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April 12, 2019

VIA: ELECTRONIC FILING

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

Re: Commission Review of Numeric Conservation Goals (Tampa Electric Company)
FPSC Docket No. 20190021-EG

Dear Mr. Teitzman:

Attached for filing in the above-styled matter are the following:

1. Petition for Approval of Numeric Conservation Goals by Tampa Electric Company.

2. Prepared Direct Testimony and Exhibit MMR-1 of Tampa Electric Company witness Mark R. Roche.

Thank you for your assistance in connection with this matter.

Sincerely,

James D. Beasley

JDB/pp
Attachment

cc: Parties of Record (w/attachment)

CERTIFICATE OF SERVICE.

I HEREBY CERTIFY that a true copy of the foregoing Petition and Prepared Direct Testimony and Exhibit MRR-1 of Mark R. Roche has been served by electronic mail on this 12th day of April 2019 to the following:

Margo Duval
Rachael Dziechciarz
Office of General Counsel
Florida Public Service Commission
2540 Shumard Oak Boulevard
Tallahassee, FL 32399-0850
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J. R. Kelly
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ATTORNEY

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Commission review of numeric Conservation goals (Tampa Electric Company)	)))	DOCKET NO. 20190021-EG FILED: April 12, 2019

PETITION FOR APPROVAL OF NUMERIC
CONSERVATION GOALS BY TAMPA ELECTRIC COMPANY

Tampa Electric Company ("Tampa Electric" or "the company"), by and through its undersigned attorneys, files this petition with proposed numeric conservation goals and requests that the Florida Public Service Commission ("Commission") accept, approve and adopt Tampa Electric's proposed numeric conservation goals as the numeric goals established by the Commission for Tampa Electric Company pursuant to Section 366.82, Florida Statutes, and Rules 27-17.001 and 25-17.0021, Florida Administrative Code. In support of this petition, the company says:

1. Tampa Electric is a public utility subject to the jurisdiction of the Commission pursuant to Chapter 366 of the Florida Statutes. Tampa Electric's General Offices are located at 702 North Franklin Street, Tampa, FL 33601.

2. Copies of all notices and pleadings with respect to this petition should be furnished to:

James D. Beasley
jbeasley@ausley.com
J. Jeffry Wahlen
jwahlen@ausley.com
Malcolm N. Means
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Post Office Box 391
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Paula K. Brown
regdept@tecoenergy.com
Manager, Regulatory Coordination
Tampa Electric Company
Post Office Box 111
Tampa, FL 33601
(813) 228-1444
(813) 228-1770 (fax)

3. The agency affected by this petition is:

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

4. Tampa Electric is subject to Section 366.92, Florida Statutes, part of the Florida Energy Efficiency and Conservation Act ("FEECA"), which requires the Commission to adopt appropriate 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.

5. Docket No. 20190021-EG is one of seven that has been opened by the Commission to establish numeric conservation goals for each of the seven Florida FEECA utilities pursuant to Section 366.82, Florida Statutes, and Rule 25-17.0021, Florida Administrative Code. The seven separate dockets were consolidated for hearing in Order No. PSC-2019-0062-PCO-EG, issued February 18, 2019.

6. As a result of Tampa Electric's evaluations, the company proposes the following numeric conservation goal which Tampa Electric has determined to be reasonably achievable in the residential, commercial and industrial classes within Tampa Electric's service area over a ten-year period. The company's proposed conservation goals at the generator for years 2020 through 2029 are as follows:

Residential

Summer Demand:	54.0 MW
Winter Demand:	25.5 MW
Annual Energy:	103.6 GWh

Commercial/Industrial

Summer Demand:	25.8 MW
Winter Demand:	17.8 MW
Annual Energy:	61.4 GWh

Combined

Summer Demand:	79.7 MW
Winder Demand:	43.3 MW
Annual Energy:	165.0 GWh

7. The testimony of Mark Roche, file contemporaneously with this petition, along with the exhibit and schedules attached thereto, sets forth the company's ten year projections of the total cost-effective winter and summer peak MW demand reduction and the annual GWh savings which are reasonably achievable through implementation of demand side measures in Tampa Electric's service area for the residential, commercial and industrial classes.

8. As demonstrated by the testimony of witness Roche, the company's proposed numeric conservation goals for the period 2020 through 2029 are reasonable and are consistent with the requirements of Section 366.82, Florida Statutes, and Rule 25-17.0021, Florida Administrative Code.

9. Tampa Electric knows of no material facts in dispute regarding the relief requested herein. There is no agency decision, so Tampa Electric cannot state when or how it received notice of an agency decision.

10. Tampa Electric is entitled to relief pursuant to Sections 366.81 and 366.82, Florida Statutes, and Rule 25-17.0021, Florida Administrative Code.

WHEREFORE, Tampa Electric Company requests that the Florida Public Service Commission enter an order approving and establishing the company's proposed numeric conservations goals as set forth in this filing for the period 2020 through 2029 pursuant to Section 366.82, Florida Statutes, and Rule 25-17.0021, Florida Administrative Code, and grant such other relief as is just and reasonable under the facts and law as determined by the Commission.

DATED this 12th day of April 2019.

Respectfully submitted,

JAMES D. BEASLEY
J. JEFFRY WAHLEN
MALCOLM N. MEANS
Ausley & McMullen
Post Office Box 391
Tallahassee, FL 32302
(850) 224-9115

ATTORNEYS FOR TAMPA ELECTRIC COMPANY

CERTIFICATE OF SERVICE.

I HEREBY CERTIFY that a true copy of the foregoing Petition, filed on behalf of Tampa Electric Company, has been served by electronic mail on this 12th day of April 2019 to the following:

Margo Duval Rachael Dziechciarz Office of General Counsel Florida Public Service Commission 2540 Shumard Oak Boulevard Tallahassee, FL 32399-0850 mduval@psc.state.fl.us rdziechc@psc.state.fl.us J. R. Kelly Patricia A. Christensen Office of Public Counsel c/o The Florida Legislature 111 West Madison Street Tallahassee, FL 32399 Kelly.jr@leg.state.fl.us Christensen.patty@leg.state.fl.us	Erik Sayler Joan T. Matthews Allan J. Charles Florida Department of Agriculture & Consumer Services Office of General Counsel The Mayo Building 407 S. Calhoun Street, Suite 520 Tallahassee, FL 32399-0800 erik.sayler@FreshFromFlorida.com joan.matthews@FreshFromFlorida.com allan.charles@FreshFromFlorida.com ______________________ ATTORNEY

TECO
TAMPA ELECTRIC
AN EMERA COMPANY

BEFORE THE

FLORIDA PUBLIC SERVICE COMMISSION

DOCKET NO. 20190021-EG

IN RE: COMMISSION REVIEW OF

NUMERIC CONSERVATION GOALS

TAMPA ELECTRIC COMPANY

TESTIMONY AND EXHIBIT

OF

MARK R. ROCHE

FILED: April 12, 2019

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

PREPARED DIRECT TESTIMONY

OF

MARK R. ROCHE

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INTRODUCTION:

Q. Please state your name, address, occupation and employer.

A. My name is Mark R. Roche. My business address is 702 North Franklin Street, Tampa, Florida 33602. I am employed by Tampa Electric Company ("Tampa Electric" or "the company") as Manager, Regulatory Rates in the Regulatory Affairs Department.

Q. Please provide a brief outline of your educational background and business experience.

A. I graduated from Thomas Edison State College in 1994 with a Bachelor of Science degree in Nuclear Engineering Technology and from Colorado State University in 2009 with a Master's degree in Business Administration. My work experience includes twelve years with the US Navy in nuclear operations as well as twenty-one years of electric and gas utility experience. My utility work has included various positions in Marketing and Sales, Customer Service, Distributed Resources, Load Management, Power Quality, Distribution Control Center Operations, Meter Department, Meter Field Operations, Service Delivery, Revenue Assurance, Commercial and Industrial

Energy Management Services, and Electric and Gas Demand Side Management ("DSM") Planning and Forecasting. In my current position, I am responsible for Tampa Electric's Energy Conservation Cost Recovery ("ECCR") Clause and Storm Hardening, and Peoples Gas System's Natural Gas Conservation Cost Recovery ("NGCCR") Clause.

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

A. The purpose of my testimony is to present, for Commission review and approval, Tampa Electric's proposed numerical DSM goals for 2020-2029. Tampa Electric's proposed goals are based upon the analytical work performed by the company and Nexant. Nexant is a consulting and analysis services firm with an exclusive focus on energy in providing support to clients in the areas of demand management, demand response, grid management and renewables as well as offering a comprehensive suite of software designed to support these areas. Nexant has over 18 years of experience in the field of DSM evaluations and was chosen through a rigorous request for proposal vetting process. The goals are separated into summer demand, winter demand and annual energy components for both the residential and commercial/industrial sectors. In support of the proposed DSM goals, my testimony will demonstrate that the process Tampa Electric utilized to establish its reasonably achievable, cost-effective goals complies with the requirements of Rule 25-17.0021, Florida Administrative Code ("F.A.C.").

In addition, my testimony complies with the requirements asked of the Florida Energy Efficiency and Conservation Act ("FEECA") utilities by Commission Staff on June 20, 2018 and the Order Establishing Procedure within this proceeding by addressing the following components within my testimony:

- Provide the process used by Tampa Electric to develop the DSM Technical, Economic and Achievable Potentials.
- Provide the complete measure list that was evaluated and identify measures that were eliminated or added as compared to the 2013 technical potential study.
- Provide the number of measures that were screened out during free-ridership consideration and the list of measures that remained cost-effective at the achievable potential.
- Provide the impact from energy efficiency that is occurring in Tampa Electric's service area

stemming from Energy Efficiency and Appliance Standards.

- Provide the economic and achievable potential for residential and commercial/industrial winter and summer demand and annual energy savings for a Base Case that includes the effects of free-ridership but does not include costs associated with carbon dioxide emissions, for both a Rate Impact Measure ("RIM") test-based evaluation and a Total Resource Cost ("TRC") test-based evaluation.
- Provide an estimate of the average residential customer bill impact for each evaluation.
- Provide a detailed description of how the Base Case was developed, including forecasts for generation resources, customer winter and summer demand and annual energy for load, and fuel prices.
- Provide the economic potential for residential and commercial/industrial winter and summer demand and annual energy savings for the following sensitivities, for both a RIM and TRC based evaluation:
    - Higher fuel prices;
    - Lower fuel prices;

- Shorter free-ridership exclusion periods and;
- longer free-ridership exclusion periods.

- Provide a detailed description of how the sensitivities were developed and compare them to the Base Case, including forecasts for fuel prices.
- Provide a discussion of how supply-side efficiencies are incorporated in the utility's planning process and how supply-side efficiencies impact demand-side management programs.
- Provide a discussion of how the utility's proposed goals encourage the development of demand-side renewable energy systems.
- Provide a discussion of the utility's current demand-side management programs that includes historical participation rates, cumulative kilowatt ("kW") and kilowatt hour ("kWh") savings, measures included in each program, and program impacts related to building code and appliance efficiency standards.
- Provide an explanation of how free-ridership was addressed in the development of the goals and include any analysis performed.

- Provide explanations of what were the primary drivers that significantly influenced the achievable potential's results.
- Provide an explanation for potential fuel cost changes and include any analysis performed.

Q. Have you prepared any exhibits in support of your testimony?

A. Yes. I have prepared an exhibit entitled, "Exhibit of Mark R. Roche." It consists of 17 documents and has been identified as Exhibit No. MRR-1, which contains the following documents:

- Document No. 1 contains Tampa Electric's proposed DSM goals at the generator for 2020-2029.
- Document No. 2 provides the overall process used to develop the company's proposed DSM goals for 2020-2029.
- Document No. 3 provides the process used to develop the Technical Potential and the Market Potential Study of Demand Side Management in Tampa Electric Company's Service Territory Report.
- Document No. 4 provides the comprehensive DSM measure list utilized in this proceeding.
- Document No. 5 provides the DSM measures that were

either added or removed to the 2018 comprehensive measures list as compared to the 2013 technical potential study.

- Document No. 6 provides Tampa Electric's DSM Technical Potential for Energy Efficiency, Demand Response and Distributed Energy Resources.
- Document No. 7 provides the process used to develop the Economic Potential.
- Document No. 8 contains Tampa Electric's avoided unit cost data used for cost-effectiveness evaluations.
- Document No. 9 contains all the assumptions used for the performance of cost-effectiveness.
- Document No. 10 provides Tampa Electric's 2020-2029 DSM Economic Potential for the RIM and TRC cost-effectiveness tests.
- Document No. 11 provides the DSM Economic Potential cost-effectiveness sensitivity analyses.
- Document No. 12 provides the process used to develop the Achievable Potential.
- Document No. 13 provides the 2020-2029 estimated annual DSM Achievable Potential for the RIM and TRC cost-effectiveness tests.
- Document No. 14 provides the list of DSM measures that make up the RIM and TRC DSM Achievable

Potentials.

- Document No. 15 provides a summary of the overall potentials.
- Document No. 16 provides the projected residential annual bill impacts for the RIM and TRC 2020-2029 DSM portfolios.
- Document No. 17 provides Tampa Electric's current DSM programs and achievements.

Q. Is Nexant providing direct testimony?

A. Yes, Jim Herndon, Nexant's Vice President, Strategy and Planning, will be filing direct testimony that will support the goals Tampa Electric is proposing for the 2020-2029 DSM goals period.

TAMPA ELECTRIC'S PROPOSED DSM GOALS:

Q. What are Tampa Electric's cumulative DSM goals that are appropriate and reasonably achievable for the period 2020-2029?

A. The appropriate and reasonable cumulative DSM goals at the generator for Tampa Electric for the period 2020-2029 are as follows:

Residential

Summer Demand:	54.0 MW
Winter Demand:	25.5 MW
Annual Energy:	103.6 GWh

Commercial/Industrial

Summer Demand:	25.8 MW
Winter Demand:	17.8 MW
Annual Energy:	61.4 GWh

Combined

Summer Demand:	79.7 MW
Winter Demand:	43.3 MW
Annual Energy:	165.0 GWh

Q. What cost-effectiveness methodology did Tampa Electric utilize to derive these proposed DSM goals?

A. The cost-effectiveness methodology that Tampa Electric utilized for these proposed goals is the RIM test in conjunction with the Participant Cost Test ("PCT"). The RIM test, when used in tandem with the PCT, provides a cost-effective, fair, reasonable and equitable determination of DSM expenditures for both the DSM program participants and non-participants. The RIM test puts the least amount of upward pressure on rates while allowing for significant accomplishments of DSM measure deployment. Furthermore, the RIM test does not promote cross-subsidization among participants and non-participants. Finally, history indicates that this Commission's longstanding decisions in the past to approve a utility's DSM goals based on the RIM test have not hindered the DSM performance of the Florida utilities relative to other utilities in the industry. Based on these results and the fairness of the methodology, Tampa Electric believes its DSM goals for the 2020-2029 period should be established on the RIM test basis.

Q. What is the annual portion of these proposed goals for each segment on an annual basis for the upcoming period of 2020-2029?

A. The annual portion for these proposed goals for each segment (Residential, Commercial/Industrial and Combined) for the upcoming period of 2020-2029 are included in my Exhibit No. MRR-1, Document No. 1 which details the incremental annual and cumulative amounts that comprise these goals.

Q. How do Tampa Electric's proposed DSM goals for the upcoming period of 2020-2029 compare to the company's proposed DSM goals for the 2015–2024 period?

A. Tampa Electric’s proposed cumulative DSM goals for the upcoming period of 2020-2029 as compared to the company’s proposed DSM goals for the 2015–2024 period show a slight decrease in overall demand reduction and an increase in the annual energy (“AE”). Here is the comparison of the proposed cumulative combined DSM goals for the upcoming period of 2020-2029 as compared to the company’s proposed DSM goals for the 2015–2024 period proposed goals at the generator:

	2020-2029	2015-2024
Summer Demand:	79.7 MW	56.3 MW
Winter Demand:	43.3 MW	78.3 MW
Annual Energy:	165.0 GWh	144.3 GWh

Q. What are the major drivers that established Tampa Electric’s overall proposed 2020-2029 DSM goals for demand to be at a slightly lower level than what the company proposed during the last DSM goals setting process?

A. There are several factors that influenced the slight overall reduction in the company’s current proposed DSM goals for demand from those proposed five years ago. These factors include:

- In addition to the continued decline of average electricity usage per customer, the overall annual customer growth for the company's service area is projected to slightly decrease, thereby deferring the in-service date of the next generating unit in the company's expansion plan used for DSM evaluations.
- The base year avoided and fixed O&M costs for Tampa Electric's next avoided unit has decreased.
- The avoided generating unit fuel cost has decreased with a lower fuel escalation rate.
- Florida building codes have become more stringent from previous levels, thus placing more downward pressure on customer usage.
- Various Federal energy efficiency and appliance standards have been enacted affecting several baseline measures used for the evaluation of potential DSM measures.

Q. What is Tampa Electric's average electricity usage per month for a typical residential customer and how does this compare to the usage of five years ago?

A. In 2018, a typical Tampa Electric residential customer used a weather adjusted kWh amount of 1,107 kWh on a monthly basis. Five years ago, the typical Tampa Electric residential customer used a weather adjusted kWh amount of 1,173 kWh on a monthly basis.

Q. What is the proposed avoided unit and associated costs that Tampa Electric utilized in the preparation of these proposed DSM goals?

A. The proposed avoided unit is a 7FA.05 Combustion Turbine that has a winter capacity rating of 245 MW and a summer capacity rating of 229 MW. The proposed unit would be placed into service in January of 2023. The cost of the unit has a base year avoided generating cost of $526.30 per kW and a fixed O&M cost of $5.83 per kW per year.

Q. How do these avoided unit costs compare to the avoided unit that was used five years ago?

A. The avoided unit cost five years ago had a base year avoided generating cost of $650.64 per kW and a fixed O&M cost of $11.95 per kW per year.

Q. How did the avoided generating unit fuel cost and fuel escalation rate used in the new goal setting compare to the avoided generating unit that was used five years ago?

A. The current avoided generating fuel cost is 3.75 cents per kilowatt-hour ("kWh") with a fuel escalation rate of 4.54 percent. The avoided generating fuel cost five years ago was 4.70 cents per kWh and the fuel escalation rate was 5.21 percent.

Q. For the 2020-2029 DSM goals setting period, what is the company's projected energy and demand impacts due to energy efficiency and appliance standards improvements?

A. The company's estimate for the energy and demand impacts due to more stringent energy efficiency and appliance standards over the 2020-2029 DSM goals period is an overall reduction of customer energy usage of 5.79 GWh, a reduction in overall summer demand of 158 MW and a reduction in overall winter demand of 163 MW.

Q. Were there any drivers that put upward pressure on Tampa Electric's proposed 2020-2029 DSM demand goals to be set at a higher level than what the company proposed during the last DSM goals setting process?

A. Yes, while the combination of all drivers caused the overall proposed demand goals to be lower, there were several drivers that caused the overall decrease to be a lessor amount than it would have been absent of those factors. Those factors include:

- K-Factor increase;
- Decreased customer equipment escalation rate;
- Decreased utility discount rate;
- Increased base year avoided transmission cost; and
- Increased base year avoided distribution cost.

Q. Would you explain why the proposed 2020-2029 DSM goals for summer demand and annual energy went up, while the winter demand goal went down as compared to 2015-2024 DSM goals setting period?

A. Yes, the main driver causing the summer demand to go up is the increased weighting of the value of the next avoided unit for the summer peaking period. This increase in summer weighting causes technologies that impact summer demand to be more cost-effective while at the same time decreasing the cost-effectiveness of technologies that impact winter demand. The increase in the proposed 2020-2029 annual energy savings goals is attributed to more residential technologies having a summer demand impact achieving cost-effectiveness coupled with more summer months and cooling hours thus increasing the overall combined annual energy goal slightly as compared to the 2015-2024 DSM goals proceeding.

Q. Regardless of the results of the RIM cost-effectiveness analysis, do you believe that DSM goals should always be set higher than previously set goals?

A. No, I do not. Setting goals too high just for the sake of having higher goals can lead to costly, unfair and imprudent results for Tampa Electric's customers. DSM goals should be set with a clear focus on the costs the utility would have to incur to serve the load that the conservation efforts are reasonably projected to avoid. In addition, the conservation measures selected should minimize rate impacts and avoid cross-subsidization between customers. The Commission has been able to accomplish these objectives in the past through the primary use of the RIM test (to minimize rate impacts and avoid cross-subsidization), the two-year payback screen to minimize free ridership and a process that focuses on the utility's most recently projected resource needs.

Q. How do Tampa Electric's DSM goals accomplishments compare to other utilities in the nation?

A. Tampa Electric's accomplishments are significantly greater than most other utilities in the United States. Tampa Electric began its DSM efforts in the late 1970s prior to the 1980 legislative enactment FEECA. Since then, the company has aggressively sought Commission approval for numerous DSM programs designed to promote energy efficient technologies and to change customer behavioral patterns such that energy savings occur with minimal effect on customer comfort. Additionally, the company has modified existing DSM programs over time to promote evolving technologies and to maintain program cost-effectiveness.

From the inception of Tampa Electric's Commission approved programs through the end of 2018, the company has achieved the following savings:

Summer Demand:	729.7 MW
Winter Demand:	1,236.0 MW
Annual Energy:	1,560.5 GWh

These peak load achievements have eliminated the need for nearly seven 180 MW power plants.

The magnitude of these continuing efforts by Tampa

Electric, as well as other utilities in Florida, are clearly demonstrated by Florida's ranking in the United States Energy Information Administration's recent analyses. With respect to "Total Energy Consumed per Capita, 2016", Florida ranks 46th (of 51 States). With respect to "Total Energy Expenditures per Capita, 2016", Florida ranks 50th. Finally, with respect to "Average Retail Price of Electricity to the Residential Sector, December 2018", Florida ranks 26th. This last ranking is particularly noteworthy with Florida's average Residential Retail price of 11.86 cents per kWh which is 10.8 percent below the national average and substantially lower than other States such as Massachusetts with a residential retail price of 21.99 cents per kWh, New York at 17.34 cents per kWh and California at 19.44 cents per kWh. This residential retail price deserves merit with the fact that Tampa Electric has achieved its level of DSM reduction impacts within stringent regulatory rules and statutory requirements by offering a portfolio of DSM programs that reduce rates for all customers, both DSM participants and non-participants alike. It is also worth noting that Tampa Electric's current Residential Retail Price of 10.36 cents per kWh is significantly lower than the Florida average.

OVERALL PROCESS TO DEVELOP DSM GOALS:

Q. Would you describe the overall process that Tampa Electric utilized to develop the proposed DSM goals in this proceeding?

A. Yes, the overall process first starts with the development of a technical potential study which is the theoretical maximum amount of energy and capacity that could be displaced by energy efficiency, demand response and distributed energy resources regardless of cost, acceptability to customers and other barriers that may prevent the installation or adoption of an energy efficiency measure. The technical potential is only constrained by factors such as technical feasibility and the applicability of measures.

Once the technical potential is developed, the company determines the economic potential. The economic potential is determined by evaluating each of the measures cost-effectiveness under the RIM and TRC cost effectiveness tests. The economic potential is the amount of energy and capacity that could be reduced by those energy efficiency, demand response and distributed energy resource measures that pass cost-effectiveness.

For the RIM economic potential, lost revenue is the only cost component that is introduced. For the TRC economic potential, the full incremental cost of the measure is the only cost component introduced.

Once the economic potential is achieved, the company removes programs that have a negative PCT, runs the sensitivity analyses for low and high fuel, and then performs the consideration of free-ridership at this point. After these sensitivity analyses are performed, the company introduces program administration costs, evaluates adoption rates and participation rates based upon incentives, and then develops the achievable potential which become the company's proposed DSM goals. This overall process is included in my Exhibit No. MRR-1, Document No. 2.

Q. Did Tampa Electric develop its own Technical Potential Study?

A. No, Tampa Electric, in collaboration with the other FEECA utilities (Florida Power and Light, Duke Energy Florida, Gulf Power Corporation, Orlando Utilities Commission, Jacksonville Electric Authority and Florida Public Utilities) utilized a vendor to develop the technical potential study.

Q. Did the vendor develop a technical potential study for all the FEECA utilities to use or a technical potential study specific for each utility including Tampa Electric?

A. The vendor developed a technical potential study that was specific for each utility, including Tampa Electric.

Q. Why did Tampa Electric have a new technical potential study developed?

A. Tampa Electric, in collaboration with the other FEECA utilities, made the decision to have a new technical potential study developed because the prior technical potential study that was used in the previous numeric goals proceeding was a refreshed technical potential study that was developed from the Itron technical potential study performed ten years ago in 2009.

Q. Did Tampa Electric develop its own economic potential?

A. Yes.

Q. Did Tampa Electric perform its own fuel sensitivity analyses and free-ridership considerations?

A. Yes.

Q. Did Tampa Electric perform its own achievable potential?

A. Yes.

PROCESS TO DEVELOP THE TECHNICAL POTENTIAL:

Q. Please discuss the process that Tampa Electric utilized to develop the technical potential that would be used to develop the company's proposed DSM goals?

A. Tampa Electric started the process of developing the proposed goals by collaborating with the other FEECA utilities in making the decision to have a new technical potential study developed. I have included an overview of the process to develop the technical potential in my Exhibit No. MRR-1, Document No. 3. I have also included the Market Potential Study Report from Nexant, within my Exhibit No. MRR-1, Document No. 3, that was developed specifically for Tampa Electric which includes the process that was utilized to develop Tampa Electric's technical potential.

To support the development of the new technical potential study, the FEECA utilities initiated the process, starting in early 2016, to discuss the timing and deliverables needed. Starting on June 13, 2017, the FEECA utilities participated in ongoing weekly conference calls to support the development of the technical potential study. In July 2017, the FEECA utilities initiated a request for proposal to seek vendors that were capable of performing a technical potential study. From August 2017 through September 2017, the FEECA utilities screened and evaluated the responses to the request for proposals. The proposals were screened based upon several criteria which included prior experience, quality of experience, ability to achieve deliverables and deadlines, methodology, data sources and uses, engineering methods, alternative approaches, discovery thoroughness, other supporting documentation, price and price controls. In addition to screening the request for proposals on what was submitted, every vendor that submitted a request for proposal supplied utility names and points of contact to which at least two of these sourced utilities were called and interviewed to discuss the working relationship, project management effectiveness, study quality, witness performance, overall outcome, other DSM related engagements and overall impression. After the screening was completed, the FEECA utilities invited the top two vendors to a final selection presentation in addition to a question and answer meeting that was held on October 2, 2017. At the conclusion of this meeting, the FEECA utilities met and selected the vendor Nexant to perform the technical potential study.

Q. After the FEECA utilities selected Nexant to perform the technical potential study, how did Nexant gather the necessary data to be able to conduct a technical potential study specific to Tampa Electric?

A. Shortly after the FEECA utility meeting on October 2, 2017, Nexant provided the company with a sheet that outlined the comprehensive information needed that was specific to Tampa Electric. This data sheet included Tampa Electric's peak load and energy sales forecasts for 2018-2028, details used for developing the company's 10-year load forecast, customer premise forecasts for 2018-2028, customer characteristics and billing data, any load research data for 2015 and 2016, prior utility potential studies, historical program and measure information, preliminary technical potential measure lists, and hourly utility system load data for 2012 through 2016.

Q. Did Tampa Electric provide all the data that was requested by Nexant for the performance of the technical potential study?

A. No, there were some items that Tampa Electric did not have. These items included having all of Tampa Electric business customers segmented by their NAICS or SIC code, availability of Advanced Metering Infrastructure ("AMI") and the associated 15-minute interval data and customer end use load shapes, recent end-use survey and baseline study data, studies of thermostat control and conjoined studies regarding customer preferences for program or rate design.

Q. Is the technical potential study that was performed by Nexant specific for Tampa Electric, less accurate due to these data items that were missing?

A. No, one of the main benefits of doing a technical potential study in a collaborative fashion with the other neighboring FEECA utilities and Nexant is to be able to use proxy data to fill in these sources of data when the data requested does not exist. Even if these data pieces could not have been fulfilled by proxy, I am confident that the technical potential developed by Nexant specific for Tampa Electric would have been accurate.

Q. How did the FEECA utilities evaluate which measures would be included in the process of developing the technical potential study?

A. Nexant and all the FEECA utilities provided input into which measures would be included in the process of developing the technical potential study. Each of the provided measures was reviewed for its technical feasibility and applicability and had to meet the following two additional criteria:

1) The measure must be commercially available in the Florida marketplace.
2) The measure cannot be considered a behavioral savings.

Q. Did the FEECA utilities seek any other input for which measures would be included in the process of developing the technical potential study?

A. Yes, the FEECA utilities asked for and received a list of proposed measures from the Southern Alliance for Clean Energy ("SACE").

Q. Did the FEECA utilities add any of the measures that SACE provided in their measures list that the FEECA utilities used as the final measures list, and if no, why?

A. No, when the FEECA utilities reviewed the list of proposed measures from SACE, the majority of those proposed measures were already included in the utility developed measures list. The remaining measures were chosen not to be used because they were either a behavioral measure or would not be considered a measure. An example of this is a duct seal with a blower door. Duct sealing is a measure and it is included in the measure list, but the blower door is not a measure, it would be considered to be a piece of test equipment.

Q. Did Tampa Electric meet with SACE after the measure list was developed?

A. Yes, the company chose to meet with SACE in a series of conference calls between December 19, 2018, and January 25, 2019.

Q. What was the purpose of the conference calls with SACE?

A. The main purpose was to allow SACE an opportunity to critique and provide feedback on the draft technical potential studies that the company was receiving from Nexant.

Q. What feedback did SACE provide?

A. First, I thought their feedback was very constructive to Tampa Electric. SACE provided the following recommendations:

- Adjust the line loss factor within the company's cost effectiveness model to account for line losses during only the peak hour.
- Adjust the life of measures for building envelope type measures to greater than a 20-year life.
- Adjust the baseline for certain measures to quantify the savings from what is actually installed in the field versus a minimum building code or federal appliance standard.
- Adjust the applicability of wall insulation.
- Adjust the free-ridership screen.

Q. Did Tampa Electric implement any of these recommendations from SACE?

A. Yes, the company changed the appropriate residential and commercial building envelope measure lives to cap them at the company’s DSM study period of 25 years. The following building envelope items: windows, doors, ceiling insulation, wall insulation and the home or building structure all have industry rated lives of well over 25 years. The company also agreed to examine the line loss factor at the peak hour at some time in the future, currently the company utilizes a weighted average to develop the transmission and distribution line loss factors which has consistently been used for all of the company’s prior DSM goal setting proceedings.

Q. Why did the company not adopt the other three recommendations by SACE?

A. The company does not agree with using an adjusted baseline for certain measures to quantify the energy savings from what is actually installed in the field versus a minimum building code or federal appliance standard. The additional measurement and verification costs for a potential participant would make the DSM program very difficult to pass cost effectiveness due to having a heavy burden in overall utility costs such as labor, equipment and other internal costs as compared to the incentive that could be provided to the customer.

The company does not agree with the assessment of the applicability factor for homes in Florida for wall insulation since most single-family homes will be of block construction. Finally, the company does not view a need for a change in the way free-ridership is taken into consideration for the company's proposed DSM goals and programs.

Q. Were there any measures, beyond behavioral or ones that would be considered test equipment, chosen not to be used as a DSM measure?

A. Yes, being consistent with prior DSM goal setting periods, the company did not include any supply side efficiency measures as potential measures for this DSM goals setting proceeding.

Q. Please identify how many DSM measures were evaluated that support this 2020-2029 DSM goals setting proceeding?

A. Tampa Electric's comprehensive DSM measure list developed was comprised of the following:

Residential Energy Efficiency Measures: 91
Commercial Energy Efficiency Measures: 127
Industrial Energy Efficiency Measures: 30

Demand Response Measures: 21

<u>Distributed Energy Resource Measures: 9</u>

Combined Total DSM Measures: 278

Q. How does this measure list compare to the prior DSM goal setting proceeding that occurred in 2014?

A. In the prior DSM goal setting proceeding that occurred in 2014, Tampa Electric at that time had 274 total DSM measures that were evaluated.

Q. How did Tampa Electric ensure that the DSM measure list was complete and accurate?

A. Tampa Electric in collaboration with the other FEECA utilities and Nexant conducted weekly phones calls beginning in October of 2017 through the beginning of 2019 to ensure the DSM measure list and the associated demand and energy savings impacts from each measure were accurate.

Q. Beyond the measure list categories listed above, did the measures have further segmentation?

A. Yes, each of the energy efficiency, demand response and distribute energy resources categories for residential, commercial and industrial sectors were further segmented.

Residential energy efficiency and demand response was segmented into:

- Single family homes
- Multi-family homes
- Manufactured homes

Residential distributed energy resources was segmented into:

- Single family homes
- Multi-family homes

Commercial energy efficiency was segmented into:

- Assembly
- College and University
- Grocery
- Healthcare
- Hospitals
- Institutional
- Lodging/Hospitality
- Miscellaneous
- Restaurants
- Retail
- School K-12
- Warehouse

Commercial demand response was segmented into customers using the following energy usages:

- 0 – 15,000 kWh
- 15,0001 – 25,000 kWh
- 25,001 – 50,000 kWh
- ≥ 50,001 kWh

Commercial distributed energy resources was segmented into the following:

Battery storage:

- 0 - 15 MWh
- >15 MWh - 25 MWh
- >25 - 50 MWh
- >50 MWh

Photovoltaics:

- Assembly
- College and University
- Grocery
- Healthcare
- Hospitals
- Institutional
- Lodging/Hospitality
- Miscellaneous
- Restaurants
- Retail
- School K-12

- Warehouse

Combined Heat and Power:

- 5,500 kW Steam Turbine-Biomass
- 3,500 kW Steam Turbine-Biomass
- 3,500 kW Gas Turbine
- 3,000 kW Gas Turbine
- 2,500 kW Gas Turbine
- 4,500 kW Reciprocating Engine
- 1,500 kW Steam Turbine-Biomass
- 3,000 kW Reciprocating Engine
- 1,125 kW Fuel Cell
- 800 kW Fuel Cell-Biogas
- 1,250 kW Reciprocating Engine
- 1,250 kW Reciprocating Engine-Biogas
- 500 kW Fuel Cell
- 350 kW Reciprocating Engine
- 175 kW Fuel Cell
- 200 kW Micro Turbine
- 150 kW Reciprocating Engine
- 100 kW Micro Turbine
- 100 kW Micro Turbine- Biogas
- 50 kW Micro Turbine

Industrial energy efficiency was segmented into:

- Agriculture and Assembly
- Chemicals and Plastics

- Construction
- Electrical and Electronic Equipment
- Lumber/Furniture/Pulp/Paper
- Metal Products and Machinery
- Miscellaneous Manufacturing
- Primary Resource Industries
- Stone/Clay/Glass/Concrete
- Textiles and Leather
- Transportation Equipment
- Water and Wastewater

Large Commercial and Industrial demand response was segmented into customers using the following demand usages:

- 0 – 50 kW
- 51 – 300 kW
- 301 – 500 kW
- ≥ 501 kW

Q. How do these residential, commercial and industrial segments affect the measure list?

A. The segmentation means that when we look at an individual measure from the measure list, it will be examined from a multiple of ways for cost-effectiveness. For example, a residential smart thermostat is one measure and will be analyzed six ways. It will be analyzed if it was installed in a new or existing single-family home, new or existing multi-family residence, and a new or existing manufactured home. These additional analyses are called permutations. The residential, commercial and industrial segmentation provided above required 4,317 individual permutations of the measure list to be performed for cost-effectiveness.

Q. Were there any commercial or industrial segments that were excluded from the technical potential?

A. No, the technical potential was based upon the load forecast of Tampa Electric, so all customers and market segments were included in the technical potential analysis.

Q. Does the measure list contain demand-side renewable energy systems?

A. Yes, the Distributed Energy Resource measures contains residential and commercial photovoltaic systems.

Q. Do you have a list of all the DSM measures you provide the count for above?

A. Yes, the comprehensive list of all the DSM measures the company utilized in the development of the company's proposed 2020-2029 DSM goals is included in my Exhibit No. MRR-1, Document No. 4.

Q. Do you have a list of all the DSM measures that were eliminated or added as compared to the 2013 technical potential study?

A. Yes, the comprehensive list of all the DSM measures the company utilized in the development of the company's proposed 2015-2024 DSM goals and a list providing those measures that were added or removed in the newly developed comprehensive measure list is included in my Exhibit No. MRR-1, Document No. 5.

Q. Did the collaborative process among the FEECA utilities bring value to the overall DSM goals setting process?

A. Yes, the process provided many benefits including economic benefits from sharing in the total costs, provided an open platform to thoroughly vet differences which has provided consistency, established accurate baselines to begin the new period of setting DSM goals.

TAMPA ELECTRIC'S TECHNICAL POTENTIAL:

Q. What is Tampa Electric's technical potential?

A. The company's technical potential is made up of estimates for energy efficiency, demand response and distributed energy resources. The technical potential estimates from these categories are not additive due to the interactive effect of certain measures on end uses. With this backdrop, Tampa Electric's technical potential for energy efficiency is:

Summer Demand: 1,138 MW
Winter Demand: 583 MW
Annual Energy: 4,483 GWh

Tampa Electric's technical potential for demand response is:

Summer Demand: 2,399 MW
Winter Demand: 2,318 MW
Annual Energy: 0 GWh

Tampa Electric's technical potential for distributed energy resources is:

Summer Demand: 2,215 MW
Winter Demand: 619 MW

Annual Energy: 12,266 GWh

The full detail of these values is included in the company's Market Potential Study Report from Nexant in my Exhibit MRR-1, Document No. 3. I have also included a comparison of Tampa Electric's 2014 Technical Potential in my Exhibit MRR-1, Document No. 6.

PROCESS USED TO DEVELOP THE ECONOMIC POTENTIAL:

Q. Please describe the process Tampa Electric utilized to develop the company's economic potential?

A. The process to develop the economic potential began in the beginning of 2017 by meeting with the company's Load Research and Forecasting and Resource Planning Departments to make them aware of the data that will be needed to be able to support the development of the technical potential but also the information that will support the analysis for the economic potential. The company's Load Research and Forecasting Department was asked to prepare a load forecast specifically for the DSM goals setting 2020-2029 period. The company's Resource Planning Department was asked to utilize the DSM goals setting 2020-2029 load forecast and perform an updated integrated resource planning ("IRP") process to determine the timing and costs of the next avoided unit and fuel costs.

The process then determined the remaining cost-effectiveness inputs by taking the current 2019 values and escalating them into the year 2020.

The process then took the comprehensive list of all DSM measures contained in the technical potential that were spread across the various categories and building types and developed the economic potential by utilizing the Commission's approved cost-effectiveness tests, namely, the RIM and TRC tests. When calculating the RIM test, only lost revenues were considered on the cost side of the equation. For the TRC test, only the customer's full incremental equipment cost was considered on the cost side of the equation. For both the RIM and TRC tests, the benefits were comprised of avoided supply side costs that included the generator, transmission and distribution, and fuel costs. This process to develop the economic potential is included in my Exhibit No. MRR-1, Document No. 7.

Q. Is the load forecast that was generated to support the

2020-2029 DSM goals setting period the same as Tampa Electric's typical annual forecast used to develop the company's Ten-Year Site Plan?

A. No, the load forecast that is developed specifically for the DSM goals setting 2020-2029 period uses the same methodology as the company's typical annual forecast used to develop the company's Ten-Year Site Plan with the exception that it assumes that all DSM activities stop as of December 31, 2019.

Q. Is the IRP process used with this modified load forecast to support the 2020-2029 DSM goals setting period the same as Tampa Electric's typical annual process used to develop the company's Ten-Year Site Plan?

A. Yes, it is identical.

Q. Is the IRP process used to support the 2020-2029 DSM goals setting period the same process that Tampa Electric used in prior DSM goals setting periods?

A. Yes, the IRP process that Tampa Electric used has been utilized and approved in all previous DSM goals setting proceedings and is clearly delineated in the company's annual Ten-Year Site Plan filing.

Q. Do you have a list that details the information of Tampa Electric's avoided unit, including fuel costs, that was determined in the IRP process that was performed?

A. Yes, in my Exhibit No. MRR-1, Document No. 8 details the information of Tampa Electric's avoided unit and fuel costs that were determined in the IRP process that was performed.

Q. Do you have a list that identifies all input assumptions that were used in the RIM and TRC cost-effectiveness tests to develop the economic potential?

A. Yes, in my Exhibit No. MRR-1, Document No. 9 identifies all the input assumptions that were used in the cost-effectiveness RIM and TRC tests to develop the economic potential.

TAMPA ELECTRIC'S ECONOMIC POTENTIAL:

Q. What is Tampa Electric's economic potential?

A. Under the RIM cost-effectiveness test evaluation, the economic potential resulted in the following savings:

Summer Demand:	4,928 MW
Winter Demand:	3,256 MW
Annual Energy:	12,669 GWh

Under the TRC cost-effectiveness test evaluation, this economic potential resulted in the following savings:

Summer Demand:	2,656 MW
Winter Demand:	2,488 MW
Annual Energy:	1,785 GWh

The details of these values are included in my Exhibit MRR-1, Document No. 10.

TAMPA ELECTRIC'S ECONOMIC POTENTIAL SENSITIVITIES:

Q. Please describe what economic potential sensitivities Tampa Electric conducted to be compliant with the Commission's Order Establishing Procedures in this proceeding?

A. Tampa Electric's economic potential sensitivity analyses were conducted based upon the RIM and TRC economic potentials with regard to the following factors:

1) Lower fuel costs;

2) Higher fuel costs;

3) Shorter free-ridership consideration;

4) Longer free-ridership consideration; and

5) Consideration of the cost of carbon.

Q. How did the company perform the sensitivity for lower and higher fuel costs?

A. The sensitivity for lower and higher fuel costs was performed by varying the fuel cost in a similar manner as Tampa Electric's sensitivity conducted in the company's annual fuel docket when the company conducted fuel hedging.

Q. How did the company perform the sensitivity for shorter and longer free-ridership consideration?

A. The sensitivity for shorter and longer free-ridership consideration was performed by changing the requirement from a two-year simple payback to a one-year simple payback (shorter) and a three-year simple payback (longer).

Q. Did the company perform the sensitivity for the consideration of the cost of carbon?

A. No, Tampa Electric did not include the cost of carbon dioxide ("CO_2" or "Carbon") in the process of establishing the economic potential.

Q. Why did Tampa Electric not consider the cost of carbon?

A. Tampa Electric has two reasons for not considering the cost of carbon. The first is that Tampa Electric does not include the cost of carbon in the IRP process that was used to establish the costs and fuel costs of the next avoided unit for this 2020-2029 DSM goals setting proceeding and the company does not include the cost of carbon in the IRP process that is used to develop the annual Ten-Year Site Plan. The second is the cost of carbon in the state of Florida is not imposed by any State or Federal regulations on the emissions of carbon nor have any laws for the emission of greenhouse gases like carbon currently been enacted at the Federal or State levels.

Q. Has the company ever considered the cost of carbon in a DSM goals setting proceeding?

A. Yes, it has been used only one time. It was used in the 2005-2014 DSM goals setting proceeding where Tampa

Electric followed the Commission Staff's request to perform carbon sensitivities on Tampa Electric's economic potential.

Q. Please describe the results of the sensitivity analyses that were performed when applied to Tampa Electric's 2020-2029 RIM and TRC DSM economic potentials?

A. Tampa Electric's sensitivity analyses results on the 2020-2029 RIM and TRC DSM economic potentials were modest at best. From a RIM perspective, the greater variation occurred with summer demand and annual energy relative to fuel costs and annual energy due to payback duration. From a TRC perspective, the greater variation occurred with annual energy relative to fuel costs and payback duration. The processes to perform the sensitivity analyses are included in my Exhibit MRR-1, Document No. 11.

Q. Do you have a summary showing the results of the sensitivity analyses?

A. Yes, my Exhibit No. MRR-1, Document No. 15 provides a summary showing the results of the sensitivity analyses.

Q. Should the results of these sensitivity analyses be used in any manner to influence or establish Tampa Electric's DSM goals for the 2020-2029 period?

A. No, Tampa Electric believes the sensitivity analyses simply provides a relative indication as to how cost-effectiveness evaluations may be affected by changes in assumptions. There is no basis to conclude that assumption changes modeled by the company for this sensitivity exercise will in some manner become more plausible than the actual assumptions utilized.

TAMPA ELECTRIC'S CONSIDERATION OF FREE-RIDERS:

Q. Please provide the process that Tampa Electric utilized to consider free-riders used to develop the proposed DSM goals in this proceeding?

A. Tampa Electric accomplished the free-ridership consideration requirement through the application of a longstanding Commission recognized practice, initially approved in the 1994 DSM goals proceeding. There, the Commission approved the use of a participant payback of two years or less without a utility incentive. The free-ridership consideration is performed by removing those measures from the RIM and TRC achievable potential consideration that have a simple payback equal to or less than two years. The execution of this consideration for free-ridership required not only the use of the RIM and TRC cost-effectiveness tests, but also the PCT in conjunction with each.

Q. What does the term "free-ridership" mean to Tampa Electric?

A. The term "free-ridership" describes a situation where a customer willingly accepts a rebate or other type of incentive to purchase goods or services that the customer would have purchased anyway, without the rebate or other incentive, because of the cost-effectiveness of the goods or services purchased.

Q. Does Tampa Electric support the two-year or less simple payback screen as an appropriate way to consider for free-riders?

A. Yes, the two-year or less period of time is sufficient motivation for a customer's natural, self-serving adoption of the DSM measure. Simplistically, Tampa Electric, and ultimately its customers, should not pay specific customers to do what they would do on their own without an incentive. Because of this and Rule 25-17.0021, F.A.C., which requires the minimization of free riders in the setting of DSM goals, the two-year simple payback criterion is the appropriate means to apply to minimize free ridership as required by Rule.

Q. How many measures remained qualified and the associated summer demand, winter demand and annual energy savings of these measures after consideration of free-ridership under the RIM and PCT evaluation?

A. After consideration of free-ridership, 1,100 individual measure permutations remained qualified under the RIM and PCT evaluation and resulted in the following savings:

Summer Demand:	2,557 MW
Winter Demand:	2,409 MW
Annual Energy:	747 GWh

Q. How many measures were removed due to having a simple payback of two-years or less after consideration of free-ridership under the RIM and PCT evaluation?

A. After consideration of free-ridership, the two-year payback removed 779 individual measure permutations under the RIM and PCT evaluation.

Q. How many measures remained qualified and the associated summer demand, winter demand and annual energy savings of these measures after consideration of free-ridership under the TRC and PCT evaluation?

A. After consideration of free-ridership, 944 individual measure permutations remained qualified under the TRC and PCT evaluation and resulted in the following savings:

Summer Demand:	2,465 MW
Winter Demand:	2,326 MW
Annual Energy:	686 GWh

Q. How many measures were removed due to having a simple payback of two-years after consideration of free-ridership under the TRC and PCT evaluation?

A. After consideration of free-ridership, the two-year payback removed 1,005 individual measure permutations under the TRC and PCT evaluation.

Q. Did Tampa Electric comply with Staff's request and the Order Establishing Procedure by performing a sensitivity analyses utilizing the consideration of free-ridership?

A. Yes, as described earlier Tampa Electric complied with Staff’s request and the Order Establishing Procedure by performing a sensitivity analyses utilizing the consideration of free-ridership of a one-year and three-year period for the simple payback.

Q. How many individual measure permutations were removed due to having a simple payback of one-year and three-year period for the free-ridership sensitivity as compared to the two-year free-ridership consideration under the RIM and PCT, and the TRC and PCT evaluation?

A. The amount of measure permutations that were removed under the RIM and PCT, and the TRC and PCT evaluation after consideration of free-ridership and the free-ridership sensitivity analyses are below:

Measure permutations removed under RIM and PCT:

One-year Free-Ridership Sensitivity:	427
Two-year Free-Ridership Consideration:	779
Three-year Free-Ridership Sensitivity:	1,065

Measure permutations removed under TRC and PCT:

One-year Free-Ridership Sensitivity:	523
Two-year Free-Ridership Consideration:	1,005

Three-year Free-Ridership Sensitivity: 1,301

Q. Do you have a summary showing the free-ridership consideration in addition to the results of the free-ridership sensitivities?

A. Yes, my Exhibit No. MRR-1, Document No. 15 provides a summary showing the results of the free-ridership consideration and sensitivity analyses.

PROCESS TO DEVELOP THE ACHIEVABLE POTENTIAL:

Q. Would you describe the overall process that Tampa Electric utilized to develop the achievable potential in this proceeding?

A. Yes, the process to develop the achievable potential study takes all the measures that successfully passed cost-effectiveness and the free-ridership consideration at the economic potential and to now perform both RIM and TRC cost-effectiveness by first including program administration costs without any incentives or rebates. The measures that pass this level of RIM and TRC cost-effectiveness are then analyzed to see if an incentive or a rebate can be provided. In this process, for the RIM test the rebate is set at either the maximum level to drive the RIM cost-effectiveness score to be 1.01 or to the level that places the measure simple payback of two years. For the TRC cost-effectiveness test, the rebate is set at the level that places the measures simple payback of two years. Once the incentive levels have been determined that will maximize participation, the company used Bass Models, Adoption Curves and its experience with current programs and incentives to estimate and project the activity over the 2020-2029 DSM goals setting period within each of the cost-effective measures. The individual measures annual energy (in kWh) and summer and winter demand (in kW) are determined for their contributions in each of the 2020-2029 DSM goals period years. All the residential and commercial/industrial contributions are summed by year for these sectors and totaled to become the annual and cumulative DSM achievable potential. This process to develop the achievable potential is included in my Exhibit MRR-1, Document No 12.

Q. How did Tampa Electric develop the administrative costs utilized in the development of the achievable potential?

A. Tampa Electric has significant experience running effective DSM programs and utilized the administrative cost estimated based on its experience with the same or similar measures contained in the company’s existing DSM programs.

TAMPA ELECTRIC’S ACHIEVABLE POTENTIAL:

Q. What is Tampa Electric’s total achievable potential?

A. Under the RIM cost-effectiveness test evaluation, the achievable potential resulted in 78 individual evaluations remaining with the following savings:

Summer Demand:	74.4 MW
Winter Demand:	40.4 MW
Annual Energy:	156.5 GWh

Under the TRC cost-effectiveness test evaluation, this achievable potential resulted in 68 individual evaluations remaining with the following savings:

Summer Demand:	154.7 MW
Winter Demand:	75.6 MW
Annual Energy:	392.9 GWh

These values are stated at the meter level and are also included in my Exhibit MRR-1, Document No. 13.

Q. Do these DSM achievable potentials include demand response and distributed energy resources?

A. Yes, in addition to energy efficiency, these DSM achievable potentials include demand response and consideration of distributed energy resources. No measures within distributed energy resources remained cost-effective.

Q. Will you provide a list of the RIM-based cost-effective measures and TRC-based cost-effective measures that made the contributions to the achievable potential?

A. Yes, the list of measures that supported the RIM-based and TRC-based achievable potential are included in my Exhibit No. MRR-1, Document No. 14.

Q. Is the achievable potential the same as what the company is proposing as the DSM goals for the 2020-2029 goals setting period in this proceeding?

A. The RIM-based achievable potential is the amount of cost-effective annual energy (in kWh) and summer and winter demand (in kW) given the current economic conditions that Tampa Electric is seeing for its next avoided unit at the meter. To obtain the DSM goals for the 2020-2029 goals setting period, these annual energy and summer and winter demand savings will be adjusted so that amount of savings is provided at the generator level, which are the proposed company's 2020-2029 DSM goals.

Q. What is Tampa Electric's total achievable potential after being adjusted to savings at the generator?

A. Under the RIM cost-effectiveness test evaluation, the achievable potential at the generator resulted in the following savings:

Summer Demand:	79.7 MW
Winter Demand:	43.3 MW
Annual Energy:	165.0 GWh

Under the TRC cost-effectiveness test evaluation, the achievable potential at the generator resulted in the following savings:

Summer Demand:	165.9 MW
Winter Demand:	81.1 MW
Annual Energy:	414.6 GWh

These values are also included in my Exhibit MRR-1, Document No. 13.

Q. Would you provide the DSM achievable potentials at the generator for energy efficiency and demand response separately?

A. Yes, for energy efficiency under the RIM cost-effectiveness test evaluation, the achievable potential at the generator resulted in the following savings:

Summer Demand:	51.7 MW
Winter Demand:	26.3 MW
Annual Energy:	165.0 GWh

For demand response under the RIM cost-effectiveness test evaluation, the achievable potential at the generator resulted in the following savings:

Summer Demand:	28.0 MW
Winter Demand:	17.1 MW
Annual Energy:	0.0 GWh

For energy efficiency under the TRC cost-effectiveness test evaluation, the achievable potential at the generator resulted in the following savings:

Summer Demand:	122.1 MW
Winter Demand:	54.1 MW
Annual Energy:	414.6 GWh

For demand response under the TRC cost-effectiveness test evaluation, the achievable potential at the generator resulted in the following savings:

Summer Demand:	43.8 MW
Winter Demand:	26.9 MW
Annual Energy:	0.0 GWh

Q. From the RIM-based achievable potential, will the measures that remained cost-effective become the new DSM programs Tampa Electric will submit within the DSM Plan once the goals are approved?

A. Not necessarily, the data obtained from the process to develop the achievable potential will be used, but the process to develop DSM goals is to determine the amount of cost-effective annual energy (in kWh) and summer and winter demand (in kW) given the current economic conditions that Tampa Electric is seeing for its next avoided unit at this time. It is a combination of theoretical, mathematical and realistic inputs for each individual measure as they stand alone. Designing a DSM program that would be used to support obtaining the Commission's annual and cumulative DSM goals may use a single measure or any combination of measures to develop a cost-effective program. Tampa Electric is not limited to using any measures that could be utilized in a cost-effective DSM Program. For example, the company is planning to retain its current weatherization and energy education programs that include energy-efficiency kits which are made up of both cost-effective and not cost-effective measures which focus on gaining participation of low-income customers in the company's DSM programs portfolio.

Q. What residential summer and winter Megawatt (MW) and annual Gigawatt-hour (GWh) goals should be established for the period 2020-2029 at the generator?

A. Tampa Electric's reasonably achievable generator level combined RIM-based Residential DSM goals for the 2020-2029 period are:

Summer Demand:	54.0 MW
Winter Demand:	25.5 MW
Annual Energy:	103.6 GWh

Q. What commercial/industrial summer and winter Megawatt (MW) and annual Gigawatt hour (GWh) goals should be established for the period 2020-2029 at the generator?

A. Tampa Electric's reasonably achievable generator level combined RIM-based Commercial/Industrial DSM goals for the 2020-2029 period are:

Summer Demand: 25.8 MW
Winter Demand: 17.8 MW
Annual Energy: 61.4 GWh

Q. Do you have a summary of each of the potentials from the technical potential through the economic, including sensitivities and ending with the achievable potential?

A. Yes, my Exhibit No. MRR-1, Document No. 15 provides a summary of each of the potentials developed that include the impacts of the sensitivities.

ADHERENCE TO F.A.C. RULES AND STATUTORY REQUIREMENTS:

Q. Has Tampa Electric provided an adequate assessment of the achievable potential of all available demand-side conservation and efficiency measures, including demand response and distributed energy resources?

A. Yes, Tampa Electric has conducted an adequate assessment of the full technical, economic and achievable potentials of all available demand-side conservation and efficiency measures including demand response and distributed energy resources. The company employed a reasonable approach to identifying administrative costs and incentives for the measures and evaluated the measures against the appropriate supply-side avoided cost data.

Q. Does the evaluation process utilized by Tampa Electric to establish its proposed DSM goals for the 2020-2029 period address the requirements of Rule 25-17.0021, F.A.C.?

A. Yes, the Rule requires a utility to:

1) Project its proposed DSM goals in both the residential and commercial/industrial sectors.
2) Give consideration to measures applicable for new and existing construction.
3) Ensure that major end-use categories specified in the Rule be assessed.
4) Consider such things as overlapping measures, appliance efficiency standards, interactions with building codes, free-riders, rebound effects and the utility's latest monitoring and evaluation data.

The comprehensive DSM measure list developed by the FEECA utilities and Nexant for Electric Energy and Peak Demand savings for Tampa Electric, and the company's overall evaluation process for its technical potential to its proposed DSM goals for the 2020-2029 period fully meet the requirements of Rule 25-17.0021, F.A.C.

Q. Has Tampa Electric provided an adequate assessment of the full technical potential of all available demand-side conservation and efficiency measures, demand response and demand-side renewable energy systems?

A. Yes, Tampa Electric, in conjunction with the other FEECA utilities, developed a comprehensive DSM measure list. Subsequently, the company conducted an adequate assessment of the full technical potential of all available demand-side conservation and efficiency measures, demand response and distributed energy resources which included renewable energy systems. A total of 301 measures, including energy efficiency, demand response and distributed energy resources measures were identified and evaluated by the company. These 301 measures and the additional residential and commercial segmentation required over 70,000 cost-effectiveness evaluations.

Q. How has Tampa Electric incorporated supply-side efficiencies into its planning process?

A. Supply-side efficiencies include improvements in generation, transmission and distribution. Therefore, Tampa Electric's motivation to deliver electric service to its customers in the most economical and efficient manner possible makes executing supply-side efficiencies a naturally occurring result. A review of Tampa Electric's plans for supply-side endeavors is an inherent element of the company's annual Ten-Year Site Plan which is routinely reviewed by this Commission. Furthermore, both supply-side efficiency and conservation resources are analyzed in every need determination for new sources of generation. When Tampa Electric selects its avoided supply-side costs for utilization in DSM cost-effectiveness evaluations, it is selecting resources that have previously been reviewed and determined to be efficient. Of further note is the fact that while efficiency improvements in supply-side resources are important, these improvements have a tendency to reduce potential savings available through DSM activity.

Q. Does Tampa Electric's proposed DSM goals adequately reflect the costs and benefits to customers who will participate in programs developed to promote DSM measures?

A. Yes, through Tampa Electric's, the other FEECA utilities and Nexant's work to develop the technical potential study with updated baselines and incremental equipment costs, the company's proposed RIM-based DSM goals adequately reflect the costs and benefits to customers who will participate in programs developed to promote DSM measures.

Q. Does Tampa Electric's proposed DSM goals adequately reflect the costs and benefits to the general body of ratepayers as a whole, including utility incentives and participant contributions?

A. Yes, the surest way to adequately reflect the costs and benefits to the general body of ratepayers as a whole without subsidization within or across rate classes is to employ the continued use of the RIM cost-effective test for DSM goals setting and program approval. Since the inception of DSM in Florida, this Commission has a longstanding practice of utilizing the RIM test to provide fair, equitable and reasonable treatment for all ratepayers while minimizing overall rate impacts of DSM expenditures. Tampa Electric strongly encourages the Commission to continue this practice so as to establish meaningful DSM goals while minimizing overall rate impacts.

PROJECTED 2020-2029 RESIDENTIAL BILL IMPACTS:

Q. For Tampa Electric, what are the 2020-2029 annual bill impacts on residential customers using 1,200 kWh/month for the projected RIM-based achievable portfolio and the projected TRC-based achievable portfolio?

A. To make the determination of the 1,200 kWh/month annual residential bill impact for the 2020-2029 period relative to the RIM-based and TRC-based achievable portfolios, Tampa Electric's approach was to provide the total impact of each of these portfolios and also include the current ongoing costs of maintaining existing DSM on the company's system. These current ongoing costs principally included load management costs associated with maintaining the existing level of load management on the system, the costs to perform energy audits as required by Rule 25-17.003, F.A.C., projected research and development, supporting advertising for DSM programs, energy education and supporting administration activities. The results of these analyses for the 2020-2029 period are contained in my Exhibit No. MRR-1, Document No. 16 which provides the estimated ten-year total cost for a 1,200 kWh/month bill would be $356.78 for the RIM-based achievable portfolios and $516.13 for the TRC-based achievable portfolio.

It is important to realize the dollar amounts for the RIM and TRC achievable portfolios are estimates for only one customer's electric bill. A more realistic view is gained by looking at the impact across the company's entire system and thus its entire customer base. The estimated ECCR clause cost to deliver the RIM-based achievable portfolio for the 2020-2029 period is projected to be $396.4 million. The estimated ECCR clause cost to deliver the TRC-based achievable portfolio for the 2020-2029 period is projected to be $573.5 million. Therefore, the TRC-based achievable portfolio is a $177.1 million greater burden for customers. Furthermore, the RIM-based achievable portfolio, by definition of the RIM test, is cost-effective for both participating and non-participating customers; therefore, there are no losers. However, the TRC-based achievable portfolio is cost-effective for program participants but not for non-participants. Under the TRC-based achievable portfolio, non-participants will actually be subsidizing the program participants for their DSM efforts. Therefore, the RIM-based achievable portfolio is the more cost-effective, less expensive, more reasonable and equitable approach to take in order to provide another resource to assist the company in meeting future system needs.

OTHER INFORMATION REQUESTED BY THE COMMISSION'S ORDER ESTABLISHING PROCEDURE:

Q. Does your testimony include the company's current DSM programs, that includes the historical participation rates, cumulative kW and kWh savings, measures included in each program and program impacts related to building code and appliance efficiency standards?

A. Yes, in addition to the historical savings and impacts from appliance efficiency standards as previously discussed earlier, I am including descriptions of Tampa Electric's current portfolio of Commission approved DSM programs and the most recent annual and cumulative DSM achievements from the company's DSM programs in my Exhibit MRR-1, Document No. 17.

Q. What goals, if any, should be established for increasing the development of demand-side renewable energy systems, pursuant to Section 366.82(2), F.S.?

A. Currently, there are a few key reasons why there is not a need for having a goal or incentives for the development of demand-side renewable energy systems. The company gained a lot of information when it offered incentives under the renewable energy systems initiative pilot program that was offered during the 2010 through 2015 DSM goals period and the company is continuing to see the price of solar renewable energy systems decrease. The residential renewable energy systems still are not cost-effective in all three cost-effectiveness tests (TRC, RIM and PCT). The commercial renewable energy systems passed under the RIM cost-effectiveness test but significantly failed the other two cost-effectiveness tests (TRC and PCT). The residential and commercial renewable energy systems were both screened out without any program administration or incentive costs so they will not pass cost-effectiveness as a DSM program over the foreseeable horizon. Another main reason for not having a goal or incentives for renewable energy systems is the current market, even with these systems being not cost-effective, many residential and commercial customers are making the choice to install these systems on their own or leasing these systems. Since the renewable energy systems initiative pilot closed, the company has seen the following new customer interconnections of renewable energy systems at the end of each of these years:

2016: 286
2017: 740
2018: 1,259

Q. If the renewable energy systems passed cost-effectiveness, would Tampa Electric offer a DSM program that had goals and incentives for these systems?

A. Yes, if the renewable energy systems passed cost-effectiveness and the other screening that is performed, Tampa Electric would design a DSM program to offer and incentivize the installation of renewable energy systems.

Q. Does Tampa Electric support renewable energy system installations?

A. Yes, the company supports both customer and utility installed renewable energy system installations. When customers install a renewable energy system, the interconnection process they go through is very customer friendly and we have many solar experts that will assist the customer with any questions. From a utility perspective, in 2017, Tampa Electric committed to add 600 MW of solar renewable energy systems and is committed to making its generation fleet cleaner and greener.

Q. Does Tampa Electric see any need for a different type of program to increase the development of demand-side renewable energy systems?

A. Tampa Electric believes there is a need for more energy education surrounding all of the potential options that a customer can choose if they want their energy needs to come from a renewable energy system. With the increase in home systems ownership, leasing opportunities, participation in a renewable block program, participation in a community shared solar program, or some of the other mechanisms that we see around the United States today. More education around these options is still needed.

CONCLUSIONS:

Q. What overall DSM goals are reasonably achievable for Tampa Electric for the 2020-2029 period?

A. Based on the thorough and rigorous analysis performed by Nexant and Tampa Electric for this current DSM goals setting process, the company's reasonably achievable generator level combined RIM-based DSM goals for the

2020-2029 period are:

Summer Demand:	79.7 MW
Winter Demand:	43.3 MW
Annual Energy:	165.0 GWh

These amounts are detailed on an annual basis for both the residential and commercial/industrial sectors in my Exhibit No. MRR-1, Document No. 1.

By accomplishing these DSM goals, Tampa Electric will increase overall energy efficiency in its service area and lower electric rates for all customers. The company is quite aware that keeping electric rates as low as possible while advancing broad scale efforts of overall conservation is important to its customers and therefore the company.

Q. Does the methodology used by Tampa Electric to set DSM goals for the 2020-2029 period comply with statutory and F.A.C. requirements?

A. Yes. Tampa Electric began its evaluation with having a technical potential study developed that utilized a comprehensive and up to date list of potential DSM measures for residential and commercial and industrial sectors. These measures were applied over multiple construction and building types and considered several aspects of measure interaction as well as free-ridership consideration. Tampa Electric adhered to statutory requirements by developing estimated economic and achievable potentials while properly reflecting cost and benefits to all customers. Additionally, Tampa Electric utilized a sound, proven approach that has been used and approved in principle by this Commission in past DSM goals setting proceedings.

Q. Does Tampa Electric's proposed DSM goals provide a cost-effective means for all ratepayers to help meet the need for additional generation through 2029?

A. Yes, through the continued use of the RIM cost-effectiveness test, Tampa Electric has assured its ratepayers that the most cost-effective resources will be used to meet future capacity needs.

Q. Should Tampa Electric's proposed 2020-2029 DSM goals be approved?

A. Yes. Tampa Electric's proposed 2020-2029 DSM goals meet rule and statutory requirements, are cost-effective for participants and non-participants, help to minimize the rate impact for future capacity needs, addresses the desires and needs of its customers, and are reasonably achievable.

Q. Are the Company's proposed goals based on an adequate assessment of the full technical potential of all available demand-side and supply-side conservation and efficiency measures, including demand-side renewable energy systems, pursuant to Section 366.82(3), F.S.?

A. Yes.

Q. Does the Company's proposed goals adequately reflect the costs and benefits to customers participating in the measure, pursuant to Section 366.82(3)(a), F.S.?

A. Yes.

Q. The Company's proposed goals adequately reflect the costs and benefits to the general body of ratepayers as a whole, including utility incentives and participant contributions, pursuant to Section 366.82(3)(b), F.S.?

A. Yes.

Q. Does the Company’s proposed goals adequately reflect the need for incentives to promote both customer-owned and utility-owned energy efficiency and demand-side renewable energy systems, pursuant to Section 366.82(3)(c), F.S.?

A. Yes.

Q. Does the Company’s proposed goals adequately reflect the costs imposed by state and federal regulations on the emission of greenhouse gases, pursuant to Section 366.82(3)(d), F.S.?

A. Yes.

Q. What cost-effectiveness test or tests should the Commission use to set goals, pursuant to Section 366.82, F.S.?

A. The RIM-based cost-effectiveness test.

Q. Does the Company’s proposed goals appropriately reflect consideration of free riders?

A. Yes.

Q. What residential summer and winter Megawatt (MW) and annual Gigawatt-hour (GWh) goals should be established for the period 2020-2029?

A. Tampa Electric's reasonably achievable generator level combined RIM-based Residential DSM goals for the 2020-2029 period are:

Summer Demand:	53.9 MW
Winter Demand:	25.5 MW
Annual Energy:	103.6 GWh

Q. What commercial/industrial summer and winter Megawatt (MW) and annual Gigawatt hour (GWh) goals should be established for the period 2020-2029?

A. Tampa Electric's reasonably achievable generator level combined RIM-based Commercial/Industrial DSM goals for the 2020-2029 period are:

Summer Demand:	25.8 MW
Winter Demand:	17.8 MW
Annual Energy:	61.4 GWh

Q. Does this conclude your testimony?

A. Yes.

EXHIBIT

OF

MARK R. ROCHE

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Tampa Electric's
2020-2029 Proposed DSM Goals

Proposed Residential DSM Goals at the Generator

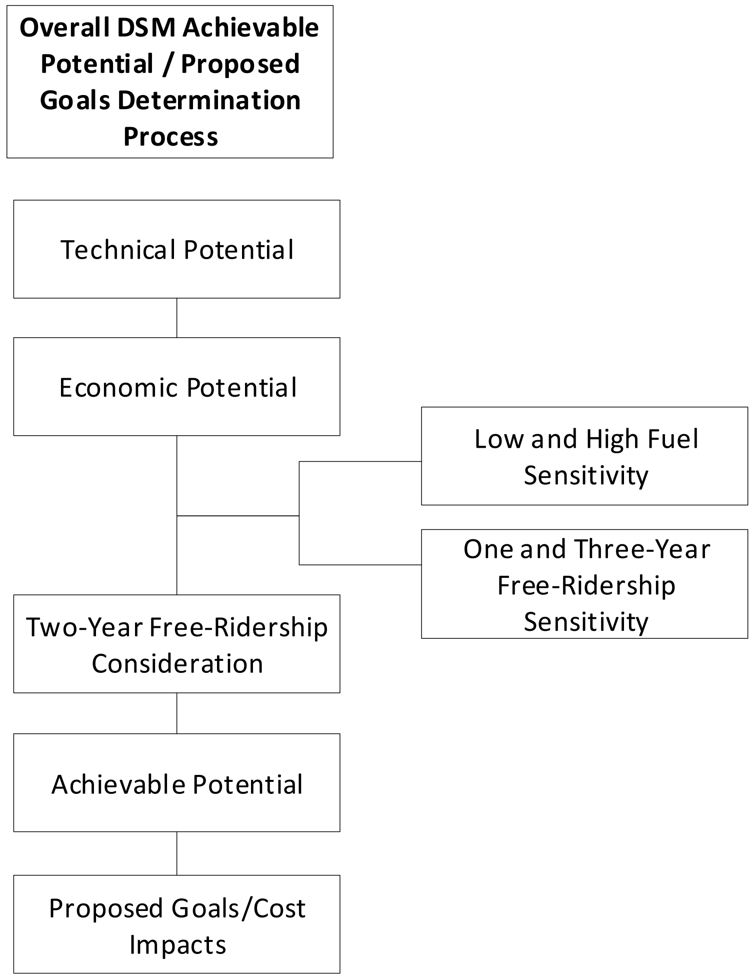
Year	Summer Demand (MW)		Winter Demand (MW)		Annual Energy (GWh)	
	Incremental	Cumulative	Incremental	Cumulative	Incremental	Cumulative
2020	4.7	4.7	2.6	2.6	9.3	9.3
2021	4.9	9.6	2.6	5.1	9.6	18.8
2022	5.0	14.5	2.6	7.7	9.7	28.5
2023	5.2	19.7	2.6	10.3	10.0	38.5
2024	5.4	25.0	2.6	12.8	10.3	48.9
2025	5.6	30.6	2.5	15.4	10.7	59.5
2026	5.8	36.4	2.5	17.9	11.0	70.5
2027	6.0	42.4	2.5	20.4	11.3	81.8
2028	5.6	47.9	2.5	23.0	10.5	92.3
2029	6.0	54.0	2.5	25.5	11.3	103.6

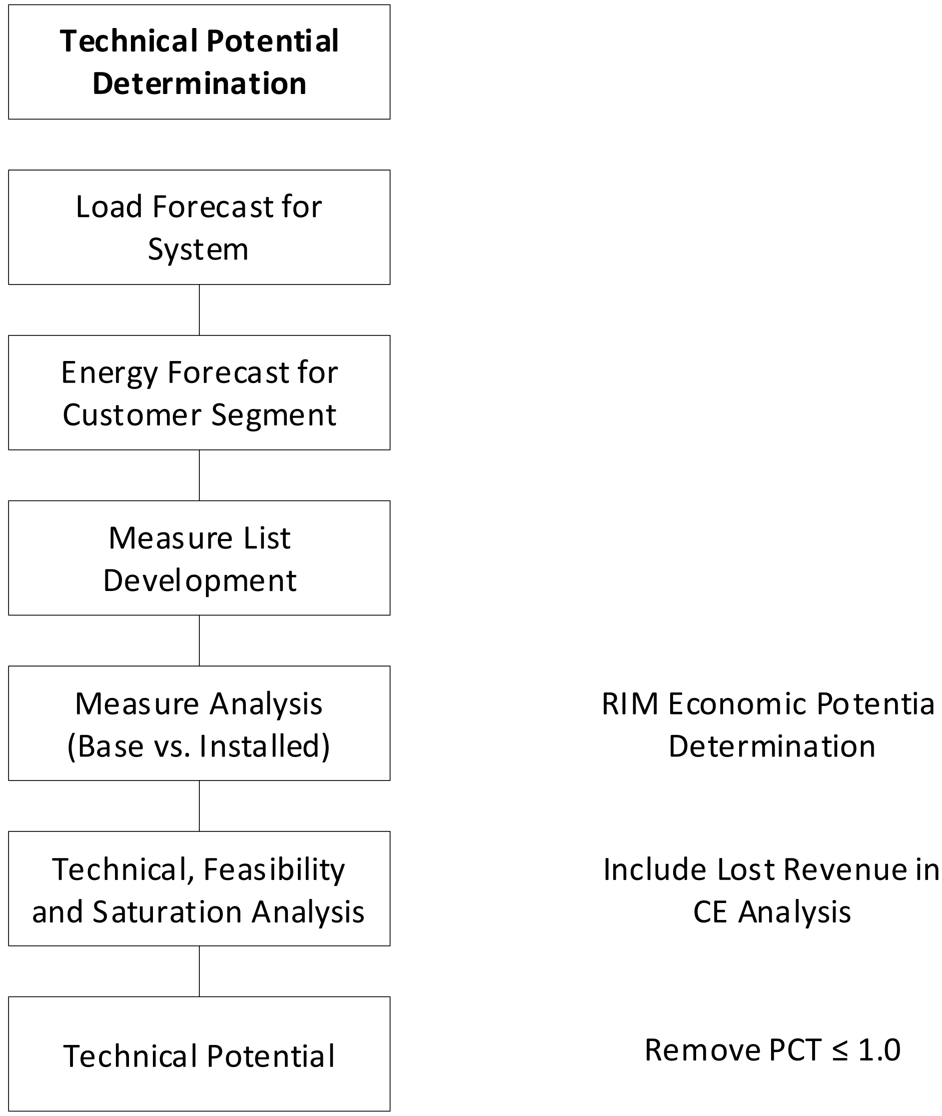
Proposed Commercial/Industrial DSM Goals at the Generator

Year	Summer Demand (MW)		Winter Demand (MW)		Annual Energy (GWh)	
	Incremental	Cumulative	Incremental	Cumulative	Incremental	Cumulative
2020	2.7	2.7	1.9	1.9	5.5	5.5
2021	2.5	5.2	1.7	3.6	6.5	12.0
2022	2.4	7.6	1.6	5.3	5.5	17.5
2023	2.9	10.5	2.0	7.3	6.5	24.0
2024	2.4	12.9	1.6	8.9	5.6	29.6
2025	2.5	15.4	1.8	10.7	6.7	36.3
2026	2.8	18.2	1.9	12.6	5.8	42.1
2027	2.6	20.8	1.8	14.4	6.8	48.9
2028	2.4	23.2	1.7	16.1	5.8	54.7
2029	2.6	25.8	1.8	17.8	6.8	61.4

Proposed Combined DSM Goals at the Generator

Year	Summer Demand (MW)		Winter Demand (MW)		Annual Energy (GWh)	
	Incremental	Cumulative	Incremental	Cumulative	Incremental	Cumulative
2020	7.4	7.4	4.5	4.5	14.8	14.8
2021	7.4	14.8	4.3	8.8	16.0	30.9
2022	7.3	22.1	4.2	13.0	15.2	46.0
2023	8.0	30.2	4.6	17.5	16.5	62.5
2024	7.8	37.9	4.2	21.7	15.9	78.4
2025	8.1	46.1	4.3	26.0	17.4	95.8
2026	8.5	54.6	4.5	30.5	16.8	112.6
2027	8.5	63.1	4.3	34.8	18.0	130.6
2028	8.0	71.1	4.2	39.0	16.3	146.9
2029	8.6	79.7	4.3	43.3	18.1	165.0


Overall DSM Achievable Potential / Proposed Goals Determination Process
Technical Potential
Economic Potential
Low and High Fuel Sensitivity
One and Three-Year Free-Ridership Sensitivity
Two-Year Free-Ridership Consideration
Achievable Potential
Proposed Goals/Cost Impacts


Technical Potential Determination
Load Forecast for System
Energy Forecast for Customer Segment
Measure List Development
Measure Analysis (Base vs. Installed)
Technical, Feasibility and Saturation Analysis
Technical Potential
RIM Economic Potentia Determination
Include Lost Revenue in CE Analysis
Remove PCT ≤ 1.0

REPORT

Reimagine tomorrow.

Market Potential Study of Demand-Side Management in Tampa Electric Company's Service Territory

Submitted to Tampa Electric Company

April, 2019

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1 Executive Summary

In October, 2017, the seven electric utilities subject to the Florida Energy Efficiency and Conservation Act (FEECA Utilities) retained Nexant, 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 objectives of the study included:

- 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 Tampa Electric Company's (TECO) service territory.

1.1 Methodology

Nexant 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, Nexant 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 Nexant's Microsoft Excel-based EE modeling tool, TEA-POT (Technical / Economic / Achievable POTential). This modeling tool was built on a platform that provides the ability to calculate 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.

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 commercial and industrial customers. The direct load control program assessment focused on the potential for demand reduction through heating, ventilation, and air conditioning (HVAC), water heater, 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 customer's 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 used a "bottom-up" modeling approach to estimate the potential of the various DSRE technologies for residential, commercial, and industrial customers. Individual distributed generation models were created for the three DSRE technologies studied to estimate market potential.

1.2 Savings Potential

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

1.2.1 EE Technical 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 technical potential results are summarized in Table 1-1.

Table 1-1: EE Technical Potential

	Savings Potential		
	Summer Peak Demand (MW)	Winter Peak Demand (MW)	Energy (GWh)
Residential	755	388	2,791
Non-Residential[1]	383	195	1,691
Total	1,138	583	4,483

1.2.2 DR Technical 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, 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 technical potential results are summarized in Table 1-2.

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

Table 1-2: DR Technical Potential

	Savings Potential	
	Summer Peak Demand (MW)	Winter Peak Demand (MW)
Residential	1,208	1,645
Non-Residential	1,191	673
Total	2,398	2,318

1.2.3 DSRE Technical 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 each FEECA utility's customer base.

Table 1-3: DSRE Technical Potential[2]

	Savings Potential		
	Summer Peak Demand (MW)	Winter Peak Demand (MW)	Energy (GWh)
PV Systems			
Residential	509	19	3,461
Non-Residential	835	31	5,679
Total	1,344	50	9,140
Battery Storage charged from PV Systems			
Residential	214	211	-
Non-Residential	1	-	-
Total	216	211	-
CHP Systems			
Total	656	358	3,126

[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, 2017, the seven electric utilities subject to the Florida Energy Efficiency and Conservation Act (FEECA Utilities) retained Nexant, 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 objectives of the study included:

- Assessing 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 technical potential analysis of Tampa Electric Company's (TECO) service territory.

The following deliverables were developed by Nexant 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, state, sector, and end-use
- Baseline technology saturations, energy consumption, and demand
- Technical potential demand and energy savings
- Supporting calculation spreadsheets

2.1 Market Potential Study Approach

DSM market potential studies (MPS) typically include three scenarios: technical, economic, and achievable potential. Each scenario is defined by specific criteria, which collectively describe levels of opportunity for DSM savings. Nexant only estimated technical potential for TECO, and TECO conducted their economic and achievable potential analyses.

Nexant estimates levels of DSM 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.
- Economic Potential is the amount of energy and capacity that could be reduced by DSM measures that are considered cost-effective. Nexant did not perform this analysis for TECO.

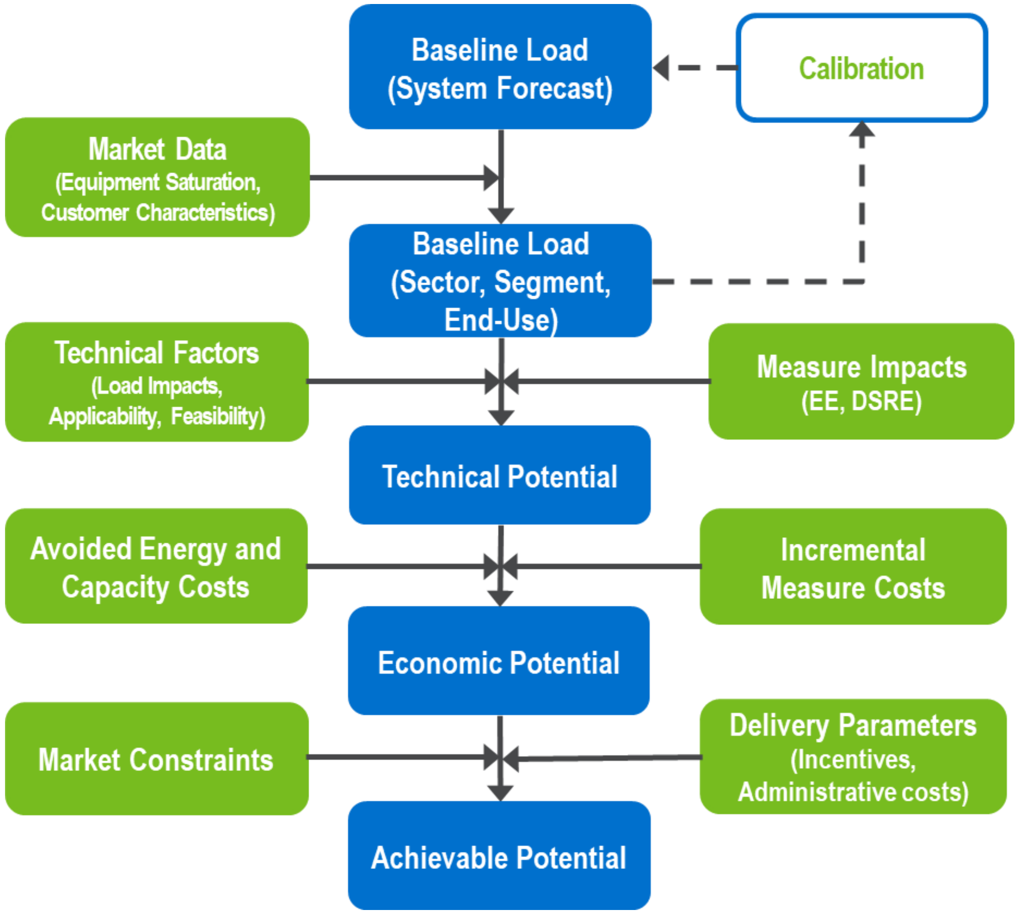
- Achievable Potential is the DSM savings feasible when considering how utility-sponsored program might address market barriers and affect customer adoption of DSM technologies. Nexant did not perform this analysis for TECO.

Quantifying these levels of DSM potential is the result of an analytical process that refines DSM opportunities from the theoretical maximum to realistic measure savings. Nexant's general methodology for estimating DSM market potential is a hybrid "top-down/bottom-up" approach, which 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. Nexant applied customer segmentation and consumption data from each utility and data from secondary sources to describe baseline customer-class and end-use components.
- Collect cost and impact data for measures: For those measures passing the qualitative screening, conduct market research and estimate costs, energy, 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).
- Identify DSM opportunities: DSM opportunities applicable to TECO's climate and customers were analyzed to best depict DSM market potential. Effects for a range of DSM technologies for each end-use could then be examined, while accounting for current market saturations, technical feasibility, measure impacts, and costs.

Figure 2-1 provides an illustration of the MPS process, 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. Nexant 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 2-1: Approach to Market Potential Modeling



Nexant estimated DSM savings based on a combination of market research, analysis, and a review of TECO's existing DSM programs, all in coordination with TECO. Nexant examined the technical potential for EE, DR, and DSRE opportunities; this report is organized to offer detail on each DSM category.

2.2 EE Potential Overview

To estimate EE market potential, this study utilized Nexant's Microsoft Excel-based modeling tool, TEA-POT (Technical / Economic / Achievable POTential). This modeling tool was built on a platform that provides the ability to calculate multiple scenarios and recalculate potential savings based on variable inputs such as sales/load forecasts, electricity prices, discount rates, and actual utility program savings. The model provides transparency into the assumptions and calculations for estimating market potential.

2.3 DR Potential Overview

To estimate DR market potential, Nexant considered customer demand during utility peaking conditions and projected customer response to DR measures. Customer demand was determined by looking at interval data for a sample of each customer segment. For each segment, Nexant determined the portion of a customer's load that could be curtailed during the system peak. Projected customer response to DR measures was developed based on the performance of existing Florida DR programs. If a DR strategy did not currently exist in Florida, other programs in the United States were used as a proxy to estimate the performance of the program if it were implemented in Florida.

2.4 DSRE Potential Overview

The DSRE technologies included in this study are rooftop solar photovoltaic (PV) systems, battery storage systems, and combined heat and power (CHP) systems. Nexant leveraged the customer segmentation and load disaggregation data assembled for the EE and DR analyses and used a "bottom-up" modeling approach to estimate the potential of the various DSRE technologies in the residential, commercial, and industrial sectors. Individual distributed generation models were created for the three DSRE technologies studied to estimate market potential.

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, Nexant 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.

Nexant segmented customers according to the following:

1) By Sector – how much of TECO's energy sales, summer peak, and winter peak load 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 3-1 summarizes the segmentation within each sector. The customer segmentation is discussed in Section 3.1.1. 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 3-1: 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	
	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 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 3-2.

Table 3-2: End-Uses

Residential End-Uses	Commercial End-Uses	Industrial End-Uses
Space heating	Space heating	Process heating
Space cooling	Space cooling	Process cooling
Domestic hot water	Domestic hot water	Compressed air
Ventilation and circulation	Ventilation and circulation	Motors/pumps
Lighting	Interior lighting	Fan, blower motors
Cooking	Exterior lighting	Process-specific
Appliances	Cooking	Industrial lighting
Electronics	Refrigeration	Exterior lighting
Miscellaneous	Office equipment	HVAC
	Miscellaneous	Other

For DR, the end-uses targeted were those with controllable load for residential customers (*i.e.* HVAC, water heaters, and pool pumps) and small C&I customers (HVAC). For large C&I customers, all load during peak hours was included assuming these customers would potentially would 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 are current DSM offerings reflected in the energy and demand forecast?
- What are the assumed weather conditions and hour(s) of the day when the system is projected to peak?
- How much of the load forecast is attributable to customers that are 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?
- If separate forecasts are not developed by region or sector, are there trends in the load composition that Nexant should account for in the study?

3.1.2.1 Electricity Consumption (kWh) Forecast

Nexant segmented the TECO 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. Nexant developed these forecasts for the years 2020-2029, and based it on data provided by TECO, primarily their 2017 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, Nexant developed a list of electricity end-uses by sector (Table 3-2). To develop this list, Nexant began with TECO's estimates of average end-use consumption by customer and sector. Nexant combined these data with other information, such as utility residential appliance saturation surveys, to develop estimates of customers' baseline consumption. Nexant 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, Nexant 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 2020 sales by end-use:

Residential sector:

- The disaggregation was based on TECO 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.
    - Nexant made conversions to usage estimates generated by applying utility-provided residential appliance saturation surveys (RASS) and EIA end-use modeling estimates.

Commercial sector:

- The disaggregation was based on TECO 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.

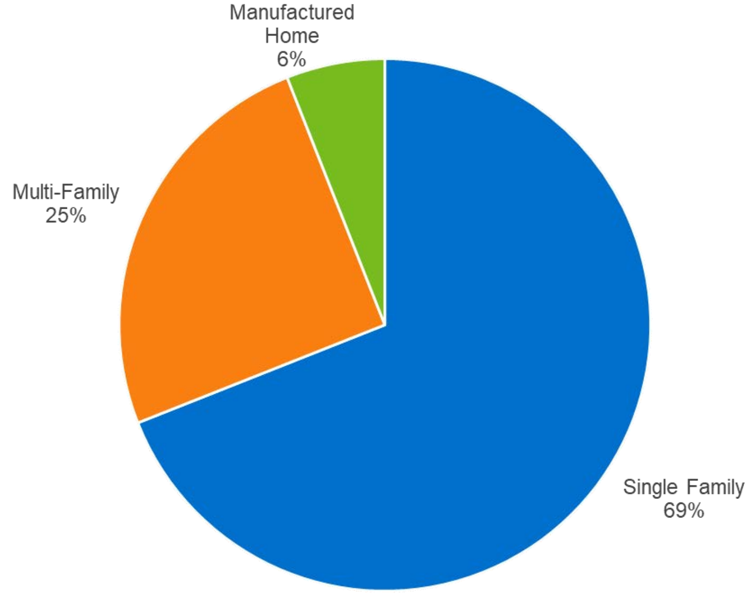
3.2 Analysis of Customer Segmentation

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 Nexant with data concerning the premise type and loads characteristics for all customers for the MPS analysis. Nexant examined the provided data from multiple perspectives to identify customer segments. Nexant's approach to segmentation varied slightly for non-residential and residential customers, but the overall logic was consistent with the concept of expressing the customers in terms that were relevant to DSM opportunities.

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

Segmentation of residential customer accounts enabled Nexant to align DSM opportunities with appropriate DSM measures. Nexant 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 3-1.

Figure 3-1: Residential Customer Segmentation



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

For the EE and DSRE analysis, Nexant segmented C&I customers 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. Nexant 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. Nexant 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 Nexant applied are shown below in Figure 3-2 and Figure 3-3.

Figure 3-2: Commercial Customer Segmentation

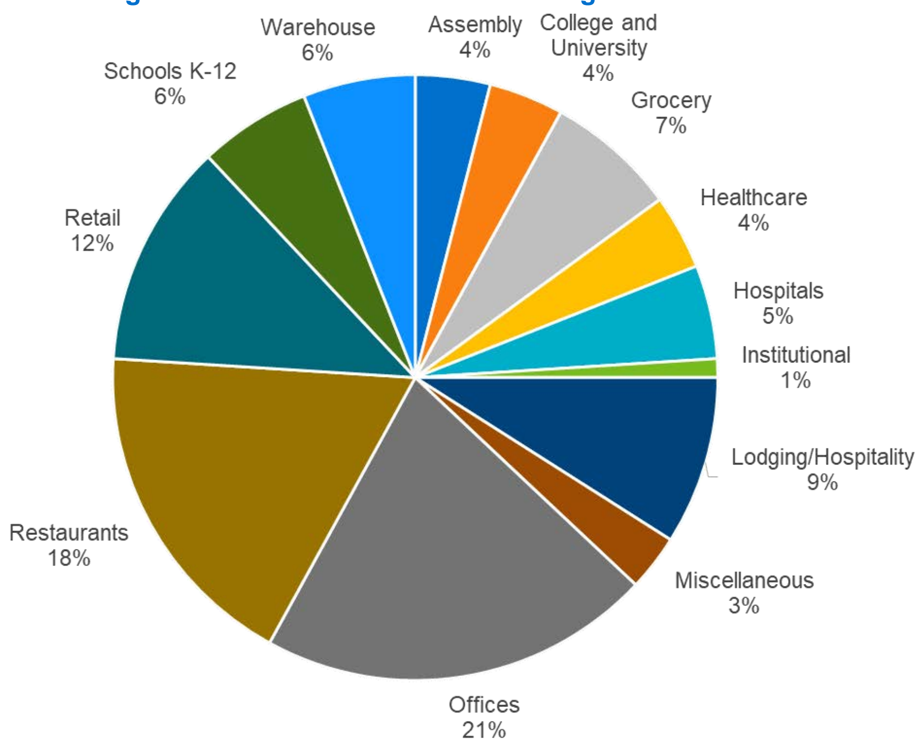
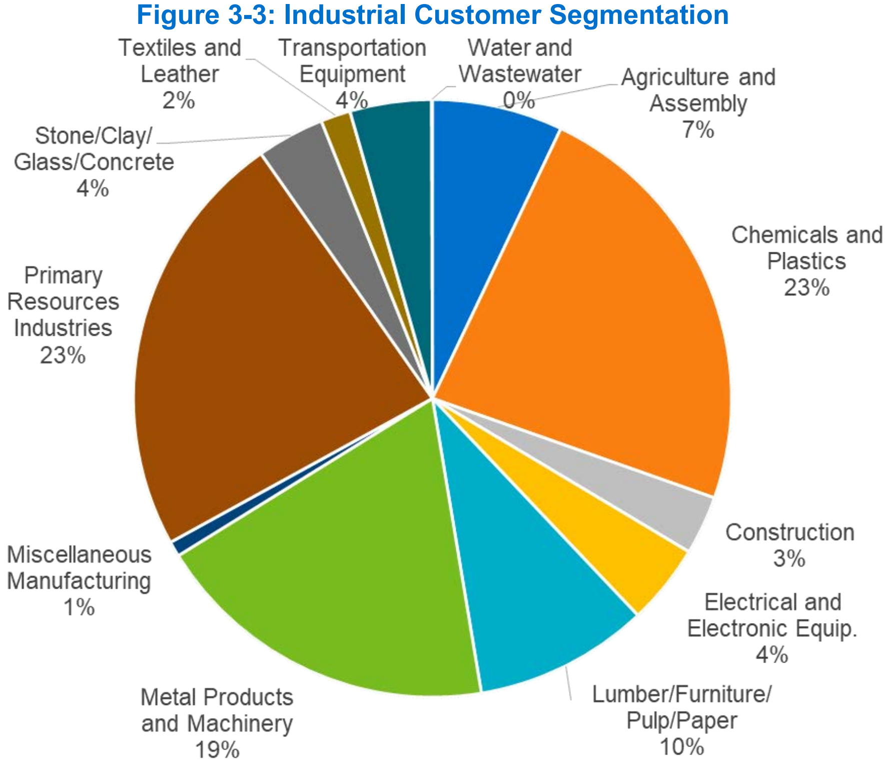


Figure 3-3: Industrial Customer Segmentation



3.2.3 Commercial and Industrial Customers (DR Analysis)

For the DR analysis, Nexant 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[3]. Nexant 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 3-3 shows the account breakout between small C&I and large C&I.

Table 3-3: Summary of Customer Classes for DR Analysis

Customer Class	Annual kWh	Number of Accounts
Small C&I	0-15,000 kWh	43,096
	15,001-25,000 kWh	9,401
	25,001-50,000 kWh	9,062
	50,001 kWh +	3,289
	Total	64,848
Large C&I	0-50 kW	8,294
	51-300 kW	6,173
	301-500 kW	702
	501 kW +	702
	Total	15,841

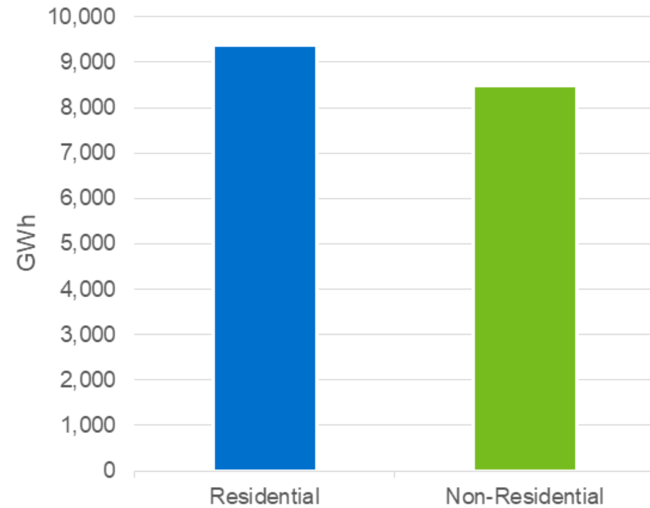
3.3 Analysis of System Load

3.3.1 System Energy Sales

Technical potential is based on TECO's load forecast for the year 2020 from their 2017 Ten Year Site Plan, which is illustrated in Figure 3-4.

[3] To be eligible, customers cannot have annual usage less than 9,000 kWh.

Figure 3-4: 2020 Electricity Sales Forecast by Sector



3.3.2 System Demand

To determine the technical potential for DR, Nexant 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 all 8,760 hours of the most recent five years leading up to the study (2011-2016). The utility summer and winter peaks were then identified within the utility-defined peaking conditions. For TECO the summer peaking conditions were defined as July and August from 5:00-6:00 PM and the winter peaking conditions were defined as January and February 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 loads for the base year 2020 by sector and end-use are summarized in Figure 3-5, Figure 3-6 and Figure 3-7.

Figure 3-5: Residential Baseline (2020) Energy Sales by End-Use

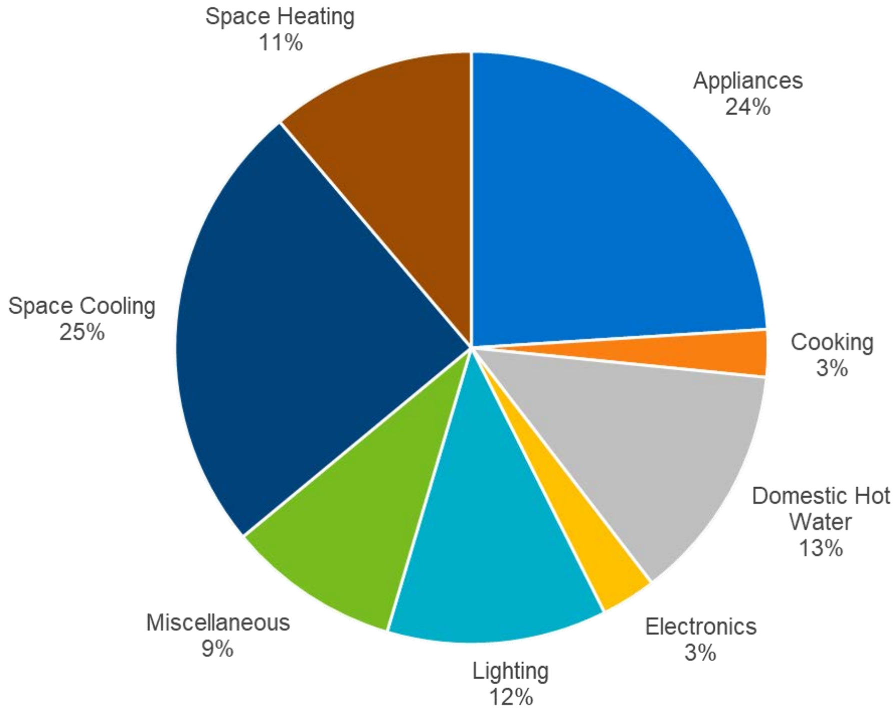


Figure 3-6: Commercial Baseline (2020) Energy Sales by End-Use

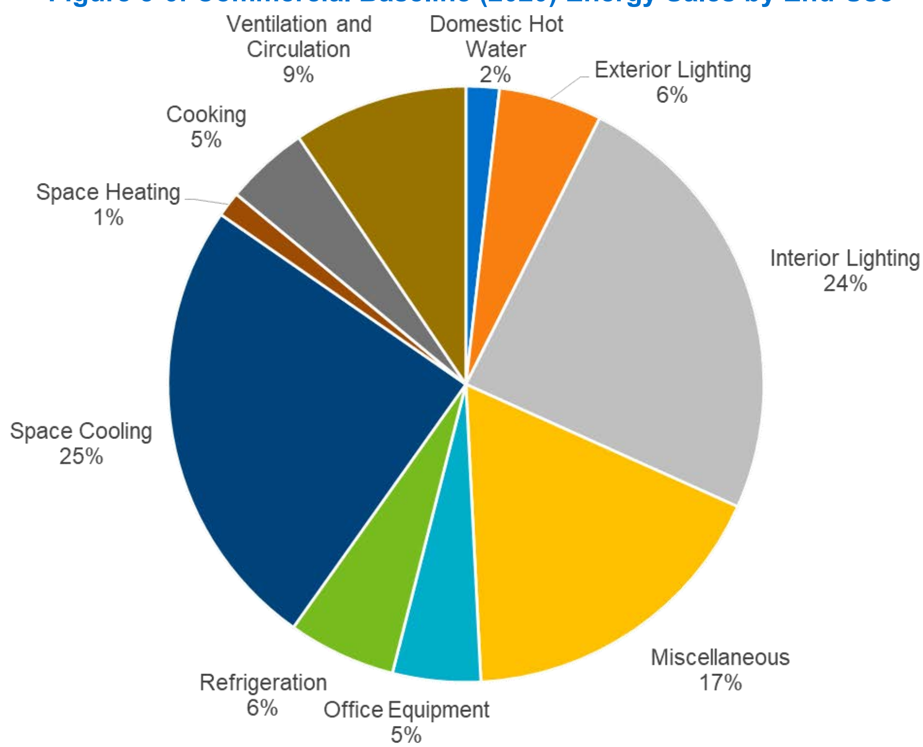
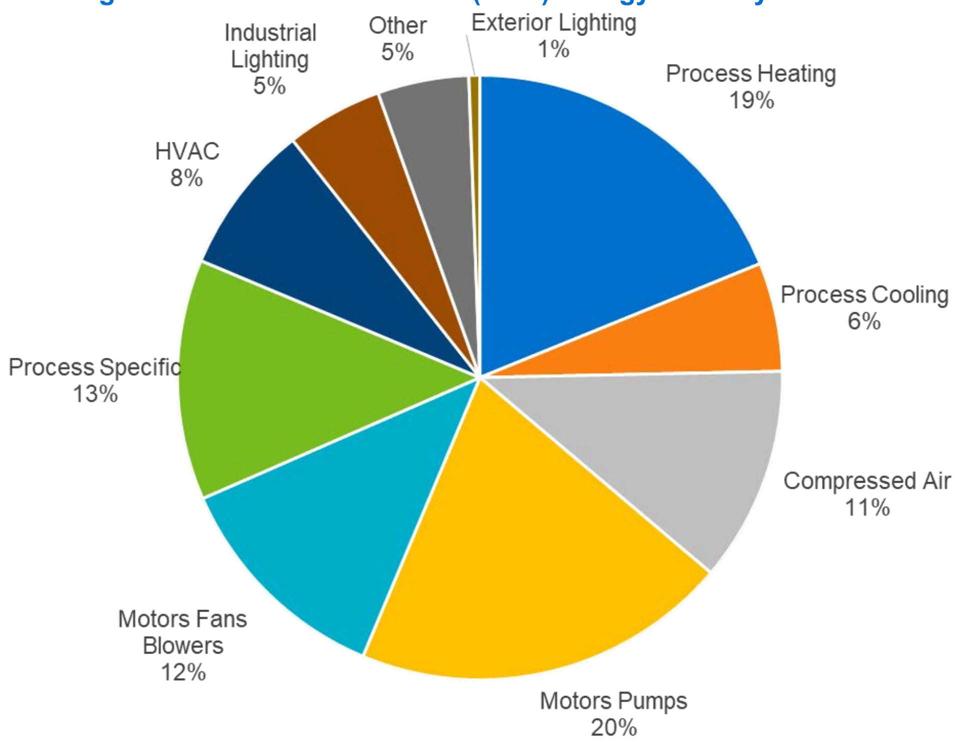


Figure 3-7: Industrial Baseline (2020) Energy Sales by End-Use



4 DSM Measure Development

Market 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

Nexant 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 2014 Goals docket. This list was then adjusted based on proposed measure additions and revisions provided by the FEECA Utilities. Nexant further refined the measure list based on reviews of Nexant's DSM measure library, compiled from similar market potential studies conducted in recent years throughout the United States, including recent studies for Georgia Power Company and Duke Energy Carolinas, as well as measures included in other utility programs where Nexant is involved with program design, implementation, or evaluation. In addition, Nexant evaluated whether each measure had the appropriate data available to estimate impacts in the potential analyses. A draft version of the measure list was shared with interested parties Earthjustice/Southern Alliance for Clean Energy (SACE) for Nexant and the FEECA Utilities to gather and consider their input. The results of that consideration were provided to Earthjustice/SACE and later shared with the Florida Public Service Commission Staff (Staff) and all other interested parties at an informal meeting held by Staff. 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:

- Applicability and commercial availability of EE technologies in Florida. 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[1]. 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 are not allowed to be counted 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, behavioral measure savings may be obtained in part from the installation of EE technologies, which would overlap with other EE measures included in the study.

Upon development of the final EE measure list, a Microsoft Excel workbook was developed for each measure to quantify measure inputs necessary for assessment of the measure's potential and cost-effectiveness. Relevant inputs included the following:

- Measure description: measure classification by type, end-use, and subsector, and description of the base-case scenario.
- kWh savings: Energy savings associated with each measure were developed through engineering algorithms or building simulation modeling, taking weather zones and customer segments into consideration as appropriate. Reference sources used for developing residential and commercial measure savings included a variety of Florida-specific, as well as regional and national sources, such utility-specific measurement & verification (M&V) data, technical reference manuals (TRM) from other jurisdictions, ENERGY STAR calculators, and manufacturer or retailer specifications on particular products. Industrial measure savings were primarily based on Department of Energy's (DOE) Industrial Assessment Center database, using assessments conducted in the Southeast region, as well as TRMs, utility reference data, and Nexant DSM program experience.

  Energy savings were applied in Nexant'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, and other regional and national measure databases and EE program evaluations

[1] As the study is being used to inform 2020-2029 DSM planning, for applicable lighting technologies, the baseline lighting standard is compliant with the 2020 EISA backstop provision.

- 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, RSMeans database, and other secondary sources.
- Measure Applicability: 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 primarily derived from data in current regional and national databases, as well as TECO's program tracking data. These factors are described in Table 4-1.

Table 4-1: 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 4-2, the measure list includes 248 unique energy-efficiency measures. Expanding the measures to account for all appropriate combinations of segments, end-uses, and construction types resulted in 4,164 measure permutations.

Table 4-2: EE Measure Counts by Sector

Sector	Unique Measures	Permutations
Residential	91	546
Commercial	127	3,298
Industrial[2]	30	320

[2] Due to the heterogeneous nature of the Industrial sector, including variations in equipment, operating schedule, process loads, and other segment-specific characteristics, the unique industrial measures encompass multiple individual equipment and technology improvements. Savings estimates for industrial measures reflect the implementation of these various individual improvements as summarized in the measure list in Appendix A.

4.3 DR Measures

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

- **Direct Load Control.** Customers receive incentive payments for allowing the utility to control their selected equipment, 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) 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, Nexant did not break out results by measure because all of the developed measures target the end uses estimated for technical potential.

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[3].

[3] This study did not include ground-mounted or utility-scale solar PV installations as these were determined to often not be connected to customer premise metering and therefore outside the scope of this analysis.

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 steam or hot water to meet 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 2020 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 savings potential when all technically feasible DSM measures are implemented at their full market potential 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 commercially available DSM measures to all residential, commercial, and industrial customers in the utility's service territory.

5.1 Methodology

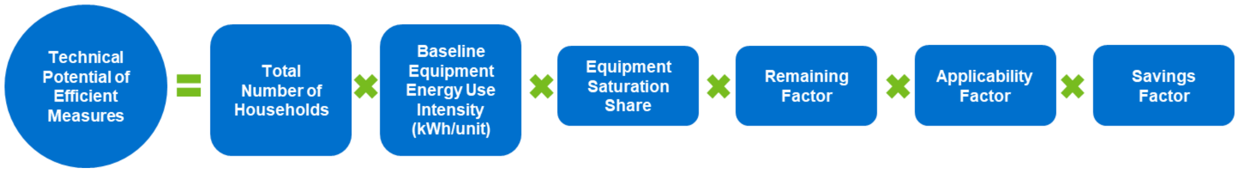
5.1.1 EE Technical Potential

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 Nexant 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 5-1 below, while the core equation used in the nonresidential sector technical potential analysis for each individual efficiency measure is shown in Equation 5-2.

Equation 5-1: Core Equation for Residential Sector 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.

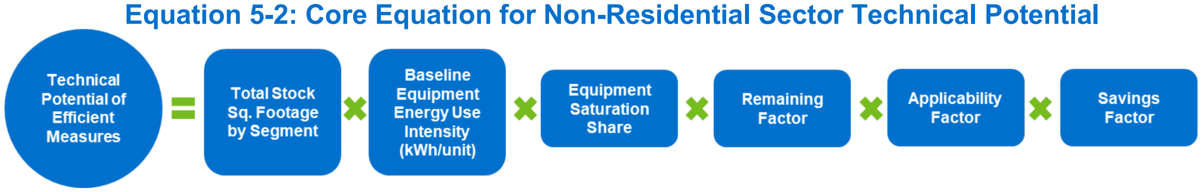
Equipment Saturation Share = the fraction of the end-use electrical energy that is applicable for the efficient technology in a given market segment. For example, for residential cooling, the saturation share would be the fraction of all residential electric customers that have central air conditioners in their household.

Remaining Factor = 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 the most energy efficient technology.

Applicability 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 5-2: Core Equation for Non-Residential Sector 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.

Equipment Saturation Share = 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.

Remaining Factor = the fraction of equipment that is not considered to already be energy efficient.

Applicability 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. Nexant reported the technical potential for 2020, based on currently known DSM measures and observed electricity consumption patterns.

Measure Interaction and Competition

While the technical potential equations listed above focus on the technical potential of a single measure or technology, Nexant's 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, Nexant's 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: 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

Because the anticipated impacts of efficiency actions that may be taken even in the absence of utility intervention are included in the baseline forecast, savings due to naturally-occurring EE were considered separately in the potential estimates. Nexant verified with TECO's forecasting group to ensure that the 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. While some changes have relatively little impact on overall sales, others—particularly the Energy Independence and Security Act (EISA) and other federal legislation—will have noticeable influence.
- **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 potential study estimated the net penetration rates, representing the difference between the anticipated adoption of efficiency measures as a result of DSM efforts and the "business as usual" adoption rates absent DSM intervention. This is true even in the technical potential, where adoption was assumed to be 100%.

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 customers generally do not provide the utility with direct control over particular end-uses. Instead, many of these customers will forego virtually all 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. Nexant's approach used for load disaggregation is more advanced than what is used for most potential studies. Instead of disaggregating annual consumption or peak demand, Nexant produced end-use load disaggregation for all 8760 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, Nexant 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.

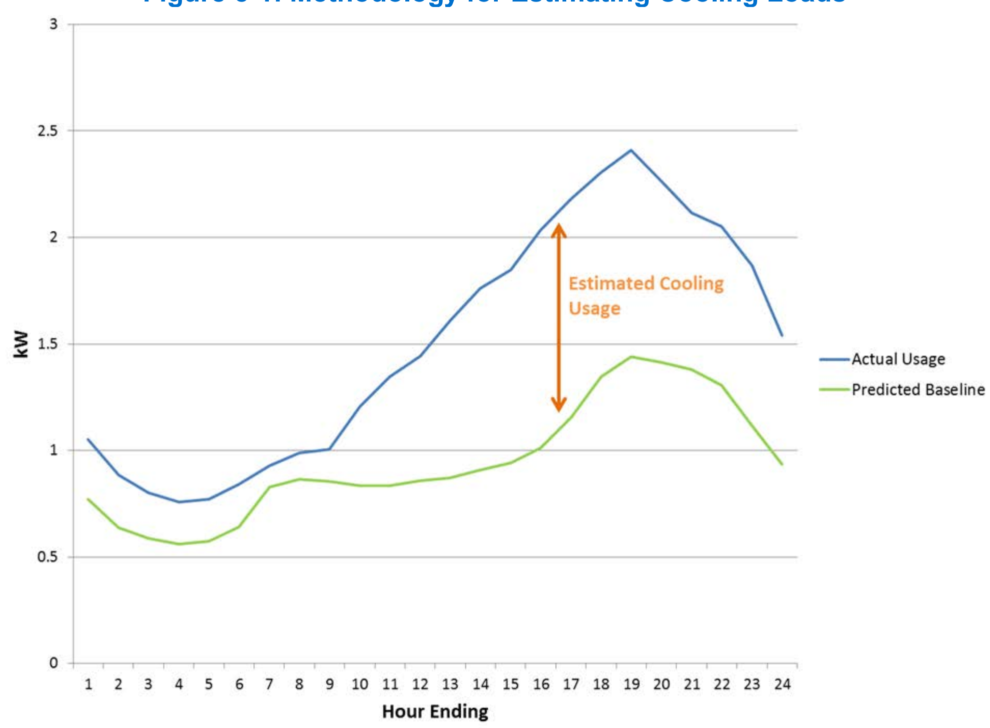
Technical potential, in the context of DR, is defined as the total amount of load available for reduction that is coincident with the period of interest; in this case, the system peak hour for the summer and winter seasons. Thus, two sets of capacity values are estimated: a summer capacity and a winter 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, and water heaters. 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 interval data from a sample of customers provided by TECO. This sample included a customer breakout based on size and housing type for each rate class. Nexant 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 5-1 (a similar methodology was used to predict heating loads).

Figure 5-1: 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 CPS Energy's Home Manager DR program.

For all eligible loads, the technical potential was defined as the amount that was coincident with system peak hours for each season, which are July and August from 5:00-6:00 PM for summer, and January and February 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.

In order to account for existing utility DR programs, all customers currently enrolled in a DR offering were excluded from the technical potential. This methodology was consistent across all three sectors.

5.1.3 DSRE Technical Potential

5.1.3.1 PV Systems

To determine technical potential for PV systems, Nexant 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. Relevant parameters included number of facilities, average number of floors, and average premises square footage.
- Step 2: The total available roof area feasible for installing PV systems was calculated. Relevant parameters included share of pitched and flat roofs and unusable area due to other rooftop equipment.
- Step 3: Estimated the expected power density (kW per square foot of roof area).
- Step 4: Using PVWatts[7], secondary research, and M&V evaluations of PV systems, Nexant used its technical potential PV calculator to calculate energy generation/savings using researched system capacity factors.

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

Equation 5-3: Core Equation for Solar Technical Potential

$$\text{Technical Potential of PV Systems} = \text{Usable PV Area} \times \text{PV Density / 1000} \times \text{Capacity Factor} \times \text{Energy Savings Factor}$$

[7] PVWatts estimates PV energy production and costs. Developed by the National Renewable Energy Laboratory. http://pvwatts.nrel.gov/

Where:

Usable PV Area for Residential: (Total Floor Area[8] / Average No. of Stories[9]) x ((% of Sloped Roofs x Usable Area of Sloped Roofs) + (% of Flat Roofs x Usable Area of Flat Roofs))

Usable PV Area for Commercial: Total Floor Area[10] x ((% of Sloped Roofs x Usable Area of Sloped Roofs) + (% of Flat Roofs x Usable Area of Flat Roofs))

PV Density (Watts/Square foot): Maximum power generated in Watts per square foot of solar panel.

Capacity Factor: Annual Energy Generation Factor for PV

Energy Savings Factor: AC Energy Conversion factor for each kW of the system, obtained from PV Watts. Energy Savings Factor = Alternating Current System Output (kWh)/ Direct Current System Size (kW)

5.1.3.2 Battery Storage 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. 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:

- Develop an 8,760 hour annual load shape for a PV system based on estimated annual hours of available sunlight.

[8] Utility-provided data and US Census, South Region

[9] Single Family = RECS, South Atlantic Region; Multi-Family = US Census, South Region
https://www.census.gov/construction/chars/mfu.html

[10] Floor space = based on utility data. Average floors by building type = Commercial Building Energy Consumption Survey (CBECS), South Atlantic Region

- Compare the PV generation with a total home or total business 8,760 hour annual load shape to determine the hours that the full solar energy is used and the hours where excess solar power is generated.
- Develop a battery charge/discharge 8,760 load profile to identify available stored load during summer and winter peak periods, which was applied as the technical potential.

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, Nexant 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, Nexant used the utility-provided customer data with NAICS or SIC codes as well as annual consumption data, and categorized all non-residential customers 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. 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 coupled with PV, 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 5-1 summarizes the EE technical potential by sector:

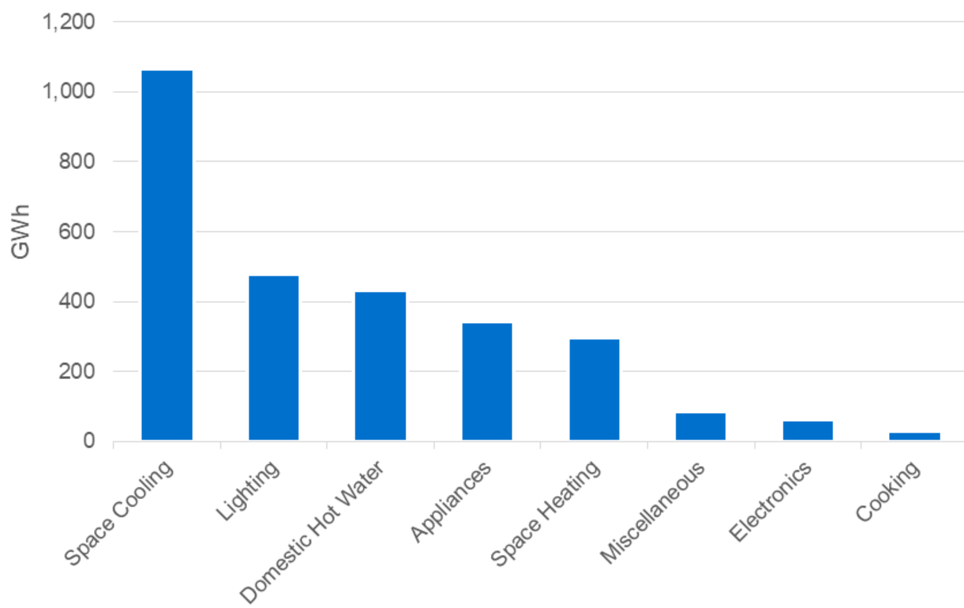
Table 5-1: EE Technical Potential by Sector

	Savings Potential		
	Summer Peak Demand (MW)	Winter Peak Demand (MW)	Energy (GWh)
Residential	755	388	2,791
Non-Residential[11]	383	195	1,691
Total	1,138	583	4,483

5.2.2 Residential

Figure 5-2, Figure 5-3, and Figure 5-4 summarize the residential sector EE technical potential by end-use.

Figure 5-2: Residential EE Technical Potential by End-Use (Energy Savings)



[11] Non-Residential results include all commercial and industrial customer segments

Figure 5-3: Residential EE Technical Potential by End-Use (Summer Peak Savings)

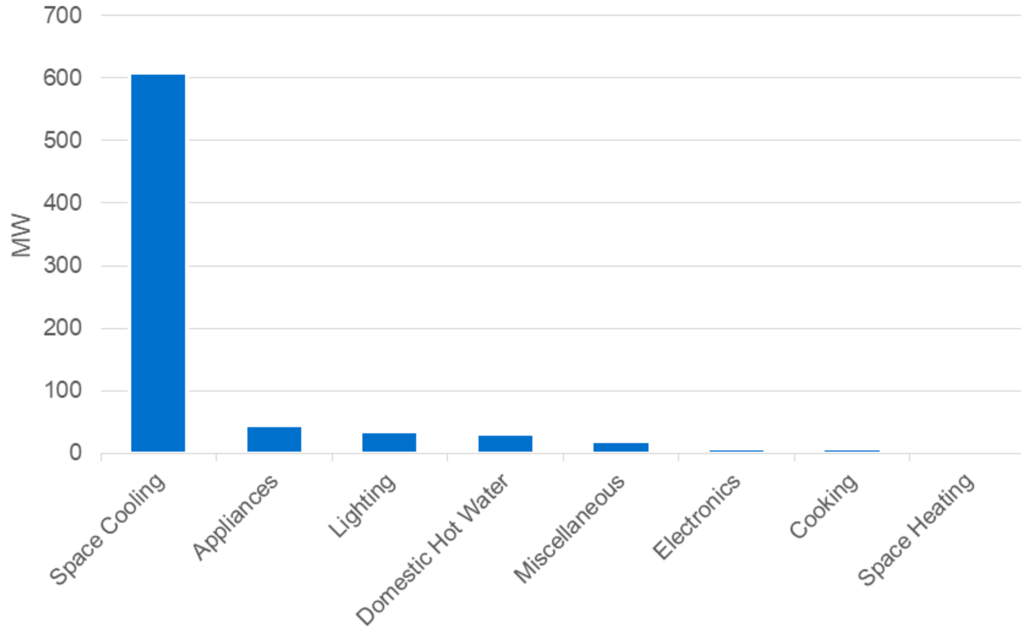
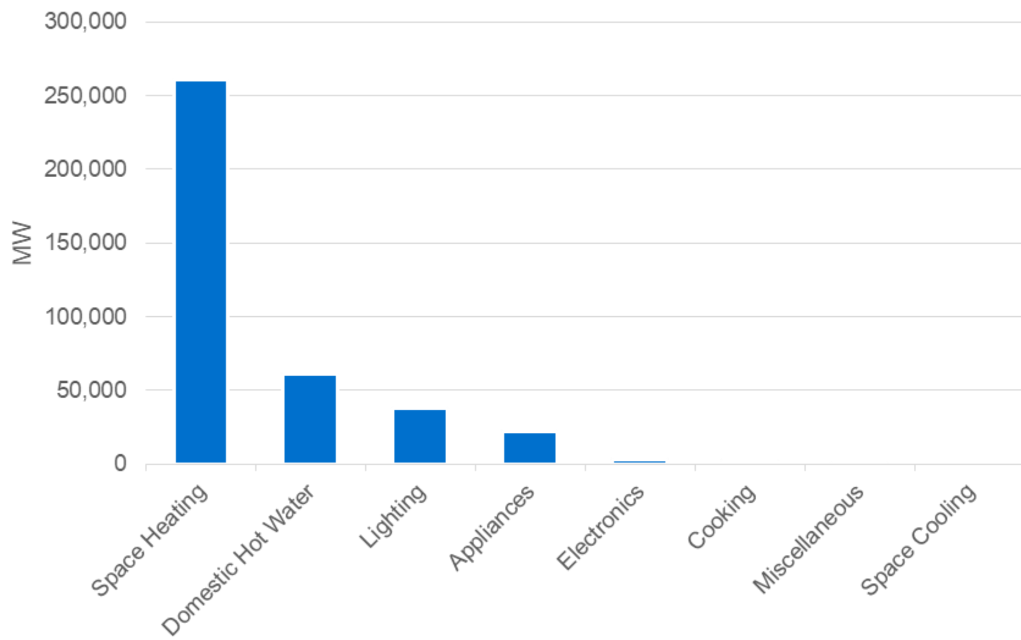


Figure 5-4: Residential EE Technical Potential by End-Use (Winter Peak Savings)



5.2.3 Non-Residential

5.2.3.1 Commercial Segments

Figure 5-5, Figure 5-6, and Figure 5-7 summarize the commercial EE technical potential by end-use.

Figure 5-5: Commercial EE Technical Potential by End-Use (Energy Savings)

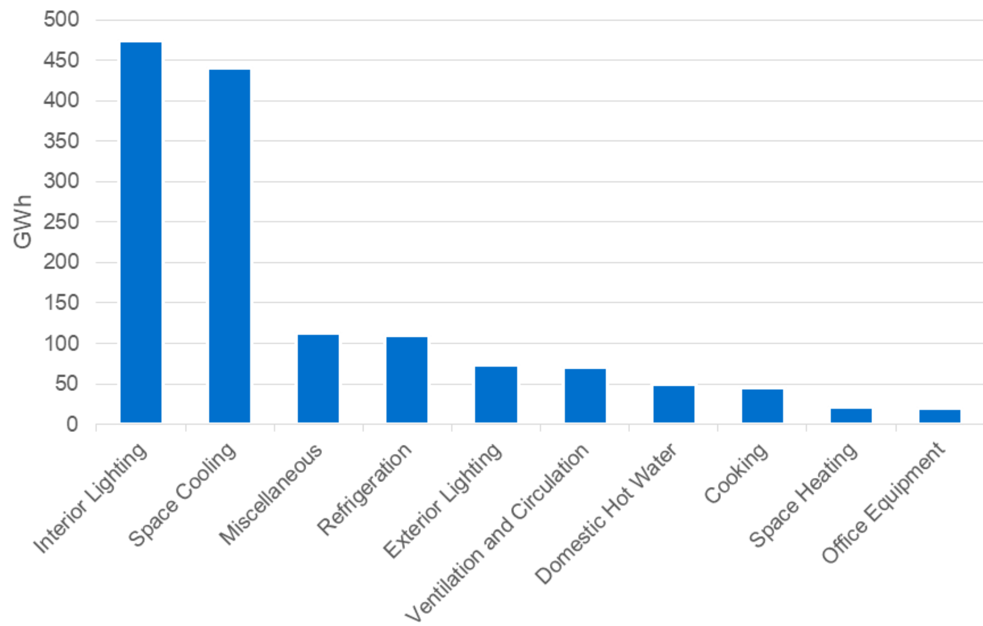


Figure 5-6: Commercial EE Technical Potential by End-Use (Summer Peak Savings)

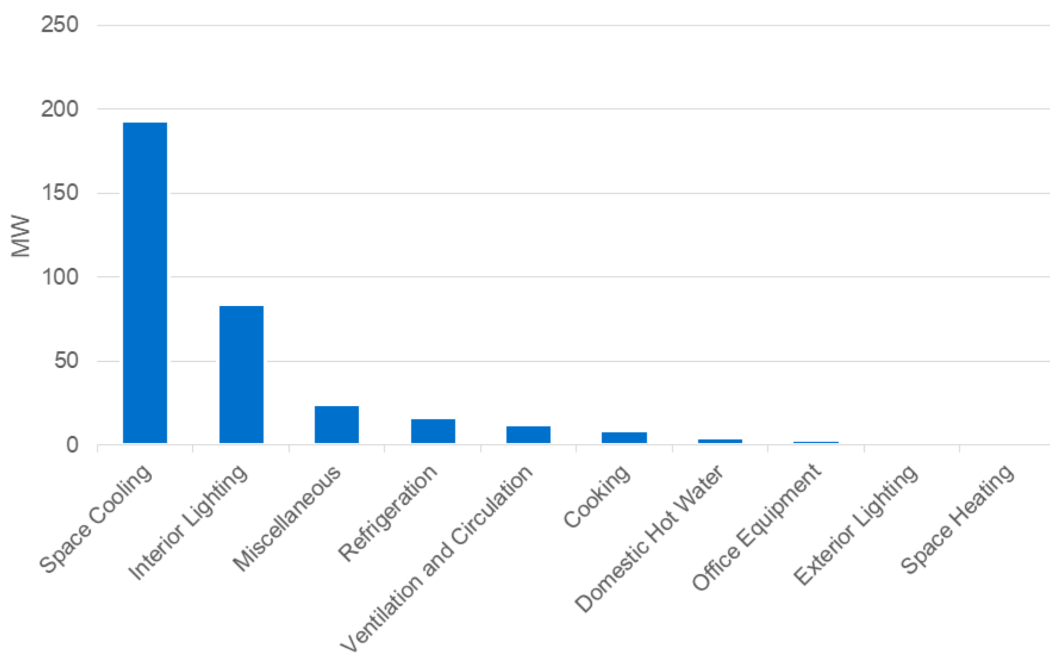
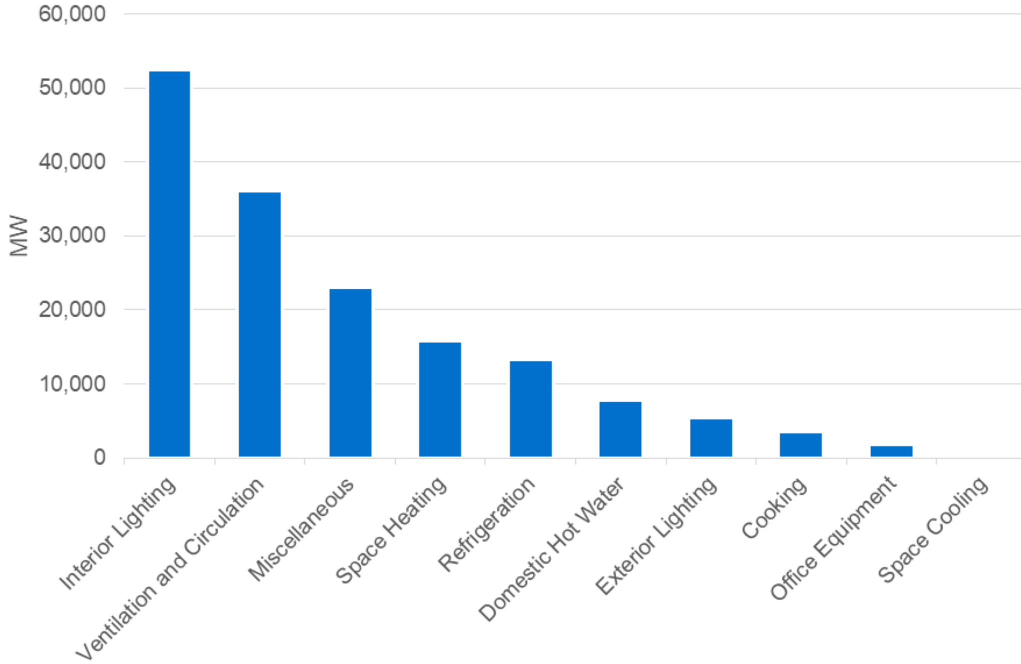


Figure 5-7: Commercial EE Technical Potential by End-Use (Winter Peak Savings)



5.2.3.2 Industrial Segments

Figure 5-8, Figure 5-9, and Figure 5-10 summarize the industrial EE technical potential by end-use.

Figure 5-8: Industrial EE Technical Potential by End-Use (Energy Savings)

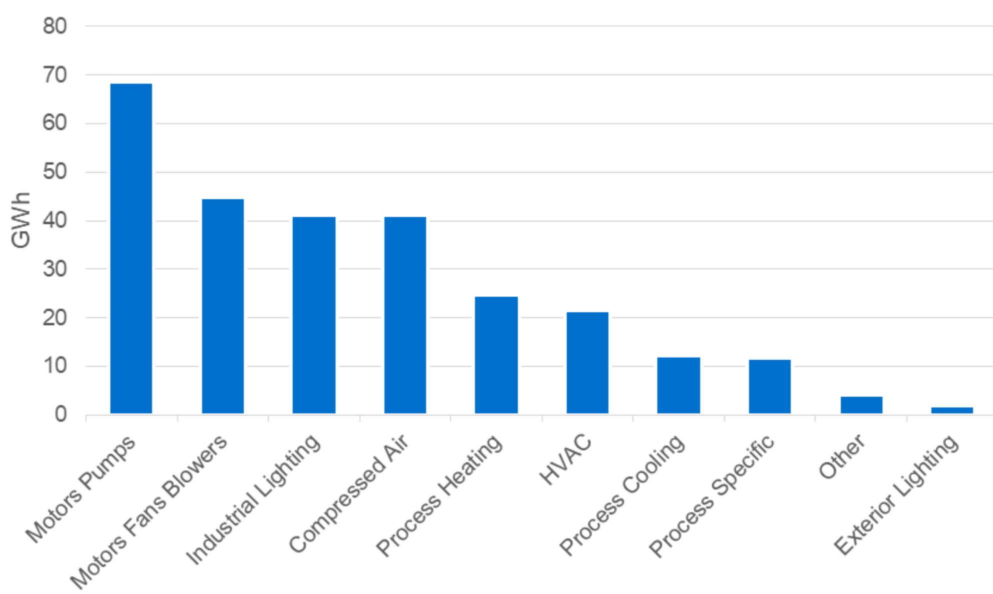


Figure 5-9: Industrial EE Technical Potential by End-Use (Summer Peak Savings)

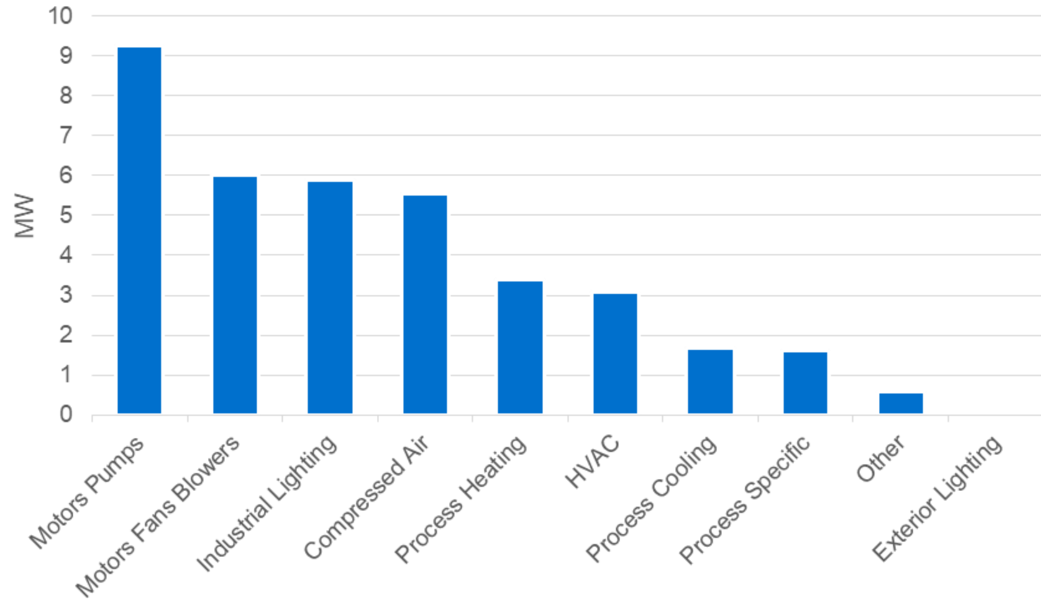
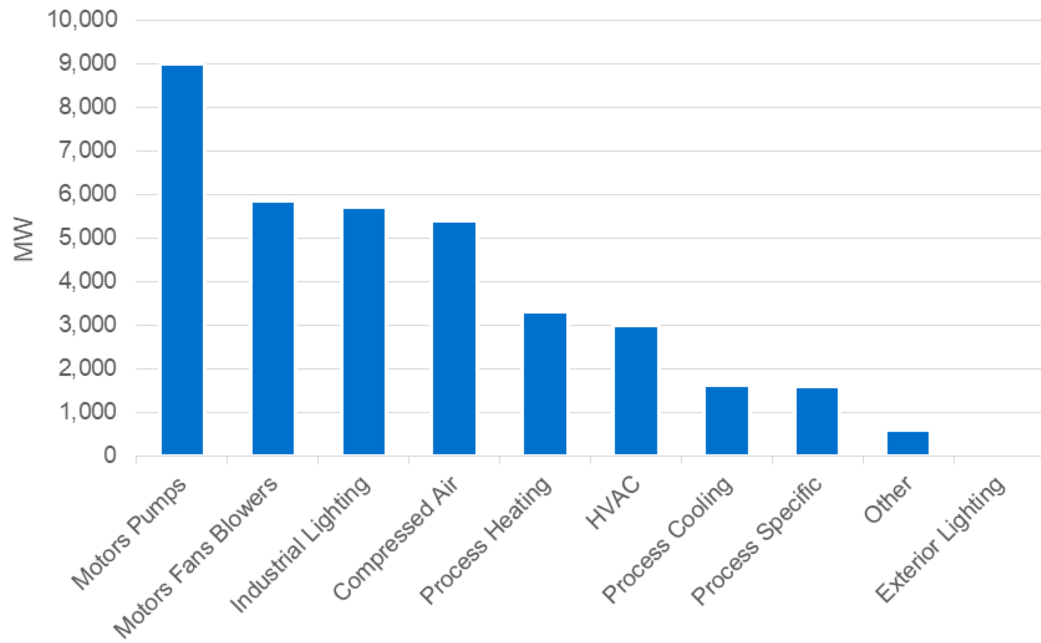


Figure 5-10: Industrial EE Technical Potential by End-Use (Winter Peak Savings)



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 5-2 summarizes the seasonal DR technical potential by sector:

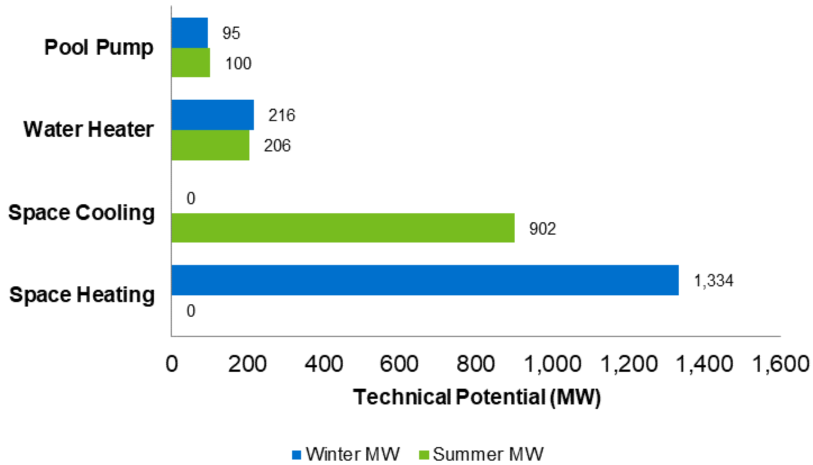
Table 5-2: DR Technical Potential by Sector

	Savings Potential	
	Summer Peak Demand (MW)	Winter Peak Demand (MW)
Residential	1,208	1,645
Non-Residential	1,191	673
Total	2,398	2,318

5.3.1 Residential

Residential technical potential is summarized in Figure 5-11.

Figure 5-11: Residential DR Technical Potential by End-Use (Incremental to Existing)[12]

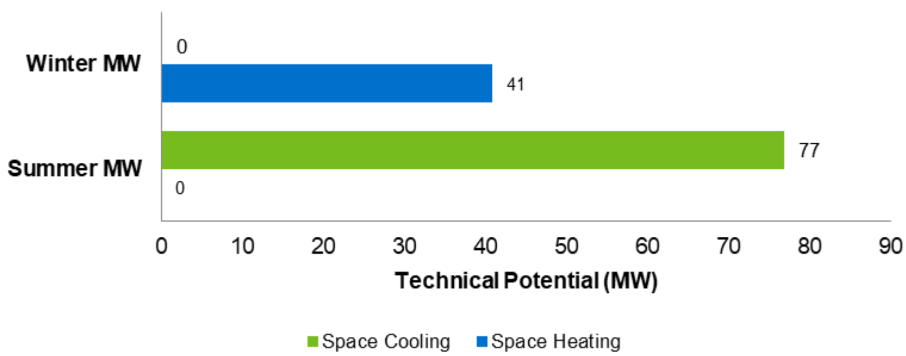


5.3.2 Non-Residential

5.3.2.1 Small C&I Customers

For small C&I technical potential looked at cooling and heating loads only. Small C&I technical potential is provided in Figure 5-12.

Figure 5-12: Small C&I DR Technical Potential by End-Use (Incremental to Existing)[13]



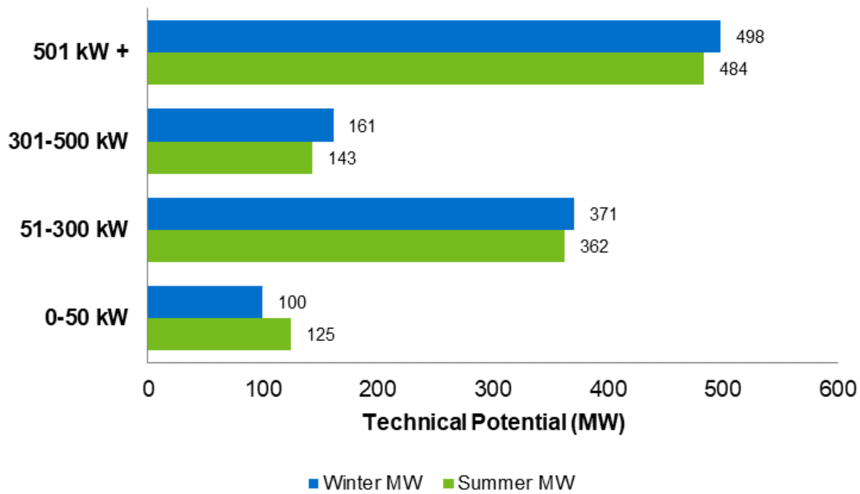
[12] All currently enrolled DR customers are excluded

[13] All currently enrolled DR customers are excluded

5.3.2.2 Large C&I Customers

Figure 5-13 provides the technical potential for large C&I customers, broken down by customer size.

Figure 5-13: Large C&I DR Technical Potential by Segment (Incremental to Existing)[14]



[14] All currently enrolled DR customers are excluded

5.4 DSRE Technical Potential

Table 5-3 provides the detailed results of the DSRE technical potential.

Table 5-3: DSRE Technical Potential[15]

	Savings Potential		
	Summer Peak Demand (MW)	Winter Peak Demand (MW)	Energy (GWh)
PV Systems			
Residential	509	19	3,461
Non-Residential	835	31	5,679
Total	1,344	50	9,140
Battery Storage charged from PV Systems			
Residential	214	211	-
Non-Residential	1	-	-
Total	216	211	-
CHP Systems			
Total	656	358	3,126

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

6 Appendices

Appendix A EE MPS Measure List

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

Measures that are new for the 2019 MPS are indicated with an asterisk.

A.1 Residential Measures

Measure	End-Use	Description	Baseline
Energy Star Clothes Dryer	Appliances	One Electric Resistance Clothes Dryer meeting current ENERGY STAR® Standards	One Clothes Dryer meeting Federal Standard
Energy Star Clothes Washer	Appliances	One Clothes Washer meeting current ENERGY STAR® Standards	One Clothes Washer meeting Federal Standard
Energy Star Dishwasher	Appliances	One Dishwasher meeting current ENERGY STAR® Requirements	One Dishwasher meeting Federal Standard
Energy Star Freezer	Appliances	One Freezer meeting current ENERGY STAR® Standards	One Freezer meeting Federal Standard
Energy Star Refrigerator	Appliances	One Refrigerator meeting current ENERGY STAR® Standards	One Refrigerator meeting Federal Standard
Heat Pump Clothes Dryer*	Appliances	One Heat Pump Clothes Dryer	One Clothes Dryer meeting Federal Standard
Removal of 2nd Refrigerator-Freezer	Appliances	No Refrigerator	Current Market Average Refrigerator
High Efficiency Convection Oven*	Cooking	One Full-Size Convection Oven meeting current ENERGY STAR® Standards	One Standard Economy-Grade Full-Size Oven
High Efficiency Induction Cooktop*	Cooking	One residential induction cooktop	One standard residential electric cooktop
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
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
Heat Pump Water Heater	Domestic Hot Water	Heat Pump Water Heater (EF=2.50)	Code-Compliant 50 Gallon Electric Resistance Water Heater
Heat Trap	Domestic Hot Water	Heat Trap	Existing Water Heater without heat trap
Hot Water Pipe Insulation	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
Instantaneous Hot Water System*	Domestic Hot Water	Instantaneous Hot Water System	Standard Efficiency Storage Tank Water Heater
Low Flow Showerhead	Domestic Hot Water	Low-Flow Handheld Showerhead, Flow Rate: 1.50 gpm	Standard Handheld Showerhead, Flow Rate: 2.50 gpm
Solar Water Heater	Domestic Hot Water	Solar Powered 50 Gallon Electric Resistance Water Heater (EF = 1.84)	Code-Compliant 50 Gallon Electric Resistance Water Heater
Thermostatic Shower Restriction Valve*	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
Water Heater Blanket	Domestic Hot Water	50 Gallon Electric Resistance Water Heater with Insulated Tank Wrap (R-11)	Market Average 50 Gallon Electric Resistance Water Heater, No Tank Wrap
Water Heater Thermostat Setback	Domestic Hot Water	50 Gallon Electric Resistance Water Heater with Temperature Set-point of 125°F	Market Average 50 Gallon Electric Resistance Water Heater, Temp. Set-point = 130°F
Water Heater Timeclock	Domestic Hot Water	Water Heater Timeclock	Existing Water Heater without time clock

Measure	End-Use	Description	Baseline
Energy Star Air Purifier*	Electronics	One 120 CFM Air Purifier meeting current ENERGY STAR® Standards	One Standard Air Purifier
Energy Star Audio-Video Equipment	Electronics	One DVD/Blu-Ray Player meeting current ENERGY STAR® Standards	One Market Average DVD/Blu-Ray Player
Energy Star Imaging Equipment*	Electronics	One imaging device meeting current ENERGY STAR® Standards	One non-ENERGY STAR® imaging device
Energy Star Personal Computer	Electronics	One Personal Computer (desktop or laptop) meeting current ENERGY STAR® Standards	One non-ENERGY STAR® Personal Computer
Energy Star TV	Electronics	One Television meeting current ENERGY STAR® Standards	One non-ENERGY STAR® Television
Smart Power Strip	Electronics	Smart plug strips for entertainment centers and home office	Standard entertainment center or home office usage, no smart strip controls
CFL - 15W Flood	Lighting	CFL (assume 15W) replacing EISA-2020 compliant baseline lamp (65w flood)	EISA-2020 compliant baseline lamp (65W flood)
CFL - 15W Flood (Exterior)	Lighting	CFL (assume 15W) replacing EISA-2020 compliant baseline lamp (65w flood)	EISA-2020 compliant baseline lamp (65W flood)
CFL-13W	Lighting	CFL (assume 13W) replacing EISA-2020 compliant baseline lamp (60w equivalent)	EISA-2020 compliant baseline lamp (60W equivalent)
CFL-23W	Lighting	CFL (assume 23W) replacing EISA-2020 compliant baseline lamp (100w equivalent)	EISA-2020 compliant baseline lamp (100W equivalent)
Exterior Lighting Controls*	Lighting	Timer on Outdoor Lighting, Controlling 120 Watts	120 Watts of Lighting, Manually Controlled
Interior Lighting Controls*	Lighting	Switch Mounted Occupancy Sensor, 120 Watts Controlled	120 Watts of Lighting, Manually Controlled
LED - 14W	Lighting	LED (assume 14W) replacing EISA-2020 compliant baseline lamp (100w equivalent)	EISA-2020 compliant baseline lamp (100W equivalent)
LED - 9W	Lighting	LED (assume 9W) replacing EISA-2020 compliant baseline lamp (60w equivalent)	EISA-2020 compliant baseline lamp (60W equivalent)
LED - 9W Flood	Lighting	LED (assume 9W) replacing EISA-2020 compliant baseline lamp (65w flood)	EISA Compliant Halogen Lamp
LED - 9W Flood (Exterior)	Lighting	LED (assume 9W) replacing EISA-2020 compliant baseline lamp (65w flood)	EISA Compliant Halogen Lamp
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 Wattage T8 Fixture	Lighting	Low Wattage (28w) T8 Lamps in Linear Fluorescent Fixture	Standard (32w) T8 lamps in Linear Fluorescent Fixture
Energy Star Bathroom Ventilating Fan*	Miscellaneous	Bathroom Exhaust Fan meeting current ENERGY STAR Standards	Bathroom Exhaust Fan meeting Federal Standard
Energy Star Ceiling Fan*	Miscellaneous	60" Ceiling Fan Meeting current ENERGY STAR Standards	Standard, non-ENERGYSTAR Ceiling Fan
Energy Star Dehumidifier*	Miscellaneous	One Dehumidifier meeting current ENERGY STAR Standards	One Dehumidifier meeting Federal Standard
Heat Pump Pool Heater*	Miscellaneous	Heat Pump Swimming Pool Heater	Electric Resistance Swimming Pool Heater
Solar Pool Heater*	Miscellaneous	Solar Swimming Pool Heater	Electric Resistance Swimming Pool Heater
Solar Powered Pool Pumps	Miscellaneous	Solar Powered Pool Pump	Single Speed Pool Pump Motor
Two Speed Pool Pump	Miscellaneous	Dual Speed Pool Pump Motor	Single Speed Pool Pump Motor
Variable Speed Pool Pump	Miscellaneous	Variable Speed Pool Pump Motor	Single Speed Pool Pump Motor

Measure	End-Use	Description	Baseline
15 SEER Central AC	Space Cooling	15 SEER Central AC	Code-Compliant Central AC, 14 SEER
16 SEER Central AC	Space Cooling	16 SEER Central AC	Code-Compliant Central AC, 14 SEER
17 SEER Central AC	Space Cooling	17 SEER Central AC	Code-Compliant Central AC, 14 SEER
18 SEER Central AC	Space Cooling	18 SEER Central AC	Code-Compliant Central AC, 14 SEER
21 SEER Central AC	Space Cooling	21 SEER Central AC	Code-Compliant Central AC, 14 SEER
Central AC Tune Up	Space Cooling	System tune-up, including coil cleaning, refrigerant charging, and other diagnostics	Existing Typical Central AC without Regular Maintenance/tune-up
Energy Star Room AC	Space Cooling	Room AC meeting current ENERGY STAR standards	Code-Compliant Room AC
Solar Attic Fan*	Space Cooling	Standard Central Air Conditioning with Solar Attic Fan	Standard Central Air Conditioning, No Solar Attic Fan
14 SEER ASHP from base electric resistance heating	Space Cooling, Space Heating	14 SEER Air Source Heat Pump	Base AC, 14 SEER, Electric resistance heating, 3.41 HSPF
15 SEER Air Source Heat Pump	Space Cooling, Space Heating	15 SEER Air Source Heat Pump	Code-Compliant ASHP, 14 SEER, 8.2 HSPF
16 SEER Air Source Heat Pump	Space Cooling, Space Heating	16 SEER Air Source Heat Pump	Code-Compliant ASHP, 14 SEER, 8.2 HSPF
17 SEER Air Source Heat Pump	Space Cooling, Space Heating	17 SEER Air Source Heat Pump	Code-Compliant ASHP, 14 SEER, 8.2 HSPF
18 SEER Air Source Heat Pump	Space Cooling, Space Heating	18 SEER Air Source Heat Pump	Code-Compliant ASHP, 14 SEER, 8.2 HSPF
21 SEER Air Source Heat Pump	Space Cooling, Space Heating	21 SEER Air Source Heat Pump	Code-Compliant ASHP, 14 SEER, 8.2 HSPF
21 SEER ASHP from base electric resistance heating	Space Cooling, Space Heating	21 SEER Air Source Heat Pump	Base AC, 14 SEER, Electric resistance heating, 3.41 HSPF
Air Sealing-Infiltration Control	Space Cooling, Space Heating	Standard Heating and Cooling System with Improved Infiltration Control	Standard Heating and Cooling System with Standard Infiltration Control
Ceiling Insulation(R12 to R38)	Space Cooling, 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(R19 to R38)	Space Cooling, 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(R2 to R38)	Space Cooling, 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(R30 to R38)	Space Cooling, Space Heating	Blown-in insulation in ceiling cavity/attic, existing (1986-2016) homes	Existing ceiling insulation based on building code at time of construction
Duct Insulation	Space Cooling, Space Heating	Standard Electric Heating and Central AC with Insulated Ductwork	Standard Electric Heating and Central AC with Uninsulated Ductwork
Duct Repair	Space Cooling, Space Heating	Duct Repair to eliminate/minimize leaks, includes testing and sealing	Standard Electric Heating and Central AC with typical duct leakage
Energy Star Certified Roof Products	Space Cooling, Space Heating	Energy Star Certified Roof Products	Standard Black Roof
Energy Star Door*	Space Cooling, Space Heating	21ft2 of Opaque Door meeting current Energy Star Requirements	21ft2 of Opaque Door meeting current FL Code Requirements
Energy Star Windows	Space Cooling, Space Heating	100ft2 of Window meeting current Energy Star Version Requirements	100ft2 of Window current FL energy code requirements

Measure	End-Use	Description	Baseline
Floor Insulation*	Space Cooling, Space Heating	Increased Floor Insulation (R-13)	Standard Electric Heating and Central AC with Uninsulated Floor
Green Roof*	Space Cooling, Space Heating	Vegetated Roof Surface on top of Standard Roof	Standard Black Roof
Ground Source Heat Pump*	Space Cooling, Space Heating	Ground Source Heat Pump	Code-Compliant ASHP, 14 SEER, 8.2 HSPF
Heat Pump Tune Up	Space Cooling, Space Heating	System tune-up, including coil cleaning, refrigerant charging, and other diagnostics	Standard Heating and Cooling System without Regular Maintenance/tune-up
Home Energy Management System*	Space Cooling, Space Heating	Typical HVAC by Building Type Controlled by Home Energy Management System (smart hub and hub-connected thermostat)	Typical HVAC by Building Type, Manually Controlled
Programmable Thermostat	Space Cooling, Space Heating	Pre-set programmable thermostat that replaces manual thermostat	Standard Heating and Cooling System with Manual Thermostat
Radiant Barrier	Space Cooling, Space Heating	Radiant Barrier	No radiant barrier
Sealed crawlspace*	Space Cooling, Space Heating	Encapsulated and semi-conditioned crawlspace	Naturally vented, unconditioned crawlspace
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
Spray Foam Insulation(Base R12)	Space Cooling, 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 R19)	Space Cooling, 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)	Space Cooling, 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)	Space Cooling, Space Heating	Open cell spray foam along roofline in existing (1986-2016) homes	Existing ceiling insulation based on building code at time of construction
Storm Door*	Space Cooling, Space Heating	21ft2 of Opaque Door meeting current Energy Star Version Requirements	21ft2 of Opaque Door meeting current FL Code Requirements
Variable Refrigerant Flow (VRF) HVAC Systems*	Space Cooling, Space Heating	Variable Refrigerant Flow (VRF) HVAC Systems	Code-Compliant ASHP, 14 SEER, 8.2 HSPF
Wall Insulation	Space Cooling, Space Heating	Increased Exterior Above-Grade Wall Insulation (R-13)	Market Average Existing Exterior Above-Grade Wall Insulation
Window Sun Protection	Space Cooling, Space Heating	Window Film Applied to Standard Window	Standard Window with below Code Required Minimum SHGC
HVAC ECM Motor	Space Heating	Variable Speed Electronically Commutated Motor for an Electric Furnace	Permanent Split Capacitor Motor for Electric Furnace

A.2 Commercial Measures

Measure	End-Use	Description	Baseline
Efficient Exhaust Hood	Cooking	Kitchen ventilation with automatically adjusting fan controls	Kitchen ventilation with constant speed ventilation motor
Energy Star Commercial Oven	Cooking	One 12-Pan Combination Oven meeting current ENERGY STAR® Standards	One Standard Economy-Grade 12-Pan Combination Oven
Energy Star Fryer	Cooking	One Standard Vat Electric Fryer meeting current ENERGY STAR® Standards	One Standard Economy-Grade Standard Vat Electric Fryer
Energy Star Griddle	Cooking	One Griddle meeting current ENERGY STAR® Standards	One Conventional Griddle
Energy Star Hot Food Holding Cabinet	Cooking	One Hot Food Holding Cabinet meeting current ENERGY STAR® Standards	One Standard Hot Food Holding Cabinet
Energy Star Steamer	Cooking	One 4-Pan Electric Steamer meeting current ENERGY STAR® Standards	One Standard Economy-Grade 4-Pan Steamer
Induction Cooktops	Cooking	Efficient Induction Cooktop	One Standard Electric Cooktop
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
Energy Star Commercial Dishwasher	Domestic Hot Water	One Dishwasher meeting current ENERGY STAR® Requirements	One Dishwasher meeting Federal Standard
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
Heat Pump Water Heater	Domestic Hot Water	Efficient 50 Gallon Electric Heat Pump Water Heater	Code-Compliant 50 Gallon Electric Heat Pump Water Heater
Hot Water Circulation Pump Control	Domestic Hot Water	Recirculation Pump with Demand Control Mechanism	Uncontrolled Recirculation Pump
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
Instantaneous Hot Water System*	Domestic Hot Water	Instantaneous Hot Water System	Code-Compliant Electric Storage Water Heater
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 10% Less Efficient than Federal Standard
Solar Water Heater	Domestic Hot Water	Solar Powered 50 Gallon Electric Resistance Water Heater (EF = 4.05)	Code-Compliant 50 Gallon Electric Heat Pump Water Heater
Tank Wrap on Water Heater*	Domestic Hot Water	50 Gallon Electric Resistance Water Heater with Insulated Tank Wrap (R-11)	Market Average 50 Gallon Electric Resistance Water Heater, No Tank Wrap
Thermostatic Shower Restriction Valve*	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
Bi-Level Lighting Control (Exterior)*	Exterior Lighting	Bi-Level Controls on Exterior Lighting, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
CFL - 15W Flood	Exterior Lighting	CFL (assume 15W) replacing EISA-2020 compliant baseline lamp (65w flood)	EISA-2020 compliant baseline lamp (65W flood)
High Efficiency HID Lighting	Exterior Lighting	One Pulse Start Metal Halide 200W	Average Lumen Equivalent High Intensity Discharge Fixture
LED - 9W Flood	Exterior Lighting	LED (assume 9W) replacing EISA-2020 compliant baseline lamp (65w flood)	EISA-2020 compliant baseline lamp (65W flood)
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 Exterior Lighting	Exterior Lighting	One 65W LED Canopy Light	Average Lumen Equivalent Exterior HID Area Lighting

Measure	End-Use	Description	Baseline
LED Parking Lighting*	Exterior Lighting	One 160W LED Area Light	Average Lumen Equivalent Exterior HID Area Lighting
LED Street Lights*	Exterior Lighting	One 210W LED Area Light	Average Lumen Equivalent Exterior HID Area Lighting
LED Traffic and Crosswalk Lighting*	Exterior Lighting	LED Crosswalk Sign	Energy Star Qualifying Crosswalk Sign
Outdoor Lighting Controls	Exterior Lighting	Install Exterior Photocell Dimming Controls, 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
CFL-23W	Interior Lighting	CFL (assume 23W) replacing EISA-2020 compliant baseline lamp (100w equivalent)	EISA-2020 compliant baseline lamp (100W equivalent)
High Bay Fluorescent (T5)	Interior Lighting	One 4' 4-Lamp High Bay T5 Fixture	Average Lumen Equivalent High Intensity Discharge Fixture
High Bay LED	Interior Lighting	One 150W High Bay LED Fixture	Weighted Existing Fluorescent High-Bay Fixture
Interior Lighting Controls	Interior Lighting	Install Interior Photocell Dimming Controls, 500 Watts Controlled	500 Watts of Lighting, Manually Controlled
LED - 14W	Interior Lighting	LED (assume 14W) replacing EISA-2020 compliant baseline lamp (100w equivalent)	EISA-2020 compliant baseline lamp (100W equivalent)
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 Linear - Fixture Replacement*	Interior Lighting	2x4 LED Troffer	Lumen-Equivalent 32-Watt T8 Fixture
LED Linear - Lamp Replacement	Interior Lighting	Linear LED (21W)	Lumen-Equivalent 32-Watt T8 Lamp
Premium T8 - Fixture Replacement	Interior Lighting	Reduced Wattage (28W) T8 Fixture with Low Ballast Factor	Lumen-Equivalent 32-Watt T8 Fixture
Premium T8 - Lamp Replacement	Interior Lighting	Replace Bulbs in T8 Fixture with Reduced Wattage (28W) Bulbs	32-Watt T8 Fixture
Efficient Battery Charger*	Miscellaneous	Single-phase Ferro resonant or silicon-controlled rectifier charging equipment with power conversion efficiency >=89% & maintenance power <= 10 W	FR or SCR charging stations with power conversion efficiency < 89% or > 10 W
Efficient Motor Belts*	Miscellaneous	Synchronous belt, 98% efficiency	Standard V-belt drive
ENERGY STAR Commercial Clothes Washer*	Miscellaneous	One Commercial Clothes Washer meeting current ENERGY STAR® Requirements	One Commercial Clothes Washer meeting Federal Standard
ENERGY STAR Water Cooler*	Miscellaneous	One Storage Type Hot/Cold Water Cooler Unit meeting current ENERGY STAR® Standards	One Standard Storage Type Hot/Cold Water Cooler Unit
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
Regenerative Drive Elevator Motor*	Miscellaneous	Regenerative drive produced energy when motor in overhaul condition	Standard motor
Solar Pool Heater*	Miscellaneous	Solar Swimming Pool Heater	Electric Resistance Swimming Pool Heater
Heat Pump Pool Heater*	Miscellaneous	Heat Pump Swimming Pool Heater	Electric Resistance Swimming Pool Heater
Two Speed Pool Pump*	Miscellaneous	Dual Speed Pool Pump Motor	Single Speed Pool Pump Motor
Variable Speed Pool Pump*	Miscellaneous	Variable Speed Pool Pump Motor	Single Speed Pool Pump Motor
Solar Powered Pool Pump*	Miscellaneous	Solar Powered Pool Pump Motor	Single Speed Pool Pump Motor
VSD Controlled Compressor	Miscellaneous	Variable Speed Drive Control - includes all non-HVAC applications	Constant speed motors & pumps
Facility Energy Management System	Multiple End-Uses	Energy Management System deployed to automatically control HVAC, lighting, and other systems as applicable	Standard/manual facility equipment controls

Measure	End-Use	Description	Baseline
Retro-Commissioning*	Multiple End-Uses	Perform facility retro-commissioning, including assessment, process improvements, and optimization of energy-consuming equipment and systems at the facility	Comparable facility, no retro-commissioning
ENERGY STAR Imaging Equipment	Office Equipment	One imaging device meeting current ENERGY STAR® Standards	One non-ENERGY STAR® imaging device
Energy Star PCs	Office Equipment	One Personal Computer (desktop or laptop) meeting current ENERGY STAR® Standards	One non-ENERGY STAR® Personal Computer
Energy Star Servers	Office Equipment	One Server meeting current ENERGY STAR Standards	One Standard Server
Energy Star Uninterruptable Power Supply*	Office Equipment	Standard Desktop Plugged into Energy Star Uninterruptable Power Supply at 25% Load	Standard Desktop Plugged into Uninterruptable Power Supply at 25% Load
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 network power down to lower power states.	One computer and monitor, manually controlled
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
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
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
Demand Defrost	Refrigeration	Walk-In Freezer System with Demand-Controlled Electric Defrost Cycle	Walk-In Freezer System with Timer-Controlled Electric Defrost Cycle
Energy Star Commercial Glass Door Freezer*	Refrigeration	One Glass Door Freezer meeting current ENERGY STAR® Standards	One Glass Door Freezer meeting Federal Standards
Energy Star Commercial Glass Door Refrigerator*	Refrigeration	One Glass Door Refrigerator meeting current ENERGY STAR® Standards	One Glass Door Refrigerator meeting Federal Standards
Energy Star Commercial Solid Door Freezer*	Refrigeration	One Solid Door Freezer meeting current ENERGY STAR® Standards	One Solid Door Freezer meeting Federal Standards
Energy Star Commercial Solid Door Refrigerator*	Refrigeration	One Solid Door Refrigerator meeting current ENERGY STAR® Standards	One Solid Door Refrigerator meeting Federal Standards
Energy Star Ice Maker	Refrigeration	One Continuous Self-Contained Ice Maker meeting current ENERGY STAR® Standards (8.9 kWh / 100 lbs of ice)	One Continuous Self-Contained Ice Maker meeting Federal Standard
Energy Star Refrigerator*	Refrigeration	One Refrigerator meeting current ENERGY STAR® Standards	One Refrigerator meeting Federal Standard
Energy Star Vending Machine	Refrigeration	One Refrigerated Vending Machine meeting current ENERGY STAR® Standards	One standard efficiency Refrigerated Vending Machine
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
Freezer-Cooler Replacement Gaskets	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
High Efficiency Refrigeration Compressor	Refrigeration	High Efficiency Refrigeration Compressors	Existing Compressor
High R-Value Glass Doors	Refrigeration	Display Door with High R-Value, One-Door Medium Temperature Reach-In Case	Standard Door, One-Door Medium Temperature Reach-In Case
Night Covers for Display Cases	Refrigeration	One Open Vertical Case with Night Covers	One Existing Open Vertical Case, No Night Covers

Measure	End-Use	Description	Baseline
PSC to ECM Evaporator Fan Motor (Reach-In)*	Refrigeration	Medium Temperature Reach-In Case with 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 Reach-In Case with Permanent Split Capacitor Evaporator Fan Motor
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
Strip Curtains for Walk-ins	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
Chilled Water Controls Optimization*	Space Cooling	Deploy an algorithm package on the chiller to totalize the available power inputs and calculate the cooling load, and accordingly apply small set-point adjustments to the plant control system	Standard chilled water controls
Chilled Water System - Variable Speed Drives	Space Cooling	10HP Chilled Water Pump with VFD Control	10HP Chilled Water Pump Single Speed
Cool Roof	Space Cooling	Cool Roof - Includes both DX and chiller cooling systems	Code-Compliant Flat Roof
High Efficiency Chiller (Air Cooled, 50 tons)	Space Cooling	High Efficiency Chiller (Air Cooled, 50 tons)	Code-Compliant Air Cooled Positive Displacement Chiller, 50 Tons
High Efficiency Chiller (Water cooled-centrifugal, 200 tons)	Space Cooling	Water Cooled Centrifugal Chiller with Integral VFD, 200 Tons	Code-Compliant Water Cooled Centrifugal Chiller, 200 Tons
Thermal Energy Storage	Space Cooling	Deploy thermal energy storage technology (ice harvester, etc.) to shift load	Code compliant chiller
Air Curtains*	Space Cooling, Space Heating	Air Curtain across door opening	Door opening with no air curtain
Airside Economizer*	Space Cooling, Space Heating	Airside Economizer	No economizer
Ceiling Insulation(R12 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 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 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(R30 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
Dedicated Outdoor Air System on VRF unit*	Space Cooling, Space Heating	Code-Compliant VRF utilizing Dedicated Outdoor Air System	Code-Compliant PTHP
Destratification Fans*	Space Cooling, Space Heating	Destratification Fans improve temperature distribution by circulating warmer air from the ceiling back down to the floor level	No destratification fan
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)
Duct Sealing Repair	Space Cooling, Space Heating	Duct Repair to eliminate/minimize leaks, includes testing and sealing	Standard AC with typical duct leakage
Energy Recovery Ventilation System (ERV)	Space Cooling, Space Heating	Unitary Cooling Equipment that Incorporates Energy Recovery	Current Market Packaged or Split DX Unit

Measure	End-Use	Description	Baseline
Facility Commissioning*	Space Cooling, Space Heating	Perform facility commissioning to optimize building operations in new facilities	Standard new construction facility with no commissioning
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	Green Roof	Code-Compliant Flat Roof
High Efficiency Chiller (Water cooled-positive displacement, 100 tons)	Space Cooling, Space Heating	Water Cooled Positive Displacement Chiller with Integral VFD, 100 Tons	Code-Compliant Water Cooled Positive Displacement Chiller, 100 Tons
High Efficiency Data Center Cooling*	Space Cooling, Space Heating	High Efficiency CRAC (computer room air conditioner)	Standard Efficiency CRAC
High Efficiency DX 135k- less than 240k BTU	Space Cooling, Space Heating	High Efficiency DX Unit, 15 tons	Code-Compliant Packaged or Split DX Unit, 15 Tons
High Efficiency PTAC	Space Cooling, Space Heating	High Efficiency PTAC	Code-Compliant PTAC
High Efficiency PTHP	Space Cooling, Space Heating	High Efficiency PTHP	Code-Compliant PTHP
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
HVAC tune-up	Space Cooling, Space Heating	PTAC/PTHP system tune-up, including coil cleaning, refrigerant charging, and other diagnostics	Existing PTAC/PTHP without Regular Maintenance/tune-up
HVAC tune-up_RTU	Space Cooling, Space Heating	Rooftop Unit (RTU) System tune-up, including coil cleaning, refrigerant charging, and other diagnostics	Existing typical RTU without Regular Maintenance/tune-up
Infiltration Reduction - Air Sealing*	Space Cooling, Space Heating	Reduced leakage through caulking, weather-stripping	Standard Heating and Cooling System with Moderate Infiltration
Low U-Value Windows*	Space Cooling, Space Heating	100ft2 of Window meeting current Energy Star Standards	100ft2 of Window meeting Florida energy code
Programmable Thermostat*	Space Cooling, Space Heating	Pre-set programmable thermostat that replaces manual thermostat	Standard Heating and Cooling System with Manual Thermostat
Roof Insulation	Space Cooling, Space Heating	Roof Insulation (built-up roof applicable to flat/low slope roofs)	Code-Compliant Flat Roof
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
Variable Refrigerant Flow (VRF) HVAC Systems*	Space Cooling, Space Heating	Variable Refrigerant Flow (VRF) HVAC Systems	Code-Compliant PTHP
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*	Space Cooling, Space Heating	The heat reclaim system transfers waste heat from refrigeration system to space heating or hot water	No heat recovery
Waterside Economizer*	Space Cooling, Space Heating	Waterside Economizer	No economizer
Window Sun Protection	Space Cooling, Space Heating	Window Sun Protection (Includes sunscreen, film, tinting or overhang to minimize heat gain through window)	Standard Window with below Code Required Minimum SHGC
ECM Motors on Furnaces	Space Heating	Variable Speed Electronically Commutated Motor for an Electric Furnace	Permanent Split Capacitor Motor for Electric Furnace
10HP Open Drip-Proof(ODP) Motor*	Ventilation and Circulation	High Efficiency 10 HP Open-Drip Proof Motor, 4-Pole, 1800 RPM	10 HP Open-Drip Proof Motor with EPACT 1992 Efficiency

Measure	End-Use	Description	Baseline
CO Sensors for Parking Garage Exhaust*	Ventilation and Circulation	Enclosed Parking Garage Exhaust with CO Control	Constant Volume Enclosed Parking Garage Exhaust
Demand Controlled Ventilation	Ventilation and Circulation	Return Air System with CO2 Sensors	Standard Return Air System, No Sensors
High Speed Fans	Ventilation and Circulation	High Speed Fan, 24" - 35" Blade Diameter	Standard Speed Fan, 24" - 35" Blade Diameter
VAV System*	Ventilation and Circulation	Variable Air Volume Distribution System	Constant Air Volume Distribution System

A.3 Industrial Measures

Measure	End-Use	Description	Baseline
Building Envelope Improvements	HVAC	Facility envelope improvements to improve thermal efficiency. Individual improvements may include additional insulation, cool roof, infiltration reduction, improved fenestration efficiency	Typical existing facility
HVAC Equipment Upgrades	HVAC	Equipment upgrades to improve operating efficiency. Includes high efficiency HVAC equipment (including DX units and chillers), HVAC VFDs, economizers, ECM motors	Market average HVAC equipment at existing facilities
HVAC Recommissioning	HVAC	Diagnostic evaluation and optimization of facility HVAC system	Comparable facility, no retro-commissioning
HVAC Improved Controls	HVAC	Improved control technologies such as EMS, thermostats, demand controlled ventilation	Standard/manual HVAC controls
Efficient Lighting - High Bay	Industrial Lighting	Efficient high bay lighting fixtures, including HID and LED	Market average high bay lighting
Efficient Lighting - Other Interior Lighting	Industrial Lighting	Efficient interior lighting, including conversion to efficient linear fluorescent, LEDs, and delamping	Market average interior lighting
Lighting Controls – Interior*	Industrial Lighting	Improved control technologies for interior lighting, such as time clocks, bi-level fixture controls, photocell controls, and occupancy/vacancy sensors	Standard/manual interior lighting controls
Efficient Lighting – Exterior*	Exterior Lighting	Efficient exterior lighting, including exterior walkway lighting, pathway lighting, security lighting, and customer-owned street lighting	Market average exterior lighting
Lighting Controls - Exterior	Exterior Lighting	Improved control technologies for exterior lighting, such as time clocks, bi-level fixture controls, photocell controls, and motion sensors	Standard/manual exterior lighting controls
Compressed Air System Optimization	Compressed Air	Compressed air system improvements, including system optimization, appropriate sizing, minimizing air pressure, replace compressed air use with mechanical or electrical functions	Standard compressed air system operations
Compressed Air Controls	Compressed Air	Improved control technologies for compressed air system, including optimized distribution system, VFD controls	Standard compressed air system operations with manual controls
Compressed Air Equipment	Compressed Air	Equipment upgrades to improve operating efficiency, including motor replacement, integrated VFD compressed air systems, improved nozzles, receiver capacity additions	Market average compressed air equipment
Fan Improved Controls	Motors Fans Blowers	Improved fan control technologies	Standard/manual fan controls
Fan System Optimization	Motors Fans Blowers	Fan system optimization	Standard fan operation
Fan Equipment Upgrades	Motors Fans Blowers	Equipment upgrades to improve operating efficiency, including motor replacement, VFD installation	Market average fan equipment
Pump Improved Controls	Motors Pumps	Improved pump control technologies	Standard/manual pump controls
Pump System Optimization	Motors Pumps	Pump system optimization	Standard pump system operations

Measure	End-Use	Description	Baseline
Pump Equipment Upgrade	Motors Pumps	Equipment upgrades to improve operating efficiency, including motor replacement, VFD installation	Market average pump equipment
Motor Equipment Upgrades	Motors Pumps	Equipment upgrades to improve operating efficiency, including motor replacement, efficient drives, ECM motors, VFD installation	Market average motors
Motor Improved Controls	Motors Pumps	Improved motor control technologies	Standard/manual motor controls
Motor Optimization	Motors Pumps	Motor system optimization, including replacing drive belts, electric actuators, pump/motor rewinds	Standard motor operation
Process Heat Improved Controls	Process Heating	Improved process heat control technologies	Standard/manual process heat controls
Process Heat System Optimization	Process Heating	Process heat system optimization	Standard process heat system operations
Process Heat Equipment Upgrade	Process Heating	Equipment upgrades to improve operating efficiency	Market average process heating equipment
Process Other Systems Optimization	Process Specific	Process other system optimization	Standard process other system operations
Process Other Equipment Upgrades	Process Specific	Equipment upgrades to improve operating efficiency of industry-specific process equipment, such as injection molders, extruders, and other machinery	Market average process equipment
Process Refrig System Optimization	Process Cooling	Process refrigeration system optimization, including ventilation optimization, demand defrost, and floating head pressure controls	Standard process refrigeration system operations
Process Refrig Controls*	Process Cooling	Improved process refrigeration control technologies	Standard/manual process refrigeration controls
Process Refrig Equipment Upgrade*	Process Cooling	Equipment upgrades to improve operating efficiency, including efficient refrigeration compressors, evaporator fan motors, and related equipment	Market average process refrigeration equipment
Plant Energy Management	Multiple End-Uses	Facility control technologies and optimization to improve energy efficiency, including the installation of high efficient equipment, controls, and implementing system optimization practices to improve plant efficiency	Standard/manual plant energy management practices

The following EE measures from the 2014 Technical Potential Study were eliminated from the current study:

A.4 2014 EE Measures Eliminated from Current Study

Sector	Measure	2014 End-Use
Residential	AC Heat Recovery Units	HVAC
Residential	HVAC Proper Sizing	HVAC
Residential	High Efficiency One Speed Pool Pump (1.5 hp)	Motor
Commercial	LED Exit Sign	Lighting-Exterior
Commercial	High Pressure Sodium 250W Lamp	Lighting-Interior
Commercial	PSMH, 250W, magnetic ballast	Lighting-Interior
Industrial	Compressed Air-O&M	Compressed Air
Industrial	Fans - O&M	Fans
Industrial	Pumps - O&M	Pumps
Industrial	Bakery - Process (Mixing) - O&M	Process Other
Industrial	O&M/drives spinning machines	Process Other
Industrial	O&M - Extruders/Injection Moulding	Process Other

Appendix B DR MPS Measure List

B.1 Residential Measures

Measure	Type	Season	Measure 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 switches	Direct load control	Summer and Winter	Load control switch that is installed on a water heater
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

B.2 Small C&I Measures

Measure	Type	Season	Measure 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.

B.3 Large C&I Measures

Measure	Type	Season	Measure 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

No DR measures from the 2014 Technical Potential Study were eliminated from the current study.

Appendix C DSRE Measure List

C.1 Residential Measures

Measure	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

C.2 Non-Residential Measures

Measure	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 2014 Technical Potential Study were eliminated from the current study.

Appendix D Customer Demand Characteristics

Customer demand on peak days was analyzed by rate classes within each sector. Outputs presentation includes load shapes on peak days and average days, along with the estimates of technical potential by end-uses. The two end-uses, Air Conditioning and Heating, were studied for both residential and small C&I customers; however, in residential sector, another two end-uses were also incorporated into the analyses, which are Water Heaters and Pool Pumps.

Residential and Small C&I

Air Conditioning (Residential and Small C&I)

The cooling load shapes on the summer peak weekday and average weekdays were generated from interval data from a sample of customers in TECO territory for 2016. A regression model was built to estimate relationship between load values and cooling degree days (CDD) (shown as *Equation (1)*). The p-values of the model and coefficient are both less than 0.05, which means that they are of statistically significance. The product of actual hourly CDD values and coefficient would be used as cooling load during that hour in terms of per customer.

Equation (1):

$$Load_t = CDD_t * \beta_1 + i.month + \varepsilon$$

Where:

t	Hours in each day in year 2016
$Load_t$	Load occurred in each hour
CDD_t	Cooling Degree Day value associated with each hour
β_1	Change in average load per CDD
$i.month$	Nominal variable, month
ε	The error term

To study the peak technical potential, a peak day was selected if it has the hour with system peak load during summer period (July and August from 5-6 pm). Technical potential for residential customers was then calculated as the aggregate consumption during that summer peak hour.

Space Heating (Residential and Small C&I)

Similar to the analyses for air conditioning, interval data from a sample of customers in TECO territory for 2016, and the peak day was defined as the day with system peak load during winter period (January and February from 7-8 am). The regression model was modified to evaluate relationship between energy consumption and heating degree days (HDD) (shown as Equation (2)), but the technical potential was calculated in the same way as illustrated earlier.

Equation (2):

$$Load_t = HDD_t * \beta_1 + i.month + \varepsilon$$

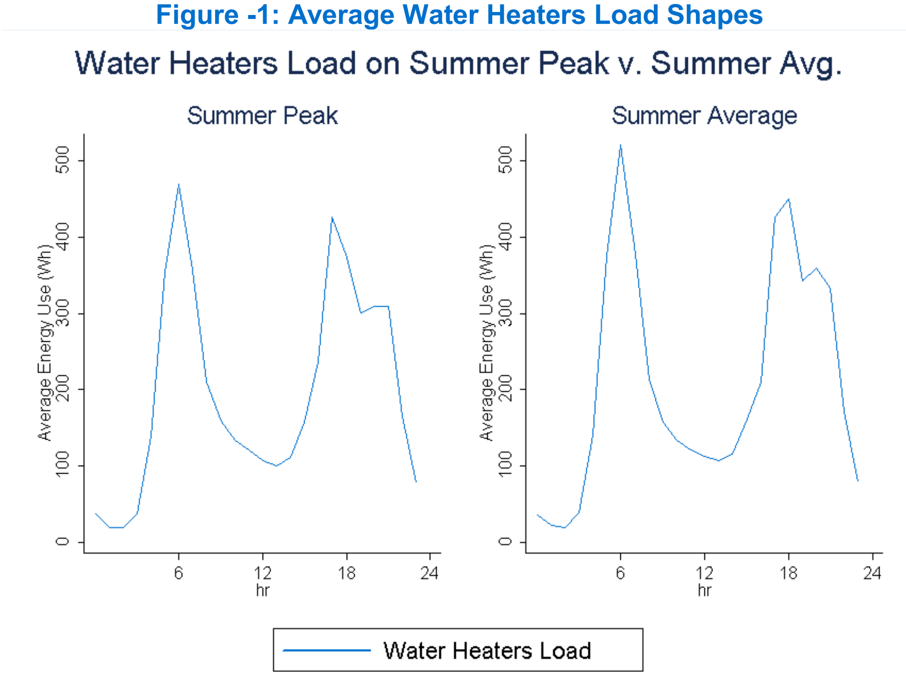
Where:

t	Hours in each day in year 2013 and 2014
$Load_t$	Load occurred in each hour
HDD_t	Heating Degree Day value associated with each hour
β_1	Change in average load per HDD
$i.month$	Nominal variable, month
ε	The error term

Water Heaters (Residential Only)

Interval load data by end-use are not available for individual customers in TECO territory, so the analyses of water heaters was completed based on end-use metered data from CPS (San Antonio) Home Manager Program. As water heater loads were assumed to be relatively constant throughout the year (used for summer and winter), average load profiles for water heaters on CPS's 2013 system peak were assumed to be representative for residential customers in TECO's jurisdiction.

Figure -1: Average Water Heaters Load Shapes

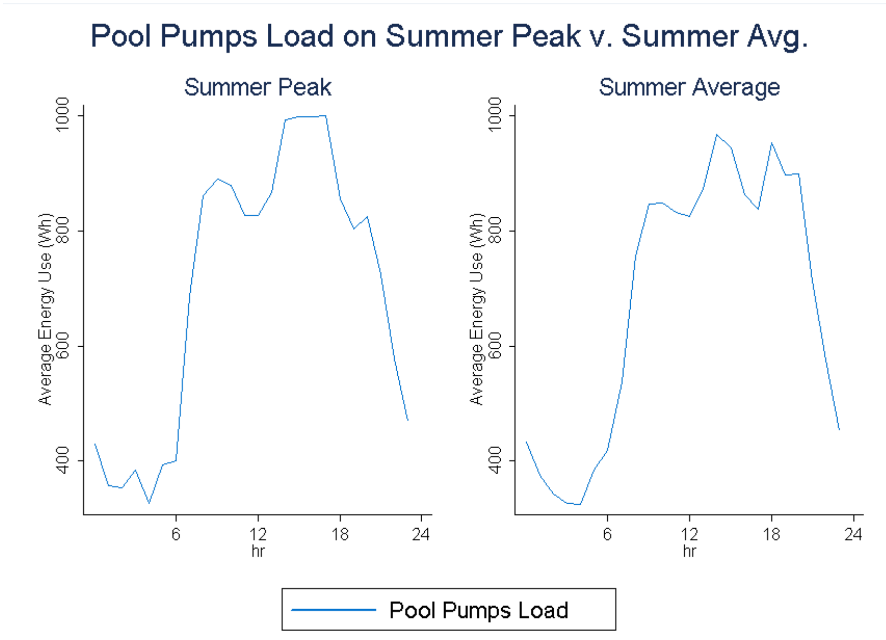


It is apparent from the Figure 8-3 that there is not much difference from peak usage and average usage, which proves that water heater loads has low sensitivity to weather. There are two spikes in a day, indicating two shifts when people would be likely to take showers. The time periods with highest consumption are 5:00 am – 7:00 am and 5:00 pm – 8:00 pm.

Pool Pumps (Residential Only)

Likewise, pool pump loads were assumed to be fairly constant throughout the summer time as well, so the average load profiles for pool pumps from CPS's project were also used to represent for residential customers in the FEECA Utilities' jurisdictions.

Figure 6-2: Average Pool Pumps Load Shapes



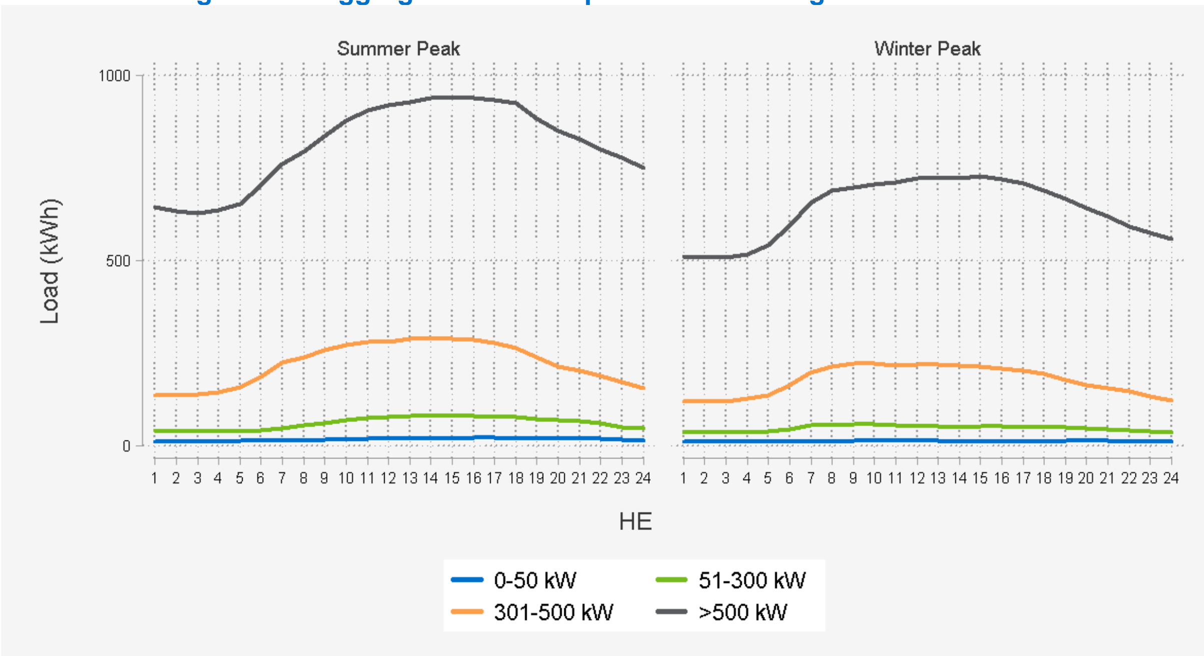
According to the Figure 8-4, the peak hours for pool pumps are 3:00 pm to 6:00 pm, and there is minor sensitivity with weather observed by comparing peak loads and average loads.

Large C&I Customers

Estimates of technical potential were based on one year of interval data (2016) for all customers in the GSD rate classes. Customers were categorized into one of four max demand segments for the purpose of analysis. Technical potential for these customers was defined as the aggregate usage within each segment during summer and winter peak system hours.

Visual presentations of the results are shown below. These graphs are useful to identify the segments with the highest potential as well as examine the weather-sensitivity of each segment by comparing peak usage to the average usage in each season.

Figure 6-3: Aggregate Load Shapes for TECO Large C&I Customers



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2018 - Comprehensive Technical Potential Measure List

Energy Efficiency

Residential - Energy Efficiency

1 Energy Star Clothes Dryer
2 Energy Star Clothes Washer
3 Energy Star Dishwasher
4 Energy Star Freezer
5 Energy Star Refrigerator
6 Heat Pump Clothes Dryer
7 Removal of 2nd Refrigerator-Freezer
8 High Efficiency Convection Oven
9 High Efficiency Induction Cooktop
10 Drain Water Heat Recovery
11 Faucet Aerator
12 Heat Pump Water Heater
13 Heat Trap
14 Hot Water Pipe Insulation
15 Instantaneous Hot Water System
16 Low Flow Showerhead
17 Solar Water Heater
18 Thermostatic Shower Restriction Valve
19 Water Heater Blanket
20 Water Heater Thermostat Setback
21 Water Heater Timeclock
22 Energy Star Air Purifier
23 Energy Star Audio-Video Equipment
24 Energy Star Imaging Equipment
25 Energy Star Personal Computer
26 Energy Star TV
27 Smart Power Strip
28 CFL - 15W Flood
29 CFL - 15W Flood (Exterior)
30 CFL-13W
31 CFL-23W
32 Exterior Lighting Controls
33 Interior Lighting Controls
34 LED - 14W
35 LED - 9W
36 LED - 9W Flood
37 LED - 9W Flood (Exterior)
38 LED Specialty Lamps-5W Chandelier
39 Linear LED
40 Low Wattage T8 Fixture
41 Energy Star Bathroom Ventilating Fan

42 Energy Star Ceiling Fan
43 Energy Star Dehumidifier
44 Heat Pump Pool Heater
45 Solar Pool Heater
46 Solar Powered Pool Pumps
47 Two Speed Pool Pump
48 Variable Speed Pool Pump
49 15 SEER Central AC
50 16 SEER Central AC
51 17 SEER Central AC
52 18 SEER Central AC
53 21 SEER Central AC
54 Central AC Tune Up
55 Energy Star Room AC
56 Solar Attic Fan
57 14 SEER ASHP from base electric resistance heating
58 15 SEER Air Source Heat Pump
59 16 SEER Air Source Heat Pump
60 17 SEER Air Source Heat Pump
61 18 SEER Air Source Heat Pump
62 21 SEER Air Source Heat Pump
63 21 SEER ASHP from base electric resistance heating
64 Air Sealing-Infiltration Control
65 Ceiling Insulation(R12 to R38)
66 Ceiling Insulation(R19 to R38)
67 Ceiling Insulation(R2 to R38)
68 Ceiling Insulation(R30 to R38)
69 Duct Insulation
70 Duct Repair
71 Energy Star Certified Roof Products
72 Energy Star Door
73 Energy Star Windows
74 Floor Insulation
75 Green Roof
76 Ground Source Heat Pump
77 Heat Pump Tune Up
78 Home Energy Management System
79 Programmable Thermostat
80 Radiant Barrier
81 Sealed Crawlspace
82 Smart Thermostat
83 Spray Foam Insulation(Base R12)
84 Spray Foam Insulation(Base R19)
85 Spray Foam Insulation(Base R2)
86 Spray Foam Insulation(Base R30)
87 Storm Door
88 Variable Refrigerant Flow (VRF) HVAC Systems
89 Wall Insulation
90 Window Sun Protection
91 HVAC ECM Motor

Commercial - Energy Efficiency

1 Efficient Exhaust Hood
2 Energy Star Commercial Oven
3 Energy Star Fryer
4 Energy Star Griddle
5 Energy Star Hot Food Holding Cabinet
6 Energy Star Steamer
7 Induction Cooktops
8 Drain Water Heat Recovery
9 Energy Star Commercial Dishwasher
10 Faucet Aerator
11 Heat Pump Water Heater
12 Hot Water Circulation Pump Control
13 Hot Water Pipe Insulation
14 Instantaneous Hot Water System
15 Low Flow Shower Head
16 Low-Flow Pre-Rinse Sprayers
17 Solar Water Heater
18 Tank Wrap on Water Heater
19 Thermostatic Shower Restriction Valve
20 Bi-Level Lighting Control (Exterior)
21 CFL - 15W Flood
22 High Efficiency HID Lighting
23 LED - 9W Flood
24 LED Display Lighting (Exterior)
25 LED Exterior Lighting
26 LED Parking Lighting
27 LED Street Lights
28 LED Traffic and Crosswalk Lighting
29 Outdoor Lighting Controls
30 Bi-Level Lighting Control (Interior)
31 CFL-23W
32 High Bay Fluorescent (T5)
33 High Bay LED
34 Interior Lighting Controls
35 LED - 14W
36 LED Display Lighting (Interior)
37 LED Linear - Fixture Replacement
38 LED Linear - Lamp Replacement
39 Premium T8 - Fixture Replacement
40 Premium T8 - Lamp Replacement
41 Efficient Battery Charger
42 Efficient Motor Belts
43 ENERGY STAR Commercial Clothes Washer
44 ENERGY STAR Water Cooler
45 Engine Block Timer
46 Regenerative Drive Elevator Motor
47 Solar Pool Heater
48 Heat Pump Pool Heater
49 Two Speed Pool Pump

50 Variable Speed Pool Pump
51 Solar Powered Pool Pump
52 VSD Controlled Compressor
53 Facility Energy Management System
54 Retro-Commissioning
55 ENERGY STAR Imaging Equipment
56 Energy Star PCs
57 Energy Star Servers
58 Energy Star Uninterruptable Power Supply
59 Network PC Power Management
60 Server Virtualization
61 Smart Strip Plug Outlet
62 Anti-Sweat Controls
63 Automatic Door Closer for Walk-in Coolers and Freezers
64 Demand Defrost
65 Energy Star Commercial Glass Door Freezer
66 Energy Star Commercial Glass Door Refrigerator
67 Energy Star Commercial Solid Door Freezer
68 Energy Star Commercial Solid Door Refrigerator
69 Energy Star Ice Maker
70 Energy Star Refrigerator
71 Energy Star Vending Machine
72 Floating Head Pressure Controls
73 Freezer-Cooler Replacement Gaskets
74 High Efficiency Refrigeration Compressor
75 High R-Value Glass Doors
76 Night Covers for Display Cases
77 PSC to ECM Evaporator Fan Motor (Reach-In)
78 PSC to ECM Evaporator Fan Motor (Walk-In, Refrigerator)
79 Refrigerated Display Case LED Lighting
80 Refrigerated Display Case Lighting Controls
81 Strip Curtains for Walk-ins
82 Chilled Water Controls Optimization
83 Chilled Water System - Variable Speed Drives
84 Cool Roof
85 High Efficiency Chiller (Air Cooled, 50 tons)
86 High Efficiency Chiller (Water cooled-centrifugal, 200 tons)
87 Thermal Energy Storage
88 Air Curtains
89 Airside Economizer
90 Ceiling Insulation(R12 to R38)
91 Ceiling Insulation(R19 to R38)
92 Ceiling Insulation(R2 to R38)
93 Ceiling Insulation(R30 to R38)
94 Dedicated Outdoor Air System on VRF unit
95 Destratification Fans
96 Duct Insulation
97 Duct Sealing Repair
98 Energy Recovery Ventilation System (ERV)
99 Facility Commissioning
100 Floor Insulation

101 Geothermal Heat Pump
102 Green Roof
103 High Efficiency Chiller (Water cooled-positive displacement, 100 tons)
104 High Efficiency Data Center Cooling
105 High Efficiency DX 135k- less than 240k BTU
106 High Efficiency PTAC
107 High Efficiency PTHP
108 Hotel Card Energy Control Systems
109 HVAC tune-up
110 HVAC tune-up - RTU
111 Infiltration Reduction - Air Sealing
112 Low U-Value Windows
113 Programmable Thermostat
114 Roof Insulation
115 Smart Thermostat
116 Variable Refrigerant Flow (VRF) HVAC Systems
117 Wall Insulation
118 Warehouse Loading Dock Seals
119 Water Cooled Refrigeration Heat Recovery
120 Waterside Economizer
121 Window Sun Protection
122 ECM Motors on Furnaces
123 10HP Open Drip-Proof(ODP) Motor
124 CO Sensors for Parking Garage Exhaust
125 Demand Controlled Ventilation
126 High Speed Fans
127 VAV System

Industrial - Energy Efficiency

1 Building Envelope Improvements
2 HVAC Equipment Upgrades
3 HVAC Recommissioning
4 HVAC Improved Controls
5 Efficient Lighting - High Bay
6 Efficient Lighting - Other Interior Lighting
7 Lighting Controls
8 Efficient Lighting - Exterior
9 Lighting Controls - Exterior
10 Compressed Air System Optimization
11 Compressed Air Controls
12 Compressed Air Equipment
13 Fan Improved Controls
14 Fan System Optimization
15 Fan Equipment Upgrades
16 Pump Improved Controls
17 Pump System Optimization
18 Pump Equipment Upgrade
19 Motor Equipment Upgrades
20 Motor Improved Controls
21 Motor Optimization
22 Process Heat Improved Controls
23 Process Heat System Optimization
24 Process Heat Equipment Upgrade
25 Process Other Systems Optimization
26 Process Other Equipment Upgrades
27 Process Refrig System Optimization
28 Process Refrig Controls
29 Process Refrig Equipment Upgrade
30 Plant Energy Management

Demand Response

Residential - Demand Response

1. Central Air Conditioner - Load Shed
2. Central Heating - Load Shed
3. Central Air Conditioner - 50% Cycling
4. Central Heating - 50% Cycling
5. Smart Thermostats - Utility Installation
6. Smart Thermostats - BYOT
7. CPP + Tech
8. Water Heater Switches
9. Pool Pump Switches
10. Room AC

Commercial - Demand Response

1. Central Air Conditioner - Load Shed
2. Central Heating - Load Shed
3. Central Air Conditioner - 50% Cycling
4. Central Heating - 50% Cycling
5. Smart Thermostats - Utility Installation
6. Smart Thermostats - BYOT
7. CPP + Tech

Large Commercial/Industrial - Demand Response

1. CPP + Tech
2. Auto DR
3. Firm Service Level
4. Guaranteed Load Drop

Distributed Energy Resources

Residential - Distributed Energy Resources

1 PV System
2 Battery Storage from PV System

Commercial/Industrial - Distributed Energy Resources

1 PV System
2 Battery Storage from PV System
3 CHP – Fuel Cell
4 CHP – Micro Turbine
5 CHP – Gas Turbine
6 CHP – Reciprocating Engine
7 CHP - Steam Turbine

Total Measures Evaluated

247 Energy Efficiency
21 Demand Response
9 Distributed Energy Resources

Total Measure Permutations

4,196 Energy Efficiency
74 Demand Response
47 Distributed Energy Resources

Added or Removed Measures for 2018 Comprehensive Technical Potential Measure List as Compared to 2013

Energy Efficiency

Residential - Energy Efficiency - Added

Energy Star Clothes Dryer
Heat Pump Clothes Dryer
High Efficiency Convection Oven
High Efficiency Induction Cooktop
Drain Water Heat Recovery
Instantaneous Hot Water System
Thermostatic Shower Restriction Valve
Energy Star Air Purifier
Energy Star Imaging Equipment
Exterior Lighting Controls
Interior Lighting Controls
Energy Star Bathroom Ventilating Fan
Energy Star Ceiling Fan
Energy Star Dehumidifier
Heat Pump Pool Heater
Solar Pool Heater
Solar Attic Fan
14 SEER ASHP from base electric resistance heating
Duct Insulation
Energy Star Door
Floor Insulation
Green Roof
Heat Pump Tune Up
Home Energy Management System
Programmable Thermostat
Smart Thermostat
Storm Door
Variable Refrigerant Flow (VRF) HVAC Systems

Residential - Energy Efficiency - Removed

AC Heat Recovery Units
HVAC Proper Sizing
High Eficiency One Speed Pool Pump

Commercial - Energy Efficiency - Added

Induction Cooktops
Energy Star Commercial Dishwasher
Hot Water Circulation Pump Control

Instantaneous Hot Water System
Low-Flow Pre-Rinse Sprayers
Tank Wrap on Water Heater
Thermostatic Shower Restriction Valve
Efficient Battery Charger
Efficient Motor Belts
ENERGY STAR Commercial Clothes Washer
ENERGY STAR Water Cooler
Engine Block Timer
Regenerative Drive Elevator Motor
Solar Pool Heater
Heat Pump Pool Heater
Two Speed Pool Pump
Variable Speed Pool Pump
Solar Powered Pool Pump
Retro-Commissioning
Energy Star Uninterruptable Power Supply
Smart Strip Plug Outlet
Energy Star Commercial Glass Door Freezer
Energy Star Commercial Glass Door Refrigerator
Energy Star Commercial Solid Door Freezer
Energy Star Commercial Solid Door Refrigerator
Energy Star Refrigerator
Energy Star Vending Machine
High Efficiency Refrigeration Compressor
Night Covers for Display Cases
Air Curtains
Airside Economizer
Dedicated Outdoor Air System on VRF unit
Destratification Fans
Facility Commissioning
Floor Insulation
Green Roof
Hotel Card Energy Control Systems
Infiltration Reduction - Air Sealing
Low U-Value Windows
Programmable Thermostat
Smart Thermostat
Variable Refrigerant Flow (VRF) HVAC Systems
Wall Insulation
Warehouse Loading Dock Seals
Water Cooled Refrigeration Heat Recovery
Waterside Economizer
ECM Motors on Furnaces
CO Sensors for Parking Garage Exhaust
High Speed Fans

Commercial - Energy Efficiency - Removed

LED Exit Sign
High Pressure Sodium 250W Lamp
PSMH 250W Magnetic Ballast

Industrial - Energy Efficiency - Added

Plant Energy Management

Industrial - Energy Efficiency - Removed

Compressed Air - O&M
Fans - O&M
Pumps - O&M
Bakery - Process (Mixing) - O&M
O&M/Drives Spinning Machines
O&M - Extruders/Injection Moulding

Demand Response

Residential - Demand Response - Added

No Measures added

Residential - Demand Response - Removed

No Measures removed

Commercial - Demand Response - Added

CPP + Tech

Commercial - Demand Response - Removed

No Measures removed

Large Commercial/Industrial - Demand Response - Added

CPP + Tech

Large Commercial/Industrial - Demand Response - Removed

No Measures removed

Distributed Energy Resources

Residential - Distributed Energy Resources - Added

Battery Storage from PV System

Residential - Distributed Energy Resources - Removede

No Measures removed

Commercial/Industrial - Distributed Energy Resources - Added

Battery Storage from PV System
CHP – Fuel Cell
CHP – Micro Turbine
CHP – Gas Turbine
CHP – Reciprocating Engine
CHP - Steam Turbine

Commercial/Industrial - Distributed Energy Resources - Added

No Measures removed

2013 - Comprehensive Technical Potential Measure List

Energy Efficiency

Residential - Energy Efficiency

1 15 SEER Split-System Air Conditioner
2 15 SEER Split-System Heat Pump
3 17 SEER Split-System Air Conditioner
4 17 SEER Split-System Heat Pump
5 19 SEER Split-System Air Conditioner
6 AC Heat Recovery Units
7 AC Maintenance (Indoor Coil Cleaning)
8 AC Maintenance (Outdoor Coil Cleaning)
9 Ceiling R-0 to R-19 Insulation
10 Ceiling R-19 to R-38 Insulation
11 CFL (18-Watt integral ballast), 0.5 hr/day
12 CFL (18-Watt integral ballast), 2.5 hr/day
13 CFL (18-Watt integral ballast), 6.0 hr/day
14 Default Window With Sunscreen
15 Duct Repair
16 Electronically Commutated Motors (ECM) on an Air Handler Unit
17 Energy Star CW CEE Tier 2 (MEF=2.0)
18 Energy Star CW CEE Tier 3 (MEF=2.2)
19 Energy Star Desktop PC
20 Energy Star DVD Player
21 Energy Star DW (EF=0.68)
22 Energy Star Laptop PC
23 Energy Star Set-Top Box
24 Energy Star TV
25 Energy Star VCR
26 Faucet Aerators
27 HE Freezer
28 HE Refrigerator - Energy Star version of above
29 HE Room Air Conditioner - EER 11
30 HE Room Air Conditioner - EER 12
31 Heat Pump Water Heater (EF=2.9)
32 Heat Trap
33 High Efficiency One Speed Pool Pump (1.5 hp)
34 LED (12-Watt integral ballast)
35 Low Flow Showerhead
36 Photovoltaic System
37 Pipe Wrap
38 Proper Refrigerant Charging and Air Flow
39 PV-Powered Pool Pumps
40 Radient Barrier
41 Reflective Roof

42 Refrigerator/freezer recycling
43 RET 2L4'T8, 1EB
44 ROB 2L4'T8, 1EB
45 Sealed Attic w/Sprayed Foam Insulated Roof Deck
46 Sealed Attics
47 Single Pane Clear Windows to Double Pane Low-E Windows
48 Smart Plug
49 Solar Water Heating
50 Two Speed Pool Pump (1.5 hp)
51 Variable-Speed Pool Pump (<1 hp)
52 Wall 2x4 R-0 to Blow-In R-13 Insulation
53 Water Heater Blanket
54 Water Heater Temperature Check and Adjustment
55 Water Heater Timeclock
56 Weather Strip/Caulk w/Blower Door
57 Window Film
58 Window Tinting

Commercial - Energy Efficiency

1 Aerosole Duct Sealing
2 Air Handler Optimization
3 Anti-sweat (humidistat) controls
4 Ceiling Insulation
5 Centrifugal Chiller, 0.51 kW/ton, 500 tons
6 CFL Hardwired, Modular 18W
7 CFL Screw-in 18W
8 Chiller Tune Up/Diagnostics
9 Compressor VSD retrofit
10 Continuous Dimming
11 Convection Oven
12 Cool Roof
13 Copier Power Management Enabling
14 dehumidification hybrid desiccant heat pump
15 Demand Control Ventilation (DCV)
16 Demand controlled circulating systems
17 Demand Defrost Electric
18 Demand Hot Gas Defrost
19 Duct/Pipe Insulation
20 DX Coil Cleaning
21 DX Packaged System, EER=11.9, 10 tons
22 DX Tune Up/ Advanced Diagnostics
23 Efficient compressor motor
24 Efficient Fryer
25 Electronically Commutated Motors (ECM) on an Air Handler Unit
26 EMS - Chiller
27 EMS Optimization

28 Energy Recovery Ventilation (ERV)
29 Energy Star or Better Copier
30 Energy Star or Better Monitor
31 Evaporator fan controller for MT walk-ins
32 Faucet Aerator
33 Floating head pressure controls
34 Flood LED 14W
35 Freezer-Cooler Replacement Gaskets
36 Geothermal Heat Pump, EER=13, 10 tons
37 Griddle
38 HE PTAC, EER=9.6, 1 ton
39 Heat Pump Water Heater (air source)
40 Heat Recovery Unit
41 Heat Trap
42 High Bay T5
43 High Efficiency Chiller Motors
44 High Efficiency Fan Motor, 15hp, 1800rpm, 92.4%
45 High Pressure Sodium 250W Lamp
46 High R-Value Glass Doors
47 High-efficiency fan motors
48 Holding Cabinet
49 Hot Water Pipe Insulation
50 Hybrid Dessicant-DX System (Trane CDQ)
51 Ice Machine
52 LED (12-Watt)
53 LED Display Lighting
54 LED Exit Sign
55 LED High Bay 83W (400W equivalent)
56 LED Linear Tube 22W
57 Lighting Control Tuneup
58 Monitor Power Management Enabling
59 Multiplex Compressor System
60 Night covers for display cases
61 Occupancy Sensor
62 Occupancy Sensor (hotels)
63 Optimize Controls
64 Outdoor LED 104W
65 Outdoor Lighting Controls (Photocell/Timeclock)
66 Oversized Air Cooled Condenser
67 Packaged HP System, EER=11.7, 10 tons
68 PC Manual Power Management Enabling
69 PC Network Power Management Enabling
70 Photovoltaic System
71 Premium T8, EB, Reflector
72 Premium T8, Elecctronic Ballast
73 Printer Power Management Enabling
74 PSMH, 250W, magnetic ballast

75 Refrigeration Commissioning
76 ROB Premium T8, 1EB
77 ROB Premium T8, EB, Reflector
78 Roof Insulation
79 Run Time Optimizer
80 Separate Makeup Air / Exhaust Hoods AC
81 Server Virtualization
82 Showerhead
83 Solar Water Heater
84 Steamer
85 Strip curtains for walk-ins
86 Thermal Energy Storage (TES)
87 Variable Speed Drive Control
88 Vending Misers (cooled machines only)
89 VSD for Chiller Pumps and Towers
90 Window Film (Standard)

Industrial - Energy Efficiency

1 Aerosole Duct Sealing
2 Air conveying systems
3 Bakery - Process
4 Bakery - Process (Mixing) - O&M
5 Centrifugal Chiller, 0.51 kW/ton, 500 tons
6 CFL Hardwired, Modular 18W
7 CFL Screw-in 18W
8 Chiller Tune Up/Diagnostics
9 Clean Room - Controls
10 Clean Room - New Designs
11 Comp Air - ASD (100+ hp)
12 Comp Air - ASD (1-5 hp)
13 Comp Air - ASD (6-100 hp)
14 Comp Air - Motor practices-1 (100+ HP)
15 Comp Air - Motor practices-1 (1-5 HP)
16 Comp Air - Motor practices-1 (6-100 HP)
17 Comp Air - Replace 100+ HP motor
18 Comp Air - Replace 1-5 HP motor
19 Comp Air - Replace 6-100 HP motor
20 Compressed Air - Controls
21 Compressed Air - System Optimization
22 Compressed Air- Sizing
23 Compressed Air-O&M
24 Cool Roof
25 Direct drive Extruders
26 Drives - EE motor
27 Drives - Optimization process (M&T)
28 Drives - Process Control

29 Drives - Process Controls (batch + site)
30 Drives - Scheduling
31 Drying (UV/IR)
32 Duct/Pipe Insulation
33 DX Coil Cleaning
34 DX Packaged System, EER=11.9, 10 tons
35 DX Tune Up/ Advanced Diagnostics
36 Efficient Curing ovens
37 Efficient desalter
38 Efficient drives
39 Efficient drives - rolling
40 Efficient electric melting
41 Efficient grinding
42 Efficient Machinery
43 Efficient practices printing press
44 Efficient Printing press (fewer cylinders)
45 Efficient processes (welding, etc.)
46 Efficient Refrigeration - Operations
47 EMS - Chiller
48 EMS Optimization - Chiller
49 Extruders/injection Moulding-multipump
50 Fans - ASD (100+ hp)
51 Fans - ASD (1-5 hp)
52 Fans - ASD (6-100 hp)
53 Fans - Controls
54 Fans - Motor practices-1 (100+ HP)
55 Fans - Motor practices-1 (1-5 HP)
56 Fans - Motor practices-1 (6-100 HP)
57 Fans - O&M
58 Fans - Replace 100+ HP motor
59 Fans - Replace 1-5 HP motor
60 Fans - Replace 6-100 HP motor
61 Fans - System Optimization
62 Fans- Improve components
63 Gap Forming papermachine
64 Geothermal Heat Pump, EER=13, 10 tons
65 Heat Pumps - Drying
66 Heating - Optimization process (M&T)
67 Heating - Process Control
68 Heating - Scheduling
69 High Bay T5
70 High Consistency forming
71 High Efficiency Chiller Motors
72 Hybrid Dessicant-DX System (Trane CDQ)
73 Injection Moulding - Direct drive
74 Injection Moulding - Impulse Cooling
75 Intelligent extruder (DOE)

76 Light cylinders
77 Machinery
78 Membranes for wastewater
79 Near Net Shape Casting
80 New transformers welding
81 O&M - Extruders/Injection Moulding
82 O&M/drives spinning machines
83 Occupancy Sensor
84 Optimization control PM
85 Optimization Refrigeration
86 Optimize Controls
87 Optimize drying process
88 Other Process Controls (batch + site)
89 Power recovery
90 Premium T8, Electronic Ballast
91 Process control
92 Process Drives - ASD
93 Process optimization
94 Pumps - ASD (100+ hp)
95 Pumps - ASD (1-5 hp)
96 Pumps - ASD (6-100 hp)
97 Pumps - Controls
98 Pumps - Motor practices-1 (100+ HP)
99 Pumps - Motor practices-1 (1-5 HP)
100 Pumps - Motor practices-1 (6-100 HP)
101 Pumps - O&M
102 Pumps - Replace 100+ HP motor
103 Pumps - Replace 1-5 HP motor
104 Pumps - Replace 6-100 HP motor
105 Pumps - Sizing
106 Pumps - System Optimization
107 Refinery Controls
108 Replace V-Belts
109 Roof Insulation
110 Top-heating (glass)
111 VSD for Chiller Pumps and Towers
112 Window Film (Standard) - Chiller
113 Run Time Optimizer
114 Dehumidification Hybrid Desiccant Heat Pump (5 TON)
115 LED Linear Tube 22W
116 Flood LED 14W
117 LED High Bay 83W

Demand Response

Residential

1 In home display with peak threshold warning system and pre set control strategies
2 On-off switching via low-power wireless communication technology
3 Smart thrermostats
4 Switch - cycling program
5 Switch - shedding program

Commercial

1 Automated control strategies
2 Direct load control

Industrial

1 Automated control strategies
2 Direct load control

Total Measures

265 Energy Efficiency
9 Demand Response

274 Total

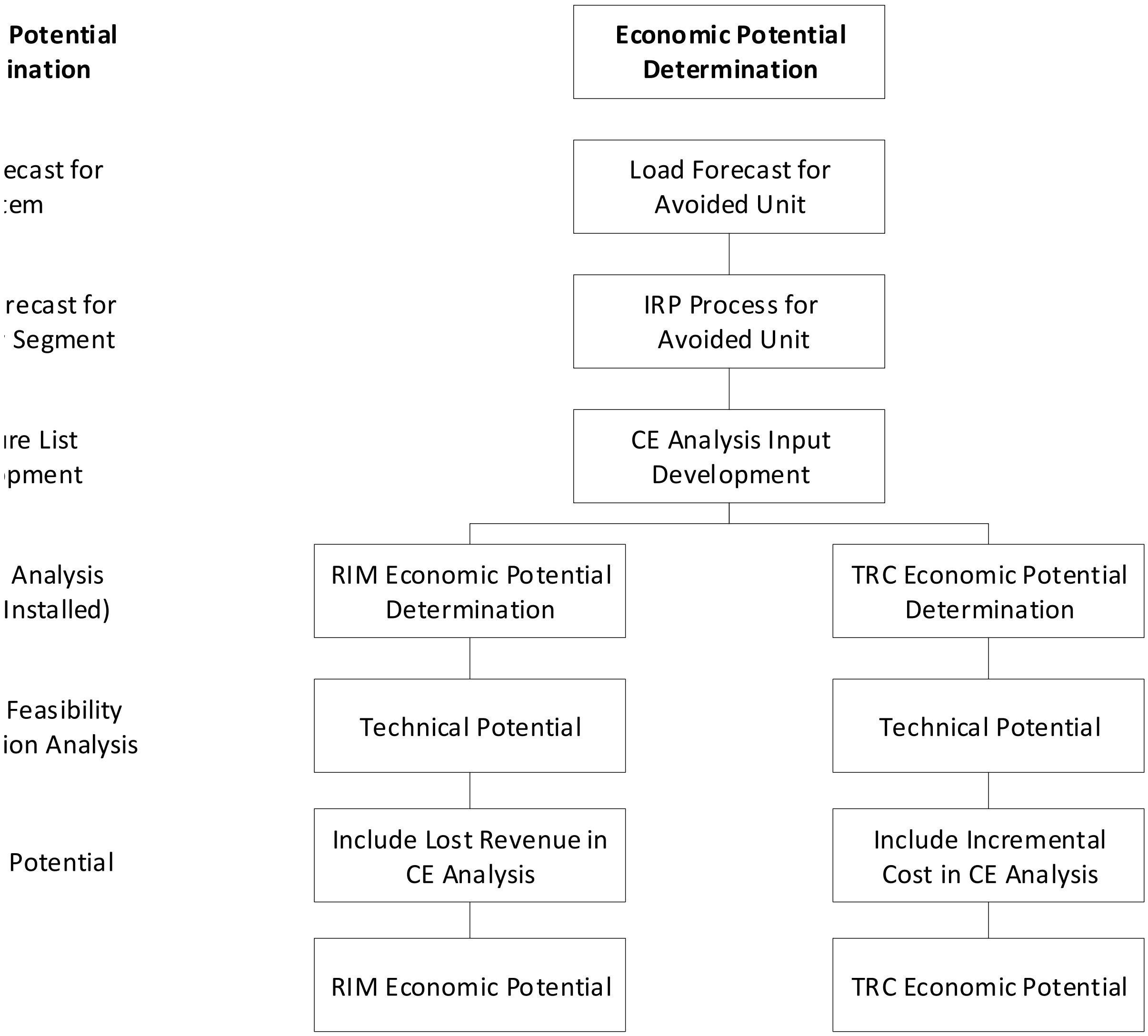
Tampa Electric's 2019 Technical Potential

1. Tampa Electric's 2019 Technical Potential

Energy Efficiency:	SkW	1,138 MW
	WkW	583 MW
	AE	4,483 GWh
Demand Response:	SkW	2,399 MW
	WkW	2,318 MW
	AE	0 GWh
Distributed Energy Resources:	SkW	2,215 MW
	WkW	619 MW
	AE	12,266 GWh

2. Tampa Electric's 2014 Technical Potential

Energy Efficiency:	SkW	1,306 MW
	WkW	823 MW
	AE	5,961 GWh
Demand Response:	SkW	2,929 MW
	WkW	430 MW
	AE	0 GWh
Distributed Energy Resources:	SkW	2,929 MW
	WkW	447 MW
	AE	7,892 GWh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Feasibility
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Potential
Economic Potential Determination
Load Forecast for Avoided Unit
IRP Process for Avoided Unit
CE Analysis Input Development
RIM Economic Potential Determination
TRC Economic Potential Determination
Technical Potential
Technical Potential
Include Lost Revenue in CE Analysis
Include Incremental Cost in CE Analysis
RIM Economic Potential
TRC Economic Potential

Tampa Electric's Avoided Unit Data for 2020-2029 DSM Goals Setting

1. In-service Date:	January 1, 2023
2. Type of Unit:	7 FA.05 CT
3. Type of Fuel:	Natural Gas
4. Average Annual heat rate Average (Btu/kWh):	11,110
5. Cost of Fuel Natural Gas (2023 $/MMBtu):	5.59
6. Construction Cost (W/O AFUDC)	
a: 2018 $000	122,820
b: $/kW (based on winter rating)	501.92
7. Construction Escalation Rate 2018 & beyond:	2.4 percent
8. In-service Cost (W/AFUDC)	
a: 2023 $000	144,381
b: $/kW (based on average rating)	590.03
9. Incremental Capital Structure	
a: Debt	46.00 percent
c: Common Stock	54.00 percent
10. Cost of Capital	
a: Debt	4.50 percent
c: Common Stock	10.25 percent
11. Book Life	30 years
12. Tax Life	15 years
13. AFUDC Rate	6.46 percent
14. Effective Tax Rate	25.345 percent
15. Other Taxes (2023)	1.21 percent
16. Other Taxes Escalation Rate	0.00 percent
17. Discount Rate for Present Worth	7.080 percent
18. Fixed O&M Costs (2018 $/kW/yr)	5.56
19. Variable O&M Costs (2018 $/MWh)	11.46
20. O&M Escalation Rate 2018 & beyond	2.4 percent
21. Value of K-factor	1.521
22. Capacity (kW) Winter	245,000
23 Capacity (kW) Summer	229,000

Tampa Electric's Cost-Effectiveness Inputs for 2020-2029 DSM Goals Setting

Line Losses and Outage Rate	**units**
Residential Line loss percentage	7.3 percent
Commercial/Industrial Line loss percentage	7.0 percent
Forced outage rate	3.4 percent

Life & k factors	**units**
Generator economic life	25 years
T&D economic life	25 years
k factor for generation	1.5213
k factor for T&D	1.5213

Utility & Customer costs	**units**
Utility cost escalation rate	2.4 percent
Customer equipment escalation rate	2.3 percent
Customer O&M escalation rate	2.3 percent
Utility discount rate	7.08 percent
Utility AFUDC rate	6.46 percent
Utility rebate/incentive escalation rate	0.0 percent

Avoided generator, trans., & dist. Costs	**units**
Base year	2020
In-service year for avoided generating unit	2023
In-service year for avoided T&D	2021
Base year avoided generating unit cost	$526.30/kW
Base year avoided transmission cost	$34.90/kW
Base year distribution cost	$82.37/kW
Gen., tran., & dist. cost escalation rate	2.4 percent
Generator fixed O&M cost	$5.83/kW-yr
Generator fixed O&M escalation rate	2.4 percent
Transmission fixed O&M cost	$2.78/kW-yr
Distribution fixed O&M cost	$11.34/kW-yr
T&D fixed O&M escalation rate	2.4 percent
Avoided gen unit variable O&M costs	0.210cents/kWh
Generator variable O&M cost escalation rate	2.4 percent
Generator capacity factor	9.1 percent
Avoided generating unit fuel cost	3.75cents/kWh
Avoided gen unit fuel escalation rate	4.54 percent
Avoided purchase capacity cost per kW	$0/kW-yr
Capacity cost escalation rate	0 percent

Tampa Electric's 2019 Economic Potential

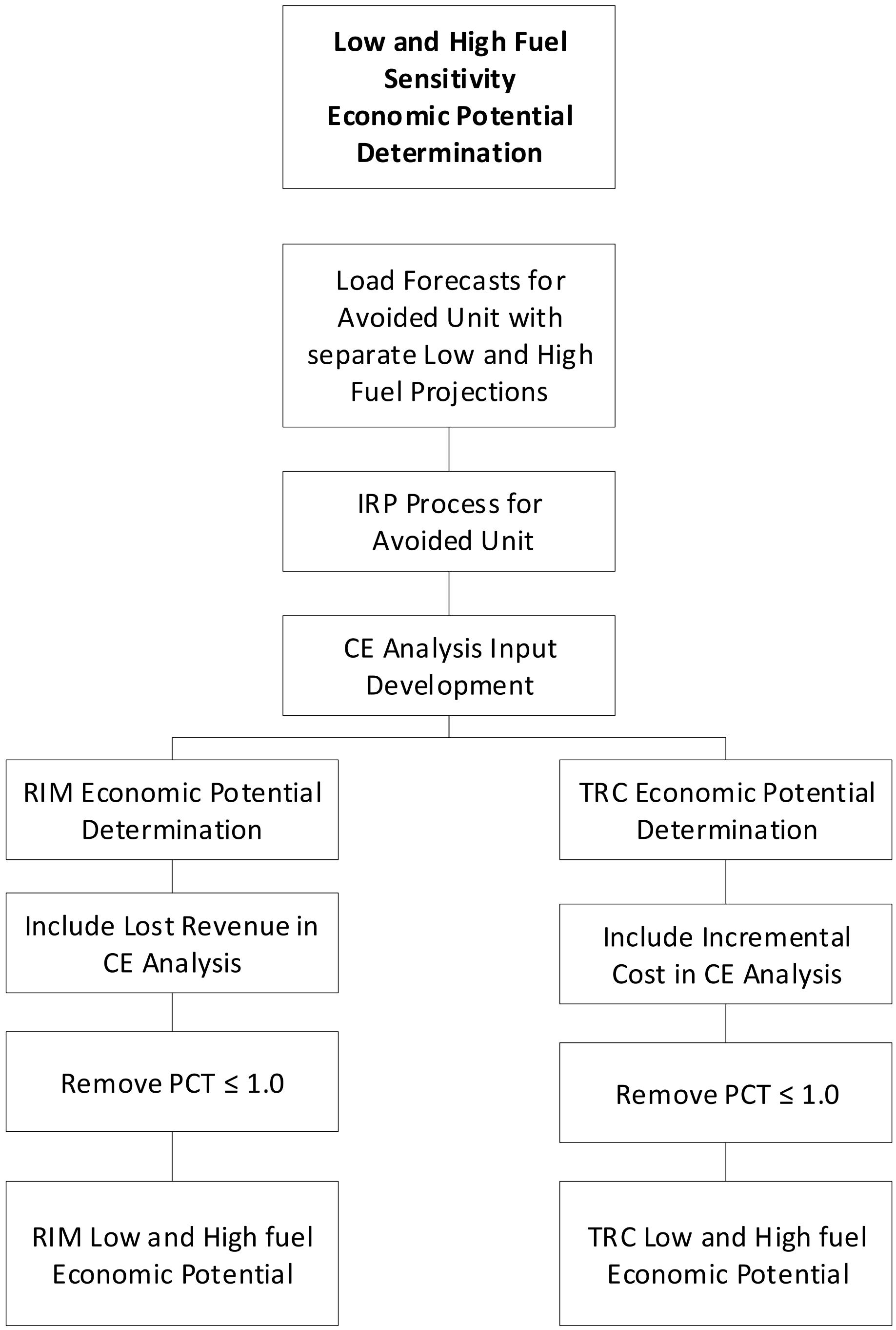
1. **Tampa Electric's 2019 Economic Potential**

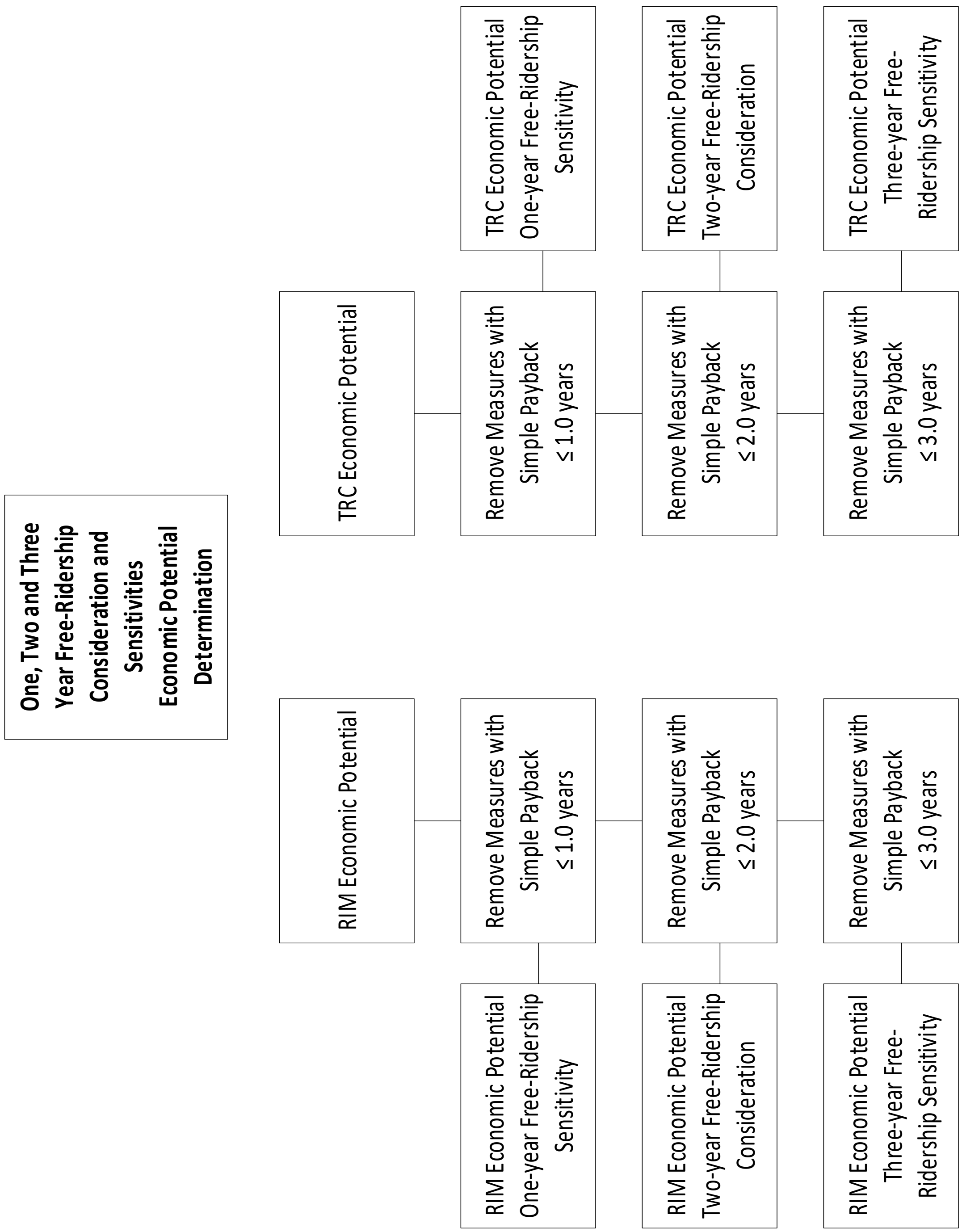
RIM Based

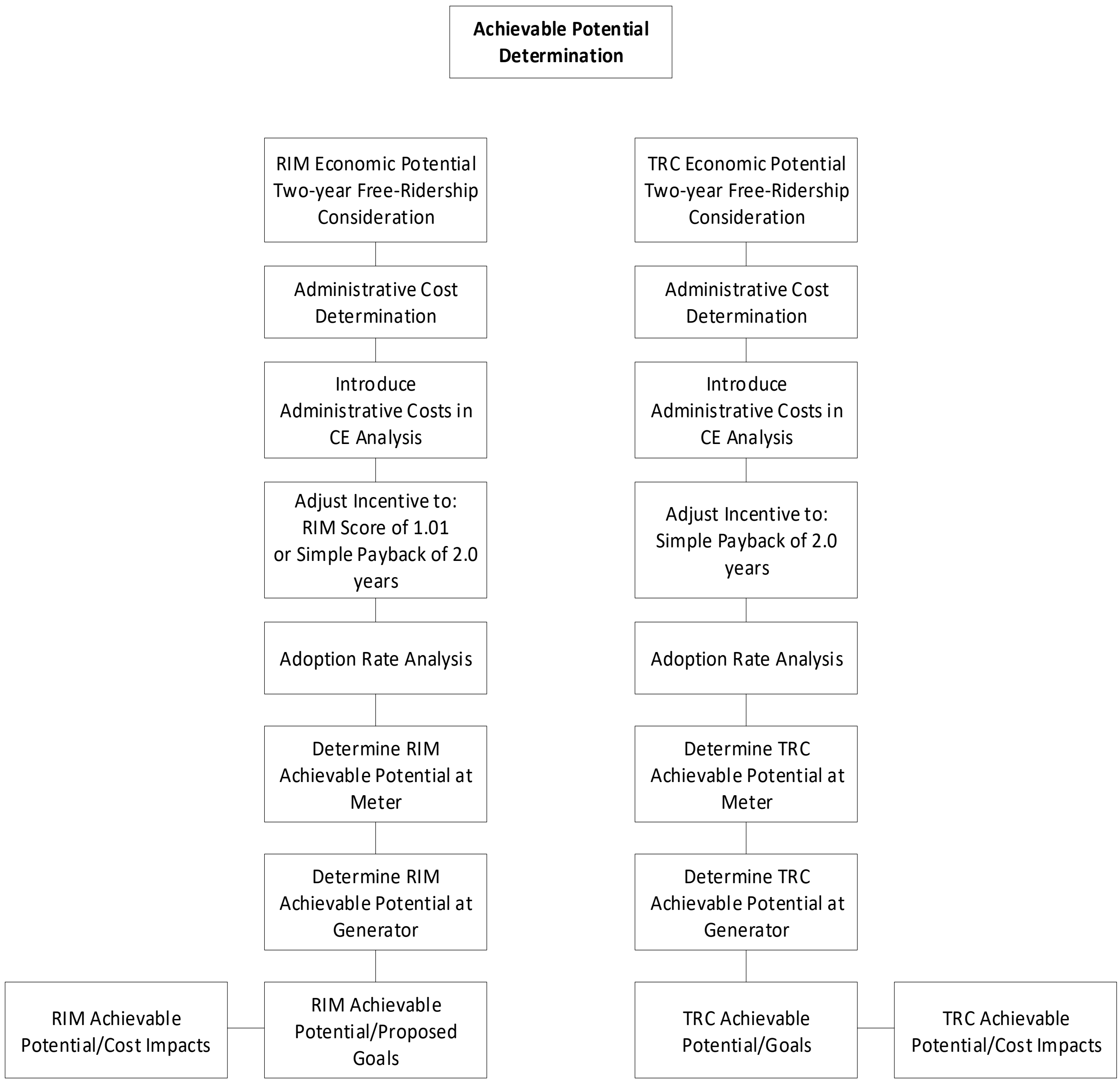
Energy Efficiency:	SkW	824 MW
	WkW	338 MW
	AE	2,613 GWh
Demand Response:	SkW	2,399 MW
	WkW	2,318 MW
	AE	0 GWh
Distributed Energy Resources:	SkW	1,705 MW
	WkW	600 MW
	AE	10,056 GWh

TRC Based

Energy Efficiency:	SkW	326 MW
	WkW	265 MW
	AE	1,785 GWh
Demand Response:	SkW	2,330 MW
	WkW	2,223 MW
	AE	0 GWh
Distributed Energy Resources:	SkW	0 MW
	WkW	0 MW
	AE	0 GWh


Low and High Fuel Sensitivity Economic Potential Determination
Load Forecasts for Avoided Unit with separate Low and High Fuel Projections
IRP Process for Avoided Unit
CE Analysis Input Development
RIM Economic Potential Determination
TRC Economic Potential Determination
Include Lost Revenue in CE Analysis
Include Incremental Cost in CE Analysis
Remove PCT ≤ 1.0
Remove PCT ≤ 1.0
RIM Low and High fuel Economic Potential
TRC Low and High fuel Economic Potential


One, Two and Three Year Free-Ridership Consideration and Sensitivities Economic Potential Determination
RIM Economic Potential
Remove Measures with Simple Payback ≤ 1.0 years
RIM Economic Potential One-year Free-Ridership Sensitivity
Remove Measures with Simple Payback ≤ 2.0 years
RIM Economic Potential Two-year Free-Ridership Consideration
Remove Measures with Simple Payback ≤ 3.0 years
RIM Economic Potential Three-year Free-Ridership Sensitivity
TRC Economic Potential
Remove Measures with Simple Payback ≤ 1.0 years
TRC Economic Potential One-year Free-Ridership Sensitivity
Remove Measures with Simple Payback ≤ 2.0 years
TRC Economic Potential Two-year Free-Ridership Consideration
Remove Measures with Simple Payback ≤ 3.0 years
TRC Economic Potential Three-year Free-Ridership Sensitivity


Achievable Potential Determination
RIM Economic Potential Two-year Free-Ridership Consideration
TRC Economic Potential Two-year Free-Ridership Consideration
Administrative Cost Determination
Administrative Cost Determination
Introduce Administrative Costs in CE Analysis
Introduce Administrative Costs in CE Analysis
Adjust Incentive to: RIM Score of 1.01 or Simple Payback of 2.0 years
Adjust Incentive to: Simple Payback of 2.0 years
Adoption Rate Analysis
Adoption Rate Analysis
Determine RIM Achievable Potential at Meter
Determine TRC Achievable Potential at Meter
Determine RIM Achievable Potential at Generator
Determine TRC Achievable Potential at Generator
RIM Achievable Potential/Cost Impacts
RIM Achievable Potential/Proposed Goals
TRC Achievable Potential/Goals
TRC Achievable Potential/Cost Impacts

Tampa Electric's 2019 Achievable Potential

1. **Tampa Electric's 2019 Achievable Potential at <u>Meter</u>**

<u>RIM Based</u>

Residential:	SkW	50.3 MW
	WkW	23.7 MW
	AE	98.1 GWh
Commercial/Industrial:	SkW	24.1 MW
	WkW	16.7 MW
	AE	58.4 GWh
Combined:	SkW	74.4 MW
	WkW	40.4 MW
	AE	156.5 GWh

<u>TRC Based</u>

Residential:	SkW	115.7 MW
	WkW	44.9 MW
	AE	305.4 GWh
Commercial/Industrial:	SkW	39.0 MW
	WkW	30.8 MW
	AE	87.6 GWh
Combined:	SkW	154.7 MW
	WkW	75.6 MW
	AE	392.9 GWh

2. **Tampa Electric's 2019 Achievable Potential at <u>Generator</u>**

<u>RIM Based – Proposed Goals</u>

Residential:	SkW	54.0 MW
	WkW	25.5 MW
	AE	103.6 GWh
Commercial/Industrial:	SkW	25.8 MW
	WkW	17.8 MW
	AE	61.4 GWh
Combined:	SkW	79.7 MW
	WkW	43.3 MW
	AE	165.0 GWh

TRC Based

Residential:	SkW	124.2 MW
	WkW	48.1 MW
	AE	322.5 GWh
Commercial/Industrial:	SkW	41.7 MW
	WkW	32.9 MW
	AE	92.1 GWh
Combined:	SkW	165.9 MW
	WkW	81.1 MW
	AE	414.6 GWh

RIM Achievable Potential Measures

Residential

1 Variable Speed Pool Pump
2 Two Speed Pool Pump
3 Smart Thermostat
4 Programmable Thermostat
5 Energy Star Windows
6 ENERGY STAR Certified Home
7 Duct Repair
8 Ceiling Insulation(R2 to R38)
9 Smart Thermostats - Utility Installation
10 Smart Thermostats - BYOT
11 Pool Pump Switches
12 CPP + Tech
13 Central Heating - Load Shed
14 Central Air Conditioner - Load Shed
15 Central Air Conditioner - 50% Cycling

Commercial/Industrial

1 Water Cooled Refrigeration Heat Recovery
2 VSD Controlled Compressor
3 Variable Speed Pool Pump
4 Variable Refrigerant Flow (VRF) HVAC Systems
5 Solar Water Heater
6 Solar Pool Heater
7 Smart Thermostat
8 Programmable Thermostat
9 LED Street Lights
10 Hot Water Pipe Insulation
11 High Efficiency PTHP
12 High Efficiency PTAC
13 High Efficiency DX 135k- less than 240k BTU
14 High Efficiency Chiller (Water cooled-positive displacement, 100 tons)
15 High Efficiency Chiller (Water cooled-centrifugal, 200 tons)
16 High Efficiency Chiller (Air Cooled, 50 tons)
17 Heat Pump Water Heater
18 Heat Pump Pool Heater
19 Floating Head Pressure Controls
20 Facility Energy Management System
21 Facility Commissioning
22 ENERGY STAR Water Cooler
23 Energy Star Hot Food Holding Cabinet

24 Energy Star Commercial Oven
25 Energy Star Commercial Glass Door Refrigerator
26 ENERGY STAR certified buildings program
27 Efficient Exhaust Hood
28 ECM Motors on Furnaces
29 Dedicated Outdoor Air System on VRF unit
30 CO Sensors for Parking Garage Exhaust
31 Chilled Water System - Variable Speed Drives
32 Smart Thermostats - Utility Installation
33 Smart Thermostats - BYOT
34 Guaranteed Load Drop
35 Firm Service Level
36 CPP + Tech
37 CPP
38 Central Heating - Load Shed
39 Central Heating - 50% Cycling
40 Central Air Conditioner - Load Shed
41 Central Air Conditioner - 50% Cycling
42 Auto DR
43 Pump System Optimization
44 Pump Equipment Upgrade
45 Process Refrig Equipment Upgrade
46 Process Refrig Controls
47 Process Other Systems Optimization
48 Process Heat Improved Controls
49 Process Heat Equipment Upgrade
50 Motor Optimization
51 Motor Equipment Upgrades
52 Lighting Controls - Exterior
53 Lighting Controls
54 HVAC Recommissioning
55 HVAC Improved Controls
56 HVAC Equipment Upgrades
57 Fan Equipment Upgrades
58 Efficient Lighting - Other Interior Lighting
59 Efficient Lighting - High Bay
60 Efficient Lighting - Exterior
61 Compressed Air Equipment
62 Compressed Air Controls
63 Building Envelope Improvements

TRC Achievable Potential Measures

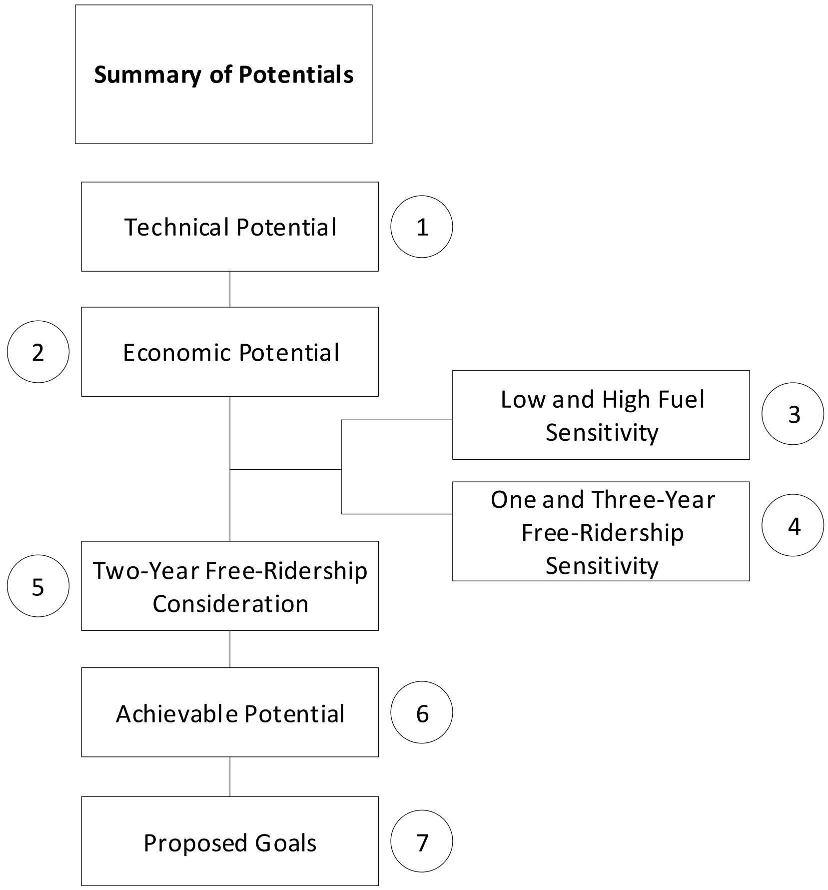
Residential

1 Ceiling Insulation(R2 to R38)
2 Central Air Conditioner - 50% Cycling
3 Central Air Conditioner - Load Shed
4 CPP + Tech
5 Duct Repair
6 ENERGY STAR Certified Home
7 Energy Star Windows
8 Programmable Thermostat
9 Smart Thermostat
10 Smart Thermostats - BYOT
11 Smart Thermostats - Utility Installation
12 Solar Pool Heater
13 Two Speed Pool Pump
14 Variable Speed Pool Pump

Commercial/Industrial

1 Anti-Sweat Controls
2 Auto DR
3 Building Envelope Improvements
4 Central Air conditioner - 50% Cycling
5 Central Air Conditioner - Load Shed
6 Central Heating - Load Shed
7 Chilled Water System - Variable Speed Drives
8 CO Sensors for Parking Garage Exhaust
9 Compressed Air Controls
10 Compressed Air Equipment
11 CPP
12 CPP + Tech
13 Demand Controlled Ventilation
14 ECM Motors on Furnaces
15 Efficient Exhaust Hood
16 Efficient Lighting - Exterior
17 Efficient Lighting - High Bay
18 Efficient Lighting - Other Interior Lighting
19 ENERGY STAR certified buildings program
20 Energy Star Commercial Glass Door Refrigerator
21 Energy Star Commercial Oven
22 Energy Star Commercial Solid Door Refrigerator
23 ENERGY STAR Water Cooler
24 Facility Energy Management System

25 Fan Equipment Upgrades
26 Firm Service Level
27 Floating Head Pressure Controls
28 Guaranteed Load Drop
29 Heat Pump Pool Heater
30 High Bay LED
31 High Efficiency Chiller (Air Cooled, 50 tons)
32 High Efficiency Chiller (Water cooled-positive displacement, 100 tons)
33 Hot Water Pipe Insulation
34 HVAC Equipment Upgrades
35 HVAC Improved Controls
36 HVAC Recommissioning
37 LED Street Lights
38 Lighting Controls
39 Lighting Controls - Exterior
40 Motor Equipment Upgrades
41 Motor Optimization
42 Process Heat Equipment Upgrade
43 Process Refrig Controls
44 Process Refrig Equipment Upgrade
45 Programmable Thermostat
46 Pump Equipment Upgrade
47 Pump System Optimization
48 Smart Thermostat
49 Smart Thermostats - BYOT
50 Smart Thermostats - Utility Installation
51 Solar Pool Heater
52 Solar Water Heater
53 Variable Speed Pool Pump
54 VSD Controlled Compressor



1. Technical Potential

Energy Efficiency:	SkW	1,138 MW
	WkW	583 MW
	AE	4,483 GWh
Demand Response:	SkW	2,399 MW
	WkW	2,318 MW
	AE	0 GWh
Distributed Energy Resources:	SkW	2,215 MW
	WkW	619 MW
	AE	12,266 GWh

2. Economic Potential

RIM Based

Energy Efficiency:	SkW	824 MW
	WkW	338 MW
	AE	1,785 GWh
Demand Response:	SkW	2,399 MW
	WkW	2,318 MW
	AE	0 GWh
Distributed Energy Resources:	SkW	1,705 MW
	WkW	600 MW
	AE	10,056 GWh

TRC Based

Energy Efficiency:	SkW	326 MW
	WkW	265 MW
	AE	1,785 GWh
Demand Response:	SkW	2,330 MW
	WkW	2,223 MW
	AE	0 GWh
Distributed Energy Resources:	SkW	0 MW
	WkW	0 MW
	AE	0 GWh

3. Low and High Fuel Sensitivities

RIM Based Low Fuel Sensitivity

Energy Efficiency:	SkW	270 MW
	WkW	153 MW
	AE	1,196 GWh
Demand Response:	SkW	2,399 MW
	WkW	2,318 MW
	AE	0 GWh
Distributed Energy Resources:	SkW	0 MW
	WkW	0 MW
	AE	0 GWh

TRC Based Low Fuel Sensitivity

Energy Efficiency:	SkW	321 MW
	WkW	263 MW
	AE	1,739 GWh
Demand Response:	SkW	2,330 MW
	WkW	2,223 MW
	AE	0 GWh
Distributed Energy Resources:	SkW	0 MW
	WkW	0 MW
	AE	0 GWh

RIM Based High Fuel Sensitivity

Energy Efficiency:	SkW	333 MW
	WkW	191 MW
	AE	1,534 GWh
Demand Response:	SkW	2,399 MW
	WkW	2,318 MW
	AE	0 GWh
Distributed Energy Resources:	SkW	0 MW
	WkW	0 MW
	AE	0 GWh

TRC Based High Fuel Sensitivity

Energy Efficiency:	SkW	384 MW
	WkW	283 MW
	AE	2,020 GWh
Demand Response:	SkW	2,316 MW
	WkW	2,176 MW
	AE	0 GWh
Distributed Energy Resources:	SkW	0 MW
	WkW	0 MW
	AE	0 GWh

4. One and Three-Year Free-Ridership Sensitivities

RIM Based One-Year Free-Ridership

Energy Efficiency:	SkW	204 MW
	WkW	107 MW
	AE	999 GWh
Demand Response:	SkW	2,399 MW
	WkW	2,318 MW
	AE	0 GWh
Distributed Energy Resources:	SkW	0 MW
	WkW	0 MW
	AE	0 GWh

TRC Based One-Year Free-Ridership

Energy Efficiency:	SkW	210 MW
	WkW	167 MW
	AE	1,275 GWh
Demand Response:	SkW	2,330 MW
	WkW	2,223 MW
	AE	0 GWh
Distributed Energy Resources:	SkW	0 MW
	WkW	0 MW
	AE	0 GWh

RIM Based Three-Year Free-Ridership

Energy Efficiency:	SkW	127 MW
	WkW	61 MW
	AE	570 GWh
Demand Response:	SkW	2,399 MW
	WkW	2,318 MW
	AE	0 GWh
Distributed Energy Resources:	SkW	0 MW
	WkW	0 MW
	AE	0 GWh

<u>TRC Based RIM Based Three-Year Free-Ridership</u>

Energy Efficiency:	SkW	102 MW
	WkW	64 MW
	AE	488 GWh
Demand Response:	SkW	2,330 MW
	WkW	2,223 MW
	AE	0 GWh
Distributed Energy Resources:	SkW	0 MW
	WkW	0 MW
	AE	0 GWh

5. Two-Year Free-Ridership Consideration

<u>RIM Based</u>

Energy Efficiency:	SkW	158 MW
	WkW	91 MW
	AE	747 GWh
Demand Response:	SkW	2,399 MW
	WkW	2,318 MW
	AE	0 GWh
Distributed Energy Resources:	SkW	0 MW
	WkW	0 MW
	AE	0 GWh

<u>TRC Based</u>

Energy Efficiency:	SkW	135 MW
	WkW	103 MW
	AE	686 GWh
Demand Response:	SkW	2,330 MW
	WkW	2,223 MW
	AE	0 GWh
Distributed Energy Resources:	SkW	0 MW
	WkW	0 MW
	AE	0 GWh

6. Achievable Potential at Meter

<u>RIM Based</u>

Residential:	SkW	50.3 MW
	WkW	23.7 MW
	AE	98.1 GWh
Commercial/Industrial:	SkW	24.1 MW
	WkW	16.7 MW
	AE	58.4 GWh
Combined:	SkW	74.4 MW
	WkW	40.4 MW
	AE	156.5 GWh

<u>TRC Based</u>

Residential:	SkW	115.7 MW
	WkW	44.9 MW
	AE	305.4 GWh
Commercial/Industrial:	SkW	39.0 MW
	WkW	30.8 MW
	AE	87.6 GWh
Combined:	SkW	154.7 MW
	WkW	75.6 MW
	AE	392.9 GWh

7. Achievable Potential at Generator

<u>RIM Based – Proposed Goals</u>

Residential:	SkW	54.0 MW
	WkW	25.5 MW
	AE	103.6 GWh
Commercial/Industrial:	SkW	25.8 MW
	WkW	17.8 MW
	AE	61.4 GWh
Combined:	SkW	79.7 MW
	WkW	43.3 MW
	AE	165.0 GWh

TRC Based

Residential:	SkW	124.2 MW
	WkW	48.1 MW
	AE	322.5 GWh
Commercial/Industrial:	SkW	41.7 MW
	WkW	32.9 MW
	AE	92.1 GWh
Combined:	SkW	165.9 MW
	WkW	81.1 MW
	AE	414.6 GWh

Tampa Electric's Residential
Annual Bill Impacts for the RIM and TRC
2020-2029 DSM Portfolios
(based upon 1,200 kWh monthly usage)

	Annual DSM Portfolio Costs			Annual Bill Impact		
Year	**RIM**	**TRC**	**Delta**	**RIM**	**TRC**	**Delta**
2020	$43,950,027	$60,890,919	$16,940,892	$39.56	$54.80	$15.25
2021	$43,946,242	$61,074,545	$17,128,303	$39.55	$54.97	$15.42
2022	$43,944,296	$61,245,693	$17,301,398	$39.55	$55.12	$15.57
2023	$38,761,317	$56,184,945	$17,423,628	$34.89	$50.57	$15.68
2024	$37,317,059	$54,957,123	$17,640,064	$33.59	$49.46	$15.88
2025	$37,513,771	$55,298,760	$17,784,990	$33.76	$49.77	$16.01
2026	$37,642,276	$55,622,906	$17,980,630	$33.88	$50.06	$16.18
2027	$37,745,853	$55,887,403	$18,141,550	$33.97	$50.30	$16.33
2028	$37,708,539	$56,028,886	$18,320,347	$33.94	$50.43	$16.49
2029	$37,888,200	$56,284,805	$18,396,604	$34.10	$50.66	$16.56
Total	$396,417,580	$573,475,985	$177,058,405	$356.78	$516.13	$159.35

Tampa Electric's Current DSM Programs and Achievements

In 2018, Tampa Electric continued operating within the 2015-2024 DSM Plan which supports the approved Florida Public Service Commission ("FPSC") goals which are reasonable, beneficial and cost-effective to all customers as required by the Florida Energy Efficiency and Conservation Act. The following is a list that briefly describes the company's current DSM programs:

1. Energy Audits - a "how to" information and analysis guide for customers. Six types of audits are available to Tampa Electric customers; four types are for residential customers and two types are for commercial/industrial customers.

2. Residential Ceiling Insulation – a rebate program that encourages existing residential customers to install additional ceiling insulation in existing homes.

3. Residential Duct Repair – a rebate program that encourages residential customers to repair leaky duct work of central air conditioning systems in existing homes.

4. Residential Electronically Commutated Motor (ECM) – a rebate program that encourages residential customers to replace their existing HVAC air handler motor with an ECM.

5. Energy Education, Awareness and Agency Outreach - a program that provides opportunities for engaging and educating groups of customers, students on energy-efficiency and conservation in an organized setting and electric vehicles at participating high schools. Participants are provided with an energy savings kit which includes energy saving devices and supporting information appropriate for the audience. Measures in the energy savings kit includes: four LED lamps, Water Heater Temperature Check and Adjustment Card, two Low Flow Faucet Aerators, Wall Plate Thermometer, Air Filter Whistle, and an Energy Savings Education Handout.

6. Energy Star for New Multi-Family Residences - a rebate program that encourages the construction of new multi-family residences to meet the requirements to achieve the ENERGY STAR certified apartments and condominium label.

7. Energy Star for New Homes - a rebate program that encourages residential customers to construct residential dwellings that qualify for the Energy Star Award by achieving efficiency levels greater than current Florida building code baseline practices.

8. Residential Heating and Cooling – a rebate program that encourages residential customers to install high-efficiency residential heating and cooling equipment in existing homes.

9. Neighborhood Weatherization – a program that provides for the installation of energy efficient measures for qualified low-income customers. Measures include: Duct Sealing if needed, Ceiling Insulation if needed, six LED lamps, Water Heater wrap if needed, Hot

Water Pipe Insulation, Water Heater Temperature Check and Adjustment Card, up to three Low Flow Faucet Aerators, up to two Low Flow Shower Heads, Wall Plate Thermometer, Refrigerator Coil Cleaning and Brush, HVAC Weather Stripping Kit, Air Filter Whistle, Weatherization Measures (weather stripping, caulk and foam sealant), and an Energy Savings Education Handout.

10. Residential Price Responsive Load Management (Energy Planner) – a program that reduces weather-sensitive loads through an innovative price responsive rate used to encourage residential customers to make behavioral or equipment usages changes by pre-programming HVAC, water heating and pool pumps.

11. Residential Wall Insulation – a rebate program that encourages existing residential customers to install additional wall insulation in existing homes.

12. Residential Window Replacement – a rebate program that encourages existing residential customers to install window upgrades in existing homes.

13. Commercial Ceiling Insulation – a rebate program that encourages commercial and industrial customers to install additional ceiling insulation in existing commercial structures.

14. Commercial Chiller – a rebate program that encourages commercial and industrial customers to install high efficiency chiller equipment.

15. Cogeneration – an incentive program whereby large industrial customers with waste heat or fuel resources may install electric generating equipment, meet their own electrical requirements and/or sell their surplus to the company.

16. Conservation Value – a rebate program that encourages commercial and industrial customers to invest in energy efficiency and conservation measures that are not sanctioned by other commercial programs.

17. Cool Roof – a rebate program that encourages commercial and industrial customers to install a cool roof system above conditioned spaces.

18. Commercial Cooling – a rebate program that encourages commercial and industrial customers to install high efficiency direct expansion commercial air conditioning cooling equipment.

19. Demand Response – a turn-key incentive program for commercial and industrial customers to reduce their demand for electricity in response to market signals.

20. Commercial Duct Repair – a rebate program that encourage existing commercial and industrial customers to repair leaky ductwork of central air-conditioning systems in

existing commercial and industrial facilities.

21. Commercial Electronically Commutated Motors (ECM) - a rebate program that encourages commercial and industrial customers to replace their existing air handler motors or refrigeration fan motors with an ECM.

22. Industrial Load Management – an incentive program whereby large industrial customers allow for the interruption of their facility or portions of their facility electrical load.

23. Lighting Conditioned Space – a rebate program that encourages commercial and industrial customers to invest in more efficient lighting technologies in existing conditioned areas of commercial and industrial facilities.

24. Lighting Non-Conditioned Space – a rebate program that encourages commercial and industrial customers to invest in more efficient lighting technologies in existing non-conditioned areas of commercial and industrial facilities.

25. Lighting Occupancy Sensors – a rebate program that encourages commercial and industrial customers to install occupancy sensors to control commercial lighting systems.

26. Commercial Load Management – an incentive program that encourages commercial and industrial customers to allow for the control of weather-sensitive heating, cooling and water heating systems to reduce the associated weather sensitive peak.

27. Refrigeration Anti-Condensate Control – a rebate program that encourages commercial and industrial customers to install anti-condensate equipment sensors and control within refrigerated door systems.

28. Standby Generator – an incentive program designed to utilize the emergency generation capacity of commercial/industrial facilities in order to reduce weather sensitive peak demand.

29. Street and Outdoor Lighting Conversion – a program that recovers the remaining net book value for converting the company's existing metal halide and high pressure sodium street and outdoor luminaires to light emitting diode technology.

30. Thermal Energy Storage - a rebate program that encourages commercial and industrial customers to install an off-peak air conditioning system.

31. Commercial Wall Insulation – a rebate program that encourages commercial and industrial customers to install wall insulation in existing commercial and industrial structures.

32. Commercial Water Heating – a rebate program that encourages commercial and industrial customers to install high efficiency water heating systems.

33. Conservation Research and Development (R&D) – a program that allows for the exploration of DSM measures that have insufficient data on the cost-effectiveness of the measure and the potential impact to Tampa Electric and its ratepayers.

The programs listed above were developed to meet FPSC demand and energy goals established in Docket No. 130201-EI, Order No. PSC-14-0696-FOF-EU, Issued December 16, 2014. The 2015 through 2018 demand and energy savings achievements by Tampa Electric's conservation and load management DSM programs are listed in Table III-1 below.

TABLE III-1
Comparison of Achieved MW and GWh Reductions With Florida Public Service Commission Goals
Savings at the Generator

Residential

Year	Winter Peak MW Reduction Total Achieved	Winter Peak MW Reduction Commission Approved Goal	Winter Peak MW Reduction % Variance	Summer Peak MW Reduction Total Achieved	Summer Peak MW Reduction Commission Approved Goal	Summer Peak MW Reduction % Variance	GWh Energy Reduction Total Achieved	GWh Energy Reduction Commission Approved Goal	GWh Energy Reduction % Variance
2015	12.3	2.6	473.1%	10.8	1.1	981.8%	21.2	1.8	1,177.8%
2016	7.7	4.1	187.8%	5.1	1.6	318.8%	13.2	3.5	377.1%
2017	6.9	5.2	132.7%	4.7	2.2	213.6%	14.9	4.8	310.4%
2018	8.0	6.5	123.0%	5.6	2.7	205.7%	17.1	6.1	280.3%
2019		7.6			3.1			6.9	
2020		7.6			3.3			7.4	
2021		8.0			3.3			7.7	
2022		7.4			3.0			6.9	
2023		6.8			2.9			6.3	
2024		6.1			2.5			5.5	

Commercial/Industrial

Year	Winter Peak MW Reduction Total Achieved	Winter Peak MW Reduction Commission Approved Goal	Winter Peak MW Reduction % Variance	Summer Peak MW Reduction Total Achieved	Summer Peak MW Reduction Commission Approved Goal	Summer Peak MW Reduction % Variance	GWh Energy Reduction Total Achieved	GWh Energy Reduction Commission Approved Goal	GWh Energy Reduction % Variance
2015	8.1	1.2	675.0%	11.7	1.7	688.2%	12.5	3.9	320.5%
2016	2.9	1.3	223.1%	4.4	2.5	176.0%	17.8	6.0	296.7%
2017	9.2	1.6	575.0%	10.4	2.7	385.2%	30.2	8.0	377.5%
2018	13.0	1.7	767.1%	15.0	3.3	453.6%	33.7	9.2	365.9%
2019		1.6			3.3			9.9	
2020		1.7			3.5			10.3	
2021		1.9			3.6			10.4	
2022		1.9			3.3			10.2	
2023		1.8			3.5			9.9	
2024		1.7			3.2			9.6	

Combined Total

Year	Winter Peak MW Reduction Total Achieved	Winter Peak MW Reduction Commission Approved Goal	Winter Peak MW Reduction % Variance	Summer Peak MW Reduction Total Achieved	Summer Peak MW Reduction Commission Approved Goal	Summer Peak MW Reduction % Variance	GWh Energy Reduction Total Achieved	GWh Energy Reduction Commission Approved Goal	GWh Energy Reduction % Variance
2015	20.4	3.8	536.8%	22.5	2.8	803.6%	33.7	5.7	591.2%
2016	10.6	5.4	196.3%	9.5	4.1	231.7%	31.0	9.5	326.3%
2017	16.1	6.8	236.8%	15.1	4.9	308.2%	45.1	12.8	352.3%
2018	21.0	8.2	256.5%	20.5	6.0	342.1%	50.8	15.3	331.8%
2019		9.2			6.4			16.8	
2020		9.3			6.8			17.7	
2021		9.9			6.9			18.1	
2022		9.3			6.3			17.1	
2023		8.6			6.4			16.2	
2024		7.8			5.7			15.1	