

# Integrated Resource Plan

## Technical Appendix

### Volume 2

#### Demand Side Management

# DEMAND-SIDE MANAGEMENT ANALYSIS

## Table of Contents

Executive Summary .....	2
Major Enhancements Since Last IRP .....	6
Introduction.....	7
Screening Criteria .....	7
Description of DSM Screening and Evaluation.....	8
Carbon Price Cases .....	9
DSM Program choices and Final Cost-Effectiveness Analysis .....	13
Quantitative Evaluation Process .....	13
Accounting for program impacts .....	16
The program portfolio.....	16
Recommendations.....	17
Descriptions of the DSM Programs .....	18
Estimated Impacts.....	18
Other Exhibits .....	19
Factoring Environmental Cost Considerations into DSM Evaluation.....	20

## **Executive Summary**

East Kentucky Power Cooperative (EKPC) selects Demand-Side Management (DSM) programs to offer on the basis of meeting customer needs and resource planning objectives in a cost-effective manner. EKPC analyzes DSM measures and programs using both qualitative and quantitative criteria. These criteria include customer acceptance, measure applicability, savings potential, and cost-effectiveness. The cost-effectiveness of DSM resources is analyzed in a rigorous fashion using standard (California) tests for cost-effectiveness.

For the 2022 IRP, EKPC has continued to enhance its DSM planning capabilities by undertaking an updated study of savings potential in its service territory. EKPC sponsored GDS Associates, Inc (“GDS”) to prepare this Energy Efficiency and Demand Response Study.

For the potential study, GDS conducted a cost-effectiveness screening of a comprehensive set of measures using the Total Resource Cost test from the California standard.

EKPC evaluated 476 DSM measures for the 2022 Integrated Resource Plan. These include 462 energy efficiency measures, and 14 demand response programs.

For more details on the energy efficiency measures and the results of the economic screening of those measures, please see the GDS Energy Efficiency and Demand Response Potential report (**Exhibit DSM-1**).

DSM programs include a package of one or more measures. EKPC prepared cost and participation estimates for the DSM programs it selected, and conducted a final cost-effectiveness analysis for each DSM program using the widely-accepted *DSMore* software tool.

EKPC used the \$ 3 million residential energy efficiency budget scenario from the GDS potential study to develop participation estimates for the DSM programs.

All of the programs selected, with the exception of the energy audit program<sup>1</sup>, were shown to be cost-effective using the Total Resource Cost (“TRC”) test.

The DSM portfolio for the 2022 IRP includes eight (8) programs: seven (7) energy efficiency programs and one (1) demand response programs.

EKPC presents the following DSM Program Portfolio for the 2022 IRP:

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<sup>1</sup>. The energy audit program is a customer service tool for high bill complaints; it also saves electricity,

**Table DSM-1**

**DSM Programs<sup>2</sup>**

<b>Program Name</b>	<b>Class</b>	<b>Summer Peak Demand Impact in 2036 (MW)</b>	<b>Annual Energy Impact in 2036 (MWh)</b>	<b>Total Resource Cost Test Benefit/ Cost Ratio</b>
Button-Up Weatherization	Residential	2.0	8,516	1.68
CARES – Low Income	Residential	3.7	25,285	1.15
Heat Pump Retrofit	Residential	2.5	51,845	1.60
Touchstone Energy (TSE) Home	Residential	3.4	15,368	2.10
ENERGY STAR® Manufactured Home	Residential	0.4	3,045	1.62
Residential Energy Audit	Residential	0.3	1,233	0.45
Residential Efficient Lighting	Residential	0.4	3,780	3.93
Direct Load Control- Residential: AC Switch or Bring Your Own Thermostat (BYOT) <sup>3</sup>	Residential	36.0	1,080	2.17

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<sup>2</sup> All impacts are cumulative incremental starting with new participation in 2022. All impacts represent net savings at the customer meter. Positive values indicate savings.

<sup>3</sup> The tariff allows small commercial customers to participate. However, we are not projecting to have any small commercial participants in this IRP. The savings and costs for this program are based on the Residential BYOT option.

This portfolio of DSM programs is projected to produce \$ 108.3 million of benefits and \$ 44.4 million of net benefits (2022 \$) on a total resource basis over the lifetime of the cost-effectiveness study (25 years). They will require an investment of \$ 63.8 million (2022 \$) by EKPC, its owner-members, and participating retail members in order to realize these savings.

## Major Enhancements Since Last IRP

EKPC has made several improvements to its DSM planning since the 2019 IRP. They include:

1. EKPC retained GDS Associates to prepare an updated Energy Efficiency and Demand Response Potential Study for EKPC (see **Exhibit DSM-1**). The measure list for energy efficiency was expanded. As a result, a more comprehensive set of DSM measures has been evaluated for this 2022 IRP.
2. EKPC updated our method for calculated avoided transmission costs by adding the 12 month coincident peak option in the Open Access Transmission Tariff (OATT).
3. EKPC introduced carbon price cases to test the sensitivity of DSM savings and cost-effectiveness to this factor.
4. EKPC prepared and submitted DSM Annual Reports for 2018, 2019, and 2020 (see **Exhibit DSM-2**).
5. EKPC sponsored multiple EKPC DSM Collaborative meetings in 2021 to review all energy efficiency and demand response measure cost-effectiveness results and obtained input from the Collaborative representatives pertaining to DSM program changes.

## **Introduction**

EKPC evaluates the future electric service requirements for its owner-members with balanced consideration of demand-side and supply-side resource options. The purpose of this section is to describe the evaluation of DSM resources for inclusion in the integrated analysis portion of the IRP.

DSM resources consist of customer energy programs that seek to change the power consumption of customer facilities in a way that meets planning objectives. They include energy efficiency, load management, demand response, and other demand-side programs.

EKPC's DSM analysis is conducted on an aggregate basis, with all owner-members combined, rather than on an individual retail member basis.

## **Screening Criteria**

EKPC analyzes DSM measures and programs using both qualitative and quantitative criteria. These criteria include customer acceptance, measure applicability, savings potential, and cost-effectiveness. The cost-effectiveness of DSM resources is analyzed in a rigorous fashion using the California tests for cost-effectiveness.

## Description of DSM Screening and Evaluation

EKPC uses a robust process to screen and evaluate DSM resources for inclusion in this plan.

For the 2022 IRP, EKPC has once again undertaken a comprehensive study of energy efficiency (“EE”) and demand response (“DR”) savings potential. EKPC hired GDS Associates, Inc. (“GDS”) as its contractor to conduct this energy efficiency and demand response potential study.

For the potential study, GDS conducted a cost-effectiveness screening of a comprehensive set of measures using the Total Resource Cost (“TRC”) test from the California standard. The EE potential study also used applicability factors for each measure in determining the savings potential.

For more details, including the measure lists, screening results, and estimates of economic and achievable potential, please refer to the Final Report for the Energy Efficiency and Demand Response Potential Study submitted by GDS. That report can be found in **Exhibit DSM-1**.

GDS developed a set of funding scenarios which determined the achievable potential given a specified budget level. This provided a basis for determining participation rates in DSM programs.

EKPC evaluated 476 DSM measures for the 2022 Integrated Resource Plan. These include 462 energy efficiency measures, and 14 demand response programs.

## Carbon price cases

EKPC performed sensitivity analysis to account for the uncertainty surrounding future carbon regulation. EKPC hired Guidehouse (Navigant) to develop three carbon price cases:

- Low Carbon –a per MWh adder for carbon costs based on the Regional Greenhouse Gas Initiative (RGGI)
- Mid Carbon –a per MWh adder for carbon costs based on a Biden Administration proposal
- High Carbon –a per MWh adder for carbon costs based on the social cost of carbon in New York.

**Table DSM-2** provides the annual carbon price adders for each of the cases:

<b>Table DSM-2</b>			
<b>\$/MWH Adder for CO2</b>			
Year	Low Case	Mid Case	High Case
2021	\$3.49	\$23.41	\$62.24
2022	\$3.83	\$24.44	\$64.02
2023	\$4.19	\$25.53	\$66.48
2024	\$4.59	\$26.69	\$69.08
2025	\$5.03	\$27.91	\$71.26
2026	\$5.50	\$29.18	\$74.09
2027	\$6.01	\$30.50	\$76.47
2028	\$6.57	\$31.88	\$79.53
2029	\$7.17	\$33.30	\$82.69
2030	\$7.83	\$34.77	\$85.30
2031	\$8.38	\$36.27	\$88.59
2032	\$8.96	\$37.81	\$91.96
2033	\$9.59	\$39.40	\$94.78

2034	\$10.26	\$41.04	\$98.36
2035	\$10.98	\$42.75	\$102.05
2036	\$11.75	\$44.51	\$105.15
2037	\$12.57	\$46.32	\$109.07
2038	\$13.45	\$48.20	\$113.11
2039	\$14.40	\$50.14	\$116.52
2040	\$15.40	\$52.15	\$120.81
2041	\$16.48	\$54.22	\$125.24
2042	\$17.63	\$56.36	\$129.80
2043	\$18.87	\$58.57	\$134.52
2044	\$20.18	\$60.85	\$139.38
2045	\$21.60	\$63.21	\$144.39

EKPC had GDS evaluate measure cost-effectiveness based on four (4) economic scenarios:

- Base Case – EKPC’s avoided costs for energy capacity from PJM
- Low Carbon – Base case plus a per MWh adder for carbon costs based on the Regional Greenhouse Gas Initiative (RGGI)
- Mid Carbon – Base case plus a per MWh adder for carbon costs based on a Biden Administration proposal
- High Carbon – Base case plus a per MWh adder for carbon costs based on the social cost of carbon in New York.

Under the Mid and High carbon cases, additional EE measures became cost-effective. The Mid case resulted in about 30% more measures being cost-effective.

EKPC directed GDS to estimate energy and demand impacts for four annual EE budget scenarios that corresponded to the four economic scenarios:

Base Case	Low Carbon	Mid Carbon	High Carbon
\$3 million	\$4 million	\$6 million	\$15 million

EKPC prepared DSM plans for each of these budget scenarios.

Also, two EE programs were added to the DSM portfolio for the Mid and High Carbon cases: the ENERGY STAR<sup>®</sup> Appliance rebate program, and the Small Business Lighting program.

EKPC set annual participation levels for DSM for each budget scenario.

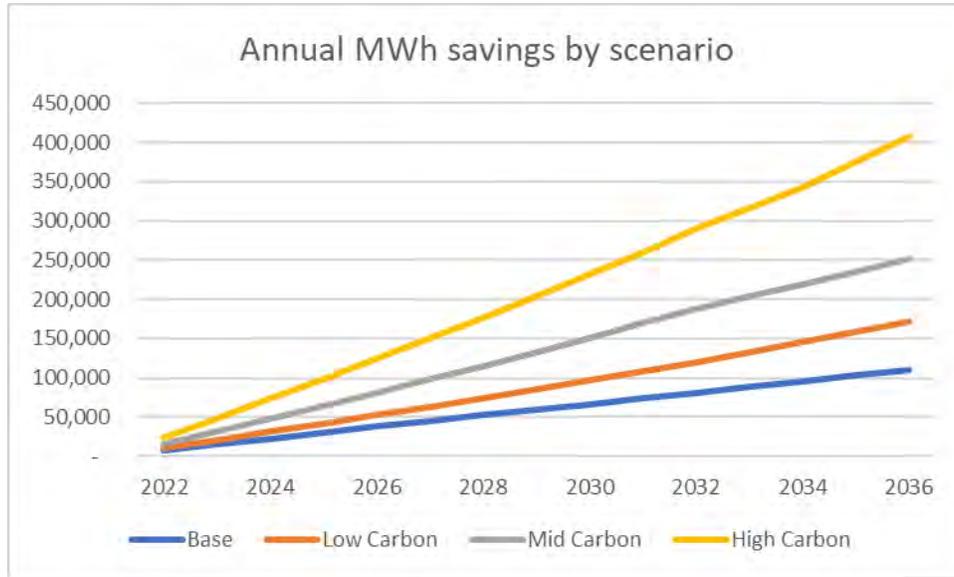
**Table DSM-3** shows the projected cumulative energy and demand savings in 2036 for each of these four scenarios:

**Table DSM-3**

Scenario	Annual MWh	Winter Peak MW	Summer Peak MW
Base case	110,151	30	49
LOW carbon	171,896	49	56
MID carbon	251,474	64	70
HIGH carbon	407,873	127	97

**Figure DSM-1** shows the annual MWh savings for each scenario:

Figure DSM-1



## **DSM Program choices and Final Cost-Effectiveness Analysis**

A DSM program consists of a package of one or more EE and/or DR measures. EKPC selected a portfolio of DSM programs in order to best achieve its objectives of meeting customer needs and acquiring cost-effective savings with a specified budget.

EKPC used the \$3 million EE budget scenario from the GDS study to develop participation estimates for the selected EE programs. In the same way, EKPC developed participation estimates for the DR programs.

Each program was designed using savings, costs, incentives, and participation estimates. Using these parameters, EKPC used the widely-used *DSMore* software tool to conduct a final cost-effectiveness analysis for each DSM program.

## **Quantitative Evaluation Process**

For this IRP, EKPC is once again using the *DSMore* software package to conduct the more detailed quantitative evaluation. *DSMore* was developed in 2003 by Integral Analytics. *DSMore* is a financial analysis tool designed to evaluate the costs, benefits, and risk profile of demand side management programs and measures. This tool combines Microsoft Excel spreadsheets with a separate component that performs detailed calculations. The user interfaces only with the Excel spreadsheet, which accepts inputs and returns outputs.

All of the standard DSM cost-effectiveness tests can be calculated using this tool: the TRC, the Utility Cost test, the Participant Cost (PC) test, the Ratepayer Impact (RIM) Test, and the Societal Cost (SC) Test. *DSMore* provides the results of those tests for both energy efficiency and demand response programs. This tool is one of the few packages viewed as “best practice” in the industry. *DSMore* has been used by more than 20 utilities, including other utilities in Kentucky.

*DSMore* calculates the impact of DSM programs on EKPC, the owner-members, and their retail members. The software tracks both the physical changes, such as the level of power demand, and the dollar flows. *DSMore* produces a quantitative estimate of the costs and benefits for each of the parties using models of the electric system and its customers.

The results of each perspective can be expressed in a variety of ways, but in all cases, it is necessary to calculate the net present value of program impacts over the life cycle of those impacts. *DSMore* uses this information to calculate the benefit/cost (b/c) ratio for each of these four tests.

These tests are not intended to be used individually or in isolation. The first critical test that a DSM program must pass is the PC test, because without participants, no savings occur. The results of tests that measure efficiency, such as the TRC and the SC, must be compared not only to each other, but also to the RIM test. The use of multiple tests helps ensure that the resulting portfolio of DSM programs attracts participants, results in the wise use of resources, and limits cross-subsidization.

EKPC is a full requirements Generation and Transmission provider for its 16 owner-members. Each owner-member is an independent non-profit corporation and operates distinct from EKPC. As a result, it is necessary to examine the impacts of DSM

programs separately for EKPC and for the typical owner-member. EKPC uses a customized version of *DSMore* to separately report the RIM test for EKPC and for the owner-member.

Each of the programs was modeled in detail with *DSMore*. For certain programs, several measures were modeled individually and then aggregated at the program level.

Each DSM program model includes:

- Typical participant electricity savings (kWh and kW)
- Lifetime of the measure savings
- Incremental measure costs (participant costs)
- EKPC and distribution cooperative administrative costs
- Rebates to customers, and from EKPC to the cooperative
- Detailed retail and wholesale rate schedules
- Customer participation levels including free rider estimates.

In addition to the detailed modeling of the DSM programs, *DSMore* also includes a detailed model of the supply side costs.

Major categories of supply side costs that are accounted for by the model include:

- Marginal energy costs (by hour of the year, correlated with weather and load)
- Marginal generation capacity costs (by year, including seasonal allocation)
- Marginal transmission & distribution capacity costs (by year, incl. seasonal allocation)
- Fossil fuel (natural gas & propane) costs (by year)
- Environmental externality costs (costs not internalized in energy or capacity costs; chiefly carbon related)

## **Accounting for program impacts**

The impacts for the DSM programs are accounted for in the Load Forecast.

## **The program portfolio**

The DSM portfolio for the 2022 IRP includes seven energy efficiency programs and one demand response program.

All of the programs selected, with the exception of the energy audit program<sup>4</sup>, were shown to be cost-effective using the Total Resource Cost (“TRC”) test.

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<sup>4</sup>. The energy audit program is a customer service tool for high bill complaints; it also saves electricity,

## Recommendations

EKPC presents the following DSM Program Portfolio for this IRP:

**Table DSM-4**  
**DSM Programs<sup>5</sup>**

<b>Program Name</b>	<b>Class</b>	<b>Summer Peak Demand Impact in 2036 (MW)</b>	<b>Annual Energy Impact in 2036 (MWh)</b>	<b>Total Resource Cost Test Benefit/Cost Ratio</b>
Button-Up Weatherization	Residential	2.0	8,516	1.68
CARES – Low Income	Residential	3.7	25,285	1.15
Heat Pump Retrofit	Residential	2.5	51,845	1.60
Touchstone Energy (TSE) Home	Residential	3.4	15,368	2.10
ENERGY STAR® Manufactured Home	Residential	0.4	3,045	1.62
Residential Energy Audit	Residential	0.3	1,233	0.45
Residential Efficient Lighting	Residential	0.4	3,780	3.93
Direct Load Control- Residential: AC Switch or Bring Your Own Thermostat <sup>6</sup>	Residential	36.0	1,080	2.17

<sup>5</sup> All impacts are cumulative incremental starting with new participation in 2022. All impacts represent net savings at the customer meter. Positive values indicate savings.

<sup>6</sup> The tariff allows small commercial customers to participate in the AC switch program. However, we are not projecting to have any small commercial participants in this IRP. The savings and costs for this program are based on the Residential BYOT option.

This portfolio of DSM programs is projected to produce \$ 108.3 million of benefits and \$ 44.4 million of net benefits (2022 \$) on a total resource basis over the lifetime of the cost-effectiveness study (25 years). They will require an investment of \$ 63.8 million (2022 \$) by EKPC, its owner-members, and participating retail members in order to realize these savings.

### **Descriptions of the DSM Programs**

**Exhibit DSM-3** provides assumptions sheets for each DSM program. For one program, separate analysis was performed for individual measures and then aggregated. Separate assumptions sheets were completed for each measure in the Heat Pump Retrofit program (2 measures).

**Exhibit DSM-4** provides more detailed results of the quantitative screen in the form of summary sheets for each DSM program.

**Exhibit DSM-5** provides program descriptions for each of the programs.

DSM program design and implementation are complex and dynamic undertakings. It is possible that DSM programs that are selected through this evaluation process may not be implemented as they have been described in this document.

### **Estimated Impacts**

The following table provides the forecasted impacts of the DSM programs on utility sales and coincident peak demands. Negative values denote reductions in load requirements while positive values denote increases in load requirements.

**Table DSM-5**

**Load Impacts of DSM Programs**

*(negative value= reduction in load)*

<b>Year</b>	<b>Impact on Energy Requirements (MWh)</b>	<b>Impact on Winter Peak (MW)</b>	<b>Impact on Summer Peak (MW)</b>
2022	-7,508	-2.0	-3.3
2023	-15,016	-4.1	-6.6
2024	-22,523	-6.1	-9.8
2025	-30,031	-8.2	-13.1
2026	-37,539	-10.2	-16.4
2027	-44,800	-12.2	-19.6
2028	-52,061	-14.2	-22.8
2029	-59,323	-16.2	-26.1
2030	-66,584	-18.1	-29.3
2031	-73,845	-20.1	-32.5
2032	-81,106	-22.1	-35.7
2033	-88,368	-24.0	-38.9
2034	-95,629	-26.0	-42.2
2035	-102,890	-28.0	-45.4
2036	-110,151	-29.9	-48.6

Year by year impacts for each individual program are provided in **Exhibit DSM-6**.

**Other Exhibits**

**Exhibit DSM-7** contains the remaining required program-specific tables: targeted classes and end uses, the expected duration of each program, projected costs, and projected cost savings.

**Exhibit DSM-8** contains the updated activities with the DSM Collaborative.

**Exhibit DSM-9** contains a table that shows the amount of demand response peak savings that EKPC has offered into the PJM auction.

### **Factoring Environmental Cost Considerations into DSM Evaluation**

EKPC has explicitly factored environmental costs into this evaluation of DSM resources. There are three major categories of environmental cost:

- (1) Cost of purchasing allowances;
- (2) Capital costs of compliance at power plants; and
- (3) Future environmental compliance costs.

EKPC has accounted for all three categories of environmental cost in its DSM evaluation. The following table describes how this was accomplished:

**Table DSM-6**  
**Accounting for Environmental Costs**

<b>ENVIRONMENTAL COST</b>	<b>WHERE ACCOUNTED FOR</b>	<b>SPECIFICS</b>
Allowance purchases	Marginal energy costs	SOx and NOx
Capital investments for compliance	Marginal capacity costs	Primarily Scrubbers, SCRs, other controls
Future Environmental Compliance Costs <sup>7</sup>	Future Environmental Compliance Cost adder	Used in Societal Cost test; value is set to \$0/MWh. Assessment of likely future environmental compliance cost value to be placed on carbon dioxide by government legislation and/or regulation over the 15 year planning period.

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<sup>7</sup> For this IRP, EKPC conducted a sensitivity analysis on carbon price. See “Carbon Price Cases” above.

Exhibit DSM-1

EE Potential Report



**GDS Associates, Inc.**  
ENGINEERS & CONSULTANTS  
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*prepared for*

# EAST KENTUCKY POWER COOPERATIVE

**EAST KENTUCKY  
POWER COOPERATIVE**

A Touchstone Energy Cooperative 

## 2021 POTENTIAL STUDY

**FINAL REPORT**

*November*

# 2021

*prepared by*

**GDS ASSOCIATES INC**

<b>1</b>	<b>EXECUTIVE SUMMARY</b>	<b>1</b>
1.1	Background	1
1.2	Study Scope	1
1.3	Energy Efficiency Potential	2
1.4	Demand Response Potential	3
<b>2</b>	<b>BASELINE FORECAST</b>	<b>5</b>
2.1	EKPC Member Service Territories	5
2.2	Sector-Level Forecasts and Market Segmentation	5
	<b>2.2.1 C&amp;I Sector</b>	<b>6</b>
<b>3</b>	<b>METHODOLOGY</b>	<b>8</b>
3.1	Overview of Approach	8
3.2	Market Characterization	8
3.3	Measure Characterization	10
	<b>3.3.1 Measure Lists</b>	<b>10</b>
	<b>3.3.2 Assumptions and Sources</b>	<b>10</b>
3.4	Energy Efficiency Potential	12
	<b>3.4.1 Types of Potential</b>	<b>12</b>
	<b>3.4.2 Technical Potential</b>	<b>12</b>
	<b>3.4.3 Economic Potential</b>	<b>13</b>
	<b>3.4.4 Achievable Potential</b>	<b>13</b>
<b>4</b>	<b>RESIDENTIAL ENERGY EFFICIENCY POTENTIAL FINDINGS</b>	<b>16</b>
4.1	Technical/Economic Potential	17
4.2	Achievable Potential	18
4.3	Residential Benefits and Costs	19
<b>5</b>	<b>COMMERCIAL AND INDUSTRIAL ENERGY EFFICIENCY POTENTIAL</b>	<b>21</b>
5.1	Commercial Energy Efficiency Potential	22
	<b>5.1.1 Technical/Economic Potential</b>	<b>22</b>
	<b>5.1.2 Achievable Potential</b>	<b>23</b>
5.2	Industrial Energy Efficiency Potential	24
	<b>5.2.1 Technical/Economic Potential</b>	<b>24</b>
	<b>5.2.2 Achievable Potential</b>	<b>25</b>
5.3	Commercial and Industrial Benefits and Costs	27
<b>6</b>	<b>DR POTENTIAL RESULTS</b>	<b>28</b>
6.1	Analysis Approach	28
	<b>6.1.1 Definition of Demand Response</b>	<b>28</b>
	<b>6.1.2 Demand Response Program Options</b>	<b>28</b>
	<b>6.1.3 Demand Response Potential Assessment Approach Overview</b>	<b>29</b>
	<b>6.1.4 Avoided Costs</b>	<b>30</b>

**6.1.5 Demand Response Program Assumptions ..... 30**

**6.1.6 DR Program Adoption Levels ..... 33**

6.2 Demand Response Potential.....34

**6.2.1 Technical/Economic Potential..... 35**

**6.2.2 Achievable Potential ..... 35**

6.3 Demand Response Potential Benefits and Costs.....36

**7 PROGRAM SCENARIOS ..... 38**

# 1 EXECUTIVE SUMMARY

## 1.1 BACKGROUND

This energy efficiency and demand response potential study for the East Kentucky Power Cooperative (EKPC) provides a roadmap and identifies the energy efficiency and demand response measures having the greatest potential savings and the measures that are the most cost-effective. In addition to technical and economic potential estimates, the development of achievable potential estimates for a range of feasible energy efficiency measures is useful for program planning and modification purposes. Unlike achievable potential estimates, technical and economic potential estimates do not include customer acceptance considerations for energy efficiency measures, which are often among the most important factors when estimating the likely customer response to new programs.

All energy efficiency results were developed using customized residential, commercial, and industrial sector-level energy efficiency potential assessment Excel models and Company-specific cost effectiveness criteria including the most recent EKPC avoided energy and capacity cost projections for electricity. Demand response results were calculated in a separate model.

The results of this study provide detailed information on measures that are cost-effective and have potential kWh and kW savings. The data referenced in this report were the best available at the time this analysis was developed. As building and appliance codes and energy efficiency standards change, and as energy prices fluctuate, additional opportunities for energy efficiency may occur while current practices may become outdated. Actual energy and demand savings will depend upon the level and degree of voluntary member system participation in DSM programs.

## 1.2 STUDY SCOPE

This study examines the potential to reduce electric consumption and peak demand through the implementation of DSM technologies and practices in residential, commercial, and industrial facilities. The study assessed energy efficiency potential and demand response throughout EKPC Members' service territories over fifteen years, from 2021 through 2036.

The scope of this study distinguishes three types of energy efficiency potential: (1) technical, (2) economic, and (3) achievable.

- **Technical Potential** is the theoretical maximum amount of energy use that could be displaced by efficiency, disregarding all non-engineering constraints such as cost-effectiveness and the willingness of end users to adopt the efficiency measures. Technical potential is constrained only by factors such as technical feasibility and applicability of measures.
- **Economic Potential** refers to the subset of the technical potential that is economically cost-effective as compared to conventional supply-side energy resources. Economic potential follows the same adoption rates as technical potential. Like technical potential, the economic scenario ignores market barriers to ensuring actual implementation of efficiency. Finally, economic potential only considers the costs of efficiency measures themselves, ignoring any programmatic costs (e.g., marketing, analysis, administration) that would be necessary to capture them.<sup>1</sup>
- **Achievable Potential** is the amount of energy use that efficiency can realistically be expected to displace, assuming the most aggressive program scenario possible (e.g., providing end users with payments for the entire incremental cost of more efficient equipment). Achievable potential considers real-world barriers to encouraging end users to adopt efficiency measures, the non-measure costs of delivering programs (for

<sup>1</sup> National Action Plan for Energy Efficiency, "Guide for Conducting Energy Efficiency Potential Studies" (November 2007), page 2-4.

administration, marketing, tracking systems, and monitoring and evaluation), and the capability of programs and administrators to boost program activity over time. The study assessed two types of achievable potential: maximum (MAP) and realistic (RAP).

GDS also calculated savings and costs estimates associated with four different program spending scenarios. These are summarized in Chapter 7 of the report.

### 1.3 ENERGY EFFICIENCY POTENTIAL

Figure 1-1 and Table 1-1 provide the technical, economic, MAP and RAP results for the 3-year, 10-year, and 15-year timeframes. The cumulative annual 5-year technical potential is 23% of the forecasted sales, and the economic potential is 16% of forecasted sales. The cumulative annual 5-year MAP is 8.2% and the RAP is 5.9%, as a percentage of forecasted sales. Over the duration of the study timeframe the technical potential rises to 36% and the economic potential rises to 26% of forecasted sales, indicating that nearly two-thirds of the technical potential is cost-effective. The MAP and RAP rise respectively to 15% and 11% of forecasted sales over the study timeframe. The gap between economic potential and MAP/RAP represents market barriers to prospective program participants, both financial and non-financial, to achieving the full amount of economic potential.

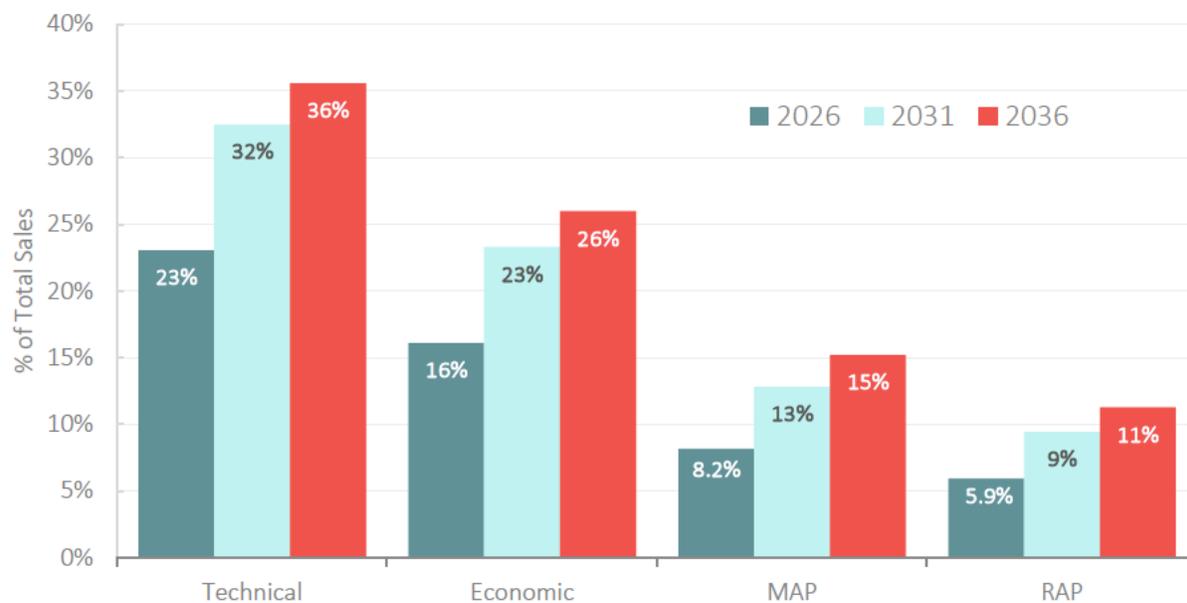


FIGURE 1-1: OVERVIEW OF ENERGY EFFICIENCY POTENTIAL

TABLE 1-1 CUMULATIVE ANNUAL ENERGY EFFICIENCY POTENTIAL SUMMARY – ALL SECTORS

	2022	2023	2024	2031	2036
<b>Energy (MWh)</b>					
<b>Technical</b>	993,802	1,669,175	2,309,915	4,968,676	5,698,900
<b>Economic</b>	701,936	1,172,009	1,614,651	3,563,891	4,159,482
<b>MAP</b>	326,062	564,681	793,512	1,957,719	2,432,083
<b>RAP</b>	196,326	381,053	556,953	1,445,208	1,807,652
<b>Energy Savings (as % of Forecast)</b>					
<b>Technical</b>	7.0%	11.6%	15.9%	32.5%	35.6%
<b>Economic</b>	4.9%	8.1%	11.1%	23.3%	26.0%

	2022	2023	2024	2031	2036
MAP	2.3%	3.9%	5.5%	12.8%	15.2%
RAP	1.4%	2.6%	3.8%	9.4%	11.3%

Table 1-2 provides the incremental annual technical, economic, MAP and RAP energy savings, in total MWh and as a percentage of the sales forecast. The incremental MAP ranges from 2.1% to 2.6% per year over the study horizon. The incremental RAP ranges from 1.2% to 1.6% per year over the study horizon.

TABLE 1-2 INCREMENTAL ANNUAL ENERGY EFFICIENCY POTENTIAL SUMMARY – ALL SECTORS

	2022	2023	2024	2031	2036
<b>Energy (MWh)</b>					
Technical	993,802	899,046	863,706	545,431	512,765
Economic	701,936	604,927	576,372	390,955	383,810
MAP	326,062	372,868	361,131	315,280	312,698
RAP	196,326	229,089	219,747	188,164	184,604
<b>Energy Savings (as % of Forecast)</b>					
Technical	7.0%	6.2%	5.9%	3.7%	3.4%
Economic	4.9%	4.2%	4.0%	2.6%	2.6%
MAP	2.3%	2.6%	2.5%	2.1%	2.1%
RAP	1.4%	1.6%	1.5%	1.3%	1.2%

#### 1.4 DEMAND RESPONSE POTENTIAL

Figure 1-2 provide the technical, economic, MAP and RAP results for the 3-year, 10-year, and 15-year timeframes. The cumulative annual 5-year technical potential is 62% of the peak demand forecasted, and the economic potential is 46% of forecasted demand. The cumulative annual 5-year MAP is 22.0% and the RAP is 14.4%, as a percentage of forecasted demand.

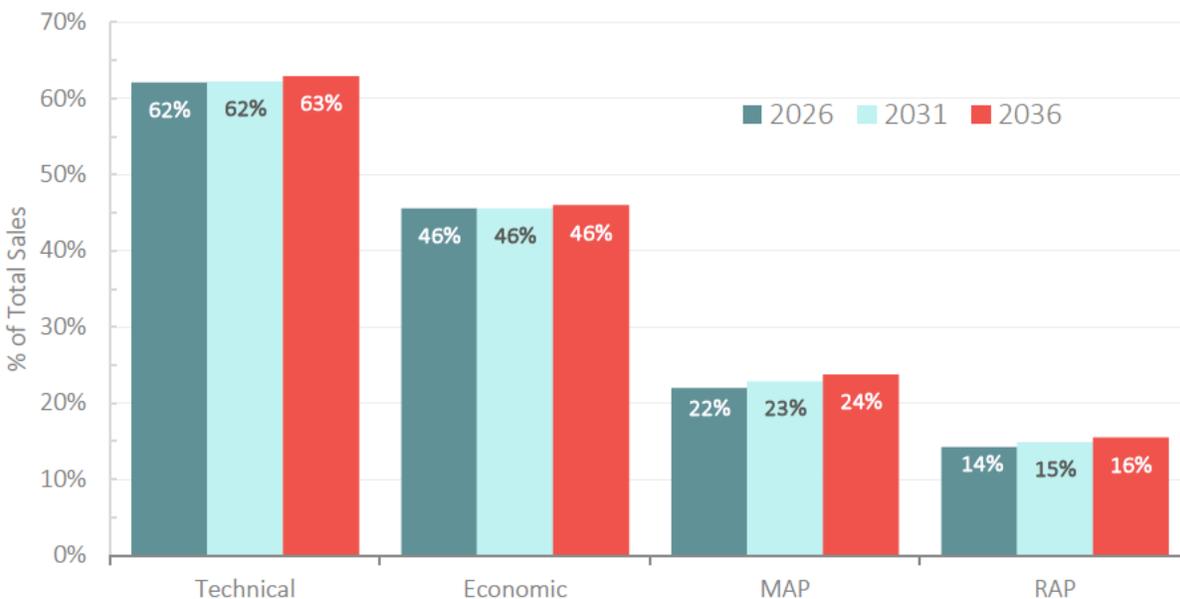


FIGURE 1-2: OVERVIEW OF DEMAND RESPONSE POTENTIAL

Table 1-1 provides 15-yr MAP and RAP potential by residential program. The Critical Peak Pricing with Enabling Tech program provides the most MAP and RAP potential, accounting for 6.0% peak savings in the MAP scenario and 1.6% savings in the RAP scenario.

TABLE 1-3 DEMAND RESPONSE MAP &amp; RAP POTENTIAL – RESIDENTIAL PROGRAMS

Residential Program	MAP (MW)	RAP (MW)	MAP (% of Forecast)	RAP (% of Forecast)
DLC AC (BYOT Thermostat)	17.0	11.9	0.6%	0.4%
DLC AC (Utility Incentivized Thermostat)	17.0	11.9	0.6%	0.4%
DLC AC (Switch)	11.7	7.7	0.4%	0.3%
DLC Swimming Pool Pumps	17.6	8.8	0.6%	0.3%
DLC Water Heating	0.0	0.0	0.0%	0.0%
Critical Peak Pricing with Enabling Tech	167.6	43.3	6.0%	1.6%
Critical Peak Pricing without Enabling Tech	22.6	13.5	0.8%	0.5%
PEV Charging	7.7	4.7	0.3%	0.2%
<b>Total</b>	<b>261.2</b>	<b>101.6</b>	<b>9.4%</b>	<b>3.7%</b>

Table 1-4 provides 15-yr MAP and RAP potential by C/I program. The Interruptible Rate program provides the most MAP and RAP potential, accounting for 10.8% peak savings in the MAP scenario and 10.4% savings in the RAP scenario.

TABLE 1-4 DEMAND RESPONSE MAP &amp; RAP POTENTIAL – C/I PROGRAMS

C/I Program	MAP (MW)	RAP (MW)	MAP (% of Forecast)	RAP (% of Forecast)
DLC AC (BYOT Thermostat)	6.5	2.8	0.2%	0.1%
DLC AC (Utility Incentivized Thermostat)	6.5	2.8	0.2%	0.1%
DLC Water Heating	7.6	3.3	0.3%	0.1%
DLC Agricultural Irrigation	9.7	4.8	0.3%	0.2%
Interruptible Rate	300.5	288.8	10.8%	10.4%
Large C&I Behavioral	0.6	0.1	0.0%	0.0%
Demand Buyback	0.0	0.0	0.0%	0.0%
Critical Peak Pricing with Enabling Tech	61.3	22.8	2.2%	0.8%
Critical Peak Pricing without Enabling Tech	5.4	3.8	0.2%	0.1%
<b>Total</b>	<b>398.1</b>	<b>329.1</b>	<b>14.3%</b>	<b>11.9%</b>

## 2 BASELINE FORECAST

The chapter provides updated forecast information on electricity consumption, consumption by market segment and by energy end use in EKPC's member service territories. This chapter also provides an overview of the number of households and housing units in EKPC's service area. Developing this information is a fundamental part of any energy efficiency potential study. It is necessary to understand how energy is consumed in a state or region before one can assess the energy efficiency savings potential that remains to be tapped.

### 2.1 EKPC MEMBER SERVICE TERRITORIES

EKPC member service territories are in an area from central Kentucky to eastern Kentucky. Figure 2-1 shows a map of the 16 cooperatives in EKPC's service area. Note that the size of service areas varies.

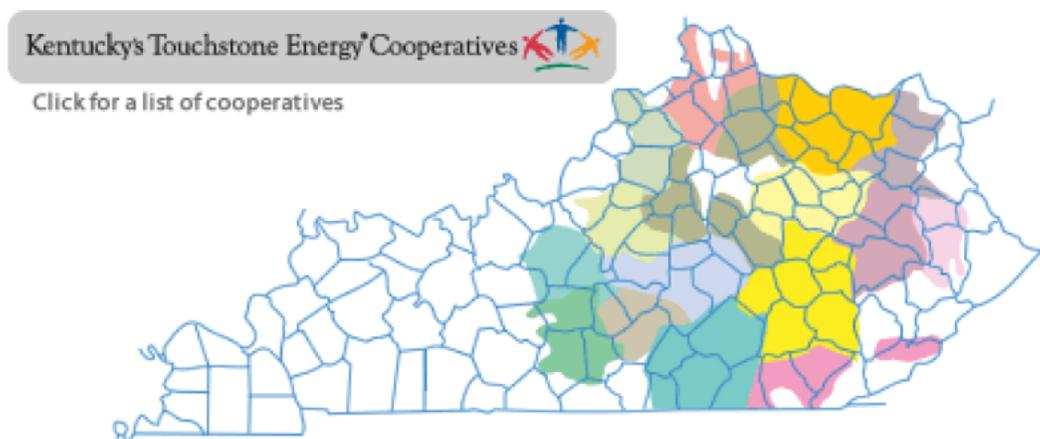


FIGURE 2-1. MAP OF THE 16 COOPERATIVES IN THE EKPC SERVICE TERRITORY

### 2.2 SECTOR-LEVEL FORECASTS AND MARKET SEGMENTATION

Table 2-1 provides the sales by sector across the 2022-2036 timeframe. Sales are forecasted to gradually increase over the timeframe of the study in both the residential and C/I sectors. Total sales are forecasted to be just over 16 million MWh by 2036.

TABLE 2-1 15-YR SALES FORECASTS BY SECTOR (MWH)

Year	Residential	C/I	Total
2022	7,253,125	7,014,164	14,267,289
2023	7,283,102	7,160,104	14,443,206
2024	7,322,856	7,232,600	14,555,456
2025	7,346,496	7,301,808	14,648,304
2026	7,392,185	7,357,686	14,749,871
2027	7,447,191	7,405,788	14,852,979
2028	7,528,324	7,464,246	14,992,570
2029	7,573,245	7,518,491	15,091,736
2030	7,614,810	7,571,407	15,186,216
2031	7,659,372	7,637,014	15,296,386

Year	Residential	C/I	Total
2032	7,745,879	7,713,949	15,459,828
2033	7,794,976	7,773,150	15,568,127
2034	7,876,424	7,838,788	15,715,212
2035	7,960,650	7,904,790	15,865,440
2036	8,045,776	7,971,349	16,017,125

### 2.2.1 C&I Sector

In the C&I sector, disaggregated forecast data provides the foundation for the development of energy efficiency potential estimates. GDS received a base case sales forecast from EKPC for the residential, commercial, and industrial sectors. The forecast was further segmented into end-uses by building type using CBECS 2015 end-use survey data.

Figure 2-2 provides a breakdown of commercial electric sales by building type.<sup>2</sup> Sales are nearly evenly distributed across retail, office, and education buildings, which account for nearly 60% of sales. Healthcare, warehouses, and food sales and service account for another approximately 25% of sales in the commercial sector.

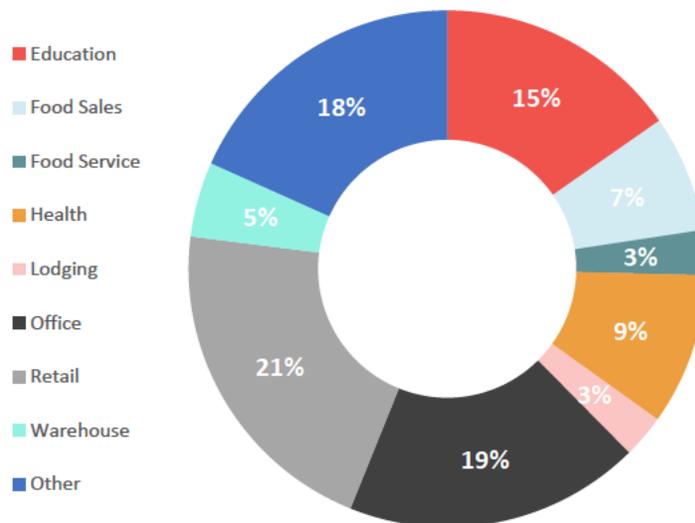


FIGURE 2-2: COMMERCIAL ELECTRIC SALES BREAKDOWN BY BUILDING TYPE

Figure 2-3 provides an illustration of the leading end-uses across all building types in the commercial sector. Lighting, space cooling, and ventilation are the primary end-uses with a significant share of load across most building types. Shares of refrigeration and office/computing are often dependent on the type of building, with refrigeration loads greatest in food sales and food service while office/computing loads are greatest in offices and education.

<sup>2</sup> "Other" commercial building types include buildings that engage in several different activities.

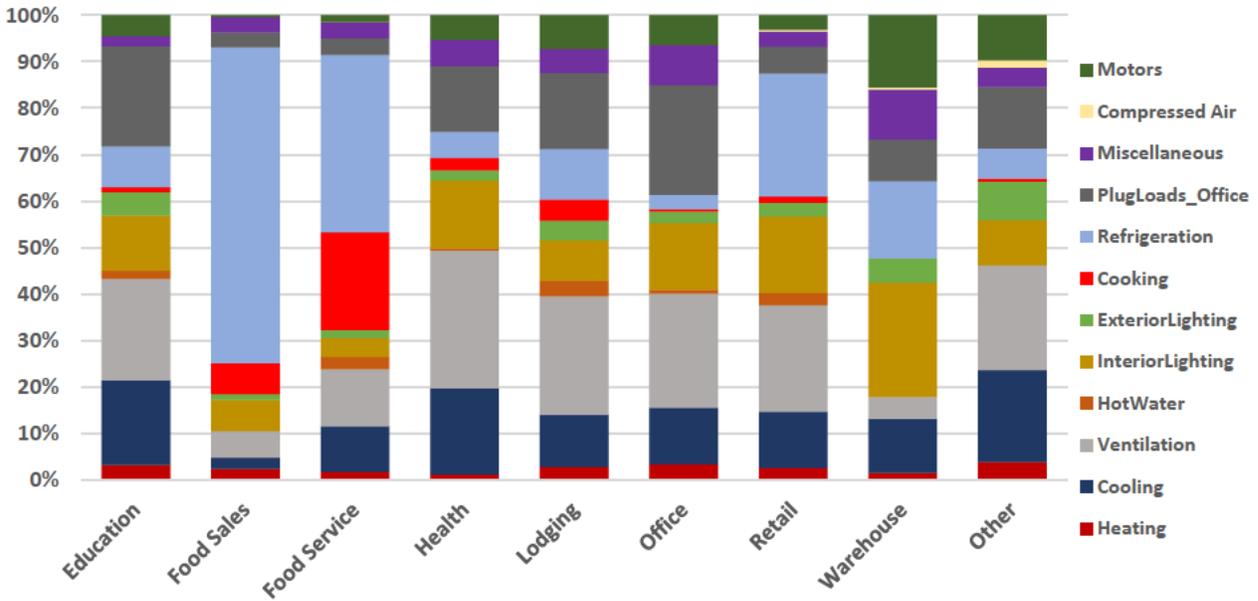


FIGURE 2-3: COMMERCIAL ELECTRIC END-USE BREAKDOWN BY BUILDING TYPE<sup>3</sup>

Industrial sales were also segmented by end-use based on the overall distribution of sales by industry type and EIA MECS data on end-use consumption by industrial segment.

Figure 2-4 provides a breakdown of the sales by end-use. Overall, the weighted average industrial sales by end-use in the EKPC service area was roughly 33% Machine Drive, 11% Process Heat, 14% HVAC, and 12% Lighting. These four end-uses accounted for 70% of sales.

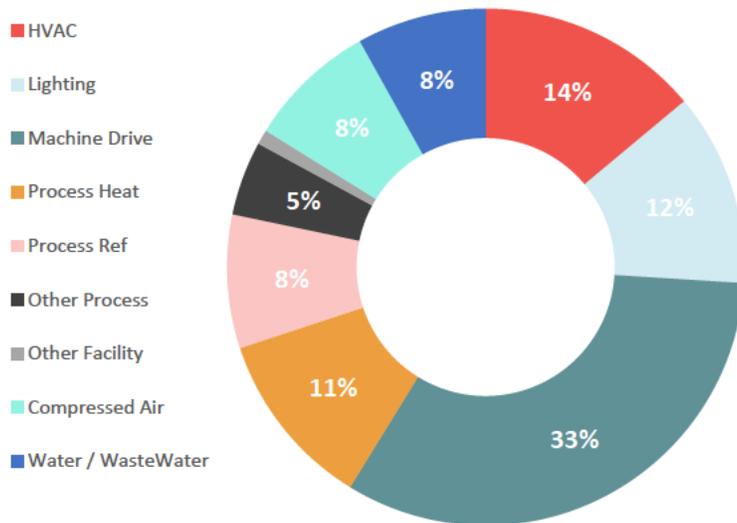


FIGURE 2-4: INDUSTRIAL ELECTRIC END-USE BREAKDOWN

<sup>3</sup> Data labels for segments that contribute less than 5% of the total sector sales were removed to improve Figure readability.

## 3 METHODOLOGY

This section describes the overall methodology utilized to assess the electric energy efficiency potential in the EKPC service area. The main objectives of the study were to estimate the technical, economic, maximum, and realistic achievable potential savings from energy efficiency and demand response (see Chapter 6 for demand response methodology details) in the EKPC territory; and to quantify these estimates of potential in terms of MWh and MW savings, for each level of energy efficiency potential. This document describes the general steps and methods that were used at each stage of the analytical process necessary to produce the various estimates of energy efficiency potential. GDS did not examine delivery approaches for energy efficiency programs as this task was not included in the scope of work for this study.

Energy efficiency potential studies involve several analytical steps to produce estimates of each type of energy efficiency potential: technical, economic, and achievable. This study utilizes benefit/cost screening tools for the residential and non-residential sectors to assess the cost effectiveness of energy efficiency measures. These cost effectiveness screening tools are Excel-based models that integrate technology-specific impacts and costs, customer characteristics, utility avoided cost forecasts and more. Excel was used as the modeling platform to provide transparency to the estimation process and allow for simple customization based on EKPC's unique characteristics and the availability of specific model input data. The major analytical steps and an overview of the potential savings are summarized below, and specific changes in methodology from one sector to another have been noted throughout this section.

### 3.1 OVERVIEW OF APPROACH

For the residential sector, GDS took a bottom-up approach to the modeling, whereby measure-level estimates of costs, savings, and useful lives were used as the basis for developing the technical, economic, and achievable potential estimates. The measure data was used to build-up the technical potential, by applying the data to each relevant market segment. The measure data allowed for benefit-cost screening to assess economic potential, which was in turn used as the basis for achievable potential, which took into consideration incentives and estimates of annual adoption rates.

For the commercial and industrial sectors, GDS took a bottom-up modeling approach to first estimate measure-level savings and costs as well as cost-effectiveness, and then applied cost-effective measure savings to all applicable shares of energy load. Disaggregated forecast data served as the foundation for the development of the energy efficiency potential estimates. The creation of the disaggregation involved two steps. First, GDS looked at actual customer groupings based on NAICS code and then calibrated our top-down load allocation based these codes to determine whether the customer was captured in the load forecast. Second, GDS determined the appropriate industry for industrial customers and the building type for commercial customers.

### 3.2 MARKET CHARACTERIZATION

The initial step in the analysis was to gather a clear understanding of the current market segments in the EKPC service area. The GDS team coordinated with EKPC to gather utility sales and customer data and existing market research to define appropriate market sectors and market segments. This information served as the basis for completing a forecast disaggregation and market characterization of both the residential and nonresidential sectors.

In the residential sector, GDS calibrated its building energy modeling simulations with EKPC's electric sales forecasts. This process began with the construction of building energy models, using the BEopt™ (Building Energy Optimization) software, which were specified in accordance with the most currently available data describing the residential building stock in the EKPC service area. Models were constructed for both single-family and manufactured homes, as well as various types of heating and cooling equipment. Key characteristics

defining these models include conditioned square footage, typical building envelope conditions such as insulation levels and representative appliance and HVAC efficiency levels. The simulations yielded estimated energy consumption for each building prototype, including estimates of each key end use. These end use estimates were then multiplied by the estimated proportion of customers that applied to each end use, to calculate an estimated service territory total consumption for each end use. For example, simulated heat pump electric heating consumption was multiplied by the proportion of homes that rely on heat pumps for their electric heating needs, to calculate the total heat pump electric heating load in the EKPC service territory.

In the commercial and industrial sectors, disaggregated forecast data provides the foundation for the development of energy efficiency potential estimates. GDS disaggregated the commercial sector sales into building type using data provided by EKPC with regional energy use estimates from the US Energy Information Administration (EIA) 2012 Commercial Building Energy Consumption Survey (CBECS) data for the East South-Central Census region. For the industrial sector, the baseline electric forecasts were disaggregated by industry type using detailed sales by customer for all customers over 1,000 kW demand, and a sample of customers under 1,000 kW demand

GDS further disaggregated sales for each of the segments into end uses. For commercial segments, GDS again primarily used EIA 2012 Commercial Building Energy Consumption Survey (CBECS) data for the East South-Central Census region. This information was used to determine energy use intensities, expressed in kWh per square foot, for each end use within each segment. For the industrial sector, the analysis relied on the EIA's Manufacturing Energy Consumption survey to disaggregate industry-specific estimates of electric consumption into end uses.

- **Residential.** The residential forecast was broken out by housing type between existing income qualified and market-rate customers as well as new construction.
- **Commercial.** Typically based on major EIA CBECS business types: retail, warehouse, food sales, office, lodging, health, food service, education, and miscellaneous.
- **Industrial.** As determined by actual load consumption shares and major industry types as defined by EIA's Manufacturing Energy Consumption Survey (MECS) data.

The segmentation analysis was performed by applying EKPC-specific segment and end-use consumption shares, and by EIA CBECS and MECS data (end-use segmentation) to forecast year sales. Within the residential, commercial, and industrial market segments, the sector level disaggregated forecasts were further segmented by the major end uses shown in Table 3-1.

TABLE 3-1: ELECTRIC END-USE LOADS

Residential	Commercial/Industrial
Heating	Interior Lighting
Cooling	Exterior Lighting
Water Heating	Refrigeration
Cooking	Space Cooling
Refrigerator	Space Heating
Freezer	Ventilation
Dishwasher	Water Heating
Clothes Washer	Plug Loads / Office Equipment
Dryer	Cooking
TV	Other
Light	Whole Building / Behavioral
Miscellaneous	

### 3.3 MEASURE CHARACTERIZATION

This section of the report provides an overview of the measure lists used in the study as well as the assumptions and sources used to characterize these measures.

#### 3.3.1 Measure Lists

The energy efficiency measures included in this study cover energy efficiency measures currently included in EKPC's energy efficiency programs, as well as additional measures suggested by the GDS Team based on existing knowledge and current databases of electric end-use technologies and energy efficiency measures. The study scope includes measures and practices that are currently commercially available as well as emerging technologies. The commercially available measures are of the most immediate interest to EKPC. However, a small number of well documented emerging technologies were considered for each sector. Emerging technology research was focused on measures that are commercially available but may not be widely accepted at the current time. These measure lists were then reviewed, discussed, and updated as necessary. A complete listing of the energy efficiency measures included in this study is provided in the Appendices of this report.

In addition, this study includes measures that could be relatively easily substituted for, or applied to, existing technologies on a retrofit or replace-on-burnout basis. Replace-on-burnout applies to equipment replacements that are made normally in the market when a piece of equipment is at the end of its useful life. A retrofit measure is eligible to be replaced at any time in the life of the equipment or building. Replace-on-burnout measures are generally characterized by incremental measure costs and savings (e.g. the costs and savings of a high-efficiency versus standard efficiency air conditioner); whereas retrofit measures are generally characterized by full costs and savings (e.g. the full costs and savings associated with adding ceiling insulation into an existing attic). For new construction, energy efficiency measures can be implemented when each new home or building is constructed, thus the rate of availability is a direct function of the rate of new construction.

In total, GDS analyzed 256 measure types for EKPC. Many measures required multiple permutations for different applications, such as different building types, efficiency levels, and replacement options. GDS developed a total of 1,440 measure permutations for this study. Table 3-2 provides a breakdown of the sector-level number of measures and permutations.

TABLE 3-2 MEASURE COUNTS BY SECTOR

Sector	# of Measures	Total Permutations
Residential	112	376
C/I	144	1,064
Total	256	1,440

#### 3.3.2 Assumptions and Sources

A significant amount of data is needed to estimate the kWh and kW savings potential for individual energy efficiency and demand response measures or programs across the entire existing residential and non-residential sectors for EKPC. GDS used Kentucky specific data wherever it was available and up to date. Considerable effort was expended to identify, review, and document all available data sources.

This review has allowed the development of reasonable and supportable assumptions regarding measure lives; measure installed incremental or full costs (as appropriate); and electric savings and saturations for each energy efficiency measure included in the final list of measures in this study.

Costs and savings for new construction and replace on burnout measures are calculated as the incremental difference between the code minimum equipment and the energy efficiency measure. This approach is utilized because the

consumer must select an efficiency level that is at least the code minimum equipment. The incremental cost is calculated as the difference between the cost of high efficiency and standard (code compliant) equipment. However, for retrofit measures, the measure cost is considered the “full” cost of the measure, as the baseline scenario assumes the consumer would do nothing. In general, the savings for retrofit measures are calculated as the difference between the energy use of the removed equipment and the energy use of the new high efficiency equipment (until the removed equipment would have reached the end of its useful life).

**Measure Savings:** GDS utilized several sources including the 2021 Ill TRM to inform calculations supporting estimates of annual measure savings as a percentage of base equipment usage. Other sources used include:

- Mid-Atlantic TRM, Indiana TRM, Maine TRM, Minnesota TRM, and other existing deemed savings databases
- Building energy simulation software (BEopt) and engineering analyses
- Secondary sources such as the American Council for an Energy-Efficient Economy (ACEEE), Department of Energy (DOE), Energy Information Administration (EIA), ENERGY STAR®, and other technical potential studies

**Measure Costs:** Measure costs represent either incremental or full costs. These costs typically include the incremental cost of measure installation, when appropriate based on the measure definition. For purposes of this study, nominal measure costs held constant over time.

GDS obtained measure cost estimates from a variety of sources, starting with the 2021 Ill TRM. Other sources leveraged include:

- Mid-Atlantic TRM, Indiana TRM, Maine TRM, Minnesota TRM, and other existing deemed savings databases
- Secondary sources such as the ACEEE, ENERGY STAR, National Renewable Energy Lab (NREL), California Database for Energy Efficient Resources (DEER) database, Northeast Energy Efficiency Partnership (NEEP) Incremental Cost Study, and other technical potential studies

**Measure Life:** Measure life represents the number of years that energy using equipment is expected to operate. GDS obtained measure life estimates from the 2021 Ill TRM, and used the following other data sources:

- TRMs in other states
- Manufacturer data
- Savings calculators and life-cycle cost analyses
- The California DEER database
- Other consultant research or technical reports

**Building/Equipment Saturation Data:** To assess the amount of electric energy efficiency savings still available, estimates of the current saturation of baseline equipment and energy efficiency measures, or for the non-residential sector, the amount of energy use that is associated with a specific end-use (such as HVAC) and percent of that energy use that is associated with energy efficient equipment are necessary. Up-to-date measure saturation data were primarily obtained from the following recent studies:

- 2020 and 2016 EKPC Member System End-Use Surveys
- 2015 EIA Residential Energy Consumption Survey (RECS)
- Energy Stat Unit Shipment Data
- 2014 EIA Manufacturing Energy Consumption Survey (MECS)
- 2012 EIA Commercial Building Energy Consumption Survey (CBECS)

### 3.4 ENERGY EFFICIENCY POTENTIAL

This section provides an overview of the types of potential and key considerations in assessing each level of energy efficiency potential.

#### 3.4.1 Types of Potential

This section reviews the types of potential analyzed in this report, as well as some key methodological considerations in the development of technical, economic, and achievable potential.

The first two types of potential, technical and economic, provide a theoretical upper bound for energy savings from energy efficiency measures. Still, even the best-designed portfolio of programs is unlikely to capture 100% of the technical or economic potential. Therefore, achievable potential attempts to estimate what savings can be realistically achieved through market interventions, when it can be captured, and how much it would cost to do so. Figure 1-1 illustrates the types of energy efficiency potential considered in this analysis.

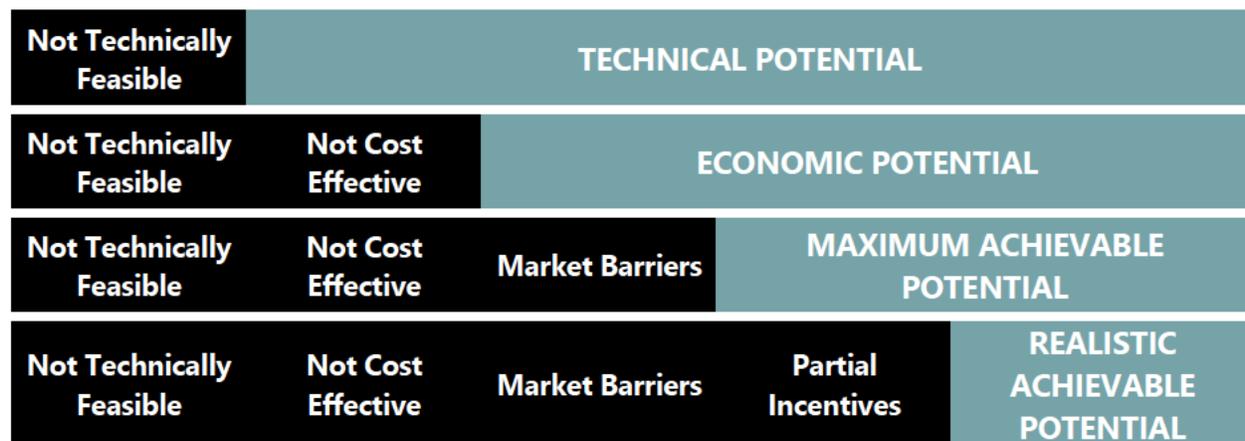


FIGURE 3-1 TYPE OF ENERGY EFFICIENCY POTENTIAL<sup>4</sup>

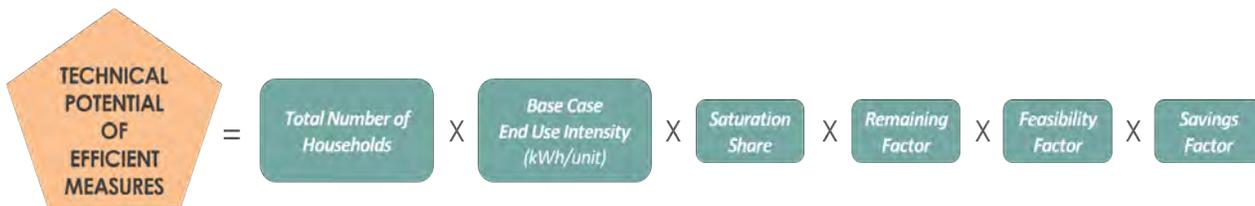
#### 3.4.2 Technical Potential

The Technical potential is the theoretical maximum amount of energy use that could be displaced by efficiency, disregarding all non-engineering constraints such as cost-effectiveness and the willingness of end users to adopt the efficiency measures. Technical potential is only constrained by factors such as technical feasibility and applicability of measures. Under technical potential, GDS assumed that 100% of new construction and market opportunity measures are adopted as those opportunities become available (e.g., as new buildings are constructed, they immediately adopt efficiency measures, or as existing measures reach the end of their useful life). For retrofit measures, implementation was assumed to be resource constrained and that it was not possible to install all retrofit measures all at once. Rather, retrofit opportunities were assumed to be replaced incrementally until 100% of stock was converted to the efficient measure over a period of no more than 15 years.

The core equation used in the residential sector energy efficiency technical potential analysis for each individual efficiency measure is shown in Equation 3-1 below. The C&I sector employs a similar analytical approach.

<sup>4</sup> Reproduced from "Guide to Resource Planning with Energy Efficiency." November 2007. US Environmental Protection Agency (EPA). Figure 2-1. Modified to depict the additional levels of achievable and program potential included in this study.

## EQUATION 3-1 CORE EQUATION FOR RESIDENTIAL SECTOR TECHNICAL POTENTIAL

**Where...**

**Base Case Equipment End-Use Intensity** = the electricity used per customer per year by each base-case technology in each market segment. In other words, the base case equipment end-use intensity is the consumption of the electrical energy using equipment that the efficient technology replaces or affects.

**Saturation Share** = the fraction of the end-use electrical energy that is applicable for the efficient technology in each market segment. For example, for residential water heating, the saturation share would be the fraction of all residential electric customers that have electric water heating 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 electric water heaters that is not already energy efficient.

**Feasibility Factor** = (also functions as the applicability factor) the fraction of the applicable units that is technically feasible for conversion to the most efficient available technology from an engineering perspective (e.g., it may not be possible to install heat pump water heaters in all homes because of space limitations).

**Savings Factor** = the percentage reduction in electricity consumption resulting from the application of the efficient technology.

**Competing Measures & Interactive Effects Adjustments**

GDS prevents double-counting of savings, and accounts for competing measures and interactive savings effects, through three primary adjustment factors:

**Baseline Saturation Adjustment.** Competing measure shares are factored into the baseline saturation estimates. For example, nearly all homes can receive insulation. To account for this, GDS' analysis used multiple measure permutations that account for varying impacts of different heating/cooling combinations and baseline saturations were applied to reflect the proportions of households with each heating/cooling combination.

**Applicability Factor Adjustment.** Combined measures into measure groups, where total applicability factor across measures is set to 100%. For example, homes cannot receive a programmable thermostat, connected thermostat, and smart thermostat. In general, the models assign the measure with the most savings the greatest applicability factor in the measure group, with competing measures picking up any remaining share.

**Interactive Savings Adjustment.** As savings are introduced from select measures, the per-unit savings from other measures need to be adjusted (downward) to avoid over-counting. The analysis typically prioritizes market opportunity equipment measures (versus retrofit measures that can be installed at any time). For example, the savings from a smart thermostat are adjusted down to reflect the efficiency gains of installing an efficient air source heat pump.

**3.4.3 Economic Potential**

Economic potential refers to the subset of the technical potential that is economically cost-effective (based on screening with the TRC test) as compared to conventional supply-side energy resources.

**3.4.4 Achievable Potential**

Achievable potential is the amount of energy that can realistically be saved given various market barriers. Achievable potential considers real-world barriers to encouraging end users to adopt efficiency measures; the non-measure costs of delivering programs (for administration, marketing, analysis, and EM&V); and the

capability of programs and administrators to boost program activity over time. Barriers include financial, customer awareness and willingness-to-participate (“WTP”) in programs, technical constraints, and other barriers the “program intervention” is modeled to overcome. Additional considerations include political and/or regulatory constraints. The potential study evaluated two achievable potential scenarios:

- **MAP** estimates achievable potential on paying incentives equal to up to 100% of measure incremental costs and aggressive adoption rates.<sup>5</sup>
- **RAP** estimates achievable potential with EKPC paying incentive levels (as a percent of incremental measure costs) closely calibrated to historical levels but is not constrained by any previously determined spending levels.

#### 3.4.4.1 Market Adoption Rates

GDS assessed achievable potential on a measure-by-measure basis. In addition to accounting for the natural replacement cycle of equipment in the achievable potential scenario, GDS estimated measure specific maximum adoption rates that reflect the presence of possible market barriers and associated difficulties in achieving the 100% market adoption assumed in the technical and economic scenarios.

The initial step was to assess the long-term market adoption potential for energy efficiency technologies. Due to the wide variety of measures across multiple end-uses, GDS employed varied measure and end-use-specific ultimate adoption rates versus a singular universal market adoption curve. These long-term market adoption estimates were based on aggregated WTP market research across several recent GDS studies. The WTP research included questions to residential homeowners and nonresidential facility managers regarding their perceived willingness to purchase and install energy efficient technologies across various end uses and incentive/payback performance levels. One caveat to this approach is that the WTP adoption score is generally a simple function of incentive levels and/or payback performance.

GDS utilized likelihood and willingness-to-participate data to estimate the long-term market adoption potential for both the maximum and realistic achievable scenarios. Table 3-3 presents the long-term market adoption rates at varied incentive levels used for the residential sector. Most end-uses are based on the WTP market research.

TABLE 3-3 RESIDENTIAL LONG-TERM MARKET ADOPTION RATES AT DISCRETE INCENTIVE LEVELS

End Use	0% Incentive	50% Incentive	75% Incentive	100% Incentive
Water Heating	39%	60%	69%	79%
HVAC Equipment	28%	51%	64%	79%
HVAC Shell	33%	53%	62%	77%
Appliances	48%	67%	75%	83%
Other	45%	66%	76%	88%

Table 3-4 presents the long-term market adoption rates used in the nonresidential sector.

TABLE 3-4 NONRESIDENTIAL LONG-TERM MARKET ADOPTION RATES AT DISCRETE PAYBACK INTERVALS

End-Use	10 Year Payback Period	5 Year Payback Period	3 Year Payback Period	1 Year Payback Period	0 Year Payback Period
Lighting	43%	52%	61%	71%	78%

<sup>5</sup> *ibid.*

End-Use	10 Year Payback Period	5 Year Payback Period	3 Year Payback Period	1 Year Payback Period	0 Year Payback Period
HVAC	28%	37%	48%	61%	71%
Refrigeration	18%	26%	38%	53%	67%
Water Heat	47%	58%	69%	79%	86%
Other	43%	52%	61%	71%	78%

In the maximum achievable potential scenario, incentives were assumed to represent 100% of the measure cost (0-year payback).

GDS then estimated initial year adoption rates by reviewing the current saturation levels of efficient technologies and (if necessary) calibrating the estimates of 2022 annual potential to recent historical levels achieved by EKPC. The calibration was only considered if recent historical savings outpaced the estimated near-term potential. GDS then assumed a non-linear ramp rate from the initial year market adoption rate to the various long-term market adoption rates for each specific end-use.

#### 3.4.4.2 Non-Incentive Costs

Consistent with National Action Plan for Energy Efficiency (NAPEE) guidelines,<sup>6</sup> utility non-incentive costs were included in the overall assessment of cost-effectiveness at the RAP scenario. Non-incentive costs were calibrated to recent EKPC levels. Non-incentive costs were then escalated annually at the rate of inflation.<sup>7</sup>

<sup>6</sup> National Action Plan for Energy Efficiency (2007). Guide for Conducting Energy Efficiency Potential Studies. Prepared by Optimal Energy. This study notes that economic potential only considers the cost of efficiency measures themselves, ignoring programmatic costs. Conversely, achievable potential should consider the non-measures costs of delivering programs. Pg. 2-4.

<sup>7</sup> As noted earlier in the report, measure costs and utility incentives were not escalated over the 20-year analysis timeframe to keep those costs constant in nominal dollars.

## 4 RESIDENTIAL ENERGY EFFICIENCY POTENTIAL FINDINGS

This chapter provides the potential results for technical, economic, and achievable potential for the residential sector. The chapter breaks down the potential by sector, end use and market segment. The results are provided on a five, ten and fifteen-year basis. Budget and benefit-cost data are provided for the achievable potential scenarios.

Figure 4-1 and Table 4-1 provide the technical, economic, MAP and RAP results for the 3-year, 10-year, and 15-year timeframes. The cumulative annual 5-year technical potential is 35% of the residential forecasted sales, and the economic potential is 22% of forecasted sales. The cumulative annual 5-year MAP is 9.4% and the RAP is 6.9%, as a percentage of forecasted residential sales. Over the duration of the study timeframe the technical potential rises to 47% and the economic potential rises to 30% of forecasted sales, indicating that nearly two-thirds of the technical potential is cost-effective. The MAP and RAP rise respectively to 17% and 13% of forecasted sales over the study timeframe. The gap between economic potential and MAP/RAP represents market barriers to prospective program participants, both financial and non-financial, to achieving the full amount of economic potential.

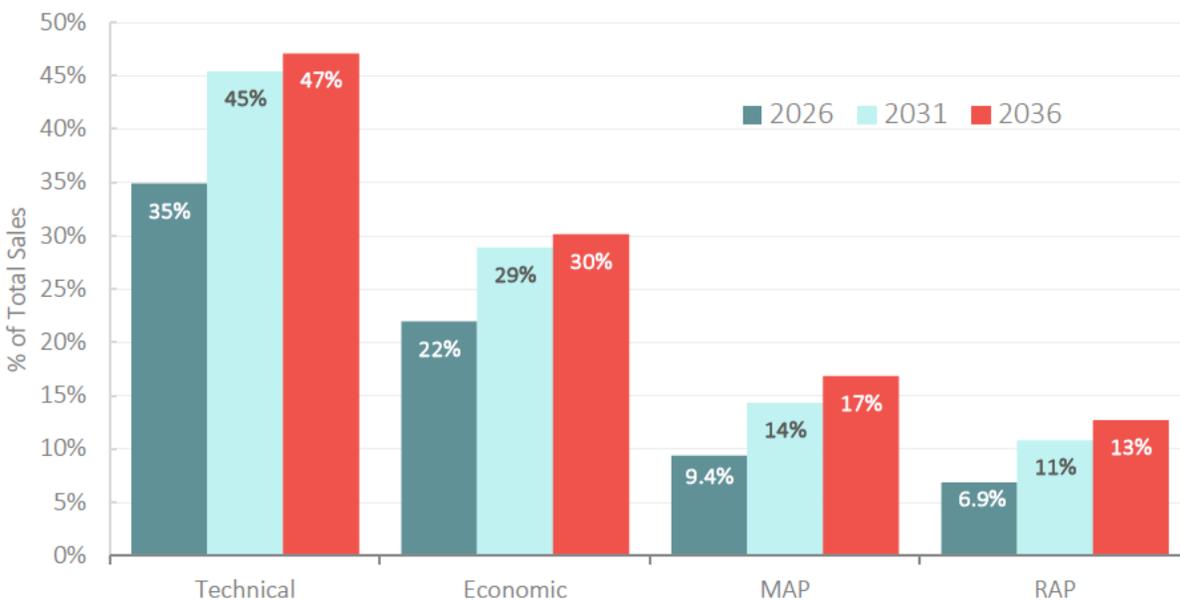


FIGURE 4-1: OVERVIEW OF RESIDENTIAL POTENTIAL

TABLE 4-1 RESIDENTIAL CUMULATIVE ANNUAL ENERGY EFFICIENCY POTENTIAL SUMMARY

	2022	2023	2024	2031	2036
<b>Energy (MWh)</b>					
Technical	842,684	1,351,627	1,820,540	3,474,627	3,788,466
Economic	561,899	877,896	1,162,682	2,212,215	2,424,194
MAP	219,181	349,821	474,739	1,097,598	1,353,946
RAP	119,918	226,701	328,021	827,128	1,023,211
<b>Energy Savings (as % of Forecast)</b>					
Technical	11.6%	18.6%	24.9%	45.4%	47.1%
Economic	7.7%	12.1%	15.9%	28.9%	30.1%
MAP	3.0%	4.8%	6.5%	14.3%	16.8%
RAP	1.7%	3.1%	4.5%	10.8%	12.7%

Table 4-2 provides the incremental annual technical, economic, MAP and RAP energy savings, in total MWh and as a percentage of the sector-level sales forecast. The incremental MAP ranges from 2.7% to 3.6% per year over the study horizon. The incremental RAP ranges from 1.4% to 2.1% per year over the study horizon.

TABLE 4-2 RESIDENTIAL INCREMENTAL ANNUAL ENERGY EFFICIENCY POTENTIAL SUMMARY

	2022	2023	2024	2031	2036
<b>Energy (MWh)</b>					
Technical	842,684	732,616	691,879	372,145	347,486
Economic	561,899	450,852	418,516	230,747	230,219
MAP	219,181	264,889	257,217	214,433	214,970
RAP	119,918	151,146	145,167	113,472	112,067
<b>Energy Savings (as % of Forecast)</b>					
Technical	11.6%	10.1%	9.4%	4.9%	4.3%
Economic	7.7%	6.2%	5.7%	3.0%	2.9%
MAP	3.0%	3.6%	3.5%	2.8%	2.7%
RAP	1.7%	2.1%	2.0%	1.5%	1.4%

#### 4.1 TECHNICAL/ECONOMIC POTENTIAL

Table 4-3 provides cumulative annual technical and economic potential results across the for the 1-year, 2-year, 3-year, 10-year, and 15-year timeframes. The technical potential is more than 1.8 million MWh by 2024 and rises to more than 3.7 million MWh by 2036. Economic potential rises to more than 1.1 million MWh by 2036 as well. Peak demand savings associated with technical potential reach 342 MW by 2024 and reach approximately 688 MW by 2036.

TABLE 4-3 TECHNICAL &amp; ECONOMIC RESIDENTIAL POTENTIAL

	2022	2023	2024	2031	2036
<b>Energy (MWh)</b>					
Technical	842,684	1,351,627	1,820,540	3,474,627	3,788,466
Economic	561,899	877,896	1,162,682	2,212,215	2,424,194
<b>Peak Demand (MW)</b>					
Technical	139.0	243.5	342.0	653.1	688.2
Economic	76.4	117.8	153.5	262.3	279.8

Figure 4-2 shows a comparison of the technical and economic potential (15-year) by end use. HVAC Equipment and HVAC Shell are the leading end-use among technical and economic potential. Water Heating savings also account for significant technical and economic potential.

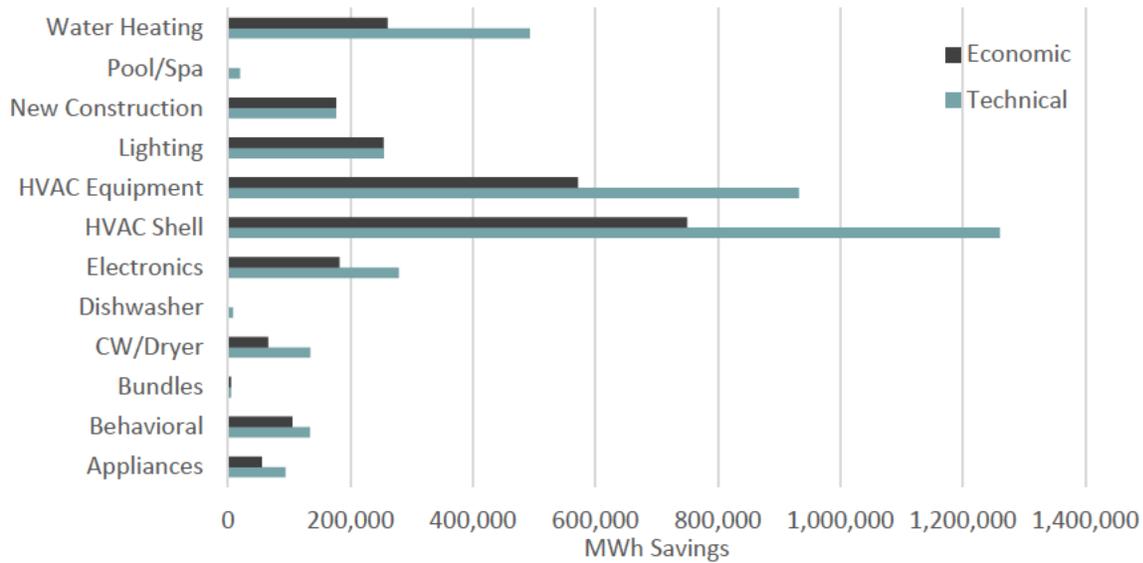


FIGURE 4-2: 15-YR RESIDENTIAL TECHNICAL & ECONOMIC POTENTIAL, BY END-USE

#### 4.2 ACHIEVABLE POTENTIAL

Figure 4-3 provides the MAP and RAP across the 15-yr timeframe of the study. The green and red bars provide the respective incremental annual MAP and RAP in MWh per year energy savings. The green and orange lines provide the corresponding cumulative annual MAP and RAP as a percent of forecasted annual residential sector sales. The MAP rises to 17% by 2036, and the RAP rises to 13%.

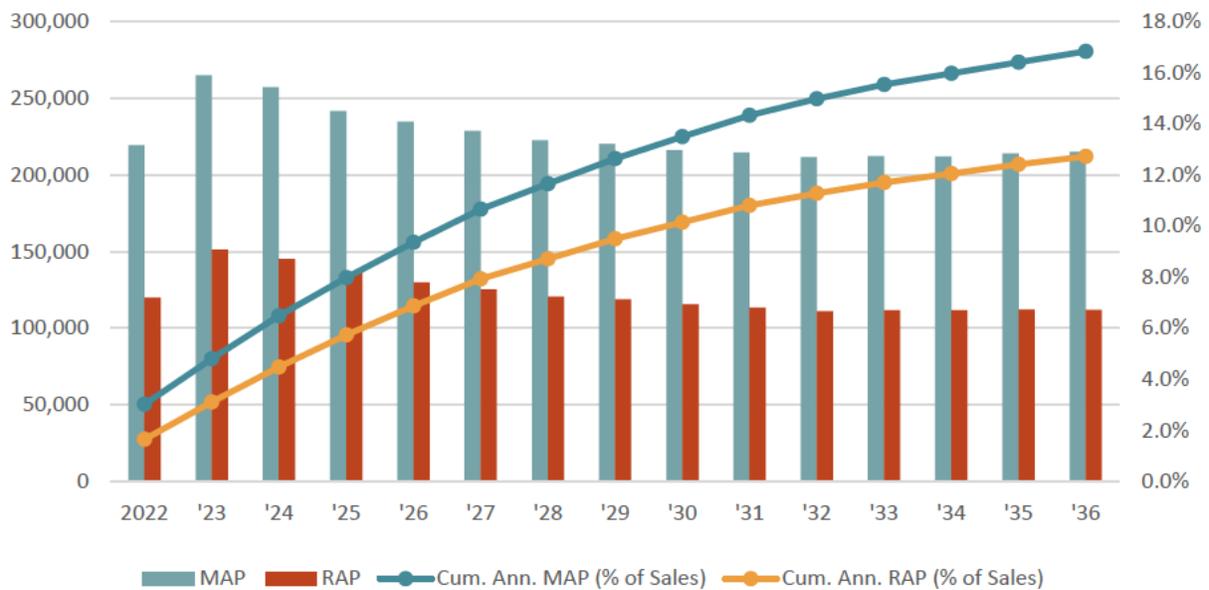


FIGURE 4-3: OVERVIEW OF RESIDENTIAL POTENTIAL – RAP 2036

Figure 4-4 provides a breakdown of the RAP potential in 2036 across residential end-uses and building type market segments.<sup>8</sup> In the RAP scenario, HVAC Shell and Water Heating are the leading end-uses, accounting for nearly 50% of the potential. Across building types, residential single-family existing homes account for 77%

<sup>8</sup> Segments with less than 4% of total end-use or building type share do not display a data label (%) in pie-charts to improve readability of data.

of the achievable potential, with manufactured homes accounting for 12% and new construction accounting for 10%.

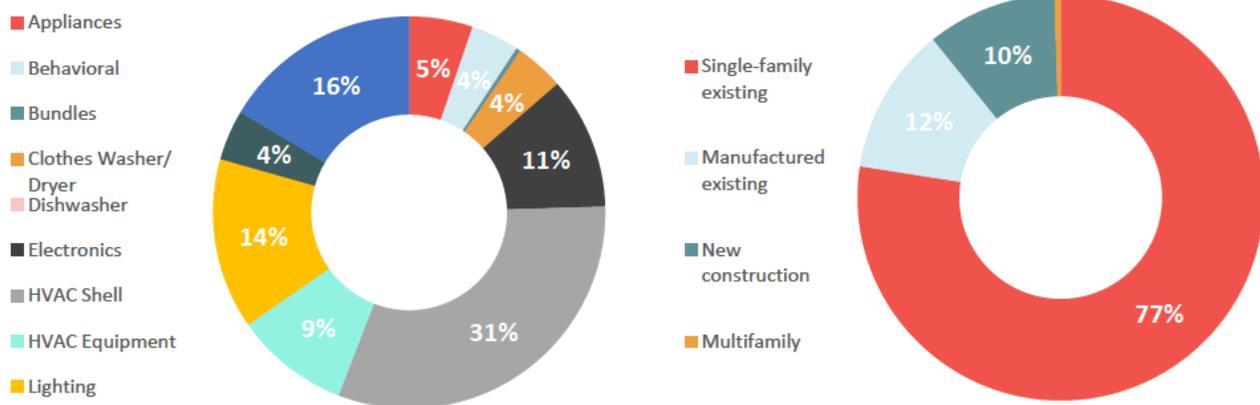


FIGURE 4-4: RESIDENTIAL POTENTIAL BY END-USE AND BUILDING TYPE – RAP 2036

Table 4-4 provides incremental and cumulative annual residential sector energy and demand savings for MAP and RAP across the next three years as well as over the 10-yr and 20-yr time horizons. Incremental RAP energy savings begin at roughly 120,000 MWh in 2022 and then grow before trailing back off over time. Cumulative RAP energy savings rise to approximately 1 million MWh by 2036.

TABLE 4-4 RESIDENTIAL SECTOR MAP & RAP POTENTIAL

	2022	2023	2024	2031	2036
<b>Incremental Annual Energy (MWh)</b>					
MAP	219,181	264,889	257,217	214,433	214,970
RAP	119,918	151,146	145,167	113,472	112,067
<b>Incremental Annual Demand (MW)</b>					
MAP	26.5	32.1	30.8	24.0	22.7
RAP	15.4	19.7	18.8	13.4	12.1
<b>Cumulative Annual Energy (MWh)</b>					
MAP	219,181	349,821	474,739	1,097,598	1,353,946
RAP	119,918	226,701	328,021	827,128	1,023,211
<b>Cumulative Annual Demand (MW)</b>					
MAP	26.5	43.5	59.5	134.9	158.3
RAP	15.4	30.0	43.9	111.0	129.6

#### 4.3 RESIDENTIAL BENEFITS AND COSTS

This section provides benefits and costs information for the residential sector. Table 4-5 provided the NPV benefits and costs for the MAP and RAP scenarios. In the MAP scenario the NPV benefits are nearly \$900 million over the study timeframe with a TRC ratio of 1.27. In the RAP scenario, the NPV benefits are more than \$700 million over the study timeframe with a TRC ratio of 1.67.

TABLE 4-5 NPV BENEFITS AND COSTS MAP & RAP POTENTIAL – 2036

	NPV Benefits	NPV Costs	TRC Ratio
MAP	\$868	\$682	1.27
RAP	\$746	\$447	1.67

Figure 4-5 provides a breakdown of the MAP and RAP annual budgets over the study timeframe. The budgets are broken down by incentive or admin (non-incentive) costs. RAP budgets increase early in the timeframe before decreasing and beginning to level off.

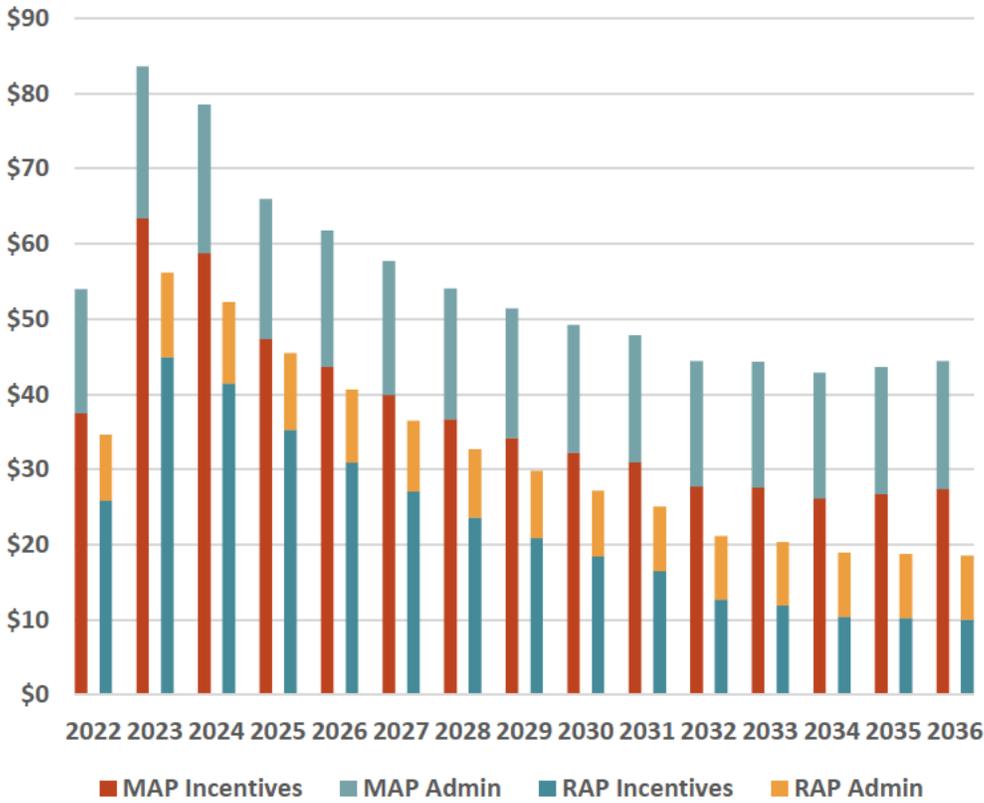


FIGURE 4-5: RESIDENTIAL ANNUAL BUDGETS FOR MAP AND RAP (\$, MILLIONS)

## 5 COMMERCIAL AND INDUSTRIAL ENERGY EFFICIENCY POTENTIAL

This chapter provides the potential results for technical, economic, and achievable potential for the commercial and industrial sectors. The chapter breaks down the potential by sector, end use and market segment. The results are provided on a five, ten and fifteen-year basis. Budget and benefit-cost data are provided for the achievable potential scenarios.

Figure 5-1 and Table 5-1 provide the technical, economic, MAP and RAP results for the 3-year, 10-year, and 15-year timeframes. The cumulative annual 5-year technical potential is 11% of the combined commercial and industrial (“C/I”) forecasted sales, and the economic potential is 10% of forecasted C/I sales. The cumulative annual 5-year MAP is 7.0% and the RAP is 5.0%, as a percentage of forecasted C/I sales. Over the duration of the study timeframe the technical potential rises to 24% and the economic potential rises to 22% of forecasted sales. The nearly identical technical and economic potential indicate that most measure are cost-effective. The MAP and RAP rise respectively to 14% and 10% of forecasted sales over the study timeframe. The gap between economic potential and MAP/RAP represents market barriers to prospective program participants, both financial and non-financial, to achieving the full amount of economic potential.

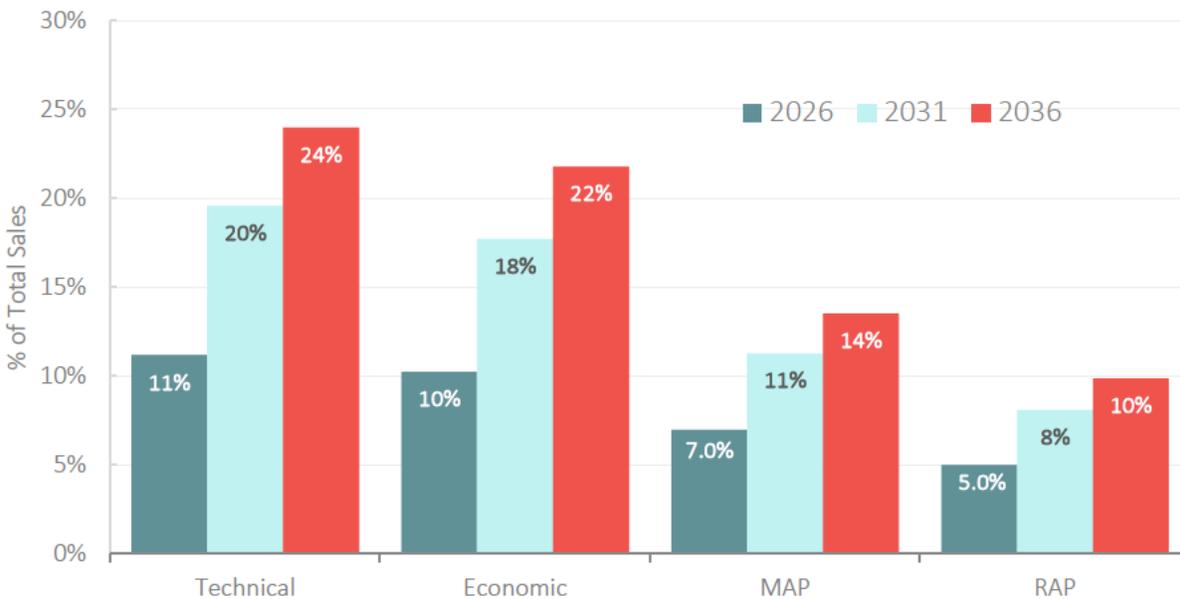


FIGURE 5-1: OVERVIEW OF C/I POTENTIAL

TABLE 5-1 C/I CUMULATIVE ANNUAL ENERGY EFFICIENCY POTENTIAL SUMMARY

	2022	2023	2024	2031	2036
<b>Energy (MWh)</b>					
Technical	151,117	317,548	489,375	660,761	821,693
Economic	140,038	294,113	451,969	608,085	752,787
MAP	106,880	214,859	318,773	418,040	512,358
RAP	76,408	154,352	228,932	299,942	367,290
<b>Energy Savings (as % of Forecast)</b>					
Technical	2.2%	4.4%	6.8%	9.0%	11.2%
Economic	2.0%	4.1%	6.2%	8.3%	10.2%
MAP	1.5%	3.0%	4.4%	5.7%	7.0%
RAP	1.1%	2.2%	3.2%	4.1%	5.0%

Table 5-2 provides the incremental annual technical, economic, MAP and RAP energy savings, in total MWh and as a percentage of the sector-level sales forecast. The incremental MAP ranges from 1.4% to 1.5% per year over the study horizon. The incremental RAP ranges from 1.0% to 1.1% per year over the study horizon.

TABLE 5-2 C/I INCREMENTAL ANNUAL ENERGY EFFICIENCY POTENTIAL SUMMARY

	2022	2023	2024	2031	2036
<b>Energy (MWh)</b>					
Technical	151,117	166,430	171,827	184,384	176,924
Economic	140,038	154,076	157,856	168,921	160,508
MAP	106,880	107,979	103,914	111,610	108,303
RAP	76,408	77,943	74,580	79,855	77,448
<b>Energy Savings (as % of Forecast)</b>					
Technical	2.2%	2.3%	2.4%	2.5%	2.4%
Economic	2.0%	2.2%	2.2%	2.3%	2.2%
MAP	1.5%	1.5%	1.4%	1.5%	1.5%
RAP	1.1%	1.1%	1.0%	1.1%	1.1%

## 5.1 COMMERCIAL ENERGY EFFICIENCY POTENTIAL

This section provides detail regarding the commercial electric energy efficiency potential in the East Kentucky service area. Details by level of potential, end-use and building type are provided.

### 5.1.1 Technical/Economic Potential

Table 5-3 provides cumulative annual technical and economic potential results across the for the 1-year, 2-year, 3-year, 10-year, and 15-year timeframes. The technical potential is nearly 163,000 MWh by 2024 and rises to more than 774,000 MWh by 2036. Economic potential rises to more than 598,000 MWh by 2036 as well. Peak demand savings associated with technical potential reach 37 MW by 2024 and reach approximately 171 MW by 2036.

TABLE 5-3 TECHNICAL &amp; ECONOMIC COMMERCIAL POTENTIAL

	2022	2023	2024	2031	2036
<b>Energy (MWh)</b>					
Technical	47,870	102,122	162,798	616,065	774,079
Economic	36,790	78,687	125,392	282,765	598,933
<b>Peak Demand (MW)</b>					
Technical	10.9	23.2	36.6	133.5	171.1
Economic	8.4	17.9	28.3	104.5	135.4

Figure 5-2 shows a comparison of the technical and economic potential (15-year) by end use. HVAC and Lighting are the leading end-use among technical and economic potential. Plug Loads, Whole Building and Refrigeration savings also account for significant technical and economic potential.

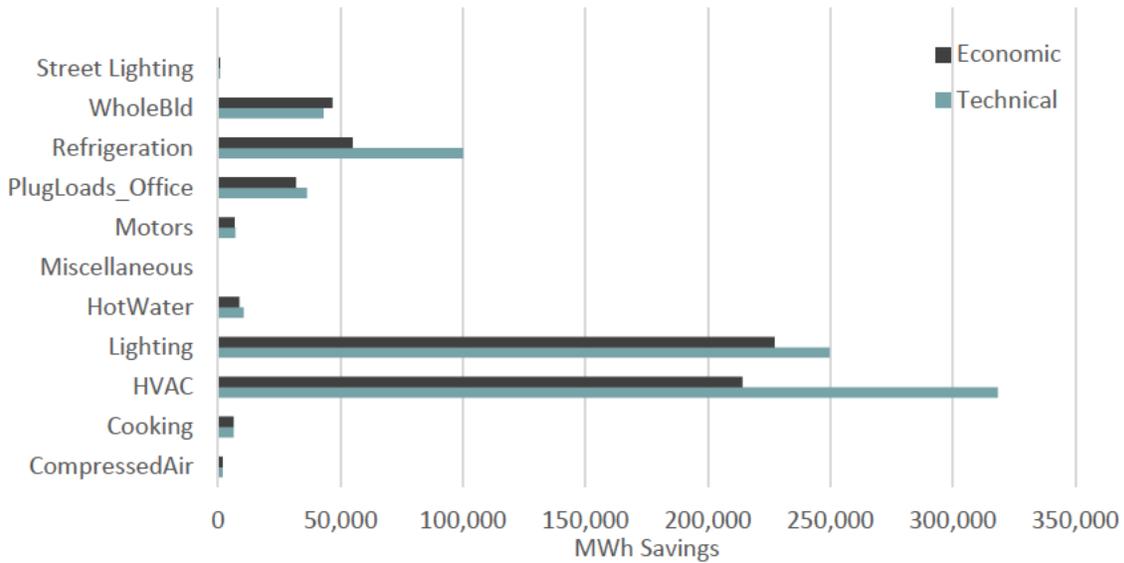


FIGURE 5-2: 15-YR COMMERCIAL TECHNICAL & ECONOMIC POTENTIAL, BY END-USE

### 5.1.2 Achievable Potential

Figure 5-3 provides the MAP and RAP across the 15-yr timeframe of the study. The green and red bars provide the respective incremental annual MAP and RAP in MWh per year energy savings. The green and orange lines provide the corresponding cumulative annual MAP and RAP as a percent of forecasted annual commercial sector sales. The MAP rises to 16% by 2036, and the RAP rises to 11%.

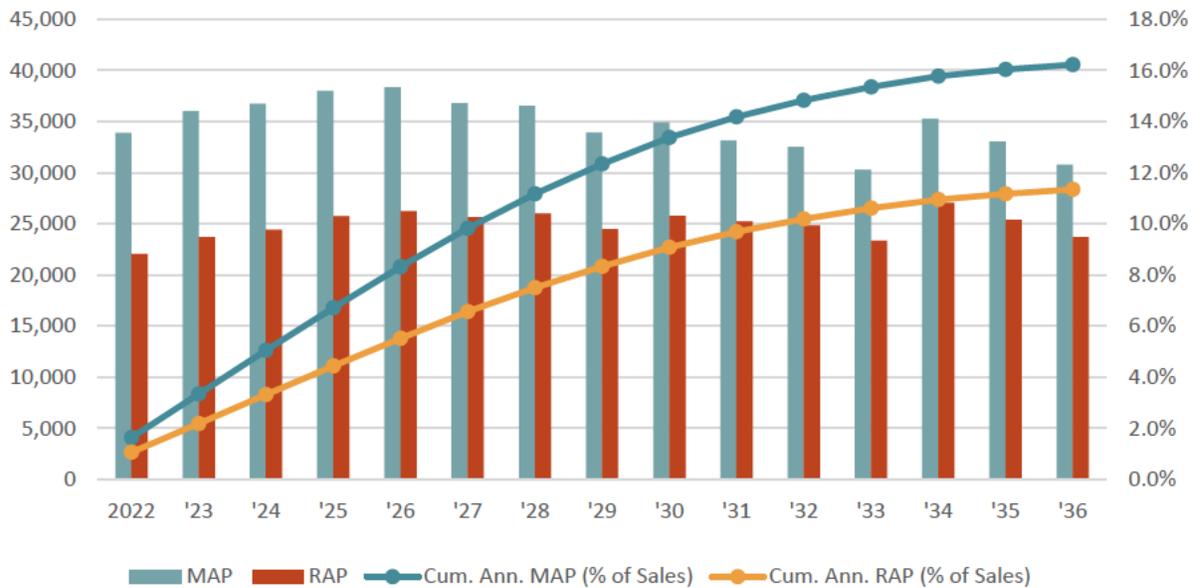


FIGURE 5-3: OVERVIEW OF COMMERCIAL POTENTIAL – RAP 2036

Figure 5-4 provides a breakdown of the RAP potential in 2036 across commercial end-uses and building type market segments.<sup>9</sup> In the RAP scenario, Lighting and HVAC account for nearly 75% of the potential. Across building types, retail, office, and education, and warehouse represent nearly 60% of the achievable potential.

<sup>9</sup> Segments with less than 5% of total end-use or building type share do not display a data label (%) in pie-charts to improve readability of data.

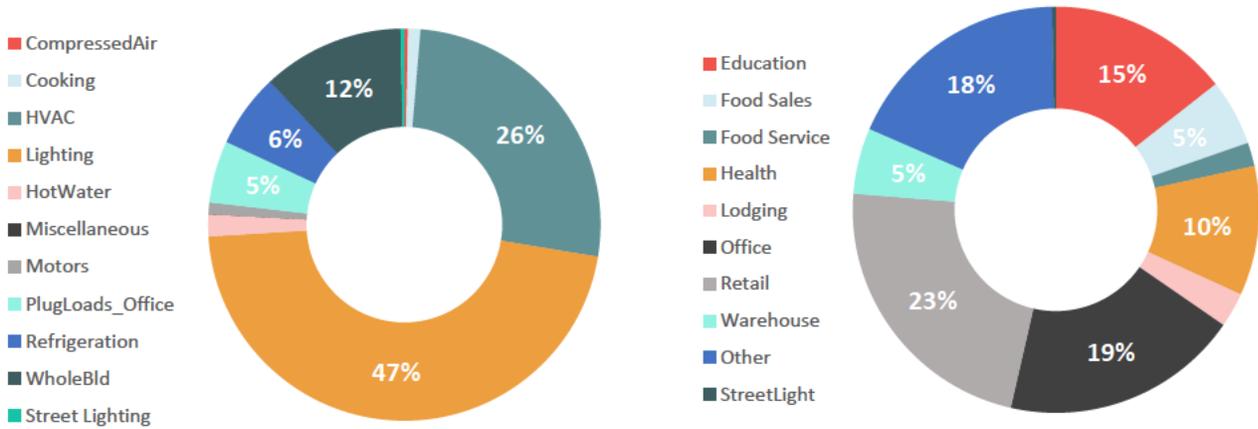


FIGURE 5-4: COMMERCIAL POTENTIAL BY END-USE AND BUILDING TYPE – RAP 2036

Table 5-4 provides incremental and cumulative annual commercial sector energy and demand savings for MAP and RAP across the next three years as well as over the 10-yr and 20-yr time horizons. Incremental RAP energy savings begin at roughly 22,000 MWh in 2022 and remain steady over time. Cumulative RAP energy savings rise to approximately 261,000 MWh by 2036.

TABLE 5-4 COMMERCIAL SECTOR MAP & RAP POTENTIAL

	2022	2023	2024	2031	2036
<b>Incremental Annual Energy (MWh)</b>					
MAP	33,915	36,036	36,732	33,177	30,804
RAP	22,059	23,727	24,433	25,238	23,693
<b>Incremental Annual Demand (MW)</b>					
MAP	7.2	7.6	7.7	6.8	6.4
RAP	4.5	4.8	5.0	5.0	4.7
<b>Cumulative Annual Energy (MWh)</b>					
MAP	33,915	69,952	106,684	314,839	374,196
RAP	22,059	45,786	70,220	215,150	261,649
<b>Cumulative Annual Demand (MW)</b>					
MAP	7.2	14.7	22.4	67.0	82.2
RAP	4.5	9.4	14.3	44.3	55.2

## 5.2 INDUSTRIAL ENERGY EFFICIENCY POTENTIAL

This section provides detail regarding the industrial electric energy efficiency potential in the East Kentucky service area. Details by level of potential, end-use and building type are provided.

### 5.2.1 Technical/Economic Potential

Table 5-5 provides cumulative annual technical and economic potential results across the for the 1-year, 2-year, 3-year, 10-year, and 15-year timeframes. The technical potential is nearly 327,000 MWh by 2024 and rises to more than 1.1 million MWh by 2036. Economic potential is the same as technical potential, as all technical potential is cost-effective. Peak demand savings associated with technical potential reach 54 MW by 2024 and reach approximately 193 MW by 2036.

TABLE 5-5 TECHNICAL & ECONOMIC INDUSTRIAL POTENTIAL

	2022	2023	2024	2031	2036
<b>Energy (MWh)</b>					
<b>Technical</b>	103,247	215,426	326,577	877,985	1,136,355
<b>Economic</b>	103,247	215,426	326,577	877,985	1,136,355
<b>Peak Demand (MW)</b>					
<b>Technical</b>	17.5	35.9	54.0	148.0	192.7
<b>Economic</b>	17.5	35.9	54.0	148.0	192.7

Figure 5-5 shows a comparison of the technical and economic potential (15-year) by end use. Machine/process is the leading end-use among technical and economic potential. Lighting and HVAC savings also account for significant technical and economic potential.

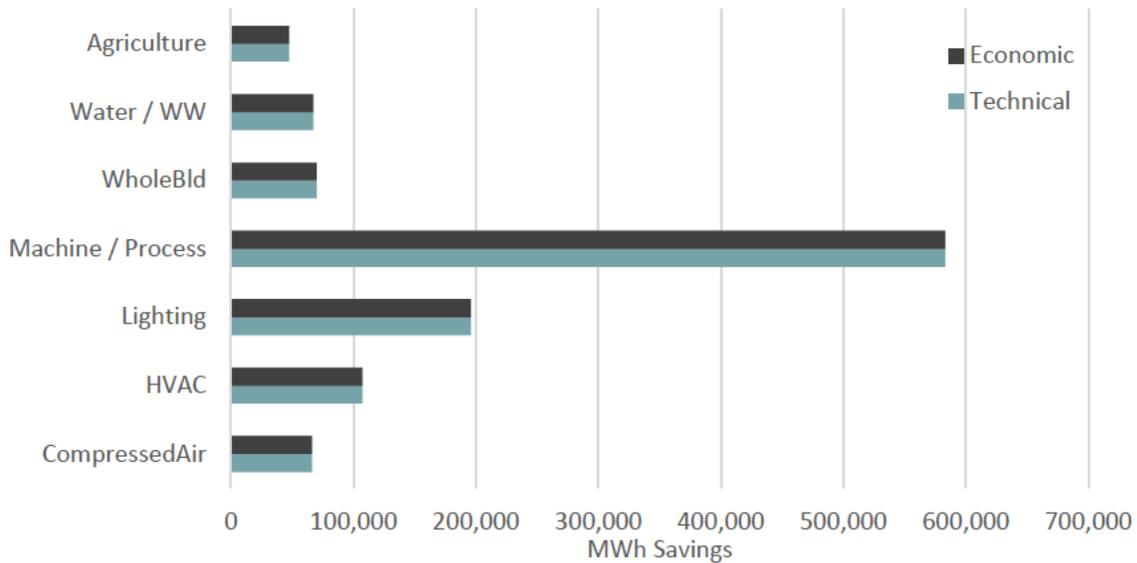


FIGURE 5-5: 15-YR INDUSTRIAL TECHNICAL & ECONOMIC POTENTIAL, BY END-USE

### 5.2.2 Achievable Potential

Figure 5-6 provides the MAP and RAP across the 15-yr timeframe of the study. The green and red bars provide the respective incremental annual MAP and RAP in MWh per year energy savings. The green and orange lines provide the corresponding cumulative annual MAP and RAP as a percent of forecasted annual industrial sector sales. The MAP rises to 12% by 2036, and the RAP rises to 9%.

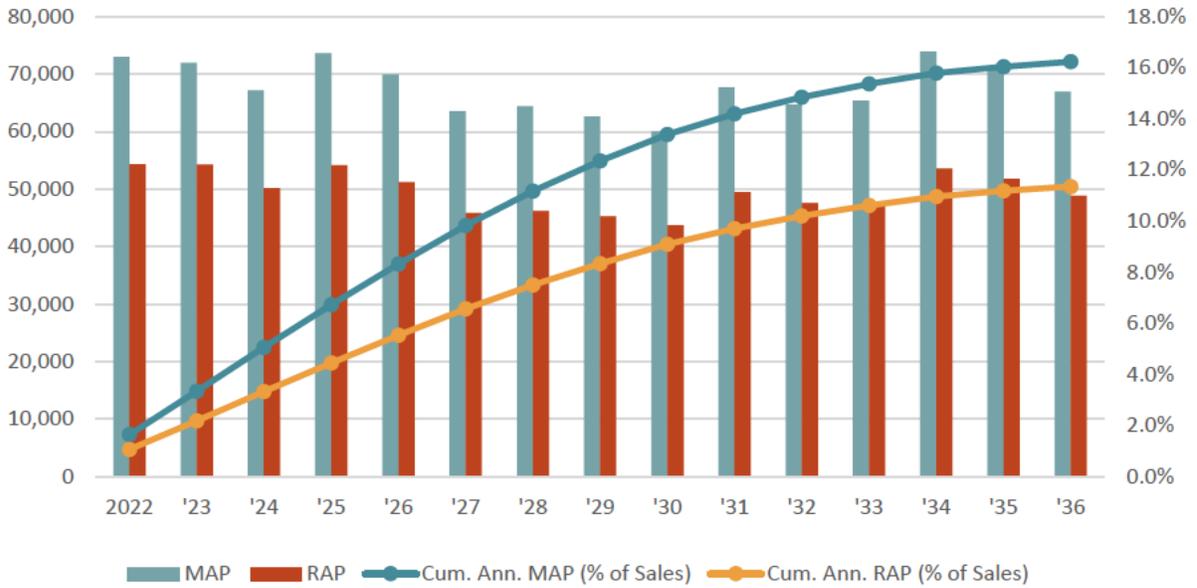


FIGURE 5-6: OVERVIEW OF INDUSTRIAL POTENTIAL – RAP 2036

Figure 5-7 provides a breakdown of the RAP potential in 2036 across industrial end-uses. In the RAP scenario, Machine/Process accounts for more than 50% of the potential, with the remaining potential coming from Lighting, HVAC, Compressed Air, Whole Building, Water/Wastewater and Agriculture.

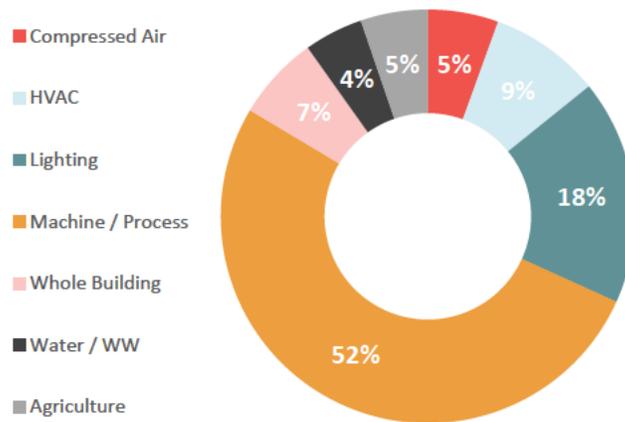


FIGURE 5-7: INDUSTRIAL POTENTIAL BY END-USE AND BUILDING TYPE – RAP 2036

Table 5-6 provides incremental and cumulative annual industrial sector energy and demand savings for MAP and RAP across the next three years as well as over the 10-yr and 20-yr time horizons. Incremental RAP energy savings begin at roughly 54,000 MWh in 2022 and remain steady, with a slight decrease over time. Cumulative RAP energy savings rise to approximately 523,000 MWh by 2036.

TABLE 5-6 INDUSTRIAL SECTOR MAP & RAP POTENTIAL

	2022	2023	2024	2031	2036
<b>Incremental Annual Energy (MWh)</b>					
<b>MAP</b>	72,965	71,942	67,182	67,669	66,924
<b>RAP</b>	54,349	54,216	50,147	49,454	48,844

	2022	2023	2024	2031	2036
<b>Incremental Annual Demand (MW)</b>					
MAP	12.2	11.7	11.1	11.6	11.5
RAP	8.8	8.5	8.0	8.5	8.4
<b>Cumulative Annual Energy (MWh)</b>					
MAP	72,965	144,907	212,089	545,283	703,941
RAP	54,349	108,565	158,712	402,930	522,791
<b>Cumulative Annual Demand (MW)</b>					
MAP	12.2	23.9	34.9	91.7	119.0
RAP	8.8	17.4	25.4	66.7	87.3

### 5.3 COMMERCIAL AND INDUSTRIAL BENEFITS AND COSTS

This section provides benefits and costs information for the combined C/I sector. Table 5-7 provided the NPV benefits and costs for the MAP and RAP scenarios. The NPV benefits are nearly \$1 billion over the study timeframe with a TRC ratio of 3.18. In the RAP scenario, the NPV benefits are nearly \$700 million over the study timeframe with a TRC ratio of 3.35.

TABLE 5-7 NPV BENEFITS AND COSTS MAP & RAP POTENTIAL – 2036

	NPV Benefits	NPV Costs	TRC Ratio
MAP	\$976	\$307	3.18
RAP	\$697	\$208	3.35

Figure 5-8 provides a breakdown of the MAP and RAP annual budgets over the study timeframe. The budgets are broken down by incentive or admin (non-incentive) costs. RAP budgets hold steady at approximately \$10 million per year.

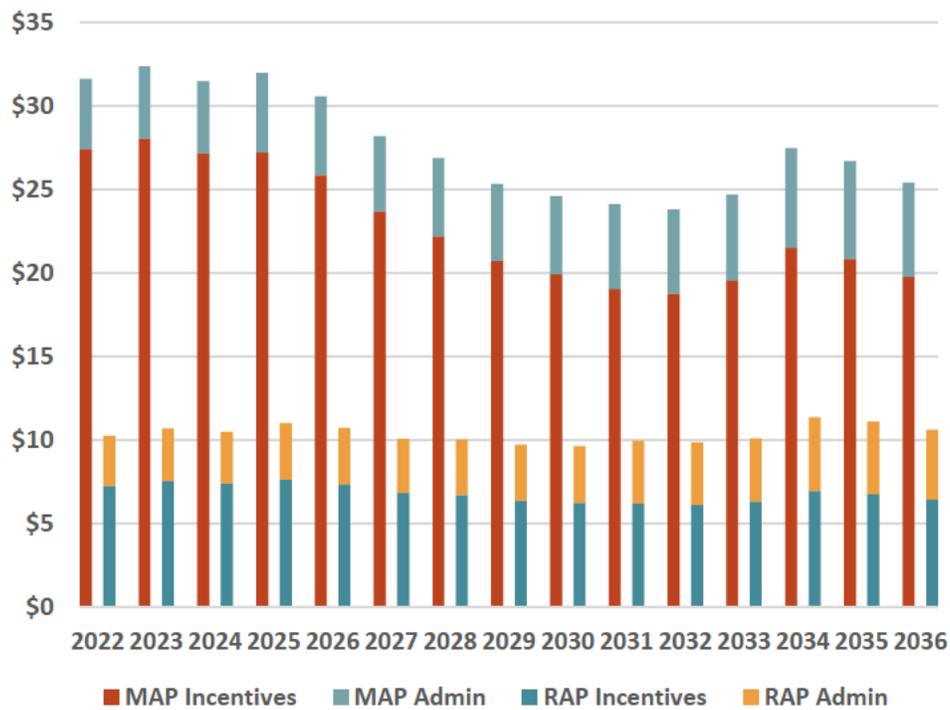


FIGURE 5-8: C/I ANNUAL BUDGETS FOR MAP AND RAP (\$, MILLIONS)

## DR POTENTIAL RESULTS

### 6.1 ANALYSIS APPROACH

This section provides an overview of the demand response potential methodology. Summary results of the demand response analysis are provided in Section 6.2.

#### 6.1.1 Definition of Demand Response

According to the Federal Energy Regulatory Commission (FERC), demand response is defined as changes in electric usage by demand-side resources from their normal consumption patterns in response to changes in the price of electricity over time, or to incentive payments designed to induce lower electricity use at times of high wholesale market prices or when system reliability is jeopardized. FERC's definition of demand response conforms to the North American Electric Reliability Corporation (NERC) definition developed by a consortium of utilities and end users.

This study uses the FERC definition of demand response so that all potential DR, including rate options, are identified. East Kentucky's integrated resource planning team will analyze and adjust as necessary the identified DR potential for how DR potential will be used to construct alternative resource plans.

#### 6.1.2 Demand Response Program Options

Table 6-1 provides a brief description of the demand response (DR) program options that were considered as part of the base analysis and identifies the eligible customer segment for each demand response program to be considered in this study. The list of DR options was determined based on a review of the 2018 EKPC DSM Study, East Kentucky's current and/or planned offerings, as well as DR programs run by other utilities in the region. The base case analysis includes direct load control (DLC), rate design, and aggregator options.

TABLE 6-1 DEMAND RESPONSE BASE CASE PROGRAM OPTIONS AND ELIGIBLE MARKETS

DR Program Option	Program Description	Eligible Markets
DLC AC (Switch)	The compressor of the air conditioner is remotely shut off (cycled) by the system operator for periods that may range from 7 ½ to 15 minutes during every 30-minute period (i.e., 25%-50% duty cycle)	Residential and Small Non-Residential Customers
DLC AC (Thermostat)	The system operator can remotely raise the AC's thermostat set point during peak load conditions, lowering AC load.	Residential and Small Non-Residential Customers
DLC Pool Pumps	The swimming pool pump is remotely shut off by the system operator for periods normally ranging from 2 to 4 hours.	Residential Customers
DLC Water Heaters	The water heater is remotely shut off by the system operator for periods normally ranging from 2 to 8 hours.	Residential and Small Non-Residential Customers
DLC Agricultural Irrigation	The irrigation pump is remotely shut off by the system operator for periods normally ranging from 2 to 4 hours.	Farms

DR Program Option	Program Description	Eligible Markets
Interruptible Rate	A discounted rate is offered to the customer for agreeing to interrupt or curtail load during peak period. The interruption is mandatory. No buy-through options are available.	Large Non-Residential Customers
Large C&I Behavioral	Participants are required to be available to curtail their load any non-holiday weekday during peak hours. Each event typically lasts 4 hours in duration.	Large Non-Residential Customers
Demand Buyback	A year-round, flexible, Internet-based bidding program that offers business customers credits for voluntarily reducing power when an event is called.	Large Non-Residential Customers
Critical Peak Pricing with Enabling Technology	A retail rate in which an extra-high price for electricity is provided during a limited number of critical periods (e.g. 100 hours) of the year. Market-based prices are typically provided on a day-ahead basis, or an hour-ahead basis. Includes enabling technology that connects technologies within building. Only for customers with AC.	Residential and Non-Residential Customers
Critical Peak Pricing without Enabling Technology	A retail rate in which an extra-high price for electricity is provided during a limited number of critical periods (e.g. 100 hours) of the year. Market-based prices are typically provided on a day-ahead basis, or an hour-ahead basis.	Residential and Non-Residential Customers
PEV Charging	Special rate service for electric vehicles that charge off-peak	Residential and Non-Residential Customers

### 6.1.3 Demand Response Potential Assessment Approach Overview

The analysis of DR, where possible, closely follows the approach outlined for energy efficiency. The framework for assessing the cost-effectiveness of demand response programs is based on *A Framework for Evaluating the Cost-Effectiveness of Demand Response, prepared for the National Forum on the National Action Plan (NAPA) on Demand Response*.<sup>10</sup> Additionally, GDS reviewed the May 2017 National Standard Practice Manual published by the National Efficiency Screening Project.<sup>11</sup>

The demand response analysis was conducted using the GDS Demand Response Model. The DR Model determines the estimated savings for each demand response program by performing a review of all benefits and cost associated with each program. GDS developed the model such that the value of future programs could be determined and will help facilitate demand response program planning strategies. The model contains approximately 50 required inputs for each program including: expected life, coincident peak (“CP”) kW load reductions, proposed rebate levels, program related expenses such as vendor service fees, marketing and evaluation cost and on-going O&M expenses. This model and future program planning features can be used to standardize the cost-effectiveness screening process between East Kentucky departments interested in the deployment of demand response resources.

<sup>10</sup> Study was prepared by Synapse Energy Economics and the Regulatory Assistance Project, February 2013.

<sup>11</sup> [National Standard Practice Manual for Assessing Cost-Effectiveness of Energy Efficiency Resources](#), May 18, 2017, Prepared by The National Efficiency Screening Project

The TRC Test was used to determine the cost-effectiveness of each demand response program. Benefits are based on avoided generation capacity, energy (including load shifting) and T&D infrastructure costs. Costs include incremental program equipment costs (such as control switches or smart thermostats), fixed program capital costs (such as the cost of a central controller), program administrative, marketing and evaluation costs. Incremental equipment program costs are included for both new and replacement units (such as control switches) to account for units that are replaced at the end of their useful life.

The demand response analysis includes estimates of technical, economic, achievable, and program potential. Achievable potential is broken into maximum and realistic potential in this study:

**MAP** represents an estimate of the maximum cost-effective demand response potential that can be achieved over the study period. For this study, this will be defined as customer participation in demand response program options that reflect a “best practices” estimate of what could eventually be achieved. MAP assumes no barriers to effective delivery of programs.

**RAP** represents an estimate of the amount of demand response potential that can be realistically achieved over the study period. For this study, this will be defined as achieving customer participation in demand response program options that reflect a realistic estimate of what could eventually be achieved assuming typical or “average” industry experience. RAP is a discounted MAP, by considering program barriers that limit participation, therefore reducing savings that could be achieved.

#### 6.1.4 Avoided Costs

Demand response avoided costs are consistent with those utilized in the energy efficiency potential analysis and were provided by East Kentucky. The primary benefit of demand response is avoided generation capacity, resulting from a reduction in the need for new peaking generation capacity. Demand response can also produce energy related benefits. Demand response programs can also potentially delay the construction of new transmission and distribution lines and facilities, which is reflected in avoided T&D costs. If the demand response option is considered “load shifting”, such as direct load control of electric water heating, the consumption of energy is shifted from the control period to the period immediately following the period of control. If the program is not considered to be “load shifting” the measure is turned off during peak control hours, and the energy is saved altogether. The number of annual control hours for all direct load control programs was determined by GDS.

#### 6.1.5 Demand Response Program Assumptions

This section briefly discusses the general assumptions and sources that will be used to complete the demand response potential analysis.

**Load Reduction:** Demand reductions were based on various secondary data sources including the FERC and other industry reports, including demand response potential studies. Direct load control options are typically calculated based on a per-unit kW demand reduction whereas rate-based DR options and aggregator programs are typically assumed to reduce a percentage of the total facility peak load.

TABLE 6-2 DEMAND RESPONSE LOAD REDUCTION IMPACTS

Program	Residential Load Reduction (kW)	Non-Residential Load Reduction (kW)
DLC Central AC (Switch)	0.62	N/A
DLC Central AC (Thermostat)	1.15	1.93
DLC Water Heating	0.43	1.2
DLC Pool Pumps	1.36	N/A

Program	Residential Load Reduction (kW)	Non-Residential Load Reduction (kW)
Interruptible Rate	N/A	3 MW for RAP, 2.5 MW for MAP
DLC Agricultural Irrigation	N/A	44
Critical Peak Pricing with Enabling Tech	31% of CP Billing Demand	21.5% of CP Billing Demand
Critical Peak Pricing without Enabling Tech	11.7% of CP Billing Demand	4.2% of CP Billing Demand
Large C&I Behavioral	N/A	35
Demand Bidding	N/A	7% of CP Billing Demand
PEV Charging	0.6	0.6
Golf Cart Charging	N/A	42.75
Thermal Electric Storage Rate	N/A	19.4

**Eligible Control Units:** The number of control units (or demand response equipment) per participant were calculated based on the average number of units in homes in the East Kentucky territory. This was used to determine the total equipment cost.

**Useful Life:** The useful life of equipment used in demand response programs, such as load control switches, smart thermostats, or AMI equipment, was determined using TRMs, and data from manufacturers. This useful life was used to determine when equipment needs to be re-installed in the study after the device has failed, therefore adding a second equipment cost for some participants in the study. GDS used a useful life of 20 years for AMI meters<sup>12</sup>, 11 years for smart thermostats<sup>13</sup>, 10 years for level 2 EV chargers<sup>14</sup>, and 15 years for load switches.<sup>15</sup>

**Equipment and Incentive Costs:** Equipment costs were included for each new participant. Incentives were included for all programs in the Base Case. These costs were either on a per participant, per kW or per kWh basis (noted in table).

TABLE 6-3 ASSUMED BASE CASE EQUIPMENT AND INCENTIVE COSTS

	DR Program Option	Incentive Costs	Equipment Costs
Residential	DLC AC (Switch)	\$20/participant-year	\$95
	DLC AC (BYOT Thermostat)	\$25/participant-year + one-time \$100 incentive	\$100
	DLC AC (Utility Incentivized Thermostat)	\$25/participant-year + one-time \$100 incentive	\$100
	DLC Swimming Pool Pumps	\$10/participant-year	\$95
	DLC Water Heating	\$10/participant-year	\$95

<sup>12</sup> Ameren Illinois AMI Cost/Benefit Analysis, 2012

<sup>13</sup> Illinois Technical Reference Manual 2018

<sup>14</sup> US DOE, Costs Associated with Non-Residential EV Supply Equipment, 2015

<sup>15</sup> Comverge

	DR Program Option	Incentive Costs	Equipment Costs
	Critical Peak Pricing with Enabling Technology	\$0	\$100
	Critical Peak Pricing without Enabling Technology	\$0	\$0
	PEV Charging	\$0	\$0
Non-Residential	DLC AC (BYOT Thermostat)	\$25/participant-year + one-time \$100 incentive	\$100
	DLC AC (Utility Incentivized Thermostat)	\$25/participant-year + one-time \$100 incentive	\$100
	DLC Water Heaters	\$10/participant-year	\$95
	DLC Agricultural Irrigation	\$41/kW-year	\$95
	Interruptible Rate	\$8.5/kW-year	\$0
	Large C&I Behavioral	\$8.5/kW-year	\$0
	Demand Buyback	\$0.5/kWh-year	\$0
	Critical Peak Pricing with Enabling Technology	\$0	\$100
	Critical Peak Pricing without Enabling Technology	\$0	\$0
	Golf Cart Charging Rate	\$4500/kW-year	\$9,000
	Thermal Electric Storage Cooling Rate	\$0	\$54,534

**Program Costs:** One-time program development costs of \$400,000 were included in the first year of the analysis for new programs.<sup>16</sup> This cost was split between similar programs. No program development costs are assumed for programs that already exist. Each program includes an evaluation cost, marketing cost (higher for MAP than RAP), and administration cost. All program costs were escalated each year by the general rate of inflation assumed for this study.

**Eligible Market Size:** For direct load control programs, the size of the eligible market was determined by multiplying the forecast of East Kentucky's customers by the saturation of the end use to be controlled. End use saturations were obtained from the 2020 Owner Member End-Use Survey Report as well as 2016 End Use Survey Data for data that was not included in the 2020 Report.

A forecast of AMI deployment rates for years 2022 and 2023 was provided by East Kentucky for the 2018 study. GDS took these forecasts and used the percentage of customers with AMI in 2023 and applied it to the eligible customers for those rate programs that require smart meters. Two-way communication is fundamental for these pricing programs and AMI meters allow for hourly load data to be read and transmitted to the utility. Since it is imperative that hourly data must be read for rate programs, GDS assumed AMI meters were required to participate in these programs.

<sup>16</sup> Tennessee Valley Authority Potential Study Vol. 3: Demand Response Potential Study, Global Energy partners, December 2011

### 6.1.6 DR Program Adoption Levels

Long-term program adoption levels (or “steady state” participation) represent the enrollment rate once the fully achievable participation has been reached. GDS has reviewed industry data and program adoption levels from several utilities’ DR programs.

Customer participation in new demand response programs is assumed to reach the steady state adoption rate over a five-year period. The path to steady state customer participation follows an “S-shaped” curve, in which participation growth accelerates over the first half of the five-year period, and then slows over the second half of the period (Figure 6-1). Table 6-4 provides the Base Case long-term adoption rates for MAP and RAP.

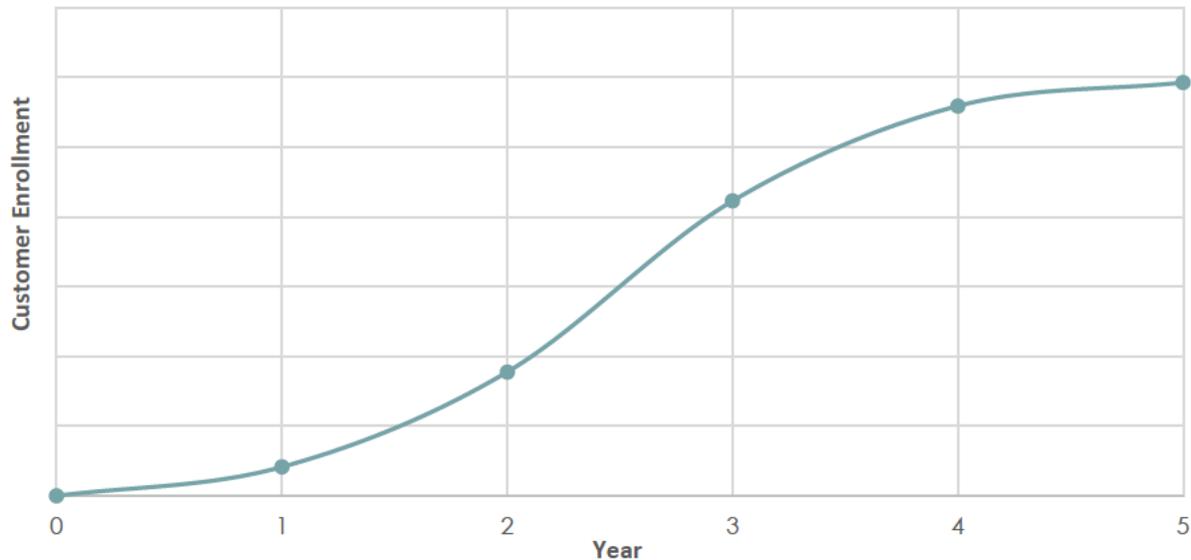


FIGURE 6-1 ILLUSTRATION OF S-SHAPED MARKET ADOPTION CURVE

TABLE 6-4 BASE CASE ADOPTION RATES

Sector	Program	Steady State MAP Adoption Rate	Steady State RAP Adoption Rate
Residential	DLC AC (Switch)	31%	20%
	DLC AC (BYOT Thermostat)	18%	13%
	DLC AC (Utility Incentivized Thermostat)	18%	13%
	DLC Pool Pumps	38%	19%
	DLC Water Heaters	36%	23%
	Critical Peak Pricing with Enabling Technology	91%	22%
	Critical Peak Pricing without Enabling Technology	82%	17%
PEV Charging	94%	57%	
Non-Residential	DLC AC (BYOT Thermostat)	10%	4%
	DLC AC (Utility Incentivized Thermostat)	10%	4%
	DLC Water Heaters	16%	7%

Sector	Program	Steady State MAP Adoption Rate	Steady State RAP Adoption Rate
	DLC Agricultural Irrigation	30%	15%
	Interruptible Rate	21%	12%
	Large C&I Behavioral	21%	14%
	Demand Buyback	9%	1%
	Critical Peak Pricing with Enabling Technology	69%	20%
	Critical Peak Pricing without Enabling Technology	63%	18%

Double-counting savings from demand response programs that affect the same end uses is a common issue that must be addressed when calculating the demand response savings potential. For example, a customer cannot elect to participate in both DLC programs and rate programs and claim savings from both programs for curtailing the same end use. One cannot save a kW of load in a specific hour more than once. In general, the hierarchy of demand response programs is accounted for by subtracting the number participants in a higher priority program from the eligible market for a lower priority program. Table 6-5 shows the hierarchy for each sector, with 1 being the top priority.

TABLE 6-5 BASE CASE DR HIERARCHY FOR EACH SECTOR

Order	Residential Hierarchy	Small Non-Residential Hierarchy	Large Non-Residential Hierarchy
1	Direct Load Control	Direct Load Control	Interruptible Rate
2	Critical Peak Pricing	Critical Peak Pricing	Large C&I Behavioral
3			Demand Buyback
4			Critical Peak Pricing

## 6.2 DEMAND RESPONSE POTENTIAL

This section provides the potential results for technical, economic, and achievable demand response potential for all sectors. The section breaks down the potential by sector, end use and market segment. The results are provided on a five, ten and fifteen-year basis. Budget and benefit-cost data are provided for the achievable potential scenarios.

Figure 6-2 provide the technical, economic, MAP and RAP results for the 3-year, 10-year, and 15-year timeframes. The cumulative annual 5-year technical potential is 62% of the peak demand forecasted, and the economic potential is 46% of forecasted demand. The cumulative annual 5-year MAP is 22.0% and the RAP is 14.4%, as a percentage of forecasted demand.

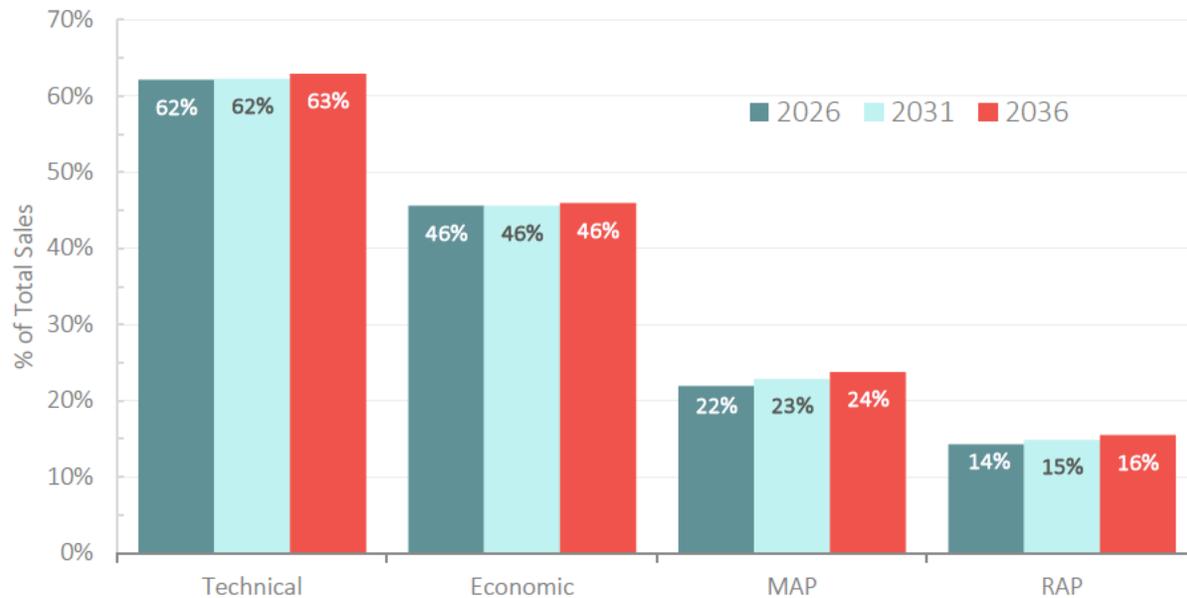


FIGURE 6-2: OVERVIEW OF DEMAND RESPONSE POTENTIAL

### 6.2.1 Technical/Economic Potential

Table 6-6 provides cumulative annual technical and economic potential results across the for the 1-year, 2-year, 3-year, 10-year, and 15-year timeframes. The technical potential is more than 1,660 MW by 2024. Economic potential rises to more than 1,200 MW by 2024 as well.

TABLE 6-6 TECHNICAL &amp; ECONOMIC DEMAND RESPONSE POTENTIAL

	2022	2023	2024	2031	2036
<b>Peak Demand (MW)</b>					
<b>Technical</b>	1,677	1,689	1,660	1,694	1,745
<b>Economic</b>	1,253	1,261	1,229	1,240	1,276

### 6.2.2 Achievable Potential

Table 6-7 provides 15-yr MAP and RAP potential by residential program. The Critical Peak Pricing with Enabling Tech program provides the most MAP and RAP potential, accounting for 6.0% peak savings in the MAP scenario and 1.6% savings in the RAP scenario.

TABLE 6-7 DEMAND RESPONSE MAP &amp; RAP POTENTIAL – RESIDENTIAL PROGRAMS

Residential Program	MAP (MW)	RAP (MW)	MAP (% of Forecast)	RAP (% of Forecast)
DLC AC (BYOT Thermostat)	17.0	11.9	0.6%	0.4%
DLC AC (Utility Incentivized Thermostat)	17.0	11.9	0.6%	0.4%
DLC AC (Switch)	11.7	7.7	0.4%	0.3%
DLC Swimming Pool Pumps	17.6	8.8	0.6%	0.3%
DLC Water Heating	0.0	0.0	0.0%	0.0%
Critical Peak Pricing with Enabling Tech	167.6	43.3	6.0%	1.6%
Critical Peak Pricing without Enabling Tech	22.6	13.5	0.8%	0.5%
PEV Charging	7.7	4.7	0.3%	0.2%
<b>Total</b>	<b>261.2</b>	<b>101.6</b>	<b>9.4%</b>	<b>3.7%</b>

Table 6-8 provides 15-yr MAP and RAP potential by C/I program. The Interruptible Rate program provides the most MAP and RAP potential, accounting for 10.8% peak savings in the MAP scenario and 10.4% savings in the RAP scenario.

TABLE 6-8 DEMAND RESPONSE MAP &amp; RAP POTENTIAL – C/I PROGRAMS

C/I Program	MAP (MW)	RAP (MW)	MAP (% of Forecast)	RAP (% of Forecast)
DLC AC (BYOT Thermostat)	6.5	2.8	0.2%	0.1%
DLC AC (Utility Incentivized Thermostat)	6.5	2.8	0.2%	0.1%
DLC Water Heating	7.6	3.3	0.3%	0.1%
DLC Agricultural Irrigation	9.7	4.8	0.3%	0.2%
Interruptible Rate	300.5	288.8	10.8%	10.4%
Large C&I Behavioral	0.6	0.1	0.0%	0.0%
Demand Buyback	0.0	0.0	0.0%	0.0%
Critical Peak Pricing with Enabling Tech	61.3	22.8	2.2%	0.8%
Critical Peak Pricing without Enabling Tech	5.4	3.8	0.2%	0.1%
<b>Total</b>	<b>398.1</b>	<b>329.1</b>	<b>14.3%</b>	<b>11.9%</b>

### 6.3 DEMAND RESPONSE POTENTIAL BENEFITS AND COSTS

This section provides benefits and costs information for the demand response analysis. Table 6-9 provided the NPV benefits and costs for the MAP and RAP scenarios. In the MAP scenario, the NPV benefits are more than \$700 million over the study timeframe with a TRC ratio of 5.52. In the RAP scenario, the NPV benefits are more than \$470 million over the study timeframe with a TRC ratio of 6.94.

TABLE 6-9 NPV BENEFITS AND COSTS MAP &amp; RAP DEMAND RESPONSE POTENTIAL – 2036

	NPV Benefits	NPV Costs	TRC Ratio
<b>MAP</b>	\$703	\$127	5.52
<b>RAP</b>	\$471	\$68	6.94

Figure 6-3 provides a breakdown of the MAP and RAP annual budgets over the study timeframe. The budgets are broken down by incentive or admin (non-incentive) costs. RAP budgets remain steady throughout the first 10 years of the study timeframe.

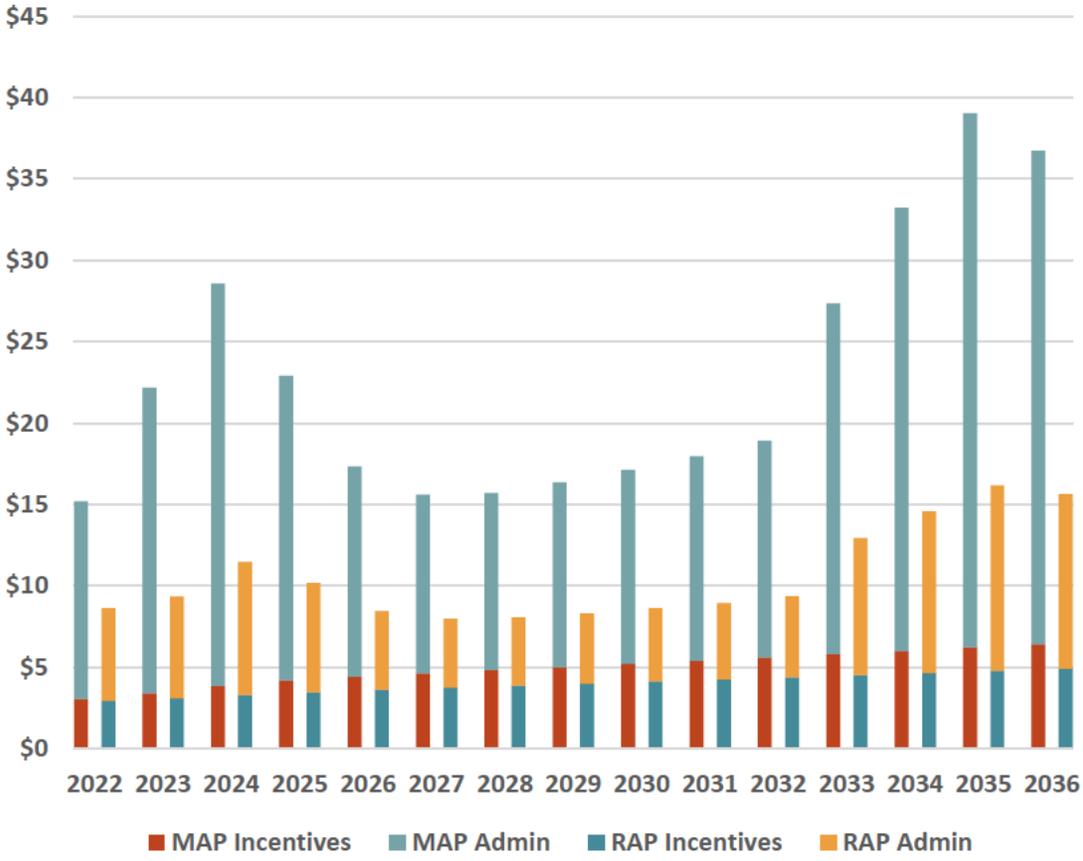


FIGURE 6-3: DEMAND RESPONSE ANNUAL BUDGETS FOR MAP AND RAP (\$, MILLIONS)

## 7 PROGRAM SCENARIOS

The GDS Team calculated estimated savings for each EKPC program at four different spending scenarios: \$3 million, \$4 million, \$6 million, and \$15 million. Each scenario is based on a different set of avoided costs, with the \$3 million scenario using the base avoided costs, with the three increased spending levels using low, mid, and high carbon savings adders in the avoided costs to increase the value of energy saved. GDS re-evaluated the cost-effectiveness of each measure for each avoided cost scenario and scaled the achievable potential (RAP) to align with the program spending amounts.

Annual budgets are escalated at the assumed rate of inflation. In all cases, including the \$15 million scenario, there is enough achievable potential to meet the annual budget over the timeframe of the study. In the base and low carbon case, GDS assumed no new programs. In the mid and high carbon cases, GDS added an ENERGY STAR Appliance program and a C/I Lighting program. The tables below provide summary results for the savings and spending associated with each program in each funding scenario.

Table 7-1 provides the incremental annual energy and demand savings across all programs by funding scenario. In the \$3 million funding scenario, the annual energy savings start at 8,118 MWh in 2022 and rise to 8,391 MWh by 2026. In the high carbon scenario (\$15 million) the annual energy savings start at 25,049 MWh in 2022 and rise to 26,486 MWh by 2026.

TABLE 7-1 ANNUAL ENERGY AND DEMAND SAVINGS – BY PROGRAM FUNDING SCENARIO

	2022	2023	2024	2025	2026
<b>\$3 million</b>					
Energy (MWh)	8,118	8,078	8,169	8,275	8,391
Demand (MW)	0.7	0.7	0.7	0.7	0.7
<b>\$4 million</b>					
Energy (MWh)	10,766	10,636	10,744	10,858	11,000
Demand (MW)	1.0	1.0	1.0	1.0	1.0
<b>\$6 million</b>					
Energy (MWh)	16,115	16,171	16,480	16,819	17,228
Demand (MW)	1.9	1.9	1.9	2.0	2.1
<b>\$15 million</b>					
Energy (MWh)	25,049	25,069	25,490	25,924	26,486
Demand (MW)	3.6	3.5	3.6	3.7	3.8

Table 7-2 provides the 2022 budgets by program for each spending scenario. The table shows fixed costs as well. The program budgets are inclusive of incentives, admin, and net lost revenues, as applicable. Budgets were increased by spending scenario according to which programs had the most achievable potential as identified by the potential study analysis.

TABLE 7-2 2022 PROGRAM BUDGETS – BY SPENDING SCENARIO

Program	\$3 million scenario	\$4 million scenario	\$6 million scenario	\$15 million scenario
Residential Energy Audit	\$225,000	\$300,000	\$400,000	\$425,000
Button-Up Weatherization	\$350,000	\$500,000	\$575,000	\$3,750,000
CARES Program	\$350,000	\$475,000	\$550,000	\$3,500,000
Heat Pump Retrofit	\$1,000,000	\$1,333,333	\$1,500,000	\$1,550,000
Residential Lighting	\$50,000	\$66,667	\$100,000	\$100,000

Program	\$3 million scenario	\$4 million scenario	\$6 million scenario	\$15 million scenario
TSE New Home	\$750,000	\$1,000,000	\$1,200,000	\$2,700,000
ES Manufactured Home	\$150,000	\$200,000	\$250,000	\$750,000
ENERGY STAR Appliance Rebate	\$0	\$0	\$250,000	\$500,000
Commercial Lighting	\$0	\$0	\$900,000	\$1,200,000
Fixed Costs	\$125,000	\$125,000	\$275,000	\$525,000
Sub-Total	\$2,875,000	\$3,875,000	\$5,725,000	\$14,475,000
<b>Total</b>	<b>\$3,000,000</b>	<b>\$4,000,000</b>	<b>\$6,000,000</b>	<b>\$15,000,000</b>

## APPENDIX A: RESIDENTIAL MEASURE DETAIL

Appendix A: Residential Measure Detail

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	Base Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	Base Saturation	EE Saturation	TRC Ratio	UCT Ratio	PCT Ratio	RIM Test Ratio	TP 15-yr (2036)	EP 15-yr (2036)	MAP 15-yr (2036)	RAP 15-yr (2036)
1001	Appliances	Energy Star Compliant Top-Mount Refrigerator	No Program	SF	MO	442	10%	37	0.01	17	\$40	132%	33%	0.6	1.2	1.6	0.4	3,746	0	0	0
1002	Appliances	CEE Tier 2 Compliant Top-Mount Refrigerator	No Program	SF	MO	442	25%	55	0.01	17	\$140	132%	33%	0.2	0.5	1.0	0.2	5,613	0	0	0
1003	Appliances	Energy Star Compliant Side-by-Side Refrigerator	No Program	SF	MO	517	10%	52	0.01	17	\$40	132%	33%	0.8	1.6	2.0	0.4	5,248	0	0	0
1004	Appliances	CEE Tier 2 Compliant Side-by-Side Refrigerator	No Program	SF	MO	517	25%	78	0.01	17	\$140	132%	33%	0.3	0.6	1.2	0.3	7,877	0	0	0
1005	Appliances	Energy Star Compliant Chest Freezer	No Program	SF	MO	311	10%	31	0.01	22	\$35	58%	29%	0.7	1.5	1.8	0.4	2,194	0	0	0
1006	Appliances	Energy Star Compliant Upright Freezer (Manual Def.)	No Program	SF	MO	349	10%	35	0.01	22	\$35	58%	29%	0.8	1.7	1.9	0.4	2,462	0	0	0
1007	Appliances	Second Refrigerator Turn In	No Program	SF	Recycle	1,036	100%	1,036	0.15	8	\$131	7%	0%	2.5	2.5	5.9	0.4	15,196	15,196	14,697	14,697
1008	Appliances	Second Freezer Turn In	No Program	SF	Recycle	942	100%	942	0.14	8	\$131	15%	0%	2.2	2.2	5.5	0.4	30,775	30,775	29,764	29,764
1009	Appliances	Energy Star Compliant Top-Mount Refrigerator	No Program	MH	MO	442	10%	37	0.01	17	\$40	132%	33%	0.6	1.2	1.6	0.4	781	0	0	0
1010	Appliances	CEE Tier 2 Compliant Top-Mount Refrigerator	No Program	MH	MO	442	25%	55	0.01	17	\$140	132%	33%	0.2	0.5	1.0	0.2	1,170	0	0	0
1011	Appliances	Energy Star Compliant Side-by-Side Refrigerator	No Program	MH	MO	517	10%	52	0.01	17	\$40	132%	33%	0.8	1.6	2.0	0.4	1,094	0	0	0
1012	Appliances	CEE Tier 2 Compliant Side-by-Side Refrigerator	No Program	MH	MO	517	25%	78	0.01	17	\$140	132%	33%	0.3	0.6	1.2	0.3	1,642	0	0	0
1013	Appliances	Energy Star Compliant Chest Freezer	No Program	MH	MO	311	10%	31	0.01	22	\$35	58%	29%	0.7	1.5	1.8	0.4	457	0	0	0
1014	Appliances	Energy Star Compliant Upright Freezer (Manual Def.)	No Program	MH	MO	349	10%	35	0.01	22	\$35	58%	29%	0.8	1.7	1.9	0.4	513	0	0	0
1015	Appliances	Second Refrigerator Turn In	No Program	MH	Recycle	1,036	100%	1,036	0.15	8	\$131	7%	0%	2.5	2.5	5.9	0.4	3,167	3,167	3,063	3,063
1016	Appliances	Second Freezer Turn In	No Program	MH	Recycle	942	100%	942	0.14	8	\$131	15%	0%	2.2	2.2	5.5	0.4	6,415	6,415	6,204	6,204
1017	Appliances	Energy Star Compliant Top-Mount Refrigerator	No Program	SF	NC	442	10%	37	0.01	17	\$40	132%	0%	0.6	1.2	1.6	0.4	574	0	0	0
1018	Appliances	CEE Tier 2 Compliant Top-Mount Refrigerator	No Program	SF	NC	442	25%	55	0.01	17	\$140	132%	0%	0.2	0.5	1.0	0.2	860	0	0	0
1019	Appliances	Energy Star Compliant Side-by-Side Refrigerator	No Program	SF	NC	517	10%	52	0.01	17	\$40	132%	0%	0.8	1.6	2.0	0.4	804	0	0	0
1020	Appliances	CEE Tier 2 Compliant Side-by-Side Refrigerator	No Program	SF	NC	517	25%	78	0.01	17	\$140	132%	0%	0.3	0.6	1.2	0.3	1,207	0	0	0
1021	Appliances	Energy Star Compliant Chest Freezer	No Program	SF	NC	311	10%	31	0.01	22	\$35	58%	0%	0.7	1.5	1.8	0.4	426	0	0	0
1022	Appliances	Energy Star Compliant Upright Freezer (Manual Def.)	No Program	SF	NC	349	10%	35	0.01	22	\$35	58%	0%	0.8	1.7	1.9	0.4	478	0	0	0
1023	Appliances	Energy Star Compliant Top-Mount Refrigerator	No Program	MH	NC	442	10%	37	0.01	17	\$40	132%	0%	0.6	1.2	1.6	0.4	120	0	0	0
1024	Appliances	CEE Tier 2 Compliant Top-Mount Refrigerator	No Program	MH	NC	442	25%	55	0.01	17	\$140	132%	0%	0.2	0.5	1.0	0.2	179	0	0	0
1025	Appliances	Energy Star Compliant Side-by-Side Refrigerator	No Program	MH	NC	517	10%	52	0.01	17	\$40	132%	0%	0.8	1.6	2.0	0.4	168	0	0	0
1026	Appliances	CEE Tier 2 Compliant Side-by-Side Refrigerator	No Program	MH	NC	517	25%	78	0.01	17	\$140	132%	0%	0.3	0.6	1.2	0.3	252	0	0	0
1027	Appliances	Energy Star Compliant Chest Freezer	No Program	MH	NC	311	10%	31	0.01	22	\$35	58%	0%	0.7	1.5	1.8	0.4	89	0	0	0
1028	Appliances	Energy Star Compliant Upright Freezer (Manual Def.)	No Program	MH	NC	349	10%	35	0.01	22	\$35	58%	0%	0.8	1.7	1.9	0.4	100	0	0	0
2001	Behavioral	Energy Display Monitor - Gas/CAC	No Program	SF	Opt-In	13,949	9%	1,255	0.14	1	\$250	40%	1%	0.2	0.3	1.1	0.2	16,909	0	0	0
2002	Behavioral	BillingInsights - Gas/CAC	Residential Energy Audit	SF	Opt-Out	13,949	2%	279	0.10	1	\$7	40%	1%	2.2	1.0	5.0	0.5	16,283	26,137	31,117	10,649
2003	Behavioral	Energy Display Monitor - ASHP	No Program	SF	Opt-In	17,770	9%	1,599	0.18	1	\$250	46%	1%	0.2	0.4	1.1	0.2	24,776	0	0	0
2004	Behavioral	BillingInsights - ASHP	Residential Energy Audit	SF	Opt-Out	17,770	2%	355	0.07	1	\$7	46%	1%	1.9	1.0	4.6	0.4	23,858	38,296	45,593	15,603
2005	Behavioral	Energy Display Monitor - Elec Furn/CAC	No Program	SF	Opt-In	24,656	9%	2,219	0.25	1	\$250	15%	1%	0.3	0.6	1.3	0.2	11,211	0	0	0
2006	Behavioral	BillingInsights - Elec Furn/CAC	Residential Energy Audit	SF	Opt-Out	24,656	2%	493	0.07	1	\$7	15%	1%	2.6	1.0	6.4	0.4	10,796	17,329	20,631	7,060
2007	Behavioral	Energy Display Monitor - Gas/CAC	No Program	MH	Opt-In	11,217	9%	1,010	0.12	1	\$250	28%	1%	0.2	0.3	1.0	0.2	2,004	0	0	0
2008	Behavioral	BillingInsights - Gas/CAC	Residential Energy Audit	MH	Opt-Out	11,217	2%	224	0.07	1	\$7	28%	1%	1.7	1.0	4.0	0.5	1,930	3,098	3,688	1,262
2009	Behavioral	Energy Display Monitor - ASHP	No Program	MH	Opt-In	15,081	9%	1,357	0.15	1	\$250	54%	1%	0.2	0.4	1.0	0.2	5,224	0	0	0
2010	Behavioral	BillingInsights - ASHP	Residential Energy Audit	MH	Opt-Out	15,081	2%	302	0.06	1	\$7	54%	1%	1.7	1.0	3.9	0.4	5,031	8,075	9,614	3,290
2011	Behavioral	Energy Display Monitor - Elec Furn/CAC	No Program	MH	Opt-In	20,488	9%	1,844	0.21	1	\$250	18%	1%	0.3	0.5	1.1	0.2	2,315	0	0	0
2012	Behavioral	BillingInsights - Elec Furn/CAC	Residential Energy Audit	MH	Opt-Out	20,488	2%	410	0.06	1	\$7	18%	1%	2.2	1.0	5.3	0.4	2,229	3,578	4,260	1,458
2013	Behavioral	Energy Display Monitor - Gas/CAC	No Program	SF	NC	12,068	9%	1,086	0.12	1	\$250	24%	0%	0.2	0.3	1.0	0.2	988	0	0	0
2014	Behavioral	BillingInsights - Gas/CAC	Residential Energy Audit	SF	NC	12,068	2%	241	0.05	1	\$7	24%	0%	1.6	1.0	4.1	0.4	951	1,527	732	250
2015	Behavioral	Energy Display Monitor - ASHP	No Program	SF	NC	14,766	9%	1,329	0.15	1	\$250	76%	0%	0.2	0.4	1.0	0.2	3,912	0	0	0
2016	Behavioral	BillingInsights - ASHP	Residential Energy Audit	SF	NC	14,766	2%	295	0.04	1	\$7	76%	0%	1.5	1.0	3.8	0.4	3,768	6,047	2,898	992
2017	Behavioral	Energy Display Monitor - Gas/CAC	No Program	MH	NC	9,871	9%	888	0.10	1	\$250	24%	0%	0.2	0.2	0.9	0.1	168	0	0	0
2018	Behavioral	BillingInsights - Gas/CAC	Residential Energy Audit	MH	NC	9,871	2%	197	0.04	1	\$7	24%	0%	1.4	1.0	3.5	0.4	162	260	125	43
2019	Behavioral	Energy Display Monitor - ASHP	No Program	MH	NC	12,747	9%	1,147	0.13	1	\$250	76%	0%	0.2	0.3	0.9	0.2	704	0	0	0
2020	Behavioral	BillingInsights - ASHP	Residential Energy Audit	MH	NC	12,747	2%	255	0.04	1	\$7	76%	0%	1.3	1.0	3.3	0.4	678	1,088	522	178
3001	Bundles	Multi-Family Homes Efficiency Kit	No Program	MF	Retrofit	9,460	4%	754	0.09	7	\$13	86%	20%	15.5	15.2	34.1	0.4	3,777	3,777	3,157	3,157
3002	Bundles	Multi-Family Homes Efficiency Kit	No Program	MF	NC	9,460	4%	754	0.09	7	\$13	86%	0%	15.5	15.2	34.1	0.4	989	989	630	630
4001	Clothes Washer/ Dryer	Energy Star Clothes Washer (w/ Elec. WH & Elec. Dryer)	No Program	SF	MO	613	27%	126	0.43	14	\$84	72%	41%	2.5	1.5	3.7	0.4	15,152	15,152	11,853	9,608
4002	Clothes Washer/ Dryer	Energy Star Most Efficient Clothes Washer (w/ Elec. WH & Elec. Dryer)	No Program	SF	MO	613	39%	236	0.39	14	\$141	72%	41%	2.1	1.4	3.6	0.3	28,355	28,355	22,182	17,980

Appendix A: Residential Measure Detail

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	Base Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	Base Saturation	EE Saturation	TRC Ratio	UCT Ratio	PCT Ratio	RIM Test Ratio	TP 15-yr (2036)	EP 15-yr (2036)	MAP 15-yr (2036)	RAP 15-yr (2036)
4003	Clothes Washer/ Dryer	Energy Star Clothes Washer (w/ NG WH & Elec. Dryer)	No Program	SF	MO	422	18%	115	0.80	14	\$84	11%	41%	2.7	1.8	4.0	0.5	2,169	2,169	1,697	1,375
4004	Clothes Washer/ Dryer	Energy Star Most Efficient Clothes Washer (w/ NG WH & Elec. Dryer)	No Program	SF	MO	422	21%	114	0.39	14	\$141	11%	41%	1.9	0.8	3.1	0.3	2,156	2,156	1,687	1,367
4005	Clothes Washer/ Dryer	ENERGY STAR Clothes Dryer	No Program	SF	MO	769	21%	160	0.57	16	\$152	88%	11%	0.6	1.2	1.7	0.4	50,689	0	0	0
4006	Clothes Washer/ Dryer	Energy Star Clothes Washer (w/ Elec. WH & Elec. Dryer)	No Program	MH	MO	613	27%	163	0.43	14	\$84	66%	41%	2.6	1.8	4.2	0.4	3,713	3,713	2,904	2,354
4007	Clothes Washer/ Dryer	Energy Star Most Efficient Clothes Washer (w/ Elec. WH & Elec. Dryer)	No Program	MH	MO	613	39%	242	0.39	14	\$141	66%	41%	2.1	1.5	3.6	0.3	5,525	5,525	4,322	3,503
4008	Clothes Washer/ Dryer	Energy Star Clothes Washer (w/ NG WH & Elec. Dryer)	No Program	MH	MO	422	18%	77	0.80	14	\$84	10%	41%	2.6	1.5	3.5	0.5	277	277	216	175
4009	Clothes Washer/ Dryer	Energy Star Most Efficient Clothes Washer (w/ NG WH & Elec. Dryer)	No Program	MH	MO	422	21%	88	0.39	14	\$141	10%	41%	1.9	0.7	2.9	0.3	317	317	248	201
4010	Clothes Washer/ Dryer	ENERGY STAR Clothes Dryer	No Program	MH	MO	769	21%	160	0.57	16	\$152	88%	11%	0.6	1.2	1.7	0.4	10,565	0	0	0
4011	Clothes Washer/ Dryer	Energy Star Clothes Washer (w/ Elec. WH & Elec. Dryer)	No Program	SF	NC	613	27%	163	0.43	14	\$84	72%	0%	2.6	1.8	4.2	0.4	2,749	2,749	2,089	1,710
4012	Clothes Washer/ Dryer	Energy Star Most Efficient Clothes Washer (w/ Elec. WH & Elec. Dryer)	No Program	SF	NC	613	39%	242	0.39	14	\$141	72%	0%	2.1	1.5	3.6	0.3	4,091	4,091	3,109	2,545
4013	Clothes Washer/ Dryer	Energy Star Clothes Washer (w/ NG WH & Elec. Dryer)	No Program	SF	NC	422	18%	77	0.80	14	\$84	12%	0%	2.6	1.5	3.5	0.5	219	219	166	136
4014	Clothes Washer/ Dryer	Energy Star Most Efficient Clothes Washer (w/ NG WH & Elec. Dryer)	No Program	SF	NC	422	21%	88	0.39	14	\$141	12%	0%	1.9	0.7	2.9	0.3	251	251	191	156
4015	Clothes Washer/ Dryer	ENERGY STAR Clothes Dryer	No Program	SF	NC	769	21%	160	0.57	16	\$152	88%	0%	0.6	1.2	1.7	0.4	6,484	0	0	0
4016	Clothes Washer/ Dryer	Energy Star Clothes Washer (w/ Elec. WH & Elec. Dryer)	No Program	MH	NC	613	27%	163	0.43	14	\$84	10%	0%	2.6	1.8	4.2	0.4	83	83	63	52
4017	Clothes Washer/ Dryer	Energy Star Most Efficient Clothes Washer (w/ Elec. WH & Elec. Dryer)	No Program	MH	NC	613	39%	242	0.39	14	\$141	10%	0%	2.1	1.5	3.6	0.3	123	123	94	77
4018	Clothes Washer/ Dryer	Energy Star Clothes Washer (w/ NG WH & Elec. Dryer)	No Program	MH	NC	422	18%	77	0.80	14	\$84	11%	0%	2.6	1.5	3.5	0.5	42	42	32	26
4019	Clothes Washer/ Dryer	Energy Star Most Efficient Clothes Washer (w/ NG WH & Elec. Dryer)	No Program	MH	NC	422	21%	88	0.39	14	\$141	11%	0%	1.9	0.7	2.9	0.3	48	48	36	30
4020	Clothes Washer/ Dryer	ENERGY STAR Clothes Dryer	No Program	MH	NC	769	21%	160	0.57	16	\$152	88%	0%	0.6	1.2	1.7	0.4	1,352	0	0	0
5001	Dishwasher	Energy Star Dishwasher (Electric Water Heating)	No Program	SF	MO	307	12%	37	0.15	11	\$76	56%	83%	0.5	0.5	1.1	0.3	5,054	0	0	0
5002	Dishwasher	Energy Star Dishwasher (Non-Electric WH)	No Program	SF	MO	135	12%	16	0.06	11	\$76	9%	83%	0.3	0.2	0.9	0.2	350	0	0	0
5003	Dishwasher	Energy Star Dishwasher (Electric Water Heating)	No Program	MH	MO	307	12%	37	0.15	11	\$76	56%	83%	0.5	0.5	1.1	0.3	1,053	0	0	0
5004	Dishwasher	Energy Star Dishwasher (Non-Electric WH)	No Program	MH	MO	135	12%	16	0.06	11	\$76	9%	83%	0.3	0.2	0.9	0.2	73	0	0	0
5005	Dishwasher	Energy Star Dishwasher (Electric Water Heating)	No Program	SF	NC	307	12%	37	0.15	11	\$76	55%	0%	0.5	0.5	1.1	0.3	965	0	0	0
5006	Dishwasher	Energy Star Dishwasher (Non-Electric WH)	No Program	SF	NC	135	12%	16	0.06	11	\$76	9%	0%	0.3	0.2	0.9	0.2	71	0	0	0
5007	Dishwasher	Energy Star Dishwasher (Electric Water Heating)	No Program	MH	NC	307	12%	37	0.15	11	\$76	55%	0%	0.5	0.5	1.1	0.3	201	0	0	0
5008	Dishwasher	Energy Star Dishwasher (Non-Electric WH)	No Program	MH	NC	135	12%	16	0.06	11	\$76	9%	0%	0.3	0.2	0.9	0.2	15	0	0	0
6001	Electronics	Efficient Televisions	No Program	SF	MO	208	67%	139	0.12	6	\$14	256%	62%	2.3	4.5	5.2	0.4	102,611	102,611	90,590	67,297
6002	Electronics	Energy Star Desktop Computer	No Program	SF	MO	124	20%	25	0.00	4	\$20	43%	62%	0.1	0.3	0.9	0.2	3,076	0	0	0
6003	Electronics	Energy Star Computer Monitor	No Program	SF	MO	50	20%	10	0.01	5	\$3	43%	81%	0.9	1.8	2.1	0.4	1,059	0	0	0
6004	Electronics	Energy Star Laptop Computer	No Program	SF	MO	31	25%	8	0.00	4	\$3	84%	83%	0.4	0.7	1.5	0.2	1,569	0	0	0
6005	Electronics	Smart Strip Power Strip - Tier 1	No Program	SF	MO	432	13%	57	0.01	7	\$10	130%	4%	1.4	2.8	3.6	0.4	30,048	30,048	17,752	14,535
6006	Electronics	Smart Strip Power Strip - Tier 2	No Program	SF	MO	432	55%	77	0.01	7	\$30	200%	4%	0.6	1.3	1.9	0.3	62,890	0	0	0
6007	Electronics	Office Multifunction Device	No Program	SF	MO	60	46%	28	0.02	6	\$30	59%	98%	0.3	0.6	0.9	0.3	3,463	0	0	0
6008	Electronics	Efficient Televisions	No Program	MH	MO	208	67%	139	0.12	6	\$14	225%	62%	2.3	4.5	5.2	0.4	18,760	18,760	16,562	12,304
6009	Electronics	Energy Star Desktop Computer	No Program	MH	MO	124	20%	25	0.00	4	\$20	25%	62%	0.1	0.3	0.9	0.2	373	0	0	0
6010	Electronics	Energy Star Computer Monitor	No Program	MH	MO	50	20%	10	0.01	5	\$3	25%	81%	0.9	1.8	2.1	0.4	129	0	0	0
6011	Electronics	Energy Star Laptop Computer	No Program	MH	MO	31	25%	8	0.00	4	\$3	85%	83%	0.4	0.7	1.5	0.2	329	0	0	0
6012	Electronics	Smart Strip Power Strip - Tier 1	No Program	MH	MO	432	13%	57	0.01	7	\$10	130%	4%	1.4	2.8	3.6	0.4	6,263	6,263	3,700	3,030
6013	Electronics	Smart Strip Power Strip - Tier 2	No Program	MH	MO	432	55%	77	0.01	7	\$30	200%	4%	0.6	1.3	1.9	0.3	13,109	0	0	0
6014	Electronics	Office Multifunction Device	No Program	MH	MO	60	46%	28	0.02	6	\$30	27%	98%	0.3	0.6	0.9	0.3	327	0	0	0
6015	Electronics	Efficient Televisions	No Program	SF	NC	208	67%	139	0.12	6	\$14	256%	0%	2.3	4.5	5.2	0.4	16,737	16,737	14,039	10,901
6016	Electronics	Energy Star Desktop Computer	No Program	SF	NC	124	20%	25	0.00	4	\$20	43%	0%	0.1	0.3	0.9	0.2	502	0	0	0
6017	Electronics	Energy Star Computer Monitor	No Program	SF	NC	50	20%	10	0.01	5	\$3	43%	0%	0.9	1.8	2.1	0.4	201	0	0	0
6018	Electronics	Energy Star Laptop Computer	No Program	SF	NC	31	25%	8	0.00	4	\$3	84%	0%	0.4	0.7	1.5	0.2	304	0	0	0
6019	Electronics	Smart Strip Power Strip - Tier 1	No Program	SF	NC	432	13%	57	0.01	7	\$10	130%	0%	1.4	2.8	3.6	0.4	3,463	3,463	1,231	1,045
6020	Electronics	Smart Strip Power Strip - Tier 2	No Program	SF	NC	432	55%	77	0.01	7	\$30	200%	0%	0.6	1.3	1.9	0.3	7,249	0	0	0
6021	Electronics	Office Multifunction Device	No Program	SF	NC	60	46%	28	0.02	6	\$30	59%	0%	0.3	0.6	0.9	0.3	766	0	0	0
6022	Electronics	Efficient Televisions	No Program	MH	NC	208	67%	139	0.12	6	\$14	225%	0%	2.3	4.5	5.2	0.4	3,060	3,060	2,567	1,993
6023	Electronics	Energy Star Desktop Computer	No Program	MH	NC	124	20%	25	0.00	4	\$20	25%	0%	0.1	0.3	0.9	0.2	61	0	0	0
6024	Electronics	Energy Star Computer Monitor	No Program	MH	NC	50	20%	10	0.01	5	\$3	25%	0%	0.9	1.8	2.1	0.4	24	0	0	0
6025	Electronics	Energy Star Laptop Computer	No Program	MH	NC	31	25%	8	0.00	4	\$3	85%	0%	0.4	0.7	1.5	0.2	64	0	0	0
6026	Electronics	Smart Strip Power Strip - Tier 1	No Program	MH	NC	432	13%	57	0.01	7	\$10	130%	0%	1.4	2.8	3.6	0.4	722	722	257	218
6027	Electronics	Smart Strip Power Strip - Tier 2	No Program	MH	NC	432	55%	77	0.01	7	\$30	200%	0%	0.6	1.3	1.9	0.3	1,511	0	0	0
6028	Electronics	Office Multifunction Device	No Program	MH	NC	60	46%	28	0.02	6	\$30	27%	0%	0.3	0.6	0.9	0.3	72	0	0	0

Appendix A: Residential Measure Detail

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	Base Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EU/L	Measure Cost	Base Saturation	EE Saturation	TRC Ratio	UCT Ratio	PCT Ratio	RIM Test Ratio	TP 15-yr (2036)	EP 15-yr (2036)	MAP 15-yr (2036)	RAP 15-yr (2036)
7001	HVAC Shell	Insulation - Ceiling (R-0 to R-38) - (Elec AC & Gas Heat)	Button-Up Weatherization	SF	Retrofit	6,659	40%	2,633	3.93	25	\$2,340	40%	36%	3.2	6.9	4.6	1.1	2,548	3,092	2,154	601
7002	HVAC Shell	Insulation - Ceiling (R-11 to R-49) - (Elec AC & Gas Heat)	Button-Up Weatherization	SF	Retrofit	4,334	8%	355	0.77	25	\$2,145	40%	36%	0.7	1.2	1.3	0.7	4,464	0	0	0
7003	HVAC Shell	Insulation - Ceiling (R-19 to R-49) - (Elec AC & Gas Heat)	Button-Up Weatherization	SF	Retrofit	4,206	5%	227	0.46	25	\$1,794	40%	36%	0.5	0.7	1.1	0.5	7,919	0	0	0
7004	HVAC Shell	Insulation - Floor (R-0 to R-19) - (Elec AC & Gas Heat)	Button-Up Weatherization	SF	Retrofit	4,015	-9%	-365	-0.21	20	\$1,268	3%	36%	0.2	0.0	1.0	0.5	-395	0	0	0
7005	HVAC Shell	Insulation - Floor (R-11 to R-30) - (Elec AC & Gas Heat)	Button-Up Weatherization	SF	Retrofit	4,296	-3%	-146	-0.10	20	\$1,268	3%	36%	0.1	0.0	0.7	0.2	-407	0	0	0
7006	HVAC Shell	Wall Insulation - (Elec AC & Gas Heat)	Button-Up Weatherization	SF	Retrofit	4,862	14%	666	1.04	25	\$1,920	40%	82%	1.2	1.8	2.2	0.7	16,104	19,539	2,035	1,320
7007	HVAC Shell	Basement Wall Insulation - (Elec AC & Gas Heat)	Button-Up Weatherization	SF	Retrofit	4,206	3%	131	-0.10	20	\$1,360	3%	36%	0.3	0.0	1.6	-0.2	506	0	0	0
7008	HVAC Shell	Energy Star Windows - (Elec AC & Gas Heat)	No Program	SF	Retrofit	4,206	6%	247	0.37	25	\$5,624	40%	49%	0.1	0.6	0.3	0.4	10,475	0	0	0
7009	HVAC Shell	Air Sealing (Tier 1) - (Elec AC & Gas Heat)	Button-Up Weatherization	SF	Retrofit	4,625	5%	247	0.34	20	\$605	40%	47%	1.4	0.5	3.9	0.3	5,352	6,494	3,930	4,134
7010	HVAC Shell	Air Sealing (Tier 2) - (Elec AC & Gas Heat)	Button-Up Weatherization	SF	Retrofit	4,327	8%	360	0.48	20	\$605	40%	47%	1.4	0.7	3.5	0.4	7,807	9,472	5,732	6,030
7011	HVAC Shell	Duct Sealing - (Elec AC & Gas Heat)	No Program	SF	Retrofit	4,254	10%	425	0.30	20	\$330	40%	47%	0.9	0.6	2.7	0.3	14,763	0	0	0
7012	HVAC Shell	Cool Roof - (Elec AC & Gas Heat)	No Program	SF	Retrofit	4,206	41%	1,727	2.55	20	\$2,935	40%	24%	0.8	3.2	0.9	0.8	93,254	0	0	0
7013	HVAC Shell	Insulation - Ceiling (R-0 to R-38) - (Elec HP)	Button-Up Weatherization	SF	Retrofit	13,962	47%	6,561	3.01	25	\$2,340	46%	36%	3.0	9.3	4.7	0.6	7,303	8,861	6,173	1,723
7014	HVAC Shell	Insulation - Ceiling (R-11 to R-49) - (Elec HP)	Button-Up Weatherization	SF	Retrofit	8,836	18%	1,586	0.72	25	\$2,145	46%	36%	0.8	2.3	1.5	0.5	22,942	0	0	0
7015	HVAC Shell	Insulation - Ceiling (R-19 to R-49) - (Elec HP)	Button-Up Weatherization	SF	Retrofit	8,027	10%	777	0.38	25	\$1,794	46%	36%	0.5	1.1	1.1	0.4	31,120	0	0	0
7016	HVAC Shell	Insulation - Floor (R-0 to R-19) - (Elec HP)	Button-Up Weatherization	SF	Retrofit	8,448	8%	668	-0.15	20	\$1,268	4%	36%	0.2	0.4	1.3	0.2	832	0	0	0
7017	HVAC Shell	Insulation - Floor (R-11 to R-30) - (Elec HP)	Button-Up Weatherization	SF	Retrofit	7,890	2%	184	-0.06	20	\$1,268	4%	36%	0.0	0.1	0.8	0.1	590	0	0	0
7018	HVAC Shell	Wall Insulation - (Elec HP)	Button-Up Weatherization	SF	Retrofit	10,518	24%	2,556	0.86	25	\$1,920	46%	82%	1.3	3.3	2.5	0.5	71,077	86,239	8,982	5,825
7019	HVAC Shell	Basement Wall Insulation - (Elec HP)	Button-Up Weatherization	SF	Retrofit	8,027	4%	297	-0.14	20	\$1,360	4%	36%	0.0	0.1	0.8	0.1	1,324	0	0	0
7020	HVAC Shell	Energy Star Windows - (Elec HP)	No Program	SF	Retrofit	8,027	6%	515	0.30	25	\$5,624	46%	49%	0.1	0.8	0.3	0.4	25,146	0	0	0
7021	HVAC Shell	Air Sealing (Tier 1) - (Elec HP)	Button-Up Weatherization	SF	Retrofit	9,767	12%	1,159	0.22	20	\$605	46%	47%	1.0	1.0	3.1	0.3	28,924	70,189	42,473	44,678
7022	HVAC Shell	Air Sealing (Tier 2) - (Elec HP)	Button-Up Weatherization	SF	Retrofit	8,414	9%	774	0.20	20	\$605	46%	47%	0.7	0.7	2.4	0.3	19,317	0	0	0
7023	HVAC Shell	Duct Sealing - (Elec HP)	No Program	SF	Retrofit	8,347	10%	835	0.30	20	\$330	46%	47%	0.9	0.9	2.5	0.4	33,321	0	0	0
7024	HVAC Shell	Cool Roof - (Elec HP)	No Program	SF	Retrofit	8,027	21%	1,653	1.24	20	\$2,935	46%	24%	0.5	2.1	1.0	0.5	102,702	0	0	0
7025	HVAC Shell	Insulation - Ceiling (R-0 to R-38) - (Elec Furnace / AC)	Button-Up Weatherization	SF	Retrofit	25,991	48%	12,402	3.28	25	\$2,340	15%	36%	4.8	15.0	8.6	0.6	4,502	5,462	3,805	1,062
7026	HVAC Shell	Insulation - Ceiling (R-11 to R-49) - (Elec Furnace / AC)	Button-Up Weatherization	SF	Retrofit	16,374	19%	3,102	0.71	25	\$2,145	15%	36%	1.3	3.6	2.6	0.5	14,638	17,760	12,374	3,818
7027	HVAC Shell	Insulation - Ceiling (R-19 to R-49) - (Elec Furnace / AC)	Button-Up Weatherization	SF	Retrofit	14,913	11%	1,641	0.38	25	\$1,794	15%	36%	0.8	1.9	1.9	0.4	21,442	0	0	0
7028	HVAC Shell	Insulation - Floor (R-0 to R-19) - (Elec Furnace / AC)	Button-Up Weatherization	SF	Retrofit	14,913	5%	773	-0.08	20	\$1,268	1%	36%	0.3	0.5	1.4	0.2	314	0	0	0
7029	HVAC Shell	Insulation - Floor (R-11 to R-30) - (Elec Furnace / AC)	Button-Up Weatherization	SF	Retrofit	14,490	4%	592	-0.07	20	\$1,268	1%	36%	0.2	0.4	1.2	0.2	619	0	0	0
7030	HVAC Shell	Wall Insulation - (Elec Furnace / AC)	Button-Up Weatherization	SF	Retrofit	19,682	25%	4,909	0.89	25	\$1,920	15%	82%	2.1	5.5	4.4	0.5	44,524	54,022	5,627	3,649
7031	HVAC Shell	Basement Wall Insulation - (Elec Furnace / AC)	Button-Up Weatherization	SF	Retrofit	14,913	8%	1,157	-0.17	20	\$1,360	1%	36%	0.4	0.7	1.7	0.2	1,680	0	0	0
7032	HVAC Shell	Energy Star Windows - (Elec Furnace / AC)	No Program	SF	Retrofit	14,913	6%	962	0.31	25	\$5,624	15%	49%	0.2	1.2	0.4	0.4	15,311	0	0	0
7033	HVAC Shell	Air Sealing (Tier 1) - (Elec Furnace / AC)	Button-Up Weatherization	SF	Retrofit	18,874	14%	2,636	0.24	20	\$605	15%	47%	2.1	2.1	5.7	0.4	21,449	26,024	15,748	16,565
7034	HVAC Shell	Air Sealing (Tier 2) - (Elec Furnace / AC)	Button-Up Weatherization	SF	Retrofit	15,796	11%	1,759	0.20	20	\$605	15%	47%	1.4	1.4	4.1	0.3	14,316	17,370	10,511	11,057
7035	HVAC Shell	Duct Sealing - (Elec Furnace / AC)	No Program	SF	Retrofit	15,277	10%	1,528	0.30	20	\$330	15%	47%	1.3	1.3	3.7	0.4	19,889	24,132	14,602	15,361
7036	HVAC Shell	Cool Roof - (Elec AC & Gas Heat)	No Program	SF	Retrofit	14,913	4%	606	1.31	20	\$2,935	15%	24%	0.4	1.4	0.5	0.7	12,285	0	0	0
7037	HVAC Shell	Insulation - Ceiling (R-0 to R-38) - (Elec AC & Gas Heat)	CARES Program	SF	Retrofit	6,659	40%	2,633	3.93	25	\$2,340	40%	36%	3.2	2.2	5.3	0.8	1,664	2,019	1,407	1,480
7038	HVAC Shell	Insulation - Ceiling (R-11 to R-49) - (Elec AC & Gas Heat)	CARES Program	SF	Retrofit	4,334	8%	355	0.77	25	\$2,145	40%	36%	0.7	0.4	1.9	0.3	2,915	3,537	2,464	2,592
7039	HVAC Shell	Insulation - Ceiling (R-19 to R-49) - (Elec AC & Gas Heat)	CARES Program	SF	Retrofit	4,206	5%	227	0.46	25	\$1,794	40%	36%	0.5	0.3	1.7	0.3	5,170	0	0	0
7040	HVAC Shell	Insulation - Floor (R-0 to R-19) - (Elec AC & Gas Heat)	CARES Program	SF	Retrofit	4,015	-9%	-365	-0.21	20	\$1,268	3%	36%	0.2	0.0	1.3	0.3	-258	0	0	0
7041	HVAC Shell	Insulation - Floor (R-11 to R-30) - (Elec AC & Gas Heat)	CARES Program	SF	Retrofit	4,296	-3%	-146	-0.10	20	\$1,268	3%	36%	0.1	0.0	1.1	0.1	-265	0	0	0

Appendix A: Residential Measure Detail

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	Base Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EU/L	Measure Cost	Base Saturation	EE Saturation	TRC Ratio	UCT Ratio	PCT Ratio	RIM Test Ratio	TP 15-yr (2036)	EP 15-yr (2036)	MAP 15-yr (2036)	RAP 15-yr (2036)
7042	HVAC Shell	Wall Insulation - (Elec AC & Gas Heat)	CARES Program	SF	Retrofit	4,862	14%	666	1.04	25	\$1,920	40%	82%	1.2	0.7	2.8	0.5	10,514	12,757	1,329	2,501
7043	HVAC Shell	Basement Wall Insulation - (Elec AC & Gas Heat)	CARES Program	SF	Retrofit	4,206	3%	131	-0.10	20	\$1,360	3%	36%	0.3	0.0	2.1	-0.1	330	0	0	0
7044	HVAC Shell	Energy Star Windows - (Elec AC & Gas Heat)	No Program	SF	Retrofit	4,206	6%	247	0.37	25	\$5,624	40%	49%	0.1	0.1	1.1	0.1	6,839	0	0	0
7045	HVAC Shell	Air Sealing (Tier 1) - (Elec AC & Gas Heat)	CARES Program	SF	Retrofit	4,625	5%	247	0.34	20	\$605	40%	47%	1.7	0.6	4.6	0.4	3,494	4,240	2,566	2,699
7046	HVAC Shell	Air Sealing (Tier 2) - (Elec AC & Gas Heat)	CARES Program	SF	Retrofit	4,327	8%	360	0.48	20	\$605	40%	47%	1.7	0.8	4.1	0.5	5,097	6,185	3,742	3,937
7047	HVAC Shell	Duct Sealing - (Elec AC & Gas Heat)	No Program	SF	Retrofit	4,254	10%	425	0.30	20	\$330	40%	47%	2.1	1.3	4.9	0.5	9,638	11,695	7,077	7,444
7048	HVAC Shell	Cool Roof - (Elec AC & Gas Heat)	No Program	SF	Retrofit	4,206	41%	1,727	2.55	20	\$2,935	40%	24%	0.8	0.8	1.6	0.5	60,885	0	0	0
7049	HVAC Shell	Insulation - Ceiling (R-0 to R-38) - (Elec HP)	CARES Program	SF	Retrofit	13,962	47%	6,561	3.01	25	\$2,340	46%	36%	3.0	3.0	5.4	0.6	4,768	5,785	4,031	4,240
7050	HVAC Shell	Insulation - Ceiling (R-11 to R-49) - (Elec HP)	CARES Program	SF	Retrofit	8,836	18%	1,586	0.72	25	\$2,145	46%	36%	0.8	0.8	2.2	0.4	14,979	18,174	12,663	13,320
7051	HVAC Shell	Insulation - Ceiling (R-19 to R-49) - (Elec HP)	CARES Program	SF	Retrofit	8,027	10%	777	0.38	25	\$1,794	46%	36%	0.5	0.5	1.7	0.3	20,318	0	0	0
7052	HVAC Shell	Insulation - Floor (R-0 to R-19) - (Elec HP)	CARES Program	SF	Retrofit	8,448	8%	668	-0.15	20	\$1,268	4%	36%	0.2	0.2	1.7	0.1	543	0	0	0
7053	HVAC Shell	Insulation - Floor (R-11 to R-30) - (Elec HP)	CARES Program	SF	Retrofit	7,890	2%	184	-0.06	20	\$1,268	4%	36%	0.0	0.0	1.2	0.0	385	0	0	0
7054	HVAC Shell	Wall Insulation - (Elec HP)	CARES Program	SF	Retrofit	10,518	24%	2,556	0.86	25	\$1,920	46%	82%	1.3	1.3	3.1	0.4	46,406	56,305	5,864	11,038
7055	HVAC Shell	Basement Wall Insulation - (Elec HP)	CARES Program	SF	Retrofit	8,027	4%	297	-0.14	20	\$1,360	4%	36%	0.0	0.0	1.3	0.0	864	0	0	0
7056	HVAC Shell	Energy Star Windows - (Elec HP)	No Program	SF	Retrofit	8,027	6%	515	0.30	25	\$5,624	46%	49%	0.1	0.1	1.1	0.1	16,418	0	0	0
7057	HVAC Shell	Air Sealing (Tier 1) - (Elec HP)	CARES Program	SF	Retrofit	9,767	12%	1,159	0.22	20	\$605	46%	47%	1.3	1.3	3.6	0.4	18,884	22,913	13,865	14,585
7058	HVAC Shell	Air Sealing (Tier 2) - (Elec HP)	CARES Program	SF	Retrofit	8,414	9%	774	0.20	20	\$605	46%	47%	0.9	0.9	2.7	0.3	12,612	15,302	9,260	9,741
7059	HVAC Shell	Duct Sealing - (Elec HP)	No Program	SF	Retrofit	8,347	10%	835	0.30	20	\$330	46%	47%	2.0	2.0	4.4	0.5	21,755	26,396	15,973	16,802
7060	HVAC Shell	Cool Roof - (Elec HP)	No Program	SF	Retrofit	8,027	21%	1,653	1.24	20	\$2,935	46%	24%	0.5	0.5	1.8	0.3	67,053	0	0	0
7061	HVAC Shell	Insulation - Ceiling (R-0 to R-38) - (Elec Furnace / AC)	CARES Program	SF	Retrofit	25,991	48%	12,402	3.28	25	\$2,340	15%	36%	4.8	4.8	9.3	0.5	2,939	3,566	2,485	2,614
7062	HVAC Shell	Insulation - Ceiling (R-11 to R-49) - (Elec Furnace / AC)	CARES Program	SF	Retrofit	16,374	19%	3,102	0.71	25	\$2,145	15%	36%	1.3	1.3	3.3	0.4	9,557	11,596	8,079	8,499
7063	HVAC Shell	Insulation - Ceiling (R-19 to R-49) - (Elec Furnace / AC)	CARES Program	SF	Retrofit	14,913	11%	1,641	0.38	25	\$1,794	15%	36%	0.8	0.8	2.4	0.3	13,999	16,986	11,835	12,449
7064	HVAC Shell	Insulation - Floor (R-0 to R-19) - (Elec Furnace / AC)	CARES Program	SF	Retrofit	14,913	5%	773	-0.08	20	\$1,268	1%	36%	0.3	0.3	1.8	0.2	205	0	0	0
7065	HVAC Shell	Insulation - Floor (R-11 to R-30) - (Elec Furnace / AC)	CARES Program	SF	Retrofit	14,490	4%	592	-0.07	20	\$1,268	1%	36%	0.2	0.2	1.6	0.1	404	0	0	0
7066	HVAC Shell	Wall Insulation - (Elec Furnace / AC)	CARES Program	SF	Retrofit	19,682	25%	4,909	0.89	25	\$1,920	15%	82%	2.1	2.1	5.0	0.4	29,069	35,270	3,674	6,914
7067	HVAC Shell	Basement Wall Insulation - (Elec Furnace / AC)	CARES Program	SF	Retrofit	14,913	8%	1,157	-0.17	20	\$1,360	1%	36%	0.4	0.4	2.1	0.2	1,097	0	0	0
7068	HVAC Shell	Energy Star Windows - (Elec Furnace / AC)	No Program	SF	Retrofit	14,913	6%	962	0.31	25	\$5,624	15%	49%	0.2	0.2	1.3	0.1	9,996	0	0	0
7069	HVAC Shell	Air Sealing (Tier 1) - (Elec Furnace / AC)	CARES Program	SF	Retrofit	18,874	14%	2,636	0.24	20	\$605	15%	47%	2.6	2.6	6.8	0.4	14,004	16,991	10,282	10,815
7070	HVAC Shell	Air Sealing (Tier 2) - (Elec Furnace / AC)	CARES Program	SF	Retrofit	15,796	11%	1,759	0.20	20	\$605	15%	47%	1.8	1.8	4.9	0.4	9,347	11,341	6,863	7,219
7071	HVAC Shell	Duct Sealing - (Elec Furnace / AC)	No Program	SF	Retrofit	15,277	10%	1,528	0.30	20	\$330	15%	47%	3.1	3.1	7.2	0.4	12,985	15,755	9,534	10,029
7072	HVAC Shell	Cool Roof - (Elec AC & Gas Heat)	No Program	SF	Retrofit	14,913	4%	606	1.31	20	\$2,935	15%	24%	0.4	0.4	1.3	0.3	8,021	0	0	0
7073	HVAC Shell	Insulation - Ceiling (R-0 to R-38) - (Elec AC & Gas Heat)	Weatherization	MH	Retrofit	3,030	1%	45	0.36	25	\$1,613	28%	36%	1.0	0.5	2.6	0.4	6	8	5	2
7074	HVAC Shell	Energy Star Windows - (Elec AC & Gas Heat)	No Program	MH	Retrofit	3,048	21%	629	0.89	25	\$3,507	28%	49%	0.4	1.5	0.7	0.6	3,934	0	0	0
7075	HVAC Shell	Air Sealing (Tier 1) - (Elec AC & Gas Heat)	Weatherization	MH	Retrofit	3,344	6%	197	0.24	20	\$417	28%	47%	0.9	0.4	2.9	0.3	630	0	0	0
7076	HVAC Shell	Air Sealing (Tier 2) - (Elec AC & Gas Heat)	Weatherization	MH	Retrofit	3,211	6%	200	0.26	20	\$417	28%	47%	0.9	0.4	2.7	0.3	640	0	0	0
7077	HVAC Shell	Duct Sealing - (Elec AC & Gas Heat)	No Program	MH	Retrofit	3,131	10%	313	0.30	20	\$296	28%	47%	0.8	0.5	2.3	0.3	1,602	0	0	0
7078	HVAC Shell	Insulation - Ceiling (R-0 to R-38) - (Elec HP)	Weatherization	MH	Retrofit	9,748	33%	3,182	0.88	25	\$1,613	54%	36%	1.8	3.9	3.6	0.5	11,439	13,879	9,670	4,194
7079	HVAC Shell	Energy Star Windows - (Elec HP)	No Program	MH	Retrofit	6,911	16%	1,080	0.89	25	\$3,507	54%	49%	0.4	1.9	0.7	0.6	13,104	0	0	0
7080	HVAC Shell	Air Sealing (Tier 1) - (Elec HP)	Weatherization	MH	Retrofit	8,039	10%	784	0.18	20	\$417	54%	47%	0.7	0.7	2.4	0.3	4,862	0	0	0
7081	HVAC Shell	Air Sealing (Tier 2) - (Elec HP)	Weatherization	MH	Retrofit	7,481	9%	681	0.19	20	\$417	54%	47%	0.7	0.7	2.2	0.3	4,224	0	0	0
7082	HVAC Shell	Duct Sealing - (Elec HP)	No Program	MH	Retrofit	7,225	10%	723	0.30	20	\$296	54%	47%	0.8	0.8	2.3	0.4	7,166	0	0	0
7083	HVAC Shell	Insulation - Ceiling (R-0 to R-38) - (Elec Furnace / AC)	Weatherization	MH	Retrofit	17,588	34%	6,022	0.43	25	\$1,613	18%	36%	2.8	6.0	6.3	0.4	19,551	23,721	16,528	7,168
7084	HVAC Shell	Energy Star Windows - (Elec Furnace / AC)	No Program	MH	Retrofit	12,319	14%	1,680	0.89	25	\$3,507	18%	49%	0.5	2.5	1.0	0.5	6,646	0	0	0
7085	HVAC Shell	Air Sealing (Tier 1) - (Elec Furnace / AC)	Weatherization	MH	Retrofit	14,818	12%	1,748	0.18	20	\$417	18%	47%	1.4	1.4	4.1	0.3	3,534	4,288	2,595	2,730
7086	HVAC Shell	Air Sealing (Tier 2) - (Elec Furnace / AC)	Weatherization	MH	Retrofit	13,574	11%	1,520	0.20	20	\$417	18%	47%	1.3	1.3	3.7	0.3	3,073	3,728	2,256	2,373
7087	HVAC Shell	Duct Sealing - (Elec Furnace / AC)	No Program	MH	Retrofit	12,786	10%	1,279	0.30	20	\$296	18%	47%	1.2	1.2	3.3	0.4	4,136	5,018	3,037	3,194
7088	HVAC Shell	Insulation - Ceiling (R-0 to R-38) - (Elec AC & Gas Heat)	CARES Program	MH	Retrofit	3,030	1%	45	0.36	25	\$1,613	28%	36%	1.0	0.2	3.1	0.2	4	5	4	4
7089	HVAC Shell	Energy Star Windows - (Elec AC & Gas Heat)	No Program	MH	Retrofit	3,048	21%	629	0.89	25	\$3,507	28%	49%	0.4	0.3	1.5	0.2	2,568	0	0	0
7090	HVAC Shell	Air Sealing (Tier 1) - (Elec AC & Gas Heat)	CARES Program	MH	Retrofit	3,344	6%	197	0.24	20	\$417	28%	47%	1.7	0.7	4.5	0.4	411	499	302	317
7091	HVAC Shell	Air Sealing (Tier 2) - (Elec AC & Gas Heat)	CARES Program	MH	Retrofit	3,211	6%	200	0.26	20	\$417	28%	47%	1.6	0.7	4.1	0.4	418	507	307	323
7092	HVAC Shell	Duct Sealing - (Elec AC & Gas Heat)	No Program	MH	Retrofit	3,131	10%	313	0.30	20	\$296	28%	47%	1.9	1.3	4.3	0.5	1,046	1,269	768	808
7093	HVAC Shell	Insulation - Ceiling (R-0 to R-38) - (Elec HP)	CARES Program	MH	Retrofit	9,748	33%	3,182	0.88	25	\$1,613	54%	36%	1.8	1.8	4.1	0.4	7,468	9,061	6,313	6,641
7094	HVAC Shell	Energy Star Windows - (Elec HP)	No Program	MH	Retrofit	6,911	16%	1,080	0.89	25	\$3,507	54%	49%	0.4	0.4	1.5	0.3	8,556	0	0	0

Appendix A: Residential Measure Detail

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	Base Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	Base Saturation	EE Saturation	TRC	UCT Ratio	PCT Ratio	RIM Test Ratio	TP 15-yr (2036)	EP 15-yr (2036)	MAP 15-yr (2036)	RAP 15-yr (2036)
7095	HVAC Shell	Air Sealing (Tier 1) - (Elec HP)	CARES Program	MH	Retrofit	8,039	10%	784	0.18	20	\$417	54%	47%	1.3	1.3	3.5	0.4	3,174	3,851	2,331	2,452
7096	HVAC Shell	Air Sealing (Tier 2) - (Elec HP)	CARES Program	MH	Retrofit	7,481	9%	681	0.19	20	\$417	54%	47%	1.2	1.2	3.2	0.4	2,758	3,346	2,025	2,130
7097	HVAC Shell	Duct Sealing - (Elec HP)	No Program	MH	Retrofit	7,225	10%	723	0.30	20	\$296	54%	47%	2.0	2.0	4.3	0.5	4,679	5,677	3,435	3,614
7098	HVAC Shell	Insulation - Ceiling (R-0 to R-38) - (Elec Furnace / AC)	CARES Program	MH	Retrofit	17,588	34%	6,022	0.43	25	\$1,613	18%	36%	2.8	2.8	6.9	0.4	12,765	15,488	10,791	11,351
7099	HVAC Shell	Energy Star Windows - (Elec Furnace / AC)	No Program	MH	Retrofit	12,319	14%	1,680	0.89	25	\$3,507	18%	49%	0.5	0.5	1.8	0.3	4,339	5,264	3,120	3,282
7100	HVAC Shell	Air Sealing (Tier 1) - (Elec Furnace / AC)	CARES Program	MH	Retrofit	14,818	12%	1,748	0.18	20	\$417	18%	47%	2.6	2.6	6.6	0.4	2,308	2,800	1,694	1,782
7101	HVAC Shell	Air Sealing (Tier 2) - (Elec Furnace / AC)	CARES Program	MH	Retrofit	13,574	11%	1,520	0.20	20	\$417	18%	47%	2.3	2.3	5.9	0.4	2,006	2,434	1,473	1,549
7102	HVAC Shell	Duct Sealing - (Elec Furnace / AC)	No Program	MH	Retrofit	12,786	10%	1,279	0.30	20	\$296	18%	47%	3.0	3.0	6.8	0.4	2,700	3,276	1,983	2,086
8001	HVAC Equipment	HVAC Tune-Up (Central AC) (from 10seer to 11 seer)	No Program	SF	Retrofit	3,754	5%	188	0.24	3	\$225	38%	35%	0.2	0.2	1.2	0.1	27,003	0	0	0
8002	HVAC Equipment	High Efficiency Central AC - 16 SEER from 14 seer	No Program	SF	MO	2,181	14%	312	0.44	18	\$533	38%	17%	0.8	1.6	1.2	0.6	4,513	0	0	0
8003	HVAC Equipment	High Efficiency Central AC - 17 SEER from 14 seer	No Program	SF	MO	2,181	20%	436	0.42	18	\$829	38%	17%	0.6	1.1	1.2	0.5	6,303	0	0	0
8004	HVAC Equipment	Ductless mini-split AC replacing central AC (gas)	No Program	SF	MO	2,181	34%	736	0.86	18	\$3,913	40%	17%	0.2	0.5	0.7	0.3	11,136	0	0	0
8005	HVAC Equipment	HVAC Tune-Up (Heat Pump) (from 10 seer to 11 seer)	No Program	SF	Retrofit	8,027	5%	401	0.24	3	\$225	47%	35%	0.3	0.3	1.5	0.2	71,496	0	0	0
8006	HVAC Equipment	High Efficiency Heat Pump (HP Upgrade) - 16 SEER/9.0 HSPF from 14 seer	No Program	SF	MO	6,456	9%	597	0.51	18	\$1,097	47%	27%	0.5	1.0	1.2	0.4	40,335	0	0	0
8007	HVAC Equipment	High Efficiency Heat Pump (HP Upgrade) - 17 SEER/9.5 HSPF from 14 seer	No Program	SF	MO	6,456	12%	743	0.63	18	\$1,645	47%	27%	0.4	0.9	1.1	0.4	30,132	0	0	0
8008	HVAC Equipment	Ground Source Heat Pump (HP Upgrade) 18.2 eer from 14 seer ASHP	No Program	SF	MO	6,456	21%	1,331	0.42	25	\$15,868	47%	27%	0.1	0.2	0.6	0.1	6,477	0	0	0
8009	HVAC Equipment	Dual Fuel Heat Pump Upgrade (Replacing New ASHP)	No Program	SF	MO	6,456	36%	2,305	0.51	18	\$1,097	47%	27%	0.7	2.6	1.0	0.4	15,570	0	0	0
8010	HVAC Equipment	Ductless mini-split HP (replacing ASHP)	No Program	SF	MO	6,456	24%	1,545	0.51	18	\$3,125	47%	27%	0.3	0.7	1.1	0.3	20,882	0	0	0
8011	HVAC Equipment	Heat Pump (Replacing Electric Furnace and 14 seer AC) - 16 SEER/9.0 HSPF	Heat Pump Retrofit	SF	MO	14,182	59%	8,323	0.61	18	\$3,470	15%	0%	1.2	8.6	3.1	0.4	178,120	178,536	57,119	24,682
8012	HVAC Equipment	Dual Fuel Heat Pump (Replacing Electric Furnace)	Heat Pump Retrofit	SF	MO	14,913	72%	10,761	1.57	18	\$4,197	15%	0%	1.2	12.1	2.1	0.4	49,349	49,464	15,825	6,641
8013	HVAC Equipment	Ductless mini-split HP (replacing electric furnace)	Heat Pump Retrofit	SF	MO	14,913	67%	10,002	1.45	18	\$4,768	15%	0%	1.2	7.6	2.8	0.4	45,868	45,975	14,709	6,455
8014	HVAC Equipment	Heat Pump (Replacing Electric Furnace and 14 seer AC) - 16 SEER/9.0 HSPF	CARES Program	SF	MO	14,182	59%	8,323	0.61	18	\$3,470	15%	0%	1.2	8.6	3.1	0.4	116,293	116,565	37,293	16,115
8015	HVAC Equipment	Dual Fuel Heat Pump (Replacing Electric Furnace)	CARES Program	SF	MO	14,913	72%	10,761	1.57	18	\$4,197	15%	0%	1.2	12.1	2.1	0.4	32,220	32,295	10,332	4,336
8016	HVAC Equipment	Ductless mini-split HP (replacing electric furnace)	CARES Program	SF	MO	14,913	67%	10,002	1.45	18	\$4,768	15%	0%	1.2	11.3	2.7	0.4	29,947	30,017	9,603	3,963
8017	HVAC Equipment	Efficient Room A/C (11 EER to 11.5 EER)	No Program	SF	MO	490	10%	18	0.07	12	\$40	17%	51%	0.6	1.2	0.9	0.7	467	0	0	0
8018	HVAC Equipment	Ductless mini-split AC seer 16 (from 11seer RAC)	No Program	SF	MO	490	22%	108	0.24	18	\$3,307	17%	51%	0.0	0.1	0.5	0.1	2,384	0	0	0
8019	HVAC Equipment	Room Air Conditioner Recycling	No Program	SF	Recycle	113	100%	113	0.11	4	\$49	13%	0%	0.4	0.4	1.8	0.3	1,582	0	0	0
8020	HVAC Equipment	Programmable Thermostat - Gas/AC	No Program	SF	Retrofit	4,206	4%	151	0.00	15	\$35	40%	39%	3.5	3.0	10.7	0.3	9,285	9,285	5,552	2,132
8021	HVAC Equipment	Programmable Thermostat - ASHP	No Program	SF	Retrofit	8,027	4%	289	0.00	15	\$35	47%	39%	3.0	6.0	9.4	0.3	20,942	20,942	12,523	4,809
8022	HVAC Equipment	Programmable Thermostat - Elec Furnace/AC	No Program	SF	Retrofit	14,913	4%	537	0.00	15	\$35	15%	58%	5.6	11.2	16.9	0.3	9,992	9,992	4,787	750
8023	HVAC Equipment	Smart Thermostat - Gas Heat / AC	No Program	SF	Retrofit	4,206	8%	353	0.00	11	\$175	40%	39%	1.4	1.1	4.6	0.3	6,431	6,431	6,454	2,562
8024	HVAC Equipment	Smart Thermostat - ASHP	No Program	SF	Retrofit	8,027	10%	803	0.00	11	\$175	47%	39%	1.3	2.6	4.3	0.3	17,268	17,268	17,329	6,878
8025	HVAC Equipment	Smart Thermostat - Elec Furnace/AC	No Program	SF	Retrofit	14,913	10%	1,491	0.00	11	\$175	15%	58%	2.4	4.8	7.6	0.3	6,804	6,804	7,202	6,250
8026	HVAC Equipment	ECM Furnace Fan	No Program	SF	Retrofit	5,305	13%	693	0.19	6	\$322	80%	24%	0.5	1.0	1.5	0.3	9,234	0	0	0
8027	HVAC Equipment	HVAC Tune-Up (Central AC) (from 10seer to 11 seer)	No Program	MH	Retrofit	2,697	5%	135	0.17	3	\$225	38%	35%	0.1	0.1	1.2	0.1	4,044	0	0	0
8028	HVAC Equipment	High Efficiency Central AC - 16 SEER from 14 seer	No Program	MH	MO	1,958	12%	227	0.28	18	\$533	38%	17%	0.5	1.0	1.0	0.5	683	0	0	0
8029	HVAC Equipment	High Efficiency Central AC - 17 SEER from 14 seer	No Program	MH	MO	1,958	18%	361	0.48	18	\$829	38%	17%	0.6	1.1	1.0	0.5	1,088	0	0	0
8030	HVAC Equipment	Ductless mini-split AC replacing central AC (gas)	No Program	MH	MO	2,303	40%	911	0.65	18	\$3,913	40%	17%	0.2	0.4	0.8	0.3	2,872	0	0	0
8031	HVAC Equipment	HVAC Tune-Up (Heat Pump) (from 10 seer to 11 seer)	No Program	MH	Retrofit	6,911	5%	346	0.17	3	\$225	47%	35%	0.2	0.2	1.4	0.2	12,831	0	0	0
8032	HVAC Equipment	High Efficiency Heat Pump (HP Upgrade) - 16 SEER/9.0 HSPF from 14 seer	No Program	MH	MO	5,541	9%	510	0.44	18	\$1,097	47%	27%	0.5	0.9	1.1	0.4	7,182	0	0	0
8033	HVAC Equipment	High Efficiency Heat Pump (HP Upgrade) - 17 SEER/9.5 HSPF from 14 seer	No Program	MH	MO	5,541	12%	639	0.55	18	\$1,645	47%	27%	0.4	0.7	1.0	0.4	5,399	0	0	0
8034	HVAC Equipment	Dual Fuel Heat Pump Upgrade (Replacing New ASHP)	No Program	MH	MO	5,541	26%	1,433	0.34	18	\$1,097	47%	27%	0.5	1.6	0.8	0.4	4,035	0	0	0
8035	HVAC Equipment	Ductless mini-split HP (replacing ASHP)	No Program	MH	MO	5,541	21%	1,151	0.44	18	\$3,125	47%	27%	0.3	0.5	1.0	0.3	3,243	0	0	0
8036	HVAC Equipment	Heat Pump (Replacing Electric Furnace and 14 seer AC) - 16 SEER/9.0 HSPF	Heat Pump Retrofit	MH	MO	11,457	56%	6,426	0.48	18	\$3,470	15%	0%	1.0	6.7	2.4	0.4	28,664	0	0	0
8037	HVAC Equipment	Dual Fuel Heat Pump (Replacing Electric Furnace)	Heat Pump Retrofit	MH	MO	12,319	67%	8,210	1.32	18	\$4,197	15%	0%	1.0	9.4	1.8	0.4	7,847	0	0	0
8038	HVAC Equipment	Ductless mini-split HP (replacing electric furnace)	Heat Pump Retrofit	MH	MO	12,319	64%	7,929	1.32	18	\$4,768	15%	0%	1.0	6.1	2.2	0.4	7,579	0	0	0
8039	HVAC Equipment	Heat Pump (Replacing Electric Furnace and 14 seer AC) - 16 SEER/9.0 HSPF	CARES Program	MH	MO	11,457	56%	6,426	0.48	18	\$3,470	15%	0%	1.0	6.7	2.4	0.4	18,715	18,759	6,001	2,593
8040	HVAC Equipment	Dual Fuel Heat Pump (Replacing Electric Furnace)	CARES Program	MH	MO	12,319	67%	8,210	1.32	18	\$4,197	15%	0%	1.0	9.4	1.8	0.4	5,124	5,135	1,643	689
8041	HVAC Equipment	Ductless mini-split HP (replacing electric furnace)	CARES Program	MH	MO	12,319	64%	7,929	1.32	18	\$4,768	15%	0%	1.0	9.2	2.2	0.4	4,948	4,960	1,587	655
8042	HVAC Equipment	Efficient Room A/C (11 EER to 11.5 EER)	No Program	MH	MO	490	10%	18	0.07	12	\$40	17%	51%	0.6	1.2	0.9	0.7	97	0	0	0
8043	HVAC Equipment	Ductless mini-split AC seer 16 (from 11seer RAC)	No Program	MH	MO	490	22%	108	0.24	18	\$2,480	17%	51%	0.1	0.1	0.6	0.1	497	0	0	0
8044	HVAC Equipment	Room Air Conditioner Recycling	No Program	MH	Recycle	113	100%	113	0.11	4	\$49	13%	0%	0.4	0.4	1.8	0.3	330	0	0	0
8045	HVAC Equipment	Programmable Thermostat - Gas/AC	No Program	MH	Retrofit	3,048	4%	110	0.00	15	\$35	40%	39%	2.6	2.2	8.2	0.3	1,402	2,805	1,677	644

Appendix A: Residential Measure Detail

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	Base Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EU/L	Measure Cost	Base Saturation	EE Saturation	TRC	UCT Ratio	PCT Ratio	RIM Test Ratio	TP 15-yr (2036)	EP 15-yr (2036)	MAP 15-yr (2036)	RAP 15-yr (2036)
8046	HVAC Equipment	Programmable Thermostat - ASHP	No Program	MH	Retrofit	6,911	4%	249	0.00	15	\$35	47%	39%	2.6	5.2	8.1	0.3	3,758	3,758	2,247	863
8047	HVAC Equipment	Programmable Thermostat - Elec Furnace/AC	No Program	MH	Retrofit	12,319	4%	443	0.00	15	\$35	15%	58%	4.6	9.2	14.1	0.3	1,720	1,720	824	129
8048	HVAC Equipment	Smart Thermostat - Gas Heat / AC	No Program	MH	Retrofit	3,048	8%	256	0.00	11	\$175	40%	39%	0.7	2.7	0.2	971	0	0	0	
8049	HVAC Equipment	Smart Thermostat - ASHP	No Program	MH	Retrofit	6,911	10%	691	0.00	11	\$175	47%	39%	1.1	2.2	3.8	0.3	3,099	3,099	3,110	1,234
8050	HVAC Equipment	Smart Thermostat - Elec Furnace/AC	No Program	MH	Retrofit	12,319	10%	1,232	0.00	11	\$175	15%	58%	2.0	3.9	6.3	0.3	1,172	1,172	1,240	1,076
8051	HVAC Equipment	ECM Furnace Fan	No Program	MH	Retrofit	5,305	13%	693	0.19	6	\$322	80%	24%	0.5	1.0	1.5	0.3	1,925	0	0	0
8052	HVAC Equipment	High Efficiency Central AC - 16 SEER from 14 seer	No Program	SF	NC	2,226	11%	243	0.25	18	\$533	38%	0%	0.5	1.0	1.1	0.5	520	0	0	0
8053	HVAC Equipment	High Efficiency Central AC - 17 SEER from 14 seer	No Program	SF	NC	2,226	18%	390	0.41	18	\$829	38%	0%	0.5	1.1	1.1	0.5	836	0	0	0
8054	HVAC Equipment	Ductless mini-split AC replacing central AC (gas)	No Program	SF	NC	2,534	40%	1,004	0.69	18	\$3,913	40%	0%	0.2	0.5	0.8	0.3	2,255	0	0	0
8055	HVAC Equipment	High Efficiency Heat Pump (HP Upgrade) - 16 SEER/9.0 HSPF from 14 seer	No Program	SF	NC	5,234	6%	307	0.29	18	\$1,097	47%	0%	0.3	0.6	0.8	0.3	3,260	0	0	0
8056	HVAC Equipment	High Efficiency Heat Pump (HP Upgrade) - 17 SEER/9.5 HSPF from 14 seer	No Program	SF	NC	5,234	9%	449	0.40	18	\$1,645	47%	0%	0.3	0.5	0.8	0.3	2,863	0	0	0
8057	HVAC Equipment	Ground Source Heat Pump (HP Upgrade) 18.2 eer from 14 seer ASHP	No Program	SF	NC	5,234	21%	1,121	0.35	25	\$15,868	47%	0%	0.1	0.1	0.6	0.1	1,190	0	0	0
8058	HVAC Equipment	Dual Fuel Heat Pump Upgrade (Replacing New ASHP)	No Program	SF	NC	5,234	32%	1,684	0.29	18	\$1,097	47%	0%	0.6	1.8	1.0	0.4	1,787	0	0	0
8059	HVAC Equipment	Ductless mini-split HP (replacing ASHP)	No Program	SF	NC	5,234	23%	1,221	0.40	18	\$3,125	47%	0%	0.3	0.5	1.0	0.3	2,591	0	0	0
8060	HVAC Equipment	Efficient Room A/C (11 EER to 11.5 EER)	No Program	SF	NC	490	10%	18	0.07	12	\$40	17%	0%	0.6	1.2	0.9	0.7	71	0	0	0
8061	HVAC Equipment	Ductless mini-split AC seer 16 (from 11eer RAC)	No Program	SF	NC	490	22%	108	0.24	18	\$3,307	17%	0%	0.0	0.1	0.5	0.1	434	0	0	0
8062	HVAC Equipment	Programmable Thermostat - Gas/AC	No Program	SF	NC	2,534	4%	91	0.00	15	\$35	40%	0%	2.2	1.8	7.1	0.3	850	1,701	1,167	838
8063	HVAC Equipment	Programmable Thermostat - ASHP	No Program	SF	NC	5,234	4%	188	0.00	15	\$35	47%	0%	2.0	3.9	6.3	0.3	2,075	4,151	2,848	2,046
8064	HVAC Equipment	Smart Thermostat - Gas Heat / AC	No Program	SF	NC	2,534	8%	213	0.00	11	\$175	40%	0%	0.6	0.7	2.4	0.2	1,984	0	0	0
8065	HVAC Equipment	Smart Thermostat - ASHP	No Program	SF	NC	5,234	10%	523	0.00	11	\$175	47%	0%	0.8	1.7	3.0	0.3	5,765	0	0	0
8066	HVAC Equipment	ECM Furnace Fan	No Program	SF	NC	4,867	9%	462	0.13	6	\$322	91%	0%	0.3	0.6	1.2	0.3	951	0	0	0
8067	HVAC Equipment	High Efficiency Central AC - 16 SEER from 14 seer	No Program	MH	NC	1,791	13%	225	0.26	18	\$533	38%	0%	0.5	1.0	1.0	0.5	101	0	0	0
8068	HVAC Equipment	High Efficiency Central AC - 17 SEER from 14 seer	No Program	MH	NC	1,791	19%	348	0.41	18	\$829	38%	0%	0.5	1.0	1.0	0.5	155	0	0	0
8069	HVAC Equipment	Ductless mini-split AC replacing central AC (gas)	No Program	MH	NC	1,791	29%	522	0.56	18	\$3,913	40%	0%	0.1	0.3	0.7	0.2	244	0	0	0
8070	HVAC Equipment	High Efficiency Heat Pump (HP Upgrade) - 16 SEER/9.0 HSPF from 14 seer	No Program	MH	NC	4,971	8%	422	0.37	18	\$1,097	47%	0%	0.4	0.7	1.0	0.4	935	0	0	0
8071	HVAC Equipment	High Efficiency Heat Pump (HP Upgrade) - 17 SEER/9.5 HSPF from 14 seer	No Program	MH	NC	4,971	11%	537	0.47	18	\$1,645	47%	0%	0.3	0.6	0.9	0.3	713	0	0	0
8072	HVAC Equipment	Dual Fuel Heat Pump Upgrade (Replacing New ASHP)	No Program	MH	NC	4,971	34%	1,696	0.37	18	\$1,097	47%	0%	0.6	1.9	1.0	0.4	750	0	0	0
8073	HVAC Equipment	Ductless mini-split HP (replacing ASHP)	No Program	MH	NC	4,971	21%	1,023	0.36	18	\$3,125	47%	0%	0.2	0.4	0.9	0.2	453	0	0	0
8074	HVAC Equipment	Efficient Room A/C (11 EER to 11.5 EER)	No Program	MH	NC	490	10%	18	0.07	12	\$40	17%	0%	0.6	1.2	0.9	0.7	15	0	0	0
8075	HVAC Equipment	Ductless mini-split AC seer 16 (from 11eer RAC)	No Program	MH	NC	490	22%	108	0.24	18	\$2,480	17%	0%	0.1	0.1	0.6	0.1	90	0	0	0
8076	HVAC Equipment	Programmable Thermostat - Gas/AC	No Program	MH	NC	2,094	4%	75	0.00	15	\$35	40%	0%	2.1	1.5	6.5	0.3	146	293	201	144
8077	HVAC Equipment	Programmable Thermostat - ASHP	No Program	MH	NC	2,094	4%	75	0.00	15	\$35	47%	0%	0.8	1.6	2.8	0.3	173	0	0	0
8078	HVAC Equipment	Smart Thermostat - Gas Heat / AC	No Program	MH	NC	2,094	8%	176	0.00	11	\$175	40%	0%	0.6	0.5	2.2	0.2	342	0	0	0
8079	HVAC Equipment	Smart Thermostat - ASHP	No Program	MH	NC	4,971	10%	497	0.00	11	\$175	47%	0%	0.8	1.6	2.9	0.3	1,141	0	0	0
8080	HVAC Equipment	ECM Furnace Fan	No Program	MH	NC	4,867	9%	462	0.13	6	\$322	91%	0%	0.3	0.6	1.2	0.3	198	0	0	0
9001	Lighting	Standard LED (Replacing EISA Bulb)	Residential Lighting	SF	MO	36	85%	31	0.04	15	\$2	1701%	50%	5.7	19.1	5.7	0.5	81,745	82,123	65,460	50,842
9002	Lighting	Specialty LED (Replacing Specialty Incandescent)	Residential Lighting	SF	MO	67	89%	60	0.06	15	\$4	456%	50%	4.1	34.0	4.4	0.5	42,413	42,610	33,964	22,430
9003	Lighting	Standard LED (Replacing CFL)	Residential Lighting	SF	MO	7	85%	6	0.01	15	\$1	1134%	50%	3.7	3.9	4.8	0.5	11,079	11,130	8,872	8,813
9004	Lighting	Specialty LED (Replacing Specialty CFL)	Residential Lighting	SF	MO	9	89%	8	0.01	15	\$2	304%	50%	2.3	4.7	3.3	0.4	3,918	3,936	3,138	2,487
9005	Lighting	Reflector LED (Replacing EISA Bulb)	Residential Lighting	SF	MO	73	87%	63	0.06	15	\$7	489%	50%	3.7	36.0	4.1	0.5	48,208	48,431	38,604	23,985
9006	Lighting	Reflector LED (Replacing CFL Bulb)	Residential Lighting	SF	MO	8	87%	7	0.01	15	\$3	326%	50%	1.8	4.1	2.6	0.4	3,634	3,651	2,910	2,061
9007	Lighting	Linear LED	No Program	SF	Retrofit	70	29%	22	0.03	18	\$10	405%	0%	1.4	2.9	3.2	0.4	36,575	36,745	28,227	20,957
9008	Lighting	Residential Occupancy Sensors	No Program	SF	Retrofit	136	30%	41	0.07	10	\$40	16%	13%	0.4	0.9	1.3	0.3	1,189	0	0	0
9009	Lighting	LED Nightlights	No Program	SF	Retrofit	32	93%	30	0.00	8	\$3	100%	50%	2.0	3.9	6.1	0.3	7,439	7,473	4,076	2,413
9010	Lighting	Standard LED (Replacing EISA Bulb)	Residential Lighting	SF	NC	36	85%	31	0.04	15	\$2	1701%	50%	5.7	19.1	5.7	0.5	6,156	6,184	4,928	3,828
9011	Lighting	Specialty LED (Replacing Specialty Incandescent)	Residential Lighting	SF	NC	67	89%	60	0.06	15	\$4	456%	50%	4.1	34.0	4.4	0.5	3,194	3,209	2,557	1,689
9012	Lighting	Standard LED (Replacing CFL)	Residential Lighting	SF	NC	7	85%	6	0.01	15	\$1	1134%	50%	3.7	3.9	4.8	0.5	834	838	668	663
9013	Lighting	Specialty LED (Replacing Specialty CFL)	Residential Lighting	SF	NC	9	89%	8	0.01	15	\$2	304%	50%	2.3	4.7	3.3	0.4	295	296	236	187
9014	Lighting	Reflector LED (Replacing EISA Bulb)	Residential Lighting	SF	NC	73	87%	63	0.06	15	\$7	489%	50%	3.7	36.0	4.1	0.5	3,630	3,647	2,906	1,806
9015	Lighting	Reflector LED (Replacing CFL Bulb)	Residential Lighting	SF	NC	8	87%	7	0.01	15	\$3	326%	50%	1.8	4.1	2.6	0.4	274	275	219	155
9016	Lighting	Residential Occupancy Sensors	No Program	SF	NC	136	30%	41	0.07	10	\$40	16%	0%	0.4	0.9	1.3	0.3	312	0	0	0
9017	Lighting	Standard LED (Replacing EISA Bulb)	Residential Lighting	MF	MO	36	85%	31	0.04	15	\$2	714%	50%	5.7	19.1	5.7	0.5	1,107	1,112	886	688
9018	Lighting	Specialty LED (Replacing Specialty Incandescent)	Residential Lighting	MF	MO	67	89%	60	0.06	15	\$4	192%	50%	4.1	34.0	4.4	0.5	576	579	461	305
9019	Lighting	Standard LED (Replacing CFL)	Residential Lighting	MF	MO	7	85%	6	0.01	15	\$1	476%	50%	3.7	3.9	4.8	0.5	150	151	120	119
9020	Lighting	Specialty LED (Replacing Specialty CFL)	Residential Lighting	MF	MO	9	89%	8	0.01	15	\$2	128%	50%	2.3	4.7	3.3	0.4	53	53	43	34
9021	Lighting	Reflector LED (Replacing EISA Bulb)	Residential Lighting	MF	MO	73	87%	63	0.06	15	\$7	205%	50%	3.7	36.0	4.1	0.5	652	655	522	324

Appendix A: Residential Measure Detail

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	Base Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EU/L	Measure Cost	Base Saturation	EE Saturation	TRC Ratio	UCT Ratio	PCT Ratio	RIM Test Ratio	TP 15-yr (2036)	EP 15-yr (2036)	MAP 15-yr (2036)	RAP 15-yr (2036)
9022	Lighting	Reflector LED (Replacing CFL Bulb)	Residential Lighting	MF	MO	8	87%	7	0.01	15	\$3	137%	50%	1.8	4.1	2.6	0.4	49	49	39	28
9023	Lighting	Linear LED	No Program	MF	Retrofit	70	29%	22	0.03	18	\$10	170%	0%	1.4	2.9	3.2	0.4	496	498	382	284
9024	Lighting	Residential Occupancy Sensors	No Program	MF	Retrofit	136	30%	41	0.07	10	\$40	7%	13%	0.4	0.9	1.3	0.3	16	0	0	0
9025	Lighting	LED Nightlights	No Program	MF	Retrofit	32	93%	30	0.00	8	\$3	100%	50%	2.0	3.9	6.1	0.3	240	241	131	78
9026	Lighting	Standard LED (Replacing EISA Bulb)	Residential Lighting	MF	NC	36	85%	31	0.04	15	\$2	714%	50%	5.7	19.1	5.7	0.5	83	84	67	52
9027	Lighting	Specialty LED (Replacing Specialty Incandescent)	Residential Lighting	MF	NC	67	89%	60	0.06	15	\$4	192%	50%	4.1	34.0	4.4	0.5	43	44	35	23
9028	Lighting	Standard LED (Replacing CFL)	Residential Lighting	MF	NC	7	85%	6	0.01	15	\$1	476%	50%	3.7	3.9	4.8	0.5	11	11	9	9
9029	Lighting	Specialty LED (Replacing Specialty CFL)	Residential Lighting	MF	NC	9	89%	8	0.01	15	\$2	128%	50%	2.3	4.7	3.3	0.4	4	4	3	3
9030	Lighting	Reflector LED (Replacing EISA Bulb)	Residential Lighting	MF	NC	73	87%	63	0.06	15	\$7	205%	50%	3.7	36.0	4.1	0.5	49	49	39	24
9031	Lighting	Reflector LED (Replacing CFL Bulb)	Residential Lighting	MF	NC	8	87%	7	0.01	15	\$3	137%	50%	1.8	4.1	2.6	0.4	4	4	3	2
9032	Lighting	Residential Occupancy Sensors	No Program	MF	NC	136	30%	41	0.07	10	\$40	7%	0%	0.4	0.9	1.3	0.3	4	0	0	0
10001	New Construction	New Construction - 15% more efficient (w/AC only)	TSE New Home	SF	NC	12,068	15%	1,810	0.37	20	\$990	24%	0%	1.4	1.5	3.9	0.4	10,054	10,054	3,122	2,532
10002	New Construction	New Construction - 15% more efficient (w/Elec. HP)	TSE New Home	SF	NC	14,766	15%	2,215	0.32	20	\$761	76%	0%	1.8	1.8	4.9	0.4	39,825	39,825	12,368	12,214
10003	New Construction	New Construction - 30% more efficient (w/AC only)	TSE New Home	SF	NC	12,068	30%	3,620	0.73	20	\$1,980	24%	0%	1.4	3.0	3.5	0.4	20,107	20,107	6,244	3,789
10004	New Construction	New Construction - 30% more efficient (w/Elec. HP)	TSE New Home	SF	NC	14,766	30%	4,430	0.64	20	\$1,522	76%	0%	1.8	3.6	4.4	0.4	79,650	79,650	24,735	16,743
10005	New Construction	New Construction - 15% more efficient (w/AC only)	ES Manufactured Home	MH	NC	9,871	15%	1,481	0.33	20	\$990	24%	0%	1.0	0.8	3.3	0.3	1,714	1,714	532	532
10006	New Construction	New Construction - 15% more efficient (w/Elec. HP)	ES Manufactured Home	MH	NC	12,747	15%	1,912	0.31	20	\$761	76%	0%	1.0	1.0	3.2	0.3	7,166	7,166	2,225	2,225
10007	New Construction	New Construction - 30% more efficient (w/AC only)	ES Manufactured Home	MH	NC	9,871	30%	2,961	0.66	20	\$1,980	24%	0%	1.2	1.6	3.3	0.4	3,428	3,428	1,065	766
10008	New Construction	New Construction - 30% more efficient (w/Elec. HP)	ES Manufactured Home	MH	NC	12,747	30%	3,824	0.61	20	\$1,522	76%	0%	1.5	2.0	4.1	0.4	14,332	14,332	4,451	3,603
11002	Pool/Spa	Variable Speed Pool Pumps	No Program	SF	MO	1,167	26%	308	0.26	7	\$314	9%	21%	0.5	1.1	1.0	0.5	9,790	0	0	0
11005	Pool/Spa	Variable Speed Pool Pumps	No Program	MH	NC	1,167	26%	308	0.26	7	\$314	0%	0%	0.5	1.1	1.0	0.5	0	0	0	0
11008	Pool/Spa	Variable Speed Pool Pumps	No Program	SF	MO	1,167	26%	308	0.26	7	\$314	9%	21%	0.5	1.1	1.0	0.5	9,790	0	0	0
11011	Pool/Spa	Variable Speed Pool Pumps	No Program	MH	NC	1,167	26%	308	0.26	7	\$314	0%	0%	0.5	1.1	1.0	0.5	0	0	0	0
12001	Water Heating	Low Flow Faucet Aerators	No Program	SF	Retrofit	3,460	1%	88	1.34	10	\$3	259%	77%	23.2	15.0	31.5	0.6	34,915	34,915	19,451	19,451
12002	Water Heating	Low Flow Showerhead	No Program	SF	Retrofit	3,460	5%	168	0.07	10	\$12	151%	72%	10.9	3.8	18.9	0.3	35,711	35,711	17,475	17,475
12003	Water Heating	Thermostatic Restriction Valve	No Program	SF	Retrofit	3,460	2%	72	0.21	10	\$50	150%	4%	1.4	0.5	3.0	0.2	37,496	37,496	28,089	28,089
12004	Water Heating	Water Heater Blanket	No Program	SF	Retrofit	3,460	2%	175	0.02	5	\$35	86%	9%	0.9	0.9	3.0	0.3	1,419	0	0	0
12005	Water Heating	Water Heater Pipe Wrap	No Program	SF	Retrofit	3,460	4%	258	0.03	15	\$18	86%	24%	7.3	7.3	16.4	0.4	77,928	77,928	53,476	53,476
12006	Water Heating	Heat Pump Water Heater (resistance heat)	No Program	SF	MO	3,460	14%	499	0.20	15	\$1,030	13%	14%	0.2	0.4	1.0	0.2	3,453	0	0	0
12007	Water Heating	Heat Pump Water Heater (ASHP heat)	No Program	SF	MO	3,460	37%	1,297	0.51	15	\$1,030	39%	14%	0.5	1.1	1.8	0.3	27,523	0	0	0
12008	Water Heating	Heat Pump Water Heater (non-electric heat)	No Program	SF	MO	3,460	60%	2,076	0.82	15	\$1,030	34%	14%	0.8	1.7	2.6	0.3	38,303	0	0	0
12009	Water Heating	CO2 Heat Pump Water Heater	No Program	SF	MO	3,460	66%	2,284	0.90	10	\$3,800	86%	14%	0.2	0.4	1.0	0.2	35,465	0	0	0
12010	Water Heating	Solar Water Heating	No Program	SF	MO	3,460	60%	2,059	0.42	20	\$4,950	86%	14%	0.2	0.4	1.0	0.2	31,977	0	0	0
12011	Water Heating	Drain Water Heat Recovery	No Program	SF	Retrofit	3,460	6%	458	1.80	30	\$742	86%	0%	0.6	1.3	1.6	0.4	32,987	0	0	0
12012	Water Heating	Low Flow Faucet Aerators	No Program	MH	Retrofit	3,460	1%	88	0.01	10	\$3	173%	77%	15.9	7.7	31.5	0.3	4,852	4,852	2,703	2,703
12013	Water Heating	Low Flow Showerhead	No Program	MH	Retrofit	3,460	5%	168	0.07	10	\$12	86%	72%	10.9	3.8	18.9	0.3	4,253	4,253	2,081	2,081
12014	Water Heating	Thermostatic Restriction Valve	No Program	MH	Retrofit	3,460	2%	72	0.21	10	\$50	86%	4%	1.4	0.5	3.0	0.2	4,497	4,497	3,369	3,369
12015	Water Heating	Water Heater Blanket	No Program	MH	Retrofit	3,460	2%	175	0.02	5	\$35	86%	9%	0.9	0.9	3.0	0.3	296	0	0	0
12016	Water Heating	Water Heater Pipe Wrap	No Program	MH	Retrofit	3,460	4%	258	0.03	15	\$18	86%	24%	7.3	7.3	16.4	0.4	16,243	16,243	11,146	11,146
12017	Water Heating	Heat Pump Water Heater (resistance heat)	No Program	MH	MO	3,460	14%	499	0.20	15	\$1,030	15%	14%	0.2	0.4	1.0	0.2	858	0	0	0
12018	Water Heating	Heat Pump Water Heater (ASHP heat)	No Program	MH	MO	3,460	37%	1,297	0.51	15	\$1,030	47%	14%	0.5	1.1	1.8	0.3	6,839	0	0	0
12019	Water Heating	Heat Pump Water Heater (non-electric heat)	No Program	MH	MO	3,460	60%	2,076	0.82	15	\$1,030	24%	14%	0.8	1.7	2.6	0.3	5,645	0	0	0
12020	Water Heating	CO2 Heat Pump Water Heater	No Program	MH	MO	3,460	66%	2,284	0.90	10	\$3,800	86%	14%	0.2	0.4	1.0	0.2	7,392	0	0	0
12021	Water Heating	Solar Water Heating	No Program	MH	MO	3,460	60%	2,059	0.42	20	\$4,950	86%	14%	0.2	0.4	1.0	0.2	6,665	0	0	0
12022	Water Heating	Drain Water Heat Recovery	No Program	MH	Retrofit	3,460	6%	458	1.80	30	\$742	86%	0%	0.6	1.3	1.6	0.4	6,876	0	0	0
12023	Water Heating	Low Flow Faucet Aerators	No Program	SF	NC	3,460	1%	88	0.01	10	\$3	257%	0%	15.9	7.7	31.5	0.3	10,637	10,637	8,414	8,414
12024	Water Heating	Low Flow Showerhead	No Program	SF	NC	3,460	5%	168	0.07	10	\$12	151%	0%	10.9	3.8	18.9	0.3	11,983	11,983	9,365	9,365
12025	Water Heating	Thermostatic Restriction Valve	No Program	SF	NC	3,460	2%	72	0.21	10	\$50	150%	0%	1.4	0.5	3.0	0.2	5,089	5,089	1,853	1,853
12026	Water Heating	Water Heater Blanket	No Program	SF	NC	3,460	2%	175	0.02	5	\$35	86%	0%	0.9	0.9	3.0	0.3	1,767	0	0	0
12027	Water Heating	Water Heater Pipe Wrap	No Program	SF	NC	3,460	4%	258	0.03	15	\$18	86%	0%	7.3	7.3	16.4	0.4	10,419	10,419	6,513	6,513
12028	Water Heating	Heat Pump Water Heater (resistance heat)	No Program	SF	NC	3,460	14%	499	0.20	15	\$1,030	13%	0%	0.2	0.4	1.0	0.2	417	0	0	0
12029	Water Heating	Heat Pump Water Heater (ASHP heat)	No Program	SF	NC	3,460	37%	1,297	0.51	15	\$1,030	39%	0%	0.5	1.1	1.8	0.3	3,320	0	0	0
12030	Water Heating	Heat Pump Water Heater (non-electric heat)	No Program	SF	NC	3,460	60%	2,076	0.82	15	\$1,030	34%	0%	0.8	1.7	2.6	0.3	4,620	0	0	0
12031	Water Heating	CO2 Heat Pump Water Heater	No Program	SF	NC	3,460	66%	2,284	0.90	10	\$3,800	86%	0%	0.2	0.4	1.0	0.2	4,278	0	0	0
12032	Water Heating	Solar Water Heating	No Program	SF	NC	3,460	60%	2,059	0.42	20	\$4,950	86%	0%	0.2	0.4	1.0	0.2	3,857	0	0	0
12033	Water Heating	Drain Water Heat Recovery	No Program	SF	NC	3,460	6%	458	1.80	30	\$742	86%	0%	0.6	1.3	1.6	0.4	3,700	0	0	0

Appendix A: Residential Measure Detail

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	Base Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	Base Saturation	EE Saturation	TRC Ratio	UCT Ratio	PCT Ratio	RIM Test Ratio	TP 15-yr (2036)	EP 15-yr (2036)	MAP 15-yr (2036)	RAP 15-yr (2036)
12034	Water Heating	Low Flow Faucet Aerators	No Program	MH	NC	3,460	1%	88	0.01	10	\$3	257%	0%	15.9	7.7	31.5	0.3	2,217	2,217	1,754	1,754
12035	Water Heating	Low Flow Showerhead	No Program	MH	NC	3,460	5%	168	0.07	10	\$12	86%	0%	10.9	3.8	18.9	0.3	1,417	1,417	1,108	1,108
12036	Water Heating	Thermostatic Restriction Valve	No Program	MH	NC	3,460	2%	72	0.21	10	\$50	86%	0%	1.4	0.5	3.0	0.2	606	606	221	221
12037	Water Heating	Water Heater Blanket	No Program	MH	NC	3,460	2%	175	0.02	5	\$35	86%	0%	0.9	0.9	3.0	0.3	368	0	0	0
12038	Water Heating	Water Heater Pipe Wrap	No Program	MH	NC	3,460	4%	258	0.03	15	\$18	86%	0%	7.3	7.3	16.4	0.4	2,172	2,172	1,358	1,358
12039	Water Heating	Heat Pump Water Heater (resistance heat)	No Program	MH	NC	3,460	14%	499	0.20	15	\$1,030	15%	0%	0.2	0.4	1.0	0.2	104	0	0	0
12040	Water Heating	Heat Pump Water Heater (ASHP heat)	No Program	MH	NC	3,460	37%	1,297	0.51	15	\$1,030	47%	0%	0.5	1.1	1.8	0.3	831	0	0	0
12041	Water Heating	Heat Pump Water Heater (non-electric heat)	No Program	MH	NC	3,460	60%	2,076	0.82	15	\$1,030	24%	0%	0.8	1.7	2.6	0.3	686	0	0	0
12042	Water Heating	CO2 Heat Pump Water Heater	No Program	MH	NC	3,460	66%	2,284	0.90	10	\$3,800	86%	0%	0.2	0.4	1.0	0.2	892	0	0	0
12043	Water Heating	Solar Water Heating	No Program	MH	NC	3,460	60%	2,059	0.42	20	\$4,950	86%	0%	0.2	0.4	1.0	0.2	804	0	0	0
12044	Water Heating	Drain Water Heat Recovery	No Program	MH	NC	3,460	6%	458	1.80	30	\$742	86%	0%	0.6	1.3	1.6	0.4	771	0	0	0

## APPENDIX B: COMMERCIAL AND INDUSTRIAL MEASURE DETAIL

Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	RAP Incentive (%)	MAP Adoption Rate	RAP Adoption Rate	Measure Level BC Tests			Cumulative Annual Potential			
														TRC	UCT	RIM	15 YR Technical	15 YR Economic	15 YR MAP	15 YR RAP
1	Compressed Air	Efficient Air Compressors	Biz-Custom	Education	ROB	31%	1,223	0.21	15	\$100	50%	66.3%	56.3%	11.6	23.2	0.8	0	0	0	0
2	Compressed Air	Retro-commissioning_Compessed Air Optimization	Biz-Custom	Education	Retro	15%	1	0.00	5	\$0	50%	66.3%	56.4%	4.4	8.9	0.7	0	0	0	0
3	Cooking	Commercial Griddles	Biz-Precriptive	Education	ROB	15%	2,596	0.23	12	\$774	50%	66.3%	51.2%	2.4	4.8	0.6	67,478	67,478	37,576	27,753
4	Cooking	Convection Ovens	Biz-Precriptive	Education	ROB	15%	1,879	0.43	12	\$471	50%	66.3%	62.4%	3.4	6.8	0.7	35,777	35,777	19,302	17,411
5	Cooking	Combination Ovens	Biz-Precriptive	Education	ROB	41%	6,368	0.74	12	\$1,568	50%	66.3%	62.4%	3.0	6.0	0.7	85,184	85,184	45,958	41,455
6	Cooking	Commercial Fryers	Biz-Precriptive	Education	ROB	14%	2,378	0.15	12	\$1,200	50%	66.3%	47.1%	1.4	2.7	0.5	112,266	112,266	65,324	42,455
7	Cooking	Commercial Steam Cookers	Biz-Precriptive	Education	ROB	67%	13,162	3.00	12	\$2,490	50%	66.3%	53.6%	4.5	9.0	0.8	116,806	116,806	66,430	47,806
8	Cooking	Insulated Holding Cabinets (Full Size)	Biz-Precriptive	Education	ROB	69%	5,278	0.80	12	\$1,200	50%	66.3%	52.6%	3.4	6.8	0.7	44,902	57,354	33,372	25,022
9	Cooking	Insulated Holding Cabinets (Half-Size)	Biz-Precriptive	Education	ROB	58%	1,788	0.30	12	\$1,500	50%	66.3%	41.2%	0.9	1.9	0.6	10,545	0	0	0
10	Cooling	Air Conditioner - 16 SEER (5-20 Tons)	Biz-Precriptive	Education	ROB	13%	767	0.99	15	\$720	50%	60.5%	36.0%	2.5	4.9	1.4	602,866	602,866	306,767	157,877
11	Cooling	Air Conditioner - 18 SEER (5-20 Tons)	Biz-Precriptive	Education	ROB	19%	1,157	1.49	15	\$1,200	50%	60.5%	36.0%	2.2	4.4	1.3	821,751	821,751	418,146	215,198
12	Cooling	Air Conditioner - 21 SEER (5-20 Tons)	Biz-Precriptive	Education	ROB	24%	1,493	1.93	15	\$1,680	50%	60.5%	36.0%	2.0	4.1	1.3	978,376	978,376	497,844	256,214
13	Cooling	Air Conditioner - 16 SEER (20+ Tons)	Biz-Precriptive	Education	ROB	8%	1,042	1.35	15	\$3,600	50%	60.5%	36.0%	0.7	1.3	0.8	395,854	0	0	0
14	Cooling	Air Conditioner - 18 SEER (20+ Tons)	Biz-Precriptive	Education	ROB	15%	1,923	2.48	15	\$7,200	50%	60.5%	36.0%	0.6	1.2	0.7	674,592	0	0	0
15	Cooling	Air Conditioner - 21 SEER (20+ Tons)	Biz-Precriptive	Education	ROB	21%	2,679	3.46	15	\$10,800	50%	60.5%	36.0%	0.6	1.1	0.7	872,495	0	0	0
16	Cooling	Comprehensive Rooftop Unit Quality Maintenance (AC Tune-up)	Biz-Custom	Education	Retro	6%	4,830	1.78	3	\$500	50%	60.5%	60.0%	2.5	5.0	0.7	797,159	821,379	237,619	230,822
17	Cooling	Air Side Economizer	Biz-Custom	Education	Retro	2%	188	0.01	5	\$170	50%	60.5%	46.4%	0.3	0.7	0.3	288,183	0	0	0
18	Cooling	Advanced Rooftop Controls	Biz-Custom	Education	Retro	14%	925	0.34	10	\$3,412	50%	60.5%	36.0%	0.2	0.5	0.3	2,294,388	0	0	0
19	Cooling	Air Conditioner - 16 SEER (<5 Tons)	Biz-Precriptive	Education	ROB	19%	496	0.64	15	\$820	50%	60.5%	36.0%	1.4	2.8	1.1	107,800	149,740	76,195	39,214
20	Cooling	Air Conditioner - 18 SEER(<5 Tons)	Biz-Precriptive	Education	ROB	28%	735	0.95	15	\$1,640	50%	60.5%	36.0%	1.0	2.1	1.0	118,299	164,324	83,616	43,033
21	Cooling	Air Conditioner - 21 SEER(<5 Tons)	Biz-Precriptive	Education	ROB	38%	1,007	1.30	15	\$2,460	50%	60.5%	36.0%	0.9	1.9	0.9	148,333	0	0	0
22	Cooling	Centrifugal Chiller - Average kW/Ton 0.626	Biz-Custom	Education	ROB	26%	12,228	5.45	20	\$27,598	50%	60.5%	36.0%	0.8	1.5	0.6	2,256,199	0	0	0
23	Cooling	Reciprocating Chiller - Average kW/Ton 0.99	Biz-Custom	Education	ROB	27%	15,285	15.05	20	\$22,126	50%	60.5%	36.0%	1.8	3.5	1.1	1,668,220	1,668,220	848,870	436,869
24	Cooling	Screw Chiller - Average kW/Ton 0.675	Biz-Custom	Education	ROB	23%	15,355	14.80	20	\$22,083	50%	60.5%	36.0%	1.7	3.5	1.1	0	0	0	0
25	Cooling	Chiller Tune-up	Biz-Custom	Education	Retro	8%	7,337	1.71	5	\$836	50%	60.5%	60.0%	3.3	6.6	0.7	667,973	667,973	188,064	181,763
26	Cooling	PTAC - 7,000 to 15,000 Btuh - lodging	Biz-Precriptive	Education	ROB	19%	280	0.16	15	\$84	50%	60.5%	43.1%	4.8	9.6	1.1	0	0	0	0
27	Cooling	HVAC Occupancy Controls	Biz-Precriptive	Education	Retro	5%	1	0.00	12	\$0	50%	60.5%	47.4%	14.4	28.7	2.0	1,631,136	1,769,063	917,524	604,816
28	Cooling	Smart Thermostat	Biz-Precriptive	Education	ROB	18%	1,145	0.00	11	\$175	50%	60.5%	47.3%	4.0	7.5	0.6	224,512	245,506	140,711	102,881
29	Cooling	Window Film	Biz-Custom	Education	Retro	2%	1,311	0.64	10	\$1,092	50%	60.5%	40.0%	1.1	2.2	0.7	441,080	486,025	258,195	120,172
30	Ext Lighting	LED wallpack (existing W<250)	Biz-Lighting	Education	Retro	66%	567	0.00	12	\$248	30%	70.6%	49.8%	1.3	4.3	0.5	1,559,815	1,559,815	1,039,153	651,846
31	Ext Lighting	LED parking lot fixture (existing W≥250)	Biz-Lighting	Education	Retro	60%	959	0.00	12	\$756	30%	70.6%	41.4%	0.7	2.4	0.5	1,422,166	0	0	0
32	Ext Lighting	LED parking lot fixture (existing W<250)	Biz-Lighting	Education	Retro	66%	567	0.00	12	\$248	30%	70.6%	49.8%	1.3	4.3	0.5	1,559,815	1,559,815	1,039,153	651,846
33	Ext Lighting	LED outdoor pole decorative fixture (existing W≥250)	Biz-Lighting	Education	Retro	60%	959	0.00	12	\$756	30%	70.6%	41.4%	0.7	2.4	0.5	1,422,166	0	0	0
34	Ext Lighting	LED parking garage fixture (existing W≥250)	Biz-Lighting	Education	Retro	60%	1,953	0.00	6	\$756	30%	70.6%	51.2%	0.8	2.6	0.4	1,455,741	0	0	0
35	Ext Lighting	LED parking garage fixture (existing W<250)	Biz-Lighting	Education	Retro	66%	1,154	0.00	6	\$248	30%	70.6%	55.6%	1.4	4.7	0.5	1,596,639	1,596,639	1,063,178	776,848
36	Heating	Heat Pump - 16 SEER (<5 Tons)	Biz-Precriptive	Education	ROB	19%	1,655	0.64	15	\$2,055	50%	60.5%	36.0%	1.0	2.0	0.7	22,044	83,756	42,619	21,934
37	Heating	Heat Pump - 18 SEER(<5 Tons)	Biz-Precriptive	Education	ROB	24%	2,141	0.95	15	\$3,425	50%	60.5%	36.0%	0.8	1.6	0.7	23,339	0	0	0
38	Heating	Heat Pump - 21 SEER(<5 Tons)	Biz-Precriptive	Education	ROB	29%	2,507	1.30	15	\$4,500	50%	60.5%	36.0%	0.8	1.6	0.7	26,021	0	0	0
39	Heating	Geothermal HP - SEER 20.3 (<5 Tons)	Biz-Precriptive	Education	ROB	36%	3,161	1.23	15	\$4,700	50%	60.5%	36.0%	0.8	1.7	0.6	35,285	0	0	0
40	Heating	Geothermal HP - SEER 23.1 (<5 Tons)	Biz-Precriptive	Education	ROB	46%	4,016	1.53	3	\$7,300	50%	60.5%	36.0%	0.1	0.3	0.2	8,064	0	0	0
41	Heating	Geothermal HP - SEER 29.3 (<5 Tons)	Biz-Precriptive	Education	ROB	50%	4,342	1.93	5	\$9,200	50%	60.5%	36.0%	0.2	0.4	0.3	13,181	0	0	0
42	Heating	Heat Pump - 16 SEER (5-20 Tons)	Biz-Precriptive	Education	ROB	9%	3,211	0.99	15	\$4,110	50%	60.5%	36.0%	0.9	1.8	0.6	66,800	0	0	0
43	Heating	Heat Pump - 18 SEER (5-20 Tons)	Biz-Precriptive	Education	ROB	19%	6,738	1.49	15	\$6,850	50%	60.5%	36.0%	1.0	2.1	0.6	160,541	414,404	210,868	108,523
44	Heating	Heat Pump - 21 SEER (5-20 Tons)	Biz-Precriptive	Education	ROB	25%	8,605	1.93	15	\$9,000	50%	60.5%	36.0%	1.0	2.0	0.6	199,864	515,906	262,518	135,104
45	Heating	Geothermal HP - SEER 20.3 (5-20 Tons)	Biz-Precriptive	Education	ROB	23%	3,349	3.62	10	\$7,700	50%	60.5%	36.0%	0.6	1.2	0.7	116,456	0	0	0
46	Heating	Geothermal HP - SEER 23.1 (5-20 Tons)	Biz-Precriptive	Education	ROB	35%	5,067	4.23	20	\$12,800	50%	60.5%	36.0%	0.9	1.8	0.8	191,874	0	0	0
47	Heating	Geothermal HP - SEER 29.3 (5-20 Tons)	Biz-Precriptive	Education	ROB	39%	5,731	5.05	20	\$17,700	50%	60.5%	36.0%	0.8	1.6	0.8	182,929	0	0	0
48	Heating	Heat Pump - 16 SEER (20+ Tons)	Biz-Precriptive	Education	ROB	11%	7,714	0.67	15	\$8,220	50%	60.5%	36.0%	0.8	1.7	0.5	73,110	0	0	0
49	Heating	Heat Pump - 18 SEER (20+ Tons)	Biz-Precriptive	Education	ROB	21%	14,870	2.48	15	\$13,700	50%	60.5%	36.0%	1.1	2.1	0.6	180,480	280,961	142,967	73,577
50	Heating	Heat Pump - 21 SEER (20+ Tons)	Biz-Precriptive	Education	ROB	26%	18,687	3.46	15	\$18,000	50%	60.5%	36.0%	1.0	2.1	0.6	221,716	345,156	175,632	90,389
51	Heating	Geothermal HP - SEER 20.3 (20+ Tons)	Biz-Precriptive	Education	ROB	24%	7,219	3.62	20	\$10,700	50%	60.5%	36.0%	1.2	2.5	0.8	180,661	281,244	143,110	73,651
52	Heating	Geothermal HP - SEER 23.1 (20+ Tons)	Biz-Precriptive	Education	ROB	36%	10,654	8.46	5	\$18,300	50%	60.5%	36.0%	0.4	0.7	0.5	106,874	0	0	0
53	Heating	Geothermal HP - SEER 29.3 (20+ Tons)	Biz-Precriptive	Education	ROB	40%	11,983	10.09	12	\$26,200	50%	60.5%	36.0%	0.7	1.3	0.7	220,879	0	0	0
54	Heating	PTAC - 7,000 to 15,000 Btuh - lodging	Biz-Precriptive	Education	ROB	11%	407	0.08	11	\$175	50%	60.5%	39.8%	1.8	3.6	0.7	0	0	0	0
55	Hot Water	Heat Pump Water Heater	Biz-Precriptive	Education	ROB	35%	1,871	0.11	10	\$1,574	50%	73.1%	45.7%	0.7	1.4	0.4	1,754,294	0	0	0
56	Hot Water	Hot Water Pipe Insulation	Biz-Precriptive	Education	Retro	2%	108	0.01	20	\$60	50%	84.0%	84.0%	2.1	4.3	0.7	27,042	29,870	12,659	12,659
57	Hot Water	Low Flow Pre-Rinse Sprayers	Biz-Precriptive	Education	ROB	26%	764	0.15	5	\$35	50%	84.0%	84.0%	7.8	15.7	0.7	153,797	220,060	161,378	161,378
58	Hot Water	Faucet Aerator	Biz-Precriptive	Education	Retro	66%	1,070	0.12	10	\$3	50%	84.0%	84.0%	265.6	531.2	0.7	187,010	262,600	112,553	112,553
59	Hot Water	ENERGY STAR Commercial Washing Machines	Biz-Precriptive	Education	ROB	43%	671	0.02	7	\$250	50%	73.1%	55.7%	1.1	2.1	0.5	361,656	514,484	346,731	238,113
60	Int Lighting	LED T8 Tube Replacement	Biz-Lighting	Education	Retro	46%	41	0.01	15	\$15	30%	70.6%	51.8%	3.0	10.1	0.8	8,202,651	8,202,651	5,390,054	3,573,880
61	Int Lighting	LED troffer, 2'X2' and 2'X4'	Biz-Lighting	Education	Retro	49%	132	0.04	15	\$80	30%	70.6%	45.0%	1.8	6.1	0.8	5,279,803	5,279,803	3,455,896	1,870,132

Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	RAP Incentive (%)	MAP Adoption Rate	RAP Adoption Rate	Measure Level BC Tests			Cumulative Annual Potential			
														TRC	UCT	RIM	15 YR Technical	15 YR Economic	15 YR MAP	15 YR RAP
62	Int Lighting	LED high bay fixture	Biz-Lighting	Education	Retro	70%	1,670	0.47	15	\$330	30%	70.6%	56.0%	5.6	18.6	0.9	245,198	245,198	161,122	119,016
63	Int Lighting	LED low bay fixture	Biz-Lighting	Education	Retro	63%	317	0.09	15	\$44	30%	70.6%	57.5%	7.9	26.4	0.9	220,185	220,185	144,686	110,743
64	Int Lighting	LED downlight, screw-in lamp, 4W, interior	Biz-Lighting	Education	ROB	83%	39	0.02	15	\$2	30%	70.6%	60.9%	29.2	97.5	1.0	434,497	434,497	258,998	203,532
65	Int Lighting	LED downlight fixture	Biz-Lighting	Education	Retro	70%	88	0.03	15	\$27	30%	70.6%	60.0%	4.0	13.4	0.9	63,556	63,556	29,228	17,103
66	Int Lighting	LED downlight, screw-in lamp, 12W, interior	Biz-Lighting	Education	ROB	83%	127	0.05	15	\$2	30%	70.6%	61.9%	94.9	316.4	1.0	2,497,662	2,497,662	1,471,203	1,188,768
67	Int Lighting	DeLamp Fluorescent Fixture Average Lamp Wattage 28W	Biz-Lighting	Education	Retro	100%	93	0.03	11	\$12	30%	70.6%	57.8%	6.4	21.5	0.8	2,045,499	2,045,499	1,818,889	1,585,180
68	Int Lighting	Central Lighting Monitoring & Controls (non-networked)	Biz-Lighting	Education	Retro	20%	8,341	1.53	12	\$3,700	30%	70.6%	49.6%	1.8	6.0	0.7	777,522	842,407	756,191	524,025
69	Int Lighting	Daylighting Controls	Biz-Lighting	Education	Retro	30%	2,643	0.57	12	\$3,000	30%	70.6%	37.3%	0.7	2.4	0.6	473,101	0	0	0
70	Int Lighting	Network Lighting Controls - Wireless (WiFi)	Biz-Lighting	Education	Retro	47%	7,650	2.86	8	\$1,683	30%	70.6%	55.5%	3.1	10.3	0.9	2,851,883	3,089,875	2,885,623	2,349,560
71	Int Lighting	Occupancy Sensors	Biz-Lighting	Education	Retro	30%	457	0.02	8	\$54	30%	70.6%	58.2%	3.9	12.9	0.6	2,280,051	2,470,323	2,307,026	1,989,792
72	Int Lighting	Bi-Level Lighting Fixture – Stairwells, Hallways, and Garages	Biz-Lighting	Education	Retro	50%	517	0.06	10	\$274	30%	70.6%	47.1%	1.2	3.9	0.6	1,712,561	1,712,561	1,569,810	1,037,462
73	Int Lighting	LED Exit Sign - 4 Watt Fixture (2 lamp)	Biz-Lighting	Education	Retro	73%	96	0.01	5	\$33	30%	80.0%	80.0%	1.0	3.3	0.6	28,673	28,673	14,930	16,278
74	Misc	Power Distribution Equipment Upgrades	Biz-Custom	Education	Retro	1%	6	0.00	30	\$8	50%	66.3%	37.6%	1.7	3.4	0.8	11,847	11,847	6,842	2,783
75	Motors	Cogged V-Belt	Biz-Custom	Education	Retro	3%	534	0.10	15	\$384	50%	66.3%	43.2%	1.3	2.7	0.6	129,931	129,931	83,702	50,031
76	Motors	Pump and Fan Variable Frequency Drive Controls (Pumps)	Biz-Custom	Education	Retro	38%	731	0.15	15	\$200	50%	66.3%	51.7%	3.6	7.1	0.7	1,754,256	1,754,256	979,818	652,611
77	Plug Loads Office	ENERGY STAR Uninterrupted Power Supply	Biz-Custom	Education	ROB	3%	85	0.01	15	\$59	50%	76.0%	76.0%	1.4	2.7	0.6	5,022	5,022	3,147	3,147
78	Plug Loads Office	Plug Load Occupancy Sensor	Biz-Custom	Education	Retro	15%	169	0.00	8	\$70	50%	66.3%	48.9%	1.0	2.0	0.5	4,838,203	4,838,203	3,155,964	2,197,501
79	Plug Loads Office	Energy Star Server	Biz-Custom	Education	ROB	13%	90	0.01	15	\$156	50%	66.3%	36.0%	0.5	1.0	0.4	628,099	0	0	0
80	Plug Loads Office	Data Center Hot/Cold Aisle Configuration	Biz-Custom	Education	Retro	13%	90	0.01	15	\$156	50%	66.3%	36.0%	0.5	1.0	0.4	566,422	0	0	0
81	Plug Loads Office	Electrically Commutated Plug Fans in data centers	Biz-Custom	Education	Retro	18%	15,778	1.80	15	\$480	50%	66.3%	57.7%	28.9	57.8	0.7	376,059	376,059	193,722	148,051
82	Plug Loads Office	High Efficiency CRAC unit	Biz-Custom	Education	ROB	30%	162	0.02	15	\$63	50%	66.3%	49.5%	2.3	4.7	0.6	60,779	60,779	33,788	22,373
83	Plug Loads Office	Computer Room Air Conditioner Economizer	Biz-Custom	Education	Retro	86%	358	0.00	15	\$82	50%	66.3%	52.6%	3.2	6.5	0.6	198,540	198,540	101,989	63,685
84	Refrigeration	Strip Curtains	Biz-Prescriptive	Education	Retro	81%	270	0.03	4	\$9	50%	56.7%	48.3%	7.3	14.6	0.6	1,284,185	1,284,185	566,774	427,257
85	Refrigeration	Bare Suction Line	Biz-Custom	Education	Retro	93%	21	0.00	15	\$4	50%	56.7%	40.0%	4.5	8.9	0.7	56,466	56,466	24,925	12,797
86	Refrigeration	Floating Head Pressure Controls	Biz-Prescriptive	Education	Retro	50%	1,327	0.15	15	\$80	50%	56.7%	46.9%	14.1	28.1	0.7	492,446	492,446	218,135	155,598
87	Refrigeration	Saturated Suction Controls	Biz-Custom	Education	Retro	50%	416	0.18	15	\$559	50%	56.7%	40.0%	0.9	1.8	0.7	153,114	0	0	0
88	Refrigeration	Compressor Retrofit	Biz-Custom	Education	Retro	20%	163	0.07	15	\$477	50%	56.7%	32.0%	0.4	0.8	0.5	726,913	0	0	0
89	Refrigeration	Electronically Commutated (EC) Walk-In Evaporator Fan Motor	Biz-Custom	Education	Retro	65%	824	0.09	15	\$78	50%	56.7%	46.4%	8.9	17.9	0.7	655,452	655,452	251,788	155,947
90	Refrigeration	Evaporator Fan Motor Controls	Biz-Custom	Education	Retro	25%	478	0.06	13	\$291	50%	56.7%	28.0%	1.2	2.5	0.5	252,390	257,887	146,333	58,581
91	Refrigeration	Variable Speed Condenser Fan	Biz-Custom	Education	Retro	50%	1,480	0.00	15	\$1,170	50%	56.7%	36.0%	0.9	1.8	0.4	656,809	0	0	0
92	Refrigeration	Refrigeration Economizer	Biz-Custom	Education	Retro	2%	1,357	0.00	15	\$2,558	50%	56.7%	36.0%	0.4	0.8	0.3	12,375	0	0	0
93	Refrigeration	Anti-Sweat Heater Controls MT	Biz-Custom	Education	Retro	55%	722	0.00	12	\$250	50%	56.7%	46.4%	1.7	3.4	0.5	1,102,328	1,102,328	426,604	263,911
94	Refrigeration	Auto Door Closer, Cooler	Biz-Custom	Education	Retro	0%	943	0.14	8	\$157	50%	56.7%	46.4%	3.0	6.0	0.6	2,885	2,885	1,105	684
95	Refrigeration	Display Case Door Retrofit, Medium Temp	Biz-Prescriptive	Education	Retro	36%	578	0.09	12	\$686	50%	64.0%	64.0%	0.6	1.2	0.5	51,008	0	0	0
96	Refrigeration	Electronically Commutated (EC) Reach-In Evaporator Fan Motor	Biz-Custom	Education	Retro	65%	824	0.09	15	\$78	50%	56.7%	46.4%	8.9	17.9	0.7	187,748	187,748	70,954	43,894
97	Refrigeration	Q-Sync Motor for Walk-In and Reach-In Evaporator Fan Motor	Biz-Custom	Education	Retro	51%	504	0.06	10	\$96	50%	56.7%	46.4%	3.1	6.2	0.6	53,017	53,017	20,444	12,647
98	Refrigeration	Energy Star Reach-In Refrigerator, Glass Doors	Biz-Prescriptive	Education	ROB	27%	410	0.05	12	\$600	50%	64.0%	64.0%	0.5	0.9	0.4	532,517	0	0	0
99	Refrigeration	Energy Star Reach-In Refrigerator, Solid Doors	Biz-Prescriptive	Education	ROB	25%	283	0.03	12	\$600	50%	64.0%	64.0%	0.3	0.7	0.3	511,023	0	0	0
100	Refrigeration	Anti-Sweat Heater Controls LT	Biz-Custom	Education	Retro	36%	578	0.09	12	\$686	50%	56.7%	46.4%	0.6	1.2	0.5	243,781	0	0	0
101	Refrigeration	Auto Door Closer, Freezer	Biz-Custom	Education	Retro	1%	2,307	0.31	8	\$157	50%	56.7%	46.5%	7.3	14.5	0.7	3,725	3,725	1,427	885
102	Refrigeration	Display Case Door Retrofit, Low Temp	Biz-Prescriptive	Education	Retro	50%	1,453	0.23	12	\$686	50%	64.0%	64.0%	1.6	3.1	0.6	79,897	79,897	23,115	23,115
103	Refrigeration	Energy Star Reach-In Freezer, Glass Doors	Biz-Prescriptive	Education	ROB	15%	488	0.06	12	\$450	50%	64.0%	64.0%	0.8	1.5	0.5	100,999	0	0	0
104	Refrigeration	Energy Star Reach-In Freezer, Solid Doors	Biz-Prescriptive	Education	ROB	20%	935	0.11	12	\$450	50%	64.0%	64.0%	1.4	2.9	0.6	133,837	133,837	67,134	67,134
105	Refrigeration	Retro-commissioning_Refrigerator Optimization	Biz-Custom	Education	Retro	3%	1	0.00	3	\$0	50%	56.7%	45.3%	2.2	4.3	0.5	255,635	255,635	138,783	105,626
106	Refrigeration	Energy Star Ice Machine	Biz-Prescriptive	Education	ROB	10%	721	0.07	15	\$1,426	50%	59.2%	59.2%	0.4	0.8	0.4	80,585	0	0	0
107	Refrigeration	LED Refrigerated Display Case Lighting Average 6W/LF	Biz-Lighting	Education	Retro	37%	574	0.13	12	\$1,010	50%	56.7%	46.4%	0.5	1.0	0.4	581,411	0	0	0
108	Ventilation	Demand Controlled Ventilation (DCV) Exhaust Hood	Biz-Custom	Education	ROB	50%	3	0.00	20	\$2	50%	60.5%	39.2%	1.8	3.5	0.6	3,580,242	3,580,242	1,839,965	1,031,473
109	Ventilation	Pump and Fan Variable Frequency Drive Controls (Fans)	Biz-Custom	Education	Retro	41%	923	0.19	15	\$375	50%	60.5%	40.4%	2.5	5.0	0.7	11,019,695	11,019,695	5,310,943	2,501,538
110	Ventilation	Demand Control Ventilation	Biz-Custom	Education	Retro	20%	408	0.07	15	\$227	50%	60.5%	36.7%	1.8	3.6	0.7	4,526,800	4,526,800	2,842,539	1,632,797
111	WholeBld_HVAC	HVAC - Energy Management System	Biz-Custom	Education	Retro	15%	1,044	0.05	15	\$4,000	50%	60.5%	28.0%	0.2	0.4	0.3	11,369,305	0	0	0
112	WholeBld_HVAC	GREM Controls	Biz-Custom	Education	Retro	0%	0	0.00	8	\$0	0%	60.5%	53.4%	0.0	#DIV/0	0.0	0	0	0	0
113	WholeBld_HVAC	Retro-commissioning_Bld Optimization	Biz-Custom	Education	Retro	15%	1	0.00	3	\$0	50%	60.5%	49.3%	2.0	4.1	0.6	5,354,561	5,650,644	3,766,935	3,057,407
114	WholeBld	WholeBldg - Com RET	Biz-Custom	Education	Retro	15%	1	0.00	12	\$0	50%	66.3%	55.7%	7.7	15.4	0.7	6,679,458	7,245,020	5,436,741	4,693,666
115	WholeBld_NC	WholeBldg - Com NC	Biz-NC	Education	NC	25%	1	0.00	12	\$0	50%	68.0%	68.0%	7.7	15.4	0.7	0	0	0	0
116	Compressed Air	Efficient Air Compressors	Biz-Custom	Food Sales	ROB	31%	1,223	0.21	15	\$100	50%	66.3%	56.3%	11.3	22.7	0.7	0	0	0	0
117	Compressed Air	Retro-commissioning_Compressed Air Optimization	Biz-Custom	Food Sales	Retro	15%	1	0.00	5	\$0	50%	66.3%	56.4%	4.3	8.7	0.6	0	0	0	0
118	Cooking	Commercial Griddles	Biz-Prescriptive	Food Sales	ROB	15%	2,596	0.23	12	\$774	50%	66.3%	51.2%	2.3	4.5	0.6	207,299	207,299	115,438	85,261
119	Cooking	Convection Ovens	Biz-Prescriptive	Food Sales	ROB	15%	1,879	0.43	12	\$471	50%	66.3%	62.4%	3.2	6.5	0.7	110,278	110,278	59,497	53,667
120	Cooking	Combination Ovens	Biz-Prescriptive	Food Sales	ROB	41%	6,368	0.74	12	\$1,568	50%	66.3%	62.4%	2.9	5.7	0.6	260,706	260,706	140,656	126,873
121	Cooking	Commercial Fryers	Biz-Prescriptive	Food Sales	ROB	14%	2,378	0.15	12	\$1,200	50%	66.3%	47.1%	1.3	2.6	0.5	344,893	344,893	200,682	130,426
122	Cooking	Commercial Steam Cookers	Biz-Prescriptive	Food Sales	ROB	67%	13,162	3.00	12	\$2,490	50%	66.3%	53.6%	4.3	8.6	0.7	358,838	358,838	204,078	146,864

Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	% Elec Savings	Per Unit Elec Savings kW	Per Unit Summer kW	EE EUL	Measure Cost	RAP Incentive (%)	MAP Adoption Rate	RAP Adoption Rate	Measure Level BC Tests			Cumulative Annual Potential			
														TRC	UCT	RIM	15 YR Technical	15 YR Economic	15 YR MAP	15 YR RAP
123	Cooking	Insulated Holding Cabinets (Full Size)	Biz-Prescriptive	Food Sales	ROB	69%	5,278	0.80	12	\$1,200	50%	66.3%	52.6%	3.2	6.5	0.7	137,908	176,197	102,523	76,869
124	Cooking	Insulated Holding Cabinets (Half-Size)	Biz-Prescriptive	Food Sales	ROB	58%	1,788	0.30	12	\$1,500	50%	66.3%	41.2%	0.9	1.8	0.5	32,427	0	0	0
125	Cooling	Air Conditioner - 16 SEER (5-20 Tons)	Biz-Prescriptive	Food Sales	ROB	12%	1,347	0.99	15	\$720	50%	60.5%	37.2%	3.0	6.0	1.1	30,156	30,156	15,345	8,259
126	Cooling	Air Conditioner - 18 SEER (5-20 Tons)	Biz-Prescriptive	Food Sales	ROB	19%	2,031	1.49	15	\$1,200	50%	60.5%	36.0%	2.7	5.4	1.1	41,105	41,105	20,916	10,764
127	Cooling	Air Conditioner - 21 SEER (5-20 Tons)	Biz-Prescriptive	Food Sales	ROB	24%	2,622	1.93	15	\$1,680	50%	60.5%	36.0%	2.5	5.0	1.0	48,940	48,940	24,903	12,816
128	Cooling	Air Conditioner - 16 SEER (20+ Tons)	Biz-Prescriptive	Food Sales	ROB	8%	1,829	1.35	15	\$3,600	50%	60.5%	36.0%	0.8	1.6	0.7	19,801	0	0	0
129	Cooling	Air Conditioner - 18 SEER (20+ Tons)	Biz-Prescriptive	Food Sales	ROB	15%	3,377	2.48	15	\$7,200	50%	60.5%	36.0%	0.8	1.5	0.7	33,744	0	0	0
130	Cooling	Air Conditioner - 21 SEER (20+ Tons)	Biz-Prescriptive	Food Sales	ROB	21%	4,703	3.46	15	\$10,800	50%	60.5%	36.0%	0.7	1.4	0.7	43,643	0	0	0
131	Cooling	Comprehensive Rooftop Unit Quality Maintenance (AC Tune-up)	Biz-Custom	Food Sales	Retro	6%	874	0.32	3	\$500	50%	60.5%	60.0%	0.4	0.9	0.4	40,440	0	0	0
132	Cooling	Air Side Economizer	Biz-Custom	Food Sales	Retro	2%	189	0.01	5	\$170	50%	60.5%	46.4%	0.3	0.6	0.3	14,645	0	0	0
133	Cooling	Advanced Rooftop Controls	Biz-Custom	Food Sales	Retro	23%	1,493	0.55	10	\$3,412	50%	60.5%	36.0%	0.4	0.7	0.4	187,274	0	0	0
134	Cooling	Air Conditioner - 16 SEER (<5 Tons)	Biz-Prescriptive	Food Sales	ROB	19%	871	0.64	15	\$820	50%	60.5%	36.0%	1.7	3.4	1.0	61,472	61,472	31,280	16,098
135	Cooling	Air Conditioner - 18 SEER(<5 Tons)	Biz-Prescriptive	Food Sales	ROB	28%	1,290	0.95	15	\$1,640	50%	60.5%	36.0%	1.3	2.5	0.9	67,459	67,459	34,326	17,666
136	Cooling	Air Conditioner - 21 SEER(<5 Tons)	Biz-Prescriptive	Food Sales	ROB	38%	1,769	1.30	15	\$2,460	50%	60.5%	36.0%	1.2	2.3	0.8	84,586	84,586	43,041	22,151
137	Cooling	Centrifugal Chiller - Average kW/Ton 0.626	Biz-Custom	Food Sales	ROB	26%	2,213	0.99	20	\$4,996	50%	60.5%	36.0%	0.7	1.5	0.6	0	0	0	0
138	Cooling	Reciprocating Chiller - Average kW/Ton 0.99	Biz-Custom	Food Sales	ROB	27%	2,767	2.72	20	\$4,005	50%	60.5%	36.0%	1.7	3.4	1.1	0	0	0	0
139	Cooling	Screw Chiller - Average kW/Ton 0.675	Biz-Custom	Food Sales	ROB	23%	2,779	2.68	20	\$3,997	50%	60.5%	36.0%	1.7	3.4	1.1	0	0	0	0
140	Cooling	Chiller Tune-up	Biz-Custom	Food Sales	Retro	8%	1,328	0.31	5	\$151	50%	60.5%	60.0%	3.2	6.3	0.7	0	0	0	0
141	Cooling	PTAC - 7,000 to 15,000 Btuh - lodging	Biz-Prescriptive	Food Sales	ROB	19%	281	0.16	15	\$85	50%	60.5%	43.0%	4.6	9.3	1.0	0	0	0	0
142	Cooling	HVAC Occupancy Controls	Biz-Prescriptive	Food Sales	Retro	5%	1	0.00	12	\$0	50%	60.5%	47.4%	8.4	16.9	1.2	105,796	113,198	58,115	38,344
143	Cooling	Smart Thermostat	Biz-Prescriptive	Food Sales	ROB	18%	1,150	0.00	11	\$175	50%	60.5%	47.3%	3.8	7.1	0.5	8,981	9,674	5,488	4,019
144	Cooling	Window Film	Biz-Custom	Food Sales	Retro	4%	622	0.30	10	\$518	50%	60.5%	40.0%	1.0	2.2	0.7	75,478	81,736	42,952	20,010
145	Ext Lighting	LED wallpack (existing W<250)	Biz-Lighting	Food Sales	Retro	66%	567	0.00	12	\$248	30%	70.6%	49.8%	1.3	4.3	0.5	183,278	183,278	123,627	79,202
146	Ext Lighting	LED parking lot fixture (existing W>250)	Biz-Lighting	Food Sales	Retro	60%	959	0.00	12	\$756	30%	70.6%	41.4%	0.7	2.4	0.5	167,104	0	0	0
147	Ext Lighting	LED parking lot fixture (existing W<250)	Biz-Lighting	Food Sales	Retro	66%	567	0.00	12	\$248	30%	70.6%	49.8%	1.3	4.3	0.5	183,278	183,278	123,627	79,202
148	Ext Lighting	LED outdoor pole decorative fixture (existing W>250)	Biz-Lighting	Food Sales	Retro	60%	959	0.00	12	\$756	30%	70.6%	41.4%	0.7	2.4	0.5	167,104	0	0	0
149	Ext Lighting	LED parking garage fixture (existing W>250)	Biz-Lighting	Food Sales	Retro	60%	1,953	0.00	6	\$756	30%	70.6%	51.2%	0.8	2.6	0.4	171,049	0	0	0
150	Ext Lighting	LED parking garage fixture (existing W<250)	Biz-Lighting	Food Sales	Retro	66%	1,154	0.00	6	\$248	30%	70.6%	55.6%	1.4	4.7	0.5	187,605	187,605	126,470	93,631
151	Heating	Heat Pump - 16 SEER (<5 Tons)	Biz-Prescriptive	Food Sales	ROB	19%	1,350	0.64	15	\$2,055	50%	60.5%	36.0%	0.9	1.7	0.7	54,923	0	0	0
152	Heating	Heat Pump - 18 SEER(<5 Tons)	Biz-Prescriptive	Food Sales	ROB	26%	1,872	0.95	15	\$3,425	50%	60.5%	36.0%	0.7	1.5	0.6	65,228	0	0	0
153	Heating	Heat Pump - 21 SEER(<5 Tons)	Biz-Prescriptive	Food Sales	ROB	33%	2,389	1.30	15	\$4,500	50%	60.5%	36.0%	0.7	1.5	0.6	83,588	0	0	0
154	Heating	Geothermal HP - SEER 20.3 (<5 Tons)	Biz-Prescriptive	Food Sales	ROB	36%	2,590	1.23	15	\$4,700	50%	60.5%	36.0%	0.7	1.4	0.6	88,523	0	0	0
155	Heating	Geothermal HP - SEER 23.1 (<5 Tons)	Biz-Prescriptive	Food Sales	ROB	45%	3,253	1.53	3	\$7,300	50%	60.5%	36.0%	0.1	0.2	0.2	19,601	0	0	0
156	Heating	Geothermal HP - SEER 29.3 (<5 Tons)	Biz-Prescriptive	Food Sales	ROB	53%	3,804	1.93	5	\$9,200	50%	60.5%	36.0%	0.2	0.4	0.3	36,780	0	0	0
157	Heating	Heat Pump - 16 SEER (5-20 Tons)	Biz-Prescriptive	Food Sales	ROB	10%	2,359	0.99	15	\$4,110	50%	60.5%	36.0%	0.7	1.4	0.6	14,938	0	0	0
158	Heating	Heat Pump - 18 SEER (5-20 Tons)	Biz-Prescriptive	Food Sales	ROB	19%	4,341	1.49	15	\$6,850	50%	60.5%	36.0%	0.7	1.5	0.6	28,126	0	0	0
159	Heating	Heat Pump - 21 SEER (5-20 Tons)	Biz-Prescriptive	Food Sales	ROB	25%	5,566	1.93	15	\$9,000	50%	60.5%	36.0%	0.7	1.4	0.6	35,279	0	0	0
160	Heating	Geothermal HP - SEER 20.3 (5-20 Tons)	Biz-Prescriptive	Food Sales	ROB	36%	5,149	3.62	10	\$7,700	50%	60.5%	36.0%	0.7	1.5	0.7	53,181	0	0	0
161	Heating	Geothermal HP - SEER 23.1 (5-20 Tons)	Biz-Prescriptive	Food Sales	ROB	45%	6,491	4.23	20	\$12,800	50%	60.5%	36.0%	1.0	2.0	0.8	68,346	322,096	163,898	84,350
162	Heating	Geothermal HP - SEER 29.3 (5-20 Tons)	Biz-Prescriptive	Food Sales	ROB	53%	7,615	5.05	20	\$17,700	50%	60.5%	36.0%	0.9	1.7	0.8	68,623	0	0	0
163	Heating	Heat Pump - 16 SEER (20+ Tons)	Biz-Prescriptive	Food Sales	ROB	10%	4,591	1.35	15	\$8,220	50%	60.5%	36.0%	0.6	1.2	0.5	11,256	0	0	0
164	Heating	Heat Pump - 18 SEER (20+ Tons)	Biz-Prescriptive	Food Sales	ROB	19%	8,737	2.48	15	\$13,700	50%	60.5%	36.0%	0.7	1.4	0.5	24,219	0	0	0
165	Heating	Heat Pump - 21 SEER (20+ Tons)	Biz-Prescriptive	Food Sales	ROB	24%	11,331	3.46	15	\$18,000	50%	60.5%	36.0%	0.7	1.4	0.6	31,730	0	0	0
166	Heating	Geothermal HP - SEER 20.3 (20+ Tons)	Biz-Prescriptive	Food Sales	ROB	36%	10,513	7.24	20	\$10,700	50%	60.5%	36.0%	2.0	4.0	1.0	101,846	258,928	131,755	67,807
167	Heating	Geothermal HP - SEER 23.1 (20+ Tons)	Biz-Prescriptive	Food Sales	ROB	45%	13,197	8.46	5	\$18,300	50%	60.5%	36.0%	0.4	0.8	0.4	33,563	0	0	0
168	Heating	Geothermal HP - SEER 29.3 (20+ Tons)	Biz-Prescriptive	Food Sales	ROB	53%	15,446	10.09	12	\$26,200	50%	60.5%	36.0%	0.7	1.5	0.7	73,295	0	0	0
169	Heating	PTAC - 7,000 to 15,000 Btuh - lodging	Biz-Prescriptive	Food Sales	ROB	10%	249	0.08	11	\$175	50%	60.5%	36.0%	1.2	2.4	0.6	0	0	0	0
170	Hot Water	Heat Pump Water Heater	Biz-Prescriptive	Food Sales	ROB	35%	3,788	0.23	10	\$1,574	50%	73.1%	54.8%	1.3	2.7	0.5	0	0	0	0
171	Hot Water	Hot Water Pipe Insulation	Biz-Prescriptive	Food Sales	Retro	2%	219	0.03	20	\$60	50%	84.0%	84.0%	4.2	8.4	0.7	0	0	0	0
172	Hot Water	Low Flow Pre-Rinse Sprayers	Biz-Prescriptive	Food Sales	ROB	26%	764	0.15	5	\$35	50%	84.0%	84.0%	7.6	15.2	0.7	0	0	0	0
173	Hot Water	Faucet Aerator	Biz-Prescriptive	Food Sales	Retro	66%	1,425	0.16	10	\$3	50%	84.0%	84.0%	341.4	682.9	0.7	0	0	0	0
174	Hot Water	ENERGY STAR Commercial Washing Machines	Biz-Prescriptive	Food Sales	ROB	43%	671	0.02	7	\$250	50%	73.1%	55.7%	1.0	2.0	0.5	0	0	0	0
175	Int Lighting	LED T8 Tube Replacement	Biz-Lighting	Food Sales	Retro	45%	71	0.01	15	\$15	30%	70.6%	55.7%	4.4	14.6	0.7	2,197,431	2,197,431	1,468,380	1,089,851
176	Int Lighting	LED troffer, 2'X2' and 2'X4'	Biz-Lighting	Food Sales	Retro	48%	228	0.04	15	\$80	30%	70.6%	52.2%	2.6	8.8	0.7	1,416,218	1,416,218	946,353	645,077
177	Int Lighting	LED high bay fixture	Biz-Lighting	Food Sales	Retro	69%	2,882	0.50	15	\$330	30%	70.6%	58.3%	8.1	26.9	0.7	38,003	38,003	25,394	20,009
178	Int Lighting	LED low bay fixture	Biz-Lighting	Food Sales	Retro	62%	548	0.10	15	\$44	30%	70.6%	59.5%	11.5	38.3	0.7	34,023	34,023	22,735	18,378
179	Int Lighting	LED downlight, screw-in lamp, 4W, interior	Biz-Lighting	Food Sales	ROB	82%	62	0.02	15	\$2	30%	70.6%	61.4%	38.9	129.5	0.8	79,316	79,316	46,720	37,271
180	Int Lighting	LED downlight fixture	Biz-Lighting	Food Sales	Retro	69%	141	0.04	15	\$27	30%	70.6%	60.0%	5.3	17.8	0.8	19,228	19,228	8,843	5,174
181	Int Lighting	LED downlight, screw-in lamp, 12W, interior	Biz-Lighting	Food Sales	ROB	82%	203	0.05	15	\$2	30%	70.6%	62.0%	126.1	420.4	0.8	759,867	759,867	447,586	363,303
182	Int Lighting	DeLamp Fluorescent Fixture Average Lamp Wattage 28W	Biz-Lighting	Food Sales	Retro	100%	161	0.03	11	\$12	30%	70.6%	59.7%	9.3	31.0	0.7	547,185	547,185	494,361	435,895
183	Int Lighting	Central Lighting Monitoring & Controls (non-networked)	Biz-Lighting	Food Sales	Retro	20%	8,341	1.53	12	\$3,700	30%	70.6%	49.6%	1.7	5.7	0.7	243,048	263,423	239,334	163,235

Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	RAP Incentive (%)	MAP Adoption Rate	RAP Adoption Rate	Measure Level BC Tests			Cumulative Annual Potential			
														TRC	UCT	RIM	15 YR Technical	15 YR Economic	15 YR MAP	15 YR RAP
184	Int Lighting	Daylighting Controls	Biz-Lighting	Food Sales	Retro	30%	2,643	0.57	12	\$3,000	30%	70.6%	37.3%	0.7	2.3	0.6	148,155	0	0	0
185	Int Lighting	Network Lighting Controls - Wireless (WiFi)	Biz-Lighting	Food Sales	Retro	47%	7,650	2.86	8	\$1,683	30%	70.6%	55.5%	3.0	9.9	0.8	898,416	973,732	926,319	735,888
186	Int Lighting	Occupancy Sensors	Biz-Lighting	Food Sales	Retro	30%	457	0.02	8	\$54	30%	70.6%	58.2%	3.6	12.1	0.6	703,861	762,866	725,721	610,702
187	Int Lighting	Bi-Level Lighting Fixture – Stairwells, Hallways, and Garages	Biz-Lighting	Food Sales	Retro	50%	517	0.06	10	\$274	30%	70.6%	47.1%	1.1	3.7	0.6	30,569	30,569	28,471	18,421
188	Int Lighting	LED Exit Sign - 4 Watt Fixture (2 lamp)	Biz-Lighting	Food Sales	Retro	72%	92	0.01	5	\$33	30%	80.0%	80.0%	0.9	3.0	0.5	7,589	0	0	0
189	Misc	Power Distribution Equipment Upgrades	Biz-Custom	Food Sales	Retro	1%	6	0.00	30	\$8	50%	66.3%	37.6%	1.7	3.4	0.8	20,533	20,533	11,859	4,824
190	Motors	Cogged V-Belt	Biz-Custom	Food Sales	Retro	3%	604	0.10	15	\$384	50%	66.3%	44.7%	1.5	2.9	0.6	9,191	9,191	5,921	3,687
191	Motors	Pump and Fan Variable Frequency Drive Controls (Pumps)	Biz-Custom	Food Sales	Retro	38%	731	0.15	15	\$200	50%	66.3%	51.7%	3.6	7.1	0.7	5,673	5,673	3,169	2,110
192	Plug Loads Office	ENERGY STAR Uninterrupted Power Supply	Biz-Custom	Food Sales	ROB	3%	85	0.01	15	\$59	50%	76.0%	76.0%	1.3	2.7	0.6	0	0	0	0
193	Plug Loads Office	Plug Load Occupancy Sensor	Biz-Custom	Food Sales	Retro	15%	169	0.00	8	\$70	50%	66.3%	48.9%	1.0	2.0	0.4	340,350	0	0	0
194	Plug Loads Office	Energy Star Server	Biz-Custom	Food Sales	ROB	13%	90	0.01	15	\$156	50%	66.3%	36.0%	0.5	1.0	0.4	0	0	0	0
195	Plug Loads Office	Data Center Hot/Cold Aisle Configuration	Biz-Custom	Food Sales	Retro	13%	90	0.01	15	\$156	50%	66.3%	36.0%	0.5	1.0	0.4	0	0	0	0
196	Plug Loads Office	Electrically Commutated Plug Fans in data centers	Biz-Custom	Food Sales	Retro	18%	15,778	1.80	15	\$480	50%	66.3%	57.7%	28.2	56.5	0.7	0	0	0	0
197	Plug Loads Office	High Efficiency CRAC unit	Biz-Custom	Food Sales	ROB	30%	162	0.02	15	\$63	50%	66.3%	49.5%	2.3	4.6	0.6	0	0	0	0
198	Plug Loads Office	Computer Room Air Conditioner Economizer	Biz-Custom	Food Sales	Retro	86%	358	0.00	15	\$82	50%	66.3%	52.6%	3.2	6.3	0.5	0	0	0	0
199	Refrigeration	Strip Curtains	Biz-Prescriptive	Food Sales	Retro	81%	270	0.03	4	\$9	50%	56.7%	48.3%	7.3	14.6	0.6	6,502,905	6,502,905	2,870,050	2,163,562
200	Refrigeration	Bare Section Line	Biz-Custom	Food Sales	Retro	93%	21	0.00	15	\$4	50%	56.7%	40.0%	4.5	8.9	0.7	205,365	205,365	91,290	46,893
201	Refrigeration	Floating Head Pressure Controls	Biz-Prescriptive	Food Sales	Retro	50%	1,327	0.15	15	\$80	50%	56.7%	46.9%	14.0	28.1	0.7	1,791,001	1,791,001	798,899	570,132
202	Refrigeration	Saturated Suction Controls	Biz-Custom	Food Sales	Retro	50%	416	0.18	15	\$559	50%	56.7%	40.0%	0.9	1.8	0.7	556,855	0	0	0
203	Refrigeration	Compressor Retrofit	Biz-Custom	Food Sales	Retro	20%	163	0.07	15	\$477	50%	56.7%	32.0%	0.4	0.8	0.5	3,642,647	0	0	0
204	Refrigeration	Electronically Commutated (EC) Walk-In Evaporator Fan Motor	Biz-Custom	Food Sales	Retro	65%	824	0.09	15	\$78	50%	56.7%	46.4%	8.9	17.9	0.7	3,292,236	3,292,236	1,272,708	788,614
205	Refrigeration	Evaporator Fan Motor Controls	Biz-Custom	Food Sales	Retro	25%	478	0.06	13	\$291	50%	56.7%	28.0%	1.2	2.5	0.5	1,244,437	1,280,503	737,403	295,626
206	Refrigeration	Variable Speed Condenser Fan	Biz-Custom	Food Sales	Retro	50%	1,480	0.00	15	\$1,170	50%	56.7%	36.0%	0.9	1.8	0.4	3,293,890	0	0	0
207	Refrigeration	Refrigeration Economizer	Biz-Custom	Food Sales	Retro	2%	1,357	0.00	15	\$2,558	50%	56.7%	36.0%	0.4	0.8	0.3	60,961	0	0	0
208	Refrigeration	Anti-Sweat Heater Controls MT	Biz-Custom	Food Sales	Retro	55%	722	0.00	12	\$250	50%	56.7%	46.4%	1.7	3.4	0.5	2,507,861	2,507,861	970,548	600,413
209	Refrigeration	Auto Door Closer, Cooler	Biz-Custom	Food Sales	Retro	0%	943	0.14	8	\$157	50%	56.7%	46.4%	3.0	6.0	0.6	6,564	6,564	2,514	1,555
210	Refrigeration	Display Case Door Retrofit, Medium Temp	Biz-Prescriptive	Food Sales	Retro	36%	578	0.09	12	\$686	50%	64.0%	64.0%	0.6	1.2	0.5	116,046	0	0	0
211	Refrigeration	Electronically Commutated (EC) Reach-In Evaporator Fan Motor	Biz-Custom	Food Sales	Retro	65%	824	0.09	15	\$78	50%	56.7%	46.4%	8.9	17.9	0.7	427,137	427,137	161,424	99,862
212	Refrigeration	Q-Sync Motor for Walk-In and Reach-In Evaporator Fan Motor	Biz-Custom	Food Sales	Retro	51%	504	0.06	10	\$96	50%	56.7%	46.4%	3.1	6.2	0.6	120,616	120,616	46,511	28,773
213	Refrigeration	Energy Star Reach-In Refrigerator, Glass Doors	Biz-Prescriptive	Food Sales	ROB	27%	410	0.05	12	\$600	50%	64.0%	64.0%	0.5	0.9	0.4	1,211,507	0	0	0
214	Refrigeration	Energy Star Reach-In Refrigerator, Solid Doors	Biz-Prescriptive	Food Sales	ROB	25%	283	0.03	12	\$600	50%	64.0%	64.0%	0.3	0.7	0.3	1,162,608	0	0	0
215	Refrigeration	Anti-Sweat Heater Controls LT	Biz-Custom	Food Sales	Retro	36%	578	0.09	12	\$686	50%	56.7%	46.4%	0.6	1.2	0.5	554,616	0	0	0
216	Refrigeration	Auto Door Closer, Freezer	Biz-Custom	Food Sales	Retro	1%	2,307	0.31	8	\$157	50%	56.7%	46.5%	7.3	14.5	0.7	8,475	8,475	3,246	2,015
217	Refrigeration	Display Case Door Retrofit, Low Temp	Biz-Prescriptive	Food Sales	Retro	50%	1,453	0.23	12	\$686	50%	64.0%	64.0%	1.6	3.1	0.6	181,771	181,771	52,588	52,588
218	Refrigeration	Energy Star Reach-In Freezer, Glass Doors	Biz-Prescriptive	Food Sales	ROB	15%	488	0.06	12	\$450	50%	64.0%	64.0%	0.8	1.5	0.5	229,779	0	0	0
219	Refrigeration	Energy Star Reach-In Freezer, Solid Doors	Biz-Prescriptive	Food Sales	ROB	20%	935	0.11	12	\$450	50%	64.0%	64.0%	1.4	2.9	0.6	304,486	304,486	152,733	152,733
220	Refrigeration	Retro-commissioning_Refrigerator Optimization	Biz-Custom	Food Sales	Retro	3%	1	0.00	3	\$0	50%	56.7%	45.3%	2.2	4.3	0.5	938,039	938,039	509,256	387,588
221	Refrigeration	Energy Star Ice Machine	Biz-Prescriptive	Food Sales	ROB	10%	721	0.07	15	\$1,426	50%	59.2%	59.2%	0.4	0.8	0.4	17,129	0	0	0
222	Refrigeration	LED Refrigerated Display Case Lighting Average 6W/LF	Biz-Lighting	Food Sales	Retro	37%	574	0.13	12	\$1,010	50%	56.7%	46.4%	0.5	0.9	0.4	1,322,744	0	0	0
223	Ventilation	Demand Controlled Ventilation (DCV) Exhaust Hood	Biz-Custom	Food Sales	ROB	50%	3	0.00	20	\$2	50%	60.5%	39.2%	1.7	3.3	0.6	249,232	249,232	128,086	71,804
224	Ventilation	Pump and Fan Variable Frequency Drive Controls (Fans)	Biz-Custom	Food Sales	Retro	41%	923	0.19	15	\$375	50%	60.5%	40.4%	2.4	4.8	0.7	1,244,686	1,244,686	599,876	282,551
225	Ventilation	Demand Control Ventilation	Biz-Custom	Food Sales	Retro	20%	505	0.18	15	\$227	50%	60.5%	39.3%	2.7	5.1	0.8	769,098	769,098	482,944	300,338
226	WholeBld_HVAC	HVAC - Energy Management System	Biz-Custom	Food Sales	Retro	15%	1,044	0.05	15	\$4,000	50%	60.5%	28.0%	0.2	0.4	0.2	1,331,949	0	0	0
227	WholeBld_HVAC	GREM Controls	Biz-Custom	Food Sales	Retro	0%	0	0.00	8	\$0	0%	60.5%	53.4%	0.0	#DIV/0	0.0	0	0	0	0
228	WholeBld_HVAC	Retro-commissioning_Bld Optimization	Biz-Custom	Food Sales	Retro	15%	1	0.00	3	\$0	50%	60.5%	49.3%	1.9	3.9	0.5	629,552	658,102	437,082	355,025
229	WholeBld	WholeBld - Com RET	Biz-Custom	Food Sales	Retro	15%	1	0.00	12	\$0	50%	66.3%	55.7%	7.4	14.8	0.7	3,274,712	3,583,956	2,646,924	2,263,641
230	WholeBld_NC	WholeBld - Com NC	Biz-NC	Food Sales	NC	25%	1	0.00	12	\$0	50%	68.0%	68.0%	7.4	14.8	0.7	0	0	0	0
231	Compressed Air	Efficient Air Compressors	Biz-Custom	Food Service	ROB	31%	1,223	0.21	15	\$100	50%	66.3%	56.3%	11.4	22.8	0.7	8,103	8,103	4,381	3,499
232	Compressed Air	Retro-commissioning_Compressed Air Optimization	Biz-Custom	Food Service	Retro	15%	1	0.00	5	\$0	50%	66.3%	56.4%	4.4	8.7	0.6	1,365	1,365	804	591
233	Cooking	Commercial Griddles	Biz-Prescriptive	Food Service	ROB	15%	2,596	0.23	12	\$774	50%	66.3%	51.2%	2.3	4.6	0.6	251,834	251,834	140,237	103,578
234	Cooking	Convection Ovens	Biz-Prescriptive	Food Service	ROB	15%	1,879	0.43	12	\$471	50%	66.3%	62.4%	3.3	6.5	0.7	133,922	133,922	72,253	65,173
235	Cooking	Combination Ovens	Biz-Prescriptive	Food Service	ROB	41%	6,368	0.74	12	\$1,568	50%	66.3%	62.4%	2.9	5.7	0.6	316,841	316,841	170,942	154,191
236	Cooking	Commercial Fryers	Biz-Prescriptive	Food Service	ROB	14%	2,378	0.15	12	\$1,200	50%	66.3%	47.1%	1.3	2.6	0.5	418,987	418,987	243,795	158,446
237	Cooking	Commercial Steam Cookers	Biz-Prescriptive	Food Service	ROB	67%	13,162	3.00	12	\$2,490	50%	66.3%	53.6%	4.3	8.6	0.7	435,928	435,928	247,921	178,416
238	Cooking	Insulated Holding Cabinets (Full Size)	Biz-Prescriptive	Food Service	ROB	69%	5,278	0.80	12	\$1,200	50%	66.3%	52.6%	3.3	6.5	0.7	167,540	214,050	124,548	93,383
239	Cooking	Insulated Holding Cabinets (Half-Size)	Biz-Prescriptive	Food Service	ROB	58%	1,788	0.30	12	\$1,500	50%	66.3%	41.2%	0.9	1.8	0.5	39,390	0	0	0
240	Cooling	Air Conditioner - 16 SEER (5-20 Tons)	Biz-Prescriptive	Food Service	ROB	12%	923	0.99	15	\$720	50%	60.5%	36.0%	2.6	5.2	1.3	52,350	52,350	26,638	13,709
241	Cooling	Air Conditioner - 18 SEER (5-20 Tons)	Biz-Prescriptive	Food Service	ROB	19%	1,392	1.49	15	\$1,200	50%	60.5%	36.0%	2.3	4.7	1.2	71,356	71,356	36,310	18,687
242	Cooling	Air Conditioner - 21 SEER (5-20 Tons)	Biz-Prescriptive	Food Service	ROB	24%	1,797	1.93	15	\$1,680	50%	60.5%	36.0%	2.1	4.3	1.2	84,957	84,957	43,230	22,248
243	Cooling	Air Conditioner - 16 SEER (20+ Tons)	Biz-Prescriptive	Food Service	ROB	8%	1,254	1.35	15	\$3,600	50%	60.5%	36.0%	0.7	1.4	0.8	34,374	0	0	0
244	Cooling	Air Conditioner - 18 SEER (20+ Tons)	Biz-Prescriptive	Food Service	ROB	15%	2,314	2.48	15	\$7,200	50%	60.5%	36.0%	0.6	1.3	0.7	58,578	0	0	0

Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	RAP Incentive (%)	MAP Adoption Rate	RAP Adoption Rate	Measure Level BC Tests			Cumulative Annual Potential			
														TRC	UCT	RIM	15 YR Technical	15 YR Economic	15 YR MAP	15 YR RAP
245	Cooling	Air Conditioner - 21 SEER (20+ Tons)	Biz-Prescriptive	Food Service	ROB	21%	3,224	3.46	15	\$10,800	50%	60.5%	36.0%	0.6	1.2	0.7	75,763	0	0	0
246	Cooling	Comprehensive Rooftop Unit Quality Maintenance (AC Tune-up)	Biz-Custom	Food Service	Retro	6%	383	0.22	3	\$500	50%	60.5%	60.0%	0.2	0.5	0.3	69,818	0	0	0
247	Cooling	Air Side Economizer	Biz-Custom	Food Service	Retro	2%	122	0.01	5	\$170	50%	60.5%	46.4%	0.2	0.4	0.3	25,267	0	0	0
248	Cooling	Advanced Rooftop Controls	Biz-Custom	Food Service	Retro	25%	1,045	0.59	10	\$3,412	50%	60.5%	36.0%	0.3	0.6	0.4	349,091	0	0	0
249	Cooling	Air Conditioner - 16 SEER (<5 Tons)	Biz-Prescriptive	Food Service	ROB	19%	597	0.64	15	\$820	50%	60.5%	36.0%	1.5	2.9	1.1	114,335	158,818	80,814	41,591
250	Cooling	Air Conditioner - 18 SEER(<5 Tons)	Biz-Prescriptive	Food Service	ROB	28%	884	0.95	15	\$1,640	50%	60.5%	36.0%	1.1	2.2	0.9	125,471	174,286	88,685	45,642
251	Cooling	Air Conditioner - 21 SEER(<5 Tons)	Biz-Prescriptive	Food Service	ROB	38%	1,212	1.30	15	\$2,460	50%	60.5%	36.0%	1.0	2.0	0.9	157,325	0	0	0
252	Cooling	Centrifugal Chiller - Average kW/Ton 0.626	Biz-Custom	Food Service	ROB	26%	970	0.43	20	\$2,189	50%	60.5%	36.0%	0.7	1.5	0.6	0	0	0	0
253	Cooling	Reciprocating Chiller - Average kW/Ton 0.99	Biz-Custom	Food Service	ROB	27%	1,212	1.19	20	\$1,755	50%	60.5%	36.0%	1.7	3.4	1.1	0	0	0	0
254	Cooling	Screw Chiller - Average kW/Ton 0.675	Biz-Custom	Food Service	ROB	23%	1,218	1.17	20	\$1,752	50%	60.5%	36.0%	1.7	3.4	1.1	0	0	0	0
255	Cooling	Chiller Tune-up	Biz-Custom	Food Service	Retro	8%	582	0.21	5	\$102	50%	60.5%	60.0%	2.3	4.7	0.7	0	0	0	0
256	Cooling	PTAC - 7,000 to 15,000 Btuh - lodging	Biz-Prescriptive	Food Service	ROB	19%	182	0.16	15	\$86	50%	60.5%	38.8%	3.8	7.5	1.2	0	0	0	0
257	Cooling	HVAC Occupancy Controls	Biz-Prescriptive	Food Service	Retro	5%	1	0.00	12	\$0	50%	60.5%	47.4%	10.8	21.7	1.5	163,249	177,839	91,422	60,335
258	Cooling	Smart Thermostat	Biz-Prescriptive	Food Service	ROB	18%	745	0.00	11	\$175	50%	60.5%	44.7%	2.5	4.7	0.5	15,663	17,210	9,779	6,621
259	Cooling	Window Film	Biz-Custom	Food Service	Retro	4%	256	0.12	10	\$213	50%	60.5%	40.0%	1.0	2.2	0.7	108,802	120,390	63,378	29,537
260	Ext Lighting	LED wallpack (existing W<250)	Biz-Lighting	Food Service	Retro	66%	567	0.00	12	\$248	30%	70.6%	49.8%	1.3	4.3	0.5	94,351	94,351	59,926	35,277
261	Ext Lighting	LED parking lot fixture (existing W≥250)	Biz-Lighting	Food Service	Retro	60%	959	0.00	12	\$756	30%	70.6%	41.4%	0.7	2.4	0.5	86,025	0	0	0
262	Ext Lighting	LED parking lot fixture (existing W<250)	Biz-Lighting	Food Service	Retro	66%	567	0.00	12	\$248	30%	70.6%	49.8%	1.3	4.3	0.5	94,351	94,351	59,926	35,277
263	Ext Lighting	LED outdoor pole decorative fixture (existing W≥250)	Biz-Lighting	Food Service	Retro	60%	959	0.00	12	\$756	30%	70.6%	41.4%	0.7	2.4	0.5	86,025	0	0	0
264	Ext Lighting	LED parking garage fixture (existing W≥250)	Biz-Lighting	Food Service	Retro	60%	1,953	0.00	6	\$756	30%	70.6%	51.2%	0.8	2.6	0.4	88,066	0	0	0
265	Ext Lighting	LED parking garage fixture (existing W<250)	Biz-Lighting	Food Service	Retro	66%	1,154	0.00	6	\$248	30%	70.6%	55.6%	1.4	4.7	0.5	96,589	96,589	61,162	42,984
266	Heating	Heat Pump - 16 SEER (<5 Tons)	Biz-Prescriptive	Food Service	ROB	19%	1,772	0.64	15	\$2,055	50%	60.5%	36.0%	1.0	2.0	0.7	16,570	63,341	32,129	16,535
267	Heating	Heat Pump - 18 SEER(<5 Tons)	Biz-Prescriptive	Food Service	ROB	25%	2,311	0.95	15	\$3,425	50%	60.5%	36.0%	0.8	1.7	0.6	17,752	0	0	0
268	Heating	Heat Pump - 21 SEER(<5 Tons)	Biz-Prescriptive	Food Service	ROB	29%	2,733	1.30	15	\$4,500	50%	60.5%	36.0%	0.8	1.6	0.6	20,099	0	0	0
269	Heating	Geothermal HP - SEER 20.3 (<5 Tons)	Biz-Prescriptive	Food Service	ROB	36%	3,387	1.23	15	\$4,700	50%	60.5%	36.0%	0.8	1.7	0.6	26,541	0	0	0
270	Heating	Geothermal HP - SEER 23.1 (<5 Tons)	Biz-Prescriptive	Food Service	ROB	46%	4,296	1.53	3	\$7,300	50%	60.5%	36.0%	0.1	0.3	0.2	6,039	0	0	0
271	Heating	Geothermal HP - SEER 29.3 (<5 Tons)	Biz-Prescriptive	Food Service	ROB	50%	4,686	1.93	5	\$9,200	50%	60.5%	36.0%	0.2	0.4	0.3	10,113	0	0	0
272	Heating	Heat Pump - 16 SEER (5-20 Tons)	Biz-Prescriptive	Food Service	ROB	9%	3,402	0.99	15	\$4,110	50%	60.5%	36.0%	0.9	1.8	0.6	4,119	0	0	0
273	Heating	Heat Pump - 18 SEER (5-20 Tons)	Biz-Prescriptive	Food Service	ROB	19%	7,051	1.49	15	\$6,850	50%	60.5%	36.0%	1.0	2.1	0.6	9,693	25,559	13,006	6,693
274	Heating	Heat Pump - 21 SEER (5-20 Tons)	Biz-Prescriptive	Food Service	ROB	25%	9,009	1.93	15	\$9,000	50%	60.5%	36.0%	1.0	2.0	0.6	12,074	31,839	16,201	8,338
275	Heating	Geothermal HP - SEER 20.3 (5-20 Tons)	Biz-Prescriptive	Food Service	ROB	25%	3,927	3.62	10	\$7,700	50%	60.5%	36.0%	0.6	1.3	0.7	7,905	0	0	0
276	Heating	Geothermal HP - SEER 23.1 (5-20 Tons)	Biz-Prescriptive	Food Service	ROB	36%	5,758	4.23	20	\$12,800	50%	60.5%	36.0%	1.0	1.9	0.8	12,557	0	0	0
277	Heating	Geothermal HP - SEER 29.3 (5-20 Tons)	Biz-Prescriptive	Food Service	ROB	41%	6,551	5.05	20	\$17,700	50%	60.5%	36.0%	0.8	1.6	0.8	12,063	0	0	0
278	Heating	Heat Pump - 16 SEER (20+ Tons)	Biz-Prescriptive	Food Service	ROB	11%	8,019	1.35	15	\$8,220	50%	60.5%	36.0%	0.9	1.8	0.5	4,364	0	0	0
279	Heating	Heat Pump - 18 SEER (20+ Tons)	Biz-Prescriptive	Food Service	ROB	21%	15,442	2.48	15	\$13,700	50%	60.5%	36.0%	1.1	2.1	0.6	9,623	14,494	7,375	3,796
280	Heating	Heat Pump - 21 SEER (20+ Tons)	Biz-Prescriptive	Food Service	ROB	26%	19,456	3.46	15	\$18,000	50%	60.5%	36.0%	1.0	2.1	0.6	11,879	17,892	9,104	4,686
281	Heating	Geothermal HP - SEER 20.3 (20+ Tons)	Biz-Prescriptive	Food Service	ROB	26%	8,382	7.24	20	\$10,700	50%	60.5%	36.0%	1.8	3.6	1.1	15,549	23,419	11,917	6,133
282	Heating	Geothermal HP - SEER 23.1 (20+ Tons)	Biz-Prescriptive	Food Service	ROB	37%	12,043	8.46	5	\$18,300	50%	60.5%	36.0%	0.4	0.7	0.4	6,213	0	0	0
283	Heating	Geothermal HP - SEER 29.3 (20+ Tons)	Biz-Prescriptive	Food Service	ROB	42%	13,630	10.09	12	\$26,200	50%	60.5%	36.0%	0.7	1.4	0.7	12,943	0	0	0
284	Heating	PTAC - 7,000 to 15,000 Btuh - lodging	Biz-Prescriptive	Food Service	ROB	11%	424	0.08	11	\$175	50%	60.5%	40.2%	1.8	3.5	0.6	0	0	0	0
285	Hot Water	Heat Pump Water Heater	Biz-Prescriptive	Food Service	ROB	35%	1,738	0.10	10	\$1,574	50%	73.1%	44.6%	0.6	1.2	0.4	473,222	0	0	0
286	Hot Water	Hot Water Pipe Insulation	Biz-Prescriptive	Food Service	Retro	2%	101	0.01	20	\$60	50%	84.0%	84.0%	1.9	3.8	0.6	7,812	8,575	3,634	3,634
287	Hot Water	Low Flow Pre-Rinse Sprayers	Biz-Prescriptive	Food Service	ROB	26%	764	0.15	5	\$35	50%	84.0%	84.0%	7.5	15.1	0.7	45,301	63,176	46,329	46,329
288	Hot Water	Faucet Aerator	Biz-Prescriptive	Food Service	Retro	66%	1,425	0.16	10	\$3	50%	84.0%	84.0%	339.2	678.3	0.7	55,000	75,391	32,313	32,313
289	Hot Water	ENERGY STAR Commercial Washing Machines	Biz-Prescriptive	Food Service	ROB	43%	671	0.02	7	\$250	50%	73.1%	55.7%	1.0	2.0	0.5	106,474	147,700	99,541	68,358
290	Int Lighting	LED T8 Tube Replacement	Biz-Lighting	Food Service	Retro	46%	75	0.01	15	\$15	30%	70.6%	55.9%	4.7	15.7	0.7	306,801	306,801	192,590	136,694
291	Int Lighting	LED troffer, 2'X2' and 2'X4'	Biz-Lighting	Food Service	Retro	49%	239	0.04	15	\$80	30%	70.6%	52.6%	2.8	9.5	0.7	197,561	197,561	124,017	79,818
292	Int Lighting	LED high bay fixture	Biz-Lighting	Food Service	Retro	70%	3,020	0.55	15	\$330	30%	70.6%	58.5%	8.7	28.9	0.8	0	0	0	0
293	Int Lighting	LED low bay fixture	Biz-Lighting	Food Service	Retro	63%	574	0.10	15	\$44	30%	70.6%	59.7%	12.3	41.1	0.8	0	0	0	0
294	Int Lighting	LED downlight, screw-in lamp, 4W, interior	Biz-Lighting	Food Service	ROB	83%	84	0.02	15	\$2	30%	70.6%	61.6%	50.1	166.9	0.8	62,491	62,491	36,809	29,556
295	Int Lighting	LED downlight fixture	Biz-Lighting	Food Service	Retro	69%	190	0.04	15	\$27	30%	70.6%	60.0%	6.9	23.0	0.8	15,207	15,207	6,993	4,092
296	Int Lighting	LED downlight, screw-in lamp, 12W, interior	Biz-Lighting	Food Service	ROB	83%	273	0.06	15	\$2	30%	70.6%	62.1%	162.5	541.7	0.8	598,700	598,700	352,654	286,812
297	Int Lighting	DeLamp Fluorescent Fixture Average Lamp Wattage 28W	Biz-Lighting	Food Service	Retro	100%	168	0.03	11	\$12	30%	70.6%	59.8%	10.0	33.3	0.7	76,889	76,889	73,796	65,132
298	Int Lighting	Central Lighting Monitoring & Controls (non-networked)	Biz-Lighting	Food Service	Retro	20%	8,341	1.53	12	\$3,700	30%	70.6%	49.6%	1.7	5.8	0.7	53,944	58,461	55,620	37,881
299	Int Lighting	Daylighting Controls	Biz-Lighting	Food Service	Retro	30%	2,643	0.57	12	\$3,000	30%	70.6%	37.3%	0.7	2.4	0.6	32,866	0	0	0
300	Int Lighting	Network Lighting Controls - Wireless (WiFi)	Biz-Lighting	Food Service	Retro	47%	7,650	2.86	8	\$1,683	30%	70.6%	55.5%	3.0	10.0	0.8	199,620	216,332	215,626	170,842
301	Int Lighting	Occupancy Sensors	Biz-Lighting	Food Service	Retro	30%	457	0.02	8	\$54	30%	70.6%	58.2%	3.7	12.3	0.6	157,298	170,467	169,911	142,601
302	Int Lighting	Bi-Level Lighting Fixture – Stairwells, Hallways, and Garages	Biz-Lighting	Food Service	Retro	50%	517	0.06	10	\$274	30%	70.6%	47.1%	1.1	3.8	0.6	6,797	6,797	6,635	4,284
303	Int Lighting	LED Exit Sign - 4 Watt Fixture (2 lamp)	Biz-Lighting	Food Service	Retro	73%	95	0.01	5	\$33	30%	80.0%	80.0%	0.9	3.0	0.5	1,707	0	0	0
304	Misc	Power Distribution Equipment Upgrades	Biz-Custom	Food Service	Retro	1%	6	0.00	30	\$8	50%	66.3%	37.6%	1.7	3.4	0.8	7,474	7,474	4,316	1,756
305	Motors	Cogged V-Belt	Biz-Custom	Food Service	Retro	3%	534	0.10	15	\$384	50%	66.3%	43.2%	1.3	2.7	0.6	14,687	14,687	9,462	5,655

Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	RAP Incentive (%)	MAP Adoption Rate	RAP Adoption Rate	Measure Level BC Tests			Cumulative Annual Potential			
														TRC	UCT	RIM	15 YR Technical	15 YR Economic	15 YR MAP	15 YR RAP
306	Motors	Pump and Fan Variable Frequency Drive Controls (Pumps)	Biz-Custom	Food Service	Retro	38%	731	0.15	15	\$200	50%	66.3%	51.7%	3.6	7.1	0.7	8,349	8,349	4,663	3,106
307	Plug Loads Office	ENERGY STAR Uninterrupted Power Supply	Biz-Custom	Food Service	ROB	3%	85	0.01	15	\$59	50%	76.0%	76.0%	1.3	2.7	0.6	692	692	434	434
308	Plug Loads Office	Plug Load Occupancy Sensor	Biz-Custom	Food Service	Retro	15%	169	0.00	8	\$70	50%	66.3%	48.9%	1.0	2.0	0.4	145,700	0	0	0
309	Plug Loads Office	Energy Star Server	Biz-Custom	Food Service	ROB	13%	90	0.01	15	\$156	50%	66.3%	36.0%	0.5	1.0	0.4	0	0	0	0
310	Plug Loads Office	Data Center Hot/Cold Aisle Configuration	Biz-Custom	Food Service	Retro	13%	90	0.01	15	\$156	50%	66.3%	36.0%	0.5	1.0	0.4	0	0	0	0
311	Plug Loads Office	Electrically Commutated Plug Fans in data centers	Biz-Custom	Food Service	Retro	18%	15,778	1.80	15	\$480	50%	66.3%	57.7%	28.4	56.8	0.7	0	0	0	0
312	Plug Loads Office	High Efficiency CRAC unit	Biz-Custom	Food Service	ROB	30%	162	0.02	15	\$63	50%	66.3%	49.5%	2.3	4.6	0.6	0	0	0	0
313	Plug Loads Office	Computer Room Air Conditioner Economizer	Biz-Custom	Food Service	Retro	86%	358	0.00	15	\$82	50%	66.3%	52.6%	3.2	6.3	0.5	0	0	0	0
314	Refrigeration	Strip Curtains	Biz-Prescriptive	Food Service	Retro	81%	270	0.03	4	\$9	50%	56.7%	48.3%	7.3	14.6	0.6	506,919	506,919	223,728	168,655
315	Refrigeration	Bare Suction Line	Biz-Custom	Food Service	Retro	93%	21	0.00	15	\$4	50%	56.7%	40.0%	4.5	8.9	0.7	45,098	45,098	19,725	10,122
316	Refrigeration	Floating Head Pressure Controls	Biz-Prescriptive	Food Service	Retro	50%	1,327	0.15	15	\$80	50%	56.7%	46.9%	14.0	28.1	0.7	393,307	393,307	172,648	123,075
317	Refrigeration	Saturated Suction Controls	Biz-Custom	Food Service	Retro	50%	416	0.18	15	\$559	50%	56.7%	40.0%	0.9	1.8	0.7	122,293	0	0	0
318	Refrigeration	Compressor Retrofit	Biz-Custom	Food Service	Retro	20%	163	0.07	15	\$477	50%	56.7%	32.0%	0.4	0.8	0.5	290,872	0	0	0
319	Refrigeration	Electronically Commutated (EC) Walk-In Evaporator Fan Motor	Biz-Custom	Food Service	Retro	65%	824	0.09	15	\$78	50%	56.7%	46.4%	8.9	17.9	0.7	261,489	261,489	99,627	61,669
320	Refrigeration	Evaporator Fan Motor Controls	Biz-Custom	Food Service	Retro	25%	478	0.06	13	\$291	50%	56.7%	28.0%	1.2	2.5	0.5	103,110	104,418	58,134	23,229
321	Refrigeration	Variable Speed Condenser Fan	Biz-Custom	Food Service	Retro	50%	1,480	0.00	15	\$1,170	50%	56.7%	36.0%	0.9	1.8	0.4	262,560	0	0	0
322	Refrigeration	Refrigeration Economizer	Biz-Custom	Food Service	Retro	2%	1,357	0.00	15	\$2,558	50%	56.7%	36.0%	0.4	0.8	0.3	5,062	0	0	0
323	Refrigeration	Anti-Sweat Heater Controls MT	Biz-Custom	Food Service	Retro	55%	722	0.00	12	\$250	50%	56.7%	46.4%	1.7	3.4	0.5	1,305,399	1,305,399	505,192	312,529
324	Refrigeration	Auto Door Closer, Cooler	Biz-Custom	Food Service	Retro	0%	943	0.14	8	\$157	50%	56.7%	46.4%	3.0	6.0	0.6	3,417	3,417	1,308	809
325	Refrigeration	Display Case Door Retrofit, Medium Temp	Biz-Prescriptive	Food Service	Retro	36%	578	0.09	12	\$686	50%	64.0%	64.0%	0.6	1.2	0.5	60,405	0	0	0
326	Refrigeration	Electronically Commutated (EC) Reach-In Evaporator Fan Motor	Biz-Custom	Food Service	Retro	65%	824	0.09	15	\$78	50%	56.7%	46.4%	8.9	17.9	0.7	222,334	222,334	84,025	51,981
327	Refrigeration	Q-Sync Motor for Walk-In and Reach-In Evaporator Fan Motor	Biz-Custom	Food Service	Retro	51%	504	0.06	10	\$96	50%	56.7%	46.4%	3.1	6.2	0.6	62,784	62,784	24,210	14,977
328	Refrigeration	Energy Star Reach-In Refrigerator, Glass Doors	Biz-Prescriptive	Food Service	ROB	27%	410	0.05	12	\$600	50%	64.0%	64.0%	0.5	0.9	0.4	630,617	0	0	0
329	Refrigeration	Energy Star Reach-In Refrigerator, Solid Doors	Biz-Prescriptive	Food Service	ROB	25%	283	0.03	12	\$600	50%	64.0%	64.0%	0.3	0.7	0.3	605,164	0	0	0
330	Refrigeration	Anti-Sweat Heater Controls LT	Biz-Custom	Food Service	Retro	36%	578	0.09	12	\$686	50%	56.7%	46.4%	0.6	1.2	0.5	288,690	0	0	0
331	Refrigeration	Auto Door Closer, Freezer	Biz-Custom	Food Service	Retro	1%	2,307	0.31	8	\$157	50%	56.7%	46.5%	7.3	14.5	0.7	4,411	4,411	1,689	1,049
332	Refrigeration	Display Case Door Retrofit, Low Temp	Biz-Prescriptive	Food Service	Retro	50%	1,453	0.23	12	\$686	50%	64.0%	64.0%	1.6	3.1	0.6	94,616	94,616	27,373	27,373
333	Refrigeration	Energy Star Reach-In Freezer, Glass Doors	Biz-Prescriptive	Food Service	ROB	15%	488	0.06	12	\$450	50%	64.0%	64.0%	0.8	1.5	0.5	119,605	0	0	0
334	Refrigeration	Energy Star Reach-In Freezer, Solid Doors	Biz-Prescriptive	Food Service	ROB	20%	935	0.11	12	\$450	50%	64.0%	64.0%	1.4	2.9	0.6	158,492	158,492	79,501	79,501
335	Refrigeration	Retro-commissioning_Refrigerator Optimization	Biz-Custom	Food Service	Retro	3%	1	0.00	3	\$0	50%	56.7%	45.3%	2.2	4.3	0.5	201,819	201,819	109,566	83,389
336	Refrigeration	Energy Star Ice Machine	Biz-Prescriptive	Food Service	ROB	10%	721	0.07	15	\$1,426	50%	59.2%	59.2%	0.4	0.8	0.4	93,463	0	0	0
337	Refrigeration	LED Refrigerated Display Case Lighting Average 6W/LF	Biz-Lighting	Food Service	Retro	37%	574	0.13	12	\$1,010	50%	56.7%	46.4%	0.5	0.9	0.4	688,518	0	0	0
338	Ventilation	Demand Controlled Ventilation (DCV) Exhaust Hood	Biz-Custom	Food Service	ROB	50%	1	0.00	20	\$2	50%	60.5%	39.2%	0.8	1.4	0.4	171,502	0	0	0
339	Ventilation	Pump and Fan Variable Frequency Drive Controls (Fans)	Biz-Custom	Food Service	Retro	41%	923	0.19	15	\$375	50%	60.5%	40.4%	2.4	4.8	0.7	1,213,935	1,213,935	585,056	275,571
340	Ventilation	Demand Control Ventilation	Biz-Custom	Food Service	Retro	20%	488	0.06	15	\$227	50%	60.5%	39.0%	1.9	3.7	0.6	530,993	530,993	333,429	205,109
341	WholeBld_HVAC	HVAC - Energy Management System	Biz-Custom	Food Service	Retro	15%	1,044	0.05	15	\$4,000	50%	60.5%	28.0%	0.2	0.4	0.2	1,143,759	0	0	0
342	WholeBld_HVAC	GREM Controls	Biz-Custom	Food Service	Retro	0%	0	0.00	8	\$0	0%	60.5%	53.4%	0.0	#DIV/0	0.0	0	0	0	0
343	WholeBld_HVAC	Retro-commissioning_Bld Optimization	Biz-Custom	Food Service	Retro	15%	1	0.00	3	\$0	50%	60.5%	49.3%	2.0	3.9	0.6	538,992	577,117	379,672	308,441
344	WholeBld	WholeBldg - Com RET	Biz-Custom	Food Service	Retro	15%	1	0.00	12	\$0	50%	66.3%	55.7%	7.4	14.9	0.7	1,272,896	1,396,173	1,022,546	873,087
345	WholeBld_NC	WholeBldg - Com NC	Biz-NC	Food Service	NC	25%	1	0.00	12	\$0	50%	68.0%	68.0%	7.4	14.9	0.7	0	0	0	0
346	Compressed Air	Efficient Air Compressors	Biz-Custom	Health	ROB	31%	1,223	0.21	15	\$100	50%	66.3%	56.3%	11.5	23.1	0.8	0	0	0	0
347	Compressed Air	Retro-commissioning_Compressed Air Optimization	Biz-Custom	Health	Retro	15%	1	0.00	5	\$0	50%	66.3%	56.4%	4.4	8.9	0.7	0	0	0	0
348	Cooking	Commercial Griddles	Biz-Prescriptive	Health	ROB	15%	2,596	0.23	12	\$774	50%	66.3%	51.2%	2.3	4.5	0.6	106,432	106,432	59,268	43,775
349	Cooking	Convection Ovens	Biz-Prescriptive	Health	ROB	15%	1,879	0.43	12	\$471	50%	66.3%	62.4%	3.2	6.5	0.7	56,626	56,626	30,551	27,557
350	Cooking	Combination Ovens	Biz-Prescriptive	Health	ROB	41%	6,368	0.74	12	\$1,568	50%	66.3%	62.4%	2.8	5.7	0.6	133,834	133,834	72,206	65,131
351	Cooking	Commercial Fryers	Biz-Prescriptive	Health	ROB	14%	2,378	0.15	12	\$1,200	50%	66.3%	47.1%	1.3	2.6	0.5	177,076	177,076	103,035	66,964
352	Cooking	Commercial Steam Cookers	Biz-Prescriptive	Health	ROB	67%	13,162	3.00	12	\$2,490	50%	66.3%	53.6%	4.3	8.6	0.7	184,236	184,236	104,779	75,404
353	Cooking	Insulated Holding Cabinets (Full Size)	Biz-Prescriptive	Health	ROB	69%	5,278	0.80	12	\$1,200	50%	66.3%	52.6%	3.2	6.5	0.7	70,805	90,464	52,638	39,467
354	Cooking	Insulated Holding Cabinets (Half-Size)	Biz-Prescriptive	Health	ROB	58%	1,788	0.30	12	\$1,500	50%	66.3%	41.2%	0.9	1.8	0.5	16,650	0	0	0
355	Cooling	Air Conditioner - 16 SEER (5-20 Tons)	Biz-Prescriptive	Health	ROB	12%	1,740	0.99	15	\$720	50%	60.5%	40.2%	3.4	6.8	1.0	393,597	393,597	193,393	115,660
356	Cooling	Air Conditioner - 18 SEER (5-20 Tons)	Biz-Prescriptive	Health	ROB	19%	2,622	1.49	15	\$1,200	50%	60.5%	39.1%	3.1	6.2	1.0	536,502	536,502	263,609	151,928
357	Cooling	Air Conditioner - 21 SEER (5-20 Tons)	Biz-Prescriptive	Health	ROB	24%	3,385	1.93	15	\$1,680	50%	60.5%	38.1%	2.8	5.7	1.0	638,758	638,758	325,031	181,100
358	Cooling	Air Conditioner - 16 SEER (20+ Tons)	Biz-Prescriptive	Health	ROB	8%	2,362	1.35	15	\$3,600	50%	60.5%	36.0%	0.9	1.9	0.7	258,444	0	0	0
359	Cooling	Air Conditioner - 18 SEER (20+ Tons)	Biz-Prescriptive	Health	ROB	15%	4,360	2.48	15	\$7,200	50%	60.5%	36.0%	0.9	1.7	0.7	440,425	0	0	0
360	Cooling	Air Conditioner - 21 SEER (20+ Tons)	Biz-Prescriptive	Health	ROB	21%	6,073	3.46	15	\$10,800	50%	60.5%	36.0%	0.8	1.6	0.7	569,631	0	0	0
361	Cooling	Comprehensive Rooftop Unit Quality Maintenance (AC Tune-up)	Biz-Custom	Health	Retro	6%	3,353	1.60	3	\$500	50%	60.5%	60.0%	1.8	3.7	0.7	519,422	535,693	155,151	150,614
362	Cooling	Air Side Economizer	Biz-Custom	Health	Retro	2%	145	0.01	5	\$170	50%	60.5%	46.4%	0.3	0.5	0.3	187,732	0	0	0
363	Cooling	Advanced Rooftop Controls	Biz-Custom	Health	Retro	33%	1,642	0.78	10	\$3,412	50%	60.5%	36.0%	0.4	0.9	0.5	3,431,615	0	0	0
364	Cooling	Air Conditioner - 16 SEER (<5 Tons)	Biz-Prescriptive	Health	ROB	19%	1,124	0.64	15	\$820	50%	60.5%	36.0%	1.9	3.9	0.9	0	0	0	0
365	Cooling	Air Conditioner - 18 SEER (<5 Tons)	Biz-Prescriptive	Health	ROB	28%	1,665	0.95	15	\$1,640	50%	60.5%	36.0%	1.4	2.9	0.8	0	0	0	0
366	Cooling	Air Conditioner - 21 SEER (<5 Tons)	Biz-Prescriptive	Health	ROB	38%	2,284	1.30	15	\$2,460	50%	60.5%	36.0%	1.3	2.6	0.8	0	0	0	0

Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	RAP Incentive (%)	MAP Adoption Rate	RAP Adoption Rate	Measure Level BC Tests			Cumulative Annual Potential			
														TRC	UCT	RIM	15 YR Technical	15 YR Economic	15 YR MAP	15 YR RAP
367	Cooling	Centrifugal Chiller - Average kW/Ton 0.626	Biz-Custom	Health	ROB	26%	8,488	3.78	20	\$19,158	50%	60.5%	36.0%	0.7	1.5	0.6	1,370,011	0	0	0
368	Cooling	Reciprocating Chiller - Average kW/Ton 0.99	Biz-Custom	Health	ROB	27%	10,611	10.44	20	\$15,359	50%	60.5%	36.0%	1.7	3.5	1.1	1,193,867	1,193,867	607,496	312,646
369	Cooling	Screw Chiller - Average kW/Ton 0.675	Biz-Custom	Health	ROB	23%	10,659	10.27	20	\$15,329	50%	60.5%	36.0%	1.7	3.4	1.1	0	0	0	0
370	Cooling	Chiller Tune-up	Biz-Custom	Health	Retro	8%	5,093	1.54	5	\$750	50%	60.5%	60.0%	2.6	5.3	0.7	436,104	436,104	122,783	118,669
371	Cooling	PTAC - 7,000 to 15,000 Btuh - lodging	Biz-Prescriptive	Health	ROB	19%	217	0.16	15	\$87	50%	60.5%	40.5%	4.0	8.0	1.1	0	0	0	0
372	Cooling	HVAC Occupancy Controls	Biz-Prescriptive	Health	Retro	5%	1	0.00	12	\$0	50%	60.5%	47.4%	8.6	17.1	1.2	991,777	1,122,153	582,292	383,638
373	Cooling	Smart Thermostat	Biz-Prescriptive	Health	ROB	18%	886	0.00	11	\$175	50%	60.5%	45.6%	2.9	5.6	0.5	135,834	155,727	89,300	62,125
374	Cooling	Window Film	Biz-Custom	Health	Retro	4%	2,083	1.01	10	\$1,735	50%	60.5%	40.0%	1.0	2.2	0.7	608,475	705,555	375,027	174,445
375	Ext Lighting	LED wallpack (existing W<250)	Biz-Lighting	Health	Retro	66%	567	0.00	12	\$248	30%	70.6%	49.8%	1.3	4.3	0.5	425,854	425,854	274,532	166,624
376	Ext Lighting	LED parking lot fixture (existing W>250)	Biz-Lighting	Health	Retro	60%	959	0.00	12	\$756	30%	70.6%	41.4%	0.7	2.4	0.5	388,274	0	0	0
377	Ext Lighting	LED parking lot fixture (existing W<250)	Biz-Lighting	Health	Retro	66%	567	0.00	12	\$248	30%	70.6%	49.8%	1.3	4.3	0.5	425,854	425,854	274,532	166,624
378	Ext Lighting	LED outdoor pole decorative fixture (existing W>250)	Biz-Lighting	Health	Retro	60%	959	0.00	12	\$756	30%	70.6%	41.4%	0.7	2.4	0.5	388,274	0	0	0
379	Ext Lighting	LED parking garage fixture (existing W>250)	Biz-Lighting	Health	Retro	60%	1,953	0.00	6	\$756	30%	70.6%	51.2%	0.8	2.6	0.4	397,516	0	0	0
380	Ext Lighting	LED parking garage fixture (existing W<250)	Biz-Lighting	Health	Retro	66%	1,154	0.00	6	\$248	30%	70.6%	55.6%	1.4	4.7	0.5	435,990	435,990	280,619	200,918
381	Heating	Heat Pump - 16 SEER (<5 Tons)	Biz-Prescriptive	Health	ROB	19%	1,843	0.64	15	\$2,055	50%	60.5%	36.0%	1.0	2.1	0.6	0	0	0	0
382	Heating	Heat Pump - 18 SEER(<5 Tons)	Biz-Prescriptive	Health	ROB	26%	2,538	0.95	15	\$3,425	50%	60.5%	36.0%	0.9	1.7	0.6	0	0	0	0
383	Heating	Heat Pump - 21 SEER(<5 Tons)	Biz-Prescriptive	Health	ROB	33%	3,214	1.30	15	\$4,500	50%	60.5%	36.0%	0.9	1.7	0.6	0	0	0	0
384	Heating	Geothermal HP - SEER 20.3 (<5 Tons)	Biz-Prescriptive	Health	ROB	36%	3,534	1.23	15	\$4,700	50%	60.5%	36.0%	0.9	1.7	0.6	0	0	0	0
385	Heating	Geothermal HP - SEER 23.1 (<5 Tons)	Biz-Prescriptive	Health	ROB	45%	4,443	1.53	3	\$7,300	50%	60.5%	36.0%	0.1	0.3	0.2	0	0	0	0
386	Heating	Geothermal HP - SEER 29.3 (<5 Tons)	Biz-Prescriptive	Health	ROB	53%	5,156	1.93	5	\$9,200	50%	60.5%	36.0%	0.2	0.5	0.3	0	0	0	0
387	Heating	Heat Pump - 16 SEER (5-20 Tons)	Biz-Prescriptive	Health	ROB	10%	3,256	0.99	15	\$4,110	50%	60.5%	36.0%	0.9	1.7	0.6	8,530	0	0	0
388	Heating	Heat Pump - 18 SEER (5-20 Tons)	Biz-Prescriptive	Health	ROB	19%	6,085	1.49	15	\$6,850	50%	60.5%	36.0%	0.9	1.8	0.6	16,720	0	0	0
389	Heating	Heat Pump - 21 SEER (5-20 Tons)	Biz-Prescriptive	Health	ROB	25%	7,798	1.93	15	\$9,000	50%	60.5%	36.0%	0.9	1.8	0.6	20,944	0	0	0
390	Heating	Geothermal HP - SEER 20.3 (5-20 Tons)	Biz-Prescriptive	Health	ROB	35%	6,695	3.62	10	\$7,700	50%	60.5%	36.0%	0.8	1.7	0.7	27,849	0	0	0
391	Heating	Geothermal HP - SEER 23.1 (5-20 Tons)	Biz-Prescriptive	Health	ROB	44%	8,535	4.23	20	\$12,800	50%	60.5%	36.0%	1.2	2.3	0.8	36,682	178,356	90,756	46,707
392	Heating	Geothermal HP - SEER 29.3 (5-20 Tons)	Biz-Prescriptive	Health	ROB	52%	9,989	5.05	20	\$17,700	50%	60.5%	36.0%	1.0	2.0	0.7	36,653	0	0	0
393	Heating	Heat Pump - 16 SEER (20+ Tons)	Biz-Prescriptive	Health	ROB	10%	6,501	1.35	15	\$8,220	50%	60.5%	36.0%	0.8	1.5	0.5	6,847	0	0	0
394	Heating	Heat Pump - 18 SEER (20+ Tons)	Biz-Prescriptive	Health	ROB	19%	12,392	2.48	15	\$13,700	50%	60.5%	36.0%	0.9	1.8	0.5	14,807	0	0	0
395	Heating	Heat Pump - 21 SEER (20+ Tons)	Biz-Prescriptive	Health	ROB	25%	16,004	3.46	15	\$18,000	50%	60.5%	36.0%	0.9	1.8	0.6	19,164	0	0	0
396	Heating	Geothermal HP - SEER 20.3 (20+ Tons)	Biz-Prescriptive	Health	ROB	35%	13,714	7.24	20	\$10,700	50%	60.5%	36.0%	2.3	4.6	0.9	53,456	142,103	72,309	37,214
397	Heating	Geothermal HP - SEER 23.1 (20+ Tons)	Biz-Prescriptive	Health	ROB	45%	17,393	8.46	5	\$18,300	50%	60.5%	36.0%	0.4	0.9	0.5	18,013	0	0	0
398	Heating	Geothermal HP - SEER 29.3 (20+ Tons)	Biz-Prescriptive	Health	ROB	52%	20,302	10.09	12	\$26,200	50%	60.5%	36.0%	0.8	1.7	0.7	38,931	0	0	0
399	Heating	PTAC - 7,000 to 15,000 Btuh - lodging	Biz-Prescriptive	Health	ROB	11%	351	0.08	11	\$175	50%	60.5%	38.1%	1.5	3.0	0.6	0	0	0	0
400	Hot Water	Heat Pump Water Heater	Biz-Prescriptive	Health	ROB	35%	5,460	0.33	10	\$1,574	50%	73.1%	57.3%	1.9	3.9	0.6	243,819	243,819	161,482	114,626
401	Hot Water	Hot Water Pipe Insulation	Biz-Prescriptive	Health	Retro	2%	316	0.04	20	\$60	50%	84.0%	84.0%	6.1	12.2	0.7	4,208	4,208	1,908	1,920
402	Hot Water	Low Flow Pre-Rinse Sprayers	Biz-Prescriptive	Health	ROB	26%	764	0.15	5	\$35	50%	84.0%	84.0%	7.6	15.3	0.7	24,684	24,684	21,797	22,685
403	Hot Water	Faucet Aerator	Biz-Prescriptive	Health	Retro	66%	200	0.02	10	\$3	50%	84.0%	84.0%	48.3	96.5	0.7	29,944	29,944	15,561	16,077
404	Hot Water	ENERGY STAR Commercial Washing Machines	Biz-Prescriptive	Health	ROB	43%	671	0.02	7	\$250	50%	73.1%	55.7%	1.0	2.1	0.5	57,999	57,999	47,715	33,901
405	Int Lighting	LED T8 Tube Replacement	Biz-Lighting	Health	Retro	47%	81	0.01	15	\$15	30%	70.6%	56.4%	4.7	15.8	0.7	5,786,148	5,786,148	3,689,162	2,695,380
406	Int Lighting	LED troffer, 2'X2' and 2'X4'	Biz-Lighting	Health	Retro	50%	260	0.03	15	\$80	30%	70.6%	53.3%	2.9	9.5	0.7	3,719,827	3,719,827	2,362,463	1,589,051
407	Int Lighting	LED high bay fixture	Biz-Lighting	Health	Retro	71%	3,292	0.40	15	\$330	30%	70.6%	58.8%	8.7	29.1	0.7	136,605	136,605	87,097	67,708
408	Int Lighting	LED low bay fixture	Biz-Lighting	Health	Retro	64%	626	0.08	15	\$44	30%	70.6%	59.9%	12.4	41.5	0.7	123,021	123,021	78,436	62,511
409	Int Lighting	LED downlight, screw-in lamp, 4W, interior	Biz-Lighting	Health	ROB	83%	78	0.01	15	\$2	30%	70.6%	61.6%	43.9	146.5	0.8	591,455	591,455	348,386	279,336
410	Int Lighting	LED downlight fixture	Biz-Lighting	Health	ROB	70%	176	0.03	15	\$27	30%	70.6%	60.0%	6.0	20.2	0.7	72,478	72,478	33,332	19,504
411	Int Lighting	LED downlight, screw-in lamp, 12W, interior	Biz-Lighting	Health	ROB	83%	254	0.04	15	\$2	30%	70.6%	62.1%	142.6	475.3	0.8	2,833,389	2,833,389	1,668,956	1,356,763
412	Int Lighting	DeLamp Fluorescent Fixture Average Lamp Wattage 28W	Biz-Lighting	Health	Retro	100%	184	0.02	11	\$12	30%	70.6%	60.0%	10.1	33.6	0.7	1,408,181	1,408,181	1,293,779	1,151,056
413	Int Lighting	Central Lighting Monitoring & Controls (non-networked)	Biz-Lighting	Health	Retro	20%	8,341	1.53	12	\$3,700	30%	70.6%	49.6%	1.7	5.8	0.7	576,975	625,259	578,364	395,452
414	Int Lighting	Daylighting Controls	Biz-Lighting	Health	Retro	30%	2,643	0.57	12	\$3,000	30%	70.6%	37.3%	0.7	2.4	0.6	351,461	0	0	0
415	Int Lighting	Network Lighting Controls - Wireless (WiFi)	Biz-Lighting	Health	Retro	47%	7,650	2.86	8	\$1,683	30%	70.6%	55.5%	3.0	10.0	0.8	2,135,126	2,313,802	2,225,229	1,774,592
416	Int Lighting	Occupancy Sensors	Biz-Lighting	Health	Retro	30%	457	0.02	8	\$54	30%	70.6%	58.2%	3.7	12.4	0.6	1,686,033	1,827,127	1,757,185	1,484,395
417	Int Lighting	Bi-Level Lighting Fixture – Stairwells, Hallways, and Garages	Biz-Lighting	Health	Retro	50%	517	0.06	10	\$274	30%	70.6%	47.1%	1.1	3.8	0.6	1,271,039	1,271,039	1,201,099	779,697
418	Int Lighting	LED Exit Sign - 4 Watt Fixture (2 lamp)	Biz-Lighting	Health	Retro	74%	100	0.01	5	\$33	30%	80.0%	80.0%	1.0	3.3	0.5	21,636	0	0	0
419	Misc	Power Distribution Equipment Upgrades	Biz-Custom	Health	Retro	1%	6	0.00	30	\$8	50%	66.3%	37.6%	1.7	3.4	0.8	26,360	26,360	15,224	6,193
420	Motors	Cogged V-Belt	Biz-Custom	Health	Retro	3%	534	0.10	15	\$384	50%	66.3%	43.2%	1.3	2.7	0.6	28,415	28,415	18,305	10,941
421	Motors	Pump and Fan Variable Frequency Drive Controls (Pumps)	Biz-Custom	Health	Retro	38%	731	0.15	15	\$200	50%	66.3%	51.7%	3.6	7.2	0.7	2,046,103	2,046,103	1,142,826	761,183
422	Plug Loads Office	ENERGY STAR Uninterrupted Power Supply	Biz-Custom	Health	ROB	3%	85	0.01	15	\$59	50%	76.0%	76.0%	1.4	2.7	0.6	4,186	4,186	2,623	2,623
423	Plug Loads Office	Plug Load Occupancy Sensor	Biz-Custom	Health	Retro	15%	169	0.00	8	\$70	50%	66.3%	48.9%	1.0	2.0	0.5	1,981,599	1,981,599	1,292,599	900,038
424	Plug Loads Office	Energy Star Server	Biz-Custom	Health	ROB	13%	90	0.01	15	\$156	50%	66.3%	36.0%	0.5	1.0	0.4	257,253	0	0	0
425	Plug Loads Office	Data Center Hot/Cold Aisle Configuration	Biz-Custom	Health	Retro	13%	90	0.01	15	\$156	50%	66.3%	36.0%	0.5	1.0	0.4	231,992	0	0	0
426	Plug Loads Office	Electrically Commutated Plug Fans in data centers	Biz-Custom	Health	Retro	18%	15,778	1.80	15	\$480	50%	66.3%	57.7%	28.8	57.6	0.7	1,540,326	1,540,326	793,479	606,413
427	Plug Loads Office	High Efficiency CRAC unit	Biz-Custom	Health	ROB	30%	162	0.02	15	\$63	50%	66.3%	49.5%	2.3	4.7	0.6	248,970	248,970	138,404	91,647

Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	RAP Incentive (%)	MAP Adoption Rate	RAP Adoption Rate	Measure Level BC Tests			Cumulative Annual Potential			
														TRC	UCT	RIM	15 YR Technical	15 YR Economic	15 YR MAP	15 YR RAP
428	Plug Loads Office	Computer Room Air Conditioner Economizer	Biz-Custom	Health	Retro	86%	358	0.00	15	\$82	50%	66.3%	52.6%	3.2	6.5	0.6	812,676	812,676	417,467	260,680
429	Refrigeration	Strip Curtains	Biz-Prescriptive	Health	Retro	81%	270	0.03	4	\$9	50%	56.7%	48.3%	7.3	14.6	0.6	253,192	253,192	111,746	84,239
430	Refrigeration	Bare Suction Line	Biz-Custom	Health	Retro	93%	21	0.00	15	\$4	50%	56.7%	40.0%	4.5	8.9	0.7	22,525	22,525	9,852	5,055
431	Refrigeration	Floating Head Pressure Controls	Biz-Prescriptive	Health	Retro	50%	1,327	0.15	15	\$80	50%	56.7%	46.9%	14.0	28.1	0.7	196,446	196,446	86,233	61,472
432	Refrigeration	Saturated Suction Controls	Biz-Custom	Health	Retro	50%	416	0.18	15	\$559	50%	56.7%	40.0%	0.9	1.8	0.7	61,082	0	0	0
433	Refrigeration	Compressor Retrofit	Biz-Custom	Health	Retro	20%	163	0.07	15	\$477	50%	56.7%	32.0%	0.4	0.8	0.5	145,283	0	0	0
434	Refrigeration	Electronically Commutated (EC) Walk-In Evaporator Fan Motor	Biz-Custom	Health	Retro	65%	824	0.09	15	\$78	50%	56.7%	46.4%	8.9	17.9	0.7	130,606	130,606	49,761	30,802
435	Refrigeration	Evaporator Fan Motor Controls	Biz-Custom	Health	Retro	25%	478	0.06	13	\$291	50%	56.7%	28.0%	1.2	2.5	0.5	51,500	52,154	29,036	11,602
436	Refrigeration	Variable Speed Condenser Fan	Biz-Custom	Health	Retro	50%	1,480	0.00	15	\$1,170	50%	56.7%	36.0%	0.9	1.8	0.4	131,141	0	0	0
437	Refrigeration	Refrigeration Economizer	Biz-Custom	Health	Retro	2%	1,357	0.00	15	\$2,558	50%	56.7%	36.0%	0.4	0.8	0.3	2,528	0	0	0
438	Refrigeration	Anti-Sweat Heater Controls MT	Biz-Custom	Health	Retro	55%	722	0.00	12	\$250	50%	56.7%	46.4%	1.7	3.4	0.5	652,010	652,010	252,329	156,099
439	Refrigeration	Auto Door Closer, Cooler	Biz-Custom	Health	Retro	0%	943	0.14	8	\$157	50%	56.7%	46.4%	3.0	6.0	0.6	1,707	1,707	654	404
440	Refrigeration	Display Case Door Retrofit, Medium Temp	Biz-Prescriptive	Health	Retro	36%	578	0.09	12	\$686	50%	64.0%	64.0%	0.6	1.2	0.5	30,170	0	0	0
441	Refrigeration	Electronically Commutated (EC) Reach-In Evaporator Fan Motor	Biz-Custom	Health	Retro	65%	824	0.09	15	\$78	50%	56.7%	46.4%	8.9	17.9	0.7	111,050	111,050	41,968	25,963
442	Refrigeration	Q-Sync Motor for Walk-in and Reach-in Evaporator Fan Motor	Biz-Custom	Health	Retro	51%	504	0.06	10	\$96	50%	56.7%	46.4%	3.1	6.2	0.6	31,359	31,359	12,092	7,481
443	Refrigeration	Energy Star Reach-In Refrigerator, Glass Doors	Biz-Prescriptive	Health	ROB	27%	410	0.05	12	\$600	50%	64.0%	64.0%	0.5	0.9	0.4	314,975	0	0	0
444	Refrigeration	Energy Star Reach-In Refrigerator, Solid Doors	Biz-Prescriptive	Health	ROB	25%	283	0.03	12	\$600	50%	64.0%	64.0%	0.3	0.7	0.3	302,262	0	0	0
445	Refrigeration	Anti-Sweat Heater Controls LT	Biz-Custom	Health	Retro	36%	578	0.09	12	\$686	50%	56.7%	46.4%	0.6	1.2	0.5	144,193	0	0	0
446	Refrigeration	Auto Door Closer, Freezer	Biz-Custom	Health	Retro	1%	2,307	0.31	8	\$157	50%	56.7%	46.5%	7.3	14.5	0.7	2,203	2,203	844	524
447	Refrigeration	Display Case Door Retrofit, Low Temp	Biz-Prescriptive	Health	Retro	50%	1,453	0.23	12	\$686	50%	64.0%	64.0%	1.6	3.1	0.6	47,258	47,258	13,672	13,672
448	Refrigeration	Energy Star Reach-In Freezer, Glass Doors	Biz-Prescriptive	Health	ROB	15%	488	0.06	12	\$450	50%	64.0%	64.0%	0.8	1.5	0.5	59,739	0	0	0
449	Refrigeration	Energy Star Reach-In Freezer, Solid Doors	Biz-Prescriptive	Health	ROB	20%	935	0.11	12	\$450	50%	64.0%	64.0%	1.4	2.9	0.6	79,162	79,162	39,709	39,709
450	Refrigeration	Retro-commissioning_Refrigerator Optimization	Biz-Custom	Health	Retro	3%	1	0.00	3	\$0	50%	56.7%	45.3%	2.2	4.3	0.5	100,803	100,803	54,725	41,651
451	Refrigeration	Energy Star Ice Machine	Biz-Prescriptive	Health	ROB	10%	721	0.07	15	\$1,426	50%	59.2%	59.2%	0.4	0.8	0.4	52,500	0	0	0
452	Refrigeration	LED Refrigerated Display Case Lighting Average 6W/LF	Biz-Lighting	Health	Retro	37%	574	0.13	12	\$1,010	50%	56.7%	46.4%	0.5	0.9	0.4	343,895	0	0	0
453	Ventilation	Demand Controlled Ventilation (DCV) Exhaust Hood	Biz-Custom	Health	ROB	50%	3	0.00	20	\$2	50%	60.5%	39.2%	1.7	3.4	0.6	2,239,622	2,239,622	1,150,991	645,238
454	Ventilation	Pump and Fan Variable Frequency Drive Controls (Fans)	Biz-Custom	Health	Retro	41%	923	0.19	15	\$375	50%	60.5%	40.4%	2.4	4.9	0.7	8,906,527	8,906,527	4,292,502	2,021,856
455	Ventilation	Demand Control Ventilation	Biz-Custom	Health	Retro	20%	486	0.10	15	\$227	50%	60.5%	38.9%	2.2	4.2	0.7	4,460,116	4,460,116	2,800,666	1,719,559
456	WholeBld_HVAC	HVAC - Energy Management System	Biz-Custom	Health	Retro	15%	1,044	0.05	15	\$4,000	50%	60.5%	28.0%	0.2	0.4	0.3	7,924,206	0	0	0
457	WholeBld_HVAC	GREM Controls	Biz-Custom	Health	Retro	0%	0	0.00	8	\$0	0%	60.5%	53.4%	0.0	#DIV/0	0.0	4,000,570	0	0	0
458	WholeBld_HVAC	Retro-commissioning_Bld Optimization	Biz-Custom	Health	Retro	15%	1	0.00	3	\$0	50%	60.5%	49.3%	2.0	4.0	0.6	3,694,070	3,959,752	2,647,230	2,154,739
459	WholeBld	WholeBldg - Com RET	Biz-Custom	Health	Retro	15%	1	0.00	12	\$0	50%	66.3%	55.7%	7.5	15.1	0.7	4,002,970	4,339,837	3,334,844	2,887,280
460	WholeBld_NC	WholeBldg - Com NC	Biz-NC	Health	NC	25%	1	0.00	12	\$0	50%	68.0%	68.0%	7.5	15.1	0.7	0	0	0	0
461	Compressed Air	Efficient Air Compressors	Biz-Custom	Lodging	ROB	31%	1,223	0.21	15	\$100	50%	66.3%	56.3%	11.3	22.5	0.7	0	0	0	0
462	Compressed Air	Retro-commissioning_Compressed Air Optimization	Biz-Custom	Lodging	Retro	15%	1	0.00	5	\$0	50%	66.3%	56.4%	4.3	8.6	0.6	0	0	0	0
463	Cooking	Commercial Griddles	Biz-Prescriptive	Lodging	ROB	15%	2,596	0.23	12	\$774	50%	66.3%	51.2%	2.3	4.5	0.6	52,414	52,414	29,187	21,557
464	Cooking	Convection Ovens	Biz-Prescriptive	Lodging	ROB	15%	1,879	0.43	12	\$471	50%	66.3%	62.4%	3.2	6.5	0.7	27,888	27,888	15,046	13,572
465	Cooking	Combination Ovens	Biz-Prescriptive	Lodging	ROB	41%	6,368	0.74	12	\$1,568	50%	66.3%	62.4%	2.8	5.7	0.6	65,902	65,902	35,556	32,072
466	Cooking	Commercial Fryers	Biz-Prescriptive	Lodging	ROB	14%	2,378	0.15	12	\$1,200	50%	66.3%	47.1%	1.3	2.6	0.5	87,203	87,203	50,741	32,977
467	Cooking	Commercial Steam Cookers	Biz-Prescriptive	Lodging	ROB	67%	13,162	3.00	12	\$2,490	50%	66.3%	53.6%	4.3	8.6	0.7	90,729	90,729	51,599	37,133
468	Cooking	Insulated Holding Cabinets (Full Size)	Biz-Prescriptive	Lodging	ROB	69%	5,278	0.80	12	\$1,200	50%	66.3%	52.6%	3.2	6.5	0.7	34,868	44,550	25,922	19,436
469	Cooking	Insulated Holding Cabinets (Half-Size)	Biz-Prescriptive	Lodging	ROB	58%	1,788	0.30	12	\$1,500	50%	66.3%	41.2%	0.9	1.8	0.5	8,199	0	0	0
470	Cooling	Air Conditioner - 16 SEER (5-20 Tons)	Biz-Prescriptive	Lodging	ROB	13%	1,341	0.99	15	\$720	50%	60.5%	37.1%	3.0	6.0	1.1	75,498	75,498	38,417	20,627
471	Cooling	Air Conditioner - 18 SEER (5-20 Tons)	Biz-Prescriptive	Lodging	ROB	19%	2,021	1.49	15	\$1,200	50%	60.5%	36.0%	2.7	5.4	1.1	102,909	102,909	52,365	26,950
472	Cooling	Air Conditioner - 21 SEER (5-20 Tons)	Biz-Prescriptive	Lodging	ROB	24%	2,609	1.93	15	\$1,680	50%	60.5%	36.0%	2.5	5.0	1.0	122,524	122,524	62,346	32,086
473	Cooling	Air Conditioner - 16 SEER (20+ Tons)	Biz-Prescriptive	Lodging	ROB	8%	1,820	1.35	15	\$3,600	50%	60.5%	36.0%	0.8	1.6	0.7	49,574	0	0	0
474	Cooling	Air Conditioner - 18 SEER (20+ Tons)	Biz-Prescriptive	Lodging	ROB	15%	3,360	2.48	15	\$7,200	50%	60.5%	36.0%	0.7	1.5	0.7	84,480	0	0	0
475	Cooling	Air Conditioner - 21 SEER (20+ Tons)	Biz-Prescriptive	Lodging	ROB	21%	4,680	3.46	15	\$10,800	50%	60.5%	36.0%	0.7	1.4	0.7	109,264	0	0	0
476	Cooling	Comprehensive Rooftop Unit Quality Maintenance (AC Tune-up)	Biz-Custom	Lodging	Retro	6%	3,007	2.51	3	\$500	50%	60.5%	60.0%	2.1	4.3	0.9	98,901	102,349	29,715	28,883
477	Cooling	Air Side Economizer	Biz-Custom	Lodging	Retro	2%	83	0.01	5	\$170	50%	60.5%	46.4%	0.2	0.3	0.2	35,713	0	0	0
478	Cooling	Advanced Rooftop Controls	Biz-Custom	Lodging	Retro	55%	1,568	1.31	10	\$3,412	50%	60.5%	36.0%	0.5	1.1	0.6	1,089,300	0	0	0
479	Cooling	Air Conditioner - 16 SEER (<5 Tons)	Biz-Prescriptive	Lodging	ROB	19%	866	0.64	15	\$820	50%	60.5%	36.0%	1.7	3.4	1.0	0	0	0	0
480	Cooling	Air Conditioner - 18 SEER (<5 Tons)	Biz-Prescriptive	Lodging	ROB	28%	1,283	0.95	15	\$1,640	50%	60.5%	36.0%	1.3	2.5	0.9	0	0	0	0
481	Cooling	Air Conditioner - 21 SEER (<5 Tons)	Biz-Prescriptive	Lodging	ROB	38%	1,760	1.30	15	\$2,460	50%	60.5%	36.0%	1.1	2.3	0.8	0	0	0	0
482	Cooling	Centrifugal Chiller - Average kW/Ton 0.626	Biz-Custom	Lodging	ROB	26%	7,612	3.39	20	\$17,179	50%	60.5%	36.0%	0.7	1.5	0.6	0	0	0	0
483	Cooling	Reciprocating Chiller - Average kW/Ton 0.99	Biz-Custom	Lodging	ROB	27%	9,515	9.37	20	\$13,773	50%	60.5%	36.0%	1.7	3.4	1.1	297,703	297,703	151,485	77,962
484	Cooling	Screw Chiller - Average kW/Ton 0.675	Biz-Custom	Lodging	ROB	23%	9,558	9.21	20	\$13,746	50%	60.5%	36.0%	1.7	3.4	1.1	85,357	85,357	43,434	22,353
485	Cooling	Chiller Tune-up	Biz-Custom	Lodging	Retro	8%	4,567	2.41	5	\$1,175	50%	60.5%	60.0%	1.9	3.7	0.8	66,921	66,921	18,841	18,210
486	Cooling	PTAC - 7,000 to 15,000 Btuh - lodging	Biz-Prescriptive	Lodging	ROB	19%	124	0.16	15	\$88	50%	60.5%	36.0%	3.2	6.4	1.4	168,388	168,388	85,684	44,097
487	Cooling	HVAC Occupancy Controls	Biz-Prescriptive	Lodging	Retro	5%	1	0.00	12	\$0	50%	60.5%	47.4%	10.4	20.8	1.4	158,059	187,756	100,158	66,305
488	Cooling	Smart Thermostat	Biz-Prescriptive	Lodging	ROB	18%	507	0.00	11	\$175	50%	60.5%	41.9%	1.7	3.1	0.5	21,423	25,965	15,368	9,541

Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	RAP Incentive (%)	MAP Adoption Rate	RAP Adoption Rate	Measure Level BC Tests			Cumulative Annual Potential			
														TRC	UCT	RIM	15 YR Technical	15 YR Economic	15 YR MAP	15 YR RAP
489	Cooling	Window Film	Biz-Custom	Lodging	Retro	6%	2,838	1.38	10	\$2,364	50%	60.5%	40.0%	1.0	2.2	0.7	144,566	178,082	97,833	45,777
490	Ext Lighting	LED wallpack (existing W<250)	Biz-Lighting	Lodging	Retro	66%	567	0.00	12	\$248	30%	70.6%	49.8%	1.3	4.3	0.5	228,912	228,912	148,983	91,980
491	Ext Lighting	LED parking lot fixture (existing W≥250)	Biz-Lighting	Lodging	Retro	60%	959	0.00	12	\$756	30%	70.6%	41.4%	0.7	2.4	0.5	208,711	0	0	0
492	Ext Lighting	LED parking lot fixture (existing W<250)	Biz-Lighting	Lodging	Retro	66%	567	0.00	12	\$248	30%	70.6%	49.8%	1.3	4.3	0.5	228,912	228,912	148,983	91,980
493	Ext Lighting	LED outdoor pole decorative fixture (existing W≥250)	Biz-Lighting	Lodging	Retro	60%	959	0.00	12	\$756	30%	70.6%	41.4%	0.7	2.4	0.5	208,711	0	0	0
494	Ext Lighting	LED parking garage fixture (existing W≥250)	Biz-Lighting	Lodging	Retro	60%	1,953	0.00	6	\$756	30%	70.6%	51.2%	0.8	2.6	0.4	213,679	0	0	0
495	Ext Lighting	LED parking garage fixture (existing W<250)	Biz-Lighting	Lodging	Retro	66%	1,154	0.00	6	\$248	30%	70.6%	55.6%	1.4	4.7	0.5	234,360	234,360	152,237	110,148
496	Heating	Heat Pump - 16 SEER (<5 Tons)	Biz-Prescriptive	Lodging	ROB	19%	2,024	0.64	15	\$2,055	50%	60.5%	36.0%	1.1	2.2	0.6	0	0	0	0
497	Heating	Heat Pump - 18 SEER (<5 Tons)	Biz-Prescriptive	Lodging	ROB	25%	2,688	0.95	15	\$3,425	50%	60.5%	36.0%	0.9	1.8	0.6	0	0	0	0
498	Heating	Heat Pump - 21 SEER (<5 Tons)	Biz-Prescriptive	Lodging	ROB	30%	3,257	1.30	15	\$4,500	50%	60.5%	36.0%	0.9	1.7	0.6	0	0	0	0
499	Heating	Geothermal HP - SEER 20.3 (<5 Tons)	Biz-Prescriptive	Lodging	ROB	36%	3,872	1.23	15	\$4,700	50%	60.5%	36.0%	0.9	1.8	0.6	0	0	0	0
500	Heating	Geothermal HP - SEER 23.1 (<5 Tons)	Biz-Prescriptive	Lodging	ROB	46%	4,898	1.53	3	\$7,300	50%	60.5%	36.0%	0.2	0.3	0.2	0	0	0	0
501	Heating	Geothermal HP - SEER 29.3 (<5 Tons)	Biz-Prescriptive	Lodging	ROB	51%	5,455	1.93	5	\$9,200	50%	60.5%	36.0%	0.2	0.5	0.3	0	0	0	0
502	Heating	Heat Pump - 16 SEER (5-20 Tons)	Biz-Prescriptive	Lodging	ROB	10%	3,782	0.99	15	\$4,110	50%	60.5%	36.0%	1.0	1.9	0.6	5,475	0	0	0
503	Heating	Heat Pump - 18 SEER (5-20 Tons)	Biz-Prescriptive	Lodging	ROB	19%	7,595	1.49	15	\$6,850	50%	60.5%	36.0%	1.1	2.1	0.6	12,250	22,305	11,350	5,841
504	Heating	Heat Pump - 21 SEER (5-20 Tons)	Biz-Prescriptive	Lodging	ROB	25%	9,712	1.93	15	\$9,000	50%	60.5%	36.0%	1.0	2.1	0.6	15,283	27,826	14,159	7,287
505	Heating	Geothermal HP - SEER 20.3 (5-20 Tons)	Biz-Prescriptive	Lodging	ROB	28%	5,443	3.62	10	\$7,700	50%	60.5%	36.0%	0.7	1.5	0.7	12,689	0	0	0
506	Heating	Geothermal HP - SEER 23.1 (5-20 Tons)	Biz-Prescriptive	Lodging	ROB	39%	7,510	4.23	20	\$12,800	50%	60.5%	36.0%	1.1	2.2	0.8	18,734	34,111	17,357	8,933
507	Heating	Geothermal HP - SEER 29.3 (5-20 Tons)	Biz-Prescriptive	Lodging	ROB	45%	8,647	5.05	20	\$17,700	50%	60.5%	36.0%	0.9	1.8	0.7	18,272	0	0	0
508	Heating	Heat Pump - 16 SEER (20+ Tons)	Biz-Prescriptive	Lodging	ROB	11%	8,484	1.35	15	\$8,220	50%	60.5%	36.0%	0.9	1.9	0.5	5,382	0	0	0
509	Heating	Heat Pump - 18 SEER (20+ Tons)	Biz-Prescriptive	Lodging	ROB	20%	16,290	2.48	15	\$13,700	50%	60.5%	36.0%	1.1	2.2	0.6	11,810	17,785	9,050	4,657
510	Heating	Heat Pump - 21 SEER (20+ Tons)	Biz-Prescriptive	Lodging	ROB	26%	20,668	3.46	15	\$18,000	50%	60.5%	36.0%	1.1	2.1	0.6	14,755	22,220	11,306	5,819
511	Heating	Geothermal HP - SEER 20.3 (20+ Tons)	Biz-Prescriptive	Lodging	ROB	29%	11,406	7.24	20	\$10,700	50%	60.5%	36.0%	2.1	4.1	1.0	24,664	37,141	18,899	9,727
512	Heating	Geothermal HP - SEER 23.1 (20+ Tons)	Biz-Prescriptive	Lodging	ROB	40%	15,541	8.46	5	\$18,300	50%	60.5%	36.0%	0.4	0.8	0.5	9,218	0	0	0
513	Heating	Geothermal HP - SEER 29.3 (20+ Tons)	Biz-Prescriptive	Lodging	ROB	46%	17,815	10.09	12	\$26,200	50%	60.5%	36.0%	0.8	1.6	0.7	19,453	0	0	0
514	Heating	PTAC - 7,000 to 15,000 Btuh - Lodging	Biz-Prescriptive	Lodging	ROB	11%	451	0.08	11	\$175	50%	60.5%	40.9%	1.8	3.6	0.6	5,314	5,314	2,851	1,742
515	Hot Water	Heat Pump Water Heater	Biz-Prescriptive	Lodging	ROB	35%	3,788	0.23	10	\$1,574	50%	73.1%	54.8%	1.3	2.6	0.5	589,181	589,181	394,389	274,659
516	Hot Water	Hot Water Pipe Insulation	Biz-Prescriptive	Lodging	Retro	2%	219	0.03	20	\$60	50%	84.0%	84.0%	4.2	8.3	0.7	9,427	9,427	4,294	4,326
517	Hot Water	Low Flow Pre-Rinse Sprayers	Biz-Prescriptive	Lodging	ROB	26%	764	0.15	5	\$35	50%	84.0%	84.0%	7.5	15.0	0.7	54,196	54,196	49,322	51,369
518	Hot Water	Faucet Aerator	Biz-Prescriptive	Lodging	Retro	66%	200	0.02	10	\$3	50%	84.0%	84.0%	47.5	94.9	0.7	65,853	65,853	35,265	36,431
519	Hot Water	ENERGY STAR Commercial Washing Machines	Biz-Prescriptive	Lodging	ROB	43%	671	0.02	7	\$250	50%	73.1%	55.7%	1.0	2.0	0.5	127,408	127,408	108,046	76,786
520	Int Lighting	LED T8 Tube Replacement	Biz-Lighting	Lodging	Retro	46%	83	0.01	15	\$15	30%	70.6%	56.5%	5.1	16.9	0.7	557,008	557,008	358,539	265,133
521	Int Lighting	LED troffer, 2'X2' and 2'X4'	Biz-Lighting	Lodging	Retro	49%	266	0.04	15	\$80	30%	70.6%	53.4%	3.1	10.2	0.7	358,579	358,579	230,813	157,908
522	Int Lighting	LED high bay fixture	Biz-Lighting	Lodging	Retro	70%	3,359	0.54	15	\$330	30%	70.6%	58.9%	9.3	31.1	0.7	13,557	13,557	8,727	6,846
523	Int Lighting	LED low bay fixture	Biz-Lighting	Lodging	Retro	63%	638	0.10	15	\$44	30%	70.6%	59.9%	13.3	44.3	0.7	12,170	12,170	7,834	6,292
524	Int Lighting	LED downlight, screw-in lamp, 4W, interior	Biz-Lighting	Lodging	ROB	83%	81	0.02	15	\$2	30%	70.6%	61.6%	48.1	160.2	0.8	290,063	290,063	170,856	137,079
525	Int Lighting	LED downlight fixture	Biz-Lighting	Lodging	Retro	69%	182	0.04	15	\$27	30%	70.6%	60.0%	6.6	22.0	0.8	35,336	35,336	16,250	9,509
526	Int Lighting	LED downlight, screw-in lamp, 12W, interior	Biz-Lighting	Lodging	ROB	83%	262	0.06	15	\$2	30%	70.6%	62.1%	156.0	520.0	0.8	1,389,492	1,389,492	818,455	665,483
527	Int Lighting	DeLamp Fluorescent Fixture Average Lamp Wattage 28W	Biz-Lighting	Lodging	Retro	100%	187	0.03	11	\$12	30%	70.6%	60.1%	10.8	35.9	0.7	129,210	129,210	126,738	111,832
528	Int Lighting	Central Lighting Monitoring & Controls (non-networked)	Biz-Lighting	Lodging	Retro	20%	8,341	1.53	12	\$3,700	30%	70.6%	49.6%	1.7	5.8	0.7	96,421	104,495	100,463	68,174
529	Int Lighting	Daylighting Controls	Biz-Lighting	Lodging	Retro	30%	2,643	0.57	12	\$3,000	30%	70.6%	37.3%	0.7	2.3	0.6	58,751	0	0	0
530	Int Lighting	Network Lighting Controls - Wireless (WiFi)	Biz-Lighting	Lodging	Retro	47%	7,650	2.86	8	\$1,683	30%	70.6%	55.5%	3.0	10.0	0.8	352,786	382,330	389,952	307,259
531	Int Lighting	Occupancy Sensors	Biz-Lighting	Lodging	Retro	30%	457	0.02	8	\$54	30%	70.6%	58.2%	3.7	12.3	0.6	277,691	300,946	306,946	256,191
532	Int Lighting	Bi-Level Lighting Fixture - Stairwells, Hallways, and Garages	Biz-Lighting	Lodging	Retro	50%	517	0.06	10	\$274	30%	70.6%	47.1%	1.1	3.7	0.6	210,947	210,947	209,454	134,586
533	Int Lighting	LED Exit Sign - 4 Watt Fixture (2 lamp)	Biz-Lighting	Lodging	Retro	73%	96	0.01	5	\$33	30%	80.0%	80.0%	0.9	3.1	0.5	3,497	0	0	0
534	Misc	Power Distribution Equipment Upgrades	Biz-Custom	Lodging	Retro	1%	6	0.00	30	\$8	50%	66.3%	37.6%	1.7	3.4	0.8	8,604	8,604	4,969	2,021
535	Motors	Cogged V-Belt	Biz-Custom	Lodging	Retro	3%	905	0.10	15	\$384	50%	66.3%	48.7%	2.0	4.0	0.6	18,442	18,442	11,937	8,272
536	Motors	Pump and Fan Variable Frequency Drive Controls (Pumps)	Biz-Custom	Lodging	Retro	38%	731	0.15	15	\$200	50%	66.3%	51.7%	3.6	7.1	0.7	179,275	179,275	100,132	66,693
537	Plug Loads Office	ENERGY STAR Uninterrupted Power Supply	Biz-Custom	Lodging	ROB	3%	85	0.01	15	\$59	50%	76.0%	76.0%	1.3	2.6	0.6	2,279	2,279	1,428	1,428
538	Plug Loads Office	Plug Load Occupancy Sensor	Biz-Custom	Lodging	Retro	15%	169	0.00	8	\$70	50%	66.3%	48.9%	1.0	2.0	0.4	653,929	0	0	0
539	Plug Loads Office	Energy Star Server	Biz-Custom	Lodging	ROB	13%	90	0.01	15	\$156	50%	66.3%	36.0%	0.5	1.0	0.4	0	0	0	0
540	Plug Loads Office	Data Center Hot/Cold Aisle Configuration	Biz-Custom	Lodging	Retro	13%	90	0.01	15	\$156	50%	66.3%	36.0%	0.5	1.0	0.4	0	0	0	0
541	Plug Loads Office	Electrically Commutated Plug Fans in data centers	Biz-Custom	Lodging	Retro	18%	15,778	1.80	15	\$480	50%	66.3%	57.7%	28.0	56.1	0.7	0	0	0	0
542	Plug Loads Office	High Efficiency CRAC unit	Biz-Custom	Lodging	ROB	30%	162	0.02	15	\$63	50%	66.3%	49.5%	2.3	4.5	0.6	0	0	0	0
543	Plug Loads Office	Computer Room Air Conditioner Economizer	Biz-Custom	Lodging	Retro	86%	358	0.00	15	\$82	50%	66.3%	52.6%	3.1	6.3	0.5	0	0	0	0
544	Refrigeration	Strip Curtains	Biz-Prescriptive	Lodging	Retro	81%	270	0.03	4	\$9	50%	56.7%	48.3%	7.3	14.6	0.6	277,082	277,082	122,290	92,187
545	Refrigeration	Bare Suction Line	Biz-Custom	Lodging	Retro	93%	21	0.00	15	\$4	50%	56.7%	40.0%	4.5	8.9	0.7	12,183	12,183	5,378	2,761
546	Refrigeration	Floating Head Pressure Controls	Biz-Prescriptive	Lodging	Retro	50%	1,327	0.15	15	\$80	50%	56.7%	46.9%	14.0	28.1	0.7	106,253	106,253	47,066	33,572
547	Refrigeration	Saturated Suction Controls	Biz-Custom	Lodging	Retro	50%	416	0.18	15	\$559	50%	56.7%	40.0%	0.9	1.8	0.7	33,037	0	0	0
548	Refrigeration	Compressor Retrofit	Biz-Custom	Lodging	Retro	20%	163	0.07	15	\$477	50%	56.7%	32.0%	0.4	0.8	0.5	156,842	0	0	0
549	Refrigeration	Electronically Commutated (EC) Walk-In Evaporator Fan Motor	Biz-Custom	Lodging	Retro	65%	824	0.09	15	\$78	50%	56.7%	46.4%	8.9	17.9	0.7	141,423	141,423	54,327	33,648

Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	RAP Incentive (%)	MAP Adoption Rate	RAP Adoption Rate	Measure Level BC Tests			Cumulative Annual Potential			
														TRC	UCT	RIM	15 YR Technical	15 YR Economic	15 YR MAP	15 YR RAP
550	Refrigeration	Evaporator Fan Motor Controls	Biz-Custom	Lodging	Retro	25%	478	0.06	13	\$291	50%	56.7%	28.0%	1.2	2.5	0.5	54,457	55,643	31,574	12,640
551	Refrigeration	Variable Speed Condenser Fan	Biz-Custom	Lodging	Retro	50%	1,480	0.00	15	\$1,170	50%	56.7%	36.0%	0.9	1.8	0.4	141,716	0	0	0
552	Refrigeration	Refrigeration Economizer	Biz-Custom	Lodging	Retro	2%	1,357	0.00	15	\$2,558	50%	56.7%	36.0%	0.4	0.8	0.3	2,670	0	0	0
553	Refrigeration	Anti-Sweat Heater Controls MT	Biz-Custom	Lodging	Retro	55%	722	0.00	12	\$250	50%	56.7%	46.4%	1.7	3.4	0.5	237,844	237,844	92,046	56,943
554	Refrigeration	Auto Door Closer, Cooler	Biz-Custom	Lodging	Retro	0%	943	0.14	8	\$157	50%	56.7%	46.4%	3.0	6.0	0.6	623	623	238	147
555	Refrigeration	Display Case Door Retrofit, Medium Temp	Biz-Prescriptive	Lodging	Retro	36%	578	0.09	12	\$686	50%	64.0%	64.0%	0.6	1.2	0.5	11,006	0	0	0
556	Refrigeration	Electronically Commutated (EC) Reach-In Evaporator Fan Motor	Biz-Custom	Lodging	Retro	65%	824	0.09	15	\$78	50%	56.7%	46.4%	8.9	17.9	0.7	40,509	40,509	15,309	9,471
557	Refrigeration	Q-Sync Motor for Walk-In and Reach-In Evaporator Fan Motor	Biz-Custom	Lodging	Retro	51%	504	0.06	10	\$96	50%	56.7%	46.4%	3.1	6.2	0.6	11,439	11,439	4,411	2,729
558	Refrigeration	Energy Star Reach-In Refrigerator, Glass Doors	Biz-Prescriptive	Lodging	ROB	27%	410	0.05	12	\$600	50%	64.0%	64.0%	0.5	0.9	0.4	114,898	0	0	0
559	Refrigeration	Energy Star Reach-In Refrigerator, Solid Doors	Biz-Prescriptive	Lodging	ROB	25%	283	0.03	12	\$600	50%	64.0%	64.0%	0.3	0.7	0.3	110,261	0	0	0
560	Refrigeration	Anti-Sweat Heater Controls LT	Biz-Custom	Lodging	Retro	36%	578	0.09	12	\$686	50%	56.7%	46.4%	0.6	1.2	0.5	52,599	0	0	0
561	Refrigeration	Auto Door Closer, Freezer	Biz-Custom	Lodging	Retro	1%	2,307	0.31	8	\$157	50%	56.7%	46.5%	7.3	14.5	0.7	804	804	308	191
562	Refrigeration	Display Case Door Retrofit, Low Temp	Biz-Prescriptive	Lodging	Retro	50%	1,453	0.23	12	\$686	50%	64.0%	64.0%	1.6	3.1	0.6	17,239	17,239	4,987	4,987
563	Refrigeration	Energy Star Reach-In Freezer, Glass Doors	Biz-Prescriptive	Lodging	ROB	15%	488	0.06	12	\$450	50%	64.0%	64.0%	0.8	1.5	0.5	21,792	0	0	0
564	Refrigeration	Energy Star Reach-In Freezer, Solid Doors	Biz-Prescriptive	Lodging	ROB	20%	935	0.11	12	\$450	50%	64.0%	64.0%	1.4	2.9	0.6	28,877	28,877	14,485	14,485
565	Refrigeration	Retro-commissioning_Refrigerator Optimization	Biz-Custom	Lodging	Retro	3%	1	0.00	3	\$0	50%	56.7%	45.3%	2.2	4.3	0.5	55,157	55,157	29,944	22,790
566	Refrigeration	Energy Star Ice Machine	Biz-Prescriptive	Lodging	ROB	10%	721	0.07	15	\$1,426	50%	59.2%	59.2%	0.4	0.8	0.4	47,420	0	0	0
567	Refrigeration	LED Refrigerated Display Case Lighting Average 6W/LF	Biz-Lighting	Lodging	Retro	37%	574	0.13	12	\$1,010	50%	56.7%	46.4%	0.5	0.9	0.4	125,448	0	0	0
568	Ventilation	Demand Controlled Ventilation (DCV) Exhaust Hood	Biz-Custom	Lodging	ROB	50%	3	0.00	20	\$2	50%	60.5%	39.2%	1.7	3.3	0.6	904,272	904,272	464,725	260,522
569	Ventilation	Pump and Fan Variable Frequency Drive Controls (Fans)	Biz-Custom	Lodging	Retro	41%	923	0.19	15	\$375	50%	60.5%	40.4%	2.4	4.7	0.7	1,959,107	1,959,107	944,192	444,729
570	Ventilation	Demand Control Ventilation	Biz-Custom	Lodging	Retro	20%	491	0.10	15	\$227	50%	60.5%	39.0%	2.1	4.2	0.7	991,884	991,884	622,839	383,844
571	WholeBld_HVAC	HVAC - Energy Management System	Biz-Custom	Lodging	Retro	15%	1,044	0.05	15	\$4,000	50%	60.5%	28.0%	0.2	0.4	0.2	0	0	0	0
572	WholeBld_HVAC	GREM Controls	Biz-Custom	Lodging	Retro	30%	1	0.00	8	\$0	50%	60.5%	43.7%	1.9	3.8	0.6	2,010,853	2,138,585	1,440,172	1,004,051
573	WholeBld_HVAC	Retro-commissioning_Bld Optimization	Biz-Custom	Lodging	Retro	15%	1	0.00	3	\$0	50%	60.5%	49.3%	2.0	3.9	0.5	820,411	879,177	598,664	488,947
574	WholeBld	WholeBldg - Com RET	Biz-Custom	Lodging	Retro	15%	1	0.00	12	\$0	50%	66.3%	55.7%	7.4	14.8	0.7	1,187,521	1,254,241	956,779	825,673
575	WholeBld_NC	WholeBldg - Com NC	Biz-NC	Lodging	NC	25%	1	0.00	12	\$0	50%	68.0%	68.0%	7.4	14.8	0.7	0	0	0	0
576	Compressed Air	Efficient Air Compressors	Biz-Custom	Retail	ROB	31%	1,223	0.21	15	\$100	50%	66.3%	56.3%	11.4	22.9	0.7	300,310	300,310	162,360	129,671
577	Compressed Air	Retro-commissioning_Compressed Air Optimization	Biz-Custom	Retail	Retro	15%	1	0.00	5	\$0	50%	66.3%	56.4%	4.4	8.8	0.6	50,591	50,591	29,793	21,921
578	Cooking	Commercial Griddles	Biz-Prescriptive	Retail	ROB	15%	2,596	0.23	12	\$774	50%	66.3%	51.2%	2.3	4.6	0.6	118,349	118,349	65,904	48,676
579	Cooking	Convection Ovens	Biz-Prescriptive	Retail	ROB	15%	1,879	0.43	12	\$471	50%	66.3%	62.4%	3.3	6.6	0.7	62,866	62,866	33,917	30,594
580	Cooking	Combination Ovens	Biz-Prescriptive	Retail	ROB	41%	6,368	0.74	12	\$1,568	50%	66.3%	62.4%	2.9	5.8	0.6	149,088	149,088	80,435	72,554
581	Cooking	Commercial Fryers	Biz-Prescriptive	Retail	ROB	14%	2,378	0.15	12	\$1,200	50%	66.3%	47.1%	1.3	2.6	0.5	196,902	196,902	114,571	74,461
582	Cooking	Commercial Steam Cookers	Biz-Prescriptive	Retail	ROB	67%	13,162	3.00	12	\$2,490	50%	66.3%	53.6%	4.4	8.8	0.7	204,863	204,863	116,510	83,846
583	Cooking	Insulated Holding Cabinets (Full Size)	Biz-Prescriptive	Retail	ROB	69%	5,278	0.80	12	\$1,200	50%	66.3%	52.6%	3.3	6.6	0.7	78,742	100,592	58,531	43,885
584	Cooking	Insulated Holding Cabinets (Half-Size)	Biz-Prescriptive	Retail	ROB	58%	1,788	0.30	12	\$1,500	50%	66.3%	41.2%	0.9	1.8	0.5	18,505	0	0	0
585	Cooling	Air Conditioner - 16 SEER (5-20 Tons)	Biz-Prescriptive	Retail	ROB	13%	1,733	0.99	15	\$720	50%	60.5%	40.2%	3.4	6.8	1.0	322,372	322,372	158,397	94,605
586	Cooling	Air Conditioner - 18 SEER (5-20 Tons)	Biz-Prescriptive	Retail	ROB	19%	2,612	1.49	15	\$1,200	50%	60.5%	39.1%	3.1	6.2	1.0	439,417	439,417	215,906	124,246
587	Cooling	Air Conditioner - 21 SEER (5-20 Tons)	Biz-Prescriptive	Retail	ROB	24%	3,372	1.93	15	\$1,680	50%	60.5%	38.1%	2.8	5.7	1.0	523,168	523,168	266,213	148,075
588	Cooling	Air Conditioner - 16 SEER (20+ Tons)	Biz-Prescriptive	Retail	ROB	8%	2,353	1.35	15	\$3,600	50%	60.5%	36.0%	0.9	1.8	0.7	211,676	0	0	0
589	Cooling	Air Conditioner - 18 SEER (20+ Tons)	Biz-Prescriptive	Retail	ROB	15%	4,343	2.48	15	\$7,200	50%	60.5%	36.0%	0.9	1.7	0.7	360,726	0	0	0
590	Cooling	Air Conditioner - 21 SEER (20+ Tons)	Biz-Prescriptive	Retail	ROB	21%	6,050	3.46	15	\$10,800	50%	60.5%	36.0%	0.8	1.6	0.7	466,551	0	0	0
591	Cooling	Comprehensive Rooftop Unit Quality Maintenance (AC Tune-up)	Biz-Custom	Retail	Retro	6%	2,403	1.14	3	\$500	50%	60.5%	60.0%	1.3	2.6	0.6	438,251	445,844	127,640	123,673
592	Cooling	Air Side Economizer	Biz-Custom	Retail	Retro	2%	146	0.01	5	\$170	50%	60.5%	46.4%	0.3	0.5	0.3	158,981	0	0	0
593	Cooling	Advanced Rooftop Controls	Biz-Custom	Retail	Retro	28%	1,422	0.68	10	\$3,412	50%	60.5%	36.0%	0.4	0.7	0.4	2,496,821	0	0	0
594	Cooling	Air Conditioner - 16 SEER (<5 Tons)	Biz-Prescriptive	Retail	ROB	19%	1,120	0.64	15	\$820	50%	60.5%	36.0%	1.9	3.9	0.9	876,190	876,190	445,847	229,454
595	Cooling	Air Conditioner - 18 SEER (<5 Tons)	Biz-Prescriptive	Retail	ROB	28%	1,659	0.95	15	\$1,640	50%	60.5%	36.0%	1.4	2.9	0.8	961,526	961,526	489,270	251,802
596	Cooling	Air Conditioner - 21 SEER (<5 Tons)	Biz-Prescriptive	Retail	ROB	38%	2,275	1.30	15	\$2,460	50%	60.5%	36.0%	1.3	2.6	0.8	1,205,635	1,205,635	613,485	315,728
597	Cooling	Centrifugal Chiller - Average kW/Ton 0.626	Biz-Custom	Retail	ROB	26%	6,084	2.71	20	\$13,732	50%	60.5%	36.0%	0.7	1.5	0.6	1,458,721	0	0	0
598	Cooling	Reciprocating Chiller - Average kW/Ton 0.99	Biz-Custom	Retail	ROB	27%	7,605	7.49	20	\$11,009	50%	60.5%	36.0%	1.7	3.5	1.1	1,059,309	1,059,309	539,027	277,409
599	Cooling	Screw Chiller - Average kW/Ton 0.675	Biz-Custom	Retail	ROB	23%	7,640	7.36	20	\$10,988	50%	60.5%	36.0%	1.7	3.4	1.1	0	0	0	0
600	Cooling	Chiller Tune-up	Biz-Custom	Retail	Retro	8%	3,651	1.10	5	\$535	50%	60.5%	60.0%	2.7	5.3	0.7	428,623	428,623	120,677	116,634
601	Cooling	PTAC - 7,000 to 15,000 Btuh - lodging	Biz-Prescriptive	Retail	ROB	19%	218	0.16	15	\$89	50%	60.5%	40.3%	3.9	7.9	1.1	0	0	0	0
602	Cooling	HVAC Occupancy Controls	Biz-Prescriptive	Retail	Retro	5%	1	0.00	12	\$0	50%	60.5%	47.4%	8.7	17.4	1.2	1,494,305	1,600,066	835,005	551,308
603	Cooling	Smart Thermostat	Biz-Prescriptive	Retail	ROB	18%	890	0.00	11	\$175	50%	60.5%	45.7%	3.0	5.6	0.5	176,407	190,238	109,864	76,640
604	Cooling	Window Film	Biz-Custom	Retail	Retro	4%	1,523	0.74	10	\$1,269	50%	60.5%	40.0%	1.0	2.2	0.7	944,233	1,024,750	548,661	255,853
605	Ext Lighting	LED wallpack (existing W<250)	Biz-Lighting	Retail	Retro	66%	567	0.00	12	\$248	30%	70.6%	49.8%	1.3	4.3	0.5	1,221,442	1,221,442	792,093	485,904
606	Ext Lighting	LED parking lot fixture (existing W≥250)	Biz-Lighting	Retail	Retro	60%	959	0.00	12	\$756	30%	70.6%	41.4%	0.7	2.4	0.5	1,113,654	0	0	0
607	Ext Lighting	LED parking lot fixture (existing W<250)	Biz-Lighting	Retail	Retro	66%	567	0.00	12	\$248	30%	70.6%	49.8%	1.3	4.3	0.5	1,221,442	1,221,442	792,093	485,904
608	Ext Lighting	LED outdoor pole decorative fixture (existing W≥250)	Biz-Lighting	Retail	Retro	60%	959	0.00	12	\$756	30%	70.6%	41.4%	0.7	2.4	0.5	1,113,654	0	0	0
609	Ext Lighting	LED parking garage fixture (existing W≥250)	Biz-Lighting	Retail	Retro	60%	1,953	0.00	6	\$756	30%	70.6%	51.2%	0.8	2.6	0.4	1,140,162	0	0	0
610	Ext Lighting	LED parking garage fixture (existing W<250)	Biz-Lighting	Retail	Retro	66%	1,154	0.00	6	\$248	30%	70.6%	55.6%	1.4	4.7	0.5	1,250,516	1,250,516	809,392	583,314

Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	RAP Incentive (%)	MAP Adoption Rate	RAP Adoption Rate	Measure Level BC Tests			Cumulative Annual Potential			
														TRC	UCT	RIM	15 YR Technical	15 YR Economic	15 YR MAP	15 YR RAP
611	Heating	Heat Pump - 16 SEER (<5 Tons)	Biz-Prescriptive	Retail	ROB	19%	1,992	0.64	15	\$2,055	50%	60.5%	36.0%	1.1	2.2	0.7	204,814	795,296	404,684	208,270
612	Heating	Heat Pump - 18 SEER(<5 Tons)	Biz-Prescriptive	Retail	ROB	26%	2,718	0.95	15	\$3,425	50%	60.5%	36.0%	0.9	1.9	0.6	235,375	0	0	0
613	Heating	Heat Pump - 21 SEER(<5 Tons)	Biz-Prescriptive	Retail	ROB	32%	3,404	1.30	15	\$4,500	50%	60.5%	36.0%	0.9	1.8	0.6	290,476	0	0	0
614	Heating	Geothermal HP - SEER 20.3 (<5 Tons)	Biz-Prescriptive	Retail	ROB	36%	3,818	1.23	15	\$4,700	50%	60.5%	36.0%	0.9	1.9	0.6	329,444	0	0	0
615	Heating	Geothermal HP - SEER 23.1 (<5 Tons)	Biz-Prescriptive	Retail	ROB	45%	4,808	1.53	3	\$7,300	50%	60.5%	36.0%	0.2	0.3	0.2	74,447	0	0	0
616	Heating	Geothermal HP - SEER 29.3 (<5 Tons)	Biz-Prescriptive	Retail	ROB	52%	5,520	1.93	5	\$9,200	50%	60.5%	36.0%	0.3	0.5	0.3	133,518	0	0	0
617	Heating	Heat Pump - 16 SEER (5-20 Tons)	Biz-Prescriptive	Retail	ROB	10%	3,573	0.99	15	\$4,110	50%	60.5%	36.0%	0.9	1.9	0.6	41,949	0	0	0
618	Heating	Heat Pump - 18 SEER (5-20 Tons)	Biz-Prescriptive	Retail	ROB	19%	6,814	1.49	15	\$6,850	50%	60.5%	36.0%	1.0	2.0	0.6	85,661	159,403	81,112	41,744
619	Heating	Heat Pump - 21 SEER (5-20 Tons)	Biz-Prescriptive	Retail	ROB	25%	8,727	1.93	15	\$9,000	50%	60.5%	36.0%	1.0	2.0	0.6	107,165	0	0	0
620	Heating	Geothermal HP - SEER 20.3 (5-20 Tons)	Biz-Prescriptive	Retail	ROB	33%	6,743	3.62	10	\$7,700	50%	60.5%	36.0%	0.8	1.7	0.7	124,981	0	0	0
621	Heating	Geothermal HP - SEER 23.1 (5-20 Tons)	Biz-Prescriptive	Retail	ROB	43%	8,744	4.23	20	\$12,800	50%	60.5%	36.0%	1.2	2.4	0.8	168,900	314,299	159,930	82,308
622	Heating	Geothermal HP - SEER 29.3 (5-20 Tons)	Biz-Prescriptive	Retail	ROB	50%	10,197	5.05	20	\$17,700	50%	60.5%	36.0%	1.0	2.0	0.7	167,768	312,193	158,859	81,756
623	Heating	Heat Pump - 16 SEER (20+ Tons)	Biz-Prescriptive	Retail	ROB	10%	7,376	1.35	15	\$8,220	50%	60.5%	36.0%	0.9	1.7	0.5	33,888	0	0	0
624	Heating	Heat Pump - 18 SEER (20+ Tons)	Biz-Prescriptive	Retail	ROB	19%	14,090	2.48	15	\$13,700	50%	60.5%	36.0%	1.0	2.0	0.6	77,973	0	0	0
625	Heating	Heat Pump - 21 SEER (20+ Tons)	Biz-Prescriptive	Retail	ROB	25%	18,102	3.46	15	\$18,000	50%	60.5%	36.0%	1.0	2.0	0.6	99,754	0	0	0
626	Heating	Geothermal HP - SEER 20.3 (20+ Tons)	Biz-Prescriptive	Retail	ROB	34%	13,878	7.24	20	\$10,700	50%	60.5%	36.0%	2.3	4.7	1.0	239,857	666,321	339,056	174,494
627	Heating	Geothermal HP - SEER 23.1 (20+ Tons)	Biz-Prescriptive	Retail	ROB	43%	17,880	8.46	5	\$18,300	50%	60.5%	36.0%	0.5	0.9	0.5	83,159	0	0	0
628	Heating	Geothermal HP - SEER 29.3 (20+ Tons)	Biz-Prescriptive	Retail	ROB	50%	20,786	10.09	12	\$26,200	50%	60.5%	36.0%	0.9	1.7	0.7	178,353	0	0	0
629	Heating	PTAC - 7,000 to 15,000 Btuh - lodging	Biz-Prescriptive	Retail	ROB	11%	397	0.08	11	\$175	50%	60.5%	39.5%	1.7	3.4	0.6	0	0	0	0
630	Hot Water	Heat Pump Water Heater	Biz-Prescriptive	Retail	ROB	35%	3,788	0.23	10	\$1,574	50%	73.1%	69.8%	1.3	2.7	0.5	2,850,797	2,850,797	1,737,268	1,601,133
631	Hot Water	Hot Water Pipe Insulation	Biz-Prescriptive	Retail	Retro	2%	219	0.03	20	\$60	50%	84.0%	84.0%	4.2	8.5	0.7	58,862	58,862	26,450	26,485
632	Hot Water	Low Flow Pre-Rinse Sprayers	Biz-Prescriptive	Retail	ROB	26%	764	0.15	5	\$35	50%	84.0%	84.0%	7.6	15.3	0.7	359,822	359,822	306,308	309,171
633	Hot Water	Faucet Aerator	Biz-Prescriptive	Retail	Retro	66%	1,425	0.16	10	\$3	50%	84.0%	84.0%	344.1	688.2	0.7	435,056	435,056	217,450	219,148
634	Hot Water	ENERGY STAR Commercial Washing Machines	Biz-Prescriptive	Retail	ROB	43%	671	0.02	7	\$250	50%	73.1%	55.7%	1.0	2.1	0.5	844,635	844,635	667,845	462,333
635	Int Lighting	LED T8 Tube Replacement	Biz-Lighting	Retail	Retro	47%	57	0.01	15	\$15	30%	70.6%	54.3%	3.7	12.3	0.8	13,703,128	13,703,128	8,788,777	6,131,060
636	Int Lighting	LED troffer, 2'X2' and 2'X4'	Biz-Lighting	Retail	Retro	50%	182	0.04	15	\$80	30%	70.6%	49.8%	2.2	7.5	0.7	8,814,264	8,814,264	5,631,173	3,456,799
637	Int Lighting	LED high bay fixture	Biz-Lighting	Retail	Retro	71%	2,301	0.46	15	\$330	30%	70.6%	57.4%	6.8	22.7	0.8	440,658	440,658	282,625	213,244
638	Int Lighting	LED low bay fixture	Biz-Lighting	Retail	Retro	63%	437	0.09	15	\$44	30%	70.6%	58.8%	9.7	32.3	0.8	396,341	396,341	254,201	198,469
639	Int Lighting	LED downlight, screw-in lamp, 4W, interior	Biz-Lighting	Retail	ROB	83%	54	0.01	15	\$2	30%	70.6%	61.3%	34.8	115.9	0.9	945,833	945,833	557,126	442,586
640	Int Lighting	LED downlight fixture	Biz-Lighting	Retail	Retro	70%	121	0.03	15	\$27	30%	70.6%	60.0%	4.8	15.9	0.8	231,274	231,274	106,360	62,235
641	Int Lighting	LED downlight, screw-in lamp, 12W, interior	Biz-Lighting	Retail	ROB	83%	174	0.05	15	\$2	30%	70.6%	62.0%	112.9	376.2	0.9	9,061,940	9,061,940	5,337,772	4,327,139
642	Int Lighting	Delamp Fluorescent Fixture Average Lamp Wattage 28W	Biz-Lighting	Retail	Retro	100%	128	0.03	11	\$12	30%	70.6%	59.1%	7.9	26.3	0.8	3,308,182	3,308,182	3,058,421	2,690,664
643	Int Lighting	Central Lighting Monitoring & Controls (non-networked)	Biz-Lighting	Retail	Retro	20%	8,341	1.53	12	\$3,700	30%	70.6%	49.6%	1.8	5.9	0.7	1,597,026	1,730,584	1,606,658	1,103,034
644	Int Lighting	Daylighting Controls	Biz-Lighting	Retail	Retro	30%	2,643	0.57	12	\$3,000	30%	70.6%	37.3%	0.7	2.4	0.6	972,568	0	0	0
645	Int Lighting	Network Lighting Controls - Wireless (WiFi)	Biz-Lighting	Retail	Retro	47%	7,650	2.86	8	\$1,683	30%	70.6%	55.5%	3.0	10.1	0.8	5,895,139	6,388,146	6,175,644	4,955,741
646	Int Lighting	Occupancy Sensors	Biz-Lighting	Retail	Retro	30%	457	0.02	8	\$54	30%	70.6%	58.2%	3.8	12.5	0.6	4,668,657	5,059,094	4,890,803	4,157,335
647	Int Lighting	Bi-Level Lighting Fixture - Stairwells, Hallways, and Garages	Biz-Lighting	Retail	Retro	50%	517	0.06	10	\$274	30%	70.6%	47.1%	1.1	3.8	0.6	1,048,851	1,048,851	995,573	649,783
648	Int Lighting	LED Exit Sign - 4 Watt Fixture (2 lamp)	Biz-Lighting	Retail	Retro	74%	98	0.01	5	\$33	30%	80.0%	80.0%	1.0	3.2	0.5	53,235	0	0	0
649	Misc	Power Distribution Equipment Upgrades	Biz-Custom	Retail	Retro	1%	6	0.00	30	\$8	50%	66.3%	37.6%	1.7	3.4	0.8	35,112	35,112	20,278	8,249
650	Motors	Cogged V-Belt	Biz-Custom	Retail	Retro	3%	455	0.10	15	\$384	50%	66.3%	41.1%	1.2	2.4	0.6	237,377	237,377	152,919	85,577
651	Motors	Pump and Fan Variable Frequency Drive Controls (Pumps)	Biz-Custom	Retail	Retro	38%	731	0.15	15	\$200	50%	66.3%	51.7%	3.6	7.1	0.7	133,191	133,191	74,392	49,549
652	Plug Loads Office	ENERGY STAR Uninterrupted Power Supply	Biz-Custom	Retail	ROB	3%	85	0.01	15	\$59	50%	76.0%	76.0%	1.3	2.7	0.6	3,371	3,371	2,113	2,113
653	Plug Loads Office	Plug Load Occupancy Sensor	Biz-Custom	Retail	Retro	15%	169	0.00	8	\$70	50%	66.3%	48.9%	1.0	2.0	0.4	1,785,501	1,785,501	1,164,684	810,970
654	Plug Loads Office	Energy Star Server	Biz-Custom	Retail	ROB	13%	90	0.01	15	\$156	50%	66.3%	36.0%	0.5	1.0	0.4	0	0	0	0
655	Plug Loads Office	Data Center Hot/Cold Aisle Configuration	Biz-Custom	Retail	Retro	13%	90	0.01	15	\$156	50%	66.3%	36.0%	0.5	1.0	0.4	0	0	0	0
656	Plug Loads Office	Electrically Commutated Plug Fans in data centers	Biz-Custom	Retail	Retro	18%	15,778	1.80	15	\$480	50%	66.3%	57.7%	28.6	57.1	0.7	0	0	0	0
657	Plug Loads Office	High Efficiency CRAC unit	Biz-Custom	Retail	ROB	30%	162	0.02	15	\$63	50%	66.3%	49.5%	2.3	4.6	0.6	0	0	0	0
658	Plug Loads Office	Computer Room Air Conditioner Economizer	Biz-Custom	Retail	Retro	86%	358	0.00	15	\$82	50%	66.3%	52.6%	3.2	6.4	0.6	0	0	0	0
659	Refrigeration	Strip Curtains	Biz-Prescriptive	Retail	Retro	81%	270	0.03	4	\$9	50%	56.7%	48.3%	7.3	14.6	0.6	2,627,696	2,627,696	1,159,731	874,253
660	Refrigeration	Bare Suction Line	Biz-Custom	Retail	Retro	93%	21	0.00	15	\$4	50%	56.7%	40.0%	4.5	8.9	0.7	233,773	233,773	102,250	52,467
661	Refrigeration	Floating Head Pressure Controls	Biz-Prescriptive	Retail	Retro	50%	1,327	0.15	15	\$80	50%	56.7%	46.9%	14.0	28.1	0.7	2,038,769	2,038,769	894,951	637,978
662	Refrigeration	Saturated Suction Controls	Biz-Custom	Retail	Retro	50%	416	0.18	15	\$559	50%	56.7%	40.0%	0.9	1.8	0.7	633,926	0	0	0
663	Refrigeration	Compressor Retrofit	Biz-Custom	Retail	Retro	20%	163	0.07	15	\$477	50%	56.7%	32.0%	0.4	0.8	0.5	1,507,784	0	0	0
664	Refrigeration	Electronically Commutated (EC) Walk-In Evaporator Fan Motor	Biz-Custom	Retail	Retro	65%	824	0.09	15	\$78	50%	56.7%	46.4%	8.9	17.9	0.7	1,355,469	1,355,469	516,434	319,670
665	Refrigeration	Evaporator Fan Motor Controls	Biz-Custom	Retail	Retro	25%	478	0.06	13	\$291	50%	56.7%	28.0%	1.2	2.5	0.5	534,486	541,267	301,348	120,412
666	Refrigeration	Variable Speed Condenser Fan	Biz-Custom	Retail	Retro	50%	1,480	0.00	15	\$1,170	50%	56.7%	36.0%	0.9	1.8	0.4	1,361,021	0	0	0
667	Refrigeration	Refrigeration Economizer	Biz-Custom	Retail	Retro	2%	1,357	0.00	15	\$2,558	50%	56.7%	36.0%	0.4	0.8	0.3	26,237	0	0	0
668	Refrigeration	Anti-Sweat Heater Controls MT	Biz-Custom	Retail	Retro	55%	722	0.00	12	\$250	50%	56.7%	46.4%	1.7	3.4	0.5	6,766,745	6,766,745	2,618,746	1,620,043
669	Refrigeration	Auto Door Closer, Cooler	Biz-Custom	Retail	Retro	0%	943	0.14	8	\$157	50%	56.7%	46.4%	3.0	6.0	0.6	17,712	17,712	6,783	4,196
670	Refrigeration	Display Case Door Retrofit, Medium Temp	Biz-Prescriptive	Retail	Retro	36%	578	0.09	12	\$686	50%	64.0%	64.0%	0.6	1.2	0.5	313,118	0	0	0
671	Refrigeration	Electronically Commutated (EC) Reach-In Evaporator Fan Motor	Biz-Custom	Retail	Retro	65%	824	0.09	15	\$78	50%	56.7%	46.4%	8.9	17.9	0.7	1,152,499	1,152,499	435,554	269,448

Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	RAP Incentive (%)	MAP Adoption Rate	RAP Adoption Rate	Measure Level BC Tests			Cumulative Annual Potential			
														TRC	UCT	RIM	15 YR Technical	15 YR Economic	15 YR MAP	15 YR RAP
672	Refrigeration	Q-Sync Motor for Walk-In and Reach-In Evaporator Fan Motor	Biz-Custom	Retail	Retro	51%	504	0.06	10	\$96	50%	56.7%	46.4%	3.1	6.2	0.6	325,455	325,455	125,498	77,637
673	Refrigeration	Energy Star Reach-In Refrigerator, Glass Doors	Biz-Prescriptive	Retail	ROB	27%	410	0.05	12	\$600	50%	64.0%	64.0%	0.5	0.9	0.4	3,268,905	0	0	0
674	Refrigeration	Energy Star Reach-In Refrigerator, Solid Doors	Biz-Prescriptive	Retail	ROB	25%	283	0.03	12	\$600	50%	64.0%	64.0%	0.3	0.7	0.3	3,136,965	0	0	0
675	Refrigeration	Anti-Sweat Heater Controls LT	Biz-Custom	Retail	Retro	36%	578	0.09	12	\$686	50%	56.7%	46.4%	0.6	1.2	0.5	1,496,472	0	0	0
676	Refrigeration	Auto Door Closer, Freezer	Biz-Custom	Retail	Retro	1%	2,307	0.31	8	\$157	50%	56.7%	46.5%	7.3	14.5	0.7	22,867	22,867	8,757	5,436
677	Refrigeration	Display Case Door Retrofit, Low Temp	Biz-Prescriptive	Retail	Retro	50%	1,453	0.23	12	\$686	50%	64.0%	64.0%	1.6	3.1	0.6	490,458	490,458	141,893	141,893
678	Refrigeration	Energy Star Reach-In Freezer, Glass Doors	Biz-Prescriptive	Retail	ROB	15%	488	0.06	12	\$450	50%	64.0%	64.0%	0.8	1.5	0.5	619,993	0	0	0
679	Refrigeration	Energy Star Reach-In Freezer, Solid Doors	Biz-Prescriptive	Retail	ROB	20%	935	0.11	12	\$450	50%	64.0%	64.0%	1.4	2.9	0.6	821,569	821,569	412,106	412,106
680	Refrigeration	Retro-commissioning_Refrigerator Optimization	Biz-Custom	Retail	Retro	3%	1	0.00	3	\$0	50%	56.7%	45.3%	2.2	4.3	0.5	1,046,159	1,046,159	567,954	432,262
681	Refrigeration	Energy Star Ice Machine	Biz-Prescriptive	Retail	ROB	10%	721	0.07	15	\$1,426	50%	59.2%	59.2%	0.4	0.8	0.4	289,196	0	0	0
682	Refrigeration	LED Refrigerated Display Case Lighting Average 6W/LF	Biz-Lighting	Retail	Retro	37%	574	0.13	12	\$1,010	50%	56.7%	46.4%	0.5	0.9	0.4	3,569,046	0	0	0
683	Ventilation	Demand Controlled Ventilation (DCV) Exhaust Hood	Biz-Custom	Retail	ROB	0%	0	0.00	20	\$0	0%	60.5%	53.4%	0.0	#DIV/0	0.0	0	0	0	
684	Ventilation	Pump and Fan Variable Frequency Drive Controls (Fans)	Biz-Custom	Retail	ROB	41%	923	0.19	15	\$375	50%	60.5%	40.4%	2.4	4.9	0.7	16,162,083	16,162,083	7,789,317	3,668,892
685	Ventilation	Demand Control Ventilation	Biz-Custom	Retail	Retro	20%	516	0.14	15	\$227	50%	60.5%	39.6%	2.5	4.8	0.7	9,237,636	9,237,636	5,800,641	3,632,366
686	WholeBld_HVAC	HVAC - Energy Management System	Biz-Custom	Retail	Retro	15%	1,044	0.05	15	\$4,000	50%	60.5%	28.0%	0.2	0.4	0.3	13,521,596	0	0	0
687	WholeBld_HVAC	GREM Controls	Biz-Custom	Retail	Retro	0%	0	0.00	8	\$0	0%	60.5%	53.4%	0.0	#DIV/0	0.0	0	0	0	
688	WholeBld_HVAC	Retro-commissioning_Bld Optimization	Biz-Custom	Retail	Retro	15%	1	0.00	3	\$0	50%	60.5%	49.3%	2.0	4.0	0.6	6,377,612	6,616,153	4,421,658	3,607,032
689	WholeBld	WholeBldg - Com RET	Biz-Custom	Retail	Retro	15%	1	0.00	12	\$0	50%	66.3%	55.7%	7.5	15.0	0.7	8,791,141	9,571,434	7,343,783	6,350,897
690	WholeBld_NC	WholeBldg - Com NC	Biz-NC	Retail	NC	25%	1	0.00	12	\$0	50%	68.0%	68.0%	7.5	15.0	0.7	0	0	0	0
691	Compressed Air	Efficient Air Compressors	Biz-Custom	Office	ROB	31%	1,223	0.21	15	\$100	50%	66.3%	56.3%	11.7	23.3	0.8	0	0	0	0
692	Compressed Air	Retro-commissioning_Compressed Air Optimization	Biz-Custom	Office	Retro	15%	1	0.00	5	\$0	50%	66.3%	56.4%	4.5	9.0	0.7	0	0	0	0
693	Cooking	Commercial Griddles	Biz-Prescriptive	Office	ROB	15%	2,596	0.23	12	\$774	50%	66.3%	51.2%	2.3	4.7	0.6	43,125	43,125	24,015	17,737
694	Cooking	Convection Ovens	Biz-Prescriptive	Office	ROB	15%	1,879	0.43	12	\$471	50%	66.3%	62.4%	3.3	6.7	0.7	22,897	22,897	12,354	11,143
695	Cooking	Combination Ovens	Biz-Prescriptive	Office	ROB	41%	6,368	0.74	12	\$1,568	50%	66.3%	62.4%	2.9	5.9	0.6	54,353	54,353	29,325	26,451
696	Cooking	Commercial Fryers	Biz-Prescriptive	Office	ROB	14%	2,378	0.15	12	\$1,200	50%	66.3%	47.1%	1.3	2.7	0.5	71,749	71,749	41,748	27,133
697	Cooking	Commercial Steam Cookers	Biz-Prescriptive	Office	ROB	67%	13,162	3.00	12	\$2,490	50%	66.3%	53.6%	4.4	8.8	0.8	74,650	74,650	42,455	30,553
698	Cooking	Insulated Holding Cabinets (Full Size)	Biz-Prescriptive	Office	ROB	69%	5,278	0.80	12	\$1,200	50%	66.3%	52.6%	3.3	6.7	0.7	28,694	36,655	21,328	15,991
699	Cooking	Insulated Holding Cabinets (Half-Size)	Biz-Prescriptive	Office	ROB	58%	1,788	0.30	12	\$1,500	50%	66.3%	41.2%	0.9	1.9	0.5	6,742	0	0	0
700	Cooling	Air Conditioner - 16 SEER (5-20 Tons)	Biz-Prescriptive	Office	ROB	12%	1,740	0.99	15	\$720	50%	60.5%	40.2%	3.5	7.0	1.0	519,775	519,775	255,391	152,738
701	Cooling	Air Conditioner - 18 SEER (5-20 Tons)	Biz-Prescriptive	Office	ROB	19%	2,622	1.49	15	\$1,200	50%	60.5%	39.1%	3.2	6.3	1.0	708,493	708,493	348,117	200,633
702	Cooling	Air Conditioner - 21 SEER (5-20 Tons)	Biz-Prescriptive	Office	ROB	24%	3,385	1.93	15	\$1,680	50%	60.5%	38.1%	2.9	5.8	1.0	843,530	843,530	429,228	239,157
703	Cooling	Air Conditioner - 16 SEER (20+ Tons)	Biz-Prescriptive	Office	ROB	8%	2,362	1.35	15	\$3,600	50%	60.5%	36.0%	0.9	1.9	0.7	341,295	0	0	0
704	Cooling	Air Conditioner - 18 SEER (20+ Tons)	Biz-Prescriptive	Office	ROB	15%	4,360	2.48	15	\$7,200	50%	60.5%	36.0%	0.9	1.8	0.7	581,616	0	0	0
705	Cooling	Air Conditioner - 21 SEER (20+ Tons)	Biz-Prescriptive	Office	ROB	21%	6,073	3.46	15	\$10,800	50%	60.5%	36.0%	0.8	1.6	0.7	752,243	0	0	0
706	Cooling	Comprehensive Rooftop Unit Quality Maintenance (AC Tune-up)	Biz-Custom	Office	Retro	6%	1,463	1.01	3	\$500	50%	60.5%	60.0%	1.0	1.9	0.7	684,537	0	0	0
707	Cooling	Air Side Economizer	Biz-Custom	Office	Retro	2%	100	0.05	5	\$170	50%	60.5%	46.4%	0.2	0.4	0.2	247,348	0	0	0
708	Cooling	Advanced Rooftop Controls	Biz-Custom	Office	Retro	62%	2,132	1.48	10	\$3,412	50%	60.5%	36.0%	0.7	1.4	0.7	8,524,715	0	0	0
709	Cooling	Air Conditioner - 16 SEER (<5 Tons)	Biz-Prescriptive	Office	ROB	19%	1,124	0.64	15	\$820	50%	60.5%	36.0%	2.0	4.0	0.9	288,431	288,431	146,768	75,534
710	Cooling	Air Conditioner - 18 SEER(<5 Tons)	Biz-Prescriptive	Office	ROB	28%	1,665	0.95	15	\$1,640	50%	60.5%	36.0%	1.5	2.9	0.8	316,523	316,523	161,062	82,890
711	Cooling	Air Conditioner - 21 SEER(<5 Tons)	Biz-Prescriptive	Office	ROB	38%	2,284	1.30	15	\$2,460	50%	60.5%	36.0%	1.3	2.7	0.8	396,881	396,881	201,952	103,934
712	Cooling	Centrifugal Chiller - Average kW/Ton 0.626	Biz-Custom	Office	ROB	26%	3,704	1.65	20	\$8,360	50%	60.5%	36.0%	0.8	1.5	0.6	671,991	0	0	0
713	Cooling	Reciprocating Chiller - Average kW/Ton 0.99	Biz-Custom	Office	ROB	27%	4,630	4.56	20	\$6,702	50%	60.5%	36.0%	1.8	3.5	1.1	1,480,247	1,480,247	753,220	387,643
714	Cooling	Screw Chiller - Average kW/Ton 0.675	Biz-Custom	Office	ROB	23%	4,651	4.48	20	\$6,689	50%	60.5%	36.0%	1.7	3.5	1.1	29,383	29,383	14,951	7,695
715	Cooling	Chiller Tune-up	Biz-Custom	Office	Retro	8%	2,222	0.97	5	\$475	50%	60.5%	60.0%	2.1	4.3	0.8	370,501	370,501	104,313	100,818
716	Cooling	PTAC - 7,000 to 15,000 Btuh - lodging	Biz-Prescriptive	Office	ROB	19%	149	0.16	15	\$90	50%	60.5%	36.0%	3.4	6.8	1.4	0	0	0	0
717	Cooling	HVAC Occupancy Controls	Biz-Prescriptive	Office	Retro	5%	1	0.00	12	\$0	50%	60.5%	47.4%	8.7	17.5	1.2	1,185,083	1,443,342	747,203	493,020
718	Cooling	Smart Thermostat	Biz-Prescriptive	Office	ROB	18%	610	0.00	11	\$175	50%	60.5%	43.4%	2.1	4.0	0.5	149,823	186,531	106,790	69,372
719	Cooling	Window Film	Biz-Custom	Office	Retro	7%	1,608	0.78	10	\$1,340	50%	60.5%	40.0%	1.1	2.2	0.7	1,266,671	1,604,876	851,926	396,986
720	Ext Lighting	LED wallpack (existing W<250)	Biz-Lighting	Office	Retro	66%	567	0.00	12	\$248	30%	70.6%	49.8%	1.3	4.3	0.5	935,032	935,032	627,350	398,320
721	Ext Lighting	LED parking lot fixture (existing W≥250)	Biz-Lighting	Office	Retro	60%	959	0.00	12	\$756	30%	70.6%	41.4%	0.7	2.4	0.5	852,518	0	0	0
722	Ext Lighting	LED parking lot fixture (existing W<250)	Biz-Lighting	Office	Retro	66%	567	0.00	12	\$248	30%	70.6%	49.8%	1.3	4.3	0.5	935,032	935,032	627,350	398,320
723	Ext Lighting	LED outdoor pole decorative fixture (existing W≥250)	Biz-Lighting	Office	Retro	60%	959	0.00	12	\$756	30%	70.6%	41.4%	0.7	2.4	0.5	852,518	0	0	0
724	Ext Lighting	LED parking garage fixture (existing W≥250)	Biz-Lighting	Office	Retro	60%	1,953	0.00	6	\$756	30%	70.6%	51.2%	0.8	2.6	0.4	872,645	0	0	0
725	Ext Lighting	LED parking garage fixture (existing W<250)	Biz-Lighting	Office	Retro	66%	1,154	0.00	6	\$248	30%	70.6%	55.6%	1.4	4.7	0.5	957,107	957,107	641,777	472,479
726	Heating	Heat Pump - 16 SEER (<5 Tons)	Biz-Prescriptive	Office	ROB	19%	1,843	0.64	15	\$2,055	50%	60.5%	36.0%	1.1	2.2	0.7	61,638	240,540	122,398	62,992
727	Heating	Heat Pump - 18 SEER(<5 Tons)	Biz-Prescriptive	Office	ROB	26%	2,538	0.95	15	\$3,425	50%	60.5%	36.0%	0.9	1.8	0.7	71,973	0	0	0
728	Heating	Heat Pump - 21 SEER(<5 Tons)	Biz-Prescriptive	Office	ROB	33%	3,214	1.30	15	\$4,500	50%	60.5%	36.0%	0.9	1.8	0.7	90,484	0	0	0
729	Heating	Geothermal HP - SEER 20.3 (<5 Tons)	Biz-Prescriptive	Office	ROB	36%	3,534	1.23	15	\$4,700	50%	60.5%	36.0%	0.9	1.8	0.6	99,241	0	0	0
730	Heating	Geothermal HP - SEER 23.1 (<5 Tons)	Biz-Prescriptive	Office	ROB	45%	4,443	1.53	3	\$7,300	50%	60.5%	36.0%	0.2	0.3	0.2	22,384	0	0	0
731	Heating	Geothermal HP - SEER 29.3 (<5 Tons)	Biz-Prescriptive	Office	ROB	53%	5,156	1.93	5	\$9,200	50%	60.5%	36.0%	0.2	0.5	0.3	40,894	0	0	0
732	Heating	Heat Pump - 16 SEER (5-20 Tons)	Biz-Prescriptive	Office	ROB	10%	3,256	0.99	15	\$4,110	50%	60.5%	36.0%	0.9	1.8	0.6	62,143	0	0	0

Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	RAP Incentive (%)	MAP Adoption Rate	RAP Adoption Rate	Measure Level BC Tests			Cumulative Annual Potential			
														TRC	UCT	RIM	15 YR Technical	15 YR Economic	15 YR MAP	15 YR RAP
733	Heating	Heat Pump - 18 SEER (5-20 Tons)	Biz-Prescriptive	Office	ROB	19%	6,085	1.49	15	\$6,850	50%	60.5%	36.0%	1.0	1.9	0.6	122,228	0	0	0
734	Heating	Heat Pump - 21 SEER (5-20 Tons)	Biz-Prescriptive	Office	ROB	25%	7,798	1.93	15	\$9,000	50%	60.5%	36.0%	0.9	1.9	0.6	153,094	0	0	0
735	Heating	Geothermal HP - SEER 20.3 (5-20 Tons)	Biz-Prescriptive	Office	ROB	35%	6,695	3.62	10	\$7,700	50%	60.5%	36.0%	0.9	1.7	0.7	201,054	0	0	0
736	Heating	Geothermal HP - SEER 23.1 (5-20 Tons)	Biz-Prescriptive	Office	ROB	44%	8,535	4.23	20	\$12,800	50%	60.5%	36.0%	1.2	2.4	0.8	264,084	697,695	355,020	182,710
737	Heating	Geothermal HP - SEER 29.3 (5-20 Tons)	Biz-Prescriptive	Office	ROB	52%	9,989	5.05	20	\$17,700	50%	60.5%	36.0%	1.0	2.1	0.8	263,787	696,912	354,622	182,505
738	Heating	Heat Pump - 16 SEER (20+ Tons)	Biz-Prescriptive	Office	ROB	10%	6,501	1.35	15	\$8,220	50%	60.5%	36.0%	0.8	1.6	0.6	50,134	0	0	0
739	Heating	Heat Pump - 18 SEER (20+ Tons)	Biz-Prescriptive	Office	ROB	19%	12,392	2.48	15	\$13,700	50%	60.5%	36.0%	0.9	1.9	0.6	108,466	0	0	0
740	Heating	Heat Pump - 21 SEER (20+ Tons)	Biz-Prescriptive	Office	ROB	25%	16,004	3.46	15	\$18,000	50%	60.5%	36.0%	0.9	1.9	0.6	140,232	0	0	0
741	Heating	Geothermal HP - SEER 20.3 (20+ Tons)	Biz-Prescriptive	Office	ROB	35%	13,714	7.24	20	\$10,700	50%	60.5%	36.0%	2.4	4.8	1.0	384,068	1,030,290	524,261	269,809
742	Heating	Geothermal HP - SEER 23.1 (20+ Tons)	Biz-Prescriptive	Office	ROB	45%	17,393	8.46	5	\$18,300	50%	60.5%	36.0%	0.5	0.9	0.5	130,387	0	0	0
743	Heating	Geothermal HP - SEER 29.3 (20+ Tons)	Biz-Prescriptive	Office	ROB	52%	20,302	10.09	12	\$26,200	50%	60.5%	36.0%	0.9	1.7	0.7	281,113	0	0	0
744	Heating	PTAC - 7,000 to 15,000 Btuh - lodging	Biz-Prescriptive	Office	ROB	11%	351	0.08	11	\$175	50%	60.5%	38.1%	1.6	3.2	0.7	0	0	0	0
745	Hot Water	Heat Pump Water Heater	Biz-Prescriptive	Office	ROB	35%	3,341	0.20	10	\$15,574	50%	73.1%	53.8%	1.2	2.5	0.5	1,106,798	1,106,798	734,077	505,017
746	Hot Water	Hot Water Pipe Insulation	Biz-Prescriptive	Office	Retro	2%	193	0.02	20	\$60	50%	84.0%	84.0%	3.8	7.7	0.7	17,306	17,306	7,894	7,955
747	Hot Water	Low Flow Pre-Rinse Sprayers	Biz-Prescriptive	Office	ROB	26%	764	0.15	5	\$35	50%	84.0%	84.0%	7.9	15.7	0.7	98,833	98,833	91,392	95,057
748	Hot Water	Faucet Aerator	Biz-Prescriptive	Office	Retro	66%	1,425	0.16	10	\$3	50%	84.0%	84.0%	354.8	709.6	0.7	120,141	120,141	65,327	67,389
749	Hot Water	ENERGY STAR Commercial Washing Machines	Biz-Prescriptive	Office	ROB	43%	671	0.02	7	\$250	50%	73.1%	55.7%	1.1	2.1	0.5	232,384	232,384	200,117	142,030
750	Int Lighting	LED T8 Tube Replacement	Biz-Lighting	Office	Retro	46%	37	0.01	15	\$15	30%	70.6%	50.7%	2.5	8.4	0.8	11,180,548	11,180,548	7,399,100	4,811,895
751	Int Lighting	LED troffer, 2'X2' and 2'X4'	Biz-Lighting	Office	Retro	49%	118	0.03	15	\$80	30%	70.6%	42.9%	1.5	5.1	0.7	7,195,594	7,195,594	4,761,924	2,443,732
752	Int Lighting	LED high bay fixture	Biz-Lighting	Office	Retro	70%	1,490	0.33	15	\$330	30%	70.6%	55.4%	4.6	15.5	0.8	204,931	204,931	136,210	99,895
753	Int Lighting	LED low bay fixture	Biz-Lighting	Office	Retro	63%	283	0.06	15	\$44	30%	70.6%	57.1%	6.6	22.0	0.8	184,085	184,085	122,355	93,325
754	Int Lighting	LED downlight, screw-in lamp, 4W, interior	Biz-Lighting	Office	ROB	83%	55	0.01	15	\$2	30%	70.6%	61.3%	33.3	111.1	0.8	1,074,062	1,074,062	632,657	503,068
755	Int Lighting	LED downlight fixture	Biz-Lighting	Office	ROB	70%	125	0.02	15	\$27	30%	70.6%	60.0%	4.6	15.3	0.8	144,102	144,102	66,271	38,778
756	Int Lighting	LED downlight, screw-in lamp, 12W, interior	Biz-Lighting	Office	ROB	83%	180	0.03	15	\$2	30%	70.6%	62.0%	108.2	360.7	0.8	5,659,657	5,659,657	3,333,718	2,703,304
757	Int Lighting	Delamp Fluorescent Fixture Average Lamp Wattage 28W	Biz-Lighting	Office	Retro	100%	83	0.02	11	\$12	30%	70.6%	57.4%	5.4	17.9	0.8	2,697,282	2,697,282	2,448,869	2,115,090
758	Int Lighting	Central Lighting Monitoring & Controls (non-networked)	Biz-Lighting	Office	Retro	20%	8,341	1.53	12	\$3,700	30%	70.6%	49.6%	1.8	6.0	0.7	1,112,590	1,205,404	1,098,295	760,459
759	Int Lighting	Daylighting Controls	Biz-Lighting	Office	Retro	30%	2,643	0.57	12	\$3,000	30%	70.6%	37.3%	0.7	2.4	0.6	676,882	0	0	0
760	Int Lighting	Network Lighting Controls - Wireless (Wifi)	Biz-Lighting	Office	Retro	47%	7,650	2.86	8	\$1,683	30%	70.6%	55.5%	3.1	10.3	0.9	4,063,825	4,402,836	4,196,794	3,412,477
761	Int Lighting	Occupancy Sensors	Biz-Lighting	Office	Retro	30%	457	0.02	8	\$54	30%	70.6%	58.2%	3.9	12.9	0.6	3,254,294	3,525,772	3,360,775	2,894,676
762	Int Lighting	Bi-Level Lighting Fixture - Stairwells, Hallways, and Garages	Biz-Lighting	Office	Retro	50%	517	0.06	10	\$274	30%	70.6%	47.1%	1.2	3.9	0.6	2,446,255	2,446,255	2,283,179	1,507,181
763	Int Lighting	LED Exit Sign - 4 Watt Fixture (2 lamp)	Biz-Lighting	Office	Retro	73%	96	0.01	5	\$33	30%	80.0%	80.0%	1.0	3.3	0.6	40,863	0	0	0
764	Misc	Power Distribution Equipment Upgrades	Biz-Custom	Office	Retro	1%	6	0.00	30	\$8	50%	66.3%	37.6%	1.7	3.5	0.8	65,431	65,431	37,788	15,372
765	Motors	Cogged V-Belt	Biz-Custom	Office	Retro	3%	282	0.10	15	\$384	50%	66.3%	36.2%	0.9	1.8	0.6	387,742	0	0	0
766	Motors	Pump and Fan Variable Frequency Drive Controls (Pumps)	Biz-Custom	Office	Retro	38%	731	0.15	15	\$200	50%	66.3%	51.7%	3.7	7.5	0.8	728,356	728,356	406,814	270,960
767	Plug Loads Office	ENERGY STAR Uninterrupted Power Supply	Biz-Custom	Office	ROB	3%	85	0.01	15	\$59	50%	76.0%	76.0%	1.4	2.7	0.6	35,586	35,586	22,302	22,302
768	Plug Loads Office	Plug Load Occupancy Sensor	Biz-Custom	Office	ROB	15%	169	0.00	8	\$70	50%	66.3%	48.9%	1.0	2.1	0.5	6,417,910	6,417,910	4,186,408	2,915,000
769	Plug Loads Office	Energy Star Server	Biz-Custom	Office	ROB	13%	90	0.01	15	\$156	50%	66.3%	36.0%	0.5	1.0	0.4	833,178	0	0	0
770	Plug Loads Office	Data Center Hot/Cold Aisle Configuration	Biz-Custom	Office	Retro	13%	90	0.01	15	\$156	50%	66.3%	36.0%	0.5	1.0	0.4	751,363	0	0	0
771	Plug Loads Office	Electrically Commutated Plug Fans in data centers	Biz-Custom	Office	Retro	18%	15,778	1.80	15	\$480	50%	66.3%	57.7%	29.2	58.3	0.7	4,987,788	4,987,788	2,569,394	1,963,649
772	Plug Loads Office	High Efficiency CRAC unit	Biz-Custom	Office	ROB	30%	162	0.02	15	\$63	50%	66.3%	49.5%	2.4	4.7	0.6	805,975	805,975	448,047	296,684
773	Plug Loads Office	Computer Room Air Conditioner Economizer	Biz-Custom	Office	Retro	86%	358	0.00	15	\$82	50%	66.3%	52.6%	3.3	6.6	0.6	2,637,403	2,637,403	1,354,817	845,954
774	Refrigeration	Strip Curtains	Biz-Prescriptive	Office	Retro	81%	270	0.03	4	\$9	50%	56.7%	48.3%	7.3	14.6	0.6	547,145	547,145	241,482	182,039
775	Refrigeration	Bare Section Line	Biz-Custom	Office	Retro	93%	21	0.00	15	\$4	50%	56.7%	40.0%	4.5	8.9	0.7	24,058	24,058	10,619	5,452
776	Refrigeration	Floating Head Pressure Controls	Biz-Prescriptive	Office	Retro	50%	1,327	0.15	15	\$80	50%	56.7%	46.9%	14.0	28.1	0.7	209,813	209,813	92,940	66,295
777	Refrigeration	Saturated Suction Controls	Biz-Custom	Office	Retro	50%	416	0.18	15	\$559	50%	56.7%	40.0%	0.9	1.8	0.7	65,236	0	0	0
778	Refrigeration	Compressor Retrofit	Biz-Custom	Office	Retro	20%	163	0.07	15	\$477	50%	56.7%	32.0%	0.4	0.8	0.5	309,711	0	0	0
779	Refrigeration	Electronically Commutated (EC) Walk-In Evaporator Fan Motor	Biz-Custom	Office	Retro	65%	824	0.09	15	\$78	50%	56.7%	46.4%	8.9	17.9	0.7	279,264	279,264	107,278	66,443
780	Refrigeration	Evaporator Fan Motor Controls	Biz-Custom	Office	Retro	25%	478	0.06	13	\$291	50%	56.7%	28.0%	1.2	2.5	0.5	107,534	109,876	62,347	24,959
781	Refrigeration	Variable Speed Condenser Fan	Biz-Custom	Office	Retro	50%	1,480	0.00	15	\$1,170	50%	56.7%	36.0%	0.9	1.8	0.4	279,843	0	0	0
782	Refrigeration	Refrigeration Economizer	Biz-Custom	Office	Retro	2%	1,357	0.00	15	\$2,558	50%	56.7%	36.0%	0.4	0.8	0.3	5,272	0	0	0
783	Refrigeration	Anti-Sweat Heater Controls MT	Biz-Custom	Office	Retro	55%	722	0.00	12	\$250	50%	56.7%	46.4%	1.7	3.4	0.5	892,358	892,358	345,345	213,642
784	Refrigeration	Auto Door Closer, Cooler	Biz-Custom	Office	Retro	0%	943	0.14	8	\$157	50%	56.7%	46.4%	3.0	6.0	0.6	2,336	2,336	894	553
785	Refrigeration	Display Case Door Retrofit, Medium Temp	Biz-Prescriptive	Office	Retro	36%	578	0.09	12	\$686	50%	64.0%	64.0%	0.6	1.2	0.5	41,292	0	0	0
786	Refrigeration	Electronically Commutated (EC) Reach-In Evaporator Fan Motor	Biz-Custom	Office	Retro	65%	824	0.09	15	\$78	50%	56.7%	46.4%	8.9	17.9	0.7	151,985	151,985	57,438	35,533
787	Refrigeration	Q-Sync Motor for Walk-In and Reach-In Evaporator Fan Motor	Biz-Custom	Office	Retro	51%	504	0.06	10	\$96	50%	56.7%	46.4%	3.1	6.2	0.6	42,919	42,919	16,550	10,238
788	Refrigeration	Energy Star Reach-In Refrigerator, Glass Doors	Biz-Prescriptive	Office	ROB	27%	410	0.05	12	\$600	50%	64.0%	64.0%	0.5	0.9	0.4	431,084	0	0	0
789	Refrigeration	Energy Star Reach-In Refrigerator, Solid Doors	Biz-Prescriptive	Office	ROB	25%	283	0.03	12	\$600	50%	64.0%	64.0%	0.3	0.7	0.3	413,684	0	0	0
790	Refrigeration	Anti-Sweat Heater Controls LT	Biz-Custom	Office	Retro	36%	578	0.09	12	\$686	50%	56.7%	46.4%	0.6	1.2	0.5	197,346	0	0	0
791	Refrigeration	Auto Door Closer, Freezer	Biz-Custom	Office	Retro	1%	2,307	0.31	8	\$157	50%	56.7%	46.5%	7.3	14.5	0.7	3,016	3,016	1,155	717
792	Refrigeration	Display Case Door Retrofit, Low Temp	Biz-Prescriptive	Office	Retro	50%	1,453	0.23	12	\$686	50%	64.0%	64.0%	1.6	3.1	0.6	64,679	64,679	18,712	18,712
793	Refrigeration	Energy Star Reach-In Freezer, Glass Doors	Biz-Prescriptive	Office	ROB	15%	488	0.06	12	\$450	50%	64.0%	64.0%	0.8	1.5	0.5	81,761	0	0	0

Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	RAP Incentive (%)	MAP Adoption Rate	RAP Adoption Rate	Measure Level BC Tests			Cumulative Annual Potential			
														TRC	UCT	RIM	15 YR Technical	15 YR Economic	15 YR MAP	15 YR RAP
794	Refrigeration	Energy Star Reach-In Freezer, Solid Doors	Biz-Prescriptive	Office	ROB	20%	935	0.11	12	\$450	50%	64.0%	64.0%	1.4	2.9	0.6	108,344	108,344	54,346	54,346
795	Refrigeration	Retro-commissioning_Refrigerator Optimization	Biz-Custom	Office	Retro	3%	1	0.00	3	\$0	50%	56.7%	45.3%	2.2	4.3	0.5	108,917	108,917	59,130	45,003
796	Refrigeration	Energy Star Ice Machine	Biz-Prescriptive	Office	ROB	10%	721	0.07	15	\$1,426	50%	59.2%	59.2%	0.4	0.8	0.4	88,957	0	0	0
797	Refrigeration	LED Refrigerated Display Case Lighting Average 6W/LF	Biz-Lighting	Office	Retro	37%	574	0.13	12	\$1,010	50%	56.7%	46.4%	0.5	1.0	0.4	470,665	0	0	0
798	Ventilation	Demand Controlled Ventilation (DCV) Exhaust Hood	Biz-Custom	Office	ROB	0%	0	0.00	20	\$0	0%	60.5%	53.4%	0.0	#DIV/0	0.0	0	0	0	0
799	Ventilation	Pump and Fan Variable Frequency Drive Controls (Fans)	Biz-Custom	Office	Retro	41%	923	0.19	15	\$375	50%	60.5%	40.4%	2.5	5.0	0.7	17,763,964	17,763,964	8,561,344	4,032,529
800	Ventilation	Demand Control Ventilation	Biz-Custom	Office	Retro	20%	506	0.02	15	\$227	50%	60.5%	39.4%	1.9	3.7	0.6	7,348,365	7,348,365	4,614,301	2,872,218
801	WholeBld_HVAC	HVAC - Energy Management System	Biz-Custom	Office	Retro	15%	1,044	0.05	15	\$4,000	50%	60.5%	28.0%	0.2	0.4	0.3	12,285,552	0	0	0
802	WholeBld_HVAC	GREM Controls	Biz-Custom	Office	Retro	0%	0	0.00	8	\$0	0%	60.5%	53.4%	0.0	#DIV/0	0.0	0	0	0	0
803	WholeBld_HVAC	Retro-commissioning_Bld Optimization	Biz-Custom	Office	Retro	15%	1	0.00	3	\$0	50%	60.5%	49.3%	2.0	4.1	0.6	5,680,658	6,179,928	4,152,189	3,399,753
804	WholeBld	WholeBldg - Com RET	Biz-Custom	Office	Retro	15%	1	0.00	12	\$0	50%	66.3%	55.7%	7.7	15.5	0.8	7,980,348	8,585,905	6,516,363	5,646,678
805	WholeBld_NC	WholeBldg - Com NC	Biz-NC	Office	NC	25%	1	0.00	12	\$0	50%	68.0%	68.0%	7.7	15.5	0.8	0	0	0	0
806	Compressed Air	Efficient Air Compressors	Biz-Custom	Warehouse	ROB	31%	1,223	0.21	15	\$100	50%	66.3%	56.3%	11.7	23.5	0.8	80,510	80,510	43,527	34,763
807	Compressed Air	Retro-commissioning_Compressed Air Optimization	Biz-Custom	Warehouse	Retro	15%	1	0.00	5	\$0	50%	66.3%	56.4%	4.5	9.0	0.7	13,563	13,563	7,987	5,877
808	Cooking	Commercial Griddles	Biz-Prescriptive	Warehouse	ROB	15%	2,596	0.23	12	\$774	50%	66.3%	51.2%	2.3	4.7	0.6	0	0	0	0
809	Cooking	Convection Ovens	Biz-Prescriptive	Warehouse	ROB	15%	1,879	0.43	12	\$471	50%	66.3%	62.4%	3.3	6.7	0.7	0	0	0	0
810	Cooking	Combination Ovens	Biz-Prescriptive	Warehouse	ROB	41%	6,368	0.74	12	\$1,568	50%	66.3%	62.4%	2.9	5.9	0.6	0	0	0	0
811	Cooking	Commercial Fryers	Biz-Prescriptive	Warehouse	ROB	14%	2,378	0.15	12	\$1,200	50%	66.3%	47.1%	1.3	2.7	0.5	0	0	0	0
812	Cooking	Commercial Steam Cookers	Biz-Prescriptive	Warehouse	ROB	67%	13,162	3.00	12	\$2,490	50%	66.3%	53.6%	4.4	8.8	0.8	0	0	0	0
813	Cooking	Insulated Holding Cabinets (Full Size)	Biz-Prescriptive	Warehouse	ROB	69%	5,278	0.80	12	\$1,200	50%	66.3%	52.6%	3.3	6.7	0.7	0	0	0	0
814	Cooking	Insulated Holding Cabinets (Half-Size)	Biz-Prescriptive	Warehouse	ROB	58%	1,788	0.30	12	\$1,500	50%	66.3%	41.2%	0.9	1.9	0.5	0	0	0	0
815	Cooling	Air Conditioner - 16 SEER (5-20 Tons)	Biz-Prescriptive	Warehouse	ROB	13%	1,128	0.99	15	\$720	50%	60.5%	36.0%	2.8	5.7	1.2	139,235	139,235	70,850	36,463
816	Cooling	Air Conditioner - 18 SEER (5-20 Tons)	Biz-Prescriptive	Warehouse	ROB	19%	1,700	1.49	15	\$1,200	50%	60.5%	36.0%	2.6	5.1	1.2	189,788	189,788	96,573	49,701
817	Cooling	Air Conditioner - 21 SEER (5-20 Tons)	Biz-Prescriptive	Warehouse	ROB	24%	2,194	1.93	15	\$1,680	50%	60.5%	36.0%	2.4	4.7	1.1	225,962	225,962	114,980	59,174
818	Cooling	Air Conditioner - 16 SEER (20+ Tons)	Biz-Prescriptive	Warehouse	ROB	8%	1,531	1.35	15	\$3,600	50%	60.5%	36.0%	0.8	1.5	0.8	91,425	0	0	0
819	Cooling	Air Conditioner - 18 SEER (20+ Tons)	Biz-Prescriptive	Warehouse	ROB	15%	2,826	2.48	15	\$7,200	50%	60.5%	36.0%	0.7	1.4	0.7	155,801	0	0	0
820	Cooling	Air Conditioner - 21 SEER (20+ Tons)	Biz-Prescriptive	Warehouse	ROB	21%	3,937	3.46	15	\$10,800	50%	60.5%	36.0%	0.7	1.3	0.7	201,508	0	0	0
821	Cooling	Comprehensive Rooftop Unit Quality Maintenance (AC Tune-up)	Biz-Custom	Warehouse	Retro	6%	954	0.35	3	\$500	50%	60.5%	60.0%	0.5	1.0	0.4	181,907	0	0	0
822	Cooling	Air Side Economizer	Biz-Custom	Warehouse	Retro	2%	189	0.01	5	\$170	50%	60.5%	46.4%	0.3	0.7	0.3	65,666	0	0	0
823	Cooling	Advanced Rooftop Controls	Biz-Custom	Warehouse	Retro	11%	746	0.27	10	\$3,412	50%	60.5%	36.0%	0.2	0.4	0.3	420,813	0	0	0
824	Cooling	Air Conditioner - 16 SEER (<5 Tons)	Biz-Prescriptive	Warehouse	ROB	19%	729	0.64	15	\$820	50%	60.5%	36.0%	1.6	3.2	1.0	354,783	354,783	180,530	92,910
825	Cooling	Air Conditioner - 18 SEER (<5 Tons)	Biz-Prescriptive	Warehouse	ROB	28%	1,079	0.95	15	\$1,640	50%	60.5%	36.0%	1.2	2.4	0.9	389,336	389,336	198,113	101,958
826	Cooling	Air Conditioner - 21 SEER (<5 Tons)	Biz-Prescriptive	Warehouse	ROB	38%	1,480	1.30	15	\$2,460	50%	60.5%	36.0%	1.1	2.2	0.9	488,181	488,181	248,409	127,843
827	Cooling	Centrifugal Chiller - Average kW/Ton 0.626	Biz-Custom	Warehouse	ROB	26%	2,416	1.08	20	\$5,453	50%	60.5%	36.0%	0.8	1.5	0.6	0	0	0	0
828	Cooling	Reciprocating Chiller - Average kW/Ton 0.99	Biz-Custom	Warehouse	ROB	27%	3,020	2.97	20	\$4,372	50%	60.5%	36.0%	1.7	3.5	1.1	0	0	0	0
829	Cooling	Screw Chiller - Average kW/Ton 0.675	Biz-Custom	Warehouse	ROB	23%	3,034	2.92	20	\$4,363	50%	60.5%	36.0%	1.7	3.5	1.1	0	0	0	0
830	Cooling	Chiller Tune-up	Biz-Custom	Warehouse	Retro	8%	1,450	0.34	5	\$164	50%	60.5%	60.0%	3.3	6.5	0.7	0	0	0	0
831	Cooling	PTAC - 7,000 to 15,000 Btuh - lodging	Biz-Prescriptive	Warehouse	ROB	19%	281	0.16	15	\$91	50%	60.5%	42.5%	4.4	8.9	1.0	0	0	0	0
832	Cooling	HVAC Occupancy Controls	Biz-Prescriptive	Warehouse	Retro	5%	1	0.00	12	\$0	50%	60.5%	47.4%	11.5	23.1	1.6	313,327	337,656	178,804	118,559
833	Cooling	Smart Thermostat	Biz-Prescriptive	Warehouse	ROB	18%	1,150	0.00	11	\$175	50%	60.5%	47.3%	3.9	7.5	0.6	43,022	46,709	27,457	20,199
834	Cooling	Window Film	Biz-Custom	Warehouse	Retro	1%	151	0.07	10	\$126	50%	60.5%	40.0%	1.1	2.2	0.7	49,159	53,709	29,321	13,743
835	Ext Lighting	LED wallpack (existing W<250)	Biz-Lighting	Warehouse	Retro	66%	567	0.00	12	\$248	30%	70.6%	49.8%	1.3	4.3	0.5	483,569	483,569	309,603	185,555
836	Ext Lighting	LED parking lot fixture (existing W<250)	Biz-Lighting	Warehouse	Retro	60%	959	0.00	12	\$756	30%	70.6%	41.4%	0.7	2.4	0.5	440,895	0	0	0
837	Ext Lighting	LED parking lot fixture (existing W<250)	Biz-Lighting	Warehouse	Retro	66%	567	0.00	12	\$248	30%	70.6%	49.8%	1.3	4.3	0.5	483,569	483,569	309,603	185,555
838	Ext Lighting	LED outdoor pole decorative fixture (existing W<250)	Biz-Lighting	Warehouse	Retro	60%	959	0.00	12	\$756	30%	70.6%	41.4%	0.7	2.4	0.5	440,895	0	0	0
839	Ext Lighting	LED parking garage fixture (existing W<250)	Biz-Lighting	Warehouse	Retro	60%	1,953	0.00	6	\$756	30%	70.6%	51.2%	0.8	2.6	0.4	451,390	0	0	0
840	Ext Lighting	LED parking garage fixture (existing W<250)	Biz-Lighting	Warehouse	Retro	66%	1,154	0.00	6	\$248	30%	70.6%	55.6%	1.4	4.7	0.5	495,079	495,079	316,467	224,845
841	Heating	Heat Pump - 16 SEER (<5 Tons)	Biz-Prescriptive	Warehouse	ROB	19%	1,789	0.64	15	\$2,055	50%	60.5%	36.0%	1.0	2.1	0.7	19,686	75,446	38,390	19,758
842	Heating	Heat Pump - 18 SEER (<5 Tons)	Biz-Prescriptive	Warehouse	ROB	25%	2,366	0.95	15	\$3,425	50%	60.5%	36.0%	0.9	1.7	0.6	21,557	0	0	0
843	Heating	Heat Pump - 21 SEER (<5 Tons)	Biz-Prescriptive	Warehouse	ROB	30%	2,852	1.30	15	\$4,500	50%	60.5%	36.0%	0.8	1.7	0.7	25,093	0	0	0
844	Heating	Geothermal HP - SEER 20.3 (<5 Tons)	Biz-Prescriptive	Warehouse	ROB	36%	3,422	1.23	15	\$4,700	50%	60.5%	36.0%	0.9	1.7	0.6	31,572	0	0	0
845	Heating	Geothermal HP - SEER 23.1 (<5 Tons)	Biz-Prescriptive	Warehouse	ROB	46%	4,331	1.53	3	\$7,300	50%	60.5%	36.0%	0.2	0.3	0.2	7,177	0	0	0
846	Heating	Geothermal HP - SEER 29.3 (<5 Tons)	Biz-Prescriptive	Warehouse	ROB	51%	4,801	1.93	5	\$9,200	50%	60.5%	36.0%	0.2	0.5	0.3	12,192	0	0	0
847	Heating	Heat Pump - 16 SEER (5-20 Tons)	Biz-Prescriptive	Warehouse	ROB	10%	3,363	0.99	15	\$4,110	50%	60.5%	36.0%	0.9	1.8	0.6	4,226	0	0	0
848	Heating	Heat Pump - 18 SEER (5-20 Tons)	Biz-Prescriptive	Warehouse	ROB	19%	6,804	1.49	15	\$6,850	50%	60.5%	36.0%	1.0	2.1	0.6	9,547	17,351	8,829	4,544
849	Heating	Heat Pump - 21 SEER (5-20 Tons)	Biz-Prescriptive	Warehouse	ROB	25%	8,699	1.93	15	\$9,000	50%	60.5%	36.0%	1.0	2.0	0.6	11,907	21,640	11,012	5,667
850	Heating	Geothermal HP - SEER 20.3 (5-20 Tons)	Biz-Prescriptive	Warehouse	ROB	27%	4,619	3.62	10	\$7,700	50%	60.5%	36.0%	0.7	1.4	0.7	9,502	0	0	0
851	Heating	Geothermal HP - SEER 23.1 (5-20 Tons)	Biz-Prescriptive	Warehouse	ROB	38%	6,451	4.23	20	\$12,800	50%	60.5%	36.0%	1.0	2.1	0.8	14,170	25,753	13,105	6,744
852	Heating	Geothermal HP - SEER 29.3 (5-20 Tons)	Biz-Prescriptive	Warehouse	ROB	44%	7,410	5.05	20	\$17,700	50%	60.5%	36.0%	0.9	1.7	0.8	13,782	0	0	0
853	Heating	Heat Pump - 16 SEER (20+ Tons)	Biz-Prescriptive	Warehouse	ROB	11%	7,634	1.35	15	\$8,220	50%	60.5%	36.0%	0.9	1.8	0.6	4,215	0	0	0
854	Heating	Heat Pump - 18 SEER (20+ Tons)	Biz-Prescriptive	Warehouse	ROB	20%	14,668	2.48	15	\$13,700	50%	60.5%	36.0%	1.0	2.1	0.6	9,258	13,950	7,098	3,653

Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	RAP Incentive (%)	MAP Adoption Rate	RAP Adoption Rate	Measure Level BC Tests			Cumulative Annual Potential			
														TRC	UCT	RIM	15 YR Technical	15 YR Economic	15 YR MAP	15 YR RAP
855	Heating	Heat Pump - 21 SEER (20+ Tons)	Biz-Prescriptive	Warehouse	ROB	26%	18,578	3.46	15	\$18,000	50%	60.5%	36.0%	1.0	2.0	0.6	11,540	17,388	8,848	4,554
856	Heating	Geothermal HP - SEER 20.3 (20+ Tons)	Biz-Prescriptive	Warehouse	ROB	28%	9,714	7.24	20	\$10,700	50%	60.5%	36.0%	2.0	3.9	1.1	18,451	27,801	14,147	7,281
857	Heating	Geothermal HP - SEER 23.1 (20+ Tons)	Biz-Prescriptive	Warehouse	ROB	39%	13,378	8.46	5	\$18,300	50%	60.5%	36.0%	0.4	0.8	0.5	7,003	0	0	0
858	Heating	Geothermal HP - SEER 29.3 (20+ Tons)	Biz-Prescriptive	Warehouse	ROB	45%	15,296	10.09	12	\$26,200	50%	60.5%	36.0%	0.7	1.5	0.7	14,742	0	0	0
859	Heating	PTAC - 7,000 to 15,000 Btuh - lodging	Biz-Prescriptive	Warehouse	ROB	11%	406	0.08	11	\$175	50%	60.5%	39.8%	1.7	3.5	0.6	0	0	0	0
860	Hot Water	Heat Pump Water Heater	Biz-Prescriptive	Warehouse	ROB	35%	3,788	0.23	10	\$1,574	50%	73.1%	54.8%	1.4	2.8	0.5	0	0	0	0
861	Hot Water	Hot Water Pipe Insulation	Biz-Prescriptive	Warehouse	Retro	2%	219	0.03	20	\$60	50%	84.0%	84.0%	4.3	8.6	0.7	0	0	0	0
862	Hot Water	Low Flow Pre-Rinse Sprayers	Biz-Prescriptive	Warehouse	ROB	26%	764	0.15	5	\$35	50%	84.0%	84.0%	7.8	15.6	0.7	0	0	0	0
863	Hot Water	Faucet Aerator	Biz-Prescriptive	Warehouse	Retro	66%	1,425	0.16	10	\$3	50%	84.0%	84.0%	351.7	703.5	0.7	0	0	0	0
864	Hot Water	ENERGY STAR Commercial Washing Machines	Biz-Prescriptive	Warehouse	ROB	43%	671	0.02	7	\$250	50%	73.1%	55.7%	1.1	2.1	0.5	0	0	0	0
865	Int Lighting	LED T8 Tube Replacement	Biz-Lighting	Warehouse	Retro	44%	40	0.01	15	\$15	30%	70.6%	51.4%	3.0	9.9	0.8	4,369,062	4,369,062	2,755,779	1,737,822
866	Int Lighting	LED troffer, 2'X2' and 2'X4'	Biz-Lighting	Warehouse	Retro	47%	127	0.04	15	\$80	30%	70.6%	44.3%	1.8	6.0	0.8	2,818,274	2,818,274	1,771,342	873,367
867	Int Lighting	LED high bay fixture	Biz-Lighting	Warehouse	Retro	69%	1,605	0.50	15	\$330	30%	70.6%	55.8%	5.5	18.2	0.9	279,909	279,909	176,552	126,266
868	Int Lighting	LED low bay fixture	Biz-Lighting	Warehouse	Retro	61%	305	0.09	15	\$44	30%	70.6%	57.4%	7.8	26.0	0.9	250,069	250,069	157,730	117,521
869	Int Lighting	LED downlight, screw lamp, 4W, interior	Biz-Lighting	Warehouse	ROB	82%	71	0.02	15	\$2	30%	70.6%	61.5%	44.2	147.4	0.8	311,150	311,150	183,277	146,671
870	Int Lighting	LED downlight fixture	Biz-Lighting	Warehouse	Retro	68%	161	0.04	15	\$27	30%	70.6%	60.0%	6.1	20.3	0.8	60,104	60,104	27,641	16,174
871	Int Lighting	LED downlight, screw lamp, 12W, interior	Biz-Lighting	Warehouse	ROB	82%	232	0.05	15	\$2	30%	70.6%	62.1%	143.6	478.8	0.8	2,384,633	2,384,633	1,404,625	1,141,214
872	Int Lighting	DeLamp Fluorescent Fixture Average Lamp Wattage 28W	Biz-Lighting	Warehouse	Retro	100%	90	0.03	11	\$12	30%	70.6%	57.7%	6.3	21.1	0.9	1,173,025	1,173,025	1,050,580	912,647
873	Int Lighting	Central Lighting Monitoring & Controls (non-networked)	Biz-Lighting	Warehouse	Retro	20%	8,341	1.53	12	\$3,700	30%	70.6%	49.6%	1.8	5.9	0.7	548,072	593,846	536,914	372,018
874	Int Lighting	Daylighting Controls	Biz-Lighting	Warehouse	Retro	30%	2,643	0.57	12	\$3,000	30%	70.6%	37.3%	0.7	2.4	0.6	333,593	0	0	0
875	Int Lighting	Network Lighting Controls - Wireless (WiFi)	Biz-Lighting	Warehouse	Retro	47%	7,650	2.86	8	\$1,683	30%	70.6%	55.5%	3.1	10.2	0.9	2,035,991	2,206,034	2,060,221	1,676,204
876	Int Lighting	Occupancy Sensors	Biz-Lighting	Warehouse	Retro	30%	457	0.02	8	\$54	30%	70.6%	58.2%	3.8	12.7	0.6	1,621,999	1,757,465	1,641,302	1,414,523
877	Int Lighting	Bi-Level Lighting Fixture - Stairwells, Hallways, and Garages	Biz-Lighting	Warehouse	Retro	50%	517	0.06	10	\$274	30%	70.6%	47.1%	1.2	3.9	0.6	361,955	361,955	333,058	220,016
878	Int Lighting	LED Exit Sign - 4 Watt Fixture (2 lamp)	Biz-Lighting	Warehouse	Retro	72%	89	0.01	5	\$33	30%	80.0%	80.0%	0.9	3.0	0.5	18,042	0	0	0
879	Misc	Power Distribution Equipment Upgrades	Biz-Custom	Warehouse	Retro	1%	6	0.00	30	\$8	50%	66.3%	37.6%	1.7	3.5	0.8	9,079	9,079	5,243	2,133
880	Motors	Cogged V-Belt	Biz-Custom	Warehouse	Retro	3%	650	0.10	15	\$384	50%	66.3%	45.5%	1.5	3.1	0.6	138,256	138,256	89,065	56,684
881	Motors	Pump and Fan Variable Frequency Drive Controls (Pumps)	Biz-Custom	Warehouse	Retro	38%	731	0.15	15	\$200	50%	66.3%	51.7%	3.6	7.1	0.7	149,332	149,332	83,407	55,554
882	Plug Loads Office	ENERGY STAR Uninterrupted Power Supply	Biz-Custom	Warehouse	ROB	3%	85	0.01	15	\$59	50%	76.0%	76.0%	1.4	2.8	0.6	12,963	12,963	8,124	8,124
883	Plug Loads Office	Plug Load Occupancy Sensor	Biz-Custom	Warehouse	Retro	15%	169	0.00	8	\$70	50%	66.3%	48.9%	1.0	2.1	0.5	622,596	622,596	406,120	282,782
884	Plug Loads Office	Energy Star Server	Biz-Custom	Warehouse	ROB	13%	90	0.01	15	\$156	50%	66.3%	36.0%	0.5	1.0	0.4	80,826	0	0	0
885	Plug Loads Office	Data Center Hot/Cold Aisle Configuration	Biz-Custom	Warehouse	Retro	13%	90	0.01	15	\$156	50%	66.3%	36.0%	0.5	1.0	0.4	72,889	0	0	0
886	Plug Loads Office	Electrically Commutated Plug Fans in data centers	Biz-Custom	Warehouse	Retro	18%	15,778	1.80	15	\$480	50%	66.3%	57.7%	29.3	58.6	0.7	483,823	483,823	249,235	190,477
887	Plug Loads Office	High Efficiency CRAC unit	Biz-Custom	Warehouse	ROB	30%	162	0.02	15	\$63	50%	66.3%	49.5%	2.4	4.7	0.7	78,172	78,172	43,456	28,775
888	Plug Loads Office	Computer Room Air Conditioner Economizer	Biz-Custom	Warehouse	Retro	86%	358	0.00	15	\$82	50%	66.3%	52.6%	3.3	6.6	0.6	256,065	256,065	131,539	82,137
889	Refrigeration	Strip Curtains	Biz-Prescriptive	Warehouse	Retro	81%	270	0.03	4	\$9	50%	56.7%	48.3%	7.3	14.6	0.6	891,903	891,903	393,640	296,742
890	Refrigeration	Bare Suction Line	Biz-Custom	Warehouse	Retro	93%	21	0.00	15	\$4	50%	56.7%	40.0%	4.5	8.9	0.7	32,529	32,529	14,412	7,401
891	Refrigeration	Floating Head Pressure Controls	Biz-Prescriptive	Warehouse	Retro	50%	1,327	0.15	15	\$80	50%	56.7%	46.9%	14.0	28.1	0.7	283,686	283,686	126,123	89,987
892	Refrigeration	Saturated Suction Controls	Biz-Custom	Warehouse	Retro	50%	416	0.18	15	\$559	50%	56.7%	40.0%	0.9	1.8	0.7	88,204	0	0	0
893	Refrigeration	Compressor Retrofit	Biz-Custom	Warehouse	Retro	20%	163	0.07	15	\$477	50%	56.7%	32.0%	0.4	0.8	0.5	502,095	0	0	0
894	Refrigeration	Electronically Commutated (EC) Walk-In Evaporator Fan Motor	Biz-Custom	Warehouse	Retro	65%	824	0.09	15	\$78	50%	56.7%	46.4%	8.9	17.9	0.7	453,291	453,291	174,708	108,232
895	Refrigeration	Evaporator Fan Motor Controls	Biz-Custom	Warehouse	Retro	25%	478	0.06	13	\$291	50%	56.7%	28.0%	1.2	2.5	0.5	172,860	177,274	101,372	40,613
896	Refrigeration	Variable Speed Condenser Fan	Biz-Custom	Warehouse	Retro	50%	1,480	0.00	15	\$1,170	50%	56.7%	36.0%	0.9	1.8	0.4	453,857	0	0	0
897	Refrigeration	Refrigeration Economizer	Biz-Custom	Warehouse	Retro	2%	1,357	0.00	15	\$2,558	50%	56.7%	36.0%	0.4	0.8	0.3	8,471	0	0	0
898	Refrigeration	Anti-Sweat Heater Controls MT	Biz-Custom	Warehouse	Retro	55%	722	0.00	12	\$250	50%	56.7%	46.4%	1.7	3.4	0.5	510,399	510,399	197,526	122,196
899	Refrigeration	Auto Door Closer, Cooler	Biz-Custom	Warehouse	Retro	0%	943	0.14	8	\$157	50%	56.7%	46.4%	3.0	6.0	0.6	1,336	1,336	512	316
900	Refrigeration	Display Case Door Retrofit, Medium Temp	Biz-Prescriptive	Warehouse	Retro	36%	578	0.09	12	\$686	50%	64.0%	64.0%	0.6	1.2	0.5	23,618	0	0	0
901	Refrigeration	Electronically Commutated (EC) Reach-In Evaporator Fan Motor	Biz-Custom	Warehouse	Retro	65%	824	0.09	15	\$78	50%	56.7%	46.4%	8.9	17.9	0.7	86,930	86,930	32,853	20,324
902	Refrigeration	Q-Sync Motor for Walk-In and Reach-In Evaporator Fan Motor	Biz-Custom	Warehouse	Retro	51%	504	0.06	10	\$96	50%	56.7%	46.4%	3.1	6.2	0.6	24,548	24,548	9,466	5,856
903	Refrigeration	Energy Star Reach-In Refrigerator, Glass Doors	Biz-Prescriptive	Warehouse	ROB	27%	410	0.05	12	\$600	50%	64.0%	64.0%	0.5	0.9	0.4	246,566	0	0	0
904	Refrigeration	Energy Star Reach-In Refrigerator, Solid Doors	Biz-Prescriptive	Warehouse	ROB	25%	283	0.03	12	\$600	50%	64.0%	64.0%	0.3	0.7	0.3	236,614	0	0	0
905	Refrigeration	Anti-Sweat Heater Controls LT	Biz-Custom	Warehouse	Retro	36%	578	0.09	12	\$686	50%	56.7%	46.4%	0.6	1.2	0.5	112,875	0	0	0
906	Refrigeration	Auto Door Closer, Freezer	Biz-Custom	Warehouse	Retro	1%	2,307	0.31	8	\$157	50%	56.7%	46.5%	7.3	14.5	0.7	1,725	1,725	661	410
907	Refrigeration	Display Case Door Retrofit, Low Temp	Biz-Prescriptive	Warehouse	Retro	50%	1,453	0.23	12	\$686	50%	64.0%	64.0%	1.6	3.1	0.6	36,994	36,994	10,703	10,703
908	Refrigeration	Energy Star Reach-In Freezer, Glass Doors	Biz-Prescriptive	Warehouse	ROB	15%	488	0.06	12	\$450	50%	64.0%	64.0%	0.8	1.5	0.5	46,765	0	0	0
909	Refrigeration	Energy Star Reach-In Freezer, Solid Doors	Biz-Prescriptive	Warehouse	ROB	20%	935	0.11	12	\$450	50%	64.0%	64.0%	1.4	2.9	0.6	61,969	61,969	31,084	31,084
910	Refrigeration	Retro-commissioning_Refrigerator Optimization	Biz-Custom	Warehouse	Retro	3%	1	0.00	3	\$0	50%	56.7%	45.3%	2.2	4.3	0.5	147,955	147,955	80,324	61,133
911	Refrigeration	Energy Star Ice Machine	Biz-Prescriptive	Warehouse	ROB	10%	721	0.07	15	\$1,426	50%	59.2%	59.2%	0.4	0.8	0.4	0	0	0	0
912	Refrigeration	LED Refrigerated Display Case Lighting Average 6W/LF	Biz-Lighting	Warehouse	Retro	37%	574	0.13	12	\$1,010	50%	56.7%	46.4%	0.5	0.9	0.4	269,204	0	0	0
913	Ventilation	Demand Controlled Ventilation (DCV) Exhaust Hood	Biz-Custom	Warehouse	ROB	0%	0	0.00	20	\$0	0%	60.5%	53.4%	0.0	#DIV/0!	0.0	0	0	0	0
914	Ventilation	Pump and Fan Variable Frequency Drive Controls (Fans)	Biz-Custom	Warehouse	Retro	41%	923	0.19	15	\$375	50%	60.5%	40.4%	2.5	4.9	0.7	867,231	867,231	417,962	196,867
915	Ventilation	Demand Control Ventilation	Biz-Custom	Warehouse	Retro	20%	432	0.07	15	\$227	50%	60.5%	37.4%	1.9	3.6	0.6	366,788	366,788	230,319	135,395

Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	RAP Incentive (%)	MAP Adoption Rate	RAP Adoption Rate	Measure Level BC Tests			Cumulative Annual Potential			
														TRC	UCT	RIM	15 YR Technical	15 YR Economic	15 YR MAP	15 YR RAP
916	WholeBld_HVAC	HVAC - Energy Management System	Biz-Custom	Warehouse	Retro	15%	1,044	0.05	15	\$4,000	50%	60.5%	28.0%	0.2	0.4	0.3	1,431,010	0	0	0
917	WholeBld_HVAC	GREM Controls	Biz-Custom	Warehouse	Retro	0%	0	0.00	8	\$0	0%	60.5%	53.4%	0.0	#DIV/0!	0.0	0	0	0	
918	WholeBld_HVAC	Retro-commissioning_Bld Optimization	Biz-Custom	Warehouse	Retro	15%	1	0.00	3	\$0	50%	60.5%	49.3%	2.0	4.0	0.6	669,210	719,651	480,279	388,582
919	WholeBld	WholeBldg - Com RET	Biz-Custom	Warehouse	Retro	15%	1	0.00	12	\$0	50%	66.3%	55.7%	7.6	15.2	0.7	2,051,087	2,173,503	1,647,633	1,426,998
920	WholeBld_NC	WholeBldg - Com NC	Biz-NC	Warehouse	NC	25%	1	0.00	12	\$0	50%	68.0%	68.0%	7.6	15.2	0.7	0	0	0	0
921	Compressed Air	Efficient Air Compressors	Biz-Custom	Other	ROB	31%	1,223	0.21	15	\$100	50%	66.3%	56.3%	11.5	23.0	0.8	1,204,811	1,204,811	651,372	520,226
922	Compressed Air	Retro-commissioning_Compressed Air Optimization	Biz-Custom	Other	Retro	15%	1	0.00	5	\$0	50%	66.3%	56.4%	4.4	8.8	0.7	202,967	202,967	119,528	87,943
923	Cooking	Commercial Griddles	Biz-Prescriptive	Other	ROB	15%	2,596	0.23	12	\$774	50%	66.3%	51.2%	2.3	4.7	0.6	50,594	50,594	28,174	20,809
924	Cooking	Convection Ovens	Biz-Prescriptive	Other	ROB	15%	1,879	0.43	12	\$471	50%	66.3%	62.4%	3.3	6.7	0.7	26,863	26,863	14,493	13,073
925	Cooking	Combination Ovens	Biz-Prescriptive	Other	ROB	41%	6,368	0.74	12	\$1,568	50%	66.3%	62.4%	2.9	5.9	0.6	63,767	63,767	34,403	31,032
926	Cooking	Commercial Fryers	Biz-Prescriptive	Other	ROB	14%	2,378	0.15	12	\$1,200	50%	66.3%	47.1%	1.3	2.7	0.5	84,175	84,175	48,979	31,832
927	Cooking	Commercial Steam Cookers	Biz-Prescriptive	Other	ROB	67%	13,162	3.00	12	\$2,490	50%	66.3%	53.6%	4.4	8.8	0.8	87,578	87,578	49,808	35,844
928	Cooking	Insulated Holding Cabinets (Full Size)	Biz-Prescriptive	Other	ROB	69%	5,278	0.80	12	\$1,200	50%	66.3%	52.6%	3.3	6.7	0.7	33,663	43,003	25,020	18,761
929	Cooking	Insulated Holding Cabinets (Half-Size)	Biz-Prescriptive	Other	ROB	58%	1,788	0.30	12	\$1,500	50%	66.3%	41.2%	0.9	1.9	0.5	7,910	0	0	0
930	Cooling	Air Conditioner - 16 SEER (5-20 Tons)	Biz-Prescriptive	Other	ROB	13%	1,341	0.99	15	\$720	50%	60.5%	37.1%	3.0	6.1	1.1	734,879	734,879	373,941	200,780
931	Cooling	Air Conditioner - 18 SEER (5-20 Tons)	Biz-Prescriptive	Other	ROB	19%	2,021	1.49	15	\$1,200	50%	60.5%	36.0%	2.7	5.5	1.1	1,001,695	1,001,695	509,710	262,321
932	Cooling	Air Conditioner - 21 SEER (5-20 Tons)	Biz-Prescriptive	Other	ROB	24%	2,609	1.93	15	\$1,680	50%	60.5%	36.0%	2.5	5.1	1.1	1,192,616	1,192,616	606,860	312,319
933	Cooling	Air Conditioner - 16 SEER (20+ Tons)	Biz-Prescriptive	Other	ROB	8%	1,820	1.35	15	\$3,600	50%	60.5%	36.0%	0.8	1.6	0.7	482,537	0	0	0
934	Cooling	Air Conditioner - 18 SEER (20+ Tons)	Biz-Prescriptive	Other	ROB	15%	3,360	2.48	15	\$7,200	50%	60.5%	36.0%	0.8	1.5	0.7	822,311	0	0	0
935	Cooling	Air Conditioner - 21 SEER (20+ Tons)	Biz-Prescriptive	Other	ROB	21%	4,680	3.46	15	\$10,800	50%	60.5%	36.0%	0.7	1.4	0.7	1,063,551	0	0	0
936	Cooling	Comprehensive Rooftop Unit Quality Maintenance (AC Tune-up)	Biz-Custom	Other	Retro	6%	2,178	1.04	3	\$500	50%	60.5%	60.0%	1.2	2.4	0.6	1,221,872	1,256,564	362,934	352,422
937	Cooling	Air Side Economizer	Biz-Custom	Other	Retro	2%	145	0.01	5	\$170	50%	60.5%	46.4%	0.3	0.5	0.3	440,520	0	0	0
938	Cooling	Advanced Rooftop Controls	Biz-Custom	Other	Retro	30%	1,493	0.71	10	\$3,412	50%	60.5%	36.0%	0.4	0.8	0.5	7,309,907	0	0	0
939	Cooling	Air Conditioner - 16 SEER (<5 Tons)	Biz-Prescriptive	Other	ROB	19%	866	0.64	15	\$820	50%	60.5%	36.0%	1.7	3.4	1.0	1,089,572	1,089,572	554,426	285,334
940	Cooling	Air Conditioner - 18 SEER (<5 Tons)	Biz-Prescriptive	Other	ROB	28%	1,283	0.95	15	\$1,640	50%	60.5%	36.0%	1.3	2.6	0.9	1,195,689	1,195,689	608,424	313,124
941	Cooling	Air Conditioner - 21 SEER (<5 Tons)	Biz-Prescriptive	Other	ROB	38%	1,760	1.30	15	\$2,460	50%	60.5%	36.0%	1.2	2.3	0.9	1,499,248	1,499,248	762,889	392,619
942	Cooling	Centrifugal Chiller - Average kW/Ton 0.626	Biz-Custom	Other	ROB	26%	5,514	2.46	20	\$12,444	50%	60.5%	36.0%	0.7	1.5	0.6	0	0	0	0
943	Cooling	Reciprocating Chiller - Average kW/Ton 0.99	Biz-Custom	Other	ROB	27%	6,892	6.78	20	\$9,976	50%	60.5%	36.0%	1.7	3.5	1.1	2,711,361	2,711,361	1,379,669	710,043
944	Cooling	Screw Chiller - Average kW/Ton 0.675	Biz-Custom	Other	ROB	23%	6,923	6.67	20	\$9,957	50%	60.5%	36.0%	1.7	3.5	1.1	774,361	774,361	394,032	202,788
945	Cooling	Chiller Tune-up	Biz-Custom	Other	Retro	8%	3,308	1.00	5	\$487	50%	60.5%	60.0%	2.7	5.4	0.7	610,682	610,682	171,935	166,174
946	Cooling	PTAC - 7,000 to 15,000 Btuh - lodging	Biz-Prescriptive	Other	ROB	19%	217	0.16	15	\$92	50%	60.5%	39.9%	3.8	7.7	1.1	0	0	0	0
947	Cooling	HVAC Occupancy Controls	Biz-Prescriptive	Other	Retro	5%	1	0.00	12	\$0	50%	60.5%	47.4%	10.6	21.1	1.5	1,997,639	2,214,917	1,181,201	782,075
948	Cooling	Smart Thermostat	Biz-Prescriptive	Other	ROB	18%	886	0.00	11	\$175	50%	60.5%	45.6%	3.0	5.7	0.5	273,099	306,304	181,257	126,687
949	Cooling	Window Film	Biz-Custom	Other	Retro	4%	1,330	0.65	10	\$1,107	50%	60.5%	40.0%	1.1	2.2	0.7	1,200,093	1,358,740	746,333	349,244
950	Ext Lighting	LED wallpack (existing W<250)	Biz-Lighting	Other	Retro	66%	567	0.00	12	\$248	30%	70.6%	49.8%	1.3	4.3	0.5	3,023,105	3,023,105	1,947,358	1,180,243
951	Ext Lighting	LED parking lot fixture (existing W≥250)	Biz-Lighting	Other	Retro	60%	959	0.00	12	\$756	30%	70.6%	41.4%	0.7	2.4	0.5	2,756,325	0	0	0
952	Ext Lighting	LED parking lot fixture (existing W<250)	Biz-Lighting	Other	Retro	66%	567	0.00	12	\$248	30%	70.6%	49.8%	1.3	4.3	0.5	3,023,105	3,023,105	1,947,358	1,180,243
953	Ext Lighting	LED outdoor pole decorative fixture (existing W≥250)	Biz-Lighting	Other	Retro	60%	959	0.00	12	\$756	30%	70.6%	41.4%	0.7	2.4	0.5	2,756,325	0	0	0
954	Ext Lighting	LED parking garage fixture (existing W≥250)	Biz-Lighting	Other	Retro	60%	1,953	0.00	6	\$756	30%	70.6%	51.2%	0.8	2.6	0.4	2,821,933	0	0	0
955	Ext Lighting	LED parking garage fixture (existing W<250)	Biz-Lighting	Other	Retro	66%	1,154	0.00	6	\$248	30%	70.6%	55.6%	1.4	4.7	0.5	3,095,063	3,095,063	1,990,532	1,423,943
956	Heating	Heat Pump - 16 SEER (<5 Tons)	Biz-Prescriptive	Other	ROB	19%	2,024	0.64	15	\$2,055	50%	60.5%	36.0%	1.1	2.3	0.7	159,236	610,308	310,554	159,826
957	Heating	Heat Pump - 18 SEER (<5 Tons)	Biz-Prescriptive	Other	ROB	25%	2,688	0.95	15	\$3,425	50%	60.5%	36.0%	0.9	1.9	0.6	175,042	0	0	0
958	Heating	Heat Pump - 21 SEER (<5 Tons)	Biz-Prescriptive	Other	ROB	30%	3,257	1.30	15	\$4,500	50%	60.5%	36.0%	0.9	1.8	0.7	204,760	0	0	0
959	Heating	Geothermal HP - SEER 20.3 (<5 Tons)	Biz-Prescriptive	Other	ROB	36%	3,872	1.23	15	\$4,700	50%	60.5%	36.0%	0.9	1.9	0.6	255,445	0	0	0
960	Heating	Geothermal HP - SEER 23.1 (<5 Tons)	Biz-Prescriptive	Other	ROB	46%	4,898	1.53	3	\$7,300	50%	60.5%	36.0%	0.2	0.3	0.2	58,298	0	0	0
961	Heating	Geothermal HP - SEER 29.3 (<5 Tons)	Biz-Prescriptive	Other	ROB	51%	5,455	1.93	5	\$9,200	50%	60.5%	36.0%	0.3	0.5	0.3	99,239	0	0	0
962	Heating	Heat Pump - 16 SEER (5-20 Tons)	Biz-Prescriptive	Other	ROB	10%	3,782	0.99	15	\$4,110	50%	60.5%	36.0%	1.0	2.0	0.6	59,040	0	0	0
963	Heating	Heat Pump - 18 SEER (5-20 Tons)	Biz-Prescriptive	Other	ROB	19%	7,595	1.49	15	\$6,850	50%	60.5%	36.0%	1.1	2.2	0.6	132,504	240,673	122,466	63,027
964	Heating	Heat Pump - 21 SEER (5-20 Tons)	Biz-Prescriptive	Other	ROB	25%	9,712	1.93	15	\$9,000	50%	60.5%	36.0%	1.1	2.2	0.6	165,289	300,221	152,767	78,621
965	Heating	Geothermal HP - SEER 20.3 (5-20 Tons)	Biz-Prescriptive	Other	ROB	28%	5,443	3.62	10	\$7,700	50%	60.5%	36.0%	0.8	1.5	0.7	135,339	0	0	0
966	Heating	Geothermal HP - SEER 23.1 (5-20 Tons)	Biz-Prescriptive	Other	ROB	39%	7,510	4.23	20	\$12,800	50%	60.5%	36.0%	1.1	2.2	0.8	199,760	362,831	184,625	95,017
967	Heating	Geothermal HP - SEER 29.3 (5-20 Tons)	Biz-Prescriptive	Other	ROB	45%	8,647	5.05	20	\$17,700	50%	60.5%	36.0%	0.9	1.9	0.8	194,735	0	0	0
968	Heating	Heat Pump - 16 SEER (20+ Tons)	Biz-Prescriptive	Other	ROB	11%	8,484	1.35	15	\$8,220	50%	60.5%	36.0%	1.0	2.0	0.6	58,276	0	0	0
969	Heating	Heat Pump - 18 SEER (20+ Tons)	Biz-Prescriptive	Other	ROB	20%	16,290	2.48	15	\$13,700	50%	60.5%	36.0%	1.1	2.3	0.6	127,927	192,734	98,072	50,473
970	Heating	Heat Pump - 21 SEER (20+ Tons)	Biz-Prescriptive	Other	ROB	26%	20,668	3.46	15	\$18,000	50%	60.5%	36.0%	1.1	2.2	0.6	159,691	240,590	122,423	63,005
971	Heating	Geothermal HP - SEER 20.3 (20+ Tons)	Biz-Prescriptive	Other	ROB	29%	11,406	7.24	20	\$10,700	50%	60.5%	36.0%	2.1	4.3	1.0	262,313	395,199	201,096	103,494
972	Heating	Geothermal HP - SEER 23.1 (20+ Tons)	Biz-Prescriptive	Other	ROB	40%	15,541	8.46	5	\$18,300	50%	60.5%								

Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	RAP Incentive (%)	MAP Adoption Rate	RAP Adoption Rate	Measure Level BC Tests			Cumulative Annual Potential			
														TRC	UCT	RIM	15 YR Technical	15 YR Economic	15 YR MAP	15 YR RAP
977	Hot Water	Low Flow Pre-Rinse Sprayers	Biz-Prescriptive	Other	ROB	26%	764	0.15	5	\$35	50%	84.0%	84.0%	7.7	15.4	0.7	0	0	0	0
978	Hot Water	Faucet Aerator	Biz-Prescriptive	Other	Retro	66%	1,425	0.16	10	\$3	50%	84.0%	84.0%	346.5	692.9	0.7	0	0	0	0
979	Hot Water	ENERGY STAR Commercial Washing Machines	Biz-Prescriptive	Other	ROB	43%	671	0.02	7	\$250	50%	73.1%	55.7%	1.0	2.1	0.5	0	0	0	0
980	Int Lighting	LED T8 Tube Replacement	Biz-Lighting	Other	Retro	46%	45	0.01	15	\$15	30%	70.6%	52.6%	3.1	10.3	0.8	7,130,896	7,130,896	4,525,290	2,983,683
981	Int Lighting	LED troffer, 2'X2' and 2'X4'	Biz-Lighting	Other	Retro	49%	145	0.03	15	\$80	30%	70.6%	46.6%	1.9	6.3	0.7	4,591,864	4,591,864	2,914,012	1,586,728
982	Int Lighting	LED high bay fixture	Biz-Lighting	Other	Retro	70%	1,832	0.44	15	\$330	30%	70.6%	56.5%	5.7	19.1	0.8	4,359,096	4,359,096	2,777,120	2,033,380
983	Int Lighting	LED low bay fixture	Biz-Lighting	Other	Retro	63%	348	0.08	15	\$44	30%	70.6%	57.9%	8.1	27.1	0.8	3,910,544	3,910,544	2,491,354	1,892,443
984	Int Lighting	LED downlight, screw-in lamp, 4W, interior	Biz-Lighting	Other	ROB	83%	64	0.01	15	\$2	30%	70.6%	61.4%	38.9	129.8	0.8	4,757,550	4,757,550	2,802,349	2,236,571
985	Int Lighting	LED downlight fixture	Biz-Lighting	Other	Retro	69%	143	0.03	15	\$27	30%	70.6%	60.0%	5.4	17.9	0.8	91,177	91,177	41,931	24,536
986	Int Lighting	LED downlight, screw-in lamp, 12W, interior	Biz-Lighting	Other	ROB	83%	206	0.05	15	\$2	30%	70.6%	62.0%	126.4	421.3	0.8	3,589,707	3,589,707	2,114,452	1,716,518
987	Int Lighting	DeLamp Fluorescent Fixture Average Lamp Wattage 28W	Biz-Lighting	Other	Retro	100%	102	0.02	11	\$12	30%	70.6%	58.2%	6.6	22.0	0.8	1,176,366	1,176,366	1,461,461	1,321,969
988	Int Lighting	Central Lighting Monitoring & Controls (non-networked)	Biz-Lighting	Other	Retro	20%	8,341	1.53	12	\$3,700	30%	70.6%	49.6%	1.8	5.9	0.7	553,798	600,083	720,128	509,885
989	Int Lighting	Daylighting Controls	Biz-Lighting	Other	Retro	30%	2,643	0.57	12	\$3,000	30%	70.6%	61.4%	0.7	2.4	0.6	337,173	0	0	0
990	Int Lighting	Network Lighting Controls - Wireless (WiFi)	Biz-Lighting	Other	Retro	47%	7,650	2.86	8	\$1,683	30%	70.6%	55.5%	3.0	10.1	0.8	1,776,192	1,924,642	2,621,901	2,217,161
991	Int Lighting	Occupancy Sensors	Biz-Lighting	Other	Retro	30%	457	0.02	8	\$54	30%	70.6%	58.2%	3.8	12.6	0.6	1,410,528	1,528,416	2,082,131	1,865,080
992	Int Lighting	Bi-Level Lighting Fixture – Stairwells, Hallways, and Garages	Biz-Lighting	Other	Retro	50%	517	0.06	10	\$274	30%	70.6%	47.1%	1.2	3.8	0.6	711,191	711,191	912,505	622,139
993	Int Lighting	LED Exit Sign - 4 Watt Fixture (2 lamp)	Biz-Lighting	Other	Retro	73%	95	0.01	5	\$33	30%	80.0%	80.0%	1.0	3.2	0.6	15,815	0	0	0
994	Misc	Power Distribution Equipment Upgrades	Biz-Custom	Other	Retro	1%	6	0.00	30	\$8	50%	66.3%	37.6%	1.7	3.4	0.8	25,855	25,855	14,932	6,074
995	Motors	Cogged V-Belt	Biz-Custom	Other	Retro	3%	534	0.10	15	\$384	50%	66.3%	43.2%	1.4	2.7	0.6	691,269	691,269	445,317	266,178
996	Motors	Pump and Fan Variable Frequency Drive Controls (Pumps)	Biz-Custom	Other	Retro	38%	731	0.15	15	\$200	50%	66.3%	51.7%	3.7	7.3	0.7	364,219	364,219	203,430	135,495
997	Plug Loads Office	ENERGY STAR Uninterrupted Power Supply	Biz-Custom	Other	ROB	3%	85	0.01	15	\$59	50%	76.0%	76.0%	1.4	2.7	0.6	20,506	20,506	12,851	12,851
998	Plug Loads Office	Plug Load Occupancy Sensor	Biz-Custom	Other	Retro	15%	169	0.00	8	\$70	50%	66.3%	48.9%	1.0	2.0	0.4	3,564,790	3,564,790	2,325,316	1,619,119
999	Plug Loads Office	Energy Star Server	Biz-Custom	Other	ROB	13%	90	0.01	15	\$156	50%	66.3%	36.0%	0.5	1.0	0.4	0	0	0	0
1000	Plug Loads Office	Data Center Hot/Cold Aisle Configuration	Biz-Custom	Other	Retro	13%	90	0.01	15	\$156	50%	66.3%	36.0%	0.5	1.0	0.4	0	0	0	0
1001	Plug Loads Office	Electrically Commutated Plug Fans in data centers	Biz-Custom	Other	Retro	18%	15,778	1.80	15	\$480	50%	66.3%	57.7%	28.8	57.5	0.7	0	0	0	0
1002	Plug Loads Office	High Efficiency CRAC unit	Biz-Custom	Other	ROB	30%	162	0.02	15	\$63	50%	66.3%	49.5%	2.3	4.7	0.6	0	0	0	0
1003	Plug Loads Office	Computer Room Air Conditioner Economizer	Biz-Custom	Other	Retro	86%	358	0.00	15	\$82	50%	66.3%	52.6%	3.2	6.4	0.6	0	0	0	0
1004	Refrigeration	Strip Curtains	Biz-Prescriptive	Other	Retro	81%	270	0.03	4	\$9	50%	56.7%	48.3%	7.3	14.6	0.6	1,123,332	1,123,332	495,781	373,740
1005	Refrigeration	Bare Suction Line	Biz-Custom	Other	Retro	93%	21	0.00	15	\$4	50%	56.7%	40.0%	4.5	8.9	0.7	49,393	49,393	21,803	11,194
1006	Refrigeration	Floating Head Pressure Controls	Biz-Prescriptive	Other	Retro	50%	1,327	0.15	15	\$80	50%	56.7%	46.9%	14.0	28.1	0.7	430,764	430,764	190,812	136,108
1007	Refrigeration	Saturated Suction Controls	Biz-Custom	Other	Retro	50%	416	0.18	15	\$559	50%	56.7%	40.0%	0.9	1.8	0.7	133,936	0	0	0
1008	Refrigeration	Compressor Retrofit	Biz-Custom	Other	Retro	20%	163	0.07	15	\$477	50%	56.7%	32.0%	0.4	0.8	0.5	635,862	0	0	0
1009	Refrigeration	Electronically Commutated (EC) Walk-In Evaporator Fan Motor	Biz-Custom	Other	Retro	65%	824	0.09	15	\$78	50%	56.7%	46.4%	8.9	17.9	0.7	573,352	573,352	220,250	136,413
1010	Refrigeration	Evaporator Fan Motor Controls	Biz-Custom	Other	Retro	25%	478	0.06	13	\$291	50%	56.7%	28.0%	1.2	2.5	0.5	220,777	225,585	128,004	51,244
1011	Refrigeration	Variable Speed Condenser Fan	Biz-Custom	Other	Retro	50%	1,480	0.00	15	\$1,170	50%	56.7%	36.0%	0.9	1.8	0.4	574,540	0	0	0
1012	Refrigeration	Refrigeration Economizer	Biz-Custom	Other	Retro	2%	1,357	0.00	15	\$2,558	50%	56.7%	36.0%	0.4	0.8	0.3	10,825	0	0	0
1013	Refrigeration	Anti-Sweat Heater Controls MT	Biz-Custom	Other	Retro	55%	722	0.00	12	\$250	50%	56.7%	46.4%	1.7	3.4	0.5	964,254	964,254	373,169	230,855
1014	Refrigeration	Auto Door Closer, Cooler	Biz-Custom	Other	Retro	0%	943	0.14	8	\$157	50%	56.7%	46.4%	3.0	6.0	0.6	2,524	2,524	967	598
1015	Refrigeration	Display Case Door Retrofit, Medium Temp	Biz-Prescriptive	Other	Retro	36%	578	0.09	12	\$686	50%	64.0%	64.0%	0.6	1.2	0.5	44,619	0	0	0
1016	Refrigeration	Electronically Commutated (EC) Reach-In Evaporator Fan Motor	Biz-Custom	Other	Retro	65%	824	0.09	15	\$78	50%	56.7%	46.4%	8.9	17.9	0.7	164,230	164,230	62,066	38,396
1017	Refrigeration	Q-Sync Motor for Walk-In and Reach-In Evaporator Fan Motor	Biz-Custom	Other	Retro	51%	504	0.06	10	\$96	50%	56.7%	46.4%	3.1	6.2	0.6	46,377	46,377	17,883	11,063
1018	Refrigeration	Energy Star Reach-In Refrigerator, Glass Doors	Biz-Prescriptive	Other	ROB	27%	410	0.05	12	\$600	50%	64.0%	64.0%	0.5	0.9	0.4	465,816	0	0	0
1019	Refrigeration	Energy Star Reach-In Refrigerator, Solid Doors	Biz-Prescriptive	Other	ROB	25%	283	0.03	12	\$600	50%	64.0%	64.0%	0.3	0.7	0.3	447,014	0	0	0
1020	Refrigeration	Anti-Sweat Heater Controls LT	Biz-Custom	Other	Retro	36%	578	0.09	12	\$686	50%	56.7%	46.4%	0.6	1.2	0.5	213,246	0	0	0
1021	Refrigeration	Auto Door Closer, Freezer	Biz-Custom	Other	Retro	1%	2,307	0.31	8	\$157	50%	56.7%	46.5%	7.3	14.5	0.7	3,259	3,259	1,248	775
1022	Refrigeration	Display Case Door Retrofit, Low Temp	Biz-Prescriptive	Other	Retro	50%	1,453	0.23	12	\$686	50%	64.0%	64.0%	1.6	3.1	0.6	69,890	69,890	20,220	20,220
1023	Refrigeration	Energy Star Reach-In Freezer, Glass Doors	Biz-Prescriptive	Other	ROB	15%	488	0.06	12	\$450	50%	64.0%	64.0%	0.8	1.5	0.5	88,348	0	0	0
1024	Refrigeration	Energy Star Reach-In Freezer, Solid Doors	Biz-Prescriptive	Other	ROB	20%	935	0.11	12	\$450	50%	64.0%	64.0%	1.4	2.9	0.6	117,073	117,073	58,725	58,725
1025	Refrigeration	Retro-commissioning_Refrigerator Optimization	Biz-Custom	Other	Retro	3%	1	0.00	3	\$0	50%	56.7%	45.3%	2.2	4.3	0.5	223,615	223,615	121,399	92,395
1026	Refrigeration	Energy Star Ice Machine	Biz-Prescriptive	Other	ROB	10%	721	0.07	15	\$1,426	50%	59.2%	59.2%	0.4	0.8	0.4	114,147	0	0	0
1027	Refrigeration	LED Refrigerated Display Case Lighting Average 6W/LF	Biz-Lighting	Other	Retro	37%	574	0.13	12	\$1,010	50%	56.7%	46.4%	0.5	0.9	0.4	508,585	0	0	0
1028	Ventilation	Demand Controlled Ventilation (DCV) Exhaust Hood	Biz-Custom	Other	ROB	0%	0	0.00	20	\$0	0%	60.5%	53.4%	0.0	#DIV/0	0.0	0	0	0	0
1029	Ventilation	Pump and Fan Variable Frequency Drive Controls (Fans)	Biz-Custom	Other	Retro	41%	923	0.19	15	\$375	50%	60.5%	40.4%	2.5	4.9	0.7	14,801,748	14,801,748	7,133,704	3,360,088
1030	Ventilation	Demand Control Ventilation	Biz-Custom	Other	Retro	20%	491	0.10	15	\$227	50%	60.5%	39.0%	2.2	4.3	0.7	7,485,988	7,485,988	4,700,719	2,896,963
1031	WholeBld_HVAC	HVAC - Energy Management System	Biz-Custom	Other	Retro	15%	1,044	0.05	15	\$4,000	50%	60.5%	28.0%	0.2	0.4	0.3	14,209,238	0	0	0
1032	WholeBld_HVAC	GREM Controls	Biz-Custom	Other	Retro	0%	0	0.00	8	\$0	0%	60.5%	53.4%	0.0	#DIV/0	0.0	0	0	0	0
1033	WholeBld_HVAC	Retro-commissioning_Bld Optimization	Biz-Custom	Other	Retro	15%	1	0.00	3	\$0	50%	60.5%	49.3%	2.0	4.0	0.6	6,612,316	7,065,165	4,761,569	3,879,286
1034	WholeBld	WholeBld - Com RET	Biz-Custom	Other	Retro	15%	1	0.00	12	\$0	50%	66.3%	55.7%	7.6	15.1	0.7	7,820,849	8,539,637	6,469,285	5,594,695
1035	WholeBld_NC	WholeBld - Com NC	Biz-NC	Other	NC	25%	1	0.00	12	\$0	50%	68.0%	68.0%	7.6	15.1	0.7	0	0	0	0
1036	Compressed Air	Efficient Air Compressor Equipment	Biz-Custom	Industrial	ROB	11%	1	0.00	13	\$0	50%	66.3%	46.4%	2.0	4.0	0.6	46,878,994	46,878,994	30,348,083	21,239,081
1037	Compressed Air	Efficient Air Compressor Controls	Biz-Custom	Industrial	Retro	7%	1	0.00	3	\$0	50%	66.3%	52.5%	1.6	3.3	0.5	19,153,248	19,153,248	11,294,239	7,612,629

Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	RAP Incentive (%)	MAP Adoption Rate	RAP Adoption Rate	Measure Level BC Tests			Cumulative Annual Potential			
														TRC	UCT	RIM	15 YR Technical	15 YR Economic	15 YR MAP	15 YR RAP
1038	HVAC	Efficient HVAC Equipment	Biz-Prescriptive	Industrial	ROB	13%	1	0.00	15	\$0	50%	60.5%	46.4%	4.8	9.5	0.7	92,251,100	92,251,100	53,187,386	40,778,167
1039	HVAC	Efficient HVAC O&M	Biz-Custom	Industrial	Retro	3%	1	0.00	3	\$0	50%	60.5%	46.2%	2.1	4.2	0.5	14,899,601	14,899,601	7,646,922	4,608,641
1040	Lighting	Efficient Lighting Equipment	Biz-Lighting	Industrial	Retro	42%	1	0.00	15	\$0	30%	70.6%	60.0%	5.4	17.8	0.7	185,562,486	185,562,486	112,660,533	86,405,580
1041	Lighting	Efficient Lighting O&M	Biz-Custom	Industrial	Retro	3%	1	0.00	3	\$0	30%	70.6%	57.8%	2.9	9.8	0.6	10,405,864	10,405,864	7,326,731	5,517,784
1042	Machine Drive	Efficient MachDr Equipment	Biz-Custom	Industrial	ROB	20%	1	0.00	15	\$0	50%	66.3%	50.7%	5.4	10.8	0.7	334,037,428	334,037,428	206,500,848	157,795,614
1043	Machine Drive	Efficient MachDr O&M	Biz-Custom	Industrial	Retro	3%	1	0.00	3	\$0	50%	66.3%	53.6%	2.1	4.2	0.5	32,633,434	32,633,434	20,392,472	14,341,905
1044	Process Heat	Efficient ProcHeat Equipment	Biz-Custom	Industrial	ROB	10%	1	0.00	15	\$0	50%	66.3%	50.6%	5.4	10.7	0.7	56,769,908	56,769,908	35,094,972	26,757,931
1045	Process Heat	Efficient ProcHeat O&M	Biz-Custom	Industrial	Retro	3%	1	0.00	3	\$0	50%	66.3%	54.5%	2.6	5.3	0.6	12,274,336	12,274,336	7,169,082	5,163,767
1046	Process Ref	Efficient ProcRefrig Equipment	Biz-Custom	Industrial	ROB	16%	1	0.00	15	\$0	50%	66.3%	50.4%	5.2	10.3	0.7	66,846,566	66,846,566	41,324,329	31,413,970
1047	Process Ref	Efficient ProcRefrig O&M	Biz-Custom	Industrial	Retro	3%	1	0.00	3	\$0	50%	66.3%	53.1%	1.9	3.8	0.5	8,700,368	8,700,368	5,275,216	3,634,851
1048	Other Process	Efficient Other Facility Process Equipment	Biz-Custom	Industrial	ROB	26%	1	0.00	11	\$0	50%	66.3%	46.4%	2.0	4.0	0.6	61,577,658	61,577,658	40,462,312	28,317,516
1049	Other Process	Efficient Other Facility Process O&M	Biz-Custom	Industrial	Retro	7%	1	0.00	11	\$0	50%	66.3%	45.7%	2.3	4.6	0.6	10,069,938	10,069,938	6,468,652	3,322,812
1050	WholeBld	Power Distribution (Transformers)	Biz-Custom	Industrial	Retro	1%	1	0.00	30	\$1	50%	66.3%	40.0%	1.7	3.4	0.8	17,410,982	17,410,982	10,345,808	3,776,219
1051	WholeBld	Strategic Energy Management	Biz-Custom	Industrial	Retro	3%	1	0.00	3	\$0	50%	66.3%	53.9%	2.3	4.6	0.6	52,240,042	52,240,042	38,360,822	30,738,669
1052	WaterWasteWater	Water Supply & Wastewater treatment pumps and process efficiency	Biz-Custom	Industrial	Retro	19%	1	0.00	11	\$0	50%	66.3%	40.9%	1.6	3.1	0.6	67,259,315	67,259,315	43,651,121	23,938,337
1053	Motors	Efficient Motor Pmp Equipment - Q1 Cost	Biz-Custom	Agriculture	ROB	13%	1	0.00	15	\$0	50%	66.3%	58.2%	188.5	377.0	0.9	4,449,347	4,449,347	1,215,415	1,066,733
1054	Motors	Efficient Motor Pmp Equipment - Q2 Cost	Biz-Custom	Agriculture	ROB	13%	1	0.00	15	\$0	50%	66.3%	57.6%	62.8	125.7	0.9	1,483,116	1,483,116	405,138	351,783
1055	Motors	Efficient Motor Pmp Equipment - Q3 Cost	Biz-Custom	Agriculture	ROB	13%	1	0.00	15	\$0	50%	66.3%	55.9%	22.6	45.2	0.9	533,922	533,922	145,850	122,999
1056	Motors	Efficient Motor Pmp O&M	Biz-Custom	Agriculture	Retro	3%	1	0.00	15	\$0	50%	66.3%	53.6%	11.9	23.8	0.9	1,217,015	1,217,015	869,680	703,267
1057	Refrigeration	Efficient Refrigeration Equipment	Biz-Custom	Agriculture	ROB	15%	1	0.00	15	\$0	50%	56.7%	35.7%	5.6	11.1	0.8	0	0	0	0
1058	Refrigeration	Refrigeration Equipment O&M	Biz-Custom	Agriculture	Retro	3%	1	0.00	3	\$0	50%	56.7%	39.7%	2.0	4.0	0.6	0	0	0	0
1059	Lighting	Efficient Lighting	Biz-Custom	Agriculture	ROB	42%	1	0.00	15	\$0	30%	70.6%	75.0%	4.6	15.2	0.6	4,343,829	4,343,829	1,264,175	1,342,297
1060	Lighting	Grow Lighting	Biz-Custom	Agriculture	Retro	39%	1	0.00	15	\$0	30%	70.6%	75.0%	3.0	9.8	0.6	34,677,983	34,677,983	22,310,244	23,688,941
1061	Ventilation	Efficient Ventilation	Biz-Custom	Agriculture	ROB	54%	1	0.00	10	\$0	50%	60.5%	35.4%	2.1	4.3	0.7	0	0	0	0
1062	HVAC	Efficient Dehumidification	Biz-Custom	Agriculture	ROB	27%	1	0.00	10	\$0	50%	60.5%	41.5%	3.4	6.8	0.7	492,401	492,401	164,906	113,186
1063	HVAC	Efficient HVAC	Biz-Custom	Agriculture	ROB	13%	1	0.00	15	\$0	50%	60.5%	41.5%	5.2	10.4	0.8	186,505	186,505	56,197	38,776
1064	Exterior Lighting	LED Streetlighting	Biz-StreetLight	StreetLight	Retro	45%	577	0.00	20	\$506	20%	85.0%	100.0%	1.1	5.4	0.6	795,936	795,936	198,984	795,936

## APPENDIX C: ANNUAL ACHIEVABLE POTENTIAL

Residential - Incremental Annual MAP Savings - by End-Use (MWh)

End Use	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Appliances	4,535	1,666	2,221	2,914	3,745	4,687	5,675	6,603	7,336	7,744	7,744	7,336	6,603	5,675	4,687
Behavioral	133,966	131,526	129,235	127,225	125,390	123,710	122,587	121,484	120,550	119,773	119,342	119,114	119,108	119,115	119,179
Bundles	75	489	570	636	675	679	650	797	607	555	513	485	472	472	682
Clothes Washer/ Dryer	2,101	2,435	2,756	3,053	3,306	3,513	3,682	3,811	3,909	3,982	4,043	4,042	4,042	4,036	4,277
Dishwasher	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Electronics	14,667	15,902	16,984	17,934	18,748	19,458	21,031	21,684	22,120	22,593	23,073	23,495	24,803	25,148	25,480
HVAC Shell	36,552	68,133	60,646	45,404	38,466	31,429	24,910	19,250	14,578	10,867	3,561	2,628	0	0	0
HVAC Equipment	12,117	17,716	17,151	16,257	15,327	14,633	14,368	14,606	15,328	16,569	17,617	19,576	20,575	22,566	24,348
Lighting	9,136	9,991	11,024	11,958	12,780	13,501	14,140	14,671	15,644	15,526	15,554	15,336	15,176	14,946	14,718
New Construction	469	614	821	1,119	1,497	1,958	2,538	3,191	3,917	4,675	5,519	6,240	6,912	7,377	7,895
Pool/Spa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water Heating	5,564	16,417	15,809	15,233	14,565	15,041	13,042	13,925	12,175	12,151	14,592	14,009	14,226	14,430	13,703
<b>Total</b>	<b>219,181</b>	<b>264,889</b>	<b>257,217</b>	<b>241,733</b>	<b>234,497</b>	<b>228,609</b>	<b>222,623</b>	<b>220,022</b>	<b>216,166</b>	<b>214,433</b>	<b>211,558</b>	<b>212,260</b>	<b>211,918</b>	<b>213,766</b>	<b>214,970</b>

Residential - Cumulative Annual MAP Savings - by End-Use (MWh)

End Use	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Appliances	4,535	6,201	8,422	11,335	15,080	19,767	25,442	32,045	34,846	40,924	46,447	50,869	53,728	54,717	53,728
Behavioral	133,966	131,526	129,235	127,225	125,390	123,710	122,587	121,484	120,550	119,773	119,342	119,114	119,108	119,115	119,179
Bundles	75	564	1,135	1,770	2,445	3,124	3,774	4,495	4,613	4,598	4,475	4,286	4,079	3,901	3,787
Clothes Washer/ Dryer	2,101	4,536	7,292	10,345	13,651	17,164	20,847	24,658	28,567	32,549	36,592	40,634	44,676	48,713	50,888
Dishwasher	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Electronics	14,667	30,569	47,553	65,487	84,235	103,693	110,299	116,168	121,421	126,234	130,758	135,043	139,117	142,945	146,698
HVAC Shell	36,552	104,410	164,302	208,577	245,713	275,669	299,016	316,496	329,102	337,787	339,082	340,141	339,050	337,594	335,771
HVAC Equipment	12,117	29,824	46,956	63,183	78,471	93,056	107,374	121,925	137,197	153,712	171,297	183,460	193,137	205,699	221,272
Lighting	9,136	19,126	30,150	42,108	54,887	68,388	82,529	97,200	112,748	127,300	141,932	156,438	170,900	185,257	199,505
New Construction	469	1,083	1,905	3,024	4,520	6,478	9,016	12,207	16,125	20,799	26,319	32,559	39,470	46,848	54,742
Pool/Spa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water Heating	5,564	21,982	37,791	53,024	67,588	82,629	95,671	109,596	121,771	133,922	143,806	148,135	154,058	161,219	168,376
<b>Total</b>	<b>219,181</b>	<b>349,821</b>	<b>474,739</b>	<b>586,078</b>	<b>691,981</b>	<b>793,679</b>	<b>876,554</b>	<b>956,274</b>	<b>1,026,940</b>	<b>1,097,598</b>	<b>1,160,049</b>	<b>1,210,678</b>	<b>1,257,324</b>	<b>1,306,006</b>	<b>1,353,946</b>

Residential - Incremental Annual RAP Savings - by End-Use (MWh)

End Use	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Appliances	4,535	1,666	2,221	2,914	3,745	4,687	5,675	6,603	7,336	7,744	7,744	7,336	6,603	5,675	4,687
Behavioral	44,268	43,620	43,018	42,474	41,990	41,553	41,287	41,025	40,819	40,659	40,603	40,602	40,646	40,701	40,785
Bundles	75	489	570	636	675	679	650	797	607	555	513	485	472	472	682
Clothes Washer/ Dryer	2,128	2,342	2,531	2,694	2,823	2,921	2,999	3,055	3,097	3,096	3,101	3,100	3,100	3,096	3,339
Dishwasher	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Electronics	13,612	14,008	14,368	14,718	14,908	15,130	16,244	16,529	16,840	17,170	17,485	17,751	18,841	19,008	19,192
HVAC Shell	33,712	57,140	51,351	42,372	35,368	28,999	23,271	18,428	14,249	10,931	4,049	3,572	2,035	1,903	1,703
HVAC Equipment	6,707	6,547	5,930	5,458	5,203	5,202	5,458	5,933	6,756	7,060	8,120	9,546	10,200	11,060	11,820
Lighting	8,954	8,440	8,733	9,015	9,302	9,593	9,889	10,118	10,635	10,485	10,545	10,499	10,380	10,210	10,040
New Construction	363	476	636	867	1,159	1,517	1,966	2,472	3,034	3,621	4,275	4,834	5,354	5,714	6,115
Pool/Spa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water Heating	5,564	16,417	15,809	15,233	14,565	15,041	13,042	13,925	12,175	12,151	14,592	14,009	14,226	14,430	13,703
<b>Total</b>	<b>119,918</b>	<b>151,146</b>	<b>145,167</b>	<b>136,381</b>	<b>129,737</b>	<b>125,321</b>	<b>120,482</b>	<b>118,886</b>	<b>115,550</b>	<b>113,472</b>	<b>111,028</b>	<b>111,734</b>	<b>111,858</b>	<b>112,269</b>	<b>112,067</b>

Residential - Cumulative Annual RAP Savings - by End-Use (MWh)

End Use	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Appliances	4,535	6,201	8,422	11,335	15,080	19,767	25,442	32,045	34,846	40,924	46,447	50,869	53,728	54,717	53,728
Behavioral	44,268	43,620	43,018	42,474	41,990	41,553	41,287	41,025	40,819	40,659	40,603	40,602	40,646	40,701	40,785
Bundles	75	564	1,135	1,770	2,445	3,124	3,774	4,495	4,613	4,598	4,475	4,286	4,079	3,901	3,787
Clothes Washer/ Dryer	2,128	4,470	7,001	9,694	12,517	15,439	18,438	21,493	24,590	27,687	30,788	33,888	36,988	40,084	41,295
Dishwasher	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Electronics	13,612	27,620	41,988	56,707	71,614	86,744	99,621	112,229	124,815	137,415	150,018	162,623	175,230	187,836	199,443
HVAC Shell	33,712	90,758	141,885	183,934	218,912	247,453	270,203	287,996	301,472	311,574	314,682	317,647	318,994	320,039	320,739
HVAC Equipment	6,707	13,253	19,180	24,634	29,832	35,028	40,479	46,404	53,149	60,201	68,309	73,554	79,772	87,465	96,485
Lighting	8,954	17,394	26,127	35,143	44,445	54,038	63,928	74,046	84,083	94,038	104,146	114,295	124,402	134,405	144,290
New Construction	363	839	1,475	2,342	3,502	5,018	6,984	9,456	12,491	16,112	20,387	25,221	30,575	36,289	42,405
Pool/Spa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water Heating	5,564	21,982	37,791	53,024	67,588	82,629	95,671	109,596	121,771	133,922	143,806	148,135	154,058	161,219	168,376
<b>Total</b>	<b>119,918</b>	<b>226,701</b>	<b>328,021</b>	<b>421,058</b>	<b>507,925</b>	<b>590,793</b>	<b>655,826</b>	<b>718,785</b>	<b>772,650</b>	<b>827,128</b>	<b>873,819</b>	<b>911,520</b>	<b>949,123</b>	<b>987,480</b>	<b>1,023,211</b>

Residential - Incremental Annual MAP Savings - by End-Use (MW)

End Use	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Appliances	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1
Behavioral	15	15	15	14	14	14	14	14	13	13	13	13	13	13	13
Bundles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clothes Washer/ Dryer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dishwasher	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Electronics	2	2	2	3	3	3	3	3	3	3	3	3	4	4	4
HVAC Shell	6	12	10	7	6	5	4	3	2	2	1	0	0	0	0
HVAC Equipment	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
Lighting	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
New Construction	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Pool/Spa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water Heating	1	2	2	1	1	2	1	1	1	1	1	1	1	1	1
<b>Total</b>	<b>26</b>	<b>32</b>	<b>31</b>	<b>28</b>	<b>27</b>	<b>26</b>	<b>25</b>	<b>25</b>	<b>24</b>	<b>24</b>	<b>23</b>	<b>23</b>	<b>23</b>	<b>23</b>	<b>23</b>

Residential - Cumulative Annual MAP Savings - by End-Use (MW)

End Use	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Appliances	1	1	1	2	2	3	4	5	5	6	7	7	8	8	8
Behavioral	15	15	15	14	14	14	14	14	13	13	13	13	13	13	13
Bundles	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0
Clothes Washer/ Dryer	0	0	1	1	1	2	2	2	3	3	3	4	4	5	5
Dishwasher	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Electronics	2	4	7	10	12	15	16	17	18	18	19	19	20	20	21
HVAC Shell	6	18	28	35	41	46	49	52	54	56	56	56	56	56	55
HVAC Equipment	0	0	0	0	1	1	1	2	2	3	3	4	5	6	7
Lighting	1	2	3	5	6	8	9	11	13	15	17	19	20	22	24
New Construction	0	0	0	0	0	0	1	1	1	2	2	2	3	4	4
Pool/Spa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water Heating	1	3	4	6	7	9	10	11	13	14	14	15	15	16	17
<b>Total</b>	<b>26</b>	<b>44</b>	<b>59</b>	<b>73</b>	<b>85</b>	<b>98</b>	<b>107</b>	<b>115</b>	<b>122</b>	<b>130</b>	<b>135</b>	<b>140</b>	<b>145</b>	<b>150</b>	<b>155</b>

Residential - Incremental Annual RAP Savings - by End-Use (MW)

End Use	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Appliances	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1
Behavioral	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Bundles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clothes Washer/ Dryer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dishwasher	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Electronics	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3
HVAC Shell	5	9	9	7	6	5	4	3	2	2	1	1	0	0	0
HVAC Equipment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lighting	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
New Construction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pool/Spa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water Heating	1	2	2	1	1	2	1	1	1	1	1	1	1	1	1
<b>Total</b>	<b>15</b>	<b>20</b>	<b>19</b>	<b>17</b>	<b>16</b>	<b>16</b>	<b>15</b>	<b>14</b>	<b>14</b>	<b>13</b>	<b>13</b>	<b>13</b>	<b>12</b>	<b>12</b>	<b>12</b>

Residential - Cumulative Annual RAP Savings - by End-Use (MW)

End Use	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Appliances	1	1	1	2	2	3	4	5	5	6	7	7	8	8	8
Behavioral	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Bundles	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0
Clothes Washer/ Dryer	0	0	1	1	1	1	2	2	2	3	3	3	3	4	4
Dishwasher	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Electronics	2	4	6	8	10	13	13	13	14	14	14	15	15	15	16
HVAC Shell	5	15	23	30	36	41	45	48	50	52	52	53	53	54	54
HVAC Equipment	0	0	0	0	0	0	1	1	1	1	1	2	2	3	3
Lighting	1	2	3	4	5	6	8	9	10	11	13	14	15	16	17
New Construction	0	0	0	0	0	0	1	1	1	1	2	2	2	3	3
Pool/Spa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water Heating	1	3	4	6	7	9	10	11	13	14	14	15	15	16	17
<b>Total</b>	<b>15</b>	<b>30</b>	<b>44</b>	<b>56</b>	<b>68</b>	<b>79</b>	<b>87</b>	<b>94</b>	<b>100</b>	<b>107</b>	<b>111</b>	<b>115</b>	<b>119</b>	<b>123</b>	<b>127</b>

C&I - Incremental Annual MAP Savings - by End-Use (MWh)

Sector	End-Use	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	
Commercial	CompressedAir	62	67	69	70	71	98	96	93	89	86	106	102	97	93	88	
	Cooking	187	209	229	247	263	276	286	295	301	307	312	315	318	320	323	
	HVAC	12,346	12,315	11,972	13,030	12,671	12,237	12,971	12,297	11,574	11,198	11,437	10,715	12,281	11,635	10,881	
	Lighting	13,489	15,342	16,567	17,124	17,243	16,276	15,368	13,659	14,371	13,070	12,345	11,555	12,349	11,158	10,534	
	HotWater	700	685	676	576	605	619	632	642	648	648	652	864	813	771	659	660
	Miscellaneous	21	20	18	16	13	11	8	6	5	4	4	0	0	0	0	0
	Motors	498	515	505	471	421	360	299	240	188	145	110	27	20	15	0	
	PlugLoads_Office	1,796	1,901	1,951	1,948	1,891	1,772	1,608	1,409	1,951	1,855	1,755	1,752	1,713	1,635	1,507	
	Refrigeration	3,930	3,668	3,284	2,964	3,409	2,988	2,680	2,299	2,527	2,409	2,169	1,800	4,024	3,828	3,365	
	WholeBld	836	1,273	1,428	1,545	1,751	2,168	2,603	3,003	3,298	3,452	3,430	3,231	3,722	3,731	3,443	
Street Lighting	51	42	34	26	20	15	11	0	0	0	0	0	0	0	0		
Industrial	CompressedAir	3,270	3,422	3,492	5,088	5,024	4,809	6,175	5,858	5,439	6,663	6,241	5,549	6,793	6,347	5,650	
	HVAC	3,909	4,077	4,185	5,507	5,444	5,284	6,402	6,132	5,791	6,787	6,276	5,929	6,945	6,409	6,061	
	Lighting	32,585	26,383	20,989	17,358	13,621	10,465	2,483	2,255	1,996	2,609	2,381	2,138	2,658	2,459	2,209	
	Machine / Process	21,408	23,033	24,318	29,892	30,409	30,293	34,729	34,120	33,208	36,873	35,631	34,870	38,592	37,312	35,281	
	WholeBld	4,340	4,644	4,890	7,383	7,992	8,169	10,470	10,591	10,430	12,081	11,959	11,545	13,261	12,858	12,241	
	Water / WW	3,222	3,763	4,226	4,508	4,542	4,335	3,934	3,406	2,836	2,287	1,800	4,917	5,202	5,438	4,954	
	Agriculture	4,232	6,621	5,083	3,857	2,914	171	216	266	318	369	416	455	487	510	527	
<b>Total</b>		106,880	107,979	103,914	111,610	108,303	100,346	100,972	96,571	94,972	100,847	97,232	95,712	109,233	104,409	97,728	

C&I - Cumulative Annual MAP Savings - by End-Use (MWh)

End Use	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	
Commercial	CompressedAir	62	129	199	269	340	412	482	553	622	691	756	821	887	953	1,020
	Cooking	187	396	625	872	1,135	1,411	1,697	1,992	2,293	2,600	2,912	3,227	3,358	3,469	3,563
	HVAC	12,346	24,661	36,632	48,126	59,008	69,029	78,035	85,999	92,983	98,018	102,429	106,313	109,795	112,936	115,806
	Lighting	13,489	28,831	45,398	62,522	79,765	96,034	110,855	123,913	135,026	144,253	151,722	157,586	161,502	164,041	166,123
	HotWater	700	1,385	2,061	2,637	3,242	3,733	4,234	4,602	4,958	5,300	5,434	5,534	5,609	5,666	5,709
	Miscellaneous	21	41	59	75	88	98	107	113	118	121	121	121	121	121	121
	Motors	498	1,013	1,518	1,989	2,410	2,770	3,069	3,309	3,498	3,643	3,753	3,780	3,800	3,815	3,815
	PlugLoads_Office	1,796	3,696	5,647	7,594	9,485	11,257	12,865	14,274	15,514	16,496	17,225	17,829	18,319	18,725	19,059
	Refrigeration	3,930	7,598	10,882	13,726	16,152	18,128	19,699	20,941	21,620	22,163	22,549	22,758	23,007	23,233	23,404
	WholeBld	836	2,108	3,536	5,081	6,831	9,000	11,603	14,605	17,903	21,355	24,785	28,015	30,901	33,359	35,375
Street Lighting	51	93	126	153	173	188	199	199	199	199	199	199	199	199	199	
Industrial	CompressedAir	3,270	6,691	10,183	13,693	17,133	20,425	23,603	26,617	29,501	32,304	35,051	37,544	40,079	40,926	41,642
	HVAC	3,909	7,986	12,170	16,425	20,678	24,878	29,054	33,165	37,209	41,229	45,084	48,964	52,899	56,852	60,834
	Lighting	32,585	58,968	79,957	96,375	108,989	118,427	118,926	119,182	119,394	119,520	119,646	119,788	119,837	119,916	119,987
	Machine / Process	21,408	44,441	68,758	94,016	119,775	145,613	171,540	197,291	222,984	248,515	273,894	296,083	318,322	340,497	362,688
	WholeBld	4,340	8,984	13,873	18,974	24,185	29,084	33,525	37,230	40,346	42,606	44,459	45,932	47,112	48,010	48,707
	Water / WW	3,222	6,985	11,211	15,719	20,261	24,597	28,531	31,937	34,773	37,060	38,860	40,554	41,993	43,205	43,651
	Agriculture	4,232	10,853	15,937	19,794	22,708	22,879	23,095	23,362	23,680	24,050	24,465	24,919	25,403	25,909	26,432
<b>Total</b>	106,880	214,859	318,773	418,040	512,358	597,962	671,119	739,284	802,619	860,122	913,344	959,967	1,003,142	1,041,834	1,078,137	

C&I - Incremental Annual RAP Savings - by End-Use (MWh)

End Use	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	
Commercial	CompressedAir	48	52	54	55	55	76	74	72	70	67	82	79	76	72	69
	Cooking	144	160	174	187	199	208	216	222	227	231	235	237	239	241	243
	HVAC	6,812	6,898	6,828	7,943	7,880	7,832	8,673	8,353	7,962	8,206	8,300	7,782	9,040	8,587	8,039
	Lighting	9,304	10,638	11,539	11,988	12,097	11,548	11,048	9,952	10,802	10,010	9,580	9,143	9,694	8,853	8,355
	HotWater	627	603	586	478	499	509	519	526	531	534	748	697	656	542	544
	Miscellaneous	8	8	7	6	5	4	3	3	2	1	0	0	0	0	0
	Motors	327	338	331	308	274	234	194	156	122	94	71	16	12	9	0
	PlugLoads_Office	1,266	1,340	1,374	1,371	1,329	1,244	1,128	987	1,363	1,299	1,221	1,219	1,192	1,138	1,049
	Refrigeration	2,613	2,447	2,199	2,004	2,382	2,108	1,909	1,653	1,892	1,813	1,633	1,360	2,890	2,692	2,362
	WholeBld	707	1,076	1,207	1,305	1,470	1,831	2,211	2,565	2,834	2,983	2,978	2,818	3,259	3,277	3,031
Street Lighting	203	168	134	105	80	60	45	0	0	0	0	0	0	0	0	
Industrial	CompressedAir	2,235	2,341	2,393	3,460	3,417	3,279	4,194	3,987	3,712	4,535	4,257	3,797	4,638	4,343	3,877
	HVAC	2,785	2,924	3,025	3,847	3,831	3,755	4,442	4,295	4,097	4,702	4,404	4,202	4,822	4,506	4,303
	Lighting	24,953	20,192	16,052	13,223	10,349	7,955	1,825	1,673	1,492	1,960	1,796	1,612	2,003	1,852	1,663
	Machine / Process	15,576	16,815	17,821	21,807	22,241	22,249	25,416	25,057	24,476	27,076	26,269	25,546	28,203	27,351	25,970
	WholeBld	2,542	2,860	3,156	5,220	5,777	6,042	7,960	8,152	8,105	9,593	9,523	9,214	10,606	10,304	9,829
	Water / WW	1,767	2,064	2,318	2,472	2,491	2,377	2,158	1,868	1,555	1,254	987	2,696	2,853	2,982	2,717
	Agriculture	4,490	7,019	5,383	4,078	3,072	153	194	239	287	334	377	414	445	468	485
<b>Total</b>	<b>76,408</b>	<b>77,943</b>	<b>74,580</b>	<b>79,855</b>	<b>77,448</b>	<b>71,466</b>	<b>72,206</b>	<b>69,759</b>	<b>69,526</b>	<b>74,692</b>	<b>72,461</b>	<b>70,832</b>	<b>80,627</b>	<b>77,219</b>	<b>72,537</b>	

C&I - Cumulative Annual RAP Savings - by End-Use (MWh)

End Use	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	
Commercial	CompressedAir	48	100	153	208	264	320	376	431	486	541	593	645	698	751	804
	Cooking	144	304	478	666	865	1,073	1,289	1,511	1,737	1,968	2,203	2,440	2,535	2,616	2,684
	HVAC	6,812	13,710	20,539	27,230	33,669	39,697	45,163	50,055	54,364	57,632	60,460	62,915	65,097	67,034	68,770
	Lighting	9,304	19,941	31,481	43,469	55,566	67,109	77,761	87,278	95,565	102,601	108,472	113,269	116,790	119,325	121,484
	HotWater	627	1,230	1,816	2,294	2,793	3,174	3,561	3,856	4,143	4,421	4,525	4,604	4,663	4,708	4,744
	Miscellaneous	8	17	24	30	36	40	43	46	48	49	49	49	49	49	49
	Motors	327	666	996	1,304	1,578	1,812	2,005	2,161	2,283	2,376	2,447	2,463	2,475	2,484	2,484
	PlugLoads_Office	1,266	2,606	3,980	5,350	6,679	7,923	9,051	10,038	10,906	11,597	12,104	12,524	12,864	13,147	13,379
	Refrigeration	2,613	5,059	7,258	9,170	10,810	12,155	13,226	14,080	14,576	14,981	15,275	15,439	15,617	15,774	15,890
	WholeBld	707	1,783	2,989	4,294	5,764	7,595	9,806	12,371	15,204	18,187	21,165	23,984	26,536	28,738	30,563
Street Lighting	203	371	505	610	691	751	796	796	796	796	796	796	796	796	796	
Industrial	CompressedAir	2,235	4,577	6,969	9,378	11,740	14,008	16,204	18,301	20,310	22,272	24,197	25,950	27,736	28,341	28,852
	HVAC	2,785	5,710	8,735	11,833	14,952	18,059	21,170	24,258	27,311	30,358	33,313	36,287	39,303	42,333	45,387
	Lighting	24,953	45,145	61,198	73,738	83,357	90,569	90,963	91,201	91,395	91,530	91,653	91,773	91,816	91,872	91,923
	Machine / Process	15,576	32,391	50,212	68,791	87,793	106,939	126,224	145,464	164,710	183,883	202,999	219,898	236,864	253,798	270,748
	WholeBld	2,542	5,403	8,559	11,987	15,584	19,061	22,294	25,072	27,446	29,316	30,865	32,106	33,119	33,900	34,515
	Water / WW	1,767	3,831	6,148	8,620	11,111	13,489	15,646	17,514	19,069	20,324	21,311	22,240	23,029	23,694	23,938
	Agriculture	4,490	11,509	16,891	20,969	24,040	24,194	24,387	24,626	24,913	25,247	25,624	26,037	26,480	26,946	27,428
<b>Total</b>	<b>76,408</b>	<b>154,352</b>	<b>228,932</b>	<b>299,942</b>	<b>367,290</b>	<b>427,966</b>	<b>479,965</b>	<b>529,059</b>	<b>575,265</b>	<b>618,080</b>	<b>658,050</b>	<b>693,419</b>	<b>726,468</b>	<b>756,305</b>	<b>784,440</b>	

C&I - Incremental Annual MAP Savings - by End-Use (MW)

End Use		2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Commercial	CompressedAir	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Cooking	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	HVAC	3.8	3.8	3.7	3.9	3.7	3.5	3.6	3.4	3.2	3.1	3.2	3.1	4.0	3.8	3.6
	Lighting	2.6	3.0	3.2	3.3	3.4	3.2	2.9	2.6	2.8	2.6	2.4	2.3	2.1	1.9	1.7
	HotWater	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	Miscellaneous	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Motors	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	PlugLoads_Office	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Refrigeration	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.3	0.2	0.3	0.3
	WholeBld	0.2	0.2	0.3	0.3	0.3	0.4	0.5	0.6	0.6	0.7	0.7	0.6	0.7	0.7	0.7
Street Lighting	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Industrial	CompressedAir	0.6	0.6	0.6	0.9	0.9	0.8	1.1	1.0	0.9	1.1	1.1	1.0	1.2	1.1	1.0
	HVAC	0.7	0.7	0.7	0.9	0.9	0.9	1.1	1.0	1.0	1.2	1.1	1.0	1.2	1.1	1.0
	Lighting	5.6	4.5	3.6	3.0	2.3	1.8	0.4	0.4	0.3	0.4	0.4	0.4	0.5	0.4	0.4
	Machine / Process	3.7	3.9	4.2	5.1	5.2	5.2	5.9	5.8	5.7	6.3	6.1	6.0	6.6	6.4	6.0
	WholeBld	0.9	0.9	1.0	1.4	1.4	1.5	1.8	1.8	1.8	2.1	2.0	2.0	2.3	2.2	2.1
	Water / WW	0.6	0.6	0.7	0.8	0.8	0.7	0.7	0.6	0.5	0.4	0.3	0.8	0.9	0.9	0.8
	Agriculture	0.2	0.4	0.3	0.2	0.2	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
<b>Total</b>		7.7	8.2	8.3	8.9	8.8	8.5	8.6	8.0	8.1	7.9	7.8	7.3	8.5	7.9	7.4

C&I - Cumulative Annual MAP Savings - by End-Use (MW)

End Use		2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Commercial	CompressedAir	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2
	Cooking	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.5	0.5	0.5
	HVAC	3.8	7.6	11.2	14.8	18.1	21.1	23.9	26.4	28.7	30.6	32.2	33.8	35.3	36.8	38.2
	Lighting	2.6	5.6	8.8	12.1	15.5	18.7	21.6	24.2	26.5	28.3	29.9	31.1	31.9	32.4	32.9
	HotWater	0.1	0.1	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
	Miscellaneous	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Motors	0.1	0.2	0.3	0.4	0.5	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8
	PlugLoads_Office	0.1	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	Refrigeration	0.3	0.6	0.9	1.1	1.3	1.5	1.6	1.7	1.8	1.9	1.9	2.0	2.0	2.0	2.0
	WholeBld	0.2	0.4	0.7	1.0	1.3	1.7	2.2	2.8	3.4	4.1	4.7	5.3	5.9	6.3	6.7
Street Lighting	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Industrial	CompressedAir	0.6	1.1	1.7	2.3	2.9	3.5	4.0	4.6	5.1	5.5	6.0	6.4	6.9	7.0	7.1
	HVAC	0.7	1.4	2.1	2.8	3.5	4.3	5.0	5.7	6.4	7.1	7.7	8.4	9.1	9.7	10.4
	Lighting	5.6	10.1	13.7	16.5	18.7	20.3	20.4	20.4	20.4	20.5	20.5	20.5	20.5	20.5	20.5
	Machine / Process	3.7	7.6	11.8	16.1	20.5	24.9	29.4	33.8	38.2	42.6	46.9	50.7	54.5	58.3	62.1
	WholeBld	0.9	1.8	2.8	3.7	4.7	5.6	6.4	7.1	7.6	8.0	8.3	8.6	8.8	8.9	9.1
	Water / WW	0.6	1.2	1.9	2.7	3.5	4.2	4.9	5.5	6.0	6.3	6.7	6.9	7.2	7.4	7.5
	Agriculture	0.2	0.6	0.9	1.2	1.4	1.4	1.5	1.5	1.6	1.7	1.8	1.9	2.0	2.2	2.3
<b>Total</b>		19	39	57	75	93	109	123	136	148	159	169	178	186	194	201

C&I - Incremental Annual RAP Savings - by End-Use (MW)

End Use		2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Commercial	CompressedAir	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Cooking	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	HVAC	2.1	2.2	2.1	2.3	2.2	2.2	2.3	2.2	2.1	2.1	2.2	2.0	2.7	2.6	2.4
	Lighting	1.8	2.1	2.2	2.3	2.4	2.3	2.1	1.9	2.1	2.0	1.9	1.8	1.7	1.6	1.4
	HotWater	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0
	Miscellaneous	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Motors	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	PlugLoads_Office	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Refrigeration	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	WholeBld	0.1	0.2	0.2	0.2	0.3	0.3	0.4	0.5	0.5	0.6	0.6	0.5	0.6	0.6	0.6
Street Lighting	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Industrial	CompressedAir	0.4	0.4	0.4	0.6	0.6	0.6	0.7	0.7	0.6	0.8	0.7	0.7	0.8	0.7	0.7
	HVAC	0.5	0.5	0.5	0.7	0.7	0.6	0.8	0.7	0.7	0.8	0.8	0.7	0.8	0.8	0.7
	Lighting	4.3	3.5	2.7	2.3	1.8	1.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	Machine / Process	2.7	2.9	3.1	3.7	3.8	3.8	4.4	4.3	4.2	4.6	4.5	4.4	4.8	4.7	4.4
	WholeBld	0.5	0.5	0.6	0.9	1.0	1.1	1.4	1.4	1.4	1.6	1.6	1.6	1.8	1.8	1.7
	Water / WW	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.2	0.2	0.5	0.5	0.5	0.5
	Agriculture	0.3	0.4	0.3	0.3	0.2	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
<b>Total</b>		13.4	13.4	13.0	14.1	13.8	13.1	13.2	12.7	12.6	13.5	13.1	12.8	14.6	14.0	13.1

C&I - Cumulative Annual RAP Savings - by End-Use (MW)

End Use		2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Commercial	CompressedAir	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	Cooking	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.4	0.4
	HVAC	2.1	4.3	6.4	8.4	10.4	12.1	13.8	15.2	16.6	17.7	18.6	19.5	20.4	21.2	22.0
	Lighting	1.8	3.9	6.1	8.4	10.8	13.1	15.2	17.1	18.8	20.2	21.4	22.4	23.2	23.7	24.2
	HotWater	0.1	0.1	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4
	Miscellaneous	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Motors	0.1	0.1	0.2	0.3	0.3	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	PlugLoads_Office	0.1	0.1	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4
	Refrigeration	0.2	0.4	0.6	0.8	0.9	1.0	1.1	1.2	1.3	1.3	1.3	1.4	1.4	1.4	1.4
	WholeBld	0.1	0.3	0.6	0.8	1.1	1.4	1.9	2.4	2.9	3.5	4.0	4.6	5.0	5.5	5.8
Street Lighting	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Industrial	CompressedAir	0.4	0.8	1.2	1.6	2.0	2.4	2.8	3.1	3.5	3.8	4.1	4.4	4.7	4.9	4.9
	HVAC	0.5	1.0	1.5	2.0	2.6	3.1	3.6	4.2	4.7	5.2	5.7	6.2	6.7	7.2	7.8
	Lighting	4.3	7.7	10.5	12.6	14.3	15.5	15.6	15.6	15.6	15.7	15.7	15.7	15.7	15.7	15.7
	Machine / Process	2.7	5.5	8.6	11.8	15.0	18.3	21.6	24.9	28.2	31.5	34.8	37.7	40.6	43.5	46.4
	WholeBld	0.5	1.0	1.6	2.2	2.9	3.5	4.1	4.5	5.0	5.3	5.6	5.8	5.9	6.1	6.2
	Water / WW	0.3	0.7	1.1	1.5	1.9	2.3	2.7	3.0	3.3	3.5	3.6	3.8	3.9	4.1	4.1
	Agriculture	0.3	0.7	1.0	1.2	1.4	1.5	1.5	1.6	1.7	1.7	1.8	1.9	2.0	2.1	2.2
<b>Total</b>		13.4	26.7	39.8	52.3	64.3	75.5	85.1	94.3	102.9	110.9	118.4	125.1	131.4	137.1	142.5

Demand Response - Incremental Annual MAP Savings - by Program (MW)

Sector	Program	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Residential	DLC AC (BYOT Thermostat)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	DLC AC (Utility Incentivized Thermostat)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	DLC AC (Switch)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	DLC Swimming Pool Pumps	2	4	6	4	1	0	0	0	0	0	0	0	0	0	0
	Coincident Peak Pricing with Enabling Tech	16	38	59	38	13	3	1	0	0	0	0	0	0	0	0
	Coincident Peak Pricing without Enabling Tech	6	12	7	0	0	0	0	0	0	0	0	0	0	0	0
Non-Residential	DLC AC (BYOT Thermostat)	1	1	2	1	1	0	0	0	0	0	0	0	0	0	0
	DLC AC (Utility Incentivized Thermostat)	1	1	2	1	1	0	0	0	0	0	0	0	0	0	0
	DLC Water Heating	1	2	2	2	1	0	0	0	0	0	0	0	0	0	0
	DLC Agricultural Irrigation	1	2	3	2	1	0	0	0	0	0	0	0	0	0	0
	Interruptible Rate	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4
	Large C&I Behavioral	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coincident Peak Pricing with Enabling Tech	8	16	20	9	3	1	1	1	1	1	1	1	0	0	0
	Coincident Peak Pricing without Enabling Tech	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0
Residential & Non-Residential	PEV Charging	0	0	1	1	1	0	0	0	0	0	0	1	1	1	1
<b>Total</b>		41	84	109	63	25	11	8	7	7	7	7	7	7	8	8

Demand Response - Cumulative Annual MAP Savings - by Program (MW)

Sector	Program	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Residential	DLC AC (BYOT Thermostat)	4	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	DLC AC (Utility Incentivized Thermostat)	1	2	3	4	5	6	7	9	10	11	12	13	15	16	17
	DLC AC (Switch)	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	DLC Swimming Pool Pumps	2	5	11	15	16	16	17	17	17	17	17	17	17	17	18
	Coincident Peak Pricing with Enabling Tech	16	54	113	151	163	167	168	168	168	168	168	168	168	168	168
	Coincident Peak Pricing without Enabling Tech	6	18	26	24	22	22	22	22	22	22	22	22	22	23	23
Non-Residential	DLC AC (BYOT Thermostat)	1	2	4	5	6	6	6	6	6	6	6	6	6	6	7
	DLC AC (Utility Incentivized Thermostat)	1	2	4	5	6	6	6	6	6	6	6	6	6	6	7
	DLC Water Heating	1	2	5	6	7	7	7	7	7	7	7	7	7	8	8
	DLC Agricultural Irrigation	1	3	7	9	9	10	10	10	10	10	10	10	10	10	10
	Interruptible Rate	251	254	257	260	264	267	271	274	278	281	285	289	293	297	301
	Large C&I Behavioral	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1
	Coincident Peak Pricing with Enabling Tech	8	24	43	53	56	57	57	58	58	59	59	60	60	61	61
	Coincident Peak Pricing without Enabling Tech	1	4	5	5	5	5	5	5	5	5	5	5	5	5	5
Residential & Non-Residential	PEV Charging	0	1	1	2	3	3	4	4	5	5	6	6	7	7	8
<b>Total</b>		303	387	496	558	581	592	600	607	615	622	629	637	644	652	659

Demand Response - Incremental Annual RAP Savings - by Program (MW)

Sector	Program	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Residential	DLC AC (BYOT Thermostat)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	DLC AC (Utility Incentivized Thermostat)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	DLC AC (Switch)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	DLC Swimming Pool Pumps	1	2	3	2	1	0	0	0	0	0	0	0	0	0	0
	Coincident Peak Pricing with Enabling Tech	4	10	15	10	3	1	0	0	0	0	0	0	0	0	0
	Coincident Peak Pricing without Enabling Tech	1	3	5	3	1	0	0	0	0	0	0	0	0	0	0
Non-Residential	DLC AC (BYOT Thermostat)	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0
	DLC AC (Utility Incentivized Thermostat)	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0
	DLC Water Heating	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0
	DLC Agricultural Irrigation	0	1	2	1	0	0	0	0	0	0	0	0	0	0	0
	Interruptible Rate	2	3	3	2	3	3	3	3	3	3	3	3	3	3	3
	Coincident Peak Pricing with Enabling Tech	2	5	7	4	2	1	0	0	0	0	0	0	0	0	0
Residential & Non-Residential	Coincident Peak Pricing without Enabling Tech	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0
Residential & Non-Residential	PEV Charging	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>		14	27	39	26	12	7	5	5	5	5	5	5	5	5	5

Demand Response - Cumulative Annual RAP Savings - by Program (MW)

Sector	Program	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Residential	DLC AC (BYOT Thermostat)	3	4	4	5	6	6	7	7	8	9	9	10	11	11	12
	DLC AC (Utility Incentivized Thermostat)	1	1	2	3	4	4	5	6	7	8	8	9	10	11	12
	DLC AC (Switch)	11	9	8	8	8	8	8	8	8	8	8	8	8	8	8
	DLC Swimming Pool Pumps	1	3	5	7	8	8	8	8	8	8	8	9	9	9	9
	Coincident Peak Pricing with Enabling Tech	4	13	28	38	41	42	42	43	43	43	43	43	43	43	43
	Coincident Peak Pricing without Enabling Tech	1	5	9	12	13	13	13	13	13	13	13	13	13	13	13
Non-Residential	DLC AC (BYOT Thermostat)	0	1	2	2	2	3	3	3	3	3	3	3	3	3	3
	DLC AC (Utility Incentivized Thermostat)	0	1	2	2	2	3	3	3	3	3	3	3	3	3	3
	DLC Water Heating	0	1	2	3	3	3	3	3	3	3	3	3	3	3	3
	DLC Agricultural Irrigation	0	2	3	4	5	5	5	5	5	5	5	5	5	5	5
	Interruptible Rate	250	253	255	258	260	263	266	268	271	274	277	280	283	286	289
	Coincident Peak Pricing with Enabling Tech	2	7	15	19	20	21	21	21	22	22	22	22	22	23	23
Residential & Non-Residential	Coincident Peak Pricing without Enabling Tech	0	1	3	3	3	3	4	4	4	4	4	4	4	4	4
Residential & Non-Residential	PEV Charging	0	0	1	1	2	2	2	3	3	3	3	4	4	4	5
<b>Total</b>		275	301	339	365	377	384	389	394	399	404	409	415	420	425	431

## APPENDIX D: PROGRAM POTENTIAL DETAIL

Incremental Annual Savings - Base Case (\$3 million budget scenario)

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Energy (MWh)	8,118	8,078	8,169	8,275	8,391	8,522	8,677	8,842	9,021	9,217	9,579	9,831	10,314	10,545	10,792
Demand (MW)	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9

Cumulative Annual Savings - Base Case (\$3 million budget scenario)

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Energy (MWh)	8,118	13,299	18,609	23,983	29,431	34,963	40,602	46,343	52,199	58,189	64,469	70,972	77,876	84,914	92,098
Demand (MW)	0.7	1.1	1.5	1.9	2.3	2.7	3.1	3.6	4.0	4.5	5.0	5.5	6.0	6.5	7.0

Annual Budget - by Program

Program	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Residential Energy Audit	\$225,000	\$231,300	\$237,776	\$244,434	\$251,278	\$258,314	\$265,547	\$272,982	\$280,626	\$288,483	\$296,561	\$304,864	\$313,401	\$322,176	\$331,197
Button-Up Weatherization	\$350,000	\$359,800	\$369,874	\$380,231	\$390,877	\$401,822	\$413,073	\$424,639	\$436,529	\$448,752	\$461,317	\$474,234	\$487,512	\$501,162	\$515,195
CARES Program	\$350,000	\$359,800	\$369,874	\$380,231	\$390,877	\$401,822	\$413,073	\$424,639	\$436,529	\$448,752	\$461,317	\$474,234	\$487,512	\$501,162	\$515,195
Heat Pump Retrofit	\$1,000,000	\$1,028,000	\$1,056,784	\$1,086,374	\$1,116,792	\$1,148,063	\$1,180,208	\$1,213,254	\$1,247,225	\$1,282,148	\$1,318,048	\$1,354,953	\$1,392,892	\$1,431,893	\$1,471,986
Residential Lighting	\$50,000	\$51,400	\$52,839	\$54,319	\$55,840	\$57,403	\$59,010	\$60,663	\$62,361	\$64,107	\$65,902	\$67,748	\$69,645	\$71,595	\$73,599
TSE New Home	\$750,000	\$771,000	\$792,588	\$814,780	\$837,594	\$861,047	\$885,156	\$909,941	\$935,419	\$961,611	\$988,536	\$1,016,215	\$1,044,669	\$1,073,920	\$1,103,989
ES Manufactured Home	\$150,000	\$154,200	\$158,518	\$162,956	\$167,519	\$172,209	\$177,031	\$181,988	\$187,084	\$192,322	\$197,707	\$203,243	\$208,934	\$214,784	\$220,798
ENERGY STAR Appliance Rebate	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Commercial Lighting	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Fixed Costs	\$125,000	\$128,500	\$132,098	\$135,797	\$139,599	\$143,508	\$147,526	\$151,657	\$155,903	\$160,268	\$164,756	\$169,369	\$174,111	\$178,987	\$183,998
Sub-Total	\$2,875,000	\$2,955,500	\$3,038,254	\$3,123,325	\$3,210,778	\$3,300,680	\$3,393,099	\$3,488,106	\$3,585,773	\$3,686,174	\$3,789,387	\$3,895,490	\$4,004,564	\$4,116,692	\$4,231,959
<b>Total</b>	<b>\$3,000,000</b>	<b>\$3,084,000</b>	<b>\$3,170,352</b>	<b>\$3,259,122</b>	<b>\$3,350,377</b>	<b>\$3,444,188</b>	<b>\$3,540,625</b>	<b>\$3,639,763</b>	<b>\$3,741,676</b>	<b>\$3,846,443</b>	<b>\$3,954,143</b>	<b>\$4,064,859</b>	<b>\$4,178,675</b>	<b>\$4,295,678</b>	<b>\$4,415,957</b>

Annual Budget - by Category

Category	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Incentives	\$964,945	\$986,686	\$1,007,248	\$1,026,986	\$1,046,971	\$1,066,276	\$1,084,111	\$1,099,770	\$1,117,093	\$1,135,389	\$1,067,099	\$1,073,189	\$1,026,642	\$1,038,953	\$1,048,306
Admin	\$465,820	\$480,458	\$491,511	\$503,097	\$514,941	\$527,308	\$540,432	\$554,549	\$569,245	\$584,970	\$613,140	\$631,813	\$668,683	\$685,535	\$703,682
Net Lost Revenues	\$1,444,235	\$1,488,355	\$1,539,495	\$1,593,242	\$1,648,866	\$1,707,096	\$1,768,557	\$1,833,787	\$1,899,435	\$1,965,815	\$2,109,148	\$2,190,488	\$2,309,239	\$2,392,204	\$2,479,970
Fixed Costs	\$125,000	\$128,500	\$132,098	\$135,797	\$139,599	\$143,508	\$147,526	\$151,657	\$155,903	\$160,268	\$164,756	\$169,369	\$174,111	\$178,987	\$183,998
<b>Total</b>	<b>\$3,000,000</b>	<b>\$3,084,000</b>	<b>\$3,170,352</b>	<b>\$3,259,122</b>	<b>\$3,350,377</b>	<b>\$3,444,188</b>	<b>\$3,540,625</b>	<b>\$3,639,763</b>	<b>\$3,741,676</b>	<b>\$3,846,443</b>	<b>\$3,954,143</b>	<b>\$4,064,859</b>	<b>\$4,178,675</b>	<b>\$4,295,678</b>	<b>\$4,415,957</b>

Incremental Annual Savings - Base Case (\$4 million budget scenario)

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Energy (MWh)	10,766	10,636	10,744	10,858	11,000	11,164	11,360	11,570	11,797	12,062	12,502	12,841	13,758	14,065	14,393
Demand (MW)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.2	1.2	1.2	1.2	1.3

Cumulative Annual Savings - Base Case (\$4 million budget scenario)

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Energy (MWh)	10,766	17,538	24,471	31,465	38,546	45,733	53,056	60,510	68,108	75,894	84,028	92,461	101,707	111,131	120,752
Demand (MW)	1.0	1.5	2.0	2.6	3.1	3.7	4.2	4.8	5.4	6.0	6.7	7.4	8.1	8.9	9.6

Annual Budget - by Program

Program	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Residential Energy Audit	\$300,000	\$308,400	\$317,035	\$325,912	\$335,038	\$344,419	\$354,063	\$363,976	\$374,168	\$384,644	\$395,414	\$406,486	\$417,868	\$429,568	\$441,596
Button-Up Weatherization	\$500,000	\$514,000	\$528,392	\$543,187	\$558,396	\$574,031	\$590,104	\$606,627	\$623,613	\$641,074	\$659,024	\$677,477	\$696,446	\$715,946	\$735,993
CARES Program	\$475,000	\$488,300	\$501,972	\$516,028	\$530,476	\$545,330	\$560,599	\$576,296	\$592,432	\$609,020	\$626,073	\$643,603	\$661,624	\$680,149	\$699,193
Heat Pump Retrofit	\$1,333,333	\$1,370,667	\$1,409,045	\$1,448,499	\$1,489,057	\$1,530,750	\$1,573,611	\$1,617,672	\$1,662,967	\$1,709,530	\$1,757,397	\$1,806,604	\$1,857,189	\$1,909,190	\$1,962,648
Residential Lighting	\$66,667	\$68,533	\$70,452	\$72,425	\$74,453	\$76,538	\$78,681	\$80,884	\$83,148	\$85,477	\$87,870	\$90,330	\$92,859	\$95,460	\$98,132
TSE New Home	\$1,000,000	\$1,028,000	\$1,056,784	\$1,086,374	\$1,116,792	\$1,148,063	\$1,180,208	\$1,213,254	\$1,247,225	\$1,282,148	\$1,318,048	\$1,354,953	\$1,392,892	\$1,431,893	\$1,471,986
ES Manufactured Home	\$200,000	\$205,600	\$211,357	\$217,275	\$223,358	\$229,613	\$236,042	\$242,651	\$249,445	\$256,430	\$263,610	\$270,991	\$278,578	\$286,379	\$294,397
ENERGY STAR Appliance Rebate	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Commercial Lighting	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Fixed Costs	\$125,000	\$128,500	\$132,098	\$135,797	\$139,599	\$143,508	\$147,526	\$151,657	\$155,903	\$160,268	\$164,756	\$169,369	\$174,111	\$178,987	\$183,998
Sub-Total	\$3,875,000	\$3,983,500	\$4,095,038	\$4,209,699	\$4,327,571	\$4,448,743	\$4,573,307	\$4,701,360	\$4,832,998	\$4,968,322	\$5,107,435	\$5,250,443	\$5,397,456	\$5,548,584	\$5,703,945
<b>Total</b>	<b>\$4,000,000</b>	<b>\$4,112,000</b>	<b>\$4,227,136</b>	<b>\$4,345,496</b>	<b>\$4,467,170</b>	<b>\$4,592,250</b>	<b>\$4,720,833</b>	<b>\$4,853,017</b>	<b>\$4,988,901</b>	<b>\$5,128,590</b>	<b>\$5,272,191</b>	<b>\$5,419,812</b>	<b>\$5,571,567</b>	<b>\$5,727,571</b>	<b>\$5,887,943</b>

Annual Budget - by Category

Category	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Incentives	\$1,343,815	\$1,389,342	\$1,420,169	\$1,452,459	\$1,482,480	\$1,510,897	\$1,537,377	\$1,560,942	\$1,587,797	\$1,603,061	\$1,518,477	\$1,526,744	\$1,400,779	\$1,417,606	\$1,430,420
Admin	\$620,105	\$633,833	\$647,755	\$661,451	\$676,514	\$692,535	\$709,541	\$727,849	\$746,818	\$768,451	\$802,958	\$828,450	\$900,141	\$922,805	\$947,222
Net Lost Revenues	\$1,911,080	\$1,960,325	\$2,027,114	\$2,095,790	\$2,168,577	\$2,245,311	\$2,326,389	\$2,412,569	\$2,498,383	\$2,596,810	\$2,786,000	\$2,895,249	\$3,096,536	\$3,208,173	\$3,326,303
Fixed Costs	\$125,000	\$128,500	\$132,098	\$135,797	\$139,599	\$143,508	\$147,526	\$151,657	\$155,903	\$160,268	\$164,756	\$169,369	\$174,111	\$178,987	\$183,998
<b>Total</b>	<b>\$4,000,000</b>	<b>\$4,112,000</b>	<b>\$4,227,136</b>	<b>\$4,345,496</b>	<b>\$4,467,170</b>	<b>\$4,592,250</b>	<b>\$4,720,833</b>	<b>\$4,853,017</b>	<b>\$4,988,901</b>	<b>\$5,128,590</b>	<b>\$5,272,191</b>	<b>\$5,419,812</b>	<b>\$5,571,567</b>	<b>\$5,727,571</b>	<b>\$5,887,943</b>

Incremental Annual Savings - Base Case (\$6 million budget scenario)

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Energy (MWh)	16,115	16,171	16,480	16,819	17,228	17,632	18,100	18,562	18,504	19,389	19,825	20,098	20,360	21,449	21,694
Demand (MW)	1.9	1.9	1.9	2.0	2.1	2.1	2.2	2.2	2.2	2.4	2.4	2.4	2.3	2.3	2.3

Cumulative Annual Savings - Base Case (\$6 million budget scenario)

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Energy (MWh)	16,115	27,168	38,632	50,396	62,523	75,003	87,721	100,821	112,807	125,532	138,410	149,711	160,449	172,056	183,767
Demand (MW)	1.9	3.2	4.6	6.1	7.5	9.1	10.6	12.3	13.7	15.2	16.8	18.3	19.6	20.9	22.1

Annual Budget - by Program

Program	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Residential Energy Audit	\$400,000	\$411,200	\$422,714	\$434,550	\$446,717	\$459,225	\$472,083	\$485,302	\$498,890	\$512,859	\$527,219	\$541,981	\$557,157	\$572,757	\$588,794
Button-Up Weatherization	\$575,000	\$591,100	\$607,651	\$624,665	\$642,156	\$660,136	\$678,620	\$697,621	\$717,155	\$737,235	\$757,877	\$779,098	\$800,913	\$823,338	\$846,392
CARES Program	\$550,000	\$565,400	\$581,231	\$597,506	\$614,236	\$631,434	\$649,115	\$667,290	\$685,974	\$705,181	\$724,926	\$745,224	\$766,090	\$787,541	\$809,592
Heat Pump Retrofit	\$1,500,000	\$1,542,000	\$1,585,176	\$1,629,561	\$1,675,189	\$1,722,094	\$1,770,313	\$1,819,881	\$1,870,838	\$1,923,221	\$1,977,072	\$2,032,430	\$2,089,338	\$2,147,839	\$2,207,979
Residential Lighting	\$100,000	\$102,800	\$105,678	\$108,637	\$111,679	\$114,806	\$118,021	\$121,325	\$124,723	\$128,215	\$131,805	\$135,495	\$139,289	\$143,189	\$147,199
TSE New Home	\$1,200,000	\$1,233,600	\$1,268,141	\$1,303,649	\$1,340,151	\$1,377,675	\$1,416,250	\$1,455,905	\$1,496,670	\$1,538,577	\$1,581,657	\$1,625,944	\$1,671,470	\$1,718,271	\$1,766,383
ES Manufactured Home	\$250,000	\$257,000	\$264,196	\$271,593	\$279,198	\$287,016	\$295,052	\$303,314	\$311,806	\$320,537	\$329,512	\$338,738	\$348,223	\$357,973	\$367,996
ENERGY STAR Appliance Rebate	\$250,000	\$257,000	\$264,196	\$271,593	\$279,198	\$287,016	\$295,052	\$303,314	\$311,806	\$320,537	\$329,512	\$338,738	\$348,223	\$357,973	\$367,996
Commercial Lighting	\$900,000	\$925,200	\$951,106	\$977,737	\$1,005,113	\$1,033,256	\$1,062,188	\$1,091,929	\$1,122,503	\$1,153,933	\$1,186,243	\$1,219,458	\$1,253,603	\$1,288,703	\$1,324,787
Fixed Costs	\$275,000	\$282,700	\$290,616	\$298,753	\$307,118	\$315,717	\$324,557	\$333,645	\$342,987	\$352,591	\$362,463	\$372,612	\$383,045	\$393,771	\$404,796
Sub-Total	\$5,725,000	\$5,885,300	\$6,050,088	\$6,219,491	\$6,393,637	\$6,572,658	\$6,756,693	\$6,945,880	\$7,140,365	\$7,340,295	\$7,545,823	\$7,757,106	\$7,974,305	\$8,197,586	\$8,427,118
<b>Total</b>	<b>\$6,000,000</b>	<b>\$6,168,000</b>	<b>\$6,340,704</b>	<b>\$6,518,244</b>	<b>\$6,700,755</b>	<b>\$6,888,376</b>	<b>\$7,081,250</b>	<b>\$7,279,525</b>	<b>\$7,483,352</b>	<b>\$7,692,886</b>	<b>\$7,908,287</b>	<b>\$8,129,719</b>	<b>\$8,357,351</b>	<b>\$8,591,357</b>	<b>\$8,831,914</b>

Annual Budget - by Category

Category	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Incentives	\$2,103,394	\$2,153,117	\$2,194,026	\$2,231,991	\$2,263,562	\$2,292,493	\$2,314,570	\$2,333,995	\$2,342,522	\$2,357,318	\$2,236,919	\$2,257,136	\$2,263,543	\$2,131,262	\$2,152,655
Admin	\$1,076,115	\$1,110,183	\$1,133,663	\$1,155,804	\$1,176,203	\$1,197,453	\$1,217,890	\$1,238,905	\$1,266,069	\$1,284,491	\$1,333,726	\$1,383,323	\$1,418,616	\$1,525,409	\$1,566,116
Net Lost Revenues	\$2,545,491	\$2,622,000	\$2,722,399	\$2,831,696	\$2,953,872	\$3,082,712	\$3,224,233	\$3,372,980	\$3,531,774	\$3,698,486	\$3,975,178	\$4,116,647	\$4,292,147	\$4,540,915	\$4,708,347
Fixed Costs	\$275,000	\$282,700	\$290,616	\$298,753	\$307,118	\$315,717	\$324,557	\$333,645	\$342,987	\$352,591	\$362,463	\$372,612	\$383,045	\$393,771	\$404,796
<b>Total</b>	<b>\$6,000,000</b>	<b>\$6,168,000</b>	<b>\$6,340,704</b>	<b>\$6,518,244</b>	<b>\$6,700,755</b>	<b>\$6,888,376</b>	<b>\$7,081,250</b>	<b>\$7,279,525</b>	<b>\$7,483,352</b>	<b>\$7,692,886</b>	<b>\$7,908,287</b>	<b>\$8,129,719</b>	<b>\$8,357,351</b>	<b>\$8,591,357</b>	<b>\$8,831,914</b>

Incremental Annual Savings - Base Case (\$15 million budget scenario)

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Energy (MWh)	25,049	25,069	25,490	25,924	26,486	27,062	27,725	28,425	28,648	29,884	31,812	32,643	33,660	39,685	40,546
Demand (MW)	3.6	3.5	3.6	3.7	3.8	3.9	3.9	4.0	4.1	4.2	4.5	4.6	4.4	4.0	4.1

Cumulative Annual Savings - Base Case (\$15 million budget scenario)

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Energy (MWh)	25,049	44,650	64,750	85,211	106,158	127,575	149,199	171,398	192,684	215,013	238,898	261,702	284,007	311,996	340,633
Demand (MW)	3.6	6.5	9.4	12.4	15.5	18.8	22.0	25.3	28.5	31.8	35.3	38.8	42.1	44.9	47.7

Annual Budget - by Program

Program	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Residential Energy Audit	\$425,000	\$436,900	\$449,133	\$461,709	\$474,637	\$487,927	\$501,589	\$515,633	\$530,071	\$544,913	\$560,170	\$575,855	\$591,979	\$608,554	\$625,594
Button-Up Weatherization	\$3,750,000	\$3,855,000	\$3,962,940	\$4,073,902	\$4,187,972	\$4,305,235	\$4,425,781	\$4,549,703	\$4,677,095	\$4,808,054	\$4,942,679	\$5,081,074	\$5,223,344	\$5,369,598	\$5,519,947
CARES Program	\$3,500,000	\$3,598,000	\$3,698,744	\$3,802,309	\$3,908,773	\$4,018,219	\$4,130,729	\$4,246,390	\$4,365,289	\$4,487,517	\$4,613,167	\$4,742,336	\$4,875,121	\$5,011,625	\$5,151,950
Heat Pump Retrofit	\$1,550,000	\$1,593,400	\$1,638,015	\$1,683,880	\$1,731,028	\$1,779,497	\$1,829,323	\$1,880,544	\$1,933,199	\$1,987,329	\$2,042,974	\$2,100,177	\$2,158,982	\$2,219,434	\$2,281,578
Residential Lighting	\$100,000	\$102,800	\$105,678	\$108,637	\$111,679	\$114,806	\$118,021	\$121,325	\$124,723	\$128,215	\$131,805	\$135,495	\$139,289	\$143,189	\$147,199
TSE New Home	\$2,700,000	\$2,775,600	\$2,853,317	\$2,933,210	\$3,015,340	\$3,099,769	\$3,186,563	\$3,275,786	\$3,367,508	\$3,461,799	\$3,558,729	\$3,658,373	\$3,760,808	\$3,866,110	\$3,974,362
ES Manufactured Home	\$750,000	\$771,000	\$792,588	\$814,780	\$837,594	\$861,047	\$885,156	\$909,941	\$935,419	\$961,611	\$988,536	\$1,016,215	\$1,044,669	\$1,073,920	\$1,103,989
ENERGY STAR Appliance Rebate	\$500,000	\$514,000	\$528,392	\$543,187	\$558,396	\$574,031	\$590,104	\$606,627	\$623,613	\$641,074	\$659,024	\$677,477	\$696,446	\$715,946	\$735,993
Commercial Lighting	\$1,200,000	\$1,233,600	\$1,268,141	\$1,303,649	\$1,340,151	\$1,377,675	\$1,416,250	\$1,455,905	\$1,496,670	\$1,538,577	\$1,581,657	\$1,625,944	\$1,671,470	\$1,718,271	\$1,766,383
Fixed Costs	\$525,000	\$539,700	\$554,812	\$570,346	\$586,316	\$602,733	\$619,609	\$636,958	\$654,793	\$673,128	\$691,975	\$711,350	\$731,268	\$751,744	\$772,793
Sub-Total	\$14,475,000	\$14,880,300	\$15,296,948	\$15,725,263	\$16,165,570	\$16,618,206	\$17,083,516	\$17,561,855	\$18,053,586	\$18,559,087	\$19,078,741	\$19,612,946	\$20,162,109	\$20,726,648	\$21,306,994
<b>Total</b>	<b>\$15,000,000</b>	<b>\$15,420,000</b>	<b>\$15,851,760</b>	<b>\$16,295,609</b>	<b>\$16,751,886</b>	<b>\$17,220,939</b>	<b>\$17,703,125</b>	<b>\$18,198,813</b>	<b>\$18,708,380</b>	<b>\$19,232,214</b>	<b>\$19,770,716</b>	<b>\$20,324,296</b>	<b>\$20,893,377</b>	<b>\$21,478,391</b>	<b>\$22,079,786</b>

Annual Budget - by Category

Category	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Incentives	\$7,577,048	\$7,797,206	\$7,977,418	\$8,154,235	\$8,321,836	\$8,483,513	\$8,634,121	\$8,772,260	\$8,917,815	\$9,046,225	\$8,188,957	\$8,262,230	\$8,196,458	\$7,317,059	\$7,359,600
Admin	\$1,822,088	\$1,876,905	\$1,913,699	\$1,947,881	\$1,984,382	\$2,024,464	\$2,065,400	\$2,110,495	\$2,164,312	\$2,215,981	\$2,396,024	\$2,496,325	\$2,608,522	\$3,120,457	\$3,217,809
Net Lost Revenues	\$5,075,864	\$5,206,189	\$5,405,832	\$5,623,147	\$5,859,353	\$6,110,230	\$6,383,995	\$6,679,100	\$6,971,460	\$7,296,880	\$8,493,761	\$8,854,391	\$9,357,128	\$10,289,131	\$10,729,585
Fixed Costs	\$525,000	\$539,700	\$554,812	\$570,346	\$586,316	\$602,733	\$619,609	\$636,958	\$654,793	\$673,128	\$691,975	\$711,350	\$731,268	\$751,744	\$772,793
<b>Total</b>	<b>\$15,000,000</b>	<b>\$15,420,000</b>	<b>\$15,851,760</b>	<b>\$16,295,609</b>	<b>\$16,751,886</b>	<b>\$17,220,939</b>	<b>\$17,703,125</b>	<b>\$18,198,813</b>	<b>\$18,708,380</b>	<b>\$19,232,214</b>	<b>\$19,770,716</b>	<b>\$20,324,296</b>	<b>\$20,893,377</b>	<b>\$21,478,391</b>	<b>\$22,079,786</b>

# 2021 POTENTIAL STUDY

*November*

# 2021

**FINAL REPORT**

Exhibit DSM-2

Annual Reports  
for DSM

# DSM

Demand Side Management  
2018 Annual Report





# Table of Contents

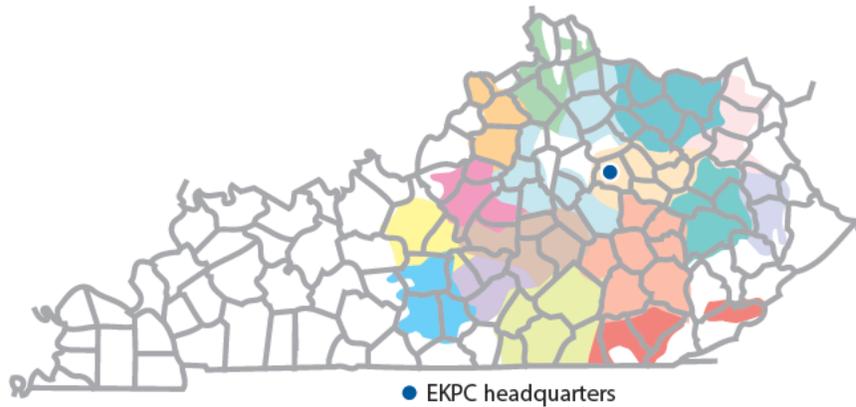
Who We Are	2	Direct Load Control (DLC)	7
Residential Lighting	3	Appliance Recycling	7
HVAC Duct Sealing	3	ENERGY STAR Appliance Rebates	8
Button-Up Weatherization	4	ENERGY STAR Manufactured Home	8
Touchstone Energy Home	5	Commercial Programs	9
CARES	6	Impact Measures	10
Heat Pump Retrofit	6	Basic Program Assumptions	14



# Who We Are

Located in the heart of the Bluegrass state, East Kentucky Power Cooperative is a not-for-profit generation and transmission (G&T) electric utility with headquarters in Winchester, Ky. Our cooperative has a vital mission: to safely generate and deliver affordable, reliable electric power to 16 owner-member cooperatives serving more than one million Kentuckians.

Together, with our 16 owner-members, we're known as Kentucky's Touchstone Energy Cooperatives. The member co-ops distribute energy to over 530,000 Kentucky homes, farms, businesses and industries across 87 counties. We're leaders in energy efficiency and environmental stewardship. And we're committed to providing power to improve the lives of people in Kentucky.



## Sixteen distribution cooperatives, which are called the member systems, own EKPC. The 16 co-ops include:

- Big Sandy RECC
- Blue Grass Energy Cooperative
- Clark Energy Cooperative
- Cumberland Valley Electric
- Farmers RECC
- Fleming-Mason Energy Cooperative
- Grayson RECC
- Inter-County Energy
- Jackson Energy Cooperative
- Licking Valley RECC
- Nolin RECC
- Owen Electric Cooperative
- Salt River Electric Cooperative
- Shelby Energy Cooperative
- South Kentucky RECC
- Taylor County RECC

### East Kentucky Power Generation

<b>Coal</b>	<b>Generation</b>	<b>Natural Gas</b>	<b>Generation</b>	<b>Landfill</b>	<b>Generation</b>
Spurlock	1,346 new MW	Smith	Summer	Bavarian	4.6 net MW
Cooper	341 net	Combustion	753 net MW	Laurel Ridge	3.0 net MW
MW		Turbine	Winter	Green Valley	2.3 net MW
<b>Total</b>	<b>1,687 net MW</b>	Units	989 net MW	Pearl Hollow	2.3 net MW
		Bluegrass**	Summer	Pendleton	3.0 net MW
<b>Hydro</b>	<b>Generation</b>	Combustion	501 net MW	Glasgow***	0.9 net MW
Southeastern	170 MW	Turbine	Winter	<b>Total Landfill</b>	<b>16.1 net MW</b>
Power Adm.		Units	567 net MW	<b>Solar Generation</b>	
(SEPA)		<b>Total Natural Gas Summer</b>	<b>1,254 net MW</b>	Cooperative Solar	8.5 net MW
		<b>Total Natural Gas Winter</b>	<b>1,556 net MW</b>		

\*\* Under an existing agreement, which continues until April 2019, a third party receives the output of one Bluegrass Generating Station unit.

\*\*\* Under an existing agreement, a third party receives the output of Glasgow in a 10-year power purchase agreement.

## Residential Lighting:

Since 2003, EKPC and its owner-member cooperatives have provided more than one million compact fluorescent lights (CFL) and light-emitting diodes (LED) bulbs to members.

In 2018, cooperatives provided more than 54,676 LEDs to its members. Each member who participated in a free, online energy audit called **BillingInsights™** received an LED, along with Annual Meeting attendees. These LEDs are expected to result in a lifetime savings of 10,498 MWh and 20,995,584 pounds of carbon dioxide emissions.



## HVAC Duct Sealing:

Since the 1990s, EKPC and its owner-member cooperatives have offered this program to reduce the energy loss through a home's HVAC duct system. This program provides incentives to members who seal ductwork through traditional mastic sealers. Duct loss measurement requires the use of a blower door test (before and after the duct sealing work is performed). Duct leakage per system must be reduced to below 10 percent of the fan's rated capacity. All joints in the duct system must be sealed with foil tape and mastic. This program was targeted to single-family homes using electric furnaces or electric heat pumps. All participating homes must have duct systems that are at least two years old to qualify for the incentive. The program was offered only to homes that had centrally-ducted heating systems in unconditioned areas.

In 2018, 37 HVAC Duct Sealing rebates were provided to members, resulting in a lifetime savings of 498 MWh and 996,480 pounds of carbon dioxide emissions.



# Button-Up Weatherization:

Since the early 1990s, EKPC and its owner-member cooperatives have offered this program to improve a home's energy efficiency, comfort, and reduce energy use. This program offers incentives to members who add insulation materials or use other weatherization techniques to reduce heat loss in the home. Any member who resides in a site-built or manufactured home that is at least two years old and uses electricity as their primary source of heat is eligible.

This program offers a whole-house approach with multiple levels.

## Button-Up Weatherization with Air Sealing:

*This version of the Button-Up encourages members to air seal the envelope of their home in addition to the regular Button-Up improvements. A blower door test is required to demonstrate the impact in kW demand reduction, and an added incentive is paid based on that reduction.*

## Advanced Weatherization Level 2:

*Level 2 encourages homeowners to address all of their home's inefficiencies at one time. The resulting BTU<sub>h</sub> savings can be as much as 150 percent of Button-Up Level I. Achieving this level of savings results in a greater incentive.*

## Advanced Weatherization Level 3:

*This version represents the highest level. Level 3 also encourages homeowners to address all of their home's inefficiencies at one time. The resulting BTU<sub>h</sub> savings can be as much as 200 percent of Button-Up Level I. Achieving this level of savings results in an even greater incentive.*



Levels 2 and 3 of this program are targeted to members who currently heat their home with electricity, particularly homes with unfinished basements, homes that have partition walls separating a crawl space or garage, and Cape Cod style homes (1.5 stories).

In 2018, 557 Button-Up rebates were provided to members, resulting in a lifetime savings of 12,300 MWh and 24,599,167 pounds of carbon dioxide emissions.

# Touchstone Energy Home:

Since 2003, EKPC and its owner-member cooperatives have offered this program to increase energy efficiency in new-home construction. This program is designed to encourage new homes to be built to higher standards for thermal integrity and equipment efficiency, as well as to choose a geothermal or an air-source heat pump, rather than less efficient forms of heating and cooling. Homes built to Touchstone Energy Home standards typically use 30 percent less energy than the same home built to typical construction standards. Plans are submitted before the home is built, a pre-drywall inspection is made, and a blower door test is administered after the home is built to verify that the home meets the standard.

This program is targeted towards the residential new construction market and members who are constructing new site-built homes.

**In 2018, 472 Touchstone Energy Home rebates were provided to members, resulting in a lifetime savings of 24,193 MWh and 48,386,640 pounds of carbon dioxide emissions.**

EKPC's owner-members have also used this program to partner with Kentucky's affordable housing builders. Relationships with these organizations have led to improved efficiency in affordable housing and lower monthly energy costs for recipients of these homes.



## CARES:

The Community Assistance Resources for Energy Savings (CARES) program began in early 2015, and provides an incentive to enhance the weatherization and energy efficiency services provided to the end-use members by the Kentucky Community Action Agencies (CAA) network. EKPC and its owner-members provide an incentive to the CAA implementing the project on behalf of the end-use member.

This program is available to end-use members who qualify for weatherization and energy-efficiency services through their local CAA in all service territories of participating cooperatives. The maximum incentive possible per household is \$2,000.

**In 2018, 66 CARES incentives were provided, resulting in a lifetime savings of 4,684 MWh and 9,367,380 pounds of carbon dioxide emissions.**



## Heat Pump Retrofit:

For decades, EKPC and its owner-member cooperatives have offered this program to lower the cost of heating homes and increase comfort. This program provides incentives for members to replace their existing resistance heat source with a high-efficiency heat pump through three levels of rebates.

Level 1 offers a rebate for a 13 SEER/7.5 HSPF heat pump. Level 2 offers a rebate for a 14 SEER/8.0 HSPF heat pump. Level 3 offers a rebate for a 15 SEER/8.5 HSPF or higher heat pump. The existing heating system must be two years or older to qualify for incentives unless the heat pump is being installed in a new manufactured home. New manufactured homeowners who install a heat pump qualify based on the levels above.

The program is targeted to members who currently use a resistance heat source. Incentives are offered when the homeowner's primary source of heat is an electric resistance furnace, ceiling cable heat, or baseboard heat in both site-built and manufactured homes.

**In 2018, 524 Heat Pump Retrofit rebates were provided to members, resulting in a lifetime savings of 81,658 MWh and 163,316,440 pounds of carbon dioxide emissions.**



## Direct Load Control:

Since 2008, EKPC and its owner-member cooperatives have offered this program to manage peak usage. This program offers incentives to members who enroll central air-conditioners and electric water heaters. Switches are installed and, during periods of high demand, the utility briefly cycles the appliance off in order to reduce system peaks and save on costs for peak power. Although EKPC's system typically peaks in winter, member's heating appliances are not interrupted to lower peak. Member comfort and safety are top priority.

This program is targeted to any member with central air-conditioning, heat pump or electric tank water heaters, 40 gallons or greater.

**In 2018, 205 switches were installed, resulting in a reduction of 0.164 MW during the summer months and 0.034 MW in the winter.**



## Appliance Recycling:

The Appliance Recycling program began in 2014 in an effort to encourage members to recycle old, inefficient refrigerators and freezers. Members receive a \$50 incentive for recycling refrigerators and/or freezers that meet qualifying conditions. The appliances must be in working condition, plugged in and running at scheduled pick-up, between 7.75 and 30 cubic feet, and empty and defrosted with water lines disconnected.

EKPC and its owner-member cooperatives partner with Appliance Recycling Centers of America, Inc. (ARCA) for proper recycling procedures that meet all federal and state requirements.

This program was available to all end-use members who qualify.

**In 2018, 1,057 incentives were provided to members, resulting in a lifetime savings of 5,432 MWh and 10,864,560 pounds of carbon dioxide emissions.**



# ENERGY STAR Appliance Rebate:

The ENERGY STAR Appliance Rebate program began in 2014 in an effort to encourage members to purchase new, energy-efficient appliances. EKPC and its owner-member cooperatives provide the incentives to members who purchase and install the ENERGY STAR certified appliances listed in the table.

This program was available to all end-use members who qualify.

**In 2018, 10,717 rebates were provided to members, resulting in a lifetime savings of 37,396 MWh and 74,791,976 pounds of carbon dioxide emissions.**

ENERGY STAR Appliances	Rebate
Refrigerator	\$100
Freezer	\$50
Dishwasher	\$50
Clothes Washer	\$75
Heat Pump Water Heater	\$300
Heat Pump	\$300
Central Air Conditioning	\$300

# ENERGY STAR Manufactured Home:

The ENERGY STAR Manufactured Home program began in 2014. An upstream program, EKPC works directly with the manufacturer to automatically upgrade the home to ENERGY STAR certified standards. EKPC utilizes a third-party administrator, Systems Building Research Alliance (SBRA), to verify information and ensure quality control.

Once the installation address is verified to be on a participating cooperative's service lines, the member will automatically receive the upgrade. An ENERGY STAR certified manufactured home is a home that has been designed, produced and installed by the home manufacturer to meet ENERGY STAR requirements for energy efficiency. These manufactured homes feature efficient heating and cooling equipment, water heaters, properly installed insulation, high-performance windows, tight construction and sealed ducts.

This program is available to all end-use members who qualify.

**In 2018, 30 rebates were provided to members, resulting in a lifetime savings of 5,376 MWh and 10,752,300 pounds of carbon dioxide emissions.**



# Commercial Programs:

## Commercial & Industrial Advanced Lighting

For several years, EKPC and its owner-member cooperatives have offered this program to improve lighting in commercial or industrial facilities. This program offers incentives to install high-efficiency lamps and ballasts, including, but not limited to, LED exit signs, T-5 fluorescent fixtures and advanced controls.

This program was targeted to any existing commercial or industrial facility in the service territory of a distribution cooperative. The facility and its lighting must have been in service for at least two years.

**In 2018, 183 C&I Advanced Lighting rebates were provided to members, resulting in a lifetime savings of 175,269 MWh and 350,538,554 pounds of carbon dioxide emissions.**



## Industrial Compressed-Air

For several years, EKPC and its owner-member cooperatives have offered this program to refund the cost of a leak-detection audit. This program is designed to reduce electricity consumption through detecting and repairing compressed-air leaks. Compressed-air production and distribution represents one of the primary electricity costs in many industrial plants. Both the supply side (compressors and conditioning equipment) and the demand side (distribution and end use) can be targeted to significantly improve energy efficiency.

This program was targeted to any existing commercial or industrial facility that uses electricity compressed air applications.



# Impact Measures:

System summary of 2018 DSM program savings

## DSM program totals for installed measures in 2018

All programs	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2018 program costs	Lifetime energy savings (MWh)	Cost of demand saved (\$/kW)	Cost of energy saved (\$/kWh)	Lifetime CO2 savings (lbs)
All DSM Programs	68,853	29,391	4.419	4.261	\$7,267,557	358,162	\$1,391	0.020	716,324,401

## Appliance Recycling

Residential program	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2018 program costs	Measure life (years)	Lifetime energy savings (MWh)	Cost of energy saved (\$/kWh)	Lifetime CO2 savings (lbs)
Appliance Recycling	1,057	776	0.112	0.078	\$258,320	7	5,432	\$0.05	10,864,560

## Button-Up Weatherization

Residential program	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2018 program costs	Measure life (years)	Lifetime energy savings (MWh)	Cost of energy saved (\$/kWh)	Lifetime CO2 savings (lbs)
Button-Up level 1	556	812	0.191	0.628	\$355,863	15	12,185	\$0.03	24,369,204
Button-Up level 2	0	0	0	0	0	0	0	0	0
Button-Up level 3	1	8	0.002	0.006	\$2,625	15	115	\$0.02	229,963

## CARES

Residential program	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2018 program costs	Measure life (years)	Lifetime energy savings (MWh)	Cost of energy saved (\$/kWh)	Lifetime CO2 savings (lbs)
CARES	66	312	0.048	0.095	\$157,095	15	4,684	\$0.03	9,367,380

\* Includes \$941,590 program administration and promotional expenses.

## Commercial and Industrial

C&I programs	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2018 program costs	Measure life (years)	Lifetime energy savings (MWh)	Cost of energy saved (\$/kWh)	Lifetime CO2 savings (lbs)
Commercial Lighting	183	17,527	2.493	1.668	\$1,293,209	10	175,269	\$0.007	350,538,554
Compressed Air	0	0	0	0	-	-	0	0	0

## Direct Load Control

Residential program	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2018 program costs	Cost of Demand saved (\$/KW)
DLC Air Conditioner	140	0.7	0.14	0	\$155,795.41	\$1,112.82
DLC Water Heater	65	0.65	0.024	0.034	\$72,333.59	\$3,007.63
DLC total	205	1.35	0.164	0.034	\$228,129.00	\$1,390.61

## Energy Audits

Residential program	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2018 program costs	Measure life (years)	Lifetime energy savings (MWh)	Cost of energy saved (\$/kWh)	Lifetime CO2 savings (lbs)
In-home	2	1	0.000	0.000	\$809	8	10	\$0.08	20,800
Online	327	169	0.000	0.000	\$132,191	5	847	\$0.16	1,694,520

## ENERGY STAR® Appliance Rebate

Residential program	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2018 program costs	Measure life (years)	Lifetime energy savings (MWh)	Cost of energy saved (\$/kWh)	Lifetime CO2 savings (lbs)
ES Heat Pump	1,665	1,233	0.460	0.000	\$955,780	15	18,488	\$0.05	36,975,960
ES Central Air Conditioner	388	167	0.164	0.000	\$125,660	15	2,507	\$0.05	5,014,920
ES Clothier Washer	2,428	664	0.057	0.133	\$226,645	12	7,967	\$0.03	15,934,800
ES Dishwasher	2,598	195	0.025	0.025	\$154,195	10	1,948	\$0.08	3,896,280
ES Freezer	396	20	0.003	0.002	\$19,570	12	243	\$0.08	485,616
ES Heat Pump Water Heater	245	240	0.022	0.056	\$58,610	13	3,117	\$0.02	6,234,800
ES Refrigerator	2,997	260	0.013	0.026	\$407,490	12	3,125	\$0.13	6,249,600
ES Total	10,717	2,779	0.744	0.241	\$1,947,950	—	37,396	\$0.052	74,791,976

## ENERGY STAR® Manufactured Home

Residential program	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2018 program costs	Measure life (years)	Lifetime energy savings (MWh)	Cost of energy saved (\$/kWh)	Lifetime CO2 savings (lbs)
ES Manufactured Home	30	358	0.015	0.086	\$129,000	15	5,376	\$0.02	10,752,300

## Heat Pump Retrofit

Residential program	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2018 program costs	Measure life (years)	Lifetime energy savings (MWh)	Cost of energy saved (\$/kWh)	Lifetime CO2 savings (lbs)
Heat Pump	524	4,083	0.196	0.000	\$1,090,954	20	81,658	\$0.01	163,316,440

## HVAC Duct Seal

Residential program	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2018 program costs	Measure life (years)	Lifetime energy savings (MWh)	Cost of energy saved (\$/kWh)	Lifetime CO2 savings (lbs)
HVAC Duct Sealing	37	42	0.012	0.039	\$20,000	12	498	\$0.040	996,480

## Residential Lighting

Residential program	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2018 program costs	Measure life (years)	Lifetime energy savings (MWh)	Cost of energy saved (\$/kWh)	Lifetime CO2 savings (lbs)
LEDs	54,676	1,312	0.131	0.219	\$50,943	8	10,498	\$0.000	20,995,584

## Touchstone Energy Home

Residential program	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2018 program costs	Measure life (years)	Lifetime energy savings (MWh)	Cost of energy saved (\$/kWh)	Lifetime CO2 savings (lbs)
TSE Home Prescriptive	153	393	0.101	0.379	\$214,200	20	7,858	\$0.030	15,716,160
TSE Home Performance	319	817	0.210	0.789	\$444,680	20	16,335	\$0.030	32,670,480

## 2018 Basic Program Assumptions <sup>1</sup>

### Measure: Button-Up Level 1

Annual kWh Saved:	2,205
Winter Demand Savings:	1.71
Summer Demand Savings:	0.52
Lifetime of Savings:	15 years
Installation Rate:	100%
TRC: <sup>2</sup>	1.45

### Measure: Button-Up Level 2

Annual kWh Saved:	4,567
Winter Demand Savings:	3.53
Summer Demand Savings:	1.07
Lifetime of Savings:	15 years
<i>(Weighted mix of measures)</i>	
Installation Rate:	100%
TRC:	1.52

### Measure: Button-Up Level 3

Annual kWh Saved:	6,090
Winter Demand Savings:	4.71
Summer Demand Savings:	1.43
Lifetime of Savings:	15 years
<i>(Weighted mix of measures)</i>	
Installation Rate:	100%
TRC:	1.56

### Measure: Button-Up w/Air Seal

Annual kWh Saved:	3,045
Winter Demand Savings:	2.35
Summer Demand Savings:	0.720
Lifetime of Savings:	15 years
Installation Rate:	100%
TRC:	1.44

### Measure: HVAC Maintenance Program

For a typical heat pump in typical residence to same home reduced by 12% savings

Annual kWh Saved:	1,354
Winter Demand Savings:	1.07
Summer Demand Savings:	0.40
Lifetime of Savings:	12 years
Installation Rate:	100%
TRC:	1.15

### Measure: Heat Pump SEER 13

From Electric Furnace and Central Air to ENERGY STAR SEER 13, HSPF 7.5

Annual kWh Saved:	7,174
Winter Demand Savings:	0
Summer Demand Savings:	0.15
Lifetime of Savings:	20 years
Installation Rate:	100%
TRC:	1.52

### Measure: Heat Pump SEER 14

From Electric Furnace and Central Air to ENERGY STAR SEER 14, HSPF 8.0

Annual kWh Saved:	7,533
Winter Demand Savings:	0
Summer Demand Savings:	0.32
Lifetime of Savings:	20 years
Installation Rate:	100%
TRC:	1.32

### Measure: Heat Pump SEER 15

From Electric Furnace and Central Air to ENERGY STAR SEER 15, HSPF 8.5

Annual kWh Saved:	7,978
Winter Demand Savings:	0
Summer Demand Savings:	0.45
Lifetime of Savings:	20 years
Installation Rate:	100%
TRC:	1.08

### Measure: Touchstone Energy Home

Prescriptive and Performance Level #2 – Encourages new homes to be built to a standard of at least SEER 14.5, HSPF 8.2; HERS Rating of 79 and below

Annual kWh Saved:	2,568
Winter Demand Savings:	2.48
Summer Demand Savings:	0.66
Lifetime of Savings:	20 years
Installation Rate:	100%
TRC:	1.98

### Measure: Touchstone Energy Home

Performance Level #1 – Encourages new homes to be built to a standard of at least SEER 14.5, HSPF 8.2; HERS rating of 80-85

Annual kWh Saved:	1,758
Winter Demand Savings:	1.7
Summer Demand Savings:	0.45
Lifetime of Savings:	20 years
Installation Rate:	100%
TRC:	2.06

### Measure: LEDs

Annual kWh Saved:	24
Winter Demand Savings:	0.0040
Summer Demand Savings:	0.0024
Lifetime of Savings:	8 years
Installation Rate:	80%
TRC:	2.13

### Measure: Commercial Advanced Lighting

Unit is 1 kW connected load savings

Annual kWh Saved:	4,252
Winter Demand Savings:	0.45
Summer Demand Savings:	0.85
Lifetime of Savings:	10 years
Installation Rate:	100%
TRC:	2.22

### Measure: Industrial Compressed Air

Annual kWh Saved:	3,800
Winter Demand Savings:	0.30
Summer Demand Savings:	0.75
Lifetime of Savings:	7 years
Installation Rate:	0
TRC:	1.62

### Measure: Water Heater >40 gals

Annual kWh Saved:	10
Winter Demand Savings:	0.52
Summer Demand Savings:	0.37
Lifetime of Savings:	20 years
Installation Rate:	100%

### Measure: Central Air Conditioning

Annual kWh Saved:	5
Winter Demand Savings:	0.0
Summer Demand Savings:	1.0
Lifetime of Savings:	20 years
Installation Rate:	100%
TRC for Load Control Program	2.68

**Measure: ENERGY STAR® Appliances**

TRC: 1.49 in aggregate

**Measure: ENERGY STAR® Heat Pump**

Annual kWh Saved: 804  
Winter Demand Savings: 0.00  
Summer Demand Savings: 0.30  
Lifetime of Savings: 20 years  
Installation Rate: 100%

**Measure: ENERGY STAR® Central Air**

Annual kWh Saved: 529  
Winter Demand Savings: 0.00  
Summer Demand Savings: 0.52  
Lifetime of Savings: 15 years  
Installation Rate: 100%

**Measure: ENERGY STAR® Clothes Washer**

Annual kWh Saved: 350  
Winter Demand Savings: 0.07  
Summer Demand Savings: 0.03  
Lifetime of Savings: 12 years  
Installation Rate: 100%

**Measure: ENERGY STAR® Dish Washer**

Annual kWh Saved: 79  
Winter Demand Savings: 0.01  
Summer Demand Savings: 0.01  
Lifetime of Savings: 10 years  
Installation Rate: 100%

**Measure: ENERGY STAR® Freezer**

Annual kWh Saved: 67  
Winter Demand Savings: 0.01  
Summer Demand Savings: 0.01  
Lifetime of Savings: 12 years  
Installation Rate: 100%

**Measure: ENERGY STAR® Refrigerator**

Annual kWh Saved: 100  
Winter Demand Savings: 0.01  
Summer Demand Savings: 0.01  
Lifetime of Savings: 12 years  
Installation Rate: 100%

**Measure: ENERGY STAR® Heat Pump Water Heater**

Annual kWh Saved: 2,200  
Winter Demand Savings: 0.51  
Summer Demand Savings: 0.20  
Lifetime of Savings: 13 years  
Installation Rate: 100%

**Measure: Appliance Recycling**

Annual kWh Saved: 696  
Winter Demand Savings: 0.07  
Summer Demand Savings: 0.10  
Lifetime of Savings: 7 years  
Installation Rate: 100%  
TRC: 2.01

**Measure: CARES**

Annual kWh Saved: 4,731  
Winter Demand Savings: 1.44  
Summer Demand Savings: 0.72  
Lifetime of Savings: 15 years  
Installation Rate: 100%  
TRC: 1.34

**Measure: ENERGY STAR® Manufactured Home**

Annual kWh Saved: 11,947  
Winter Demand Savings: 2.88  
Summer Demand Savings: 0.51  
Lifetime of Savings: 15 years  
Installation Rate: 100%  
TRC: 4.09

<sup>1</sup> Savings numbers are "ex ante" or as planned gross savings except where noted.  
<sup>2</sup> Total Resource Cost (TRC) is an overall program benefits/costs analysts ratio.





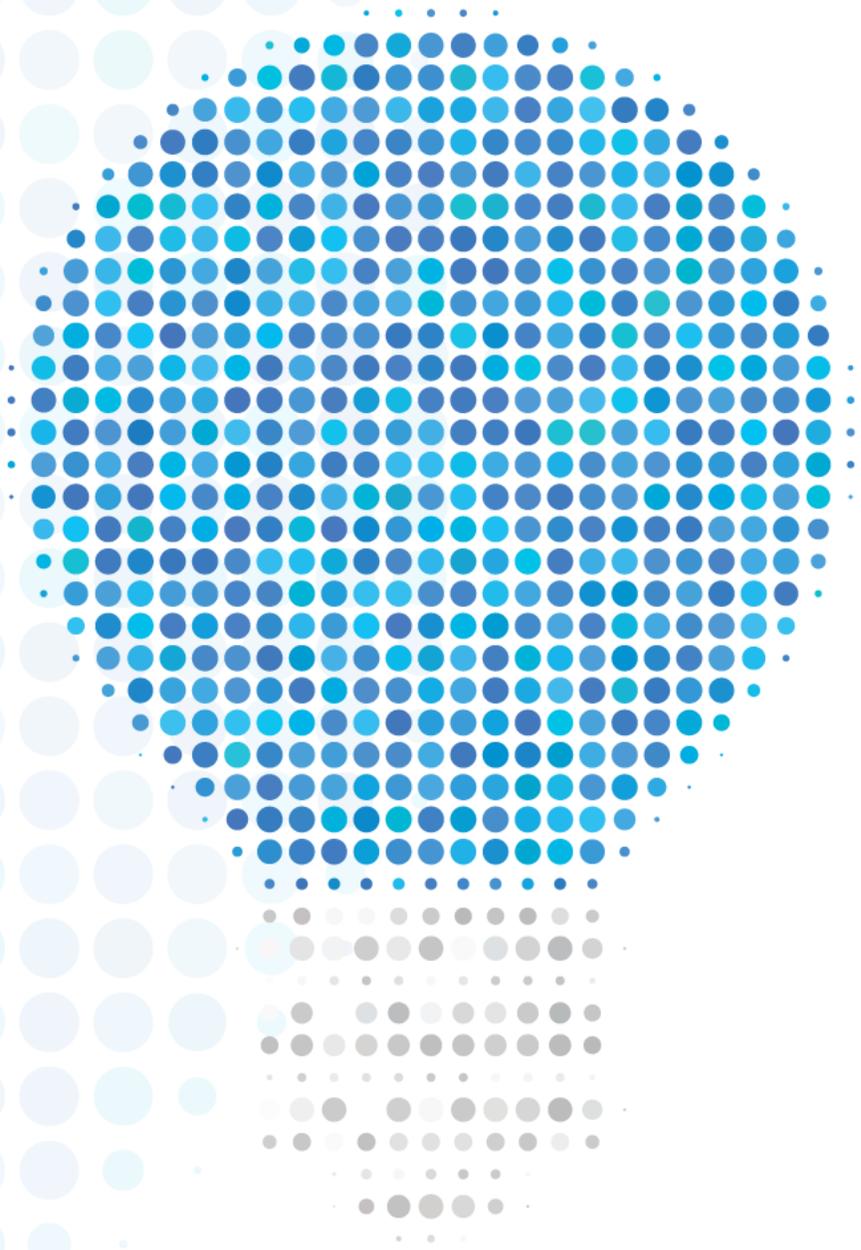
**EAST KENTUCKY POWER COOPERATIVE**

A Touchstone Energy Cooperative 

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# DSM

Demand Side Management  
2019 Annual Report





# Table of Contents

Who We Are	2
Residential Lighting	3
HVAC Duct Sealing	3
Button-Up Weatherization	4
Touchstone Energy Home	5
CARES	6
Heat Pump Retrofit	6
Direct Load Control (DLC)	7
Appliance Recycling	7
ENERGY STAR Manufactured Home	8
ENERGY STAR Appliance Rebate	8
Commercial Program	9
Impact Measures	10
Basic Program Assumptions	14

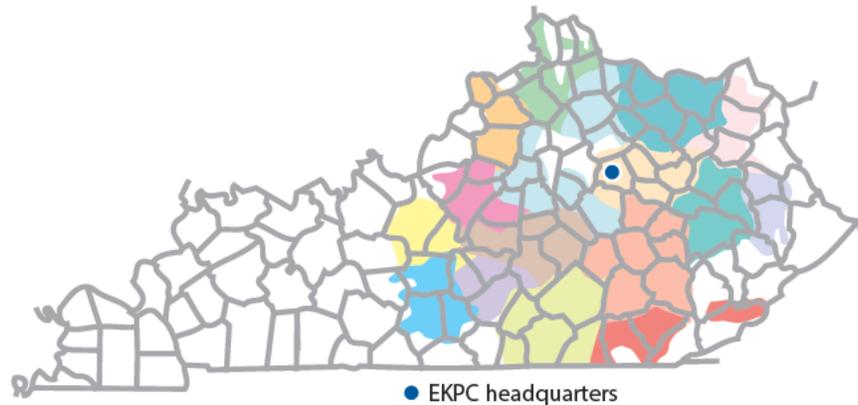
In 2019, the Kentucky Public Service Commission approved requests to sunset several Demand Side Management programs. Throughout the years, programs have been added, changed and discontinued to meet ever-evolving needs. When a program is no longer cost-effective for the membership, it becomes necessary to eliminate it. Our responsibility has always been to provide members with affordable energy, and we will continue to do so.

Discontinued programs include: HVAC Duct Sealing, ENERGY STAR Appliance Rebates, Appliance Recycling, commercial and industrial advanced lighting and industrial compressed air.

# Who We Are

Located in the heart of the Bluegrass state, East Kentucky Power Cooperative is a not-for-profit generation and transmission (G&T) electric utility with headquarters in Winchester, Ky. Our cooperative has a vital mission: to safely generate and deliver affordable, reliable electric power to 16 owner-member cooperatives serving more than one million Kentuckians.

Together, with our 16 owner-members, we're known as Kentucky's Touchstone Energy Cooperatives. The member co-ops distribute energy to over 530,000 Kentucky homes, farms, businesses and industries across 87 counties. We're leaders in energy efficiency and environmental stewardship. And we're committed to providing power to improve the lives of people in Kentucky.



## Sixteen distribution cooperatives, which are called the member systems, own EKPC. The 16 co-ops include:

- Big Sandy RECC
- Blue Grass Energy Cooperative
- Clark Energy Cooperative
- Cumberland Valley Electric
- Farmers RECC
- Fleming-Mason Energy Cooperative
- Grayson RECC
- Inter-County Energy
- Jackson Energy Cooperative
- Licking Valley RECC
- Nolin RECC
- Owen Electric Cooperative
- Salt River Electric Cooperative
- Shelby Energy Cooperative
- South Kentucky RECC
- Taylor County RECC

### East Kentucky Power Generation

<b>Coal</b>	<b>Generation</b>	<b>Natural Gas</b>	<b>Generation</b>	<b>Landfill</b>	<b>Generation</b>
Spurlock Cooper	1,346 net MW	Smith Combustion Turbine Units	Summer 753 net MW	Bavarian	4.6 net MW
	341 net MW	Bluegrass** Combustion Turbine Units	Winter 989 net MW	Laurel Ridge	3.0 net MW
<b>Total</b>	<b>1,687 net MW</b>	<b>Total Natural Gas Summer</b>	<b>1,254 net MW</b>	Green Valley	2.3 net MW
		<b>Total Natural Gas Winter</b>	<b>1,556 net MW</b>	Pearl Hollow	2.3 net MW
<b>Hydro</b>	<b>Generation</b>			Pendleton	3.0 net MW
Southeastern Power Adm. (SEPA)	170 MW			Glasgow***	0.9 net MW
				<b>Total Landfill</b>	<b>16.1 net MW</b>
				<b>Solar Generation Cooperative Solar</b>	<b>8.5 net MW</b>

\*\* Under an existing agreement, which continues until April 2019, a third party receives the output of one Bluegrass Generating Station unit.

\*\*\* Under an existing agreement, a third party receives the output of Glasgow in a 10-year power purchase agreement.

## Residential Lighting:

Since 2003, EKPC and its owner-member cooperatives have provided more than one million compact fluorescent lights (CFL) and light-emitting diodes (LED) bulbs to members.

In 2019, cooperatives provided more than 53,540 LEDs to its members. Each member who participated in a free, online energy audit called **BillingInsights™** received an LED, along with Annual Meeting attendees. These LEDs are expected to result in a lifetime savings of 10,280 MWh and 20,559,360 pounds of carbon dioxide emissions.



## HVAC Duct Sealing:<sup>\*</sup>

Since the 1990s, EKPC and its owner-member cooperatives have offered this program to reduce the energy loss through a home's HVAC duct system. This program provides incentives to members who seal ductwork through traditional mastic sealers. Duct loss measurement requires the use of a blower door test (before and after the duct sealing work is performed). Duct leakage per system must be reduced to below 10 percent of the fan's rated capacity. All joints in the duct system must be sealed with foil tape and mastic. This program was targeted to single-family homes using electric furnaces or electric heat pumps. All participating homes must have duct systems that are at least two years old to qualify for the incentive. The program was offered only to homes that had centrally-ducted heating systems in unconditioned areas.

In 2019, 7 HVAC Duct Sealing rebates were provided to members, resulting in a lifetime savings of 100 MWh and 199,296 pounds of carbon dioxide emissions.

*\* This program was discontinued in 2019.*



# Button-Up Weatherization:\*

Since the early 1990s, EKPC and its owner-member cooperatives have offered this program to improve a home's energy efficiency, comfort, and reduce energy use. This program offers incentives to members who add insulation materials or use other weatherization techniques to reduce heat loss in the home. Any member who resides in a site-built or manufactured home that is at least two years old and uses electricity as their primary source of heat is eligible.

This program offers a whole-house approach with multiple levels.

## **Button-Up Weatherization with Air Sealing:**

*This version of the Button-Up encourages members to air seal the envelope of their home in addition to the regular Button-Up improvements. A blower door test is required to demonstrate the impact in kW demand reduction, and an added incentive is paid based on that reduction.*

## **Advanced Weatherization Level 2:**

*Level 2 encourages homeowners to address all of their home's inefficiencies at one time. The resulting BTUh savings can be as much as 150 percent of Button-Up Level I. Achieving this level of savings results in a greater incentive.*

## **Advanced Weatherization Level 3:**

*This version represents the highest level. Level 3 also encourages homeowners to address all of their home's inefficiencies at one time. The resulting BTUh savings can be as much as 200 percent of Button-Up Level I. Achieving this level of savings results in an even greater incentive.*



Levels 2 and 3 of this program are targeted to members who currently heat their home with electricity, particularly homes with unfinished basements, homes that have partition walls separating a crawl space or garage, and Cape Cod style homes (1.5 stories).

In 2019, 140 Button-Up rebates were provided to members, resulting in a lifetime savings of 4,975 MWh and 9,950,591 pounds of carbon dioxide emissions.

*\* This program was adjusted to one level in 2019, the Button-Up Weatherization with Air Sealing.*

# Touchstone Energy Home:

Since 2003, EKPC and its owner-member cooperatives have offered this program to increase energy efficiency in new-home construction. This program is designed to encourage new homes to be built to higher standards for thermal integrity and equipment efficiency, as well as to choose a geothermal or an air-source heat pump, rather than less efficient forms of heating and cooling. Homes built to Touchstone Energy Home standards typically use 30 percent less energy than the same home built to typical construction standards. Plans are submitted before the home is built, a pre-drywall inspection is made, and a blower door test is administered after the home is built to verify that the home meets the standard.

This program is targeted towards the residential new construction market and members who are constructing new site-built homes.

**In 2019, 298 Touchstone Energy Home rebates were provided to members, resulting in a lifetime savings of 17,645 MWh and 35,291,520 pounds of carbon dioxide emissions.**

EKPC's owner-members have also used this program to partner with Kentucky's affordable housing builders. Relationships with these organizations have led to improved efficiency in affordable housing and lower monthly energy costs for recipients of these homes.



## CARES:

The Community Assistance Resources for Energy Savings (CARES) program began in early 2015, and provides an incentive to enhance the weatherization and energy efficiency services provided to the end-use members by the Kentucky Community Action Agencies (CAA) network. EKPC and its owner-members provide an incentive to the CAA implementing the project on behalf of the end-use member.

This program is available to end-use members who qualify for weatherization and energy-efficiency services through their local CAA in all service territories of participating cooperatives. The maximum incentive possible per household is \$2,000.

**In 2019, 53 CARES incentives were provided, resulting in a lifetime savings of 3,761 MWh and 7,522,290 pounds of carbon dioxide emissions.**



## Heat Pump Retrofit:

For decades, EKPC and its owner-member cooperatives have offered this program to lower the cost of heating homes and increase comfort. This program provides incentives for members to replace their existing resistance heat source with a high-efficiency heat pump through three levels of rebates.

Level 1 offers a rebate for a 13 SEER/7.5 HSPF heat pump. Level 2 offers a rebate for a 14 SEER/8.0 HSPF heat pump. Level 3 offers a rebate for a 15 SEER/8.5 HSPF or higher heat pump. The existing heating system must be two years or older to qualify for incentives unless the heat pump is being installed in a new manufactured home. New manufactured homeowners who install a heat pump qualify based on the levels above.

The program is targeted to members who currently use a resistance heat source. Incentives are offered when the homeowner's primary source of heat is an electric resistance furnace, ceiling cable heat, or baseboard heat in both site-built and manufactured homes.

**In 2019, 380 Heat Pump Retrofit rebates were provided to members, resulting in a lifetime savings of 14,669 MWh and 29,337,400 pounds of carbon dioxide emissions.**



## Direct Load Control:<sup>\*</sup>

Since 2008, EKPC and its owner-member cooperatives have offered this program to manage peak usage. This program offers incentives to members who enroll central air-conditioners and electric water heaters. Switches are installed and, during periods of high demand, the utility briefly cycles the appliance off in order to reduce system peaks and save on costs for peak power. Although EKPC's system typically peaks in winter, member's heating appliances are not interrupted to lower peak. Member comfort and safety are top priority.

This program is targeted to any member with central air-conditioning, heat pump or electric tank water heaters, 40 gallons or greater.

**In 2019, 75 switches were installed, resulting in a reduction of 0.070 MW during the summer months and 0.004 MW in the winter.**

*\* Electric water heater switches are no longer being installed, due to program changes.*



## Appliance Recycling:<sup>\*</sup>

The Appliance Recycling program began in 2014 in an effort to encourage members to recycle old, inefficient refrigerators and freezers. Members receive a \$50 incentive for recycling refrigerators and/or freezers that meet qualifying conditions. The appliances must be in working condition, plugged in and running at scheduled pick-up, between 7.75 and 30 cubic feet, and empty and defrosted with water lines disconnected.

EKPC and its owner-member cooperatives partner with Appliance Recycling Centers of America, Inc. (ARCA) for proper recycling procedures that meet all federal and state requirements.

This program was available to all end-use members who qualify.

**In 2019, 117 incentives were provided to members, resulting in a lifetime savings of 624 MWh and 1,247,232 pounds of carbon dioxide emissions.**

*\* This program was discontinued in 2019.*



# ENERGY STAR Manufactured Home:

The ENERGY STAR Manufactured Home program began in 2014. An upstream program, EKPC works directly with the manufacturer to automatically upgrade the home to ENERGY STAR certified standards. EKPC utilizes a third-party administrator, Systems Building Research Alliance (SBRA), to verify information and ensure quality control.

Once the installation address is verified to be on a participating cooperative's service lines, the member will automatically receive the upgrade. An ENERGY STAR certified manufactured home is a home that has been designed, produced and installed by the home manufacturer to meet ENERGY STAR requirements for energy efficiency. These manufactured homes feature efficient heating and cooling equipment, water heaters, properly installed insulation, high-performance windows, tight construction and sealed ducts.

This program is available to all end-use members who qualify.

**In 2019, 20 rebates were provided to members, resulting in a lifetime savings of 3,347 MWh and 6,694,980 pounds of carbon dioxide emissions.**



# ENERGY STAR Appliance Rebate: \*

The ENERGY STAR Appliance Rebate program began in 2014 in an effort to encourage members to purchase new, energy-efficient appliances. EKPC and its owner-member cooperatives provide the incentives to members who purchase and install the ENERGY STAR certified appliances listed in the table.

This program was available to all end-use members who qualify.

**In 2019, 1,979 rebates were provided to members, resulting in a lifetime savings of 7,862 MWh and 15,725,866 pounds of carbon dioxide emissions.**

ENERGY STAR Appliances	Rebate
Refrigerator	\$100
Freezer	\$50
Dishwasher	\$50
Clothes Washer	\$75
Heat Pump Water Heater	\$300
Heat Pump	\$300
Central Air Conditioning	\$300

*\* This program was discontinued in 2019.*

# Commercial Program:

## Commercial & Industrial Advanced Lighting

For several years, EKPC and its owner-member cooperatives have offered this program to improve lighting in commercial or industrial facilities. This program offers incentives to install high-efficiency lamps and ballasts, including, but not limited to, LED exit signs, T-5 fluorescent fixtures and advanced controls.

This program was targeted to any existing commercial or industrial facility in the service territory of a distribution cooperative. The facility and its lighting must have been in service for at least two years.

**In 2019, 81 C&I Advanced Lighting rebates were provided to members, resulting in a lifetime savings of 60,814 MWh and 121,628,063 pounds of carbon dioxide emissions.**



# Impact Measures:

System summary of 2019 DSM program savings

## DSM program totals for installed measures in 2019

All programs	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2019 program costs	Lifetime energy savings (MWh)	Cost of demand saved (\$/kW)	Cost of energy saved (\$/kWh)	Lifetime CO2 savings (lbs)
All DSM Programs	57,001	10,623	1.845	2.168	\$3,707,613	\$1,150	125,375	0.031	250,750,124

## Appliance Recycling

Residential program	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2019 program costs	Measure life (years)	Lifetime energy savings (MWh)	Cost of energy saved (\$/kWh)	Lifetime CO2 savings (lbs)
Appliance Recycling	117	89	0.013	0.009	\$38,786	7	624	\$0.41	1,247,232

## Button-Up Weatherization

Residential program	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2019 program costs	Measure life (years)	Lifetime energy savings (MWh)	Cost of energy saved (\$/kWh)	Lifetime CO2 savings (lbs)
Button-Up level 1	129	238	0.056	0.184	\$100,492	15	3,576	\$0.03	7,152,232
Button-Up level 2	1	5	0.001	0.004	\$2,085	15	78	\$0.03	156,673
Button-Up level 3	10	88	0.021	0.068	\$26,250	15	1,321	\$0.02	2,641,686

## CARES

Residential program	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2019 program costs	Measure life (years)	Lifetime energy savings (MWh)	Cost of energy saved (\$/kWh)	Lifetime CO2 savings (lbs)
CARES	53	251	0.038	0.076	\$129,972	15	3,761	\$0.03	7,522,290

\* Includes \$817,777 program administration and promotional expenses.

## Commercial and Industrial

C&I programs	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2019 program costs	Measure life (years)	Lifetime energy savings (MWh)	Cost of energy saved (\$/kWh)	Lifetime CO2 savings (lbs)
Lighting upgrade	81	6,081	1.110	0.737	\$695,691	10	60,814	\$0.011	121,628,063

## Direct Load Control

Residential program	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2019 program costs	Cost of Demand saved (\$/KW)
DLC Air Conditioner	67	0.335	0.067	0	\$71,864.38	\$1,072.60
DLC Water Heater	8	0.08	0.003	0.004	\$8,580.82	\$2,898.93
DLC total	75	0.415	0.070	0.004	\$80,445.20	\$1,149.87

## Energy Audits

Residential program	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2019 program costs	Measure life (years)	Lifetime energy savings (MWh)	Cost of energy saved (\$/kWh)	Lifetime CO2 savings (lbs)
In-home	1	162	0.000	0.000	\$428	8	1,294	\$0.00	2,587,744
Online	310	1	0.000	0.000	\$132,572	5	3	\$45.86	5,782

## ENERGY STAR® Appliance Rebate

Residential program	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2019 program costs	Measure life (years)	Lifetime energy savings (MWh)	Cost of energy saved (\$/kWh)	Lifetime CO2 savings (lbs)
ES Heat Pump	359	293	0.110	0.000	\$218,731	15	4,402	\$0.05	8,803,800
ES Central Air Conditioner	59	21	0.020	0.000	\$16,261	15	309	\$0.05	618,930
ES Clothier Washer	354	94	0.008	0.019	\$34,610	12	1,126	\$0.03	2,251,200
ES Dishwasher	494	35	0.004	0.004	\$36,093	10	352	\$0.10	704,680
ES Freezer	82	4	0.001	0.000	\$4,308	12	46	\$0.09	91,656
ES Heat Pump Water Heater	74	86	0.008	0.020	\$17,909	13	1,115	\$0.02	2,230,800
ES Refrigerator	557	43	0.002	0.004	\$97,069	12	512	\$0.19	1,024,800

## ENERGY STAR® Manufactured Home

Residential program	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2019 program costs	Measure life (years)	Lifetime energy savings (MWh)	Cost of energy saved (\$/kWh)	Lifetime CO2 savings (lbs)
ES Manufactured Home	20	223	0.010	0.053	\$81,680	15	3,347	\$0.02	6,694,980

## Heat Pump Retrofit

Residential program	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2019 program costs	Measure life (years)	Lifetime energy savings (MWh)	Cost of energy saved (\$/kWh)	Lifetime CO2 savings (lbs)
Heat Pump	380	733	0.036	0.000	\$696,895	20	14,669	\$0.05	29,337,400

## HVAC Duct Seal

Residential program	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2019 program costs	Measure life (years)	Lifetime energy savings (MWh)	Cost of energy saved (\$/kWh)	Lifetime CO2 savings (lbs)
HVAC Duct Sealing	7	8	0.002	0.008	\$4,000	12	100	\$0.04	199,296

## Residential Lighting

Residential program	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2019 program costs	Measure life (years)	Lifetime energy savings (MWh)	Cost of energy saved (\$/kWh)	Lifetime CO2 savings (lbs)
LEDs	53,540	1,285	0.128	0.214	\$49,809	8	10,280	\$0.00	20,559,360

## Touchstone Energy Home

Residential program	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2019 program costs	Measure life (years)	Lifetime energy savings (MWh)	Cost of energy saved (\$/kWh)	Lifetime CO2 savings (lbs)
TSE Home Prescriptive	73	195	0.048	0.181	\$102,350	20	3,903	\$0.03	7,806,560
TSE Home Performance	225	687	0.158	0.582	\$323,400	20	13,742	\$0.02	27,484,960

# 2019 Basic Program Assumptions <sup>1</sup>

## Measure: Button-Up Level 1

Annual kWh Saved:	2,205
Winter Demand Savings:	1.71
Summer Demand Savings:	0.52
Lifetime of Savings:	15 years
Installation Rate:	100%
TRC: <sup>2</sup>	1.45

## Measure: Button-Up Level 2

Annual kWh Saved:	4,567
Winter Demand Savings:	3.53
Summer Demand Savings:	1.07
Lifetime of Savings:	15 years
<i>(Weighted mix of measures)</i>	
Installation Rate:	100%
TRC:	1.52

## Measure: Button-Up Level 3

Annual kWh Saved:	6,090
Winter Demand Savings:	4.71
Summer Demand Savings:	1.43
Lifetime of Savings:	15 years
<i>(Weighted mix of measures)</i>	
Installation Rate:	100%
TRC:	1.56

## Measure: Button-Up w/Air Seal

Annual kWh Saved:	3,045
Winter Demand Savings:	2.35
Summer Demand Savings:	0.720
Lifetime of Savings:	15 years
Installation Rate:	100%
TRC:	1.44

## Measure: HVAC Duct Sealing

For a typical heat pump in typical residence to same home reduced by 12% savings

Annual kWh Saved:	1,038
Winter Demand Savings:	1.07
Summer Demand Savings:	0.40
Lifetime of Savings:	12 years
Installation Rate:	100%
TRC:	1.15

## Measure: Heat Pump SEER 13

From Electric Furnace and Central Air to ENERGY STAR SEER 13, HSPF 7.5

Annual kWh Saved:	7,174
Winter Demand Savings:	0
Summer Demand Savings:	0.15
Lifetime of Savings:	20 years
Installation Rate:	100%
TRC:	1.52

## Measure: Heat Pump SEER 14

From Electric Furnace and Central Air to ENERGY STAR SEER 14, HSPF 8.0

Annual kWh Saved:	7,533
Winter Demand Savings:	0
Summer Demand Savings:	0.32
Lifetime of Savings:	20 years
Installation Rate:	100%
TRC:	1.32

## Measure: Heat Pump SEER 15

From Electric Furnace and Central Air to ENERGY STAR SEER 15, HSPF 8.5

Annual kWh Saved:	7,978
Winter Demand Savings:	0
Summer Demand Savings:	0.45
Lifetime of Savings:	20 years
Installation Rate:	100%
TRC:	1.08

### Measure: Touchstone Energy Home

Prescriptive and Performance Level #2 – Encourages new homes to be built to a standard of at least SEER 14.5, HSPF 8.2; HERS Rating of 79 and below

Annual kWh Saved:	2,568
Winter Demand Savings:	2.48
Summer Demand Savings:	0.66
Lifetime of Savings:	20 years
Installation Rate:	100%
TRC:	1.98

### Measure: Touchstone Energy Home

Performance Level #1 – Encourages new homes to be built to a standard of at least SEER 14.5, HSPF 8.2; HERS rating of 80-85

Annual kWh Saved:	1,758
Winter Demand Savings:	1.7
Summer Demand Savings:	0.45
Lifetime of Savings:	20 years
Installation Rate:	100%
TRC:	2.06

### Measure: LEDs

Annual kWh Saved:	24
Winter Demand Savings:	0.0040
Summer Demand Savings:	0.0024
Lifetime of Savings:	8 years
Installation Rate:	80%
TRC:	2.13

### Measure: Commercial Advanced Lighting

Unit is 1 kW connected load savings

Annual kWh Saved:	4,252
Winter Demand Savings:	0.45
Summer Demand Savings:	0.85
Lifetime of Savings:	10 years
Installation Rate:	100%
TRC:	2.22

### Measure: Industrial Compressed Air

Annual kWh Saved:	3,800
Winter Demand Savings:	0.30
Summer Demand Savings:	0.75
Lifetime of Savings:	7 years
Installation Rate:	0
TRC:	1.62

### Measure: Water Heater >40 gals

Annual kWh Saved:	10
Winter Demand Savings:	0.52
Summer Demand Savings:	0.37
Lifetime of Savings:	20 years
Installation Rate:	100%

### Measure: Central Air Conditioning

Annual kWh Saved:	5
Winter Demand Savings:	0.0
Summer Demand Savings:	1.0
Lifetime of Savings:	20 years
Installation Rate:	100%

TRC for Load Control Program	2.68
------------------------------	------

**Measure: ENERGY STAR® Appliances**

TRC: 1.49 in aggregate

**Measure: ENERGY STAR® Heat Pump**

Annual kWh Saved: 804  
Winter Demand Savings: 0.00  
Summer Demand Savings: 0.30  
Lifetime of Savings: 20 years  
Installation Rate: 100%

**Measure: ENERGY STAR® Central Air**

Annual kWh Saved: 529  
Winter Demand Savings: 0.00  
Summer Demand Savings: 0.52  
Lifetime of Savings: 15 years  
Installation Rate: 100%

**Measure: ENERGY STAR® Clothes Washer**

Annual kWh Saved: 350  
Winter Demand Savings: 0.07  
Summer Demand Savings: 0.03  
Lifetime of Savings: 12 years  
Installation Rate: 100%

**Measure: ENERGY STAR® Dish Washer**

Annual kWh Saved: 79  
Winter Demand Savings: 0.01  
Summer Demand Savings: 0.01  
Lifetime of Savings: 10 years  
Installation Rate: 100%

**Measure: ENERGY STAR® Freezer**

Annual kWh Saved: 67  
Winter Demand Savings: 0.01  
Summer Demand Savings: 0.01  
Lifetime of Savings: 12 years  
Installation Rate: 100%

**Measure: ENERGY STAR® Refrigerator**

Annual kWh Saved: 100  
Winter Demand Savings: 0.01  
Summer Demand Savings: 0.01  
Lifetime of Savings: 12 years  
Installation Rate: 100%

**Measure: ENERGY STAR® Heat Pump Water Heater**

Annual kWh Saved: 2,200  
Winter Demand Savings: 0.51  
Summer Demand Savings: 0.20  
Lifetime of Savings: 13 years  
Installation Rate: 100%

**Measure: Appliance Recycling**

Annual kWh Saved: 696  
Winter Demand Savings: 0.07  
Summer Demand Savings: 0.10  
Lifetime of Savings: 7 years  
Installation Rate: 100%  
TRC: 2.01

**Measure: CARES**

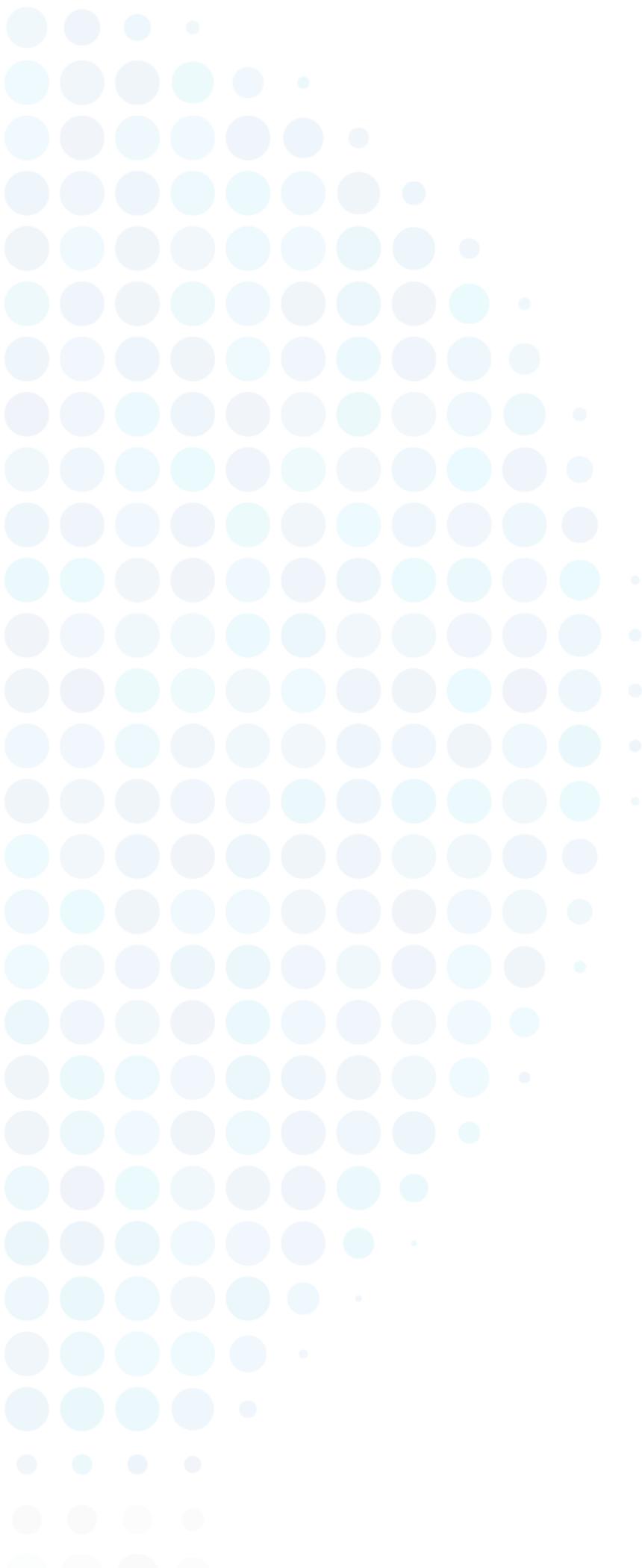
Annual kWh Saved: 4,731  
Winter Demand Savings: 1.44  
Summer Demand Savings: 0.72  
Lifetime of Savings: 15 years  
Installation Rate: 100%  
TRC: 1.34

**Measure: ENERGY STAR® Manufactured Home**

Annual kWh Saved: 11,947  
Winter Demand Savings: 2.88  
Summer Demand Savings: 0.51  
Lifetime of Savings: 15 years  
Installation Rate: 100%  
TRC: 4.09

1 Savings numbers are "ex ante" or as planned gross savings except where noted.  
2 Total Resource Cost (TRC) is an overall program benefits/costs analysts ratio.





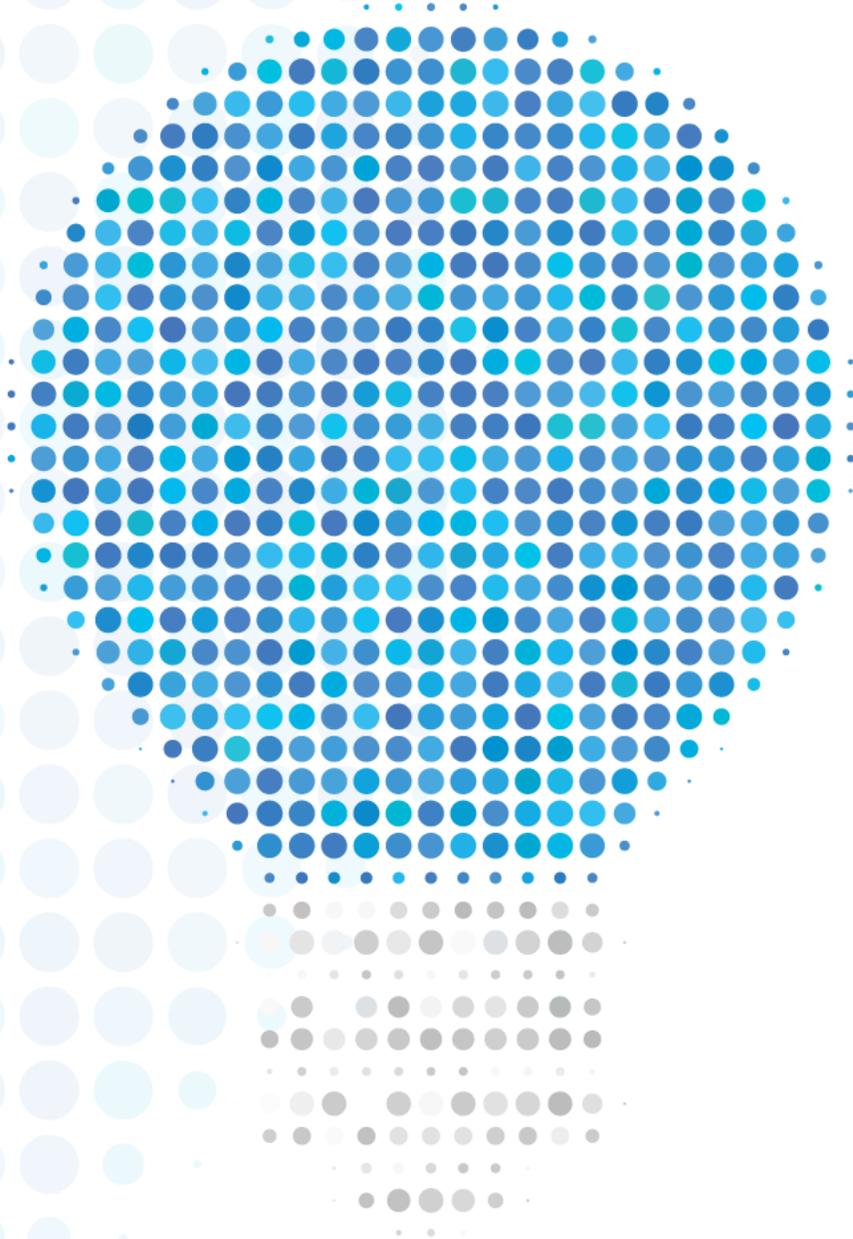
**EAST KENTUCKY POWER COOPERATIVE**

A Touchstone Energy Cooperative 

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# DSM

Demand Side Management  
2020 Annual Report



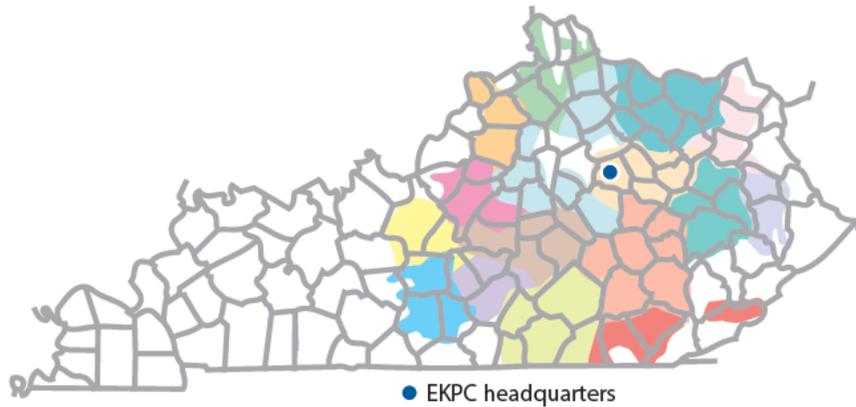
# Table of Contents

- Who We Are 2
- Button-Up Weatherization 3
- ENERGY STAR Manufactured Home 3
- Touchstone Energy Home 4
- Heat Pump Retrofit 5
- Direct Load Control (DLC) 5
- Residential Lighting 6
- CARES 6
- Impact Measures 7
- Basic Program Assumptions 10

# Who We Are

Located in the heart of the Bluegrass state, East Kentucky Power Cooperative is a not-for-profit generation and transmission (G&T) electric utility with headquarters in Winchester, Ky. Our cooperative has a vital mission: to safely generate and deliver affordable, reliable, sustainable electric power to 16 owner-member cooperatives serving more than one million Kentuckians.

Together, with our 16 owner-members, we're known as Kentucky's Touchstone Energy Cooperatives. The member co-ops distribute energy to over 554,000 Kentucky homes, farms, businesses and industries across 87 counties. We're leaders in energy efficiency and environmental stewardship. And we're committed to providing power to improve the lives of people in Kentucky.



Sixteen distribution cooperatives, which are called the member systems, own EKPC. The 16 co-ops include:

- Big Sandy RECC
- Blue Grass Energy Cooperative
- Clark Energy Cooperative
- Cumberland Valley Electric
- Farmers RECC
- Fleming-Mason Energy Cooperative
- Grayson RECC
- Inter-County Energy
- Jackson Energy Cooperative
- Licking Valley RECC
- Nolin RECC
- Owen Electric Cooperative
- Salt River Electric Cooperative
- Shelby Energy Cooperative
- South Kentucky RECC
- Taylor County RECC

## East Kentucky Power Generation

<b>Coal</b>	<b>Generation</b>	<b>Natural Gas</b>	<b>Generation</b>	<b>Landfill</b>	<b>Generation</b>
Spurlock	1,346 net MW	Smith	Summer	Bavarian	4.6 net MW
Cooper	341 net MW	Combustion	753 net MW	Laurel Ridge	3.0 net MW
<b>Total</b>	<b>1,687 net MW</b>	Turbine	Winter	Green Valley	2.3 net MW
		Units	989 net MW	Pearl Hollow	2.3 net MW
		Bluegrass	Summer	Pendleton	3.0 net MW
<b>Hydro</b>	<b>Generation</b>	Combustion	501 net MW	Glasgow*	0.9 net MW
Southeastern	170 MW	Turbine	Winter	<b>Total Landfill</b>	<b>16.1 net MW</b>
Power Adm. (SEPA)		Units	567 net MW		
		<b>Total Natural Gas Summer</b>	<b>1,254 net MW</b>	<b>Solar Generation</b>	
		<b>Total Natural Gas Winter</b>	<b>1,556 net MW</b>	Cooperative Solar	8.5 net MW

\* Under an existing agreement, a third party receives the output of Glasgow in a 10-year power purchase agreement.

# Button-Up Weatherization:

Since the early 1990s, EKPC and its owner-member cooperatives have offered this program to improve a home's energy efficiency, comfort, and reduce energy use. This program offers incentives to members who air seal the shell of their home with the end goal of reducing heat loss in the home. Any member who resides in a site-built or manufactured home that is at least two years old and uses electricity as their primary source of heat is eligible.

## Button-Up Weatherization with Air Sealing:

*The Button-Up encourages members to air seal the envelope of their home. Air sealing is one of the most cost effective ways to improve the efficiency of a home. A blower door test is required before and after air sealing is completed to demonstrate the impact in kW demand reduction, and an incentive is paid based on that reduction. An additional incentive is paid for increased ceiling insulation.*

In 2020, 27 Button-Up rebates were provided to members, resulting in a lifetime savings of 693 MWh and 1,385,568 pounds of carbon dioxide emissions.



# ENERGY STAR™ Manufactured Home:

The ENERGY STAR™ Manufactured Home Program began in 2014. End use members who purchase and install an ENERGY STAR™ Manufactured Home are eligible for a rebate. ENERGY STAR™ Manufactured Homes are certified by a third-party administrator, Systems Building Research Alliance (SBRA) in order to ensure quality control.

An ENERGY STAR™ certified manufactured home is a home that has been designed, produced and installed by the home manufacturer to meet ENERGY STAR™ requirements for energy efficiency. These manufactured homes feature efficient heating and cooling equipment, water heaters, properly installed insulation, high-performance windows, tight construction and sealed ducts.

This program is available to all end-use members who qualify.

In 2020, 6 rebates were provided to members, resulting in a lifetime savings of 365 MWh and 730,800 pounds of carbon dioxide emissions.



# Touchstone Energy Home:

Since 2003, EKPC and its owner-member cooperatives have offered this program to increase energy efficiency in new-home construction. This program is designed to encourage new homes to be built to higher standards for thermal integrity and equipment efficiency, as well as to choose a geothermal or an air-source heat pump, rather than less efficient forms of heating and cooling. Homes built to Touchstone Energy Home standards typically use 30 percent less energy than the same home built to typical construction standards. Plans are submitted before the home is built, a pre-drywall inspection is made, and a blower door test is administered after the home is built to verify that the home meets the standard.

This program is targeted towards the residential new construction market and members who are constructing new site-built homes.

**In 2020, 264 Touchstone Energy Home rebates were provided to members, resulting in a lifetime savings of 16,685 MWh and 33,369,440 pounds of carbon dioxide emissions.**

EKPC's owner-members have also used this program to partner with Kentucky's affordable housing builders. Relationships with these organizations have led to improved efficiency in affordable housing and lower monthly energy costs for recipients of these homes.



# Heat Pump Retrofit:

For decades, EKPC and its owner-member cooperatives have offered this program to lower the cost of heating homes and increase comfort. This program provides incentives for members to replace their existing resistance heat source with a high-efficiency heat pump through two levels of rebates.

Level 1 offers a rebate for a 14 SEER/8.2 HSPF heat pump. Level 2 offers a rebate for a 15 SEER/8.5 HSPF heat pump or higher heat pump. Popularity of mini-split ductless heat pumps has risen in recent years. The retrofit program also offers a special incentive for mini-split systems. The existing heating system must be two years or older to qualify for incentives unless the heat pump is being installed in a new manufactured home. New manufactured homeowners who install a heat pump qualify based on the levels above.

The program is targeted to members who currently use a resistance heat source. Incentives are offered when the homeowner's primary source of heat is an electric resistance furnace, ceiling cable heat, or baseboard heat in both site-built and manufactured homes.

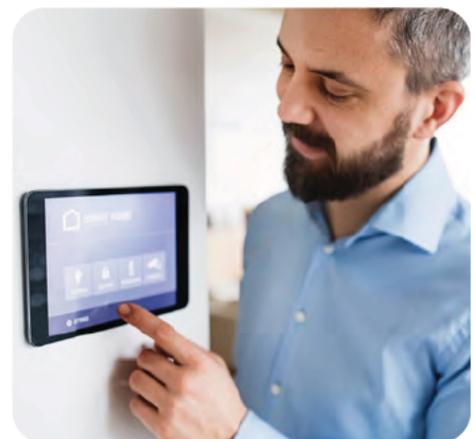
**In 2020, 363 Heat Pump Retrofit rebates were provided to members, resulting in a lifetime savings of 53,247 MWh and 106,493,120 pounds of carbon dioxide emissions.**



# Direct Load Control:

Since 2008, EKPC and its owner-member cooperatives have offered this program to manage peak usage. This program offers incentives to members who enroll central air-conditioners. Switches are installed and, during periods of high demand, the utility briefly cycles the appliance off in order to reduce system peaks and save on costs for peak power. Although EKPC's system typically peaks in winter, member's heating appliances are not interrupted to lower peak. Member comfort and safety are top priority.

This program is targeted to any member with central air-conditioning or heat pump. Beginning in 2019, EKPC also began offering a thermostat program that includes a qualifying Wi-Fi enabled thermostat so that end use members could enroll their smart thermostats in direct load control events. Enrollees in this program help lower energy demand during EKPC's system peaks.



## Residential Lighting:

Since 2003, EKPC and its owner-member cooperatives have provided more than one million compact fluorescent lights (CFL) and light-emitting diodes (LED) bulbs to members.

**In 2020, cooperatives provided 64,665 LEDs to its members. Each member who participated in a free, online energy audit called Virtual Energy Assessment received an LED, along with Annual Meeting attendees. These LEDs are expected to result in a lifetime savings of 12,416 MWh and 24,831,360 pounds of carbon dioxide emissions.**



## CARES:

The Community Assistance Resources for Energy Savings (CARES) program began in early 2015, and provides an incentive to enhance the weatherization and energy efficiency services provided to the end-use members by the Kentucky Community Action Agencies (CAA) network. EKPC and its owner-members provide an incentive to the CAA implementing the project on behalf of the end-use member.

This program is available to end-use members who qualify for weatherization and energy-efficiency services through their local CAA in all service territories of participating cooperatives. The maximum incentive possible per household is \$2,000.

**In 2020, 56 CARES incentives were provided, resulting in a lifetime savings of 3,974 MWh and 7,948,080 pounds of carbon dioxide emissions.**



# Impact Measures:

System summary of 2020 DSM program savings

DSM program totals (totals for installed energy-efficiency measures and total DLC participation for 2020)

All programs	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2020 program costs	Lifetime energy savings (MWh)	Cost of demand saved (\$/kW)	Cost of energy saved (\$/kWh)	Lifetime CO2 savings (lbs)
All DSM Programs	101,190	5,687	28.189	8.727	\$4,061,466*	\$87,635	\$66.72	0.025	175,270,908

## Button-Up Weatherization

Residential program	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2020 program costs	Measure life (years)	Lifetime energy savings (MWh)	Cost of energy saved (\$/kWh)	Lifetime CO2 savings (lbs)
Button-Up	27	46	0.011	0.036	\$22,557	15	693	\$0.033	1,385,568

## CARES

Residential program	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2020 program costs	Measure life (years)	Lifetime energy savings (MWh)	Cost of energy saved (\$/kWh)	Lifetime CO2 savings (lbs)
CARES	56	265	0.040	0.081	\$140,200	15	3,974	\$0.035	7,948,080

\* Includes \$835,972 program administration and promotional expenses.

## Energy Audits

Residential program	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2020 program costs	Measure life (years)	Lifetime energy savings (MWh)	Cost of energy saved (\$/kWh)	Lifetime CO2 savings (lbs)
Online	100	51	0.000	0.000	\$133,000	5	256	\$0.519	512,540

## ENERGY STAR® Manufactured Home

Residential program	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2020 program costs	Measure life (years)	Lifetime energy savings (MWh)	Cost of energy saved (\$/kWh)	Lifetime CO2 savings (lbs)
ES Manufactured Home	6	24	0.003	0.006	\$12,840	15	365	\$0.035	730,800

## Heat Pump Retrofit

Residential program	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2020 program costs	Measure life (years)	Lifetime energy savings (MWh)	Cost of energy saved (\$/kWh)	Lifetime CO2 savings (lbs)
Heat Pump	363	2,662	0.124	0.000	\$629,632	20	53,247	\$0.012	106,493,120

## Residential Lighting

Residential program	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2020 program costs	Measure life (years)	Lifetime energy savings (MWh)	Cost of energy saved (\$/kWh)	Lifetime CO2 savings (lbs)
LEDs	64,665	1,552	0.155	0.259	\$59,844	8	12,416	\$0.005	24,831,360

## Touchstone Energy Home

Residential program	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2020 program costs	Measure life (years)	Lifetime energy savings (MWh)	Cost of energy saved (\$/kWh)	Lifetime CO2 savings (lbs)
TSE Home Prescriptive	41	124	0.028	0.102	\$57,950	20	2,474	\$0.023	4,948,320
TSE Home Performance	223	711	0.159	0.585	\$323,400	20	14,211	\$0.023	28,421,120

## Direct Load Control Cumulative

Residential program	Participation	Annual Energy Savings (MWh)	Summer Demand Savings (MW)	Winter Demand Savings (MW)	2020 program costs	Cost of Demand saved (\$/KW)
DLC Air Conditioner	18,910	95	18.910	0.000	\$857,912	\$45.37
DLC Water Heater	14,731	147	5.450	7.660	\$668,319	\$122.62
Thermostats	2,068	10	3.309	0.000	\$319,840	\$96.66
Totals	35,709	252	27.669	7.660	\$1,846,072	\$66.72

# 2020 Basic Program Assumptions <sup>1</sup>

## Measure: Button-Up Weatherization with Air Sealing

Annual kWh Saved:	2,205
Winter Demand Savings:	1.71
Summer Demand Savings:	0.52
Lifetime of Savings:	15 years
Installation Rate:	100%
TRC: <sup>2</sup>	1.45

## Measure: Heat Pump SEER 14

From Electric Furnace to ENERGY STAR  
SEER 14, HSPF 8.2

Annual kWh Saved:	7,533
Winter Demand Savings:	0
Summer Demand Savings:	0.32
Lifetime of Savings:	20 years
Installation Rate:	100%
TRC: <sup>2</sup>	1.55

## Measure: Heat Pump SEER 15

From Electric Furnace to ENERGY STAR  
SEER 15, HSPF 8.5

Annual kWh Saved:	7,978
Winter Demand Savings:	0
Summer Demand Savings:	0.45
Lifetime of Savings:	20 years
Installation Rate:	100%
TRC: <sup>2</sup>	1.55

## Measure: Touchstone Energy Home

Prescriptive and Performance – Encourages new homes to be built to a standard of at least SEER 15, HSPF 8.5; HERS Rating of 75 and below

Annual kWh Saved:	3,172
Winter Demand Savings:	2.61
Summer Demand Savings:	0.71
Lifetime of Savings:	20 years
Installation Rate:	100%
TRC:	1.60

## Measure: LEDs

Annual kWh Saved:	24
Winter Demand Savings:	0.0040
Summer Demand Savings:	0.0024
Lifetime of Savings:	8 years
Installation Rate:	80%
TRC:	2.78

## Measure: Wi-fi Enabled Thermostat

Annual kWh Saved:	36
Winter Demand Savings:	0.00
Summer Demand Savings:	1.20
Lifetime of Savings:	15 years
Installation Rate:	100%
TRC:	3.96

## Measure: CARES

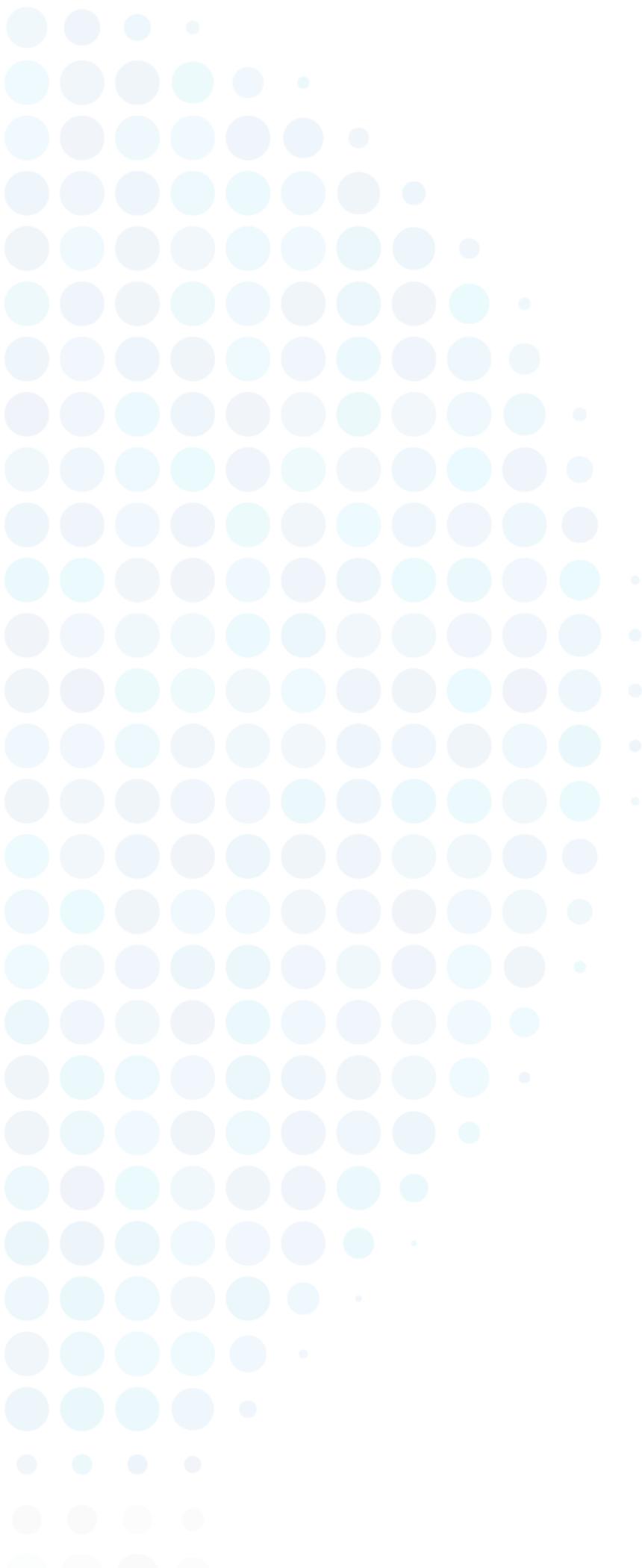
Annual kWh Saved:	4,731
Winter Demand Savings:	1.44
Summer Demand Savings:	0.72
Lifetime of Savings:	15 years
Installation Rate:	100%
TRC:	0.96

## Measure: ENERGY STAR® Manufactured Home

Annual kWh Saved:	4,060
Winter Demand Savings:	0.93
Summer Demand Savings:	0.47
Lifetime of Savings:	15 years
Installation Rate:	100%
TRC:	1.71

<sup>1</sup> Savings numbers are "ex ante" or as planned gross savings except where noted.

<sup>2</sup> Total Resource Cost (TRC) is an overall program benefits/costs analysts ratio.



**EAST KENTUCKY POWER COOPERATIVE**

A Touchstone Energy Cooperative 

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Exhibit DSM-3

Program  
Assumption Sheets

**DSM for 2022 IRP**

Residential Energy Audit Program:  
On-Line Track

**15 years of participation Year 1 is 2022 updated costs**

<b><u>Assumption</u></b>	<b><u>Source</u></b>
<b>Load Impacts</b> Before Participant 14,136 kWh, 4.29 kW (coincident with winter peak), 3.06 kW (summer)  Savings = 493 kWh, 0.16 kW (Winter), 0.09 kW (Summer) After Participant 13,643 kWh, 4.13 kW (coincident with winter system peak), 2.97 kW (summer)	Typical residential customer    Audit bundle using GDS data
<b>Lifetime of savings</b> <b>Discount rate for TRC and RIM</b> <b>Generation Capacity Cost -PJM Market,</b> 100% summer \$36.50 per kW-year in 2022 <b>Avoided Electricity Energy Costs - PJM Market,</b> AEP-Dayton hub, \$30.31 /MWh in 2022 <b>Transmission Capacity Cost - OATT tariff</b> <b>\$ 24.31 per kW-year in 2022</b>	5 Years. Source: RI TRM 5 percent per Ann Bridges, 3/14/21; 3.5 % societal test from Mercatus Center report <b>PJM capacity performance market March 2021, start year is 2022. Updated escalators to match.</b> 100% allocation to summer  based on March 3, 2021 ACES Forward prices for AEP_Dayton hub. \$30.31 /MWh in 2021. DSMore <b>Scenario 2, 1.193 esc in 2022</b>  Network rate, 2020-21. 2.3 % escalation rate. Applied to winter coincident peak.
<b>Participant Costs \$ 60</b> per audit. 2% escalation	Measure bundle: programmable thermostat, LED, low flow faucet aerator, low flow showerhead
<b>Administrative Cost</b> EK \$133,000 fixed annual \$0 per participant Co-op \$ 0 per new participant	Software cost  no administrative costs for the member cooperatives with the On-Line track
<b>Rate Schedule - Retail</b> Median Residential Rate for Co-ops Cust chrg \$15.00, Energy Rate \$.08532 <b>Rate Schedule - Wholesale</b> East Kentucky E-2 rate.	Current rates in effect as of February, 2020  Current rates in effect as of February, 2020
<b>Participation 2022-2036: 500</b> per year. 0% free riders	Based on DSM base case budget for 2022 IRP. No free riders assumed
<b>Rebates</b> Co-op to Participant \$0 EK to Co-op \$0	No financial incentive. Information and service offered free of charge. None. Member coops are providing this as a customer service.

**DSM for 2022 IRP**

Button-Up Weatherization Program

15 years of participation Year 1 is 2022

The Button-Up Weatherization Program offers an incentive for reducing the heat loss of a home. Measures are **ceiling insulation, air sealing, and duct sealing.**

<u>Assumption</u>	<u>Source</u>
<b>Load Impacts</b> Before Participant 10,500 kWh, 8.12 kW (coinc. with winter system peak), 2.47 kW (summer)  <b>Savings: 2,253 kWh 1.74 kW (winter) 0.53 kW (summer)</b> After Participant 8,247 kWh, 6.38 kW (winter peak), 1.94 (summer peak)	Mix of Furnace/Central AC and air source heat pump weighted according to saturation in existing single family homes. 70% heat pump, 30% furnace/CAC.
<b>Lifetime of savings</b> <b>Discount rate for TRC and RIM</b> <b>Generation Capacity Cost -PJM Market,</b> 100% summer <b>\$36.50</b> per kW-year in 2022 <b>Avoided Electricity Energy Costs - PJM Market,</b> AEP-Dayton hub, <b>\$30.31 /MWh</b> in 2022 <b>Transmission Capacity Cost - OATT tariff \$ 24.31 per kW-year in 2022</b> <b>Participant Costs \$1,401</b>	<b>20</b> Years weighted by measure kWh <b>5</b> percent per Ann Bridges, 3/14/21; 3.5 % societal test from Mercatus Center report <b>PJM capacity performance market March 2021, start year is 2022. Updated escalators to match.</b> 100% allocation to summer based on March 3, 2021 ACES Forward prices for AEP_Dayton hub. <b>\$30.31 /MWh</b> in 2021. DSMore <b>Scenario 2, 1.193 esc in 2022</b> Network rate, 2020-21. 2.3 % escalation rate. Applied to winter coincident peak. GDS measure costs, weighted
<b>Administrative Cost</b> EK <b>\$5,400</b> per year (2012-2036), 2% escalation  Co-op <b>\$316</b> per new participant	Program admin estimate of \$4,300 provided by EKPC Marketing/Communications, October 2010 updated to 2021 (using PPI). Also includes \$0 advertising budget.  Labor costs are \$116. (2 hours times \$58 per hour). Plus \$200 for pre and post blower door test.
<b>Rate Schedule - Retail</b> Median Residential Rate for Co-ops Cust chrg <b>\$15.00</b> , Energy Rate <b>\$0.08532</b> <b>Rate Schedule - Wholesale</b> East Kentucky E-2 rate.	Current rates in effect as of February, 2020  Current rates in effect as of February, 2020
<b>Participation - 2022-2036: 280</b> 10% free riders	Based on budget allocation for the \$ 3 million base case. Free riders based on Frontier Assoc study for LG&E/KU
<b>Rebates</b> Co-op to Participant <b>\$ 510</b>  EK to Co-op <b>\$ 1,000</b>	<b>Based on tariff - \$40 per 1,000 BTUH design day heating loss reduction</b>  <b>Reimburse for rebate, 50% of admin costs, plus compensation for net lost revenues.</b>

**DSM for 2022 IRP**

Heat Pump Retrofit Program - SEER 14

**15 years of participation Year 1 is 2022**

This program encourages residential members to convert their primary heat source from electric resistance heat to an efficient air source heat pump

<b><u>Assumption</u></b>	<b><u>Source</u></b>
<b>Load Impacts</b> Before Participant 14,843 kWh, 8.12 kW (coinc. with winter system peak), 2.25 kW (summer)  Savings: <b>7,533 kWh</b> After Participant 7,310 kWh, 8.12 kW (coinc. with winter system peak), 1.93 kW (summer)	Electric Furnace and Central A.C.  ENERGY STAR® efficiency new heat pump: SEER 14, HSPF 8.0
<b>Lifetime of savings</b> <b>Discount rate for TRC and RIM</b> <b>Generation Capacity Cost -PJM Market,</b> 100% summer <b>\$36.50</b> per kW-year in 2022 <b>Avoided Electricity Energy Costs - PJM Market, AEP-Dayton hub, \$30.31 /MWh</b> in 2022 <b>Transmission Capacity Cost - OATT tariff \$ 24.31 per kW-year in 2022</b>	<b>20</b> Years <b>5</b> percent per Ann Bridges, 3/14/21; 3.5 % societal test from Mercatus Center report <b>PJM capacity performance market March 2021, start year is 2022. Updated escalators to match.</b> 100% allocation to summer based on March 3, 2021 ACES Forward prices for AEP_Dayton hub. <b>\$30.31 /MWh</b> in 2021. DSMore <b>Scenario 2, 1.193 esc in 2022</b> Network rate, 2020-21. 2.3 % escalation rate. Applied to winter coincident peak.
<b>Participant Costs \$2,648.</b> 2% esc.	GDS cost for SEER 16, scaled back to SEER 14 using Indiana TRM, version 2.2
<b>Administrative Cost</b> EK <b>\$5,300</b> fixed annual (2022-2036). 2% esc  Co-op <b>\$220</b> per new participant. 2% esc.	Program admin based on 5 year workplan. No advertising  Cost information provided by various coops in September 2011 survey of hours and rates. Escalated to 2021 using ECI for Professional and business services
<b>Rate Schedule - Retail</b> Median Residential Rate for Co-ops Cust chrg <b>\$15.00</b> , Energy Rate <b>\$.08532</b> <b>Rate Schedule - Wholesale</b> East Kentucky E-2 rate.	Current rates in effect as of February, 2020  Current rates in effect as of February, 2020
<b>Participation - 2022-2036: 300. 0%</b> Free Riders	based on DSM 2022 IRP base case budget
<b>Rebates</b> Co-op to Participant <b>\$ 500</b> , 2% esc  EK to Co-op <b>\$1,695</b> , 2% esc	<b>two tiers: SEER 14 is \$500, SEER 15+ is \$750. modeling SEER 14</b> <b>Planned transfer payment for 5 year marketing plan. Reimburse for rebate, 50% of admin costs, plus compensation for a share of net lost revenues.</b>

**DSM for 2022 IRP**

Heat Pump Retrofit Program - SEER 15

**15 years of participation Year 1 is 2022**

This program encourages residential members to convert their primary heat source from electric resistance heat to an efficient air source heat pump

<u>Assumption</u>	<u>Source</u>
<b>Load Impacts</b> Before Participant 14,843 kWh, 8.12 kW (coinc. with winter system peak), 2.25 kW (summer)  Savings: <b>7,978 kWh</b> After Participant 6,865 kWh, 8.12 kW (coinc. with winter system peak), 1.80 kW (summer)	Electric Furnace and Central A.C.  ENERGY STAR® efficiency new heat pump: SEER 15, HSPF 8.0
<b>Lifetime of savings</b> <b>Discount rate for TRC and RIM</b> <b>Generation Capacity Cost -PJM Market,</b> 100% summer <b>\$36.50</b> per kW-year in 2022 <b>Avoided Electricity Energy Costs - PJM Market, AEP-Dayton hub, \$30.31 /MWh</b> in 2022 <b>Transmission Capacity Cost - OATT tariff \$ 24.31 per kW-year in 2022</b>	<b>20</b> Years <b>5</b> percent per Ann Bridges, 3/14/21; 3.5 % societal test from Mercatus Center report <b>PJM capacity performance market March 2021, start year is 2022. Updated escalators to match.</b> 100% allocation to summer based on March 3, 2021 ACES Forward prices for AEP_Dayton hub. <b>\$30.31 /MWh</b> in 2021. DSMore <b>Scenario 2, 1.193 esc in 2022</b> Network rate, 2020-21. 2.3 % escalation rate. Applied to winter coincident peak.
<b>Participant Costs \$3,059.</b> 2% esc.	GDS cost for SEER 16, scaled back to SEER 15 using Indiana TRM, version 2.2
<b>Administrative Cost</b> EK <b>\$5,300</b> fixed annual (2022-2036). 2% esc  Co-op <b>\$220</b> per new participant. 2% esc.	Program admin based on 5 year workplan. No advertising  Cost information provided by various coops in September 2011 survey of hours and rates. Escalated to 2021 using ECI for Professional and business services
<b>Rate Schedule - Retail</b> Median Residential Rate for Co-ops Cust chrg <b>\$15.00</b> , Energy Rate <b>\$.08532</b> <b>Rate Schedule - Wholesale</b> East Kentucky E-2 rate.	Current rates in effect as of February, 2020  Current rates in effect as of February, 2020
<b>Participation - 2022-2036: 150. 0%</b> Free Riders	Based on DSM 2022 IRP base case budget
<b>Rebates</b> Co-op to Participant <b>\$ 750</b> , 2% esc  EK to Co-op <b>\$1,991</b> , 2% esc	<b>two tiers: SEER 14 is \$500, SEER 15+ is \$750. modeling SEER 15</b> <b>Planned transfer payment for 5 year marketing plan. Reimburse for rebate, 50% of admin costs, plus compensation for a share of net lost revenues.</b>

EKPC provides an incentive to enhance the weatherization and energy efficiency services provided to its low income residential members by the Kentucky Community Action network of community action agencies (CAAs). Heat pump eligible homes receive a new SEER 14 heat pump as well as weatherization measures. Other homes receive only weatherization measures.

**15 years of participation Year 1 is 2022**

<u>Assumption</u>	<u>Source</u>
<p><b>Load Impacts</b>                      Before Participant                      11,286 kWh, 8.81 kW (coincident with winter system peak), 3.45 kW (summer), 750 therms                      Savings: <b>4,495 kWh, 59 therms</b>                      After Participant                      6,791 kWh, 7.47 kW (coincident with winter system peak), 2.79 kW (summer), <b>691 therms</b></p>	<p>HVAC loads for a typical heat pump in typical residence. Note: the program savings are based on a mix of homes with different primary heating systems: electric furnace, wood, heat pump, and other non-electric heat. Plus gas furnace.</p> <p>HVAC loads for a typical heat pump home reduced by <b>4,495 kWh</b>. Savings estimate is a weighted average based on measure packages and baseline HVAC consumption of the different participation categories. Weighted gas savings of <b>59 therms</b>.</p>
<p><b>Lifetime of savings</b>  <b>Discount rate for TRC and RIM</b>  <b>Generation Capacity Cost -PJM Market,</b>                      100% summer <b>\$36.50</b> per kW-year in 2022  <b>Avoided Electricity Energy Costs - PJM</b>                      Market, AEP-Dayton hub, <b>\$30.31 /MWh</b> in 2022  <b>Transmission Capacity Cost - OATT tariff</b>  <b>\$ 24.31 per kW-year in 2022</b>  <b>Avoided Gas Commodity Costs - \$2.87</b>                      per Mcf in 2022  <b>Participant Costs \$ 867</b></p>	<p><b>15</b> years  <b>5</b> percent per Ann Bridges, 3/14/21; 3.5 % societal test from Mercatus Center report  <b>PJM capacity performance market March 2021, start year is 2022. Updated escalators to match.</b> 100% allocation to summer                      based on March 3, 2021 ACES Forward prices for AEP_Dayton hub. <b>\$30.31 /MWh</b> in 2021. DSMore <b>Scenario 2, 1.193 esc in 2022</b>                      Network rate, 2020-21. 2.3 % escalation rate. Applied to winter coincident peak.                      DSMore scenario <b>2</b>. Based on Aces Henry Hub 3/2021 forecast .                      This is the Kentucky Housing share of measure costs, modeled to calculate a true TRC</p>
<p><b>Administrative Cost</b>                      EK <b>\$21,250</b> fixed annual (2022-2036) 2% esc.                       Co-op <b>\$2,106</b> per new participant</p>	<p>0.1 FTE for implementation admin, plus M&amp;V. escalated at 2% to 2022                       This includes the rebate to the CAA (avg will be \$2,000) but since it does not go to the consumer it is treated as a program cost. Plus coop admin cost (\$106 per participant).</p>
<p><b>Rate Schedule - Retail</b>                      Median Residential Rate for Co-ops                      Cust chrg <b>\$15.00</b>, Energy Rate <b>\$0.08532</b>  <b>Rate Schedule - Wholesale</b>                      East Kentucky E-2 rate.  <b>Natural gas delivery rate</b> is <b>\$ 5.578</b> per Mcf in 2018 (<b>\$0.578</b> per ccf for DSMore units)</p>	<p>Current rates in effect as of February, 2020                       Current rates in effect as of February, 2020                      Current rates as of August 2021. From Columbia Gas of KY GSR rate. Sum of base rate charge and gas cost demand. DSMore adds in the commodity portion using the market forecast.</p>
<p><b>Participation - 2022-2036: 375. 0%</b>                      Free Riders</p>	<p>Based on budget allocation for \$ 3 million base case</p>
<p><b>Rebates</b>                      Co-op to Participant <b>\$0</b>                      EK to Co-op <b>\$2,670</b></p>	<p>Direct installation program - no participant out of pocket costs                      100% reimbursement of program costs plus 5 years net lost revenue</p>

**DSM for 2022 IRP**

ENERGY STAR® Manufactured Home

**15 years of participation** Year 1 is 2022 All Electric manufactured home built to ENERGY STAR® standards with a SEER 14 ASHP

**Assumption**

**Source**

<b>Load Impacts</b> Before Participant 17,194 kWh, 9.58 kW (coincident with winter system peak), 3.06 kW (summer)  Savings = 4,060 kWh. 0.93 (Winter), 0.47 (summer) After Participant 13,134 kWh, 8.65 kW (coincident with winter system peak), 2.59 kW (summer)	Heating & cooling electricity loads for a standard efficiency manufactured home with an electric furnace  Heating & Cooling loads for a Manufactured home built to ENERGY STAR® standards with a SEER 14 ASHP . kWh and kW savings based on GDS assumptions as adjusted for Josh model run
<b>Lifetime of savings</b> <b>Discount rate for TRC and RIM</b> <b>Generation Capacity Cost -PJM Market,</b> 100% summer <b>\$36.50</b> per kW-year in 2022 <b>Avoided Electricity Energy Costs - PJM</b> Market, AEP-Dayton hub, <b>\$30.31 /MWh</b> in 2022 <b>Transmission Capacity Cost - OATT tariff</b> <b>\$ 24.31 per kW-year in 2022</b> <b>Participant Costs \$ 1,150</b>	<b>15</b> Years - TVA assumption <b>5</b> percent per Ann Bridges, 3/14/21; 3.5 % societal test from Mercatus Center report <b>PJM capacity performance market March 2021, start year is 2022. Updated escalators to match.</b> 100% allocation to summer based on March 3, 2021 ACES Forward prices for AEP_Dayton hub. <b>\$30.31 /MWh</b> in 2021. DSMore <b>Scenario 2, 1.193 esc in 2022</b> Network rate, 2020-21. 2.3 % escalation rate. Applied to winter coincident peak. Price premium for ENERGY STAR® Manufactured Home upgrades. \$750 for heat pump and \$400 for building shell upgrades.
<b>Administrative Cost</b> EK <b>\$10,600</b> fixed annual, plus <b>\$160</b> per home  Co-op <b>\$50</b> per new participant	Fixed annual allocated administrative costs (\$3,000) plus M&V (\$7,000). Escalation 2019-2022  \$50 for rebate processing and tracking
<b>Rate Schedule - Retail</b> Median Residential Rate for Co-ops Cust chrg <b>\$15.00</b> , Energy Rate <b>\$.08532</b> <b>Rate Schedule - Wholesale</b> East Kentucky E-2 rate.	Current rates in effect as of February, 2020  Current rates in effect as of February, 2020
<b>Participation -2022-2036: 50. 0%</b> Free Riders projected.	Based on DSM budget for 2022 IRP base case. No free riders because of nature of program
<b>Rebates</b> Co-op to Participant <b>\$1,150</b> per home  EK to Co-op <b>\$ 2,050</b>	Incentive to owner-member who purchases the home. Reimbursement for incentive, 100% of coop admin, plus 10 years estimated net lost revenue (adjusted for lower savings estimate).

To help transform the residential lighting market by facilitating a shift in consumer preferences from market baseline efficiency to higher efficiency lighting products.

**15 years of participation Year 1 is 2022**

<u>Assumption</u>	<u>Source</u>
<b>Load Impacts</b> Before Participant 74 kWh, 0.02 kW (coincident with winter system peak), 0.008 kW summer  savings: <b>63 kWh</b> (gross savings) <b>0.012</b> winter kW, <b>0.007</b> summer kW After Participant 11 kWh, 0.008 kW (coincident with winter system peak), 0.001 kW summer	10 EISA compliant light bulbs.   10 LED light bulbs providing equivalent lumens. Savings based on GDS 2021 potential study. These are gross savings (before free riders)
<b>Lifetime of savings</b> <b>Discount rate for TRC and RIM</b> <b>Generation Capacity Cost -PJM Market,</b> 100% summer <b>\$36.50</b> per kW-year in 2022 <b>Avoided Electricity Energy Costs - PJM</b> Market, AEP-Dayton hub, <b>\$30.31 /MWh</b> in 2022 <b>Transmission Capacity Cost - OATT tariff</b> <b>\$ 24.31 per kW-year in 2022</b> <b>Participant Costs \$ 9.10</b>	<b>15</b> Years. GDS 2021 Potential study <b>5</b> percent per Ann Bridges, 3/14/21; 3.5 % societal test from Mercatus Center report  <b>PJM capacity performance market March 2021, start year is 2022. Updated escalators to match.</b> 100% allocation to summer  based on March 3, 2021 ACES Forward prices for AEP_Dayton hub. <b>\$30.31 /MWh</b> in 2021. DSMore <b>Scenario 2, 1.193 esc in 2022</b>  Network rate, 2020-21. 2.3 % escalation rate. Applied to winter coincident peak. Price premium to purchase the package of LEDs versus EISA compliant light bulbs. Based on GDS 2021 potential study
<b>Administrative Cost</b> EK \$ <b>5,300</b> fixed annual (2022-2036)  Co-op \$0 per new participant	Based on 5 year workplan  EKPC pays for all program costs
<b>Rate Schedule - Retail</b> Median Residential Rate for Co-ops Cust chrg <b>\$15.00</b> , Energy Rate <b>\$.08532</b> <b>Rate Schedule - Wholesale</b> East Kentucky E-2 rate.	Current rates in effect as of February, 2020  Current rates in effect as of February, 2020
<b>Participation - 2022-2036: 5000.</b> Unit is ten(10) light bulbs for ease of modeling. <b>20%</b> free riders	Based on DSM 2022 IRP base case budget. Free rider estimate is from review of several studies.
<b>Rebates</b> Co-op to Participant <b>\$9</b> EK to Co-op <b>\$9</b>	Pass through to customer Rebate paid by EKPC

**2022 IRP**

**with updated costs**

**15 years of participation Year 1 is 2022**

Direct Load Control Program-Residential Air Conditioners - **"Bring your own thermostat"**

Reduce peak demand and energy usage through smart thermostat control

<b>Assumption</b>	<b>Source</b>
<b>Load Impacts</b>  Air Conditioner savings <b>36 kWh, 0.00 kW</b> (coincident with winter system peak), <b>1.2 kW</b> (summer)	Based on other utility M&V data for tstat DLC- Vectren Energy Delivery of Indiana 2018 evaluation report
<b>Lifetime of savings 15 Years.</b> <b>Discount rate for TRC and RIM</b> <b>Generation Capacity Cost -PJM Market,</b> 100% summer <b>\$36.50</b> per kW-year in 2022	Effective life given program history of the need for changeouts. <b>5</b> percent per Ann Bridges, 3/14/21; 3.5 % societal test from Mercatus Center report <b>PJM capacity performance market March 2021, start year is 2022. Updated escalators to match.</b> 100% allocation to summer
<b>Avoided Electricity Energy Costs - PJM</b> Market, AEP-Dayton hub, <b>\$30.31 /MWh</b> in 2022	based on March 3, 2021 ACES Forward prices for AEP_Dayton hub. <b>\$30.31 /MWh</b> in 2021. DSMore <b>Scenario 2, 1.193 esc in 2022</b>
<b>Transmission Capacity Cost - OATT tariff</b> <b>\$ 29.27</b> per kW-year in 2022	Network rate, 2020-21. 2.3 % escalation rate. Applied to average of 12 months CPs
<b>Participant Costs \$ 100</b>	Install cost for wifi-enabled thermostat
<b>Administrative Cost</b>  <b>EK \$115,000 per year fixed fees to vendors; \$38 per thermostat per year device fee to EnergyHub; plus \$10k per year fixed annual EKPC admin. escalates at 2% per year.</b>  Co-op \$0 per new participant	Vendor annual fixed fees include \$100,000 per year to EnergyHub and \$15,000 per year to ecobee. EKPC fixed annual administrative costs include program oversight, and M&V.
<b>Rate Schedule - Retail</b> Median Residential Rate for Co-ops Cust chrg <b>\$15.00</b> , Energy Rate <b>\$.08532</b> <b>Rate Schedule - Wholesale</b> East Kentucky E-2 rate.	Current rates in effect as of February, 2020  Current rates in effect as of February, 2020
<b>New Participation - 2022-2036: 2,000 new per year.</b>	projections based on 2020 results
<b>Rebates</b>  Co-op to Participant: <b>one time incentive of \$110 per new thermostat; annual incentive of \$20 per thermostat, 2% escalation rate</b>  EKPC to Co-op: <b>one time incentive of \$110 per new thermostat; annual incentive of \$20 per thermostat, 2% escalation rate</b>	Per tariff. One time incentive includes coverage (\$100) for cost of thermostat plus a sign on bonus (\$10).  Per tariff

**DSM for 2022 IRP**

Touchstone Energy Home program

15 years of participation; Year 1 is 2022

Encourages new homes to be built to higher standards for thermal integrity and equipment efficiency and high efficient heat pump systems. Measures include air sealing and insulation equivalent to 2009 IECC standards, with specific focus on completing the Thermal Bypass Checklist. **HERS <=75 (30% savings)**

<u>Assumption</u>	<u>Source</u>
<b>Load Impacts</b> Before Participant 10,574 kWh, 8.69 kW (coincident with winter system peak), 2.35 kW (summer)  Savings = <b>3,172 kWh</b> <b>2.94 kW</b> (winter), <b>0.7 kW</b> summer  After Participant 7,402 kWh, 5.75 kW (coincident with winter system peak), 1.65 kW (summer)	<b>Typical practice</b> heat pump: SEER 13, HSPF 7.7, 1700 square foot home, built to 2006 IECC standards. Standard electric hot water heater (2007 update to kWh).  Efficient air source heat pump: SEER 14.5, HSPF 8.2, 1700 square foot home, built to Touchstone Energy Home standards, with continuous insulation, R-38 in attic, air barrier, sealed duct work, and completed thermal bypass checklist. Efficient electric hot water heater. Peak savings come from DSMgr load profile
<b>Lifetime of savings</b> <b>Discount rate for TRC and RIM</b> <b>Generation Capacity Cost -PJM Market,</b> 100% summer <b>\$36.50</b> per kW-year in 2022 <b>Avoided Electricity Energy Costs - PJM</b> Market, AEP-Dayton hub, <b>\$30.31 /MWh</b> in 2022 <b>Transmission Capacity Cost - OATT tariff</b> <b>\$ 24.31</b> per kW-year in 2022 <b>Participant Costs \$1,522</b>	<b>20</b> Years <b>5</b> percent per Ann Bridges, 3/14/21; 3.5 % societal test from Mercatus Center report <b>PJM capacity performance market March 2021, start year is 2022. Updated escalators to match.</b> 100% allocation to summer based on March 3, 2021 ACES Forward prices for AEP_Dayton hub. <b>\$30.31 /MWh</b> in 2021. DSMore <b>Scenario 2, 1.193 esc in 2022</b> Network rate, 2020-21. 2.3 % escalation rate. Applied to winter coincident peak. Includes (1) costs associated with bringing standard built Kentucky home to enhanced Touchstone Energy standards (2009 IECC); (2) savings from equipment resizing (1/2 ton reduction); (3) incremental cost of an efficient water heater. KY tax credit no longer applied because of inability for builders to claim given legal structure (per Josh, Sept 2011). Costs come from GDS 2018 Potential study.
<b>Administrative Cost</b> EK <b>\$5,300</b> fixed annual 2% esc  Co-op <b>\$ 455</b> per new participant	Includes direct program administration only. From 5 year workplan. Escalation factor 2019-2022  Costs of rating and inspection. Based on typical hours and labor rates. Escalation factor 2019 - 2022
<b>Rate Schedule - Retail</b> Median Residential Rate for Co-ops Cust chrg <b>\$15.00</b> , Energy Rate <b>\$.08532</b> <b>Rate Schedule - Wholesale</b> East Kentucky E-2 rate.	Current rates in effect as of February, 2020  Current rates in effect as of February, 2020
<b>Participation - 2022-2036: 340.5% Free Riders</b>	Based on 2022 IRP base case budget . Free riders based on Frontier Assoc study for LG&E/KU
<b>Rebates</b>  Co-op to Participant <b>\$ 750</b> EK to Co-op <b>\$ 1,450</b>	<b>recommended incentive according to tariff. Customer also receives free ENERGY STAR® rating (\$500 value).</b> <b>Reimburse for rebate, 50% of admin costs, plus compensation for net lost revenues.</b>

# Exhibit DSM-4

## Summary Sheets for DSM Programs

**Residential Energy Audit Program: On-Line. 2022 IRP, 15 years of participation. Updated costs**

<u>Distribution System Benefits</u>		<u>Distribution System Costs</u>	
Power Bill Declines	\$ 952,149	Revenue Declines	(\$1,284,392)
Rebates From EK	\$0	Administrative Costs	\$0
		Rebates Paid To Consumers	\$0
<b>Total Benefits</b>	<b>\$952,149</b>	<b>Total Costs</b>	<b>(\$1,284,392)</b>
<b>Benefit / Cost Ratio: 0.74</b>			

<u>Participant Benefits</u>		<u>Participant Costs</u>	
Electric Bill Declines	\$730,372	Up Front Investment	(\$241,864)
Rebates From Distribution System	\$ -		
Reductions in O&M costs	\$0		
<b>Total Benefits</b>	<b>\$730,372</b>	<b>Total Costs</b>	<b>(\$241,864)</b>
<b>Benefit / Cost Ratio: 3.02</b>			

<u>Total Resource Benefits</u>		<u>Total Resource Costs</u>	
Avoided Energy Costs	\$533,049	Up Front Customer Investment	(\$370,245)
Avoided Gen Capacity Costs	\$248,622	Distribution System Admin. Costs	\$0
Avoided Transmission Expense	\$124,454	EK Administrative Costs	(\$1,641,420)
Reduced Customer O&M costs	\$0		
<b>Total Benefits</b>	<b>\$906,126</b>	<b>Total Costs</b>	<b>(\$2,011,665)</b>
<b>Benefit / Cost Ratio: 0.45</b>			

<u>EK Benefits</u>		<u>EK Costs</u>	
Avoided Energy Costs	\$533,049	Decrease In Revenue	(\$952,149)
Avoided Gen Capacity Costs	\$248,622	Rebates Paid	\$0
Avoided Transmission Expense	\$124,454	Administrative Costs	(\$1,641,420)
<b>Total Benefits</b>	<b>\$906,126</b>	<b>Total Costs</b>	<b>(\$2,593,568)</b>
<b>Benefit / Cost Ratio: 0.35</b>			

<u>Societal Benefits</u>		<u>Societal Costs</u>	
Avoided Energy Costs	\$604,834	Up Front Customer Investment	(\$407,094)
Avoided Gen Capacity Costs	\$282,693	Utility Admin Costs	(\$1,804,784)
Avoided Transmission Expense	\$140,870		
Environmental Externalities	\$0		
<b>Total Benefits</b>	<b>\$1,028,397</b>	<b>Total Costs</b>	<b>(\$2,211,878)</b>
<b>Benefit / Cost Ratio: 0.46</b>			

Combined RIM:			
Benefits:	\$906,126	Costs:	(\$2,925,812)
<b>Benefit / Cost Ratio: 0.31</b>			

## Button Up Weatherization program for 2022 IRP: 15 years of participation

Distribution System Benefits		Distribution System Costs	
Power Bill Declines	\$ 8,037,095	Revenue Declines	(\$9,645,229)
Rebates From EK	\$3,455,620	Administrative Costs	(\$1,091,976)
		Rebates Paid To Consumers	(\$1,762,366)
<b>Total Benefits</b>	<b>\$11,492,715</b>	<b>Total Costs</b>	<b>(\$12,499,571)</b>
<b>Benefit / Cost Ratio: 0.92</b>			

Participant Benefits		Participant Costs	
Electric Bill Declines	\$4,069,672	Up Front Investment	(\$3,162,608)
Rebates From Distribution System	\$ 1,151,271		
Reductions in O&M costs	\$0		
<b>Total Benefits</b>	<b>\$5,220,943</b>	<b>Total Costs</b>	<b>(\$3,162,608)</b>
<b>Benefit / Cost Ratio: 1.65</b>			

Total Resource Benefits		Total Resource Costs	
Avoided Energy Costs	\$4,849,388	Up Front Customer Investment	(\$4,357,192)
Avoided Gen Capacity Costs	\$2,118,078	Distribution System Admin. Costs	(\$1,091,976)
Avoided Transmission Expense	\$2,284,231	EK Administrative Costs	(\$66,644)
Reduced Customer O&M costs	\$0		
<b>Total Benefits</b>	<b>\$9,251,697</b>	<b>Total Costs</b>	<b>(\$5,515,812)</b>
<b>Benefit / Cost Ratio: 1.68</b>			

EK Benefits		EK Costs	
Avoided Energy Costs	\$4,849,388	Decrease In Revenue	(\$8,037,095)
Avoided Gen Capacity Costs	\$2,118,078	Rebates Paid	(\$3,455,620)
Avoided Transmission Expense	\$2,284,231	Administrative Costs	(\$66,644)
<b>Total Benefits</b>	<b>\$9,251,697</b>	<b>Total Costs</b>	<b>(\$11,559,360)</b>
<b>Benefit / Cost Ratio: 0.80</b>			

Societal Benefits		Societal Costs	
Avoided Energy Costs	\$6,217,477	Up Front Customer Investment	(\$4,790,846)
Avoided Gen Capacity Costs	\$2,668,252	Utility Admin Costs	(\$1,273,933)
Avoided Transmission Expense	\$2,854,563		
Environmental Externalities	\$0		
<b>Total Benefits</b>	<b>\$11,740,292</b>	<b>Total Costs</b>	<b>(\$6,064,779)</b>
<b>Benefit / Cost Ratio: 1.94</b>			

<b>Combined RIM:</b>			
Benefits:	\$9,251,697	Costs:	(\$12,566,215)
<b>Benefit / Cost Ratio: 0.74</b>			

## Heat Pump Retrofit program - SEER 14 for 2022 IRP

Distribution System Benefits		Distribution System Costs	
Power Bill Declines	\$ 26,271,684	Revenue Declines	(\$38,386,841)
Rebates From EK	\$6,275,653	Administrative Costs	(\$814,539)
		Rebates Paid To Consumers	(\$1,851,225)
<b>Total Benefits</b>	<b>\$32,547,338</b>	<b>Total Costs</b>	<b>(\$41,052,605)</b>
<b>Benefit / Cost Ratio: 0.79</b>			

Participant Benefits		Participant Costs	
Electric Bill Declines	\$14,577,121	Up Front Investment	(\$6,404,548)
Rebates From Distribution System	\$ 1,209,318		
Reductions in O&M costs	\$0		
<b>Total Benefits</b>	<b>\$15,786,439</b>	<b>Total Costs</b>	<b>(\$6,404,548)</b>
<b>Benefit / Cost Ratio: 2.46</b>			

Total Resource Benefits		Total Resource Costs	
Avoided Energy Costs	\$15,927,304	Up Front Customer Investment	(\$9,804,088)
Avoided Gen Capacity Costs	\$1,522,453	Distribution System Admin. Costs	(\$814,539)
Avoided Transmission Expense	\$0	EK Administrative Costs	(\$65,410)
Reduced Customer O&M costs	\$0		
<b>Total Benefits</b>	<b>\$17,449,757</b>	<b>Total Costs</b>	<b>(\$10,684,038)</b>
<b>Benefit / Cost Ratio: 1.63</b>			

EK Benefits		EK Costs	
Avoided Energy Costs	\$15,927,304	Decrease In Revenue	(\$26,271,684)
Avoided Gen Capacity Costs	\$1,522,453	Rebates Paid	(\$6,275,653)
Avoided Transmission Expense	\$0	Administrative Costs	(\$65,410)
<b>Total Benefits</b>	<b>\$17,449,757</b>	<b>Total Costs</b>	<b>(\$32,612,748)</b>
<b>Benefit / Cost Ratio: 0.54</b>			

Societal Benefits		Societal Costs	
Avoided Energy Costs	\$20,420,649	Up Front Customer Investment	(\$10,779,852)
Avoided Gen Capacity Costs	\$1,917,912	Utility Admin Costs	(\$967,527)
Avoided Transmission Expense	\$0		
Environmental Externalities	\$0		
<b>Total Benefits</b>	<b>\$22,338,560</b>	<b>Total Costs</b>	<b>(\$11,747,379)</b>
<b>Benefit / Cost Ratio: 1.90</b>			

Combined RIM:			
Benefits:	\$17,449,757	Costs:	(\$41,118,015)
<b>Benefit / Cost Ratio: 0.42</b>			

## Heat Pump Retrofit Program - SEER 15 for 2022 IRP. 15 years of participation

Distribution System Benefits		Distribution System Costs	
Power Bill Declines	\$ 14,022,701	Revenue Declines	(\$20,329,940)
Rebates From EK	\$3,685,789	Administrative Costs	(\$407,270)
		Rebates Paid To Consumers	(\$1,388,419)
<b>Total Benefits</b>	<b>\$17,708,491</b>	<b>Total Costs</b>	<b>(\$22,125,628)</b>
<b>Benefit / Cost Ratio: 0.80</b>			

Participant Benefits		Participant Costs	
Electric Bill Declines	\$7,720,145	Up Front Investment	(\$3,699,304)
Rebates From Distribution System	\$ 906,988		
Reductions in O&M costs	\$0		
<b>Total Benefits</b>	<b>\$8,627,134</b>	<b>Total Costs</b>	<b>(\$3,699,304)</b>
<b>Benefit / Cost Ratio: 2.33</b>			

Total Resource Benefits		Total Resource Costs	
Avoided Energy Costs	\$8,435,212	Up Front Customer Investment	(\$5,662,898)
Avoided Gen Capacity Costs	\$1,070,475	Distribution System Admin. Costs	(\$407,270)
Avoided Transmission Expense	\$0	EK Administrative Costs	(\$65,410)
Reduced Customer O&M costs	\$0		
<b>Total Benefits</b>	<b>\$9,505,686</b>	<b>Total Costs</b>	<b>(\$6,135,577)</b>
<b>Benefit / Cost Ratio: 1.55</b>			

EK Benefits		EK Costs	
Avoided Energy Costs	\$8,435,212	Decrease In Revenue	(\$14,022,701)
Avoided Gen Capacity Costs	\$1,070,475	Rebates Paid	(\$3,685,789)
Avoided Transmission Expense	\$0	Administrative Costs	(\$65,410)
<b>Total Benefits</b>	<b>\$9,505,686</b>	<b>Total Costs</b>	<b>(\$17,773,901)</b>
<b>Benefit / Cost Ratio: 0.53</b>			

Societal Benefits		Societal Costs	
Avoided Energy Costs	\$10,814,919	Up Front Customer Investment	(\$6,226,504)
Avoided Gen Capacity Costs	\$1,348,532	Utility Admin Costs	(\$519,723)
Avoided Transmission Expense	\$0		
Environmental Externalities	\$0		
<b>Total Benefits</b>	<b>\$12,163,450</b>	<b>Total Costs</b>	<b>(\$6,746,228)</b>
<b>Benefit / Cost Ratio: 1.80</b>			

Combined RIM:			
Benefits:	\$9,505,686	Costs:	(\$22,191,038)
<b>Benefit / Cost Ratio: 0.43</b>			

**CARES program (Low income) for 2022 IRP: 15 years participation**

<b>Distribution System Benefits</b>		<b>Distribution System Costs</b>	
Power Bill Declines	\$ 17,011,193	Revenue Declines	(\$22,997,088)
Rebates From EK	\$12,356,928	Administrative Costs	(\$9,746,701)
		Rebates Paid To Consumers	\$0
<b>Total Benefits</b>	<b>\$29,368,121</b>	<b>Total Costs</b>	<b>(\$32,743,788)</b>
<b>Benefit / Cost Ratio: 0.90</b>			

<b>Participant Benefits</b>		<b>Participant Costs</b>	
Electric Bill Declines	\$9,802,796	Up Front Investment	(\$2,621,197)
Rebates From Distribution System	\$ -		
Reductions in Gas bill	\$1,160,089		
<b>Total Benefits</b>	<b>\$10,962,885</b>	<b>Total Costs</b>	<b>(\$2,621,197)</b>
<b>Benefit / Cost Ratio: 4.18</b>			

<b>Total Resource Benefits</b>		<b>Total Resource Costs</b>	
Avoided Energy Costs	\$9,737,687	Up Front Customer Investment	(\$4,012,531)
Avoided Gen Capacity Costs	\$3,065,896	Distribution System Admin. Costs	(\$9,746,701)
Avoided Transmission Expense	\$2,061,614	EK Administrative Costs	(\$262,257)
Reduced Nat Gas Costs	\$1,194,361		
<b>Total Benefits</b>	<b>\$16,059,558</b>	<b>Total Costs</b>	<b>(\$14,021,488)</b>
<b>Benefit / Cost Ratio: 1.15</b>			

<b>EK Benefits</b>		<b>EK Costs</b>	
Avoided Energy Costs	\$9,737,687	Decrease In Revenue	(\$17,011,193)
Avoided Gen Capacity Costs	\$3,065,896	Rebates Paid	(\$12,356,928)
Avoided Transmission Expense	\$2,061,614	Administrative Costs	(\$262,257)
<b>Total Benefits</b>	<b>\$14,865,197</b>	<b>Total Costs</b>	<b>(\$29,630,378)</b>
<b>Benefit / Cost Ratio: 0.50</b>			

<b>Societal Benefits</b>		<b>Societal Costs</b>	
Avoided Energy Costs	\$12,012,363	Up Front Customer Investment	(\$4,411,882)
Avoided Gen Capacity Costs	\$3,738,493	Utility Admin Costs	(\$11,005,110)
Avoided Transmission Expense	\$2,495,959		
Environmental Externalities	\$0		
Reduced Gas Costs	\$ 1,466,075		
<b>Total Benefits</b>	<b>\$19,712,890</b>	<b>Total Costs</b>	<b>(\$15,416,993)</b>
<b>Benefit / Cost Ratio: 1.28</b>			

Combined RIM:			
Benefits:	\$14,865,197	Costs:	(\$33,006,045)
<b>Benefit / Cost Ratio: 0.45</b>			

**ENERGY STAR® Manufactured Home Program for 2022 IRP: 15 years of participation**

<b>Distribution System Benefits</b>		<b>Distribution System Costs</b>	
Power Bill Declines	\$ 1,899,271	Revenue Declines	(\$2,769,520)
Rebates From EK	\$1,265,004	Administrative Costs	(\$30,854)
		Rebates Paid To Consumers	(\$709,636)
<b>Total Benefits</b>	<b>\$3,164,275</b>	<b>Total Costs</b>	<b>(\$3,510,010)</b>
<b>Benefit / Cost Ratio: 0.90</b>			

<b>Participant Benefits</b>		<b>Participant Costs</b>	
Electric Bill Declines	\$1,180,543	Up Front Investment	(\$463,572)
Rebates From Distribution System	\$ 463,572		
Reductions in O&M costs	\$0		
<b>Total Benefits</b>	<b>\$1,644,115</b>	<b>Total Costs</b>	<b>(\$463,572)</b>
<b>Benefit / Cost Ratio: 3.55</b>			

<b>Total Resource Benefits</b>		<b>Total Resource Costs</b>	
Avoided Energy Costs	\$1,091,526	Up Front Customer Investment	(\$709,636)
Avoided Gen Capacity Costs	\$291,105	Distribution System Admin. Costs	(\$30,854)
Avoided Transmission Expense	\$193,034	EK Administrative Costs	(\$229,552)
Reduced Customer O&M costs	\$0		
<b>Total Benefits</b>	<b>\$1,575,665</b>	<b>Total Costs</b>	<b>(\$970,042)</b>
<b>Benefit / Cost Ratio: 1.62</b>			

<b>EK Benefits</b>		<b>EK Costs</b>	
Avoided Energy Costs	\$1,091,526	Decrease In Revenue	(\$1,899,271)
Avoided Gen Capacity Costs	\$291,105	Rebates Paid	(\$1,265,004)
Avoided Transmission Expense	\$193,034	Administrative Costs	(\$229,552)
<b>Total Benefits</b>	<b>\$1,575,665</b>	<b>Total Costs</b>	<b>(\$3,393,827)</b>
<b>Benefit / Cost Ratio: 0.46</b>			

<b>Societal Benefits</b>		<b>Societal Costs</b>	
Avoided Energy Costs	\$1,346,501	Up Front Customer Investment	(\$780,264)
Avoided Gen Capacity Costs	\$354,968	Utility Admin Costs	(\$286,323)
Avoided Transmission Expense	\$233,703		
Environmental Externalities	\$0		
<b>Total Benefits</b>	<b>\$1,935,172</b>	<b>Total Costs</b>	<b>(\$1,066,587)</b>
<b>Benefit / Cost Ratio: 1.81</b>			

Combined RIM:			
Benefits:	\$1,575,665	Costs:	(\$3,739,562)
<b>Benefit / Cost Ratio: 0.42</b>			

## Residential Efficient Lighting for 2022 IRP; 15 years of participation

Distribution System Benefits		Distribution System Costs	
Power Bill Declines	\$ 2,284,366	Revenue Declines	(\$3,438,025)
Rebates From EK	\$555,368	Administrative Costs	\$0
		Rebates Paid To Consumers	(\$555,368)
<b>Total Benefits</b>	<b>\$2,839,734</b>	<b>Total Costs</b>	<b>(\$3,993,393)</b>
<b>Benefit / Cost Ratio: 0.71</b>			

Participant Benefits		Participant Costs	
Electric Bill Declines	\$1,831,877	Up Front Investment	(\$366,826)
Rebates From Distribution System	\$ 362,795		
Reductions in O&M costs	\$0		
<b>Total Benefits</b>	<b>\$2,194,672</b>	<b>Total Costs</b>	<b>(\$366,826)</b>
<b>Benefit / Cost Ratio: 5.98</b>			

Total Resource Benefits		Total Resource Costs	
Avoided Energy Costs	\$1,519,713	Up Front Customer Investment	(\$449,231)
Avoided Gen Capacity Costs	\$343,380	Distribution System Admin. Costs	\$0
Avoided Transmission Expense	\$156,918	EK Administrative Costs	(\$65,410)
Reduced Customer O&M costs	\$0		
<b>Total Benefits</b>	<b>\$2,020,012</b>	<b>Total Costs</b>	<b>(\$514,641)</b>
<b>Benefit / Cost Ratio: 3.93</b>			

EK Benefits		EK Costs	
Avoided Energy Costs	\$1,519,713	Decrease In Revenue	(\$2,284,366)
Avoided Gen Capacity Costs	\$343,380	Rebates Paid	(\$555,368)
Avoided Transmission Expense	\$156,918	Administrative Costs	(\$65,410)
<b>Total Benefits</b>	<b>\$2,020,012</b>	<b>Total Costs</b>	<b>(\$2,905,144)</b>
<b>Benefit / Cost Ratio: 0.70</b>			

Societal Benefits		Societal Costs	
Avoided Energy Costs	\$1,874,711	Up Front Customer Investment	(\$493,941)
Avoided Gen Capacity Costs	\$418,711	Utility Admin Costs	(\$71,920)
Avoided Transmission Expense	\$189,978		
Environmental Externalities	\$0		
<b>Total Benefits</b>	<b>\$2,483,400</b>	<b>Total Costs</b>	<b>(\$565,861)</b>
<b>Benefit / Cost Ratio: 4.39</b>			

Combined RIM:			
Benefits:	\$2,020,012	Costs:	(\$4,058,803)
<b>Benefit / Cost Ratio: 0.50</b>			

**Direct Load Control- Residential: Air Conditioners - Bring Your Own Thermostat. For  
2022 IRP. 15 years of participation. Updated costs**

<b>Distribution System Benefits</b>		<b>Distribution System Costs</b>	
Power Bill Declines	\$ 10,723,078	Revenue Declines	(\$982,293)
Rebates From EK	\$8,972,995	Administrative Costs	\$0
		Rebates Paid To Consumers	(\$8,972,995)
<b>Total Benefits</b>	<b>\$19,696,073</b>	<b>Total Costs</b>	<b>(\$9,955,288)</b>
<b>Benefit / Cost Ratio: 1.98</b>			

<b>Participant Benefits</b>		<b>Participant Costs</b>	
Electric Bill Declines	\$418,715	Up Front Investment	(\$1,612,424)
Rebates From Distribution System	\$ 4,396,461		
Reductions in O&M costs	\$0		
<b>Total Benefits</b>	<b>\$4,815,175</b>	<b>Total Costs</b>	<b>(\$1,612,424)</b>
<b>Benefit / Cost Ratio: 2.99</b>			

<b>Total Resource Benefits</b>		<b>Total Resource Costs</b>	
Avoided Energy Costs	\$905,796	Up Front Customer Investment	(\$2,468,300)
Avoided Gen Capacity Costs	\$29,729,901	Distribution System Admin. Costs	\$0
Avoided Transmission Expense	\$3,998,606	EK Administrative Costs	(\$13,473,350)
Reduced Customer O&M costs	\$0		
<b>Total Benefits</b>	<b>\$34,634,303</b>	<b>Total Costs</b>	<b>(\$15,941,651)</b>
<b>Benefit / Cost Ratio: 2.17</b>			

<b>EK Benefits</b>		<b>EK Costs</b>	
Avoided Energy Costs	\$905,796	Decrease In Revenue	(\$10,723,078)
Avoided Gen Capacity Costs	\$29,729,901	Rebates Paid	(\$8,972,995)
Avoided Transmission Expense	\$3,998,606	Administrative Costs	(\$13,473,350)
<b>Total Benefits</b>	<b>\$34,634,303</b>	<b>Total Costs</b>	<b>(\$33,169,423)</b>
<b>Benefit / Cost Ratio: 1.04</b>			

<b>Societal Benefits</b>		<b>Societal Costs</b>	
Avoided Energy Costs	\$1,117,385	Up Front Customer Investment	(\$2,713,961)
Avoided Gen Capacity Costs	\$36,252,050	Utility Admin Costs	(\$17,418,611)
Avoided Transmission Expense	\$4,841,040		
Environmental Externalities	\$0		
<b>Total Benefits</b>	<b>\$42,210,475</b>	<b>Total Costs</b>	<b>(\$20,132,572)</b>
<b>Benefit / Cost Ratio: 2.10</b>			

Combined RIM:			
Benefits:	\$34,634,303	Costs:	(\$23,428,638)
<b>Benefit / Cost Ratio: 1.48</b>			

## Touchstone Energy Home program for 2022 IRP: 15 years of participation

Distribution System Benefits		Distribution System Costs	
Power Bill Declines	\$ 14,943,702	Revenue Declines	(\$17,405,500)
Rebates From EK	\$6,084,360	Administrative Costs	(\$1,909,230)
		Rebates Paid To Consumers	(\$3,147,083)
<b>Total Benefits</b>	<b>\$21,028,062</b>	<b>Total Costs</b>	<b>(\$22,461,813)</b>
<b>Benefit / Cost Ratio: 0.94</b>			

Participant Benefits		Participant Costs	
Electric Bill Declines	\$6,957,485	Up Front Investment	(\$4,171,986)
Rebates From Distribution System	\$ 2,055,840		
Reductions in O&M costs	\$0		
<b>Total Benefits</b>	<b>\$9,013,326</b>	<b>Total Costs</b>	<b>(\$4,171,986)</b>
<b>Benefit / Cost Ratio: 2.16</b>			

Total Resource Benefits		Total Resource Costs	
Avoided Energy Costs	\$8,344,299	Up Front Customer Investment	(\$6,067,156)
Avoided Gen Capacity Costs	\$3,585,694	Distribution System Admin. Costs	(\$1,909,230)
Avoided Transmission Expense	\$4,940,393	EK Administrative Costs	(\$65,410)
Reduced Customer O&M costs	\$0		
<b>Total Benefits</b>	<b>\$16,870,385</b>	<b>Total Costs</b>	<b>(\$8,041,796)</b>
<b>Benefit / Cost Ratio: 2.10</b>			

EK Benefits		EK Costs	
Avoided Energy Costs	\$8,344,299	Decrease In Revenue	(\$14,943,702)
Avoided Gen Capacity Costs	\$3,585,694	Rebates Paid	(\$6,084,360)
Avoided Transmission Expense	\$4,940,393	Administrative Costs	(\$65,410)
<b>Total Benefits</b>	<b>\$16,870,385</b>	<b>Total Costs</b>	<b>(\$21,093,472)</b>
<b>Benefit / Cost Ratio: 0.80</b>			

Societal Benefits		Societal Costs	
Avoided Energy Costs	\$10,698,358	Up Front Customer Investment	(\$6,670,997)
Avoided Gen Capacity Costs	\$4,517,082	Utility Admin Costs	(\$2,171,169)
Avoided Transmission Expense	\$6,173,921		
Environmental Externalities	\$0		
<b>Total Benefits</b>	<b>\$21,389,361</b>	<b>Total Costs</b>	<b>(\$8,842,165)</b>
<b>Benefit / Cost Ratio: 2.42</b>			

Combined RIM:			
Benefits:	\$16,870,385	Costs:	(\$22,527,223)
<b>Benefit / Cost Ratio: 0.75</b>			

# Exhibit DSM-5

## Program Descriptions for DSM Programs

## ***Program Descriptions for DSM Programs***

### **Introduction**

For over 25 years, EKPC and its 16 owner-member cooperatives have promoted the cost-effective use of energy by offering energy efficiency and demand response to their end-use retail members. These programs have been designed to meet the needs of the customer, to delay the need for additional generating capacity, and secure the most cost-effective energy resources.

This document describes the existing DSM programs. These programs are implemented and administered by EKPC and its owner-members. EKPC supports the owner-members with analysis, administrative, promotion, incentives, and other support services. EKPC considers the programs as part of its overall supply portfolio, with the understanding that the programs impact EKPC indirectly, through its owner-members.

The DSM programs in this IRP are listed below and described in this exhibit:

- Button-Up Weatherization Program (Residential)
- CARES Low-Income Weatherization (Residential)
- Heat Pump Retrofit Program (Residential)
- Touchstone Energy Program (Residential)
- ENERGY STAR<sup>®</sup> Manufactured Home Program (Residential)
- Energy Audit (Residential)
- Residential Efficient Lighting (Residential)
- Direct Load Control of Air Conditioners: Switches and Bring Your Own Thermostat (BYOT) (Residential)

## **Button-Up Weatherization Program**

### **Program Description**

The Button-up Weatherization (Button-up) Program is designed to incentivize retail members with poor energy-performing homes to improve the energy efficiency of the home's shell. The Button-up program is an important program to assist retail members with high bills caused by excessive heat losses. Air-sealing and attic insulation are the most cost-effective measures to improve home energy performance.

The Button-Up Program offers an incentive for reducing the heat loss of a home. The incentive is paid based on heat loss reduction measured in British Thermal Units per hour (BTUH). Heat loss calculations in BTUH are based on the winter design temperature. The retail member may qualify for this incentive by reducing the air leakage of their home and/or adding insulation in the attic.

Air-sealing actions reduce air infiltration by sealing air leaks in the shell walls, floors or ceiling. Electrical and plumbing protrusions as well as window and door seals are typical places where air leaks cause the home to lose heat in the winter. Typical air sealing measures include caulking, improved weather stripping, and sealing attic accesses. To receive this incentive either an EKPC approved contractor or an owner-member cooperative representative must perform a "pre" and "post" blower door test to measure actual BTUH reduced.

The attic insulation portion of the Button Up incentive will also promote the reduction of energy usage on the part of the retail members. Heat loss calculation of BTUH reduced will be made by using either the Manual J 8<sup>th</sup> Edition or through other methods approved by EKPC. In order to receive an incentive for attic insulation, an air seal must also be completed.

Per a recommendation from the EKPC Collaborative public interest group representatives, EKPC is evaluating adding a Duct Sealing measure to Button-up. The addition, if approved, will not have a material impact on energy and demand savings in this IRP Plan.

### **Target Markets**

This program is targeted at older single-family, multi-family or manufactured dwellings. Eligibility requirements are:

- Home must be 2 years old or older to qualify for the incentive.
- Primary source of heat must be electricity.

## **CARES Low-Income Weatherization Program**

### **Program Description**

EKPC's Community Assistance Resources for Energy Savings (CARES) Low Income Program provides an incentive to enhance the weatherization and energy efficiency services provided to its residential retail members by the Kentucky Community Action Agency's (CAA) network of not for profit community action agencies.

EKPC and its owner-members provide an incentive to the CAA implementing the project on behalf of the retail member.

EKPC's program has two primary objectives. First, EKPC's incentive will enable the CAA to install more measures in each home. Second, the additional incentive from EKPC will assist CAA in weatherizing more homes.

Two types of homes are eligible for incentives:

Heat Pump Eligible Homes are single family or multi-family residential dwellings that use electricity for their primary source of heat. The EKPC incentive can be used to upgrade the home to an air source heat pump as well as to install weatherization improvements including insulation, air sealing, duct sealing, and a water heater blanket.

Heat Pump Ineligible Homes are single family or multi-family residential dwellings that do not use electricity for their primary source of heat, but do cool their home with central or window unit air conditioners. The EKPC incentive can be used to install weatherization improvements.

The maximum incentive per household is \$2,000.

Per discussions with the EKPC Collaborative, EKPC is evaluating offering this program through other affordable housing non-profit organizations in addition to CAA. The program is underperforming compared to the planned energy and demand savings in this IPR. Offering this program through other non-profits is expected to increase program participation to near the plan in this IRP.

### **Target Market**

The homeowner must be a residential retail member of one of EKPC's 16 owner-member cooperatives.

The household must qualify for weatherization and energy efficiency services according to the guidelines of the Weatherization Assistance Program administered by the local CAA.

Household income cannot exceed the designated poverty guidelines established by the CAA.

## Heat Pump Retrofit Program

### Program Description

The Heat Pump Retrofit Program provides incentives for residential members to replace their existing resistance heat source (electric furnace, ceiling cable heat, baseboard heat, or electric thermal storage) with a more efficient heat pump.

Most high bill complaints are from retail members with homes that are heated with electric resistive heat instead of a heat pump. Installing an electric heat pump lowers electric bills significantly for those members.

The program provides incentives for both centrally ducted systems and mini-split systems.

At this time, the program provides incentives for two efficiency levels of centrally ducted heat pump systems: DOE minimum standard 14 SEER and ENERGY STAR® rated 15 SEER.

In recent years, EKPC and the owner-members have seen a sizable increase in mini-split heat pump systems. This heat pump technology is highly efficient and relatively new to the US market. This program provides incentives to install mini-split heat pump systems that replace resistance heat units. These installations must be ENERGY STAR® rated. The rebate will be paid per indoor head unit up to a maximum of three rebates.

Homeowners replacing their existing resistance heat source with a heat pump will qualify for the following incentive based on the equipment type:

<b><u>Equipment Type</u></b>	<b><u>Rebate</u></b>
<b>Centrally Ducted Systems:</b>	
Current Energy Conservation Standard established by the Federal Department of Energy “DOE”	\$500
Current ENERGY STAR® level equipment or greater	\$750
<b>Mini Split Systems:</b>	
Ducted or Ductless Mini-Splits ENERGY STAR® level equipment or greater (per indoor head unit – max 3)	\$250

When Federal efficiency standards increase the required SEER and Heating Season Performance Factor (HSPF) for heat pumps, these targets will be adjusted upward accordingly.

## **Target Markets**

This program is targeted to retail members who currently heat their home with a resistance heat source; this program is targeted to site built homes, manufactured homes, and multi-family dwellings

. Eligibility requirements are:

- Incentive only applies when homeowner's primary source of heat is an electric resistance heat furnace, ceiling cable heat, baseboard heat, or electric thermal storage.
- Existing heat source must be at least 2 years old.
- New manufactured homes are eligible for the incentive.
- Two (2) maximum incentive payments per location, per lifetime for centrally ducted systems.
- Ducted and Ductless mini-splits applying for the incentive will be incentivized at a rate of \$250 per indoor head unit up to a maximum of three head units per location, per lifetime.
- Participants in the Heat Pump Retrofit Program are not eligible for participation in the ENERGY STAR<sup>®</sup> Manufactured Home Program.

## **Touchstone Energy Home**

### **Program Description**

In an effort to improve new residential home energy performance, EKPC has designed the Touchstone Energy Home Program. The program is designed to encourage new homes to be built to higher standards for thermal integrity and equipment efficiency, as well as to choose a geothermal or an air source heat pump rather than less efficient forms of heating and cooling.

This program provides guidance during the building process to guarantee a home that is  $\geq 25$ -30% more efficient than the Kentucky standard built home.

The typical home built in rural Kentucky scores a 105 on the Home Energy Rating System (HERS) Index. The HERS testing and rating system is the industry accepted standard for evaluating the energy efficiency of a new home. Therefore, EKPC and the owner-members will provide the incentive for a home that either scores a HERS of 75 or better for the Performance Path or completes a Prescriptive Path check list of energy saving measures that assure the home performs equivalently to a 75 HERS tested home.

Plans are submitted before the home is built, a pre-drywall inspection is made, and a blower door test is administered after the home is built to verify that the home meets the standard.

To qualify as a Touchstone Energy Home under EKPC's program, the participating home must be located in the service territory of a participating Owner-Member System and must meet the program guidelines following one of the two available paths of approval.

All homes must receive a pre-drywall inspection and pass EKPC's pre-drywall checklist. Homes must also receive a final inspection and pass a whole house air leakage and duct leakage test.

All homes must be heated with an Air Source or Geothermal Heat Pump. The air source heat pump must meet or exceed the current ENERGY STAR® specifications for Seasonal Energy Efficiency Ratio ("SEER") and Heating Season Performance Factor ("HSPF").

Water heaters must be an electric storage tank water heater that meets or exceeds current Energy and Water Conservation standards established by the Federal Department of Energy (DOE).

In addition:

Prescriptive Path:

- Home must meet each prescriptive value on EKPC's Touchstone Energy Home Specifications.

Performance Path:

- Home must receive a HERS Index score of  $\leq 75$
- Home must pass 2009 International Energy Conservation Code performance path.

### **Target Markets**

This program is designed to serve the residential new construction market. The incentives are available to any residential retail member of participating EKPC owner-members. The primary market consists of retail members who are constructing new stick-built homes. Multi-family dwellings pre-approved by EKPC may be eligible.

## **ENERGY STAR® Manufactured Home**

### **Program Description**

The ENERGY STAR® Manufactured Home Program (ESMH) is designed to ensure that our residential retail members purchase an energy efficient manufactured home. EKPC will accomplish this by providing an incentive to purchase and install a new ENERGY STAR® certified manufactured home instead of a Housing and Urban Development (HUD) minimum standard home. The incentive is paid to the member who purchases the ENERGY STAR® manufactured home.

Through the program, EKPC will pay incentives in the form of rebates for electrically heated manufactured homes that qualify for the ENERGY STAR® label. Such homes use a combination of structural envelope and equipment measures that, in combination, result energy consumption that is significantly lower than comparable factory-built homes produced in accordance with the HUD code.

To be eligible for an incentive under this program, new manufactured homes must meet the following criteria:

- ENERGY STAR® certified according to the EPA and Systems Building Research Alliance (SBRA) guidelines
- Primary source of heat must be a heat pump.
- Home must be all electric.
- Home must be installed by or on behalf of the member on lines served by one of EKPC's 16 owner-member cooperatives.
- Participants in the ENERGY STAR® Manufactured Home Program are not eligible to participate in the Heat Pump Retrofit Program.

This program is underperforming compared to the energy and demand savings planned in this IRP. EKPC is evaluating potential program adjustments to increase program participation.

### **Target Markets**

This program is available to all residential retail members who purchase an ENERGY STAR® certified manufactured home.

## **Residential Energy Audit Program**

### **Program Description**

This program uses targeted information on home energy use to help retail members manage their energy use and save energy. The program is designed to offer two kinds of information delivery: an in-home audit and an online audit.

EKPC uses the *BillingInsights* tool from Apogee Interactive to analyze energy usage and make recommendations to lower energy consumption.

Members who complete the online *BillingInsights* analysis receive a free Light-Emitting Diode (LED) light bulb,

The in-home audit is available for retail members who want a more thorough assessment of their electricity usage. An energy advisor from one of our owner-member cooperatives will visit the home to conduct an energy audit by inspecting the appliances, building shell, heating and cooling systems, ductwork, appliances, and other sources of energy consumption and energy losses. The energy advisors have access to blower doors and infrared cameras if needed to identify air leakage and other heat losses.

The audit report includes simple low cost improvements that the homeowners can do themselves. The homeowner will also be made aware of any recommendations that are eligible for a rebate under our other energy efficiency programs.

### **Target Market**

The program is available for all residential customers but specifically targets households with higher than average electricity usage.

## **Residential Efficient Lighting Program**

### **Program Description**

The purpose of this program is to improve the efficiency of residential lighting by subsidizing the cost of higher efficiency lighting products. EKPC and its owner-members distribute LED light bulbs LEDs to members.

The program provides LEDs at the annual meetings held by the distribution cooperatives. In addition, each retail member who completes an online energy audit receives an LED light bulb.

### **Target Markets**

The program is targeted to all residential members.

## **Direct Load Control Program: Residential Air Conditioners**

### **Program Description**

The Direct Load Control Program is designed to shift loads during peak times to off-peak times in order to reduce EKPC's capacity payments to PJM.

The objective of the program is to reduce peak demand and energy usage through the installation of load control devices on residential central air conditioners and heat pumps. The peak load reduction lowers EKPC's capacity obligations and payments to PJM.

EKPC controls central air conditioners and heat pumps during these extreme peak hours and days each year to lower air conditioning load during PJM peaks.

Peak demand reduction is accomplished by cycling equipment on and off according to a predetermined control strategy. Central air conditioning and heat pump units are cycled on and off, while water heater loads are curtailed. For BYOT units, the cycling is accomplished by raising the thermostat setting for the duration of the control event. The typical control duration is three to four hours. Participating customers receive an annual incentive.

EKPC plans to continue to rely on a third party administrator to provide enrollment, installation, service calls, and measurement & verification services.

EKPC offers an incentive of \$10 per year for each water heater under control, and \$20 per year for each air conditioner being controlled by a switch or a thermostat.

### **Target Markets**

The program targets homes with central air conditioning (including heat pumps). The incentive is available to any residential retail member of a participating EKPC owner-member cooperative who has a qualifying central air conditioner or heat pump.

# Exhibit DSM-6

## Load Impacts by Program

## Load Impacts of DSM Programs

### Button-Up Weatherization Program

*(negative value = reduction in load)*

Year	Participants	Impact on Total Requirements (MWh)	Impact on Winter Peak (MW)	Impact on Summer Peak (MW)
2022	280	-568	-0.4	-0.1
2023	560	-1,136	-0.9	-0.3
2024	840	-1,703	-1.3	-0.4
2025	1,120	-2,271	-1.8	-0.5
2026	1,400	-2,839	-2.2	-0.7
2027	1,680	-3,407	-2.6	-0.8
2028	1,960	-3,974	-3.1	-0.9
2029	2,240	-4,542	-3.5	-1.1
2030	2,520	-5,110	-4.0	-1.2
2031	2,800	-5,678	-4.4	-1.3
2032	3,080	-6,245	-4.8	-1.5
2033	3,360	-6,813	-5.3	-1.6
2034	3,640	-7,381	-5.7	-1.7
2035	3,920	-7,949	-6.1	-1.9
2036	4,200	-8,516	-6.6	-2.0

### CARES-Low Income program

*(negative value = reduction in load)*

Year	Participants	Impact on Total Requirements (MWh)	Impact on Winter Peak (MW)	Impact on Summer Peak (MW)
2022	375	-1,686	-0.5	-0.2
2023	750	-3,371	-1.0	-0.5
2024	1,125	-5,057	-1.5	-0.7
2025	1,500	-6,743	-2.0	-1.0
2026	1,875	-8,428	-2.5	-1.2
2027	2,250	-10,114	-3.0	-1.5
2028	2,625	-11,799	-3.5	-1.7
2029	3,000	-13,485	-4.0	-2.0
2030	3,375	-15,171	-4.5	-2.2
2031	3,750	-16,856	-5.0	-2.5
2032	4,125	-18,542	-5.5	-2.7
2033	4,500	-20,228	-6.0	-3.0
2034	4,875	-21,913	-6.5	-3.2
2035	5,250	-23,599	-7.0	-3.5
2036	5,625	-25,285	-7.4	-3.7

**Heat Pump Retrofit program**

*(negative value = reduction in load)*

<b>Year</b>	<b>Participants</b>	<b>Impact on Total Requirements (MWh)</b>	<b>Impact on Winter Peak (MW)</b>	<b>Impact on Summer Peak (MW)</b>
2022	450	-3,456	0.0	-0.2
2023	900	-6,913	0.0	-0.3
2024	1,350	-10,369	0.0	-0.5
2025	1,800	-13,825	0.0	-0.7
2026	2,250	-17,282	0.0	-0.8
2027	2,700	-20,738	0.0	-1.0
2028	3,150	-24,194	0.0	-1.1
2029	3,600	-27,650	0.0	-1.3
2030	4,050	-31,107	0.0	-1.5
2031	4,500	-34,563	0.0	-1.6
2032	4,950	-38,019	0.0	-1.8
2033	5,400	-41,476	0.0	-2.0
2034	5,850	-44,932	0.0	-2.1
2035	6,300	-48,388	0.0	-2.3
2036	6,750	-51,845	0.0	-2.5

**Touchstone Energy Home**

*(negative value = reduction in load)*

<b>Year</b>	<b>Participants</b>	<b>Impact on Total Requirements (MWh)</b>	<b>Impact on Winter Peak (MW)</b>	<b>Impact on Summer Peak (MW)</b>
2022	340	-1,025	-0.9	-0.2
2023	680	-2,049	-1.9	-0.5
2024	1,020	-3,074	-2.8	-0.7
2025	1,360	-4,098	-3.8	-0.9
2026	1,700	-5,123	-4.7	-1.1
2027	2,040	-6,147	-5.7	-1.4
2028	2,380	-7,172	-6.6	-1.6
2029	2,720	-8,196	-7.6	-1.8
2030	3,060	-9,221	-8.5	-2.0
2031	3,400	-10,246	-9.5	-2.3
2032	3,740	-11,270	-10.4	-2.5
2033	4,080	-12,295	-11.4	-2.7
2034	4,420	-13,319	-12.3	-2.9
2035	4,760	-14,344	-13.3	-3.2
2036	5,100	-15,368	-14.2	-3.4

**ENERGY STAR® Manufactured Home Program**

*(negative value = reduction in load)*

<b>Year</b>	<b>Participants</b>	<b>Impact on Total Requirements (MWh)</b>	<b>Impact on Winter Peak (MW)</b>	<b>Impact on Summer Peak (MW)</b>
2022	50	-203	0.0	0.0
2023	100	-406	-0.1	0.0
2024	150	-609	-0.1	-0.1
2025	200	-812	-0.2	-0.1
2026	250	-1,015	-0.2	-0.1
2027	300	-1,218	-0.3	-0.1
2028	350	-1,421	-0.3	-0.2
2029	400	-1,624	-0.4	-0.2
2030	450	-1,827	-0.4	-0.2
2031	500	-2,030	-0.5	-0.2
2032	550	-2,233	-0.5	-0.3
2033	600	-2,436	-0.6	-0.3
2034	650	-2,639	-0.6	-0.3
2035	700	-2,842	-0.7	-0.3
2036	750	-3,045	-0.7	-0.4

**Residential Energy Audit Program**

*(negative value = reduction in load)*

<b>Year</b>	<b>Participants</b>	<b>Impact on Total Requirements (MWh)</b>	<b>Impact on Winter Peak (MW)</b>	<b>Impact on Summer Peak (MW)</b>
2022	500	-247	-0.1	-0.1
2023	1,000	-493	-0.2	-0.1
2024	1,500	-740	-0.2	-0.2
2025	2,000	-986	-0.3	-0.2
2026	2,500	-1,233	-0.4	-0.3
2027	2,500	-1,233	-0.4	-0.3
2028	2,500	-1,233	-0.4	-0.3
2029	2,500	-1,233	-0.4	-0.3
2030	2,500	-1,233	-0.4	-0.3
2031	2,500	-1,233	-0.4	-0.3
2032	2,500	-1,233	-0.4	-0.3
2033	2,500	-1,233	-0.4	-0.3
2034	2,500	-1,233	-0.4	-0.3
2035	2,500	-1,233	-0.4	-0.3
2036	2,500	-1,233	-0.4	-0.3

**Residential Lighting Program**

*(negative value = reduction in load)*

<b>Year</b>	<b>Participants</b>	<b>Impact on Total Requirements (MWh)</b>	<b>Impact on Winter Peak (MW)</b>	<b>Impact on Summer Peak (MW)</b>
<b>2022</b>	5,000	-252	0.0	0.0
<b>2023</b>	10,000	-504	-0.1	-0.1
<b>2024</b>	15,000	-756	-0.1	-0.1
<b>2025</b>	20,000	-1,008	-0.2	-0.1
<b>2026</b>	25,000	-1,260	-0.2	-0.1
<b>2027</b>	30,000	-1,512	-0.2	-0.2
<b>2028</b>	35,000	-1,764	-0.3	-0.2
<b>2029</b>	40,000	-2,016	-0.3	-0.2
<b>2030</b>	45,000	-2,268	-0.3	-0.2
<b>2031</b>	50,000	-2,520	-0.4	-0.3
<b>2032</b>	55,000	-2,772	-0.4	-0.3
<b>2033</b>	60,000	-3,024	-0.5	-0.3
<b>2034</b>	65,000	-3,276	-0.5	-0.4
<b>2035</b>	70,000	-3,528	-0.5	-0.4
<b>2036</b>	75,000	-3,780	-0.6	-0.4

**Direct Load Control: Residential Air Conditioner – Bring Your Own Thermostat***(negative value = reduction in load)*

<b>Year</b>	<b>Participants</b>	<b>Impact on Total Requirements (MWh)</b>	<b>Impact on Winter Peak (MW)</b>	<b>Impact on Summer Peak (MW)</b>
<b>2022</b>	2,000	-72	0.0	-2.4
<b>2023</b>	4,000	-144	0.0	-4.8
<b>2024</b>	6,000	-216	0.0	-7.2
<b>2025</b>	8,000	-288	0.0	-9.6
<b>2026</b>	10,000	-360	0.0	-12.0
<b>2027</b>	12,000	-432	0.0	-14.4
<b>2028</b>	14,000	-504	0.0	-16.8
<b>2029</b>	16,000	-576	0.0	-19.2
<b>2030</b>	18,000	-648	0.0	-21.6
<b>2031</b>	20,000	-720	0.0	-24.0
<b>2032</b>	22,000	-792	0.0	-26.4
<b>2033</b>	24,000	-864	0.0	-28.8
<b>2034</b>	26,000	-936	0.0	-31.2
<b>2035</b>	28,000	-1,008	0.0	-33.6
<b>2036</b>	30,000	-1,080	0.0	-36.0

# Exhibit DSM-7

## DSM Program Tables

**2022 IRP**

Remaining DSM program tables that are required by Section 8 of the regulations

**8.(3)(e)(1). Targeted classes and end-uses;**

The following table provides the targeted classes and end-uses for the DSM programs included in the plan. More detailed program descriptions can be found in Exhibit DSM-5 in the DSM Technical Appendix.

**Table 8.(3)(e)(1)  
Existing Programs**

Program Name	Class	End-uses
Button-Up Weatherization	Residential	Space Heating, Space Cooling
CARES – Low Income	Residential	Space Heating, Space Cooling, Water Heating, Lighting
Heat Pump Retrofit	Residential	Space Heating, Space Cooling
Touchstone Energy (TSE) Home	Residential	Space Heating, Space Cooling, Water Heating
ENERGY STAR® Manufactured Home	Residential	Space Heating, Space Cooling
Residential Energy Audit	Residential	Space Heating, Space Cooling, Water Heating, Lighting
Residential Efficient Lighting	Residential	Lighting
Direct Load Control-Residential: AC Bring Your Own Thermostat	Residential	Space Cooling

**8.(3)(e)(2). Expected duration of the program;**

**Expected duration of the program;**

The following table provides the expected duration of each program. For each program, the number of years that new participants are served is given as well as the lifetime of the measure savings:

**Table 8.(3)(e)(2)-1  
Existing Programs – Duration**

Program Name	New Participants	Savings Lifetime
Button-Up Weatherization	15 years	15 years
CARES – Low Income	15 years	15 years
Heat Pump Retrofit	15 years	20 years
Touchstone Energy (TSE) Home	15 years	20 years
ENERGY STAR® Manufactured Home	15 years	15 years
Residential Energy Audit	15 years	5 years
Residential Efficient Lighting	15 years	8 years
Direct Load Control-Residential: AC Bring Your Own Thermostat	15 years	15 years

**8.(3)(e)(3). Projected energy changes by season, and summer and winter peak demand changes;**

The following tables provide the projected annual energy, summer peak demand and winter peak demand changes for each Existing and New DSM program included in the plan:

See Exhibit DSM-6

**8.(3)(e)(4). Projected cost, including any incentive payments and program administrative costs;**

The projected costs for each DSM program are shown below in Table 8.(3)(e)(4). Cost values are the present value of the future stream of costs for that element using a 5% discount rate.

Owner-member rebates are paid to retail member participants. More details on program costs and cost-effectiveness can be found in Exhibits DSM-3 and DSM-4.

**Table 8.(3)(e)(4)**  
DSM Program Costs

Program	Program costs present value, 2022 \$ using a 5% discount rate			
	Owner-Member Admin	EKPC Admin	Rebates <sup>1</sup>	Member Investment
Button-Up Weatherization	\$1,091,976	\$66,644	\$1,762,366	\$4,357,192
CARES Low Income	\$9,746,701	\$262,257	\$0	\$4,012,531 <sup>2</sup>
Heat Pump Retrofit	\$1,221,809	\$130,820	\$3,239,644	\$15,466,986
Touchstone Energy (TSE) Home	\$1,909,230	\$65,410	\$3,147,083	\$6,067,156
ENERGY STAR® Manufactured Home	\$30,854	\$229,552	\$709,636	\$709,636
Residential Energy Audit	\$0	\$1,641,420	\$0	\$370,245
Residential Efficient Lighting	\$0	\$65,410	\$555,368	\$449,231
Direct Load Control- Residential: AC Bring Your Own Thermostat	\$0	\$13,473,350	\$8,972,995	\$2,468,300
<b>Totals</b>	<b>\$14,000,569</b>	<b>\$15,934,863</b>	<b>\$18,387,092</b>	<b>\$33,901,277</b>

<sup>1</sup> Rebates are not included in the TRC test.

<sup>2</sup> The member costs for the CARES Low Income program represent the Kentucky Housing share of measure costs. This is included (along with gas savings) in order to calculate the correct TRC for the program.

**8.(3)(e)(5). Projected cost savings, including savings in utility's generation, transmission and distribution costs.**

The projected cost savings for each DSM program are shown below in Table 8.(3)(e)(5). Values shown are the benefits in the Total Resource Cost test. Cost values are the present value of the future stream of costs using a 5% discount rate.

**Table 8.(3)(e)(5)**  
DSM Program Cost Savings

Program	present value 2022 \$ Projected Cost Savings
Button-Up Weatherization	\$9,251,697
CARES – Low Income	\$16,059,558 <sup>3</sup>
Heat Pump Retrofit	\$26,955,443
Touchstone Energy (TSE) Home	\$16,870,385
ENERGY STAR® Manufactured Home	\$1,575,665
Residential Energy Audit	\$906,126
Residential Efficient Lighting	\$2,020,012
Direct Load Control-Residential: AC Bring Your Own Thermostat	\$34,634,303
Total	\$108,273,189

The Total Resource Cost test for the entire portfolio yields a benefit-cost ratio of **1.70**.

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<sup>3</sup> Includes gas cost savings

**8.(4)(a) On total resource capacity available at the winter and summer peak:**

**6. Reductions or increases in peak demand from new conservation and load management or other demand-side programs;**

See Table DSM-3 in the main report titled “DSM Technical Appendix”.

**8.(4)(b) On planned annual generation:**

**5. Reductions or increases in energy from new conservation and load management or other demand-side programs;**

See Table DSM-3 in the main report titled “DSM Technical Appendix”.

**8.(5)(c) Criteria (for example, present value of revenue requirements, capital requirements, environmental impacts, flexibility, diversity) used to screen each resource alternative including demand-side programs, and criteria used to select the final mix of resources presented in the acquisition plan.**

Please see pages 7-8 and 13-15 in the main report title “DSM Technical Appendix”.

All DSM programs are evaluated based on the standard California tests.

# Exhibit DSM-8

DSM and Renewable  
Energy Collaborative  
Discussion and Materials

EXHIBIT 8

EKPC’s Sustainability Collaborative

EKPC’s newest Collaborative, named EKPC’s Sustainability Collaborative, began meeting in 2021. The following are active members of the Collaborative.



<b>Company/Organization</b>	
East Kentucky Power Cooperative	Bluegrass GreenSource
Mountain Association	Kentucky Conservation Committee
Big Sandy RECC	Kentuckians for the Commonwealth
Blue Grass Energy Cooperative	Kentucky Interfaith Power and Light
Clark Energy Cooperative	Frontier Housing
Cumberland Valley Electric	Kentucky Industrial Utility Customers
Farmers RECC	Nucor/Gallatin Steel
Fleming-Mason Energy Cooperative	Kentucky Association of Manufacturers
Grayson RECC	Kentucky Chamber of Commerce
Inter-County Energy Cooperative	<b>Non-voting Members and Observers (Invited)</b>
Jackson Energy Cooperative	
Licking Valley RECC	<b>Company/Organization</b>
Nolin RECC	Center for Applied Energy Research
Owen Electric Cooperative	Energy and Environment Cabinet
Salt River Electric Cooperative	
Shelby Energy Cooperative	
South Kentucky RECC	
Taylor County RECC	

The Collaborative met four (4) times in 2021. Meeting minutes are as follows:

**EKPC Sustainability Collaborative**  
**March 19, 2021**  
**Virtual Meeting**  
**(Collaborative Members Only)**

The East Kentucky Power Cooperative, Inc. (“EKPC”) Sustainability Collaborative (“Collaborative”) held its kick-off meeting, open to Collaborative members only, on March 19, 2021, at 1:00 pm eastern, via the Microsoft Teams virtual platform. Scott Drake, EKPC representative and Collaborative Co-Chair, facilitated the virtual meeting and granted attendee access.

A safety moment and welcome message were provided by EKPC executives, Denise Foster and David Crews.

At Scott Drake’s direction, attending Collaborative members introduced themselves to the group.

*Who We Are: EKPC and its Owner-Member Cooperatives*

Joe Settles, EKPC Member Services, presented an overview of the electric cooperative model; the Board of Directors’ structure; the guiding principles of EKPC, its Owner-Member distribution cooperatives and the Kentucky Touchstone Energy Cooperatives; EKPC’s generation facilities and its membership in the PJM Interconnection LLC, a regional transmission organization; and the cooperatives’ environmental stewardship and economic development focus. A brief question and answer period followed.

*EKPC Sustainability Collaborative Charter Review*

Co-Chairs, Scott Drake of EKPC and Carrie Ray of the Mountain Association for Community Economic Development (“MACED”), presented an overview of the Collaborative’s Charter, highlighting the group’s purpose, voting and non-voting member structure, meeting planning, available funding and the group decision-making process. Discussion and a brief question and answer period followed.

*EKPC Sustainability Plan*

Co-Chair Scott Drake presented to the group details of EKPC’s Sustainability Plan, including goals, working groups/teams and employee engagement. Discussion and a brief question and answer period followed.

Scott Drake advised the Collaborative members that an online polling survey would be distributed to identify the date and time of the next virtual meeting, which will be open to the public. The meeting adjourned.

**EKPC Sustainability Collaborative**  
**April 20, 2021**  
**Virtual Meeting**  
**(Open to Collaborative Members & Public)**

The East Kentucky Power Cooperative, Inc. (“EKPC”) Sustainability Collaborative (“Collaborative”) held its meeting, open to Collaborative members and public observers, on April 20, 2021, at 1:00 pm eastern, via the Microsoft Teams virtual platform. Public notice was provided on EKPC’s external website. Scott Drake, EKPC representative and Collaborative Co-Chair, facilitated the virtual meeting and granted attendee access.

A safety moment was provided by Co-Chair Carrie Ray, Mountain Association representative. An attendee roll call was conducted by Scott Drake.

Scott Drake advised the group that the Collaborative will meet frequently at this point due to preparations for the EKPC Integrated Resource Plan, to be provided to the Kentucky Public Service Commission, outlining energy efficiency and demand response programs. At a later time, the Collaborative meetings will meet on a quarterly basis as intended.

*Energy Efficiency and Demand Response*

Scott Drake and special guest, John Farley, Demand Side Management (“DSM”) energy expert, presented an overview of the energy efficiency and demand response programs offered by EKPC currently; the 2020 data associated with those programs; the process of evaluating the cost-effectiveness of such programs; and a DSM potential study in progress.

Committee member and public observer questions were addressed throughout the meeting.

Scott Drake advised the Collaborative members that an online polling survey would be distributed to identify the date and time of the next virtual meeting. The meeting adjourned at 2:36 pm.

**EKPC Sustainability Collaborative**  
**August 26, 2021**  
**Virtual Meeting**  
**(Open to Collaborative Members)**

The East Kentucky Power Cooperative, Inc. (“EKPC”) Sustainability Collaborative (“Collaborative”) held its meeting of the Collaborative representatives, on August 26, 2021, at 1:00 pm eastern, via the Microsoft Teams virtual platform. Scott Drake, EKPC representative and Collaborative Co-Chair, facilitated the virtual meeting and granted attendee access.

The meeting purpose was to review draft cost-effectiveness results of energy efficiency (EE) and demand response (DR) measures. EKPC contracted with GDS Associates to complete a technical potential study of all possible EE and DR measures. The draft results were provided to all Collaborative representatives for review, discussion and recommendations.

A safety moment was provided by Co-Chair Carrie Ray, Mountain Association representative. An attendee roll call was conducted by Scott Drake.

Scott Drake presented a review of the energy efficiency and demand response programs offered by EKPC currently; the 2020 data associated with those programs; the process of evaluating the cost-effectiveness of such programs; and a DSM potential study in progress.

The GDS Associates provided a measure-level cost-effectiveness (Total Resource Costs “TRC”) evaluation for possible residential and C&I EE and DR programs based on 4 different criteria:

- Base Case – EKPC avoided costs based on a forward price curve for energy and capacity prices in PJM.
- Low-Carbon Case - Base Case plus a per kWh energy adder for carbon from a Guidehouse study based on RGGI.
- Middle-Carbon Case – Base Case plus a per kWh energy adder for carbon from a Guidehouse study based on the Biden Administration proposal for carbon.
- High-Carbon Case – Base Case plus a per kWh energy adder for carbon from a Guidehouse study based on the social cost of carbon in NY.

John Farley, EKPC’s DSM expert consultant, provided a comparison of cost-effective measures from this study in 2021 versus the cost-effectiveness study performed in 2018 in preparation for EKPC’s IRP filing in 2019. Scott Drake and John Farley lead the discussion and answered questions pertaining to the TRC results.

General comments and questions:

- Representatives noted the EKPC should have a C&I LED lighting EE program or measures because the TRCs are above 1.0. EKPC noted that a program like that was eliminated in 2019 because of the very high level of free-riders. Most of the participants were planning to replace the less-efficient lamps with LEDs without an incentive from the utility. Representatives noted that some economically-challenge businesses still have the need for an incentive.
- Representatives suggested that EKPC and owner-member systems should be a leader in EE, especially with Low-Moderate Income (LMI) members. EKPC noted that its CARES LMI program's participation levels are under-performing and is evaluating ways to improve the program's performance.
- Representatives noted that the residential duct seal measure is cost-effective and recommended that measure to be added to the Button-up Weatherization program. EKPC is evaluating that recommendation.
- A discussion ensued about the process for identifying new programs and outreach.

Representatives requested a second virtual meeting a few weeks out to allow for more review. The next meeting to discuss EE and DR measure cost-effectiveness and programs was scheduled for September 16, 2021 at 9:30 AM EPT. Meeting adjourned.

**EKPC Sustainability Collaborative**  
**September 16, 2021**  
**Virtual Meeting**  
**(Open to Collaborative Members)**

The East Kentucky Power Cooperative, Inc. (“EKPC”) Sustainability Collaborative (“Collaborative”) held its meeting of the Collaborative representatives, on September 16, 2021, at 9:30 am eastern, via the Microsoft Teams virtual platform. Scott Drake, EKPC representative and Collaborative Co-Chair, facilitated the virtual meeting and granted attendee access.

The meeting purpose was to facilitate a deep-dive and discussion pertaining to the cost-effectiveness results of energy efficiency (EE) and demand response (DR) measures. EKPC contracted with GDS Associates to complete a technical potential study of all possible EE and DR measures. This Collaborative meeting was a follow-up meeting to the Collaborative meeting on August 26, 2021.

A safety moment was provided by Co-Chair Carrie Ray, Mountain Association representative. An attendee roll call was conducted by Scott Drake.

Scott Drake presented a review of the energy efficiency and demand response programs offered by EKPC currently; the 2020 data associated with those programs; the process of evaluating the cost-effectiveness of such programs; and a DSM potential study in progress.

The GDS Associates provided a measure-level cost-effectiveness (Total Resource Costs “TRC”) evaluation for possible residential and C&I EE and DR programs based on 4 different criteria:

- Base Case – EKPC avoided costs based on a forward price curve for energy and capacity prices in PJM.
- Low-Carbon Case - Base Case plus a per kWh energy adder for carbon from a Guidehouse study based on RGGI.
- Middle-Carbon Case – Base Case plus a per kWh energy adder for carbon from a Guidehouse study based on the Biden Administration proposal for carbon.
- High-Carbon Case – Base Case plus a per kWh energy adder for carbon from a Guidehouse study based on the social cost of carbon in NY.

EKPC acknowledged that since the August 26<sup>th</sup> meeting, it has been evaluating incorporating the Duct Sealing measure into the Button-up Weatherization program. John Farley performed additional research and evaluation of the measure’s cost-effectiveness, suggested incentive levels, and the resulting Rate Impact Measure (RIM). Those items were discuss by the Collaborative representatives. EKPC plans additional discussions with its executive staff and owner-members.

The Collaborative discussed the cost-effectiveness and potential opportunities of a C&I lighting program. Collaborative representatives noted that many small businesses still struggle with investing in energy efficient lighting upgrades and many lighting measures are cost-effective. EKPC noted that the previous C&I lighting program saw significant free-ridership that caused EKPC to eliminate the program. EKPC acknowledged that the previous program was a broad measure approach to implementation. EKPC noted that in 2022 it will evaluate developing a more narrowly focused C&I lighting program.

Meeting adjourned.

Exhibit DSM-9

Demand Response  
Bids in PJM

**EKPC Demand Response Bids in PJM**

Each year EKPC bids Demand Response (DR) capacity into the appropriate PJM Market. All bids listed below are from interruptible service participant’s load reductions. The following are the bids.

PJM Year (June-May)	MWs
2018-2019	118.8
2019-2020	120.3
2020-2021	121.8
2021-2022	See Note 1
2022-2023	
2023-2024	

Note 1: [REDACTED]

**Energy Efficiency and Direct Load Control Peak Savings**

EKPC stays abreast of market changes to ensure EKPC is best leveraging resources, including DSM savings, in PJM. EKPC operates as multiple entities in PJM acting as the only Electric Distribution Company (“EDC”), Load Serving Entity (“LSE”), and Curtailment Service Provider (“CSP”) in the EKPC zone. Offering energy efficiency into the Base Residual Auction (“BRA”) could result in EKPC obtaining payment from PJM for the load reduction. However, being an EDC, PJM would increase the reliability requirement (also known as “load obligation”) EKPC has to purchase from the market. Therefore, EE programs having direct participation in PJM programs produces virtually no net positive financial position for EKPC. Yet, reduced demand from EE program participation during summer peak hours lowers EKPC’s overall peak and, over time, lowers EKPC’s load obligation payments to PJM annually. EKPC direct load control program manages water heater switches, air conditioner switches, and thermostats to reduce peak demand. EKPC is currently evaluating the PJM Peak Shaving Adjustment (“PSA”) program as a possible opportunity to monetize the direct load control resources in a PJM program receiving a direct annual payment for the demand reduction. Additionally, EKPC utilizes the water heater switches to reduce energy costs in the winter months by shifting energy consumption from water heaters during high-energy cost hours in the day to hours having lower energy costs. EKPC utilizes water heater switches, air conditioner switches, and thermostats in a similar manner during summer months to mitigate high-energy prices.