new commercial building savings potential should also be assessed.	
Custom Industrial Measures	The utilities' list of industrial efficiency measures addresses common industrial efficiency opportunities. However, it does not address efficiency opportunities that may be unique to individual industries or even to individual industrial facilities. That can include such things as changes in types of materials used in manufacturing, reductions in waste streams, improved use of water delivered by agricultural irrigation systems, and/or other things that are not directly related to energy using equipment or controls of such equipment. It is obviously not possible to list all such measures. However, a potential study will understate savings potential if it does not include a way of capturing such potential in its estimates. One potential way to get a sense of such potential is to review results of comprehensive industrial efficiency programs run by other utilities to identify the portion of actual program savings from such unique custom measures - and then assume that portion of custom savings could be added to the savings estimated in the study for named measures.	Added to measure list for 2024 study
Electric Vehicle measures	Some EV chargers are more efficient than others. The Federal Energy Star program has a standard for them. Savings potential may not be huge, but should be considered in the study. With a growing number of EV sales, the study should also consider the potential savings from promoting the most efficient EVs within different size/style categories	Added to measure list for 2024 study
Removing screw-based LEDs	The screw-based LEDs on both the Residential and Commercial measure lists should now be considered baseline due to federal efficiency standards adopted earlier this year. Utility load forecasts for IRPs should reflect resulting improvements in end use efficiency.	Screw-based LEDs were included in the study but with limited applicability to reflect current market
Removing Commercial fluorescent lighting	LED technology - for both fixtures and lamps - has advanced significantly in recent years, to the point where it should be the only technology considered for commercial lighting. Measures such as high performance T-8 fluorescent fixtures and high bay T-5 fluorescent fixtures should be replaced with LED alternatives in the study.	Updated measure list for 2024 study to only include LED-based lamps for linear fluorescent replacements

External Measure Suggestions

Measure Suggestion	Stakeholder Comments	Action taken for FEECA Study
Removing fossil-gas fueled CHP	Fossil-fuel fired CHP systems should not be considered “renewable” and have questionable benefits if electric generation is expected to get increasingly more renewable and clean. Biogas-fueled CHP - such as systems installed in wastewater treatment facilities that use methane byproducts of processing waste - should be included in the study.	2024 study will continue to assess all CHP options
Adding livestock methane power generation to renewables list	For example, see the “cow power” program currently being run by Green Mountain Power, Vermont’s largest electric utility	2024 study will continue to assess DSRE options consistent with prior study, including customer-sited solar, solar plus storage, and CHP
Adding EV managed charging to DR list	With national market shares for EVs growing, it is important that utilities consider programs for managing when charging occurs. Numerous utilities are currently running managed charging programs. This does not currently appear to be on the measure list and should be added to the Florida utilities’ potential study.	Added to measure list for 2024 study
Residential “smart thermostat” measure can provide both efficiency savings and demand response potential	This is recognized in the inclusion of smart thermostats in both the Res EE and DR tabs of the measure list spreadsheet. We simply want to flag that it is important when assessing cost-effectiveness of this measure that these two potential benefits are considered together. In other words, the cost should be considered compared to the combined efficiency and DR potential rather than separately considered relative to just EE savings and then separately again compared to just DR potential	2024 study will include interactive impacts of EE and DR opportunities
Emerging Technologies	The efficiency potential study measure list appears to be somewhat outdated. It does not include a number of new and emerging technologies. The potential list of such technologies is long. We suggest reviewing the attached list of emerging technologies developed almost two years ago by Consumers Energy (Michigan) and including them in the study.	Consumers Energy study was reviewed and commercially available measures were added to measure list for 2024 study, including heat pump water heaters - CEE advanced tier, heat pump clothes dryers, ozone laundry systems, and 21+ SEER HVAC units

External Measure Suggestions

Docket Nos. 20240012-EG to 20240017-EG
TPS for Florida Public Utilities Company
Exhibit JH-5, Page 84 of 84



Technical Potential Study of Demand Side Management

JEA

Date: 03.07.2024

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Executive Summary

In October 2022, the six electric utilities subject to the Florida Energy Efficiency and Conservation Act (FEECA Utilities) retained Resource Innovations, Inc. for the purpose of identifying and characterizing the market for demand-side management (DSM) opportunities, including energy efficiency (EE) improvement and building retrofits, peak load reductions from demand response (DR), and demand-side renewable energy (DSRE) systems.

The main objective of the study was to assess the technical potential of demand-side resources for reducing customer electric energy consumption and seasonal peak capacity demands.

This report provides the detailed methodology and results for the technical potential analysis of JEA's service territory.

1.1 Methodology

Resource Innovations estimates DSM savings potential by applying an analytical framework that aligns baseline market conditions for energy consumption and demand with DSM opportunities. After describing the baseline condition, Resource Innovations applies estimated measure savings to disaggregated consumption and demand data. The approach varies slightly according to the type of DSM resources and available data; the specific approaches used for each type of DSM are described below.

1.1.1 EE Potential

This study utilized Resource Innovations' proprietary EE modeling tool, TEA-POT (Technical / Economic / Achievable POTential). This modeling tool was built on a platform that provides the ability to create and analyze multiple scenarios and recalculate potential savings based on variable inputs such as sales/load forecasts, electricity prices, discount rates, and actual program savings. The methodology for the EE potential assessment was based on a hybrid "top-down/bottom-up" approach, which started with the current utility load forecast, then disaggregated it into its constituent customer-class and end-use components. Our assessment examined the effect of the range of EE measures and practices on each end-use, taking into account current market saturations, and technical feasibility. These unique impacts were aggregated to produce estimates of potential at the end-use, customer class, and system levels for JEA.

1.1.2 DR Potential

The assessment of DR potential in JEA's service territory was an analysis of mass market direct load control programs for residential and small commercial and industrial (C&I) customers, and an analysis of DR programs for large C&I customers. The direct load control program assessment focused on the potential for demand reduction through heating, ventilation, and air conditioning (HVAC), water heater, managed electric vehicle charging, and pool pump load control. These end-uses were of particular interest because of their large contribution to peak period system load. For this analysis, a range of direct load control measures were examined for each customer segment to highlight the range of potential. The assessment further accounted for existing DR programs for JEA when calculating the total DR potential.

1.1.3 DSRE Potential

The DSRE technologies included in this study are rooftop solar photovoltaic (PV) systems, battery storage systems charged from customers' PV systems, and combined heat and power (CHP) systems. The study leveraged the customer segmentation and load disaggregation data assembled for the EE and DR analyses, and applied our DSRE model, SPIDER™ (Spatial Penetration and Integration of Distributed Energy Resources), for economic and adoption analysis of solar and battery storage. This model dynamically responds to rapidly changing technologies and accounts for all key time-varying elements such as technology costs, incentives, tax credits, and electric rates. To estimate technical potential for CHP, the study utilized a series of unique distributed generation potential models for each primary market sector (commercial and industrial), calculating the average building consumption, assigning minimum facility size thresholds, and estimating building energy savings share percentage for each CHP technology based on its generation capacity.

1.2 Savings Potential

Technical potential for EE, DR, and DSRE are as follows:

1.2.1 EE Potential

EE technical potential describes the savings potential when all technically feasible EE measures are fully implemented, ignoring all non-technical constraints on electricity savings, such as cost-effectiveness and customer willingness to adopt EE.

The estimated EE technical potential results are summarized in Table 1.

Table 1. EE Technical Potential

	Savings Potential		
	Summer Peak Demand (MW)	Winter Peak Demand (MW)	Energy (GWh)
Residential	517	297	1,887
Non-Residential¹	280	251	1,690
Total	797	548	3,577

1.2.2 DR Potential

DR technical potential describes the magnitude of loads that can be managed during conditions when grid operators need peak capacity. For residential and small C&I customers where DR generally takes the form of direct utility control, technical potential for DR is limited by the loads that can be controlled remotely at scale such as heating, cooling, water heaters, managed electric vehicle charging, and pool pumps. For large C&I customers, this included their entire electric demand during a utility’s system peak, as many of these types of customers will forego virtually all electric demand temporarily if the financial incentive is large enough.

The estimated DR technical potential results are summarized in Table 2.

Table 2. DR Technical Potential

	Savings Potential	
	Summer Peak Demand (MW)	Winter Peak Demand (MW)
Residential	443	1,451
Non-Residential	673	578
Total	1,116	2,029

¹ Non-Residential results include all commercial and industrial customer segments.

1.2.3 DSRE Potential

DSRE technical potential estimates quantify all technically feasible distributed generation opportunities from PV systems, battery storage systems charged from PV, and CHP technologies based on the customer characteristics of JEA’s customer base.

The estimated DSRE technical potential results are summarized in Table 3.

Table 3. DSRE Technical Potential²

	Savings Potential		
	Summer Peak Demand (MW)	Winter Peak Demand (MW)	Energy (GWh)
PV Systems			
Residential	493	19	4,146
Non-Residential	214	3	1,617
Total	707	22	5,763
Battery Storage charged from PV Systems			
Residential	304	557	0
Non-Residential	0	158	0
Total	304	715	0
CHP Systems			
Total	397	359	1,811

² PV systems and CHP systems were independently analyzed for technical potential without consideration of the competition between technologies or customer preference for DSRE system.

2 Introduction

In October, 2022, the six electric utilities subject to the Florida Energy Efficiency and Conservation Act (FEECA Utilities) retained Resource Innovations, Inc. for the purpose of identifying and characterizing the market for demand-side management (DSM) opportunities, including energy efficiency (EE) improvement and building retrofits, peak load reductions from demand response (DR), and demand-side renewable energy (DSRE) systems. The main objective of the study was:

- Assessing the technical potential of demand-side resources for reducing customer electric energy consumption and seasonal peak capacity demands.

This report provides the detailed methodology and results for the technical potential analysis of JEA's service territory.

The following deliverables were developed by Resource Innovations as part of the project and are addressed in this report:

- DSM measure list and detailed assumption workbooks
- Disaggregated baseline demand and energy use by year, sector, and end-use
- Baseline technology saturations, energy consumption, and demand
- Technical potential demand and energy savings
- Supporting calculation spreadsheets

2.1 Technical Potential Study Approach

Resource Innovations estimates technical potential according to the industry standard categorization, as follows:

Technical Potential is the theoretical maximum amount of energy and capacity that could be displaced by DSM, regardless of cost and other barriers that may prevent the installation or adoption of a DSM measure.

For this study, technical potential included full application of commercially available DSM technologies to all residential, commercial, and industrial customers in the utility's service territory.

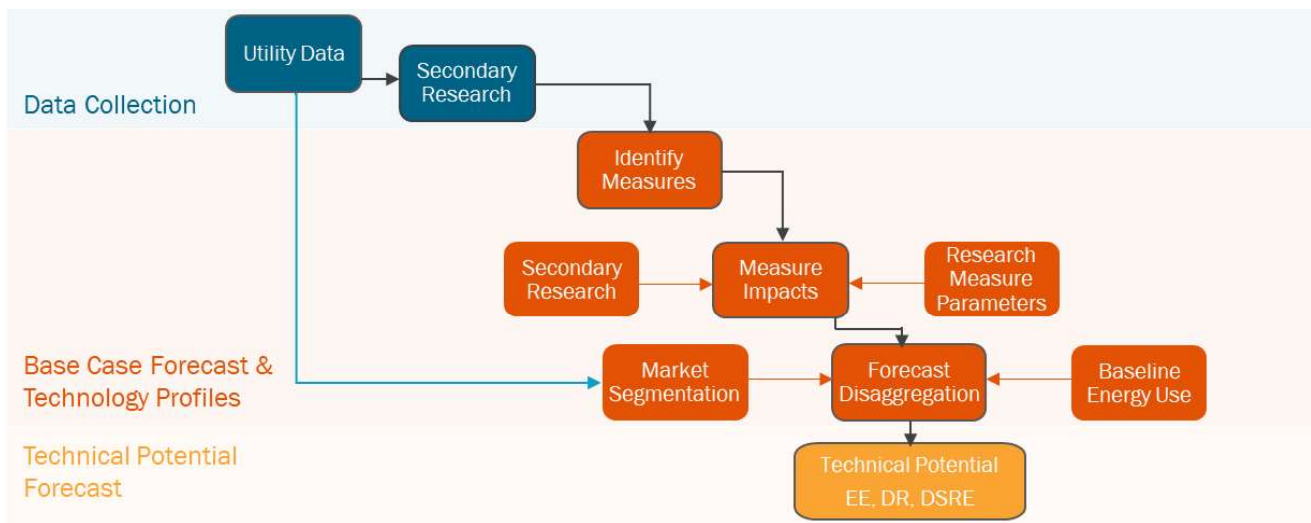
Quantifying DSM technical potential is the result of an analytical process that refines DSM opportunities that align with JEA's customers' electric consumption patterns. Resource Innovations' general methodology for estimating technical potential is a hybrid "top-

down/bottom-up” approach, which is described in detail in Sections 3 through 5 of this report and includes the following steps:

- Develop a baseline forecast: the study began with a disaggregation of the utility’s official electric energy forecast to create a baseline electric energy forecast. This forecast does not include any utility-specific assumptions around DSM performance. Resource Innovations applied customer segmentation and consumption data from each utility and data from secondary sources to describe baseline customer-class and end-use components. Additional details on the forecast disaggregation are included in Section 3.
- Identify DSM opportunities: A comprehensive set of DSM opportunities applicable to JEA’s climate and customers were analyzed to best depict DSM technical potential. Effects for a range of DSM technologies for each end-use could then be examined while accounting for current market saturations, technical feasibility, and impacts.
- Collect cost and impact data for measures: For those measures applicable to JEA’s customers, Resource Innovations conducted primary and secondary research and estimated costs, energy savings, measure life, and demand savings. We differentiated between the type of cost (capital, installation labor, maintenance, etc.) to separately evaluate different implementation modes: retrofit (capital plus installation labor plus incremental maintenance); new construction (incremental capital and incremental maintenance); and burnout costs (incremental capital and incremental maintenance costs for replacement of appliances and equipment that has reached the end of its useful life). Additional details on measure development are included in Section 4.

Figure 1 provides an illustration of the technical potential modeling process conducted for JEA, with the assessment starting with the current utility load forecast, disaggregated into its constituent customer-class and end-use components, and calibrated to ensure consistency with the overall forecast. Resource Innovations considered the range of DSM measures and practices application to each end-use, accounting for current market saturations, and technical feasibility. These unique impacts were aggregated to produce estimates of potential at the technology, end-use, customer class, and system levels.

Figure 1. Approach to Technical Potential Modeling



Resource Innovations estimated DSM technical potential based on a combination of market research, utility load forecasts and customer data, and measure impact analysis, all in coordination with JEA. Resource Innovations examined the technical potential for EE, DR, and DSRE opportunities; this report is organized to offer detail on each DSM category, with additional details on technical potential methodology presented in Section 5.

2.2 EE Potential Overview

To estimate EE potential, this study utilized Resource Innovations’ modeling tool, TEA-POT (Technical / Economic / Achievable POTential). This modeling tool was built on a platform that provides the ability to create and analyze multiple scenarios and recalculate potential savings based on variable inputs such as sales/load forecasts, electricity prices, discount rates, and actual utility program savings, as described in Section 5.1.1 below. While the analysis estimates the impacts of individual EE measures, the model accounts for interactions and overlap of individual measure impacts within an end-use or equipment type. The model provides transparency into the assumptions and calculations for estimating EE potential.

2.3 DR Potential Overview

To estimate DR market potential, Resource Innovations considered customer demand during utility peaking conditions and projected customer response to DR measures. Customer demand was determined by looking at segment-level interval data for each customer segment. For each segment, Resource Innovations determined the portion of a customer’s load that could be curtailed during the system peak.

2.4 DSRE Potential Overview

The DSRE technologies included in this study are rooftop solar photovoltaic (PV) systems, battery storage systems charged from PV, and combined heat and power (CHP) systems. The study leveraged the customer segmentation and load disaggregation data assembled for the EE and DR analyses, and applied our DSRE model, SPIDER™ (Spatial Penetration and Integration of Distributed Energy Resources), for economic and adoption analysis of solar and battery storage. This model dynamically responds to rapidly changing technologies and accounts for all key time-varying elements such as technology costs, incentives, tax credits, and electric rates. To estimate technical potential for CHP, the study utilized a series of unique distributed generation potential models for each primary market sector (commercial and industrial), calculating the average building consumption, assigning minimum facility size thresholds, and estimating building energy savings share percentage for each CHP technology based on its generation capacity.

3 Baseline Forecast Development

3.1 Market Characterization

The JEA base year energy use and sales forecast provided the reference point to determine potential savings. The end-use market characterization of the base year energy use and reference case forecast included customer segmentation and load forecast disaggregation. The characterization is described in this section, while the subsequent section addresses the measures and market potential energy and demand savings scenarios.

3.1.1 Customer Segmentation

In order to estimate EE, DR, and DSRE potential, the sales forecast and peak load forecasts were segmented by customer characteristics. As electricity consumption patterns vary by customer type, Resource Innovations segmented customers into homogenous groups to identify which customer groups are eligible to adopt specific DSM technologies, have similar building characteristics and load profiles, or are able to provide DSM grid services.

Resource Innovations segmented customers according to the following:

- 1) By Sector - how much of JEA's energy sales, summer and winter peak demand forecast is attributable to the residential, commercial, and industrial sectors?
- 2) By Customer - how much electricity does each customer typically consume annually and during system peaking conditions?
- 3) By End-Use - within a home or business, what equipment is using electricity during the system peak? How much energy does this end-use consume over the course of a year?

Table 4 summarizes the segmentation within each sector. In addition to the segmentation described here for the EE and DSRE analyses, the residential customer segments were further segmented by heating type (electric heat, gas heat, or unknown) and by annual consumption bins within each sub-segment for the DR analysis.

Table 4. Customer Segmentation

Residential	Commercial		Industrial	
Single Family	Assembly	Miscellaneous	Agriculture and Assembly	Primary Resources Industries
Multi-Family	College and University	Offices	Chemicals and Plastics	Stone/Glass/Clay/Concrete
Manufactured Homes	Grocery	Restaurant	Construction	Textiles and Leather
	Healthcare	Retail	Electrical and Electronic Equipment	Transportation Equipment
	Hospitals	Schools K-12	Lumber/Furniture/Pulp/Paper	Water and Wastewater
	Institutional	Warehouse	Metal Products and Machinery	Other
	Lodging/Hospitality		Miscellaneous Manufacturing	

From an equipment and energy use perspective, each segment has variation within each building type or sub-sector. For example, the energy consuming equipment in a convenience store will vary significantly from the equipment found in a supermarket. To account for this variation, the selected end-uses describe energy consumption patterns that are consistent with those typically studied in national or regional surveys, such as the U.S. Energy Information Administration’s (EIA) Residential Energy Consumption Survey (RECS), Commercial Building Energy Consumption Survey (CBECS) and Manufacturing Energy Consumption Survey (MECS), among others. The end-uses selected for this study are listed in Table 5.

Table 5. End-Uses

Residential End-Uses	Commercial End-Uses	Industrial End-Uses
Space heating ³	Space heating ³	Process heating
Space cooling ³	Space cooling ³	Process cooling
Domestic hot water	Domestic hot water	Compressed air
Ventilation and circulation	Ventilation and circulation	Motors/pumps

³ Includes the contribution of building envelope measures and efficiencies.

Residential End-Uses	Commercial End-Uses	Industrial End-Uses
Lighting	Interior lighting	Fan, blower motors
Cooking	Exterior lighting	Process-specific
Appliances	Cooking	Industrial lighting
Electronics	Refrigeration	Exterior lighting
Miscellaneous	Office equipment	HVAC ³
	Miscellaneous	Other

For DR, the end-uses targeted were those with controllable load for residential customers (i.e., HVAC, water heaters, pool pumps, and electric vehicles) and small C&I customers (HVAC and electric vehicles). For large C&I customers, all load during peak hours was included assuming these customers would potentially be willing to reduce electricity consumption for a limited time if offered a large enough incentive during temporary system peak demand conditions.

3.1.2 Forecast Disaggregation

A common understanding of the assumptions and granularity in the baseline load forecast was developed with input from JEA. Key discussion topics reviewed included:

- How current DSM offerings are reflected in the energy and demand forecast.
- Assumed weather conditions and hour(s) of the day when the system is projected to peak.
- Are there portions of the load forecast attributable to customers or equipment not eligible for DSM programs?
- How are projections of population increase, changes in appliance efficiency, and evolving distribution of end-use load shares accounted for in the peak demand forecast?

3.1.2.1 Electricity Consumption (kWh) Forecast

Resource Innovations segmented JEA’s electricity consumption forecast into electricity consumption load shares by customer class and end-use. The baseline customer segmentation represents the electricity market by describing how electricity was consumed within the service territory. Resource Innovations developed the forecast for the year 2025, and based it on data provided by JEA, primarily their 2023 Ten-Year Site Plan, which was the most recent plan available at the time the studies were initiated. The data addressed current baseline consumption, system load, and sales forecasts.

3.1.2.2 Peak Demand (kW) Forecast

A fundamental component of DR potential was establishing a baseline forecast of what loads or operational requirements would be absent due to existing dispatchable DR or time varying rates. This baseline was necessary to assess how DR can assist in meeting specific planning and operational requirements. We utilized JEA's summer and winter peak demand forecast, which was developed for system planning purposes.

3.1.2.3 Estimating Consumption by End-Use Technology

As part of the forecast disaggregation, Resource Innovations developed a list of electricity end-uses by sector (Table 5). To develop this list, Resource Innovations began with JEA's estimates of average end-use consumption by customer and sector. Resource Innovations combined these data with other information, such as utility residential appliance saturation surveys, as available, to develop estimates of customers' baseline consumption. Resource Innovations calibrated the utility-provided data with data available from public sources, such as the EIA's recurring data-collection efforts that describe energy end-use consumption for the residential, commercial, and manufacturing sectors.

To develop estimates of end-use electricity consumption by customer segment and end-use, Resource Innovations applied estimates of end-use and equipment-type saturation to the average energy consumption for each sector. The following data sources and adjustments were used in developing the base year 2025 sales by end-use:

Residential Sector:

- The disaggregation was based on JEA's rate class load shares and intensities.
- Baseline intensity was calibrated to account for differences in end-use saturation, fuel source, and equipment saturation as follows:
 - JEA rate class load share is based on average per customer.
 - Resource Innovations made conversions to usage estimates generated by applying JEA's 2020 Appliance Saturation Study (APSS) report, EIA RECS data, residential end-use study data from other FEECA utilities, and EIA's Annual Energy Outlook (AEO) 2023.

Commercial Sector:

- The disaggregation was based on JEA's rate class load shares, intensities, and EIA CBECS data.
- Segment data from EIA and JEA.

- Baseline intensity was calibrated to account for differences in end-use saturation, fuel source, and equipment saturation as follows:
 - Rate class load share based on EIA CBECS and end-use forecasts from JEA.

Industrial Sector:

- The disaggregation was based on rate class load shares, intensities, and EIA MECS data.
- Segment data from EIA and JEA.
- Baseline intensity was calibrated to account for differences in end-use saturation, fuel source, and equipment saturation as follows:
 - Rate class load share based on EIA MECS and end-use forecasts from JEA.

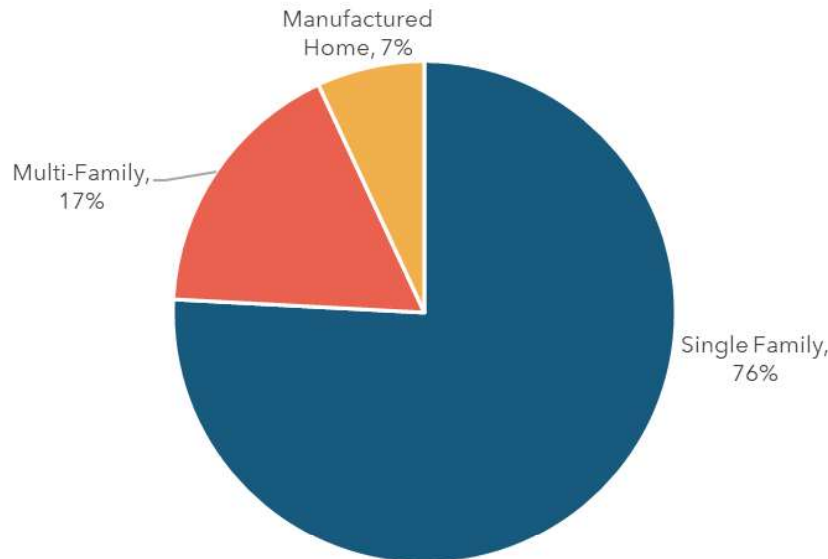
3.2 Analysis of Customer Segmentation

Customer segmentation is important to ensuring that a MPS examines DSM measure savings potential in a manner that reflects the diversity of energy savings opportunities existing across the utility's customer base. JEA provided Resource Innovations with data concerning the premise type and loads characteristics for all customers for the MPS analysis. Resource Innovations examined the provided data from multiple perspectives to identify customer segments. Resource Innovations' approach to segmentation varied slightly for non-residential and residential accounts, but the overall logic was consistent with the concept of expressing the accounts in terms that were relevant to DSM opportunities.

3.2.1 Residential Customers (EE, DR, and DSRE Analysis)

Segmentation of residential customer accounts enabled Resource Innovations to align DSM opportunities with appropriate DSM measures. Resource Innovations used utility customer data, supplemented with EIA data, to segment the residential sector by customer dwelling type (single family, multi-family, or manufactured home). The resulting distribution of customers according to dwelling unit type is presented in Figure 2.

Figure 2. Residential Customer Segmentation



3.2.2 Non-Residential (Commercial and Industrial) Customers (EE and DSRE Analysis)

For the EE and DSRE analysis, Resource Innovations segmented C&I accounts using the utility's North American Industry Classification System (NAICS) or Standard Industrial Classification (SIC) codes, supplemented by data produced by the EIA's CBECS and MECS. Resource Innovations classified the customers in this group as either commercial or industrial, on the basis of DSM measure information available and applicable to each. For example, agriculture and forestry DSM measures are commonly considered industrial savings opportunities. Resource Innovations based this classification on the types of DSM measures applicable by segment, rather than on the annual energy consumption or maximum instantaneous demand from the segment as a whole. The estimated energy sales distributions Resource Innovations applied are shown below in Figure 3 and Figure 4.

Figure 3. Commercial Customer Segmentation

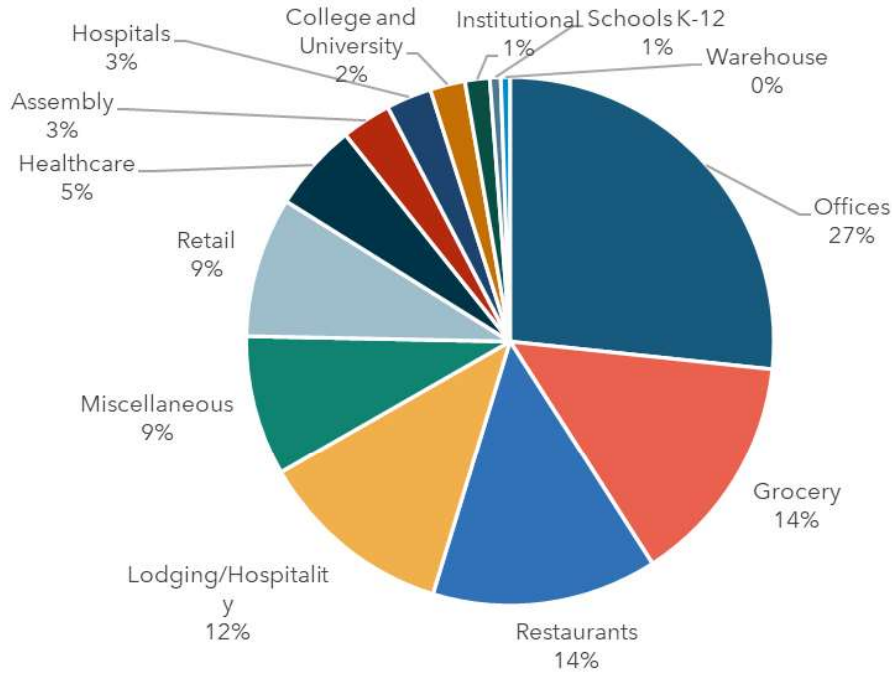
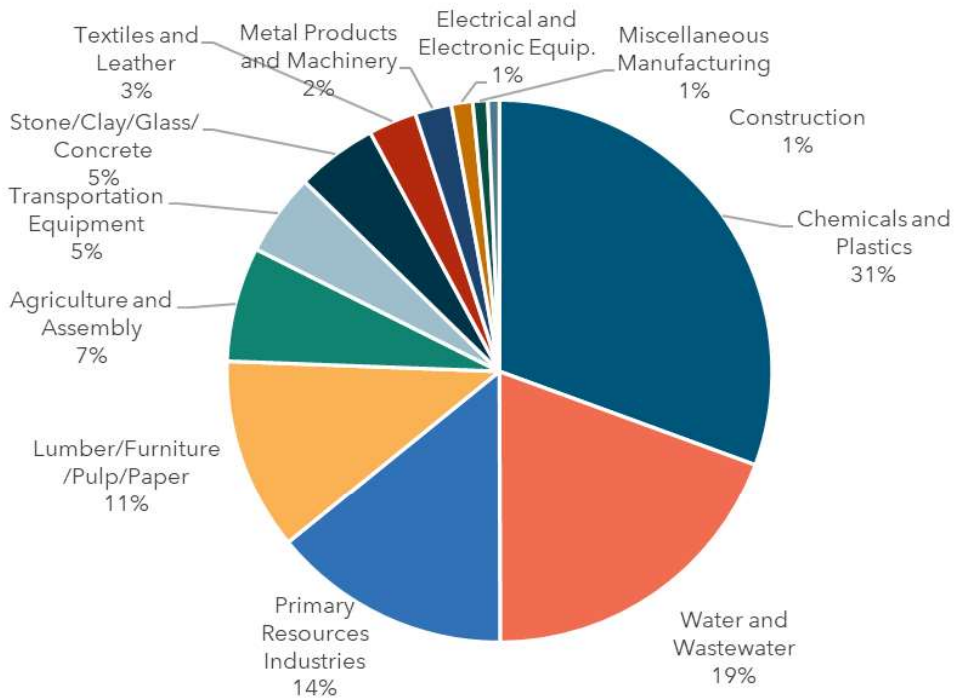


Figure 4. Industrial Customer Segmentation



3.2.3 Commercial and Industrial Accounts (DR Analysis)

For the DR analysis, Resource Innovations divided the non-residential customers into the two customer classes of small C&I and large C&I using rate class and annual consumption. For the purposes of this analysis, small C&I customers are those on the General Service (GS) tariff. Large C&I customers are all customers on the General Service Demand (GSD) tariff or on the General Service Large Demand (GSLD) tariff. Resource Innovations further segmented these two groups based on customer size. For small C&I, segmentation was determined using annual customer consumption and for large C&I the customer’s maximum demand was used. Both customer maximum demand and customer annual consumption were calculated using billing data provided by JEA.

Table 6 shows the account breakout between small C&I and large C&I.

Table 6. Summary of Customer Classes for DR Analysis

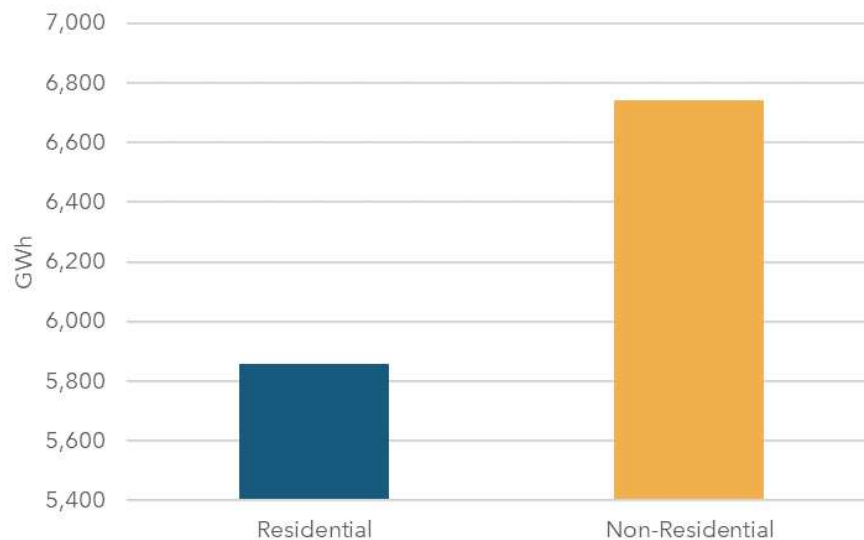
Customer Class	Annual kWh	Estimated Number of Accounts
Small C&I	0-15,000 kWh	32,188
	15,001-25,000 kWh	6,347
	25,001-50,000 kWh	1,131
	50,001 kWh +	13,802
	Total	53,468
Large C&I	0-50 kW	331
	51-300 kW	3,842
	301-500 kW	8
	501 kW +	153
	Total	4,334

3.3 Analysis of System Load

3.3.1 System Energy Sales

Technical potential is based on JEA's load forecast for the year 2025 from their 2023 Ten Year Site Plan, which is illustrated in Figure 5.

Figure 5. 2025 Electricity Sales Forecast by Sector



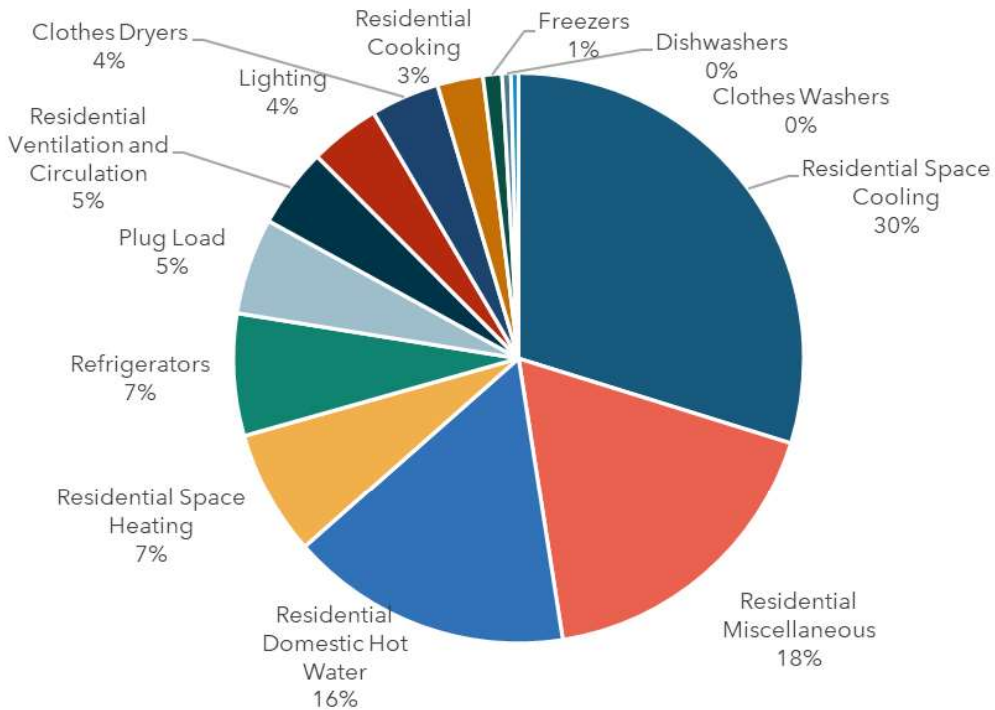
3.3.2 System Demand

To determine the technical potential for DR, Resource Innovations first established peaking conditions for each utility by looking at when each utility historically experienced its maximum demand. The primary data source used to determine when maximum DR impact was the historical system load for JEA. The data provided contained the system loads for all 8,760 hours of the most recent five years leading up to the study (2016-2021). The utility summer and winter peaks were then identified within the utility-defined peaking conditions. For JEA the summer peaking conditions were defined as August from 4:00-5:00 PM and the winter peaking conditions were defined as January from 7:00-8:00 AM. The seasonal peaks were then selected as the maximum demand during utility peaking conditions.

3.3.3 Load Disaggregation

The disaggregated annual electric loads⁴ for the base year 2025 by sector and end-use are summarized in Figure 6, Figure 7, and Figure 8.

Figure 6. Residential Baseline (2025) Energy Sales by End-Use



⁴ Full disaggregation of system demand by end-use was not conducted, as DR potential for residential and small C&I customers focused on specific end-uses of particular interest because of their large contribution to peak period system load, and was not end-use specific for large C&I customers. A description of the end-use analysis for residential and small C&I customers is included in Section 5.1.2

Figure 7. Commercial Baseline (2025) Energy Sales by End-Use

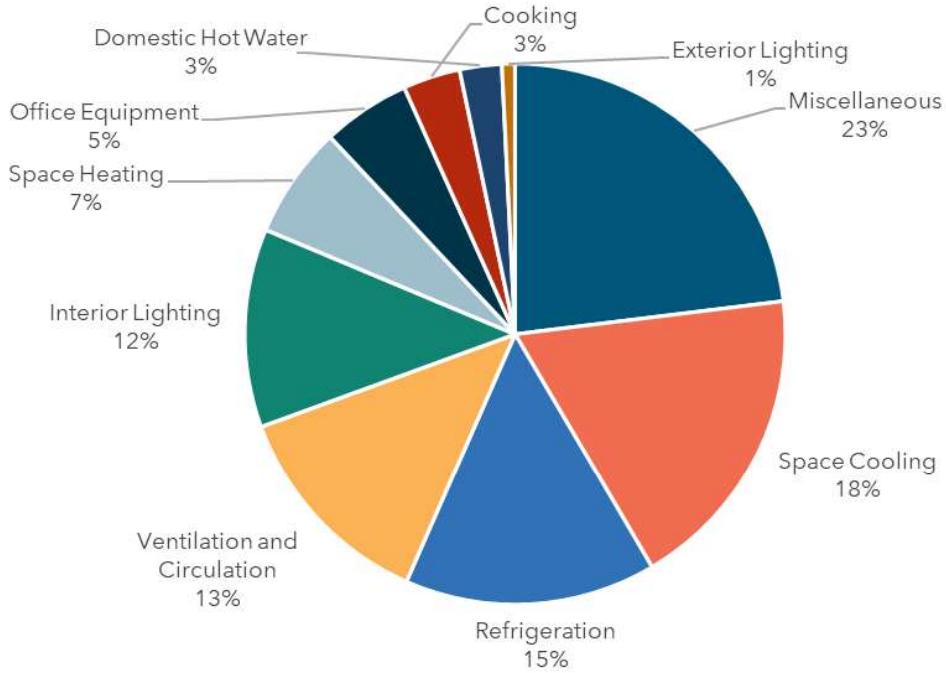
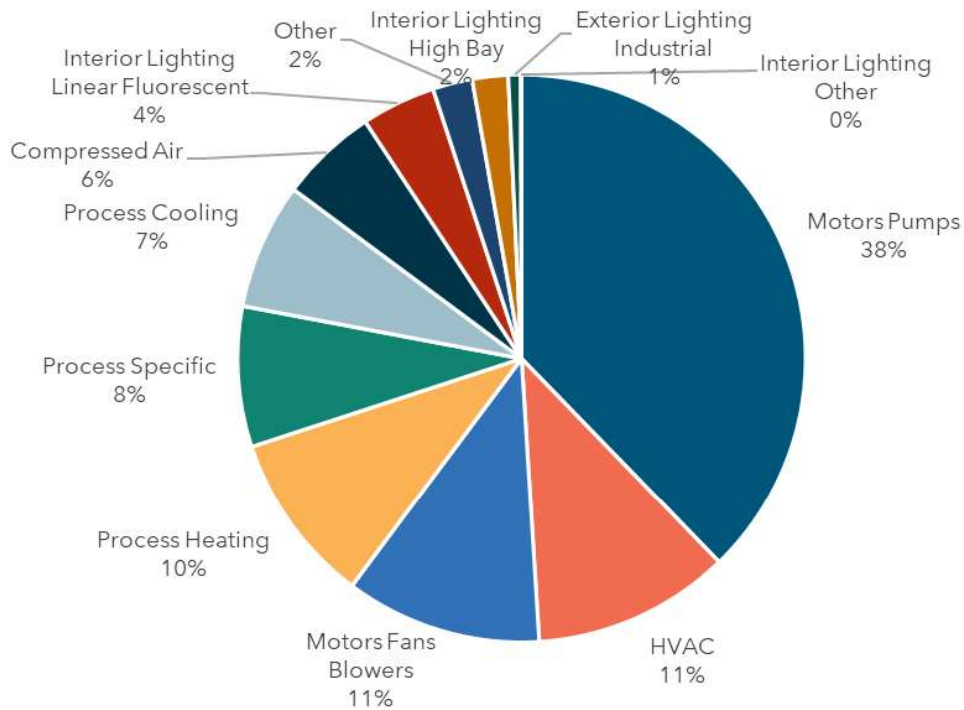


Figure 8. Industrial Baseline (2025) Energy Sales by End-Use



4 DSM Measure Development

DSM potential is described by comparing baseline market consumption with opportunities for savings. Describing these individual savings opportunities results in a list of DSM measures to analyze. This section presents the methodology to develop the EE, DR, and DSRE measure lists.

4.1 Methodology

Resource Innovations identified a comprehensive catalog of DSM measures for the study. The measure list is the same for all FEECA Utilities. The iterative vetting process with the utilities to develop the measure list began by initially examining the list of measures included in the 2019 Goals docket. This list was then adjusted based on proposed measure additions and revisions provided by the FEECA Utilities. Resource Innovations further refined the measure list based on reviews of Resource Innovations' DSM measure library, compiled from similar market potential studies conducted in recent years throughout the United States, as well as measures included in other utility programs where Resource Innovations is involved with program design, implementation, or evaluation. The FEECA Utilities also reached out to interested parties and received input with recommendations on measure additions to the 2019 measure list. Their measure suggestions were reviewed and incorporated into the study as appropriate. External measure suggestions and actions are summarized in Appendix D. The extensive, iterative review process involving multiple parties has ensured that the study included a robust and comprehensive set of DSM measures.

See Appendix A for the list of EE measures, Appendix B for the list of DR measures, and Appendix C for the list of DSRE measures analyzed in the study.

4.2 EE Measures

EE measures represent technologies applicable to the residential, commercial, and industrial customers in the FEECA Utilities' service territories. The development of EE measures included consideration of:

- EE technologies that are applicable to Florida and commercially available: Measures that are not applicable due to climate or customer characteristics were excluded, as were "emerging" technologies that are not currently commercially available to FEECA utility customers.
- Current and planned Florida Building Codes and Federal equipment standards (Codes & Standards) for baseline equipment: Measures included from prior studies

were adjusted to reflect current Codes & Standards as well as updated efficiency tiers, as appropriate.

- Eligibility for utility DSM offerings in Florida: For example, behavioral measures were excluded from consideration, as they historically have not been allowed to count towards utility DSM goals. Behavioral measures are intended to motivate customers to operate in a more energy-efficient manner (e.g., setting an air-conditioner thermostat to a higher temperature) without accompanying: a) physical changes to more efficient end-use equipment or to their building envelope, b) utility-provided products and tools to facilitate the efficiency improvements, or c) permanent operational changes that improve efficiency which are not easily revertible to prior conditions. These types of behavioral measures were excluded because of the variability in forecasting the magnitude and persistence of energy and demand savings from the utility's perspective. Additionally, decoupling behavioral measure savings from the installation of certain EE technologies like smart thermostats can be challenging and could result in overlapping potential with other EE measures included in the study.

Upon development of the final EE measure list, utility-specific measure details were developed. RI maintains a proprietary online database of energy efficiency measures for MPS studies, which was used as a starting point for measure development for this study. Measures are added or updated at the request of project stakeholders or because of changes to the EE marketplace (for example, new codes and standards, or current practice in the market). Measure data are refined as new data or algorithms are developed for estimating measure impacts, and updated for each study to incorporate inputs parameters specific to the service territory being analyzed. The database contains the following information for each of the measures:

- Measure description: measure classification by type, end-use, and subsector, and description of the base-case and the efficient-case scenarios.
- kWh savings: Energy savings associated with each measure were developed through engineering algorithms or building simulation modeling, taking climate data and customer segments into consideration as appropriate. Reference sources used for developing residential, commercial, and industrial measure savings included a variety of Florida-specific, as well as regional and national sources, such as utility-specific measurement & verification (M&V) data, technical reference manuals (TRM) from other jurisdictions, ENERGY STAR calculators, and manufacturer or retailer specifications for particular products.
- Energy savings were applied in RI's TEA-POT model as a percentage of total baseline consumption. Peak demand savings were determined using utility-specific load shapes or coincidence factors.

- Measure Expected Useful Lifetime: Sources included the Database for Energy Efficient Resources (DEER), the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Handbook, TRMs, and other regional and national measure databases and EE program evaluations.
- Measure Costs: Per-unit costs (full or incremental, depending on the application) associated with measure installations. Sources included: TRMs, ENERGY STAR calculator, online market research, FEECA utility program data, and other secondary sources.

The measure details from the online measure library are exported for use in RI’s TEA-POT model, accompanied by utility-specific estimates of measure applicability. Measure applicability is a general term encompassing an array of factors, including technical feasibility of installation, and the measure’s current saturation as well as factors to allocate savings associated with competing measures. Information used was primarily derived from data in current regional and national databases, as well as JEA’s program tracking data. These factors are described in Table 7.

Table 7. Measure Applicability Factors

Measure Impact	Explanation	Sources
Technical Feasibility	The percentage of buildings that can have the measure physically installed. Various factors may affect this, including, but not limited to, whether the building already has the baseline measure (e.g., dishwasher), and limitations on installation (e.g., size of unit and space available to install the unit).	Various secondary sources and engineering experience.
Measure Incomplete Factor	The percentage of buildings without the specific measure currently installed.	Utility RASS; EIA RECS, CBECS; MECS; ENERGY STAR sales figures; and engineering experience.
Measure Share	Used to distribute the percentage of market shares for competing measures (e.g., only blown-in ceiling insulation or spray foam insulation, not both would be installed in an attic).	Utility customer data, Various secondary sources and engineering experience.

As shown in Table 8, the measure list includes 395 unique energy-efficiency measures. Expanding the measures to account for all appropriate installation scenarios resulted in

9,535 measure permutations, which are the application of individual measures to various customer segments, construction types, and end-uses (i.e., a single air-source heat pump “measure” can be installed in single family, multi-family, and manufactured homes, as well as new and existing vintages of each home type, and impacts both space cooling and space heating end-uses, resulting in twelve separate measure “permutations” analyzed).

Table 8. EE Measure Counts by Sector

Sector	Unique Measures	Permutations
Residential	119	1,173
Commercial	164	5,798
Industrial	112	2,564

4.3 DR Measures

The DR measures included in the measure list utilize the following DR strategies:

- **Direct Load Control.** Utility control of selected equipment at the customer’s home or business, such as HVAC or water heaters.
- **Critical Peak Pricing (CPP) with Technology.** Electricity rate structures that vary based on time of day. Includes CPP when the rate is substantially higher for a limited number of hours or days per year (customers receive advance notification of CPP event) coupled with technology that enables customer to lower their usage in a specific end-use in response to the event (e.g., HVAC via smart thermostat).
- **Contractual DR.** Customers receive incentive payments or a rate discount for committing to reduce load by a pre-determined amount or to a pre-determined firm service level upon utility request.
- **Automated DR.** Utility dispatched control of specific end-uses at a customer facility.

DR initiatives that do not rely on the installation of a specific device or technology to implement (such as a voluntary curtailment program or time of use rates) were not included.

A workbook was developed for each measure which included the same measure inputs as previously described for the EE measures. In addition, the DR workbook included expected load reduction from the measure, based on utility technical potential, existing utility DR programs, and other nationwide DR programs if needed.

For technical potential, Resource Innovations did not break out results by specific measure or control technology because all of the developed measures target the end-uses estimated

for technical potential (i.e., potential is reported for space cooling end-use and not allocated to switches, smart thermostats, etc.).

4.4 DSRE Measures

The DSRE measure list includes rooftop PV systems, battery storage systems charged from PV systems, and CHP systems.

PV Systems

PV systems utilize solar panels (a packaged collection of PV cells) to convert sunlight into electricity. A system is constructed with multiple solar panels, a DC/AC inverter, a racking system to hold the panels, and electrical system interconnections. These systems are often roof-mounted systems that face south-west, south, and/or, south-east. The potential associated with roof-mounted systems installed on residential and commercial buildings was analyzed.

Battery Storage Systems Charged from PV Systems

Distributed battery storage systems included in this study consist of behind-the-meter battery systems installed in conjunction with an appropriately-sized PV system at residential and commercial customer facilities. These battery systems typically consist of a DC-charged battery, a DC/AC inverter, and electrical system interconnections to a PV system. On their own battery storage systems do not generate or conserve energy, but can collect and store excess PV generation to provide power during particular time periods, which for DSM purposes would be to offset customer demand during the utility's system peak.

CHP Systems

In most CHP applications, a heat engine creates shaft power that drives an electrical generator (fuel cells can produce electrical power directly from electrochemical reactions). The waste heat from the engine is then recovered to provide other on-site needs. Common prime mover technologies used in CHP applications and explored in this study include:

- Steam turbines
- Gas turbines
- Micro turbines
- Fuel Cells
- Internal combustion engines

A workbook was developed for each measure which included the inputs previously described for EE measures and prime mover operating parameters.

5 Technical Potential

In the previous sections, the approach for DSM measure development was summarized, and the 2025 base year load shares and reference-case load forecast were described. The outputs from these tasks provided the input for estimating the technical potential scenario, which is discussed in this section.

The technical potential scenario estimates the potential energy and demand savings when all technically feasible and commercially available DSM measures are implemented without regard for cost-effectiveness and customer willingness to adopt the most impactful EE, DR, or DSRE technologies. Since the technical potential does not consider the costs or time required to achieve these savings, the estimates provide a theoretical upper limit on electricity savings potential. Technical potential is only constrained by factors such as technical feasibility and applicability of measures. For this study, technical potential included full application of the commercially available DSM measures to all residential, commercial, and industrial customers in the utility's service territory.

5.1 Methodology

5.1.1 EE Technical Potential

EE technical potential refers to delivering less electricity to the same end-uses. In other words, technical potential might be summarized as “doing the same thing with less energy, regardless of the cost.”

DSM measures were applied to the disaggregated utility electricity sales forecasts to estimate technical potential. This involved applying estimated energy savings from equipment and non-equipment measures to all electricity end-uses and customers. Technical potential consists of the total energy and demand that can be saved in the market which Resource Innovations reported as single numerical values for each utility's service territory.

The core equation used in the residential sector EE technical potential analysis for each individual efficiency measure is shown in Equation 1 below, while the core equation used in the nonresidential sector technical potential analysis for each individual efficiency measure is shown in Equation 2.

Equation 1: Core Equation for Residential Sector EE Technical Potential



Where:

- **Baseline Equipment Energy Use Intensity** = the electricity used per customer per year by each baseline technology in each market segment. In other words, the baseline equipment energy-use intensity is the consumption of the electrical energy using equipment that the efficient technology replaces or affects.
- **Saturation Share** = the fraction of the end-use electrical energy that is applicable for the efficient technology in a given market segment. For example, for residential cooling, the saturation share would be the fraction of all residential electric customers that have central air conditioners in their household.
- **Percent Incomplete** = the fraction of equipment that is not considered to already be energy efficient. To extend the example above, the fraction of central air conditioners that is not already energy efficient.
- **Feasibility Factor** = the fraction of units that is technically feasible for conversion to the most efficient available technology from an engineering perspective (i.e., it may not be possible to install LEDs in all light sockets in a home because the available styles may not fit in every socket).
- **Savings Factor** = the percentage reduction in electricity consumption resulting from the application of the efficient technology.

Equation 2: Core Equation for Non-Residential Sector EE Technical Potential



Where:

- **Total Stock Square Footage by Segment** = the forecasted square footage level for a given building type (e.g., square feet of office buildings).
- **Baseline Equipment Energy Use Intensity** = the electricity used per square foot per year by each baseline equipment type in each market segment.

- **Saturation Shares** = the fraction of total end-use energy consumption associated with the efficient technology in a given market segment. For example, for packaged terminal air-conditioner (PTAC), the saturation share would be the fraction of all space cooling kWh in a given market segment that is associated with PTAC equipment.
- **Percent Incomplete** = the fraction of equipment that is not considered to already be energy efficient.
- **Feasibility Factor** = the fraction of the equipment or practice that is technically feasible for conversion to the efficient technology from an engineering perspective (i.e., it may not be possible to install Variable Frequency Drives (VFD) on all motors in a given market segment).
- **Savings Factor** = the percentage reduction in electricity consumption resulting from the application of the efficient technology.

It is important to note that the technical potential estimate represents electricity savings potential at a specific point in time. In other words, the technical potential estimate is based on data describing status quo customer electricity use and technologies known to exist today. As technology and electricity consumption patterns evolve over time, the baseline electricity consumption will also change accordingly. For this reason, technical potential is a discrete estimate of a dynamic market. Resource Innovations reported the technical potential for 2025, based on currently known DSM measures and observed electricity consumption patterns.

Measure Interaction and Competition (Overlap)

While the technical potential equations listed above focus on the technical potential of a single measure or technology, Resource Innovations' modeling approach does recognize the overlap of individual measure impacts within an end-use or equipment type, and accounts for the following interactive effects:

- **Measure interaction:** Installing high-efficiency equipment could reduce energy savings in absolute terms (kWh) associated with non-equipment measures that impact the same end-use. For example, installing a high-efficiency heat pump will reduce heating and cooling consumption which will reduce the baseline against which attic insulation would be applied, thus reducing savings associated with installing insulation. To account for this interaction, Resource Innovations' TEA-POT model ranks measures that interact with one another and reduces the baseline consumption for the subsequent measure based on the savings achieved by the preceding measure. For technical potential, interactive measures are ranked based on total end-use energy savings percentage.
- **Measure competition (overlap):** The "measure share"—as defined above—accounted for competing measures, ensuring savings were not double-counted. This interaction

occurred when two or more measures “competed” for the same end-use. For example, a T-12 lamp could be replaced with a T-8 or linear LED lamp.

Addressing Naturally-Occurring EE

Naturally occurring energy efficiency includes actions taken by customers to improve the efficiency of their homes and businesses in the absence of utility program intervention. For the analysis of technical potential, Resource Innovations verified with JEA’s forecasting group that the baseline sales forecasts incorporated two known sources of naturally-occurring efficiency:

- Codes and Standards: The sales forecasts already incorporated the impacts of known Code & standards changes.
- Baseline Measure Adoption: The sales forecast excluded the projected impacts of future DSM efforts but included already implemented DSM penetration.

By properly accounting for these factors, the technical potential analysis estimated the additional EE opportunities beyond what is already included in the utility sales forecast.

5.1.2 DR Technical Potential

The concept of technical potential applies differently to DR than for EE. Technical potential for DR is effectively the magnitude of loads that can be curtailed during conditions when utilities need peak capacity reductions. In evaluating this potential at peak capacity, the following were considered: which customers are consuming electricity at those times? What end-uses are in play? Can those end-use loads be managed? Large C&I accounts generally do not provide the utility with direct control over particular end-uses. Instead, many of these customers will forego electric demand temporarily if the financial incentive is large enough. For residential and small C&I customers where DR generally takes the form of direct utility control, technical potential for DR is limited by the loads that can be controlled remotely at scale.

This framework makes end-use disaggregation an important element for understanding DR potential, particularly in the residential and small C&I sectors. When done properly, end-use disaggregation not only provides insights into which loads are on and off when specific grid services are needed, it also provides insight concerning how key loads and end-uses, such as air conditioning use, vary across customers. Resource Innovations’ approach used for load disaggregation is more advanced than what is used for most potential studies. Instead of disaggregating annual consumption or peak demand, Resource Innovations produced end-use load disaggregation for all 8,760 hours. This was needed because the loads available at times when different grid applications are needed can vary substantially. Instead

of producing disaggregated loads for the average customer, the study was produced for several customer segments. For JEA, Resource Innovations examined three residential segments based on customer housing type, four different small C&I segments based on customer size, and four different large C&I segments based on customer size, for a total of 11 different customer segments.

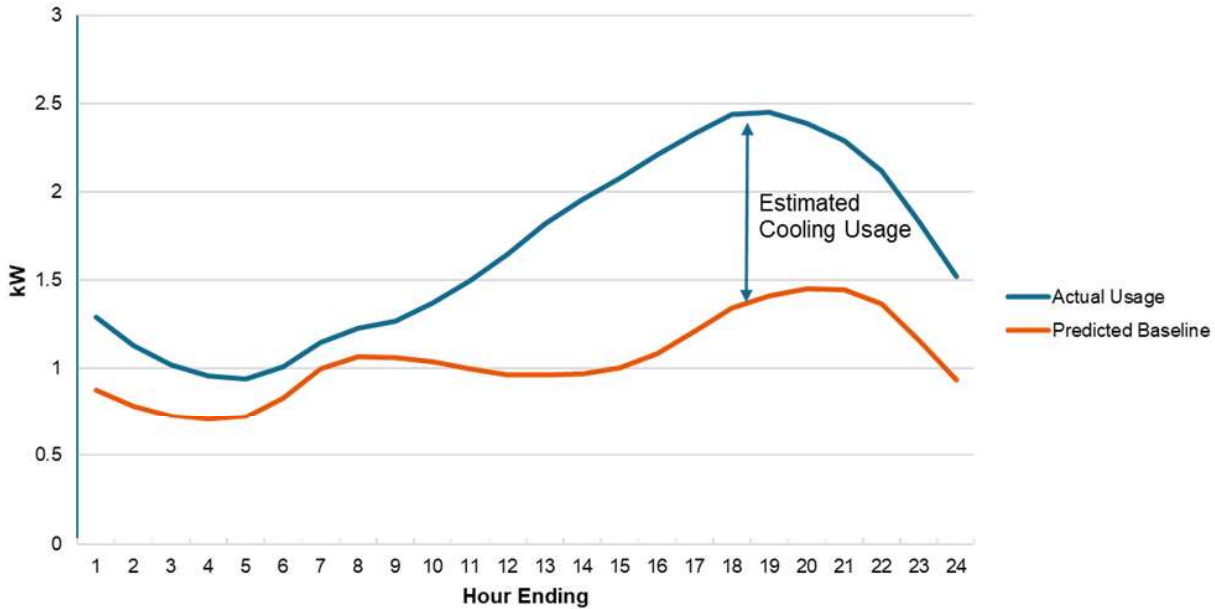
Technical potential, in the context of DR, is defined as the total amount of load available for reduction that is coincident with the period of interest; in this case, the system peak hour for the summer and winter seasons. Thus, two sets of capacity values are estimated: a summer capacity and a winter capacity.

As previously mentioned, for technical potential purposes, all coincident large C&I load is considered dispatchable, while residential and small C&I DR capacity is based on specific end-uses. Summer DR capacity for residential customers was comprised of air-conditioning (AC), pool pumps, water heaters, and managed electric vehicle charging. For small C&I customers, summer capacity was based on AC load. For winter DR capacity, residential was based on electric heating, pool pumps, and water heaters. For small C&I customers, winter capacity was based on electric heating.

AC and heating load profiles were generated for residential and small C&I customers using a segment-level interval data provided by JEA. Resource Innovations then used the interval data to create an average load profile for each customer segment.

The average load profile for each customer segment was combined with historical weather data, and used to estimate hourly load as a function of weather conditions. AC and heating loads were estimated by first calculating the baseline load on days when cooling degree days (CDD) and heating degree days (HDD) were equal to zero, and then subtracting this baseline load. This methodology is illustrated by Figure 9 (a similar methodology was used to predict heating loads).

Figure 9: Methodology for Estimating Cooling Loads



This method was able to produce estimates for average AC/heating load profiles for the different customer segments within the residential and small C&I sectors.

Profiles for residential water heater and pool pump loads were estimated by utilizing end-use load data from NREL’s residential end-use load profile database.

For all eligible loads, the technical potential was defined as the amount that was coincident with system peak hours for each season, which are August from 4:00-5:00 PM for summer, and January from 7:00-8:00 AM for winter. As mentioned in Section 4, for technical potential there was also no measure breakout needed, because all measures will target the end-uses’ estimated total loads.

5.1.3 DSRE Technical Potential

5.1.3.1 PV Systems

To determine technical potential for PV systems, RI estimated the percentage of rooftop square footage in Florida that is suitable for hosting PV technology. Our estimate of technical potential for PV systems in this report is based in part on the available roof area and consisted of the following steps:

- Step 1: Outcomes from the forecast disaggregation analysis were used to characterize the existing and new residential, commercial and industrial building stocks.
 - To calculate the total roof area for residential buildings, the average roof area per household is multiplied by the number of households.
 - For commercial and industrial buildings, RI calculated the total roof area by first dividing the load forecast by the energy usage intensity, which provides an estimate of the total building square footage. This result is then divided by the average number of floors to derive the total roof area.
- Step 2: The total available roof area feasible for installing PV systems was calculated. Relevant parameters included unusable area due to other rooftop equipment and setback requirements, in addition to possible shading from trees and limitations of roof orientation (factored into a “technical suitability” multiplier).
- Step 3: Estimated the expected power density (kW per square foot of roof area).
- Step 4: Estimated the hourly PV generation profile using NREL’s PV Watts Calculator
- Step 5: Calculated total energy and coincident peak demand potential by applying RI’s Spatial Penetration and Integration of Distributed Energy Resources (SPIDER) Model.

The methodology presented in this report uses the following formula to estimate overall technical potential of PVs:

Equation 3: Core Equation for Solar DSRE Technical Energy Potential



Where:

- **Suitable Rooftop PV Area for Residential [Square Feet]:** Number of Residential Buildings x Average Roof Area Per Building x Technical Suitability Factor
- **Suitable Rooftop PV Area for Commercial [Square Feet] :** Energy Consumption [kWh] / Energy Intensity [kWh / Square Feet] / Average No. of Stories Per Building x Technical Suitability Factor
- **PV Power Density [kW-DC/Square Feet]:** Maximum power generated in Watts per square foot of solar panel.
- **Generation Factor:** Annual Energy Generation Factor for PV, from PV Watts (dependent on local solar irradiance)

5.1.3.2 Battery Storage Systems Charged from PV Systems

Battery storage systems on their own do not generate power or create efficiency improvements, but store power for use at different times. Therefore, in analyzing the technical potential for battery storage systems, the source of the stored power and overlap with technical potential identified in other categories was considered.

Battery storage systems that are powered directly from the grid do not produce annual energy savings but may be used to shift or curtail load during particular time periods. As the DR technical potential analyzes curtailment opportunities for the summer and winter peak period, and battery storage systems can be used as a DR technology, the study concluded that no additional technical potential should be claimed for grid-powered battery systems beyond that already attributed to DR.

Battery storage systems that are connected to on-site PV systems also do not produce additional energy savings beyond the energy produced from the PV system⁵. However, PV-connected battery systems do create the opportunity to store energy during period when the PV system is generating more than the home or business is consuming and use that stored power during utility system peak periods.

To determine the additional technical potential peak demand savings for “solar plus storage” systems, our methodology consisted of the following steps:

- Assume that every PV system included in PV Technical Potential is installed with a paired storage system.
- Size the storage system assuming peak storage power is equal to peak PV generation and energy storage duration is three hours.
- Apply RI’s hourly dispatch optimization module in SPIDER to create an hourly storage dispatch profile that flattens the individual customer’s load profile to the greatest extent possible accounting for a) customer hourly load profile, b) hourly PV generation profile, and c) battery peak demand, energy capacity, and roundtrip charge/discharge efficiency.
- Calculate the effective hourly impact for the utility using the above storage dispatch profile, aligned with the utility’s peak hour (calculated separately for summer and winter)
- Report the output storage kW impact on utility coincident peak demand in summer and winter.

⁵ PV-connected battery systems experience some efficiency loss due to storage, charging, and discharging. However, for this study, these losses were not quantified.

5.1.3.3 CHP Systems

The CHP analysis created a series of unique distributed generation potential models for each primary market sector (commercial and industrial).

Only non-residential customer segments whose electric and thermal load profiles allow for the application of CHP were considered. The technical potential analysis followed a three-step process. First, minimum facilities size thresholds were determined for each non-residential customer segment. Next, the full population of non-residential customers were segmented and screened based on the size threshold established for that segment. Finally, the facilities that were of sufficient size were matched with the appropriately sized CHP technology.

To determine the minimum threshold for CHP suitability, a thermal factor was applied to potential candidate customer loads to reflect thermal load considerations in CHP sizing. In most cases, on-site thermal energy demand is smaller than electrical demand. Thus, CHP size is usually dictated by the thermal load in order to achieve improved efficiencies.

The study collected electric and thermal intensity data from other recent CHP studies. For industrial customers, Resource Innovations assumed that the thermal load would primarily be used for process operations and was not modified from the secondary data sources for Florida climate conditions. For commercial customers, the thermal load is more commonly made up of water heating, space heating, and space cooling (through the use of an absorption chiller). Therefore, to account for the hot and humid climate in Florida, which traditionally limits weather-dependent internal heating loads, commercial customers' thermal loads were adjusted to incorporate a higher proportion of space cooling to space heating as available opportunities for waste heat recovery.

Resource Innovations worked with the utility-provided customer data, focusing on annual consumption due to the absence of NAICS or SIC codes for this utility data. Non-residential customers were subsequently classified based on annual consumption and size. Since NAICS or SIC codes were unavailable, no formal segmentation occurred. Instead, the analysis focused exclusively on annual utility usage. Facilities with annual loads below the kWh thresholds were deemed unlikely to possess the consistent electric and thermal loads necessary to support CHP and were consequently excluded from consideration. Conversely, those meeting the size criteria were aligned with the corresponding CHP technology.

In general, internal combustion engines are the prime mover for systems under 500kW with gas turbines becoming progressively more popular as system size increases above that. Based on the available load by customer, adjusted by the estimated thermal factor for each

segment, CHP technologies were assigned to utility customers in a top-down fashion (i.e., starting with the largest CHP generators).

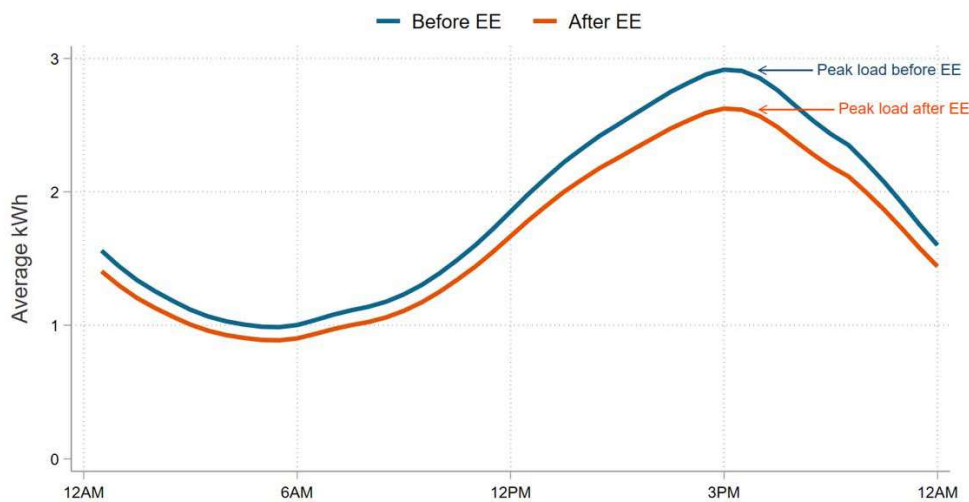
Measure Interaction

PV systems and battery storage charged from PV systems were analyzed collectively due to their common power generation source; and therefore, the identified technical potential for these systems is additive. However, CHP systems were independently analyzed for technical potential without consideration of the competition between DSRE technologies or customer preference for a particular DSRE system. Therefore, results for CHP technical potential should not be combined with PV systems or battery storage systems for overall DSRE potential but used as independent estimates.

5.1.4 Interaction of Technical Potential Impacts

As described above, the technical potential was estimated using separate models for EE, DR, and DSRE systems. However, there is interaction between these technologies; for example, a more efficient HVAC system would result in a reduced peak demand available for DR curtailment, as illustrated in Figure 10.

Figure 10: Illustration of EE Impacts on HVAC System Load Shape



Therefore, after development of the independent models, the interaction between EE, DR, and DSRE was incorporated as follows:

- The EE technical potential was assumed to be implemented first, followed by DR technical potential and DSRE technical potential.

- To account for the impact of EE technical potential on DR, the baseline load forecast for the applicable end-uses was adjusted by the EE technical potential, resulting in a reduction in baseline load available for curtailment.
- For DSRE systems, the EE and DR technical potential was incorporated in a similar fashion, adjusting the baseline load used to estimate DSRE potential.
 - For the PV analysis, this did not impact the results as the EE and DR technical potential did not affect the amount of PV that could be installed on available rooftops.
 - For the battery storage charged from PV systems, the reduced baseline load from EE resulted in additional PV-generated energy being available for the battery systems and for use during peak periods. The impact of DR events during the assumed curtailment hours was incorporated into the modeling of available battery storage and discharge loads.
- For CHP systems, the reduced baseline load from EE resulted in a reduction in the number of facilities that met the annual energy threshold needed for CHP installations. Installed DR capacity was assumed to not impact CHP potential as the CHP system feasibility was determined based on energy and thermal consumption at the facility. It should be noted that CHP systems not connected to the grid could impact the amount of load available for curtailment with utility-sponsored DR. Therefore, CHP technical potential should not be combined with DR potential but used as independent estimates.

5.2 EE Technical Potential

5.2.1 Summary

Table 9 summarizes the EE technical potential by sector:

Table 9. EE Technical Potential

	Savings Potential		
	Summer Peak Demand (MW)	Winter Peak Demand (MW)	Energy (GWh)
Residential	517	297	1,887
Non-Residential⁶	280	251	1,690
Total	797	548	3,577

⁶ Non-Residential results include all commercial and industrial customer segments.

5.2.2 Residential

Figure 11, Figure 12, and Figure 13 summarize the residential sector EE technical potential by end-use.

Figure 11: Residential EE Technical Potential by End-Use (Summer Peak Savings)

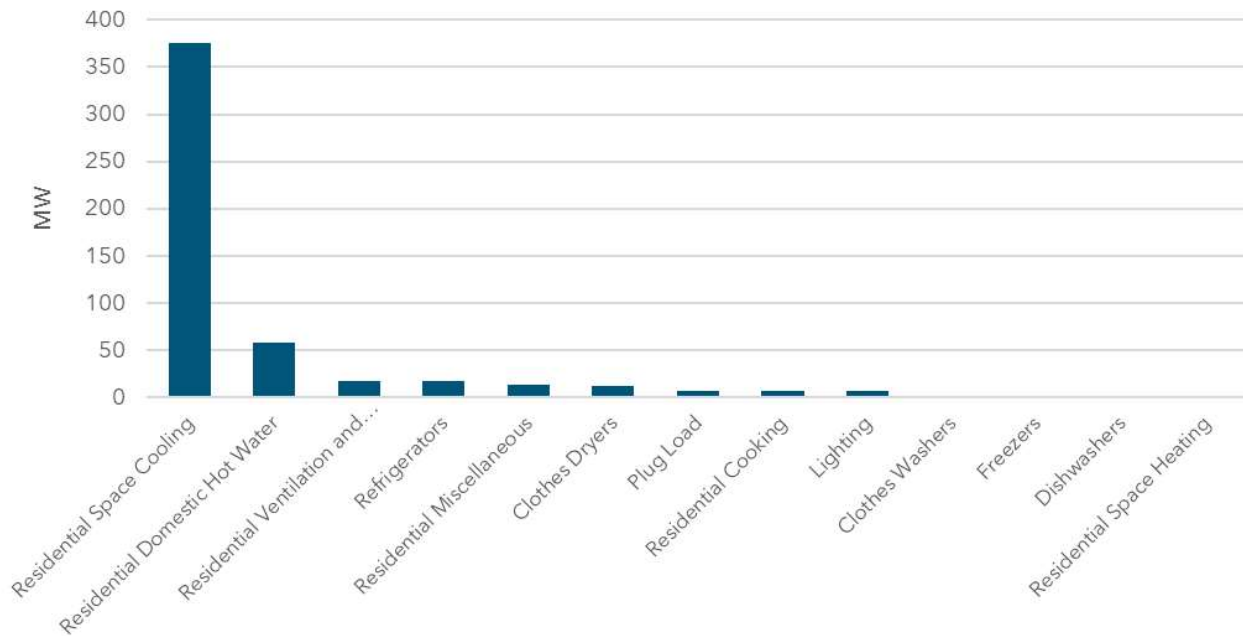


Figure 12: Residential EE Technical Potential by End-Use (Winter Peak Savings)

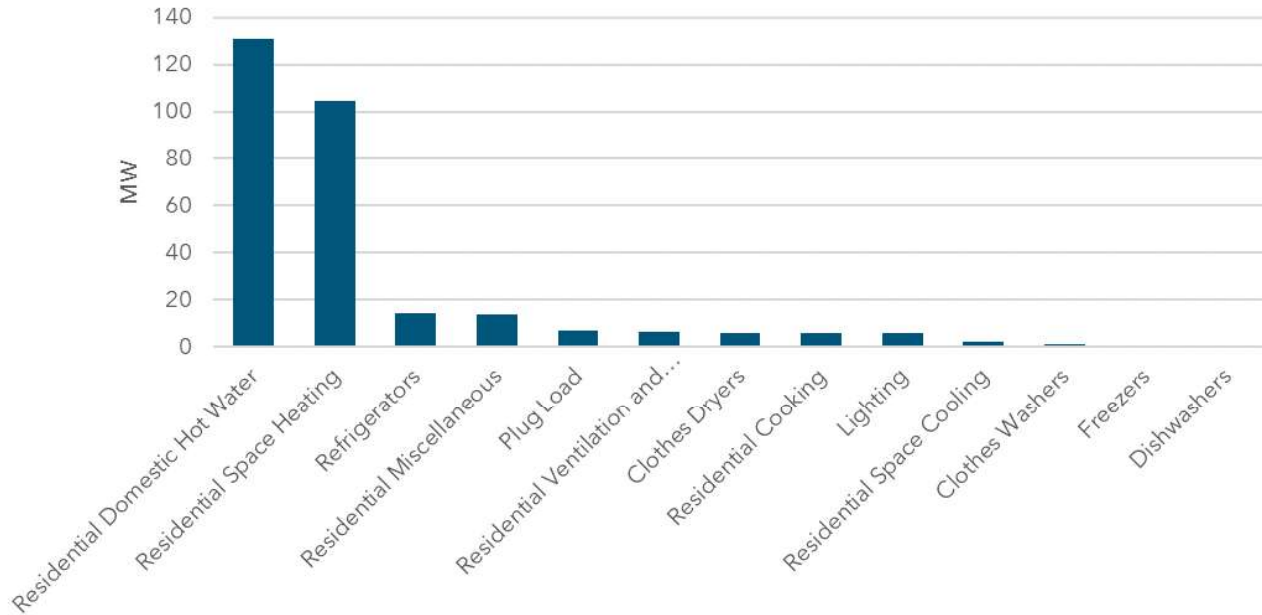
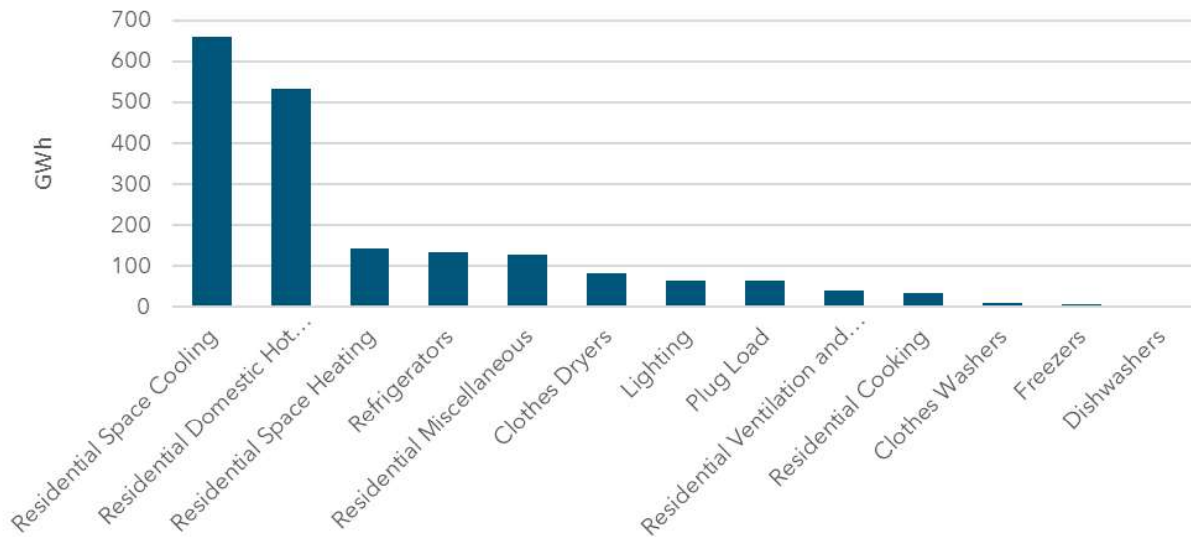


Figure 13: Residential EE Technical Potential by End-Use (Energy Savings)



5.2.3 Non-Residential

5.2.3.1 Commercial Segments

Figure 14, Figure 15, and Figure 16 summarize the commercial sector EE technical potential by end-use.

Figure 14: Commercial EE Technical Potential by End-Use (Summer Peak Savings)

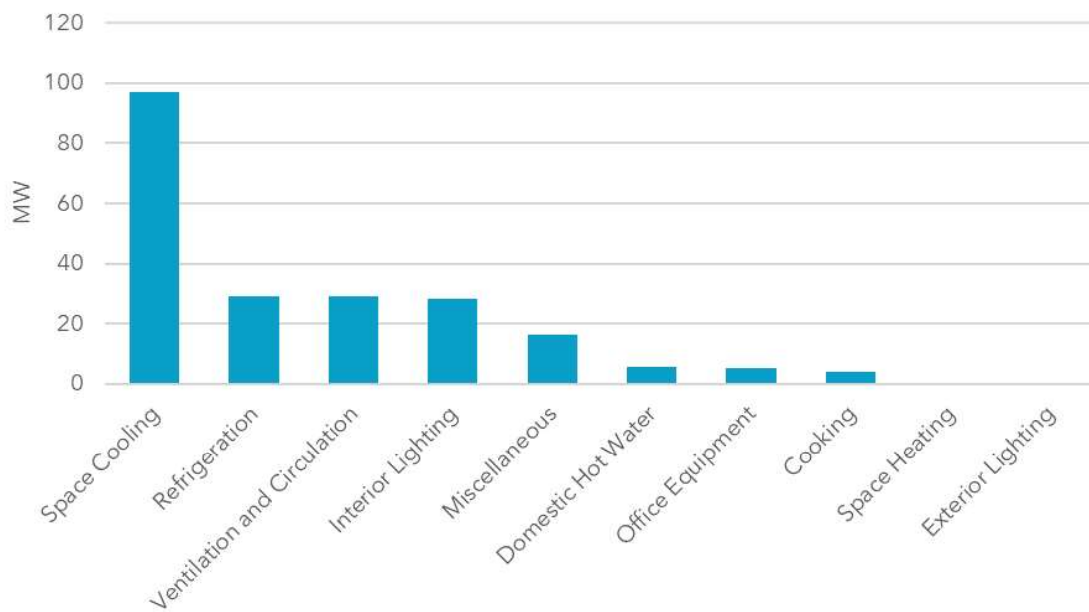


Figure 15: Commercial EE Technical Potential by End-Use (Winter Peak Savings)

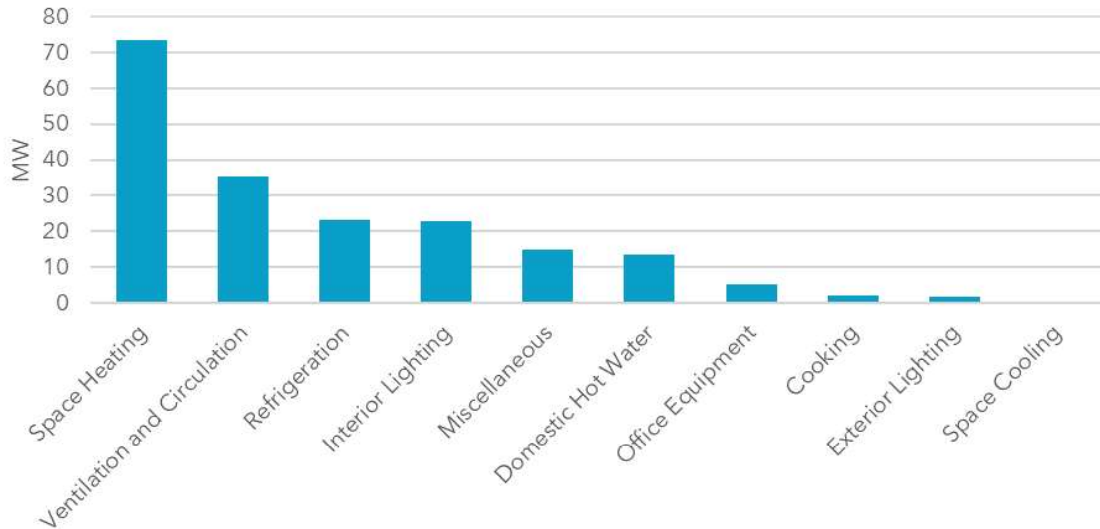
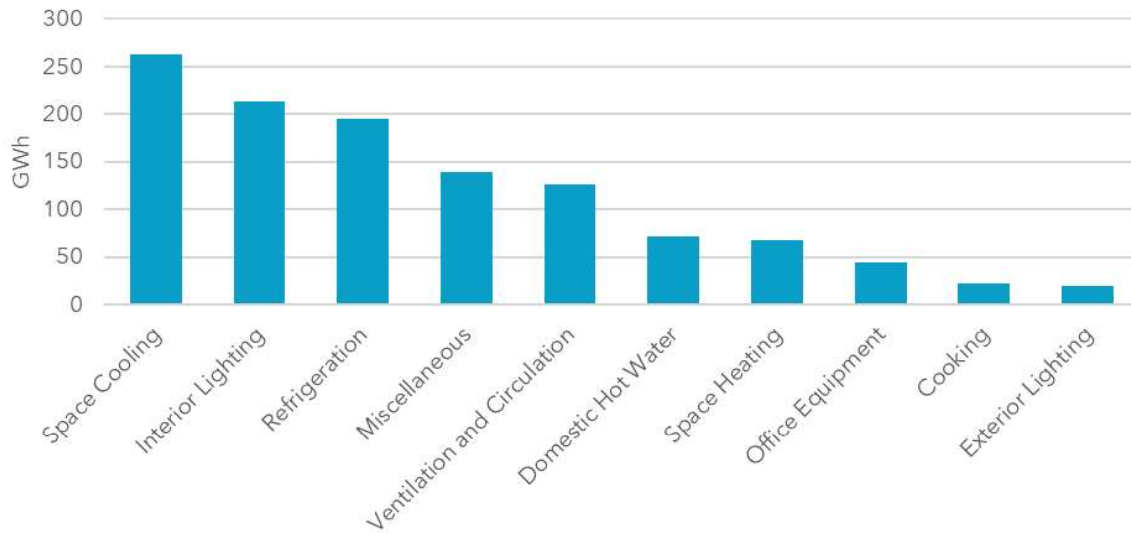


Figure 16: Commercial EE Technical Potential by End-Use (Energy Savings)



5.2.3.2 Industrial Segments

Figure 17, Figure 18, and Figure 19 summarize the industrial sector EE technical potential by end-use.

Figure 17: Industrial EE Technical Potential by End-Use (Summer Peak Savings)

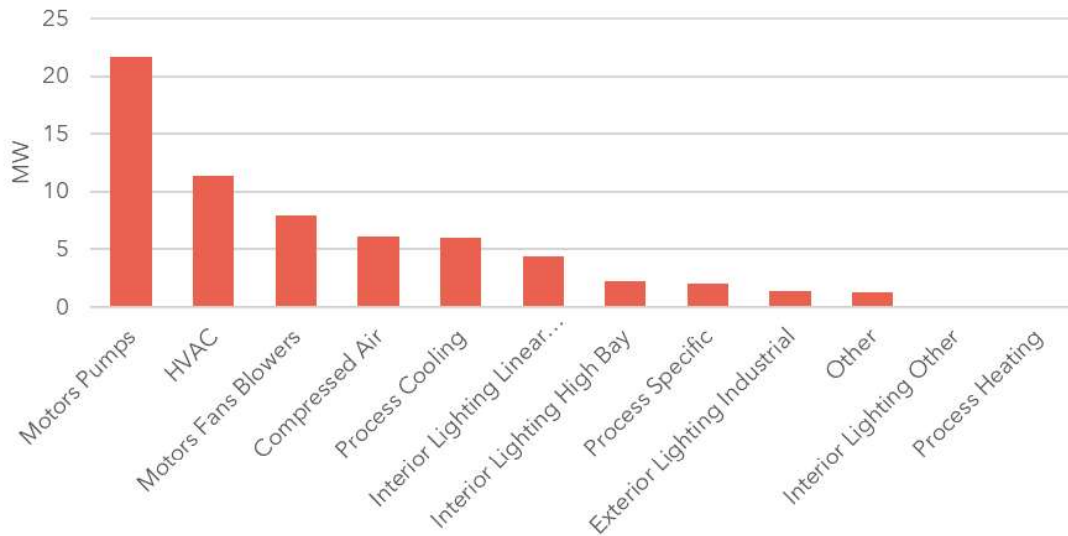


Figure 18: Industrial EE Technical Potential by End-Use (Winter Peak Savings)

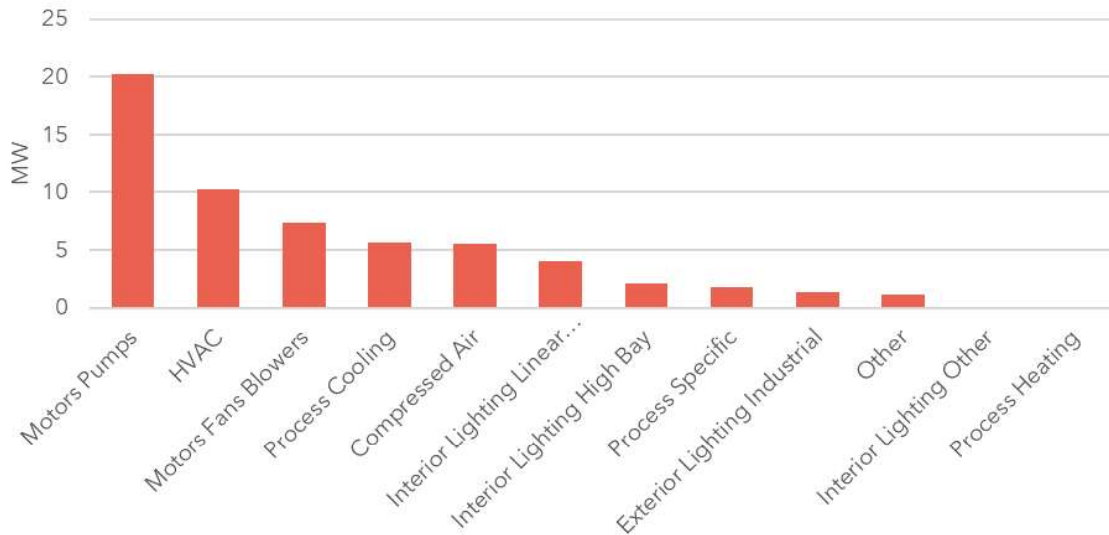
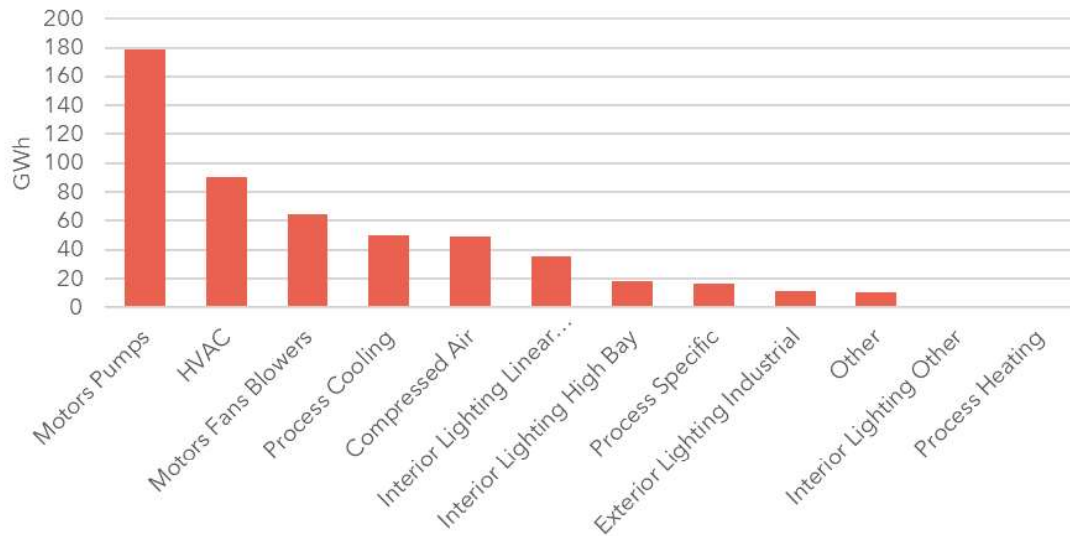


Figure 19: Industrial EE Technical Potential by End-Use (Energy Savings)



5.3 DR Technical Potential

Technical potential for DR is defined for each class of customers as follows:

- Residential & Small C&I customers - Technical potential is equal to the aggregate load for all end-uses that can participate in JEA's current programs plus DR measures not currently offered in which the utility uses specialized devices to control loads (i.e., direct load control programs). This includes cooling and heating loads for residential and small C&I customers and water heater and pool pump loads for residential customers. Not all demand reductions are delivered via direct load control of end-uses. The magnitude of demand reductions from non-direct load control such as time varying pricing, peak time rebates and targeted notifications is linked to cooling and heating loads.
- Large C&I customers - Technical potential is equal to the total amount of load for each customer segment (i.e., that customers reduce their total load to zero when called upon).

Table 10 summarizes the seasonal DR technical potential by sector:

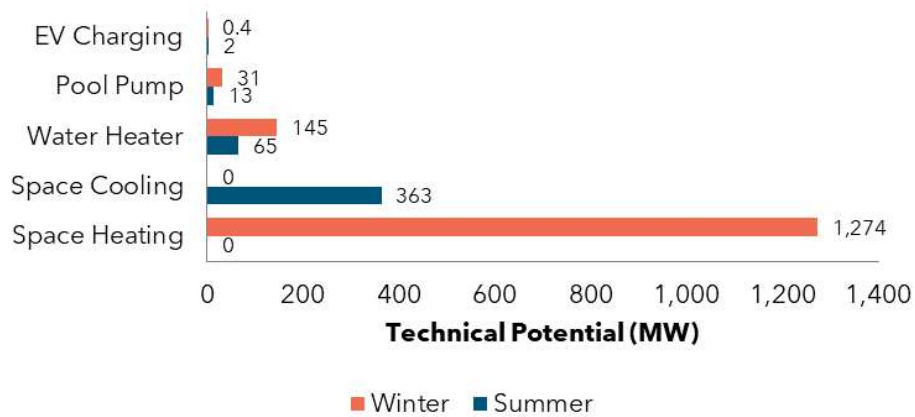
Table 10. DR Technical Potential

	Savings Potential	
	Summer Peak Demand (MW)	Winter Peak Demand (MW)
Residential	443	1,451
Non-Residential	673	578
Total	1,116	2,029

5.3.1 Residential

Residential technical potential is summarized in Figure 20.

Figure 20: Residential DR Technical Potential by End-Use

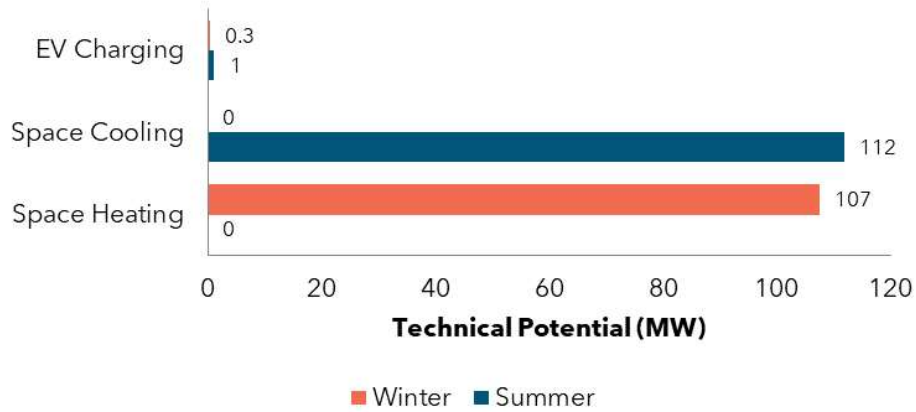


5.3.2 Non-Residential

5.3.2.1 Small C&I Customers

For small C&I technical potential, Resource Innovations looked at cooling and heating loads only. Small C&I technical potential is provided in Figure 21.

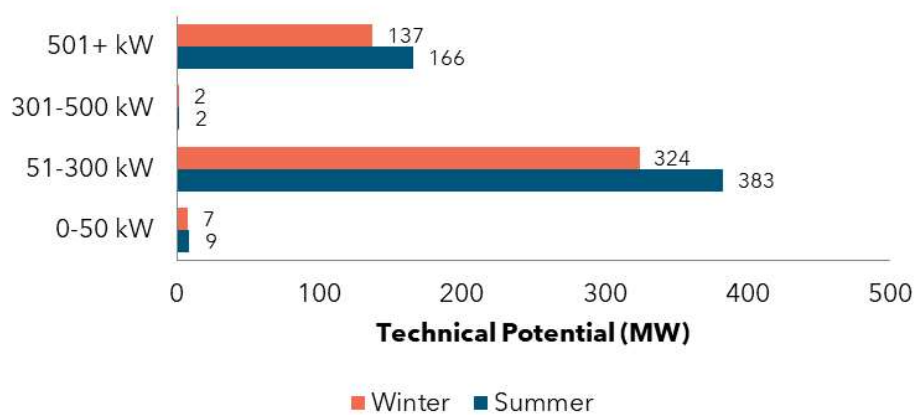
Figure 21: Small C&I DR Technical Potential by End-Use



5.3.2.2 Large C&I Customers

Figure 22 provides the technical potential for large C&I customers, broken down by customer size.

Figure 22: Large C&I DR Technical Potential by Segment



5.4 DSRE Technical Potential

Table 11 provides the results of the DSRE technical potential for each customer segment:

Table 11. DSRE Technical Potential⁷

	Savings Potential		
	Summer Peak Demand (MW)	Winter Peak Demand (MW)	Energy (GWh)
PV Systems			
Residential	493	19	4,146
Non-Residential	214	3	1,617
Total	707	22	5,763
Battery Storage charged from PV Systems			
Residential	304	557	0
Non-Residential	0	158	0
Total	304	715	0
CHP Systems			
Total	397	359	1,811

⁷ PV systems and CHP systems were independently analyzed for technical potential without consideration of the competition between technologies or customer preference for DSRE system.

Appendix A EE Measure List

For information on how Resource Innovations developed this list, please see Section 4.

Table 12: Residential EE Measures

Measure	End-Use	Description	Baseline
120v Heat Pump Water Heater 50 Gallons	Residential Domestic Hot Water	120v Heat Pump Water Heater 50 Gallons	Code-Compliant 50 Gallon Electric Resistance Water Heater
Air Sealing-Infiltration Control	Residential Space Cooling, Residential Space Heating	Standard Heating and Cooling System with Improved Infiltration Control	Standard Heating and Cooling System with Standard Infiltration Control
Air-to-Water Heat Pump	Residential Space Cooling, Residential Space Heating	Energy Star Air-to-Water Heat Pump, 25 SEER, 13 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
ASHP - 15 SEER/14.3 SEER2 from base electric resistance	Residential Space Cooling, Residential Space Heating	ASHP 15 SEER from base electric resistance	Base AC, 15 SEER, Electric resistance heating
ASHP - 24 SEER/22.9 SEER2 (from elec resistance)	Residential Space Cooling, Residential Space Heating	ASHP: 24/22.9 SEER/SEER2, 10.5 HSPF	Base AC, 15 SEER, Electric resistance heating
ASHP - 24 SEER/22.9 SEER2, 10.5 HSPF	Residential Space Cooling, Residential Space Heating	ASHP: 24/22.9 SEER/SEER2, 10.5 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
ASHP - CEE Advanced Tier: 17.8 SEER/17 SEER2; 10.0 HSPF	Residential Space Cooling, Residential Space Heating	CEE Advanced Tier ASHP: 17.8/17 SEER/SEER2; 10.0 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
ASHP - CEE Advanced Tier: 17.8 SEER/17 SEER2; 10.0 HSPF (from elec resistance)	Residential Space Cooling, Residential Space Heating	CEE Advanced Tier ASHP: 17.8/17 SEER/SEER2; 10.0 HSPF	Base AC, 15 SEER, Electric resistance heating
ASHP - CEE Tier 2: 16.8 SEER/16 SEER2; 9.0 HSPF	Residential Space Cooling, Residential Space Heating	CEE Tier 2 ASHP: 16.8/16 SEER/SEER2; 9.0 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
ASHP - CEE Tier 2: 16.8 SEER/16 SEER2; 9.0 HSPF (from elec resistance)	Residential Space Cooling, Residential Space Heating	CEE Tier 2 ASHP: 16.8/16 SEER/SEER2; 9.0 HSPF	Base AC, 15 SEER, Electric resistance heating

Measure	End-Use	Description	Baseline
ASHP - ENERGY STAR/CEE Tier 1: 16 SEER/15.2 SEER2 (from elect resistance)	Residential Space Cooling, Residential Space Heating	ENERGY STAR/CEE Tier 1 ASHP: 16/15.2 SEER/SEER2, 9.0 HSPF	Base AC, 15 SEER, Electric resistance heating
ASHP - ENERGY STAR/CEE Tier 1: 16 SEER/15.2 SEER2, 9.0 HSPF	Residential Space Cooling, Residential Space Heating	ENERGY STAR/CEE Tier 1 ASHP: 16/15.2 SEER/SEER2, 9.0 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
Basement or Crawlspace Wall Insulation R-15	Residential Space Cooling, Residential Space Heating	Increased Basement or Crawlspace Wall Insulation (R-15)	Code-Compliant Exterior Below-Grade Wall Insulation (R-10)
Bathroom Faucet Aerators	Residential Domestic Hot Water	Low-Flow Faucet Aerator with Flow Rate of 1.5 gpm	Faucet Aerator with Federal Standard Flow Rate of 2.2 gpm
CEE Advanced Tier Clothes Dryer	Clothes Dryers	CEE Advanced Tier Clothes Dryer	One Clothes Dryer meeting Federal Standard
CEE Advanced Tier Clothes Washer	Clothes Washers	Tier 3 CEE Clothes washer	One Clothes Washer meeting Federal Standard
CEE Tier 3 Refrigerator	Refrigerators	Residential Tier 3 Refrigerator	One Refrigerator meeting Federal Standard
Ceiling Insulation (R11 to R38)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1982-1985) homes	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R11 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1982-1985) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R19 to R38)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1982-2020) homes	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R19 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1982-2020) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R2 to R38)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, older (pre-1982) homes	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R2 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, older (pre-1982) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R30 to R38)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1986-2020) homes	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R30 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1986-2020) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R38 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1986-2020) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction

Measure	End-Use	Description	Baseline
Central AC - CEE Tier 2: 16.8 SEER/16 SEER2	Residential Space Cooling	Central AC - CEE Tier 2: 16.8 SEER/16 SEER2	Code-Compliant Central AC, 15 SEER (updated)
Central AC - 24 SEER/22.9 SEER2	Residential Space Cooling	Central AC - 24 SEER/22.9 SEER2	Code-Compliant Central AC, 15 SEER (updated)
Central AC - CEE Advanced Tier: 17.8 SEER/17 SEER2	Residential Space Cooling	Central AC - CEE Advanced Tier: 17.8 SEER/17 SEER2	Code-Compliant Central AC, 15 SEER (updated)
Central AC - ENERGY STAR/CEE Tier 1: 16 SEER/15.2 SEER2	Residential Space Cooling	Central AC - ENERGY STAR/CEE Tier 1: 16 SEER/15.2 SEER2	Code-Compliant Central AC, 15 SEER (updated)
Central AC Tune Up	Residential Space Cooling	System tune-up, including coil cleaning, refrigerant charging, and other diagnostics	Existing Typical Central AC without Regular Maintenance/tune-up
Dehumidifier Recycling	Plug Load	No dehumidifier	One Dehumidifier meeting Federal Standard
Drain Water Heat Recovery	Residential Domestic Hot Water	50 Gallon Electric Resistance Heater and Drain Water Heat Exchanger	50 Gallon Electric Resistance Heater, No Drain Water Heat Recovery
Duct Insulation	Residential Space Cooling, Residential Space Heating	Standard Electric Heating and Central AC with Insulated Ductwork	Standard Electric Heating and Central AC with Uninsulated Ductwork
Duct Repair	Residential Space Cooling, Residential Space Heating	Duct Repair to eliminate/minimize leaks, includes testing and sealing	Standard Electric Heating and Central AC with typical duct leakage
ECM Circulator Pump	Residential Miscellaneous	Install ECM Circulator Pump	Install Standard Circulator Pump
Energy Star Air Purifier	Plug Load	One Air Purifier meeting ENERGY STAR 2.0 Standards	One Standard Conventional Air Purifier
Energy Star Audio-Video Equipment	Plug Load	One DVD/Blu-Ray Player meeting current ENERGY STAR Standards	One Market Average DVD/Blu-Ray Player
Energy Star Bathroom Ventilating Fan	Residential Ventilation and Circulation	Bathroom Exhaust Fan meeting current ENERGY STAR Standards	Bathroom Exhaust Fan meeting Federal Standard
Energy Star Ceiling Fan	Residential Miscellaneous	60" Ceiling Fan Meeting ENERGY STAR 3.1 Standards	Standard 60" Ceiling Fan
Energy Star Clothes Dryer	Clothes Dryers	One Electric Resistance Clothes Dryer meeting ENERGY STAR 1.1 Standards	One Clothes Dryer meeting Federal Standard
Energy Star Clothes Washer	Clothes Washers	One Clothes Washer meeting ENERGY STAR 8.1 Standards	One Clothes Washer meeting Federal Standard

Measure	End-Use	Description	Baseline
Energy Star Dehumidifier	Plug Load	One Dehumidifier meeting ENERGY STAR 5.0 Standards	One Dehumidifier meeting Federal Standard
Energy Star Dishwasher	Dishwashers	One Dishwasher meeting ENERGY STAR 7.0 Requirements (effective on July 19, 2023), electric water heating	One Dishwasher meeting Federal Standard
Energy Star Dishwasher (Gas Water Heating)	Dishwashers	One Dishwasher meeting ENERGY STAR 7.0 Requirements, gas water heating	One Dishwasher meeting Federal Standard; gas water heating
Energy Star Door	Residential Space Cooling, Residential Space Heating	100ft ² of Opaque Door meeting Energy Star Version 6.0 Requirements (U-Value: 0.17)	100ft ² of Opaque Door meeting current FL Code Requirements
ENERGY STAR EV supply equipment (level 2 charger)	Residential Miscellaneous	Level 2 Electric Vehicle Supply Equipment (EVSE)	Level 1 Electric Vehicle Supply Equipment (EVSE)
Energy Star Freezer	Freezers	One Freezer meeting current ENERGY STAR 5.1 Standards	One Freezer meeting Federal Standard
Energy Star Ground Source Heat Pump	Residential Space Cooling, Residential Space Heating	Energy Star GSHP, 17.1 SEER, 12 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF
Energy Star Imaging Equipment	Plug Load	One imaging device meeting current ENERGY STAR Standards	One non-ENERGY STAR imaging device
Energy Star Monitor	Plug Load	One Monitor meeting ENERGY STAR 8.0 Standards	One Standard Monitor
Energy Star Personal Computer	Plug Load	One Personal Computer meeting ENERGY STAR 8.0 Standards	One Personal Computer meeting ENERGY STAR® 3.0 Standards
Energy Star Refrigerator	Refrigerators	One Refrigerator/Freezer meeting ENERGY STAR 5.1 Standards	One Refrigerator/Freezer meeting Federal Standard
Energy Star Room AC	Residential Space Cooling	Room AC meeting current ENERGY STAR standards	Code-Compliant Room AC
Energy Star Set-Top Receiver	Plug Load	One Set-top Box meeting ENERGY STAR 4.1 Standards	One Market Average Set-top Box
Energy Star TV	Plug Load	One Television meeting ENERGY STAR 9.0 Standards	One non-ENERGY STAR Television
Energy Star Windows	Residential Space Cooling, Residential Space Heating	100ft ² of Window meeting Energy Star Version 6.0 Requirements (U-Value: 0.27, SHGC: 0.21)	100ft ² of Window current FL energy code requirements
Exterior Wall Insulation	Residential Space Cooling, Residential Space Heating	Increased Exterior Above-Grade Wall Insulation (R-13)	Market Average Existing Exterior Above-Grade Wall Insulation

Measure	End-Use	Description	Baseline
Filter Whistle	Residential Ventilation and Circulation	Install the Furnace Filter Alarm	No Furnace Filter Alarm on a Central Forced-Air Furnace
Floor Insulation	Residential Space Heating	Increased Floor Insulation (R-30)	Code-Compliant Floor Insulation
Freezer Recycling	Freezers	No Freezer	Current Market Freezer
Green Roof	Residential Space Cooling	Vegetated Roof Surface on top of Standard Roof	Standard Black Roof
Heat Pump Clothes Dryer	Clothes Dryers	One Heat Pump Clothes Dryer	One Clothes Dryer meeting Federal Standard
Heat Pump Pool Heater	Residential Miscellaneous	Heat Pump Swimming Pool Heater	Electric Resistance Swimming Pool Heater
Heat Pump Tune Up	Residential Space Cooling, Residential Space Heating	System tune-up, including coil cleaning, refrigerant charging, and other diagnostics	Standard Heating and Cooling System without Regular Maintenance/tune-up
Heat Pump Water Heater 50 Gallons-CEE Advanced Tier	Residential Domestic Hot Water	CEE Advanced Tier Heat Pump Water Heater 50 Gallons	Code-Compliant 50 Gallon Electric Resistance Water Heater
Heat Pump Water Heater 50 Gallons-ENERGY STAR	Residential Domestic Hot Water	Heat Pump Water Heater 50 Gallons	Code-Compliant 50 Gallon Electric Resistance Water Heater
Heat Pump Water Heater 80 Gallons-ENERGY STAR	Residential Domestic Hot Water	Energy Star Heat Pump Water Heater 80 Gallons	Code-Compliant 80 Gallon Electric Resistance Water Heater
Heat Trap	Residential Domestic Hot Water	Heat Trap	Existing Water Heater without heat trap
High Efficiency Convection Oven	Residential Cooking	One Full-Size Convection Oven meeting ENERGY STAR 3.0 Standards	One Standard Economy-Grade Full-Size Oven
High Efficiency Induction Cooktop	Residential Cooking	One residential induction cooktop	One standard residential electric cooktop
Home Energy Management System	Lighting, Plug Load, Residential Space Cooling, Residential Space Heating	Typical HVAC by Building Type Controlled by Energy Management System	Typical HVAC by Building Type, Manually Controlled
Hot Water Pipe Insulation	Residential Domestic Hot Water	1' of Insulated Pipe in Unconditioned Spaces, Insulation of R-5	1' of Pipe in Unconditioned Spaces with Code Minimum of 1" of Insulation
HVAC ECM Motor	Residential Ventilation and Circulation	A brushless permanent magnet (ECM) blower motor for electric furnace	Permanent Split Capacitor Motor for Electric Furnace
HVAC Economizer	Residential Space Cooling	Install residential economizer	No economizer
HVAC Zoning System	Residential Space Cooling, Residential Space Heating	Install dampers in the ducts, dividing home into multiple	Single zone HVAC system

Measure	End-Use	Description	Baseline
		zones, each controlled by its own thermostat	
Indoor Daylight Sensor	Lighting	Install Indoor Daylight Sensors, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Induction Range	Residential Cooking	Residential induction range	Electric range
Instantaneous Hot Water System	Residential Domestic Hot Water	Instantaneous Hot Water System	Standard Efficiency Storage Tank Water Heater
Kitchen Faucet Aerators	Residential Domestic Hot Water	Low-Flow Faucet Aerator with Flow Rate of 1.5 gpm	Faucet Aerator with Federal Standard Flow Rate of 2.2 gpm
LED - 9W_CFL Baseline	Lighting	LED (assume 9W) replacing CFL baseline lamp	14W CFL (60W equivalent)
LED - 9W_Halogen Baseline	Lighting	LED (assume 9W) replacing EISA-2020 compliant baseline lamp	EISA-2020 compliant baseline lamp (60W equivalent)
LED Specialty Lamps-5W Chandelier	Lighting	5 W Chandelier LED	Standard incandescent chandelier lamp
Linear LED	Lighting	Linear LED Lamps in Linear Fluorescent Fixture	Standard (32w) T8 lamps in Linear Fluorescent Fixture
Low Flow Showerhead	Residential Domestic Hot Water	Low-Flow Handheld Showerhead, Flow Rate: 1.60 gpm	Standard Handheld Showerhead, Flow Rate: 2.50 gpm
New Construction - Whole Home Improvements - Tier 1	Whole Home	Performance-based improvements in new homes - 20% savings	Residential New Construction (Baseline Efficiency)
New Construction - Whole Home Improvements - Tier 2	Whole Home	Performance-based improvements in new homes - 35% savings	Residential New Construction (Baseline Efficiency)
Occupancy Sensors Switch Mounted	Lighting	Switch Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor Lighting Timer	Lighting	Timer on Outdoor Lighting, Controlling 120 Watts	120 Watts of Lighting, Manually Controlled
Outdoor Motion Sensor	Lighting	Motion Sensor on Outdoor Lighting, Controlling 120 Watts	120 Watts of Lighting, Manually Controlled
Ozone Laundry	Clothes Washers	Add a New, Single-Unit Ozone Laundry System to the Clothes Washer	One Clothes Washer meeting Federal Standard
Programmable Thermostat	Residential Space Cooling, Residential Space Heating	Standard Heating and Cooling System with Programmable Thermostat	Standard Heating and Cooling System with Manual Thermostat
Properly Sized CAC	Residential Space Cooling	Properly Sized Central Air Conditioning	Standard Central Air Conditioning, Oversized

Measure	End-Use	Description	Baseline
Radiant Barrier	Residential Space Cooling	Radiant Barrier	No radiant barrier
Reflective Roof	Residential Space Cooling	Reflective Roof Treatment	Standard dark shingle
Refrigerator Coil Cleaning	Refrigerators	Refrigerator Coil Cleaning	
Refrigerator Recycling	Refrigerators	No Refrigerator	Current Market Average Refrigerator
Residential Whole House Fan	Residential Space Cooling	Standard Central Air Conditioning with Whole House Fan	Standard Central Air Conditioning, No Whole House Fan
Sealed crawlspace	Residential Space Cooling, Residential Space Heating	Encapsulated and semi-conditioned crawlspace	Naturally vented, unconditioned crawlspace
Smart Breaker	Whole Home	Smart Breaker	standard electric breakers
Smart Panel	Whole Home	Multi-channel device that attaches to customer's circuit breaker to enable monitoring and control of major end-use appliances by customer	standard electric panel
Smart Power Strip	Plug Load	Smart plug strips for entertainment centers and home office	Standard entertainment center or home office usage, no smart strip controls
Smart Thermostat	Residential Space Cooling, Residential Space Heating	Standard Heating and Cooling System with Smart Thermostat	Standard Heating and Cooling System with Manual Thermostat
Solar Attic Fan	Residential Space Cooling	Standard Central Air Conditioning with Solar Attic Fan	Standard Central Air Conditioning, No Solar Attic Fan
Solar Pool Heater	Residential Miscellaneous	Solar Swimming Pool Heater	Electric Resistance Swimming Pool Heater
Solar Powered Pool Pumps	Residential Miscellaneous	Solar Powered Pool Pump	Variable Speed Pool Pump Motor
Solar Thermal Water Heating System	Residential Domestic Hot Water	Solar Thermal System with Electric Backup	Code-Compliant 50 Gallon Electric Resistance Water Heater
Spray Foam Insulation(Base R11)	Residential Space Cooling, Residential Space Heating	Open cell spray foam along roofline in existing (1982-1985) homes	Existing ceiling insulation based on building code at time of construction
Spray Foam Insulation(Base R19)	Residential Space Cooling, Residential Space Heating	Open cell spray foam along roofline in existing (1982-1985) homes	Existing ceiling insulation based on building code at time of construction
Spray Foam Insulation(Base R2)	Residential Space Cooling, Residential Space Heating	Open cell spray foam along roofline in older (pre-1982) homes	Existing ceiling insulation based on building code at time of construction

Measure	End-Use	Description	Baseline
Spray Foam Insulation(Base R30)	Residential Space Cooling, Residential Space Heating	Open cell spray foam along roofline in existing (1986-2020) homes	Existing ceiling insulation based on building code at time of construction
Thermostatic Shower Restriction Valve	Residential Domestic Hot Water	50 Gallon Electric Resistance Heater and Thermostatic Shower Valves	50 Gallon Electric Resistance Heater and Standard Shower Valves
Variable Refrigerant Flow (VRF) HVAC Systems	Residential Space Cooling, Residential Space Heating	Variable Refrigerant Flow (VRF) HVAC Systems	Code-Compliant ASHP, 15 SEER, 8.8 HSPF
Water Heater Blanket	Residential Domestic Hot Water	50 Gallon Electric Resistance Water Heater with Insulated Tank Wrap	Code-Compliant 50 Gallon Electric Resistance Water Heater, No Tank Wrap
Water Heater Thermostat Setback	Residential Domestic Hot Water	50 Gallon Electric Resistance Water Heater with Temperature Setpoint of 119°F	Code-Compliant 50 Gallon Electric Resistance Water Heater (Temp. Setpoint = 130°F)
Water Heater Timeclock	Residential Domestic Hot Water	Water Heater Timeclock	Existing Water Heater without time clock
Weather stripping	Residential Space Cooling, Residential Space Heating	Specific quantity of weather stripping to seal	
Window Caulking	Residential Space Cooling, Residential Space Heating	Window caulking	
Window Sun Protection	Residential Space Cooling	Window Film Applied to Standard Window	Standard Window with below Code Required Minimum SHGC

Table 13: Commercial EE Measures

Measure	End-Use	Description	Baseline
1.5HP Open Drip-Proof (ODP) Motor	Ventilation and Circulation	High Efficiency 1.5 HP Open-Drip Proof Motor	1.5HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency
10HP Open Drip-Proof (ODP) Motor	Ventilation and Circulation	High Efficiency 10 HP Open-Drip Proof Motor	10HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency
20HP Open Drip-Proof (ODP) Motor	Ventilation and Circulation	High Efficiency 20 HP Open-Drip Proof Motor	20HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency
Advanced Rooftop Controller	Ventilation and Circulation	Advanced Rooftop Controller	Without Advanced Rooftop Controller
Air Compressor Optimization	Miscellaneous	Performing Routine Maintenance on 20HP Inlet	20 HP Inlet Modulation Fixed-Speed Compressor

Measure	End-Use	Description	Baseline
		Modulation Fixed-Speed Compressor	
Air Curtains	Space Cooling, Space Heating	Air Curtain across door opening	Door opening with no air curtain
Airside Economizer	Space Cooling	Airside Economizer	No economizer
Anti-Sweat Controls	Refrigeration	One Medium Temperature Reach-In Case with Anti-Sweat Heater Controls	One Medium Temperature Reach-In Case without Anti-Sweat Heater Controls
Auto Off Time Switch	Interior Lighting	Auto-Off Time Switch on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Automatic Door Closer for Walk-in Coolers and Freezers	Refrigeration	One Medium Temperature Walk-In Refrigerator Door with Auto-Closer	One Medium Temperature Walk-In Refrigerator Door without Auto-Closer
Beverage Vending Machine Controls	Refrigeration	One non-ENERGY STAR beverage vending machine equipped with infrared occupancy sensing controls	One non-ENERGY STAR beverage vending machine, no controls
Bi-Level Lighting Control (Exterior)	Exterior Lighting	Bi-Level Controls on Exterior Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Bi-Level Lighting Control (Interior)	Interior Lighting	Bi-Level Controls on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Ceiling Insulation (R19 to R38)	Space Cooling, Space Heating	Blown-in insulation in ceiling cavity/attic	Market Average Existing Ceiling Insulation in older steep slope, residential style commercial building
Ceiling Insulation (R19 to R49)	Space Cooling, Space Heating	Blown-in insulation in ceiling cavity/attic - Beyond Code	Market Average Existing Ceiling Insulation in older steep slope, residential style commercial building
Ceiling Insulation (R2 to R38)	Space Cooling, Space Heating	Blown-in insulation in ceiling cavity/attic	Market Average Existing Ceiling Insulation in older steep slope, residential style commercial building
Ceiling Insulation (R2 to R49)	Space Cooling, Space Heating	Blown-in insulation in ceiling cavity/attic - Beyond Code	Market Average Existing Ceiling Insulation in older steep slope, residential style commercial building
Chilled Water Reset	Space Cooling	One Chiller with Reset of Chilled Water Temperature Setpoint	One Chiller with Fixed Chilled Water Temperature
Chiller maintenance	Space Cooling	O&M improvements to restore chiller performance	

Measure	End-Use	Description	Baseline
CO Sensors for Parking Garage Exhaust	Miscellaneous	Enclosed Parking Garage Exhaust with CO Control	Constant Volume Enclosed Parking Garage Exhaust
Commercial Duct Sealing	Space Cooling, Space Heating	Standard Electric Heating and Central AC with Improved Duct Sealing	Standard Electric Heating and Central AC, Standard Duct Sealing
Commercial Strategic Energy Management	Whole Building	Commercial Strategic Energy Management	No active energy management
Custom measure - Non-lighting	Space Cooling, Space Heating	Custom Improvement to Facility's Operations	Baseline Technology/Process
Data Center Hot Cold Aisle	Office Equipment	Equipment configuration that saves HVAC	No hot, cold aisle containment
Dedicated Outside Air System (DOAS)	Space Cooling, Space Heating	Install Dedicated Outside Air System (DOAS)	Typical HVAC by Building Type
Demand Controlled Circulating Systems	Domestic Hot Water	Recirculation Pump with Demand Control Mechanism	Uncontrolled Recirculation Pump
Demand Controlled Ventilation	Ventilation and Circulation	Return Air System with CO2 Sensors	Standard Return Air System, No Sensors
Demand Defrost	Refrigeration	Walk-In Freezer System with Demand-Controlled Electric Defrost Cycle	Walk-In Freezer System with Timer-Controlled Electric Defrost Cycle
Destratification Fans	Space Heating	Destratification Fans improve temperature distribution by circulating warmer air from the ceiling back down to the floor level	No destratification fan
Door Gasket (Cooler)	Refrigeration	New Door Gasket on One-Door Medium Temperature Reach-In Case	Worn or Damaged Door Gasket on One-Door Medium Temperature Reach-In Case
Door Gasket (Freezer)	Refrigeration	New Door Gasket on One-Door Medium Temperature Reach-In Case	Worn or Damaged Door Gasket on One-Door Medium Temperature Reach-In Case
Drain water heat recovery	Domestic Hot Water	Hot Water Loop with 50 Gallon Electric Resistance Heater and Drain Water Heat Exchanger	Standard Hot Water Loop with 50 Gallon Electric Resistance Heater, No Drain Water Heat Recovery
Dual Enthalpy Economizer	Ventilation and Circulation	Standard HVAC Unit with an economizer and dual enthalpy differential control	HVAC unit with no economizer or with a non-functional disabled economizer
Duct Insulation	Space Cooling, Space Heating	Standard Electric Heating and Central AC with Insulated Ductwork (R-8)	Standard Electric Heating and Central AC with Uninsulated Ductwork (R-4)
Ductless Mini-Split AC	Space Cooling	Ductless Mini-Split AC, 4 Ton, 16 SEER	Code-Compliant AC Unit, 4 Ton, 15 SEER

Measure	End-Use	Description	Baseline
Ductless Mini-Split HP	Space Cooling, Space Heating	Ductless Mini-Split HP, 17 SEER, 9.5 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF
DX Coil Cleaning	Space Cooling	DX Coil Cleaning	DX Coil Not Cleaned
ECM Motors on Furnaces	Space Heating	Variable Speed Electronically Commutated Motor for an Electric Furnace	Permanent Split Capacitor Motor for Electric Furnace
Efficient Battery Charger	Miscellaneous	Efficient Battery Charger	FR or SCR charging stations with power conversion efficiency < 89% or > 10 W
Efficient Exhaust Hood	Cooking	Kitchen ventilation with automatically adjusting fan controls	Kitchen ventilation with constant speed ventilation motor
Efficient Motor Belts	Miscellaneous	Synchronous belt, 98% efficiency	Standard V-belt drive
Efficient New Construction Lighting	Interior Lighting	Efficient New Construction Lighting, 15% Better than Code	New Construction with Lighting Power Density meeting Code Minimum
Energy Recovery Ventilation System (ERV)	Space Cooling	Unitary Cooling Equipment that Incorporates Energy Recovery	Current Market Packaged or Split DX Unit
Energy Star Combination Oven	Cooking	Energy Star Combination Oven meeting ENERGY STAR Version 3.0 Standards	One Standard Economy-Grade 10-Pan Combination Oven
Energy Star Commercial Clothes Washer	Miscellaneous	One Commercial Clothes Washer meeting current ENERGY STAR Version 8.1 Standards	One Commercial Clothes Washer meeting Federal Standard
Energy Star Commercial Dishwasher	Domestic Hot Water	One Commercial Dishwasher meeting ENERGY STAR Version 3.0 Standards	One Dishwasher meeting Federal Standard
Energy Star Commercial Glass Door Freezer	Refrigeration	One Glass Door Freezer meeting ENERGY STAR Version 5.0 Standards	One Glass Door Freezer meeting Federal Standards
Energy Star Commercial Glass Door Refrigerator	Refrigeration	One Glass Door Refrigerator meeting ENERGY STAR Version 5.0 Standards	One Glass Door Refrigerator meeting Federal Standards
Energy Star Commercial Solid Door Freezer	Refrigeration	One Solid Door Freezer meeting ENERGY STAR Version 5.0 Standards	One Solid Door Freezer meeting Federal Standards
Energy Star Commercial Solid Door Refrigerator	Refrigeration	One Solid Door Refrigerator meeting ENERGY STAR Version 5.0 Standards	One Solid Door Refrigerator meeting Federal Standards
Energy Star convection oven	Cooking	Energy Star convection oven meeting ENERGY STAR Version 3.0 Standards	One Standard Economy-Grade Full-Size Convection Oven

Measure	End-Use	Description	Baseline
Energy Star EV Chargers	Miscellaneous	Level 2 Electric Vehicle Supply Equipment (EVSE)	Level 1 Electric Vehicle Supply Equipment (EVSE)
Energy Star Fryer	Cooking	One Standard Vat Electric Fryer meeting ENERGY STAR Version 3.0 Standards	One Standard Economy-Grade Standard Vat Electric Fryer
Energy Star Griddle	Cooking	One Griddle meeting current ENERGY STAR Version 1.2 Standards	One Conventional Griddle
Energy Star Hot Food Holding Cabinet	Cooking	One Hot Food Holding Cabinet meeting current ENERGY STAR Version 2.0 Standards	One Standard Hot Food Holding Cabinet
Energy Star Ice Maker	Refrigeration	One Continuous Self-Contained Ice Maker meeting ENERGY STAR Version 3.0 Standards	One Continuous Self-Contained Ice Maker meeting Federal Standard
ENERGY STAR Imaging Equipment	Office Equipment	One imaging device meeting current ENERGY STAR Standards	One non-ENERGY STAR imaging device
Energy Star LED Directional Lamp	Interior Lighting	Energy Star 7.6W Directional LED lamp	50W Incandescent lamp
Energy Star Monitors	Office Equipment	One Monitor meeting ENERGY STAR 8.0 Standards	One Standard Monitor
Energy Star PCs	Office Equipment	One Personal Computer (desktop or laptop) meeting current ENERGY STAR® Standards	One non-ENERGY STAR® Personal Computer
Energy Star room AC	Space Cooling	Room AC meeting current ENERGY STAR standards	Code-Compliant Room AC, 1 Ton, 10.9 CEER
Energy Star Servers	Office Equipment	One Server meeting ENERGY STAR 2.0 Standards	One Standard Server
Energy Star Steamer	Cooking	One 4-Pan Electric Steamer meeting ENERGY STAR® 2.0 Standards	One Standard Economy-Grade 4-Pan Steamer
Energy Star Uninterruptable Power Supply	Office Equipment	Standard Desktop Plugged into Energy Star Uninterruptable Power Supply at 25% Load	Standard Desktop Plugged into Average Rotary Uninterruptable Power Supply at 25% Load
Energy Star Vending Machine	Refrigeration	One Refrigerated Vending Machine meeting ENERGY STAR Version 4.0 Standards	One Refrigerated Vending Machine meeting ENERGY STAR® 1.0 Standards
ENERGY STAR Water Cooler	Miscellaneous	One Storage Type Hot/Cold Water Cooler Unit meeting ENERGY STAR Version 3.0 Standards	One Standard Storage Type Hot/Cold Water Cooler Unit
Energy Star windows	Space Cooling, Space Heating	100ft2 of Window meeting Energy Star Version 6.0	100ft2 of Window meeting Energy Star Version 5.0

Measure	End-Use	Description	Baseline
		Requirements (U-Value: 0.27, SHGC: 0.21)	Requirements (U-Value: 0.3, SHGC: 0.3)
Engine Block Timer	Miscellaneous	Plug-in timer that activates engine block timer to reduce unnecessary run time	Engine block heater (typically used for backup generators) running continuously
Escalator Motor Efficiency Controller	Miscellaneous	Install Escalator Motor Efficiency Controller	Escalator without Motor Efficiency Controller
Facility Commissioning	Space Cooling, Space Heating, Ventilation and Circulation	Perform facility commissioning to optimize building operations in new facilities	Standard new construction facility with no commissioning
Facility Energy Management System	Space Cooling, Space Heating, Ventilation and Circulation	Typical HVAC by Building Type Controlled by Energy Management System	Standard/manual facility equipment controls
Faucet Aerator	Domestic Hot Water	Low-flow lavatory faucet aerator, flow rate: 1.0 gpm	Federal lavatory flow rate standard, 1994, flow rate: 2.2 gpm
Floating Head Pressure Controls	Refrigeration	Medium-Temperature Refrigeration System with 5HP Compressor and Adjustable Condenser Head Pressure Control Valve	Medium-Temperature Refrigeration System with 5 HP Compressor without Adjustable Condenser Head Pressure Control Valve
Floor Insulation	Space Cooling, Space Heating	Increased Floor Insulation (R-19)	Market Average Existing Floor Insulation
Geothermal Heat Pump	Space Cooling, Space Heating	Geothermal Heat Pump	Code-Compliant Air Source Heat Pump
Green roof	Space Cooling, Space Heating	Vegetated Roof Surface on top of Standard Roof	Standard Black Roof
HE Air Cooled Chiller - All Compressor Types - 100 Tons	Space Cooling	HE Air Cooled Chiller - Air Compressor Types - 100 Tons	Code-Compliant Air Cooled Positive Displacement Chiller, 100 Tons
HE DX 11.25-20.0 Tons Elec Heat	Space Cooling, Space Heating	High Efficiency Packaged or Split DX Unit, 15 Tons, 11.5 SEER	Code-Compliant Packaged or Split DX Unit, 15 Tons, 11 SEER
HE DX 11.25-20.0 Tons Other Heat	Space Cooling	High Efficiency Packaged or Split DX Unit, 15 Tons, 11.5 SEER	Code-Compliant Packaged or Split DX Unit, 15 Tons, 11 SEER
HE DX 5.4-11.25 Tons Elect Heat	Space Cooling, Space Heating	High Efficiency Packaged or Split DX Unit, 7.5 Tons, 12 SEER	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11 SEER
HE DX 5.4-11.25 Tons Other Heat	Space Cooling	High Efficiency Packaged or Split DX Unit, 7.5 Tons, 12 SEER	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11 SEER

Measure	End-Use	Description	Baseline
HE DX Less than 5.4 Tons Elect Heat	Space Cooling, Space Heating	High Efficiency Packaged or Split DX Unit, 5 Tons, 14.5 SEER	Code-Compliant Packaged or Split DX Unit, 5 Tons, 13 SEER
HE DX Less than 5.4 Tons Other Heat	Space Cooling	High Efficiency Packaged or Split DX Unit, 5 Tons, 14.5 SEER	Code-Compliant Packaged or Split DX Unit, 5 Tons, 13 SEER
HE Water Cooled Chiller - Centrifugal Compressor - 200 Tons	Space Cooling	Water Cooled Centrifugal Chiller with Integral VFD, 200 Tons	Code-Compliant Water Cooled Centrifugal Chiller, 200 Tons
HE Water Cooled Chiller - Centrifugal Compressor - 500 Tons	Space Cooling	Water Cooled Centrifugal Chiller with Integral VFD, 500 Tons	Code-Compliant Water Cooled Centrifugal Chiller, 500 Tons
HE Water Cooled Chiller - Rotary or Screw Compressor - 175 Tons	Space Cooling	Water Cooled Positive Displacement Chiller with Integral VFD, 175 Tons	Code-Compliant Water Cooled Positive Displacement Chiller, 175 Tons
HE Water Cooled Chiller - Rotary or Screw Compressor - 50 Tons	Space Cooling	Water Cooled Positive Displacement Chiller with Integral VFD, 50 Tons	Code-Compliant Water Cooled Positive Displacement Chiller, 50 Tons
Heat Pump Pool Heater Commercial	Miscellaneous	High Efficiency Pool Heater Eff. $\geq 84\%$	Standard Efficiency Pool Heater 78% Eff.
Heat Pump Water Heater	Domestic Hot Water	Efficient 50 Gallon Electric Heat Pump Water Heater	Code-Compliant 50 Gallon Electric Heat Pump Water Heater
High Efficiency Air Compressor	Miscellaneous	20 HP VFD Air Compressor	20 HP Inlet Modulation Fixed-Speed Compressor
High Efficiency Data Center Cooling	Space Cooling	High Efficiency CRAC (computer room air conditioner)	Standard Efficiency CRAC
High Efficiency PTAC	Space Cooling	High Efficiency PTAC	Code-Compliant PTAC
High Efficiency PTHP	Space Cooling, Space Heating	High Efficiency PTHP	Code-Compliant PTHP
High Efficiency Refrigeration Compressor_Discus	Refrigeration	High Efficiency Refrigeration Compressors	Standard Compressor
High Efficiency Refrigeration Compressor_Scroll	Refrigeration	High Efficiency Refrigeration Compressors	Standard Compressor
High Speed Fans	Ventilation and Circulation	High Speed Fan, 24" - 35" Blade Diameter	Standard Speed Fan, 24" - 35" Blade Diameter
Hot water pipe insulation	Domestic Hot Water	1' of Insulated Pipe in Unconditioned Spaces, Insulation of R-4	1' of Pipe in Unconditioned Spaces with Code Minimum of 1" of Insulation

Measure	End-Use	Description	Baseline
Hotel Card Energy Control Systems	Space Cooling, Space Heating	Guest Room HVAC Unit Controlled by Hotel-Key-Card Activated Energy Control System	Guest Room HVAC Unit, Manually Controlled by Guest
Indoor daylight sensor	Interior Lighting	Install Indoor Daylight Sensors, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Induction Cooktops	Cooking	Efficient Induction Cooktop	One Standard Electric Cooktop
Infiltration Reduction - Air Sealing	Space Cooling, Space Heating	Reduced leakage through caulking, weather-stripping	Standard Heating and Cooling System with Moderate Infiltration
Instantaneous Hot Water System Commercial	Domestic Hot Water	Instantaneous Hot Water System	Code-Compliant Electric Storage Water Heater
LED - 14W_CFL Baseline	Interior Lighting	LED (assume 14W) replacing CFL	100W equivalent CFL
LED - 9W Flood_CFL Baseline	Exterior Lighting	LED (assume 9W) replacing CFL	14W CFL
LED Canopy Lighting (Exterior)	Exterior Lighting	One 67.2W LED Canopy Light	Average Lumen Equivalent Exterior Incandescent Area Lighting
LED Display Lighting (Exterior)	Exterior Lighting	One Letter of LED Signage, < 2ft in Height	One Letter of Neon or Argon-mercury Signage, < 2ft in Height
LED Display Lighting (Interior)	Interior Lighting	One Letter of LED Signage, < 2ft in Height	One Letter of Neon or Argon-mercury Signage, < 2ft in Height
LED Exit Sign	Interior Lighting	One 5W Single-Sided LED Exit Sign	One 9W Single-Sided CFL Exit Sign
LED Exterior Wall Packs	Exterior Lighting	One 35W LED Wall Pack	Average Lumen Equivalent Exterior Incandescent Area Lighting
LED High Bay_HID Baseline	Interior Lighting	One 140W High Bay LED Fixture	Lumen-Equivalent HID High Bay Fixture
LED High Bay_LF Baseline	Interior Lighting	One 140W High Bay LED Fixture	Lumen-Equivalent Linear Fluorescent High Bay Fixture
LED Linear - Fixture Replacement	Interior Lighting	2x4 LED Troffer	Lumen-Equivalent 32-Watt T8 Lamp
LED Linear - Lamp Replacement	Interior Lighting	Linear LED (16W)	Lumen-Equivalent 32-Watt T8 Lamp
LED Parking Lighting	Exterior Lighting	One 160W LED Area Light	Average Lumen Equivalent Exterior HID Area Lighting
LEED New Construction Whole Building	Space Cooling, Space Heating	LEED New Construction Whole Building	Comparable facility, code-compliance construction
Light Tube	Interior Lighting	One 14" Light Tube, Delivering light to 250 S.F. of Commercial Space	250 S.F. of Commercial Space Lit by Typical Lighting Strategies

Measure	End-Use	Description	Baseline
Low Flow Shower Head	Domestic Hot Water	Low-Flow Handheld Showerhead, Flow Rate: 1.50 gpm	Standard Handheld Showerhead, Flow Rate: 2.50 gpm
Low-Flow Pre-Rinse Sprayers	Domestic Hot Water	Low-Flow Pre-Rinse Sprayer with Flow Rate of 1.6 gpm	Pre-Rinse Sprayer with Federal Standard Flow Rate of 2.25 gpm
Network PC Power Management	Office Equipment	One computer and monitor attached to centralized energy management system that controls when desktop computers and monitors plugged into a n	One computer and monitor, manually controlled
Networked Lighting Controls	Interior Lighting	Install Networked Lighting Controls System on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Controlled either Manually or by Sensor as Specified by Code
Night Covers for Display Cases	Refrigeration	One Open Vertical Case with Night Covers	One Existing Open Vertical Case, No Night Covers
Occupancy Sensors, Ceiling Mounted	Interior Lighting	Ceiling Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Occupancy Sensors, Switch Mounted	Interior Lighting	Switch Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor Lighting Controls	Exterior Lighting	Install Exterior Photocell Dimming Controls, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor motion sensor	Exterior Lighting	Install Exterior Motion Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Ozone Laundry Commercial	Miscellaneous	Add a new ozone laundry system onto a commercial clothes washer	One commercial clothes washer without ozone laundry system
Programmable thermostat	Space Cooling, Space Heating	Pre-set programmable thermostat that replaces manual thermostat	Standard Heating and Cooling System with Manual Thermostat
PSC to ECM Evaporator Fan Motor (Reach-In)	Refrigeration	Medium Temperature Reach-In Case with equivalent size Electronically Commutated Evaporator Fan Motor	Medium Temperature Reach-In Case with Permanent Split Capacitor Evaporator Fan Motor
PSC to ECM Evaporator Fan Motor (Walk-In, Refrigerator)	Refrigeration	Medium Temperature Walk-In Case with Electronically Commutated Evaporator Fan Motor	Medium Temperature Walk-In Case with Permanent Split Capacitor Evaporator Fan Motor
Q-Sync Evaporator Fan Motor	Refrigeration	Medium Temperature Reach-In Case with	Medium Temperature Reach-In Case with 20W Permanent Split Capacitor Fan Motor

Measure	End-Use	Description	Baseline
		equivalent size Q-Sync Evaporator Fan Motor	
Reflective Roof Treatment	Space Cooling	Reflective Roof Treatment	Standard Black Roof
Refrigerated Display Case LED Lighting	Refrigeration	60" Refrigerated Case LED Strip	Lumen-Equivalent 32-Watt T8 Fixture
Refrigerated Display Case Lighting Controls	Refrigeration	Occupancy Sensors for Refrigerated Case Lighting to reduce run time	Market-Share Weighted Existing Linear Fluorescent Fixture
Refrigeration Commissioning	Refrigeration	Commissioned Refrigeration System	Non-Commissioned Refrigeration System
Refrigeration Economizer	Refrigeration	Walk-in refrigerator with economizer	Walk-in refrigerator without economizer
Regenerative Drive Elevator Motor	Miscellaneous	Regenerative drive produced energy when motor in overhaul condition	Standard motor
Retro-Commissioning (Existing Construction)	Space Cooling, Space Heating, Ventilation and Circulation	Perform facility retro-commissioning, including assessment, process improvements, and optimization of energy-consuming equipment and systems	
Roof Insulation	Space Cooling, Space Heating	Roof Insulation (built-up roof applicable to flat/low slope roofs)	Code-Compliant Flat Roof
Server Virtualization	Office Equipment	2 Virtual Host Server	20 Single Application Servers
Smart Strip Plug Outlet	Office Equipment	One Smart Strip Plug Outlet	One Standard plug strip/outlet
Smart thermostat	Space Cooling, Space Heating	Thermostats that include "smart" features such as occupancy sensors, ge-fencing, multi-zone sensors	Standard Heating and Cooling System with Manual Thermostat
Solar Pool Heater Commercial	Miscellaneous	Solar Swimming Pool Heater	Electric Resistance Swimming Pool Heater
Solar Powered Pool Pump	Miscellaneous	Solar Powered Pool Pump Motor	Variable Speed Pool Pump Motor
Solar Thermal Water Heating System Commercial	Domestic Hot Water	Solar Thermal System with Electric Backup	Code-Compliant 50 Gallon Electric Resistance Water Heater
Strip Curtains - Freezers	Refrigeration	Walk-in freezer with strip curtains at least 0.06 inches thick covering the entire area of the doorway	Walk-in freezer without strip curtains
Strip Curtains - Refrigerators	Refrigeration	Walk-in cooler with strip curtains at least 0.06 inches	Walk-in cooler without strip curtains

Measure	End-Use	Description	Baseline
		thick covering the entire area of the doorway	
Suction Pipe Insulation - Freezers	Refrigeration	Suction Pipe Insulation - Freezers	Uninsulated freezer suction lines
Suction Pipe Insulation - Refrigerators	Refrigeration	Suction Pipe Insulation - Refrigerators	Uninsulated refrigeration suction lines
Thermal Energy Storage	Space Cooling	Deploy thermal energy storage technology (ice harvester, etc.) to shift load	Code compliant chiller
Thermostatic Shower Restriction Valve Commercial	Domestic Hot Water	Hot Water Loop with 50 Gallon Electric Resistance Heater and Pressure Balance Shower Valves	Standard Hot Water Loop with 50 Gallon Electric Resistance Heater and Standard Shower Valves
Time Clock Control	Interior Lighting	Time Clock Controlled Lighting, 500 Watts Controlled	500 Watts of Lighting, Controlled either Manually or by Sensor as Specified by Code
Variable Refrigerant Flow (VRF) HVAC Systems	Space Cooling, Space Heating	Variable Refrigerant Flow (VRF) HVAC Systems	Code-Compliant PTHP
VAV System	Ventilation and Circulation	Variable Air Volume Distribution System	Constant Air Volume Distribution System
VFD on Cooling Tower Fans	Space Cooling	Cooling Tower Fans with VFD Control	Cooling Tower Fans without VFD Control
VFD on HVAC Pump	Space Cooling, Space Heating	VFD on HVAC Pump	7.5 HP HVAC Pump Motor, no VFD Control
VSD Controlled Compressor	Refrigeration	Refrigeration System with VSD Control	Refrigeration System with Standard Slide-Valve Control System
Wall Insulation	Space Cooling, Space Heating	Increased Exterior Above-Grade Wall Insulation	Market Average Existing Exterior Above-Grade Wall Insulation
Warehouse Loading Dock Seals	Space Cooling, Space Heating	Seals to reduce infiltration losses at loading dock	Loading dock with no seals
Water Cooled Refrigeration Heat Recovery	Domestic Hot Water	The heat reclaim system transfers waste heat from refrigeration system to space heating or hot water	No heat recovery
Water Heater Setback	Domestic Hot Water	A 50 gallon electric hot water tank with a thermostat setting reduced to no lower than 120 degrees.	A 50 gallon electric hot water tank with a thermostat setting that is higher than 120 degrees, typically hot water tanks with settings of 130 degrees or higher.
Water source heat pump	Space Cooling, Space Heating	Water Source Heat Pump, 2.5 Tons, 17.4 EER, 4.4 COP	Code-Compliant ASHP
Waterside Economizer	Space Cooling	Waterside Economizer	No economizer

Measure	End-Use	Description	Baseline
Window shade film	Space Cooling	Window Film with SHGC of 0.35 Applied to Standard Window	Standard Window with below Code Required Minimum SHGC
Zero Energy Doors	Refrigeration	Install zero energy doors for a reach-in refrigerated cooler or freezer	Standard vertical reach-in refrigerated cooler or freezer with anti-sweat heaters on the glass surface of the doors

Table 14: Industrial EE Measures

Measure	End-Use	Description	Baseline
1.5HP Open Drip-Proof (ODP) Motor	Motors Pumps	High Efficiency 1.5 HP Open-Drip Proof Motor	1.5HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency
10HP Open Drip-Proof (ODP) Motor	Motors Pumps	High Efficiency 10 HP Open-Drip Proof Motor	10HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency
20HP Open Drip-Proof (ODP) Motor	Motors Pumps	High Efficiency 20 HP Open-Drip Proof Motor	20HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency
3-phase High Frequency Battery Charger - 1 shift	Other	3-phase High Frequency Battery Charger	Standard Charger
Advanced Rooftop Controller	HVAC	Advanced Rooftop Controller	Without Advanced Rooftop Controller
Air Compressor Optimization	Compressed Air	Performing Routine Maintenance on 20HP Inlet Modulation Fixed-Speed Compressor	20 HP Inlet Modulation Fixed-Speed Compressor
Air curtains	HVAC	Air Curtain across door opening	Door opening with no air curtain
Airside economizer	HVAC	Airside Economizer	No economizer
Auto Closer on Refrigerator Door	Process Cooling	One Medium Temperature Walk-In Refrigerator Door with Auto-Closer	One Medium Temperature Walk-In Refrigerator Door without Auto-Closer
Auto Off Time Switch	Interior Lighting High Bay	Auto-Off Time Switch on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Bi-Level Lighting Control (Exterior)	Exterior Lighting Industrial	Install Exterior Bi-Level Lighting Control, 500 Watts Controlled	500 Watts of Lighting, No Dim Setting
Bi-Level Lighting Control (Interior)	Interior Lighting High Bay	Bi-Level Controls on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, No Dim Setting

Measure	End-Use	Description	Baseline
Chilled Water Reset	HVAC	One Chiller with Reset of Chilled Water Temperature Setpoint	One Chiller with Fixed Chilled Water Temperature
Cogged Belt on 15hp ODP Motor	Motors Pumps	15HP ODP Motor with Cogged Belts Installed on Supply and/or Return Air Fans	15HP ODP Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Cogged Belt on 40hp ODP Motor	Motors Pumps	40HP ODP Motor with Cogged Belts Installed on Supply and/or Return Air Fans	40HP ODP Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Compressed Air Desiccant Dryer	Process Specific	heated regenerative desiccant dryer without dew point demand controls	heatless regenerative desiccant dryer without dew point demand controls
Compressed Air No-Loss Condensate Drains	Process Specific	Install no-loss condensate drains	Install standard condensate drains
Compressed Air Storage Tank	Compressed Air	20 HP Inlet Modulation Fixed-Speed Compressor with Receiver Tank	20 HP Inlet Modulation Fixed-Speed Compressor, No Receiver Tank
Custom Measure - Non-Lighting	HVAC	Custom Improvement to Facility's Operations	Baseline Technology/Process
Dairy Refrigeration Heat Recovery	Other	refrigeration equipment with refrigeration heat recovery tank installed	existing dairy farm with refrigeration equipment and a water heater unit without an RHR unit
Dedicated Outside Air System (DOAS)	HVAC	Install Dedicated Outside Air System (DOAS)	Typical HVAC by Building Type
Demand Controlled Ventilation	HVAC	Return Air System with CO2 Sensors	Standard Return Air System, No Sensors
Demand Defrost	Process Cooling	Walk-In Freezer System with Demand-Controlled Electric Defrost Cycle	Walk-In Freezer System with Timer-Controlled Electric Defrost Cycle
Dew Point Sensor Control for Dessicant CA Dryer	Compressed Air	1000 CFM Heated Desiccant Air Dryer with Dew Point Controls	1000 CFM Modulating Heated Desiccant Air Dryer
Drip Irrigation Nozzles	Other	Flow Control Nozzles	Standard Irrigation Nozzles
Dual Enthalpy Economizer	Process Cooling	Standard HVAC Unit with an economizer and dual enthalpy differential control	HVAC unit with no economizer or with a non-functional disabled economizer
DX Coil Cleaning	HVAC	DX Coil Cleaning	DX Coil Not Cleaned
Efficient Compressed Air Nozzles	Compressed Air	1/4" Engineered Air Nozzle	1/4" Open-End Air Nozzle

Measure	End-Use	Description	Baseline
Efficient New Construction Lighting	Interior Lighting High Bay	Efficient New Construction Lighting, 15% Better than Code	New Construction with Lighting Power Density meeting Code Minimum
Electric Actuators	Other	Electric Actuator	Pneumatic Actuator
Energy Efficient Laboratory Fume Hood	HVAC	Variable Air Volume High Performance Fume Hood	Constant Volume Conventional Bypass Fume Hood
Energy Efficient Transformers	Other	Energy Efficient Dry Type Transformer (CSL-3)	Standard Transformer (TP-1)
Energy Recovery Ventilation System	HVAC	Unitary Cooling Equipment that Incorporates Energy Recovery	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11.2 EER
Energy Star LED Directional Lamp	Interior Lighting Other	Energy Star 7.6W Directional LED lamp	50W Incandescent lamp
Energy Star room ac	HVAC	Room AC meeting current ENERGY STAR standards	Code-Compliant Room AC
Energy Star windows	HVAC	100ft2 of Window meeting Energy Star Version 6.0 Requirements (U-Value: 0.27, SHGC: 0.21)	100ft2 of Window meeting Energy Star Version 5.0 Requirements (U-Value: 0.3, SHGC: 0.3)
Engine Block Timer	Other	An engine block heater operated by an outdoor plug-in timer	An engine block heater that is manually plugged in
Facility Commissioning	HVAC	Perform facility commissioning	Comparable facility, no commissioning
Facility Energy Management System	HVAC	Typical HVAC by Building Type Controlled by Energy Management System	Typical HVAC by Building Type, Manually Controlled
Fan Thermostat Controller	HVAC	Typical HVAC by Building Type with Fan Thermostat Controller Installed	Typical HVAC by Building Type with Programmable Thermostat
Floating Head Pressure Controller	Process Cooling	Medium-Temperature Refrigeration System with 5HP Compressor and Adjustable Condenser Head Pressure Control Valve	Medium-Temperature Refrigeration System with 5 HP Compressor without Adjustable Condenser Head Pressure Control Valve
Grain Bin Aeration Control System	Process Specific	Grain Storage Fan System with Automatic Controls	Grain Storage Fan System with Manual Controls
HE Air Cooled Chiller - All Compressor Types - 100 Tons	HVAC	HE Air Cooled Chiller - All Compressor Types - 100 Tons	Code-Compliant Air Cooled Positive Displacement Chiller, 100 Tons
HE Air Cooled Chiller - All Compressor Types - 300 Tons	HVAC	Air Cooled Positive Displacement Chiller with Integral VFD, 300 Tons, 13.7 EER	Code-Compliant Air Cooled Positive Displacement Chiller, 300 Tons, 12.5 EER

Measure	End-Use	Description	Baseline
HE DX 11.25-20.0 Tons Elec Heat	HVAC	High Efficiency Packaged or Split DX Unit, 15 Tons, 11.5 SEER	Code-Compliant Packaged or Split DX Unit, 15 Tons, 11 SEER
HE DX 11.25-20.0 Tons Other Heat	HVAC	High Efficiency Packaged or Split DX Unit, 15 Tons, 11.5 SEER	Code-Compliant Packaged or Split DX Unit, 15 Tons, 11 SEER
HE DX 5.4-11.25 Tons Elect Heat	HVAC	High Efficiency Packaged or Split DX Unit, 7.5 Tons, 12 SEER	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11 SEER
HE DX 5.4-11.25 Tons Other Heat	HVAC	High Efficiency Packaged or Split DX Unit, 7.5 Tons, 12 SEER	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11 SEER
HE DX Less than 5.4 Tons Elect Heat	HVAC	High Efficiency Packaged or Split DX Unit, 5 Tons, 14.5 SEER	Code-Compliant Packaged or Split DX Unit, 5 Tons, 13 SEER
HE DX Less than 5.4 Tons Other Heat	HVAC	High Efficiency Packaged or Split DX Unit, 5 Tons, 14.5 SEER	Code-Compliant Packaged or Split DX Unit, 5 Tons, 13 SEER
HE Water Cooled Chiller - Centrifugal Compressor - 200 Tons	HVAC	Water Cooled Centrifugal Chiller with Integral VFD, 200 Tons	Code-Compliant Water Cooled Centrifugal Chiller, 200 Tons
HE Water Cooled Chiller - Centrifugal Compressor - 500 Tons	HVAC	Water Cooled Centrifugal Chiller with Integral VFD, 500 Tons	Code-Compliant Water Cooled Centrifugal Chiller, 500 Tons
HE Water Cooled Chiller - Rotary or Screw Compressor - 175 Tons	HVAC	Water Cooled Positive Displacement Chiller with Integral VFD, 175 Tons	Code-Compliant Water Cooled Positive Displacement Chiller, 175 Tons
HE Water Cooled Chiller - Rotary or Screw Compressor - 50 Tons	HVAC	Water Cooled Positive Displacement Chiller with Integral VFD, 50 Tons	Code-Compliant Water Cooled Positive Displacement Chiller, 50 Tons
High Bay Occupancy Sensors, Ceiling Mounted	Interior Lighting High Bay	Ceiling Mounted Occupancy Sensor, 800 Watts Controlled	800 Watts of Lighting, Manually Controlled
High Efficiency Air Compressor	Compressed Air	20 HP VFD Air Compressor	20 HP Inlet Modulation Fixed-Speed Compressor
High Efficiency Refrigeration Compressor - Discus	Process Cooling	High Efficiency Refrigeration Compressors	Standard Compressor

Measure	End-Use	Description	Baseline
High Efficiency Refrigeration Compressor - Scroll	Process Cooling	High Efficiency Refrigeration Compressors	Standard Compressor
High Efficiency Welder	Process Specific	High Efficiency Welder	Standard Welding Practices
High Speed Fans	HVAC	High Speed Fan, 24" - 35" Blade Diameter	Standard Speed Fan, 24" - 35" Blade Diameter
High Volume Low Speed Fan (HVLS)	Motors Fans Blowers	20' High Volume Low Speed Fan	Conventional Circulating Fan
Indoor Agriculture - LED Grow Lights	Interior Lighting High Bay	LED grow light	1000W High Pressure Sodium
Indoor daylight sensor	Interior Lighting High Bay	Install Indoor Daylight Sensors, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Industrial Duct Sealing	HVAC	Standard Electric Heating and Central AC with Improved Duct Sealing	Standard Electric Heating and Central AC, Standard Duct Sealing
Injection Mold and Extruder Barrel Wraps	Other	2' Diameter, 20' Long Machine Barrel with 1" Insulation	2' Diameter, 20' Long Machine Barrel with no Insulation
Insulated Pellet Dryer Tanks and Ducts	Process Heating	Insulation for Pellet Tank and Duct	Uninsulated Pellet Tank and Duct
LED - 14W_CFL Baseline	Interior Lighting Other	LED (assume 14W) replacing CFL	100W equivalent CFL
LED Canopy Lighting (Exterior)	Exterior Lighting Industrial	One 67.2W LED Canopy Light	Average Lumen Equivalent Exterior Incandescent Area Lighting
LED Display Lighting (Exterior)	Exterior Lighting Industrial	One Letter of LED Signage, < 2ft in Height	One Letter of Neon or Argon-mercury Signage, < 2ft in Height
LED Display Lighting (Interior)	Interior Lighting Other	One Letter of LED Signage, < 2ft in Height	One Letter of Neon or Argon-mercury Signage, < 2ft in Height
LED exit sign	Interior Lighting Other	One 5W Single-Sided LED Exit Sign	One 9W Single-Sided CFL Exit Sign
LED Exterior Wall Packs	Exterior Lighting Industrial	One 35W LED Wall Pack	Average Lumen Equivalent Exterior Incandescent Area Lighting
LED High Bay_HID Baseline	Interior Lighting High Bay	One 140W High Bay LED Fixture	Lumen-Equivalent HID High Bay Fixture
LED High Bay_LF Baseline	Interior Lighting High Bay	One 140W High Bay LED Fixture	Lumen-Equivalent Linear Fluorescent High Bay Fixture
LED Linear - Fixture Replacement	Interior Lighting Linear Fluorescent	2x4 LED Troffer Fixture	Lumen-Equivalent 32-Watt T8 Fixture

Measure	End-Use	Description	Baseline
LED Linear - Lamp Replacement	Interior Lighting Linear Fluorescent	Linear LED	Lumen-Equivalent 32-Watt T8 Lamp
LED Parking Lighting	Exterior Lighting Industrial	One 160W LED Area Light	Average Lumen Equivalent Exterior HID Area Lighting
LEED New Construction Whole Building	HVAC	LEED Qualifying New Construction	Comparable facility, code-compliance construction
Light Tube	Interior Lighting Other	One 14" Light Tube, Delivering light to 250 S.F. of Industrial Space	250 S.F. of Industrial Space Lit by Typical Lighting Strategies
Low Energy Livestock Waterer	Motors Pumps	Install Thermostatically Controlled Livestock Watering System	Standard Livestock Watering System
Low Pressure Sprinkler Nozzles	Motors Pumps	Low Pressure Irrigation Nozzles operate at 35 psi or lower	Standard high pressure irrigation nozzles that operate at 50 psi or greater
Low Pressure-drop Filters	Compressed Air	20 HP Inlet Modulation Fixed-Speed Compressor with Low Pressure Drop Filter	20 HP Inlet Modulation Fixed-Speed Compressor, No Particulate Removal
Milk Pre-Cooler	Other	Installed pre-cooler heat exchanger	no pre-cooler heat exchanger installed
Networked Lighting Controls	Interior Lighting Linear Fluorescent	Install Networked Lighting Controls System on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Controlled either Manually or by Sensor as Specified by Code
Occupancy Sensors, Ceiling Mounted	Interior Lighting High Bay	Ceiling Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Occupancy sensors, switch mounted	Interior Lighting Linear Fluorescent	Switch Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor Lighting Controls	Exterior Lighting Industrial	Install Exterior Photocell Dimming Controls, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor motion sensor	Exterior Lighting Industrial	Install Exterior Motion Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Packaged Terminal AC	HVAC	High Efficiency Packaged Terminal AC	Code-Compliant PTAC, 10.9 EER
Process Cooling Ventilation Reduction	Process Cooling	Standard Process Cooling with Reduced Ventilation	Standard Process Cooling
Programmable thermostat	HVAC	Standard Heating and Cooling System with Programmable Thermostat	Standard Heating and Cooling System with Manual Thermostat
Reflective Roof Treatment	HVAC	Reflective Roof Treatment	Standard Black Roof

Measure	End-Use	Description	Baseline
Refrigeration Commissioning	Process Cooling	Commissioned Refrigeration System	Non-Commissioned Refrigeration System
Retro-Commissioning (Existing Construction)	HVAC	Perform Facility Retro-commissioning	
Roof insulation	HVAC	Roof Insulation (built-up roof applicable to flat/low slope roofs)	Code-Compliant Flat Roof
Smart thermostat	HVAC	Standard Heating and Cooling System with Smart Thermostat	Standard Heating and Cooling System with Manual Thermostat
Strategic Energy Management	HVAC	SEM goal setting and tracking	No active energy management
Synchronous Belt on 15hp ODP Motor	Motors Pumps	15 HP Open-Drip Proof Motor with Synchronous Belts Installed on Supply and/or Return Air Fans	15 HP Open-Drip Proof Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Synchronous Belt on 5hp ODP Motor	Motors Pumps	5 HP Open-Drip Proof Motor with Synchronous Belts Installed on Supply and/or Return Air Fans	5 HP Open-Drip Proof Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Synchronous Belt on 75hp ODP Motor	Motors Pumps	75 HP Open-Drip Proof Motor with Synchronous Belts Installed on Supply and/or Return Air Fans	75 HP Open-Drip Proof Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Thermal energy storage	HVAC	Deploy thermal energy storage technology (ice harvester, etc.) to shift load	Code compliant chiller
Time Clock Control	Interior Lighting High Bay	Time Clock Controlled Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
VAV System	HVAC	Variable Air Volume Distribution System	Constant Air Volume Distribution System
VFD on Air Compressor	Compressed Air	20 HP VFD Air Compressor	20 HP Inlet Modulation Fixed-Speed Compressor
VFD on Cooling Tower Fans	Process Cooling	Cooling Tower Fans with VFD Control	Cooling Tower Fans without VFD Control
VFD on HVAC Fan	Motors Fans Blowers	5 HP HVAC Fan Motor, with VFD Control	5 HP HVAC Fan Motor, no VFD Control
VFD on HVAC Pump	Motors Pumps	VFD on HVAC Pump	7.5 HP HVAC Pump Motor, no VFD Control
VFD on process pump	Motors Pumps	20 HP Process Pump Equipped with VFD Control	20 HP Process Pump, Constant Speed
VSD Controlled Compressor	Process Cooling	Refrigeration System with VSD Control	Refrigeration System with Standard Slide-Valve Control System

Measure	End-Use	Description	Baseline
Water source heat pump	HVAC	Water Source Heat Pump, 2.5 Tons, 17.4 EER, 4.4 COP	Code-Compliant ASHP
Waterside economizer	HVAC	Waterside Economizer	No economizer
Window shade film	HVAC	Window Film with SHGC of 0.35 Applied to Standard Window	Standard Window with below Code Required Minimum SHGC

The following EE measures from the 2019 Technical Potential Study were eliminated from the current study⁸:

Table 15: 2019 EE Measures Eliminated from Current Study

Sector	Measure	End-Use	Reason for Removal
Residential	CFL - 15W Flood	Lighting	Better technology (LED) available
Residential	CFL - 15W Flood (Exterior)	Lighting	Better technology (LED) available
Residential	CFL - 13W	Lighting	Better technology (LED) available
Residential	CFL - 23W	Lighting	Better technology (LED) available
Residential	Low Wattage T8 Fixture	Lighting	Better technology (LED) available
Residential	15 SEER Central AC	Space Cooling	Updated Federal Standard
Residential	15 SEER Air Source Heat Pump	Space Cooling, Space Heating	Updated Federal Standard
Residential	14 SEER ASHP from base electric resistance heating	Space Cooling, Space Heating	Updated Federal Standard
Residential	Two Speed Pool Pump	Miscellaneous	Updated Florida Energy Code
Residential	Variable Speed Pool Pump	Miscellaneous	Updated Florida Energy Code
Residential	Storm Door	Space Cooling, Space Heating	Minimal/uncertain energy savings
Commercial	CFL - 15W Flood	Exterior Lighting	Better technology (LED) available
Commercial	High Efficiency HID Lighting	Exterior Lighting	Better technology (LED) available

⁸ Additional measures from the 2019 study were updated to reflect current vintage/technology for the current study.

Sector	Measure	End-Use	Reason for Removal
Commercial	LED Street Lights	Exterior Lighting	Market standard
Commercial	LED Traffic and Crosswalk Lighting	Exterior Lighting	Market standard
Commercial	CFL-23W	Interior Lighting	Better technology (LED) available
Commercial	High Bay Fluorescent (T5)	Interior Lighting	Better technology (LED) available
Commercial	Premium T8 - Fixture Replacement	Interior Lighting	Better technology (LED) available
Commercial	Premium T8 - Lamp Replacement	Interior Lighting	Better technology (LED) available
Commercial	Two Speed Pool Pump	Miscellaneous	Updated Florida Energy Code
Commercial	Variable Speed Pool Pump	Miscellaneous	Updated Florida Energy Code
Commercial	Tank Wrap on Water Heater	Domestic Hot Water	Limited applicability
Commercial	Ceiling Insulation (R12 to R38)	Space Cooling, Space Heating	Consolidated measure baseline assumptions
Commercial	Ceiling Insulation (R30 to R38)	Miscellaneous	Consolidated measure baseline assumptions

Appendix B DR Measure List

Table 16: Residential DR Measures

Measure	Type	Season	Description
Central air conditioner - Load Shed	Direct load control	Summer	Direct load control program where utility provides day ahead notification that it will send remote signal to shed AC unit load during peak usage period.
Central Heating - Load Shed	Direct load control	Winter	Direct load control program where utility provides day ahead notification that it will send remote signal to shed AC unit load during peak usage period.
Central air conditioner - 50% cycling	Direct load control	Summer	Direct load control program where utility provides day ahead notification that it will send remote signal to cycle AC unit during peak usage period
Central Heating - 50% cycling	Direct load control	Winter	Direct load control program where utility provides day ahead notification that it will send remote signal to cycle AC unit during peak usage period
Smart thermostats - Utility Installation	Direct load control	Summer and Winter	Similar to AC load control program, but allows customers to participate using a compatible smart thermostat rather than an AC switch
Smart thermostats - BYOT	Direct load control	Summer and Winter	Similar to AC load control program, but allows customers to participate using a compatible smart thermostat rather than an AC switch
CPP + Tech	Pricing	Summer and Winter	Electricity rate that varies based on time of day. Can be same rate schedule for every day during a given season (time of use, or TOU) and with critical peak pricing (CPP) days when peak period rates are substantially higher for a limited number of days per year (customers receive advance notification of CPP event). Customers also receive technology that they can pre-program to curtail load when an event is called.
Water heater control	Direct load control	Summer and Winter	Load control installed on a water heater (integrated or external switch)
Pool pump switches	Direct load control	Summer and Winter	Load control program with switch installed on pool pump
Room AC	Direct load control	Summer	Load control program that is focused on room AC units rather than central AC
Managed EV Charging - switch	Direct load control	Summer and Winter	Load control switch that is installed on an EV charger
Managed EV Charging - telematics	Direct load control	Summer and Winter	Direct load control program leveraging EV smart charging software
Battery Storage with PV	Pricing/Direct load control	Summer and Winter	PV charges battery and battery discharges to grid

Table 17: Small C&I DR Measures

Measure	Type	Season	Description
Central air conditioner - Load Shed	Direct load control	Summer	Direct load control program where utility provides day ahead notification that it will send remote signal to shed AC unit load during peak usage period.
Central Heating - Load Shed*	Direct load control	Winter	Direct load control program where utility provides day ahead notification that it will send remote signal to shed AC unit load during peak usage period.
Central air conditioner - 50% cycling	Direct load control	Summer	Direct load control program where utility provides day ahead notification that it will send remote signal to cycle AC unit during peak usage period
Central Heating - 50% cycling*	Direct load control	Winter	Direct load control program where utility provides day ahead notification that it will send remote signal to cycle AC unit during peak usage period
Smart thermostats - Utility Installation*	Direct load control	Summer and Winter	Similar to AC load control program, but allows customers to participate using a compatible smart thermostat rather than an AC switch
Smart thermostats - BYOT*	Direct load control	Summer and Winter	Similar to AC load control program, but allows customers to participate using a compatible smart thermostat rather than an AC switch
CPP + Tech	Pricing	Summer and Winter	Electricity rate that varies based on time of day. Can be same rate schedule for every day during a given season (time of use, or TOU) and with critical peak pricing (CPP) days when peak period rates are substantially higher for a limited number of days per year (customers receive advance notification of CPP event). Customers also receive technology that they can pre-program to curtail load when an event is called.
Managed EV Charging - switch	Direct load control	Summer and Winter	Load control switch that is installed on an EV charger
Managed EV Charging - telematics	Direct load control	Summer and Winter	Direct load control program leveraging EV smart charging software
Battery Storage with PV	Pricing/Direct load control	Summer and Winter	PV charges battery and battery discharges to grid

Table 18: Large C&I DR Measures

Measure	Type	Season	Description
CPP + Tech	Pricing	Summer and Winter	Electricity rate that varies based on time of day. Can be same rate schedule for every day during a given season (time of use, or TOU) and with critical peak pricing (CPP) days when peak period rates are substantially higher for a limited number of days per year (customers receive advance notification of

Measure	Type	Season	Description
			CPP event). Customers also receive technology that they can pre-program to curtail load when an event is called.
Auto DR	Utility-controlled loads	Summer and Winter	Custom load control of specific end-uses/processes that is triggered by utility signal to building management system; customer can sometimes opt-out of specific events
Firm Service Level	Contractual	Summer and Winter	Customer commits to a maximum usage level during peak periods and, when notified by the utility, agrees to cut usage to that level.
Guaranteed Load Drop	Contractual	Summer and Winter	Customer agrees to reduce usage by an agreed upon amount when notified

No DR measures from the 2019 Technical Potential Study were eliminated from the current study.

Appendix C DSRE Measure List

Table 19: Residential DSRE Measures

Measure	Description
PV System	Roof-mounted system, including multiple panels, AC/DC inverter, racking system, and electrical system interconnections
Battery Storage from PV System	Lithium-ion battery system designed to integrate with an on-site PV system to store and discharge excess energy from PV generation

Table 20: Non-Residential DSRE Measures

Measure	Description
PV System	Roof-mounted system, including multiple panels, AC/DC inverter, racking system, and electrical system interconnections
Battery Storage from PV System	Lithium-ion battery system designed to integrate with an on-site PV system to store and discharge excess energy from PV generation
CHP - Fuel Cell	An electrochemical cell-based generator that reacts hydrogen fuel with oxygen
CHP - Micro Turbine	Small combustion turbine that burns gaseous or liquid fuel to drive a generator
CHP - Gas Turbine	A combustion turbine that burns gaseous or liquid fuel to drive a generator
CHP - Reciprocating Engine	An engine that uses one or more pistons to convert pressure into rotational motion
CHP - Steam Turbine	A turbine that extracts thermal energy from pressured steam to drive a generator

No DSRE measures from the 2019 Technical Potential Study were eliminated from the current study.

Appendix D External Measure Suggestions

Table 21: External Measure Suggestions and Actions

Measure Suggestion	Stakeholder Comments	Action taken for FEECA Study
Efficient Electrification Measures	All measures that can produce substantial site energy savings by converting from natural gas or other fossil fuels should be included in the Florida electric utilities' next efficiency potential study. Key examples include efficient heat pumps to displace gas furnaces and efficient heat pump water heaters to displace gas water heaters. It is important to note that these electrification measures provide not only heating energy savings and water heating energy savings, but can also potentially provide cooling efficiency benefits as well. In the case of heat pumps, that can occur because efficient heat pumps can operate in cooling mode more efficiently than standard central air conditioners. In the case of heat pump water heaters, cooling and dehumidification benefits can occur when/if the water heater is in conditioned space because they transfer heat (particularly latent heat) from the air around them to the water they are heating. A growing number of jurisdictions - including Illinois, Minnesota and some northeastern states - have begun to include efficient electrification measures in their efficiency programs portfolios.	Fuel-switching and electrification are outside the scope of this study
Networked Lighting Controls	LED lighting technology has become increasingly accepted and installed in commercial buildings. The next big efficiency opportunity in commercial lighting efficiency is in sophisticated controls integrated into the light fixtures themselves - both luminaire level lighting controls and networked lighting controls. For example, a 2017 report for both the Northwest Energy Efficiency Alliance and the Design Lights Consortium, a non-profit that works with utilities and manufacturers of lighting products (and which many utilities across the country reference for determination of eligibility of lighting products for efficiency program rebates), found that networked lighting controls can provide on the order of 50% additional savings after LED conversion. Other studies have also found the national savings potential from such products to be enormous. Moreover, these products can be designed to provide not only lighting energy savings but also a number of other non-energy benefits (e.g., asset tracking, such as the ability of hospitals to know the location of all wheel chairs). Numerous utilities across the country now actively promote this technology through their efficiency programs. For example, Commonwealth Edison, the utility serving Chicago and other parts of northern Illinois, is currently getting a significant portion of its commercial lighting savings from promotion of networked lighting controls	Added to measure list for 2024 study

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External Measure Suggestions

Measure Suggestion	Stakeholder Comments	Action taken for FEECA Study
Ductless mini-split heat pumps to displace inefficient electric baseboard heating	While most Florida residential buildings with electric heat provide that heat with heat pumps, at least some (perhaps most likely being older multi-family rental buildings) still use inefficient electric resistance heat. Ductless mini- split heat pump retrofits can very efficiently displace such inefficient electric heat and should be added to the residential measure list.	Added to measure list for 2024 study
Air Source Heat Pump baseline assumptions	<p>There are seven air source heat pump (ASHP) measures included in the residential measure list. Two of them - one at SEER 14 and a second at SEER 21 - are listed as relative to an electric resistance baseline. Five of them - SEER 15, SEER 16, SEER 17, SEER 18 and SEER 21 - appear to be relative to a baseline of a standard new ASHP. Are we interpreting this correctly? If so, we have a couple of comments/questions/suggestions:</p> <ul style="list-style-type: none"> • The efficiency standards assessed need to be modified to be consistent with new federal standards, including new testing procedures. • For cases where the baseline is "electric resistance", why only assessing two efficiency tiers (i.e., fewer than for standard ASHP baselines)? The same number of efficiency tiers should be assessed for both baselines. 	Incorporated suggestions into 2024 study, including updated baseline standard and assessing same efficiency tiers for both baselines
Heat Pump Water Heater Efficiency	The Res EE tab of the utilities draft measure list suggests that the efficiency of a heat pump water heater is an EF of 2.50. That is unrealistically low. In fact, of the 222 products listed on the Energy Star website, none had UEFs less than 2.80 and only 29 (13%) had UEFs that were less than 3.4; the average was 3.57. Indeed, the first product listed on a search of heat pump water heaters on Home Depot's website is a 50 gallon, Rheem (Pro Terra) product with a UEF of 3.75 and a cost of \$1699.	Incorporated suggestion into 2024 study
New Construction Measure Packages	The measures lists did not appear to include packages of measures for building new residential and/or new commercial buildings to levels of efficiency beyond those required by code. Utilities in many jurisdictions run new construction efficiency programs supporting such measure packages. In the residential sector, many base their programs on the long-standing Federal Energy Star standard. However, increasingly utility programs are promoting additional efficiency tiers - often as part of all-electric new construction program offerings - that go well beyond the Energy Star standard. For example, Consumers Energy (Michigan) offers \$1000 rebates to builders who construct Energy Star single family homes	Incorporated suggestion into 2024 study with 2 tiers of residential new construction whole-home improvement measures.

External Measure Suggestions

Measure Suggestion	Stakeholder Comments	Action taken for FEECA Study
	with a Home Energy Rating (HERS) score of 57 or less, but offer higher rebates for more efficient buildings - up to \$4000 for all electric homes with a HERS score of 40 or less. The Florida utilities potential study should assess savings potential for both the Energy Star level and a tier or two of additional efficiency beyond that level. Similar assessments of new commercial building savings potential should also be assessed.	
Custom Industrial Measures	The utilities' list of industrial efficiency measures addresses common industrial efficiency opportunities. However, it does not address efficiency opportunities that may be unique to individual industries or even to individual industrial facilities. That can include such things as changes in types of materials used in manufacturing, reductions in waste streams, improved use of water delivered by agricultural irrigation systems, and/or other things that are not directly related to energy using equipment or controls of such equipment. It is obviously not possible to list all such measures. However, a potential study will understate savings potential if it does not include a way of capturing such potential in its estimates. One potential way to get a sense of such potential is to review results of comprehensive industrial efficiency programs run by other utilities to identify the portion of actual program savings from such unique custom measures - and then assume that portion of custom savings could be added to the savings estimated in the study for named measures.	Added to measure list for 2024 study
Electric Vehicle measures	Some EV chargers are more efficient than others. The Federal Energy Star program has a standard for them. Savings potential may not be huge, but should be considered in the study. With a growing number of EV sales, the study should also consider the potential savings from promoting the most efficient EVs within different size/style categories	Added to measure list for 2024 study
Removing screw-based LEDs	The screw-based LEDs on both the Residential and Commercial measure lists should now be considered baseline due to federal efficiency standards adopted earlier this year. Utility load forecasts for IRPs should reflect resulting improvements in end use efficiency.	Screw-based LEDs were included in the study but with limited applicability to reflect current market
Removing Commercial fluorescent lighting	LED technology - for both fixtures and lamps - has advanced significantly in recent years, to the point where it should be the only technology considered for commercial lighting. Measures such as high performance T-8 fluorescent fixtures and high bay T-5 fluorescent fixtures should be replaced with LED alternatives in the study.	Updated measure list for 2024 study to only include LED-based lamps for linear fluorescent replacements

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External Measure Suggestions

Measure Suggestion	Stakeholder Comments	Action taken for FEECA Study
Removing fossil-gas fueled CHP	Fossil-fuel fired CHP systems should not be considered “renewable” and have questionable benefits if electric generation is expected to get increasingly more renewable and clean. Biogas-fueled CHP - such as systems installed in wastewater treatment facilities that use methane byproducts of processing waste - should be included in the study.	2024 study will continue to assess all CHP options
Adding livestock methane power generation to renewables list	For example, see the “cow power” program currently being run by Green Mountain Power, Vermont’s largest electric utility	2024 study will continue to assess DSRE options consistent with prior study, including customer-sited solar, solar plus storage, and CHP
Adding EV managed charging to DR list	With national market shares for EVs growing, it is important that utilities consider programs for managing when charging occurs. Numerous utilities are currently running managed charging programs. This does not currently appear to be on the measure list and should be added to the Florida utilities’ potential study.	Added to measure list for 2024 study
Residential “smart thermostat” measure can provide both efficiency savings and demand response potential	This is recognized in the inclusion of smart thermostats in both the Res EE and DR tabs of the measure list spreadsheet. We simply want to flag that it is important when assessing cost-effectiveness of this measure that these two potential benefits are considered together. In other words, the cost should be considered compared to the combined efficiency and DR potential rather than separately considered relative to just EE savings and then separately again compared to just DR potential	2024 study will include interactive impacts of EE and DR opportunities
Emerging Technologies	The efficiency potential study measure list appears to be somewhat outdated. It does not include a number of new and emerging technologies. The potential list of such technologies is long. We suggest reviewing the attached list of emerging technologies developed almost two years ago by Consumers Energy (Michigan) and including them in the study.	Consumers Energy study was reviewed and commercially available measures were added to measure list for 2024 study, including heat pump water heaters - CEE advanced tier, heat pump clothes dryers, ozone laundry systems, and 21+ SEER HVAC units

External Measure Suggestions

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Technical Potential Study of Demand Side Management

Orlando Utilities Commission

Date: 03.07.2024

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Executive Summary

In October, 2022, the six electric utilities subject to the Florida Energy Efficiency and Conservation Act (FEECA Utilities) retained Resource Innovations, Inc. for the purpose of identifying and characterizing the market for demand-side management (DSM) opportunities, including energy efficiency (EE) improvement and building retrofits, peak load reductions from demand response (DR), and demand-side renewable energy (DSRE) systems.

The main objective of the study was to assess the technical potential of demand-side resources for reducing customer electric energy consumption and seasonal peak capacity demands.

This report provides the detailed methodology and results for the technical potential analysis of Orlando Utilities Commission's (OUC) service territory.

1.1 Methodology

Resource Innovations estimates DSM savings potential by applying an analytical framework that aligns baseline market conditions for energy consumption and demand with DSM opportunities. After describing the baseline condition, Resource Innovations applies estimated measure savings to disaggregated consumption and demand data. The approach varies slightly according to the type of DSM resources and available data; the specific approaches used for each type of DSM are described below.

1.1.1 EE Potential

This study utilized Resource Innovations' proprietary EE modeling tool, TEA-POT (Technical / Economic / Achievable POTential). This modeling tool was built on a platform that provides the ability to create and analyze multiple scenarios and recalculate potential savings based on variable inputs such as sales/load forecasts, electricity prices, discount rates, and actual program savings. The methodology for the EE potential assessment was based on a hybrid "top-down/bottom-up" approach, which started with the current utility load forecast, then disaggregated it into its constituent customer-class and end-use components. Our assessment examined the effect of the range of EE measures and practices on each end-use, taking into account current market saturations, and technical feasibility. These unique impacts were aggregated to produce estimates of potential at the end-use, customer class, and system levels for OUC.

1.1.2 DR Potential

The assessment of DR potential in OUC's service territory was an analysis of mass market direct load control programs for residential and small commercial and industrial (C&I) customers, and an analysis of DR programs for large C&I customers. The direct load control program assessment focused on the potential for demand reduction through heating, ventilation, and air conditioning (HVAC), water heater, managed electric vehicle charging, and pool pump load control. These end-uses were of particular interest because of their large contribution to peak period system load. For this analysis, a range of direct load control measures were examined for each customer segment to highlight the range of potential. The assessment further accounted for existing DR programs for OUC when calculating the total DR potential.

1.1.3 DSRE Potential

The DSRE technologies included in this study are rooftop solar photovoltaic (PV) systems, battery storage systems charged from customers' PV systems, and combined heat and power (CHP) systems. The study leveraged the customer segmentation and load disaggregation data assembled for the EE and DR analyses, and applied our DSRE model, SPIDER™ (Spatial Penetration and Integration of Distributed Energy Resources), for economic and adoption analysis of solar and battery storage. This model dynamically responds to rapidly changing technologies and accounts for all key time-varying elements such as technology costs, incentives, tax credits, and electric rates. To estimate technical potential for CHP, the study utilized a series of unique distributed generation potential models for each primary market sector (commercial and industrial), calculating the average building consumption, assigning minimum facility size thresholds, and estimating building energy savings share percentage for each CHP technology based on its generation capacity.

1.2 Savings Potential

Technical potential for EE, DR, and DSRE are as follows:

1.2.1 EE Potential

EE technical potential describes the savings potential when all technically feasible EE measures are fully implemented, ignoring all non-technical constraints on electricity savings, such as cost-effectiveness and customer willingness to adopt EE.

The estimated EE technical potential results are summarized in Table 1.

Table 1. EE Technical Potential

	Savings Potential		
	Summer Peak Demand (MW)	Winter Peak Demand (MW)	Energy (GWh)
Residential	249	98	935
Non-Residential¹	201	99	1,044
Total	450	197	1,979

1.2.2 DR Potential

DR technical potential describes the magnitude of loads that can be managed during conditions when grid operators need peak capacity. For residential and small C&I customers where DR generally takes the form of direct utility control, technical potential for DR is limited by the loads that can be controlled remotely at scale such as heating, cooling, water heaters, managed electric vehicle charging, and pool pumps. For large C&I customers, this included their entire electric demand during a utility’s system peak, as many of these types of customers will forego virtually all electric demand temporarily if the financial incentive is large enough.

The estimated DR technical potential results are summarized in Table 2.

Table 2. DR Technical Potential

	Savings Potential	
	Summer Peak Demand (MW)	Winter Peak Demand (MW)
Residential	235	223
Non-Residential	582	563
Total	817	786

¹ Non-Residential results include all commercial and industrial customer segments.

1.2.3 DSRE Potential

DSRE technical potential estimates quantify all technically feasible distributed generation opportunities from PV systems, battery storage systems charged from PV, and CHP technologies based on the customer characteristics of OUC’s customer base.

The estimated DSRE technical potential results are summarized in Table 3.

Table 3. DSRE Technical Potential²

	Savings Potential		
	Summer Peak Demand (MW)	Winter Peak Demand (MW)	Energy (GWh)
PV Systems			
Residential	339	0	2,731
Non-Residential	162	0	1,169
Total	501	0	3,900
Battery Storage charged from PV Systems			
Residential	171	166	0
Non-Residential	14	70	0
Total	185	236	0
CHP Systems			
Total	354	292	1,591

² PV systems and CHP systems were independently analyzed for technical potential without consideration of the competition between technologies or customer preference for DSRE system.

2 Introduction

In October, 2022, the six electric utilities subject to the Florida Energy Efficiency and Conservation Act (FEECA Utilities) retained Resource Innovations, Inc. for the purpose of identifying and characterizing the market for demand-side management (DSM) opportunities, including energy efficiency (EE) improvement and building retrofits, peak load reductions from demand response (DR), and demand-side renewable energy (DSRE) systems. The main objective of the study was:

- Assessing the technical potential of demand-side resources for reducing customer electric energy consumption and seasonal peak capacity demands.

This report provides the detailed methodology and results for the technical potential analysis of OUC's service territory.

The following deliverables were developed by Resource Innovations as part of the project and are addressed in this report:

- DSM measure list and detailed assumption workbooks
- Disaggregated baseline demand and energy use by year, sector, and end-use
- Baseline technology saturations, energy consumption, and demand
- Technical potential demand and energy savings
- Supporting calculation spreadsheets

2.1 Technical Potential Study Approach

Resource Innovations estimates technical potential according to the industry standard categorization, as follows:

Technical Potential is the theoretical maximum amount of energy and capacity that could be displaced by DSM, regardless of cost and other barriers that may prevent the installation or adoption of a DSM measure.

For this study, technical potential included full application of commercially available DSM technologies to all residential, commercial, and industrial customers in the utility's service territory.

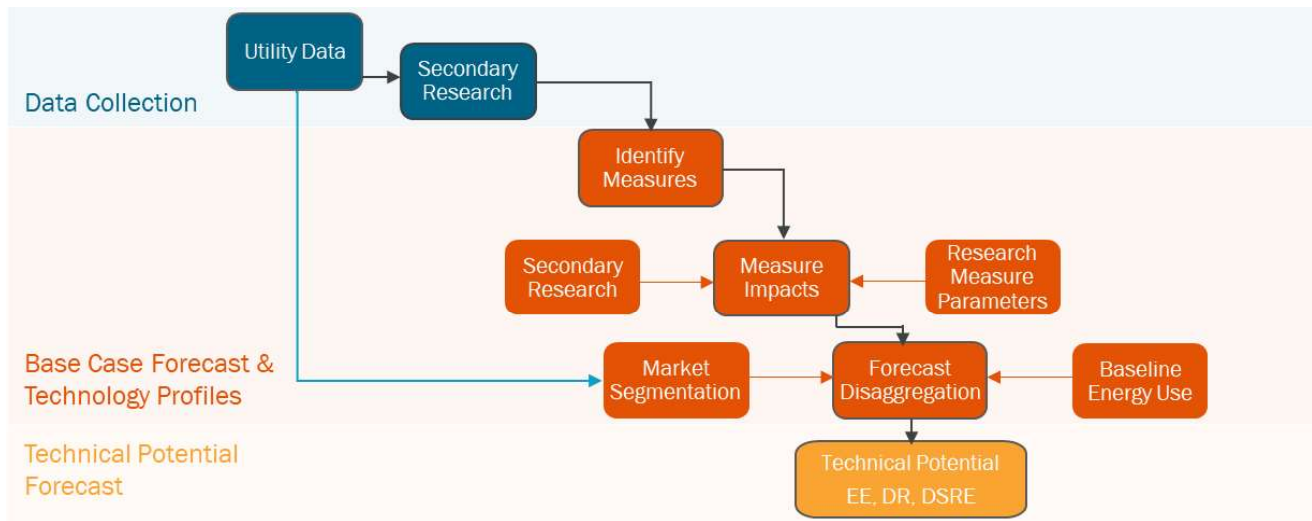
Quantifying DSM technical potential is the result of an analytical process that refines DSM opportunities that align with OUC's customers' electric consumption patterns. Resource Innovations' general methodology for estimating technical potential is a hybrid "top-

down/bottom-up” approach, which is described in detail in Sections 3 through 5 of this report and includes the following steps:

- Develop a baseline forecast: the study began with a disaggregation of the utility’s official electric energy forecast to create a baseline electric energy forecast. This forecast does not include any utility-specific assumptions around DSM performance. Resource Innovations applied customer segmentation and consumption data from each utility and data from secondary sources to describe baseline customer-class and end-use components. Additional details on the forecast disaggregation are included in Section 3.
- Identify DSM opportunities: A comprehensive set of DSM opportunities applicable to OUC’s climate and customers were analyzed to best depict DSM technical potential. Effects for a range of DSM technologies for each end-use could then be examined while accounting for current market saturations, technical feasibility, and impacts.
- Collect cost and impact data for measures: For those measures applicable to OUC’s customers, Resource Innovations conducted primary and secondary research and estimated costs, energy savings, measure life, and demand savings. We differentiated between the type of cost (capital, installation labor, maintenance, etc.) to separately evaluate different implementation modes: retrofit (capital plus installation labor plus incremental maintenance); new construction (incremental capital and incremental maintenance); and burnout costs (incremental capital and incremental maintenance costs for replacement of appliances and equipment that has reached the end of its useful life). Additional details on measure development are included in Section 4.

Figure 1 provides an illustration of the technical potential modeling process conducted for OUC, with the assessment starting with the current utility load forecast, disaggregated into its constituent customer-class and end-use components, and calibrated to ensure consistency with the overall forecast. Resource Innovations considered the range of DSM measures and practices application to each end-use, accounting for current market saturations, and technical feasibility. These unique impacts were aggregated to produce estimates of potential at the technology, end-use, customer class, and system levels.

Figure 1. Approach to Technical Potential Modeling



Resource Innovations estimated DSM technical potential based on a combination of market research, utility load forecasts and customer data, and measure impact analysis, all in coordination with OUC. Resource Innovations examined the technical potential for EE, DR, and DSRE opportunities; this report is organized to offer detail on each DSM category, with additional details on technical potential methodology presented in Section 5.

2.2 EE Potential Overview

To estimate EE potential, this study utilized Resource Innovations’ modeling tool, TEA-POT (Technical / Economic / Achievable POTential). This modeling tool was built on a platform that provides the ability to create and analyze multiple scenarios and recalculate potential savings based on variable inputs such as sales/load forecasts, electricity prices, discount rates, and actual utility program savings, as described in Section 5.1.1 below. While the analysis estimates the impacts of individual EE measures, the model accounts for interactions and overlap of individual measure impacts within an end-use or equipment type. The model provides transparency into the assumptions and calculations for estimating EE potential.

2.3 DR Potential Overview

To estimate DR market potential, Resource Innovations considered customer demand during utility peaking conditions and projected customer response to DR measures. Customer demand was determined by looking at account-level interval data for all OUC customers within each customer segment. For each segment, Resource Innovations determined the portion of a customer’s load that could be curtailed during the system peak.

2.4 DSRE Potential Overview

The DSRE technologies included in this study are rooftop solar photovoltaic (PV) systems, battery storage systems charged from PV, and combined heat and power (CHP) systems. The study leveraged the customer segmentation and load disaggregation data assembled for the EE and DR analyses, and applied our DSRE model, SPIDER™ (Spatial Penetration and Integration of Distributed Energy Resources), for economic and adoption analysis of solar and battery storage. This model dynamically responds to rapidly changing technologies and accounts for all key time-varying elements such as technology costs, incentives, tax credits, and electric rates. To estimate technical potential for CHP, the study utilized a series of unique distributed generation potential models for each primary market sector (commercial and industrial), calculating the average building consumption, assigning minimum facility size thresholds, and estimating building energy savings share percentage for each CHP technology based on its generation capacity.

3 Baseline Forecast Development

3.1 Market Characterization

The OUC base year energy use and sales forecast provided the reference point to determine potential savings. The end-use market characterization of the base year energy use and reference case forecast included customer segmentation and load forecast disaggregation. The characterization is described in this section, while the subsequent section addresses the measures and market potential energy and demand savings scenarios.

3.1.1 Customer Segmentation

In order to estimate EE, DR, and DSRE potential, the sales forecast and peak load forecasts were segmented by customer characteristics. As electricity consumption patterns vary by customer type, Resource Innovations segmented customers into homogenous groups to identify which customer groups are eligible to adopt specific DSM technologies, have similar building characteristics and load profiles, or are able to provide DSM grid services.

Resource Innovations segmented customers according to the following:

- 1) By Sector - how much of OUC's energy sales, summer and winter peak demand forecast is attributable to the residential, commercial, and industrial sectors?
- 2) By Customer - how much electricity does each customer typically consume annually and during system peaking conditions?
- 3) By End-Use - within a home or business, what equipment is using electricity during the system peak? How much energy does this end-use consume over the course of a year?

Table 4 summarizes the segmentation within each sector. In addition to the segmentation described here for the EE and DSRE analyses, the residential customer segments were further segmented by heating type (electric heat, gas heat, or unknown) and by annual consumption bins within each sub-segment for the DR analysis.

Table 4. Customer Segmentation

Residential	Commercial		Industrial	
Single Family	Assembly	Miscellaneous	Agriculture and Assembly	Primary Resources Industries
Multi-Family	College and University	Offices	Chemicals and Plastics	Stone/Glass/Clay/Concrete
Manufactured Homes	Grocery	Restaurant	Construction	Textiles and Leather
	Healthcare	Retail	Electrical and Electronic Equipment	Transportation Equipment
	Hospitals	Schools K-12	Lumber/Furniture/Pulp/Paper	Water and Wastewater
	Institutional	Warehouse	Metal Products and Machinery	Other
	Lodging/Hospitality		Miscellaneous Manufacturing	

From an equipment and energy use perspective, each segment has variation within each building type or sub-sector. For example, the energy consuming equipment in a convenience store will vary significantly from the equipment found in a supermarket. To account for this variation, the selected end-uses describe energy consumption patterns that are consistent with those typically studied in national or regional surveys, such as the U.S. Energy Information Administration’s (EIA) Residential Energy Consumption Survey (RECS), Commercial Building Energy Consumption Survey (CBECS) and Manufacturing Energy Consumption Survey (MECS), among others. The end-uses selected for this study are listed in Table 5.

Table 5. End-Uses

Residential End-Uses	Commercial End-Uses	Industrial End-Uses
Space heating ³	Space heating ³	Process heating
Space cooling ³	Space cooling ³	Process cooling
Domestic hot water	Domestic hot water	Compressed air
Ventilation and circulation	Ventilation and circulation	Motors/pumps

³ Includes the contribution of building envelope measures and efficiencies.

Residential End-Uses	Commercial End-Uses	Industrial End-Uses
Lighting	Interior lighting	Fan, blower motors
Cooking	Exterior lighting	Process-specific
Appliances	Cooking	Industrial lighting
Electronics	Refrigeration	Exterior lighting
Miscellaneous	Office equipment	HVAC ³
	Miscellaneous	Other

For DR, the end-uses targeted were those with controllable load for residential customers (i.e., HVAC, water heaters, pool pumps, and electric vehicles) and small C&I customers (HVAC and electric vehicles). For large C&I customers, all load during peak hours was included assuming these customers would potentially be willing to reduce electricity consumption for a limited time if offered a large enough incentive during temporary system peak demand conditions.

3.1.2 Forecast Disaggregation

A common understanding of the assumptions and granularity in the baseline load forecast was developed with input from OUC. Key discussion topics reviewed included:

- How current DSM offerings are reflected in the energy and demand forecast.
- Assumed weather conditions and hour(s) of the day when the system is projected to peak.
- Are there portions of the load forecast attributable to customers or equipment not eligible for DSM programs?
- How are projections of population increase, changes in appliance efficiency, and evolving distribution of end-use load shares accounted for in the peak demand forecast?

3.1.2.1 Electricity Consumption (kWh) Forecast

Resource Innovations segmented OUC’s electricity consumption forecast into electricity consumption load shares by customer class and end-use. The baseline customer segmentation represents the electricity market by describing how electricity was consumed within the service territory. Resource Innovations developed the forecast for the year 2025, and based it on data provided by OUC, primarily their 2023 Ten-Year Site Plan, which was the most recent plan available at the time the studies were initiated. The data addressed current baseline consumption, system load, and sales forecasts.

3.1.2.2 Peak Demand (kW) Forecast

A fundamental component of DR potential was establishing a baseline forecast of what loads or operational requirements would be absent due to existing dispatchable DR or time varying rates. This baseline was necessary to assess how DR can assist in meeting specific planning and operational requirements. We utilized OUC's summer and winter peak demand forecast, which was developed for system planning purposes.

3.1.2.3 Estimating Consumption by End-Use Technology

As part of the forecast disaggregation, Resource Innovations developed a list of electricity end-uses by sector (Table 5). To develop this list, Resource Innovations began with OUC's estimates of average end-use consumption by customer and sector. Resource Innovations combined these data with other information, such as utility residential appliance saturation surveys, as available, to develop estimates of customers' baseline consumption. Resource Innovations calibrated the utility-provided data with data available from public sources, such as the EIA's recurring data-collection efforts that describe energy end-use consumption for the residential, commercial, and manufacturing sectors.

To develop estimates of end-use electricity consumption by customer segment and end-use, Resource Innovations applied estimates of end-use and equipment-type saturation to the average energy consumption for each sector. The following data sources and adjustments were used in developing the base year 2025 sales by end-use:

Residential Sector:

- The disaggregation was based on OUC's rate class load shares and intensities.
- Baseline intensity was calibrated to account for differences in end-use saturation, fuel source, and equipment saturation as follows:
 - OUC rate class load share is based on average per customer.
 - Resource Innovations made conversions to usage estimates generated by applying EIA RECS data, residential end-use study data from other FEECA utilities, and EIA's Annual Energy Outlook (AEO) 2023.

Commercial Sector:

- The disaggregation was based on OUC's rate class load shares, intensities, and EIA CBECS data.
- Segment data from EIA and OUC.
- Baseline intensity was calibrated to account for differences in end-use saturation, fuel source, and equipment saturation as follows:

- Rate class load share based on EIA CBECS and end-use forecasts from OUC.

Industrial Sector:

- The disaggregation was based on rate class load shares, intensities, and EIA MECS data.
- Segment data from EIA and OUC.
- Baseline intensity was calibrated to account for differences in end-use saturation, fuel source, and equipment saturation as follows:
 - Rate class load share based on EIA MECS and end-use forecasts from OUC.

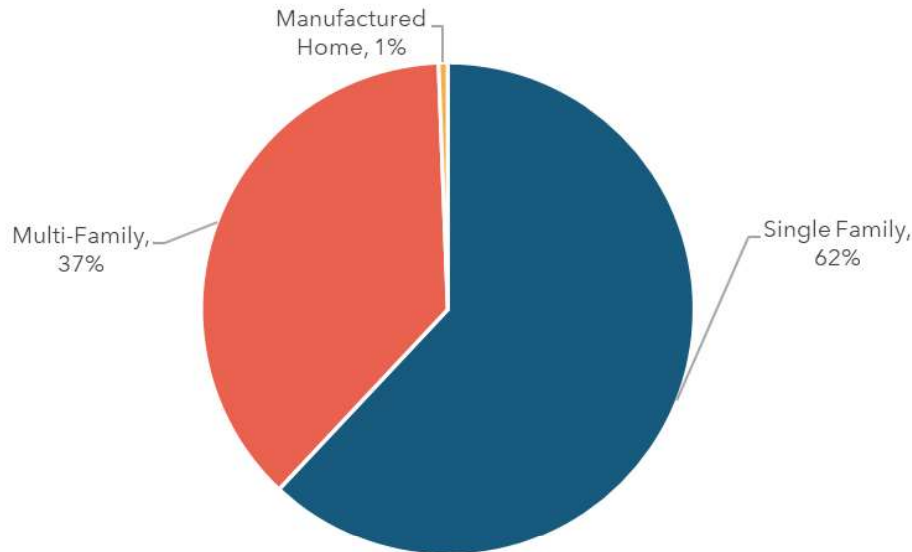
3.2 Analysis of Customer Segmentation

Customer segmentation is important to ensuring that a MPS examines DSM measure savings potential in a manner that reflects the diversity of energy savings opportunities existing across the utility's customer base. OUC provided Resource Innovations with data concerning the premise type and loads characteristics for all customers for the MPS analysis. Resource Innovations examined the provided data from multiple perspectives to identify customer segments. Resource Innovations' approach to segmentation varied slightly for non-residential and residential accounts, but the overall logic was consistent with the concept of expressing the accounts in terms that were relevant to DSM opportunities.

3.2.1 Residential Customers (EE, DR, and DSRE Analysis)

Segmentation of residential customer accounts enabled Resource Innovations to align DSM opportunities with appropriate DSM measures. Resource Innovations used utility customer data, supplemented with EIA data, to segment the residential sector by customer dwelling type (single family, multi-family, or manufactured home). The resulting distribution of customers according to dwelling unit type is presented in Figure 2.

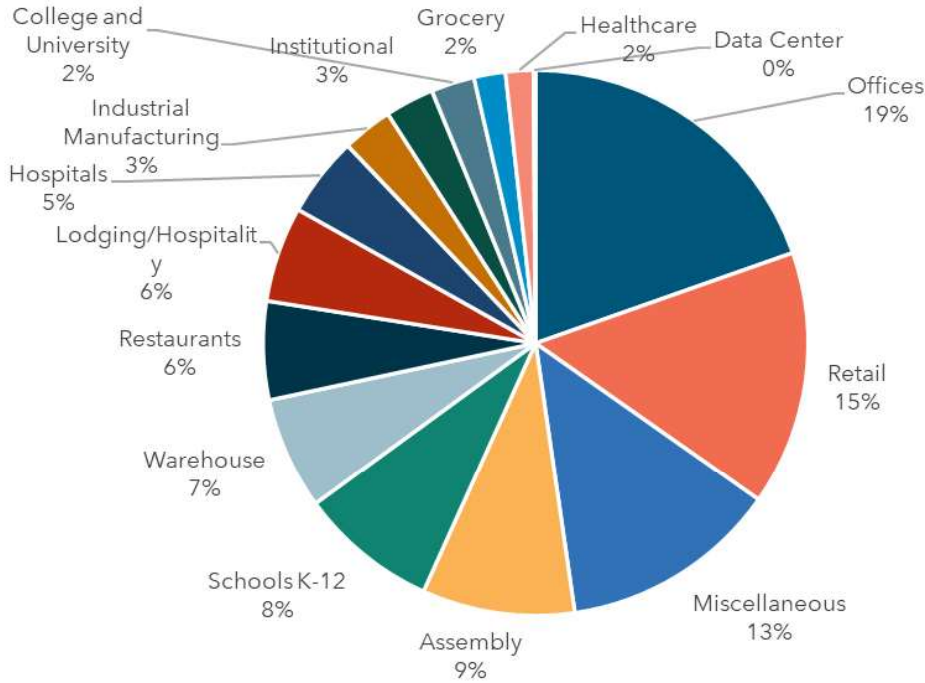
Figure 2. Residential Customer Segmentation



3.2.2 Non-Residential (Commercial and Industrial) Customers (EE and DSRE Analysis)

For the EE and DSRE analysis, Resource Innovations segmented C&I accounts using the utility's North American Industry Classification System (NAICS) or Standard Industrial Classification (SIC) codes, supplemented by data produced by the EIA's CBECS and MECS. Resource Innovations classified the customers in this group as either commercial or industrial, on the basis of DSM measure information available and applicable to each. For example, agriculture and forestry DSM measures are commonly considered industrial savings opportunities. Resource Innovations based this classification on the types of DSM measures applicable by segment, rather than on the annual energy consumption or maximum instantaneous demand from the segment as a whole. The estimated energy sales distributions Resource Innovations applied are shown below in Figure 3.

Figure 3. Business Customer Segmentation



3.2.3 Commercial and Industrial Accounts (DR Analysis)

For the DR analysis, Resource Innovations divided the non-residential customers into the two customer classes of small C&I and large C&I using rate class and annual consumption. For the purposes of this analysis, small C&I customers are those on the General Service (GS) tariff. Large C&I customers are all customers on the General Service Demand (GSD) tariff or on the General Service Large Demand (GSLD) tariff. Resource Innovations further segmented these two groups based on customer size. For small C&I, segmentation was determined using annual customer consumption and for large C&I the customer’s maximum demand was used. Both customer maximum demand and customer annual consumption were calculated using billing data provided by OUC.

Table 6 shows the account breakout between small C&I and large C&I.

Table 6. Summary of Customer Classes for DR Analysis

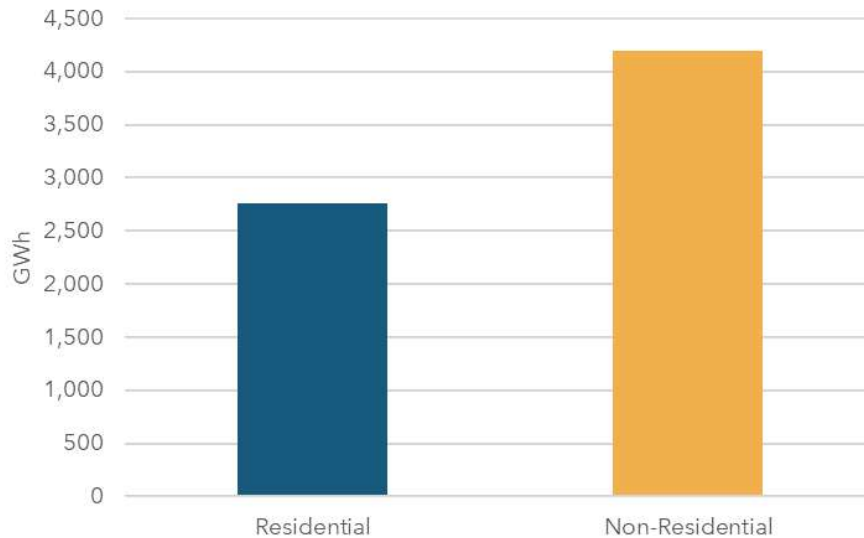
Customer Class	Annual kWh	Estimated Number of Accounts
Small C&I	0-15,000 kWh	15,967
	15,001-25,000 kWh	3,211
	25,001-50,000 kWh	3,269
	50,001 kWh +	2,096
	Total	24,543
Large C&I	0-50 kW	1,764
	51-300 kW	2,114
	301-500 kW	267
	501 kW +	373
	Total	4,518

3.3 Analysis of System Load

3.3.1 System Energy Sales

Technical potential is based on OUC's load forecast for the year 2025 from their 2023 Ten Year Site Plan, which is illustrated in **Error! Reference source not found.**

Figure 4: 2025 Electricity Sales Forecast by Sector



3.3.2 System Demand

To determine the technical potential for DR, Resource Innovations first established peaking conditions for each utility by looking at when each utility historically experienced its maximum demand. The primary data source used to determine when maximum DR impact was the historical system load for OUC. The data provided contained the system loads for all 8,760 hours of the most recent five years leading up to the study (2016-2021). The OUV summer and winter peaks were then identified within the utility-defined peaking conditions. For OUC the summer peaking conditions were defined as August from 5:00-6:00 PM and the winter peaking conditions were defined as January from 6:00-7:00 PM. The seasonal peaks were then selected as the maximum demand during utility peaking conditions.

3.3.3 Load Disaggregation

The disaggregated annual electric loads⁴ for the base year 2025 by sector and end-use are summarized in Figure 5 and Figure 6.

⁴ Full disaggregation of system demand by end-use was not conducted, as DR potential for residential and small C&I customers focused on specific end-uses of particular interest because of their large contribution to peak period system load, and was not end-use specific for large C&I customers. A description of the end-use analysis for residential and small C&I customers is included in Section 5.1.2

Figure 5: Residential Baseline (2025) Energy Sales by End-Use

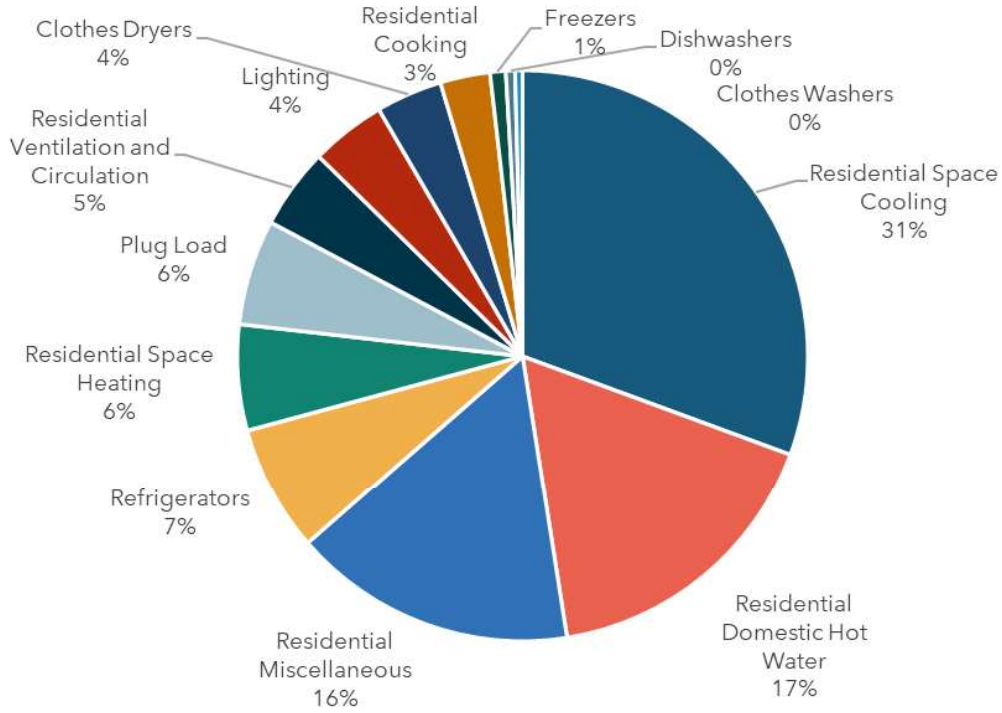
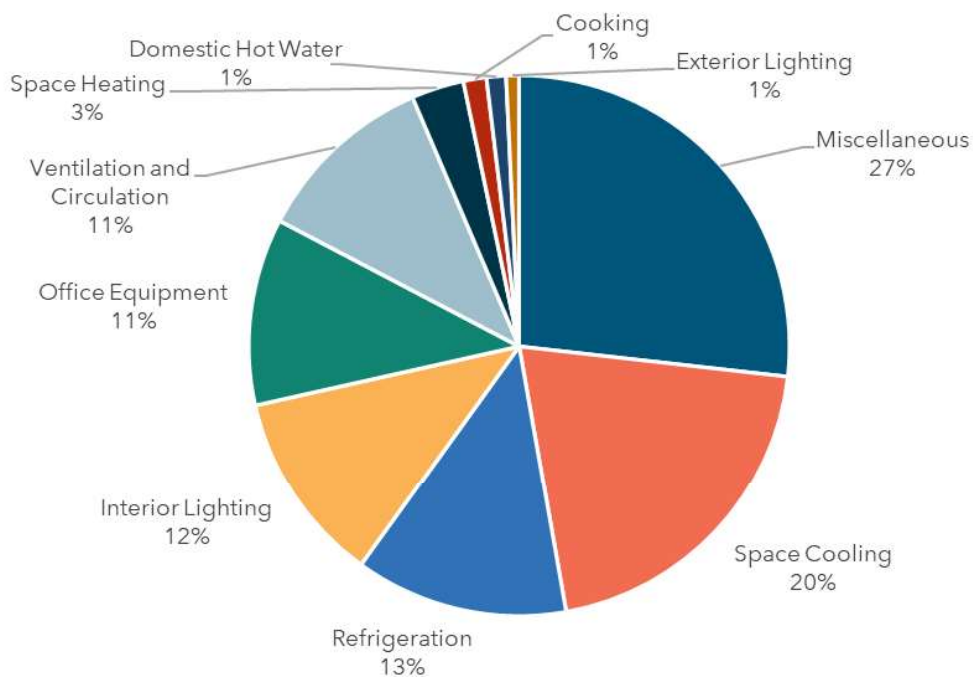


Figure 6: Business Baseline (2025) Energy Sales by End-Use



4 DSM Measure Development

DSM potential is described by comparing baseline market consumption with opportunities for savings. Describing these individual savings opportunities results in a list of DSM measures to analyze. This section presents the methodology to develop the EE, DR, and DSRE measure lists.

4.1 Methodology

Resource Innovations identified a comprehensive catalog of DSM measures for the study. The measure list is the same for all FEECA Utilities. The iterative vetting process with the utilities to develop the measure list began by initially examining the list of measures included in the 2019 Goals docket. This list was then adjusted based on proposed measure additions and revisions provided by the FEECA Utilities. Resource Innovations further refined the measure list based on reviews of Resource Innovations' DSM measure library, compiled from similar market potential studies conducted in recent years throughout the United States, as well as measures included in other utility programs where Resource Innovations is involved with program design, implementation, or evaluation. The FEECA Utilities also reached out to interested parties and received input with recommendations on measure additions to the 2019 measure list. Their measure suggestions were reviewed and incorporated into the study as appropriate. External measure suggestions and actions are summarized in Appendix D. The extensive, iterative review process involving multiple parties has ensured that the study included a robust and comprehensive set of DSM measures.

See Appendix A for the list of EE measures, Appendix B for the list of DR measures, and Appendix C for the list of DSRE measures analyzed in the study.

4.2 EE Measures

EE measures represent technologies applicable to the residential, commercial, and industrial customers in the FEECA Utilities' service territories. The development of EE measures included consideration of:

- EE technologies that are applicable to Florida and commercially available: Measures that are not applicable due to climate or customer characteristics were excluded, as were "emerging" technologies that are not currently commercially available to FEECA utility customers.
- Current and planned Florida Building Codes and Federal equipment standards (Codes & Standards) for baseline equipment: Measures included from prior studies

were adjusted to reflect current Codes & Standards as well as updated efficiency tiers, as appropriate.

- Eligibility for utility DSM offerings in Florida: For example, behavioral measures were excluded from consideration, as they historically have not been allowed to count towards utility DSM goals. Behavioral measures are intended to motivate customers to operate in a more energy-efficient manner (e.g., setting an air-conditioner thermostat to a higher temperature) without accompanying: a) physical changes to more efficient end-use equipment or to their building envelope, b) utility-provided products and tools to facilitate the efficiency improvements, or c) permanent operational changes that improve efficiency which are not easily revertible to prior conditions. These types of behavioral measures were excluded because of the variability in forecasting the magnitude and persistence of energy and demand savings from the utility's perspective. Additionally, decoupling behavioral measure savings from the installation of certain EE technologies like smart thermostats can be challenging and could result in overlapping potential with other EE measures included in the study.

Upon development of the final EE measure list, utility-specific measure details were developed. RI maintains a proprietary online database of energy efficiency measures for MPS studies, which was used as a starting point for measure development for this study. Measures are added or updated at the request of project stakeholders or because of changes to the EE marketplace (for example, new codes and standards, or current practice in the market). Measure data are refined as new data or algorithms are developed for estimating measure impacts, and updated for each study to incorporate inputs parameters specific to the service territory being analyzed. The database contains the following information for each of the measures:

- Measure description: measure classification by type, end-use, and subsector, and description of the base-case and the efficient-case scenarios.
- kWh savings: Energy savings associated with each measure were developed through engineering algorithms or building simulation modeling, taking climate data and customer segments into consideration as appropriate. Reference sources used for developing residential, commercial, and industrial measure savings included a variety of Florida-specific, as well as regional and national sources, such as utility-specific measurement & verification (M&V) data, technical reference manuals (TRM) from other jurisdictions, ENERGY STAR calculators, and manufacturer or retailer specifications for particular products.
- Energy savings were applied in RI's TEA-POT model as a percentage of total baseline consumption. Peak demand savings were determined using utility-specific load shapes or coincidence factors.

- Measure Expected Useful Lifetime: Sources included the Database for Energy Efficient Resources (DEER), the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Handbook, TRMs, and other regional and national measure databases and EE program evaluations.
- Measure Costs: Per-unit costs (full or incremental, depending on the application) associated with measure installations. Sources included: TRMs, ENERGY STAR calculator, online market research, FEECA utility program data, and other secondary sources.

The measure details from the online measure library are exported for use in RI’s TEA-POT model, accompanied by utility-specific estimates of measure applicability. Measure applicability is a general term encompassing an array of factors, including technical feasibility of installation, and the measure’s current saturation as well as factors to allocate savings associated with competing measures. Information used was primarily derived from data in current regional and national databases, as well as OUC’s program tracking data. These factors are described in Table 7.

Table 7. Measure Applicability Factors

Measure Impact	Explanation	Sources
Technical Feasibility	The percentage of buildings that can have the measure physically installed. Various factors may affect this, including, but not limited to, whether the building already has the baseline measure (e.g., dishwasher), and limitations on installation (e.g., size of unit and space available to install the unit).	Various secondary sources and engineering experience.
Measure Incomplete Factor	The percentage of buildings without the specific measure currently installed.	OUC RASS; EIA RECS, CBECS; MECS; ENERGY STAR sales figures; and engineering experience.
Measure Share	Used to distribute the percentage of market shares for competing measures (e.g., only blown-in ceiling insulation or spray foam insulation, not both would be installed in an attic).	OUC customer data, Various secondary sources and engineering experience.

As shown in Table 8, the measure list includes 395 unique energy-efficiency measures. Expanding the measures to account for all appropriate installation scenarios resulted in

9,535 measure permutations, which are the application of individual measures to various customer segments, construction types, and end-uses (i.e., a single air-source heat pump “measure” can be installed in single family, multi-family, and manufactured homes, as well as new and existing vintages of each home type, and impacts both space cooling and space heating end-uses, resulting in twelve separate measure “permutations” analyzed).

Table 8. EE Measure Counts by Sector

Sector	Unique Measures	Permutations
Residential	119	1,173
Commercial	164	5,798
Industrial	112	2,564

4.3 DR Measures

The DR measures included in the measure list utilize the following DR strategies:

- **Direct Load Control.** OUC control of selected equipment at the customer’s home or business, such as HVAC or water heaters.
- **Critical Peak Pricing (CPP) with Technology.** Electricity rate structures that vary based on time of day. Includes CPP when the rate is substantially higher for a limited number of hours or days per year (customers receive advance notification of CPP event) coupled with technology that enables customer to lower their usage in a specific end-use in response to the event (e.g., HVAC via smart thermostat).
- **Contractual DR.** Customers receive incentive payments or a rate discount for committing to reduce load by a pre-determined amount or to a pre-determined firm service level upon utility request.
- **Automated DR.** OUC dispatched control of specific end-uses at a customer facility.

DR initiatives that do not rely on the installation of a specific device or technology to implement (such as a voluntary curtailment program or time of use rates) were not included.

A workbook was developed for each measure which included the same measure inputs as previously described for the EE measures. In addition, the DR workbook included expected load reduction from the measure, based on utility technical potential, existing utility DR programs, and other nationwide DR programs if needed.

For technical potential, Resource Innovations did not break out results by specific measure or control technology because all of the developed measures target the end-uses estimated

for technical potential (i.e., potential is reported for space cooling end-use and not allocated to switches, smart thermostats, etc.).

4.4 DSRE Measures

The DSRE measure list includes rooftop PV systems, battery storage systems charged from PV systems, and CHP systems.

PV Systems

PV systems utilize solar panels (a packaged collection of PV cells) to convert sunlight into electricity. A system is constructed with multiple solar panels, a DC/AC inverter, a racking system to hold the panels, and electrical system interconnections. These systems are often roof-mounted systems that face south-west, south, and/or, south-east. The potential associated with roof-mounted systems installed on residential and commercial buildings was analyzed.

Battery Storage Systems Charged from PV Systems

Distributed battery storage systems included in this study consist of behind-the-meter battery systems installed in conjunction with an appropriately-sized PV system at residential and commercial customer facilities. These battery systems typically consist of a DC-charged battery, a DC/AC inverter, and electrical system interconnections to a PV system. On their own battery storage systems do not generate or conserve energy, but can collect and store excess PV generation to provide power during particular time periods, which for DSM purposes would be to offset customer demand during the utility's system peak.

CHP Systems

In most CHP applications, a heat engine creates shaft power that drives an electrical generator (fuel cells can produce electrical power directly from electrochemical reactions). The waste heat from the engine is then recovered to provide other on-site needs. Common prime mover technologies used in CHP applications and explored in this study include:

- Steam turbines
- Gas turbines
- Micro turbines
- Fuel Cells
- Internal combustion engines

A workbook was developed for each measure which included the inputs previously described for EE measures and prime mover operating parameters.

5 Technical Potential

In the previous sections, the approach for DSM measure development was summarized, and the 2025 base year load shares and reference-case load forecast were described. The outputs from these tasks provided the input for estimating the technical potential scenario, which is discussed in this section.

The technical potential scenario estimates the potential energy and demand savings when all technically feasible and commercially available DSM measures are implemented without regard for cost-effectiveness and customer willingness to adopt the most impactful EE, DR, or DSRE technologies. Since the technical potential does not consider the costs or time required to achieve these savings, the estimates provide a theoretical upper limit on electricity savings potential. Technical potential is only constrained by factors such as technical feasibility and applicability of measures. For this study, technical potential included full application of the commercially available DSM measures to all residential, commercial, and industrial customers in the utility's service territory.

5.1 Methodology

5.1.1 EE Technical Potential

EE technical potential refers to delivering less electricity to the same end-uses. In other words, technical potential might be summarized as "doing the same thing with less energy, regardless of the cost."

DSM measures were applied to the disaggregated utility electricity sales forecasts to estimate technical potential. This involved applying estimated energy savings from equipment and non-equipment measures to all electricity end-uses and customers. Technical potential consists of the total energy and demand that can be saved in the market which Resource Innovations reported as single numerical values for each utility's service territory.

The core equation used in the residential sector EE technical potential analysis for each individual efficiency measure is shown in Equation 1 below, while the core equation used in the nonresidential sector technical potential analysis for each individual efficiency measure is shown in Equation 2.

Equation 1: Core Equation for Residential Sector EE Technical Potential



Where:

- **Baseline Equipment Energy Use Intensity** = the electricity used per customer per year by each baseline technology in each market segment. In other words, the baseline equipment energy-use intensity is the consumption of the electrical energy using equipment that the efficient technology replaces or affects.
- **Saturation Share** = the fraction of the end-use electrical energy that is applicable for the efficient technology in a given market segment. For example, for residential cooling, the saturation share would be the fraction of all residential electric customers that have central air conditioners in their household.
- **Percent Incomplete** = the fraction of equipment that is not considered to already be energy efficient. To extend the example above, the fraction of central air conditioners that is not already energy efficient.
- **Feasibility Factor** = the fraction of units that is technically feasible for conversion to the most efficient available technology from an engineering perspective (i.e., it may not be possible to install LEDs in all light sockets in a home because the available styles may not fit in every socket).
- **Savings Factor** = the percentage reduction in electricity consumption resulting from the application of the efficient technology.

Equation 2: Core Equation for Non-Residential Sector EE Technical Potential



Where:

- **Total Stock Square Footage by Segment** = the forecasted square footage level for a given building type (e.g., square feet of office buildings).
- **Baseline Equipment Energy Use Intensity** = the electricity used per square foot per year by each baseline equipment type in each market segment.

- **Saturation Shares** = the fraction of total end-use energy consumption associated with the efficient technology in a given market segment. For example, for packaged terminal air-conditioner (PTAC), the saturation share would be the fraction of all space cooling kWh in a given market segment that is associated with PTAC equipment.
- **Percent Incomplete** = the fraction of equipment that is not considered to already be energy efficient.
- **Feasibility Factor** = the fraction of the equipment or practice that is technically feasible for conversion to the efficient technology from an engineering perspective (i.e., it may not be possible to install Variable Frequency Drives (VFD) on all motors in a given market segment).
- **Savings Factor** = the percentage reduction in electricity consumption resulting from the application of the efficient technology.

It is important to note that the technical potential estimate represents electricity savings potential at a specific point in time. In other words, the technical potential estimate is based on data describing status quo customer electricity use and technologies known to exist today. As technology and electricity consumption patterns evolve over time, the baseline electricity consumption will also change accordingly. For this reason, technical potential is a discrete estimate of a dynamic market. Resource Innovations reported the technical potential for 2025, based on currently known DSM measures and observed electricity consumption patterns.

Measure Interaction and Competition (Overlap)

While the technical potential equations listed above focus on the technical potential of a single measure or technology, Resource Innovations' modeling approach does recognize the overlap of individual measure impacts within an end-use or equipment type, and accounts for the following interactive effects:

- **Measure interaction:** Installing high-efficiency equipment could reduce energy savings in absolute terms (kWh) associated with non-equipment measures that impact the same end-use. For example, installing a high-efficiency heat pump will reduce heating and cooling consumption which will reduce the baseline against which attic insulation would be applied, thus reducing savings associated with installing insulation. To account for this interaction, Resource Innovations' TEA-POT model ranks measures that interact with one another and reduces the baseline consumption for the subsequent measure based on the savings achieved by the preceding measure. For technical potential, interactive measures are ranked based on total end-use energy savings percentage.
- **Measure competition (overlap):** The "measure share"—as defined above—accounted for competing measures, ensuring savings were not double-counted. This interaction

occurred when two or more measures “competed” for the same end-use. For example, a T-12 lamp could be replaced with a T-8 or linear LED lamp.

Addressing Naturally-Occurring EE

Naturally occurring energy efficiency includes actions taken by customers to improve the efficiency of their homes and businesses in the absence of utility program intervention. For the analysis of technical potential, Resource Innovations verified with OUC’s forecasting group that the baseline sales forecasts incorporated two known sources of naturally-occurring efficiency:

- Codes and Standards: The sales forecasts already incorporated the impacts of known Code & standards changes.
- Baseline Measure Adoption: The sales forecast excluded the projected impacts of future DSM efforts but included already implemented DSM penetration.

By properly accounting for these factors, the technical potential analysis estimated the additional EE opportunities beyond what is already included in the utility sales forecast.

5.1.2 DR Technical Potential

The concept of technical potential applies differently to DR than for EE. Technical potential for DR is effectively the magnitude of loads that can be curtailed during conditions when utilities need peak capacity reductions. In evaluating this potential at peak capacity, the following were considered: which customers are consuming electricity at those times? What end-uses are in play? Can those end-use loads be managed? Large C&I accounts generally do not provide the utility with direct control over particular end-uses. Instead, many of these customers will forego electric demand temporarily if the financial incentive is large enough. For residential and small C&I customers where DR generally takes the form of direct utility control, technical potential for DR is limited by the loads that can be controlled remotely at scale.

This framework makes end-use disaggregation an important element for understanding DR potential, particularly in the residential and small C&I sectors. When done properly, end-use disaggregation not only provides insights into which loads are on and off when specific grid services are needed, it also provides insight concerning how key loads and end-uses, such as air conditioning use, vary across customers. Resource Innovations’ approach used for load disaggregation is more advanced than what is used for most potential studies. Instead of disaggregating annual consumption or peak demand, Resource Innovations produced end-use load disaggregation for all 8,760 hours. This was needed because the loads available at times when different grid applications are needed can vary substantially. Instead

of producing disaggregated loads for the average customer, the study was produced for several customer segments. For OUC, Resource Innovations examined three residential segments based on customer housing type, four different small C&I segments based on customer size, and four different large C&I segments based on customer size, for a total of 11 different customer segments.

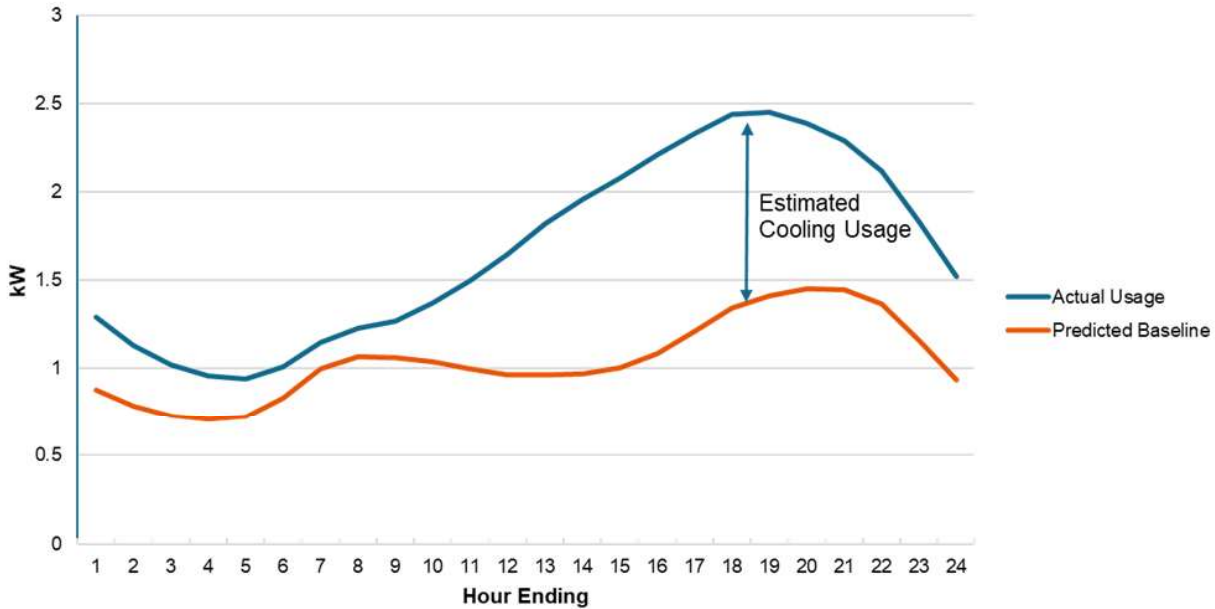
Technical potential, in the context of DR, is defined as the total amount of load available for reduction that is coincident with the period of interest; in this case, the system peak hour for the summer and winter seasons. Thus, two sets of capacity values are estimated: a summer capacity and a winter capacity.

As previously mentioned, for technical potential purposes, all coincident large C&I load is considered dispatchable, while residential and small C&I DR capacity is based on specific end-uses. Summer DR capacity for residential customers was comprised of air-conditioning (AC), pool pumps, water heaters, and managed electric vehicle charging. For small C&I customers, summer capacity was based on AC load. For winter DR capacity, residential was based on electric heating, pool pumps, and water heaters. For small C&I customers, winter capacity was based on electric heating.

AC and heating load profiles were generated for residential and small C&I customers using census-level customer interval data provided by OUC. This data included a customer breakout based on housing type for residential customers and size for small C&I customers. Resource Innovations then used the interval data from these customers to create an average load profile for each customer segment.

The average load profile for each customer segment was combined with historical weather data, and used to estimate hourly load as a function of weather conditions. AC and heating loads were estimated by first calculating the baseline load on days when cooling degree days (CDD) and heating degree days (HDD) were equal to zero, and then subtracting this baseline load. This methodology is illustrated by Figure 7 (a similar methodology was used to predict heating loads).

Figure 7: Methodology for Estimating Cooling Loads



This method was able to produce estimates for average AC/heating load profiles for the seven different customer segments within the residential and small C&I sectors.

Profiles for residential water heater and pool pump loads were estimated by utilizing end-use load data from NREL's residential end-use load profile database.

For all eligible loads, the technical potential was defined as the amount that was coincident with system peak hours for each season, which are August from 5:00-6:00 PM for summer, and January from 6:00-7:00 PM for winter. As mentioned in Section 4, for technical potential there was also no measure breakout needed, because all measures will target the end-uses' estimated total loads.

5.1.3 DSRE Technical Potential

5.1.3.1 PV Systems

To determine technical potential for PV systems, RI estimated the percentage of rooftop square footage in Florida that is suitable for hosting PV technology. Our estimate of technical potential for PV systems in this report is based in part on the available roof area and consisted of the following steps:

- Step 1: Outcomes from the forecast disaggregation analysis were used to characterize the existing and new residential, commercial and industrial building stocks.
 - To calculate the total roof area for residential buildings, the average roof area per household is multiplied by the number of households.
 - For commercial and industrial buildings, RI calculated the total roof area by first dividing the load forecast by the energy usage intensity, which provides an estimate of the total building square footage. This result is then divided by the average number of floors to derive the total roof area.
- Step 2: The total available roof area feasible for installing PV systems was calculated. Relevant parameters included unusable area due to other rooftop equipment and setback requirements, in addition to possible shading from trees and limitations of roof orientation (factored into a “technical suitability” multiplier).
- Step 3: Estimated the expected power density (kW per square foot of roof area).
- Step 4: Estimated the hourly PV generation profile using NREL’s PV Watts Calculator
- Step 5: Calculated total energy and coincident peak demand potential by applying RI’s Spatial Penetration and Integration of Distributed Energy Resources (SPIDER) Model.

The methodology presented in this report uses the following formula to estimate overall technical potential of PVs:

Equation 3: Core Equation for Solar DSRE Technical Energy Potential



Where:

- **Suitable Rooftop PV Area for Residential [Square Feet]:** Number of Residential Buildings x Average Roof Area Per Building x Technical Suitability Factor
- **Suitable Rooftop PV Area for Commercial [Square Feet] :** Energy Consumption [kWh] / Energy Intensity [kWh / Square Feet] / Average No. of Stories Per Building x Technical Suitability Factor
- **PV Power Density [kW-DC/Square Feet]:** Maximum power generated in Watts per square foot of solar panel.
- **Generation Factor:** Annual Energy Generation Factor for PV, from PV Watts (dependent on local solar irradiance)

5.1.3.2 Battery Storage Systems Charged from PV Systems

Battery storage systems on their own do not generate power or create efficiency improvements, but store power for use at different times. Therefore, in analyzing the technical potential for battery storage systems, the source of the stored power and overlap with technical potential identified in other categories was considered.

Battery storage systems that are powered directly from the grid do not produce annual energy savings but may be used to shift or curtail load during particular time periods. As the DR technical potential analyzes curtailment opportunities for the summer and winter peak period, and battery storage systems can be used as a DR technology, the study concluded that no additional technical potential should be claimed for grid-powered battery systems beyond that already attributed to DR.

Battery storage systems that are connected to on-site PV systems also do not produce additional energy savings beyond the energy produced from the PV system⁵. However, PV-connected battery systems do create the opportunity to store energy during period when the PV system is generating more than the home or business is consuming and use that stored power during utility system peak periods.

To determine the additional technical potential peak demand savings for “solar plus storage” systems, our methodology consisted of the following steps:

- Assume that every PV system included in PV Technical Potential is installed with a paired storage system.
- Size the storage system assuming peak storage power is equal to peak PV generation and energy storage duration is three hours.
- Apply RI’s hourly dispatch optimization module in SPIDER to create an hourly storage dispatch profile that flattens the individual customer’s load profile to the greatest extent possible accounting for a) customer hourly load profile, b) hourly PV generation profile, and c) battery peak demand, energy capacity, and roundtrip charge/discharge efficiency.
- Calculate the effective hourly impact for the utility using the above storage dispatch profile, aligned with the utility’s peak hour (calculated separately for summer and winter)
- Report the output storage kW impact on utility coincident peak demand in summer and winter.

⁵ PV-connected battery systems experience some efficiency loss due to storage, charging, and discharging. However, for this study, these losses were not quantified.

5.1.3.3 CHP Systems

The CHP analysis created a series of unique distributed generation potential models for each primary market sector (commercial and industrial).

Only non-residential customer segments whose electric and thermal load profiles allow for the application of CHP were considered. The technical potential analysis followed a three-step process. First, minimum facilities size thresholds were determined for each non-residential customer segment. Next, the full population of non-residential customers were segmented and screened based on the size threshold established for that segment. Finally, the facilities that were of sufficient size were matched with the appropriately sized CHP technology.

To determine the minimum threshold for CHP suitability, a thermal factor was applied to potential candidate customer loads to reflect thermal load considerations in CHP sizing. In most cases, on-site thermal energy demand is smaller than electrical demand. Thus, CHP size is usually dictated by the thermal load in order to achieve improved efficiencies.

The study collected electric and thermal intensity data from other recent CHP studies. For industrial customers, Resource Innovations assumed that the thermal load would primarily be used for process operations and was not modified from the secondary data sources for Florida climate conditions. For commercial customers, the thermal load is more commonly made up of water heating, space heating, and space cooling (through the use of an absorption chiller). Therefore, to account for the hot and humid climate in Florida, which traditionally limits weather-dependent internal heating loads, commercial customers' thermal loads were adjusted to incorporate a higher proportion of space cooling to space heating as available opportunities for waste heat recovery.

Resource Innovations worked with the utility-provided customer data, focusing on annual consumption due to the absence of NAICS or SIC codes for this utility data. Non-residential customers were subsequently classified based on annual consumption and size. Since NAICS or SIC codes were unavailable, no formal segmentation occurred. Instead, the analysis focused exclusively on annual utility usage. Facilities with annual loads below the kWh thresholds were deemed unlikely to possess the consistent electric and thermal loads necessary to support CHP and were consequently excluded from consideration. Conversely, those meeting the size criteria were aligned with the corresponding CHP technology.

In general, internal combustion engines are the prime mover for systems under 500kW with gas turbines becoming progressively more popular as system size increases above that. Based on the available load by customer, adjusted by the estimated thermal factor for each

segment, CHP technologies were assigned to utility customers in a top-down fashion (i.e., starting with the largest CHP generators).

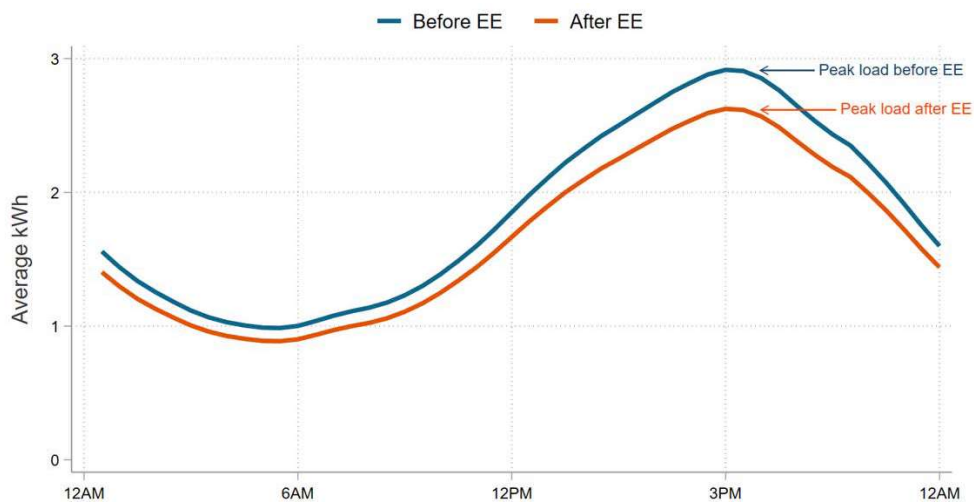
Measure Interaction

PV systems and battery storage charged from PV systems were analyzed collectively due to their common power generation source; and therefore, the identified technical potential for these systems is additive. However, CHP systems were independently analyzed for technical potential without consideration of the competition between DSRE technologies or customer preference for a particular DSRE system. Therefore, results for CHP technical potential should not be combined with PV systems or battery storage systems for overall DSRE potential but used as independent estimates.

5.1.4 Interaction of Technical Potential Impacts

As described above, the technical potential was estimated using separate models for EE, DR, and DSRE systems. However, there is interaction between these technologies; for example, a more efficient HVAC system would result in a reduced peak demand available for DR curtailment, as illustrated in Figure 8.

Figure 8: Illustration of EE Impacts on HVAC System Load Shape



Therefore, after development of the independent models, the interaction between EE, DR, and DSRE was incorporated as follows:

- The EE technical potential was assumed to be implemented first, followed by DR technical potential and DSRE technical potential.

- To account for the impact of EE technical potential on DR, the baseline load forecast for the applicable end-uses was adjusted by the EE technical potential, resulting in a reduction in baseline load available for curtailment.
- For DSRE systems, the EE and DR technical potential was incorporated in a similar fashion, adjusting the baseline load used to estimate DSRE potential.
 - For the PV analysis, this did not impact the results as the EE and DR technical potential did not affect the amount of PV that could be installed on available rooftops.
 - For the battery storage charged from PV systems, the reduced baseline load from EE resulted in additional PV-generated energy being available for the battery systems and for use during peak periods. The impact of DR events during the assumed curtailment hours was incorporated into the modeling of available battery storage and discharge loads.
- For CHP systems, the reduced baseline load from EE resulted in a reduction in the number of facilities that met the annual energy threshold needed for CHP installations. Installed DR capacity was assumed to not impact CHP potential as the CHP system feasibility was determined based on energy and thermal consumption at the facility. It should be noted that CHP systems not connected to the grid could impact the amount of load available for curtailment with utility-sponsored DR. Therefore, CHP technical potential should not be combined with DR potential but used as independent estimates.

5.2 EE Technical Potential

5.2.1 Summary

Table 9 summarizes the EE technical potential by sector:

Table 9. EE Technical Potential

	Savings Potential		
	Summer Peak Demand (MW)	Winter Peak Demand (MW)	Energy (GWh)
Residential	249	98	935
Non-Residential⁶	201	99	1,044
Total	450	197	1,979

⁶ Non-Residential results include all commercial and industrial customer segments.

5.2.2 Residential

Figure 10, Figure 10 and Figure 11 summarize the residential sector EE technical potential by end-use.

Figure 9: Residential EE Technical Potential by End-Use (Summer Peak Savings)

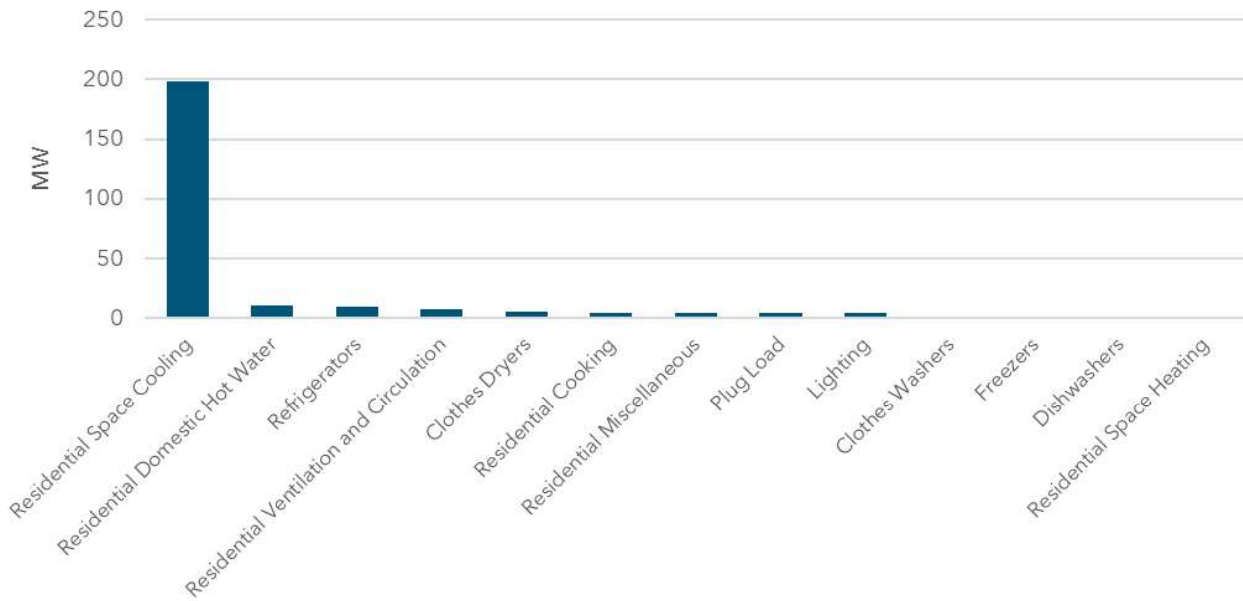


Figure 10: Residential EE Technical Potential by End-Use (Winter Peak Savings)

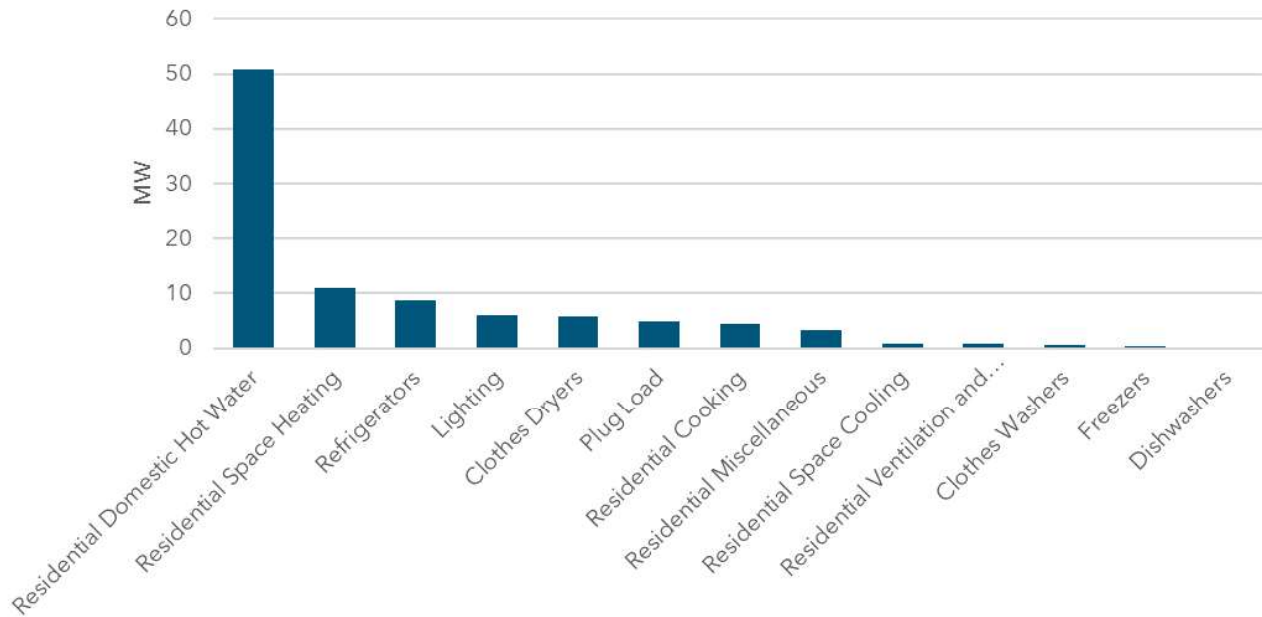
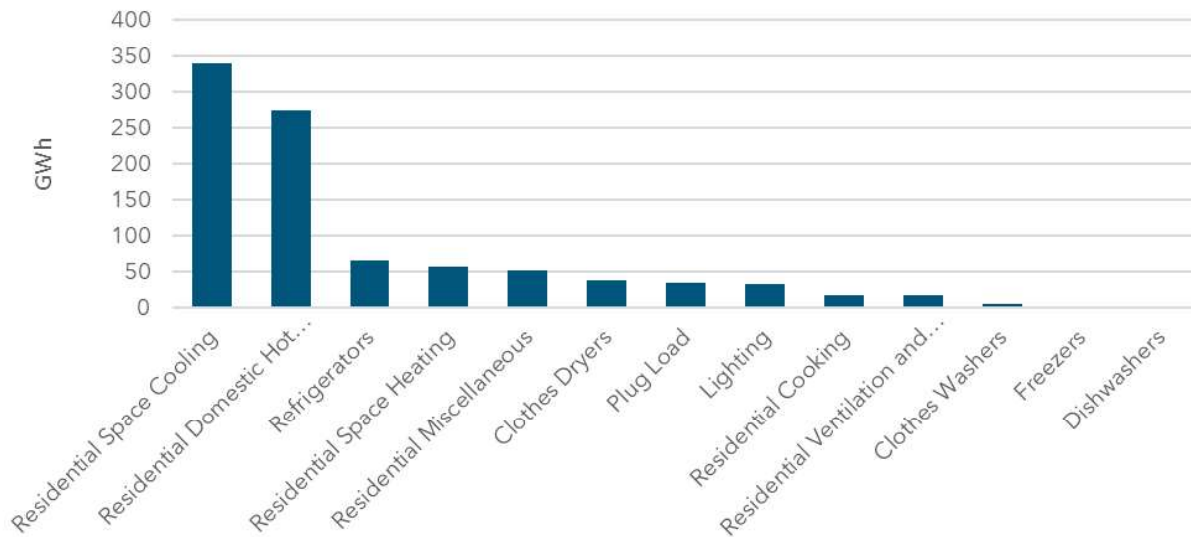


Figure 11: Residential EE Technical Potential by End-Use (Energy Savings)



5.2.3 Non-Residential

5.2.3.1 Business Segments

Figure 13, Figure 13 and Figure 14 summarize the business sector EE technical potential by end-use.

Figure 12: Business EE Technical Potential by End-Use (Summer Peak Savings)

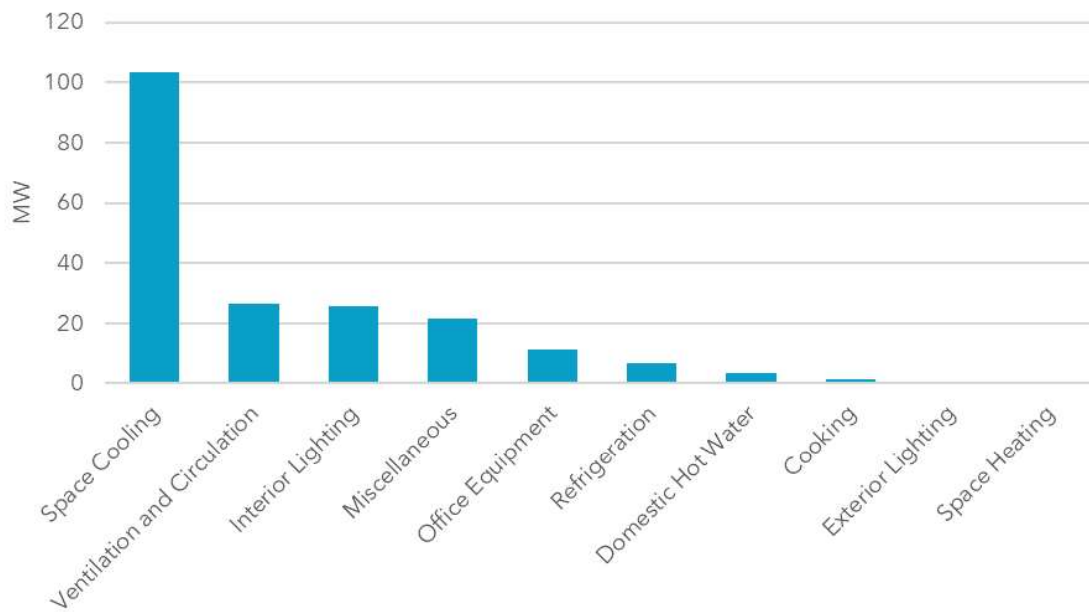


Figure 13: Business EE Technical Potential by End-Use (Winter Peak Savings)

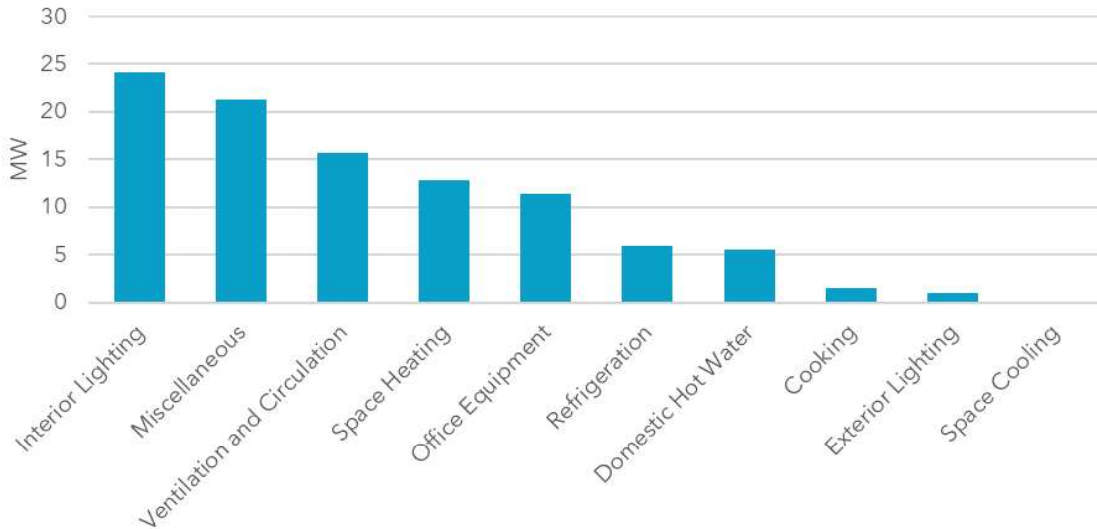
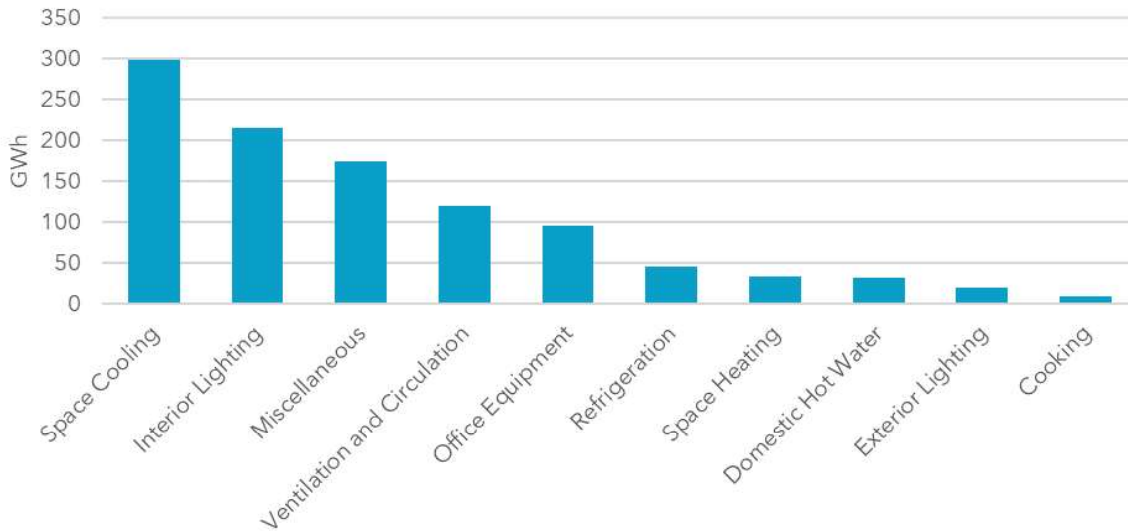


Figure 14: Business EE Technical Potential by End-Use (Energy Savings)



5.3 DR Technical Potential

Technical potential for DR is defined for each class of customers as follows:

- Residential & Small C&I customers - Technical potential is equal to the aggregate load for all end-uses that can participate in OUC’s current programs plus DR measures not currently offered in which the utility uses specialized devices to control loads (i.e. direct load control programs). This includes cooling and heating loads for residential and small C&I customers and water heater and pool pump loads for residential customers. Not all demand reductions are delivered via direct load control of end-uses. The magnitude of demand reductions from non-direct load control such as time varying pricing, peak time rebates and targeted notifications is linked to cooling and heating loads.
- Large C&I customers - Technical potential is equal to the total amount of load for each customer segment (i.e., that customers reduce their total load to zero when called upon).

Table 10 summarizes the seasonal DR technical potential by sector:

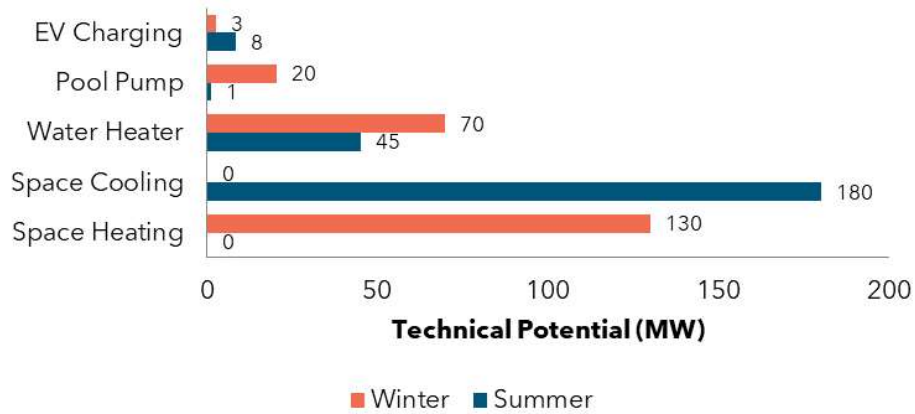
Table 10. DR Technical Potential

	Savings Potential	
	Summer Peak Demand (MW)	Winter Peak Demand (MW)
Residential	235	223
Non-Residential	582	563
Total	817	786

5.3.1 Residential

Residential technical potential is summarized in Figure 15.

Figure 15: Residential DR Technical Potential by End-Use

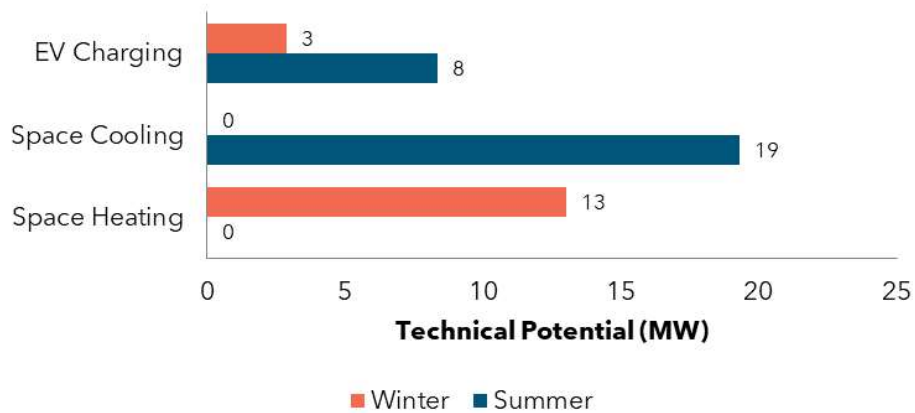


5.3.2 Non-Residential

5.3.2.1 Small C&I Customers

For small C&I technical potential, Resource Innovations looked at cooling and heating loads only. Small C&I technical potential is provided in Figure 16.

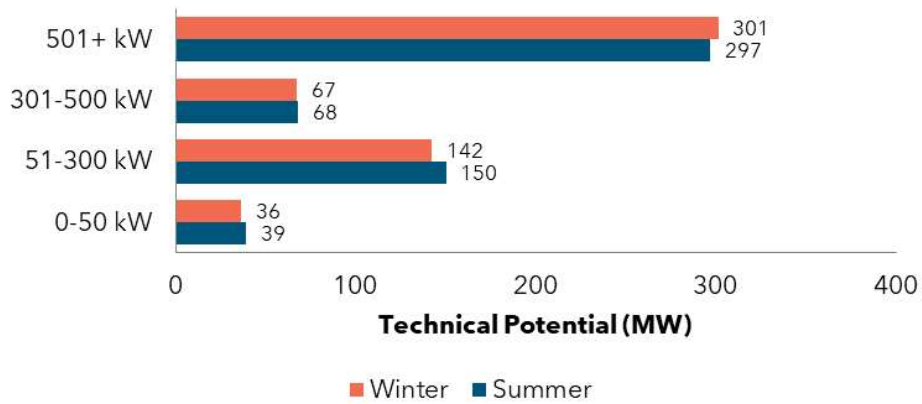
Figure 16: Small C&I DR Technical Potential by End-Use



5.3.2.2 Large C&I Customers

Figure 17 provides the technical potential for large C&I customers, broken down by customer size.

Figure 17: Large C&I DR Technical Potential by Segment



5.4 DSRE Technical Potential

Table 11 provides the results of the DSRE technical potential for each customer segment:

Table 11. DSRE Technical Potential⁷

	Savings Potential		
	Summer Peak Demand (MW)	Winter Peak Demand (MW)	Energy (GWh)
PV Systems			
Residential	339	0	2,731
Non-Residential	162	0	1,169
Total	501	0	3,900
Battery Storage charged from PV Systems			
Residential	171	166	0
Non-Residential	14	70	0
Total	185	236	0
CHP Systems			
Total	354	292	1,591

⁷ PV systems and CHP systems were independently analyzed for technical potential without consideration of the competition between technologies or customer preference for DSRE system.

Appendix A EE Measure List

For information on how Resource Innovations developed this list, please see Section 4.

Table 12: Residential EE Measures

Measure	End-Use	Description	Baseline
120v Heat Pump Water Heater 50 Gallons	Residential Domestic Hot Water	120v Heat Pump Water Heater 50 Gallons	Code-Compliant 50 Gallon Electric Resistance Water Heater
Air Sealing-Infiltration Control	Residential Space Cooling, Residential Space Heating	Standard Heating and Cooling System with Improved Infiltration Control	Standard Heating and Cooling System with Standard Infiltration Control
Air-to-Water Heat Pump	Residential Space Cooling, Residential Space Heating	Energy Star Air-to-Water Heat Pump, 25 SEER, 13 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
ASHP - 15 SEER/14.3 SEER2 from base electric resistance	Residential Space Cooling, Residential Space Heating	ASHP 15 SEER from base electric resistance	Base AC, 15 SEER, Electric resistance heating
ASHP - 24 SEER/22.9 SEER2 (from elec resistance)	Residential Space Cooling, Residential Space Heating	ASHP: 24/22.9 SEER/SEER2, 10.5 HSPF	Base AC, 15 SEER, Electric resistance heating
ASHP - 24 SEER/22.9 SEER2, 10.5 HSPF	Residential Space Cooling, Residential Space Heating	ASHP: 24/22.9 SEER/SEER2, 10.5 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
ASHP - CEE Advanced Tier: 17.8 SEER/17 SEER2; 10.0 HSPF	Residential Space Cooling, Residential Space Heating	CEE Advanced Tier ASHP: 17.8/17 SEER/SEER2; 10.0 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
ASHP - CEE Advanced Tier: 17.8 SEER/17 SEER2; 10.0 HSPF (from elec resistance)	Residential Space Cooling, Residential Space Heating	CEE Advanced Tier ASHP: 17.8/17 SEER/SEER2; 10.0 HSPF	Base AC, 15 SEER, Electric resistance heating
ASHP - CEE Tier 2: 16.8 SEER/16 SEER2; 9.0 HSPF	Residential Space Cooling, Residential Space Heating	CEE Tier 2 ASHP: 16.8/16 SEER/SEER2; 9.0 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
ASHP - CEE Tier 2: 16.8 SEER/16 SEER2; 9.0 HSPF (from elec resistance)	Residential Space Cooling, Residential Space Heating	CEE Tier 2 ASHP: 16.8/16 SEER/SEER2; 9.0 HSPF	Base AC, 15 SEER, Electric resistance heating

Measure	End-Use	Description	Baseline
ASHP - ENERGY STAR/CEE Tier 1: 16 SEER/15.2 SEER2 (from elect resistance)	Residential Space Cooling, Residential Space Heating	ENERGY STAR/CEE Tier 1 ASHP: 16/15.2 SEER/SEER2, 9.0 HSPF	Base AC, 15 SEER, Electric resistance heating
ASHP - ENERGY STAR/CEE Tier 1: 16 SEER/15.2 SEER2, 9.0 HSPF	Residential Space Cooling, Residential Space Heating	ENERGY STAR/CEE Tier 1 ASHP: 16/15.2 SEER/SEER2, 9.0 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
Basement or Crawlspace Wall Insulation R-15	Residential Space Cooling, Residential Space Heating	Increased Basement or Crawlspace Wall Insulation (R-15)	Code-Compliant Exterior Below-Grade Wall Insulation (R-10)
Bathroom Faucet Aerators	Residential Domestic Hot Water	Low-Flow Faucet Aerator with Flow Rate of 1.5 gpm	Faucet Aerator with Federal Standard Flow Rate of 2.2 gpm
CEE Advanced Tier Clothes Dryer	Clothes Dryers	CEE Advanced Tier Clothes Dryer	One Clothes Dryer meeting Federal Standard
CEE Advanced Tier Clothes Washer	Clothes Washers	Tier 3 CEE Clothes washer	One Clothes Washer meeting Federal Standard
CEE Tier 3 Refrigerator	Refrigerators	Residential Tier 3 Refrigerator	One Refrigerator meeting Federal Standard
Ceiling Insulation (R11 to R38)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1982-1985) homes	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R11 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1982-1985) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R19 to R38)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1982-2020) homes	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R19 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1982-2020) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R2 to R38)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, older (pre-1982) homes	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R2 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, older (pre-1982) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R30 to R38)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1986-2020) homes	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R30 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1986-2020) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction

Measure	End-Use	Description	Baseline
Ceiling Insulation (R38 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1986-2020) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction
Central AC - CEE Tier 2: 16.8 SEER/16 SEER2	Residential Space Cooling	Central AC - CEE Tier 2: 16.8 SEER/16 SEER2	Code-Compliant Central AC, 15 SEER (updated)
Central AC - 24 SEER/22.9 SEER2	Residential Space Cooling	Central AC - 24 SEER/22.9 SEER2	Code-Compliant Central AC, 15 SEER (updated)
Central AC - CEE Advanced Tier: 17.8 SEER/17 SEER2	Residential Space Cooling	Central AC - CEE Advanced Tier: 17.8 SEER/17 SEER2	Code-Compliant Central AC, 15 SEER (updated)
Central AC - ENERGY STAR/CEE Tier 1: 16 SEER/15.2 SEER2	Residential Space Cooling	Central AC - ENERGY STAR/CEE Tier 1: 16 SEER/15.2 SEER2	Code-Compliant Central AC, 15 SEER (updated)
Central AC Tune Up	Residential Space Cooling	System tune-up, including coil cleaning, refrigerant charging, and other diagnostics	Existing Typical Central AC without Regular Maintenance/tune-up
Dehumidifier Recycling	Plug Load	No dehumidifier	One Dehumidifier meeting Federal Standard
Drain Water Heat Recovery	Residential Domestic Hot Water	50 Gallon Electric Resistance Heater and Drain Water Heat Exchanger	50 Gallon Electric Resistance Heater, No Drain Water Heat Recovery
Duct Insulation	Residential Space Cooling, Residential Space Heating	Standard Electric Heating and Central AC with Insulated Ductwork	Standard Electric Heating and Central AC with Uninsulated Ductwork
Duct Repair	Residential Space Cooling, Residential Space Heating	Duct Repair to eliminate/minimize leaks, includes testing and sealing	Standard Electric Heating and Central AC with typical duct leakage
ECM Circulator Pump	Residential Miscellaneous	Install ECM Circulator Pump	Install Standard Circulator Pump
Energy Star Air Purifier	Plug Load	One Air Purifier meeting ENERGY STAR 2.0 Standards	One Standard Conventional Air Purifier
Energy Star Audio-Video Equipment	Plug Load	One DVD/Blu-Ray Player meeting current ENERGY STAR Standards	One Market Average DVD/Blu-Ray Player
Energy Star Bathroom Ventilating Fan	Residential Ventilation and Circulation	Bathroom Exhaust Fan meeting current ENERGY STAR Standards	Bathroom Exhaust Fan meeting Federal Standard
Energy Star Ceiling Fan	Residential Miscellaneous	60" Ceiling Fan Meeting ENERGY STAR 3.1 Standards	Standard 60" Ceiling Fan
Energy Star Clothes Dryer	Clothes Dryers	One Electric Resistance Clothes Dryer meeting ENERGY STAR 1.1 Standards	One Clothes Dryer meeting Federal Standard

Measure	End-Use	Description	Baseline
Energy Star Clothes Washer	Clothes Washers	One Clothes Washer meeting ENERGY STAR 8.1 Standards	One Clothes Washer meeting Federal Standard
Energy Star Dehumidifier	Plug Load	One Dehumidifier meeting ENERGY STAR 5.0 Standards	One Dehumidifier meeting Federal Standard
Energy Star Dishwasher	Dishwashers	One Dishwasher meeting ENERGY STAR 7.0 Requirements (effective on July 19, 2023), electric water heating	One Dishwasher meeting Federal Standard
Energy Star Dishwasher (Gas Water Heating)	Dishwashers	One Dishwasher meeting ENERGY STAR 7.0 Requirements, gas water heating	One Dishwasher meeting Federal Standard; gas water heating
Energy Star Door	Residential Space Cooling, Residential Space Heating	100ft ² of Opaque Door meeting Energy Star Version 6.0 Requirements (U-Value: 0.17)	100ft ² of Opaque Door meeting current FL Code Requirements
ENERGY STAR EV supply equipment (level 2 charger)	Residential Miscellaneous	Level 2 Electric Vehicle Supply Equipment (EVSE)	Level 1 Electric Vehicle Supply Equipment (EVSE)
Energy Star Freezer	Freezers	One Freezer meeting current ENERGY STAR 5.1 Standards	One Freezer meeting Federal Standard
Energy Star Ground Source Heat Pump	Residential Space Cooling, Residential Space Heating	Energy Star GSHP, 17.1 SEER, 12 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF
Energy Star Imaging Equipment	Plug Load	One imaging device meeting current ENERGY STAR Standards	One non-ENERGY STAR imaging device
Energy Star Monitor	Plug Load	One Monitor meeting ENERGY STAR 8.0 Standards	One Standard Monitor
Energy Star Personal Computer	Plug Load	One Personal Computer meeting ENERGY STAR 8.0 Standards	One Personal Computer meeting ENERGY STAR® 3.0 Standards
Energy Star Refrigerator	Refrigerators	One Refrigerator/Freezer meeting ENERGY STAR 5.1 Standards	One Refrigerator/Freezer meeting Federal Standard
Energy Star Room AC	Residential Space Cooling	Room AC meeting current ENERGY STAR standards	Code-Compliant Room AC
Energy Star Set-Top Receiver	Plug Load	One Set-top Box meeting ENERGY STAR 4.1 Standards	One Market Average Set-top Box
Energy Star TV	Plug Load	One Television meeting ENERGY STAR 9.0 Standards	One non-ENERGY STAR Television
Energy Star Windows	Residential Space Cooling, Residential Space Heating	100ft ² of Window meeting Energy Star Version 6.0 Requirements (U-Value: 0.27, SHGC: 0.21)	100ft ² of Window current FL energy code requirements

Measure	End-Use	Description	Baseline
Exterior Wall Insulation	Residential Space Cooling, Residential Space Heating	Increased Exterior Above-Grade Wall Insulation (R-13)	Market Average Existing Exterior Above-Grade Wall Insulation
Filter Whistle	Residential Ventilation and Circulation	Install the Furnace Filter Alarm	No Furnace Filter Alarm on a Central Forced-Air Furnace
Floor Insulation	Residential Space Heating	Increased Floor Insulation (R-30)	Code-Compliant Floor Insulation
Freezer Recycling	Freezers	No Freezer	Current Market Freezer
Green Roof	Residential Space Cooling	Vegetated Roof Surface on top of Standard Roof	Standard Black Roof
Heat Pump Clothes Dryer	Clothes Dryers	One Heat Pump Clothes Dryer	One Clothes Dryer meeting Federal Standard
Heat Pump Pool Heater	Residential Miscellaneous	Heat Pump Swimming Pool Heater	Electric Resistance Swimming Pool Heater
Heat Pump Tune Up	Residential Space Cooling, Residential Space Heating	System tune-up, including coil cleaning, refrigerant charging, and other diagnostics	Standard Heating and Cooling System without Regular Maintenance/tune-up
Heat Pump Water Heater 50 Gallons-CEE Advanced Tier	Residential Domestic Hot Water	CEE Advanced Tier Heat Pump Water Heater 50 Gallons	Code-Compliant 50 Gallon Electric Resistance Water Heater
Heat Pump Water Heater 50 Gallons-ENERGY STAR	Residential Domestic Hot Water	Heat Pump Water Heater 50 Gallons	Code-Compliant 50 Gallon Electric Resistance Water Heater
Heat Pump Water Heater 80 Gallons-ENERGY STAR	Residential Domestic Hot Water	Energy Star Heat Pump Water Heater 80 Gallons	Code-Compliant 80 Gallon Electric Resistance Water Heater
Heat Trap	Residential Domestic Hot Water	Heat Trap	Existing Water Heater without heat trap
High Efficiency Convection Oven	Residential Cooking	One Full-Size Convection Oven meeting ENERGY STAR 3.0 Standards	One Standard Economy-Grade Full-Size Oven
High Efficiency Induction Cooktop	Residential Cooking	One residential induction cooktop	One standard residential electric cooktop
Home Energy Management System	Lighting Plug Load Residential Space Cooling, Residential Space Heating	Typical HVAC by Building Type Controlled by Energy Management System	Typical HVAC by Building Type, Manually Controlled
Hot Water Pipe Insulation	Residential Domestic Hot Water	1' of Insulated Pipe in Unconditioned Spaces, Insulation of R-5	1' of Pipe in Unconditioned Spaces with Code Minimum of 1" of Insulation
HVAC ECM Motor	Residential Ventilation and Circulation	A brushless permanent magnet (ECM) blower motor for electric furnace	Permanent Split Capacitor Motor for Electric Furnace

Measure	End-Use	Description	Baseline
HVAC Economizer	Residential Space Cooling	Install residential economizer	No economizer
HVAC Zoning System	Residential Space Cooling, Residential Space Heating	Install dampers in the ducts, dividing home into multiple zones, each controlled by its own thermostat	Single zone HVAC system
Indoor Daylight Sensor	Lighting	Install Indoor Daylight Sensors, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Induction Range	Residential Cooking	Residential induction range	Electric range
Instantaneous Hot Water System	Residential Domestic Hot Water	Instantaneous Hot Water System	Standard Efficiency Storage Tank Water Heater
Kitchen Faucet Aerators	Residential Domestic Hot Water	Low-Flow Faucet Aerator with Flow Rate of 1.5 gpm	Faucet Aerator with Federal Standard Flow Rate of 2.2 gpm
LED - 9W_CFL Baseline	Lighting	LED (assume 9W) replacing CFL baseline lamp	14W CFL (60W equivalent)
LED - 9W_Halogen Baseline	Lighting	LED (assume 9W) replacing EISA-2020 compliant baseline lamp	EISA-2020 compliant baseline lamp (60W equivalent)
LED Specialty Lamps-5W Chandelier	Lighting	5 W Chandelier LED	Standard incandescent chandelier lamp
Linear LED	Lighting	Linear LED Lamps in Linear Fluorescent Fixture	Standard (32w) T8 lamps in Linear Fluorescent Fixture
Low Flow Showerhead	Residential Domestic Hot Water	Low-Flow Handheld Showerhead, Flow Rate: 1.60 gpm	Standard Handheld Showerhead, Flow Rate: 2.50 gpm
New Construction - Whole Home Improvements - Tier 1	Whole Home	Performance-based improvements in new homes - 20% savings	Residential New Construction (Baseline Efficiency)
New Construction - Whole Home Improvements - Tier 2	Whole Home	Performance-based improvements in new homes - 35% savings	Residential New Construction (Baseline Efficiency)
Occupancy Sensors Switch Mounted	Lighting	Switch Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor Lighting Timer	Lighting	Timer on Outdoor Lighting, Controlling 120 Watts	120 Watts of Lighting, Manually Controlled
Outdoor Motion Sensor	Lighting	Motion Sensor on Outdoor Lighting, Controlling 120 Watts	120 Watts of Lighting, Manually Controlled
Ozone Laundry	Clothes Washers	Add a New, Single-Unit Ozone Laundry System to the Clothes Washer	One Clothes Washer meeting Federal Standard

Measure	End-Use	Description	Baseline
Programmable Thermostat	Residential Space Cooling, Residential Space Heating	Standard Heating and Cooling System with Programmable Thermostat	Standard Heating and Cooling System with Manual Thermostat
Properly Sized CAC	Residential Space Cooling	Properly Sized Central Air Conditioning	Standard Central Air Conditioning, Oversized
Radiant Barrier	Residential Space Cooling	Radiant Barrier	No radiant barrier
Reflective Roof	Residential Space Cooling	Reflective Roof Treatment	Standard dark shingle
Refrigerator Coil Cleaning	Refrigerators	Refrigerator Coil Cleaning	
Refrigerator Recycling	Refrigerators	No Refrigerator	Current Market Average Refrigerator
Residential Whole House Fan	Residential Space Cooling	Standard Central Air Conditioning with Whole House Fan	Standard Central Air Conditioning, No Whole House Fan
Sealed crawlspace	Residential Space Cooling, Residential Space Heating	Encapsulated and semi-conditioned crawlspace	Naturally vented, unconditioned crawlspace
Smart Breaker	Whole Home	Smart Breaker	standard electric breakers
Smart Panel	Whole Home	Multi-channel device that attaches to customer's circuit breaker to enable monitoring and control of major end-use appliances by customer	standard electric panel
Smart Power Strip	Plug Load	Smart plug strips for entertainment centers and home office	Standard entertainment center or home office usage, no smart strip controls
Smart Thermostat	Residential Space Cooling, Residential Space Heating	Standard Heating and Cooling System with Smart Thermostat	Standard Heating and Cooling System with Manual Thermostat
Solar Attic Fan	Residential Space Cooling	Standard Central Air Conditioning with Solar Attic Fan	Standard Central Air Conditioning, No Solar Attic Fan
Solar Pool Heater	Residential Miscellaneous	Solar Swimming Pool Heater	Electric Resistance Swimming Pool Heater
Solar Powered Pool Pumps	Residential Miscellaneous	Solar Powered Pool Pump	Variable Speed Pool Pump Motor
Solar Thermal Water Heating System	Residential Domestic Hot Water	Solar Thermal System with Electric Backup	Code-Compliant 50 Gallon Electric Resistance Water Heater
Spray Foam Insulation(Base R11)	Residential Space Cooling, Residential Space Heating	Open cell spray foam along roofline in existing (1982-1985) homes	Existing ceiling insulation based on building code at time of construction

Measure	End-Use	Description	Baseline
Spray Foam Insulation (Base R19)	Residential Space Cooling, Residential Space Heating	Open cell spray foam along roofline in existing (1982-1985) homes	Existing ceiling insulation based on building code at time of construction
Spray Foam Insulation (Base R2)	Residential Space Cooling, Residential Space Heating	Open cell spray foam along roofline in older (pre-1982) homes	Existing ceiling insulation based on building code at time of construction
Spray Foam Insulation (Base R30)	Residential Space Cooling, Residential Space Heating	Open cell spray foam along roofline in existing (1986-2020) homes	Existing ceiling insulation based on building code at time of construction
Thermostatic Shower Restriction Valve	Residential Domestic Hot Water	50 Gallon Electric Resistance Heater and Thermostatic Shower Valves	50 Gallon Electric Resistance Heater and Standard Shower Valves
Variable Refrigerant Flow (VRF) HVAC Systems	Residential Space Cooling, Residential Space Heating	Variable Refrigerant Flow (VRF) HVAC Systems	Code-Compliant ASHP, 15 SEER, 8.8 HSPF
Water Heater Blanket	Residential Domestic Hot Water	50 Gallon Electric Resistance Water Heater with Insulated Tank Wrap	Code-Compliant 50 Gallon Electric Resistance Water Heater, No Tank Wrap
Water Heater Thermostat Setback	Residential Domestic Hot Water	50 Gallon Electric Resistance Water Heater with Temperature Setpoint of 119°F	Code-Compliant 50 Gallon Electric Resistance Water Heater (Temp. Setpoint = 130°F)
Water Heater Timeclock	Residential Domestic Hot Water	Water Heater Timeclock	Existing Water Heater without time clock
Weather stripping	Residential Space Cooling, Residential Space Heating	Specific quantity of weather stripping to seal	
Window Caulking	Residential Space Cooling, Residential Space Heating	Window caulking	
Window Sun Protection	Residential Space Cooling	Window Film Applied to Standard Window	Standard Window with below Code Required Minimum SHGC

Table 13: Commercial EE Measures

Measure	End-Use	Description	Baseline
1.5HP Open Drip-Proof (ODP) Motor	Ventilation and Circulation	High Efficiency 1.5 HP Open-Drip Proof Motor	1.5HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency
10HP Open Drip-Proof (ODP) Motor	Ventilation and Circulation	High Efficiency 10 HP Open-Drip Proof Motor	10HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency

Measure	End-Use	Description	Baseline
20HP Open Drip-Proof (ODP) Motor	Ventilation and Circulation	High Efficiency 20 HP Open-Drip Proof Motor	20HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency
Advanced Rooftop Controller	Ventilation and Circulation	Advanced Rooftop Controller	Without Advanced Rooftop Controller
Air Compressor Optimization	Miscellaneous	Performing Routine Maintenance on 20HP Inlet Modulation Fixed-Speed Compressor	20 HP Inlet Modulation Fixed-Speed Compressor
Air Curtains	Space Cooling, Space Heating	Air Curtain across door opening	Door opening with no air curtain
Airside Economizer	Space Cooling	Airside Economizer	No economizer
Anti-Sweat Controls	Refrigeration	One Medium Temperature Reach-In Case with Anti-Sweat Heater Controls	One Medium Temperature Reach-In Case without Anti-Sweat Heater Controls
Auto Off Time Switch	Interior Lighting	Auto-Off Time Switch on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Automatic Door Closer for Walk-in Coolers and Freezers	Refrigeration	One Medium Temperature Walk-In Refrigerator Door with Auto-Closer	One Medium Temperature Walk-In Refrigerator Door without Auto-Closer
Beverage Vending Machine Controls	Refrigeration	One non-ENERGY STAR beverage vending machine equipped with infrared occupancy sensing controls	One non-ENERGY STAR beverage vending machine, no controls
Bi-Level Lighting Control (Exterior)	Exterior Lighting	Bi-Level Controls on Exterior Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Bi-Level Lighting Control (Interior)	Interior Lighting	Bi-Level Controls on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Ceiling Insulation (R19 to R38)	Space Cooling, Space Heating	Blown-in insulation in ceiling cavity/attic	Market Average Existing Ceiling Insulation in older steep slope, residential style commercial building
Ceiling Insulation (R19 to R49)	Space Cooling, Space Heating	Blown-in insulation in ceiling cavity/attic - Beyond Code	Market Average Existing Ceiling Insulation in older steep slope, residential style commercial building
Ceiling Insulation (R2 to R38)	Space Cooling, Space Heating	Blown-in insulation in ceiling cavity/attic	Market Average Existing Ceiling Insulation in older steep slope, residential style commercial building
Ceiling Insulation (R2 to R49)	Space Cooling, Space Heating	Blown-in insulation in ceiling cavity/attic - Beyond Code	Market Average Existing Ceiling Insulation in older steep slope,

Measure	End-Use	Description	Baseline
			residential style commercial building
Chilled Water Reset	Space Cooling	One Chiller with Reset of Chilled Water Temperature Setpoint	One Chiller with Fixed Chilled Water Temperature
Chiller maintenance	Space Cooling	O&M improvements to restore chiller performance	
CO Sensors for Parking Garage Exhaust	Miscellaneous	Enclosed Parking Garage Exhaust with CO Control	Constant Volume Enclosed Parking Garage Exhaust
Commercial Duct Sealing	Space Cooling, Space Heating	Standard Electric Heating and Central AC with Improved Duct Sealing	Standard Electric Heating and Central AC, Standard Duct Sealing
Commercial Strategic Energy Management	Whole Building	Commercial Strategic Energy Management	No active energy management
Custom measure - Non-lighting	Space Cooling, Space Heating	Custom Improvement to Facility's Operations	Baseline Technology/Process
Data Center Hot Cold Aisle	Office Equipment	Equipment configuration that saves HVAC	No hot, cold aisle containment
Dedicated Outside Air System (DOAS)	Space Cooling, Space Heating	Install Dedicated Outside Air System (DOAS)	Typical HVAC by Building Type
Demand Controlled Circulating Systems	Domestic Hot Water	Recirculation Pump with Demand Control Mechanism	Uncontrolled Recirculation Pump
Demand Controlled Ventilation	Ventilation and Circulation	Return Air System with CO2 Sensors	Standard Return Air System, No Sensors
Demand Defrost	Refrigeration	Walk-In Freezer System with Demand-Controlled Electric Defrost Cycle	Walk-In Freezer System with Timer-Controlled Electric Defrost Cycle
Destratification Fans	Space Heating	Destratification Fans improve temperature distribution by circulating warmer air from the ceiling back down to the floor level	No destratification fan
Door Gasket (Cooler)	Refrigeration	New Door Gasket on One-Door Medium Temperature Reach-In Case	Worn or Damaged Door Gasket on One-Door Medium Temperature Reach-In Case
Door Gasket (Freezer)	Refrigeration	New Door Gasket on One-Door Medium Temperature Reach-In Case	Worn or Damaged Door Gasket on One-Door Medium Temperature Reach-In Case
Drain water heat recovery	Domestic Hot Water	Hot Water Loop with 50 Gallon Electric Resistance Heater and Drain Water Heat Exchanger	Standard Hot Water Loop with 50 Gallon Electric Resistance Heater, No Drain Water Heat Recovery

Measure	End-Use	Description	Baseline
Dual Enthalpy Economizer	Ventilation and Circulation	Standard HVAC Unit with an economizer and dual enthalpy differential control	HVAC unit with no economizer or with a non-functional disabled economizer
Duct Insulation	Space Cooling, Space Heating	Standard Electric Heating and Central AC with Insulated Ductwork (R-8)	Standard Electric Heating and Central AC with Uninsulated Ductwork (R-4)
Ductless Mini-Split AC	Space Cooling	Ductless Mini-Split AC, 4 Ton, 16 SEER	Code-Compliant AC Unit, 4 Ton, 15 SEER
Ductless Mini-Split HP	Space Cooling, Space Heating	Ductless Mini-Split HP, 17 SEER, 9.5 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF
DX Coil Cleaning	Space Cooling	DX Coil Cleaning	DX Coil Not Cleaned
ECM Motors on Furnaces	Space Heating	Variable Speed Electronically Commutated Motor for an Electric Furnace	Permanent Split Capacitor Motor for Electric Furnace
Efficient Battery Charger	Miscellaneous	Efficient Battery Charger	FR or SCR charging stations with power conversion efficiency < 89% or > 10 W
Efficient Exhaust Hood	Cooking	Kitchen ventilation with automatically adjusting fan controls	Kitchen ventilation with constant speed ventilation motor
Efficient Motor Belts	Miscellaneous	Synchronous belt, 98% efficiency	Standard V-belt drive
Efficient New Construction Lighting	Interior Lighting	Efficient New Construction Lighting, 15% Better than Code	New Construction with Lighting Power Density meeting Code Minimum
Energy Recovery Ventilation System (ERV)	Space Cooling	Unitary Cooling Equipment that Incorporates Energy Recovery	Current Market Packaged or Split DX Unit
Energy Star Combination Oven	Cooking	Energy Star Combination Oven meeting ENERGY STAR Version 3.0 Standards	One Standard Economy-Grade 10-Pan Combination Oven
Energy Star Commercial Clothes Washer	Miscellaneous	One Commercial Clothes Washer meeting current ENERGY STAR Version 8.1 Standards	One Commercial Clothes Washer meeting Federal Standard
Energy Star Commercial Dishwasher	Domestic Hot Water	One Commercial Dishwasher meeting ENERGY STAR Version 3.0 Standards	One Dishwasher meeting Federal Standard
Energy Star Commercial Glass Door Freezer	Refrigeration	One Glass Door Freezer meeting ENERGY STAR Version 5.0 Standards	One Glass Door Freezer meeting Federal Standards
Energy Star Commercial Glass Door Refrigerator	Refrigeration	One Glass Door Refrigerator meeting ENERGY STAR Version 5.0 Standards	One Glass Door Refrigerator meeting Federal Standards
Energy Star Commercial Solid Door Freezer	Refrigeration	One Solid Door Freezer meeting ENERGY STAR Version 5.0 Standards	One Solid Door Freezer meeting Federal Standards

Measure	End-Use	Description	Baseline
Energy Star Commercial Solid Door Refrigerator	Refrigeration	One Solid Door Refrigerator meeting ENERGY STAR Version 5.0 Standards	One Solid Door Refrigerator meeting Federal Standards
Energy Star convection oven	Cooking	Energy Star convection oven meeting ENERGY STAR Version 3.0 Standards	One Standard Economy-Grade Full-Size Convection Oven
Energy Star EV Chargers	Miscellaneous	Level 2 Electric Vehicle Supply Equipment (EVSE)	Level 1 Electric Vehicle Supply Equipment (EVSE)
Energy Star Fryer	Cooking	One Standard Vat Electric Fryer meeting ENERGY STAR Version 3.0 Standards	One Standard Economy-Grade Standard Vat Electric Fryer
Energy Star Griddle	Cooking	One Griddle meeting current ENERGY STAR Version 1.2 Standards	One Conventional Griddle
Energy Star Hot Food Holding Cabinet	Cooking	One Hot Food Holding Cabinet meeting current ENERGY STAR Version 2.0 Standards	One Standard Hot Food Holding Cabinet
Energy Star Ice Maker	Refrigeration	One Continuous Self-Contained Ice Maker meeting ENERGY STAR Version 3.0 Standards	One Continuous Self-Contained Ice Maker meeting Federal Standard
ENERGY STAR Imaging Equipment	Office Equipment	One imaging device meeting current ENERGY STAR Standards	One non-ENERGY STAR imaging device
Energy Star LED Directional Lamp	Interior Lighting	Energy Star 7.6W Directional LED lamp	50W Incandescent lamp
Energy Star Monitors	Office Equipment	One Monitor meeting ENERGY STAR 8.0 Standards	One Standard Monitor
Energy Star PCs	Office Equipment	One Personal Computer (desktop or laptop) meeting current ENERGY STAR® Standards	One non-ENERGY STAR® Personal Computer
Energy Star room AC	Space Cooling	Room AC meeting current ENERGY STAR standards	Code-Compliant Room AC, 1 Ton, 10.9 CEER
Energy Star Servers	Office Equipment	One Server meeting ENERGY STAR 2.0 Standards	One Standard Server
Energy Star Steamer	Cooking	One 4-Pan Electric Steamer meeting ENERGY STAR® 2.0 Standards	One Standard Economy-Grade 4-Pan Steamer
Energy Star Uninterruptable Power Supply	Office Equipment	Standard Desktop Plugged into Energy Star Uninterruptable Power Supply at 25% Load	Standard Desktop Plugged into Average Rotary Uninterruptable Power Supply at 25% Load
Energy Star Vending Machine	Refrigeration	One Refrigerated Vending Machine meeting ENERGY STAR Version 4.0 Standards	One Refrigerated Vending Machine meeting ENERGY STAR® 1.0 Standards

Measure	End-Use	Description	Baseline
ENERGY STAR Water Cooler	Miscellaneous	One Storage Type Hot/Cold Water Cooler Unit meeting ENERGY STAR Version 3.0 Standards	One Standard Storage Type Hot/Cold Water Cooler Unit
Energy Star windows	Space Cooling, Space Heating	100ft2 of Window meeting Energy Star Version 6.0 Requirements (U-Value: 0.27, SHGC: 0.21)	100ft2 of Window meeting Energy Star Version 5.0 Requirements (U-Value: 0.3, SHGC: 0.3)
Engine Block Timer	Miscellaneous	Plug-in timer that activates engine block timer to reduce unnecessary run time	Engine block heater (typically used for backup generators) running continuously
Escalator Motor Efficiency Controller	Miscellaneous	Install Escalator Motor Efficiency Controller	Escalator without Motor Efficiency Controller
Facility Commissioning	Space Cooling, Space Heating, Ventilation and Circulation	Perform facility commissioning to optimize building operations in new facilities	Standard new construction facility with no commissioning
Facility Energy Management System	Space Cooling, Space Heating, Ventilation and Circulation	Typical HVAC by Building Type Controlled by Energy Management System	Standard/manual facility equipment controls
Faucet Aerator	Domestic Hot Water	Low-flow lavatory faucet aerator, flow rate: 1.0 gpm	Federal lavatory flow rate standard, 1994, flow rate: 2.2 gpm
Floating Head Pressure Controls	Refrigeration	Medium-Temperature Refrigeration System with 5HP Compressor and Adjustable Condenser Head Pressure Control Valve	Medium-Temperature Refrigeration System with 5 HP Compressor without Adjustable Condenser Head Pressure Control Valve
Floor Insulation	Space Cooling, Space Heating	Increased Floor Insulation (R-19)	Market Average Existing Floor Insulation
Geothermal Heat Pump	Space Cooling, Space Heating	Geothermal Heat Pump	Code-Compliant Air Source Heat Pump
Green roof	Space Cooling, Space Heating	Vegetated Roof Surface on top of Standard Roof	Standard Black Roof
HE Air Cooled Chiller - All Compressor Types - 100 Tons	Space Cooling	HE Air Cooled Chiller - Air Compressor Types - 100 Tons	Code-Compliant Air Cooled Positive Displacement Chiller, 100 Tons
HE DX 11.25-20.0 Tons Elec Heat	Space Cooling, Space Heating	High Efficiency Packaged or Split DX Unit, 15 Tons, 11.5 SEER	Code-Compliant Packaged or Split DX Unit, 15 Tons, 11 SEER
HE DX 11.25-20.0 Tons Other Heat	Space Cooling	High Efficiency Packaged or Split DX Unit, 15 Tons, 11.5 SEER	Code-Compliant Packaged or Split DX Unit, 15 Tons, 11 SEER

Measure	End-Use	Description	Baseline
HE DX 5.4-11.25 Tons Elect Heat	Space Cooling, Space Heating	High Efficiency Packaged or Split DX Unit, 7.5 Tons, 12 SEER	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11 SEER
HE DX 5.4-11.25 Tons Other Heat	Space Cooling	High Efficiency Packaged or Split DX Unit, 7.5 Tons, 12 SEER	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11 SEER
HE DX Less than 5.4 Tons Elect Heat	Space Cooling, Space Heating	High Efficiency Packaged or Split DX Unit, 5 Tons, 14.5 SEER	Code-Compliant Packaged or Split DX Unit, 5 Tons, 13 SEER
HE DX Less than 5.4 Tons Other Heat	Space Cooling	High Efficiency Packaged or Split DX Unit, 5 Tons, 14.5 SEER	Code-Compliant Packaged or Split DX Unit, 5 Tons, 13 SEER
HE Water Cooled Chiller - Centrifugal Compressor - 200 Tons	Space Cooling	Water Cooled Centrifugal Chiller with Integral VFD, 200 Tons	Code-Compliant Water Cooled Centrifugal Chiller, 200 Tons
HE Water Cooled Chiller - Centrifugal Compressor - 500 Tons	Space Cooling	Water Cooled Centrifugal Chiller with Integral VFD, 500 Tons	Code-Compliant Water Cooled Centrifugal Chiller, 500 Tons
HE Water Cooled Chiller - Rotary or Screw Compressor - 175 Tons	Space Cooling	Water Cooled Positive Displacement Chiller with Integral VFD, 175 Tons	Code-Compliant Water Cooled Positive Displacement Chiller, 175 Tons
HE Water Cooled Chiller - Rotary or Screw Compressor - 50 Tons	Space Cooling	Water Cooled Positive Displacement Chiller with Integral VFD, 50 Tons	Code-Compliant Water Cooled Positive Displacement Chiller, 50 Tons
Heat Pump Pool Heater Commercial	Miscellaneous	High Efficiency Pool Heater Eff. $\geq 84\%$	Standard Efficiency Pool Heater 78% Eff.
Heat Pump Water Heater	Domestic Hot Water	Efficient 50 Gallon Electric Heat Pump Water Heater	Code-Compliant 50 Gallon Electric Heat Pump Water Heater
High Efficiency Air Compressor	Miscellaneous	20 HP VFD Air Compressor	20 HP Inlet Modulation Fixed-Speed Compressor
High Efficiency Data Center Cooling	Space Cooling	High Efficiency CRAC (computer room air conditioner)	Standard Efficiency CRAC
High Efficiency PTAC	Space Cooling	High Efficiency PTAC	Code-Compliant PTAC
High Efficiency PTHP	Space Cooling, Space Heating	High Efficiency PTHP	Code-Compliant PTHP
High Efficiency Refrigeration Compressor_Discuss	Refrigeration	High Efficiency Refrigeration Compressors	Standard Compressor

Measure	End-Use	Description	Baseline
High Efficiency Refrigeration Compressor_Scroll	Refrigeration	High Efficiency Refrigeration Compressors	Standard Compressor
High Speed Fans	Ventilation and Circulation	High Speed Fan, 24" - 35" Blade Diameter	Standard Speed Fan, 24" - 35" Blade Diameter
Hot water pipe insulation	Domestic Hot Water	1' of Insulated Pipe in Unconditioned Spaces, Insulation of R-4	1' of Pipe in Unconditioned Spaces with Code Minimum of 1"of Insulation
Hotel Card Energy Control Systems	Space Cooling, Space Heating	Guest Room HVAC Unit Controlled by Hotel-Key-Card Activated Energy Control System	Guest Room HVAC Unit, Manually Controlled by Guest
Indoor daylight sensor	Interior Lighting	Install Indoor Daylight Sensors, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Induction Cooktops	Cooking	Efficient Induction Cooktop	One Standard Electric Cooktop
Infiltration Reduction - Air Sealing	Space Cooling, Space Heating	Reduced leakage through caulking, weather-stripping	Standard Heating and Cooling System with Moderate Infiltration
Instantaneous Hot Water System Commercial	Domestic Hot Water	Instantaneous Hot Water System	Code-Compliant Electric Storage Water Heater
LED - 14W_CFL Baseline	Interior Lighting	LED (assume 14W) replacing CFL	100W equivalent CFL
LED - 9W Flood_CFL Baseline	Exterior Lighting	LED (assume 9W) replacing CFL	14W CFL
LED Canopy Lighting (Exterior)	Exterior Lighting	One 67.2W LED Canopy Light	Average Lumen Equivalent Exterior Incandescent Area Lighting
LED Display Lighting (Exterior)	Exterior Lighting	One Letter of LED Signage, < 2ft in Height	One Letter of Neon or Argon-mercury Signage, < 2ft in Height
LED Display Lighting (Interior)	Interior Lighting	One Letter of LED Signage, < 2ft in Height	One Letter of Neon or Argon-mercury Signage, < 2ft in Height
LED Exit Sign	Interior Lighting	One 5W Single-Sided LED Exit Sign	One 9W Single-Sided CFL Exit Sign
LED Exterior Wall Packs	Exterior Lighting	One 35W LED Wall Pack	Average Lumen Equivalent Exterior Incandescent Area Lighting
LED High Bay_HID Baseline	Interior Lighting	One 140W High Bay LED Fixture	Lumen-Equivalent HID High Bay Fixture
LED High Bay_LF Baseline	Interior Lighting	One 140W High Bay LED Fixture	Lumen-Equivalent Linear Fluorescent High Bay Fixture
LED Linear - Fixture Replacement	Interior Lighting	2x4 LED Troffer	Lumen-Equivalent 32-Watt T8 Lamp
LED Linear - Lamp Replacement	Interior Lighting	Linear LED (16W)	Lumen-Equivalent 32-Watt T8 Lamp

Measure	End-Use	Description	Baseline
LED Parking Lighting	Exterior Lighting	One 160W LED Area Light	Average Lumen Equivalent Exterior HID Area Lighting
LEED New Construction Whole Building	Space Cooling, Space Heating	LEED New Construction Whole Building	Comparable facility, code-compliance construction
Light Tube	Interior Lighting	One 14" Light Tube, Delivering light to 250 S.F. of Commercial Space	250 S.F. of Commercial Space Lit by Typical Lighting Strategies
Low Flow Shower Head	Domestic Hot Water	Low-Flow Handheld Showerhead, Flow Rate: 1.50 gpm	Standard Handheld Showerhead, Flow Rate: 2.50 gpm
Low-Flow Pre-Rinse Sprayers	Domestic Hot Water	Low-Flow Pre-Rinse Sprayer with Flow Rate of 1.6 gpm	Pre-Rinse Sprayer with Federal Standard Flow Rate of 2.25 gpm
Network PC Power Management	Office Equipment	One computer and monitor attached to centralized energy management system that controls when desktop computers and monitors plugged into a n	One computer and monitor, manually controlled
Networked Lighting Controls	Interior Lighting	Install Networked Lighting Controls System on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Controlled either Manually or by Sensor as Specified by Code
Night Covers for Display Cases	Refrigeration	One Open Vertical Case with Night Covers	One Existing Open Vertical Case, No Night Covers
Occupancy Sensors, Ceiling Mounted	Interior Lighting	Ceiling Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Occupancy Sensors, Switch Mounted	Interior Lighting	Switch Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor Lighting Controls	Exterior Lighting	Install Exterior Photocell Dimming Controls, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor motion sensor	Exterior Lighting	Install Exterior Motion Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Ozone Laundry Commercial	Miscellaneous	Add a new ozone laundry system onto a commercial clothes washer	One commercial clothes washer without ozone laundry system
Programmable thermostat	Space Cooling, Space Heating	Pre-set programmable thermostat that replaces manual thermostat	Standard Heating and Cooling System with Manual Thermostat
PSC to ECM Evaporator Fan Motor (Reach-In)	Refrigeration	Medium Temperature Reach-In Case with equivalent size Electronically	Medium Temperature Reach-In Case with Permanent Split Capacitor Evaporator Fan Motor

Measure	End-Use	Description	Baseline
		Commutated Evaporator Fan Motor	
PSC to ECM Evaporator Fan Motor (Walk-In, Refrigerator)	Refrigeration	Medium Temperature Walk-In Case with Electronically Commutated Evaporator Fan Motor	Medium Temperature Walk-In Case with Permanent Split Capacitor Evaporator Fan Motor
Q-Sync Evaporator Fan Motor	Refrigeration	Medium Temperature Reach-In Case with equivalent size Q-Sync Evaporator Fan Motor	Medium Temperature Reach-In Case with 20W Permanent Split Capacitor Fan Motor
Reflective Roof Treatment	Space Cooling	Reflective Roof Treatment	Standard Black Roof
Refrigerated Display Case LED Lighting	Refrigeration	60" Refrigerated Case LED Strip	Lumen-Equivalent 32-Watt T8 Fixture
Refrigerated Display Case Lighting Controls	Refrigeration	Occupancy Sensors for Refrigerated Case Lighting to reduce run time	Market-Share Weighted Existing Linear Fluorescent Fixture
Refrigeration Commissioning	Refrigeration	Commissioned Refrigeration System	Non-Commissioned Refrigeration System
Refrigeration Economizer	Refrigeration	Walk-in refrigerator with economizer	Walk-in refrigerator without economizer
Regenerative Drive Elevator Motor	Miscellaneous	Regenerative drive produced energy when motor in overhaul condition	Standard motor
Retro-Commissioning (Existing Construction)	Space Cooling, Space Heating, Ventilation and Circulation	Perform facility retro-commissioning, including assessment, process improvements, and optimization of energy-consuming equipment and systems	
Roof Insulation	Space Cooling, Space Heating	Roof Insulation (built-up roof applicable to flat/low slope roofs)	Code-Compliant Flat Roof
Server Virtualization	Office Equipment	2 Virtual Host Server	20 Single Application Servers
Smart Strip Plug Outlet	Office Equipment	One Smart Strip Plug Outlet	One Standard plug strip/outlet
Smart thermostat	Space Cooling, Space Heating	Thermostats that include "smart" features such as occupancy sensors, ge-fencing, multi-zone sensors	Standard Heating and Cooling System with Manual Thermostat
Solar Pool Heater Commercial	Miscellaneous	Solar Swimming Pool Heater	Electric Resistance Swimming Pool Heater
Solar Powered Pool Pump	Miscellaneous	Solar Powered Pool Pump Motor	Variable Speed Pool Pump Motor

Measure	End-Use	Description	Baseline
Solar Thermal Water Heating System Commercial	Domestic Hot Water	Solar Thermal System with Electric Backup	Code-Compliant 50 Gallon Electric Resistance Water Heater
Strip Curtains - Freezers	Refrigeration	Walk-in freezer with strip curtains at least 0.06 inches thick covering the entire area of the doorway	Walk-in freezer without strip curtains
Strip Curtains - Refrigerators	Refrigeration	Walk-in cooler with strip curtains at least 0.06 inches thick covering the entire area of the doorway	Walk-in cooler without strip curtains
Suction Pipe Insulation - Freezers	Refrigeration	Suction Pipe Insulation - Freezers	Uninsulated freezer suction lines
Suction Pipe Insulation - Refrigerators	Refrigeration	Suction Pipe Insulation - Refrigerators	Uninsulated refrigeration suction lines
Thermal Energy Storage	Space Cooling	Deploy thermal energy storage technology (ice harvester, etc.) to shift load	Code compliant chiller
Thermostatic Shower Restriction Valve Commercial	Domestic Hot Water	Hot Water Loop with 50 Gallon Electric Resistance Heater and Pressure Balance Shower Valves	Standard Hot Water Loop with 50 Gallon Electric Resistance Heater and Standard Shower Valves
Time Clock Control	Interior Lighting	Time Clock Controlled Lighting, 500 Watts Controlled	500 Watts of Lighting, Controlled either Manually or by Sensor as Specified by Code
Variable Refrigerant Flow (VRF) HVAC Systems	Space Cooling, Space Heating	Variable Refrigerant Flow (VRF) HVAC Systems	Code-Compliant PTHP
VAV System	Ventilation and Circulation	Variable Air Volume Distribution System	Constant Air Volume Distribution System
VFD on Cooling Tower Fans	Space Cooling	Cooling Tower Fans with VFD Control	Cooling Tower Fans without VFD Control
VFD on HVAC Pump	Space Cooling, Space Heating	VFD on HVAC Pump	7.5 HP HVAC Pump Motor, no VFD Control
VSD Controlled Compressor	Refrigeration	Refrigeration System with VSD Control	Refrigeration System with Standard Slide-Valve Control System
Wall Insulation	Space Cooling, Space Heating	Increased Exterior Above-Grade Wall Insulation	Market Average Existing Exterior Above-Grade Wall Insulation
Warehouse Loading Dock Seals	Space Cooling, Space Heating	Seals to reduce infiltration losses at loading dock	Loading dock with no seals
Water Cooled Refrigeration Heat Recovery	Domestic Hot Water	The heat reclaim system transfers waste heat from refrigeration system to space heating or hot water	No heat recovery

Measure	End-Use	Description	Baseline
Water Heater Setback	Domestic Hot Water	A 50 gallon electric hot water tank with a thermostat setting reduced to no lower than 120 degrees.	A 50 gallon electric hot water tank with a thermostat setting that is higher than 120 degrees, typically hot water tanks with settings of 130 degrees or higher.
Water source heat pump	Space Cooling, Space Heating	Water Source Heat Pump, 2.5 Tons, 17.4 EER, 4.4 COP	Code-Compliant ASHP
Waterside Economizer	Space Cooling	Waterside Economizer	No economizer
Window shade film	Space Cooling	Window Film with SHGC of 0.35 Applied to Standard Window	Standard Window with below Code Required Minimum SHGC
Zero Energy Doors	Refrigeration	Install zero energy doors for a reach-in refrigerated cooler or freezer	Standard vertical reach-in refrigerated cooler or freezer with anti-sweat heaters on the glass surface of the doors

Table 14: Industrial EE Measures

Measure	End-Use	Description	Baseline
1.5HP Open Drip-Proof (ODP) Motor	Motors Pumps	High Efficiency 1.5 HP Open-Drip Proof Motor	1.5HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency
10HP Open Drip-Proof (ODP) Motor	Motors Pumps	High Efficiency 10 HP Open-Drip Proof Motor	10HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency
20HP Open Drip-Proof (ODP) Motor	Motors Pumps	High Efficiency 20 HP Open-Drip Proof Motor	20HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency
3-phase High Frequency Battery Charger - 1 shift	Other	3-phase High Frequency Battery Charger	Standard Charger
Advanced Rooftop Controller	HVAC	Advanced Rooftop Controller	Without Advanced Rooftop Controller
Air Compressor Optimization	Compressed Air	Performing Routine Maintenance on 20HP Inlet Modulation Fixed-Speed Compressor	20 HP Inlet Modulation Fixed-Speed Compressor
Air curtains	HVAC	Air Curtain across door opening	Door opening with no air curtain
Airside economizer	HVAC	Airside Economizer	No economizer

Measure	End-Use	Description	Baseline
Auto Closer on Refrigerator Door	Process Cooling	One Medium Temperature Walk-In Refrigerator Door with Auto-Closer	One Medium Temperature Walk-In Refrigerator Door without Auto-Closer
Auto Off Time Switch	Interior Lighting High Bay	Auto-Off Time Switch on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Bi-Level Lighting Control (Exterior)	Exterior Lighting Industrial	Install Exterior Bi-Level Lighting Control, 500 Watts Controlled	500 Watts of Lighting, No Dim Setting
Bi-Level Lighting Control (Interior)	Interior Lighting High Bay	Bi-Level Controls on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, No Dim Setting
Chilled Water Reset	HVAC	One Chiller with Reset of Chilled Water Temperature Setpoint	One Chiller with Fixed Chilled Water Temperature
Cogged Belt on 15hp ODP Motor	Motors Pumps	15HP ODP Motor with Cogged Belts Installed on Supply and/or Return Air Fans	15HP ODP Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Cogged Belt on 40hp ODP Motor	Motors Pumps	40HP ODP Motor with Cogged Belts Installed on Supply and/or Return Air Fans	40HP ODP Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Compressed Air Desiccant Dryer	Process Specific	heated regenerative desiccant dryer without dew point demand controls	heatless regenerative desiccant dryer without dew point demand controls
Compressed Air No-Loss Condensate Drains	Process Specific	Install no-loss condensate drains	Install standard condensate drains
Compressed Air Storage Tank	Compressed Air	20 HP Inlet Modulation Fixed-Speed Compressor with Receiver Tank	20 HP Inlet Modulation Fixed-Speed Compressor, No Receiver Tank
Custom Measure - Non-Lighting	HVAC	Custom Improvement to Facility's Operations	Baseline Technology/Process
Dairy Refrigeration Heat Recovery	Other	refrigeration equipment with refrigeration heat recovery tank installed	existing dairy farm with refrigeration equipment and a water heater unit without an RHR unit
Dedicated Outside Air System (DOAS)	HVAC	Install Dedicated Outside Air System (DOAS)	Typical HVAC by Building Type
Demand Controlled Ventilation	HVAC	Return Air System with CO2 Sensors	Standard Return Air System, No Sensors
Demand Defrost	Process Cooling	Walk-In Freezer System with Demand-Controlled Electric Defrost Cycle	Walk-In Freezer System with Timer-Controlled Electric Defrost Cycle
Dew Point Sensor Control for Dessicant CA Dryer	Compressed Air	1000 CFM Heated Desiccant Air Dryer with Dew Point Controls	1000 CFM Modulating Heated Desiccant Air Dryer

Measure	End-Use	Description	Baseline
Drip Irrigation Nozzles	Other	Flow Control Nozzles	Standard Irrigation Nozzles
Dual Enthalpy Economizer	Process Cooling	Standard HVAC Unit with an economizer and dual enthalpy differential control	HVAC unit with no economizer or with a non-functional disabled economizer
DX Coil Cleaning	HVAC	DX Coil Cleaning	DX Coil Not Cleaned
Efficient Compressed Air Nozzles	Compressed Air	1/4" Engineered Air Nozzle	1/4" Open-End Air Nozzle
Efficient New Construction Lighting	Interior Lighting High Bay	Efficient New Construction Lighting, 15% Better than Code	New Construction with Lighting Power Density meeting Code Minimum
Electric Actuators	Other	Electric Actuator	Pneumatic Actuator
Energy Efficient Laboratory Fume Hood	HVAC	Variable Air Volume High Performance Fume Hood	Constant Volume Conventional Bypass Fume Hood
Energy Efficient Transformers	Other	Energy Efficient Dry Type Transformer (CSL-3)	Standard Transformer (TP-1)
Energy Recovery Ventilation System	HVAC	Unitary Cooling Equipment that Incorporates Energy Recovery	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11.2 EER
Energy Star LED Directional Lamp	Interior Lighting Other	Energy Star 7.6W Directional LED lamp	50W Incandescent lamp
Energy Star room ac	HVAC	Room AC meeting current ENERGY STAR standards	Code-Compliant Room AC
Energy Star windows	HVAC	100ft2 of Window meeting Energy Star Version 6.0 Requirements (U-Value: 0.27, SHGC: 0.21)	100ft2 of Window meeting Energy Star Version 5.0 Requirements (U-Value: 0.3, SHGC: 0.3)
Engine Block Timer	Other	An engine block heater operated by an outdoor plug-in timer	An engine block heater that is manually plugged in
Facility Commissioning	HVAC	Perform facility commissioning	Comparable facility, no commissioning
Facility Energy Management System	HVAC	Typical HVAC by Building Type Controlled by Energy Management System	Typical HVAC by Building Type, Manually Controlled
Fan Thermostat Controller	HVAC	Typical HVAC by Building Type with Fan Thermostat Controller Installed	Typical HVAC by Building Type with Programmable Thermostat
Floating Head Pressure Controller	Process Cooling	Medium-Temperature Refrigeration System with 5HP Compressor and Adjustable Condenser Head Pressure Control Valve	Medium-Temperature Refrigeration System with 5 HP Compressor without Adjustable Condenser Head Pressure Control Valve
Grain Bin Aeration Control System	Process Specific	Grain Storage Fan System with Automatic Controls	Grain Storage Fan System with Manual Controls

Measure	End-Use	Description	Baseline
HE Air Cooled Chiller - All Compressor Types - 100 Tons	HVAC	HE Air Cooled Chiller - All Compressor Types - 100 Tons	Code-Compliant Air Cooled Positive Displacement Chiller, 100 Tons
HE Air Cooled Chiller - All Compressor Types - 300 Tons	HVAC	Air Cooled Positive Displacement Chiller with Integral VFD, 300 Tons, 13.7 EER	Code-Compliant Air Cooled Positive Displacement Chiller, 300 Tons, 12.5 EER
HE DX 11.25-20.0 Tons Elec Heat	HVAC	High Efficiency Packaged or Split DX Unit, 15 Tons, 11.5 SEER	Code-Compliant Packaged or Split DX Unit, 15 Tons, 11 SEER
HE DX 11.25-20.0 Tons Other Heat	HVAC	High Efficiency Packaged or Split DX Unit, 15 Tons, 11.5 SEER	Code-Compliant Packaged or Split DX Unit, 15 Tons, 11 SEER
HE DX 5.4-11.25 Tons Elect Heat	HVAC	High Efficiency Packaged or Split DX Unit, 7.5 Tons, 12 SEER	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11 SEER
HE DX 5.4-11.25 Tons Other Heat	HVAC	High Efficiency Packaged or Split DX Unit, 7.5 Tons, 12 SEER	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11 SEER
HE DX Less than 5.4 Tons Elect Heat	HVAC	High Efficiency Packaged or Split DX Unit, 5 Tons, 14.5 SEER	Code-Compliant Packaged or Split DX Unit, 5 Tons, 13 SEER
HE DX Less than 5.4 Tons Other Heat	HVAC	High Efficiency Packaged or Split DX Unit, 5 Tons, 14.5 SEER	Code-Compliant Packaged or Split DX Unit, 5 Tons, 13 SEER
HE Water Cooled Chiller - Centrifugal Compressor - 200 Tons	HVAC	Water Cooled Centrifugal Chiller with Integral VFD, 200 Tons	Code-Compliant Water Cooled Centrifugal Chiller, 200 Tons
HE Water Cooled Chiller - Centrifugal Compressor - 500 Tons	HVAC	Water Cooled Centrifugal Chiller with Integral VFD, 500 Tons	Code-Compliant Water Cooled Centrifugal Chiller, 500 Tons
HE Water Cooled Chiller - Rotary or Screw Compressor - 175 Tons	HVAC	Water Cooled Positive Displacement Chiller with Integral VFD, 175 Tons	Code-Compliant Water Cooled Positive Displacement Chiller, 175 Tons
HE Water Cooled Chiller - Rotary or Screw Compressor - 50 Tons	HVAC	Water Cooled Positive Displacement Chiller with Integral VFD, 50 Tons	Code-Compliant Water Cooled Positive Displacement Chiller, 50 Tons
High Bay Occupancy Sensors, Ceiling Mounted	Interior Lighting High Bay	Ceiling Mounted Occupancy Sensor, 800 Watts Controlled	800 Watts of Lighting, Manually Controlled

Measure	End-Use	Description	Baseline
High Efficiency Air Compressor	Compressed Air	20 HP VFD Air Compressor	20 HP Inlet Modulation Fixed-Speed Compressor
High Efficiency Refrigeration Compressor - Discus	Process Cooling	High Efficiency Refrigeration Compressors	Standard Compressor
High Efficiency Refrigeration Compressor - Scroll	Process Cooling	High Efficiency Refrigeration Compressors	Standard Compressor
High Efficiency Welder	Process Specific	High Efficiency Welder	Standard Welding Practices
High Speed Fans	HVAC	High Speed Fan, 24" - 35" Blade Diameter	Standard Speed Fan, 24" - 35" Blade Diameter
High Volume Low Speed Fan (HVLS)	Motors Fans Blowers	20' High Volume Low Speed Fan	Conventional Circulating Fan
Indoor Agriculture - LED Grow Lights	Interior Lighting High Bay	LED grow light	1000W High Pressure Sodium
Indoor daylight sensor	Interior Lighting High Bay	Install Indoor Daylight Sensors, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Industrial Duct Sealing	HVAC	Standard Electric Heating and Central AC with Improved Duct Sealing	Standard Electric Heating and Central AC, Standard Duct Sealing
Injection Mold and Extruder Barrel Wraps	Other	2' Diameter, 20' Long Machine Barrel with 1" Insulation	2' Diameter, 20' Long Machine Barrel with no Insulation
Insulated Pellet Dryer Tanks and Ducts	Process Heating	Insulation for Pellet Tank and Duct	Uninsulated Pellet Tank and Duct
LED - 14W_CFL Baseline	Interior Lighting Other	LED (assume 14W) replacing CFL	100W equivalent CFL
LED Canopy Lighting (Exterior)	Exterior Lighting Industrial	One 67.2W LED Canopy Light	Average Lumen Equivalent Exterior Incandescent Area Lighting
LED Display Lighting (Exterior)	Exterior Lighting Industrial	One Letter of LED Signage, < 2ft in Height	One Letter of Neon or Argon-mercury Signage, < 2ft in Height
LED Display Lighting (Interior)	Interior Lighting Other	One Letter of LED Signage, < 2ft in Height	One Letter of Neon or Argon-mercury Signage, < 2ft in Height
LED exit sign	Interior Lighting Other	One 5W Single-Sided LED Exit Sign	One 9W Single-Sided CFL Exit Sign
LED Exterior Wall Packs	Exterior Lighting Industrial	One 35W LED Wall Pack	Average Lumen Equivalent Exterior Incandescent Area Lighting
LED High Bay_HID Baseline	Interior Lighting High Bay	One 140W High Bay LED Fixture	Lumen-Equivalent HID High Bay Fixture
LED High Bay_LF Baseline	Interior Lighting High Bay	One 140W High Bay LED Fixture	Lumen-Equivalent Linear Fluorescent High Bay Fixture

Measure	End-Use	Description	Baseline
LED Linear - Fixture Replacement	Interior Lighting Linear Fluorescent	2x4 LED Troffer Fixture	Lumen-Equivalent 32-Watt T8 Fixture
LED Linear - Lamp Replacement	Interior Lighting Linear Fluorescent	Linear LED	Lumen-Equivalent 32-Watt T8 Lamp
LED Parking Lighting	Exterior Lighting Industrial	One 160W LED Area Light	Average Lumen Equivalent Exterior HID Area Lighting
LEED New Construction Whole Building	HVAC	LEED Qualifying New Construction	Comparable facility, code-compliance construction
Light Tube	Interior Lighting Other	One 14" Light Tube, Delivering light to 250 S.F. of Industrial Space	250 S.F. of Industrial Space Lit by Typical Lighting Strategies
Low Energy Livestock Waterer	Motors Pumps	Install Thermostatically Controlled Livestock Watering System	Standard Livestock Watering System
Low Pressure Sprinkler Nozzles	Motors Pumps	Low Pressure Irrigation Nozzles operate at 35 psi or lower	Standard high pressure irrigation nozzles that operate at 50 psi or greater
Low Pressure-drop Filters	Compressed Air	20 HP Inlet Modulation Fixed-Speed Compressor with Low Pressure Drop Filter	20 HP Inlet Modulation Fixed-Speed Compressor, No Particulate Removal
Milk Pre-Cooler	Other	Installed pre-cooler heat exchanger	no pre-cooler heat exchanger installed
Networked Lighting Controls	Interior Lighting Linear Fluorescent	Install Networked Lighting Controls System on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Controlled either Manually or by Sensor as Specified by Code
Occupancy Sensors, Ceiling Mounted	Interior Lighting High Bay	Ceiling Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Occupancy sensors, switch mounted	Interior Lighting Linear Fluorescent	Switch Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor Lighting Controls	Exterior Lighting Industrial	Install Exterior Photocell Dimming Controls, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor motion sensor	Exterior Lighting Industrial	Install Exterior Motion Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Packaged Terminal AC	HVAC	High Efficiency Packaged Terminal AC	Code-Compliant PTAC, 10.9 EER
Process Cooling Ventilation Reduction	Process Cooling	Standard Process Cooling with Reduced Ventilation	Standard Process Cooling
Programmable thermostat	HVAC	Standard Heating and Cooling System with Programmable Thermostat	Standard Heating and Cooling System with Manual Thermostat

Measure	End-Use	Description	Baseline
Reflective Roof Treatment	HVAC	Reflective Roof Treatment	Standard Black Roof
Refrigeration Commissioning	Process Cooling	Commissioned Refrigeration System	Non-Commissioned Refrigeration System
Retro-Commissioning (Existing Construction)	HVAC	Perform Facility Retro-commissioning	
Roof insulation	HVAC	Roof Insulation (built-up roof applicable to flat/low slope roofs)	Code-Compliant Flat Roof
Smart thermostat	HVAC	Standard Heating and Cooling System with Smart Thermostat	Standard Heating and Cooling System with Manual Thermostat
Strategic Energy Management	HVAC	SEM goal setting and tracking	No active energy management
Synchronous Belt on 15hp ODP Motor	Motors Pumps	15 HP Open-Drip Proof Motor with Synchronous Belts Installed on Supply and/or Return Air Fans	15 HP Open-Drip Proof Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Synchronous Belt on 5hp ODP Motor	Motors Pumps	5 HP Open-Drip Proof Motor with Synchronous Belts Installed on Supply and/or Return Air Fans	5 HP Open-Drip Proof Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Synchronous Belt on 75hp ODP Motor	Motors Pumps	75 HP Open-Drip Proof Motor with Synchronous Belts Installed on Supply and/or Return Air Fans	75 HP Open-Drip Proof Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Thermal energy storage	HVAC	Deploy thermal energy storage technology (ice harvester, etc.) to shift load	Code compliant chiller
Time Clock Control	Interior Lighting High Bay	Time Clock Controlled Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
VAV System	HVAC	Variable Air Volume Distribution System	Constant Air Volume Distribution System
VFD on Air Compressor	Compressed Air	20 HP VFD Air Compressor	20 HP Inlet Modulation Fixed-Speed Compressor
VFD on Cooling Tower Fans	Process Cooling	Cooling Tower Fans with VFD Control	Cooling Tower Fans without VFD Control
VFD on HVAC Fan	Motors Fans Blowers	5 HP HVAC Fan Motor, with VFD Control	5 HP HVAC Fan Motor, no VFD Control
VFD on HVAC Pump	Motors Pumps	VFD on HVAC Pump	7.5 HP HVAC Pump Motor, no VFD Control
VFD on process pump	Motors Pumps	20 HP Process Pump Equipped with VFD Control	20 HP Process Pump, Constant Speed
VSD Controlled Compressor	Process Cooling	Refrigeration System with VSD Control	Refrigeration System with Standard Slide-Valve Control System

Measure	End-Use	Description	Baseline
Water source heat pump	HVAC	Water Source Heat Pump, 2.5 Tons, 17.4 EER, 4.4 COP	Code-Compliant ASHP
Waterside economizer	HVAC	Waterside Economizer	No economizer
Window shade film	HVAC	Window Film with SHGC of 0.35 Applied to Standard Window	Standard Window with below Code Required Minimum SHGC

The following EE measures from the 2019 Technical Potential Study were eliminated from the current study⁸:

Table 15: 2019 EE Measures Eliminated from Current Study

Sector	Measure	End-Use	Reason for Removal
Residential	CFL - 15W Flood	Lighting	Better technology (LED) available
Residential	CFL - 15W Flood (Exterior)	Lighting	Better technology (LED) available
Residential	CFL - 13W	Lighting	Better technology (LED) available
Residential	CFL - 23W	Lighting	Better technology (LED) available
Residential	Low Wattage T8 Fixture	Lighting	Better technology (LED) available
Residential	15 SEER Central AC	Space Cooling	Updated Federal Standard
Residential	15 SEER Air Source Heat Pump	Space Cooling, Space Heating	Updated Federal Standard
Residential	14 SEER ASHP from base electric resistance heating	Space Cooling, Space Heating	Updated Federal Standard
Residential	Two Speed Pool Pump	Miscellaneous	Updated Florida Energy Code
Residential	Variable Speed Pool Pump	Miscellaneous	Updated Florida Energy Code
Residential	Storm Door	Space Cooling, Space Heating	Minimal/uncertain energy savings
Commercial	CFL - 15W Flood	Exterior Lighting	Better technology (LED) available
Commercial	High Efficiency HID Lighting	Exterior Lighting	Better technology (LED) available

⁸ Additional measures from the 2019 study were updated to reflect current vintage/technology for the current study.

Sector	Measure	End-Use	Reason for Removal
Commercial	LED Street Lights	Exterior Lighting	Market standard
Commercial	LED Traffic and Crosswalk Lighting	Exterior Lighting	Market standard
Commercial	CFL-23W	Interior Lighting	Better technology (LED) available
Commercial	High Bay Fluorescent (T5)	Interior Lighting	Better technology (LED) available
Commercial	Premium T8 - Fixture Replacement	Interior Lighting	Better technology (LED) available
Commercial	Premium T8 - Lamp Replacement	Interior Lighting	Better technology (LED) available
Commercial	Two Speed Pool Pump	Miscellaneous	Updated Florida Energy Code
Commercial	Variable Speed Pool Pump	Miscellaneous	Updated Florida Energy Code
Commercial	Tank Wrap on Water Heater	Domestic Hot Water	Limited applicability
Commercial	Ceiling Insulation (R12 to R38)	Space Cooling, Space Heating	Consolidated measure baseline assumptions
Commercial	Ceiling Insulation (R30 to R38)	Miscellaneous	Consolidated measure baseline assumptions

Appendix B DR Measure List

Table 16: Residential DR Measures

Measure	Type	Season	Description
Central air conditioner - Load Shed	Direct load control	Summer	Direct load control program where utility provides day ahead notification that it will send remote signal to shed AC unit load during peak usage period.
Central Heating - Load Shed	Direct load control	Winter	Direct load control program where utility provides day ahead notification that it will send remote signal to shed AC unit load during peak usage period.
Central air conditioner - 50% cycling	Direct load control	Summer	Direct load control program where utility provides day ahead notification that it will send remote signal to cycle AC unit during peak usage period
Central Heating - 50% cycling	Direct load control	Winter	Direct load control program where utility provides day ahead notification that it will send remote signal to cycle AC unit during peak usage period
Smart thermostats - Utility Installation	Direct load control	Summer and Winter	Similar to AC load control program, but allows customers to participate using a compatible smart thermostat rather than an AC switch
Smart thermostats - BYOT	Direct load control	Summer and Winter	Similar to AC load control program, but allows customers to participate using a compatible smart thermostat rather than an AC switch
CPP + Tech	Pricing	Summer and Winter	Electricity rate that varies based on time of day. Can be same rate schedule for every day during a given season (time of use, or TOU) and with critical peak pricing (CPP) days when peak period rates are substantially higher for a limited number of days per year (customers receive advance notification of CPP event). Customers also receive technology that they can pre-program to curtail load when an event is called.
Water heater control	Direct load control	Summer and Winter	Load control installed on a water heater (integrated or external switch)
Pool pump switches	Direct load control	Summer and Winter	Load control program with switch installed on pool pump
Room AC	Direct load control	Summer	Load control program that is focused on room AC units rather than central AC
Managed EV Charging - switch	Direct load control	Summer and Winter	Load control switch that is installed on an EV charger
Managed EV Charging - telematics	Direct load control	Summer and Winter	Direct load control program leveraging EV smart charging software
Battery Storage with PV	Pricing/Direct load control	Summer and Winter	PV charges battery and battery discharges to grid

Table 17: Small C&I DR Measures

Measure	Type	Season	Description
Central air conditioner - Load Shed	Direct load control	Summer	Direct load control program where utility provides day ahead notification that it will send remote signal to shed AC unit load during peak usage period.
Central Heating - Load Shed*	Direct load control	Winter	Direct load control program where utility provides day ahead notification that it will send remote signal to shed AC unit load during peak usage period.
Central air conditioner - 50% cycling	Direct load control	Summer	Direct load control program where utility provides day ahead notification that it will send remote signal to cycle AC unit during peak usage period
Central Heating - 50% cycling*	Direct load control	Winter	Direct load control program where utility provides day ahead notification that it will send remote signal to cycle AC unit during peak usage period
Smart thermostats - Utility Installation*	Direct load control	Summer and Winter	Similar to AC load control program, but allows customers to participate using a compatible smart thermostat rather than an AC switch
Smart thermostats - BYOT*	Direct load control	Summer and Winter	Similar to AC load control program, but allows customers to participate using a compatible smart thermostat rather than an AC switch
CPP + Tech	Pricing	Summer and Winter	Electricity rate that varies based on time of day. Can be same rate schedule for every day during a given season (time of use, or TOU) and with critical peak pricing (CPP) days when peak period rates are substantially higher for a limited number of days per year (customers receive advance notification of CPP event). Customers also receive technology that they can pre-program to curtail load when an event is called.
Managed EV Charging - switch	Direct load control	Summer and Winter	Load control switch that is installed on an EV charger
Managed EV Charging - telematics	Direct load control	Summer and Winter	Direct load control program leveraging EV smart charging software
Battery Storage with PV	Pricing/Direct load control	Summer and Winter	PV charges battery and battery discharges to grid

Table 18: Large C&I DR Measures

Measure	Type	Season	Description
CPP + Tech	Pricing	Summer and Winter	Electricity rate that varies based on time of day. Can be same rate schedule for every day during a given season (time of use, or TOU) and with critical peak pricing (CPP) days when peak period rates are substantially higher for a limited number of days per year (customers receive advance notification of

Measure	Type	Season	Description
			CPP event). Customers also receive technology that they can pre-program to curtail load when an event is called.
Auto DR	Utility-controlled loads	Summer and Winter	Custom load control of specific end-uses/processes that is triggered by utility signal to building management system; customer can sometimes opt-out of specific events
Firm Service Level	Contractual	Summer and Winter	Customer commits to a maximum usage level during peak periods and, when notified by the utility, agrees to cut usage to that level.
Guaranteed Load Drop	Contractual	Summer and Winter	Customer agrees to reduce usage by an agreed upon amount when notified

No DR measures from the 2019 Technical Potential Study were eliminated from the current study.

Appendix C DSRE Measure List

Table 19: Residential DSRE Measures

Measure	Description
PV System	Roof-mounted system, including multiple panels, AC/DC inverter, racking system, and electrical system interconnections
Battery Storage from PV System	Lithium-ion battery system designed to integrate with an on-site PV system to store and discharge excess energy from PV generation

Table 20: Non-Residential DSRE Measures

Measure	Description
PV System	Roof-mounted system, including multiple panels, AC/DC inverter, racking system, and electrical system interconnections
Battery Storage from PV System	Lithium-ion battery system designed to integrate with an on-site PV system to store and discharge excess energy from PV generation
CHP - Fuel Cell	An electrochemical cell-based generator that reacts hydrogen fuel with oxygen
CHP - Micro Turbine	Small combustion turbine that burns gaseous or liquid fuel to drive a generator
CHP - Gas Turbine	A combustion turbine that burns gaseous or liquid fuel to drive a generator
CHP - Reciprocating Engine	An engine that uses one or more pistons to convert pressure into rotational motion
CHP - Steam Turbine	A turbine that extracts thermal energy from pressured steam to drive a generator

No DSRE measures from the 2019 Technical Potential Study were eliminated from the current study.

Appendix D External Measure Suggestions

Table 21: External Measure Suggestions and Actions

Measure Suggestion	Stakeholder Comments	Action taken for FEECA Study
Efficient Electrification Measures	<p>All measures that can produce substantial site energy savings by converting from natural gas or other fossil fuels should be included in the Florida electric utilities' next efficiency potential study. Key examples include efficient heat pumps to displace gas furnaces and efficient heat pump water heaters to displace gas water heaters. It is important to note that these electrification measures provide not only heating energy savings and water heating energy savings, but can also potentially provide cooling efficiency benefits as well. In the case of heat pumps, that can occur because efficient heat pumps can operate in cooling mode more efficiently than standard central air conditioners. In the case of heat pump water heaters, cooling and dehumidification benefits can occur when/if the water heater is in conditioned space because they transfer heat (particularly latent heat) from the air around them to the water they are heating. A growing number of jurisdictions - including Illinois, Minnesota and some northeastern states - have begun to include efficient electrification measures in their efficiency programs portfolios.</p>	<p>Fuel-switching and electrification are outside the scope of this study</p>
Networked Lighting Controls	<p>LED lighting technology has become increasingly accepted and installed in commercial buildings. The next big efficiency opportunity in commercial lighting efficiency is in sophisticated controls integrated into the light fixtures themselves - both luminaire level lighting controls and networked lighting controls. For example, a 2017 report for both the Northwest Energy Efficiency Alliance and the Design Lights Consortium, a non-profit that works with utilities and manufacturers of lighting products (and which many utilities across the country reference for determination of eligibility of lighting products for efficiency program rebates), found that networked lighting controls can provide on the order of 50% additional savings after LED conversion. Other studies have also found the national savings potential from such products to be enormous. Moreover, these products can be designed to provide not only lighting energy savings but also a number of other non-energy benefits (e.g., asset tracking, such as the ability of hospitals to know the location of all wheel chairs). Numerous utilities across the country now actively promote this technology through their efficiency programs. For example, Commonwealth Edison, the utility serving Chicago and other parts of northern Illinois, is currently getting a significant portion of its commercial lighting savings from promotion of networked lighting controls</p>	<p>Added to measure list for 2024 study</p>

External Measure Suggestions

Measure Suggestion	Stakeholder Comments	Action taken for FEECA Study
Ductless mini-split heat pumps to displace inefficient electric baseboard heating	While most Florida residential buildings with electric heat provide that heat with heat pumps, at least some (perhaps most likely being older multi-family rental buildings) still use inefficient electric resistance heat. Ductless mini- split heat pump retrofits can very efficiently displace such inefficient electric heat and should be added to the residential measure list.	Added to measure list for 2024 study
Air Source Heat Pump baseline assumptions	<p>There are seven air source heat pump (ASHP) measures included in the residential measure list. Two of them - one at SEER 14 and a second at SEER 21 - are listed as relative to an electric resistance baseline. Five of them - SEER 15, SEER 16, SEER 17, SEER 18 and SEER 21 - appear to be relative to a baseline of a standard new ASHP. Are we interpreting this correctly? If so, we have a couple of comments/questions/suggestions:</p> <ul style="list-style-type: none"> • The efficiency standards assessed need to be modified to be consistent with new federal standards, including new testing procedures. • For cases where the baseline is "electric resistance", why only assessing two efficiency tiers (i.e., fewer than for standard ASHP baselines)? The same number of efficiency tiers should be assessed for both baselines. 	Incorporated suggestions into 2024 study, including updated baseline standard and assessing same efficiency tiers for both baselines
Heat Pump Water Heater Efficiency	The Res EE tab of the utilities draft measure list suggests that the efficiency of a heat pump water heater is an EF of 2.50. That is unrealistically low. In fact, of the 222 products listed on the Energy Star website, none had UEFs less than 2.80 and only 29 (13%) had UEFs that were less than 3.4; the average was 3.57. Indeed, the first product listed on a search of heat pump water heaters on Home Depot's website is a 50 gallon, Rheem (Pro Terra) product with a UEF of 3.75 and a cost of \$1699.	Incorporated suggestion into 2024 study
New Construction Measure Packages	The measures lists did not appear to include packages of measures for building new residential and/or new commercial buildings to levels of efficiency beyond those required by code. Utilities in many jurisdictions run new construction efficiency programs supporting such measure packages. In the residential sector, many base their programs on the long-standing Federal Energy Star standard. However, increasingly utility programs are promoting additional efficiency tiers - often as part of all-electric new construction program offerings - that go well beyond the Energy Star standard. For example, Consumers Energy (Michigan) offers \$1000 rebates to builders who construct Energy Star single family homes	Incorporated suggestion into 2024 study with 2 tiers of residential new construction whole-home improvement measures.

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External Measure Suggestions

Measure Suggestion	Stakeholder Comments	Action taken for FEECA Study
	with a Home Energy Rating (HERS) score of 57 or less, but offer higher rebates for more efficient buildings - up to \$4000 for all electric homes with a HERS score of 40 or less. The Florida utilities potential study should assess savings potential for both the Energy Star level and a tier or two of additional efficiency beyond that level. Similar assessments of new commercial building savings potential should also be assessed.	
Custom Industrial Measures	The utilities' list of industrial efficiency measures addresses common industrial efficiency opportunities. However, it does not address efficiency opportunities that may be unique to individual industries or even to individual industrial facilities. That can include such things as changes in types of materials used in manufacturing, reductions in waste streams, improved use of water delivered by agricultural irrigation systems, and/or other things that are not directly related to energy using equipment or controls of such equipment. It is obviously not possible to list all such measures. However, a potential study will understate savings potential if it does not include a way of capturing such potential in its estimates. One potential way to get a sense of such potential is to review results of comprehensive industrial efficiency programs run by other utilities to identify the portion of actual program savings from such unique custom measures - and then assume that portion of custom savings could be added to the savings estimated in the study for named measures.	Added to measure list for 2024 study
Electric Vehicle measures	Some EV chargers are more efficient than others. The Federal Energy Star program has a standard for them. Savings potential may not be huge, but should be considered in the study. With a growing number of EV sales, the study should also consider the potential savings from promoting the most efficient EVs within different size/style categories	Added to measure list for 2024 study
Removing screw-based LEDs	The screw-based LEDs on both the Residential and Commercial measure lists should now be considered baseline due to federal efficiency standards adopted earlier this year. Utility load forecasts for IRPs should reflect resulting improvements in end use efficiency.	Screw-based LEDs were included in the study but with limited applicability to reflect current market
Removing Commercial fluorescent lighting	LED technology - for both fixtures and lamps - has advanced significantly in recent years, to the point where it should be the only technology considered for commercial lighting. Measures such as high performance T-8 fluorescent fixtures and high bay T-5 fluorescent fixtures should be replaced with LED alternatives in the study.	Updated measure list for 2024 study to only include LED-based lamps for linear fluorescent replacements

External Measure Suggestions

Measure Suggestion	Stakeholder Comments	Action taken for FEECA Study
Removing fossil-gas fueled CHP	Fossil-fuel fired CHP systems should not be considered “renewable” and have questionable benefits if electric generation is expected to get increasingly more renewable and clean. Biogas-fueled CHP - such as systems installed in wastewater treatment facilities that use methane byproducts of processing waste - should be included in the study.	2024 study will continue to assess all CHP options
Adding livestock methane power generation to renewables list	For example, see the “cow power” program currently being run by Green Mountain Power, Vermont’s largest electric utility	2024 study will continue to assess DSRE options consistent with prior study, including customer-sited solar, solar plus storage, and CHP
Adding EV managed charging to DR list	With national market shares for EVs growing, it is important that utilities consider programs for managing when charging occurs. Numerous utilities are currently running managed charging programs. This does not currently appear to be on the measure list and should be added to the Florida utilities’ potential study.	Added to measure list for 2024 study
Residential “smart thermostat” measure can provide both efficiency savings and demand response potential	This is recognized in the inclusion of smart thermostats in both the Res EE and DR tabs of the measure list spreadsheet. We simply want to flag that it is important when assessing cost-effectiveness of this measure that these two potential benefits are considered together. In other words, the cost should be considered compared to the combined efficiency and DR potential rather than separately considered relative to just EE savings and then separately again compared to just DR potential	2024 study will include interactive impacts of EE and DR opportunities
Emerging Technologies	The efficiency potential study measure list appears to be somewhat outdated. It does not include a number of new and emerging technologies. The potential list of such technologies is long. We suggest reviewing the attached list of emerging technologies developed almost two years ago by Consumers Energy (Michigan) and including them in the study.	Consumers Energy study was reviewed and commercially available measures were added to measure list for 2024 study, including heat pump water heaters - CEE advanced tier, heat pump clothes dryers, ozone laundry systems, and 21+ SEER HVAC units

External Measure Suggestions

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Exhibit JH-8 2024 Measure Lists

EE Measure Lists

Table 1: Residential EE Measures

Measure	End-Use	Description	Baseline
120v Heat Pump Water Heater 50 Gallons	Residential Domestic Hot Water	120v Heat Pump Water Heater 50 Gallons	Code-Compliant 50 Gallon Electric Resistance Water Heater
Air Sealing-Infiltration Control	Residential Space Cooling, Residential Space Heating	Standard Heating and Cooling System with Improved Infiltration Control	Standard Heating and Cooling System with Standard Infiltration Control
Air-to-Water Heat Pump	Residential Space Cooling, Residential Space Heating	Energy Star Air-to-Water Heat Pump, 25 SEER, 13 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
ASHP - 15 SEER/14.3 SEER2 from base electric resistance	Residential Space Cooling, Residential Space Heating	ASHP 15 SEER from base electric resistance	Base AC, 15 SEER, Electric resistance heating
ASHP - 24 SEER/22.9 SEER2 (from elec resistance)	Residential Space Cooling, Residential Space Heating	ASHP: 24/22.9 SEER/SEER2, 10.5 HSPF	Base AC, 15 SEER, Electric resistance heating
ASHP - 24 SEER/22.9 SEER2, 10.5 HSPF	Residential Space Cooling, Residential Space Heating	ASHP: 24/22.9 SEER/SEER2, 10.5 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
ASHP - CEE Advanced Tier: 17.8 SEER/17 SEER2; 10.0 HSPF	Residential Space Cooling, Residential Space Heating	CEE Advanced Tier ASHP:17.8/17 SEER/SEER2; 10.0 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
ASHP - CEE Advanced Tier: 17.8 SEER/17 SEER2; 10.0 HSPF (from elec resistance)	Residential Space Cooling, Residential Space Heating	CEE Advanced Tier ASHP:17.8/17 SEER/SEER2; 10.0 HSPF	Base AC, 15 SEER, Electric resistance heating
ASHP - CEE Tier 2: 16.8 SEER/16 SEER2; 9.0 HSPF	Residential Space Cooling, Residential Space Heating	CEE Tier 2 ASHP: 16.8/16 SEER/SEER2; 9.0 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
ASHP - CEE Tier 2: 16.8 SEER/16 SEER2; 9.0 HSPF (from elec resistance)	Residential Space Cooling, Residential Space Heating	CEE Tier 2 ASHP: 16.8/16 SEER/SEER2; 9.0 HSPF	Base AC, 15 SEER, Electric resistance heating
ASHP - ENERGY STAR/CEE Tier 1: 16 SEER/15.2 SEER2	Residential Space Cooling, Residential Space Heating	ENERGY STAR/CEE Tier 1 ASHP: 16/15.2 SEER/SEER2, 9.0 HSPF	Base AC, 15 SEER, Electric resistance heating

Measure	End-Use	Description	Baseline
(from elect resistance)			
ASHP - ENERGY STAR/CEE Tier 1: 16 SEER/15.2 SEER2, 9.0 HSPF	Residential Space Cooling, Residential Space Heating	ENERGY STAR/CEE Tier 1 ASHP: 16/15.2 SEER/SEER2, 9.0 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF (updated)
Basement or Crawlspace Wall Insulation R-15	Residential Space Cooling, Residential Space Heating	Increased Basement or Crawlspace Wall Insulation (R-15)	Code-Compliant Exterior Below-Grade Wall Insulation (R-10)
Bathroom Faucet Aerators	Residential Domestic Hot Water	Low-Flow Faucet Aerator with Flow Rate of 1.5 gpm	Faucet Aerator with Federal Standard Flow Rate of 2.2 gpm
CEE Advanced Tier Clothes Dryer	Clothes Dryers	CEE Advanced Tier Clothes Dryer	One Clothes Dryer meeting Federal Standard
CEE Advanced Tier Clothes Washer	Clothes Washers	Tier 3 CEE Clothes washer	One Clothes Washer meeting Federal Standard
CEE Tier 3 Refrigerator	Refrigerators	Residential Tier 3 Refrigerator	One Refrigerator meeting Federal Standard
Ceiling Insulation (R11 to R30)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1982-1985) homes, bring to current code	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R11 to R38)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1982-1985) homes	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R11 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1982-1985) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R19 to R30)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1982-2020) homes, bring to current code	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R19 to R38)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1982-2020) homes	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R19 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1982-2020) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R2 to R30)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, older (pre-1982) homes, bring to current code	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R2 to R38)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, older (pre-1982) homes	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R2 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, older (pre-1982) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R30 to R38)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1986-2020) homes	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R30 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1986-2020) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction
Ceiling Insulation (R38 to R49)	Residential Space Cooling, Residential Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1986-2020) homes - Beyond Code	Existing ceiling insulation based on building code at time of construction

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Measure	End-Use	Description	Baseline
Central AC - CEE Tier 2: 16.8 SEER/16 SEER2	Residential Space Cooling	Central AC - CEE Tier 2: 16.8 SEER/16 SEER2	Code-Compliant Central AC, 15 SEER (updated)
Central AC - 24 SEER/22.9 SEER2	Residential Space Cooling	Central AC - 24 SEER/22.9 SEER2	Code-Compliant Central AC, 15 SEER (updated)
Central AC - CEE Advanced Tier: 17.8 SEER/17 SEER2	Residential Space Cooling	Central AC - CEE Advanced Tier: 17.8 SEER/17 SEER2	Code-Compliant Central AC, 15 SEER (updated)
Central AC - ENERGY STAR/CEE Tier 1: 16 SEER/15.2 SEER2	Residential Space Cooling	Central AC - ENERGY STAR/CEE Tier 1: 16 SEER/15.2 SEER2	Code-Compliant Central AC, 15 SEER (updated)
Central AC Tune Up	Residential Space Cooling	System tune-up, including coil cleaning, refrigerant charging, and other diagnostics	Existing Typical Central AC without Regular Maintenance/tune-up
Dehumidifier Recycling	Plug Load	No dehumidifier	One Dehumidifier meeting Federal Standard
Drain Water Heat Recovery	Residential Domestic Hot Water	50 Gallon Electric Resistance Heater and Drain Water Heat Exchanger	50 Gallon Electric Resistance Heater, No Drain Water Heat Recovery
Duct Insulation	Residential Space Cooling, Residential Space Heating	Standard Electric Heating and Central AC with Insulated Ductwork	Standard Electric Heating and Central AC with Uninsulated Ductwork
Duct Repair	Residential Space Cooling, Residential Space Heating	Duct Repair to eliminate/minimize leaks, includes testing and sealing	Standard Electric Heating and Central AC with typical duct leakage
ECM Circulator Pump	Residential Miscellaneous	Install ECM Circulator Pump	Install Standard Circulator Pump
Energy Star Air Purifier	Plug Load	One Air Purifier meeting ENERGY STAR 2.0 Standards	One Standard Conventional Air Purifier
Energy Star Audio-Video Equipment	Plug Load	One DVD/Blu-Ray Player meeting current ENERGY STAR Standards	One Market Average DVD/Blu-Ray Player
Energy Star Bathroom Ventilating Fan	Residential Ventilation and Circulation	Bathroom Exhaust Fan meeting current ENERGY STAR Standards	Bathroom Exhaust Fan meeting Federal Standard
Energy Star Ceiling Fan	Residential Miscellaneous	60" Ceiling Fan Meeting ENERGY STAR 3.1 Standards	Standard 60" Ceiling Fan
Energy Star Clothes Dryer	Clothes Dryers	One Electric Resistance Clothes Dryer meeting ENERGY STAR 1.1 Standards	One Clothes Dryer meeting Federal Standard
Energy Star Clothes Washer	Clothes Washers	One Clothes Washer meeting ENERGY STAR 8.1 Standards	One Clothes Washer meeting Federal Standard
Energy Star Dehumidifier	Plug Load	One Dehumidifier meeting ENERGY STAR 5.0 Standards	One Dehumidifier meeting Federal Standard
Energy Star Dishwasher	Dishwashers	One Dishwasher meeting ENERGY STAR 7.0 Requirements (effective on July 19, 2023), electric water heating	One Dishwasher meeting Federal Standard
Energy Star Dishwasher (Gas Water Heating)	Dishwashers	One Dishwasher meeting ENERGY STAR 7.0 Requirements, gas water heating	One Dishwasher meeting Federal Standard; gas water heating
Energy Star Door	Residential Space Cooling, Residential Space Heating	100ft2 of Opaque Door meeting Energy Star Version 6.0 Requirements (U-Value: 0.17)	100ft2 of Opaque Door meeting current FL Code Requirements

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Measure	End-Use	Description	Baseline
ENERGY STAR EV supply equipment (level 2 charger)	Residential Miscellaneous	Level 2 Electric Vehicle Supply Equipment (EVSE)	Level 1 Electric Vehicle Supply Equipment (EVSE)
Energy Star Freezer	Freezers	One Freezer meeting current ENERGY STAR 5.1 Standards	One Freezer meeting Federal Standard
Energy Star Ground Source Heat Pump	Residential Space Cooling, Residential Space Heating	Energy Star GSHP, 17.1 SEER, 12 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF
Energy Star Imaging Equipment	Plug Load	One imaging device meeting current ENERGY STAR Standards	One non-ENERGY STAR imaging device
Energy Star Monitor	Plug Load	One Monitor meeting ENERGY STAR 8.0 Standards	One Standard Monitor
Energy Star Personal Computer	Plug Load	One Personal Computer meeting ENERGY STAR 8.0 Standards	One Personal Computer meeting ENERGY STAR® 3.0 Standards
Energy Star Refrigerator	Refrigerators	One Refrigerator/Freezer meeting ENERGY STAR 5.1 Standards	One Refrigerator/Freezer meeting Federal Standard
Energy Star Room AC	Residential Space Cooling	Room AC meeting current ENERGY STAR standards	Code-Compliant Room AC
Energy Star Set-Top Receiver	Plug Load	One Set-top Box meeting ENERGY STAR 4.1 Standards	One Market Average Set-top Box
Energy Star TV	Plug Load	One Television meeting ENERGY STAR 9.0 Standards	One non-ENERGY STAR Television
Energy Star Windows	Residential Space Cooling, Residential Space Heating	100ft2 of Window meeting Energy Star Version 6.0 Requirements (U-Value: 0.27, SHGC: 0.21)	100ft2 of Window current FL energy code requirements
Exterior Wall Insulation	Residential Space Cooling, Residential Space Heating	Increased Exterior Above-Grade Wall Insulation (R-13)	Market Average Existing Exterior Above-Grade Wall Insulation
Filter Whistle	Residential Ventilation and Circulation	Install the Furnace Filter Alarm	No Furnace Filter Alarm on a Central Forced-Air Furnace
Floor Insulation	Residential Space Heating	Increased Floor Insulation (R-30)	Code-Compliant Floor Insulation
Freezer Recycling	Freezers	No Freezer	Current Market Freezer
Green Roof	Residential Space Cooling	Vegetated Roof Surface on top of Standard Roof	Standard Black Roof
Heat Pump Clothes Dryer	Clothes Dryers	One Heat Pump Clothes Dryer	One Clothes Dryer meeting Federal Standard
Heat Pump Pool Heater	Residential Miscellaneous	Heat Pump Swimming Pool Heater	Electric Resistance Swimming Pool Heater
Heat Pump Tune Up	Residential Space Cooling, Residential Space Heating	System tune-up, including coil cleaning, refrigerant charging, and other diagnostics	Standard Heating and Cooling System without Regular Maintenance/tune-up
Heat Pump Water Heater 50 Gallons-CEE Advanced Tier	Residential Domestic Hot Water	CEE Advanced Tier Heat Pump Water Heater 50 Gallons	Code-Compliant 50 Gallon Electric Resistance Water Heater
Heat Pump Water Heater 50 Gallons-ENERGY STAR	Residential Domestic Hot Water	Heat Pump Water Heater 50 Gallons	Code-Compliant 50 Gallon Electric Resistance Water Heater

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Measure	End-Use	Description	Baseline
Heat Pump Water Heater 80 Gallons-ENERGY STAR	Residential Domestic Hot Water	Energy Star Heat Pump Water Heater 80 Gallons	Code-Compliant 80 Gallon Electric Resistance Water Heater
Heat Trap	Residential Domestic Hot Water	Heat Trap	Existing Water Heater without heat trap
High Efficiency Convection Oven	Residential Cooking	One Full-Size Convection Oven meeting ENERGY STAR 3.0 Standards	One Standard Economy-Grade Full-Size Oven
High Efficiency Induction Cooktop	Residential Cooking	One residential induction cooktop	One standard residential electric cooktop
Home Energy Management System	Lighting, Plug Load, Residential Space Cooling, Residential Space Heating	Typical HVAC by Building Type Controlled by Energy Management System	Typical HVAC by Building Type, Manually Controlled
Hot Water Pipe Insulation	Residential Domestic Hot Water	1' of Insulated Pipe in Unconditioned Spaces, Insulation of R-5	1' of Pipe in Unconditioned Spaces with Code Minimum of 1"of Insulation
HVAC ECM Motor	Residential Ventilation and Circulation	A brushless permanent magnet (ECM) blower motor for electric furnace	Permanent Split Capacitor Motor for Electric Furnace
HVAC Economizer	Residential Space Cooling	Install residential economizer	No economizer
HVAC Zoning System	Residential Space Cooling, Residential Space Heating	Install dampers in the ducts, dividing home into multiple zones, each controlled by its own thermostat	Single zone HVAC system
Indoor Daylight Sensor	Lighting	Install Indoor Daylight Sensors, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Induction Range	Residential Cooking	Residential induction range	Electric range
Instantaneous Hot Water System	Residential Domestic Hot Water	Instantaneous Hot Water System	Standard Efficiency Storage Tank Water Heater
Kitchen Faucet Aerators	Residential Domestic Hot Water	Low-Flow Faucet Aerator with Flow Rate of 1.5 gpm	Faucet Aerator with Federal Standard Flow Rate of 2.2 gpm
LED - 9W_CFL Baseline	Lighting	LED (assume 9W) replacing CFL baseline lamp	14W CFL (60W equivalent)
LED - 9W_Halogen Baseline	Lighting	LED (assume 9W) replacing EISA-2020 compliant baseline lamp	EISA-2020 compliant baseline lamp (60W equivalent)
LED Specialty Lamps-5W Chandelier	Lighting	5 W Chandelier LED	Standard incandescent chandelier lamp
Linear LED	Lighting	Linear LED Lamps in Linear Fluorescent Fixture	Standard (32w) T8 lamps in Linear Fluorescent Fixture
Low Flow Showerhead	Residential Domestic Hot Water	Low-Flow Handheld Showerhead, Flow Rate: 1.60 gpm	Standard Handheld Showerhead, Flow Rate: 2.50 gpm
New Construction - Whole Home Improvements - Tier 1	Whole Home	Performance-based improvements in new homes - 20% savings	Residential New Construction (Baseline Efficiency)
New Construction - Whole Home Improvements - Tier 2	Whole Home	Performance-based improvements in new homes - 35% savings	Residential New Construction (Baseline Efficiency)

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Measure	End-Use	Description	Baseline
Occupancy Sensors Switch Mounted	Lighting	Switch Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor Lighting Timer	Lighting	Timer on Outdoor Lighting, Controlling 120 Watts	120 Watts of Lighting, Manually Controlled
Outdoor Motion Sensor	Lighting	Motion Sensor on Outdoor Lighting, Controlling 120 Watts	120 Watts of Lighting, Manually Controlled
Ozone Laundry	Clothes Washers	Add a New, Single-Unit Ozone Laundry System to the Clothes Washer	One Clothes Washer meeting Federal Standard
Programmable Thermostat	Residential Space Cooling, Residential Space Heating	Standard Heating and Cooling System with Programmable Thermostat	Standard Heating and Cooling System with Manual Thermostat
Properly Sized CAC	Residential Space Cooling	Properly Sized Central Air Conditioning	Standard Central Air Conditioning, Oversized
Radiant Barrier	Residential Space Cooling	Radiant Barrier	No radiant barrier
Reflective Roof	Residential Space Cooling	Reflective Roof Treatment	Standard dark shingle
Refrigerator Coil Cleaning	Refrigerators	Refrigerator Coil Cleaning	
Refrigerator Recycling	Refrigerators	No Refrigerator	Current Market Average Refrigerator
Residential Whole House Fan	Residential Space Cooling	Standard Central Air Conditioning with Whole House Fan	Standard Central Air Conditioning, No Whole House Fan
Sealed crawlspace	Residential Space Cooling, Residential Space Heating	Encapsulated and semi-conditioned crawlspace	Naturally vented, unconditioned crawlspace
Smart Breaker	Whole Home	Smart Breaker	standard electric breakers
Smart Panel	Whole Home	Multi-channel device that attaches to customer's circuit breaker to enable monitoring and control of major end-use appliances by customer	standard electric panel
Smart Power Strip	Plug Load	Smart plug strips for entertainment centers and home office	Standard entertainment center or home office usage, no smart strip controls
Smart Thermostat	Residential Space Cooling, Residential Space Heating	Standard Heating and Cooling System with Smart Thermostat	Standard Heating and Cooling System with Manual Thermostat
Solar Attic Fan	Residential Space Cooling	Standard Central Air Conditioning with Solar Attic Fan	Standard Central Air Conditioning, No Solar Attic Fan
Solar Pool Heater	Residential Miscellaneous	Solar Swimming Pool Heater	Electric Resistance Swimming Pool Heater
Solar Powered Pool Pumps	Residential Miscellaneous	Solar Powered Pool Pump	Variable Speed Pool Pump Motor
Solar Thermal Water Heating System	Residential Domestic Hot Water	Solar Thermal System with Electric Backup	Code-Compliant 50 Gallon Electric Resistance Water Heater
Spray Foam Insulation (Base R11)	Residential Space Cooling, Residential Space Heating	Open cell spray foam along roofline in existing (1982-1985) homes	Existing ceiling insulation based on building code at time of construction

Measure	End-Use	Description	Baseline
Spray Foam Insulation (Base R19)	Residential Space Cooling, Residential Space Heating	Open cell spray foam along roofline in existing (1982-1985) homes	Existing ceiling insulation based on building code at time of construction
Spray Foam Insulation (Base R2)	Residential Space Cooling, Residential Space Heating	Open cell spray foam along roofline in older (pre-1982) homes	Existing ceiling insulation based on building code at time of construction
Spray Foam Insulation (Base R30)	Residential Space Cooling, Residential Space Heating	Open cell spray foam along roofline in existing (1986-2020) homes	Existing ceiling insulation based on building code at time of construction
Thermostatic Shower Restriction Valve	Residential Domestic Hot Water	50 Gallon Electric Resistance Heater and Thermostatic Shower Valves	50 Gallon Electric Resistance Heater and Standard Shower Valves
Variable Refrigerant Flow (VRF) HVAC Systems	Residential Space Cooling, Residential Space Heating	Variable Refrigerant Flow (VRF) HVAC Systems	Code-Compliant ASHP, 15 SEER, 8.8 HSPF
Water Heater Blanket	Residential Domestic Hot Water	50 Gallon Electric Resistance Water Heater with Insulated Tank Wrap	Code-Compliant 50 Gallon Electric Resistance Water Heater, No Tank Wrap
Water Heater Thermostat Setback	Residential Domestic Hot Water	50 Gallon Electric Resistance Water Heater with Temperature Setpoint of 119°F	Code-Compliant 50 Gallon Electric Resistance Water Heater (Temp. Setpoint = 130°F)
Water Heater Timeclock	Residential Domestic Hot Water	Water Heater Timeclock	Existing Water Heater without time clock
Weather stripping	Residential Space Cooling, Residential Space Heating	Specific quantity of weather stripping to seal	
Window Caulking	Residential Space Cooling, Residential Space Heating	Window caulking	
Window Sun Protection	Residential Space Cooling	Window Film Applied to Standard Window	Standard Window with below Code Required Minimum SHGC

Table 2: Commercial EE Measures

Measure	End-Use	Description	Baseline
1.5HP Open Drip-Proof (ODP) Motor	Ventilation and Circulation	High Efficiency 1.5 HP Open-Drip Proof Motor	1.5HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency
10HP Open Drip-Proof (ODP) Motor	Ventilation and Circulation	High Efficiency 10 HP Open-Drip Proof Motor	10HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency
20HP Open Drip-Proof (ODP) Motor	Ventilation and Circulation	High Efficiency 20 HP Open-Drip Proof Motor	20HP Open-Drip Proof Motor with Current Minimum EPACT Efficiency
Advanced Rooftop Controller	Ventilation and Circulation	Advanced Rooftop Controller	Without Advanced Rooftop Controller
Air Compressor Optimization	Miscellaneous	Performing Routine Maintenance on 20HP Inlet Modulation Fixed-Speed Compressor	20 HP Inlet Modulation Fixed-Speed Compressor

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Measure	End-Use	Description	Baseline
Air Curtains	Space Cooling, Space Heating	Air Curtain across door opening	Door opening with no air curtain
Airside Economizer	Space Cooling	Airside Economizer	No economizer
Anti-Sweat Controls	Refrigeration	One Medium Temperature Reach-In Case with Anti-Sweat Heater Controls	One Medium Temperature Reach-In Case without Anti-Sweat Heater Controls
Auto Off Time Switch	Interior Lighting	Auto-Off Time Switch on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Automatic Door Closer for Walk-in Coolers and Freezers	Refrigeration	One Medium Temperature Walk-In Refrigerator Door with Auto-Closer	One Medium Temperature Walk-In Refrigerator Door without Auto-Closer
Beverage Vending Machine Controls	Refrigeration	One non-ENERGY STAR beverage vending machine equipped with infrared occupancy sensing controls	One non-ENERGY STAR beverage vending machine, no controls
Bi-Level Lighting Control (Exterior)	Exterior Lighting	Bi-Level Controls on Exterior Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Bi-Level Lighting Control (Interior)	Interior Lighting	Bi-Level Controls on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Ceiling Insulation (R19 to R30)	Space Cooling, Space Heating	Blown-in insulation in ceiling cavity/attic	Market Average Existing Ceiling Insulation in older steep slope, residential style commercial building
Ceiling Insulation (R19 to R38)	Space Cooling, Space Heating	Blown-in insulation in ceiling cavity/attic	Market Average Existing Ceiling Insulation in older steep slope, residential style commercial building
Ceiling Insulation (R19 to R49)	Space Cooling, Space Heating	Blown-in insulation in ceiling cavity/attic - Beyond Code	Market Average Existing Ceiling Insulation in older steep slope, residential style commercial building
Ceiling Insulation (R2 to R30)	Space Cooling, Space Heating	Blown-in insulation in ceiling cavity/attic	Market Average Existing Ceiling Insulation in older steep slope, residential style commercial building
Ceiling Insulation (R2 to R38)	Space Cooling, Space Heating	Blown-in insulation in ceiling cavity/attic	Market Average Existing Ceiling Insulation in older steep slope, residential style commercial building
Ceiling Insulation (R2 to R49)	Space Cooling, Space Heating	Blown-in insulation in ceiling cavity/attic - Beyond Code	Market Average Existing Ceiling Insulation in older steep slope, residential style commercial building
Chilled Water Reset	Space Cooling	One Chiller with Reset of Chilled Water Temperature Setpoint	One Chiller with Fixed Chilled Water Temperature
Chiller maintenance	Space Cooling	O&M improvements to restore chiller performance	
CO Sensors for Parking Garage Exhaust	Miscellaneous	Enclosed Parking Garage Exhaust with CO Control	Constant Volume Enclosed Parking Garage Exhaust

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Measure	End-Use	Description	Baseline
Commercial Duct Sealing	Space Cooling, Space Heating	Standard Electric Heating and Central AC with Improved Duct Sealing	Standard Electric Heating and Central AC, Standard Duct Sealing
Commercial Strategic Energy Management	Whole Building	Commercial Strategic Energy Management	No active energy management
Custom measure - Non-lighting	Space Cooling, Space Heating	Custom Improvement to Facility's Operations	Baseline Technology/Process
Data Center Hot Cold Aisle	Office Equipment	Equipment configuration that saves HVAC	No hot, cold aisle containment
Dedicated Outside Air System (DOAS)	Space Cooling, Space Heating	Install Dedicated Outside Air System (DOAS)	Typical HVAC by Building Type
Demand Controlled Circulating Systems	Domestic Hot Water	Recirculation Pump with Demand Control Mechanism	Uncontrolled Recirculation Pump
Demand Controlled Ventilation	Ventilation and Circulation	Return Air System with CO2 Sensors	Standard Return Air System, No Sensors
Demand Defrost	Refrigeration	Walk-In Freezer System with Demand-Controlled Electric Defrost Cycle	Walk-In Freezer System with Timer-Controlled Electric Defrost Cycle
Destratification Fans	Space Heating	Destratification Fans improve temperature distribution by circulating warmer air from the ceiling back down to the floor level	No destratification fan
Door Gasket (Cooler)	Refrigeration	New Door Gasket on One-Door Medium Temperature Reach-In Case	Worn or Damaged Door Gasket on One-Door Medium Temperature Reach-In Case
Door Gasket (Freezer)	Refrigeration	New Door Gasket on One-Door Medium Temperature Reach-In Case	Worn or Damaged Door Gasket on One-Door Medium Temperature Reach-In Case
Drain water heat recovery	Domestic Hot Water	Hot Water Loop with 50 Gallon Electric Resistance Heater and Drain Water Heat Exchanger	Standard Hot Water Loop with 50 Gallon Electric Resistance Heater, No Drain Water Heat Recovery
Dual Enthalpy Economizer	Ventilation and Circulation	Standard HVAC Unit with an economizer and dual enthalpy differential control	HVAC unit with no economizer or with a non-functional disabled economizer
Duct Insulation	Space Cooling, Space Heating	Standard Electric Heating and Central AC with Insulated Ductwork (R-8)	Standard Electric Heating and Central AC with Uninsulated Ductwork (R-4)
Ductless Mini-Split AC	Space Cooling	Ductless Mini-Split AC, 4 Ton, 16 SEER	Code-Compliant AC Unit, 4 Ton, 15 SEER
Ductless Mini-Split HP	Space Cooling, Space Heating	Ductless Mini-Split HP, 17 SEER, 9.5 HSPF	Code-Compliant ASHP, 15 SEER, 8.8 HSPF
DX Coil Cleaning	Space Cooling	DX Coil Cleaning	DX Coil Not Cleaned
ECM Motors on Furnaces	Space Heating	Variable Speed Electronically Commutated Motor for an Electric Furnace	Permanent Split Capacitor Motor for Electric Furnace
Efficient Battery Charger	Miscellaneous	Efficient Battery Charger	FR or SCR charging stations with power conversion efficiency < 89% or > 10 W

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Measure	End-Use	Description	Baseline
Efficient Exhaust Hood	Cooking	Kitchen ventilation with automatically adjusting fan controls	Kitchen ventilation with constant speed ventilation motor
Efficient Motor Belts	Miscellaneous	Synchronous belt, 98% efficiency	Standard V-belt drive
Efficient New Construction Lighting	Interior Lighting	Efficient New Construction Lighting, 15% Better than Code	New Construction with Lighting Power Density meeting Code Minimum
Energy Recovery Ventilation System (ERV)	Space Cooling	Unitary Cooling Equipment that Incorporates Energy Recovery	Current Market Packaged or Split DX Unit
Energy Star Combination Oven	Cooking	Energy Star Combination Oven meeting ENERGY STAR Version 3.0 Standards	One Standard Economy-Grade 10-Pan Combination Oven
Energy Star Commercial Clothes Washer	Miscellaneous	One Commercial Clothes Washer meeting current ENERGY STAR Version 8.1 Standards	One Commercial Clothes Washer meeting Federal Standard
Energy Star Commercial Dishwasher	Domestic Hot Water	One Commercial Dishwasher meeting ENERGY STAR Version 3.0 Standards	One Dishwasher meeting Federal Standard
Energy Star Commercial Glass Door Freezer	Refrigeration	One Glass Door Freezer meeting ENERGY STAR Version 5.0 Standards	One Glass Door Freezer meeting Federal Standards
Energy Star Commercial Glass Door Refrigerator	Refrigeration	One Glass Door Refrigerator meeting ENERGY STAR Version 5.0 Standards	One Glass Door Refrigerator meeting Federal Standards
Energy Star Commercial Solid Door Freezer	Refrigeration	One Solid Door Freezer meeting ENERGY STAR Version 5.0 Standards	One Solid Door Freezer meeting Federal Standards
Energy Star Commercial Solid Door Refrigerator	Refrigeration	One Solid Door Refrigerator meeting ENERGY STAR Version 5.0 Standards	One Solid Door Refrigerator meeting Federal Standards
Energy Star convection oven	Cooking	Energy Star convection oven meeting ENERGY STAR Version 3.0 Standards	One Standard Economy-Grade Full-Size Convection Oven
Energy Star EV Chargers	Miscellaneous	Level 2 Electric Vehicle Supply Equipment (EVSE)	Level 1 Electric Vehicle Supply Equipment (EVSE)
Energy Star Fryer	Cooking	One Standard Vat Electric Fryer meeting ENERGY STAR Version 3.0 Standards	One Standard Economy-Grade Standard Vat Electric Fryer
Energy Star Griddle	Cooking	One Griddle meeting current ENERGY STAR Version 1.2 Standards	One Conventional Griddle
Energy Star Hot Food Holding Cabinet	Cooking	One Hot Food Holding Cabinet meeting current ENERGY STAR Version 2.0 Standards	One Standard Hot Food Holding Cabinet
Energy Star Ice Maker	Refrigeration	One Continuous Self-Contained Ice Maker meeting ENERGY STAR Version 3.0 Standards	One Continuous Self-Contained Ice Maker meeting Federal Standard
ENERGY STAR Imaging Equipment	Office Equipment	One imaging device meeting current ENERGY STAR Standards	One non-ENERGY STAR imaging device
Energy Star LED Directional Lamp	Interior Lighting	Energy Star 7.6W Directional LED lamp	50W Incandescent lamp

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Measure	End-Use	Description	Baseline
Energy Star Monitors	Office Equipment	One Monitor meeting ENERGY STAR 8.0 Standards	One Standard Monitor
Energy Star PCs	Office Equipment	One Personal Computer (desktop or laptop) meeting current ENERGY STAR® Standards	One non-ENERGY STAR® Personal Computer
Energy Star room AC	Space Cooling	Room AC meeting current ENERGY STAR standards	Code-Compliant Room AC, 1 Ton, 10.9 CEER
Energy Star Servers	Office Equipment	One Server meeting ENERGY STAR 2.0 Standards	One Standard Server
Energy Star Steamer	Cooking	One 4-Pan Electric Steamer meeting ENERGY STAR® 2.0 Standards	One Standard Economy-Grade 4-Pan Steamer
Energy Star Uninterruptable Power Supply	Office Equipment	Standard Desktop Plugged into Energy Star Uninterruptable Power Supply at 25% Load	Standard Desktop Plugged into Average Rotary Uninterruptable Power Supply at 25% Load
Energy Star Vending Machine	Refrigeration	One Refrigerated Vending Machine meeting ENERGY STAR Version 4.0 Standards	One Refrigerated Vending Machine meeting ENERGY STAR® 1.0 Standards
ENERGY STAR Water Cooler	Miscellaneous	One Storage Type Hot/Cold Water Cooler Unit meeting ENERGY STAR Version 3.0 Standards	One Standard Storage Type Hot/Cold Water Cooler Unit
Energy Star windows	Space Cooling, Space Heating	100ft2 of Window meeting Energy Star Version 6.0 Requirements (U-Value: 0.27, SHGC: 0.21)	100ft2 of Window meeting Energy Star Version 5.0 Requirements (U-Value: 0.3, SHGC: 0.3)
Engine Block Timer	Miscellaneous	Plug-in timer that activates engine block timer to reduce unnecessary run time	Engine block heater (typically used for backup generators) running continuously
Escalator Motor Efficiency Controller	Miscellaneous	Install Escalator Motor Efficiency Controller	Escalator without Motor Efficiency Controller
Facility Commissioning	Space Cooling, Space Heating, Ventilation and Circulation	Perform facility commissioning to optimize building operations in new facilities	Standard new construction facility with no commissioning
Facility Energy Management System	Space Cooling, Space Heating, Ventilation and Circulation	Typical HVAC by Building Type Controlled by Energy Management System	Standard/manual facility equipment controls
Faucet Aerator	Domestic Hot Water	Low-flow lavatory faucet aerator, flow rate: 1.0 gpm	Federal lavatory flow rate standard, 1994, flow rate: 2.2 gpm
Floating Head Pressure Controls	Refrigeration	Medium-Temperature Refrigeration System with 5HP Compressor and Adjustable Condenser Head Pressure Control Valve	Medium-Temperature Refrigeration System with 5 HP Compressor without Adjustable Condenser Head Pressure Control Valve
Floor Insulation	Space Cooling, Space Heating	Increased Floor Insulation (R-19)	Market Average Existing Floor Insulation
Geothermal Heat Pump	Space Cooling, Space Heating	Geothermal Heat Pump	Code-Compliant Air Source Heat Pump
Green roof	Space Cooling, Space Heating	Vegetated Roof Surface on top of Standard Roof	Standard Black Roof

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Measure	End-Use	Description	Baseline
HE Air Cooled Chiller - All Compressor Types - 100 Tons	Space Cooling	HE Air Cooled Chiller - Air Compressor Types - 100 Tons	Code-Compliant Air Cooled Positive Displacement Chiller, 100 Tons
HE DX 11.25-20.0 Tons Elec Heat	Space Cooling, Space Heating	High Efficiency Packaged or Split DX Unit, 15 Tons, 11.5 SEER	Code-Compliant Packaged or Split DX Unit, 15 Tons, 11 SEER
HE DX 11.25-20.0 Tons Other Heat	Space Cooling	High Efficiency Packaged or Split DX Unit, 15 Tons, 11.5 SEER	Code-Compliant Packaged or Split DX Unit, 15 Tons, 11 SEER
HE DX 5.4-11.25 Tons Elect Heat	Space Cooling, Space Heating	High Efficiency Packaged or Split DX Unit, 7.5 Tons, 12 SEER	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11 SEER
HE DX 5.4-11.25 Tons Other Heat	Space Cooling	High Efficiency Packaged or Split DX Unit, 7.5 Tons, 12 SEER	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11 SEER
HE DX Less than 5.4 Tons Elect Heat	Space Cooling, Space Heating	High Efficiency Packaged or Split DX Unit, 5 Tons, 14.5 SEER	Code-Compliant Packaged or Split DX Unit, 5 Tons, 13 SEER
HE DX Less than 5.4 Tons Other Heat	Space Cooling	High Efficiency Packaged or Split DX Unit, 5 Tons, 14.5 SEER	Code-Compliant Packaged or Split DX Unit, 5 Tons, 13 SEER
HE Water Cooled Chiller - Centrifugal Compressor - 200 Tons	Space Cooling	Water Cooled Centrifugal Chiller with Integral VFD, 200 Tons	Code-Compliant Water Cooled Centrifugal Chiller, 200 Tons
HE Water Cooled Chiller - Centrifugal Compressor - 500 Tons	Space Cooling	Water Cooled Centrifugal Chiller with Integral VFD, 500 Tons	Code-Compliant Water Cooled Centrifugal Chiller, 500 Tons
HE Water Cooled Chiller - Rotary or Screw Compressor - 175 Tons	Space Cooling	Water Cooled Positive Displacement Chiller with Integral VFD, 175 Tons	Code-Compliant Water Cooled Positive Displacement Chiller, 175 Tons
HE Water Cooled Chiller - Rotary or Screw Compressor - 50 Tons	Space Cooling	Water Cooled Positive Displacement Chiller with Integral VFD, 50 Tons	Code-Compliant Water Cooled Positive Displacement Chiller, 50 Tons
Heat Pump Pool Heater Commercial	Miscellaneous	High Efficiency Pool Heater Eff. >=84%	Standard Efficiency Pool Heater 78% Eff.
Heat Pump Water Heater	Domestic Hot Water	Efficient 50 Gallon Electric Heat Pump Water Heater	Code-Compliant 50 Gallon Electric Heat Pump Water Heater
High Efficiency Air Compressor	Miscellaneous	20 HP VFD Air Compressor	20 HP Inlet Modulation Fixed-Speed Compressor
High Efficiency Data Center Cooling	Space Cooling	High Efficiency CRAC (computer room air conditioner)	Standard Efficiency CRAC
High Efficiency PTAC	Space Cooling	High Efficiency PTAC	Code-Compliant PTAC
High Efficiency PTHP	Space Cooling, Space Heating	High Efficiency PTHP	Code-Compliant PTHP
High Efficiency Refrigeration Compressor_Discus	Refrigeration	High Efficiency Refrigeration Compressors	Standard Compressor
High Efficiency Refrigeration Compressor_Scroll	Refrigeration	High Efficiency Refrigeration Compressors	Standard Compressor
High Speed Fans	Ventilation and Circulation	High Speed Fan, 24" - 35" Blade Diameter	Standard Speed Fan, 24" - 35" Blade Diameter

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Measure	End-Use	Description	Baseline
Hot water pipe insulation	Domestic Hot Water	1' of Insulated Pipe in Unconditioned Spaces, Insulation of R-4	1' of Pipe in Unconditioned Spaces with Code Minimum of 1"of Insulation
Hotel Card Energy Control Systems	Space Cooling, Space Heating	Guest Room HVAC Unit Controlled by Hotel-Key-Card Activated Energy Control System	Guest Room HVAC Unit, Manually Controlled by Guest
Indoor daylight sensor	Interior Lighting	Install Indoor Daylight Sensors, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Induction Cooktops	Cooking	Efficient Induction Cooktop	One Standard Electric Cooktop
Infiltration Reduction - Air Sealing	Space Cooling, Space Heating	Reduced leakage through caulking, weather-stripping	Standard Heating and Cooling System with Moderate Infiltration
Instantaneous Hot Water System Commercial	Domestic Hot Water	Instantaneous Hot Water System	Code-Compliant Electric Storage Water Heater
LED - 14W_CFL Baseline	Interior Lighting	LED (assume 14W) replacing CFL	100W equivalent CFL
LED - 9W Flood_CFL Baseline	Exterior Lighting	LED (assume 9W) replacing CFL	14W CFL
LED Canopy Lighting (Exterior)	Exterior Lighting	One 67.2W LED Canopy Light	Average Lumen Equivalent Exterior Incandescent Area Lighting
LED Display Lighting (Exterior)	Exterior Lighting	One Letter of LED Signage, < 2ft in Height	One Letter of Neon or Argon-mercury Signage, < 2ft in Height
LED Display Lighting (Interior)	Interior Lighting	One Letter of LED Signage, < 2ft in Height	One Letter of Neon or Argon-mercury Signage, < 2ft in Height
LED Exit Sign	Interior Lighting	One 5W Single-Sided LED Exit Sign	One 9W Single-Sided CFL Exit Sign
LED Exterior Wall Packs	Exterior Lighting	One 35W LED Wall Pack	Average Lumen Equivalent Exterior Incandescent Area Lighting
LED High Bay_HID Baseline	Interior Lighting	One 140W High Bay LED Fixture	Lumen-Equivalent HID High Bay Fixture
LED High Bay_LF Baseline	Interior Lighting	One 140W High Bay LED Fixture	Lumen-Equivalent Linear Fluorescent High Bay Fixture
LED Linear - Fixture Replacement	Interior Lighting	2x4 LED Troffer	Lumen-Equivalent 32-Watt T8 Lamp
LED Linear - Lamp Replacement	Interior Lighting	Linear LED (16W)	Lumen-Equivalent 32-Watt T8 Lamp
LED Parking Lighting	Exterior Lighting	One 160W LED Area Light	Average Lumen Equivalent Exterior HID Area Lighting
LEED New Construction Whole Building	Space Cooling, Space Heating	LEED New Construction Whole Building	Comparable facility, code-compliance construction
Light Tube	Interior Lighting	One 14" Light Tube, Delivering light to 250 S.F. of Commercial Space	250 S.F. of Commercial Space Lit by Typical Lighting Strategies
Low Flow Shower Head	Domestic Hot Water	Low-Flow Handheld Showerhead, Flow Rate: 1.50 gpm	Standard Handheld Showerhead, Flow Rate: 2.50 gpm
Low-Flow Pre-Rinse Sprayers	Domestic Hot Water	Low-Flow Pre-Rinse Sprayer with Flow Rate of 1.6 gpm	Pre-Rinse Sprayer with Federal Standard Flow Rate of 2.25 gpm
Network PC Power Management	Office Equipment	One computer and monitor attached to centralized energy	One computer and monitor, manually controlled

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Measure	End-Use	Description	Baseline
		management system that controls when desktop computers and monitors plugged into a n	
Networked Lighting Controls	Interior Lighting	Install Networked Lighting Controls System on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Controlled either Manually or by Sensor as Specified by Code
Night Covers for Display Cases	Refrigeration	One Open Vertical Case with Night Covers	One Existing Open Vertical Case, No Night Covers
Occupancy Sensors, Ceiling Mounted	Interior Lighting	Ceiling Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Occupancy Sensors, Switch Mounted	Interior Lighting	Switch Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor Lighting Controls	Exterior Lighting	Install Exterior Photocell Dimming Controls, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor motion sensor	Exterior Lighting	Install Exterior Motion Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Ozone Laundry Commercial	Miscellaneous	Add a new ozone laundry system onto a commercial clothes washer	One commercial clothes washer without ozone laundry system
Programmable thermostat	Space Cooling, Space Heating	Pre-set programmable thermostat that replaces manual thermostat	Standard Heating and Cooling System with Manual Thermostat
PSC to ECM Evaporator Fan Motor (Reach-In)	Refrigeration	Medium Temperature Reach-In Case with equivalent size Electronically Commutated Evaporator Fan Motor	Medium Temperature Reach-In Case with Permanent Split Capacitor Evaporator Fan Motor
PSC to ECM Evaporator Fan Motor (Walk-In, Refrigerator)	Refrigeration	Medium Temperature Walk-In Case with Electronically Commutated Evaporator Fan Motor	Medium Temperature Walk-In Case with Permanent Split Capacitor Evaporator Fan Motor
Q-Sync Evaporator Fan Motor	Refrigeration	Medium Temperature Reach-In Case with equivalent size Q-Sync Evaporator Fan Motor	Medium Temperature Reach-In Case with 20W Permanent Split Capacitor Fan Motor
Reflective Roof Treatment	Space Cooling	Reflective Roof Treatment	Standard Black Roof
Refrigerated Display Case LED Lighting	Refrigeration	60" Refrigerated Case LED Strip	Lumen-Equivalent 32-Watt T8 Fixture
Refrigerated Display Case Lighting Controls	Refrigeration	Occupancy Sensors for Refrigerated Case Lighting to reduce run time	Market-Share Weighted Existing Linear Fluorescent Fixture
Refrigeration Commissioning	Refrigeration	Commissioned Refrigeration System	Non-Commissioned Refrigeration System
Refrigeration Economizer	Refrigeration	Walk-in refrigerator with economizer	Walk-in refrigerator without economizer
Regenerative Drive Elevator Motor	Miscellaneous	Regenerative drive produced energy when motor in overhaul condition	Standard motor
Retro-Commissioning (Existing Construction)	Space Cooling, Space Heating, Ventilation and Circulation	Perform facility retro-commissioning, including assessment, process improvements, and optimization of energy-consuming equipment and systems	

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Measure	End-Use	Description	Baseline
Roof Insulation	Space Cooling, Space Heating	Roof Insulation (built-up roof applicable to flat/low slope roofs)	Code-Compliant Flat Roof
Server Virtualization	Office Equipment	2 Virtual Host Server	20 Single Application Servers
Smart Strip Plug Outlet	Office Equipment	One Smart Strip Plug Outlet	One Standard plug strip/outlet
Smart thermostat	Space Cooling, Space Heating	Thermostats that include "smart" features such as occupancy sensors, geo-fencing, multi-zone sensors	Standard Heating and Cooling System with Manual Thermostat
Solar Pool Heater Commercial	Miscellaneous	Solar Swimming Pool Heater	Electric Resistance Swimming Pool Heater
Solar Powered Pool Pump	Miscellaneous	Solar Powered Pool Pump Motor	Variable Speed Pool Pump Motor
Solar Thermal Water Heating System Commercial	Domestic Hot Water	Solar Thermal System with Electric Backup	Code-Compliant 50 Gallon Electric Resistance Water Heater
Strip Curtains - Freezers	Refrigeration	Walk-in freezer with strip curtains at least 0.06 inches thick covering the entire area of the doorway	Walk-in freezer without strip curtains
Strip Curtains - Refrigerators	Refrigeration	Walk-in cooler with strip curtains at least 0.06 inches thick covering the entire area of the doorway	Walk-in cooler without strip curtains
Suction Pipe Insulation - Freezers	Refrigeration	Suction Pipe Insulation - Freezers	Uninsulated freezer suction lines
Suction Pipe Insulation - Refrigerators	Refrigeration	Suction Pipe Insulation - Refrigerators	Uninsulated refrigeration suction lines
Thermal Energy Storage	Space Cooling	Deploy thermal energy storage technology (ice harvester, etc.) to shift load	Code compliant chiller
Thermostatic Shower Restriction Valve Commercial	Domestic Hot Water	Hot Water Loop with 50 Gallon Electric Resistance Heater and Pressure Balance Shower Valves	Standard Hot Water Loop with 50 Gallon Electric Resistance Heater and Standard Shower Valves
Time Clock Control	Interior Lighting	Time Clock Controlled Lighting, 500 Watts Controlled	500 Watts of Lighting, Controlled either Manually or by Sensor as Specified by Code
Variable Refrigerant Flow (VRF) HVAC Systems	Space Cooling, Space Heating	Variable Refrigerant Flow (VRF) HVAC Systems	Code-Compliant PTHP
VAV System	Ventilation and Circulation	Variable Air Volume Distribution System	Constant Air Volume Distribution System
VFD on Cooling Tower Fans	Space Cooling	Cooling Tower Fans with VFD Control	Cooling Tower Fans without VFD Control
VFD on HVAC Pump	Space Cooling, Space Heating	VFD on HVAC Pump	7.5 HP HVAC Pump Motor, no VFD Control
VSD Controlled Compressor	Refrigeration	Refrigeration System with VSD Control	Refrigeration System with Standard Slide-Valve Control System
Wall Insulation	Space Cooling, Space Heating	Increased Exterior Above-Grade Wall Insulation	Market Average Existing Exterior Above-Grade Wall Insulation

Measure	End-Use	Description	Baseline
Warehouse Loading Dock Seals	Space Cooling, Space Heating	Seals to reduce infiltration losses at loading dock	Loading dock with no seals
Water Cooled Refrigeration Heat Recovery	Domestic Hot Water	The heat reclaim system transfers waste heat from refrigeration system to space heating or hot water	No heat recovery
Water Heater Setback	Domestic Hot Water	A 50 gallon electric hot water tank with a thermostat setting reduced to no lower than 120 degrees.	A 50 gallon electric hot water tank with a thermostat setting that is higher than 120 degrees, typically hot water tanks with settings of 130 degrees or higher.
Water source heat pump	Space Cooling, Space Heating	Water Source Heat Pump, 2.5 Tons, 17.4 EER, 4.4 COP	Code-Compliant ASHP
Waterside Economizer	Space Cooling	Waterside Economizer	No economizer
Window shade film	Space Cooling	Window Film with SHGC of 0.35 Applied to Standard Window	Standard Window with below Code Required Minimum SHGC
Zero Energy Doors	Refrigeration	Install zero energy doors for a reach-in refrigerated cooler or freezer	Standard vertical reach-in refrigerated cooler or freezer with anti-sweat heaters on the glass surface of the doors

Table 3: Industrial EE Measures

Measure	End-Use	Description	Baseline
1.5HP Open Drip-Proof (ODP) Motor	Motors Pumps	High Efficiency 1.5 HP Open-Drip Proof Motor	1.5HP Open-Drip Proof Motor with Current Minimum EPACK Efficiency
10HP Open Drip-Proof (ODP) Motor	Motors Pumps	High Efficiency 10 HP Open-Drip Proof Motor	10HP Open-Drip Proof Motor with Current Minimum EPACK Efficiency
20HP Open Drip-Proof (ODP) Motor	Motors Pumps	High Efficiency 20 HP Open-Drip Proof Motor	20HP Open-Drip Proof Motor with Current Minimum EPACK Efficiency
3-phase High Frequency Battery Charger - 1 shift	Other	3-phase High Frequency Battery Charger	Standard Charger
Advanced Rooftop Controller	HVAC	Advanced Rooftop Controller	Without Advanced Rooftop Controller
Air Compressor Optimization	Compressed Air	Performing Routine Maintenance on 20HP Inlet Modulation Fixed-Speed Compressor	20 HP Inlet Modulation Fixed-Speed Compressor
Air curtains	HVAC	Air Curtain across door opening	Door opening with no air curtain
Airside economizer	HVAC	Airside Economizer	No economizer
Auto Closer on Refrigerator Door	Process Cooling	One Medium Temperature Walk-In Refrigerator Door with Auto-Closer	One Medium Temperature Walk-In Refrigerator Door without Auto-Closer
Auto Off Time Switch	Interior Lighting High Bay	Auto-Off Time Switch on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Bi-Level Lighting Control (Exterior)	Exterior Lighting Industrial	Install Exterior Bi-Level Lighting Control, 500 Watts Controlled	500 Watts of Lighting, No Dim Setting

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Measure	End-Use	Description	Baseline
Bi-Level Lighting Control (Interior)	Interior Lighting High Bay	Bi-Level Controls on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, No Dim Setting
Chilled Water Reset	HVAC	One Chiller with Reset of Chilled Water Temperature Setpoint	One Chiller with Fixed Chilled Water Temperature
Cogged Belt on 15hp ODP Motor	Motors Pumps	15HP ODP Motor with Cogged Belts Installed on Supply and/or Return Air Fans	15HP ODP Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Cogged Belt on 40hp ODP Motor	Motors Pumps	40HP ODP Motor with Cogged Belts Installed on Supply and/or Return Air Fans	40HP ODP Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Compressed Air Desiccant Dryer	Process Specific	heated regenerative desiccant dryer without dew point demand controls	heatless regenerative desiccant dryer without dew point demand controls
Compressed Air No-Loss Condensate Drains	Process Specific	Install no-loss condensate drains	Install standard condensate drains
Compressed Air Storage Tank	Compressed Air	20 HP Inlet Modulation Fixed-Speed Compressor with Receiver Tank	20 HP Inlet Modulation Fixed-Speed Compressor, No Receiver Tank
Custom Measure - Non-Lighting	HVAC	Custom Improvement to Facility's Operations	Baseline Technology/Process
Dairy Refrigeration Heat Recovery	Other	refrigeration equipment with refrigeration heat recovery tank installed	existing dairy farm with refrigeration equipment and a water heater unit without an RHR unit
Dedicated Outside Air System (DOAS)	HVAC	Install Dedicated Outside Air System (DOAS)	Typical HVAC by Building Type
Demand Controlled Ventilation	HVAC	Return Air System with CO2 Sensors	Standard Return Air System, No Sensors
Demand Defrost	Process Cooling	Walk-In Freezer System with Demand-Controlled Electric Defrost Cycle	Walk-In Freezer System with Timer-Controlled Electric Defrost Cycle
Dew Point Sensor Control for Dessicant CA Dryer	Compressed Air	1000 CFM Heated Desiccant Air Dryer with Dew Point Controls	1000 CFM Modulating Heated Desiccant Air Dryer
Drip Irrigation Nozzles	Other	Flow Control Nozzles	Standard Irrigation Nozzles
Dual Enthalpy Economizer	Process Cooling	Standard HVAC Unit with an economizer and dual enthalpy differential control	HVAC unit with no economizer or with a non-functional disabled economizer
DX Coil Cleaning	HVAC	DX Coil Cleaning	DX Coil Not Cleaned
Efficient Compressed Air Nozzles	Compressed Air	1/4" Engineered Air Nozzle	1/4" Open-End Air Nozzle
Efficient New Construction Lighting	Interior Lighting High Bay	Efficient New Construction Lighting, 15% Better than Code	New Construction with Lighting Power Density meeting Code Minimum
Electric Actuators	Other	Electric Actuator	Pneumatic Actuator
Energy Efficient Laboratory Fume Hood	HVAC	Variable Air Volume High Performance Fume Hood	Constant Volume Conventional Bypass Fume Hood
Energy Efficient Transformers	Other	Energy Efficient Dry Type Transformer (CSL-3)	Standard Transformer (TP-1)

Measure	End-Use	Description	Baseline
Energy Recovery Ventilation System	HVAC	Unitary Cooling Equipment that Incorporates Energy Recovery	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11.2 EER
Energy Star LED Directional Lamp	Interior Lighting Other	Energy Star 7.6W Directional LED lamp	50W Incandescent lamp
Energy Star room ac	HVAC	Room AC meeting current ENERGY STAR standards	Code-Compliant Room AC
Energy Star windows	HVAC	100ft2 of Window meeting Energy Star Version 6.0 Requirements (U-Value: 0.27, SHGC: 0.21)	100ft2 of Window meeting Energy Star Version 5.0 Requirements (U-Value: 0.3, SHGC: 0.3)
Engine Block Timer	Other	An engine block heater operated by an outdoor plug-in timer	An engine block heater that is manually plugged in
Facility Commissioning	HVAC	Perform facility commissioning	Comparable facility, no commissioning
Facility Energy Management System	HVAC	Typical HVAC by Building Type Controlled by Energy Management System	Typical HVAC by Building Type, Manually Controlled
Fan Thermostat Controller	HVAC	Typical HVAC by Building Type with Fan Thermostat Controller Installed	Typical HVAC by Building Type with Programmable Thermostat
Floating Head Pressure Controller	Process Cooling	Medium-Temperature Refrigeration System with 5HP Compressor and Adjustable Condenser Head Pressure Control Valve	Medium-Temperature Refrigeration System with 5 HP Compressor without Adjustable Condenser Head Pressure Control Valve
Grain Bin Aeration Control System	Process Specific	Grain Storage Fan System with Automatic Controls	Grain Storage Fan System with Manual Controls
HE Air Cooled Chiller - All Compressor Types - 100 Tons	HVAC	HE Air Cooled Chiller - All Compressor Types - 100 Tons	Code-Compliant Air Cooled Positive Displacement Chiller, 100 Tons
HE Air Cooled Chiller - All Compressor Types - 300 Tons	HVAC	Air Cooled Positive Displacement Chiller with Integral VFD, 300 Tons, 13.7 EER	Code-Compliant Air Cooled Positive Displacement Chiller, 300 Tons, 12.5 EER
HE DX 11.25-20.0 Tons Elec Heat	HVAC	High Efficiency Packaged or Split DX Unit, 15 Tons, 11.5 SEER	Code-Compliant Packaged or Split DX Unit, 15 Tons, 11 SEER
HE DX 11.25-20.0 Tons Other Heat	HVAC	High Efficiency Packaged or Split DX Unit, 15 Tons, 11.5 SEER	Code-Compliant Packaged or Split DX Unit, 15 Tons, 11 SEER
HE DX 5.4-11.25 Tons Elect Heat	HVAC	High Efficiency Packaged or Split DX Unit, 7.5 Tons, 12 SEER	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11 SEER
HE DX 5.4-11.25 Tons Other Heat	HVAC	High Efficiency Packaged or Split DX Unit, 7.5 Tons, 12 SEER	Code-Compliant Packaged or Split DX Unit, 7.5 Tons, 11 SEER
HE DX Less than 5.4 Tons Elect Heat	HVAC	High Efficiency Packaged or Split DX Unit, 5 Tons, 14.5 SEER	Code-Compliant Packaged or Split DX Unit, 5 Tons, 13 SEER
HE DX Less than 5.4 Tons Other Heat	HVAC	High Efficiency Packaged or Split DX Unit, 5 Tons, 14.5 SEER	Code-Compliant Packaged or Split DX Unit, 5 Tons, 13 SEER
HE Water Cooled Chiller - Centrifugal Compressor - 200 Tons	HVAC	Water Cooled Centrifugal Chiller with Integral VFD, 200 Tons	Code-Compliant Water Cooled Centrifugal Chiller, 200 Tons
HE Water Cooled Chiller - Centrifugal Compressor - 500 Tons	HVAC	Water Cooled Centrifugal Chiller with Integral VFD, 500 Tons	Code-Compliant Water Cooled Centrifugal Chiller, 500 Tons

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Measure	End-Use	Description	Baseline
HE Water Cooled Chiller - Rotary or Screw Compressor - 175 Tons	HVAC	Water Cooled Positive Displacement Chiller with Integral VFD, 175 Tons	Code-Compliant Water Cooled Positive Displacement Chiller, 175 Tons
HE Water Cooled Chiller - Rotary or Screw Compressor - 50 Tons	HVAC	Water Cooled Positive Displacement Chiller with Integral VFD, 50 Tons	Code-Compliant Water Cooled Positive Displacement Chiller, 50 Tons
High Bay Occupancy Sensors, Ceiling Mounted	Interior Lighting High Bay	Ceiling Mounted Occupancy Sensor, 800 Watts Controlled	800 Watts of Lighting, Manually Controlled
High Efficiency Air Compressor	Compressed Air	20 HP VFD Air Compressor	20 HP Inlet Modulation Fixed-Speed Compressor
High Efficiency Refrigeration Compressor - Discus	Process Cooling	High Efficiency Refrigeration Compressors	Standard Compressor
High Efficiency Refrigeration Compressor - Scroll	Process Cooling	High Efficiency Refrigeration Compressors	Standard Compressor
High Efficiency Welder	Process Specific	High Efficiency Welder	Standard Welding Practices
High Speed Fans	HVAC	High Speed Fan, 24" - 35" Blade Diameter	Standard Speed Fan, 24" - 35" Blade Diameter
High Volume Low Speed Fan (HVLS)	Motors Fans Blowers	20' High Volume Low Speed Fan	Conventional Circulating Fan
Indoor Agriculture - LED Grow Lights	Interior Lighting High Bay	LED grow light	1000W High Pressure Sodium
Indoor daylight sensor	Interior Lighting High Bay	Install Indoor Daylight Sensors, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Industrial Duct Sealing	HVAC	Standard Electric Heating and Central AC with Improved Duct Sealing	Standard Electric Heating and Central AC, Standard Duct Sealing
Injection Mold and Extruder Barrel Wraps	Other	2' Diameter, 20' Long Machine Barrel with 1" Insulation	2' Diameter, 20' Long Machine Barrel with no Insulation
Insulated Pellet Dryer Tanks and Ducts	Process Heating	Insulation for Pellet Tank and Duct	Uninsulated Pellet Tank and Duct
LED - 14W_CFL Baseline	Interior Lighting Other	LED (assume 14W) replacing CFL	100W equivalent CFL
LED Canopy Lighting (Exterior)	Exterior Lighting Industrial	One 67.2W LED Canopy Light	Average Lumen Equivalent Exterior Incandescent Area Lighting
LED Display Lighting (Exterior)	Exterior Lighting Industrial	One Letter of LED Signage, < 2ft in Height	One Letter of Neon or Argon-mercury Signage, < 2ft in Height
LED Display Lighting (Interior)	Interior Lighting Other	One Letter of LED Signage, < 2ft in Height	One Letter of Neon or Argon-mercury Signage, < 2ft in Height
LED exit sign	Interior Lighting Other	One 5W Single-Sided LED Exit Sign	One 9W Single-Sided CFL Exit Sign
LED Exterior Wall Packs	Exterior Lighting Industrial	One 35W LED Wall Pack	Average Lumen Equivalent Exterior Incandescent Area Lighting
LED High Bay_HID Baseline	Interior Lighting High Bay	One 140W High Bay LED Fixture	Lumen-Equivalent HID High Bay Fixture

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Measure	End-Use	Description	Baseline
LED High Bay_LF Baseline	Interior Lighting High Bay	One 140W High Bay LED Fixture	Lumen-Equivalent Linear Fluorescent High Bay Fixture
LED Linear - Fixture Replacement	Interior Lighting Linear Fluorescent	2x4 LED Troffer Fixture	Lumen-Equivalent 32-Watt T8 Fixture
LED Linear - Lamp Replacement	Interior Lighting Linear Fluorescent	Linear LED	Lumen-Equivalent 32-Watt T8 Lamp
LED Parking Lighting	Exterior Lighting Industrial	One 160W LED Area Light	Average Lumen Equivalent Exterior HID Area Lighting
LEED New Construction Whole Building	HVAC	LEED Qualifying New Construction	Comparable facility, code-compliance construction
Light Tube	Interior Lighting Other	One 14" Light Tube, Delivering light to 250 S.F. of Industrial Space	250 S.F. of Industrial Space Lit by Typical Lighting Strategies
Low Energy Livestock Waterer	Motors Pumps	Install Thermostatically Controlled Livestock Watering System	Standard Livestock Watering System
Low Pressure Sprinkler Nozzles	Motors Pumps	Low Pressure Irrigation Nozzles operate at 35 psi or lower	Standard high pressure irrigation nozzles that operate at 50 psi or greater
Low Pressure-drop Filters	Compressed Air	20 HP Inlet Modulation Fixed-Speed Compressor with Low Pressure Drop Filter	20 HP Inlet Modulation Fixed-Speed Compressor, No Particulate Removal
Milk Pre-Cooler	Other	Installed pre-cooler heat exchanger	no pre-cooler heat exchanger installed
Networked Lighting Controls	Interior Lighting Linear Fluorescent	Install Networked Lighting Controls System on Interior Lighting, 500 Watts Controlled	500 Watts of Lighting, Controlled either Manually or by Sensor as Specified by Code
Occupancy Sensors, Ceiling Mounted	Interior Lighting High Bay	Ceiling Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Occupancy sensors, switch mounted	Interior Lighting Linear Fluorescent	Switch Mounted Occupancy Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor Lighting Controls	Exterior Lighting Industrial	Install Exterior Photocell Dimming Controls, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Outdoor motion sensor	Exterior Lighting Industrial	Install Exterior Motion Sensor, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
Packaged Terminal AC	HVAC	High Efficiency Packaged Terminal AC	Code-Compliant PTAC, 10.9 EER
Process Cooling Ventilation Reduction	Process Cooling	Standard Process Cooling with Reduced Ventilation	Standard Process Cooling
Programmable thermostat	HVAC	Standard Heating and Cooling System with Programmable Thermostat	Standard Heating and Cooling System with Manual Thermostat
Reflective Roof Treatment	HVAC	Reflective Roof Treatment	Standard Black Roof
Refrigeration Commissioning	Process Cooling	Commissioned Refrigeration System	Non-Commissioned Refrigeration System
Retro-Commissioning (Existing Construction)	HVAC	Perform Facility Retro-commissioning	
Roof insulation	HVAC	Roof Insulation (built-up roof applicable to flat/low slope roofs)	Code-Compliant Flat Roof

Measure	End-Use	Description	Baseline
Smart thermostat	HVAC	Standard Heating and Cooling System with Smart Thermostat	Standard Heating and Cooling System with Manual Thermostat
Strategic Energy Management	HVAC	SEM goal setting and tracking	No active energy management
Synchronous Belt on 15hp ODP Motor	Motors Pumps	15 HP Open-Drip Proof Motor with Synchronous Belts Installed on Supply and/or Return Air Fans	15 HP Open-Drip Proof Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Synchronous Belt on 5hp ODP Motor	Motors Pumps	5 HP Open-Drip Proof Motor with Synchronous Belts Installed on Supply and/or Return Air Fans	5 HP Open-Drip Proof Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Synchronous Belt on 75hp ODP Motor	Motors Pumps	75 HP Open-Drip Proof Motor with Synchronous Belts Installed on Supply and/or Return Air Fans	75 HP Open-Drip Proof Motor with Smooth V-Belts Installed on Supply and/or Return Air Fans
Thermal energy storage	HVAC	Deploy thermal energy storage technology (ice harvester, etc.) to shift load	Code compliant chiller
Time Clock Control	Interior Lighting High Bay	Time Clock Controlled Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
VAV System	HVAC	Variable Air Volume Distribution System	Constant Air Volume Distribution System
VFD on Air Compressor	Compressed Air	20 HP VFD Air Compressor	20 HP Inlet Modulation Fixed-Speed Compressor
VFD on Cooling Tower Fans	Process Cooling	Cooling Tower Fans with VFD Control	Cooling Tower Fans without VFD Control
VFD on HVAC Fan	Motors Fans Blowers	5 HP HVAC Fan Motor, with VFD Control	5 HP HVAC Fan Motor, no VFD Control
VFD on HVAC Pump	Motors Pumps	VFD on HVAC Pump	7.5 HP HVAC Pump Motor, no VFD Control
VFD on process pump	Motors Pumps	20 HP Process Pump Equipped with VFD Control	20 HP Process Pump, Constant Speed
VSD Controlled Compressor	Process Cooling	Refrigeration System with VSD Control	Refrigeration System with Standard Slide-Valve Control System
Water source heat pump	HVAC	Water Source Heat Pump, 2.5 Tons, 17.4 EER, 4.4 COP	Code-Compliant ASHP
Waterside economizer	HVAC	Waterside Economizer	No economizer
Window shade film	HVAC	Window Film with SHGC of 0.35 Applied to Standard Window	Standard Window with below Code Required Minimum SHGC

DR Measure Lists

Table 4: Residential DR Measures

Measure	Type	Season	Description
Central air conditioner - Load Shed	Direct load control	Summer	Direct load control program where utility provides day ahead notification that it will send remote signal to shed AC unit load during peak usage period.
Central Heating - Load Shed	Direct load control	Winter	Direct load control program where utility provides day ahead notification that it will send remote signal to shed AC unit load during peak usage period.
Central air conditioner - 50% cycling	Direct load control	Summer	Direct load control program where utility provides day ahead notification that it will send remote signal to cycle AC unit during peak usage period
Central Heating - 50% cycling	Direct load control	Winter	Direct load control program where utility provides day ahead notification that it will send remote signal to cycle AC unit during peak usage period
Smart thermostats - Utility Installation	Direct load control	Summer and Winter	Similar to AC load control program, but allows customers to participate using a compatible smart thermostat rather than an AC switch
Smart thermostats - BYOT	Direct load control	Summer and Winter	Similar to AC load control program, but allows customers to participate using a compatible smart thermostat rather than an AC switch
CPP + Tech	Pricing	Summer and Winter	Electricity rate that varies based on time of day. Can be same rate schedule for every day during a given season (time of use, or TOU) and with critical peak pricing (CPP) days when peak period rates are substantially higher for a limited number of days per year (customers receive advance notification of CPP event). Customers also receive technology that they can pre-program to curtail load when an event is called.
Water heater control	Direct load control	Summer and Winter	Load control installed on a water heater (integrated or external switch)
Pool pump switches	Direct load control	Summer and Winter	Load control program with switch installed on pool pump
Room AC	Direct load control	Summer	Load control program that is focused on room AC units rather than central AC
Managed EV Charging - switch	Direct load control	Summer and Winter	Load control switch that is installed on an EV charger
Managed EV Charging - telematics	Direct load control	Summer and Winter	Direct load control program leveraging EV smart charging software
Battery Storage with PV	Pricing/Direct load control	Summer and Winter	PV charges battery and battery discharges to grid

Table 5: Small C&I DR Measures

Measure	Type	Season	Description
Central air conditioner - Load Shed	Direct load control	Summer	Direct load control program where utility provides day ahead notification that it will send remote signal to shed AC unit load during peak usage period.

Measure	Type	Season	Description
Central Heating - Load Shed*	Direct load control	Winter	Direct load control program where utility provides day ahead notification that it will send remote signal to shed AC unit load during peak usage period.
Central air conditioner - 50% cycling	Direct load control	Summer	Direct load control program where utility provides day ahead notification that it will send remote signal to cycle AC unit during peak usage period
Central Heating - 50% cycling*	Direct load control	Winter	Direct load control program where utility provides day ahead notification that it will send remote signal to cycle AC unit during peak usage period
Smart thermostats - Utility Installation*	Direct load control	Summer and Winter	Similar to AC load control program, but allows customers to participate using a compatible smart thermostat rather than an AC switch
Smart thermostats - BYOT*	Direct load control	Summer and Winter	Similar to AC load control program, but allows customers to participate using a compatible smart thermostat rather than an AC switch
CPP + Tech	Pricing	Summer and Winter	Electricity rate that varies based on time of day. Can be same rate schedule for every day during a given season (time of use, or TOU) and with critical peak pricing (CPP) days when peak period rates are substantially higher for a limited number of days per year (customers receive advance notification of CPP event). Customers also receive technology that they can pre-program to curtail load when an event is called.
Managed EV Charging - switch	Direct load control	Summer and Winter	Load control switch that is installed on an EV charger
Managed EV Charging - telematics	Direct load control	Summer and Winter	Direct load control program leveraging EV smart charging software
Battery Storage with PV	Pricing/Direct load control	Summer and Winter	PV charges battery and battery discharges to grid

Table 6: Large C&I DR Measures

Measure	Type	Season	Description
CPP + Tech	Pricing	Summer and Winter	Electricity rate that varies based on time of day. Can be same rate schedule for every day during a given season (time of use, or TOU) and with critical peak pricing (CPP) days when peak period rates are substantially higher for a limited number of days per year (customers receive advance notification of CPP event). Customers also receive technology that they can pre-program to curtail load when an event is called.
Auto DR	Utility-controlled loads	Summer and Winter	Custom load control of specific end-uses/processes that is triggered by utility signal to building management system; customer can sometimes opt-out of specific events
Firm Service Level	Contractual	Summer and Winter	Customer commits to a maximum usage level during peak periods and, when notified by the utility, agrees to cut usage to that level.
Guaranteed Load Drop	Contractual	Summer and Winter	Customer agrees to reduce usage by an agreed upon amount when notified

DSRE Measure Lists

Table 7: Residential DSRE Measures

Measure	Description
PV System	Roof-mounted system, including multiple panels, AC/DC inverter, racking system, and electrical system interconnections
Battery Storage from PV System	Lithium-ion battery system designed to integrate with an on-site PV system to store and discharge excess energy from PV generation

Table 8: Non-Residential DSRE Measures

Measure	Description
PV System	Roof-mounted system, including multiple panels, AC/DC inverter, racking system, and electrical system interconnections
Battery Storage from PV System	Lithium-ion battery system designed to integrate with an on-site PV system to store and discharge excess energy from PV generation
CHP – Fuel Cell	An electrochemical cell-based generator that reacts hydrogen fuel with oxygen
CHP – Micro Turbine	Small combustion turbine that burns gaseous or liquid fuel to drive a generator
CHP – Gas Turbine	A combustion turbine that burns gaseous or liquid fuel to drive a generator
CHP – Reciprocating Engine	An engine that uses one or more pistons to convert pressure into rotational motion
CHP - Steam Turbine	A turbine that extracts thermal energy from pressured steam to drive a generator

Exhibit JH-9

Comparison of 2019 Measure List and 2024 Measure List

EE Measure Lists

EE Measures Added Since 2019 Study

Sector	Measure
Residential	CEE Advanced Tier Clothes Dryer
Residential	CEE Advanced Tier Clothes Washer
Residential	Ozone Laundry
Residential	Energy Star Dishwasher (Gas Water Heating)
Residential	Freezer Recycling
Residential	LED - 9W_Halogen Baseline
Residential	Occupancy Sensors Switch Mounted
Residential	Outdoor Motion Sensor
Residential	Dehumidifier Recycling
Residential	Energy Star Monitor
Residential	Energy Star Set-Top Receiver
Residential	CEE Tier 3 Refrigerator
Residential	Refrigerator Coil Cleaning
Residential	Induction Range
Residential	120v Heat Pump Water Heater 50 Gallons
Residential	Bathroom Faucet Aerators
Residential	Heat Pump Water Heater 50 Gallons-ENERGY STAR
Residential	Heat Pump Water Heater 80 Gallons-ENERGY STAR
Residential	ECM Circulator Pump
Residential	ENERGY STAR EV supply equipment (level 2 charger)
Residential	HVAC Economizer
Residential	Properly Sized CAC
Residential	Residential Whole House Fan
Residential	Air-to-Water Heat Pump
Residential	ASHP - 15 SEER/14.3 SEER2 from base electric resistance
Residential	ASHP - CEE Advanced Tier: 17.8 SEER/17 SEER2; 10.0 HSPF (from elec resistance)
Residential	ASHP - CEE Tier 2: 16.8 SEER/16 SEER2; 9.0 HSPF (from elec resistance)
Residential	ASHP - ENERGY STAR/CEE Tier 1: 16 SEER/15.2 SEER2 (from elect resistance)

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Comparison of Comprehensive 2019 Measure
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Sector	Measure
Residential	ASHP - ENERGY STAR/CEE Tier 1: 16 SEER/15.2 SEER2, 9.0 HSPF
Residential	Ceiling Insulation (R11 to R30)
Residential	Ceiling Insulation (R11 to R49)
Residential	Ceiling Insulation (R19 to R30)
Residential	Ceiling Insulation (R19 to R49)
Residential	Ceiling Insulation (R2 to R30)
Residential	Ceiling Insulation (R2 to R49)
Residential	Ceiling Insulation (R30 to R49)
Residential	Ceiling Insulation (R38 to R49)
Residential	HVAC Zoning System
Residential	Weather stripping
Residential	Window Caulking
Residential	Filter Whistle
Residential	New Construction - Whole Home Improvements - Tier 1
Residential	New Construction - Whole Home Improvements - Tier 2
Residential	Smart Breaker
Residential	Smart Panel
Commercial	Energy Star convection oven
Commercial	Water Heater Setback
Commercial	LED Canopy Lighting (Exterior)
Commercial	Outdoor motion sensor
Commercial	Auto Off Time Switch
Commercial	Efficient New Construction Lighting
Commercial	Energy Star LED Directional Lamp
Commercial	Indoor daylight sensor
Commercial	LED Exit Sign
Commercial	LED High Bay_LF Baseline
Commercial	Light Tube
Commercial	Occupancy Sensors, Ceiling Mounted
Commercial	Occupancy Sensors, Switch Mounted
Commercial	Time Clock Control
Commercial	Air Compressor Optimization
Commercial	Energy Star EV Chargers
Commercial	High Efficiency Air Compressor
Commercial	Ozone Laundry Commercial
Commercial	Regenerative Drive Elevator Motor
Commercial	Data Center Hot Cold Aisle

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Sector	Measure
Commercial	Energy Star Monitors
Commercial	Beverage Vending Machine Controls
Commercial	Door Gasket (Freezer)
Commercial	High Efficiency Refrigeration Compressor_Scroll
Commercial	Q-Sync Evaporator Fan Motor
Commercial	Refrigeration Commissioning
Commercial	Refrigeration Economizer
Commercial	Strip Curtains - Refrigerators
Commercial	Suction Pipe Insulation - Freezers
Commercial	Suction Pipe Insulation - Refrigerators
Commercial	Ductless Mini-Split AC
Commercial	Energy Star room AC
Commercial	HE DX 5.4-11.25 Tons Other Heat
Commercial	HE DX Less than 5.4 Tons Other Heat
Commercial	HE Water Cooled Chiller - Centrifugal Compressor - 500 Tons
Commercial	HE Water Cooled Chiller - Rotary or Screw Compressor - 50 Tons
Commercial	Ceiling Insulation (R19 to R30)
Commercial	Ceiling Insulation (R19 to R49)
Commercial	Ceiling Insulation (R2 to R30)
Commercial	Ceiling Insulation (R2 to R49)
Commercial	Custom measure - Non-lighting
Commercial	Ductless Mini-Split HP
Commercial	HE DX 11.25-20.0 Tons Elec Heat
Commercial	HE DX 5.4-11.25 Tons Elect Heat
Commercial	HE DX Less than 5.4 Tons Elect Heat
Commercial	LEED New Construction Whole Building
Commercial	VFD on HVAC Pump
Commercial	Water source heat pump
Commercial	1.5HP Open Drip-Proof (ODP) Motor
Commercial	20HP Open Drip-Proof (ODP) Motor
Commercial	Advanced Rooftop Controller
Commercial	Dual Enthalpy Economizer
Commercial	Commercial Strategic Energy Management
Industrial	Compressed Air Storage Tank
Industrial	Efficient Compressed Air Nozzles
Industrial	Low Pressure-drop Filters
Industrial	VFD on Air Compressor

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Sector	Measure
Industrial	Bi-Level Lighting Control (Exterior)
Industrial	LED Display Lighting (Exterior)
Industrial	LED Exterior Wall Packs
Industrial	LED Parking Lighting
Industrial	Outdoor motion sensor
Industrial	Air curtains
Industrial	Airside economizer
Industrial	Chilled Water Reset
Industrial	Custom Measure - Non-Lighting
Industrial	Dedicated Outside Air System (DOAS)
Industrial	Demand Controlled Ventilation
Industrial	DX Coil Cleaning
Industrial	Energy Efficient Laboratory Fume Hood
Industrial	Energy Recovery Ventilation System
Industrial	Energy Star room ac
Industrial	Energy Star windows
Industrial	Facility Commissioning
Industrial	Facility Energy Management System
Industrial	Fan Thermostat Controller
Industrial	HE Air Cooled Chiller - All Compressor Types - 300 Tons
Industrial	HE DX 11.25-20.0 Tons Elec Heat
Industrial	HE DX 11.25-20.0 Tons Other Heat
Industrial	HE DX 5.4-11.25 Tons Elect Heat
Industrial	HE DX 5.4-11.25 Tons Other Heat
Industrial	HE DX Less than 5.4 Tons Elect Heat
Industrial	HE DX Less than 5.4 Tons Other Heat
Industrial	HE Water Cooled Chiller - Centrifugal Compressor - 200 Tons
Industrial	HE Water Cooled Chiller - Centrifugal Compressor - 500 Tons
Industrial	HE Water Cooled Chiller - Rotary or Screw Compressor - 175 Tons
Industrial	HE Water Cooled Chiller - Rotary or Screw Compressor - 50 Tons
Industrial	High Speed Fans
Industrial	Industrial Duct Sealing
Industrial	LEED New Construction Whole Building
Industrial	Packaged Terminal AC
Industrial	Programmable thermostat
Industrial	Reflective Roof Treatment
Industrial	Smart thermostat

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Sector	Measure
Industrial	Thermal energy storage
Industrial	VAV System
Industrial	Water source heat pump
Industrial	Waterside economizer
Industrial	Window shade film
Industrial	Auto Off Time Switch
Industrial	Bi-Level Lighting Control (Interior)
Industrial	Efficient New Construction Lighting
Industrial	High Bay Occupancy Sensors, Ceiling Mounted
Industrial	Indoor Agriculture - LED Grow Lights
Industrial	Indoor daylight sensor
Industrial	LED High Bay_LF Baseline
Industrial	Occupancy Sensors, Ceiling Mounted
Industrial	Time Clock Control
Industrial	LED Linear - Lamp Replacement
Industrial	Occupancy sensors, switch mounted
Industrial	Energy Star LED Directional Lamp
Industrial	LED - 14W_CFL Baseline
Industrial	LED Display Lighting (Interior)
Industrial	LED exit sign
Industrial	Light Tube
Industrial	High Volume Low Speed Fan (HVLS)
Industrial	20HP Open Drip-Proof (ODP) Motor
Industrial	Cogged Belt on 40hp ODP Motor
Industrial	Low Energy Livestock Waterer
Industrial	Low Pressure Sprinkler Nozzles
Industrial	Synchronous Belt on 15hp ODP Motor
Industrial	Synchronous Belt on 5hp ODP Motor
Industrial	Synchronous Belt on 75hp ODP Motor
Industrial	3-phase High Frequency Battery Charger - 1 shift
Industrial	Dairy Refrigeration Heat Recovery
Industrial	Drip Irrigation Nozzles
Industrial	Electric Actuators
Industrial	Energy Efficient Transformers
Industrial	Engine Block Timer
Industrial	Injection Mold and Extruder Barrel Wraps
Industrial	Milk Pre-Cooler

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Sector	Measure
Industrial	Auto Closer on Refrigerator Door
Industrial	Demand Defrost
Industrial	Dual Enthalpy Economizer
Industrial	High Efficiency Refrigeration Compressor - Scroll
Industrial	Process Cooling Ventilation Reduction
Industrial	VFD on Cooling Tower Fans
Industrial	VSD Controlled Compressor
Industrial	Compressed Air Desiccant Dryer
Industrial	Compressed Air No-Loss Condensate Drains

EE Measures Eliminated Since 2019 Study

Sector	Measure
Residential	CFL - 15W Flood
Residential	CFL - 15W Flood (Exterior)
Residential	CFL - 13W
Residential	CFL - 23W
Residential	Low Wattage T8 Fixture
Residential	15 SEER Central AC
Residential	15 SEER Air Source Heat Pump
Residential	14 SEER ASHP from base electric resistance heating
Residential	Two Speed Pool Pump
Residential	Variable Speed Pool Pump
Residential	Storm Door
Commercial	CFL - 15W Flood
Commercial	High Efficiency HID Lighting
Commercial	LED Street Lights
Commercial	LED Traffic and Crosswalk Lighting
Commercial	CFL-23W
Commercial	High Bay Fluorescent (T5)
Commercial	Premium T8 - Fixture Replacement
Commercial	Premium T8 - Lamp Replacement
Commercial	Two Speed Pool Pump
Commercial	Variable Speed Pool Pump
Commercial	Tank Wrap on Water Heater
Commercial	Ceiling Insulation(R12 to R38)
Commercial	Ceiling Insulation(R30 to R38)

DR Measure Lists

DR Measures Added Since 2019 Study

Sector	Measure
Residential	Managed EV Charging - switch
Residential	Managed EV Charging - telematics
Residential	Battery Storage with PV
Commercial	Managed EV Charging - switch
Commercial	Managed EV Charging - telematics
Commercial	Battery Storage with PV

DR Measures Eliminated Since 2019 Study

Sector	Measure
None	

DSRE Measure Lists

DSRE Measures Added Since 2019 Study

Sector	Measure
None	

DSRE Measures Eliminated Since 2019 Study

Sector	Measure
None	

Exhibit JH-10

DEF Measure Screening and Economic Sensitivities

Measure Screening

The program development process was initiated with 395 EE measures, 33 DR measures, and 9 DSRE measures contributing to the technical potential, which are detailed in Exhibit JH-8. Table 1 summarizes the number of measures by category and the number of measure permutations, which are the application of individual measures to various customer segments, construction types, and end-uses (*i.e.*, a single air-source heat pump “measure” can be installed in single family, multi-family, and manufactured homes, as well as new and existing vintages of each home type, and impacts both space cooling and space heating end-uses, resulting in twelve separate measure “permutations” analyzed)

Table 1. TP Measure Counts

Category	Sector	Measures	Permutations
EE	Residential	119	1,173
EE	Commercial	164	5,798
EE	Industrial	112	2,564
DR	Residential	16	48
DR	Small-Medium Business	13	52
DR	Large Commercial & Industrial	4	16
DSRE	Residential	2	2
DSRE	Non-Residential	7	42

The subsequent program development process included the following steps that refined the measure lists for the RIM scenario and TRC scenario. The following tables summarize the count of measures and permutations **excluded** at each step:

Economic Analysis – Cost-effectiveness screening

Measures that did not achieve a cost-effectiveness ratio of 1.0 for the TRC test and PCT were excluded from the TRC scenario. Measures that did not achieve a ratio of 1.0 for the RIM test and PCT were excluded from the RIM scenario for the economic analysis. Individual measures did not include any utility program costs (program administrative or incentive costs), and therefore were

evaluated on the basis of measure cost-effectiveness without any utility intervention. Table 2 summarizes the count of unique measures and measure permutations excluded at this step:

Table 2: Measures Excluded – Economic Analysis, TRC scenario and RIM scenario

Category	Sector	TRC Scenario		RIM Scenario	
		Measures	Permutations	Measures	Permutations
EE	Residential	52	641	84	815
EE	Commercial	53	3,117	121	5,021
EE	Industrial	38	1,034	112	2,564
DR	Residential	3	N/A*	0	N/A*
DR	Small-Medium Business	2	N/A*	0	N/A*
DR	Large Commercial & Industrial	0	N/A*	0	N/A*
DSRE	Residential	2	2	2	2
DSRE	Non-Residential	7	42	7	42

*Screening for the DR economic analysis was done at the measure level, not by permutation

Measure Adoption Forecast – Cost-effectiveness screening

All technical potential measures were re-screened in the development of the measure adoption forecasts. Associated program costs, including program administrative costs and customer incentives, were included in the economic analysis used for estimating measure adoption forecasts. Because this step occurred prior to each utility developing specific programs aligned with their proposed goals, representative administrative costs were developed using average FEECA Utility program cost data, where available from current programs, and supplemented with other utility program cost data where needed. In order to evenly apply these representative costs to measures with a variety of savings impacts, typical costs were estimated on a variable basis per kWh saved.

Measures that did not achieve a cost-effectiveness ratio of 1.0 for the TRC test and PCT were excluded from the TRC scenario. Measures that did not achieve a ratio of 1.0 for the RIM test and PCT were excluded from the RIM scenario for the economic analysis. Table 3 summarizes the count of unique measures and measure permutations excluded at this step:

Table 3: Measures Excluded – Measure Adoption Forecast, TRC scenario and RIM scenario

Category	Sector	TRC Scenario		RIM Scenario	
		Measures	Permutations	Measures	Permutations
EE	Residential	47	535	80	717
EE	Commercial	53	3,005	117	4,931
EE	Industrial	40	1,089	112	2,564
DR	Residential	4	14	5	17
DR	Small-Medium Business	4	29	6	35
DR	Large Commercial & Industrial	0	0	0	0
DSRE	Residential	2	2	2	2
DSRE	Non-Residential	7	42	7	42

Measure Adoption Forecast – Free ridership screening

Consistent with prior DSM analyses in Florida, free ridership was addressed by applying a two-year payback criterion, which eliminated measures having a simple payback of less than two years. In addition to the measures and permutations excluded based on the cost-effectiveness screening summarized in Table 3 above, Table 4 summarizes the count of unique measures and measure permutations excluded at this step:

Table 4: Measures Excluded – Measure Adoption Forecast, 2-year payback screening (additional exclusions)

Category	Sector	TRC Scenario		RIM Scenario	
		Measures	Permutations	Measures	Permutations
EE	Residential	22	171	2	47
EE	Commercial	25	1,054	0	89
EE	Industrial	38	881	0	0
DR	Residential	0	0	0	0
DR	Small-Medium Business	0	0	0	0
DR	Large Commercial & Industrial	0	0	0	0
DSRE	Residential	0	0	0	0
DSRE	Non-Residential	0	0	0	0

Economic Sensitivities

As part of the economic analysis, the study included development of sensitivities related to free ridership, future fuel costs, as follows:

Sensitivity #1: Higher Fuel Prices

For this sensitivity, both the RIM and TRC scenarios were screened using electric utility supply costs adjusted to a “high fuel” cost scenario. The following table summarizes the number of unique measures and measure permutations that are cost effective under each scenario:

Table 5: Economic Sensitivity #1 – Passing Measures, Higher Fuel Prices

Category*	Sector	TRC Scenario		RIM Scenario	
		Measures	Permutations	Measures	Permutations
EE	Residential	68	535	36	360
EE	Commercial	114	2,753	44	893
EE	Industrial	76	1,585	0	0

*DR measures were not included in the economic sensitivities as fuel prices do not affect DR results.

*No DSRE measures passed the economic screening for this sensitivity.

Sensitivity #2: Lower Fuel Prices

For this sensitivity, both the RIM and TRC scenarios were screened using electric utility supply costs adjusted to a “low fuel” cost scenario. The following table summarizes the number of unique measures and measure permutations that are cost effective under each scenario:

Table 6: Economic Sensitivity #2 – Passing Measures, Lower Fuel Prices

Category*	Sector	TRC Scenario		RIM Scenario	
		Measures	Permutations	Measures	Permutations
EE	Residential	66	523	35	358
EE	Commercial	108	2,575	39	611
EE	Industrial	72	1,467	0	0

*DR measures were not included in the economic sensitivities as fuel prices do not affect DR results.

*No DSRE measures passed the economic screening for this sensitivity.

Sensitivity #3: Shorter free-ridership exclusion periods

For this sensitivity, both the RIM and TRC scenarios were screened as described above for the Economic Analysis, but the simple payback screening criteria was reduced to one year or longer:

Table 7: Economic Sensitivity #3 – Passing Measures, Shorter free-ridership exclusion period

Category*	Sector	TRC Scenario		RIM Scenario	
		Measures	Permutations	Measures	Permutations
EE	Residential	53	436	32	328
EE	Commercial	98	2,061	43	739
EE	Industrial	48	873	0	0

*DR measures were not included in the economic sensitivities as there is negligible customer incremental cost for DR measures and therefore differences in simple payback do not affect DR results.

*No DSRE measures passed the economic screening for this sensitivity.

Sensitivity #4: Longer free-ridership exclusion periods

For this sensitivity, both the RIM and TRC scenarios were screened as described above for the Economic Analysis, but the simple payback screening criteria was increased to three years or longer:

Table 8: Economic Sensitivity #4 – Passing Measures, Longer free-ridership exclusion period

Category*	Sector	TRC Scenario		RIM Scenario	
		Measures	Permutations	Measures	Permutations
EE	Residential	41	290	29	234
EE	Commercial	72	1,065	41	550
EE	Industrial	23	396	0	0

*DR measures were not included in the economic sensitivities as there is negligible customer incremental cost for DR measures and therefore differences in simple payback do not affect DR results.

*No DSRE measures passed the economic screening for this sensitivity.

Exhibit JH-11

FPUC Measure Screening and Economic Sensitivities

Measure Screening

The program development process was initiated with 395 EE measures, 29 DR measures, and 9 DSRE measures contributing to the technical potential, which are detailed in Exhibit JH-8. Table 1 summarizes the number of measures by category and the number of measure permutations, which are the application of individual measures to various customer segments, construction types, and end-uses (*i.e.*, a single air-source heat pump “measure” can be installed in single family, multi-family, and manufactured homes, as well as new and existing vintages of each home type, and impacts both space cooling and space heating end-uses, resulting in twelve separate measure “permutations” analyzed)

Table 1. TP Measure Counts

Category	Sector	Measures	Permutations
EE	Residential	119	1,173
EE	Commercial	164	5,798
EE	Industrial	112	2,564
DR	Residential	14	14
DR	Small-Medium Business	11	11
DR	Large Commercial & Industrial	4	4
DSRE	Residential	2	2
DSRE	Non-Residential	7	42

The subsequent program development process included the following steps that refined the measure lists for the RIM scenario and TRC scenario. The following tables summarize the count of measures and permutations **excluded** at each step:

Economic Analysis – Cost-effectiveness screening

Technical potential measures that did not achieve a cost-effectiveness ratio of 1.0 for the TRC test and PCT were excluded from the TRC scenario. Measures that did not achieve a ratio of 1.0 for the RIM test and PCT were excluded from the RIM scenario for the economic analysis. Individual measures did not include any utility program costs (program administrative or incentive costs), and therefore were evaluated on the basis of measure cost-effectiveness without any utility intervention. Table 2 summarizes the count of unique measures and measure permutations excluded at this step:

Table 2: Measures Excluded – Economic Analysis, TRC scenario and RIM scenario

Category	Sector	TRC Scenario		RIM Scenario	
		Measures	Permutations	Measures	Permutations
EE	Residential	68	771	119	1,173
EE	Commercial	68	3,516	164	5,798
EE	Industrial	40	1,093	112	2,564
DR	Residential	12	N/A*	1	N/A*
DR	Small-Medium Business	9	N/A*	1	N/A*
DR	Large Commercial & Industrial	4	N/A*	0	N/A*
DSRE	Residential	2	2	2	2
DSRE	Non-Residential	7	42	7	42

*Screening for the DR economic analysis was done at the measure level, not by permutation

Measure Adoption Forecast – Cost-effectiveness screening

All technical potential measures were re-screened in the development of the measure adoption forecasts. Associated program costs, including program administrative costs and customer incentives, were included in the economic analysis used for estimating measure adoption forecasts. Because this step occurred prior to each utility developing specific programs aligned with their proposed goals, representative administrative costs were developed using average FEECA Utility program cost data, where available from current programs, and supplemented with other utility program cost data where needed. In order to evenly apply these representative costs to measures with a variety of savings impacts, typical costs were estimated on a variable basis per kWh saved.

Measures that did not achieve a cost-effectiveness ratio of 1.0 for the TRC test and PCT were excluded from the TRC scenario. Measures that did not achieve a ratio of 1.0 for the RIM test and PCT were excluded from the RIM scenario for the economic analysis. Table 3 summarizes the count of unique measures and measure permutations excluded at this step:

Table 3: Measures Excluded – Measure Adoption Forecast, TRC scenario and RIM scenario

Category	Sector	TRC Scenario		RIM Scenario	
		Measures	Permutations	Measures	Permutations
EE	Residential	71	803	119	1,173
EE	Commercial	70	3,632	164	5,798
EE	Industrial	42	1,142	112	2,564
DR	Residential	14	14	14	14
DR	Small-Medium Business	11	11	11	11
DR	Large Commercial & Industrial	4	4	4	4
DSRE	Residential	2	2	2	2
DSRE	Non-Residential	7	42	7	42

Measure Adoption Forecast – Free ridership screening

Consistent with prior DSM analyses in Florida, free ridership was addressed by applying a two-year payback criterion, which eliminated measures having a simple payback of less than two years. In addition to the measures and permutations excluded based on the cost-effectiveness screening summarized in Table 3 above, Table 4 summarizes the count of unique measures and measure permutations excluded at this step:

Table 4: Measures Excluded – Measure Adoption Forecast, 2-year payback screening (additional exclusions)

Category	Sector	TRC Scenario		RIM Scenario	
		Measures	Permutations	Measures	Permutations
EE	Residential	18	140	0	0
EE	Commercial	38	1,268	0	0
EE	Industrial	39	836	0	0
DR	Residential	0	0	0	0
DR	Small-Medium Business	0	0	0	0
DR	Large Commercial & Industrial	0	0	0	0
DSRE	Residential	0	0	0	0
DSRE	Non-Residential	0	0	0	0

DSM Program Development – Cost-effectiveness screening

As described in Exhibit No. JH-14, RI worked collaboratively with FPUC on the DSM program development process, resulting in a Proposed Goals Scenario, a RIM Scenario, and a TRC Scenario. All technical potential measures were re-analyzed in the DSM program development process.

For the RIM Scenario and TRC Scenario program development, updated non-incentive costs specific to FPUC were developed and applied in the updated cost-effectiveness screening of technical potential measures, which included the following criteria for each scenario:

- RIM-scenario – measures that failed the RIM-scenario criteria (RIM test, PCT, and payback period of at least 2 years) were excluded from the initial measure bundling analysis
- TRC-scenario – measures that failed the TRC-scenario criteria (TRC test, PCT, and payback period of at least 2 years) were excluded from the initial measure bundling analysis

Table 5 summarizes the count of unique measures and measure permutations excluded for each scenario at this step:

Table 5: Measures Excluded – DSM Program Development, TRC Scenario and RIM Scenario

Category	Sector	TRC Scenario		RIM Scenario	
		Measures	Permutations	Measures	Permutations
EE	Residential	91	972	119	1,173
EE	Commercial	110	4,910	164	5,798
EE	Industrial	81	1,979	112	2,564
DR	Residential	14	14	14	14
DR	Small-Medium Business	11	11	11	11
DR	Large Commercial & Industrial	4	4	4	4
DSRE	Residential	2	2	2	2
DSRE	Non-Residential	7	42	7	42

The development of the Proposed Goals Scenario started with assessment of technical potential measures study that passed, or were close to passing, the economic analysis, as well as measures included in current FPUC programs or that may be logical additions to current FPUC programs. Therefore, all individual EE measures were included in the initial analysis. Due to the DSM program development cost-effectiveness screening resulting in no DSRE measures or DR measures passing the RIM or TRC scenarios, these measures were excluded in the Proposed Goals Scenario analysis.

Economic Sensitivities

As part of the economic analysis, the study included development of sensitivities related to future fuel costs and free ridership, as follows:

Sensitivity #1: Higher Fuel Prices

For this sensitivity, both the RIM and TRC scenarios were screened using electric utility supply costs adjusted to a “high fuel” cost scenario. The following table summarizes the number of unique measures and measure permutations that are cost effective under each scenario:

Table 6: Economic Sensitivity #1 – Passing Measures, Higher Fuel Prices

Category*	Sector	TRC Scenario		RIM Scenario	
		Measures	Permutations	Measures	Permutations
EE	Residential	59	444	9	60
EE	Commercial	107	2,586	0	0
EE	Industrial	77	1,587	0	0

*DR measures were not included in the economic sensitivities as fuel prices do not affect DR results.

*No DSRE measures passed the economic screening for this sensitivity.

Sensitivity #2: Lower Fuel Prices

For this sensitivity, both the RIM and TRC scenarios were screened using electric utility supply costs adjusted to a “low fuel” cost scenario. The following table summarizes the number of unique measures and measure permutations that are cost effective under each scenario:

Table 7: Economic Sensitivity #2 – Passing Measures, Lower Fuel Prices

Category*	Sector	TRC Scenario		RIM Scenario	
		Measures	Permutations	Measures	Permutations
EE	Residential	46	349	0	0
EE	Commercial	90	2,112	0	0
EE	Industrial	68	1,372	0	0

*DR measures were not included in the economic sensitivities as fuel prices do not affect DR results.

*No DSRE measures passed the economic screening for this sensitivity.

Sensitivity #3: Shorter free-ridership exclusion periods

For this sensitivity, both the RIM and TRC scenarios were screened as described above for the Economic Analysis, but the simple payback screening criteria was reduced to one year or longer:

Table 8: Economic Sensitivity #3 – Passing Measures, Shorter free-ridership exclusion period

Category*	Sector	TRC Scenario		RIM Scenario	
		Measures	Permutations	Measures	Permutations
EE	Residential	38	312	0	0
EE	Commercial	79	1,522	0	0
EE	Industrial	45	824	0	0

*DR measures were not included in the economic sensitivities as there is negligible customer incremental cost for DR measures and therefore differences in simple payback do not affect DR results.

*No DSRE measures passed the economic screening for this sensitivity.

Sensitivity #4: Longer free-ridership exclusion periods

For this sensitivity, both the RIM and TRC scenarios were screened as described above for the Economic Analysis, but the simple payback screening criteria was increased to three years or longer:

Table 9: Economic Sensitivity #4 – Passing Measures, Longer free-ridership exclusion period

Category*	Sector	TRC Scenario		RIM Scenario	
		Measures	Permutations	Measures	Permutations
EE	Residential	26	153	0	0
EE	Commercial	39	422	0	0
EE	Industrial	22	349	0	0

*DR measures were not included in the economic sensitivities as there is negligible customer incremental cost for DR measures and therefore differences in simple payback do not affect DR results.

*No DSRE measures passed the economic screening for this sensitivity.

Exhibit JH-12

JEA Measure Screening and Economic Sensitivities

Measure Screening

The program development process was initiated with 395 EE measures, 33 DR measures, and 9 DSRE measures contributing to the technical potential, which are detailed in Exhibit JH-8. Table 1 summarizes the number of measures by category and the number of measure permutations, which are the application of individual measures to various customer segments, construction types, and end-uses (*i.e.*, a single air-source heat pump “measure” can be installed in single family, multi-family, and manufactured homes, as well as new and existing vintages of each home type, and impacts both space cooling and space heating end-uses, resulting in twelve separate measure “permutations” analyzed)

Table 1. TP Measure Counts

Category	Sector	Measures	Permutations
EE	Residential	119	1,173
EE	Commercial	164	5,798
EE	Industrial	112	2,564
DR	Residential	16	16
DR	Small-Medium Business	13	52
DR	Large Commercial & Industrial	4	16
DSRE	Residential	2	2
DSRE	Non-Residential	7	42

The subsequent program development process included the following steps that refined the measure lists for the RIM scenario and TRC scenario. The following tables summarize the count of measures and permutations **excluded** at each step:

Economic Analysis – Cost-effectiveness screening

Technical potential measures that did not achieve a cost-effectiveness ratio of 1.0 for the TRC test and PCT were excluded from the TRC scenario. Measures that did not achieve a ratio of 1.0 for the RIM test and PCT were excluded from the RIM scenario for the economic analysis. Individual measures did not include any utility program costs (program administrative or incentive costs), and

therefore were evaluated on the basis of measure cost-effectiveness without any utility intervention. Table 2 summarizes the count of unique measures and measure permutations excluded at this step:

Table 2: Measures Excluded – Economic Analysis, TRC scenario and RIM scenario

Category	Sector	TRC Scenario		RIM Scenario	
		Measures	Permutations	Measures	Permutations
EE	Residential	66	755	110	1,109
EE	Commercial	70	3,592	164	5,798
EE	Industrial	42	1,143	112	2,564
DR	Residential	3	N/A*	0	N/A*
DR	Small-Medium Business	2	N/A*	1	N/A*
DR	Large Commercial & Industrial	0	N/A*	0	N/A*
DSRE	Residential	2	2	2	2
DSRE	Non-Residential	7	42	7	42

*Screening for the DR economic analysis was done at the measure level, not by permutation

Measure Adoption Forecast – Cost-effectiveness screening

All technical potential measures were re-screened in the development of the measure adoption forecasts. Associated program costs, including program administrative costs and customer incentives, were included in the economic analysis used for estimating measure adoption forecasts. Because this step occurred prior to each utility developing specific programs aligned with their proposed goals, representative administrative costs were developed using average FEECA Utility program cost data, where available from current programs, and supplemented with other utility program cost data where needed. In order to evenly apply these representative costs to measures with a variety of savings impacts, typical costs were estimated on a variable basis per kWh saved.

Measures that did not achieve a cost-effectiveness ratio of 1.0 for the TRC test and PCT were excluded from the TRC scenario. Measures that did not achieve a ratio of 1.0 for the RIM test and PCT were excluded from the RIM scenario for the economic analysis. Table 3 summarizes the count of unique measures and measure permutations excluded at this step:

Table 3: Measures Excluded – Measure Adoption Forecast, TRC scenario and RIM scenario

Category	Sector	TRC Scenario		RIM Scenario	
		Measures	Permutations	Measures	Permutations
EE	Residential	71	804	114	1,125
EE	Commercial	79	3,874	164	5,798
EE	Industrial	48	1,294	112	2,564
DR	Residential	14	14	14	14
DR	Small-Medium Business	10	47	10	47
DR	Large Commercial & Industrial	0	8	0	8
DSRE	Residential	2	2	2	2
DSRE	Non-Residential	7	42	7	42

Measure Adoption Forecast – Free ridership screening

Consistent with prior DSM analyses in Florida, free ridership was addressed by applying a two-year payback criterion, which eliminated measures having a simple payback of less than two years. In addition to the measures and permutations excluded based on the cost-effectiveness screening summarized in Table 3 above, Table 4 summarizes the count of unique measures and measure permutations excluded at this step:

Table 4: Measures Excluded – Measure Adoption Forecast, 2-year payback screening (additional exclusions)

Category	Sector	TRC Scenario		RIM Scenario	
		Measures	Permutations	Measures	Permutations
EE	Residential	18	134	0	0
EE	Commercial	25	842	0	0
EE	Industrial	29	661	0	0
DR	Residential	0	0	0	0
DR	Small-Medium Business	0	0	0	0
DR	Large Commercial & Industrial	0	0	0	0
DSRE	Residential	0	0	0	0
DSRE	Non-Residential	0	0	0	0

DSM Program Development – Cost-effectiveness screening

As described in Exhibit No. JH-15, RI worked collaboratively with JEA on the DSM program development process, resulting in a Proposed Goals Scenario, a RIM Scenario, and a TRC Scenario. All technical potential measures were re-analyzed in the DSM program development process.

For the RIM Scenario and TRC Scenario program development, updated non-incentive costs specific to JEA were developed and applied in the updated cost-effectiveness screening of technical potential measures, which included the following criteria for each scenario:

- RIM Scenario – measures that failed the RIM Scenario criteria (RIM test, PCT, and payback period of at least 2 years) were excluded from the initial measure bundling analysis
- TRC Scenario – measures that failed the TRC Scenario criteria (TRC test, PCT, and payback period of at least 2 years) were excluded from the initial measure bundling analysis

Table 5 summarizes the count of unique measures and measure permutations excluded for each scenario at this step:

Table 5: Measures Excluded – DSM Program Development, TRC Scenario and RIM Scenario

Category	Sector	TRC Scenario		RIM Scenario	
		Measures	Permutations	Measures	Permutations
EE	Residential	92	956	114	1,125
EE	Commercial	104	4,718	164	5,798
EE	Industrial	77	1,955	112	2,564
DR	Residential	16	16	16	16
DR	Small-Medium Business	13	52	13	52
DR	Large Commercial & Industrial	0	12	0	12
DSRE	Residential	2	2	2	2
DSRE	Non-Residential	7	42	7	42

The development of the Proposed Goals Scenario started with assessment of technical potential measures study that passed, or were close to passing, the economic analysis, as well as measures included in current JEA programs or that may be logical additions to current JEA programs. Therefore, all individual EE measures were included in the initial analysis, as well as Large Commercial DR measures. Due to the DSM program development cost-effectiveness screening resulting in no DSRE measures or DR measures for Residential or Small-Medium Businesses passing the RIM or TRC scenarios, these measures were excluded in the Proposed Goals Scenario analysis.

Economic Sensitivities

As part of the economic analysis, the study included development of sensitivities related to future fuel costs and free ridership, as follows:

Sensitivity #1: Higher Fuel Prices

For this sensitivity, both the RIM and TRC scenarios were screened using electric utility supply costs adjusted to a “high fuel” cost scenario. The following table summarizes the number of unique measures and measure permutations that are cost effective under each scenario:

Table 6: Economic Sensitivity #1 – Passing Measures, Higher Fuel Prices

Category*	Sector	TRC Scenario		RIM Scenario	
		Measures	Permutations	Measures	Permutations
EE	Residential	57	443	20	152
EE	Commercial	99	2,387	0	0
EE	Industrial	72	1,478	0	0

*DR measures were not included in the economic sensitivities as fuel prices do not affect DR results.

*No DSRE measures passed the economic screening for this sensitivity.

Sensitivity #2: Lower Fuel Prices

For this sensitivity, both the RIM and TRC scenarios were screened using electric utility supply costs adjusted to a “low fuel” cost scenario. The following table summarizes the number of unique measures and measure permutations that are cost effective under each scenario:

Table 7: Economic Sensitivity #2 – Passing Measures, Lower Fuel Prices

Category*	Sector	TRC Scenario		RIM Scenario	
		Measures	Permutations	Measures	Permutations
EE	Residential	45	355	2	8
EE	Commercial	81	1,846	0	0
EE	Industrial	63	1,266	0	0

*DR measures were not included in the economic sensitivities as fuel prices do not affect DR results.

*No DSRE measures passed the economic screening for this sensitivity.

Sensitivity #3: Shorter free-ridership exclusion periods

For this sensitivity, both the RIM and TRC scenarios were screened as described above for the Economic Analysis, but the simple payback screening criteria was reduced to one year or longer:

Table 8: Economic Sensitivity #3 – Passing Measures, Shorter free-ridership exclusion period

Category*	Sector	TRC Scenario		RIM Scenario	
		Measures	Permutations	Measures	Permutations
EE	Residential	41	334	9	64
EE	Commercial	80	1,646	0	0
EE	Industrial	53	1,014	0	0

*DR measures were not included in the economic sensitivities as there is negligible customer incremental cost for DR measures and therefore differences in simple payback do not affect DR results.

*No DSRE measures passed the economic screening for this sensitivity.

Sensitivity #4: Longer free-ridership exclusion periods

For this sensitivity, both the RIM and TRC scenarios were screened as described above for the Economic Analysis, but the simple payback screening criteria was increased to three years or longer:

Table 9: Economic Sensitivity #4 – Passing Measures, Longer free-ridership exclusion period

Category*	Sector	TRC Scenario		RIM Scenario	
		Measures	Permutations	Measures	Permutations
EE	Residential	34	257	9	64
EE	Commercial	56	928	0	0
EE	Industrial	34	643	0	0

*DR measures were not included in the economic sensitivities as there is negligible customer incremental cost for DR measures and therefore differences in simple payback do not affect DR results.

*No DSRE measures passed the economic screening for this sensitivity.

Exhibit JH-13

OUC Measure Screening and Economic Sensitivities

Measure Screening

The program development process was initiated with 395 EE measures, 33 DR measures, and 9 DSRE measures contributing to the technical potential, which are detailed in Exhibit JH-8. Table 1 summarizes the number of measures by category and the number of measure permutations, which are the application of individual measures to various customer segments, construction types, and end-uses (*i.e.*, a single air-source heat pump “measure” can be installed in single family, multi-family, and manufactured homes, as well as new and existing vintages of each home type, and impacts both space cooling and space heating end-uses, resulting in twelve separate measure “permutations” analyzed)

Table 1. TP Measure Counts

Category	Sector	Measures	Permutations
EE	Residential	119	1,173
EE	Commercial	164	5,798
EE	Industrial	112	2,564
DR	Residential	16	48
DR	Small-Medium Business	13	52
DR	Large Commercial & Industrial	4	16
DSRE	Residential	2	2
DSRE	Non-Residential	7	42

The subsequent program development process included the following steps that refined the measure lists for the RIM scenario and TRC scenario. The following tables summarize the count of measures and permutations **excluded** at each step:

Economic Analysis – Cost-effectiveness screening

Technical potential measures that did not achieve a cost-effectiveness ratio of 1.0 for the TRC test and PCT were excluded from the TRC scenario. Measures that did not achieve a ratio of 1.0 for the RIM test and PCT were excluded from the RIM scenario for the economic analysis. Individual measures did not include any utility program costs (program administrative or incentive costs), and

therefore were evaluated on the basis of measure cost-effectiveness without any utility intervention. Table 2 summarizes the count of unique measures and measure permutations excluded at this step:

Table 2: Measures Excluded – Economic Analysis, TRC scenario and RIM scenario

Category	Sector	TRC Scenario		RIM Scenario	
		Measures	Permutations	Measures	Permutations
EE	Residential	76	857	119	1,173
EE	Commercial	84	4,079	163	5,784
EE	Industrial	52	1,354	112	2,564
DR	Residential	4	N/A*	0	N/A*
DR	Small-Medium Business	2	N/A*	0	N/A*
DR	Large Commercial & Industrial	0	N/A*	0	N/A*
DSRE	Residential	2	2	2	2
DSRE	Non-Residential	7	42	7	42

*Screening for the DR economic analysis was done at the measure level, not by permutation

Measure Adoption Forecast – Cost-effectiveness screening

All technical potential measures were re-screened in the development of the measure adoption forecasts. Associated program costs, including program administrative costs and customer incentives, were included in the economic analysis used for estimating measure adoption forecasts. Because this step occurred prior to each utility developing specific programs aligned with their proposed goals, representative administrative costs were developed using average FEECA Utility program cost data, where available from current programs, and supplemented with other utility program cost data where needed. In order to evenly apply these representative costs to measures with a variety of savings impacts, typical costs were estimated on a variable basis per kWh saved.

Measures that did not achieve a cost-effectiveness ratio of 1.0 for the TRC test and PCT were excluded from the TRC scenario. Measures that did not achieve a ratio of 1.0 for the RIM test and PCT were excluded from the RIM scenario for the economic analysis. Table 3 summarizes the count of unique measures and measure permutations excluded at this step:

Table 3: Measures Excluded – Measure Adoption Forecast, TRC scenario and RIM scenario

Category	Sector	TRC Scenario		RIM Scenario	
		Measures	Permutations	Measures	Permutations
EE	Residential	76	865	119	1,173
EE	Commercial	95	4,390	163	5,784
EE	Industrial	59	1,509	112	2,564
DR	Residential	16	48	16	48
DR	Small-Medium Business	5	42	6	43
DR	Large Commercial & Industrial	0	7	0	7
DSRE	Residential	2	2	2	2
DSRE	Non-Residential	7	42	7	42

Measure Adoption Forecast – Free ridership screening

Consistent with prior DSM analyses in Florida, free ridership was addressed by applying a two-year payback criterion, which eliminated measures having a simple payback of less than two years. In addition to the measures and permutations excluded based on the cost-effectiveness screening summarized in Table 3 above, Table 4 summarizes the count of unique measures and measure permutations excluded at this step:

Table 4: Measures Excluded – Measure Adoption Forecast, 2-year payback screening (additional exclusions)

Category	Sector	TRC Scenario		RIM Scenario	
		Measures	Permutations	Measures	Permutations
EE	Residential	18	140	0	0
EE	Commercial	27	860	0	0
EE	Industrial	37	802	0	0
DR	Residential	0	0	0	0
DR	Small-Medium Business	0	0	0	0
DR	Large Commercial & Industrial	0	0	0	0
DSRE	Residential	0	0	0	0
DSRE	Non-Residential	0	0	0	0

DSM Program Development – Cost-effectiveness screening

As described in Exhibit No. JH-16, RI worked collaboratively with OUC on the DSM program development process, resulting in a Proposed Goals Scenario, a RIM Scenario, and a TRC Scenario. All technical potential measures were re-analyzed in the DSM program development process.

For the RIM Scenario and TRC Scenario program development, updated non-incentive costs specific to OUC were developed and applied in the updated cost-effectiveness screening of technical potential measures, which included the following criteria for each scenario:

- RIM Scenario – measures that failed the RIM Scenario criteria (RIM test, PCT, and payback period of at least 2 years) were excluded from the initial measure bundling analysis
- TRC Scenario – measures that failed the TRC Scenario criteria (TRC test, PCT, and payback period of at least 2 years) were excluded from the initial measure bundling analysis

Table 5 summarizes the count of unique measures and measure permutations excluded for each scenario at this step:

Table 5: Measures Excluded – DSM Program Development, TRC Scenario and RIM Scenario

Category	Sector	TRC Scenario		RIM Scenario	
		Measures	Permutations	Measures	Permutations
EE	Residential	101	1,061	119	1,173
EE	Commercial	118	5,165	163	5,784
EE	Industrial	93	2,237	112	2,564
DR	Residential	16	48	16	48
DR	Small-Medium Business	13	52	13	52
DR	Large Commercial & Industrial	0	12	0	12
DSRE	Residential	2	2	2	2
DSRE	Non-Residential	7	42	7	42

The development of the Proposed Goals Scenario started with assessment of technical potential measures study that passed, or were close to passing, the economic analysis, as well as measures included in current OUC programs or that may be logical additions to current OUC programs. Therefore, all individual EE measures were included in the initial analysis, as well as Large Commercial DR measures. Due to the DSM program development cost-effectiveness screening resulting in no DSRE measures or DR measures for Residential or Small-Medium Businesses passing the RIM or TRC scenarios, these measures were excluded in the Proposed Goals Scenario analysis.

Economic Sensitivities

As part of the economic analysis, the study included development of sensitivities related to free ridership, future fuel costs, and carbon cost scenarios, as follows:

Sensitivity #1: Higher Fuel Prices

For this sensitivity, both the RIM and TRC scenarios were screened using electric utility supply costs adjusted to a “high fuel” cost scenario. The following table summarizes the number of unique measures and measure permutations that are cost effective under each scenario:

Table 6: Economic Sensitivity #1 – Passing Measures, Higher Fuel Prices

Category*	Sector	TRC Scenario		RIM Scenario	
		Measures	Permutations	Measures	Permutations
EE	Residential	46	349	0	0
EE	Commercial	85	2,011	1	14
EE	Industrial	67	1,338	0	0

*DR measures were not included in the economic sensitivities as fuel prices do not affect DR results.

*No DSRE measures passed the economic screening for this sensitivity.

Sensitivity #2: Lower Fuel Prices

For this sensitivity, both the RIM and TRC scenarios were screened using electric utility supply costs adjusted to a “low fuel” cost scenario. The following table summarizes the number of unique measures and measure permutations that are cost effective under each scenario:

Table 7: Economic Sensitivity #2 – Passing Measures, Lower Fuel Prices

Category*	Sector	TRC Scenario		RIM Scenario	
		Measures	Permutations	Measures	Permutations
EE	Residential	41	304	0	0
EE	Commercial	69	1,360	1	14
EE	Industrial	53	1,049	0	0

*DR measures were not included in the economic sensitivities as fuel prices do not affect DR results.

*No DSRE measures passed the economic screening for this sensitivity.

Sensitivity #3: Shorter free-ridership exclusion periods

For this sensitivity, both the RIM and TRC scenarios were screened as described above for the Economic Analysis, but the simple payback screening criteria was reduced to one year or longer:

Table 8: Economic Sensitivity #3 – Passing Measures, Shorter free-ridership exclusion period

Category*	Sector	TRC Scenario		RIM Scenario	
		Measures	Permutations	Measures	Permutations
EE	Residential	32	238	0	0
EE	Commercial	65	1,141	1	14
EE	Industrial	36	615	0	0

*DR measures were not included in the economic sensitivities as there is negligible customer incremental cost for DR measures and therefore differences in simple payback do not affect DR results.

*No DSRE measures passed the economic screening for this sensitivity.

Sensitivity #4: Longer free-ridership exclusion periods

For this sensitivity, both the RIM and TRC scenarios were screened as described above for the Economic Analysis, but the simple payback screening criteria was increased to three years or longer:

Table 9: Economic Sensitivity #4 – Passing Measures, Longer free-ridership exclusion period

Category*	Sector	TRC Scenario		RIM Scenario	
		Measures	Permutations	Measures	Permutations
EE	Residential	19	85	0	0
EE	Commercial	33	426	0	0
EE	Industrial	14	212	0	0

*DR measures were not included in the economic sensitivities as there is negligible customer incremental cost for DR measures and therefore differences in simple payback do not affect DR results.

*No DSRE measures passed the economic screening for this sensitivity.

Sensitivity #5: Carbon dioxide (CO₂) costs

For this sensitivity, both the RIM and TRC scenarios were screened as described above for the Economic Analysis, but the avoided electric utility supply costs forecast was adjusted to include consideration of an additional impact for emissions assuming that there was an economic charge for carbon dioxide.

Table 10: Economic Sensitivity #5 – Passing Measures, Carbon dioxide costs

Category*	Sector	TRC Scenario		RIM Scenario	
		Measures	Permutations	Measures	Permutations
EE	Residential	43	316	0	0
EE	Commercial	82	1,835	1	14
EE	Industrial	65	1,288	0	0

*DR measures were not included in the economic sensitivities as the estimated carbon dioxide costs do not affect DR results.

*No DSRE measures passed the economic screening for this sensitivity.

Exhibit JH-14

FPUC Program Development Summary

Overview

RI worked collaboratively with FPUC on the DSM program development process to develop impacts under three scenarios: 1) potential DSM programs that contribute to proposed DSM goals (Proposed Goals Scenario), 2) potential DSM programs that pass the Participant and Rate Impact Measure Tests (RIM Scenario), and 3) potential DSM programs that pass the Participant and Total Resource Cost Tests (TRC Scenario).

Methodology

The development of DSM programs for each scenario included incorporating the measures and measure impacts developed for the Technical Potential (TP) study, reviewing FPUC's current program offerings, collaboration with FPUC on program concepts that are beneficial for their customers, and analysis of economic impacts and market adoption to create potential DSM programs. This process included the following steps:

Program Review and Measure Bundling

The analysis began with the measures from the TP study. This measure list was initially refined for program development for each scenario as follows:

1. Proposed Goals scenario – measures that passed, or were close to passing, either the TRC or RIM tests were prioritized in the initial measure bundling analysis. Measures included in current FPUC programs were also identified and included in the initial measure bundling.
2. RIM Scenario – measures that passed the RIM Scenario criteria (RIM test, PCT, and payback period of at least 2 years) were included in the initial measure bundling analysis
3. TRC Scenario – measures that passed the TRC Scenario criteria (TRC test, PCT, and payback period of at least 2 years) were included in the initial measure bundling analysis

Resource Innovations then reviewed current FPUC programs and eligible measures, and mapped individual measures to the appropriate programs for each scenario. Resource Innovations worked collaboratively with FPUC to collect program information (e.g. program manuals, participation records, energy and demand savings, budgets) and review the existing programs to determine which measures should be included in the initial program portfolios. In addition, a gap analysis was conducted to identify measures included in each scenario that are not currently offered by FPUC. These measures were either included in existing programs where there was a logical fit, or included as a new program concept.

Program Refinement and Modeling

After identifying the preliminary measure bundles and programs, Resource Innovations worked collaboratively with FPUC to develop incentive amounts and non-incentive costs. Non-incentive costs, which include costs to manage, administer, and market the program, were developed based on current FPUC program costs as well as secondary data on similar programs offered by other utilities, and refined as needed based on the proposed program delivery structure. Incentive costs were developed for each scenario as follows:

1. Proposed Goals scenario – preliminary incentive rates were informed by current incentives offered by FPUC as well as typical incentive levels offered by similar programs regionally and nationally.
2. RIM Scenario – incentive rates were developed based on the available net benefits for each measure, based on total RIM benefits minus RIM costs. Next, the incentive amount that would result in a simple payback period of two years for each measure was calculated. The final incentive applied for the measure was based on the lower of these two values.
3. TRC Scenario – the incentive amount required to result in a simple payback period of two years for each measure was used as the final incentive for the measure.

Measures included in the initial program concepts for each scenario were analyzed in RI's TEA-POT model to update the economic analysis based on the FPUC-specific non-incentive and incentive costs, and to estimate market adoption for each measure. The economic analysis included calculating updated RIM, TRC, and PCT costs and benefits for each measure and re-screening measures for each scenario.

RI's market adoption estimates use a payback acceptance criterion to estimate long-run market shares for measures as a function of measure incremental costs and expected bill savings over the measures' effective useful life (inclusive of utility incentives). Incremental adoption estimates are based on the Bass Diffusion Model, which is a mathematical description of how the rate of new product diffusion changes over time. For this study, adoption curve input parameters were developed for each measure based on specific criteria, including measure maturity in the market, overall measure cost, and whether the measure was currently offered through a utility program. RI's TEA-POT model then calculated demand and energy savings by applying estimated adoption rates to each cost-effective measure.

The TEA-POT modeling results were exported into RI's Program Planner workbook that aggregated the individual measure results into program and portfolio impacts for each scenario. For the TRC Scenario and RIM Scenario no further refinements to the programs were made. For the Proposed Goals scenario, RI continued to work collaboratively with FPUC to identify the measures and program concepts that comprise the proposed DSM goals. These impacts for each scenario are provided below.

Results

Proposed Goals Scenario

The Proposed Goals Scenario is described in more detail in Witness Craig’s testimony. The following tables include the program-level details for this scenario.

Table 1. Proposed DSM Goals – Annual MWh Targets

Annual MWh	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Audits/EE Kits	77	79	80	81	82	84	84	86	87	88
Res Heating & Cooling Upgrade	216	226	237	247	251	248	237	219	199	182
Res Low Income	70	70	70	70	70	70	70	70	70	70
Res Equipment Rebates	1	2	2	3	4	4	5	5	5	5
Residential Total	365	377	390	401	407	406	396	380	361	345
Com Heating & Cooling Upgrade	25	29	32	36	39	42	45	46	47	47
Com Chiller Upgrade	4	4	5	5	6	6	6	7	7	7
Com Lighting	70	96	125	157	188	216	236	247	247	240
Non-Residential Total	100	129	163	198	233	264	287	300	301	294
Portfolio Total	465	507	553	599	641	671	683	679	663	638

Table 2. Proposed DSM Goals – Annual summer MW Targets

Annual Summer MW	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Audits/EE Kits	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Res Heating & Cooling Upgrade	0.03	0.04	0.04	0.05	0.05	0.05	0.05	0.04	0.03	0.03
Res Low Income	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Res Equipment Rebates	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Residential Total	0.05	0.05	0.06	0.06	0.07	0.07	0.07	0.06	0.05	0.04
Com Heating & Cooling Upgrade	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Com Chiller Upgrade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Com Lighting	0.01	0.01	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03
Non-Residential Total	0.02	0.02	0.03	0.03	0.04	0.04	0.04	0.04	0.05	0.04
Portfolio Total	0.06	0.07	0.09	0.10	0.10	0.11	0.11	0.10	0.10	0.09

Table 3. Proposed DSM Goals – Annual winter MW Targets

Annual Winter MW	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Audits/EE Kits	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03
Res Heating & Cooling Upgrade	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.10	0.10	0.09
Res Low Income	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Res Equipment Rebates	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Residential Total	0.15	0.15	0.16	0.16	0.16	0.15	0.15	0.15	0.14	0.14
Com Heating & Cooling Upgrade	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02
Com Chiller Upgrade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Com Lighting	0.01	0.01	0.01	0.02	0.02	0.02	0.03	0.03	0.03	0.03
Non-Residential Total	0.02	0.02	0.02	0.03	0.03	0.04	0.04	0.04	0.04	0.04
Portfolio Total	0.17	0.17	0.18	0.18	0.19	0.19	0.19	0.19	0.18	0.18

Table 4. Proposed DSM Goals – Annual Participation Targets

Annual Participation (# measures)	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Audits/EE Kits	110	112	114	115	117	119	120	122	124	125
Res Heating & Cooling Upgrade	159	192	227	259	278	277	255	214	169	130
Res Low Income	100	100	100	100	100	100	100	100	100	100
Res Equipment Rebates	6	8	11	13	15	17	18	20	21	21
Residential Total	375	412	452	487	510	513	493	456	414	376
Com Heating & Cooling Upgrade	47	53	61	68	74	81	86	88	87	86
Com Chiller Upgrade	3	3	3	3	3	3	3	3	3	3
Com Lighting	228	307	398	495	587	671	733	770	782	770
Non-Residential Total	278	363	462	566	664	755	822	861	872	859
Portfolio Total	653	775	914	1,053	1,174	1,268	1,315	1,317	1,286	1,235

Table 5. Proposed DSM Goals – Annual Program Budget Estimates

Budgets (\$ in thousands)	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Audits/EE Kits	\$42	\$43	\$44	\$44	\$45	\$46	\$46	\$47	\$47	\$48
Res Heating & Cooling Upgrade	\$343	\$352	\$361	\$368	\$373	\$372	\$365	\$353	\$341	\$329
Res Low Income	\$38	\$38	\$38	\$38	\$38	\$38	\$38	\$38	\$38	\$38
Res Equipment Rebates	\$6	\$9	\$11	\$14	\$17	\$19	\$21	\$23	\$24	\$24
Residential Total	\$430	\$442	\$454	\$465	\$472	\$475	\$470	\$461	\$450	\$440
Com Heating & Cooling Upgrade	\$7	\$8	\$9	\$10	\$11	\$12	\$13	\$13	\$13	\$13
Com Chiller Upgrade	\$5	\$6	\$7	\$7	\$8	\$8	\$8	\$9	\$9	\$10
Com Lighting	\$22	\$30	\$39	\$49	\$59	\$67	\$73	\$77	\$78	\$76
Non-Residential Total	\$35	\$44	\$55	\$66	\$77	\$87	\$94	\$99	\$100	\$99
Portfolio Total	\$465	\$486	\$509	\$531	\$550	\$561	\$564	\$559	\$550	\$539

Table 6. Proposed DSM Goals – Cost-Effectiveness Results

Program Cost-Effectiveness	TRC		PCT		RIM	
	Net Benefits (\$)	Benefit/Cost Ratio	Net Benefits (\$)	Benefit/Cost Ratio	Net Benefits (\$)	Benefit/Cost Ratio
Res Audits/EE Kits	-20,710	1.0	737,550	11.0	-758,260	0.4
Res Heating & Cooling Upgrade	244,618	1.1	2,390,828	4.9	-2,146,210	0.4
Res Low Income	-17,581	1.0	626,103	11.0	-643,684	0.4
Res Equipment Rebates	-878	1.0	27,633	2.6	-28,511	0.5
Residential Total	205,449	1.08	3,782,114	5.91	-3,576,665	0.41
Com Heating & Cooling Upgrade	38,818	1.2	325,422	2.7	-286,605	0.5
Com Chiller Upgrade	-18,437	0.8	71,567	3.2	-90,003	0.4
Com Lighting	81,939	1.1	1,987,725	3.6	-1,905,787	0.4
Non-Residential Total	102,319	1.07	2,384,714	3.43	-2,282,395	0.40
Portfolio Total	307,769	1.08	6,166,829	4.52	-5,859,060	0.41

RIM Scenario

The RIM Scenario is comprised of measures and programs that achieved a cost-effectiveness ratio of 1.0 or higher for the PCT and RIM test, and measures that had a simple payback of two years or more (without consideration of incentives).

FPUC did not have any measures or programs that passed the cost-effectiveness screening for the RIM Scenario.

TRC Scenario

The TRC Scenario is comprised of measures and programs that achieved a cost-effectiveness ratio of 1.0 or higher for the PCT and TRC test, and measures that had a simple payback of two years or more (without consideration of incentives). Incentive rates were based on the maximum incentive amount that would result in a simple payback period of two years for each measure. The following tables include the program-level details for this scenario.

Table 7. TRC Scenario – Annual MWh Targets

Annual MWh	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Audits/EE Kits	1	2	3	3	4	5	5	5	5	4
Res Heating & Cooling Upgrade	82	88	93	99	104	109	112	114	115	115
Res New Home	34	46	60	75	89	101	111	118	122	125
Res Low Income	0	0	1	1	1	1	1	1	1	1
Res Building Envelope	16	17	18	20	21	23	24	26	27	29
Res Water Heating	109	137	167	198	228	255	277	295	308	317
Res Equipment Rebates	17	22	29	37	45	52	57	58	54	48
Res HVAC Improvements	14	15	17	19	20	21	22	23	24	25
Residential Total	272	328	389	451	512	566	609	639	657	663
Com Heating & Cooling Upgrade	40	45	50	55	59	63	66	69	70	71
Com Reflective Roof	0	0	0	0	0	0	0	0	0	0
Com Chiller Upgrade	6	7	7	8	8	9	9	10	10	10
Com Small Business	8	11	15	18	22	25	27	29	30	30
Com Custom	171	191	215	243	272	301	324	339	342	332
Com Lighting	68	93	121	152	182	208	228	238	239	231
Com Prescriptive	59	74	91	109	127	143	156	166	171	173
Non-Residential Total	351	420	499	584	670	749	811	850	862	848
Portfolio Total	624	748	888	1,035	1,182	1,314	1,420	1,490	1,519	1,511

Table 8. TRC Scenario – Annual summer MW Targets

Annual Summer MW	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Audits/EE Kits	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Res Heating & Cooling Upgrade	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Res New Home	0.01	0.01	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.04
Res Low Income	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Res Building Envelope	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Res Water Heating	0.01	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03
Res Equipment Rebates	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
Res HVAC Improvements	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Residential Total	0.05	0.06	0.07	0.08	0.10	0.11	0.11	0.12	0.12	0.13
Com Heating & Cooling Upgrade	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Com Reflective Roof	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Com Chiller Upgrade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Com Small Business	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Com Custom	0.03	0.03	0.03	0.04	0.04	0.04	0.05	0.05	0.05	0.05
Com Lighting	0.01	0.01	0.01	0.02	0.02	0.03	0.03	0.03	0.03	0.03
Com Prescriptive	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Non-Residential Total	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.13	0.13
Portfolio Total	0.11	0.13	0.15	0.18	0.20	0.22	0.24	0.25	0.25	0.25

Table 9. TRC Scenario – Annual winter MW Targets

Annual Winter MW	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Audits/EE Kits	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Res Heating & Cooling Upgrade	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.05
Res New Home	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Res Low Income	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Res Building Envelope	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01
Res Water Heating	0.03	0.03	0.04	0.05	0.06	0.06	0.07	0.07	0.08	0.08
Res Equipment Rebates	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.00
Res HVAC Improvements	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Residential Total	0.08	0.09	0.10	0.11	0.12	0.13	0.14	0.15	0.15	0.15
Com Heating & Cooling Upgrade	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Com Reflective Roof	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Com Chiller Upgrade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Com Small Business	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Com Custom	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.05	0.05	0.04
Com Lighting	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.03	0.03	0.02
Com Prescriptive	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03
Non-Residential Total	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.12	0.12	0.12
Portfolio Total	0.14	0.16	0.18	0.20	0.22	0.24	0.26	0.27	0.27	0.27

Table 10. TRC Scenario – Annual Participation Targets

Annual Participation (# measures)	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Audits/EE Kits	29	40	52	66	81	94	103	103	94	78
Res Heating & Cooling Upgrade	73	82	92	100	109	116	122	126	127	125
Res New Home	8	11	13	16	19	22	24	25	27	27
Res Low Income	8	10	13	17	21	24	26	26	24	20
Res Building Envelope	35	38	41	44	46	50	53	56	60	63
Res Water Heating	113	143	176	209	241	269	290	309	321	328
Res Equipment Rebates	172	229	302	383	467	541	588	591	545	459
Res HVAC Improvements	24	27	30	32	34	36	38	40	41	43
Residential Total	462	580	719	867	1,018	1,152	1,244	1,276	1,239	1,143
Com Heating & Cooling Upgrade	66	74	78	83	88	91	95	97	100	103
Com Reflective Roof	1	1	1	1	1	1	1	1	1	1
Com Chiller Upgrade	4	4	4	4	4	4	4	4	4	4
Com Small Business	40	52	67	82	96	109	119	126	130	134
Com Custom	40	45	52	61	67	77	82	87	90	88
Com Lighting	218	290	376	470	557	636	694	729	739	728
Com Prescriptive	61	71	83	95	107	119	128	134	134	137
Non-Residential Total	430	537	661	796	920	1,037	1,123	1,178	1,198	1,195
Portfolio Total	892	1,117	1,380	1,663	1,938	2,189	2,367	2,454	2,437	2,338

Table 11. TRC Scenario – Annual Program Budget Estimates

Budgets (\$ in thousands)	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Audits/EE Kits	\$1	\$1	\$1	\$1	\$2	\$2	\$2	\$2	\$2	\$2
Res Heating & Cooling Upgrade	\$89	\$98	\$105	\$113	\$119	\$125	\$129	\$133	\$136	\$138
Res New Home	\$13	\$18	\$23	\$29	\$34	\$39	\$42	\$45	\$47	\$48
Res Low Income	\$0	\$0	\$0	\$0	\$0	\$0	\$1	\$1	\$0	\$0
Res Building Envelope	\$24	\$26	\$28	\$30	\$32	\$34	\$37	\$39	\$42	\$44
Res Water Heating	\$236	\$291	\$351	\$412	\$471	\$525	\$571	\$608	\$638	\$660
Res Equipment Rebates	\$3	\$4	\$5	\$6	\$8	\$9	\$9	\$10	\$9	\$9
Res HVAC Improvements	\$4	\$4	\$5	\$5	\$6	\$6	\$6	\$7	\$7	\$7
Residential Total	\$369	\$442	\$519	\$597	\$672	\$740	\$798	\$845	\$881	\$907
Com Heating & Cooling Upgrade	\$14	\$16	\$18	\$19	\$21	\$22	\$23	\$24	\$25	\$25
Com Reflective Roof	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Com Chiller Upgrade	\$6	\$7	\$8	\$8	\$9	\$10	\$10	\$10	\$11	\$11
Com Small Business	\$3	\$4	\$5	\$6	\$7	\$8	\$9	\$9	\$9	\$10
Com Custom	\$36	\$39	\$43	\$47	\$52	\$56	\$60	\$62	\$62	\$60
Com Lighting	\$21	\$29	\$38	\$48	\$57	\$65	\$71	\$75	\$75	\$74
Com Prescriptive	\$11	\$14	\$18	\$21	\$24	\$27	\$30	\$31	\$32	\$32
Non-Residential Total	\$92	\$109	\$129	\$149	\$170	\$188	\$203	\$212	\$215	\$212
Portfolio Total	\$462	\$551	\$647	\$746	\$842	\$928	\$1,001	\$1,057	\$1,096	\$1,120

Table 12. TRC Scenario – Cost-Effectiveness Results

Program Cost-Effectiveness	TRC		PCT		RIM	
	Net Benefits (\$)	Benefit/Cost Ratio	Net Benefits (\$)	Benefit/Cost Ratio	Net Benefits (\$)	Benefit/Cost Ratio
Res Audits/EE Kits	475	1.0	32,626	3.4	-32,151	0.4
Res Heating & Cooling Upgrade	463,150	1.3	2,014,437	3.1	-1,551,287	0.3
Res New Home	371,130	1.7	982,183	3.8	-611,053	0.6
Res Low Income	119	1.0	8,156	3.4	-8,038	0.4
Res Building Envelope	98,763	1.3	461,433	2.4	-362,670	0.4
Res Water Heating	10,014,754	2.8	15,834,646	3.9	-5,819,893	0.2
Res Equipment Rebates	30,657	1.2	237,813	2.7	-207,156	0.5
Res HVAC Improvements	110,285	2.1	179,830	3.1	-69,545	0.7
Residential Total	11,089,333	2.36	19,751,125	3.71	-8,661,792	0.32
Com Heating & Cooling Upgrade	71,682	1.2	585,797	2.9	-514,115	0.5
Com Reflective Roof	38	1.7	123	3.4	-85	0.5
Com Chiller Upgrade	1,693	1.0	116,310	3.3	-114,617	0.4
Com Small Business	21,509	1.2	250,843	3.5	-229,334	0.4

Program Cost-Effectiveness	TRC		PCT		RIM	
	Net Benefits (\$)	Benefit/Cost Ratio	Net Benefits (\$)	Benefit/Cost Ratio	Net Benefits (\$)	Benefit/Cost Ratio
Com Custom	715,191	1.6	4,255,057	5.3	-3,539,866	0.3
Com Lighting	79,182	1.1	1,970,849	3.7	-1,891,668	0.4
Com Prescriptive	281,726	1.5	1,544,942	4.2	-1,263,216	0.4
Non-Residential Total	1,171,020	1.35	8,723,921	4.30	-7,552,900	0.37
Portfolio Total	12,260,353	2.07	28,475,046	3.87	-16,214,692	0.35

Exhibit JH-15

JEA Program Development Summary

Overview

RI worked collaboratively with JEA on the DSM program development process to develop impacts under three scenarios: 1) potential DSM programs that contribute to proposed DSM goals (Proposed Goals Scenario), 2) potential DSM programs that pass the Participant and Rate Impact Measure Tests (RIM Scenario), and 3) potential DSM programs that pass the Participant and Total Resource Cost Tests (TRC Scenario).

Methodology

The development of DSM programs for each scenario included incorporating the measures and measure impacts developed for the Technical Potential (TP) study, reviewing JEA's current program offerings, collaboration with JEA on program concepts that are beneficial for their customers, and analysis of economic impacts and market adoption to create potential DSM programs. This process included the following steps:

Program Review and Measure Bundling

The analysis began with the measures from the TP study. This measure list was initially refined for program development for each scenario as follows:

1. Proposed Goals scenario – measures that passed, or were close to passing, either the TRC or RIM tests were prioritized in the initial measure bundling analysis. Measures included in current JEA programs were also identified and included in the initial measure bundling.
2. RIM Scenario – measures that passed the RIM Scenario criteria (RIM test, PCT, and payback period of at least 2 years) were included in the initial measure bundling analysis
3. TRC Scenario – measures that passed the TRC Scenario criteria (TRC test, PCT, and payback period of at least 2 years) were included in the initial measure bundling analysis

Resource Innovations then reviewed current JEA programs and eligible measures, and mapped individual measures to the appropriate programs for each scenario. Resource Innovations worked collaboratively with JEA to collect program information (e.g. program manuals, participation records, energy and demand savings, budgets) and review the existing programs to determine which measures should be included in the initial program portfolios. In addition, a gap analysis was conducted to identify measures included in each scenario that are not currently offered by JEA. These measures were either included in existing programs where there was a logical fit, or included as a new program concept.

Program Refinement and Modeling

After identifying the preliminary measure bundles and programs, Resource Innovations worked collaboratively with JEA to develop incentive amounts and non-incentive costs. Non-incentive costs, which include costs to manage, administer, and market the program, were developed based on current JEA program costs as well as secondary data on similar programs offered by other utilities, and refined as needed based on the proposed program delivery structure. Incentive costs were developed for each scenario as follows:

1. Proposed Goals scenario – preliminary incentive rates were informed by current incentives offered by JEA as well as typical incentive levels offered by similar programs regionally and nationally.
2. RIM Scenario – incentive rates were developed based on the available net benefits for each measure, based on total RIM benefits minus RIM costs. Next, the incentive amount that would result in a simple payback period of two years for each measure was calculated. The final incentive applied for the measure was based on the lower of these two values.
3. TRC Scenario – the incentive amount required to result in a simple payback period of two years for each measure was used as the final incentive for the measure.

Measures included in the initial program concepts for each scenario were analyzed in RI's TEA-POT model to update the economic analysis based on the JEA-specific non-incentive and incentive costs, and to estimate market adoption for each measure. The economic analysis included calculating updated RIM, TRC, and PCT costs and benefits for each measure and re-screening measures for each scenario.

RI's market adoption estimates use a payback acceptance criterion to estimate long-run market shares for measures as a function of measure incremental costs and expected bill savings over the measures' effective useful life (inclusive of utility incentives). Incremental adoption estimates are based on the Bass Diffusion Model, which is a mathematical description of how the rate of new product diffusion changes over time. For this study, adoption curve input parameters were developed for each measure based on specific criteria, including measure maturity in the market, overall measure cost, and whether the measure was currently offered through a utility program. RI's TEA-POT model then calculated demand and energy savings by applying estimated adoption rates to each cost-effective measure.

The TEA-POT modeling results were exported into RI's Program Planner workbook that aggregated the individual measure results into program and portfolio impacts for each scenario. For the TRC Scenario and RIM Scenario no further refinements to the programs were made. For the Proposed Goals scenario, RI continued to work collaboratively with JEA to identify the measures and program concepts that comprise the proposed DSM goals. These impacts for each scenario are provided below.

Results

Proposed Goals Scenario

The Proposed Goals Scenario is described in more detail in Witness Pippin’s testimony. The following tables include the program-level details for this scenario.

Table 1. Proposed DSM Goals – Annual MWh Targets

Annual MWh	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Home Efficiency Upgrade	1,039	1,196	1,363	1,535	1,702	1,854	1,983	2,088	2,171	2,237
Res EE Products	1,055	1,389	1,800	2,281	2,797	3,279	3,625	3,730	3,537	3,088
Res Neighborhood	1,078	1,086	1,094	1,101	1,109	1,117	1,125	1,133	1,141	1,149
Residential Total	3,172	3,670	4,257	4,917	5,608	6,250	6,733	6,951	6,850	6,474
Com Lighting	3,346	3,562	3,771	3,975	4,169	4,334	4,444	4,470	4,403	4,257
Non-Residential Total	3,346	3,562	3,771	3,975	4,169	4,334	4,444	4,470	4,403	4,257
Portfolio Total	6,518	7,232	8,028	8,893	9,777	10,584	11,176	11,422	11,252	10,731

Table 2. Proposed DSM Goals – Annual summer MW Targets

Annual Summer MW	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Home Efficiency Upgrade	0.13	0.15	0.17	0.19	0.21	0.23	0.25	0.26	0.28	0.29
Res EE Products	0.40	0.54	0.72	0.92	1.14	1.35	1.50	1.55	1.46	1.26
Res Neighborhood	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Residential Total	0.68	0.84	1.03	1.26	1.50	1.73	1.90	1.96	1.89	1.70
Com Lighting	0.44	0.47	0.50	0.53	0.56	0.58	0.60	0.60	0.59	0.57
Non-Residential Total	0.44	0.47	0.50	0.53	0.56	0.58	0.60	0.60	0.59	0.57
Portfolio Total	1.12	1.31	1.53	1.79	2.06	2.31	2.50	2.56	2.48	2.27

Table 3. Proposed DSM Goals – Annual winter MW Targets

Annual Winter MW	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Home Efficiency Upgrade	0.45	0.50	0.55	0.61	0.66	0.70	0.74	0.77	0.79	0.81
Res EE Products	0.17	0.23	0.30	0.38	0.47	0.55	0.60	0.61	0.57	0.49
Res Neighborhood	0.26	0.26	0.26	0.26	0.26	0.26	0.27	0.27	0.27	0.27
Residential Total	0.88	0.99	1.11	1.25	1.38	1.51	1.60	1.65	1.63	1.57
Com Lighting	0.37	0.39	0.41	0.42	0.44	0.45	0.46	0.46	0.46	0.45
Non-Residential Total	0.37	0.39	0.41	0.42	0.44	0.45	0.46	0.46	0.46	0.45
Portfolio Total	1.24	1.37	1.51	1.67	1.82	1.96	2.07	2.11	2.09	2.02

Table 4. Proposed DSM Goals – Annual Participation Targets

Annual Participation (# measures)	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Home Efficiency Upgrade	351	431	519	612	700	783	853	909	950	981
Res EE Products	2,680	3,438	4,353	5,409	6,536	7,587	8,349	8,603	8,229	7,317
Res Neighborhood	1,273	1,281	1,289	1,298	1,307	1,316	1,325	1,335	1,344	1,350
Residential Total	4,304	5,150	6,161	7,319	8,543	9,686	10,527	10,847	10,523	9,648
Com Lighting	11,203	11,898	12,503	13,037	13,500	13,874	14,133	14,244	14,199	14,029
Non-Residential Total	11,203	11,898	12,503	13,037	13,500	13,874	14,133	14,244	14,199	14,029
Portfolio Total	15,507	17,048	18,664	20,356	22,043	23,560	24,660	25,091	24,722	23,677

Table 5. Proposed DSM Goals – Annual Program Budget Estimates

Budgets (\$ in thousands)	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Home Efficiency Upgrade	\$1,112	\$1,340	\$1,588	\$1,845	\$2,096	\$2,325	\$2,520	\$2,680	\$2,805	\$2,904
Res EE Products	\$280	\$366	\$472	\$595	\$728	\$852	\$941	\$968	\$920	\$806
Res Neighborhood	\$444	\$446	\$448	\$450	\$452	\$454	\$456	\$458	\$460	\$462
Residential Total	\$1,836	\$2,153	\$2,509	\$2,891	\$3,276	\$3,630	\$3,917	\$4,106	\$4,185	\$4,172
Com Lighting	\$900	\$974	\$1,044	\$1,111	\$1,174	\$1,228	\$1,266	\$1,281	\$1,270	\$1,238
Non-Residential Total	\$900	\$974	\$1,044	\$1,111	\$1,174	\$1,228	\$1,266	\$1,281	\$1,270	\$1,238
Portfolio Total	\$2,736	\$3,127	\$3,553	\$4,002	\$4,450	\$4,858	\$5,182	\$5,386	\$5,455	\$5,409

Table 6. Proposed DSM Goals – Cost-Effectiveness Results

Program Cost-Effectiveness	TRC		PCT		RIM	
	Net Benefits (\$)	Benefit/Cost Ratio	Net Benefits (\$)	Benefit/Cost Ratio	Net Benefits (\$)	Benefit/Cost Ratio
Res Home Efficiency Upgrade	9,026,783	1.6	18,157,755	2.6	-9,130,972	0.6
Res EE Products	5,361,319	1.4	18,094,140	3.5	-12,732,821	0.6
Res Neighborhood	975,832	1.2	9,031,701	6.4	-8,055,869	0.4
Residential Total	15,363,935	1.48	45,283,597	3.22	-29,919,662	0.56
Com Lighting	3,616,165	1.2	55,998,344	4.5	-52,382,179	0.3
Non-Residential Total	3,616,165	1.19	55,998,344	4.46	-52,382,179	0.30
Portfolio Total	18,980,100	1.38	101,281,941	3.77	-82,301,841	0.42

RIM Scenario

The RIM Scenario is comprised of measures and programs that achieved a cost-effectiveness ratio of 1.0 or higher for the PCT and RIM test, and measures that had a simple payback of two years or more (without consideration of incentives). Incentive rates were calculated from the RIM net benefit available and the incentive amount that would result in a simple payback period of two years for each measure. The maximum incentive was based on the lower of these two values. The following tables include the program-level details for this scenario.

Energy Efficiency Programs

Table 7. RIM Scenario – Annual MWh Targets

Annual MWh	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Home Efficiency Upgrade	12.39	12.06	11.72	11.36	10.99	10.61	10.23	9.84	9.46	9.08
Residential Total	12.39	12.06	11.72	11.36	10.99	10.61	10.23	9.84	9.46	9.08
Non-Residential Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Portfolio Total	12.39	12.06	11.72	11.36	10.99	10.61	10.23	9.84	9.46	9.08

Table 8. RIM Scenario – Annual summer MW Targets

Annual Summer MW	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Home Efficiency Upgrade	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Residential Total	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Non-Residential Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Portfolio Total	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

Table 9. RIM Scenario – Annual winter MW Targets

Annual Winter MW	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Home Efficiency Upgrade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Residential Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Non-Residential Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Portfolio Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 10. RIM Scenario – Annual Participation Targets

Annual Participation (# measures)	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Home Efficiency Upgrade	8	8	7	7	7	7	7	7	6	6
Residential Total	8	8	7	7	7	7	7	7	6	6
Non-Residential Total	0	0	0	0	0	0	0	0	0	0
Portfolio Total	8	8	7	7	7	7	7	7	6	6

Table 11. RIM Scenario – Annual Program Budget Estimates

Budgets (\$ in thousands)	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Home Efficiency Upgrade	\$3.03	\$2.95	\$2.86	\$2.78	\$2.69	\$2.59	\$2.50	\$2.40	\$2.31	\$2.22
Residential Total	\$3.03	\$2.95	\$2.86	\$2.78	\$2.69	\$2.59	\$2.50	\$2.40	\$2.31	\$2.22
Non-Residential Total	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Portfolio Total	\$3.03	\$2.95	\$2.86	\$2.78	\$2.69	\$2.59	\$2.50	\$2.40	\$2.31	\$2.22

Table 12. RIM Scenario – Cost-Effectiveness Results

Program Cost- Effectiveness	TRC		PCT		RIM	
	Net Benefits (\$)	Benefit/ Cost Ratio	Net Benefits (\$)	Benefit/ Cost Ratio	Net Benefits (\$)	Benefit/ Cost Ratio
Res Home Efficiency Upgrade	124,743	3.0	124,733	3.9	10	1.0
Residential Total	124,743	2.98	124,733	3.93	10	1.00
Non-Residential Total	0	0.00	0	0.00	0	0.00
Portfolio Total	124,743	2.98	124,733	3.93	10	1.00

Demand Response Programs

The RIM Scenario analysis resulted in four cost-effective demand response measures for the largest commercial and industrial segment, which includes customers over 500 kW. The four DR measures are presented as individual potential program options in the following tables. Each’s program’s cost and impact estimates were developed independent of the other programs; therefore, because the measures apply to the same target population of large commercial and industrial customers, the savings and participation are not additive.

Table 13. RIM Scenario – Commercial Demand Response - Automated DR Program

Annual Impacts	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Annual MWh	0	0	0	0	0	0	0	0	0	0
Summer MW (Cumulative)	11.4	20.2	27.2	32.6	36.8	40.1	42.6	44.6	46.2	47.4
Winter MW (Cumulative)	8.9	15.8	21.2	25.5	28.8	31.3	33.3	34.9	36.1	37.1
Participation (Cumulative)	8	13	18	22	24	27	28	30	31	32
Program Costs (\$ in Thousands)	\$3,671	\$1,885	\$2,049	\$2,176	\$2,276	\$2,353	\$2,414	\$2,461	\$2,498	\$2,527
COST EFFECTIVENESS	Net Benefits		Benefit/Cost Ratio							
TRC	\$8,483,023		1.38							
RIM	\$8,483,023		1.38							

Table 14. RIM Scenario – Commercial Demand Response – Critical Peak Pricing (CPP) Program

Annual Impacts	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Annual MWh	0	0	0	0	0	0	0	0	0	0
Summer MW (Cumulative)	9.4	16.8	22.5	27.0	30.4	33.2	35.3	36.9	38.2	39.2
Winter MW (Cumulative)	7.4	15.8	21.2	25.5	28.8	31.3	33.3	34.9	36.1	37.1
Participation (Cumulative)	8	13	18	22	24	27	28	30	31	32
Program Costs (\$ in Thousands)	\$3,671	\$1,740	\$1,875	\$1,981	\$2,063	\$2,127	\$2,177	\$2,217	\$2,247	\$2,271
COST EFFECTIVENESS	Net Benefits		Benefit/Cost Ratio							
TRC	\$4,935,709		1.24							
RIM	\$4,935,709		1.24							

Table 15. RIM Scenario – Commercial Demand Response – Firm Service Level Program

Annual Impacts	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Annual MWh	0	0	0	0	0	0	0	0	0	0
Summer MW (Cumulative)	9.4	16.8	22.5	27.0	30.4	33.2	35.3	36.9	38.2	39.2
Winter MW (Cumulative)	7.4	13.1	17.6	21.1	23.8	25.9	27.6	28.9	29.9	30.7
Participation (Cumulative)	8	13	18	22	24	27	28	30	31	32
Program Costs (\$ in Thousands)	\$1,721	\$1,674	\$1,759	\$1,825	\$1,876	\$1,916	\$1,947	\$1,972	\$1,991	\$2,006
COST EFFECTIVENESS	Net Benefits		Benefit/Cost Ratio							
TRC	\$8,454,026		1.50							
RIM	\$8,454,026		1.50							

Table 16. RIM Scenario – Commercial Demand Response – Guaranteed Load Drop Program

Annual Impacts	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Annual MWh	0	0	0	0	0	0	0	0	0	0
Summer MW (Cumulative)	9.4	16.8	22.5	27.0	30.4	33.2	35.3	36.9	38.2	39.2
Winter MW (Cumulative)	7.4	13.1	17.6	21.1	23.8	25.9	27.6	28.9	29.9	30.7
Participation (Cumulative)	8	13	18	22	24	27	28	30	31	32
Program Costs (\$ in Thousands)	\$1,721	\$1,674	\$1,759	\$1,825	\$1,876	\$1,916	\$1,947	\$1,972	\$1,991	\$2,006
COST EFFECTIVENESS	Net Benefits		Benefit/Cost Ratio							
TRC	\$8,454,026		1.50							
RIM	\$8,454,026		1.50							

Demand-Side Renewable Energy Programs

JEA did not have any DSRE measures or programs that passed the cost-effectiveness screening for the RIM Scenario.

TRC Scenario

The TRC Scenario is comprised of measures and programs that achieved a cost-effectiveness ratio of 1.0 or higher for the PCT and TRC test, and measures that had a simple payback of two years or more (without consideration of incentives). Incentive rates were based on the maximum incentive amount that would result in a simple payback period of two years for each measure. The following tables include the program-level details for this scenario.

Energy Efficiency Programs

Table 17. TRC Scenario – Annual MWh Targets

Annual MWh	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Audit	0	0	0	0	0	0	0	0	0	0
Res Home Efficiency Upgrade	4,760	5,843	7,045	8,307	9,544	10,667	11,615	12,368	12,939	13,364
Res EE Products	165	186	206	224	241	256	270	283	295	305
Res Marketplace	915	1,258	1,688	2,195	2,743	3,254	3,621	3,731	3,525	3,047
Res New Home	663	922	1,222	1,543	1,859	2,146	2,385	2,572	2,711	2,814
Res Neighborhood	43	58	78	102	127	149	165	168	156	132
Res Solar Water Heating	478	536	589	637	679	716	748	776	800	820
Residential Total	7,023	8,804	10,828	13,007	15,192	17,188	18,804	19,897	20,426	20,483
Com Audit	0	0	0	0	0	0	0	0	0	0
Com Prescriptive	3,683	4,378	5,131	5,927	6,729	7,472	8,070	8,443	8,552	8,424
Com Lighting	2,888	3,029	3,165	3,296	3,419	3,522	3,585	3,590	3,529	3,414
Com Custom	7,874	8,258	8,765	9,356	9,973	10,535	10,952	11,154	11,108	10,833
Com Small Business	869	958	1,057	1,167	1,279	1,377	1,441	1,448	1,389	1,277
Non-Residential Total	15,314	16,623	18,118	19,746	21,400	22,905	24,048	24,636	24,578	23,948
Portfolio Total	22,338	25,427	28,946	32,753	36,592	40,093	42,852	44,533	45,003	44,430

Table 18. TRC Scenario – Annual summer MW Targets

Annual Summer MW	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Audit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Res Home Efficiency Upgrade	0.71	0.85	1.02	1.19	1.36	1.51	1.64	1.75	1.83	1.90
Res EE Products	0.04	0.04	0.04	0.05	0.05	0.05	0.06	0.06	0.06	0.06
Res Marketplace	0.38	0.53	0.71	0.92	1.16	1.38	1.54	1.58	1.49	1.28
Res New Home	0.18	0.25	0.33	0.42	0.51	0.60	0.67	0.72	0.77	0.80
Res Neighborhood	0.00	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.01
Res Solar Water Heating	0.05	0.06	0.06	0.07	0.07	0.08	0.08	0.09	0.09	0.09
Residential Total	1.36	1.74	2.18	2.66	3.17	3.63	4.00	4.22	4.26	4.14
Com Audit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Com Prescriptive	0.77	0.90	1.05	1.19	1.34	1.48	1.59	1.67	1.71	1.70
Com Lighting	0.39	0.41	0.43	0.45	0.47	0.49	0.50	0.50	0.49	0.48
Com Custom	1.00	1.06	1.13	1.22	1.32	1.40	1.47	1.51	1.50	1.46
Com Small Business	0.10	0.11	0.12	0.13	0.14	0.15	0.15	0.15	0.15	0.14
Non-Residential Total	2.26	2.48	2.73	3.00	3.27	3.52	3.72	3.83	3.85	3.78
Portfolio Total	3.62	4.22	4.91	5.67	6.44	7.15	7.72	8.05	8.11	7.93

Table 19. TRC Scenario – Annual winter MW Targets

Annual Winter MW	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Audit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Res Home Efficiency Upgrade	1.53	1.80	2.11	2.42	2.73	3.00	3.24	3.42	3.56	3.66
Res EE Products	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03
Res Marketplace	0.16	0.22	0.29	0.38	0.47	0.56	0.61	0.63	0.58	0.50
Res New Home	0.08	0.11	0.15	0.18	0.22	0.25	0.28	0.30	0.31	0.32
Res Neighborhood	0.01	0.01	0.02	0.03	0.03	0.04	0.04	0.04	0.04	0.03
Res Solar Water Heating	0.12	0.13	0.15	0.16	0.17	0.18	0.18	0.19	0.20	0.20
Residential Total	1.91	2.30	2.73	3.19	3.64	4.05	4.38	4.60	4.72	4.74
Com Audit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Com Prescriptive	0.56	0.67	0.79	0.92	1.06	1.19	1.28	1.33	1.32	1.26
Com Lighting	0.31	0.32	0.33	0.34	0.35	0.35	0.36	0.36	0.35	0.34
Com Custom	1.01	1.06	1.13	1.21	1.29	1.38	1.44	1.48	1.48	1.44
Com Small Business	0.10	0.11	0.13	0.14	0.16	0.17	0.18	0.18	0.18	0.16
Non-Residential Total	1.97	2.15	2.37	2.61	2.86	3.09	3.27	3.35	3.33	3.21
Portfolio Total	3.88	4.45	5.10	5.80	6.50	7.14	7.64	7.95	8.04	7.95

Table 20. TRC Scenario – Annual Participation Targets

Annual Participation (# measures)	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Audit	0	0	0	0	0	0	0	0	0	0
Res Home Efficiency Upgrade	3,573	4,430	5,372	6,361	7,328	8,212	8,964	9,569	10,036	10,395
Res EE Products	700	787	867	942	1,009	1,071	1,127	1,178	1,224	1,267
Res Marketplace	4,554	6,352	8,513	10,947	13,476	15,827	17,693	18,809	19,068	18,603
Res New Home	140	193	256	322	388	448	498	536	565	586
Res Neighborhood	612	838	1,122	1,456	1,813	2,142	2,366	2,411	2,239	1,887
Res Solar Water Heating	323	362	398	430	458	483	505	524	540	554
Residential Total	9,902	12,962	16,528	20,458	24,472	28,183	31,153	33,027	33,672	33,292
Com Audit	0	0	0	0	0	0	0	0	0	0
Com Prescriptive	5,470	6,257	7,072	7,892	8,718	9,463	10,062	10,432	10,534	10,414
Com Lighting	8,633	9,080	9,461	9,794	10,076	10,293	10,437	10,488	10,439	10,314
Com Custom	1,147	1,372	1,630	1,908	2,188	2,440	2,649	2,800	2,891	2,941
Com Small Business	3,438	4,007	4,667	5,412	6,181	6,866	7,315	7,377	6,991	6,233
Non-Residential Total	18,688	20,716	22,830	25,006	27,163	29,062	30,463	31,097	30,855	29,902
Portfolio Total	28,590	33,678	39,358	45,464	51,635	57,245	61,616	64,124	64,527	63,194

Table 21. TRC Scenario – Annual Program Budget Estimates

Budgets (\$ in thousands)	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Audit	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Res Home Efficiency Upgrade	\$4,445	\$5,556	\$6,783	\$8,068	\$9,326	\$10,468	\$11,433	\$12,202	\$12,789	\$13,229
Res EE Products	\$50	\$56	\$62	\$67	\$72	\$77	\$81	\$85	\$89	\$92
Res Marketplace	\$385	\$534	\$716	\$924	\$1,143	\$1,347	\$1,504	\$1,581	\$1,566	\$1,471
Res New Home	\$185	\$258	\$342	\$432	\$521	\$601	\$669	\$721	\$760	\$789
Res Neighborhood	\$12	\$16	\$22	\$28	\$35	\$41	\$45	\$46	\$43	\$36
Res Solar Water Heating	\$2,891	\$3,244	\$3,564	\$3,851	\$4,106	\$4,329	\$4,523	\$4,691	\$4,836	\$4,962
Residential Total	\$7,967	\$9,663	\$11,488	\$13,370	\$15,203	\$16,864	\$18,255	\$19,327	\$20,083	\$20,578
Com Audit	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Com Prescriptive	\$856	\$1,028	\$1,218	\$1,425	\$1,636	\$1,831	\$1,984	\$2,068	\$2,068	\$1,994
Com Lighting	\$659	\$700	\$737	\$773	\$806	\$833	\$851	\$857	\$848	\$827
Com Custom	\$1,535	\$1,626	\$1,745	\$1,883	\$2,027	\$2,159	\$2,260	\$2,315	\$2,315	\$2,265
Com Small Business	\$244	\$269	\$296	\$326	\$355	\$382	\$399	\$402	\$388	\$361
Non-Residential Total	\$3,294	\$3,623	\$3,998	\$4,407	\$4,824	\$5,205	\$5,495	\$5,641	\$5,619	\$5,447
Portfolio Total	\$11,261	\$13,286	\$15,485	\$17,777	\$20,027	\$22,069	\$23,750	\$24,968	\$25,701	\$26,025

Table 22. TRC Scenario – Cost-Effectiveness Results

Program Cost-Effectiveness	TRC		PCT		RIM	
	Net Benefits (\$)	Benefit/Cost Ratio	Net Benefits (\$)	Benefit/Cost Ratio	Net Benefits (\$)	Benefit/Cost Ratio
Res Audit	0	0.0	0	0.0	0	0.0
Res Home Efficiency Upgrade	48,391,423	1.4	173,407,418	2.8	-125,015,995	0.4
Res EE Products	249,064	1.2	1,927,784	3.5	-1,678,719	0.5
Res Marketplace	70,134,223	5.3	86,243,142	8.6	-16,108,920	0.5
Res New Home	9,542,239	2.2	20,594,117	3.8	-11,051,878	0.6
Res Neighborhood	254,297	1.5	1,030,818	4.3	-776,521	0.5
Res Solar Water Heating	153,748,769	4.6	197,514,152	5.8	-43,765,384	0.1
Residential Total	282,320,014	2.55	480,717,432	4.07	-198,397,417	0.37
Com Audit	0	0.0	0	0.0	0	0.0
Com Prescriptive	12,628,405	1.5	88,818,228	4.9	-76,189,823	0.3
Com Lighting	4,982,096	1.4	50,986,863	5.6	-46,004,767	0.3
Com Custom	21,485,142	1.6	242,017,859	9.6	-220,532,717	0.2
Com Small Business	865,840	1.2	16,379,322	5.2	-15,513,482	0.3
Non-Residential Total	39,961,483	1.51	398,202,272	7.00	-358,240,789	0.25
Portfolio Total	322,281,498	2.23	878,919,704	4.94	-556,638,206	0.30

Demand Response Programs

The TRC Scenario analysis resulted in four cost-effective demand response measures for the largest commercial and industrial segment, which includes customers over 500 kW. The four DR measures are presented as individual potential program options in the following tables. Each's program's cost and impact estimates were developed independent of the other programs; therefore, because the measures apply to the same target population of large commercial and industrial customers, the savings and participation are not additive.

Table 23. TRC Scenario – Commercial Demand Response - Automated DR Program

Annual Impacts	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Annual MWh	0	0	0	0	0	0	0	0	0	0
Summer MW (Cumulative)	11.4	20.2	27.2	32.6	36.8	40.1	42.6	44.6	46.2	47.4
Winter MW (Cumulative)	8.9	15.8	21.2	25.5	28.8	31.3	33.3	34.9	36.1	37.1
Participation (Cumulative)	8	13	18	22	24	27	28	30	31	32
Program Costs (\$ in Thousands)	\$3,671	\$1,885	\$2,049	\$2,176	\$2,276	\$2,353	\$2,414	\$2,461	\$2,498	\$2,527
COST EFFECTIVENESS	Net Benefits		Benefit/Cost Ratio							
TRC	\$8,483,023		1.38							
RIM	\$8,483,023		1.38							

Table 24. TRC Scenario – Commercial Demand Response – Critical Peak Pricing (CPP) Program

Annual Impacts	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Annual MWh	0	0	0	0	0	0	0	0	0	0
Summer MW (Cumulative)	9.4	16.8	22.5	27.0	30.4	33.2	35.3	36.9	38.2	39.2
Winter MW (Cumulative)	7.4	15.8	21.2	25.5	28.8	31.3	33.3	34.9	36.1	37.1
Participation (Cumulative)	8	13	18	22	24	27	28	30	31	32
Program Costs (\$ in Thousands)	\$3,671	\$1,740	\$1,875	\$1,981	\$2,063	\$2,127	\$2,177	\$2,217	\$2,247	\$2,271
COST EFFECTIVENESS	Net Benefits		Benefit/Cost Ratio							
TRC	\$4,935,709		1.24							
RIM	\$4,935,709		1.24							

Table 25. TRC Scenario – Commercial Demand Response – Firm Service Level Program

Annual Impacts	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Annual MWh	0	0	0	0	0	0	0	0	0	0
Summer MW (Cumulative)	9.4	16.8	22.5	27.0	30.4	33.2	35.3	36.9	38.2	39.2
Winter MW (Cumulative)	7.4	13.1	17.6	21.1	23.8	25.9	27.6	28.9	29.9	30.7
Participation (Cumulative)	8	13	18	22	24	27	28	30	31	32
Program Costs (\$ in Thousands)	\$1,721	\$1,674	\$1,759	\$1,825	\$1,876	\$1,916	\$1,947	\$1,972	\$1,991	\$2,006
COST EFFECTIVENESS	Net Benefits		Benefit/Cost Ratio							
TRC	\$8,454,026		1.50							
RIM	\$8,454,026		1.50							

Table 26. TRC Scenario – Commercial Demand Response – Guaranteed Load Drop Program

Annual Impacts	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Annual MWh	0	0	0	0	0	0	0	0	0	0
Summer MW (Cumulative)	9.4	16.8	22.5	27.0	30.4	33.2	35.3	36.9	38.2	39.2
Winter MW (Cumulative)	7.4	13.1	17.6	21.1	23.8	25.9	27.6	28.9	29.9	30.7
Participation (Cumulative)	8	13	18	22	24	27	28	30	31	32
Program Costs (\$ in Thousands)	\$1,721	\$1,674	\$1,759	\$1,825	\$1,876	\$1,916	\$1,947	\$1,972	\$1,991	\$2,006
COST EFFECTIVENESS	Net Benefits		Benefit/Cost Ratio							
TRC	\$8,454,026		1.50							
RIM	\$8,454,026		1.50							

Demand-Side Renewable Energy Programs

JEA did not have any DSRE measures or programs that passed the cost-effectiveness screening for the TRC Scenario.

Exhibit JH-16

OUC Program Development Summary

Overview

RI worked collaboratively with OUC on the DSM program development process to develop impacts under three scenarios: 1) potential DSM programs that contribute to proposed DSM goals (Proposed Goals scenario), 2) potential DSM programs that pass the Participant and Rate Impact Measure Tests (RIM Scenario), and 3) potential DSM programs that pass the Participant and Total Resource Cost Tests (TRC Scenario).

Methodology

The development of DSM programs for each scenario included incorporating the measures and measure impacts developed for the Technical Potential (TP) study, reviewing OUC's current program offerings, collaboration with OUC on program concepts that are beneficial for their customers, and analysis of economic impacts and market adoption to create potential DSM programs. This process included the following steps:

Program Review and Measure Bundling

The analysis began with the measures from the TP study. This measure list was initially refined for program development for each scenario as follows:

1. Proposed Goals scenario – measures that passed, or were close to passing, either the TRC or RIM tests were prioritized in the initial measure bundling analysis. Measures included in current OUC programs were also identified and included in the initial measure bundling.
2. RIM Scenario – measures that passed the RIM Scenario criteria (RIM test, PCT, and payback period of at least 2 years) were included in the initial measure bundling analysis
3. TRC Scenario – measures that passed the TRC Scenario criteria (TRC test, PCT, and payback period of at least 2 years) were included in the initial measure bundling analysis

Resource Innovations then reviewed current OUC programs and eligible measures, and mapped individual measures to the appropriate programs for each scenario. Resource Innovations worked collaboratively with OUC to collect program information (e.g. program manuals, participation records, energy and demand savings, budgets) and review the existing programs to determine which measures should be included in the initial program portfolios. In addition, a gap analysis was conducted to identify measures included in each scenario that are not currently offered by OUC. These measures were either included in existing programs where there was a logical fit, or included as a new program concept.

Program Refinement and Modeling

After identifying the preliminary measure bundles and programs, Resource Innovations worked collaboratively with OUC to develop incentive amounts and non-incentive costs. Non-incentive costs, which include costs to manage, administer, and market the program, were developed based on current OUC program costs as well as secondary data on similar programs offered by other utilities, and refined as needed based on the proposed program delivery structure. Incentive costs were developed for each scenario as follows:

1. Proposed Goals scenario – preliminary incentive rates were informed by current incentives offered by OUC as well as typical incentive levels offered by similar programs regionally and nationally.
2. RIM Scenario – incentive rates were developed based on the available net benefits for each measure, based on total RIM benefits minus RIM costs. Next, the incentive amount that would result in a simple payback of two years for each measure was calculated. The final incentive applied for the measure was based on the lower of these two values.
3. TRC Scenario – the incentive amount required to result in a simple payback period of two years for each measure was used as the final incentive for the measure.

Measures included in the initial program concepts for each scenario were analyzed in RI's TEA-POT model to update the economic analysis based on the OUC-specific non-incentive and incentive costs, and to estimate market adoption for each measure. The economic analysis included calculating updated RIM, TRC, and PCT costs and benefits for each measure and re-screening measures for each scenario.

RI's market adoption estimates use a payback acceptance criterion to estimate long-run market shares for measures as a function of measure incremental costs and expected bill savings over the measures' effective useful life (inclusive of utility incentives). Incremental adoption estimates are based on the Bass Diffusion Model, which is a mathematical description of how the rate of new product diffusion changes over time. For this study, adoption curve input parameters were developed for each measure based on specific criteria, including measure maturity in the market, overall measure cost, and whether the measure was currently offered through a utility program. RI's TEA-POT model then calculated demand and energy savings by applying these estimated adoption rates to each cost-effective measure.

The TEA-POT modeling results were exported into RI's Program Planner workbook that aggregated the individual measure results into program and portfolio impacts for each scenario. For the TRC Scenario and RIM Scenario no further refinements to the programs were made. For the Proposed Goals scenario, RI continued to work collaboratively with OUC to identify the measures and program concepts that comprise the proposed DSM goals. These impacts for each scenario are provided below.

Results

Proposed Goals Scenario

The Proposed Goals Scenario is described in more detail in Witness Noonan’s testimony. The following tables include the program-level details for this scenario.

Table 1. Proposed DSM Goals – Annual MWh Targets

Annual MWh	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Existing Home	849	895	940	985	1,032	1,076	1,125	1,183	1,248	1,322
Res Efficiency Delivered	74	77	81	85	88	92	96	101	106	112
Res New Home	113	119	126	133	139	146	153	161	171	181
Residential Total	1,035	1,092	1,147	1,203	1,259	1,313	1,374	1,445	1,525	1,616
Com Prescriptive	637	672	698	720	739	753	763	769	772	772
Com Lighting	1,569	1,697	1,796	1,881	1,951	2,004	2,044	2,070	2,086	2,091
Com Custom	1,001	1,139	1,275	1,417	1,558	1,689	1,799	1,876	1,912	1,904
Non-Residential Total	3,207	3,508	3,769	4,019	4,247	4,446	4,605	4,715	4,770	4,767
Portfolio Total	4,242	4,600	4,916	5,221	5,507	5,760	5,979	6,160	6,295	6,382

Table 2. Proposed DSM Goals – Annual summer MW Targets

Annual Summer MW	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Existing Home	0.09	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.11	0.11
Res Efficiency Delivered	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Res New Home	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Residential Total	0.11	0.11	0.11	0.11	0.11	0.12	0.12	0.12	0.13	0.13
Com Prescriptive	0.08	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.10
Com Lighting	0.19	0.21	0.22	0.23	0.24	0.25	0.25	0.25	0.25	0.25
Com Custom	0.21	0.24	0.26	0.30	0.33	0.35	0.38	0.39	0.40	0.40
Non-Residential Total	0.49	0.53	0.58	0.62	0.66	0.70	0.73	0.75	0.76	0.75
Portfolio Total	0.59	0.64	0.69	0.73	0.77	0.81	0.85	0.87	0.88	0.89

Table 3. Proposed DSM Goals – Annual winter MW Targets

Annual Winter MW	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Existing Home	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.23
Res Efficiency Delivered	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02
Res New Home	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03
Residential Total	0.18	0.19	0.20	0.21	0.22	0.23	0.24	0.25	0.27	0.28
Com Prescriptive	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Com Lighting	0.20	0.22	0.23	0.24	0.25	0.25	0.26	0.26	0.26	0.26
Com Custom	0.09	0.10	0.11	0.12	0.14	0.15	0.16	0.16	0.17	0.16
Non-Residential Total	0.38	0.41	0.44	0.46	0.49	0.50	0.52	0.53	0.53	0.53
Portfolio Total	0.56	0.60	0.63	0.67	0.70	0.73	0.76	0.78	0.80	0.81

Table 4. Proposed DSM Goals – Annual Participation Targets

Annual Participation (# measures)	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Existing Home	517	511	509	505	506	506	511	520	533	548
Res Efficiency Delivered	40	42	42	44	43	42	46	47	48	51
Res New Home	45	46	47	47	48	52	52	55	57	60
Residential Total	602	599	598	596	597	600	609	622	638	659
Com Prescriptive	1,521	1,612	1,675	1,726	1,763	1,790	1,803	1,813	1,814	1,807
Com Lighting	4,329	4,627	4,836	5,005	5,134	5,223	5,277	5,312	5,321	5,306
Com Custom	1,827	1,977	2,099	2,207	2,299	2,374	2,437	2,486	2,519	2,538
Non-Residential Total	7,677	8,216	8,610	8,938	9,196	9,387	9,517	9,611	9,654	9,651
Portfolio Total	8,279	8,815	9,208	9,534	9,793	9,987	10,126	10,233	10,292	10,310

Table 5. Proposed DSM Goals – Annual Program Budget Estimates

Budgets (\$ in thousands)	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Existing Home	\$2,100	\$2,306	\$2,499	\$2,686	\$2,868	\$3,037	\$3,216	\$3,415	\$3,633	\$3,875
Res Efficiency Delivered	\$91	\$98	\$104	\$110	\$116	\$122	\$128	\$134	\$142	\$151
Res New Home	\$137	\$149	\$160	\$171	\$182	\$192	\$202	\$214	\$228	\$242
Residential Total	\$2,328	\$2,552	\$2,763	\$2,967	\$3,166	\$3,350	\$3,547	\$3,763	\$4,003	\$4,268
Com Prescriptive	\$99	\$102	\$104	\$106	\$107	\$107	\$108	\$107	\$107	\$107
Com Lighting	\$201	\$215	\$225	\$233	\$239	\$243	\$246	\$248	\$248	\$248
Com Custom	\$131	\$147	\$163	\$180	\$196	\$211	\$224	\$233	\$237	\$237
Non-Residential Total	\$431	\$465	\$493	\$519	\$542	\$562	\$578	\$588	\$593	\$592
Portfolio Total	\$2,759	\$3,017	\$3,256	\$3,486	\$3,708	\$3,912	\$4,124	\$4,352	\$4,596	\$4,859

Table 6. Proposed DSM Goals – Cost-Effectiveness Results

Program Cost-Effectiveness	TRC		PCT		RIM	
	Net Benefits (\$)	Benefit/Cost Ratio	Net Benefits (\$)	Benefit/Cost Ratio	Net Benefits (\$)	Benefit/Cost Ratio
Res Existing Home	-1,439,576	0.9	12,998,056	3.4	-14,437,631	0.3
Res Efficiency Delivered	-341,217	0.6	935,030	3.0	-1,276,247	0.3
Res New Home	-144,686	0.9	1,787,071	3.7	-1,931,757	0.3
Residential Total	-1,925,478	0.84	15,720,157	3.40	-17,645,636	0.29
Com Prescriptive	185,353	1.1	5,594,996	3.2	-5,409,642	0.4
Com Lighting	173,098	1.0	14,591,930	3.1	-14,418,832	0.4
Com Custom	1,078,887	1.2	12,025,921	3.4	-10,947,034	0.4
Non-Residential Total	1,437,337	1.09	32,212,846	3.20	-30,775,509	0.36
Portfolio Total	-488,141	0.98	47,933,004	3.26	-48,421,145	0.34

RIM Scenario

The RIM Scenario is comprised of measures and programs that achieved a cost-effectiveness ratio of 1.0 or higher for the PCT and RIM test, and measures that had a simple payback of two years or more (without consideration of incentives).

Energy Efficiency Programs

OUC did not have any EE measures or programs that passed the cost-effectiveness screening for the RIM Scenario.

Demand Response Programs

The RIM Scenario analysis resulted in four cost-effective demand response measures for the largest commercial and industrial segment, which includes customers over 500 kW. The four DR measures are presented as individual potential program options in the following tables. Each's program's cost and impact estimates were developed independent of the other programs; therefore, because the measures apply to the same target population of large commercial and industrial customers, the savings and participation are not additive.

Table 7. RIM Scenario – Commercial Demand Response - Automated DR Program

Annual Impacts	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Annual MWh	0	0	0	0	0	0	0	0	0	0
Summer MW (Cumulative)	13.5	24.0	32.2	38.5	43.5	47.4	50.5	52.8	54.7	56.1
Winter MW (Cumulative)	9.9	17.7	23.7	28.4	32.1	35.0	37.2	38.9	40.3	41.4
Participation (Cumulative)	19	34	46	55	62	67	72	75	78	80
Program Costs (\$ in Thousands)	\$4,032	\$2,099	\$2,642	\$3,066	\$3,397	\$3,655	\$3,856	\$4,013	\$4,135	\$4,230
COST EFFECTIVENESS	Net Benefits		Benefit/Cost Ratio							
TRC	\$9,599,458		1.33							
RIM	\$9,599,458		1.33							

Table 8. RIM Scenario – Commercial Demand Response – Critical Peak Pricing (CPP) Program

Annual Impacts	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Annual MWh	0	0	0	0	0	0	0	0	0	0
Summer MW (Cumulative)	11.1	19.8	26.6	31.9	36.0	39.3	41.8	43.7	45.2	46.4
Winter MW (Cumulative)	8.2	14.6	19.6	23.5	26.6	28.9	30.8	32.2	33.4	34.2
Participation (Cumulative)	19	34	46	55	62	67	72	75	78	80
Program Costs (\$ in Thousands)	\$3,970	\$1,916	\$2,366	\$2,717	\$2,991	\$3,204	\$3,371	\$3,501	\$3,602	\$3,681
COST EFFECTIVENESS	Net Benefits		Benefit/Cost Ratio							
TRC	\$6,016,084		1.23							
RIM	\$6,016,084		1.23							

Table 9. RIM Scenario – Commercial Demand Response – Firm Service Level Program

Annual Impacts	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Annual MWh	0	0	0	0	0	0	0	0	0	0
Summer MW (Cumulative)	11.1	19.8	26.6	31.9	36.0	39.3	41.8	43.7	45.2	46.4
Winter MW (Cumulative)	8.2	14.6	19.6	23.5	26.6	28.9	30.8	32.2	33.4	34.2
Participation (Cumulative)	19	34	46	55	62	67	72	75	78	80
Program Costs (\$ in Thousands)	\$1,942	\$1,851	\$2,310	\$2,668	\$2,947	\$3,165	\$3,334	\$3,467	\$3,570	\$3,651
COST EFFECTIVENESS	Net Benefits		Benefit/Cost Ratio							
TRC	\$8,360,168		1.36							
RIM	\$8,360,168		1.36							

Table 10. RIM Scenario – Commercial Demand Response – Guaranteed Load Drop Program

Annual Impacts	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Annual MWh	0	0	0	0	0	0	0	0	0	0
Summer MW (Cumulative)	11.1	19.8	26.6	31.9	36.0	39.3	41.8	43.7	45.2	46.4
Winter MW (Cumulative)	8.2	14.6	19.6	23.5	26.6	28.9	30.8	32.2	33.4	34.2
Participation (Cumulative)	19	34	46	55	62	67	72	75	78	80
Program Costs (\$ in Thousands)	\$1,942	\$1,851	\$2,310	\$2,668	\$2,947	\$3,165	\$3,334	\$3,467	\$3,570	\$3,651
COST EFFECTIVENESS	Net Benefits		Benefit/Cost Ratio							
TRC	\$8,360,168		1.36							
RIM	\$8,360,168		1.36							

Demand-Side Renewable Energy Programs

OUC did not have any DSRE measures or programs that passed the cost-effectiveness screening for the RIM Scenario.

TRC Scenario

The TRC Scenario is comprised of measures and programs that achieved a cost-effectiveness ratio of 1.0 or higher for the PCT and TRC test, and measures that had a simple payback of two years or more (without consideration of incentives). Incentive rates were based on the maximum incentive amount that would result in a simple payback period of two years for each measure. The following tables include the program-level details for this scenario.

Energy Efficiency Programs

Table 11. TRC Scenario – Energy Efficiency – Annual MWh Targets

Annual MWh	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Home Energy Survey	0	0	0	0	0	0	0	0	0	0
Res Existing Home	1,165	1,277	1,385	1,493	1,598	1,695	1,797	1,907	2,025	2,154
Res Efficiency Delivered	2	2	2	2	2	2	2	2	2	2
Res New Home	428	457	472	484	501	518	541	567	598	632
Res Marketplace	18	15	12	10	9	7	6	5	5	4
Res Products	0	0	0	0	0	0	0	0	0	0
Residential Total	1,614	1,751	1,872	1,990	2,109	2,223	2,346	2,481	2,630	2,792
Com Prescriptive	1,946	2,155	2,359	2,565	2,767	2,955	3,119	3,261	3,376	3,463
Com Lighting	453	502	547	590	630	663	687	698	696	683
Com Custom	285	351	424	507	592	674	742	783	790	763
Com Green Building	1	1	1	1	1	1	1	1	1	1
Com Chiller Maintenance	0	0	0	0	0	0	0	0	0	0
Non-Residential Total	2,684	3,009	3,330	3,663	3,990	4,293	4,549	4,742	4,864	4,911
Portfolio Total	4,298	4,760	5,202	5,653	6,100	6,516	6,896	7,224	7,494	7,703

Table 12. TRC Scenario – Energy Efficiency – Annual summer MW Targets

Annual Summer MW	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Home Energy Survey	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Res Existing Home	0.14	0.16	0.18	0.20	0.22	0.24	0.25	0.27	0.29	0.31
Res Efficiency Delivered	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Res New Home	0.11	0.12	0.12	0.12	0.13	0.13	0.14	0.15	0.15	0.16
Res Marketplace	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Res Products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Residential Total	0.26	0.28	0.31	0.33	0.35	0.37	0.40	0.42	0.45	0.47
Com Prescriptive	0.59	0.66	0.72	0.79	0.85	0.91	0.97	1.01	1.05	1.07
Com Lighting	0.03	0.03	0.03	0.04	0.04	0.05	0.05	0.05	0.05	0.05
Com Custom	0.05	0.06	0.07	0.09	0.10	0.12	0.13	0.14	0.14	0.13
Com Green Building	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Com Chiller Maintenance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Non-Residential Total	0.66	0.75	0.83	0.92	1.00	1.08	1.15	1.20	1.23	1.25
Portfolio Total	0.92	1.03	1.14	1.25	1.35	1.45	1.54	1.62	1.68	1.72

Table 13. TRC Scenario – Energy Efficiency – Annual winter MW Targets

Annual Winter MW	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Home Energy Survey	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Res Existing Home	0.19	0.20	0.22	0.23	0.25	0.26	0.28	0.29	0.31	0.33
Res Efficiency Delivered	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Res New Home	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.05
Res Marketplace	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Res Products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Residential Total	0.23	0.25	0.26	0.28	0.29	0.31	0.32	0.34	0.36	0.38
Com Prescriptive	0.11	0.12	0.13	0.14	0.15	0.16	0.16	0.17	0.17	0.17
Com Lighting	0.04	0.04	0.05	0.05	0.06	0.06	0.06	0.07	0.07	0.06
Com Custom	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.09	0.09	0.09
Com Green Building	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Com Chiller Maintenance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Non-Residential Total	0.18	0.20	0.22	0.25	0.28	0.30	0.32	0.33	0.33	0.33
Portfolio Total	0.41	0.45	0.49	0.53	0.57	0.61	0.64	0.67	0.70	0.71

Table 14. TRC Scenario – Energy Efficiency – Annual Participation Targets

Annual Participation	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Home Energy Survey	0	0	0	0	0	0	0	0	0	0
Res Existing Home	1,025	1,144	1,256	1,368	1,475	1,576	1,678	1,783	1,895	2,015
Res Efficiency Delivered	6	6	5	5	5	5	5	5	5	5
Res New Home	65	69	71	73	76	78	82	85	90	95
Res Marketplace	44	37	31	26	22	18	16	14	12	11
Res Products	0	0	0	0	0	0	0	0	0	0
Residential Total	1,140	1,256	1,363	1,472	1,578	1,677	1,781	1,887	2,002	2,126
Com Prescriptive	3,536	3,917	4,259	4,577	4,873	5,141	5,381	5,611	5,826	6,026
Com Lighting	855	952	1,040	1,128	1,208	1,275	1,323	1,346	1,344	1,321
Com Custom	115	142	172	206	241	274	299	308	301	278
Com Green Building	1	1	1	1	1	1	1	1	1	1
Com Chiller Maintenance	0	0	0	0	0	0	0	0	0	0
Non-Residential Total	4,507	5,012	5,472	5,912	6,323	6,691	7,004	7,266	7,472	7,626
Portfolio Total	5,647	6,268	6,835	7,384	7,901	8,368	8,785	9,153	9,474	9,752

Table 15. TRC Scenario – Energy Efficiency – Annual Program Budget Estimates

Budgets \$ in thousands	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Res Home Energy Survey	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Res Existing Home	\$2,628	\$2,914	\$3,181	\$3,436	\$3,682	\$3,908	\$4,145	\$4,401	\$4,681	\$4,986
Res Efficiency Delivered	\$4	\$4	\$3	\$3	\$3	\$3	\$3	\$3	\$3	\$3
Res New Home	\$164	\$175	\$181	\$185	\$192	\$198	\$207	\$217	\$229	\$242
Res Marketplace	\$3	\$2	\$2	\$2	\$1	\$1	\$1	\$1	\$1	\$1
Res Products	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Residential Total	\$2,799	\$3,095	\$3,367	\$3,627	\$3,878	\$4,111	\$4,356	\$4,622	\$4,913	\$5,231
Com Prescriptive	\$211	\$233	\$255	\$277	\$300	\$321	\$340	\$356	\$368	\$375
Com Lighting	\$88	\$96	\$103	\$110	\$115	\$120	\$123	\$125	\$126	\$125
Com Custom	\$42	\$51	\$61	\$71	\$82	\$92	\$101	\$106	\$106	\$103
Com Green Building	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Com Chiller Maintenance	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Non-Residential Total	\$341	\$381	\$419	\$459	\$498	\$534	\$564	\$586	\$600	\$603
Portfolio Total	\$3,140	\$3,475	\$3,786	\$4,085	\$4,376	\$4,644	\$4,920	\$5,208	\$5,513	\$5,834

Table 16. TRC Scenario – Energy Efficiency – Cost-Effectiveness Results

Program Cost-Effectiveness	TRC		PCT		RIM	
	Net Benefits (\$)	Benefit/Cost Ratio	Net Benefits (\$)	Benefit/Cost Ratio	Net Benefits (\$)	Benefit/Cost Ratio
Res Home Energy Survey	0	0.0	0	0.0	0	0.0
Res Existing Home	74,117,690	2.8	124,910,898	4.6	-50,793,209	0.2
Res Efficiency Delivered	2,867	1.1	50,929	2.6	-48,062	0.3
Res New Home	86,901	1.0	6,609,346	4.9	-6,522,445	0.3
Res Marketplace	16,122	1.4	73,404	3.5	-57,282	0.5
Res Products	0	0.0	0	0.0	0	0.0
Residential Total	74,223,580	2.65	131,644,578	4.66	-57,420,997	0.18
Com Prescriptive	3,454,640	1.4	18,370,613	3.4	-14,915,973	0.4
Com Lighting	349,477	1.1	5,157,917	3.4	-4,808,440	0.4
Com Custom	814,419	1.4	5,316,015	4.0	-4,501,595	0.4
Com Green Building	1,745	1.4	13,147	4.8	-11,402	0.3
Com Chiller Maintenance	0	0.0	0	0.0	0	0.0
Non-Residential Total	4,620,280	1.36	28,857,691	3.51	-24,237,411	0.42
Portfolio Total	78,843,861	2.36	160,502,269	4.38	-81,658,408	0.27

Demand Response Programs

The TRC Scenario analysis resulted in four cost-effective demand response measures for the largest commercial and industrial segment, which includes customers over 500 kW. The four DR measures are presented as individual potential program options in the following tables. Each’s program’s cost and impact estimates were developed independent of the other programs; therefore, because the measures apply to the same target population of large commercial and industrial customers, the savings and participation are not additive.

Table 17. TRC Scenario – Commercial Demand Response - Automated DR Program

Annual Impacts	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Annual MWh	0	0	0	0	0	0	0	0	0	0
Summer MW (Cumulative)	13.5	24.0	32.2	38.5	43.5	47.4	50.5	52.8	54.7	56.1
Winter MW (Cumulative)	9.9	17.7	23.7	28.4	32.1	35.0	37.2	38.9	40.3	41.4
Participation (Cumulative)	19	34	46	55	62	67	72	75	78	80
Program Costs (\$ in Thousands)	\$4,032	\$2,099	\$2,642	\$3,066	\$3,397	\$3,655	\$3,856	\$4,013	\$4,135	\$4,230
COST EFFECTIVENESS	Net Benefits		Benefit/Cost Ratio							
TRC	\$9,599,458		1.33							
RIM	\$9,599,458		1.33							

Table 18. TRC Scenario – Commercial Demand Response – Critical Peak Pricing (CPP) Program

Annual Impacts	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Annual MWh	0	0	0	0	0	0	0	0	0	0
Summer MW (Cumulative)	11.1	19.8	26.6	31.9	36.0	39.3	41.8	43.7	45.2	46.4
Winter MW (Cumulative)	8.2	14.6	19.6	23.5	26.6	28.9	30.8	32.2	33.4	34.2
Participation (Cumulative)	19	34	46	55	62	67	72	75	78	80
Program Costs (\$ in Thousands)	\$3,970	\$1,916	\$2,366	\$2,717	\$2,991	\$3,204	\$3,371	\$3,501	\$3,602	\$3,681
COST EFFECTIVENESS	Net Benefits		Benefit/Cost Ratio							
TRC	\$6,016,084		1.23							
RIM	\$6,016,084		1.23							

Table 19. TRC Scenario – Commercial Demand Response – Firm Service Level Program

Annual Impacts	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Annual MWh	0	0	0	0	0	0	0	0	0	0
Summer MW (Cumulative)	11.1	19.8	26.6	31.9	36.0	39.3	41.8	43.7	45.2	46.4
Winter MW (Cumulative)	8.2	14.6	19.6	23.5	26.6	28.9	30.8	32.2	33.4	34.2
Participation (Cumulative)	19	34	46	55	62	67	72	75	78	80
Program Costs (\$ in Thousands)	\$1,942	\$1,851	\$2,310	\$2,668	\$2,947	\$3,165	\$3,334	\$3,467	\$3,570	\$3,651
COST EFFECTIVENESS	Net Benefits		Benefit/Cost Ratio							
TRC	\$8,360,168		1.36							
RIM	\$8,360,168		1.36							

Table 20. TRC Scenario – Commercial Demand Response – Guaranteed Load Drop Program

Annual Impacts	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Annual MWh	0	0	0	0	0	0	0	0	0	0
Summer MW (Cumulative)	11.1	19.8	26.6	31.9	36.0	39.3	41.8	43.7	45.2	46.4
Winter MW (Cumulative)	8.2	14.6	19.6	23.5	26.6	28.9	30.8	32.2	33.4	34.2
Participation (Cumulative)	19	34	46	55	62	67	72	75	78	80
Program Costs (\$ in Thousands)	\$1,942	\$1,851	\$2,310	\$2,668	\$2,947	\$3,165	\$3,334	\$3,467	\$3,570	\$3,651
COST EFFECTIVENESS	Net Benefits		Benefit/Cost Ratio							
TRC	\$8,360,168		1.36							
RIM	\$8,360,168		1.36							

Demand-Side Renewable Energy Programs

OUC did not have any DSRE measures or programs that passed the cost-effectiveness screening for the TRC Scenario.