BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Commission review of numeric conservation goals (JEA)	DOCKET NO.: 20240016-EG FILED: April 2, 2024

JEA'S PETITION FOR APPROVAL OF
NUMERIC CONSERVATION GOALS

JEA, by and through its undersigned attorneys, and pursuant to Sections 120.569, 120.57(1), and 366.82, Florida Statutes ("F.S."), and Rules 28-106.201 and 25-17.0021, Florida Administrative Code ("F.A.C"), petitions the Florida Public Service Commission ("Commission") to approve JEA's proposed numeric conservation goals as set forth in the attached Exhibit No. [BP-8]. In accordance with the minimum testimony requirements set forth in the Order Consolidating Dockets and Establishing Procedure, JEA is contemporaneously submitting the direct testimony of Brian C. Pippin, Bradley E. Kushner, and James Herndon, which is incorporated by reference herein. In further support of this Petition, JEA states:

BACKGROUND

1. JEA is an electric utility subject to the Florida Energy Efficiency and Conservation Act ("FEECA"), Section 366.82, F.S., which requires the Commission to adopt and periodically review goals to increase the efficiency of energy consumption, increase the development of demand side renewable energy systems, reduce and control the growth rates of electric consumption and weather sensitive peak demand, and encourage the development of demand side renewable energy resources.

2. JEA is the municipal electric utility provider for approximately 522,000 customers in the City of Jacksonville and portions of Clay, St. Johns, and Nassau Counties. JEA is governed by a Board of Directors consisting of four members appointed by the President of the City Council

and three members appointed by the Mayor of the City of Jacksonville, all of whom are approved by the City Council. The Board of Directors sets the rates, operating budget, and policies governing JEA's operations. The establishment of JEA's FEECA numeric conservation goals will affect the JEA's operating budget and could affect JEA's rates. Therefore, this proceeding will determine JEA's substantial interests.

3. The affected agency is:

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

4. All notices, pleadings and other communications required to be served on JEA in this docket should be directed to:

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5. As a utility subject to FEECA, JEA was aware that this proceeding would be held before this docket was opened.

6. JEA knows of no material facts in dispute in this proceeding. However, the Commission has set forth a tentative list of issues in the Order Consolidating Dockets and Establishing Procedure. Other parties to this proceeding may dispute JEA's position that consideration of all such issues supports approval of JEA's proposed goals.

7. This proceeding involves the formulation of agency action, rather than the reversal or modification of the agency's proposed action. Thus, subparagraphs (d) and (e) of Rule 28-106.201(2), F.A.C., do not apply to this petition. Nevertheless, the ultimate facts entitling JEA approval of its proposed conservation goals are set forth in the testimony of Brian C. Pippin, Bradley E. Kushner, and James Herndon submitted contemporaneously with this Petition. The specific statutes and rules entitling JEA to such relief are Sections 120.569, 120.57(1), and 366.82, F.S, and Rules 28-106.201, and Rule 25-17.0021, F.A.C.

JEA'S PROPOSED NUMERIC CONSERVATION GOALS

8. Section 366.82, F.S., requires the Commission to consider, among other things, the costs and benefits to the participating ratepayers as well as the general body of ratepayers as a whole, including utility incentives and participant contributions. Further, Rule 25-17.0021(3), F.A.C, requires FEECA utilities to file demand-side management ("DSM") programs that pass the Participant and Rate Impact Measure ("RIM") Tests, as well as demand-side management programs that pass the Participant and Total Resource Cost ("TRC") Tests. However, neither the statute nor the rule dictates which cost-effectiveness test must be used to establish DSM goals.

9. JEA's current numeric conservation goals were established in the Commission's 2019 Goalsetting Order, which carried forward the goals established in 2014. *See* Order No. PSC-2019-0509-FOF-EG (Nov. 26, 2019). In the 2014 Goalsetting Order, the Commission incorporated by reference a Settlement Agreement which established JEA's current conservation goals based on existing DSM programs offered by JEA. That Commission-approved Settlement Agreement stated:

> Because the RIM test ensures no impact to customers' rates, it is particularly appropriate in establishing DSM goals for municipal utilities, such as JEA. Local governing is a fundamental aspect of public power. It provides the necessary latitude to make local decisions regarding the community's investment in energy

> efficiency that best suit local needs and values. Local decisions are based on input from citizens who can speak out on electric power issues at governing board meetings. Accordingly, as the Commission has recognized in prior proceedings, it is appropriate to set goals based on RIM, but to defer to the municipal utilities' governing bodies to determine the level of investment in any non-RIM based measures.

Order No. PSC-2014-0696-FOF-EU, Attachment A, p.2 (Dec. 16, 2014). More recently, the Commission has stated:

> For municipal utilities such as JEA, local decisions fall within the jurisdiction of JEA's governing body regarding the investment in energy efficiency that best suits local needs and values. Accordingly, as we have recognized in prior proceedings, it is appropriate to defer to municipal utilities' governing bodies to determine the level of investment if measures are not cost-effective.

Order No. PSC-2020-0200-PAA-EG, p.5 (June 24, 2020) (citing Order No. PSC-2015-0324-PAA- (August 11, 2015).

10. As discussed in the pre-filed testimony of Brian Pippin and James Herndon, the cost-effectiveness analysis of DSM programs shows that only one residential program (Home Efficiency Upgrades) is cost-effective under the RIM and Participants Test combined, and no commercial/industrial programs (other than demand response which, as discussed in Mr. Pippin's testimony, is not included in JEA's proposed goals) pass the RIM and Participants combined. Nevertheless, as Mr. Pippin's testimony explains, consistent with the approach previously approved by the Commission, JEA is proposing numeric conservation goals based on the DSM programs that JEA currently offers with some modifications. The net effect is an increase in JEA's Residential goals and a tripling of JEA's Commercial goals going forward.

REQUEST FOR RELIEF

WHEREFORE, JEA respectfully requests that the Commission approve the proposed numeric conservation goals set forth in the attached Exhibit No. [BP-8].

Respectfully submitted this 2d day of April, 2024.

HOLTZMAN VOGEL BARAN TORCHINSKY & JOSEFIAK PLLC

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Counsel for JEA

CERTIFICATE OF SERVICE

I hereby certify that on April 2d, 2024, a true and correct copy of the foregoing has been furnished by electronic mail to the following:

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BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

DIRECT TESTIMONY OF BRIAN PIPPIN

ON BEHALF OF

JEA

DOCKET NO. 20240016-EG

APRIL 2, 2024

Q. Please state your name and business address.

A. My name is Brian Pippin. My business address is 225 N. Pearl St., Jacksonville, Florida, 32202.

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

A. I am employed by JEA as a Specialist in the Grid Solutions Team.

Q. What are your responsibilities in that position?

A. My current responsibility is DSM Portfolio Management. In this capacity, I ensure that all electric demand-side management (DSM) programs are meeting the numerical goals set by the Florida Public Service Commission (Commission) during the last Florida Energy Efficiency and Conservation Act (FEECA) goal-setting cycle. I assist in the evaluation of new electric DSM measures for inclusion in JEA's DSM portfolio based upon the value the measures bring to our customers and JEA. I also consult and report on the DSM portfolio's ability to meet JEA's internal DSM goals.

Q. Please summarize your educational background and professional experience.

A. I hold a Bachelor of Science in Industrial Engineering from the Georgia Institute of Technology and a Masters in Business Administration from the University of Memphis. I've worked at JEA for 19 years, initially providing energy and water conservation education to customers and later developing and implementing energy and water efficiency programs, to now managing the overall electric DSM portfolio to achieve our external FEECA and internal DSM goals.

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

A. The purpose of my testimony is to discuss (1) how JEA is governed; (2) recent trends in JEA's system load growth; and (3) JEA's proposed DSM goals and the process used to develop them. My testimony includes discussion related to JEA's existing conservation and DSM programs, how supply-side efficiencies are incorporated into JEA's planning process, and how JEA's proposed goals encourage demand-side renewable energy systems.

Q. Are you sponsoring any exhibits to your testimony?

A. Yes. Exhibit No. [BP-1] is a copy of my resume. Exhibit No. [BP-2] presents JEA's existing Florida Energy Efficiency and Conservation Act (FEECA) goals. Exhibit No. [BP-3] presents a list of the DSM and conservation programs included in JEA's existing DSM Plan. Exhibit No. [BP-4] summarizes the historical participation in JEA's existing FEECA DSM programs. Exhibit No. [BP-5] presents a summary of JEA's marketing and educational activities. Exhibit No. [BP-6] presents the estimated bill impacts on residential 1,000 kWh/month bill. Exhibit No. [BP-7] presents a summary of JEA's proposed DSM goals. Exhibit No. [BP-8] presents a comparison of JEA's current DSM programs to JEA's proposed DSM program offerings.

Q. How is JEA governed?

A. JEA is a municipal electric utility governed by a Board of Directors consisting of seven members. Four members are nominated by the City of Jacksonville City Council president and confirmed by the City of Jacksonville, City Council, and three members are appointed by the Mayor of the City of Jacksonville and confirmed by the City of Jacksonville City Council. The Board of Directors sets the rates and policies governing JEA's operations. The JEA operating budget requires City of Jacksonville City Council approval. JEA's board meetings are open to the public and ratepayers are permitted to participate in board meetings. JEA's Board of Directors sets policies consistent with the best interest of JEA's customers and community.

Q. Please describe JEA's service territory.

A. JEA is the municipal electric utility provider for the City of Jacksonville and portions of Clay, and St. Johns Counties.

Q. Please describe the demographics of JEA's customer base.

A. JEA serves approximately 522,000 customers. JEA's customers are approximately 88 percent residential. The U.S. Census Bureau last reported in 2022 that the median household income for Jacksonville was $65,579. More than 41% of Jacksonville's population earn less than the Federal Poverty Level or are considered "Asset Limited, Income Constrained, Employed" (ALICE) households, meaning that they earn more than the Federal Poverty Level, but less than the basic cost of living. This breaks down to 14% of households that live in poverty and 27% of households who live as ALICE.

For the past 10 years JEA has offered the Neighborhood Energy Efficiency Program, which is a neighborhood blitz-style program focused on the direct install of energy and water efficiency measures into the homes of our low-income Customers including efficiency and conservation behavioral best practices. JEA just recently embarked on a new low-income focused deep energy and water efficiency improvement program targeting our highest energy burden Customers across Jacksonville called the Restore, Repair and Resiliency (R3) Program. The end goal is to develop a sustainable program through-out low-income neighborhoods in Jacksonville to help hard-working families reduce energy and water use, lower utility bills and remain in their homes. JEA began with an initial pilot program in late 2022 with a core group of community organizations to provide efficiency upgrades to 15 homes on the Eastside of Jacksonville and will continue to assist 76 homes through the Department of Energy's energy efficiency and conservation block grant.

Q. Please discuss how JEA's loads have changed since the last goal setting in 2019.

A. As reported in our 2023 Ten Year Site Plan, JEA's net energy load (NEL) has increased over the 2018-2022 period at an annual average growth-rate (AAGR) of approximately 0.23 percent. JEA experienced an annual average decrease of approximately 3.61 percent in net firm winter peak demand (mild winter weather experienced in 2022) but an AAGR of approximately 2.26 percent in net firm summer peak demand, since the last potential study was performed. JEA's AAGR over the next 10 years are projected to be approximately 0.66 percent for NEL, 0.55 percent for winter net firm peak demand, and 0.54 percent for summer net firm peak demand.

Q. What are JEA's existing FEECA goals based on?

A. JEA's existing FEECA goals were established during the 2019 FEECA process. In its 2019 Goalsetting Order, the Commission determined that it was in the public interest to continue with the goals set in the 2014 Goalsetting Order. *See* Order No. PSC-2019-0509-FOF-EG. For JEA, those goals were based on a settlement agreement approved by the Commission. *See* Order No. PSC-14-0696-FOF-EU (Attachment A). The settlement agreement recognized the role of the municipal utility's governing body to determine the appropriate level of investment in conservation programs and associated rate impacts. *Id*. at p.64 (Attachment A, p.2 of 6). JEA's existing FEECA goals are presented in Exhibit No. [BP-2].

Q. What cost-effectiveness test or tests are appropriate for setting JEA's goals under FEECA?

A. Section 366.82, Florida Statutes (F.S.), requires the Commission to consider, among other things, the costs, and benefits to the participating ratepayers as well as the general body of ratepayers, including utility incentives and participant contributions. However, Section 366.82 does not dictate which cost-effectiveness test must be used to establish DSM goals. In the 2014 Goalsetting Order (Order No. PSC-14-0696-FOF-EU), the Commission determined that the Participant Test is appropriate for calculating the costs and benefits to the customers participating in the energy savings and demand reduction measures. The Commission further determined that consideration of both the Rate Impact Measure (RIM) and Total Resource Cost (TRC) tests is necessary to reflect the benefits and costs incurred by the general body of ratepayers, including utility incentives and participant contributions.

Because the RIM test ensures no impact to customers' rates, it is particularly appropriate in establishing DSM goals for municipal utilities, such as JEA. Local governing is a fundamental aspect of public power. It provides the necessary latitude to make local decisions regarding the community's investment in energy efficiency that best suit our local needs and values. Local decisions are based on input from citizens who can speak out on electric power issues at governing board meetings. Accordingly, as the Commission has recognized in prior proceedings, it is appropriate to set goals based on RIM, but to defer to the municipal utilities' governing bodies to determine the level of investment in any non-RIM based measures. *See* Order No. PSC-14-0696-FOF-EU (Attachment A, p.2 of 6).

Q. In general, how would JEA's lower income customers be affected by increases in utility rates due to the implementation of DSM programs that do not pass the RIM test?

A. Lower income customers, in general, spend a disproportionately higher percentage of their disposable income on electric utility bills than higher income customers. As a result, any increases in electric utility rates resulting from the implementation of DSM measures that do not pass RIM would have a tangible negative impact on utility affordability for the more than 40% of JEA's residential customers that earn less than the Federal Poverty Level or are considered ALICE households that are unable or choose not to participate in DSM programs that decrease their electric consumption sufficiently to offset the increased rates.

Q. Please describe JEA's current FEECA demand-side management programs.

A. Exhibit No. [BP-3] includes a summary of the DSM and conservation programs included in JEA's existing Commission-approved DSM Plan.

Q. What is the historic participation rate of JEA's current FEECA demand-side management programs?

A. Exhibit No. [BP-4] presents the historic participation rates in JEA's current FEECA demand-side management programs.

Q. Please describe the program development process.

A. 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).

Q. What, if any, measures were excluded during the process?

A. The analysis began with the measures included in the technical potential study developed by Resource Innovations as discussed in the direct testimony of Mr. Herndon. This measure list was initially refined for program development for three different scenarios related to DSM goals scenario as follows:

1. Proposed Goals Scenario – measures that passed, or were close to passing, either the TRC or RIM Tests and that passed the Participant Test, as well as measures included in JEA's current DSM programs were prioritized for measure bundling.

Please refer to Exhibit No. [JH-12] of the direct testimony of Mr. Herndon for discussion of how measures may have been excluded.

2. RIM -Scenario – measures that passed the RIM-scenario criteria (pass the RIM and Participant Tests, and payback period of at least 2 years) were included in the measure bundling. Please refer to Exhibit No. [JH-12] of the direct testimony of Mr. Herndon for discussion of how measures may have been excluded.
3. TRC -Scenario – measures that passed the TRC-scenario criteria (pass the TRC and Participant Test, and payback period of at least 2 years) were included in the initial measure bundling analysis. Please refer to Exhibit No. [JH-12] of the direct testimony of Mr. Herndon for discussion of how measures may have been excluded.

Q. What demand-side management goals would result from the use of the Participant and RIM Tests?

A. The demand-side management goals that would result from the use of the Participant and RIM Tests can be found in Exhibit No. [JH-15] ("JEA Program Development Summary") of Mr. Herndon's testimony.

Q. Please provide a breakdown at the program level with demand and energy savings, program costs and benefits, cost-effectiveness test results, list of measures included, and participation rates for demand-side management goals that would result from the use of the Participant and RIM Tests.

A. The breakdown at the program level with demand and energy savings, program costs and benefits, cost-effectiveness test results, list of measures included, and participation rates can be found in Exhibit No. [JH-15] ("JEA Program Development Summary") of Mr. Herndon's testimony.

Q. What is the estimated rate impact of the goals resulting from the use of the Participant and RIM Tests on a residential 1,000 kWh/month bill?

A. Exhibit No. [BP-6] presents the estimated bill impacts on residential 1,000 kWh/month bill for goals that would result from the use of the Participant and RIM Tests.

Q. Please describe how free-ridership was addressed in developing the demand-side management goals that would result from using the Participant and RIM Tests.

A. Consistent with prior DSM analyses in Florida, free ridership was reflected by applying a two-year payback criterion, which eliminated measures having a simple payback of less than two years. Please refer to Exhibit No. [JH-12] for discussion on sensitivities (i.e. shorter and longer) to the two-year payback period.

Q. What demand-side management goals would result from the use of the Participant and TRC tests?

A. The demand-side management goals that would result from the use of the Participant and RIM Tests can be found in Exhibit No. [JH-15] ("JEA Program Development Summary") of Mr. Herndon's testimony.

Q. Please provide a breakdown at the program level with demand and energy savings, program costs and benefits, cost-effectiveness test results, list of measures included, and participation rates for demand-side management goals that would result from the use of the Participant and TRC Tests.

A. The breakdown at the program level with demand and energy savings, program costs and benefits, cost-effectiveness test results, list of measures included, and participation rates can be found in Exhibit No. [JH-15] ("JEA Program Development Summary") of Mr. Herndon's testimony.

Q. What is the estimated rate impact of the goals developed using the Participant and TRC Tests on a residential 1,000 kWh/month bill?

A. Exhibit No. [BP-6] presents the estimated bill impacts on residential 1,000 kWh/month bill for goals that would result from the use of the Participant and TRC Tests.

Q. Please describe how free-ridership was addressed in developing the demand-side management goals that would result from using the Participant and TRC tests.

A. Consistent with prior DSM analyses in Florida, free ridership was reflected by applying a two-year payback criterion, which eliminated measures having a simple payback of less than two years. Please refer to Exhibit No. [JH-12] for discussion on sensitivities (i.e. shorter and longer) to the two-year payback period.

Q. How were JEA's proposed demand-side management goals developed?

A. JEA's current FEECA programs (as established in the 2019 FEECA process) include residential Energy Audits, residential Solar Water Heating incentives, and residential low-income focused Neighborhood Energy Efficiency (NEE) Program and on the commercial side includes Energy Audits and Prescriptive Lighting incentives. In evaluating our proposed FEECA programs for the current FEECA goal setting (2025-2034) cycle, we have removed both residential and commercial Energy Audits from the portfolio because of its lack of permanency as predominantly a behavioral based measure. In addition, we have removed our Solar Water Heating incentive due to lack of customer interest and participation.

For this FEECA goal-setting process, JEA proposes to fill the gap in savings resulting from the elimination of energy audits, by adding our existing Home Efficiency Upgrades Program, that includes incentives for HVAC, Heat Pump Water Heaters and Ceiling Insulation, and our Energy Efficient Products Program, that includes incentives for Energy Star Clothes Washer, Energy Star Room Air Conditioners and Smart Thermostats, to our FEECA portfolio. We will be continuing the NEE Program and Prescriptive Lighting incentives in the portfolio.

Q. Do JEA's proposed demand-side management goals reflect projected peak demand reductions associated with the demand response programs discussed in Exhibit No __[JH-15] to Mr. Herndon's direct testimony?

A. No. JEA offers interruptible load rates. However, JEA has not included projected peak demand reductions associated with demand response or interruptible load in our proposed goals as the current interruptible rate option for customers is considered behavioral in nature and historically JEA has not had to utilize interruptible load. As such, including peak demand reductions associated with the demand response potential identified for large commercial customers in the RIM and TRC scenarios overlaps with our current interruptible load rate, and would inflate our proposed goals and jeopardize our ability to meet our goals regardless of our continuing efforts to offer demand-side management to our customers.

Q. What are JEA's proposed demand-side management goals?

A. JEA's proposed demand-side management goals can be found in Exhibit No. [JH-15] ("JEA Program Development Summary") to Mr. Herndon's testimony, and are summarized in Exhibit No. [BP-7] JEA's proposed DSM goals.

Q. Please provide a breakdown at the program level with demand and energy savings, program costs and benefits, cost-effectiveness test results, list of measures included, and participation rates associated with JEA's proposed DSM goals.

A. The breakdown at the program level with demand and energy savings, program costs and benefits, cost-effectiveness test results, list of measures included, and participation rates associated with JEA's proposed DSM goals can be found in Exhibit No. [JH-15] ("JEA Program Development Summary") of Mr. Herndon's testimony.

Q. What is the estimated rate impact of the JEA's proposed demand-side management goals on a residential 1,000 kWh/month bill?

A. Exhibit No. [BP-6] presents the estimated bill impacts on residential 1,000 kWh/month bill associated with JEA's proposed DSM goals.

Q. Did JEA perform any sensitivities that included costs associated with carbon dioxide emissions?

A. JEA did not perform any sensitivities that included costs associated with carbon dioxide emissions. While there is much speculation on the potential for greenhouse gas emissions regulation, it would be inappropriate to establish DSM goals that would increase customer rates based on yet-to-be defined regulations.

Q. Please describe how free-ridership was addressed in developing JEA's proposed demand-side management goals.

A. Consistent with prior DSM analyses in Florida, free ridership was reflected by applying a two-year payback criterion, which eliminated measures having a simple payback of less than two years. Please refer to Exhibit No. [JH-12] for discussion on sensitivities (i.e. shorter and longer) to the two-year payback period.

Q. Please describe the efforts JEA has made to address customers who rent in program development, including a list of programs they would be eligible to participate in.

A. Renters are known to be a hard-to-reach customer segment because the types of measures the can be implemented by those who rent rather than own their dwellings are limited. However, measures such as Energy Star Clothes Washers and Room Air Conditioners, included in the Energy Efficient Products Program, are portable and may therefore be available to renters depending on their specific rental agreements. In addition, almost all the direct install measures in the Neighborhood Energy Efficiency Program are non-permanent and may be available to renters depending on their specific rental agreements. In general, all customers, including those customers who rent, may benefit from JEA's educational and community outreach initiatives related to demand-side management, conservation, and energy and water efficiency.

Q. How are supply-side efficiencies incorporated in JEA's most recent planning process and how do they impact demand-side management programs?

A. JEA continually monitors the operation of its generating units and determines methods to utilize and/or modify the system in the most efficient manner. A recent example of improvement to the efficiency of supply-side resources is advanced gas path additions and compressor modifications for some of JEA's existing combustion turbines. Improvements to the efficiency of supply-side resources (i.e., lower operating costs) should reduce the cost-effectiveness of DSM programs, all else equal.

Q. How do JEA's proposed goals encourage demand-side renewable energy systems?

A. Resource Innovations fully considered demand-side renewable energy systems and found no cost-effective achievable potential for such systems. Therefore, JEA is not proposing goals associated with demand-side renewable energy systems.

Q How do the programs used to determine JEA's proposed goals compare to JEA's current demand-side management program offerings?

A. Exhibit No. ___ [BP-8] presents a comparison of JEA's current DSM programs to JEA's proposed DSM program offerings.

Q. Does this conclude your testimony?

A. Yes, it does.

Brian Pippin

PROFILE

Customer experience-oriented business leader and program manager with 20 years of utility knowledge in new product/program design, development and implementation that build customer loyalty. A natural collaborator, orator, and influencer who's successfully executed multiple cross-functional customer facing initiatives through effective team leadership, shared visioning and the continuous improvement of people, processes, and systems.

WORK EXPERIENCE – **JEA (Jacksonville, FL)**

2016 – Present
Specialist / Director, Customer Experience Insights & Solutions / Strategic Segment Manager

- Tasked with the long-term strategy and market development of JEA's demand side management (DSM), digital customer engagement and dynamic pricing offerings.
- Effectively manage JEA's energy and water DSM portfolio (25+ measures) for both residential and commercial customers with a budget more than $15MM annually.
- Successfully implemented a year-long residential demand pilot with 3,000 customers by leading 30+ cross-functional employees, representing 12 different departments, from the customer call center to metering.
- Directly managed 4 Program Managers and 14 external contract employees.

2014 – 2016
Customer Solutions Manager

- Tasked with the growth and market development of JEA's billing and payment (ebill, autopay, prepaid, budget billing) solutions.
- Tripled enrollment numbers for all billing and payment programs through creative marketing, evolving the offering and call center sales strategy.

2006 – 2014
Conservation and Efficiency Specialist

- Authored 20+ residential and commercial customer targeted fact sheets centered on the technical and financial efficacy of energy and water saving practices and products.

- Delivered 100s of consultative presentations (one-on-one/one-on-many) to customers on JEA programs and service offerings most notably through a two-year stint as host of the “Q&A with JEA” FM radio show and co-host of the “JEA Efficiency Coach” TV show.

2005 – 2006
New Technology Analyst

- Focused on the business case development for all new technology projects from pre-planning to implementation. Most notably helping to establish JEA’s Technology Project Committee (TPC) which provides the Senior Leadership Team a vehicle to review and evaluate the business case of technology projects.

2004 – 2005
Operations Analyst

- Support the preplanning, planning, analysis, design, construction, testing and implementation of data processing and information systems.
- Reengineer process maps to improve efficiency and effectiveness of SDLC execution.
- Consult with cross-functional business units to identify and quantify the savings drivers in their current processes to analyze the financial metrics of the project.

EDUCATION

1999 - 2001 University of Memphis Memphis, TN
Master of Business Administration (3.9/4.0 GPA)

1992 - 1997 Georgia Institute of Technology Atlanta, GA
Bachelor of Industrial Engineering (3.4/4.0 GPA)

CAREER RELATED CERTIFICATIONS

Building Analyst (BA) – Inactive
Building Performance Institute, Inc.

- Class 1 Home Efficiency Rating System (HERS) Energy Auditor – Inactive
Residential Energy Service Network
- Certified Energy Manager (CEM) – Inactive
Association of Energy Engineers
- Certified Green Professional (CGP) – Inactive
National Association of Home Builders

Commission-Approved Conservation Goals for JEA

Total

Year	Winter Peak MW Reduction Goal	Summer Peak MW Reduction Goal	GWh Energy Reduction Goal
2020	0.967	1.080	2.58
2021	0.967	1.080	2.58
2022	0.967	1.080	2.58
2023	0.967	1.080	2.58
2024	0.967	1.080	2.58

Residential

Year	Winter Peak MW Reduction Goal	Summer Peak MW Reduction Goal	GWh Energy Reduction Goal
2020	0.960	0.940	2.50
2021	0.960	0.940	2.50
2022	0.960	0.940	2.50
2023	0.960	0.940	2.50
2024	0.960	0.940	2.50

Commercial/Industrial

Year	Winter Peak MW Reduction Goal	Summer Peak MW Reduction Goal	GWh Energy Reduction Goal
2020	0.007	0.140	0.08
2021	0.007	0.140	0.08
2022	0.007	0.140	0.08
2023	0.007	0.140	0.08
2024	0.007	0.140	0.08

Current JEA FEECA Programs

JEA's FEECA portfolio consists of three (3) residential and two (2) commercial programs as described below.

A. Residential FEECA Programs

- Residential Energy Audit Program uses in-person auditors and online software to examine homes, educate customers and make recommendations on low-cost or no-cost energy-saving practices and measures.

- Residential Solar Water Heating pays a financial incentive to customers to encourage the use of solar water heating technology.

- Neighborhood Efficiency Program offers education concerning the efficient use of energy & water as well as the direct installation of an array of energy & water efficient measures at no cost to income-qualified customers.

B. Commercial FEECA Programs

- Commercial Energy Audit Program uses in-person auditors to examine businesses, educate customers and make recommendations on low-cost or no-cost energy-saving practices and measures.

- Commercial Prescriptive Lighting Program pays a financial incentive to customers to install high efficiency lighting technology.

Historical Participation in Current JEA FEECA Programs

Program Name: REA: Residential Energy Audits
Program Start Date: 1978
Reporting Period: **2023**

a	b	c	d	e	f	g	h	I
Year	Total Number of Customers	Total Number of Eligible Customers	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % (d/cx100)	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % (g/c)	Actual Participation Over (Under) Projected Participants (g-d)
2020	424,939	424,939	5,200	1.2%	13,111	13,111	3.1%	7,911
2021	431,420	431,420	10,400	2.4%	11,405	24,516	5.7%	14,116
2022	437,973	437,973	15,600	3.6%	12,387	36,903	8.4%	21,303
2023	444,544	444,544	20,800	4.7%	10,504	47,407	10.7%	26,607
2024	450,901	450,901	26,000	5.8%				

Program Name: RSWH: Residential Solar Water Heating
Program Start Date: 2002
Reporting Period: **2023**

a	b	c	d	e	f	g	h	I
Year	Total Number of Customers	Total Number of Eligible Customers	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % (d/cx100)	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % (g/c)	Actual Participation Over (Under) Projected Participants (g-d)
2020	424,939	424,939	2	0.000%	0	0	0.0%	(2)
2021	431,420	431,420	4	0.001%	0	0	0.0%	(4)
2022	437,973	437,973	6	0.001%	0	0	0.0%	(6)
2023	444,544	444,544	8	0.002%	1	1	0.0%	(7)
2024	450,901	450,901	10	0.002%				

Program Name: NEE: Neighborhood Energy Efficiency
Program Start Date: 2008
Reporting Period: **2023**

a	b	c	d	e	f	g	h	I
Year	Total Number of Customers	Total Number of Eligible Customers	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % (d/cx100)	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % (g/c)	Actual Participation Over (Under) Projected Participants (g-d)
2020	424,939	127,482	1,350	1.1%	1,122	1,122	0.9%	(228)
2021	431,420	129,426	2,700	2.1%	1,687	2,809	2.2%	109
2022	437,973	131,392	4,050	3.1%	1,413	4,222	3.2%	172
2023	444,544	133,363	5,400	4.0%	1,308	5,530	4.1%	130
2024	450,901	135,270	6,750	5.0%				

Program Name: CEA: Commercial Energy Audits
Program Start Date: 1978
Reporting Period: **2023**

a	b	c	d	e	f	g	h	I
Year	Total Number of Customers	Total Number of Eligible Customers	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % (d/cx100)	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % (g/c)	Actual Participation Over (Under) Projected Participants (g-d)
2020	54,298	54,298	100	0.2%	142	142	0.3%	42
2021	54,932	54,932	200	0.4%	173	315	0.6%	115
2022	55,557	55,557	300	0.5%	320	635	1.1%	335
2023	56,173	56,173	400	0.7%	246	881	1.6%	481
2024	56,784	56,784	500	0.9%				

Program Name: CPL: Commercial Prescriptive Lighting
Program Start Date: 2009
Reporting Period: **2023**

a	b	c	d	e	f	g	h	I
Year	Total Number of Customers	Total Number of Eligible Customers	Projected Cumulative Number of Program Participants	Projected Cumulative Penetration Level % (d/cx100)	Actual Annual Number of Program Participants	Actual Cumulative Number of Program Participants	Actual Cumulative Penetration Level % (g/c)	Actual Participation Over (Under) Projected Participants (g-d)
2020	54,298	54,298	20	0.04%	141	141	0.26%	121
2021	54,932	54,932	40	0.07%	54	195	0.35%	155
2022	55,557	55,557	60	0.11%	54	249	0.45%	189
2023	56,173	56,173	80	0.14%	101	350	0.62%	270
2024	56,784	56,784	100	0.18%				

Customer Programs & Solutions

Conservation and Efficiency

GOALS

- Increase customer satisfaction, build brand loyalty.
- Increase customer awareness and adoption of conservation and efficiency programs and solutions.
- JEA viewed as an Environmental Steward in the community by customers.

Goal	Strategy	Audience(s)
Increase customer awareness and adoption	**Reach customers using paid advertising to promote conservation and efficiency through integrating messages into buys with efficiency.** • Align other communications tactics with paid advertising that touts conservation and efficiency messages • Serve targeted ads to customers who meet certain criteria – homeowners, customers with visits to home improvement websites, etc • Bundle messaging - Tie conservation and efficiency messaging with environmental messaging to make the connect for customers. Combine rebate messaging with efficiency assessments, etc	General customers Segmented general customers General customers
Increase customer awareness and adoption	**Reach specialty audiences through digital channels by leveraging hyper-targetted marketing tactics to deliver customized messaging.** • Use email communications to target customers who have high energy and water usage and/or have called the call center with high bill complaints • Use email communications to promote rebate programs to customers who have taken advantage of our efficiency assessments • Place paid ads on home improvement and solar energy websites	Low-income/ underserved General customers

	• Target renters using inserts and email communications about programs relative to renting vs owning a home • Work with HOAs and property management groups to better reach our customers with conservation and efficiency tips and savings tips • New functionality - popup messaging in customer accounts on jea.com to promote conservation and efficiency programs – tie to seasons	Millennial/Gen Z Millennial/Gen Z, low-income General customers
Increase customer satisfaction, awareness and adoption	**Reach engaged customers with messaging on shared channels through organic social media promotions and content development.** • Develop seasonal campaigns for social media channels – right solution, right time • Utilize evergreen messaging to keep programs in front of customers and on top of mind throughout the year • Tie environmental and conservation messaging – ex: Conserving not only saves you, it saves the environment • Utilize a show-and-tell method to promote efficiency assessments using media coverage, social media content, in-person demonstrations for community groups, etc. Share case studies, like we do for rebates, about the savings customers have experienced after assessments	General customers General customers General customers Millennial/Gen Z General customers
Increase customer satisfaction, brand loyalty	**Develop and/or refine conservation and efficiency offerings by engaging customers through planned research efforts.** • Use customer feedback in Focus Groups and Customer Surveys to gain better insight of what types of programs customers want, how we can improve the current programs we offer and how we can better inform them about our program offerings	All customer target groups

Increase customer awareness and adoption	**Make customers aware of JEA conservation and efficiency solutions by integrating promotion/sales through all customer touchpoints.** • Utilize customer advisor scripts to recommend conservation and efficiency solutions when customers call with high bill complaints • Utilize hold messaging to promote customer conservation and efficiency programs and solutions • Align messaging, marketing plans and goals with program implementation contractors utilizing their channels as needed • Utilize PQC as “efficiency reps” by providing messaging and collateral they can share with their JEA customers. • Utilize the confirmation/reminder notification communications as touchpoints to promote available programs and solutions. If there’s a way to link customer information, have those recommendations be customized to the person/account who made the appointment • Onsite Information Sharing - Take advantage of onsite customer events to share information about ways to save, conservation and rebate programs. Equip ambassadors with collateral and talking points • Use partnerships as a way to share conservation and efficiency messaging through marketing benefits and the additional customer reach	Low-income/ underserved General customers General customers General customers General customers General customers
JEA viewed as an Environmental Steward	**Create foundational knowledge about the importance of conservation through younger generations by engaging youth audiences with educational entertainment.** • Create fun, interactive and educational pieces for younger audiences that highlight the benefits of conservation and efficiency. The assets can be shared in the same way as PowerPals and AquaPals workbooks	General customers

	• Develop a "first time renters" education program	Millennial/ Gen Z, low-income Millennial/ Gen Z, low-income

Measuring Success

- JDP Survey
- Digital Analytics
- Focus Groups
- Brand Tracking Surveys
- Program Adoption

Estimated Bill Impacts –RIM Scenario, TRC Scenario, and JEA's Proposed Goals

Estimated Monthly Bill Impact for 2025 through 2034 for Residential 1,000 kWh/Month Customer - JEA RIM Scenario										
Calendar Year	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Monthly Increase to 1,000 kWh Bill	$0.14	$0.13	$0.14	$0.14	$0.14	$0.15	$0.15	$0.15	$0.15	$0.15

Estimated Monthly Bill Impact for 2025 through 2034 for Residential 1,000 kWh/Month Customer - JEA TRC Scenario										
Calendar Year	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Monthly Increase to 1,000 kWh Bill	$1.03	$1.17	$1.34	$1.52	$1.69	$1.84	$1.96	$2.04	$2.09	$2.11

Estimated Monthly Bill Impact for 2025 through 2034 for Residential 1,000 kWh/Month Customer - JEA Proposed Goals										
Calendar Year	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Monthly Increase to 1,000 kWh Bill	0.22	0.25	0.28	0.31	0.34	0.37	0.40	0.41	0.41	0.41

Year	Residential			Commercial/Industrial			Total		
	Summer Peak Demand Reduction (MW)	Winter Peak Demand Reduction (MW)	Annual Energy (MWh)	Summer Peak Demand Reduction (MW)	Winter Peak Demand Reduction (MW)	Annual Energy (MWh)	Summer Peak Demand Reduction (MW)	Winter Peak Demand Reduction (MW)	Annual Energy (MWh)
2025	0.68	0.88	3,172	0.44	0.37	3,346	1.12	1.25	6,518
2026	0.84	0.99	3,670	0.47	0.39	3,562	1.31	1.38	7,232
2027	1.03	1.11	4,257	0.50	0.41	3,771	1.53	1.52	8,028
2028	1.26	1.25	4,917	0.53	0.42	3,975	1.79	1.67	8,892
2029	1.50	1.38	5,608	0.56	0.44	4,169	2.06	1.82	9,777
2030	1.73	1.51	6,250	0.58	0.45	4,334	2.31	1.96	10,584
2031	1.90	1.60	6,733	0.60	0.46	4,444	2.50	2.06	11,177
2032	1.96	1.65	6,951	0.60	0.46	4,470	2.56	2.11	11,421
2033	1.89	1.63	6,850	0.59	0.46	4,403	2.48	2.09	11,253
2034	1.70	1.57	6,474	0.57	0.45	4,257	2.27	2.02	10,731

JEA's Existing DSM Programs	**JEA's Proposed DSM Programs**
Residential Energy Audit (Online & In-Person)	Residential Home Efficiency Upgrades • HVAC • Heat Pump Water Heaters • Ceiling Insulation
Residential Solar Water Heating	Residential Energy Efficient Products • Energy Star Clothes Washers • Energy Star Room Air Conditioners • Smart Thermostats
Residential Neighborhood Efficiency	Residential Neighborhood Efficiency
Commercial Prescriptive Lighting	Commercial Prescriptive Lighting
Commercial Energy Audit (In-Person ONLY)	

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

DIRECT TESTIMONY OF BRADLEY E. KUSHNER

ON BEHALF OF

JEA

DOCKET NO. 20240016-EG

APRIL 2, 2024

Q. Please state your name and business address.

A. My name is Bradley E. Kushner. My business address is 4767 New Broad Street, Orlando, Florida 32814.

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

A. I am employed by nFront Consulting LLC (nFront) as a Manager and Executive Consultant and I am the National Director of nFront's Energy practice.

Q. What are your responsibilities in that position?

A. I oversee management of the financial and business aspects of nFront and work with others in the firm to provide consulting services to clients. My responsibilities include project management and project support for various projects for electric utility clients. These projects include integrated resource plans, power supply studies, power supply requests for proposals, demand-side management/conservation reports, and other regulatory filings.

Q. Please describe nFront Consulting LLC.

A. nFront Consulting is organized into two service practices – Energy and Transmission & Delivery. nFront Consulting's Energy Practice provides advisory services to support our electric industry clients. nFront Consulting assists in the areas of planning, implementing, and managing resources, portfolios, and individual business unit operations. nFront Consulting interacts on behalf of our clients with regulatory, political, and environmental agencies; the financial community; and other professional service providers on national, state, and local levels.

nFront Consulting's Transmission and Delivery Services Practice provides independent transmission consulting, analyses and advisory services to support project financing, acquisitions, development, transmission risk, curtailment and congestion assessments, transmission planning, resource integration, and open access, expert witness and regulatory services.

Q. Please summarize your educational background and professional experience.

A. I received my Bachelors of Science degree in Mechanical Engineering from the University of Missouri-Columbia in 2000 and my Master of Business Administration from Emporia State University in 2013. I have nearly 25 years of experience in the engineering and consulting industry, including experience in the development of integrated resource plans, ten-year-site plans, Demand-Side Management and energy conservation plans, and other capacity planning studies for clients throughout the United States. Utilities in Florida for which I have worked include JEA, Florida Municipal Power Agency, Kissimmee Utility Authority, Orlando Utilities Commission (OUC), Lakeland Electric, Gainesville Regional Utilities (GRU), Reedy

Creek Improvement District, Tampa Electric Company, and the City of Tallahassee. I have performed production cost modeling, economic analysis, and related support for six electric power plant need determination petitions filed on behalf of Florida utilities and approved by the Florida Public Service Commission (FPSC). I have also testified before the FPSC in Need for Power and Florida Energy Efficiency and Conservation Act (FEECA) Goal-Setting proceedings.

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

A. The purpose of my testimony in this proceeding is to discuss how JEA's load forecast was developed and the methodology used to develop the avoided capacity costs that were provided to Resource Innovations for use in their analyses of DSM measures for JEA. I will also discuss JEA's fuel forecasts used in the production cost modeling that formed the basis for the avoided energy costs provided to Resource Innovations.

Q. Are you sponsoring any exhibits to your testimony?

A. Yes. Exhibit No. [BEK-1] is a copy of my resume. Exhibit No. [BEK-2] summarizes the avoided unit costs.

Q. How was JEA's load forecast developed?

A. The JEA load forecast used for purposes of calculating the avoided costs provided to Resource Innovations is based on the load forecast reflected in JEA's 2023 Ten-Year Site Plan, the most recent Ten-Year Site Plan available at the time the analysis began.

The load forecast includes forecasts of seasonal peak demands and annual net energy for load and accounts for interruptible load and the impacts of demand-side management and plug-in electric vehicles. JEA uses the National Oceanic and Atmospheric Administration (NOAA) Weather Station – Jacksonville International Airport for the weather parameters, Moody's Analytics economic parameters for Duval County, projections of residential and commercial customers. JEA's load forecast uses 10 years of historical data, allowing JEA to capture recent trends in customer behavior and energy efficiency and conservation in the actual data that is used in developing projected peak demand and energy requirements.

Additional information related to JEA's load forecast is included in JEA's 2023 Ten-Year Site Plan.

Q. How was the timing of avoidable capacity additions determined?

A. Based on JEA's current load forecast and available generating resources, JEA is anticipated to require additional capacity to maintain a 15 percent reserve margin beginning in 2030. For the anticipated capacity requirements beginning in 2030, it has been assumed that JEA would install a new advanced-class combined cycle at the existing Greenland Energy Center (GEC). JEA has made no commitments to this new combined cycle, and for purposes of this docket, it is considered avoidable capacity and used to develop the avoided capacity costs provided to Resource Innovations for use in their analyses of DSM measures for JEA.

Q. How were capital costs for the additional capacity calculated?

A. The capital cost for the new advanced-class combined cycle was based on estimates used by JEA for resource planning activities and included in Schedule 9 of JEA's 2023 10-Year Site Plan, which presents the estimated in-service year (i.e. 2030) capital cost inclusive of escalation and costs for interest during construction. The estimated in-service year capital cost was multiplied by a fixed charge rate to determine a levelized installed capital cost, which was divided by the output of the combustion turbine to develop a levelized installed capital cost per kW. Adjustments were made to account for the capital cost per kW during summer and winter seasons, given the expected difference in capacity of the advanced-class combined cycle for summer and winter.

Q. How were fixed operating and maintenance (O&M) costs for the additional capacity calculated?

A. The fixed O&M cost for the new advanced-class combined cycle was based on estimates used by JEA for resource planning activities and included in Schedule 9 of JEA's 2023 10-Year Site Plan, which presents the estimated in-service year (i.e. 2030) fixed O&M cost. The fixed O&M costs were escalated to nominal dollars at a 3.0 percent annual escalation rate.

Q. Please discuss how the total avoided costs per kW were calculated.

A. Total avoided costs per kW were calculated by adding the avoided capital costs per kW to the avoided fixed O&M costs per kW. The avoided costs per kW are presented in Exhibit No. [BEK-2].

Q. Please discuss the base case fuel forecast.

A. JEA's generating units utilize a diverse mix of fuels, including natural gas, biomass, petroleum coke, and fuel oil. The base case fuel forecast used for purposes of calculating the avoided energy costs provided to Resource Innovations is based on the fuel price forecasts reflected in JEA's 2023 Ten-Year Site Plan, the most recent Ten-Year Site Plan available at the time the analysis began. The natural gas price projections are based on short-term NYMEX price projections and longer-term price projections are based on escalation rates from the U.S. Energy Information Administration's Annual Energy Outlook 2022 (AEO2022) and include costs for delivery to JEA's generating units. Coal price projections are based on short-term NYMEX Argus-McCloskey price projections and longer-term price projections are based on escalation rates from the AEO2022 and include costs for delivery based on historical transportation costs. Projected prices for petroleum coke are based on historical price differences between JEA's coal and petroleum coke prices. Fuel oil price projections are based on short-term NYMEX price projections and longer-term price projections are based on the AEO2022.

Additional information related to JEA's fuel price projections is included in JEA's 2023 Ten-Year Site Plan.

Q. Did JEA consider high and low fuel price sensitivities?

A. Yes. In addition to the base case fuel price forecasts, JEA considered high and low fuel price sensitivities. The high and low fuel price sensitivity projections provide a band of plus/minus 25 percent around the base case fuel price projections. This high and low band is consistent with what JEA used in the 2019 FEECA goal-setting process.

Q. How were energy costs for each of the cases previously identified in your testimony developed?

A. Under my direction and supervision, PLEXOS, an industry accepted production cost model, was used to perform production cost modeling of its electric generating system, taking into account JEA's generating resources, the avoided unit, load forecast, and the base fuel price projections discussed previously in my testimony.

The resulting energy costs were taken from the PLEXOS output and include fuel as well as non-fuel variable O&M costs associated with dispatch of JEA's resources to meet forecast system demand requirements. The PLEXOS output was provided for use in the economic analysis.

Q. Were energy costs developed for each of the fuel price cases discussed previously in your testimony?

A. Yes. The energy costs developed using the base case fuel price projections were increased by 25 percent for the high fuel sensitivity and decreased by 25 percent for the low fuel sensitivity.

Q. Does this conclude your testimony?

A. Yes, it does.

OVERVIEW

Mr. Kushner has nearly 25 years in the energy industry with a specialty in electric utility system resource planning. His expertise includes the following areas:

- Conservation / Demand-Side Management / Energy Efficiency
- Expert Testimony
- Regulatory Compliance and Support
- Integrated Resource Plans
- Power Supply Studies
- Conventional Energy Technologies
- Renewable Energy Technologies
- Economic Analysis
- Production Cost Modeling
- Independent Engineering
- Project Management
- Power Supply Requests for Proposals (RFPs)

Mr. Kushner has provided testimony in many conservation and energy efficiency dockets, power plant need determination proceedings, and integrated resource plans. Mr. Kushner has managed numerous integrated resource plans, need for power applications, power supply studies, demand-side management/energy efficiency/conservation evaluations and power supply request for proposals (RFPs), among other studies. Mr. Kushner has a demonstrated ability to manage internal and external project teams with diverse experience levels and areas of expertise, both in co-located and virtual environments. Mr. Kushner's experience in project management and expertise in the areas outlined above allow him to collaborate with clients to deliver outstanding services to his clients. His ability to effectively communicate in writing and verbally helps to keep stakeholders informed throughout project lifecycles and has contributed to his successful experiences as a witness and in formal presentations to clients' Board of Directors.

PROJECT EXPERIENCE

Demand-Side Management / Energy Efficiency/ Conservation (DSM/EE/Conservation)

Mr. Kushner's experience with the evaluation of DSM/EE/Conservation is highlighted by his involvement in the development of conservation goals and demand-side management plans for Florida utilities as part of the 2009, 2014, and 2019 Florida Energy Efficiency and Conservation Act (FEECA) filings. Mr. Kushner led development of the filings and testified as to the appropriateness of the numeric goals and process utilized to evaluate the cost-effectiveness of DSM/EE/Conservation programs.

Expert Witness Support

Mr. Kushner has testified as a witness in numerous proceedings related to Determination of Need petitions and Florida Energy Efficiency and Conservation Act (FEECA) filings in the State of Florida and has been involved as a witness in integrated resource planning (IRP) proceedings elsewhere in the United States. Related experience includes coordinating/leading responses to hundreds of interrogatories and production of document requests.

Electric Utility System Resource Planning / Production Cost Modeling

With his extensive experience in Electric Utility System Resource Planning and production cost modeling, Mr. Kushner recognizes that while industry best practices provide effective guidelines, the unique nature of each client's situation require strategic thinking and the ability to develop plans that are specific to the client's needs. Mr. Kushner's expertise in generation (including conventional and renewable technologies), demand-side management, and fundamentals of production cost modeling allow Mr. Kushner to deliver comprehensive resource plans that clients can utilize for future decision making.

Integrated Resource Plans /Power Supply Studies

Mr. Kushner has been involved as the project manager, study manager, and lead analyst on several integrated resource plans (IRP) or power supply studies during his professional career. Mr. Kushner has been involved in such studies for clients in Alaska, Colorado, Florida, Massachusetts, Michigan, New York, Oklahoma, Texas, and Wisconsin, as well as other states and territories.

Power Supply Requests for Proposals (RFPs)

Power purchases are often an important component of electric utility system planning, and conducting a competitive power supply RFP process may be critical to the ensuring the most cost-effective, reliable, and environmentally responsible alternatives are being considered. Mr. Kushner has experience in the complete RFP lifecycle, including collaborating with clients to develop the RFP, supporting clients during issuance and subsequent management of the RFP process, screening and evaluating RFP responses, presenting the results of the RFP to clients and stakeholders, and supporting negotiations related to power purchase agreements. Mr. Kushner has managed or otherwise been involved in numerous RFP processes focused on both conventional and renewable generating technologies.

Independent Engineering / Project Financing Support

Mr. Kushner has managed projects in the area of independent engineering, related to merger and acquisition support as well as development of new power projects. Most recently, Mr. Kushner managed the independent engineering assessment of a new biomass facility in North America for which the developer was trying to obtain project financing. The independent engineering assessment included development of a due diligence report on behalf of the developer, supporting negotiations with potential investors, supporting development of the credit agreement with the eventual loan syndicate, and monthly construction monitoring activities.

PROFESSIONAL HISTORY

Mr. Kushner began his career with Black & Veatch Corporation in 2000 and has been involved in electric utility system resource planning and independent engineering engagements since that time in various roles at Black & Veatch. Most recently, Mr. Kushner was Department Head for Black & Veatch's Management Consulting group and was a Director for Black & Veatch Management Consulting LLC's electric system resource planning service offering before joining nFront Consulting LLC in 2016. Mr. Kushner is currently a Manager of nFront Consulting and the National Director of nFront Consulting's Energy practice.

EDUCATIONAL

Mr. Kushner's educational background includes a B.S. in Mechanical Engineering from the University of Missouri - Columbia and a Master of Business Administration from Emporia State University.

Calendar Year	Avoided Unit Cost - Summer (Nominal $/kW)	Avoided Unit Cost - Winter (Nominal $/kW)
2027	$0.00	$0.00
2028	$0.00	$0.00
2029	$0.00	$0.00
2030	$108.37	$98.93
2031	$108.59	$99.15
2032	$108.81	$99.37
2033	$109.04	$99.60
2034	$109.28	$99.84
2035	$109.52	$100.08
2036	$109.77	$100.33
2037	$110.03	$100.59
2038	$110.30	$100.86
2039	$110.57	$101.13
2040	$110.85	$101.42
2041	$111.14	$101.71
2042	$111.44	$102.01
2043	$111.75	$102.32
2044	$112.07	$102.63
2045	$112.40	$102.96
2046	$112.74	$103.30
2047	$113.08	$103.65
2048	$113.44	$104.00
2049	$113.81	$104.37
2050	$114.19	$104.75
2051	$114.58	$105.14
2052	$114.98	$105.55
2053	$115.40	$105.96
2054	$115.83	$106.39

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

TABLE OF CONTENTS

I. INTRODUCTION

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

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

Q. Please discuss your areas of responsibility.

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

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

A. RI was founded in 2016, and is a globally recognized consulting, software, and services firm that provides innovative DSM solutions to utilities, energy enterprises, and government entities worldwide. RI merged with Nexant, Inc., in 2021, which provided similar DSM consulting services since its founding in 2000. RI's Utility Services business unit provides DSM engineering and consulting services to government agencies and utilities, and helps residential, commercial, and industrial facility owners manage energy consumption and reduce costs in their facilities. RI also conducts development and implementation services of DSM programs for public and investor-owned utilities, governments, and end-use customers. Our range of experience in the field of EE includes, but is not limited to:

- Market potential studies
- Program design
- Program implementation
- Marketing
- Vendor outreach, education, and training
- Incentive processing and fulfillment
- Turnkey customer service
- Online program tracking and reporting
- Evaluation, measurement and verification (EM&V)

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

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

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

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

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

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

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

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

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

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

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

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

Q. Are you sponsoring any exhibits in this case?

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

- Exhibit No. JH-1 – Herndon Background and Qualifications
- Exhibit No. JH-2 – TPS for Florida Power & Light
- Exhibit No. JH-3 – TPS for Duke Energy Florida
- Exhibit No. JH-4 – TPS for Tampa Electric Company
- Exhibit No. JH-5 – TPS for Florida Public Utilities Company
- Exhibit No. JH-6 – TPS for JEA
- Exhibit No. JH-7 – TPS for Orlando Utilities Commission
- Exhibit No. JH-8 – 2024 Measure Lists
- Exhibit No. JH-9 – Comparison of Comprehensive 2019 Measure Lists to the 2024 Comprehensive Measure Lists
- Exhibit No. JH-10 – DEF Measure Screening and Economic Sensitivities
- Exhibit No. JH-11 – FPUC Measure Screening and Economic Sensitivities

- Exhibit No. JH-12 – JEA Measure Screening and Economic Sensitivities
- Exhibit No. JH-13 – OUC Measure Screening and Economic Sensitivities
- Exhibit No. JH-14 – FPUC Program Development Summary
- Exhibit No. JH-15 – JEA Program Development Summary
- Exhibit No. JH-16 – OUC Program Development Summary

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

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

In addition, RI was retained by four of the six utilities to conduct an economic analysis of EE, DR, and DSRE measures, designed to determine which measures are cost-effective from different test perspectives and to develop estimates of potential impacts if these measures were adopted in each of these four utility service areas. RI also supported three of the six utilities in developing DSM proposed goals through bundling individual DSM measures into preliminary program concepts and estimating the impacts, including participation, savings, and utility budgets, for these programs.

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

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

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

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

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

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

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

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

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

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

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

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

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

- Determine measures passing RIM test scenario and TRC test scenario: measures with a benefit/cost ratio of less than 1.0 were screened from the economic analysis.
- RI also performed this economic screening analysis using a set of economic sensitivities.

- *Measure adoption forecasts*. For a subset of the FEECA Utilities, RI updated the economic analysis and developed market adoption estimates for passing measures under each cost-effectiveness test scenario. This step produced an updated "RIM Scenario" and a "TRC Scenario" of passing measures and associated energy and demand savings. Key tasks included:
    - Applying estimated representative program costs, based on current FEECA program data and other secondary sources, and rerunning the economic analysis for both the TRC and RIM scenarios, including screening these passing measures from the Participant Cost Test (PCT) perspective for each scenario.
    - Incorporating free ridership screening based on payback analysis, removing measures with a payback of less than two years.
    - Applying estimated market adoption rates for passing measures for each scenario, based on economic and market

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

- *Measure bundling and program development*. For a subset of utilities, RI supported the development of program concepts that formed the basis for proposed DSM goals. Key tasks included:
    - Measure bundling: RI worked collaboratively with the FEECA Utilities to identify measures that aligned with current programs or logically made sense to offer as a program.
    - Estimating program metrics, including annual participation, savings, and utility budgets.

II. MEASURE IDENTIFICATION AND SELECTION

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

A. The starting point for measure identification was the list of measures included in the 2019 Florida TP Studies. Using this set of measures, the FEECA Utilities initially reviewed and added proposed measures, and provided the combined list to RI. RI compared the preliminary list to its DSM measure library, compiled from similar studies conducted in recent years, as well as from other utility DSM programs that RI has designed, implemented, or evaluated. 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, as detailed in Appendix D of each TPS report.

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

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

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

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

A. Yes. The thorough process for developing the list resulted in a comprehensive set of over 400 unique EE, DR, and DSRE measures that fully addressed DSM opportunities across all electric energy-consuming end-uses at residential, commercial, and industrial facilities in the FEECA Utilities' service areas. The final measure list is provided in Exhibit No. JH-8.

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

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

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

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

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

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

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

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

III. TECHNICAL POTENTIAL

Q. Please define Technical Potential.

A. Section 366.82(3) of FEECA requires the Commission to "…evaluate the full technical potential of all available demand-side and supply-side conservation and efficiency measures, including demand-side renewable energy systems." Therefore, a TP analysis is the first in a series of steps in the DSM Goals development process. Its purpose is to identify the theoretical limit to reducing summer and winter electric peak demand and energy. The TP assumes every identified potential end-use measure is installed everywhere it is "technically" feasible to do so from an engineering standpoint, regardless of cost, customer acceptance, or any other real-world constraints (such as product availability, contractor/vendor capacity, cost-effectiveness, normal equipment replacement rates, or customer preferences).

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

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

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

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

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

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

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

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

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

The final component of estimating overall TP is to account for the interaction between measures. In some situations, measures compete with each other, such as a 16 SEER air source heat pump and an 18 SEER air source heat pump. For TP, the measure with the highest savings factor is prioritized. The other interaction is measure overlap, where the impacts of one measure may affect the savings for a subsequent measure. An example of measure overlap would be the installation of an 18 SEER air source heat pump as well as a smart thermostat that optimizes the operation of the heat pump. To account for overlapping impacts, RI's model ranks measures that interact with one another and reduces the baseline consumption for the subsequent measure based on savings achieved by the preceding measure. For TP, interactive measures are ranked based on the total end-use energy savings percentage, with the measures having a greater savings treated as being implemented first.

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

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

Similar to the estimation of EE TP, the DR analysis begins with a disaggregation of the utility load forecast. RI's approach for load disaggregation to identify DR opportunities is more advanced than that used for most potential studies. Instead of disaggregating annual consumption or peak demand, RI produced end-use load disaggregation for all 8,760 hours of the year. This was needed because customer loads available at times when utility system needs arise can vary substantially. For this study, curtailable load opportunities, coincident with both the summer system peak and winter system peak, were analyzed. Additionally, instead of producing disaggregated loads for the average customer, the study produced loads for several customer segments. RI examined three residential segments based on customer housing type, four different small commercial and industrial (C&I) segments, and four different large C&I customer segments, for a total of 11 different customer segments. Next, RI identified the available load for the appropriate end-uses that can be curtailed. RI's approach assumed that large C&I customers would forego virtually all electric demand temporarily if the financial incentive was large enough. For residential and small C&I customers, TP for DR is limited by loads that can be controlled remotely at scale. For this study, it was assumed that summer DR capacity for residential customers was comprised of air conditioning (A/C), pool pumps, water heaters, and electric vehicle charging. For small C&I customers, summer capacity was based on A/C load and electric vehicle charging.

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

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

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

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

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

The analysis was conducted in five steps, as follows:

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

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

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

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

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

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

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

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

- Sized the storage system to peak PV generation and assumed energy storage duration of three hours.
- Applied RI's hourly dispatch optimization model in SPIDER to create an hourly storage dispatch profile that flattened the individual customer's load profile to the greatest extent possible, accounting for (a) a customer's hourly load profile; (b) hourly PV generation profile; and (c) battery peak demand, energy capacity, and roundtrip charge/discharge efficiency.
- Calculated 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).

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

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

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

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

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

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

IV. ECONOMIC ANALYSIS

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

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

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

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

A. When analyzing DSM measures, different cost-effectiveness tests are considered to reflect the perspectives of different stakeholders. The Ratepayer Impact Measure (RIM) test addresses an electric utility customer perspective, which considers the net impact on electric utility rates associated with a measure or program. The Total Resource Cost (TRC) test addresses a societal perspective, which considers costs of a DSM measure or program relative to the benefits of avoided utility supply costs. The Participant Cost Test (PCT) addresses a participant perspective, which considers net benefits to those participating in a DSM program.

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

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

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

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)

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

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

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

- 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.

- Both scenarios required the measures to pass the PCT. Similar to the TRC and RIM perspectives, the PCT screening was conducted without any utility's incentive costs applied to the measure.

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

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

Q. Were any additional economic sensitivities considered?

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

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

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

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

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

V. MEASURE ADOPTION FORECASTS

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

A. Yes. The 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.

In addition, 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.

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

Q. How were measure incentives determined for this study?

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

- For the RIM Scenario, the RIM net benefit for each measure was calculated based on total RIM benefits minus total RIM costs. Next, the amount required to result in a simple payback period of two years for each measure was calculated. The maximum incentive was based on the lower of these two values.
- For the TRC Scenario, since the TRC test does not include utility incentives as a cost or benefit, the maximum incentive was based on the amount required to result in a simple payback period of two years for each measure.

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

A. RI's methodology consisted of applying estimates of market adoption, based on utility-sponsored program incentives for all cost-effective EE measures in each Base Case scenario. RI's market adoption estimates used 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 were 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 adoption curves to each cost-effective measure.

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

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

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

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

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

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

VI. DSM GOAL DEVELOPMENT

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

A. For JEA, OUC, and FPUC, RI assisted with the development of 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). The proposed DSM goal development process and results for each scenario is described in more detail in Exhibit No. JH-14, No. JH-15, and No. JH-16, and consisted of the following steps:

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

Step 2: Program Refinement and Modeling. Preliminary program concepts and measure bundles were refined into proposed program offerings and incentive and non-incentive budgets, participation estimates, and impacts were developed using RI's TEA-POT model. The modeling results were exported into RI's Program Planner workbook that aggregated the 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 each utility to identify the measures and program concepts that comprise the proposed DSM goals.

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

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

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

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

VII. REASONABLENESS OF RI'S ANALYSES

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

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

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

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

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

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

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

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

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

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

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

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

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

Q. Does this conclude your direct testimony?

A. Yes.

resource innovations

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 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.

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-Residential[1]	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 Potential[2]

	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.

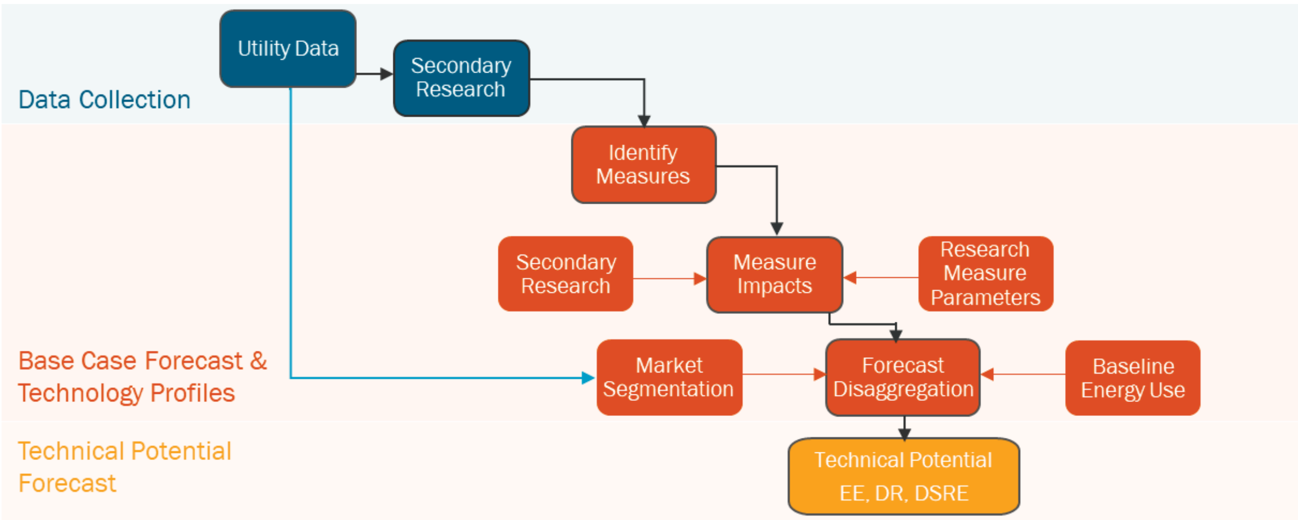
Quantifying DSM technical potential is the result of an analytical process that refines DSM opportunities that align with FPL's customers' electric consumption patterns. Resource Innovations' general methodology for estimating technical potential is a hybrid "top-

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.

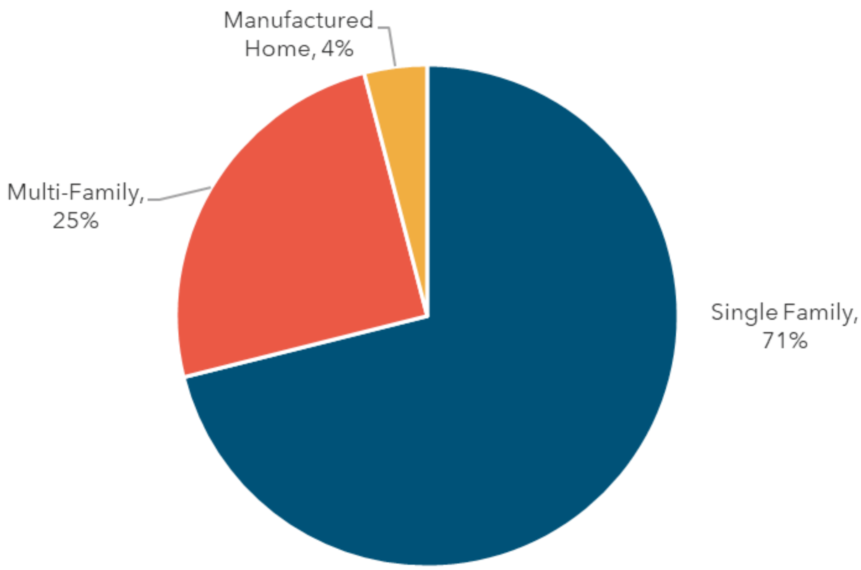
3.2 Analysis of Customer Segmentation

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

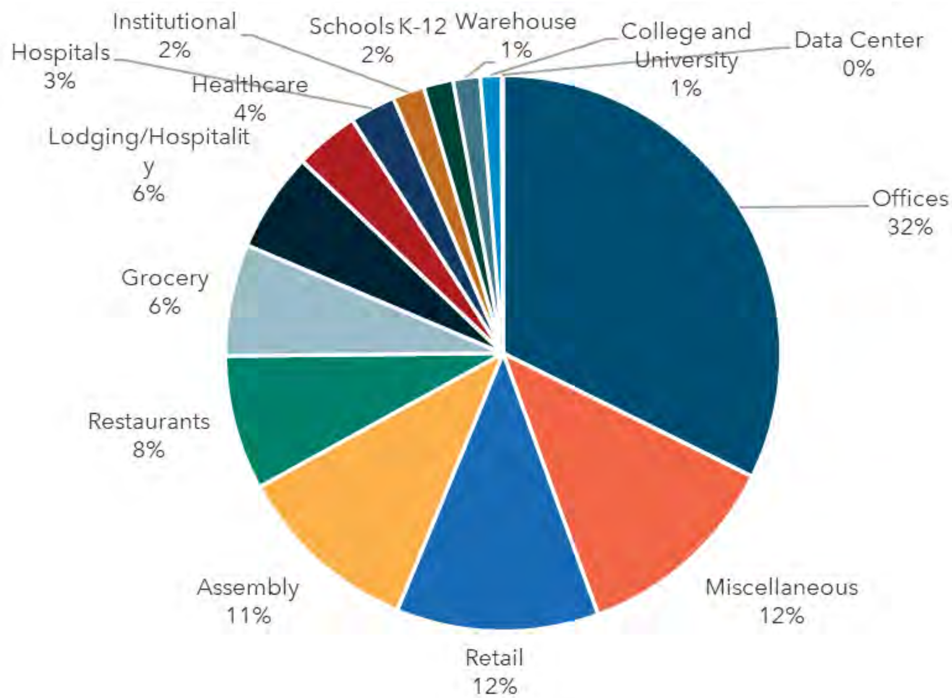
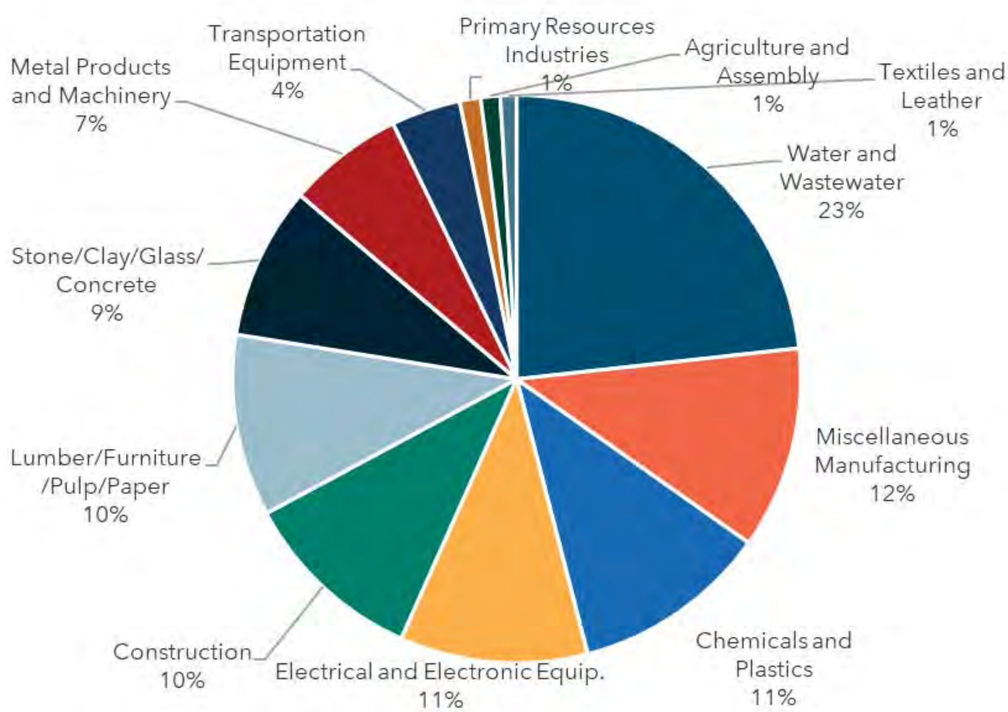


Figure 4. Industrial Customer Segmentation



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

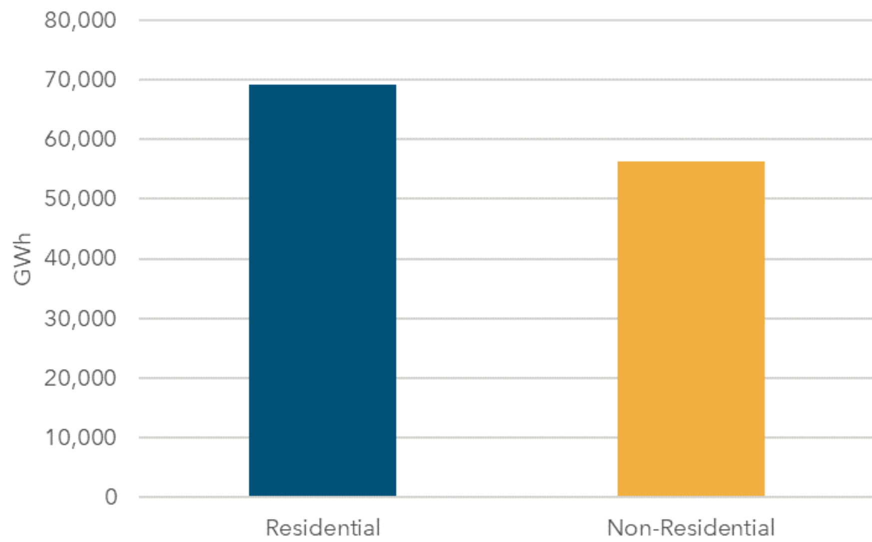
Customer Class	Annual kWh	Estimated Number of Accounts
Small C&I	0-15,000 kWh	360,182
	15,001-25,000 kWh	81,685
	25,001-50,000 kWh	78,842
	50,001 kWh +	36,567
	Total	557,276
Large C&I	0-50 kW	64,699
	51-300 kW	49,692
	301-500 kW	5,141
	501 kW +	4,332
	Total	123,864

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 loads[4] 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

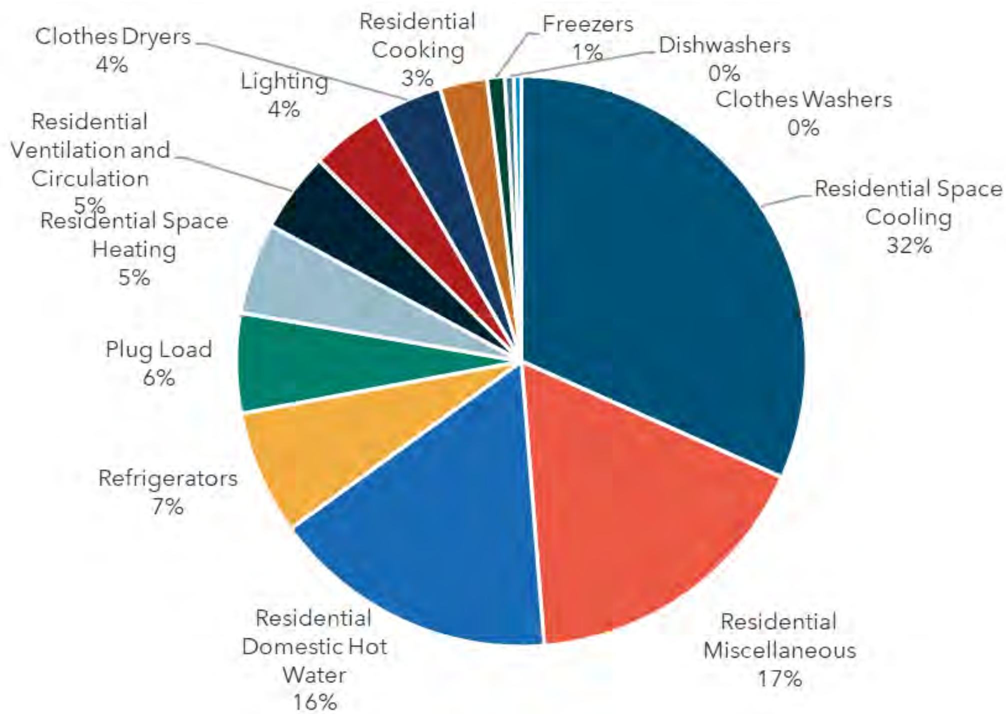


Figure 7. Commercial Baseline (2025) Energy Sales by End-Use

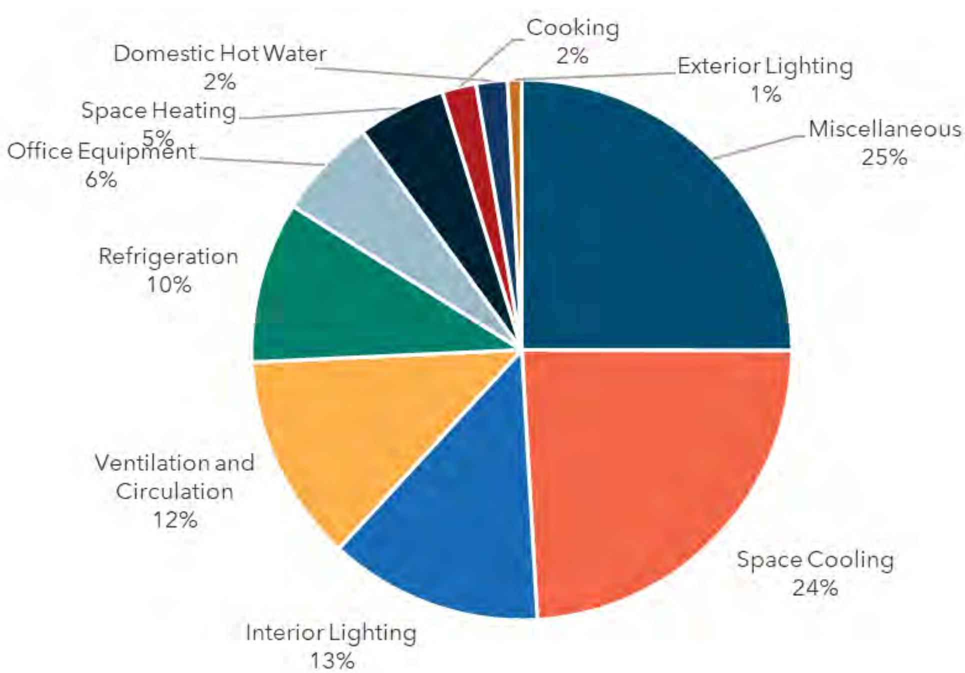
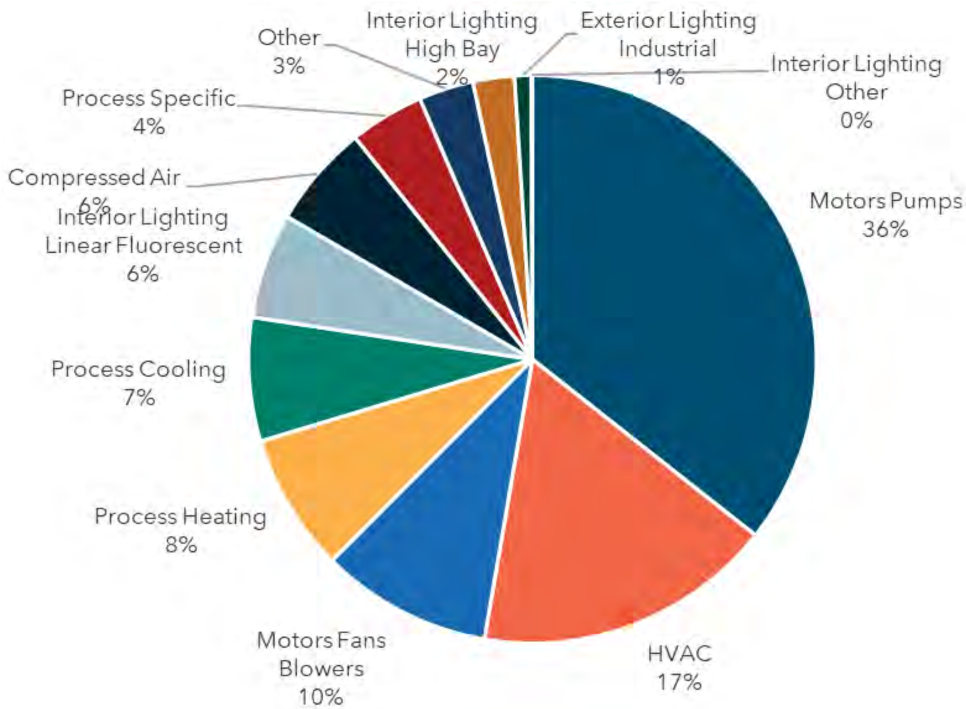


Figure 8. Industrial Baseline (2025) Energy Sales by End-Use



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

Technical Potential of Efficient Measures = Total Number of Households × Base Case Equipment Energy Use Intensity (kWh/unit) × Saturation Shares × Percent Incomplete × Feasibility Factor × Savings Factor

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

Technical Potential of Efficient Measures = Total Stock Sq. Footage by Building Type by EDC × Base Case Equipment Energy Use Intensity (kWh/unit) × Saturation Shares × Percent Incomplete × Feasibility Factor × Savings Factor

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.

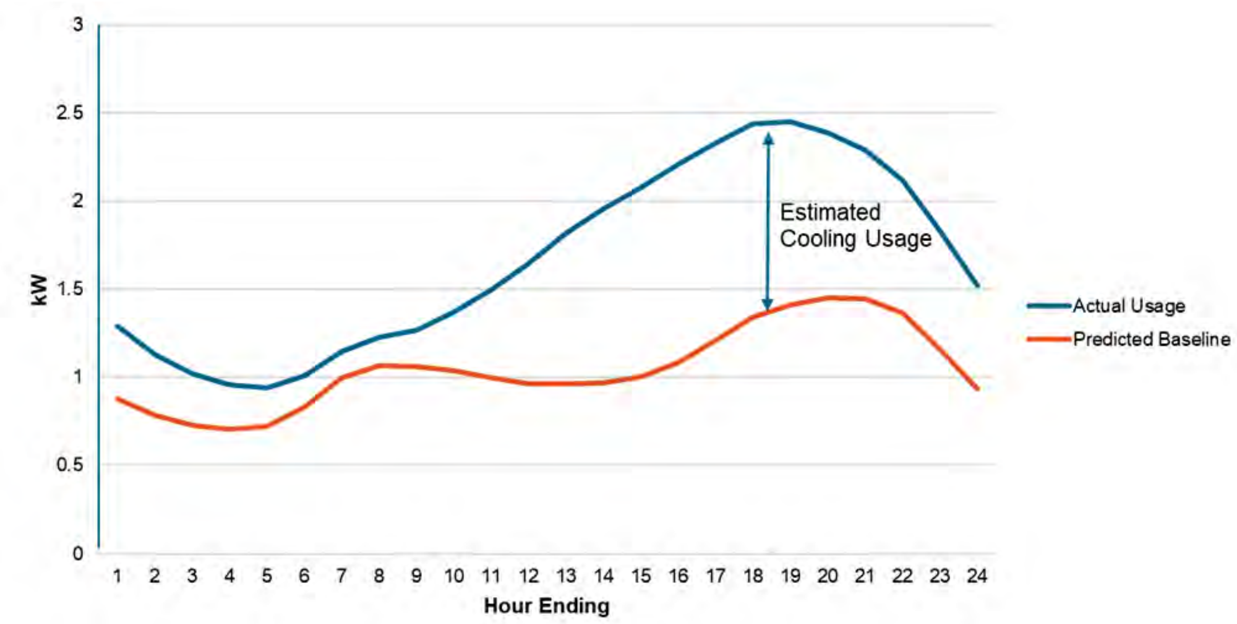
Technical potential, in the context of DR, is defined as the total amount of load available for reduction that is coincident with the period of interest; in this case, the system peak hour for the summer and winter seasons. Thus, two sets of capacity values are estimated: a summer capacity and a winter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

PV Technical Energy Potential = Suitable Rooftop PV Area (Sq Ft) × PV Power Density (kW-DC/Sq Ft) × Generation Factor (kWh/kW-DC)

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 system[5]. 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).

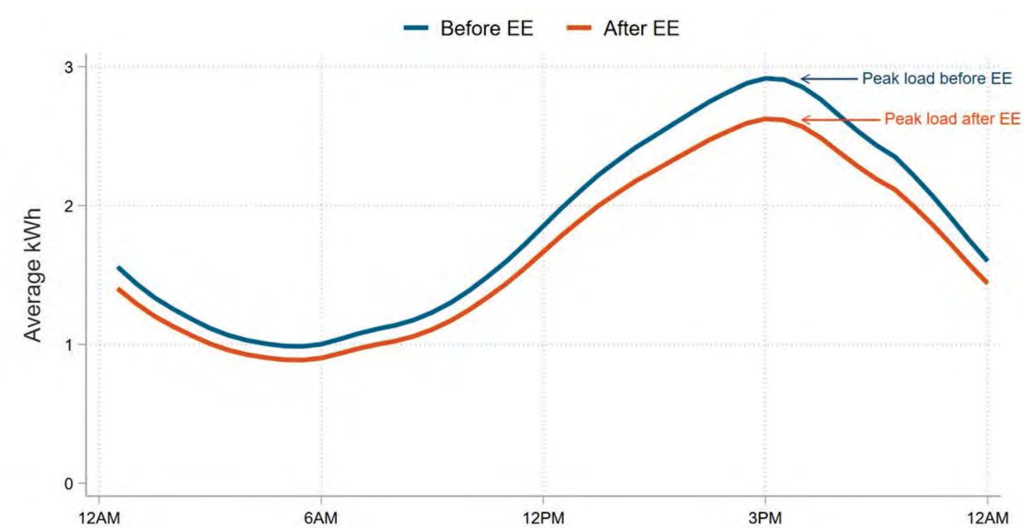
Measure Interaction

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)

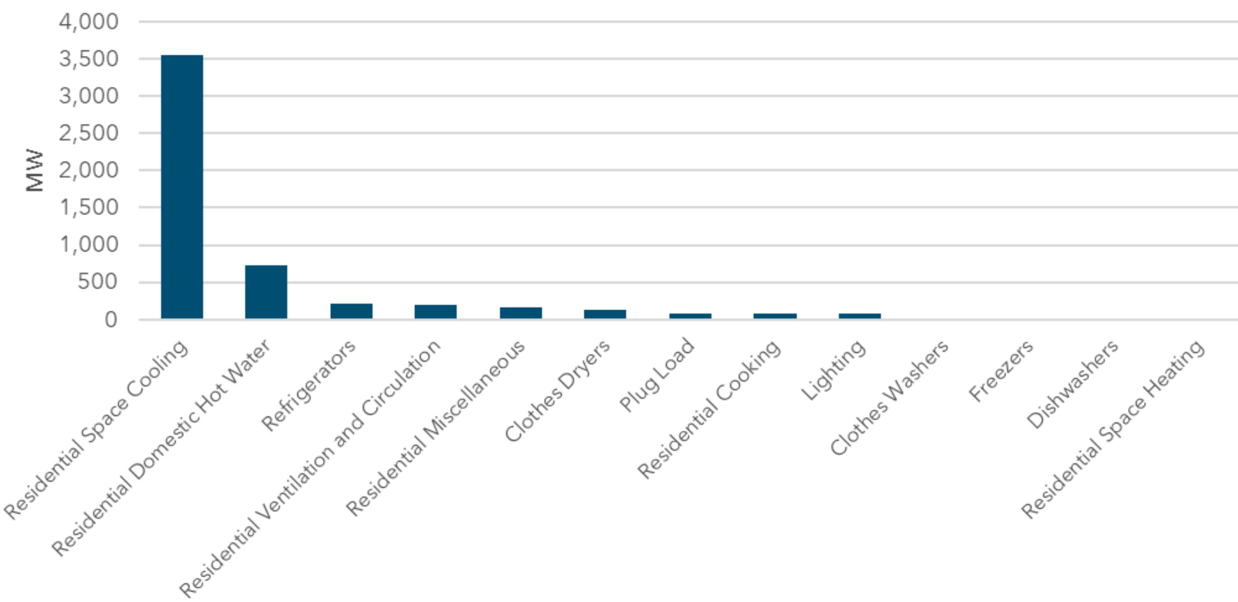


Figure 12: Residential EE Technical Potential by End-Use (Winter Peak Savings)

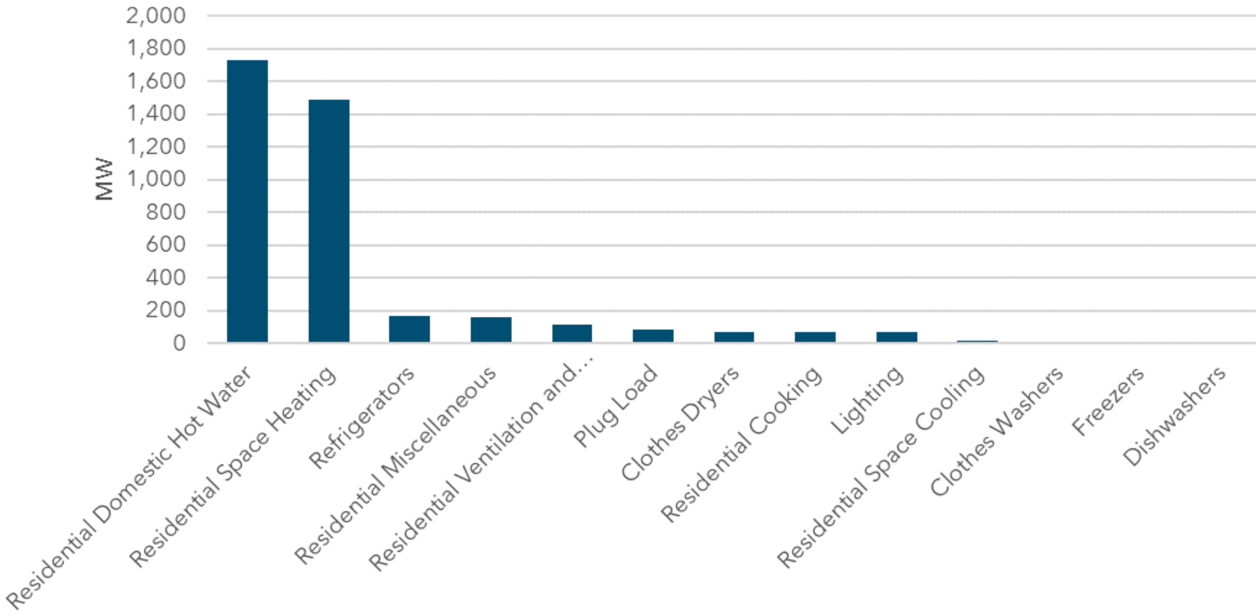
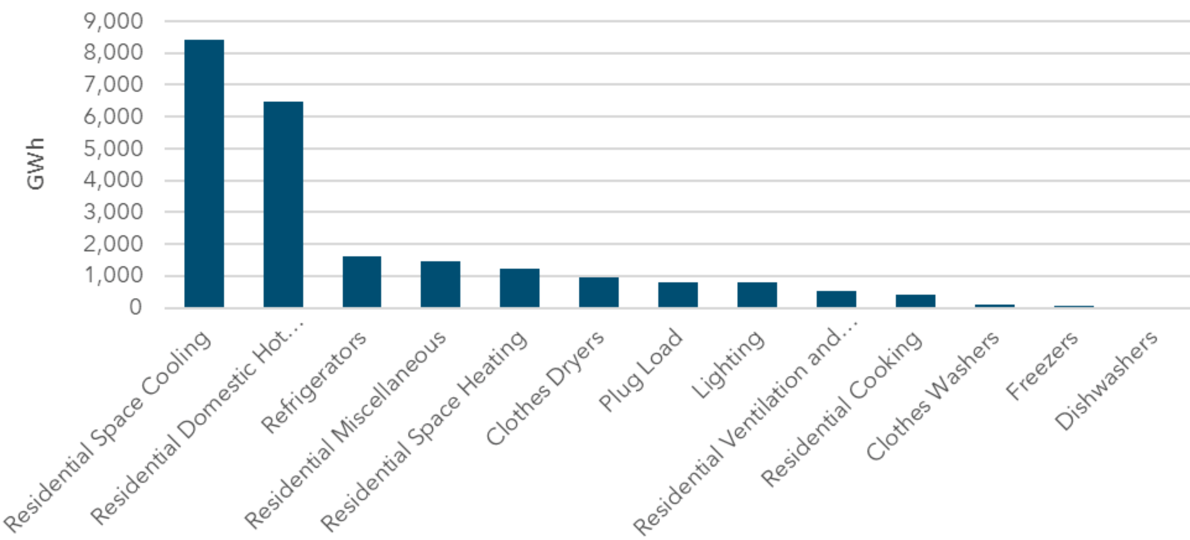


Figure 13: Residential EE Technical Potential by End-Use (Energy Savings)



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)

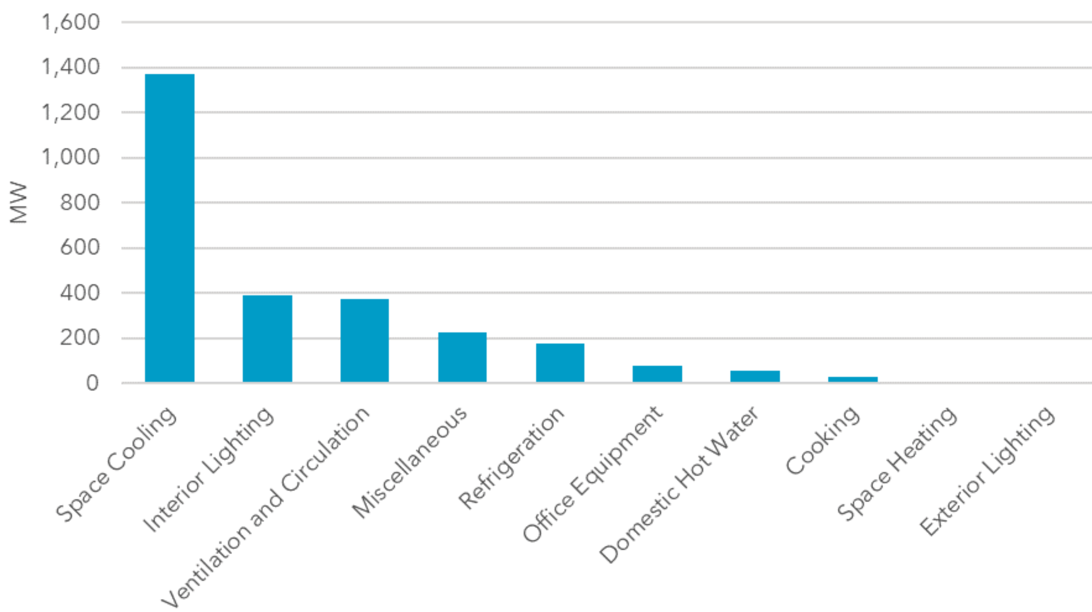


Figure 15: Commercial EE Technical Potential by End-Use (Winter Peak Savings)

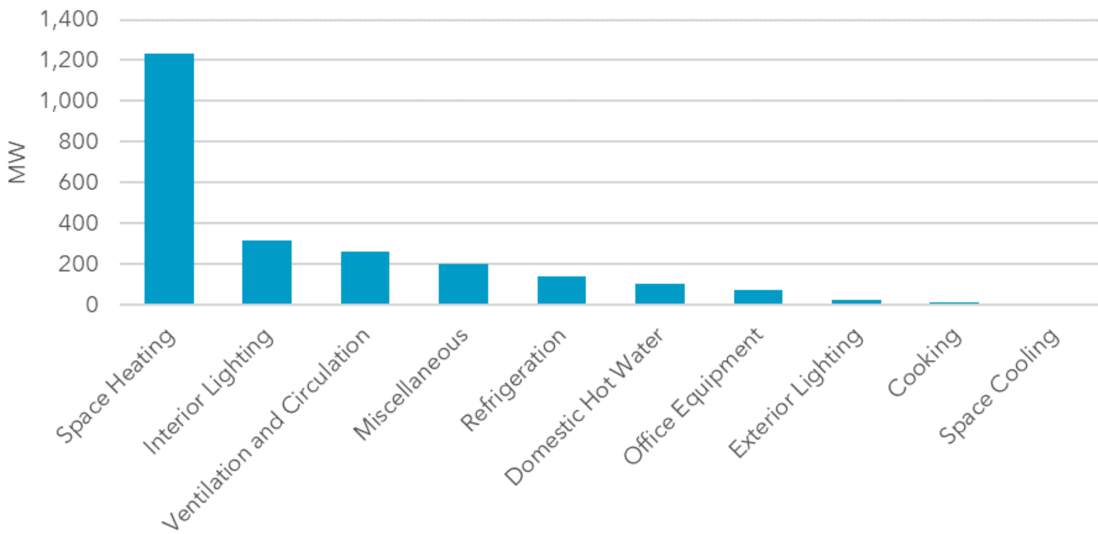
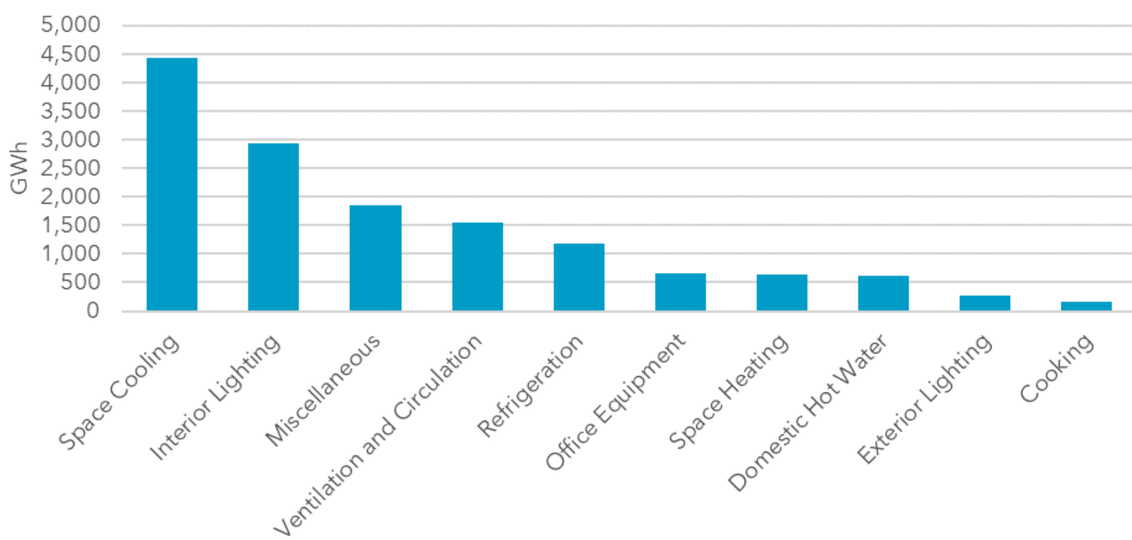


Figure 16: Commercial EE Technical Potential by End-Use (Energy Savings)



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)

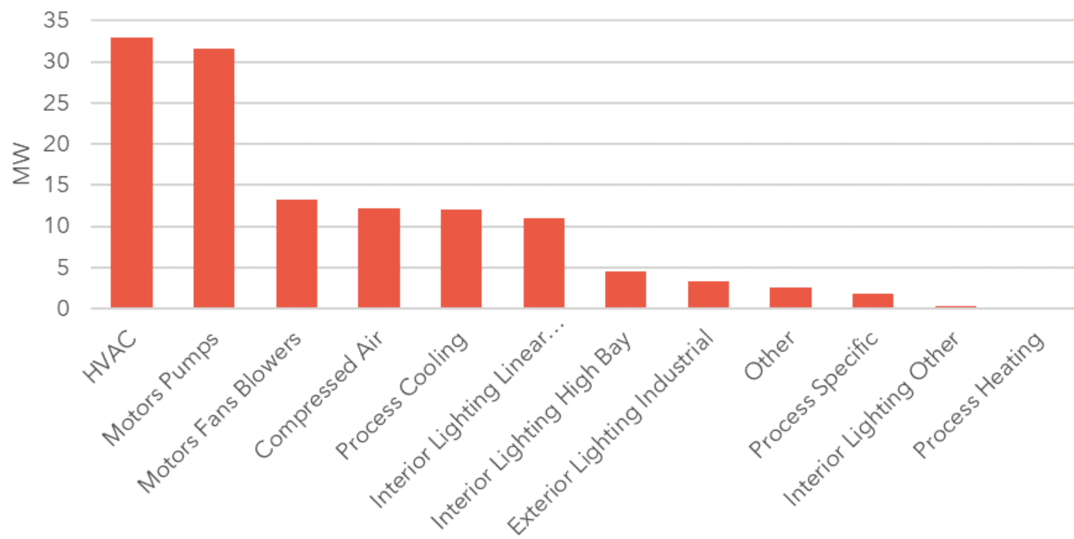


Figure 18: Industrial EE Technical Potential by End-Use (Winter Peak Savings)

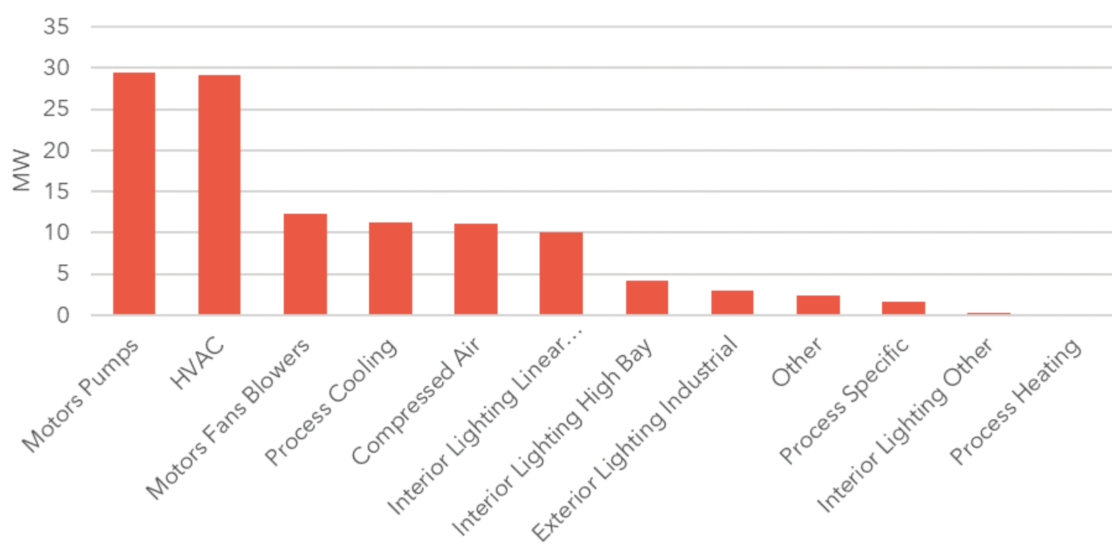
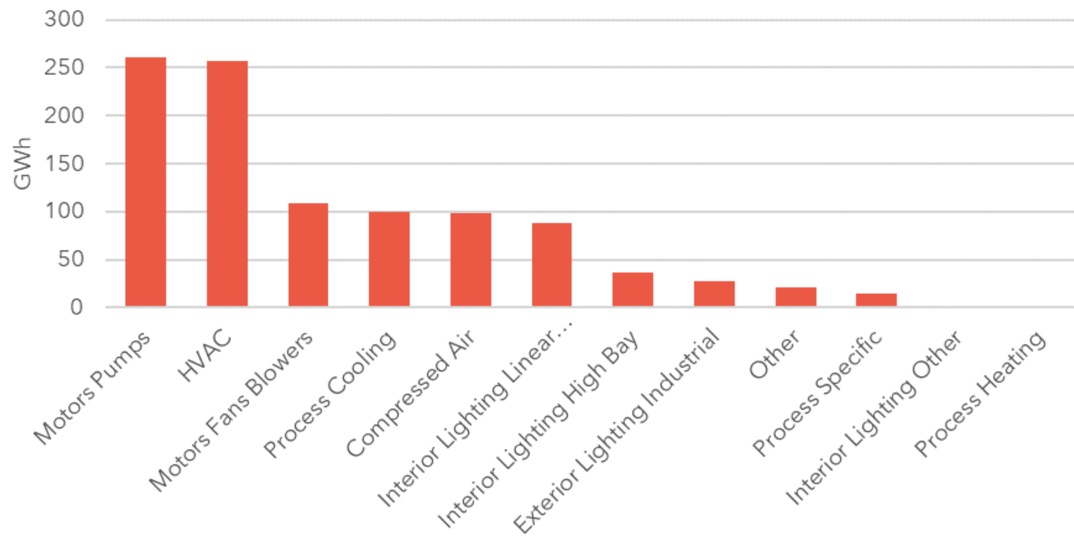


Figure 19: Industrial EE Technical Potential by End-Use (Energy Savings)



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:

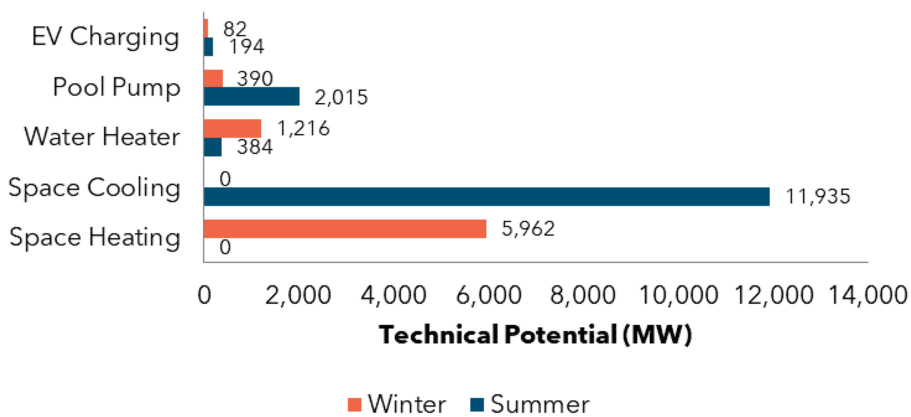
Table 10. DR Technical Potential

	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

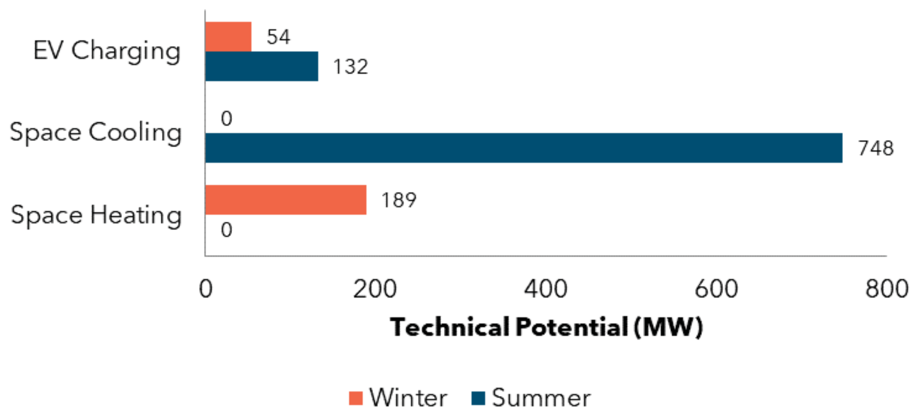


5.3.2 Non-Residential

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.

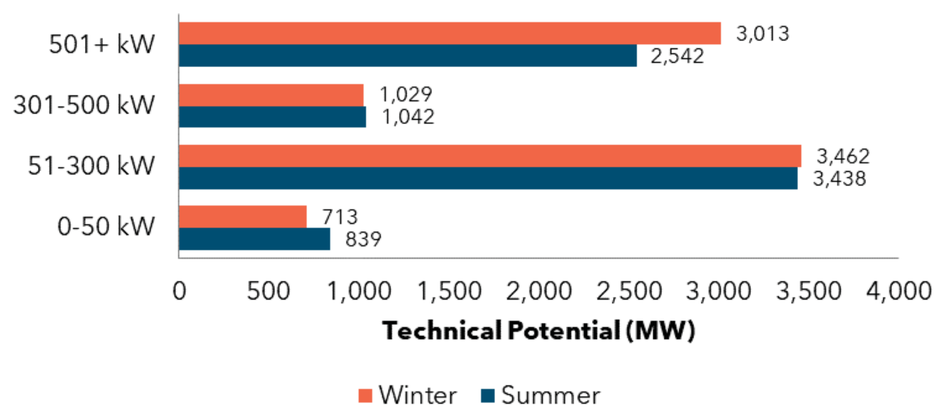
Figure 21: Small C&I DR Technical Potential by End-Use



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 Potential[7]

	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	100ft2 of Opaque Door meeting Energy Star Version 6.0 Requirements (U-Value: 0.17)	100ft2 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 STARÂ® 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

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 = 130Â°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 STARÂ® Standards	One non-ENERGY STARÂ® 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 STARÂ® 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 STARÂ® 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. >=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 Desicant Air Dryer with Dew Point Controls	1000 CFM Modulating Heated Desicant 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 study[8]:

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	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

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	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: • 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.

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

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

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-Residential[1]	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 Potential[2]

	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.

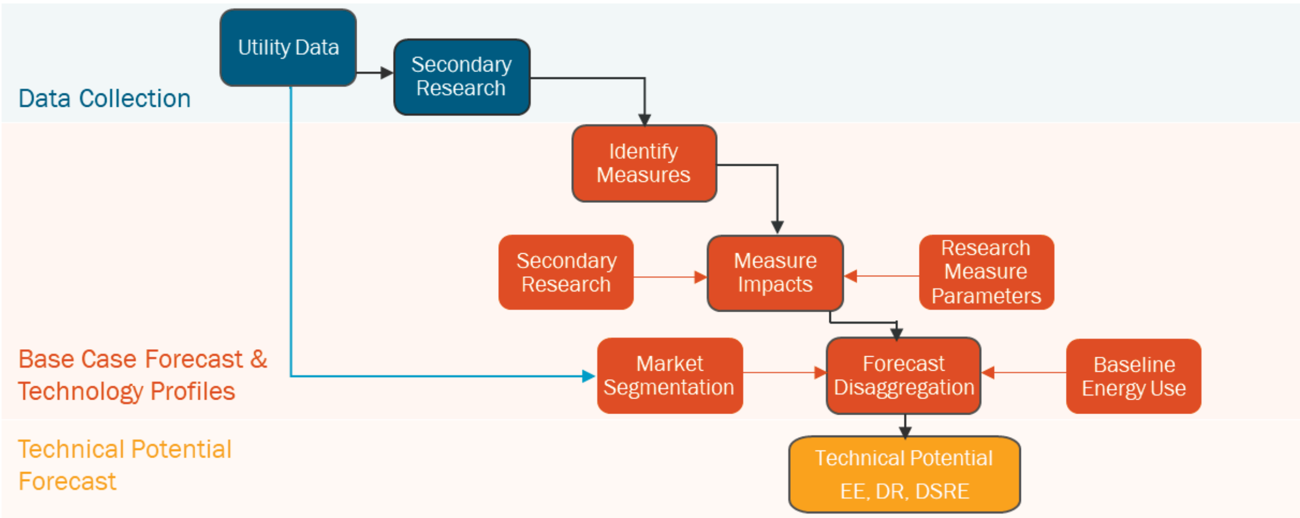
Quantifying DSM technical potential is the result of an analytical process that refines DSM opportunities that align with DEF's customers' electric consumption patterns. Resource Innovations' general methodology for estimating technical potential is a hybrid "top-

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.

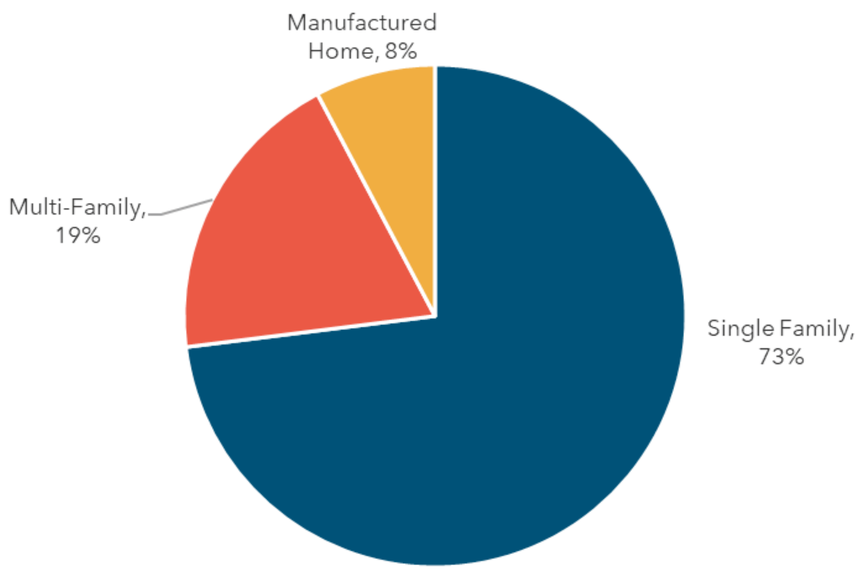
3.2 Analysis of Customer Segmentation

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

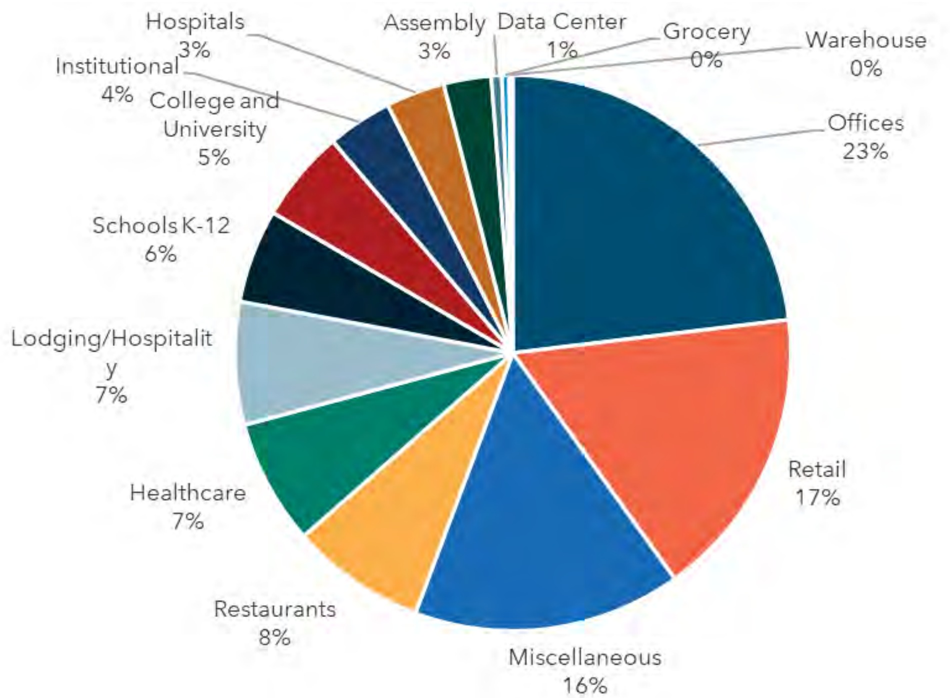
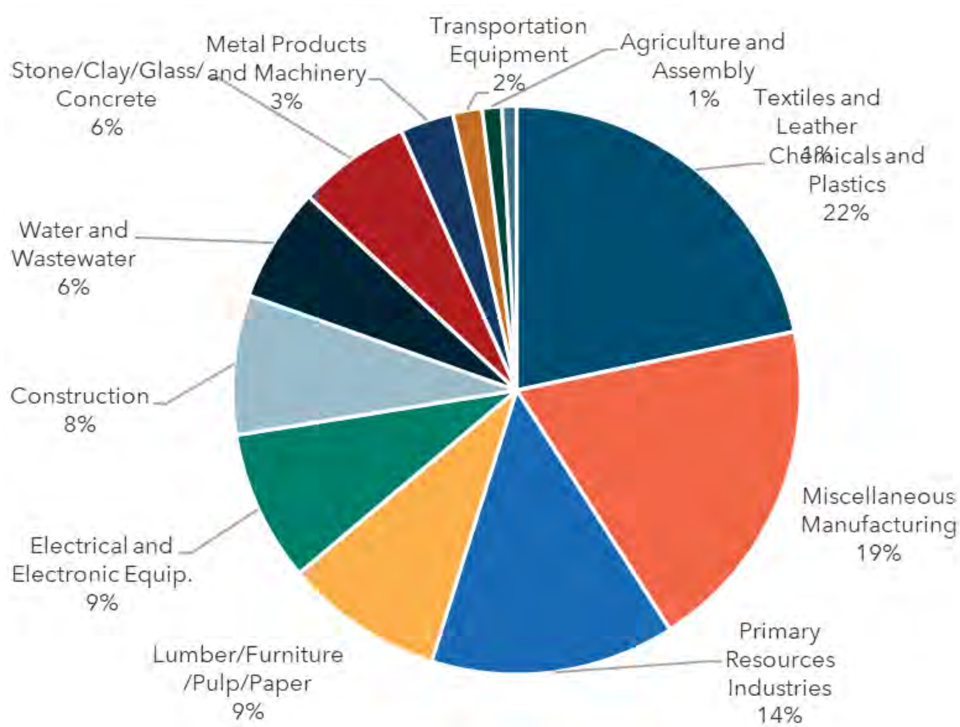


Figure 4. Industrial Customer Segmentation



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

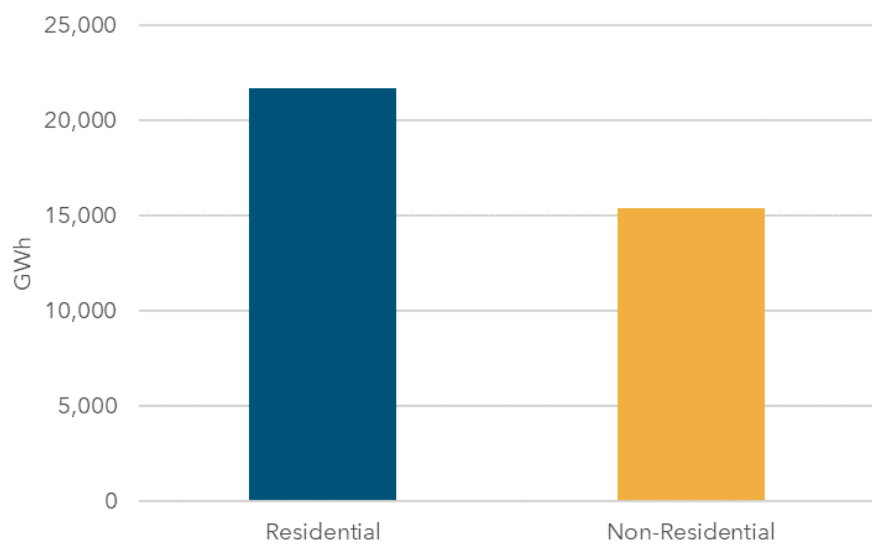
Customer Class	Annual kWh	Estimated Number of Accounts
Small C&I	0-15,000 kWh	113,449
	15,001-25,000 kWh	15,600
	25,001-50,000 kWh	10,446
	50,001 kWh +	7,403
	Total	146,898
Large C&I	0-50 kW	35,795
	51-300 kW	8,700
	301-500 kW	850
	501 kW +	924
	Total	46,269

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 loads[4] 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

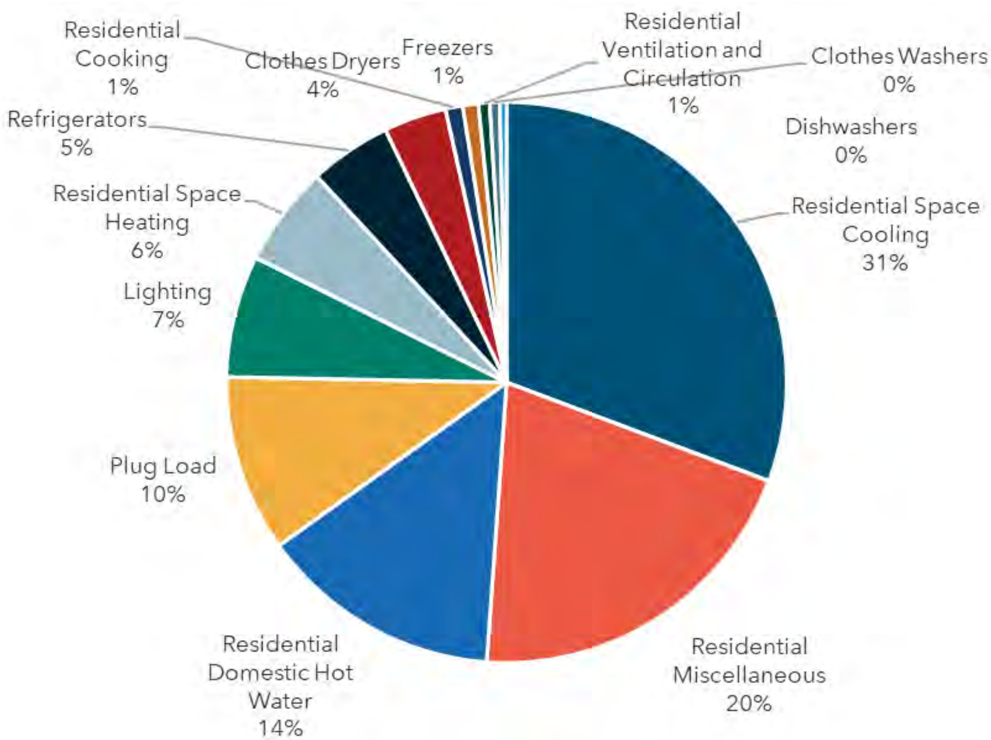


Figure 7. Commercial Baseline (2025) Energy Sales by End-Use

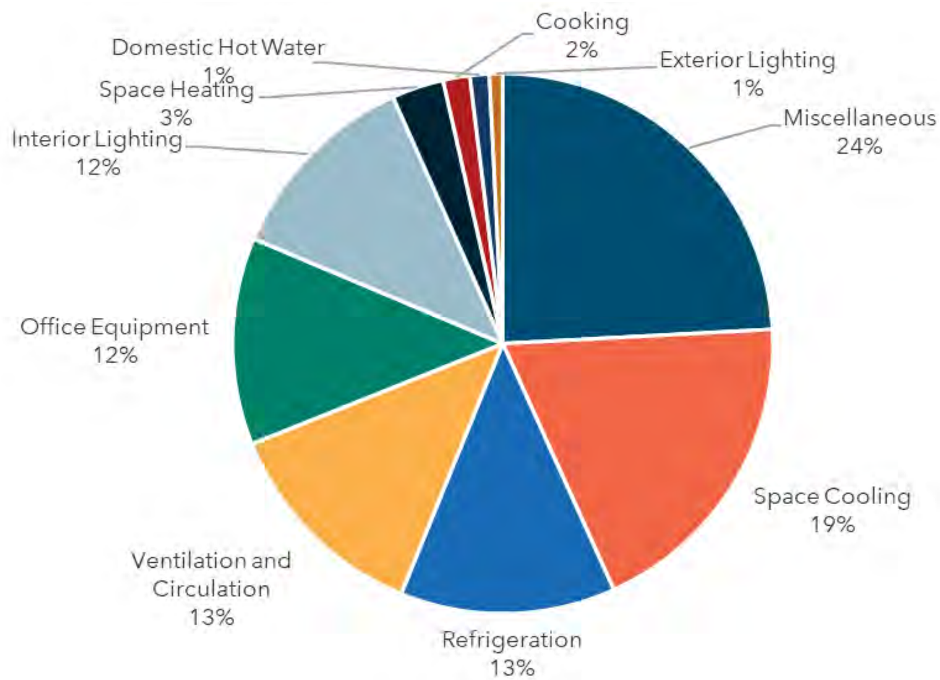
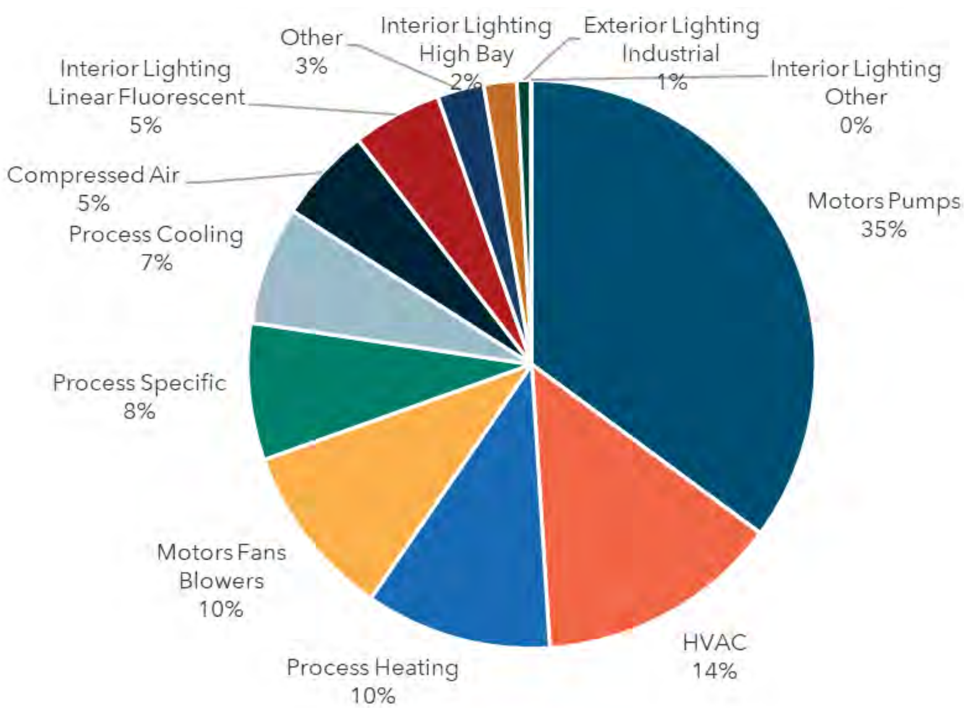


Figure 8. Industrial Baseline (2025) Energy Sales by End-Use



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.

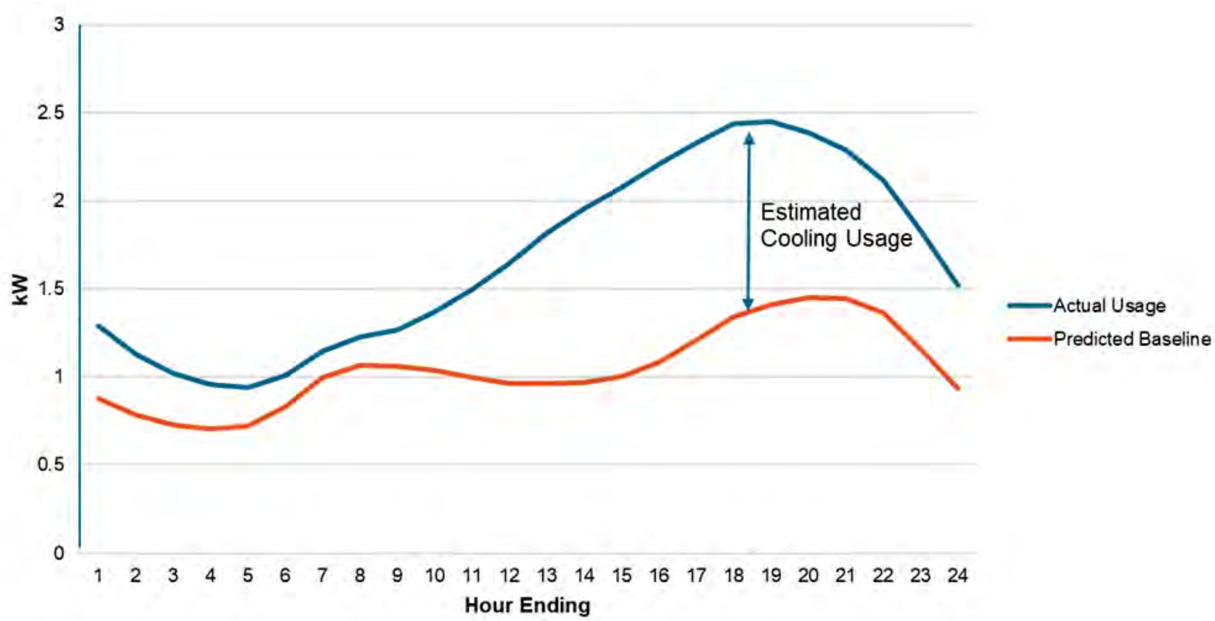
Technical potential, in the context of DR, is defined as the total amount of load available for reduction that is coincident with the period of interest; in this case, the system peak hour for the summer and winter seasons. Thus, two sets of capacity values are estimated: a summer capacity and a winter 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.
    - o To calculate the total roof area for residential buildings, the average roof area per household is multiplied by the number of households.
    - o 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

PV Technical Energy Potential = Suitable Rooftop PV Area (Sq Ft) × PV Power Density (kW-DC/Sq Ft) × Generation Factor (kWh/kW-DC)

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 system[5]. 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).

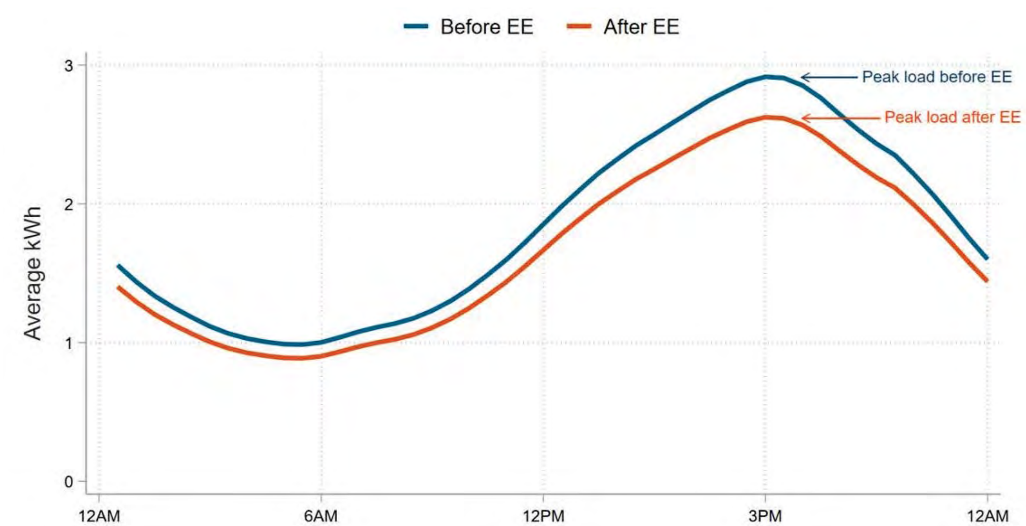
Measure Interaction

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)

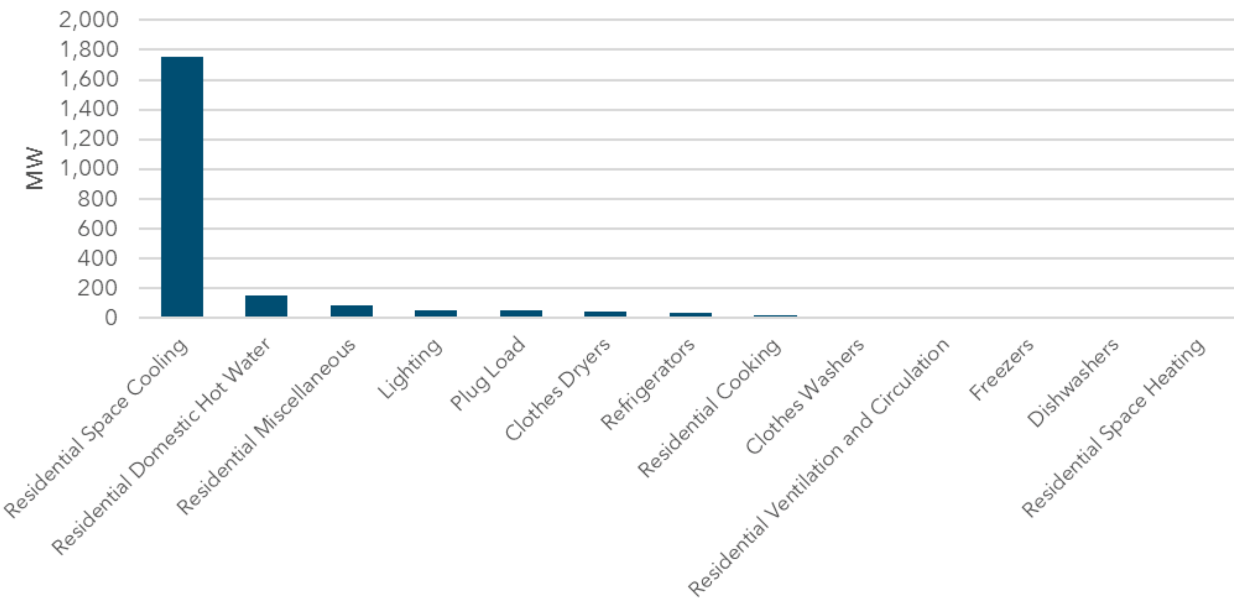


Figure 12: Residential EE Technical Potential by End-Use (Winter Peak Savings)

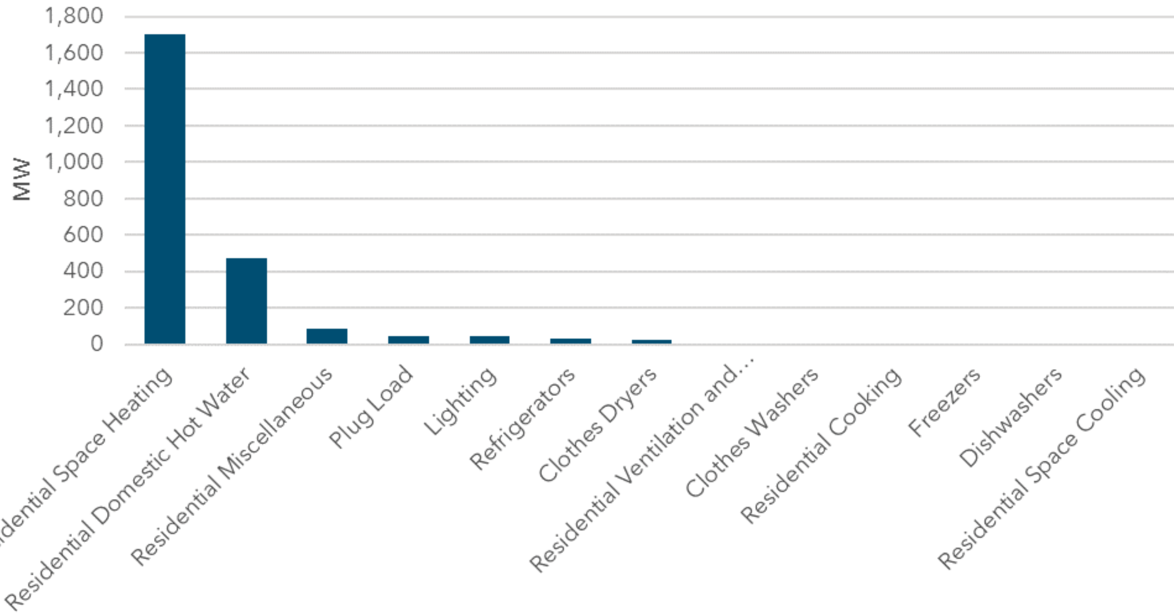
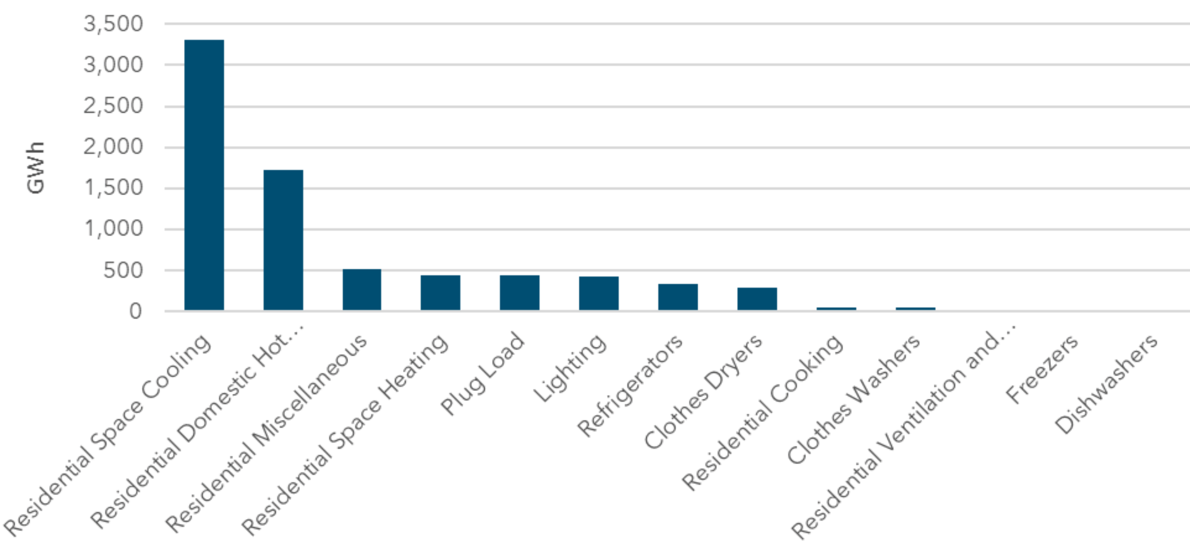


Figure 13: Residential EE Technical Potential by End-Use (Energy Savings)



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)

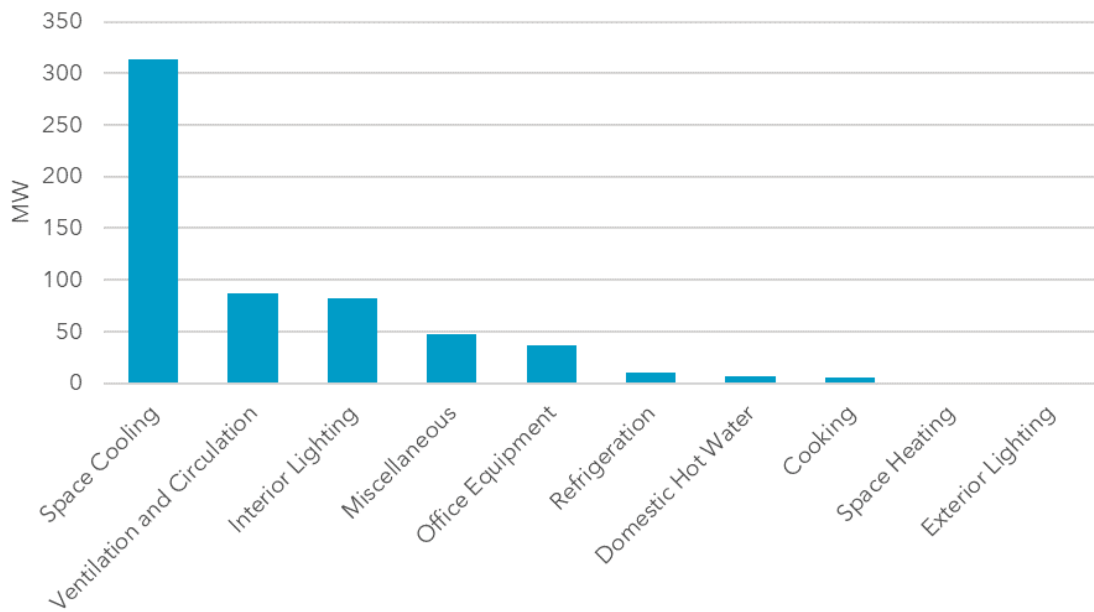


Figure 15: Commercial EE Technical Potential by End-Use (Winter Peak Savings)

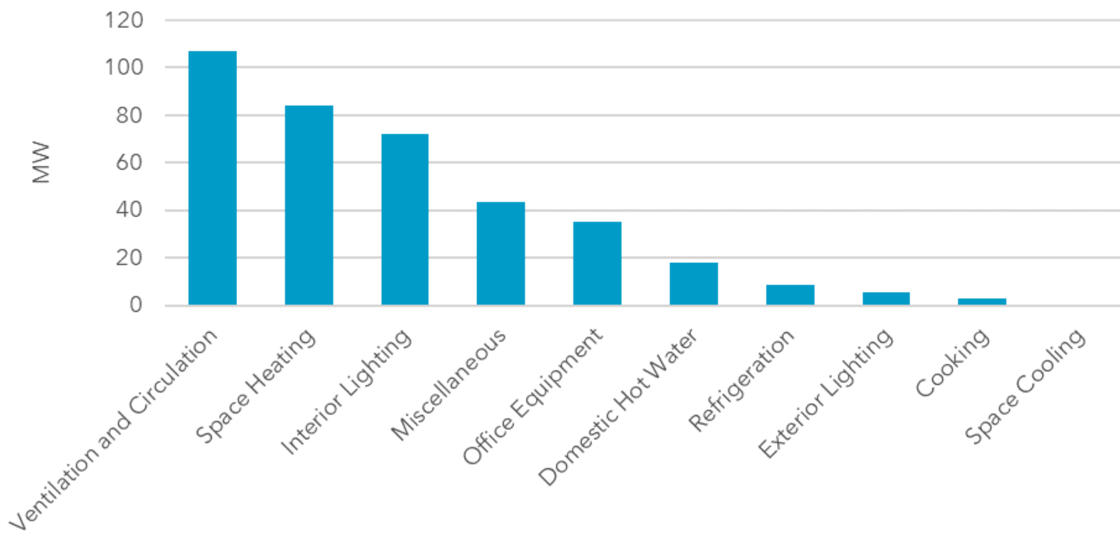
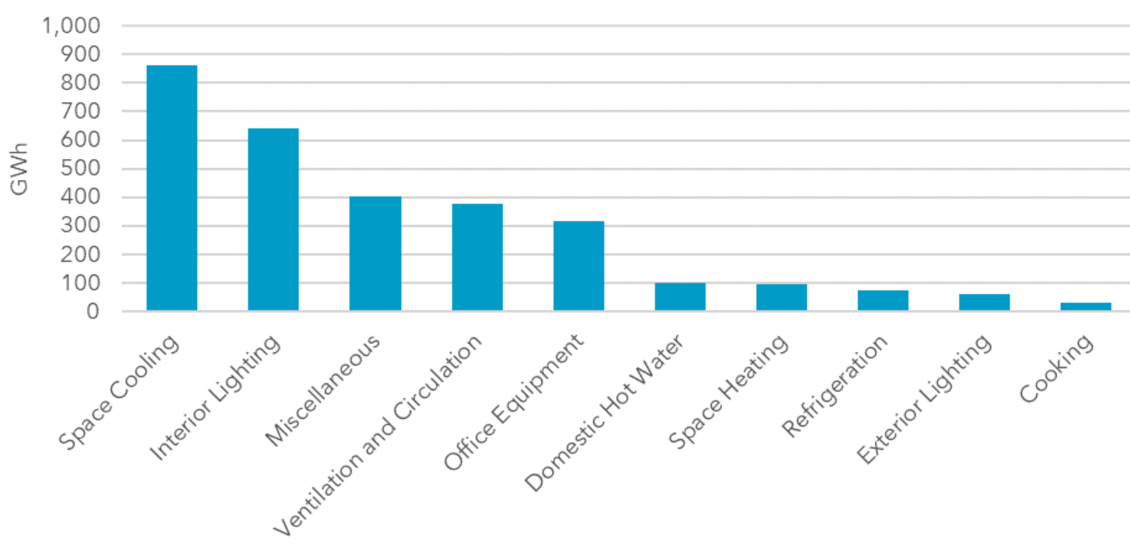


Figure 16: Commercial EE Technical Potential by End-Use (Energy Savings)



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)

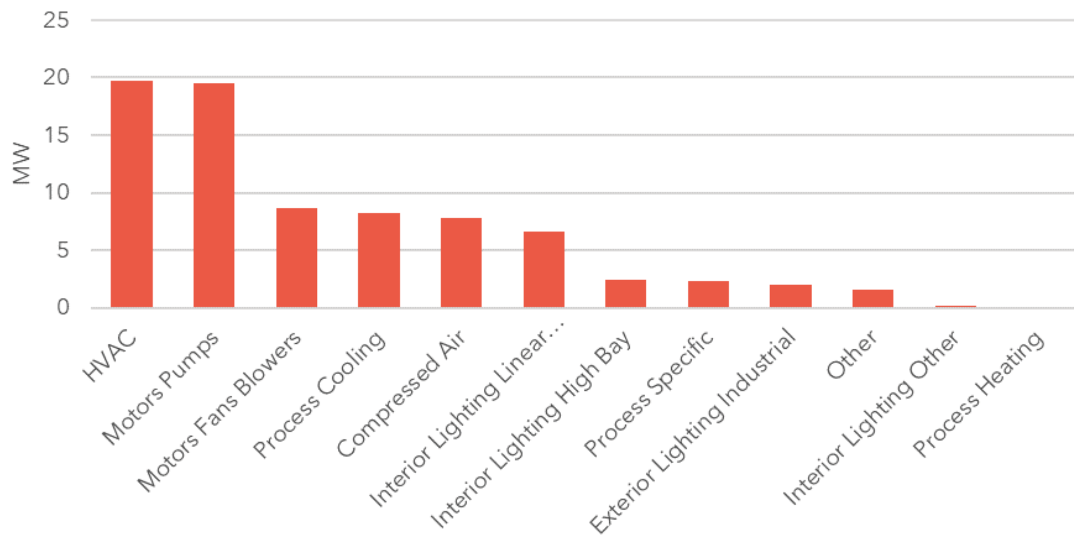


Figure 18: Industrial EE Technical Potential by End-Use (Winter Peak Savings)

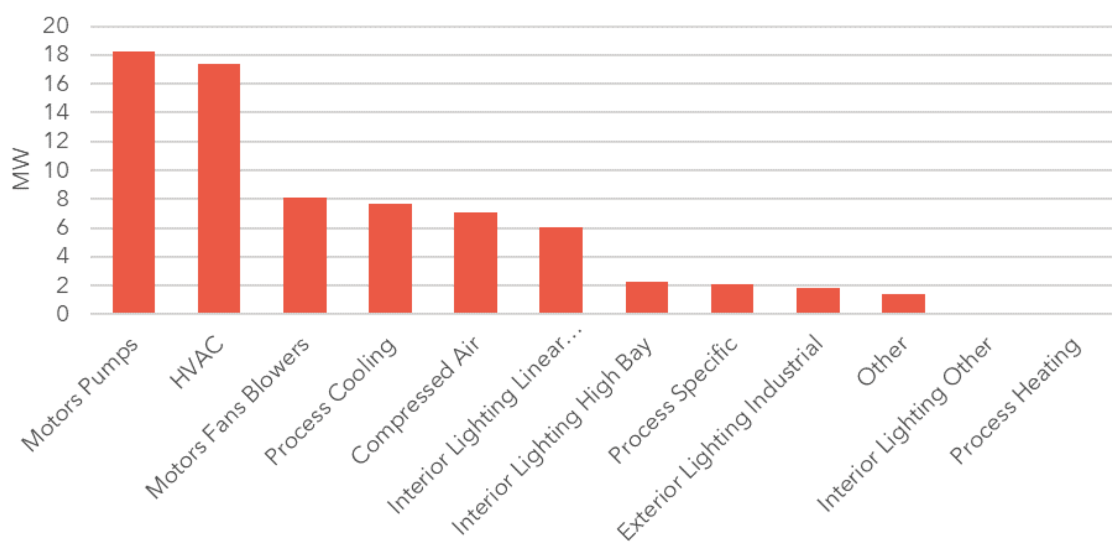
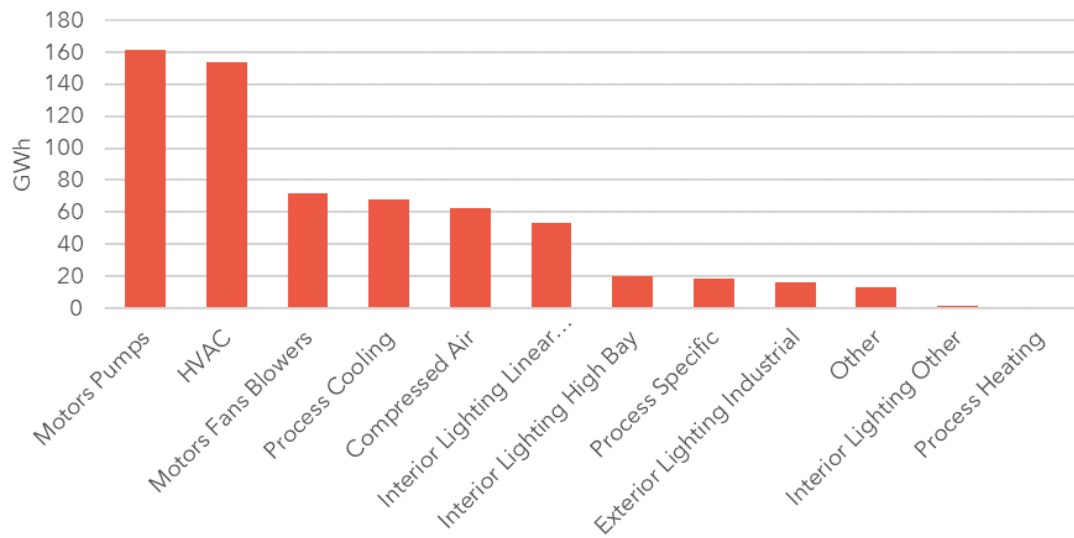


Figure 19: Industrial EE Technical Potential by End-Use (Energy Savings)



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:

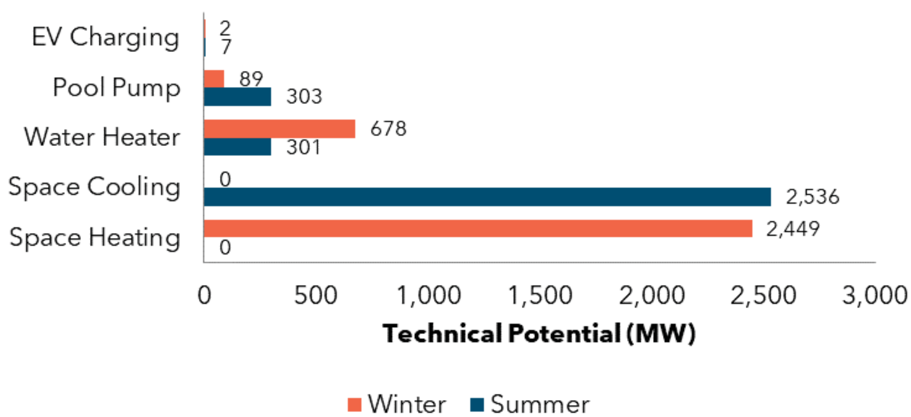
Table 10. DR Technical Potential

	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

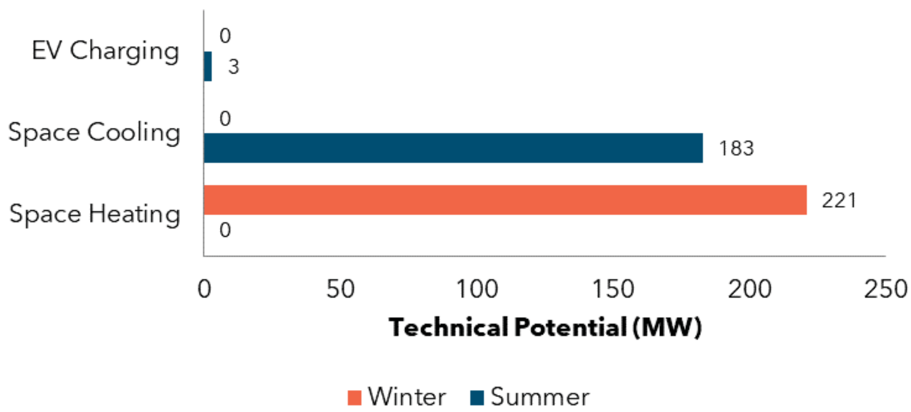


5.3.2 Non-Residential

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.

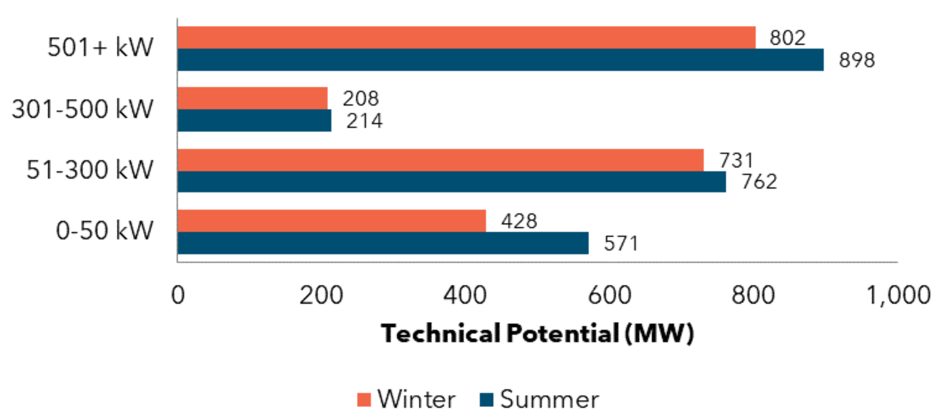
Figure 21: Small C&I DR Technical Potential by End-Use



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 Potential[7]

	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	100ft2 of Opaque Door meeting Energy Star Version 6.0 Requirements (U-Value: 0.17)	100ft2 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 STARÂ® 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

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 = 130Â°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 STARÂ® Standards	One non-ENERGY STARÂ® 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 STARÂ® 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 STARÂ® 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. >=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 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

Measure	End-Use	Description	Baseline
Dew Point Sensor Control for Dessicant CA Dryer	Compressed Air	1000 CFM Heated Desicant Air Dryer with Dew Point Controls	1000 CFM Modulating Heated Desicant 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 study[8]:

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

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	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: • 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.

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

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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resource innovations

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-Residential[1]	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 Potential[2]

	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.

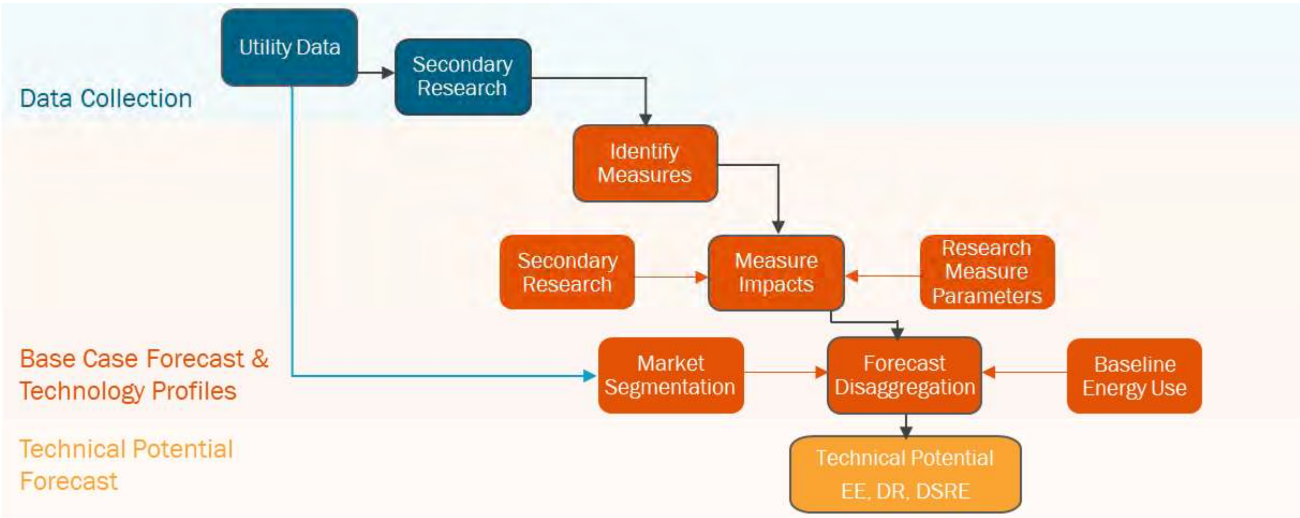
Quantifying DSM technical potential is the result of an analytical process that refines DSM opportunities that align with TECO's customers' electric consumption patterns. Resource Innovations' general methodology for estimating technical potential is a hybrid "top-

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.

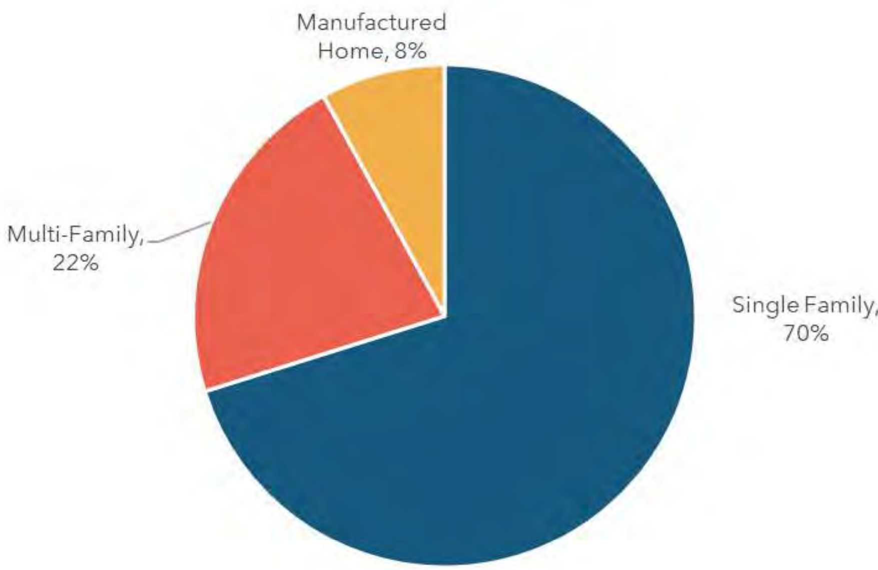
3.2 Analysis of Customer Segmentation

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

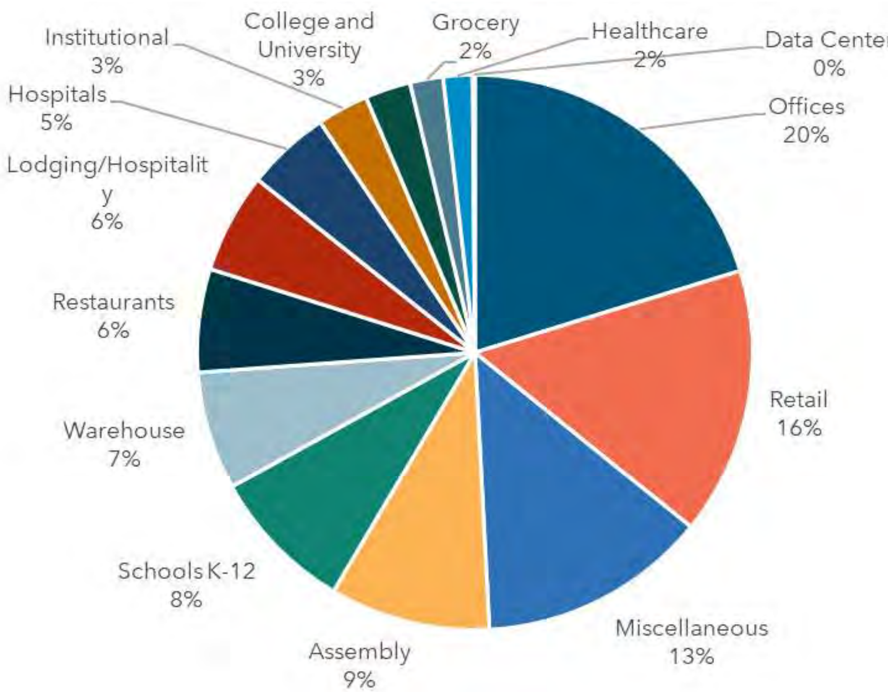
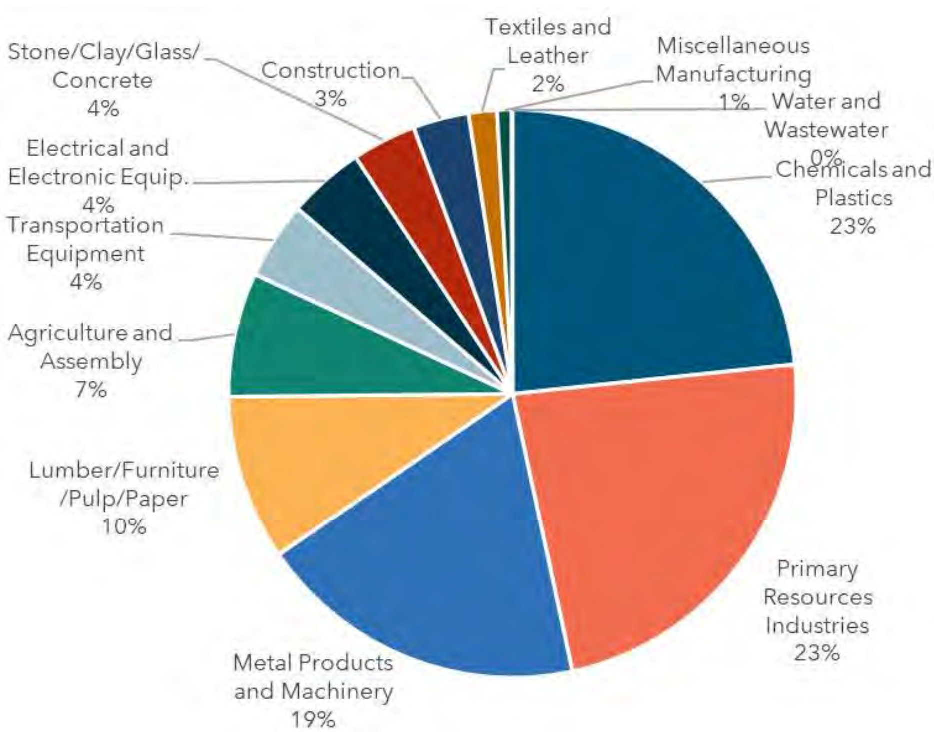


Figure 4. Industrial Customer Segmentation



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

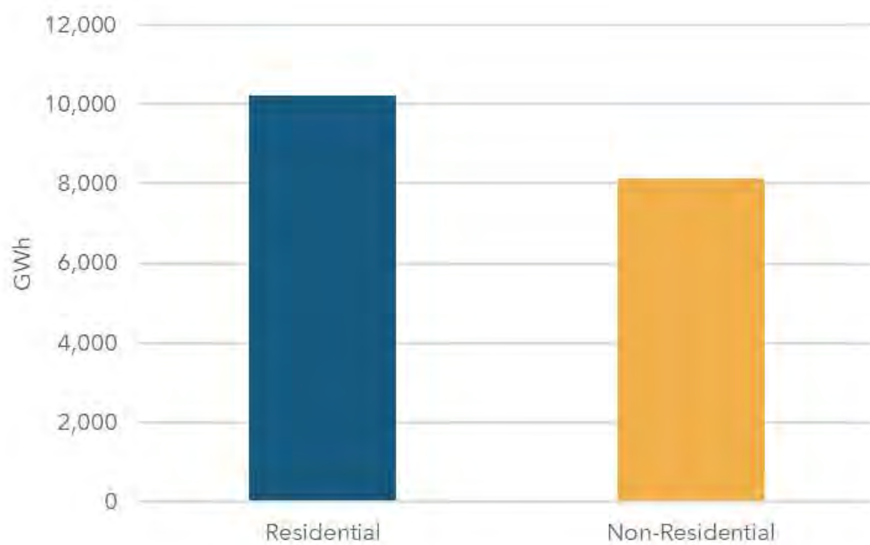
Customer Class	Annual kWh	Estimated Number of Accounts
Small C&I	0-15,000 kWh	43,294
	15,001-25,000 kWh	9,444
	25,001-50,000 kWh	9,104
	50,001 kWh +	3,304
	Total	65,146
Large C&I	0-50 kW	8,716
	51-300 kW	6,487
	301-500 kW	738
	501 kW +	738
	Total	16,679

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 loads[4] for the base year 2025 by sector and end-use are summarized in Figure 6, Figure 7, and Figure 8.

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[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

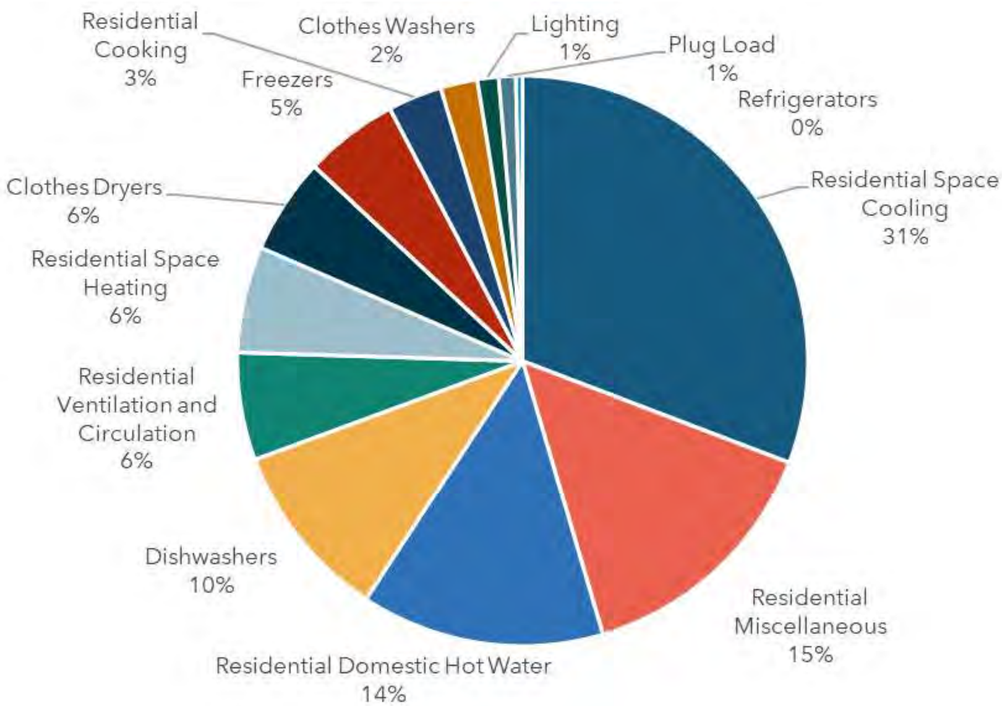


Figure 7. Commercial Baseline (2025) Energy Sales by End-Use

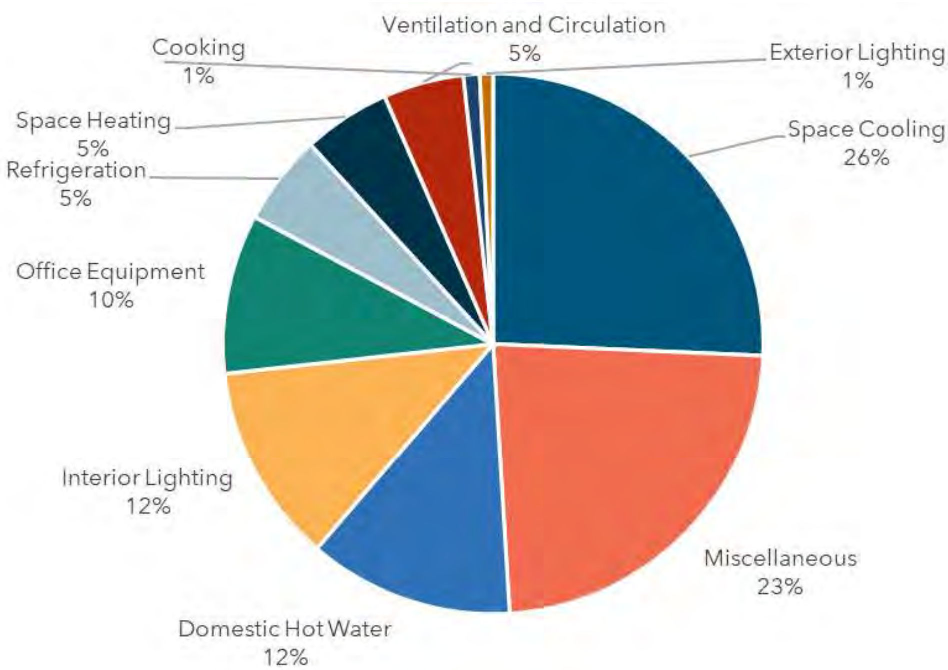
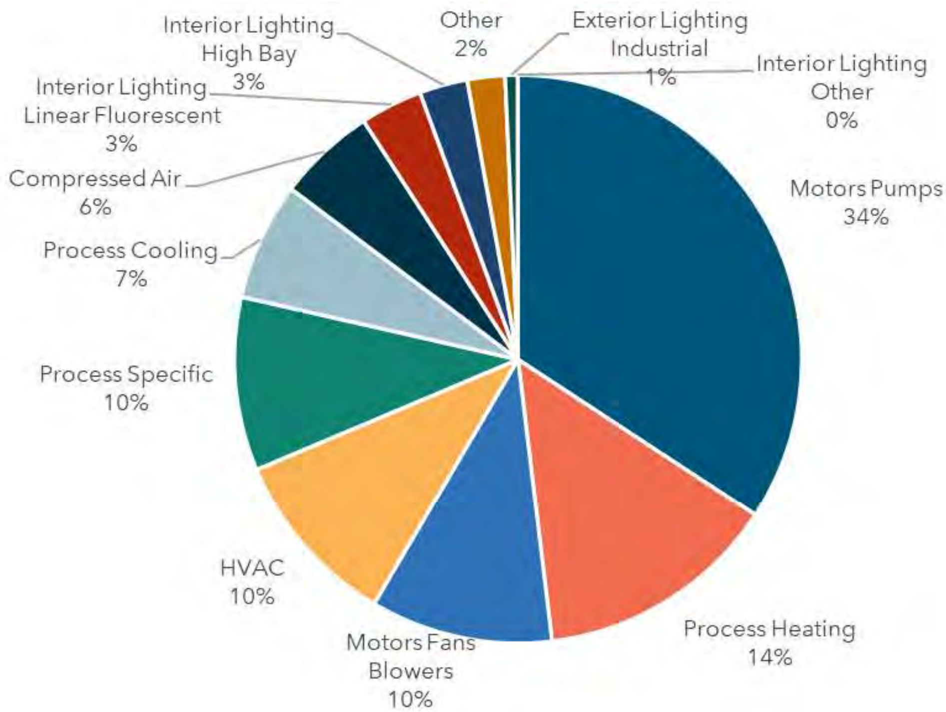


Figure 8. Industrial Baseline (2025) Energy Sales by End-Use



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

Technical Potential of Efficient Measures = Total Number of Households × Base Case Equipment Energy Use Intensity (kWh/unit) × Saturation Shares × Percent Incomplete × Feasibility Factor × Savings Factor

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

Technical Potential of Efficient Measures = Total Stock Sq. Footage by Building Type by EDC × Base Case Equipment Energy Use Intensity (kWh/unit) × Saturation Shares × Percent Incomplete × Feasibility Factor × Savings Factor

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.

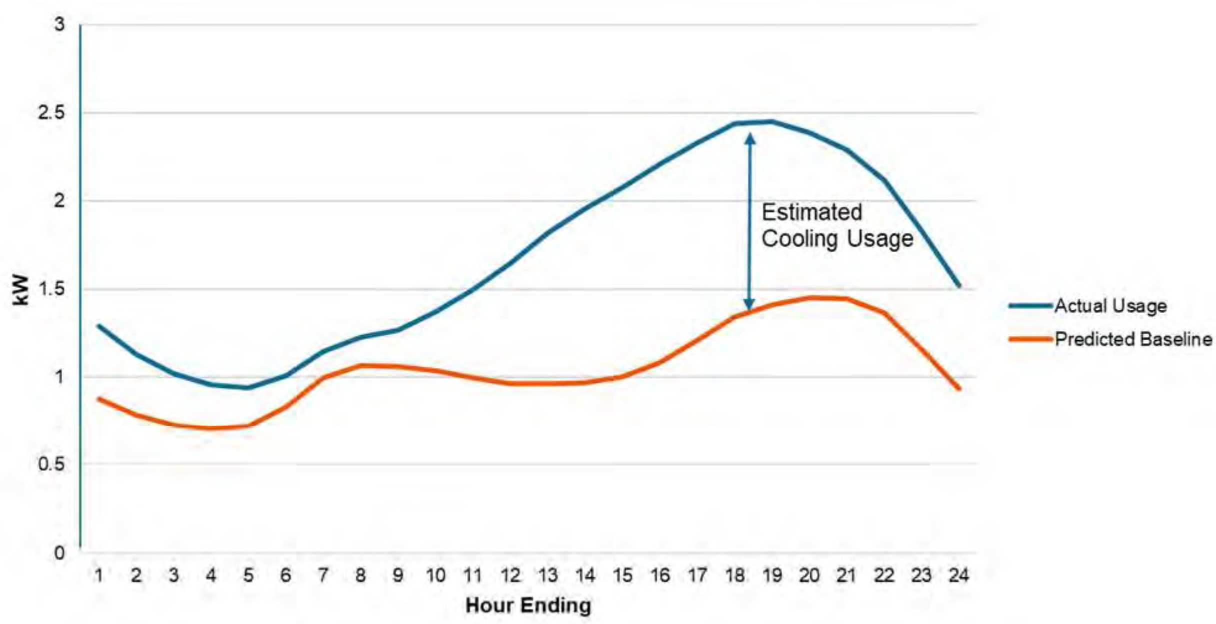
Technical potential, in the context of DR, is defined as the total amount of load available for reduction that is coincident with the period of interest; in this case, the system peak hour for the summer and winter seasons. Thus, two sets of capacity values are estimated: a summer capacity and a winter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

$$\text{PV Technical Energy Potential} = \text{Suitable Rooftop PV Area (Sq Ft)} \times \text{PV Power Density (kW-DC/Sq Ft)} \times \text{Generation Factor (kWh/kW-DC)}$$

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 system[5]. 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).

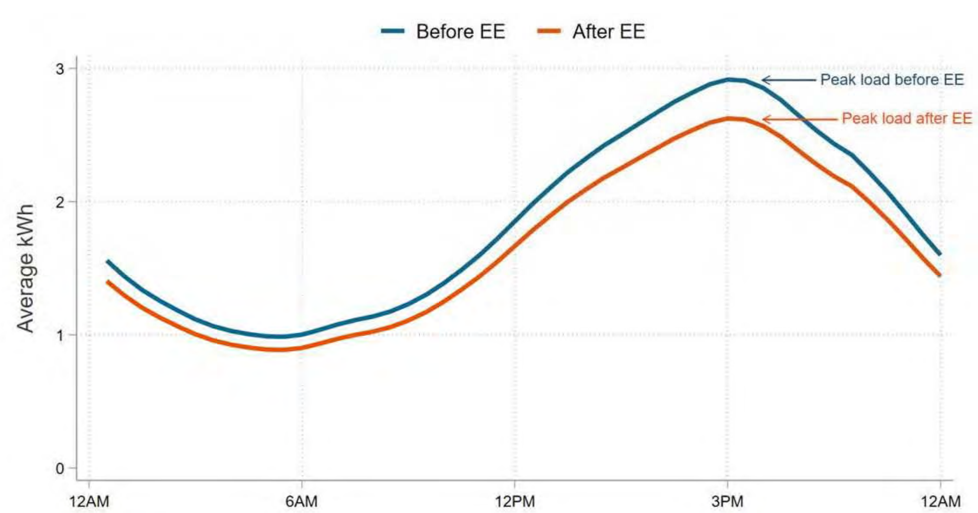
Measure Interaction

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-Residential[6]	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)

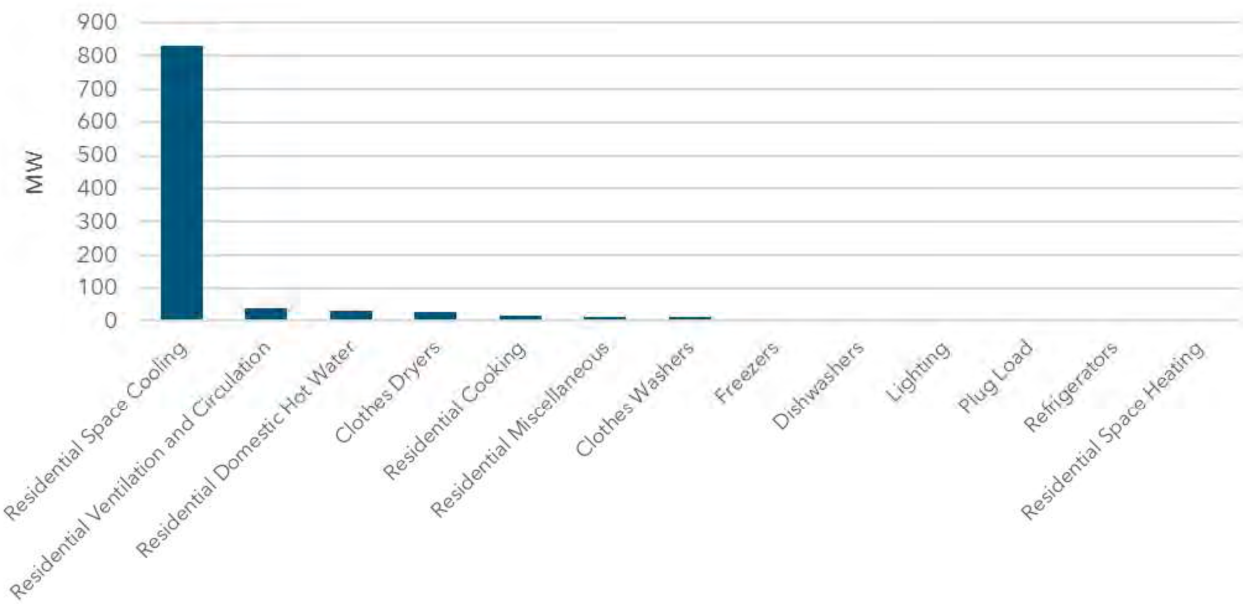


Figure 12: Residential EE Technical Potential by End-Use (Winter Peak Savings)

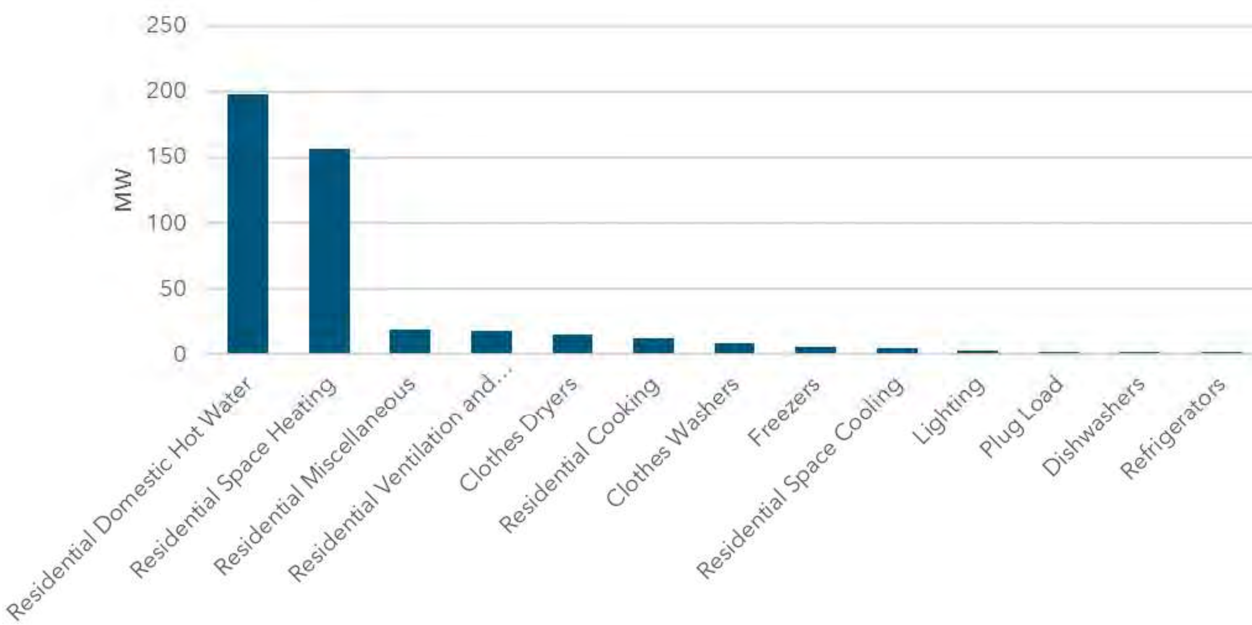
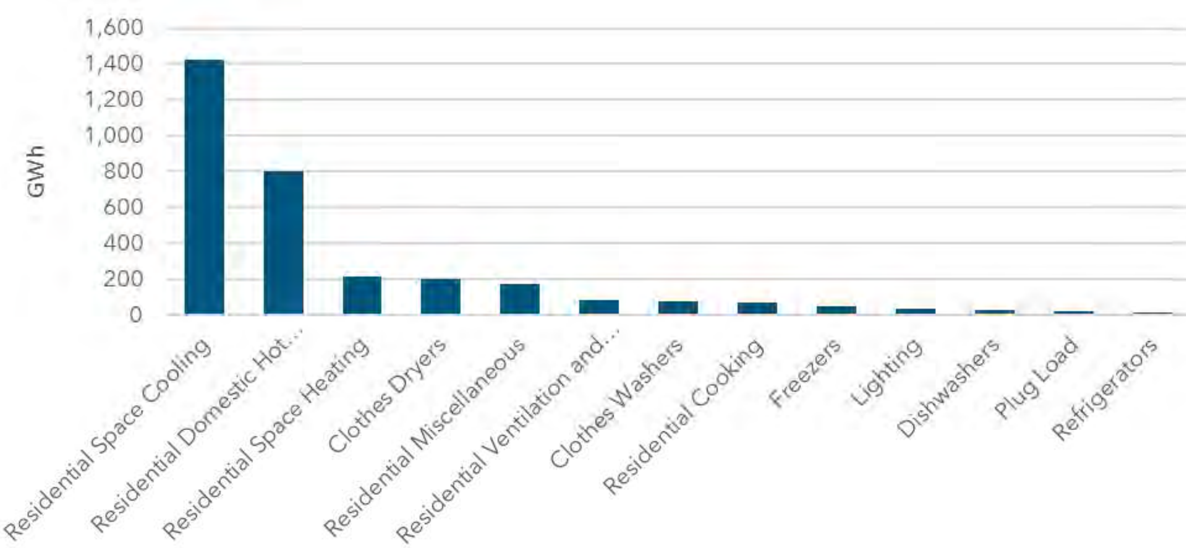


Figure 13: Residential EE Technical Potential by End-Use (Energy Savings)



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)

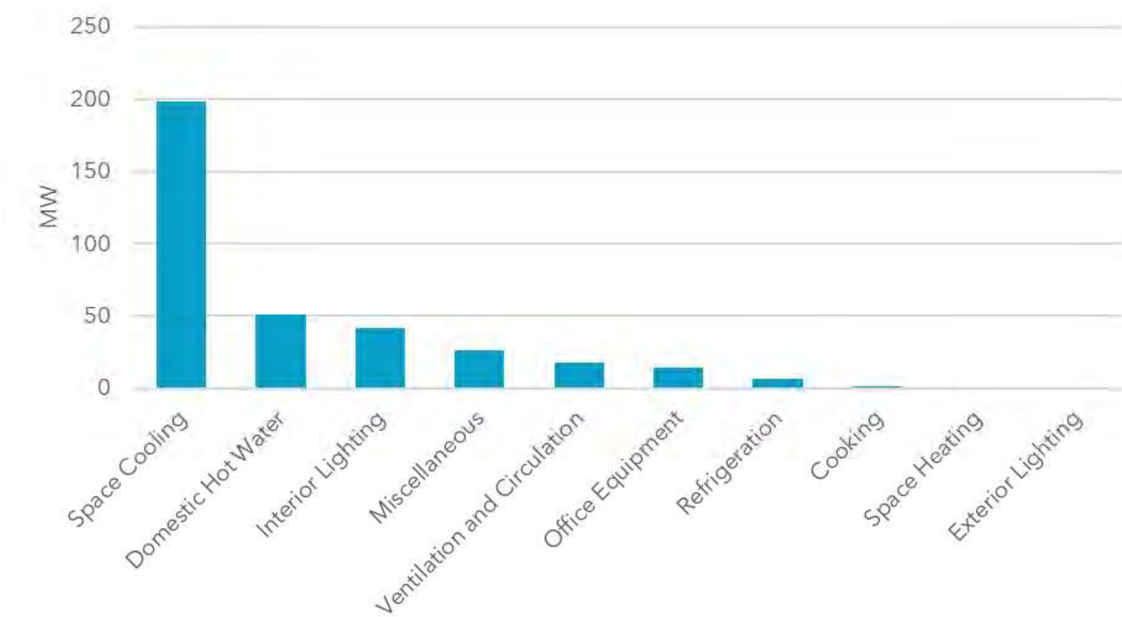


Figure 15: Commercial EE Technical Potential by End-Use (Winter Peak Savings)

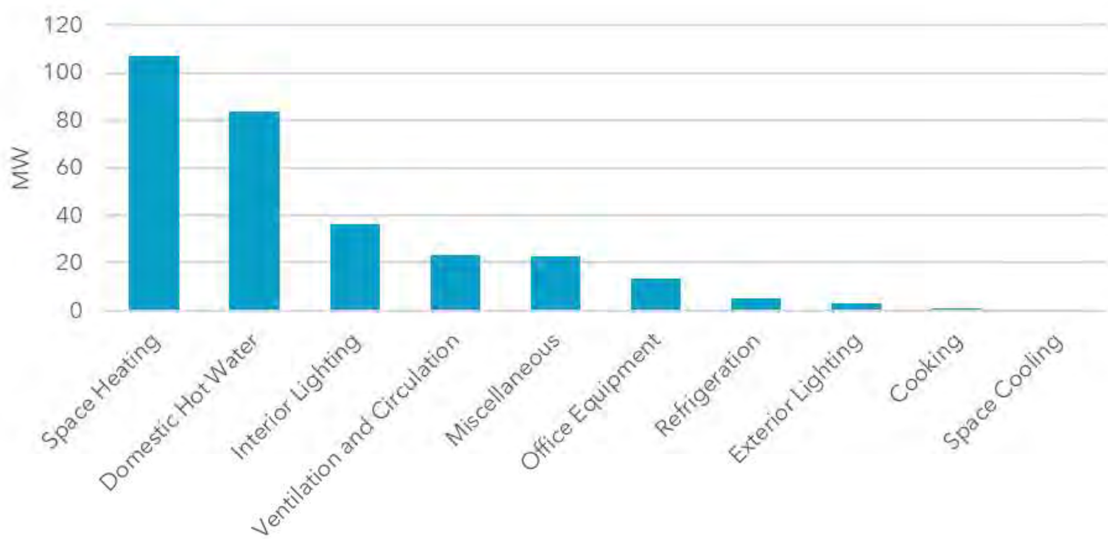
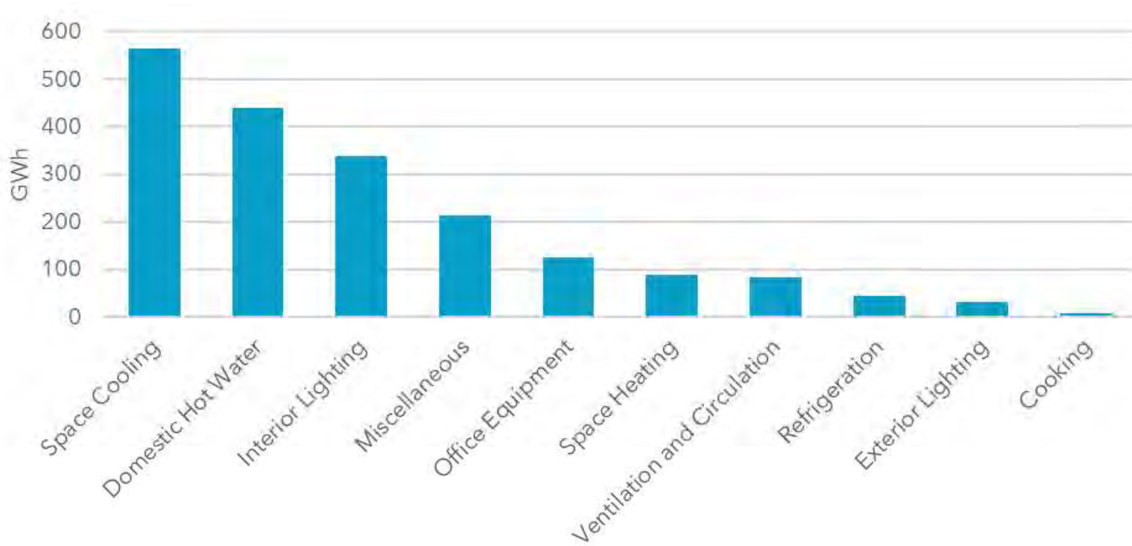


Figure 16: Commercial EE Technical Potential by End-Use (Energy Savings)



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)

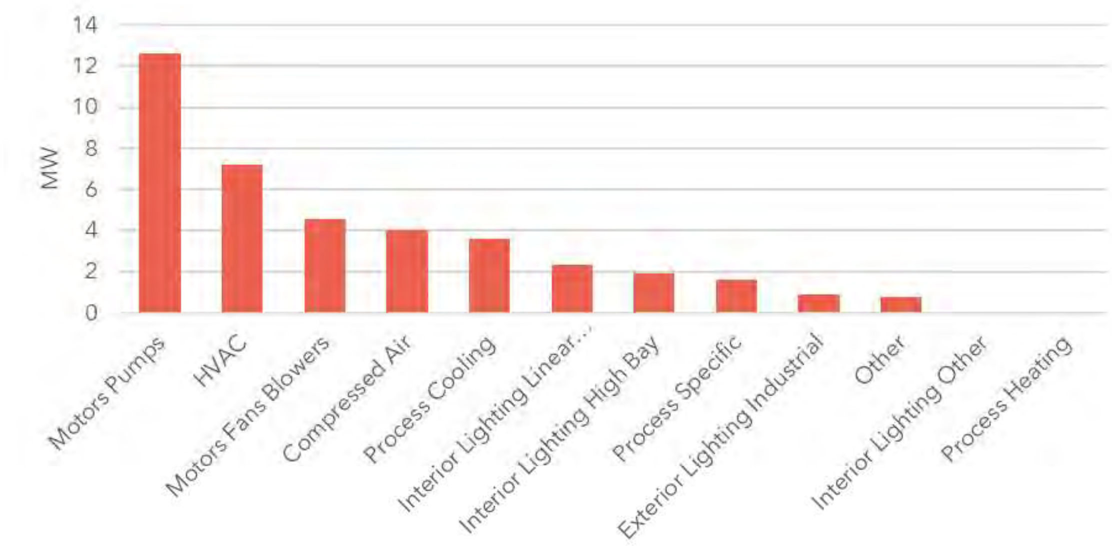


Figure 18: Industrial EE Technical Potential by End-Use (Winter Peak Savings)

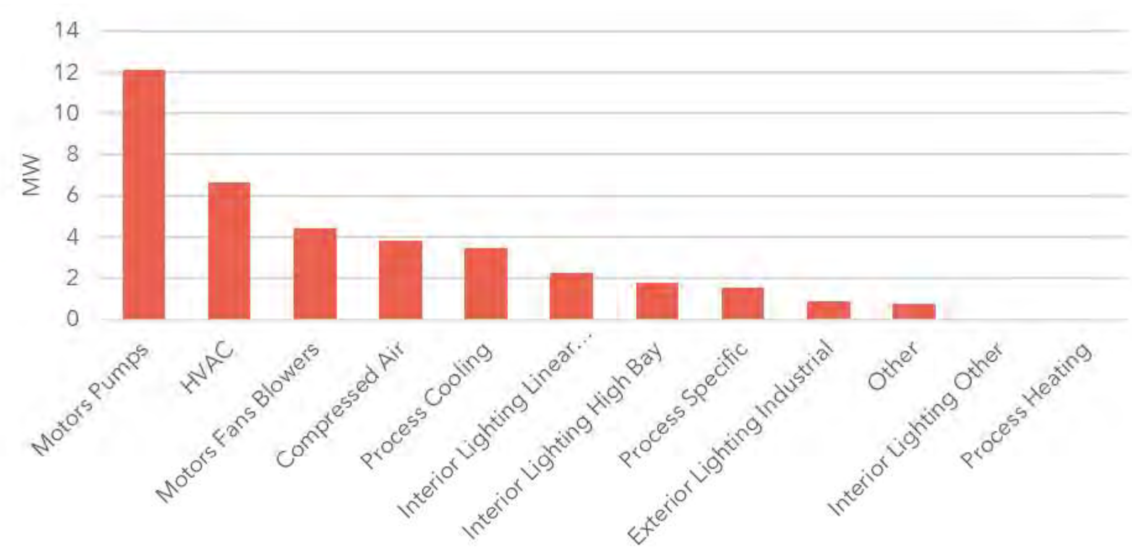
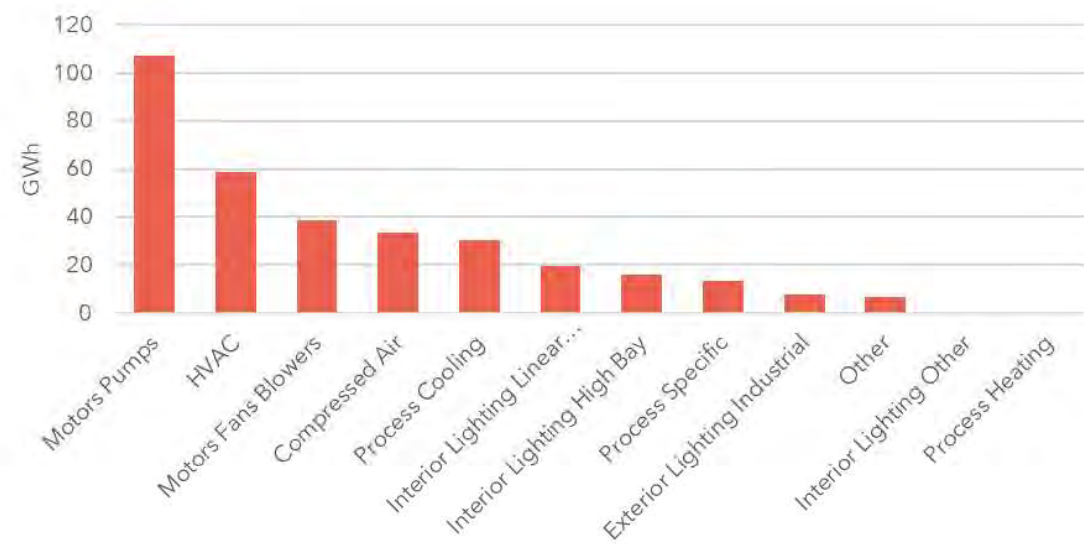


Figure 19: Industrial EE Technical Potential by End-Use (Energy Savings)



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:

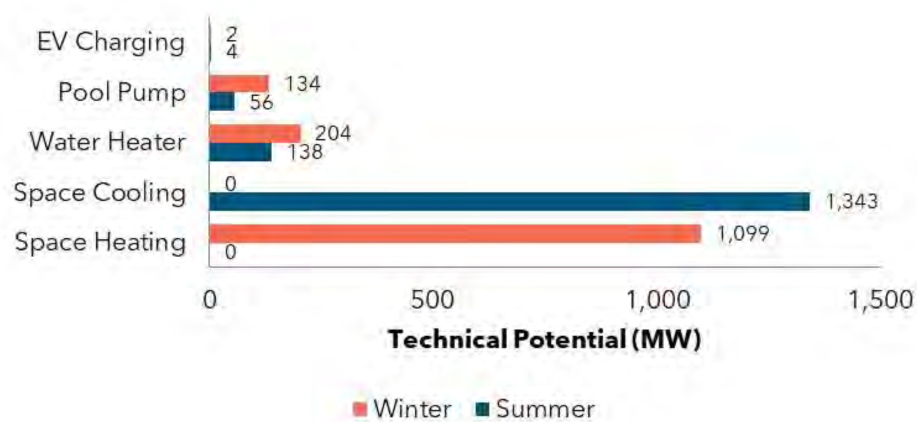
Table 10. DR Technical Potential

	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

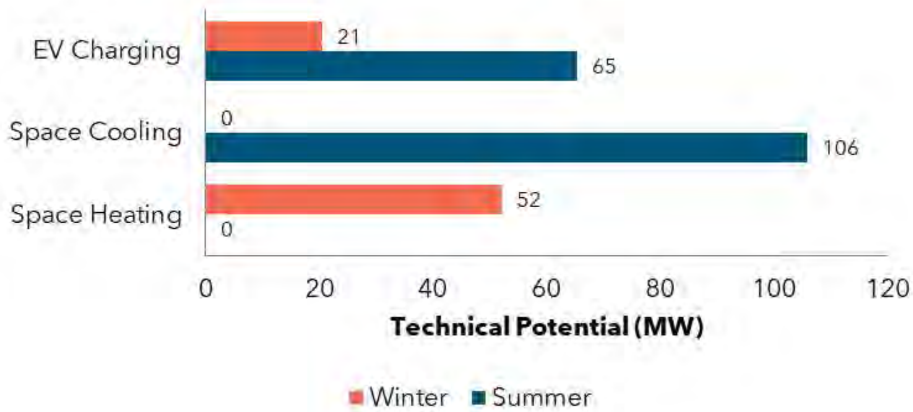


5.3.2 Non-Residential

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.

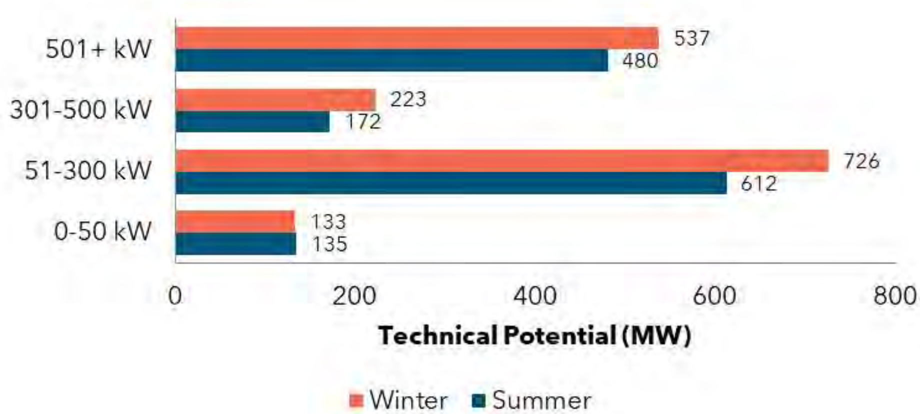
Figure 21: Small C&I DR Technical Potential by End-Use



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 Potential[7]

	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	100ft2 of Opaque Door meeting Energy Star Version 6.0 Requirements (U-Value: 0.17)	100ft2 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 STARÂ® 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

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 = 130Â°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 STARÂ® Standards	One non-ENERGY STARÂ® 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 STARÂ® 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 STARÂ® 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. >=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 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, 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

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 Desicant Air Dryer with Dew Point Controls	1000 CFM Modulating Heated Desicant 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 study[8]:

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

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	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: • 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.

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

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-Residential[1]	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 Potential[2]

	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.

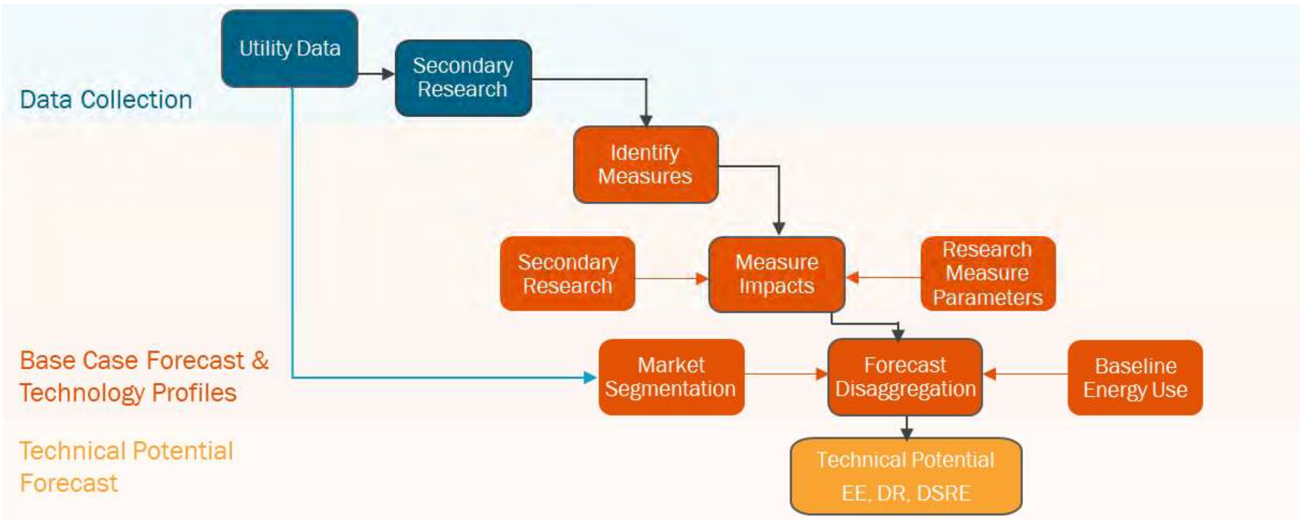
Quantifying DSM technical potential is the result of an analytical process that refines DSM opportunities that align with FPUC's customers' electric consumption patterns. Resource Innovations' general methodology for estimating technical potential is a hybrid "top-

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.

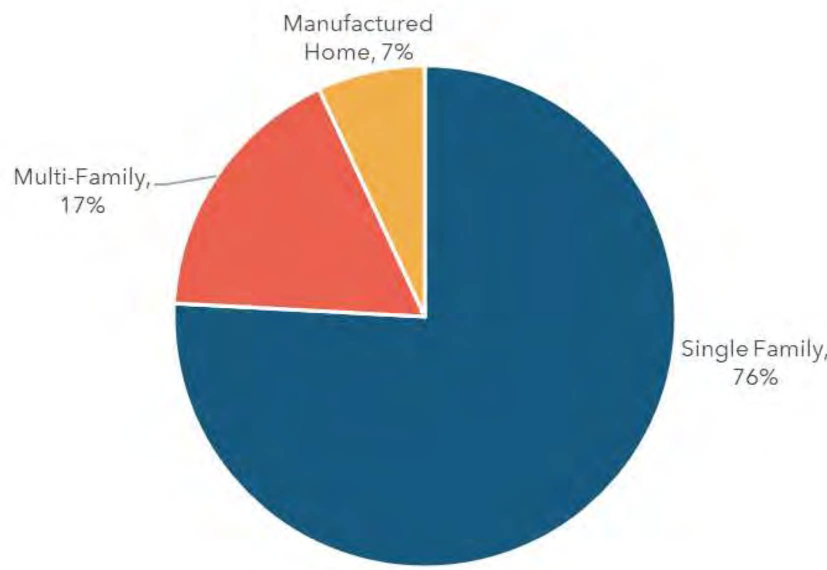
3.2 Analysis of Customer Segmentation

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

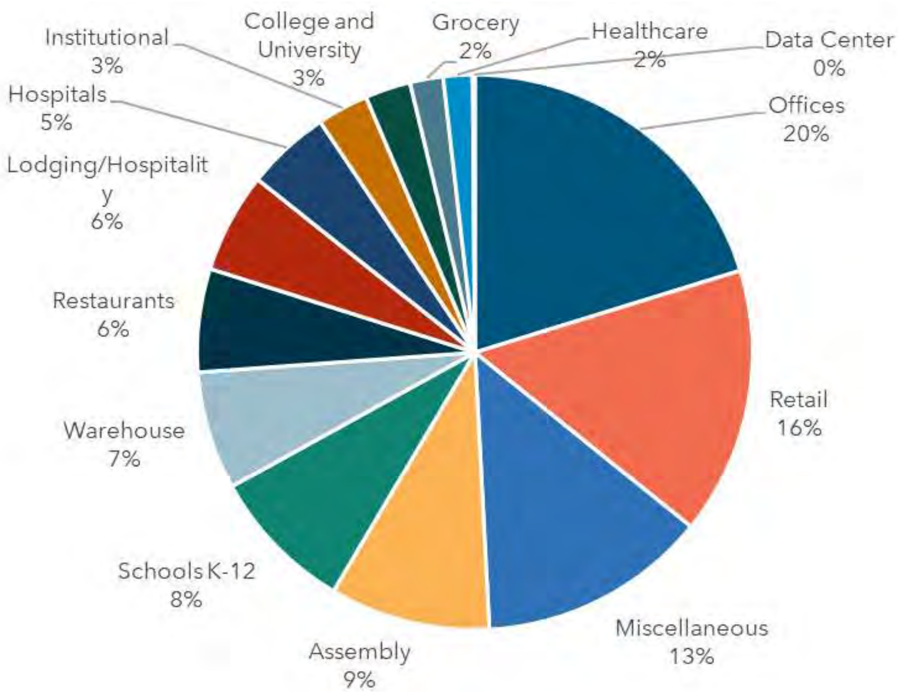
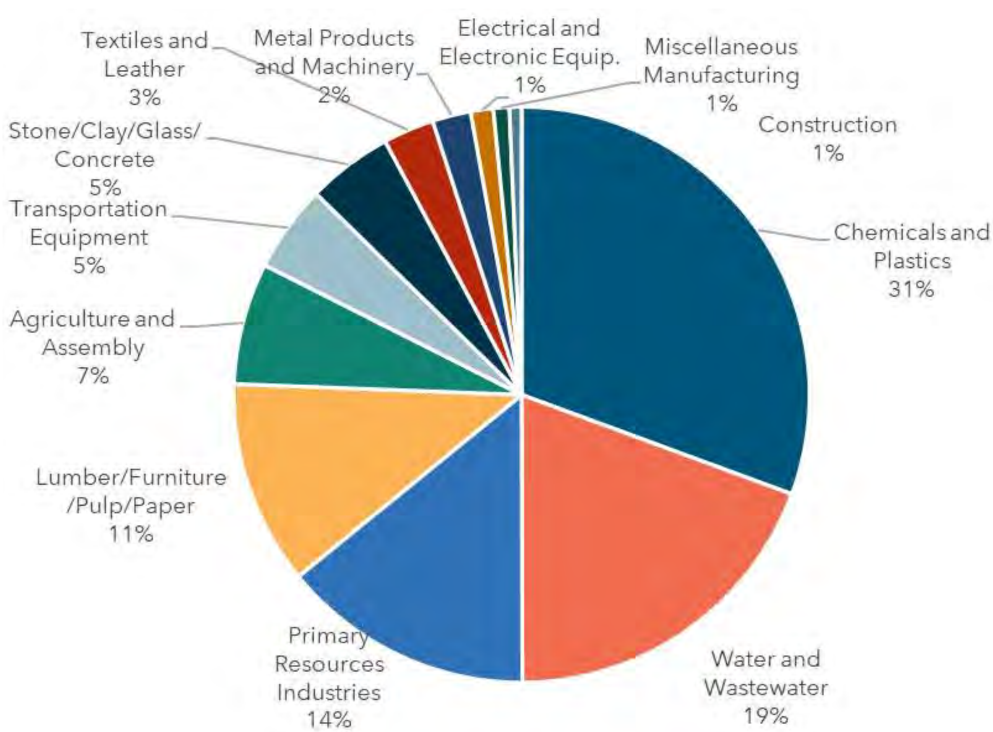


Figure 4. Industrial Customer Segmentation



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

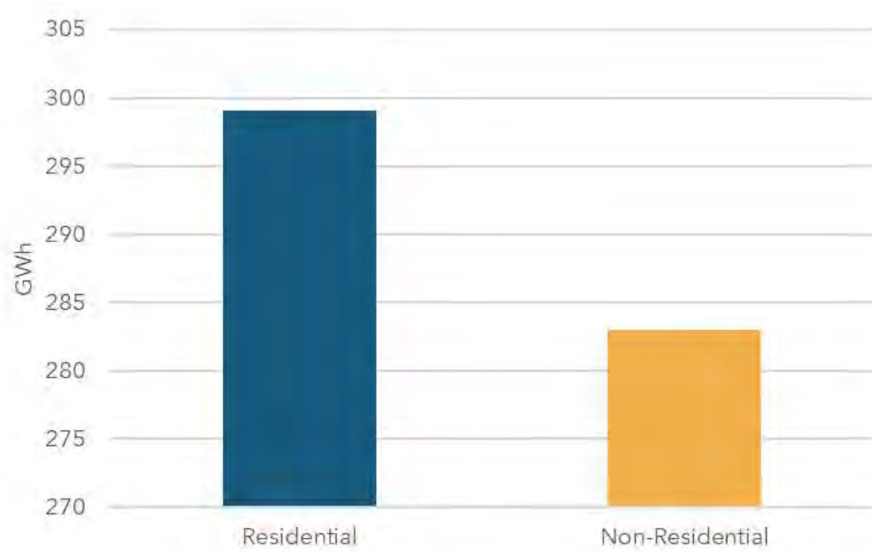
Customer Class	Annual kWh	Estimated Number of Accounts
Small C&I	0-15,000 kWh	2,559
	15,001-25,000 kWh	566
	25,001-50,000 kWh	457
	50,001 kWh +	246
	Total	3,828
Large C&I	0-50 kW	269
	51-300 kW	327
	301-500 kW	14
	501 kW +	8
	Total	618

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



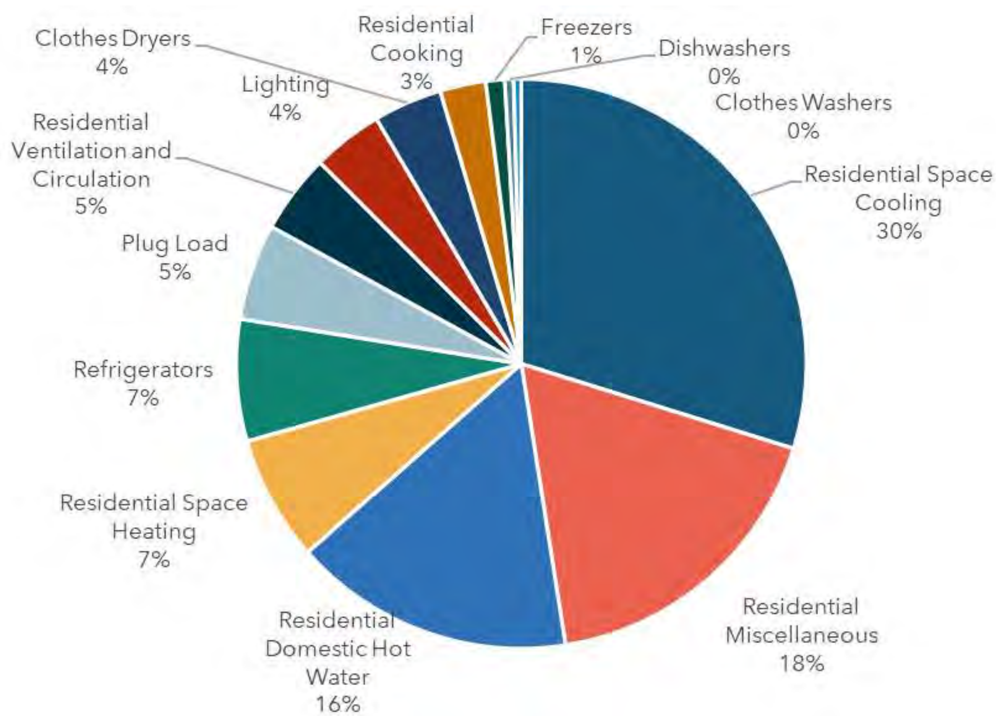
3.3.2 System Demand

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 loads[4] 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

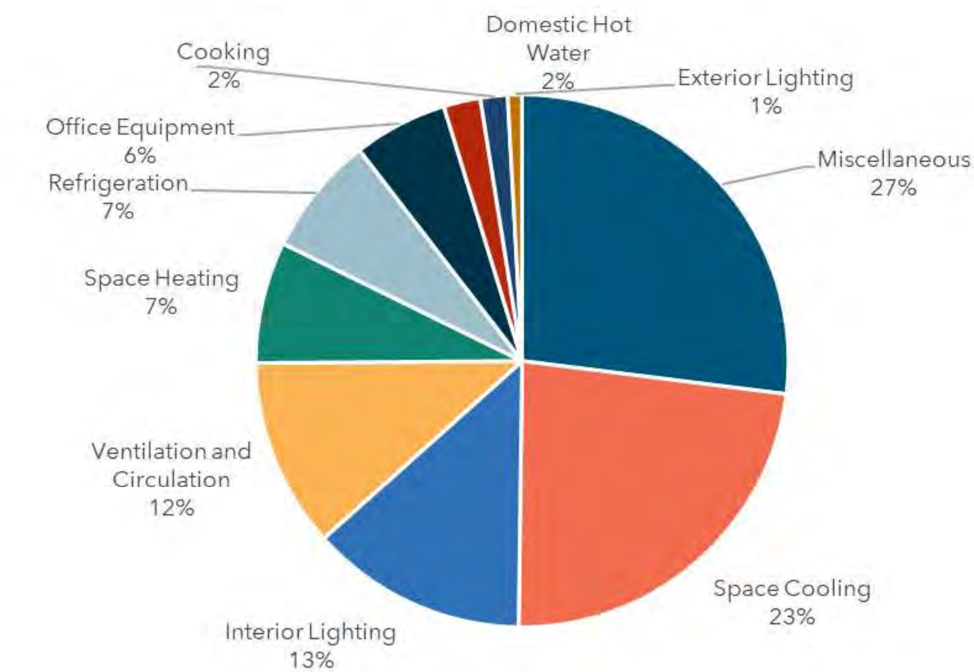
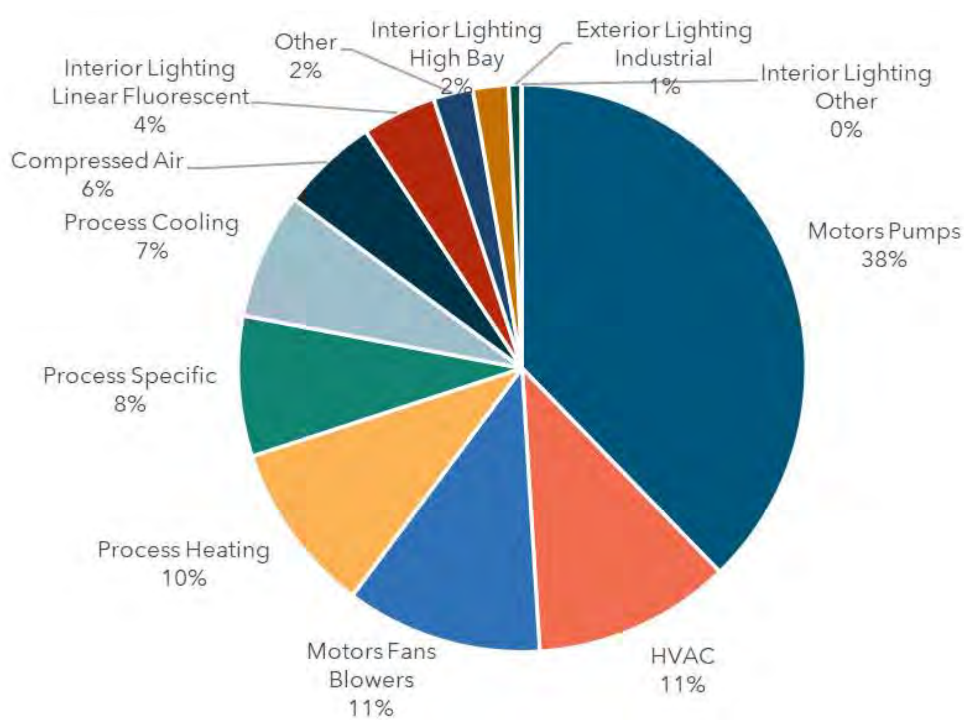


Figure 8. Industrial Baseline (2025) Energy Sales by End-Use



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

Technical Potential of Efficient Measures = Total Number of Households × Base Case Equipment Energy Use Intensity (kWh/unit) × Saturation Shares × Percent Incomplete × Feasibility Factor × Savings Factor

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

Technical Potential of Efficient Measures = Total Stock Sq. Footage by Building Type by EDC × Base Case Equipment Energy Use Intensity (kWh/unit) × Saturation Shares × Percent Incomplete × Feasibility Factor × Savings Factor

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.

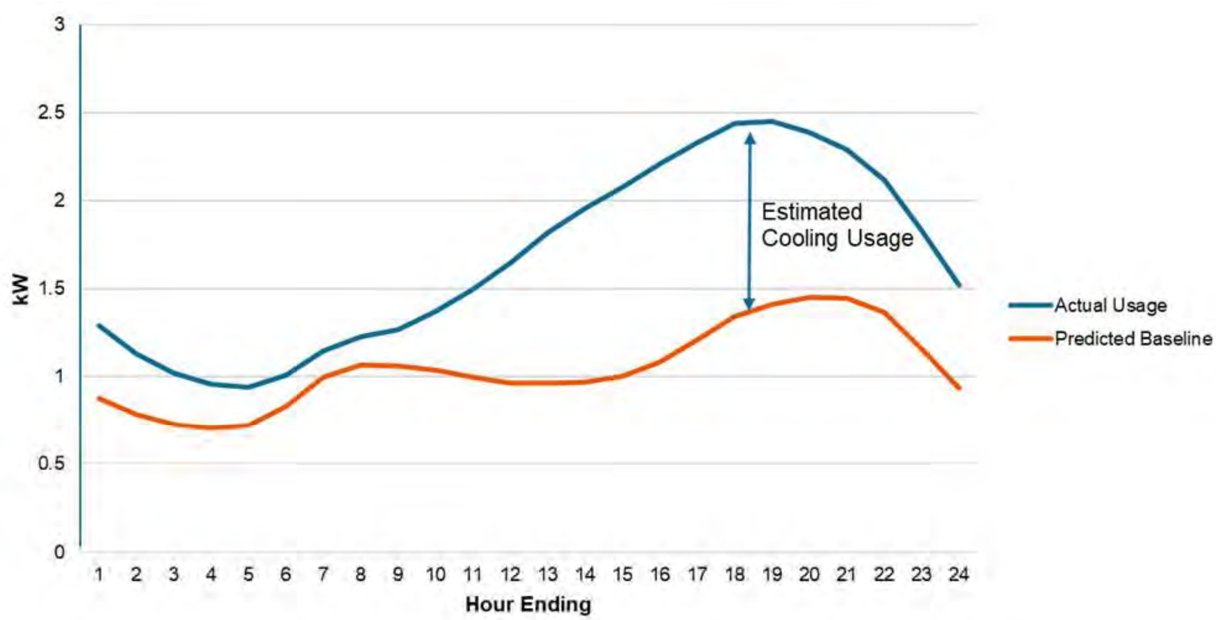
Technical potential, in the context of DR, is defined as the total amount of load available for reduction that is coincident with the period of interest; in this case, the system peak hour for the summer and winter seasons. Thus, two sets of capacity values are estimated: a summer capacity and a winter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

PV Technical Energy Potential = Suitable Rooftop PV Area (Sq Ft) × PV Power Density (kW-DC/Sq Ft) × Generation Factor (kWh/kW-DC)

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 system[5]. 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).

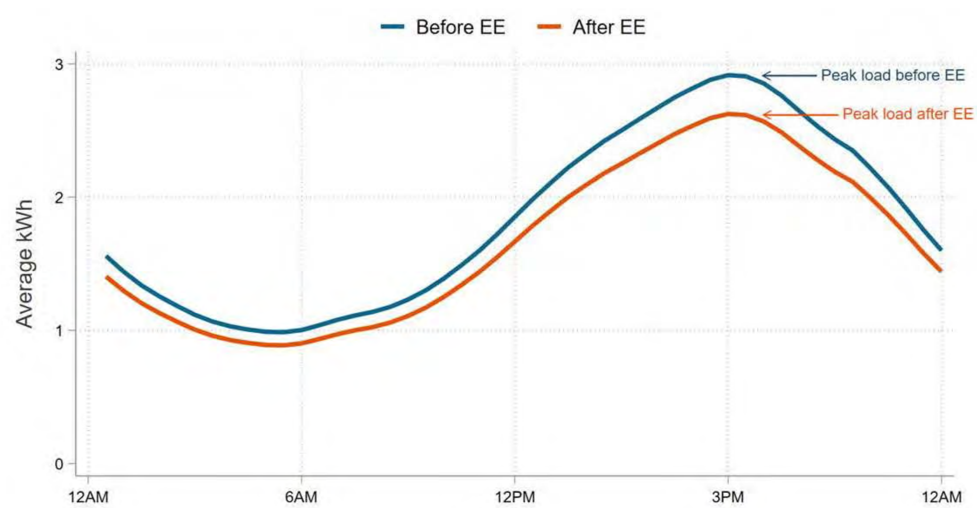
Measure Interaction

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-Residential[6]	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)

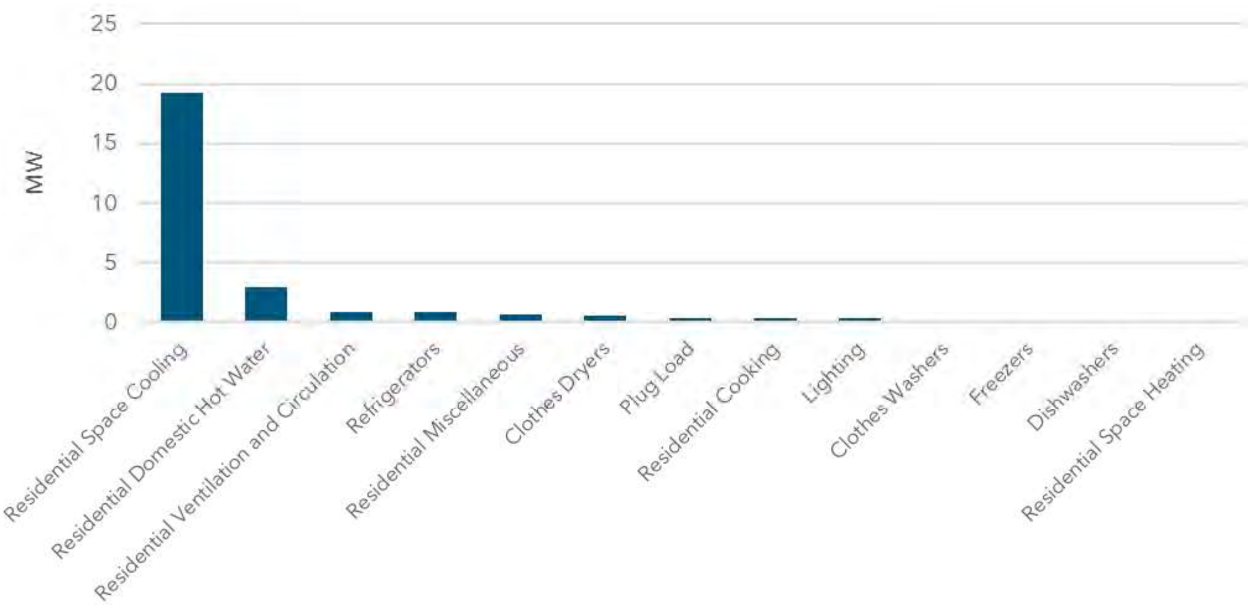


Figure 12: Residential EE Technical Potential by End-Use (Winter Peak Savings)

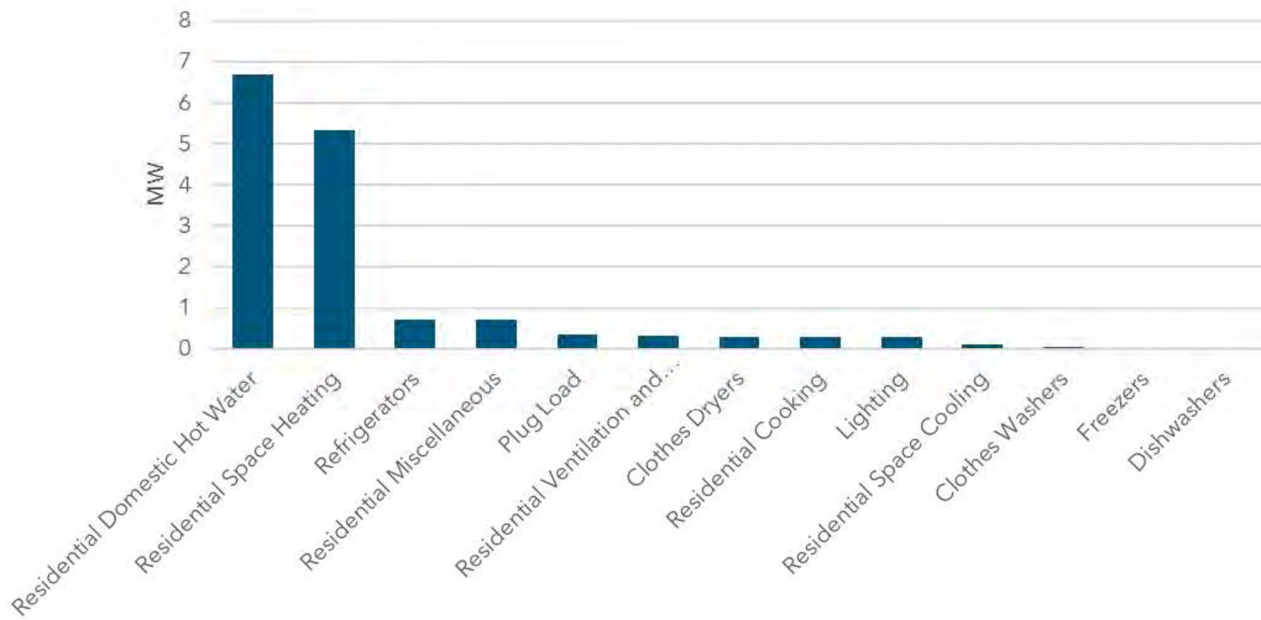
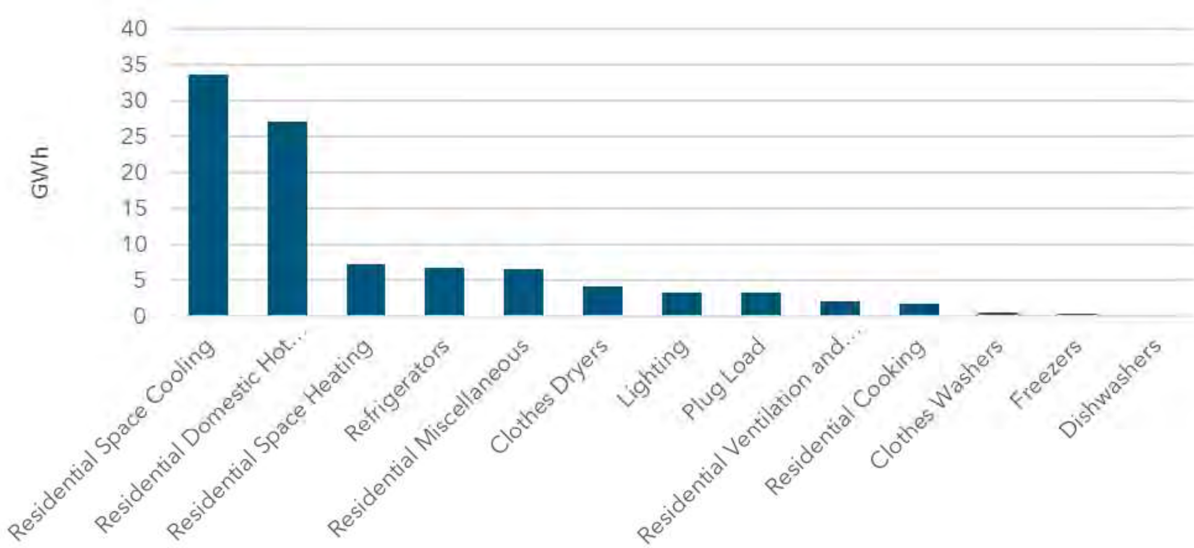


Figure 13: Residential EE Technical Potential by End-Use (Energy Savings)



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)

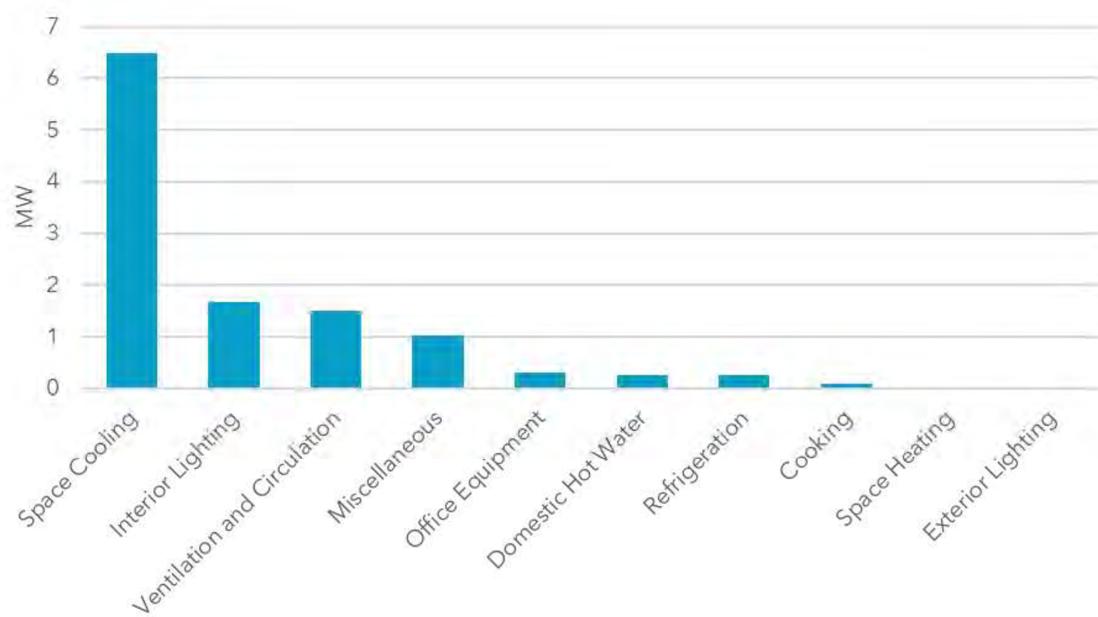


Figure 15: Commercial EE Technical Potential by End-Use (Winter Peak Savings)

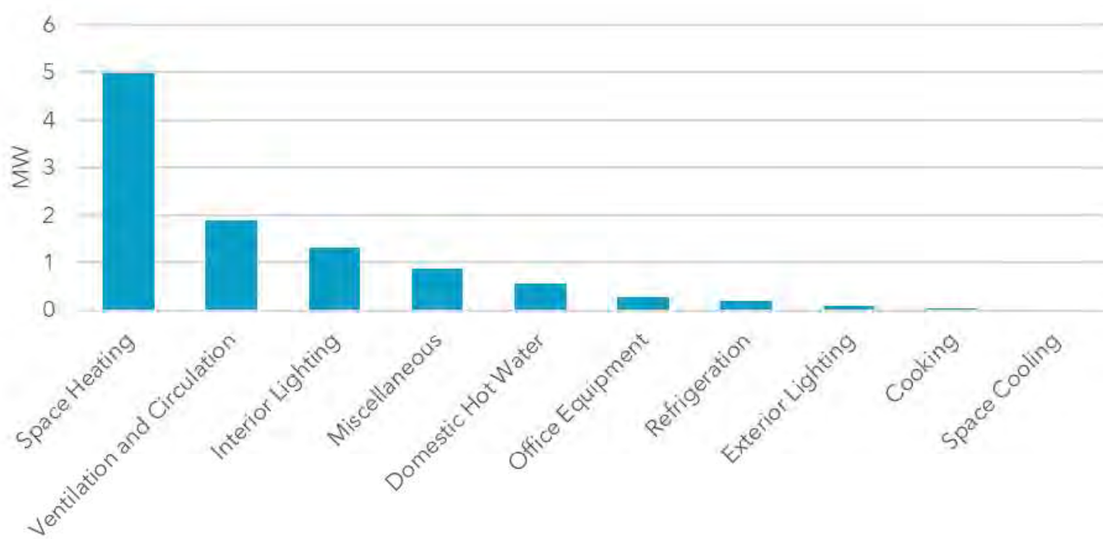
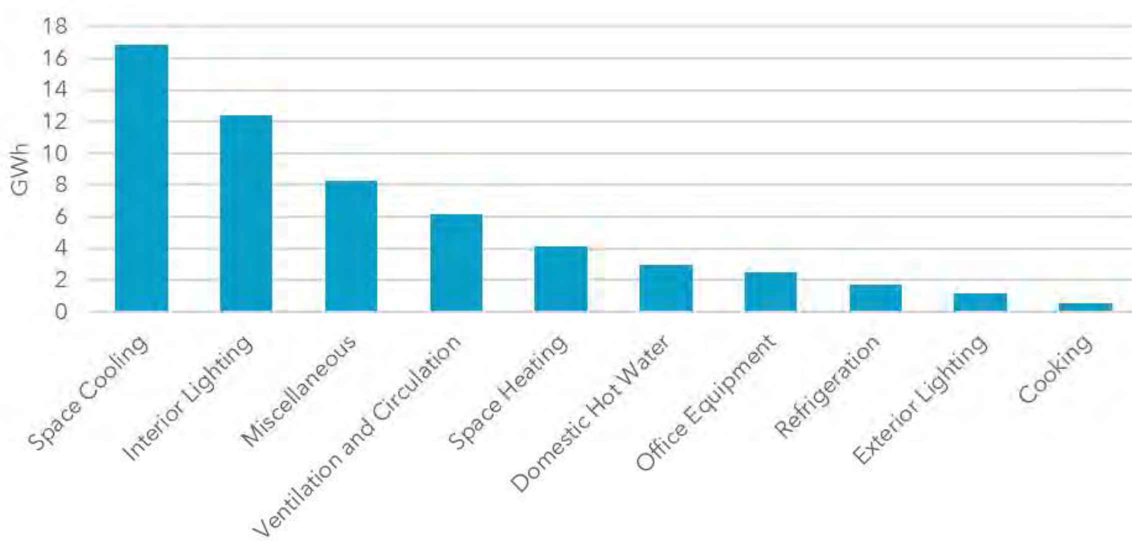


Figure 16: Commercial EE Technical Potential by End-Use (Energy Savings)



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)

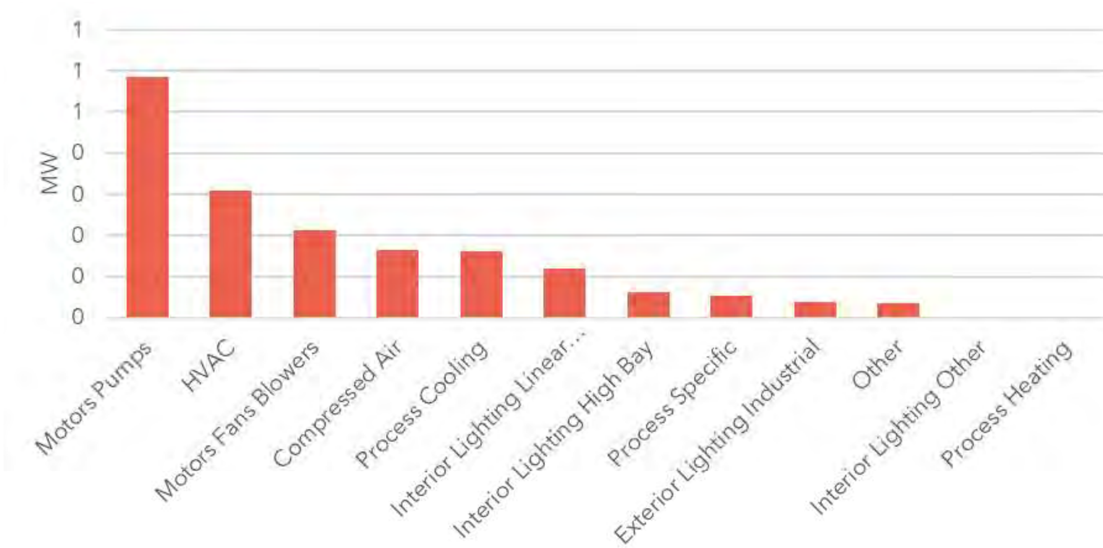


Figure 18: Industrial EE Technical Potential by End-Use (Winter Peak Savings)

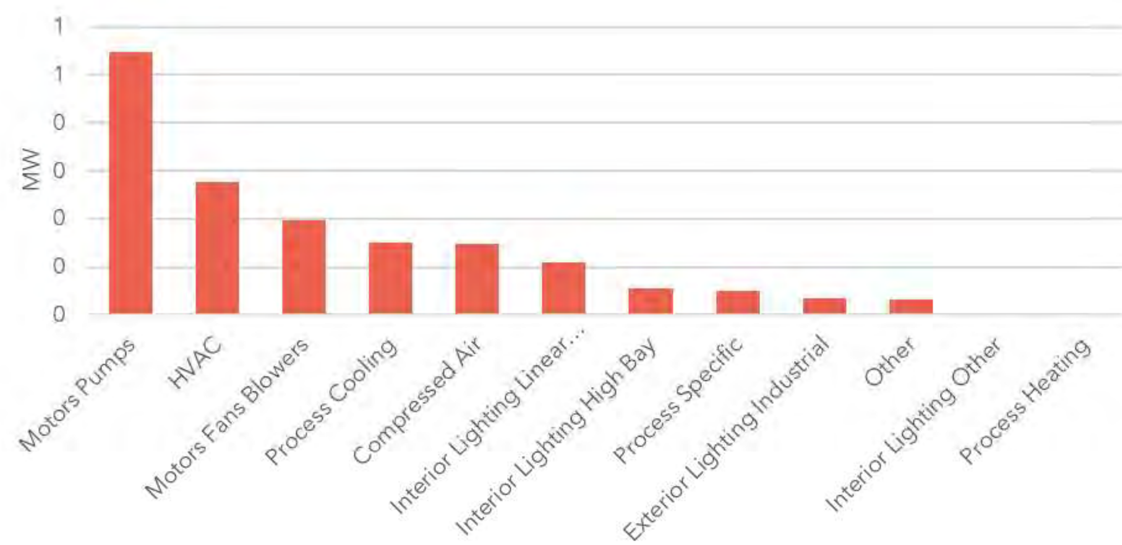
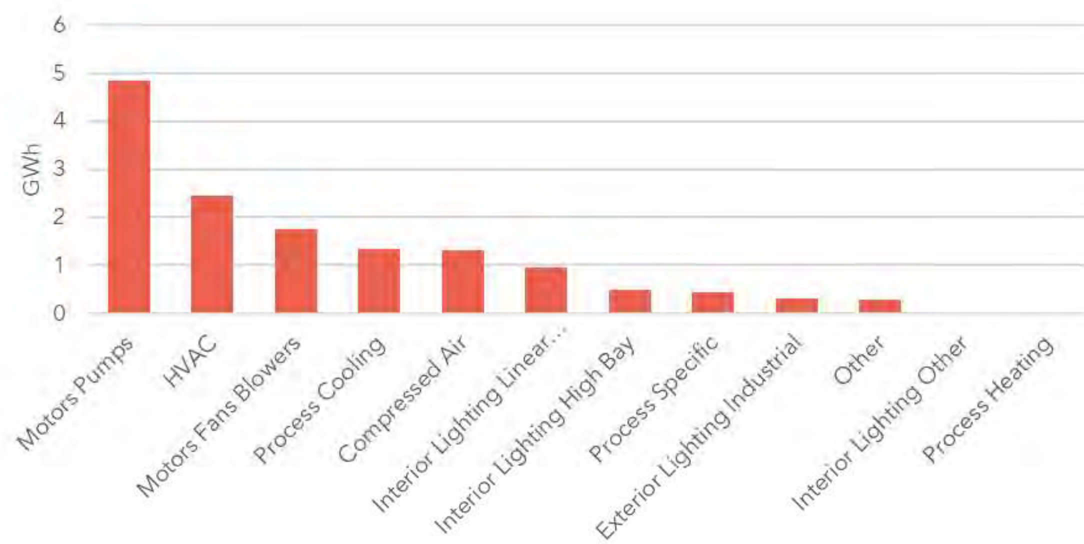


Figure 19: Industrial EE Technical Potential by End-Use (Energy Savings)



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:

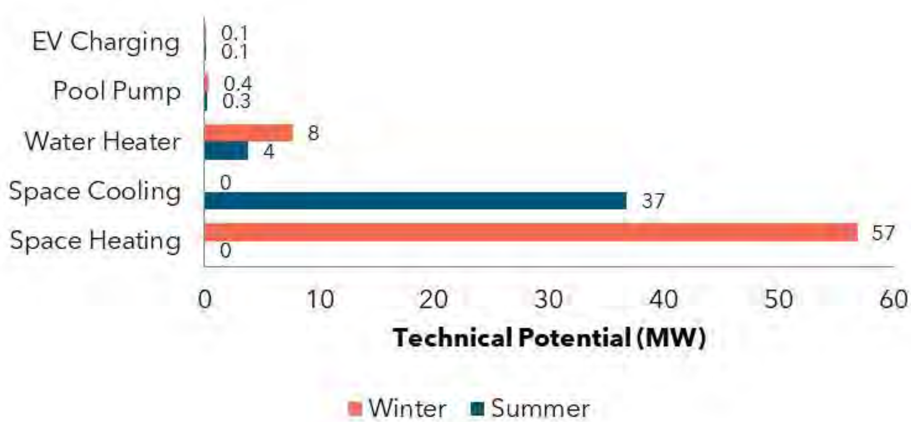
Table 10. DR Technical Potential

	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

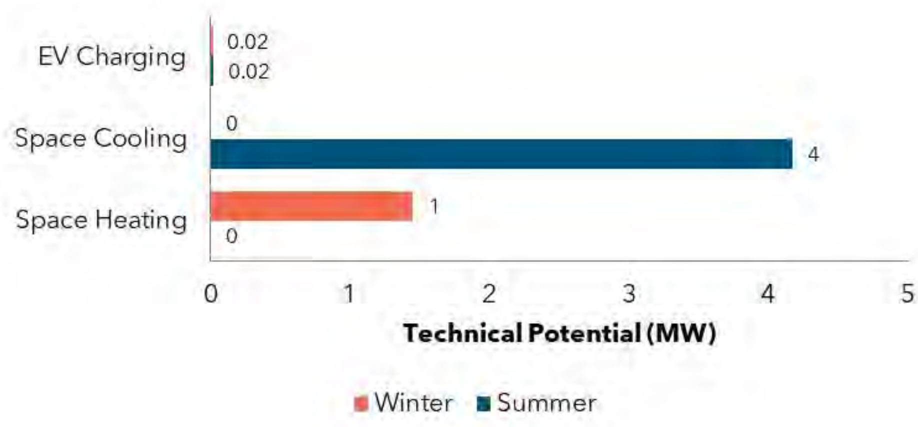


5.3.2 Non-Residential

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.

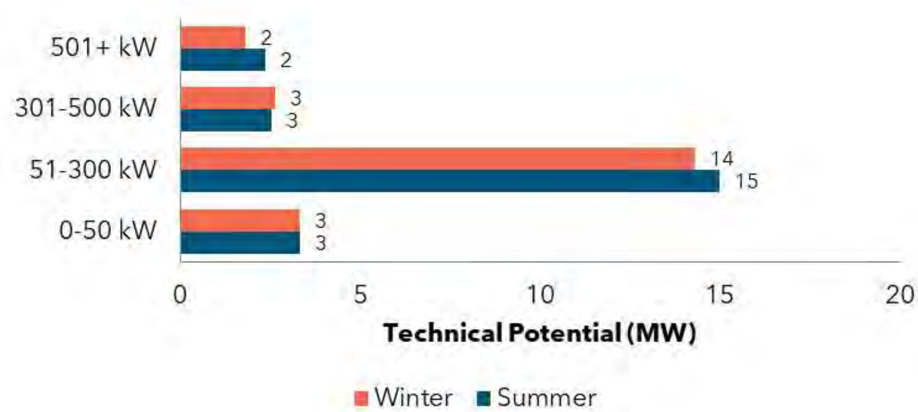
Figure 21: Small C&I DR Technical Potential by End-Use



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 Potential[7]

	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	100ft2 of Opaque Door meeting Energy Star Version 6.0 Requirements (U-Value: 0.17)	100ft2 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 STARÂ® 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

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 = 130Â°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 STARÂ® Standards	One non-ENERGY STARÂ® 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 STARÂ® 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 STARÂ® 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. >=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, 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	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 Desicant Air Dryer with Dew Point Controls	1000 CFM Modulating Heated Desicant 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 study[8]:

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	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

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	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: • 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.

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

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

resource innovations

Technical Potential Study of Demand Side Management

JEA

Date: 03.07.2024

Table of Contents

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-Residential[1]	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 Potential[2]

	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.

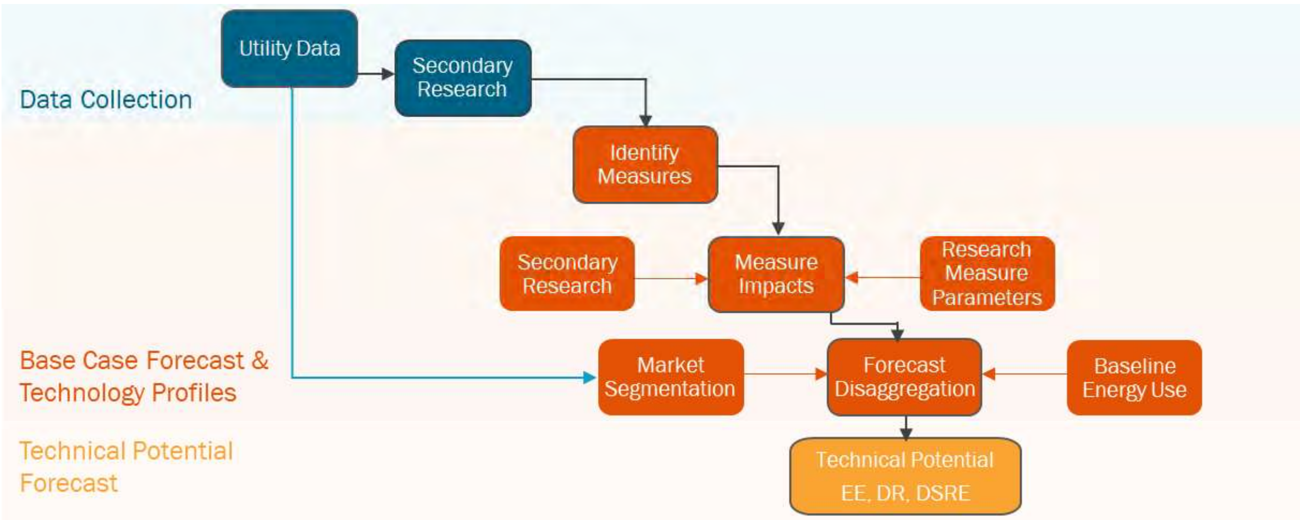
Quantifying DSM technical potential is the result of an analytical process that refines DSM opportunities that align with JEA's customers' electric consumption patterns. Resource Innovations' general methodology for estimating technical potential is a hybrid "top-

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.

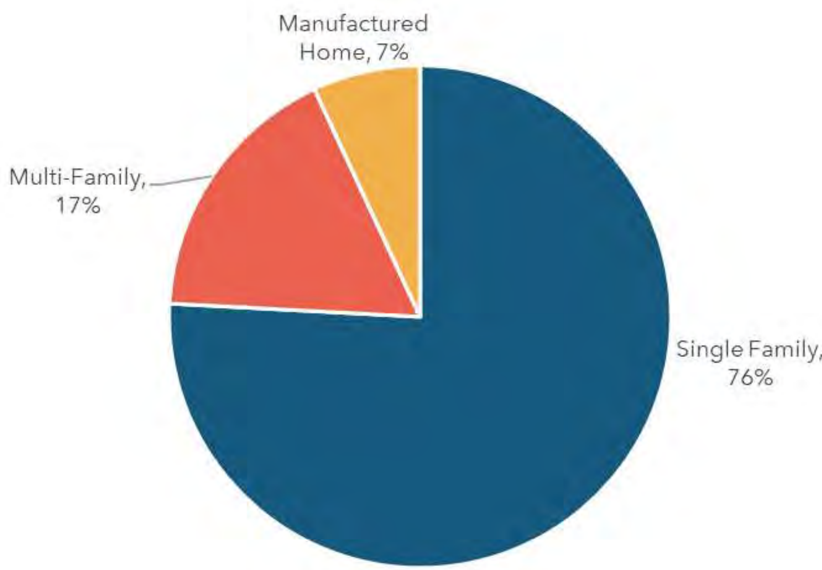
3.2 Analysis of Customer Segmentation

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

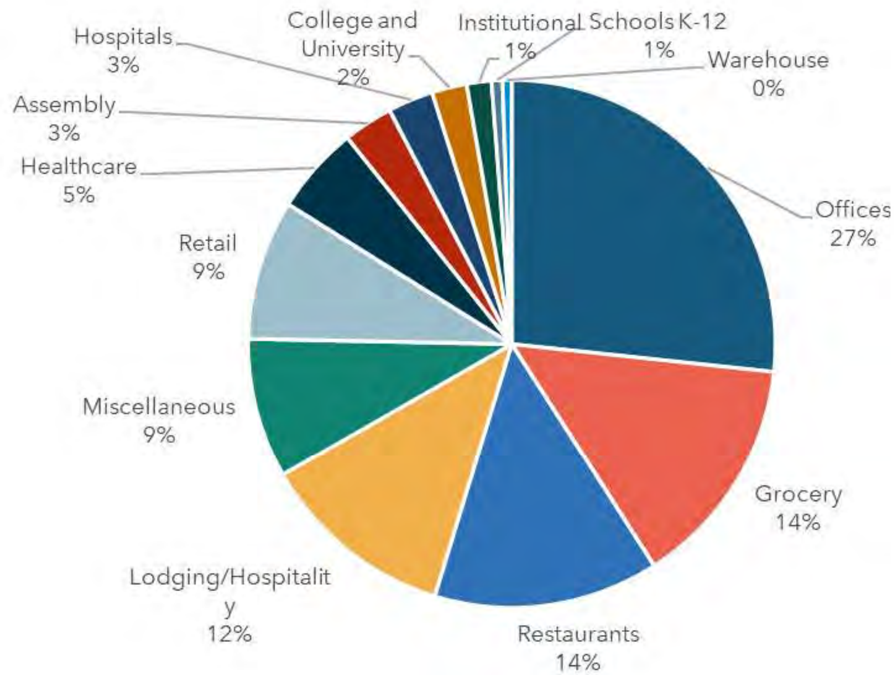
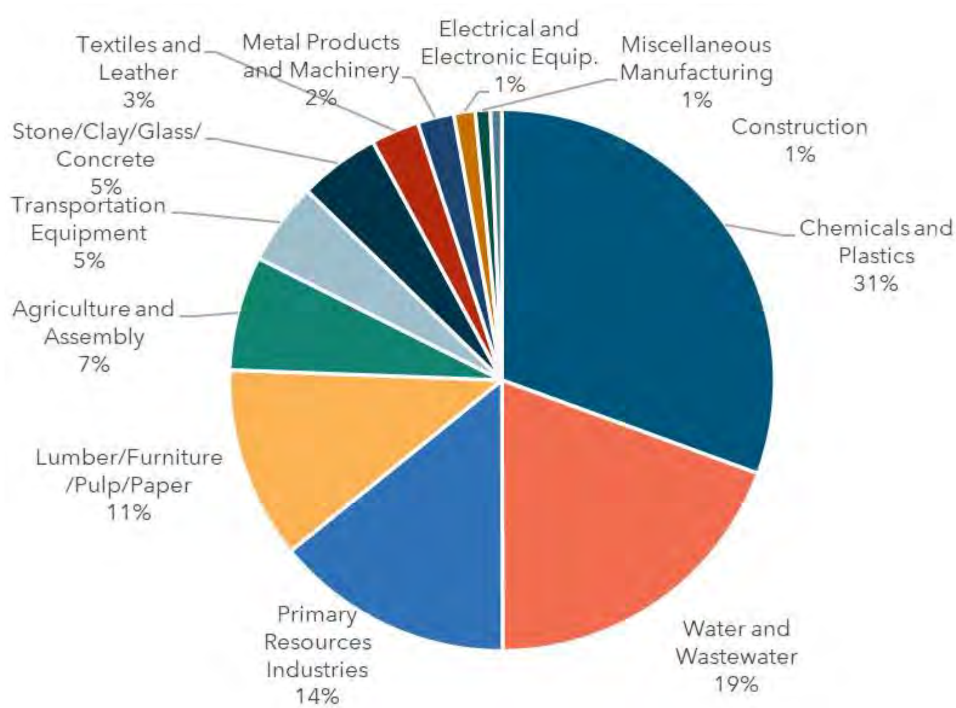


Figure 4. Industrial Customer Segmentation



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

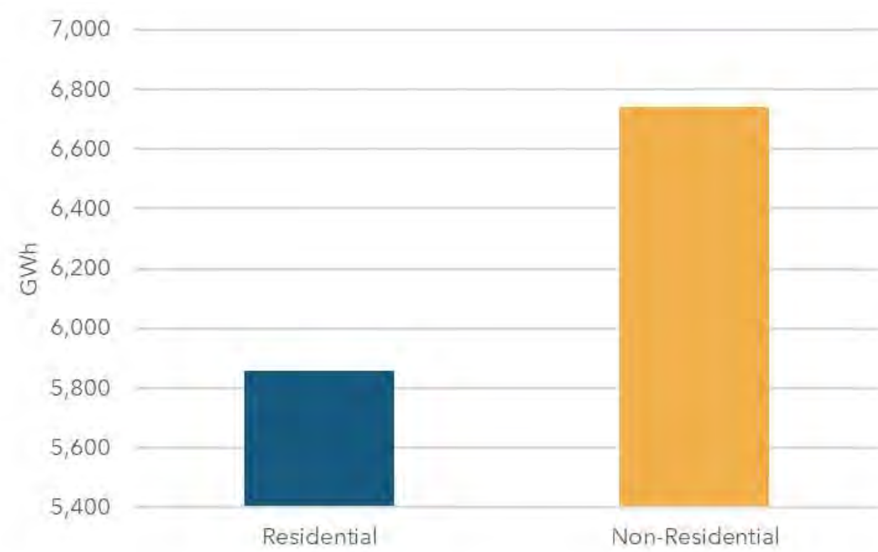
Customer Class	Annual kWh	Estimated Number of Accounts
Small C&I	0-15,000 kWh	32,188
	15,001-25,000 kWh	6,347
	25,001-50,000 kWh	1,131
	50,001 kWh +	13,802
	Total	53,468
Large C&I	0-50 kW	331
	51-300 kW	3,842
	301-500 kW	8
	501 kW +	153
	Total	4,334

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



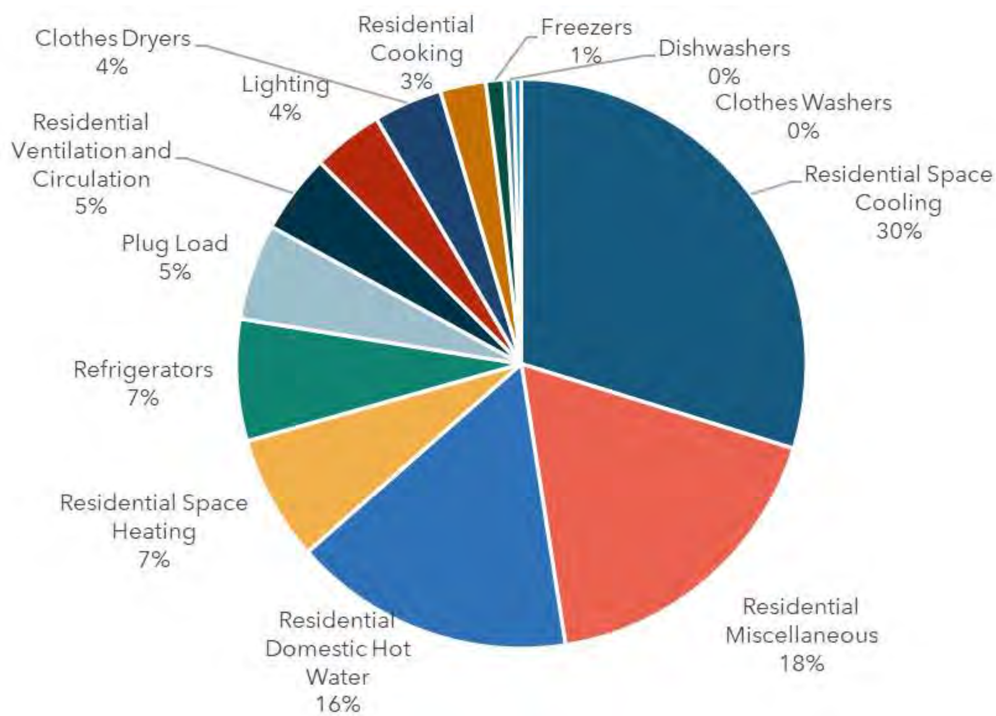
3.3.2 System Demand

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 loads[4] 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

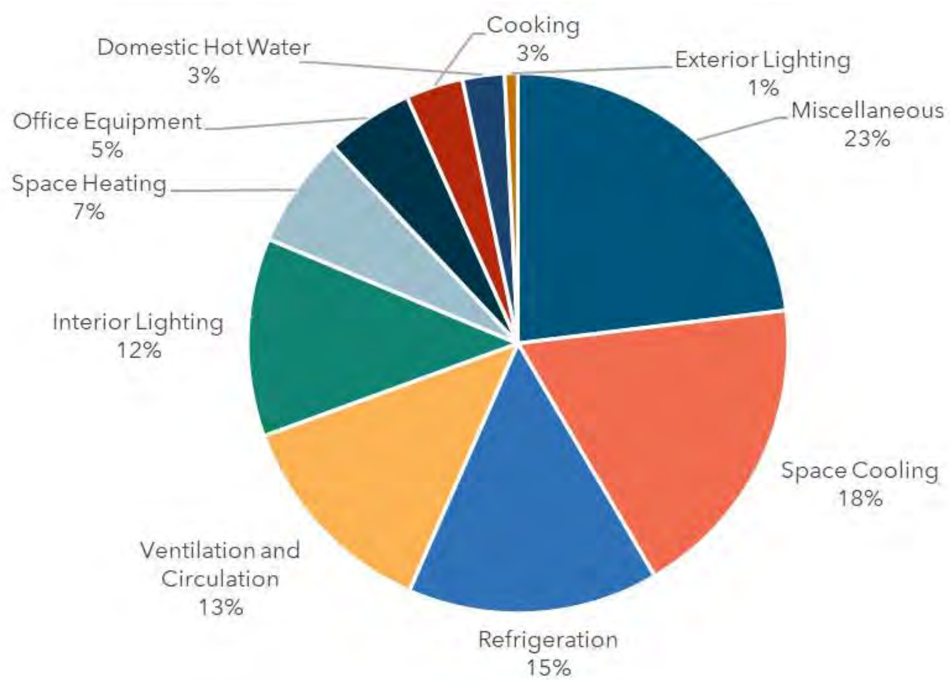
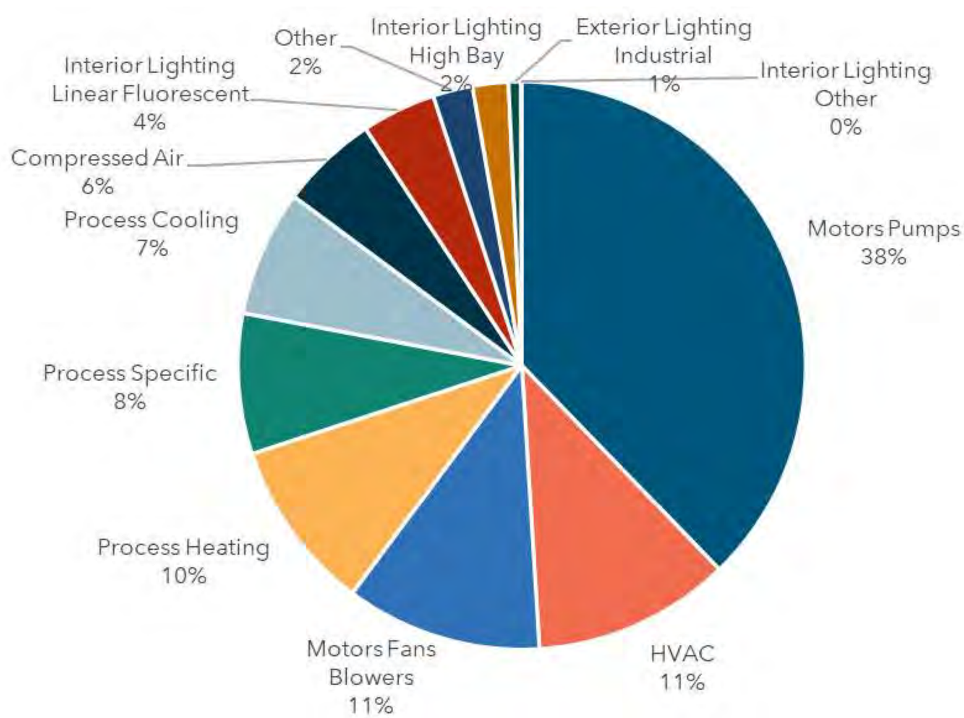


Figure 8. Industrial Baseline (2025) Energy Sales by End-Use



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

$$\text{Technical Potential of Efficient Measures} = \text{Total Number of Households} \times \text{Base Case Equipment Energy Use Intensity (kWh/unit)} \times \text{Saturation Shares} \times \text{Percent Incomplete} \times \text{Feasibility Factor} \times \text{Savings Factor}$$

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

$$\text{Technical Potential of Efficient Measures} = \text{Total Stock Sq. Footage by Building Type by EDC} \times \text{Base Case Equipment Energy Use Intensity (kWh/unit)} \times \text{Saturation Shares} \times \text{Percent Incomplete} \times \text{Feasibility Factor} \times \text{Savings Factor}$$

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.

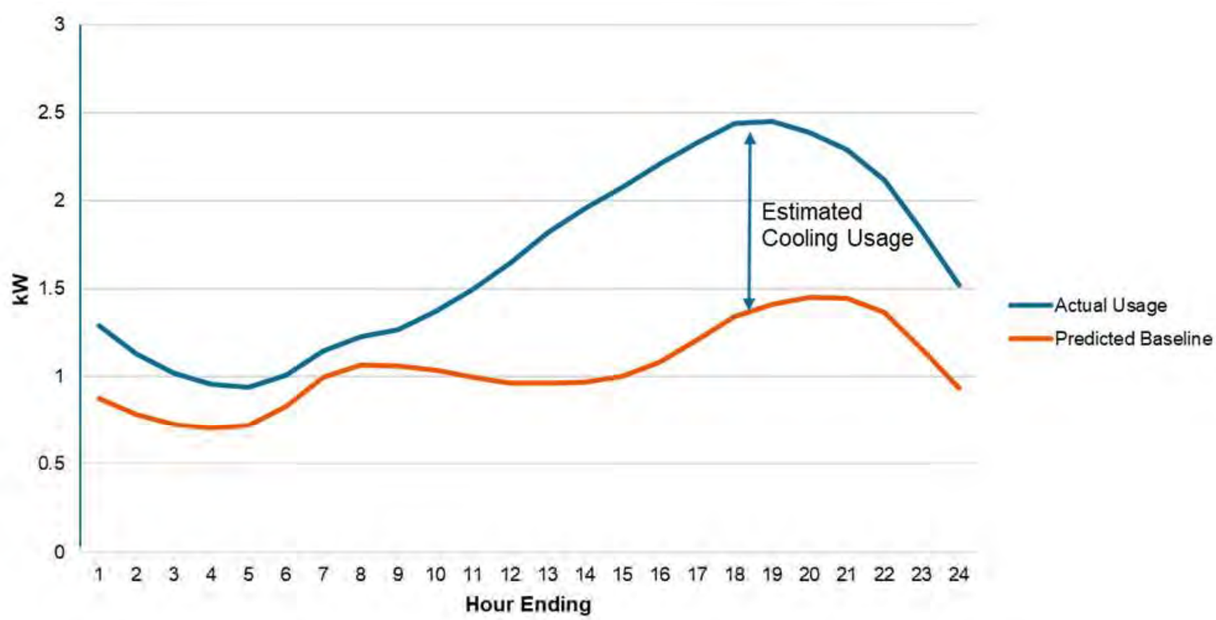
Technical potential, in the context of DR, is defined as the total amount of load available for reduction that is coincident with the period of interest; in this case, the system peak hour for the summer and winter seasons. Thus, two sets of capacity values are estimated: a summer capacity and a winter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

PV Technical Energy Potential = Suitable Rooftop PV Area (Sq Ft) × PV Power Density (kW-DC/Sq Ft) × Generation Factor (kWh/kW-DC)

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 system[5]. 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).

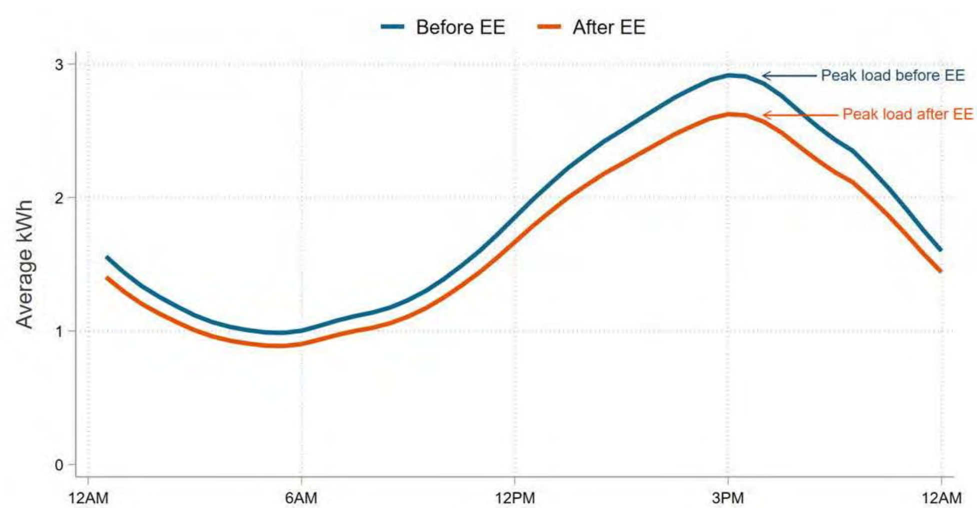
Measure Interaction

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-Residential[6]	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)

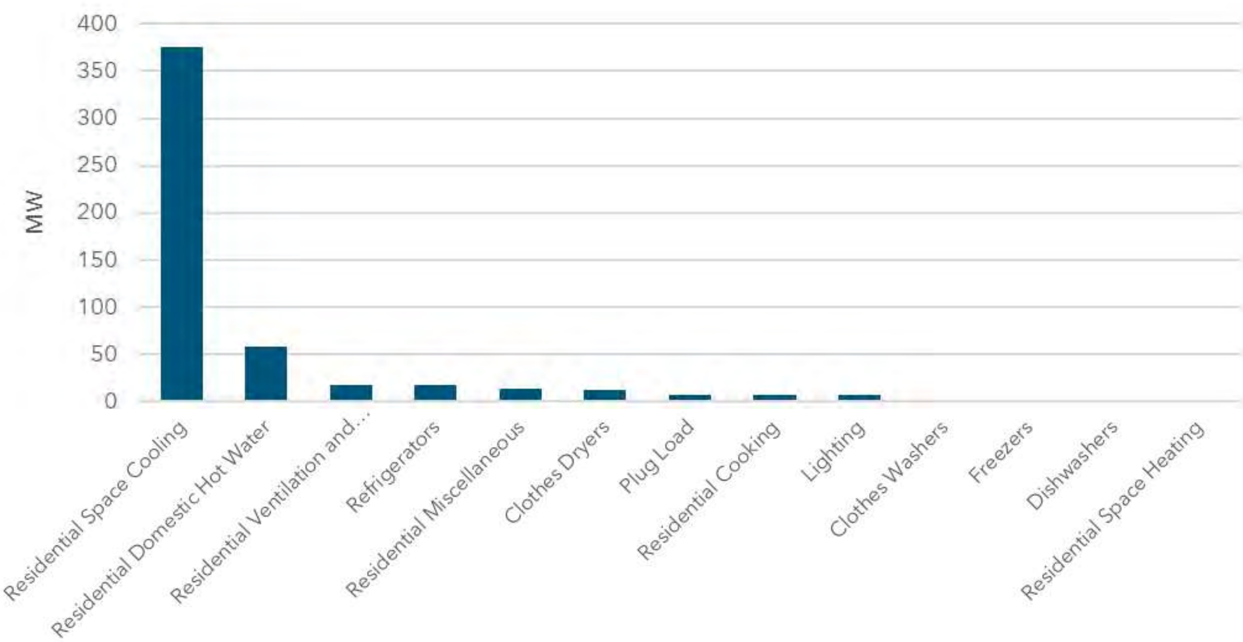


Figure 12: Residential EE Technical Potential by End-Use (Winter Peak Savings)

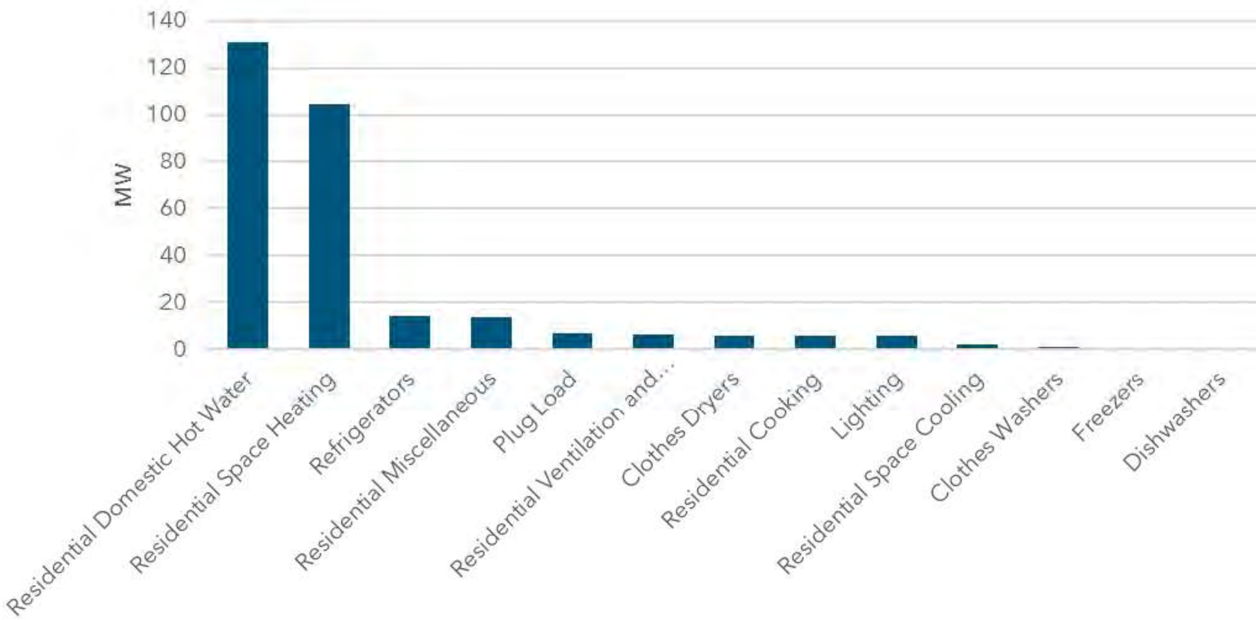
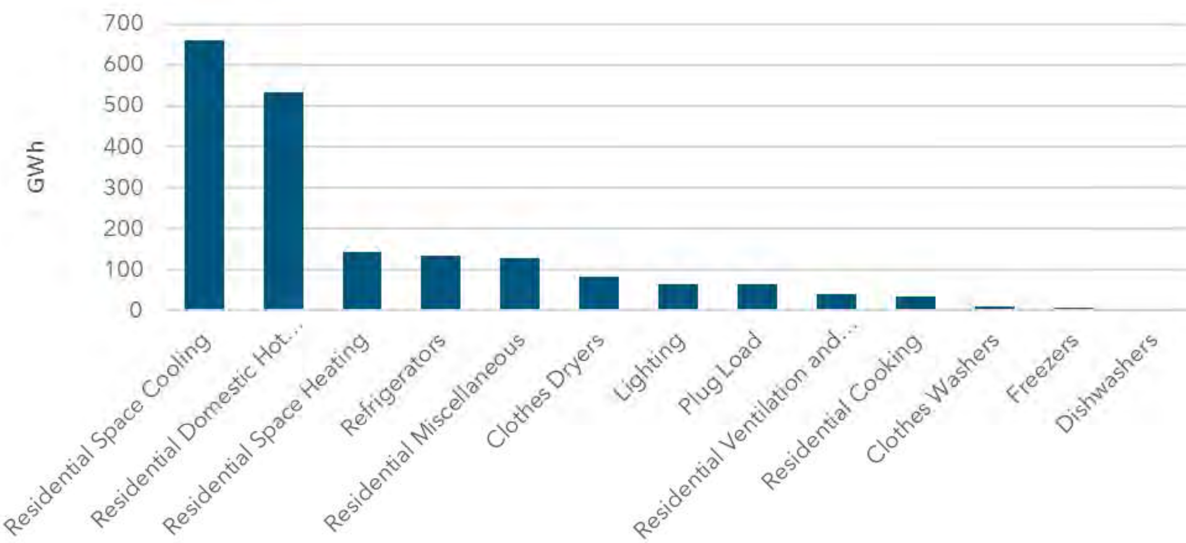


Figure 13: Residential EE Technical Potential by End-Use (Energy Savings)



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)

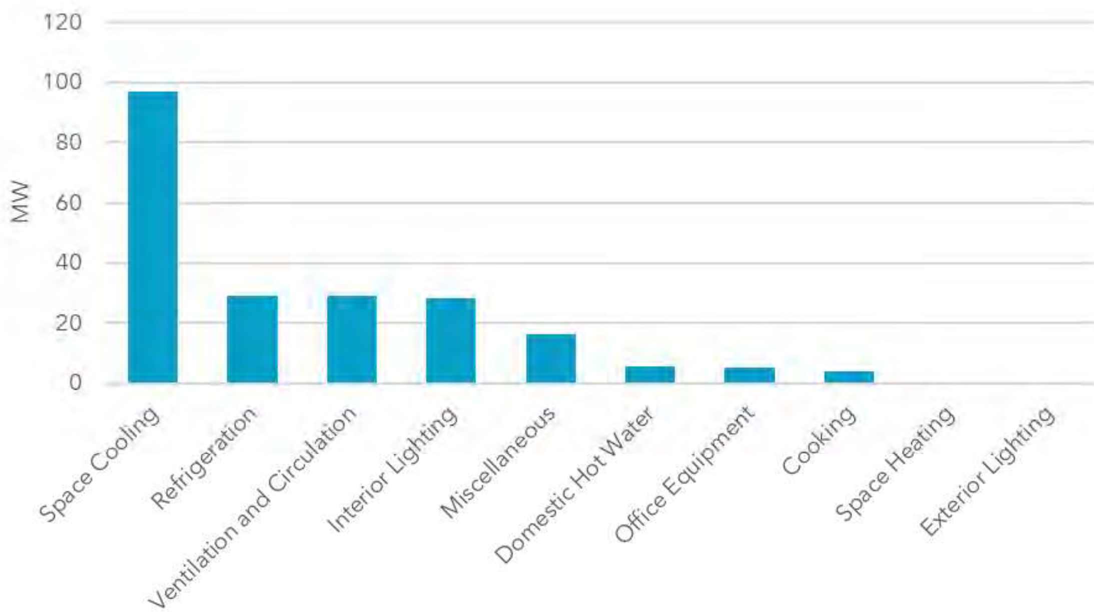


Figure 15: Commercial EE Technical Potential by End-Use (Winter Peak Savings)

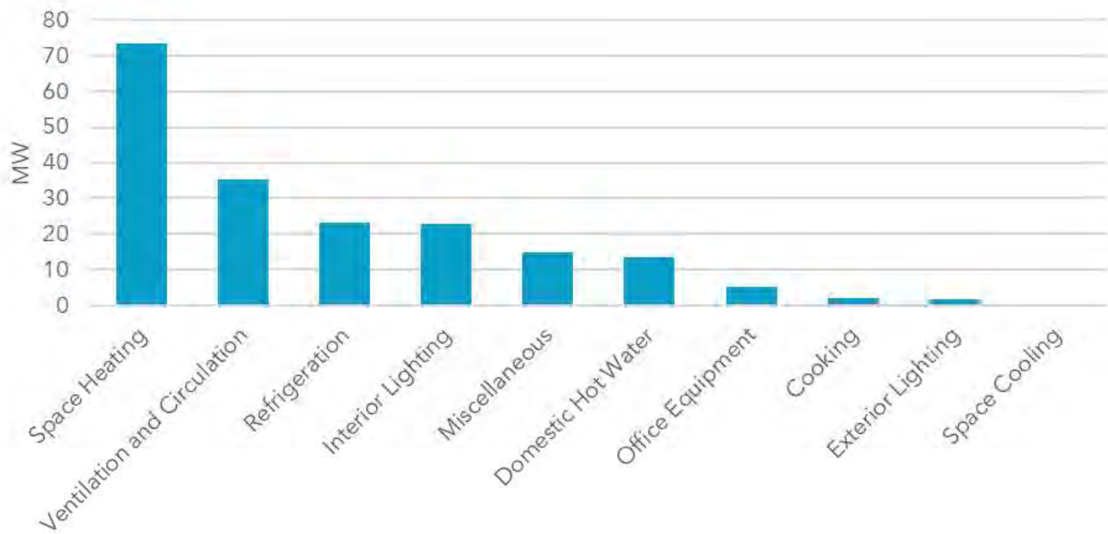
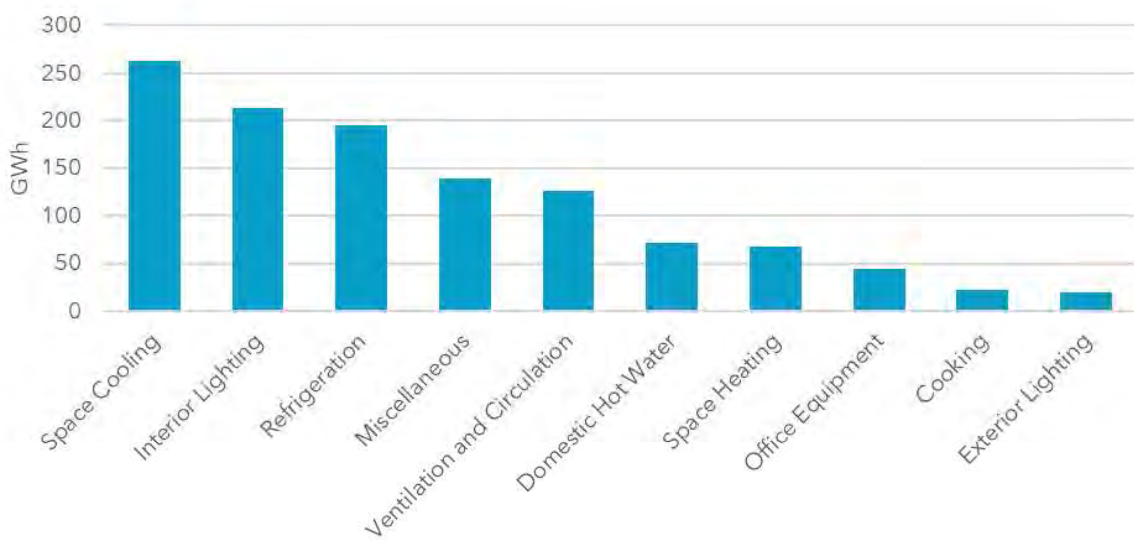


Figure 16: Commercial EE Technical Potential by End-Use (Energy Savings)



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)

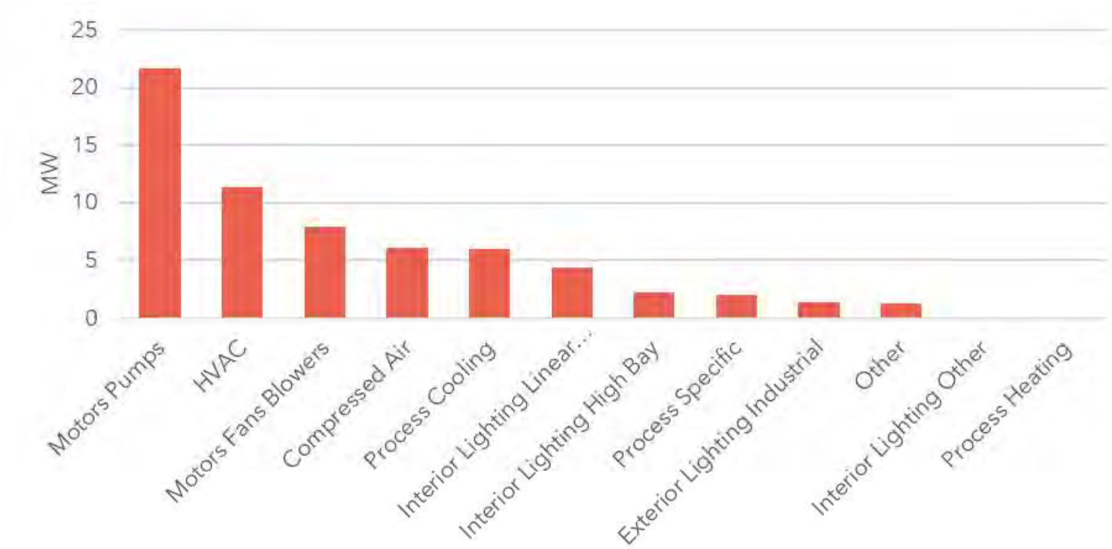


Figure 18: Industrial EE Technical Potential by End-Use (Winter Peak Savings)

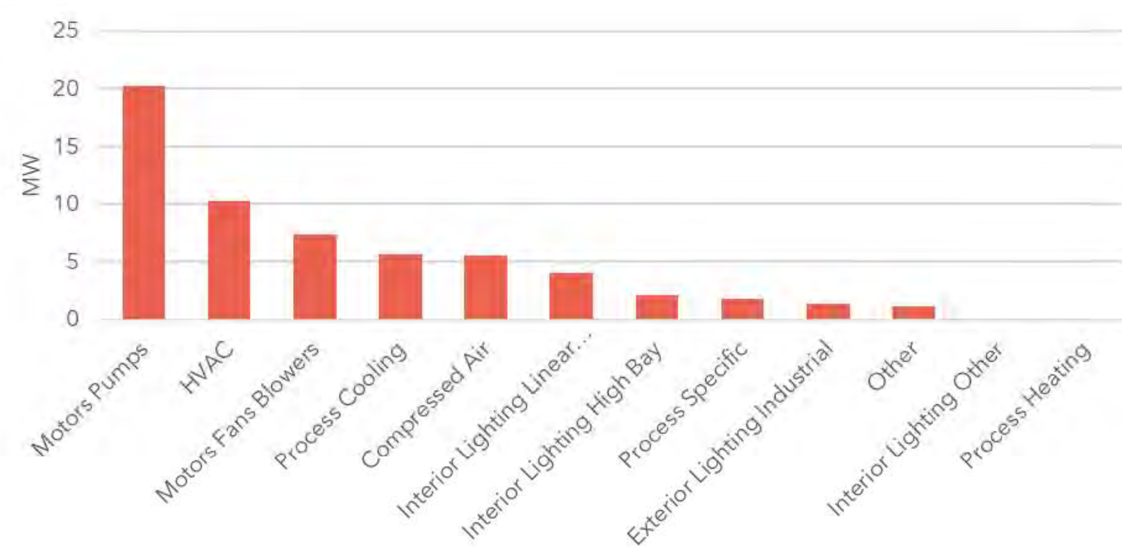
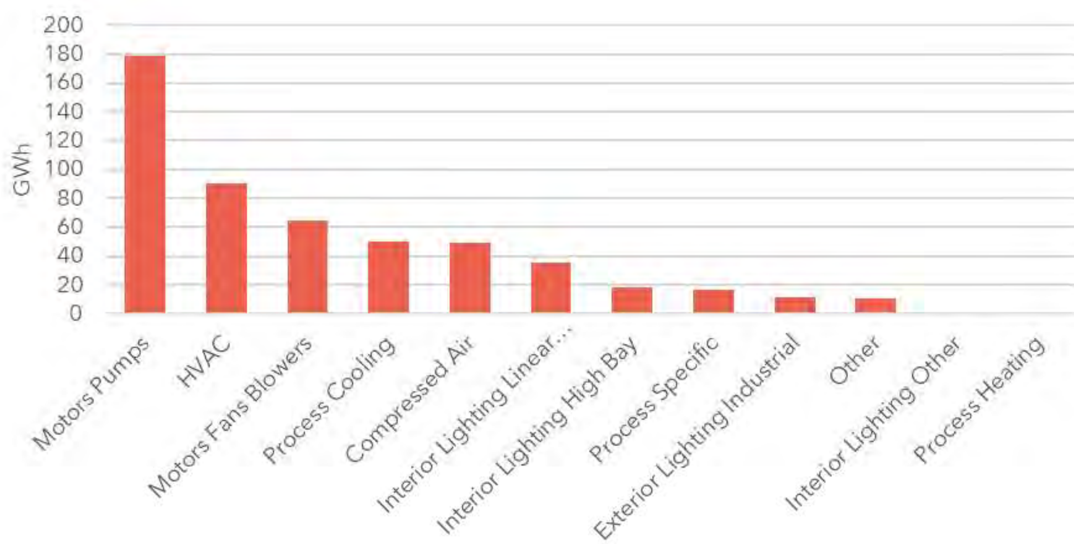


Figure 19: Industrial EE Technical Potential by End-Use (Energy Savings)



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.

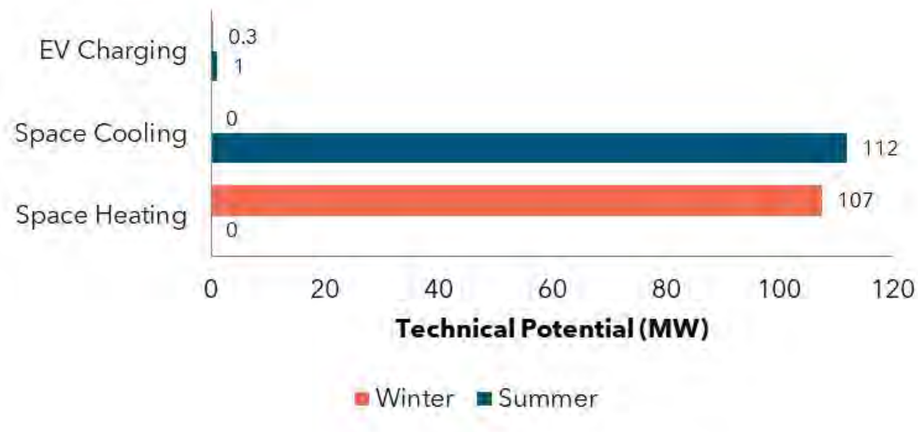
Figure 20: Residential DR Technical Potential by End-Use

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.

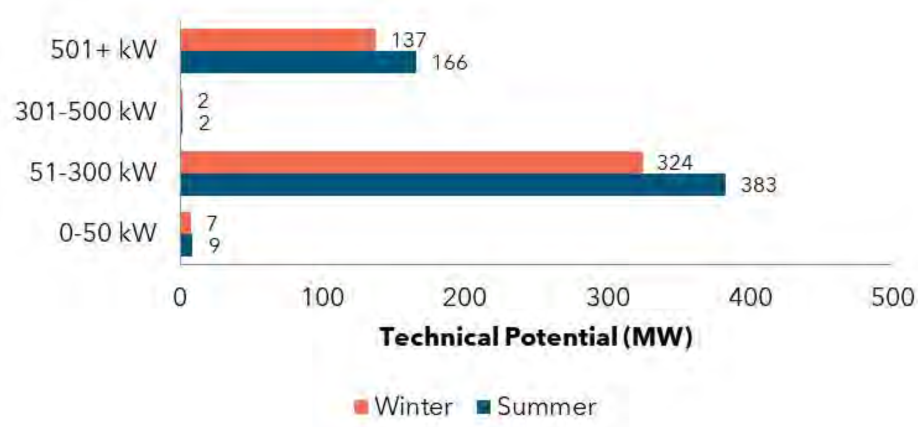
Figure 21: Small C&I DR Technical Potential by End-Use



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 Potential[7]

	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	100ft2 of Opaque Door meeting Energy Star Version 6.0 Requirements (U-Value: 0.17)	100ft2 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 STARÂ® 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

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 = 130Â°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 STARÂ® Standards	One non-ENERGY STARÂ® 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 STARÂ® 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 STARÂ® 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. >=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, 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
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 Desicant Air Dryer with Dew Point Controls	1000 CFM Modulating Heated Desicant 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 study[8]:

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

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	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: • 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.

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

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

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-Residential[1]	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 Potential[2]

	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.

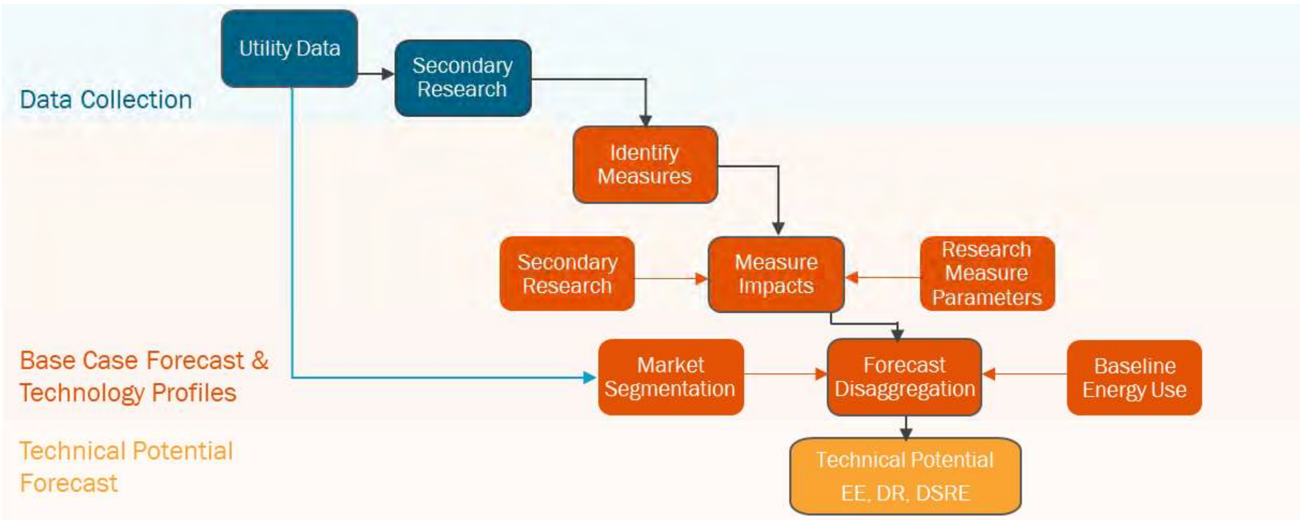
Quantifying DSM technical potential is the result of an analytical process that refines DSM opportunities that align with OUC's customers' electric consumption patterns. Resource Innovations' general methodology for estimating technical potential is a hybrid "top-

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.

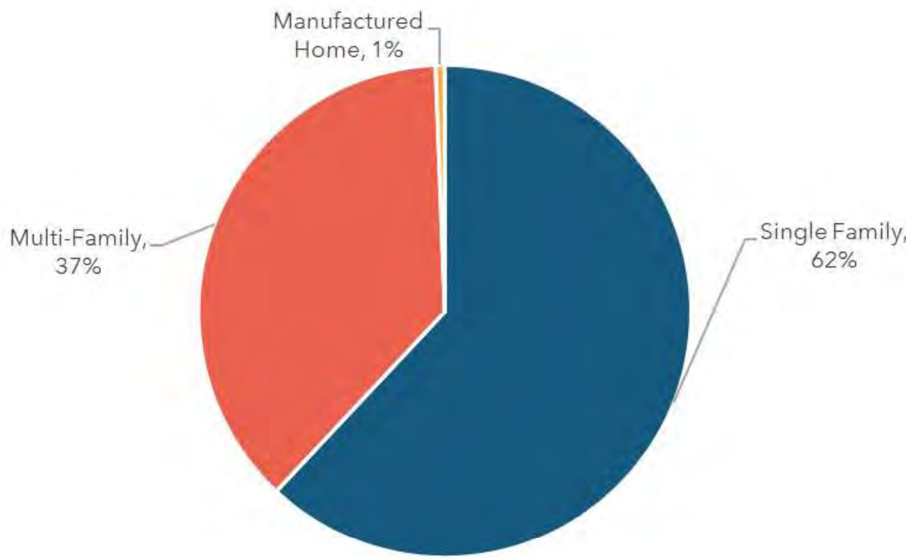
3.2 Analysis of Customer Segmentation

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.

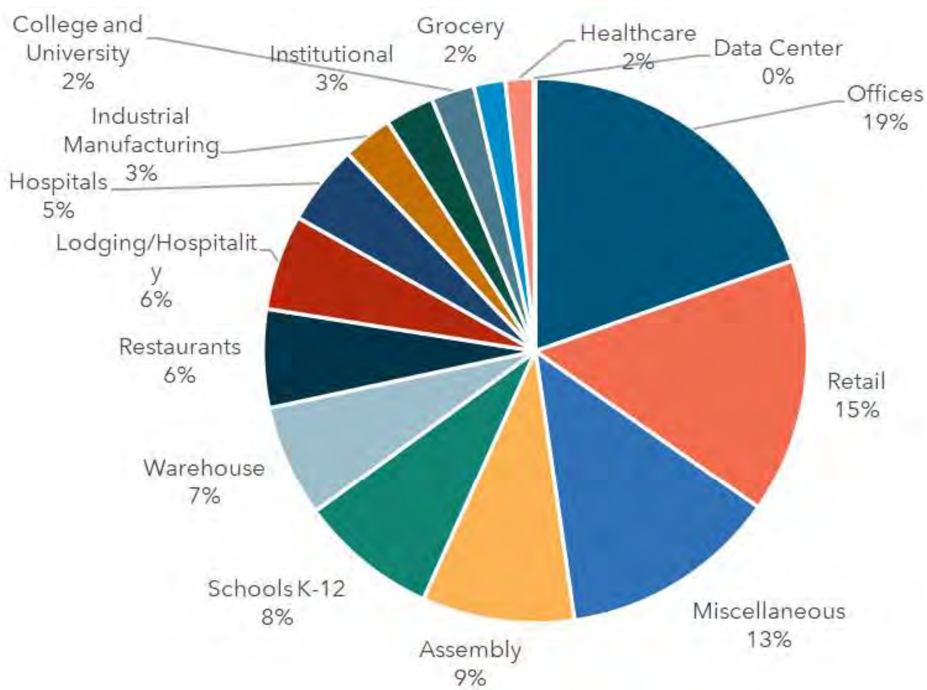
Figure 2. Residential Customer Segmentation



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

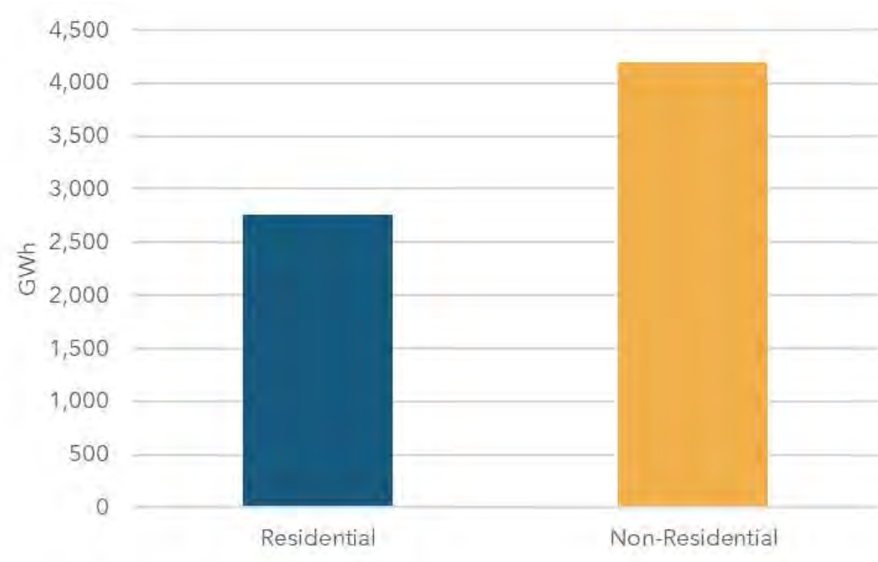
Customer Class	Annual kWh	Estimated Number of Accounts
Small C&I	0-15,000 kWh	15,967
	15,001-25,000 kWh	3,211
	25,001-50,000 kWh	3,269
	50,001 kWh +	2,096
	Total	24,543
Large C&I	0-50 kW	1,764
	51-300 kW	2,114
	301-500 kW	267
	501 kW +	373
	Total	4,518

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 loads[4] 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

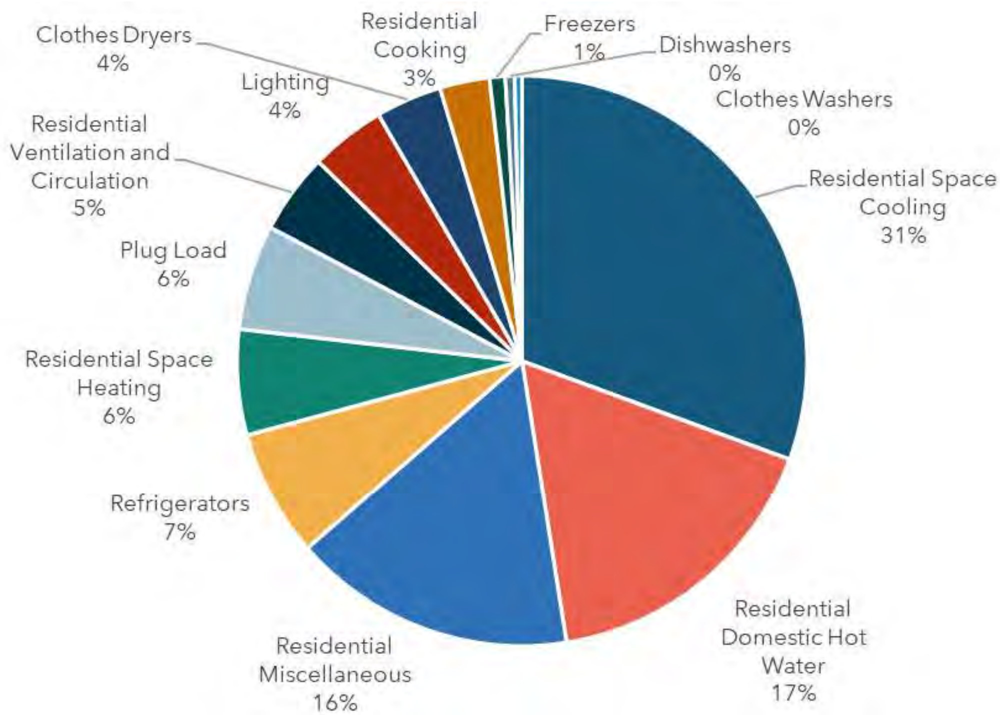
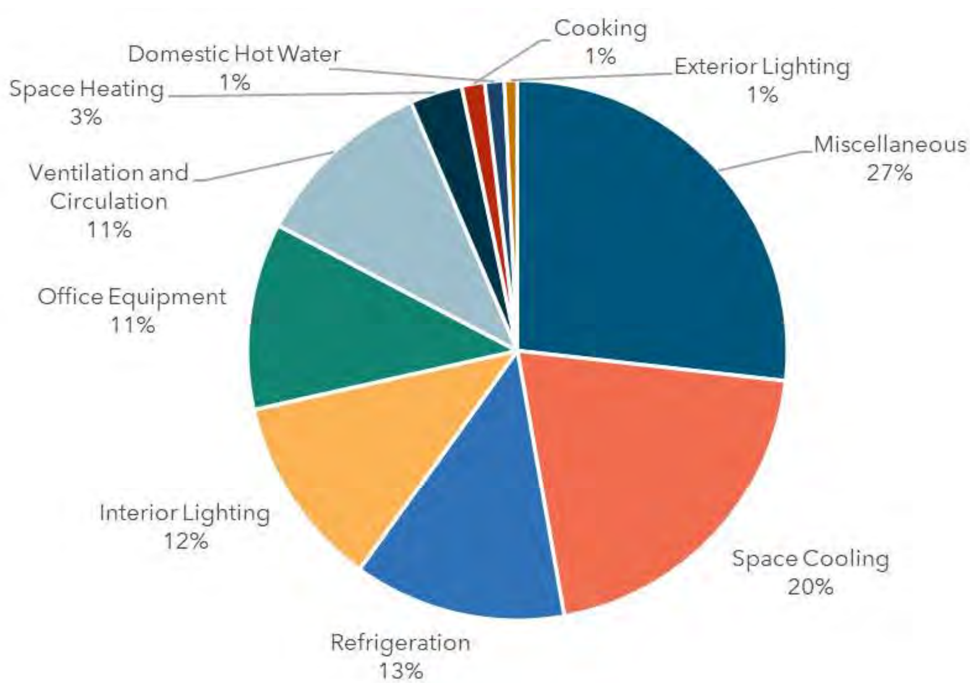


Figure 6: Business Baseline (2025) Energy Sales by End-Use



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

Technical Potential of Efficient Measures = Total Number of Households × Base Case Equipment Energy Use Intensity (kWh/unit) × Saturation Shares × Percent Incomplete × Feasibility Factor × Savings Factor

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

Technical Potential of Efficient Measures = Total Stock Sq. Footage by Building Type by EDC × Base Case Equipment Energy Use Intensity (kWh/unit) × Saturation Shares × Percent Incomplete × Feasibility Factor × Savings Factor

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.

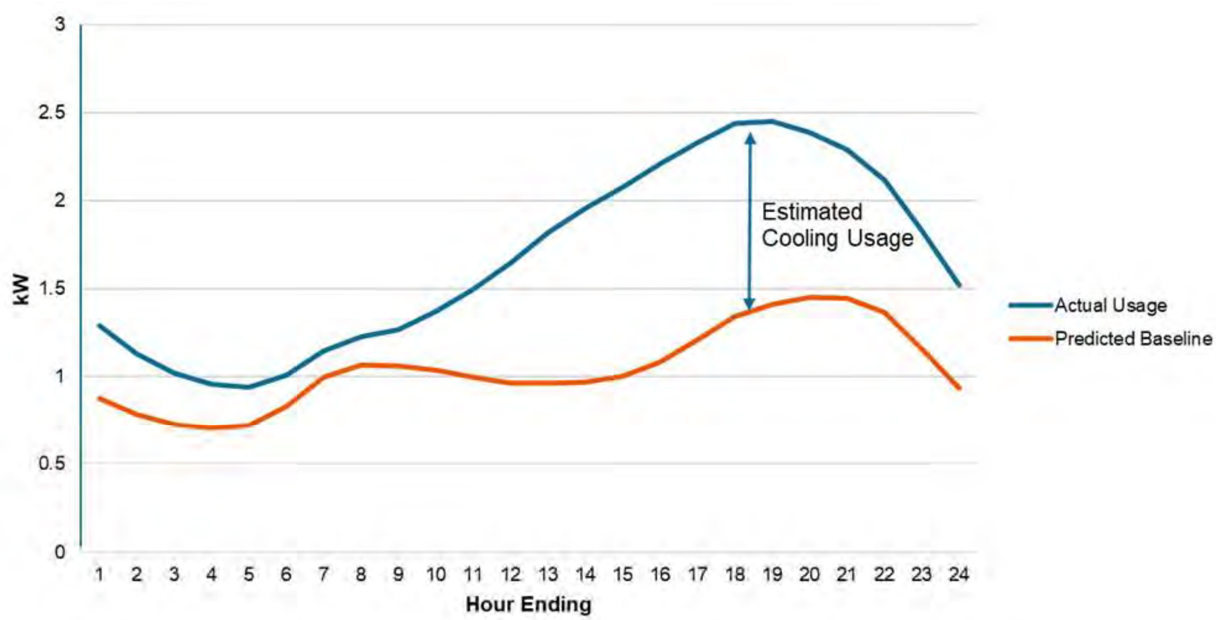
Technical potential, in the context of DR, is defined as the total amount of load available for reduction that is coincident with the period of interest; in this case, the system peak hour for the summer and winter seasons. Thus, two sets of capacity values are estimated: a summer capacity and a winter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

PV Technical Energy Potential = Suitable Rooftop PV Area (Sq Ft) × PV Power Density (kW-DC/Sq Ft) × Generation Factor (kWh/kW-DC)

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 system[5]. 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).

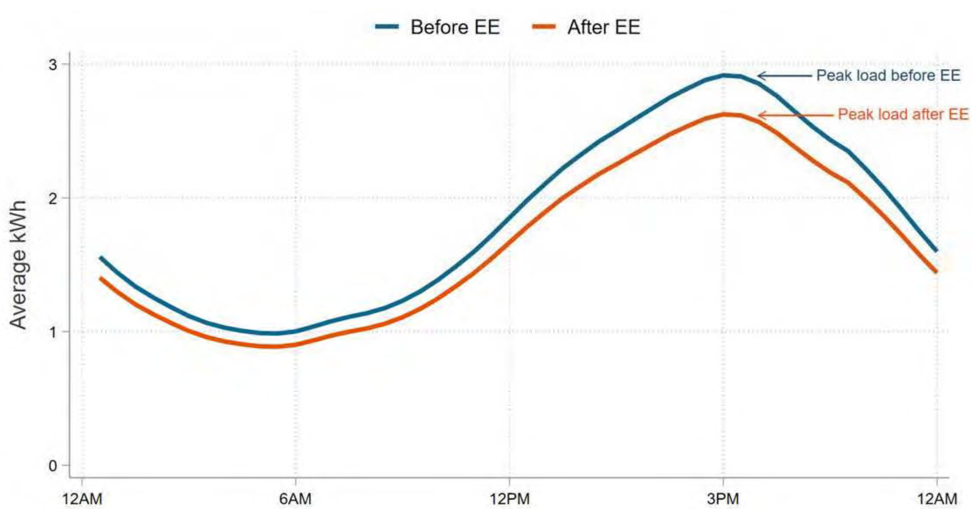
Measure Interaction

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-Residential[6]	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)

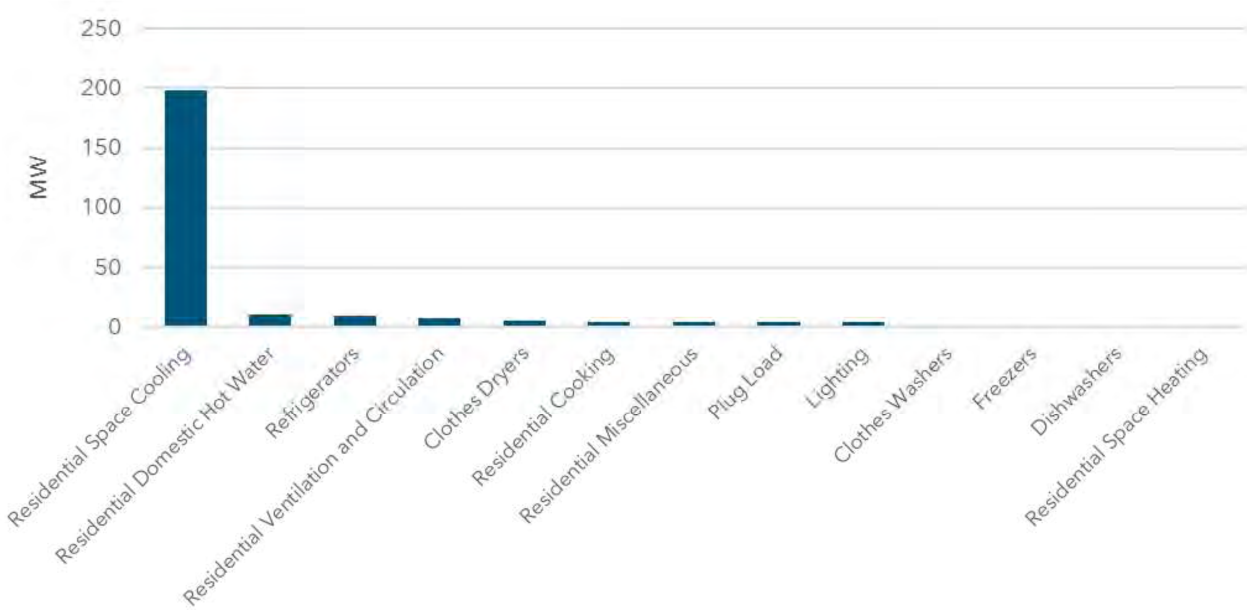


Figure 10: Residential EE Technical Potential by End-Use (Winter Peak Savings)

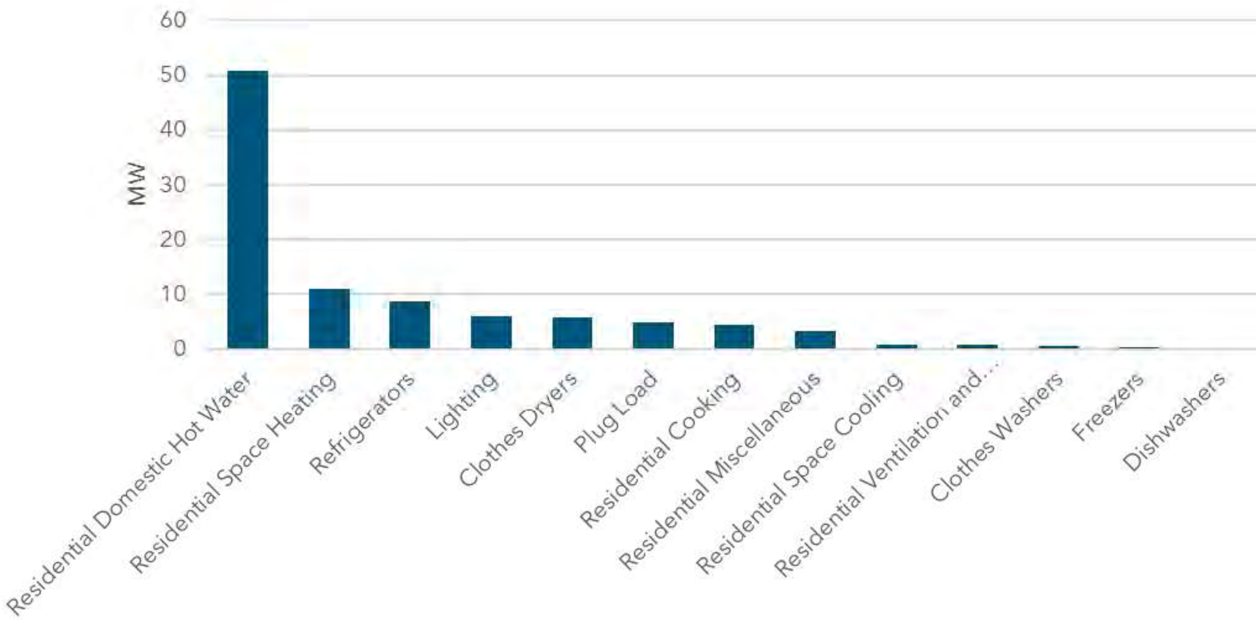
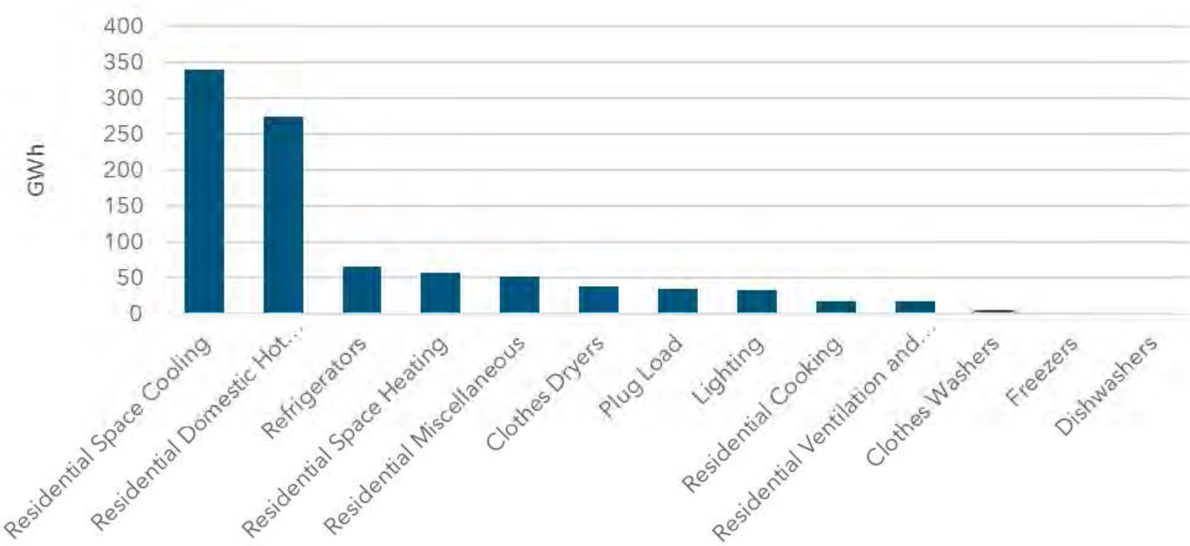


Figure 11: Residential EE Technical Potential by End-Use (Energy Savings)



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)

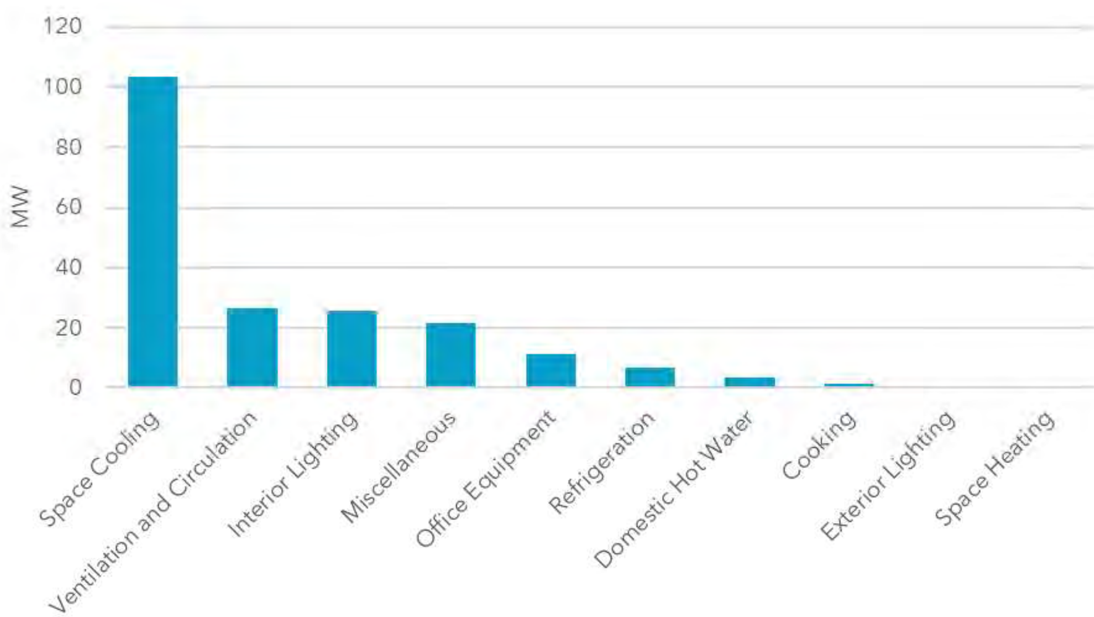


Figure 13: Business EE Technical Potential by End-Use (Winter Peak Savings)

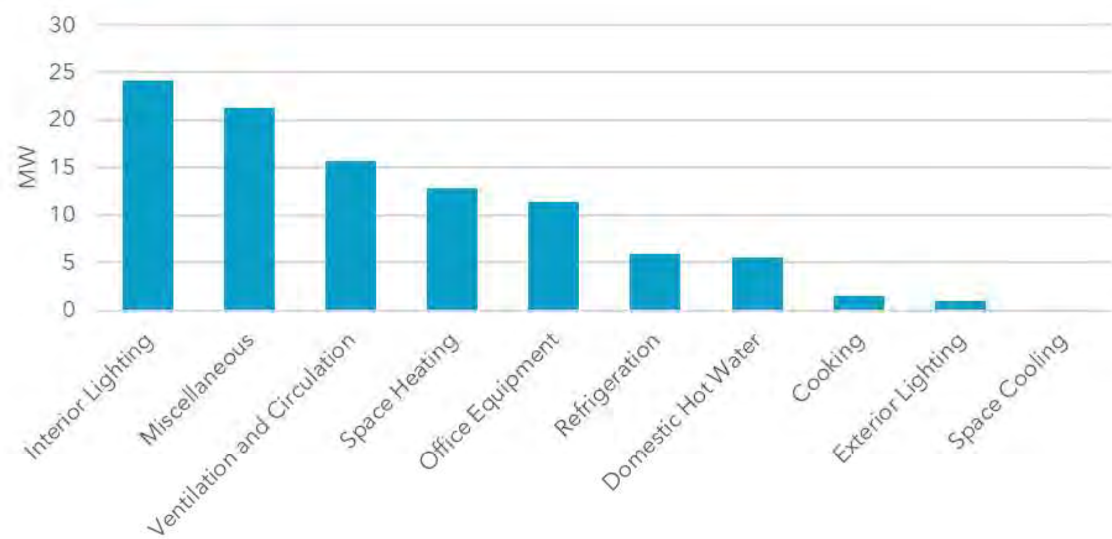
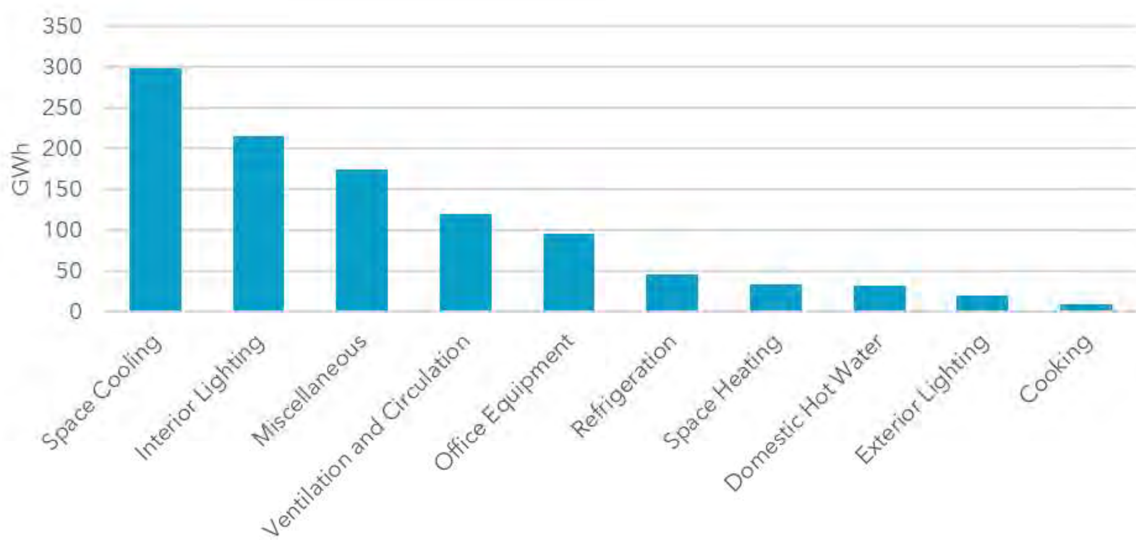


Figure 14: Business EE Technical Potential by End-Use (Energy Savings)



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:

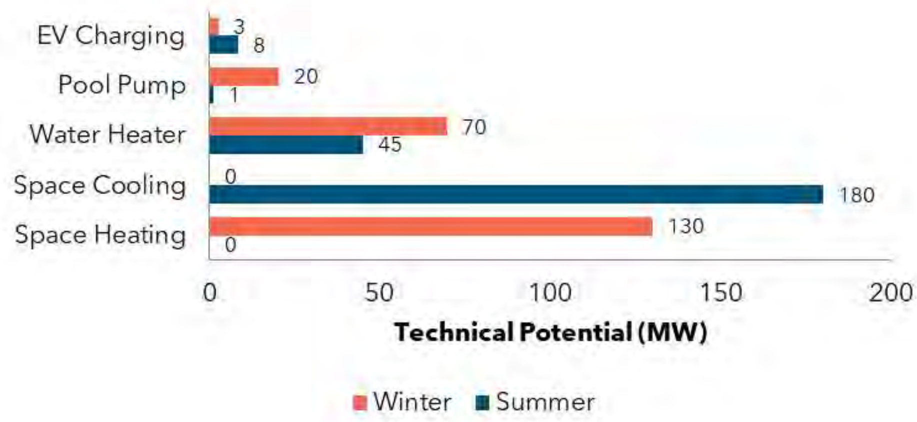
Table 10. DR Technical Potential

	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

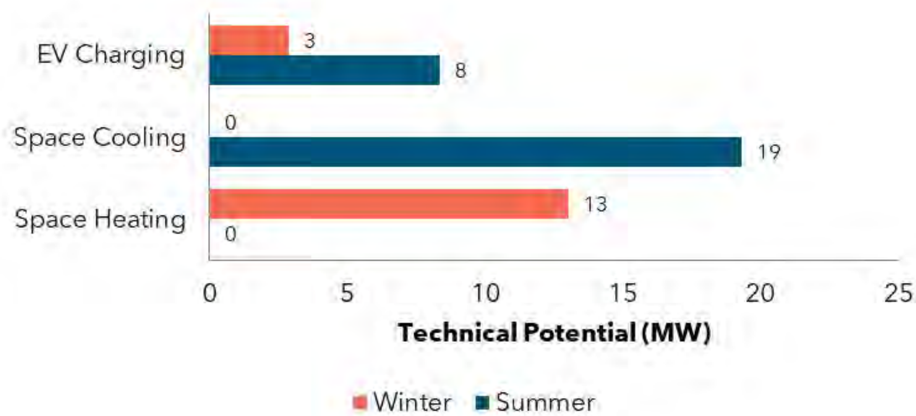


5.3.2 Non-Residential

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.

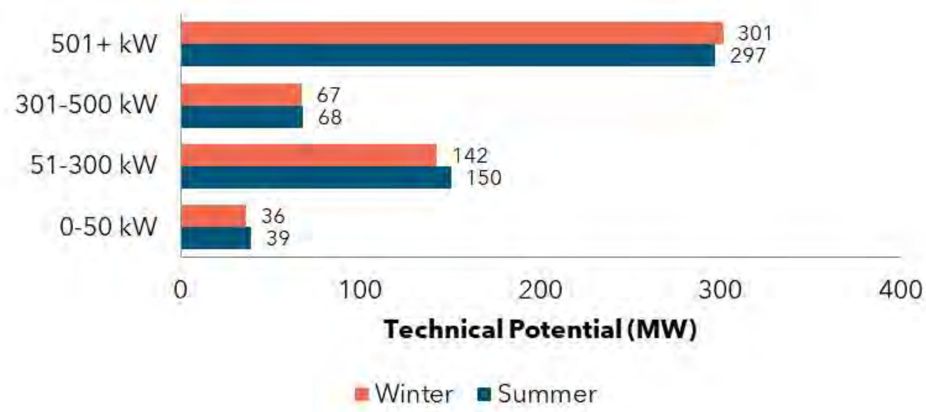
Figure 16: Small C&I DR Technical Potential by End-Use



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 Potential[7]

	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	100ft2 of Opaque Door meeting Energy Star Version 6.0 Requirements (U-Value: 0.17)	100ft2 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 STARÂ® 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

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 Advaned 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 = 130Â°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 STARÂ® Standards	One non-ENERGY STARÂ® 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 STARÂ® 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 STARÂ® 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. >=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

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, 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 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 Desicant Air Dryer with Dew Point Controls	1000 CFM Modulating Heated Desicant 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 study[8]:

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

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	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: • 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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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

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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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

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

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 STARÂ® 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

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)

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 = 130Â°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

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

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

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

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 STARÂ® Standards	One non-ENERGY STARÂ® 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 STARÂ® 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 STARÂ® 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

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

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

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	

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 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 Desicant Air Dryer with Dew Point Controls	1000 CFM Modulating Heated Desicant 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

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

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)

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

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

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

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

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 (CO_2) 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

	TRC		PCT		RIM	
Program Cost-Effectiveness	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-effectivess 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-effectivess 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

	TRC		**PCT**		**RIM**	
Program Cost-Effectiveness	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

	TRC		PCT		RIM	
Program Cost-Effectiveness	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

	TRC		**PCT**		**RIM**	
Program Cost-Effectiveness	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-effectivess 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

	TRC		**PCT**		**RIM**	
Program Cost-Effectiveness	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-effectivess 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

	TRC		**PCT**		**RIM**	
Program Cost-Effectiveness	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-effectivess 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-effectivess 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

	TRC		PCT		RIM	
Program Cost-Effectiveness	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.