STATE OF INDIANA

INDIANA UTILITY REGULATORY COMMISSION

IN THE MATTER OF THE VERIFIED PETITION OF INDIANA MICHIGAN POWER COMPANY FOR APPROVAL OF: (1) DEMAND SIDE MANAGEMENT (DSM) PLAN, INCLUDING ENERGY EFFICIENCY (EE) PROGRAMS, DEMAND RESPONSE PROGRAMS, AND ENHANCED CONSERVATION VOLTAGE; AND (2) ASSOCIATED ACCOUNTING AND RATEMAKING TREATMENT, INCLUDING TIMELY RECOVERY THROUGH I&M'S DSM/EE PROGRAM COST RIDER OF ASSOCIATED COSTS, INCLUDING PROGRAM OPERATING COSTS, NET LOST REVENUE, AND FINANCIAL INCENTIVES.	)))))))))))))	**CAUSE NO.**

SUBMISSION OF DIRECT TESTIMONY OF
JEFFREY R. HUBER

Applicant, Indiana Michigan Power Company (I&M), by counsel, respectfully submits the direct testimony and attachments of Jeffrey R. Huber in this Cause.

Respectfully submitted,

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CERTIFICATE OF SERVICE

The undersigned hereby certifies that a copy of the foregoing was served this 31st day of March, 2022, by email transmission, hand delivery or United States Mail, first class, postage prepaid to:

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STATE OF INDIANA

BEFORE THE INDIANA UTILITY REGULATORY COMMISSION

PRE-FILED VERIFIED DIRECT TESTIMONY

OF

JEFFREY R. HUBER

ON BEHALF OF

INDIANA MICHIGAN POWER COMPANY

I. Introduction

Q. Please state your name and business address.

A. My name is Jeffrey R. Huber. I am employed as a Principal, by GDS Associates, Inc. (GDS). My business address is 1850 Parkway Place, Suite 800, Marietta, Georgia 30067. I am submitting this testimony on behalf of Indiana Michigan Power Company.

Q. Please describe GDS.

A. GDS is a multi-service consulting and engineering firm. Formed in 1986, GDS employs a staff of more than 175 in nine locations across the U.S. GDS offers information technology, market research, and statistical services to a broad client base of Electric, Gas, Water, and Wastewater Utilities.

Q. Please describe your background and experience.

A. I received Bachelor's degrees in Anthropology and Criminology from the University of Florida in May 2001. In May 2004, I was awarded a Master of Arts degree in Anthropology, with a graduate minor in Statistics, from the University of Tennessee.

Since joining GDS Associates in 2005, I have been involved primarily on planning and/or evaluation projects for energy efficiency and demand response programs for utility clients and/or state organizations. I have conducted energy efficiency potential market assessments in over a dozen states and across more than two dozen utility service areas focused primarily across the Midwest, South, and Northeast. I have formally presented results from these market potential assessments in front of Commissions and Commission staff in Indiana, Maine,

Michigan, Missouri, Pennsylvania, and Vermont. In addition to market potential assessments, I have conducted market baseline studies for residential market rates, residential low-income, and nonresidential customers in several states, performed cost-effectiveness screening of utility programs, and engaged in regulatory oversight of energy efficiency programs for other organizations.

Q. What is the purpose of your testimony?

A. My testimony describes the 2021 I&M Market Potential Study[1] (I&M MPS) and explains how the results of the MPS were used to create energy efficiency (EE), demand response (DR), and distributed energy resources (DER) inputs that were used in the development of the I&M 2021 Integrated Resource Plan (IRP).

Q. Are you sponsoring any Attachments?

A. Yes. I am sponsoring the following attachments:

- Attachment JRH-1: 2021 I&M Indiana Market Potential Study (I&M Indiana MPS),
- Attachment JRH-2: 2021 Market Potential Study Executive Summary.

The EE, DR, and DER IRP inputs are based on the combined results of the I&M Indiana MPS and I&M Michigan MPS, which are summarized in Attachment JRH-2.

[1] General references to the "Market Potential Study" or "MPS" describe what was done for both the Indiana MPS and the Michigan MPS.

II. Market Potential Study

Q. Please provide an overview of the I&M MPS.

A. The I&M MPS assessed EE, DR, and DER potential. The I&M Indiana MPS provided estimates of energy and peak demand savings for a 20-year time horizon (2022-2041), the associated costs, and the recommended EE and DR programs needed to realize these savings. The study included primary market research and a comprehensive review of current programs, historical savings, and projected energy savings opportunities, to develop estimates of technical, economic, and achievable potential. The study examined a full array of technologies, programs, and energy efficient building practices. The analysis leveraged a proven modeling framework to develop the projections of EE, DR, and DER potential.

Q. Did GDS and I&M provide opportunities for interested stakeholders to engage during the development of the I&M MPS?

A. Yes. I&M held four stakeholder meetings with Indiana stakeholders during the development of the I&M MPS. These meetings were coordinated by I&M and implemented by GDS. For each meeting, GDS discussed study progress and offered stakeholders the opportunity to provide feedback on key areas of the study. For example, GDS offered stakeholders the opportunity to review and provide feedback on customer survey questions and their list of EE measures to be included in the study. GDS responded to stakeholder feedback and adopted several of the changes offered by stakeholders.

Q. Please describe the modeling framework.

A. The study used Excel-based planning models to perform the analyses for the I&M MPS. The models develop forecasts of measure and program costs, participants, and energy and demand savings. The models include calculations of measure-level benefit-cost ratios, which determine which measures and programs are cost-effective. The EE and DR models are transparent where all formulas, model inputs and outputs are accessible and allow for end-user manipulation for review and future analysis. Separate models were developed for the residential and non-residential sectors to account for the different methodological approaches used to analyze the respective sectors.

In the residential sector, a "bottom-up" approach was used to estimate EE potential. The bottom-up approach begins with characterizing the eligible equipment stock, estimating savings and screening for cost-effectiveness first at the measure level, then summing savings at the end-use and service area levels. In the commercial and industrial sectors, a top-down modeling approach was used 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 electric energy load. A bottom-up approach also was used in the demand response and DER analyses for all sectors.

Q. What key inputs did I&M provide to GDS for the I&M MPS?

A. I&M provided GDS with several key data inputs crucial to the development of the I&M MPS. This included a sector-level I&M Indiana forecast of MWh sales and peak load; electric avoided costs (for energy, capacity, transmission, and

distribution)[2], line losses, planning reserve margin and other data needed to perform cost-effectiveness analysis; program planning and historical program achievement documents, which allowed GDS to fine-tune near-term savings and costs projections; customer data used to design and conduct market research surveys and to identify which customers have opted out of DSM programs; the 2018 Residential Appliance Saturation Survey; and customer segmentation data based on I&M Indiana-specific segment and end-use consumption shares derived from I&M's customer database and SIC code analysis.

Q. Did the I&M MPS analyses apply any adjustments to the I&M Indiana energy sales forecast?

A. Yes. Before assessing the future potential for EE, DR, or DER in the I&M Indiana service area, modifications to I&M's 2020-vintage forecast were necessary to create an adjusted baseline forecast for use in the I&M Indiana MPS, Attachment JRH-1.

First, the I&M sales forecast uses the appliance efficiency forecast published in the Energy Information Administration (EIA) Annual Energy Outlook (AEO) as an input for the various end-use indices contained within the statistically adjusted end-use models employed by I&M. Over time, the EIA efficiency projections allow for existing equipment stock to exceed the prevailing federal minimum efficiency standards. In contrast, most savings from efficient technologies contained in the I&M MPS (and included in the I&M EE and DR

[2] For more detail regarding the development of avoided cost components that were used in the MPS, please refer to the testimony of Company witness Walter.

programs) are based on comparisons to equipment that meets, but does not exceed, known federal minimum efficiency standards. To better align the sales forecast used in the I&M MPS with the assumed savings opportunities, GDS developed an adjusted “code frozen” forecast that permits the existing equipment stock to improve and meet, but not exceed, legislated federal minimum standards. The result is a sales forecast that is higher, over the 20-year horizon, than I&M’s base sales forecast used with the IRP.

Second, in Indiana, commercial or industrial customers with a peak load greater than 1MW are eligible to opt out of utility-funded electric energy efficiency programs. In the I&M Indiana service area, approximately 9% of commercial kWh sales have opted out of utility-funded electric energy efficiency programs, while roughly 50% of industrial kWh sales have opted out. GDS excluded these sales from the forecast and associated reported estimates of future electric energy efficiency potential.

Last, commercial and industrial (C&I) sales in the I&M forecast are consistent with the designated commercial and industrial rate code based on the current tariff designation. As a result, there were a small number of customers that GDS typically classifies as commercial, based on their Standard Industry Code (SIC), but were designated as industrial in the 2019 I&M C&I sector customer data. To better align commercial vs. industrial savings opportunities with a facility’s typical service type, GDS reclassified these industrial sales to the commercial sector. The result of this reclassification was a shift of approximately 0.9% of industrial sector sales in Indiana to the commercial sector.

Q. Did I&M seek opportunities to engage customers during the development of the I&M MPS?

A. Yes. The I&M MPS leveraged survey results from more than 500 non-residential and 1,600 residential customers that provided guidance on what types of programs would be most used and beneficial within I&M's service territory. This primary market research updated equipment penetration, saturation, efficiency characteristics, and customer willingness to participate data[3], across select end-uses/technologies. Due to COVID-19 considerations and overall schedule constraints, GDS conducted a web-based survey to complete the research. The surveys were available to both business and residential customers and allowed the study to appropriately consider the specific market conditions that exist in the I&M Indiana service territory. The resulting data was used to develop updated estimates of baseline and efficient equipment saturation estimates in the I&M MPS analyses and to develop expected long-term adoption rates for EE, DR and DER over the study horizon.

Q. How did the I&M Indiana territory-specific market research data inform the I&M MPS?

A. The primary market research, discussed in Attachments JRH-1 and JRH-2, developed survey sampling targets designed to achieve statistically significant results at three levels- the I&M service territory level, the I&M Indiana level and

[3] Willingness to participate (WTP) survey research asked respondents about customer willingness to adopt energy efficiency technologies at different financial incentive levels. The surveys also collected data on the importance of non-financial barriers toward future adoption levels. The research is explained in more detail in Attachment JRH-1.

I&M Michigan level. This allowed the I&M MPS to develop I&M system-specific and territory-specific baseline and efficiency equipment saturation estimates. The primary market research also yielded I&M system-specific and territory-specific long-term adoption rate estimates. For example, I&M Indiana customers were found to have a lower saturation of LED lighting, were less likely to own (rather than rent) their facilities, and operate slightly smaller facilities, compared to I&M Michigan customers.

Q. How did the I&M MPS address different market segments and sector classes?

A. Measure list and assumption development was a collaborative effort that was informed by I&M and stakeholders based on a wide range of sources including current I&M program offerings, the Michigan Energy Measures Database (MEMD), the Illinois Technical Reference Manual, and other commercially viable technologies. The final measure lists ultimately included in the MPS reflected the informed comments and considerations from the parties that participated in the measure list review process. The study analyzed more than 2,100 total measure permutations across the residential, commercial, and industrial/agricultural sectors. The study reviewed approximately three dozen end uses across the three sectors.

The development of measure assumptions and market characteristics involved a comprehensive review of the existing resources. The study leverages prior I&M EE, and DR plans, I&M evaluation report findings, program planning assumptions, and key secondary data sources such as the MEMD and Illinois

Technical Reference Manual (TRM), as well as data from the Energy Information Administration (EIA), the American Council for an Energy Efficient Economy, and DOE commercial building reports.

Q. Can you please describe the types of EE potential included in the I&M Indiana MPS?

A. The amount of available EE is typically described in four sets: technical potential, economic potential, achievable potential, and program potential. Briefly, the technical potential encompasses all known efficiency improvements that are possible, regardless of cost, and thus cost-effectiveness (i.e., all EE measures would be adopted if technically feasible).

The logical subset of this pool is the economic potential. In Indiana, economic potential for EE only includes measures that are cost-effective based on screening with the Utility Cost Test (UCT). In the I&M Indiana territory, the UCT considers electric energy, capacity, and transmission & distribution (T&D) savings as benefits, and utility incentives and direct install equipment expenses as the cost. Consistent with application of economic potential according to the National Action Plan for Energy Efficiency, the measure level economic screening does not consider non-incentive/measure delivery costs (e.g., admin, marketing, evaluation etc.) in determining cost-effectiveness. Apart from the income-qualified segment of the residential sector, all measures were required to have a UCT benefit-cost ratio greater than 1.0 to be included in economic potential and all subsequent estimates of EE potential. Income-qualified program measures were not required

to be cost-effective, and therefore were not screened for economic or achievable potential.

Achievable potential is the amount of cost-effective 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 constraints, customer awareness and willingness-to-participate (WTP) in programs, technical constraints, and other barriers that the "program intervention" is modeled to overcome. Additional considerations include political and/or regulatory constraints. As detailed in the I&M Indiana MPS, Attachment JRH-1, the potential study evaluated two achievable potential scenarios:

- Maximum Achievable Potential (MAP) estimates achievable potential with I&M paying incentives equal to 100% of measure incremental costs and aggressive adoption rates.
- Realistic Achievable Potential (RAP) estimates achievable potential with I&M 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.

Finally, the GDS Team conducted research and analysis to identify areas for I&M to consider for potential improvements to the current program portfolio. Program potential also considers what is possible to be accomplished with utility-

sponsored programs versus EE savings that happen through alternative means. Overall, GDS refined the Realistic Achievable Potential into the Program Potential scenario based primarily on the following updated factors:

- Incentive levels and structures: Measures within existing I&M programs were modeled within their current framework unless research dictates otherwise,
- Program non-incentive costs (e.g., admin, marketing, evaluation etc.),
- Measure Assignments: In some cases, achievable potential cost-effective measures were reassigned to new program types and,
- Income-Qualified Historical Spending: Program potential aligned income-qualified program spending with historical levels to reduce cross-subsidization concerns across customer segments.

Q. Did the assessment of program potential consider program delivery costs in the assessment of program cost-effectiveness?

A. Yes. In contrast to the estimates of economic and achievable potential presented in the MPS, which only considered utility incentives in assessing measure-level cost-effectiveness, program potential mapped individual measures into a set of recommended programs and included estimates of utility costs associated with program delivery. As a direct result, select individual measures that were included in the economic and achievable potential, were removed from the program potential if the delivery costs needed to create viable programs rendered the grouping of measures to not be cost-effective. To help balance the impact of these program delivery costs, GDS considered how varying incentive levels and

measure/program mapping could be altered to align with industry best practices and maintain cost-effective programs and overall portfolio.

Q. How were recommended programs included in the energy efficiency program potential based on a review of industry best practices?

A. The program potential was based on research into industry trends and best practices which allowed the recommended programs to address opportunities to close gaps between I&M's portfolio of offerings and other portfolios that are achieving higher volumes of savings, and/or are ranked among the nation's top DSM portfolios. This research included reviewing literature (e.g., industry association trends report, conference papers, government agency white papers, evaluation reports, and DSM plans), as well as data associated with the program portfolios offered by peer regional utilities. The analysis used a set of guiding principles including identifying cost-effective program opportunities, identifying opportunities for long-term success, while incorporating program objectives I&M highlighted in its most recent DSM Plan filings. This process allowed I&M's program potential analysis to integrate I&M's current program offerings with future potential and leverage industry best practices customized for the I&M service territory.

Q. Did the I&M Indiana MPS also address future savings from Demand Response programs?

A. Yes. Demand Response potential for the I&M territory was estimated following a similar methodology as the EE analysis. Technical, economic, and two achievable scenarios (maximum and realistic) were developed for I&M's territories considering

the potential for 23 different DR program iterations, including traditional direct load control as well as more novel demand-rate options. Expansions to I&M's existing DR programs were considered, as well as new program opportunities. Because demand response is evaluated for cost-effectiveness at a program level, all utility cost components were considered in the economic potential screening, including program development, implementation, incentive, and evaluation costs. Programs were screened using the Utility Cost Test (UCT), using a threshold of 1.0 and considering the performance of the program across the full twenty-year study period. In this study, the MAP scenario represented a 'best practice' estimate of what could be achieved considering I&M's customers' likely participation rates and assumes higher levels of incentives for participation. The RAP scenario reflected a realistic scenario estimate based on typical or 'average' participation rates likely to be achieved considering program barriers. Please see Attachment JRH-1 for additional discussion regarding DR potential.

Q. How did the demand response analysis utilize best practices for developing program recommendations?

A. Similar to the program potential analysis for energy efficiency program potential, the demand response program recommendations are based on a combination of existing I&M program offerings, I&M program pilots, and industry best practices. Industry best practice research included reviewing literature (e.g., industry association trends report, conference papers, government agency white papers, evaluation reports, and DSM plans), as well as data associated with the program portfolios offered by peer utilities. This process allowed I&M's program potential

analysis to integrate I&M's current program offerings with future potential and leverage industry best practices customized for the I&M service territory. Because demand response is screened at the program level, the demand response program potential is equivalent to the RAP scenario.

Q. How did the I&M Indiana MPS examine Distributed Energy Resource Potential?

A. DER resources were modeled based on residential and non-residential solar photovoltaic (PV) and non-residential combined heat and power (CHP) resources. Potential for both resources was assessed based on premise-level availability to host the DER technology across I&M's territory with economic analysis based on estimated market costs and generation benefits to the end-use customer. To determine the level of customer penetration, GDS estimated adoption forecasts for I&M's customers based on Bass diffusion curves. The diffusion curves were informed by existing installed systems, assumed maximum market penetration, and coefficients of innovation and imitation. GDS used I&M's internal customer data to inform quantities of existing solar PV and CHP systems active in I&M's service territory. Using primary research conducted in 2021 with I&M residential and non-residential customers, GDS estimated various adoption levels to calculate scenarios of maximum market penetration. The Bass curve was fitted within these parameters using innovation and imitation coefficients based on state-specific research conducted by NREL. This forecast considered the level of solar (PV) and CHP installations over the 20-year MPS time horizon. Additional detail regarding the DER methodology can be found in Attachment JRH-1.

Q. How were existing I&M DER resources factored into the analysis of future DER potential?

A. The DER potential analysis included a market characterization of residential and non-residential customers by premise type, business function, and cohorts of energy consumption. This segmented characterization allows the DER analysis to align the proper system type and capacity type with the appropriate premise type. An additional important component of the market characterization is to identify the existing, installed DER systems for I&M customers. These existing DER systems are removed from the technical potential as non-eligible future resource opportunities.

Q. Were DERs evaluated for cost-effectiveness consistent with EE and DR resources?

A. DER cost effectiveness was determined using the Total Resource Cost (TRC) Test as opposed to the UCT used for EE and DR. GDS used the TRC for the primary cost-effectiveness screening test for DERs to encapsulate electric and natural gas utility impacts, customer perspectives, and determine whether a utility-sponsored program intervention is prudent. Ultimately, no solar PV or CHP technologies passed cost-effectiveness screening at a minimum TRC threshold of 1.0. As a result, achievable market potential was not identified.

Q. Is the development of the MPS consistent with industry best practices?

A. Yes. Over the past two decades, GDS has completed over 85 market potential studies for utilities and government agencies. Many of these studies are directly used for integrated resource planning and/or demand-side resource planning

purposes. For I&M MPS, GDS followed the methodology presented in the National Action Plan for Energy Efficiency (NAPEE) November 2007 report titled "Guide to Conducting Energy Efficiency Potential Studies." Wherever available, GDS used I&M Indiana service area specific data for building characteristics, energy using equipment saturation data, customer counts by sector, I&M Indiana forecast of MWh sales and peak load, electric avoided costs, line losses, planning reserve margin and other data. As added best practice, I&M and GDS provided updates to the MPSC staff on assumptions and methodological considerations related to the MPS. GDS took all stakeholder feedback into consideration when finalizing modeling inputs. Furthermore, GDS coordinated with I&M and key stakeholders to avoid constraining both short-term and long-term achievable savings. This was achieved by using a program awareness factor, derived from the I&M 2018 JD Power Customer Satisfaction Survey, which yielded higher long-term market adoption rates compared to initial WTP survey data, as well as taking a nuanced approach to calibrating initial year market adoption rates that precluded scaling down near-term potential if recent historical savings outpaced initial estimates of near-term potential.

III. DSM (EE/DR/DER) IRP Inputs

Q. Will you please describe the process used to develop EE IRP input bundles?

A. EE bundles for IRP modeling were developed by GDS using a statistical process, known as "k-means clustering", to determine the number of bundles, and which measures, to assign to individual bundles. In statistical terms, k-means clustering measures the Euclidean distance between a randomly selected "centroid" (a single

point in the Euclidean space), and a single data point, which in this analysis is an EE measure. A set number of bundles is defined for the process to assign each EE measure to one of the bundles. The process is iterative for each EE measure until the distances between points are minimized.

The Net Present Value (NPV) benefits and costs per lifetime kWh savings for each EE measure were used to cluster the measures into bundles. After the k-means clustering analysis is performed and each measure has been assigned to a bundle, various statistical metrics are output to help the user determine the quality of the clustering for that set number of bundles. The clustering analysis was performed for numbers of bundles ranging from two to twenty. There is no right or wrong answer when selecting the number of bundles, as the user must weigh the feasibility of using any number of bundles against the statistical metrics that help to identify the optimal numbers of bundles.

Based on the k-means clustering outputs, GDS identified 5 residential bundles, 1 income-qualified bundle, and 8 C&I bundles for IRP inputs. Following the measure-bundle assignment, GDS then mapped the program potential savings from the I&M MPS into the identified EE bundles for IRP model input. It is important to note that the bundles are not equal in measure counts or overall magnitude of savings. Select bundles are as small as a single measure type, while other bundles represent a comprehensive suite of measures across various end-uses, provided they possess similar characteristics (e.g. Net Present Value Benefits and Net Present Value Costs) as identified by the k-means clustering technique. Table JRH-1 provides a high level overview of the end-uses included within each bundle

and the relative magnitude of each bundle compared to total sector savings over the initial vintage (2023-2025) timeframe.

Table JRH-1 Overview of EE IRP Input Bundles (Vintage 1)

Sector & Bundle	*Primary End-Uses Includes*	*% of Total Sector EE Savings*
Residential #1	*Refrigeration*	*0.1%*
Residential #2	*Cooling*	*1.1%*
Residential #3	*Plug Loads*	*11.2%*
Residential #4	*Cooling*	*0.0%*
Residential #5	*Behavior, Lighting, Water Heat, Plug Loads, Appliances, Other*	*87.6%*
Income-Qualified #1	*Behavior, HVAC, Water Heat, Plug Load, Appliances*	*100%*
C&I #1	*Int. Lighting, PlugLoads, Ind. Process, Whole Building, Comp. Air, Misc.*	*20.5%*
C&I #2	*Behavior*	*0.8%*
C&I #3	*Int. Lighting, Machine Drive, Ventilation, Refrigeration, Cooling, Other*	*56.2%*
C&I #4	*RCx, SEM, Industrial Process, Other*	*6.3%*
C&I #5	*Industrial RCx, Comp. Air*	*3.8%*
C&I #6	*Industrial RCx, Lighting*	*1.6%*
C&I #7	*Ext. Lighting, Int. Lighting*	*9.1%*
C&I #8	*Cool/Heat*	*1.8%*

Q. Were I&M MPS findings directly used in the development of the EE inputs for the IRP?

A. For the Reference case of the IRP analysis, I&M used the EE program potential identified in the I&M MPS as the starting point for developing bundles of EE to be modeled in Aurora[4]. The program potential was selected over estimates of achievable potential that include measures that were originally cost-effective at the measure level but were not cost-effective after considering program delivery costs. In addition the program potential also aligned income-qualified program spending

[4] For additional discussion regarding the modeling of EE in the IRP, please refer to the testimony of Company witness Soller.

with historical levels. To allow EE to be modeled as a selectable resource, utility costs associated with delivering programs to achieved the modeled EE savings were also included in the IRP model. Again the I&M MPS program potential costs informed the costs for the EE IRP inputs.

Q. Were any savings adjustments made to the I&M MPS EE results in developing the IRP inputs?

A. Yes. Two adjustments to EE potential savings were necessary prior to inclusion in the IRP. The first adjusted the incremental annual savings for the EE IRP inputs, while the second adjusted the lifetime savings.

The first adjustment uplifted program potential savings to the generator level from the customer meter level since potential savings are reported at the meter-level in the I&M MPS. Sector savings were adjusted using on I&M's Peak Demand System Loss Factors to convert savings from the meter level up to the generator level.

The second savings adjustment, referred to as a "Supplemental Efficiency Adjustment (SEA)" is an adjustment to the lifetime savings reflected in the EE IRP inputs and is included to align the projections of future EE potential with the embedded efficiency trends already included in the I&M load forecast. The SEA adjustment begins by calculating the weighted average Effective Useful Life (EUL) of each incremental annual EE bundle. The lifetime savings of each individual measure included in the EE bundle is reflective of the overall bundles weighted average EUL to maintain a consistent estimate of lifetime savings impacts. Finally, an SEA matrix (either 5-year, 10-year, 15-Year, or 20-year) was applied to the

annual stream of lifetime savings (based on the weighted average EUL) to account for the portion of future year savings that are assumed to already be reflected in the I&M sales forecast.[5]

Q. Is the SEA adjustment an appropriate and reasonable adjustment to the EE IRP Inputs?

A. Yes. As previously noted, the sales forecast developed for the I&M MPS does not include any projections of efficiency beyond prevailing building codes and equipment standards, while the I&M load forecast used for the IRP includes implicit assumptions about future energy efficiency. The SEA adjustment, which is applied to estimates of gross EE savings that were developed assuming the "code frozen" forecast, functions to net out savings from program free-riders as well as any additional efficiency trends above prevailing codes and standards that are already embedded in the IRP load forecast.

Q. Were any cost adjustments made to I&M MPS EE results in developing the IRP inputs?

A. Adjustments were made to EE cost because the IRP's Capacity Expansion Model does not calculate avoided transmission and distribution (T&D) cost identified for EE (and DR) measures. For this adjustment, GDS provided I&M and Siemens with EE (and demand response) costs adjusted to net out the avoided net present value lifetime T&D benefits associated with peak demand savings, thereby increasing the value of EE and DR.

[5] See Company witness Burnett's testimony for additional discussion regarding the development of the I&M sales forecast.

Q. Was there any further segmentation of the EE IRP inputs beyond by sector and bundle, as described above?

A. Yes. GDS provided the EE IRP inputs across three different vintage bundles: 2023-2025, 2026-2028, and 2029-2040 to better optimize the value of EE to the system over time periods that align with subsequent I&M planning periods. The EE energy impacts for each vintage block provide the cumulative annual lifetime savings. Conversely, because EE program costs are only incurred during the year of measure installation, budgets are only accounted for during the identified years in each vintage block.

Q. Were any steps taken to account for the value of time-differentiated savings by measure in the development of the EE inputs?

A. Yes. In the IRP, the Aurora software views demand-side resources as non-dispatchable "generators" that produce energy similar to non-dispatchable supply-side generators such as wind or solar. Therefore, the value of each resource is impacted by the hours of the day and time of the year that it "generates" energy.

In addition to the annual impacts, typical hourly annual (8,760 hour) load shapes for each EE bundle, that reflect the various measures and end-uses reflected in each EE bundle, were developed to permit the IRP model to assess the value of energy savings on an hourly basis. GDS disaggregated the IRP input EE bundle savings based on the same end-use load shapes utilized in the market potential to produce an overall bundle 8,760 savings profile. As a result, the 8,760 hourly shapes provided for IRP inputs are unique for each EE sector and vintage bundle.

Q. Did GDS develop DR savings inputs for the IRP model?

A. Yes. Levels of cost-effective DR potential for demand reductions during the I&M system peak associated with RAP and MAP scenarios, and all associated utility costs, were provided as direct inputs to the IRP.

Q. Were any adjustments made to the I&M MPS DR results in developing the DR IRP inputs?

A. Yes, RAP and MAP scenario coincident peak demand reductions for demand response were each divided into two bundles, by sector, based on resource type: whether a dispatchable, or callable, DR resource or a fixed DR resource. Time-of-use rate programs make up the only fixed DR resource in the RAP and MAP scenarios. All other programs in the scenarios were dispatchable resources. Additionally, similar to EE cost inputs, DR program costs were reduced based on the net present value of lifetime avoided T&D benefits associated with peak demand savings.

Q. Were any DER impacts evaluated in the I&M MPS included in the IRP model?

A. Yes. Although the I&M MPS found no cost-effective achievable potential (under current avoided costs and cost-effectiveness screening parameters) from DERs, GDS performed additional modeling based on a business-as-usual scenario to understand how future DER growth may occur in the I&M service territory. GDS evaluated DER potential based on its current trajectory and with no utility intervention (i.e., no utility rebates offered to customers for DER installation and operation). This scenario was modelled based on primary data reported from its customers on data for willingness to adopt DER technologies without any utility

incentive. Forecasted incremental generation additional to existing capacity for solar PV and CHP over the study horizon was then provided to I&M for input into the IRP, with hourly impacts based on an Indiana-representative solar shape.

IV. Conclusions

Q. Will you please summarize why the I&M Indiana MPS best serves the interests of DSM and IRP planning for I&M Indiana?

A. The I&M Indiana MPS included primary market research and a comprehensive review of current programs, historical savings, and projected energy savings opportunities to develop estimates of technical, economic, achievable, and program potential. The primary market research was used to update estimates of baseline and efficient equipment saturation in the market potential study and to develop expected long-term adoption rates for EE over the study horizon. The near-term achievable potential in the I&M Indiana MPS accounts for recent historical savings achievements and the long-term achievable potential is based on territory-specific market adoption rate research. The I&M Indiana MPS included recommendations for potential improvements to the current program portfolio. Further, IRP inputs are directly based on the results of the I&M Indiana MPS. Last, the I&M Indiana MPS utilized industry best practices including leveraging Stakeholder feedback throughout the project.

Q. Does this conclude your pre-filed testimony?

A. Yes.

VERIFICATION

I, Jeffrey R. Huber, Principal at GDS Associates, Inc., affirm under penalties of perjury that the foregoing representations are true and correct to the best of my knowledge, information, and belief.

Date: March 30, 2022.

_____

Jeffrey R. Huber

GDS Associates, Inc.
ENGINEERS & CONSULTANTS
gdsassociates.com

prepared for

INDIANA MICHIGAN POWER COMPANY

INDIANA MICHIGAN POWER℠
An AEP Company

2021 POTENTIAL STUDY

FINAL REPORT

September
2021

prepared by
GDS ASSOCIATES INC
BRIGHTLINE GROUP

1 EXECUTIVE SUMMARY

1.1 BACKGROUND & STUDY SCOPE

As part of their larger 2021 Integrated Resource Plan (IRP), Indiana-Michigan Power ("I&M") commissioned GDS Associates ("GDS") and Brightline Group, collectively "the GDS Team", to assess energy savings potential in both the Indiana and Michigan jurisdictions of the I&M service area to help inform future planning efforts. Separate estimates of electric energy efficiency, demand response, and distributed energy resource (DER) potential were developed.

In addition, I&M also requested that GDS conduct limited primary market research to help inform key inputs in the market potential analysis. The final research sought focused on 1) collecting updated equipment penetration, saturation, and efficiency characteristics, 2) site conditions related to distributed energy resources, and 3) customer willingness to participate (WTP) in program offerings across select end-uses/measures.

This report focuses on the presentation of market research and potential savings for the I&M Indiana service area. A separate report presents the findings for the I&M Michigan service area.

1.2 TYPES OF POTENTIAL ANALYZED

This potential study provides a roadmap for both policy makers and I&M as they develop strategies and programs for energy efficiency (EE), demand response (DR), and distributed energy resources (DERs) in the I&M service area. In addition to technical and economic potential estimates, the development of achievable and program potential estimates for a range of feasible measures is useful for program planning and modification purposes. Unlike achievable and program potential estimates, technical and economic potential estimates do not include customer acceptance considerations for measures, which are often among the most important factors when estimating the likely customer response to new programs. For this study, the GDS Team produced the following estimates of demand side management potential:

- Technical potential
- Economic potential
- Achievable potential
  - Maximum achievable potential ("MAP")
  - Realistically achievable potential ('RAP")
- Program potential
  - Based off of RAP

1.3 APPROACH SUMMARY

The purpose of this market potential study is to provide a foundation for the continuation of utility-administered energy efficiency and demand response programs in the I&M service area, to determine the remaining opportunities for cost-effective energy savings, demand savings, and distributed energy resources for the I&M service area. This study has examined a full array of technologies, programs, and energy efficient building practices that are technically achievable.

The GDS Team used a bottom-up approach to estimate energy efficiency potential in the residential sector. Bottom-up approaches begin with characterizing the eligible equipment stock, estimating savings and screening for cost-effectiveness first at the measure level, then summing savings at the end-use and service area levels. In the commercial and industrial sectors, the GDS team utilized a top-down 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 electric energy load. Bottom-up approaches were also used in the demand response and DER analyses for all sectors.

1.4 STUDY LIMITATIONS AND CAVEATS

As with any assessment of potential, this study necessarily builds on various assumptions and data sources, including the following:

- Energy efficiency measure lives, savings, and costs (total measure costs, incremental costs, and incentive costs)
- Projected penetration rates for energy efficiency measures
- Projections of energy avoided costs
- Future known changes to codes and standards
- End-use saturations and fuel shares

While the GDS Team has sought to use the best and most current available data (including the use of new primary market research in key market subsegments of interest based on stakeholder feedback) there are often reasonable alternative assumptions which would yield slightly different results. For instance, the analysis assumes that many existing measures, regardless of their current efficiency levels, can be eligible for future installation and savings opportunities. Other studies may select a narrower viewpoint, limiting the amount of potential from equipment that is already considered to be energy efficient. Additionally, the models used in this analysis must make several assumptions regarding program delivery and the timing of equipment replacement that may ultimately occur more rapidly (or more slowly) than currently forecasted.

Furthermore, while the lists of energy efficiency measures examined in this study analysis represent technologies available on the market today as well as a limited number of emerging technologies not currently offered by I&M, these measure lists may not be exhaustive. The GDS Team acknowledges that new efficient technologies may become available over the course of the 20-year study timeframe that could produce efficiency gains and costs at different levels than those currently assumed.

Last, where possible, the GDS Team and I&M collaborated to ensure consistency with assumptions and methodological considerations that are expected to be employed by during the program planning process. However, final program designs and implementation strategies may need additional flexibility to target specific or underserved markets, address equity concerns, or react to changing customer preferences.

1.5 POTENTIAL SAVINGS OVERVIEW

The following several sub-sections provide an overview of the energy efficiency potential as well as summary demand response potential and distributed energy resource potential. Chapters 4 through 7 of this report provide additional summary data and methodological considerations and descriptions.

1.5.1 Energy Efficiency Potential for Residential Market Rate Customers

Figure 1-1 provides the technical, economic, MAP and RAP results for the 3-year, 10-year, and 20-year timeframes. The cumulative annual 3-year technical potential is 12.0% of forecasted sales, and the economic potential is 9.6% of forecasted sales. The cumulative annual 3-year MAP is 3.8% and the RAP is 3.4%, as a percentage of forecasted sales. Over the duration of the study timeframe the technical and economic potential rise to 39% and 33% of forecasted sales, respectively. This indicates that a large portion of the technical potential is cost-effective. The MAP and RAP rise respectively to 19% and 15% 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.

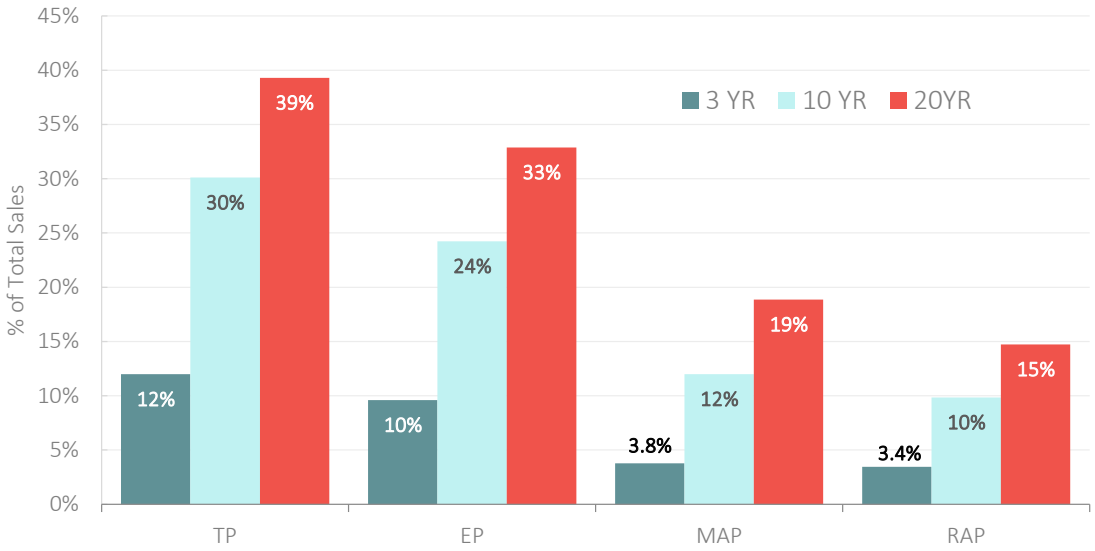


FIGURE 1-1: OVERVIEW OF RESIDENTIAL ENERGY EFFICIENCY POTENTIAL

Table 1-1 provides incremental and cumulative annual energy and demand savings for MAP and RAP across the next five years as well as over the 10-yr and 20-yr time horizons. Incremental RAP energy savings range from 51,000 MWh in 2023 to nearly 82,000 MWh by 2042, and cumulative RAP energy savings rise to more than 654,000 MWh by 2042.

TABLE 1-1 RESIDENTIAL MAP & RAP POTENTIAL

	2023	2024	2025	2026	2027	2032	2042
Incremental Annual Energy (MWh)							
MAP	54,178	60,854	68,856	74,284	79,181	93,219	92,961
RAP	51,137	55,857	61,248	64,477	67,382	77,504	81,753
Incremental Annual Energy (MW)							
MAP	12.6	14.2	16.0	17.3	18.3	20.6	20.5
RAP	11.3	12.3	13.2	13.9	14.4	16.2	17.0
Cumulative Annual Energy (MWh)							
MAP	54,178	106,390	161,163	215,487	272,022	516,067	837,342
RAP	51,137	98,599	146,823	193,585	241,112	423,566	654,240
Cumulative Annual Energy (MW)							
MAP	12.6	25.8	40.2	53.9	68.0	121.1	186.7
RAP	11.3	22.6	34.3	45.1	56.2	93.8	144.3

1.5.2 Energy Efficiency Potential for Commercial Customers

Error! Reference source not found. provides the technical, economic, MAP and RAP results for the 3-year, 10-year, and 20-year timeframes. The cumulative annual 3-year technical potential is 11% of forecasted commercial sales, and the economic potential is also 11% of forecasted commercial sales. The cumulative annual 3-year MAP is 6.6% and the RAP is 4.8%, as a percentage of forecasted commercial sales. Over the duration of the study timeframe the technical and economic potential rise to 37% of forecasted sales. The nearly identical technical and economic potential indicate that most measure are cost-effective under the UCT screen. The MAP and RAP rise respectively to 20% and 15% 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.

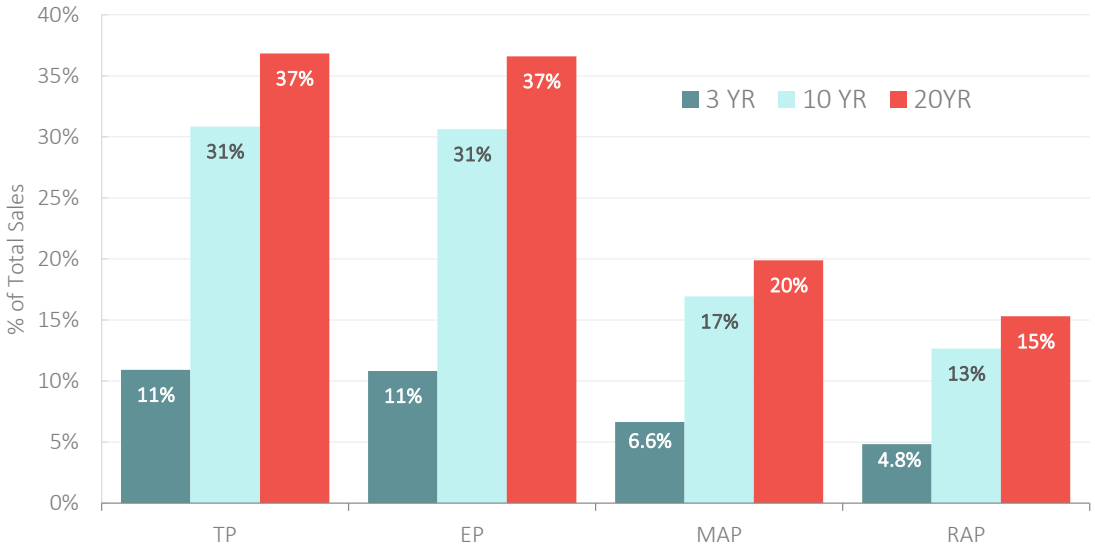


FIGURE 1-2: OVERVIEW OF COMMERCIAL ENERGY EFFICIENCY POTENTIAL

Table 1-2 provides incremental and cumulative annual commercial sector energy and demand savings for MAP and RAP across the next five years as well as over the 10-yr and 20-yr time horizons. Incremental RAP energy savings begin at roughly 80,200 MWh in 2023 followed by a steady decline over the next several years as commercial lighting savings become increasingly difficult to sustain. Cumulative RAP energy savings rise to approximately 600,000 MWh by 2042.

TABLE 1-2 COMMCERCIAL MAP & RAP POTENTIAL

	2023	2024	2025	2026	2027	2032	2042
Incremental Annual Energy (MWh)							
MAP	80,262	76,588	76,131	77,699	77,833	77,755	89,588
RAP	58,440	55,437	55,959	58,167	58,640	61,227	72,290
Incremental Annual Energy (MW)							
MAP	12.4	12.1	12.4	13.1	13.6	13.2	16.8
RAP	8.7	8.5	8.8	9.6	10.1	10.5	12.8
Cumulative Annual Energy (MWh)							
MAP	80,262	156,317	231,267	304,046	369,794	623,649	780,233
RAP	58,440	113,341	168,112	221,708	270,092	466,484	600,007
Cumulative Annual Energy (MW)							
MAP	12.4	24.6	36.9	49.3	61.1	112.2	166.9
RAP	8.7	17.2	26.0	34.9	43.6	82.6	124.4

1.5.3 Energy Efficiency Potential for Industrial Customers

Figure 1-3**Error! Reference source not found.** provides the technical, economic, MAP and RAP results for the 3-year, 10-year, and 20-year timeframes. The cumulative annual 3-year technical and economic potential is 6% of forecasted industrial sales.[1] The cumulative annual 3-year MAP is 3.6% and the RAP is 2.6%, as a percentage

[1] Agriculture is included in the industrial sector savings and forecasted sales.

of forecasted commercial sales. Over the duration of the study timeframe the technical and economic potential rise to 21% of forecasted sales. The identical technical and economic potential indicate that all industrial savings are cost-effective under the UCT screen based on the broader end-use analysis employed for this study. The MAP and RAP rise respectively to 14% and 10% of forecasted sales over the study timeframe. As with the commercial sector 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.

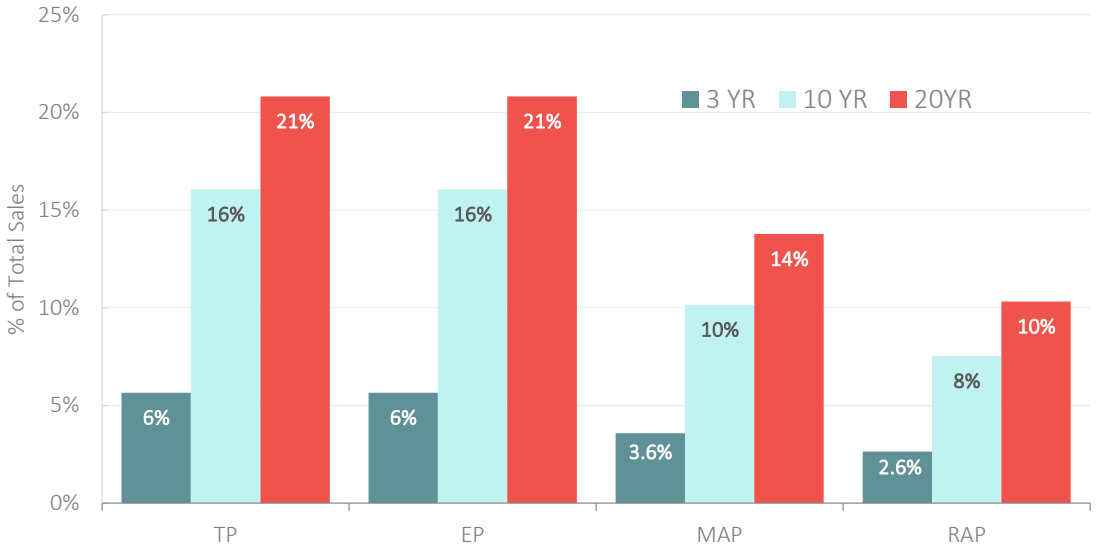


FIGURE 1-3: OVERVIEW OF INDUSTRIAL ENERGY EFFICIENCY POTENTIAL

Table 1-2 provides cumulative annual technical and economic potential results across the 2023-2027 (Years 1-5) timeframe, as well as for 2032 (10th-year) and 2042 (20th-year). Both technical and economic potential is nearly 194,000 MWh by 2025 and rises to approximately 752,500 MWh by 2042. Peak demand savings associated with technical and economic potential reach just under 34 MW by 2025 and reach approximately 130 MW by 2042.

TABLE 1-3 INDUSTRIAL MAP & RAP POTENTIAL

	2023	2024	2025	2026	2027	2032	2042
Incremental Annual Energy (MWh)							
MAP	41,551	40,892	39,948	46,691	46,013	51,231	54,938
RAP	30,573	30,109	29,461	34,639	34,201	38,798	51,949
Incremental Annual Energy (MW)							
MAP	7.2	7.1	6.9	8.0	7.9	8.8	9.4
RAP	5.3	5.2	5.1	6.0	5.9	6.7	7.2
Cumulative Annual Energy (MWh)							
MAP	41,551	82,444	122,392	161,140	198,771	356,788	497,824
RAP	30,573	60,682	90,143	118,779	146,623	264,537	373,038
Cumulative Annual Energy (MW)							
MAP	7.2	14.3	21.1	27.8	34.3	61.5	85.8
RAP	5.3	10.5	15.5	20.5	25.3	45.6	64.2

1.5.4 Demand Response Potential for All Customers

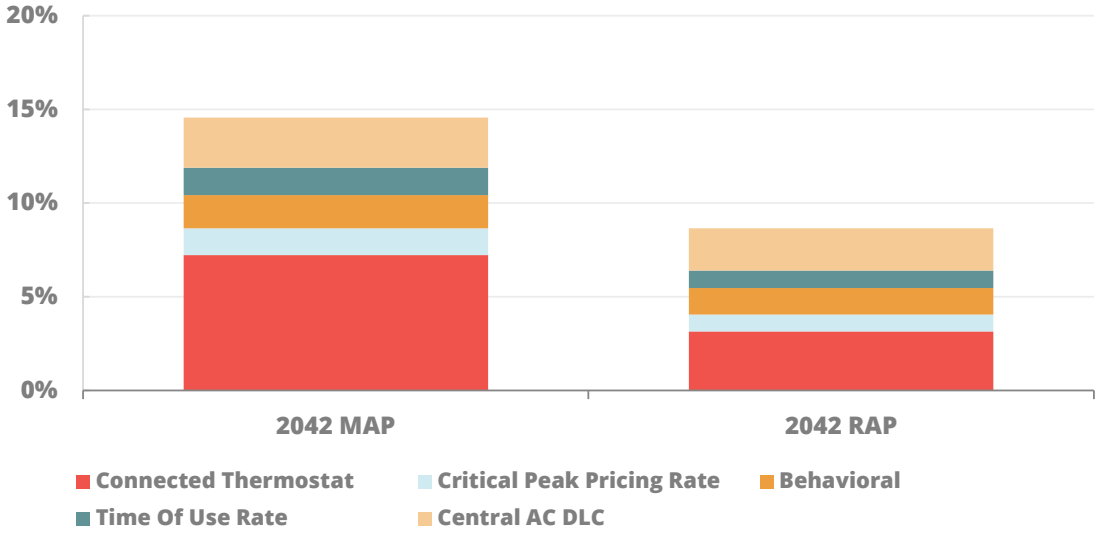


Figure 1-4 shows the 2042 residential MAP and RAP demand response potential for Indiana. These demand reduction values are presented at the customer meter level.

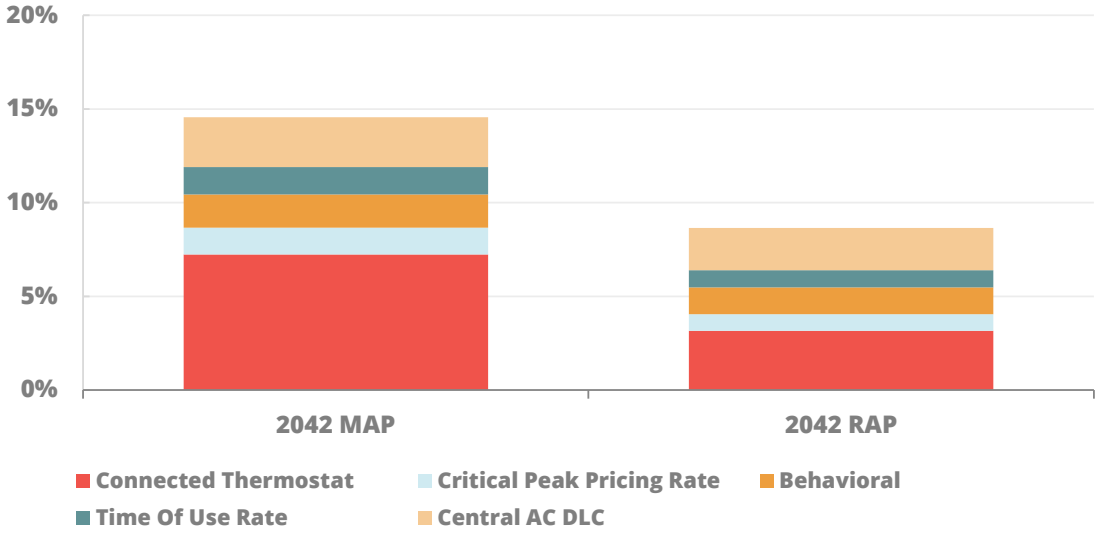


FIGURE 1-4 SUMMER PEAK MW RESIDENTIAL SECTOR BASE CASE RESULTS AS % OF 2042 RESIDENTIAL CLASS LOAD (MI)

Figure 1-5 shows the 2042 C&I sector MAP and RAP demand response potential for Indiana. These demand reduction values are present at the customer meter level.

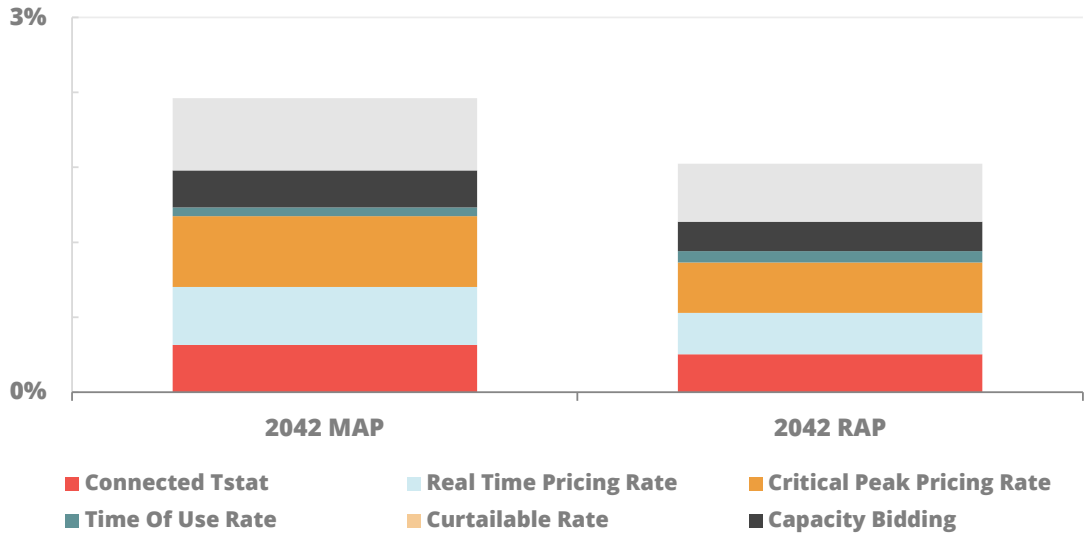


FIGURE 1-5: SUMMER PEAK MW C&I SECTOR BASE CASE RESULTS AS % OF 2042 C&I CLASS LOAD (MI)

1.5.5 Distributed Energy Resource Potential for All Customers

Table 1-4 summarizes the CHP cumulative annual potential estimates for electric demand and Table 1-5 for electric energy within I&M's Indiana service territory. 2042 technical market potential for CHP represents 17.3% of the 2042 non-residential sector sales forecast.

TABLE 1-4: SUMMARY OF CHP ELECTRIC DEMAND MARKET POTENTIAL

Year	Technical Peak Capacity (MW)	Economic (MW)	MAP (MW)	RAP (MW)
2023	3	0	0	0
2027	49	0	0	0
2032	154	0	0	0
2042	185	0	0	0

TABLE 1-5: SUMMARY OF CHP ELECTRIC ENERGY MARKET POTENTIAL

Year	Technical (MWh)	Economic (MWh)	MAP (MWh)	RAP (MWh)
2023	73,191	0	0	0
2027	426,286	0	0	0
2032	1,339,712	0	0	0
2042	1,608,618	0	0	0

Table 1-6 summarizes the solar PV cumulative annual potential estimates for electric demand and Table 1-7 for electric energy within I&M's Indiana service territory. The residential 2042 technical market potential for solar PV represents

55.9% of the 2042 residential sector sales forecast. Additionally, the non-residential 2042 technical market potential represents 64% of the 2042 non-residential sector sales forecast.

TABLE 1-6: SUMMARY OF SOLAR PV ELECTRIC DEMAND MARKET POTENTIAL

Year	Technical DC Capacity (MW)	Technical Peak Capacity (MW)	Economic (MW)	MAP (MW)	RAP (MW)
2023	333	109	0	0	0
2027	1,918	601	0	0	0
2032	5,658	1,771	0	0	0
2042	6,628	2,074	0	0	0

TABLE 1-7: SUMMARY OF SOLAR ELECTRIC ENERGY MARKET POTENTIAL

Year	Technical (MWh)	Economic (MWh)	MAP (MWh)	RAP (MWh)
2023	433,828	0	0	0
2027	2,399,988	0	0	0
2032	7,069,659	0	0	0
2042	8,280,565	0	0	0

2 MARKET RESEARCH

The initial step in the assessment of future potential is to develop a clear understanding of the current market segments, as well as a clear understanding of the market research data available in the I&M service area. In late 2020 I&M requested the GDS team to conduct market research that would inform critical elements of the market potential study. The research objectives were developed in coordination with I&M and the potential study team. Primary market research activities were focused on collecting updated equipment penetration, saturation, and efficiency characteristics; and customer willingness to participate (WTP) in program offerings across select end-uses/measures.

The resulting data was used to develop updated estimates of baseline and efficient equipment saturation estimates in the market potential study and develop expected long-term adoption rates for energy efficiency, demand response, and DERs over the study horizon. The GDS Team conducted surveys of business and residential customers during January and February of 2021 with the objectives of gathering primary data on the following topics:

- Willingness to participate in a variety of energy efficiency, demand response and distributed energy resource (DER) program scenarios.
- Baseline / Saturation of energy-using equipment
- Program awareness
- Barriers

Survey results served as inputs for the market potential model, enabling the market potential analysis to take into consideration the specific market conditions that exist in I&M's service territory. **Error! Reference source not found.** Figure 2-1 presents a summary of the specific technologies and Demand Side Management (DSM) topic areas addressed within the business and residential surveys.

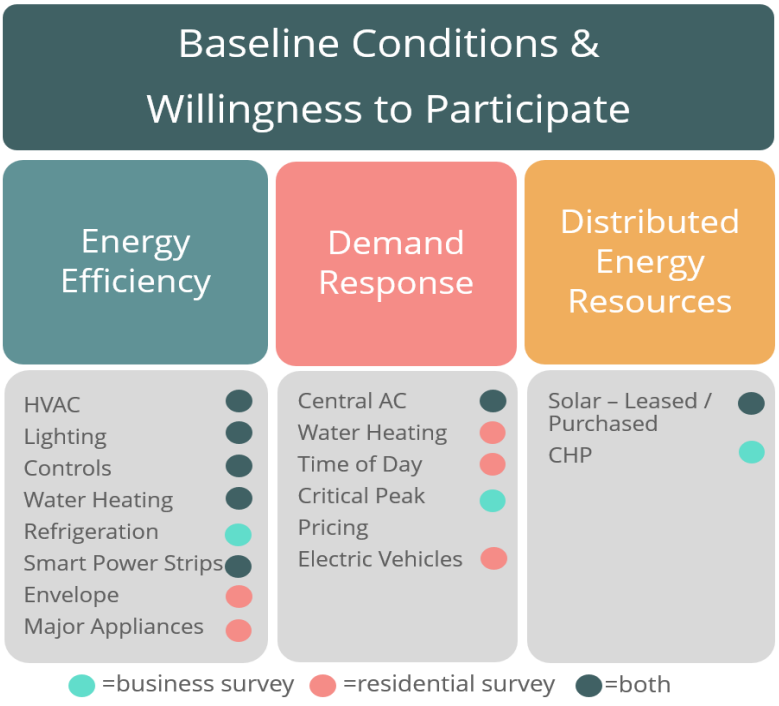


FIGURE 2-1 SURVEY SCOPE

Data collection results specific to the I&M's Indiana service area are provided below.

2.1 PRIMARY DATA COLLECTION

The following subsections provide an overview of the primary data collection activities conducted by the GDS team to support the market potential analysis of energy efficiency, demand response, and DER potential. The GDS team conducted survey research in the residential and nonresidential sectors.

2.1.1 Survey Administration

Surveys were administered in an online format, with email recruitment followed by two reminder emails sent at approximately one-week increments. VuPoint Research administered the business and residential online surveys and conducted telephone follow up to businesses who had initiated but not completed the survey after the initial email recruitment period. BrightLine Group administered the online multifamily property owner and manager survey and conducted both email and telephone follow up recruitment.

Respondents who completed the survey were entered into a drawing to win an electronic gift card. $100 gift cards were awarded to ten randomly selected business survey respondents and five randomly selected residential survey respondents. All four multifamily property owner / manager respondents received a $100 gift card.

2.1.2 Sampling Approach

The team developed a sampling approach with an objective of achieving industry-standard statistical significance (90% confidence, 10% relative precision, or 90/10) at the strata level for all questions, taking into consideration there would be variation in the willingness to participate (WTP) modules included in each survey to keep survey length manageable for respondents. The sample design assumed a coefficient of variation (CV) of 0.5 for the residential sample, and 0.7 for the business sample, assuming there would likely be greater variation among business responses.

Overall, the response outcomes were positive, and the survey effort produced a robust set of primary data. The team set aggressive sampling targets, with a goal of having high levels of statistical significance for detailed sub-groups within the population. The response fell short on some of those targets, but the team gathered a strong data set that meets the needs of the analysis. Table 2-1 sampling targets and response outcomes.

The business survey achieved 90/10 at the strata level for the baseline questions, and at the state level for other questions (i.e., 189 business respondents started the survey and completed the baseline questions but did not complete the survey in its entirety).[2] The residential survey achieved 90/10 for all strata except multifamily (see Table 2-2).[3]

TABLE 2-1 SURVEY SAMPLING TARGETS AND RESPONSE SUMMARY

State	Target Completes	Completes (Entire Survey)	Completes (Baseline Questions)
Nonresidential Customer Survey *Stratification: state, small /large*			
Indiana	**530**	**375**	**504**

[2] The response to business baseline questions would meet 90/10 for IN assuming a CV of 0.7, and for MI assuming a CV of 0.6.

[3] The residential survey achieved 90/10 at the strata level for Indiana multifamily – income qualified, but not for other multifamily strata.

State	Target Completes	Completes (Entire Survey)	Completes (Baseline Questions)
Michigan	522	158	218
Total	1,052	533	722
Residential Customer Survey *Stratification: state, single / multifamily, and income-qualified / market rate*			
Indiana	544	820	1,085
Michigan	544	829	1,114
Total	1,088	1,649	2,199

2.1.3 Residential Online Survey

The residential customer research targeted homeowners and tenants in the following key segments: income-eligible and market-rate customers, and customers occupying single family and multifamily homes. Income-eligible was defined by household size as 200% of the federal poverty threshold.

A residential online customer survey collected home characteristics, equipment penetration for key end-uses – such as heating, cooling, water heating, insulation, smart power strips, thermostats, major appliances, solar PV systems, pool pumps, and electric vehicles – and information on barriers and willingness to adopt a range of energy efficient measures at varying incentive levels. Table 2-2 provides the targeted and completed residential online surveys in Indiana.

TABLE 2-2 TARGETED AND COMPLETED RESIDENTIAL SECTOR ONLINE SURVEYS – INDIANA

Strata	State	Target Sample Size	Total Completed
Single Family – Market Rate	Indiana	136	289
Multifamily – Market Rate	Indiana	136	6
Single Family – IQ	Indiana	136	441
Multifamily – IQ	Indiana	136	84

2.1.4 Business Sector Online Survey

Primary data collection was also conducted in the nonresidential sector via an online survey with business customers. The survey collected business and facility characteristics, as well as equipment penetrations for key end-uses, such as lighting, heating, cooling, water heating, refrigeration, thermostats, and on-site generation (including solar PV systems). The nonresidential online survey also collected information on barriers to energy efficiency and willingness-to-adopt energy efficient measures under various incentive offerings. In total, GDS collected survey data from 722 commercial customers, with 504 in the I&M Indiana service area and 218 from the I&M Michigan service area. GDS examined the annual energy consumption data from the survey participants and developed a weighting adjustment based on the sample's consumption by building type relative to the I&M population in both the Indiana and Michigan service area.

2.2 RESIDENTIAL MARKET DATA

The tables below provide some key home and equipment characteristics by key market segment. The results have been weighted to align the sample distribution with that of the overall residential populations in Indiana and Michigan.

Table 2-3 presents some key household and equipment characteristics for the residential sector by I&M service area, housing type, and income type. The data presented below includes the average number of units per household for occupants, water devices, thermostat and plug load controls, and key appliances.

TABLE 2-3: KEY HOUSEHOLD AND EQUIPMENT CHARACTERISTICS (AVG # PER HH)

	Total	I&M – Indiana	I&M – Michigan	Single Family	Multi-family	Market Rate	Income Qualified
Household Characteristics							
Avg. # of Occupants	2.5	2.6	2.2	2.5	2.3	2.6	2.5
Avg # of Showerheads	1.7	1.6	1.9	1.7	1.4	1.5	1.8
Avg # of Faucets	3.8	3.6	4.2	3.9	3.0	3.2	4.1
Avg # of Thermostats	1.4	1.4	1.6	1.5	1.3	1.4	1.5
Avg # of Smart Thermostats	0.2	0.2	0.3	0.2	0.1	0.1	0.2
Avg # of Smart Power Strips	0.5	0.4	0.5	0.5	0.5	0.6	0.4
Avg # of Refrigerators	1.5	1.5	1.7	1.6	1.1	1.3	1.6
Avg # of Stand-Alone Freezers	0.6	0.6	0.6	0.6	0.4	0.6	0.6

Table 2-4 provides example summary data by market segment for major residential end-uses. These data points of electric appliances and water heating equipment penetrations help quantify the eligible population of equipment by market segment. In addition, the research also provided recent market conditions for remaining efficiency opportunities. For example, the research determined the percent of households that have emerging technologies such as heat pump dyers and heat pump water heaters, as well as the percent of homes with insulation and air sealing needs.

TABLE 2-4: SELECT RESIDENTIAL MARKET RESEARCH RESULTS FOR KEY END-USES

End-Use	Equipment	Total	I&M – Indiana	I&M – Michigan	Single Family	Multi-family	Market Rate	Income Qualified
WH	Electric WH	36%	36%	37%	34%	57%	37%	35%
	Heat Pump WH *(as a % of electric WH)*	2%	2%	2%	2%	2%	3%	2%
Shell	Uninsulated Attic	3%	3%	2%	3%	6%	5%	2%
	Uninsulated Walls	3%	4%	3%	3%	13%	6%	2%
	Uninsulated Basement Wall	24%	22%	30%	24%	15%	29%	22%
	Uninsulated Basement Floor/Crawl	30%	26%	42%	31%	12%	29%	30%
	Single Pane Windows	14%	15%	9%	13%	40%	20%	12%
	Prior Insulation/Sealing Activities	55%	55%	56%	57%	23%	50%	57%
Appliance	In Unit Clothes Washer	86%	86%	88%	90%	62%	81%	89%
	Common Area Clothes Washer	5%	5%	4%	3%	15%	7%	3%
	In Unit Clothes Dryer	86%	85%	87%	89%	61%	80%	88%

End-Use	Equipment	Total	I&M – Indiana	I&M – Michigan	Single Family	Multi-family	Market Rate	Income Qualified
	Heat Pump Dryer *(as a % of all Dryers)*	5%	6%	4%	5%	9%	6%	5%
DER	Solar Panels Present?	1%	1%	1%	1%	0%	0%	1%
	Electric Vehicle	2%	2%	2%	2%	1%	1%	2%

Error! Reference source not found. provides current information on LED lighting in the residential market for I&M market segments. At least one LED bulb can be found in 90% of I&M Indiana residences. According to survey participants, roughly 60% of all sockets in the I&M Indiana service area have LEDs.[4]

TABLE 2-5 RESIDENTIAL LIGHTING BULB TYPE

	Total	I&M – Indiana	I&M – Michigan	Single Family	Multi-family	Market Rate	Income Qualified
% w/ at least one lamp							
LED	91%	90%	95%	93%	78%	88%	92%
CFL	62%	62%	62%	63%	53%	59%	63%
Incandescent/Halogen	62%	62%	65%	63%	55%	56%	65%
Fluorescent	49%	48%	55%	51%	36%	42%	52%
% of all lamps							
LED	59%	59%	59%	60%	53%	57%	60%
CFL	16%	16%	15%	15%	18%	18%	15%
Incandescent/Halogen	19%	19%	20%	18%	23%	19%	19%
Fluorescent	6%	6%	6%	6%	7%	6%	7%

2.3 BUSINESS MARKET DATA

Table 2-6 provides select demographic information in the business sector. In general, I&M Indiana commercial facilities had similar characteristics to the I&M Michigan service area. I&M Indiana commercial participants indicated a slightly higher likelihood of leasing their facilities and operating slightly smaller facilities.

TABLE 2-6 COMMERCIAL BUILDING CHARACTERISTICS

	Total	I&M Indiana	I&M Michigan
Own	78%	75%	85%
Lease	21%	24%	15%
Occupy Entire Facility	80%	80%	80%
Occupy Part of Facility	11%	11%	11%
Occupy None (Manage Only)	9%	9%	9%

[4] Estimates are based on participant self-report data. GDS anticipates that participants likely overestimate the overall saturation of LED lighting relative to the total number of sockets found in the residence. Still, the data supports that LED saturation is rapidly increasing and becoming the dominant bulb type in residences.

	Total	I&M Indiana	I&M Michigan
% of Facilities Built Before 1990	67%	68%	65%
Average Size of Facility (Sq. Ft)	31,820	29,990	36,287
Average Weekday Hours of Operation	9.4	9.0	10.6
Average Weekend Hours of Operation	7.5	6.9	9.1

The penetration of different lighting fixtures in I&M businesses is shown in Table 2-7. Linear LED fixtures are estimated to be nearly 50% of all facilities. In I&M Indiana area, participants indicated lower saturation of LED lighting (as a % of total facility lighting) than I&M Michigan. The table also includes the % of facilities with different lighting control types as well as % of lighting that is controlled. Table 2-8 provides example summary data by business size for major end-uses.

TABLE 2-7: COMMERCIAL SECTOR LIGHTING END-USE CHARACTERISITCS

End Use	Equipment	Total	I&M Indiana	I&M Michigan
Lighting *(% with Type)*	Linear Fluorescent	71%	73%	65%
	Linear LED	47%	47%	47%
	Nonlinear LED	50%	48%	53%
	Incandescent	43%	42%	45%
Lighting *(% of all Lighting)*	Linear Fluorescent	43%	46%	33%
	Linear LED	23%	22%	26%
	Nonlinear LED	16%	15%	21%
	Other	18%	18%	19%
Lighting Controls	Occupancy Sensors	14%	13%	16%
	% of Lighting Controlled	4%	4%	4%
	Daylight Dimming	6%	5%	8%
	% of Lighting Controlled	1%	1%	2%
	Time Controls	17%	17%	17%
	% of Lighting Controlled	2%	2%	3%
	Advanced Lighting Controls	3%	2%	4%
	% of Lighting Controlled	>1%	>1%	2%

TABLE 2-8 COMMERCIAL SECTOR EQUIPMENT PENETRATION ACROSS KEY END-USES

End Use	Equipment	Penetration		
		Total	I&M Indiana	I&M Michigan
Heating	Boiler	6%	6%	6%
	Furnace	70%	71%	65%
	Heat Pump	1%	1%	1%
	Electric Resistance	>1%	1%	>1%
	Unit Heater	9%	8%	12%
	Infrared	3%	3%	2%
Cooling	Packaged System AC	45%	43%	51%
	Split System AC	51%	52%	49%
	Heat Pump (Ducted)	25%	23%	32%
	Heat Pump (Ductless)	5%	4%	9%

End Use	Equipment	Penetration		
		Total	I&M Indiana	I&M Michigan
	Chiller	4%	4%	4%
	Window AC	22%	21%	23%
Thermostats	Smart Thermostats	9%	10%	6%
	% of Space Controlled by Smart Thermostat	57%	55%	66%
Ventilation	Demand Controlled Ventilation	5%	5%	6%
	Vent Hoods	20%	19%	23%
	Vent Hoods with Demand Controlled Vent.	27%	24%	32%
Refrigeration	Has Commercial Refrigeration?	16%	15%	19%
	Display Cases w/ Night Covers	21%	17%	31%
	Ref. Walk-Ins with Strip Curtains	31%	26%	41%
	Ice Machines	11%	11%	11%
Smart Strips	Smart Strips (% of All Strips)	48%	57%	25%
Water Heating	Electric WH	47%	44%	56%
On-Site Generation	Renewable Energy Generation	2%	1%	2%
	Emergency/Backup Generation	7%	7%	6%
	Cogeneration/CHP	0%	0%	0%

2.4 ADOPTION CURVE MARKET DATA

In addition to new primary research on building and energy-consuming equipment characteristics in the I&M service area, one of the major objectives of the primary research was to develop survey research that could be utilized to develop measure/program adoption curves to develop estimates of achievable potential. Table 2-9 describes the end-uses or categories in which adoption rate estimates were developed for energy efficiency, demand response programs, or distributed energy resources by the GDS team.

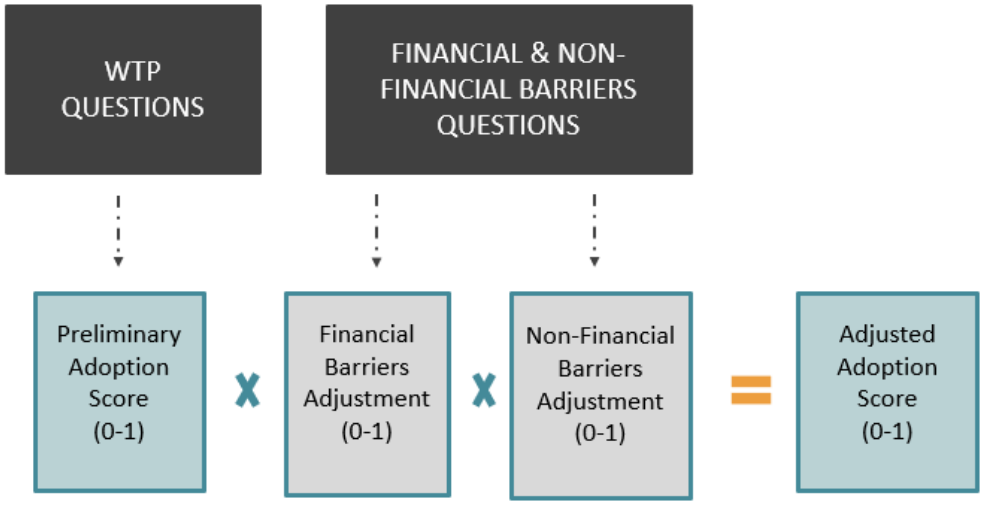
TABLE 2-9 ADOPTION RATE CATEGORIES ANALYZED

Willingness to Participate	EE End Uses	DR Programs	DER
Residential Customers	Heating/CAC Water Heating Major Appliances Insulation/Air Sealing	Central AC Control Water Heater Control Customized DR (Time of Use)	Solar PV (Purchase) Electric Vehicles (Evs)
Business Customers	HVAC Equipment Water Heating Equip. Refrigeration Lighting Equipment	Central AC Control Customized DR (Critical Peak Pricing)	Solar PV (Purchase) Solar PV (Lease)

Adoption rate calculations were based on a battery of questions which assessed (1) the respondent's willingness to adopt energy efficiency technologies or participate in demand response programs in scenarios

with varying levels of program support, (2) the magnitude of the respondent's financial and non-financial barriers to adoption/participation. Adoption rates were calculated based on the equation shown below.

EQUATION 2-1 ADOPTION RATE FORMULA FOR FINAL ADOPTION SCORE



Direct willingness-to-participate questions are the starting point of measure/program-specific adoption curve calculations. For each item, respondents were asked to rate the likelihood that they would purchase the energy efficient version of the equipment, or participate in the DR program, at various incentive levels, including no incentive and an incentive that covers the full incremental (or total) cost.

Responses to financial and non-financial barrier questions were then used to adjust the preliminary adoption score. If "cost" was a consideration to prevent customers from purchasing energy efficient equipment, GDS assumed a financial barrier adjustment. The 0% incentive level was reduced by 100%, the 25% incentive level was reduced by 80%, the 50% incentive level was reduced by 60%, the 75% incentive level was reduced by 40%, and the 100% incentive level was reduced by 20%.

If another reason was a consideration to prevent customers from purchasing energy efficient equipment, GDS assumed a non-financial barrier adjustment. The 0% incentive level was reduced by 50%, the 25% incentive level was reduced by 40%, the 50% incentive level was reduced by 30%, the 75% incentive level was reduced by 20%, and the 100% incentive level was reduced by 10%.

2.4.1 Residential Sector Final Adoption Scores

Table 2-10 presents the adjusted adoption scores (after financial and non-financial adjustments) for I&M Indiana residential customers. In general, Indiana residential customers indicated a lesser willingness to participate and install HVAC-related energy efficiency measures compared to Michigan residential customers, particularly at lower incentive levels relative to other end-uses.

TABLE 2-10 RESIDENTIAL FINAL ADOPTION SCORES BY INCENTIVE LEVEL

Indiana (All Homeowners)	Annual Incentive (% of incremental measure cost)				
	0%	25%	50%	75%	100%
HVAC	31%	41%	54%	66%	81%
Water Heat	18%	28%	41%	54%	74%
Insulation/Air Sealing	15%	27%	41%	55%	80%
Appliances	18%	27%	41%	56%	73%

Final adoption scores for residential direct load control (DLC) of central AC and water heating systems are shown in Table 2-11, depending on varying annual incentive levels. Current annual incentive offerings are $25 for direct load control of central air conditioning systems. Table 2-12 provides the final adoption score for a Time of Use (TOU) rate option based on a prescribed difference between peak and off-peak rates.

TABLE 2-11 DLC DEMAND RESPONSE FINAL ADOPTION SCORES BY INCENTIVE LEVEL

DR – DLC	Annual Incentive (% of incremental measure cost)				
Market Rate	**$0**	**$15**	**$25**	**$35**	**$50**
Central AC – SF	13%	25%	32%	37%	46%
Central AC – MF	20%	26%	29%	31%	43%
Water Heat – SF	11%	16%	20%	24%	31%
Water Heat – MF	19%	22%	24%	26%	34%
Income-Eligible	**$0**	**$15**	**$25**	**$35**	**$50**
Central AC – SF	16%	27%	32%	35%	41%
Central AC – MF	20%	28%	32%	34%	41%
Water Heat – SF	10%	16%	20%	25%	32%
Water Heat – MF	12%	18%	23%	29%	38%

TABLE 2-12 TOU DEMAND RESPONSE FINAL ADOPTION SCORES BY INCENTIVE LEVEL

DR – Rate	Lower off-peak rate			
Market Rate	**$0.08**	**$0.06**	**$0.04**	**$0.03**
DR-TOU – SF	18%	25%	33%	41%
DR TOU – MF	16%	16%	16%	24%
Income-Eligible	**$0.08**	**$0.06**	**$0.04**	**$0.03**
DR-TOU – SF	22%	26%	31%	38%
DR TOU – MF	24%	27%	35%	39%

The final adoption scores related to select distributed energy resources are presented in Table 2-13. Survey questions asked participants about their likelihood to purchase and/or lease solar PV systems as well as electric vehicles assuming different incentive level amounts (or payback periods).

TABLE 2-13: RESIDENTIAL DER FINAL ADOPTION SCORES

Solar Purchase	Annual Incentive (% of incremental measure cost)				
	0%	**25%**	**50%**	**75%**	**100%**
Homeowners/Tenants	6%	14%	28%	45%	72%
Electric Vehicle	**Annual Incentive (% of incremental measure cost)**				
	0%	**25%**	**50%**	**75%**	**100%**
Homeowners/Tenants	5%	12%	24%	14%	38%

2.4.2 Business Sector Final Adoption Scores

Table 2-14 presents the adjusted adoption scores (after financial and non-financial adjustments) for I&M Indiana nonresidential customers across several end-uses, depending on whether the investment is a minor or

major investment. Small businesses indicated a minor investment to be approximately $4,000 or less. Final adoption scores were generally similar regardless of the initial investment amount.

In contrast to the residential sector energy efficiency WTP research, the nonresidential WTP survey questions incentives were described in the form of payback periods to better align with how purchasing decisions are likely to considered.

TABLE 2-14 NONRESIDENTIAL FINAL ADOPTION SCORES BY INCENTIVE LEVEL AND INVESTMENT TYPE – I&M INDIANA

Minor Inv.	Payback Performance (after incentive)				
	10 Years	5 Years	3 Years	1 Year	0 Years
HVAC	33%	44%	55%	67%	75%
Lighting	48%	60%	71%	79%	84%
Refrigeration	28%	37%	50%	63%	72%
Water Heat	50%	61%	72%	82%	87%
Major Inv.	**Payback Performance (after incentive)**				
	10 Years	5 Years	3 Years	1 Years	0 Years
HVAC	39%	48%	57%	67%	74%
Lighting	54%	63%	71%	79%	83%
Refrigeration	32%	40%	52%	64%	69%
Water Heat	57%	67%	74%	82%	86%

Final adoption scores for business sector demand response options are shown in Table 2-15, depending on varying annual incentive levels for direct load control as well as volunteer load reduction. The table also provides business sector responses for participation likelihood in a Critical Peak Pricing (CPP) DR rate program on a prescribed difference between peak and off-peak rates designs.

TABLE 2-15 NONRESIDENTIAL DEMAND RESPONSE FINAL ADOPTION SCORES

DR – DLC	Annual Incentive				
	$0	$15	$25	$35	$50
Central AC	21%	24%	27%	30%	34%
DR – Rates	**Lower than current rate**				
	5%	10%	20%	40%	
Critical Peak Pricing	18%	22%	30%	40%	

Table 2-16 provides the final adoption scores for solar PV purchasing and/or leasing in the business sector.

TABLE 2-16 NONRESIDENTIAL DER FINAL ADOPTION SCORES

Purchased Solar	Payback Years				
	10 YR	5 YR	3 YR	1 YR	0 YR
Business	Did not ask	39%	51%	66%	72%
Solar Lease					

	0%	10%	33%	67%	85%
Business	17%	24%	32%	41%	49%

3 BASELINE FORECAST

The load forecast is a critical input into I&M's 2021 DSM Market Potential Study, having various uses in estimation of residential and business sector potential. Therefore, the GDS Team took considerable time and effort to review I&M's most recently completed load forecast models and documentation to produce the various forecast components necessary as inputs into this analysis. The chapter describes the various ways in which the forecast is used for this study, presents the baseline and disaggregated forecasts, and describes the methodology and data sources used by GDS for the purposes of generating the load forecasts that were used in the potential analysis.

3.1 I&M LOAD FORECASTING SYSTEM

I&M employs a sophisticated load forecasting system that uses econometric and Statistically Adjusted End-Use ("SAE") models to project number of consumers, average consumption per consumer, and total energy sales by class. Residential, Commercial, and Industrial consumers are projected using traditional econometric techniques. Residential average usage and commercial energy sales are projected using SAE model specifications. Industrial energy sales are projected using econometric techniques.

A residential SAE model specification takes end-use data drawn from utility, regional, and even national sources and develops monthly end-use indices designed to predict average household consumption. The end-use data includes market shares of key electric consuming appliances, average device efficiency trends, average building shell efficiency trends, price elasticity of demand, income elasticity of demand, and elasticity associated with the average number of people per household. A cooling index is developed to represent space cooling load and is further modified by Cooling Degree Days to incorporate summer weather into the model. Likewise, a heating index representing space heating is modified by Heating Degree Days. Finally, a base index is developed to represent consumption of all other end-uses in the home.

A commercial SAE model specification is very similar to a residential specification, except end-use energy intensity indices are developed for each commercial building type based on area employment in various industry codes. National and regional commercial data is used to estimate end-use consumption for various industries (for example, restaurants will have higher cooking usage shares than offices).

I&M also projects the impacts of DSM programs it has run in the past. The DSM impacts included in the load forecast are inputs derived from the previous IRP study conducted by I&M in 2018 and 2019.

3.2 ADJUSTMENTS TO THE I&M INDIANA LOAD FORECAST

Before assessing the future potential for energy efficiency, demand response, or distributed energy resources in the I&M Indiana service area, a few modifications to I&M's 2020-vintage forecast were necessary to create an adjusted baseline forecast. These modifications are addressed in more detail below.

3.2.1 Code Frozen Efficiency Adjustments

The base case forecast I&M developed uses the appliance efficiency forecast published in the Energy Information Administration's (EIA) Annual Energy Outlook (AEO) as inputs for the various end-use indices contained within the SAE models. While this is the best practice for developing a base case forecast, to determine potential impacts of DSM/EE programs it is helpful to understand how energy sales would be impacted if appliance efficiencies were held constant at the prevailing U.S. code level. If the base case efficiency level is below code in a given year, the base case forecasted energy sales will be adjusted downward in said year, and if the base case efficiency level is above code in a given year, forecasted energy sales will be adjusted upward. The process for the code frozen efficiency adjustments follows, using residential cooling load as an

example. The "code frozen" forecast allows for a comparison to the base case forecast so that energy savings due to above or below code appliances can be isolated and accounted for separately from DSM/EE programs.

A forecast number of customers is multiplied by the cooling end-use market share saturation and the year over year change in the number of appliances to determine the number of cooling end-use appliances in the I&M service territory. The change in the number of appliances from year to year is then multiplied by the prevailing U.S code efficiency level in that year, while the number of existing appliances is multiplied by the base year efficiency level. The result is a weighted average of existing and new stock appliances and their efficiencies, creating the code frozen efficiency level for the I&M Indiana service territory. Next, the percent difference between the Base Case efficiency level and the Code Frozen efficiency level is multiplied by the base case energy consumption for cooling load, resulting in the adjustment applicable to the base case forecast for cooling load. The results of the code frozen efficiency adjustments are shown below in Figure 3-1 and Figure 3-2.

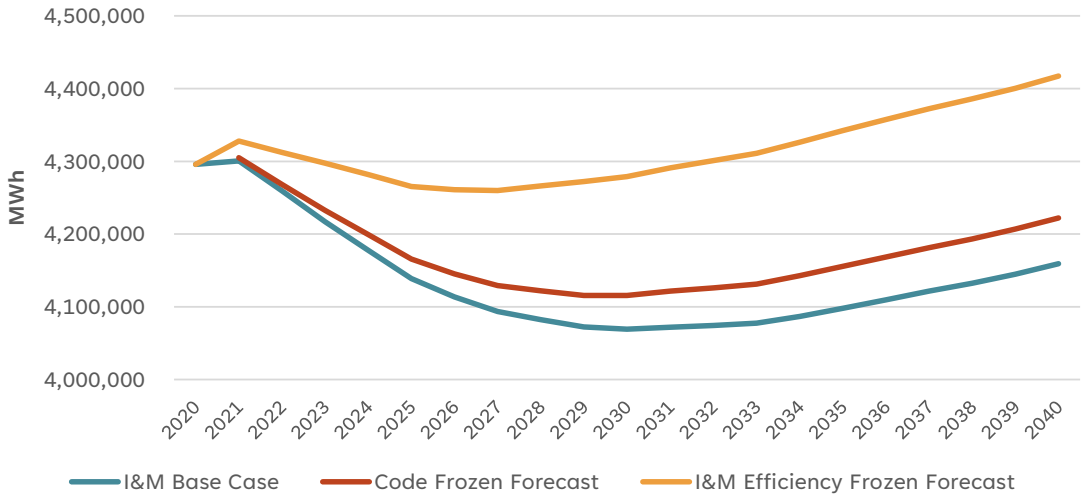


FIGURE 3-1. INDIANA RESIDENTIAL SECTOR FORECAST TRENDS

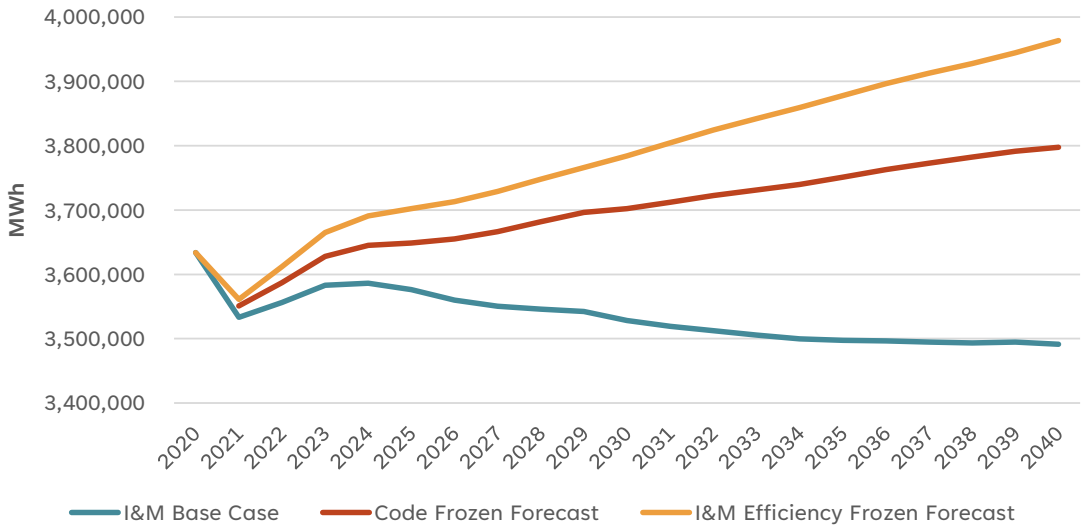


FIGURE 3-2. INDIANA COMMERCIAL SECTOR FORECAST TRENDS

3.2.2 Adjustment for Large C&I Opt-Out Customers

The 2019 I&M Indiana business sector customer database containing usage and demographic data for all C&I customers, with indication for large customer opt-out of DSM/EE programs status was utilized to determine how to adjust for opt-out customers. The number of customers and total energy use was calculated both including and excluding opt-out customers. The load forecast for the C&I sectors was adjusted down by the percent of load attributed to opt-out customers from the customer database, in effect excluding from the potential analysis any load of opt-out customers. The opt-out adjustment was held constant for all years of the load forecast. In total, GDS removed approximately 9% of commercial energy sales and 50% of industrial energy sales due to large customer opt-out.

3.2.3 Reclassification of Load

The 2019 I&M Indiana C&I sector customer database designated commercial and industrial rate code based on current tariff definition. When only using the account type/tariff definition to classify customers as either commercial or industrial, there were several manufacturing type premises classified as commercial, as well as several customers that GDS typically classifies as commercial classified as industrial, (i.e. a retail service building coded as an industrial account).

Additionally, the dataset also identified each business by Standard Industry Code (SIC). To reclassify I&M C&I sector data, GDS mapped industry codes to a specified building type and classified the building type as either commercial or industrial. Customers with a building type classified as “Industrial Manufacturing” were coded as Industrial customers, while all other building types were coded as Commercial. While the goal for this analysis is to determine the actual amount of energy sales attributable to the commercial and industrial customer classes as a whole, it is only achievable by analyzing individual customer data. The result of this reclassification was a shift of approximately 0.5% of industrial sector sales, or 32,925 MWh, to the commercial sector. This 0.5% shift was then applied to the I&M base case forecasted sales for the commercial and industrial classes. It is important to have accurate energy sales by customer class so that specific DSM/EE programs have the correct amount of energy sales eligible for savings.

3.3 LOAD FORECAST DISAGGREGATION

The baseline forecasts represent projected total energy sales by class. For the potential studies, it is useful to have the class forecasts disaggregated in several different ways. This section presents the forecast disaggregation scenarios used by GDS to determine intensity by end-use.

3.3.1 Residential Sector

The residential electric calibration effort led to an end-use intensity breakdown as shown below in . Overall, we estimated per home consumption to be 10,470 kWh per year. The “Other” end use is the leading end-use which includes plug loads such as electronics and miscellaneous small appliances.,. This reflects the increasing prominence of electronics and other plug-in load devices.

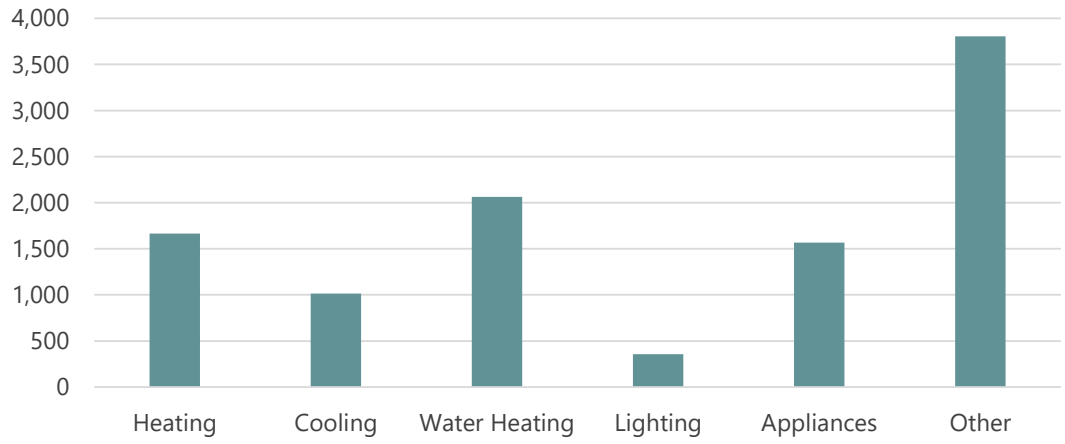


FIGURE 3-3 RESIDENTIAL ELECTRIC END-USE BREAKDOWN

3.3.2 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 I&M for the residential, commercial and industrial sectors. As noted above, the C&I forecast was adjusted from the base case by using SIC information from I&M to reclassify usage as commercial or industrial. SIC information from I&M, along with CBECS building type consumption tables, was then used to segment the forecast into building types. The forecast was further segmented into end-uses by building type using CBECS 2012 end-use survey data. Figure 3-4 provides a breakdown of commercial electric sales by building type and industrial sales by sector.[5]

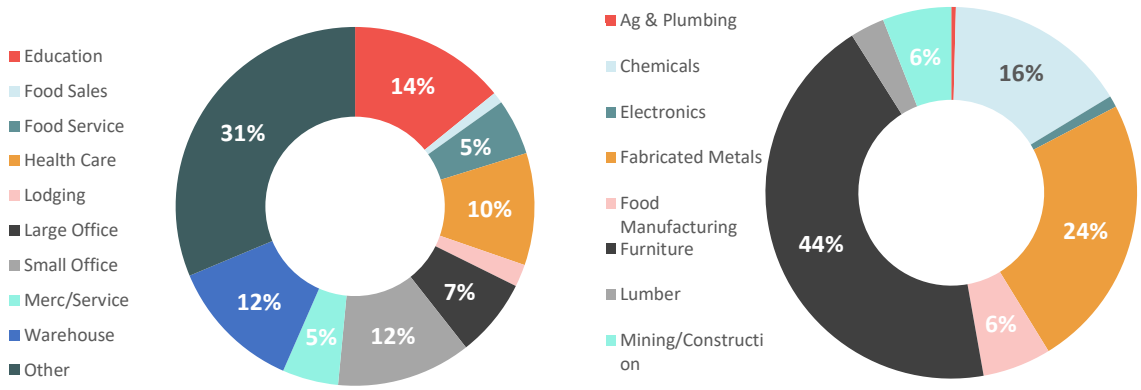


FIGURE 3-4: COMMERCIAL ELECTRIC SALES BREAKDOWN BY BUILDING TYPE

Figure 3-5 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

5 "Other" commercial building types include buildings that engage in several different activities, a majority of which are commercial (e.g. retail space), though the single largest activity may be industrial or agricultural; "other" also includes miscellaneous buildings that do not fit into any other category.

refrigeration loads greatest in food sales and food service while office/computing loads are greatest in offices and education.

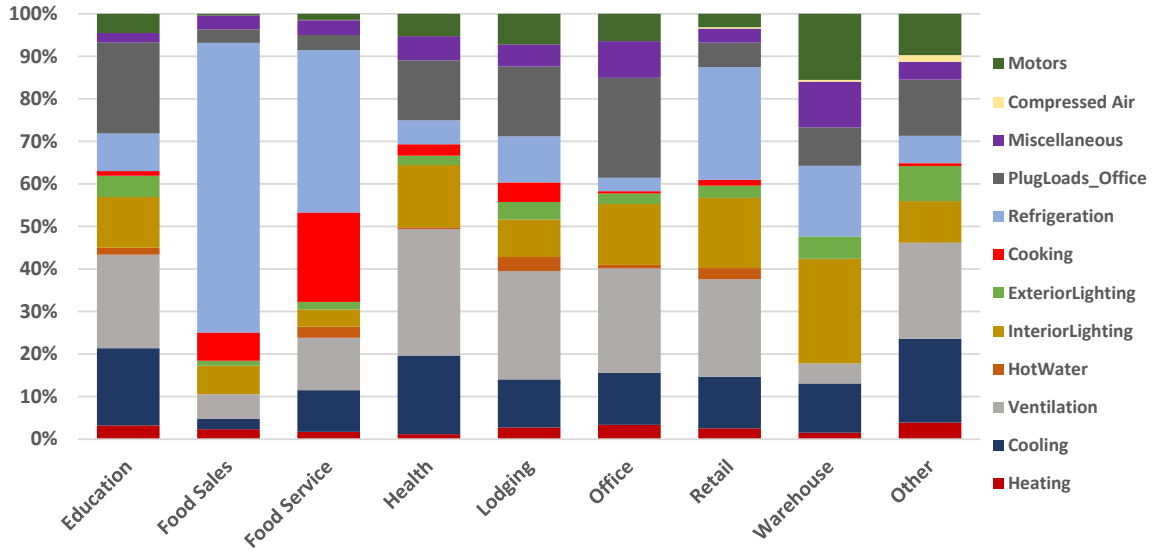


FIGURE 3-5: COMMERCIAL ELECTRIC END-USE BREAKDOWN BY BUILDING TYPE[6]

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 3-5 provides a breakdown of the sales by end-use. Overall, the weighted average industrial sales by end-use in the I&M Indiana service area was roughly 38% Machine Drive, 16% Process Heat, 10% HVAC, 9% Compressed Air, 9% Lighting, and 7% Process Refrigeration. The remaining 12% was split between other process and other facility loads.

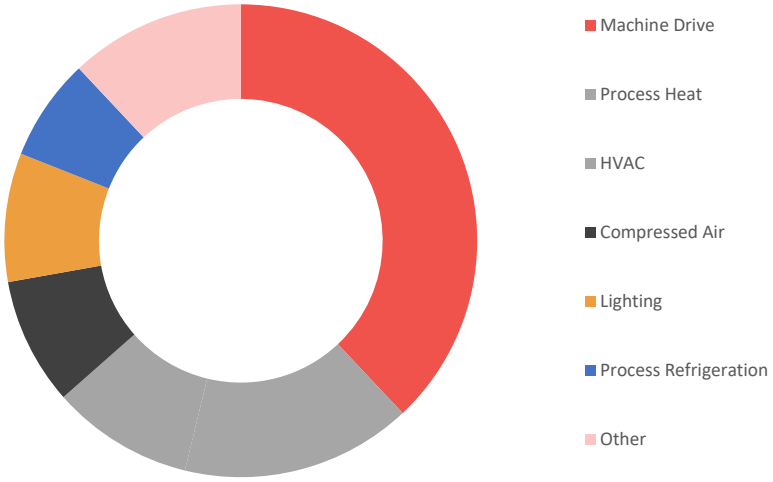


FIGURE 3-6: INDUSTRIAL ELECTRIC END-USE BREAKDOWN BY BUILDING TYPE

[6] Data labels for segments that contribute less than 5% of the total sector sales were removed to improve Figure readability.

4 ENERGY EFFICIENCY POTENTIAL ANALYSIS

4.1 ANALYSIS APPROACH

This section describes the overall methodology utilized to assess the electric energy efficiency potential in the I&M service area. The main objectives of the energy efficiency potential analysis were to estimate the technical, economic, maximum, and realistic achievable potential savings from energy efficiency in the I&M Indiana service territory; and to quantify these estimates of potential in terms of MWh and MW savings, for each level of energy efficiency potential.

4.1.1 Overview of Approach

For the residential sector, GDS utilized a bottom-up approach to the modeling of energy efficiency potential, 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, taking into consideration incentives and estimates of annual adoption rates. For the C&I sector, GDS employed a bottom-up modeling approach to first estimate measure-level savings, costs, and cost-effectiveness, and then applied measure savings to all applicable shares of energy load.

4.1.2 Market Characterization

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

4.1.2.1 Forecast Disaggregation

As noted in Chapter 3, through the development of the baseline forecasts, the GDS Team produced disaggregated forecasts by sector and end-use. The resulting aggregate baseline forecasts were disaggregated by sector and then further segmented as follows:

- ***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 I&M Indiana-specific segment and end-use consumption shares, derived from I&M's customer database and SIC code analysis (building segmentation), 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 4-1.

TABLE 4-1: ELECTRIC END-USE LOADS

Residential	C&I	
	Commercial	Industrial
Heating	Interior Lighting	Lighting
Cooling	Exterior Lighting	HVAC
Water Heating	Refrigeration	Machine Drive
Cooking	Space Cooling	Process Heat
Refrigerator	Space Heating	Process Cool / Refrigeration
Freezer	Ventilation	Other Process
Dishwasher	Water Heating	Process – Machine Drive
Clothes Washer	Plug Loads / Office Equipment	Other Facility
Dryer	Cooking	Compressed Air
TV	Other	Water / Wastewater
Light	Whole Building / Behavioral	Process – Agriculture
Miscellaneous		Whole Building / Behavior

4.1.2.2 Eligible Opt-Out Customers

In Indiana, individual commercial or industrial customer sites with a peak load greater than 1MW are eligible to opt out of utility-funded electric energy efficiency programs. In the I&M Indiana service area, approximately 9% of total retail commercial sales have opted out of utility-funded electric energy efficiency programs, while roughly 50% of total retail industrial sales have opted out.

Figure 4-1 shows the total sales for the C&I sectors, as well as the sales, by sector, that have currently opted out of paying the charge levied to support utility-administered energy efficiency programs. The portion of sales that have not opted out include both ineligible load (i.e., does not meet the 1 MW peak demand requirement) as well as eligible load that has not yet opted out.

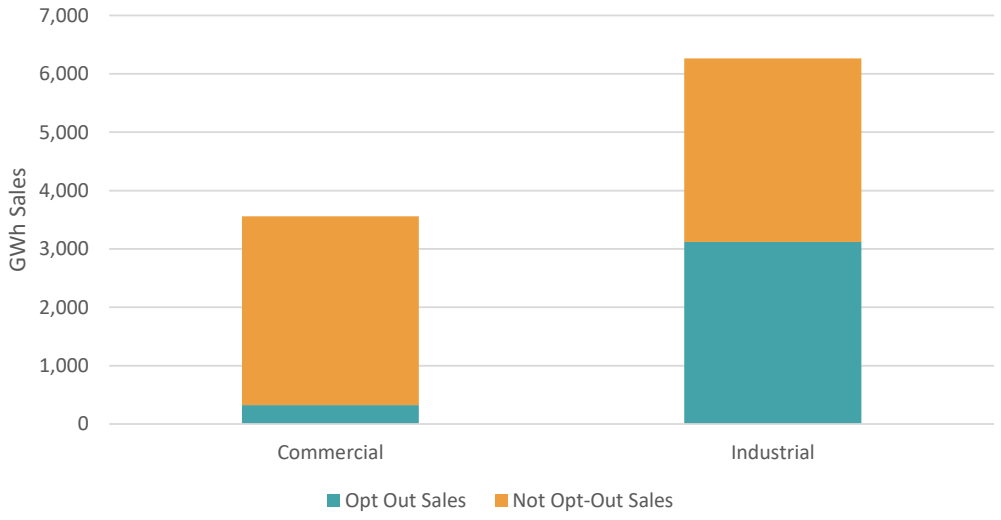


FIGURE 4-1 OPT-OUT SALES BY C&I SECTOR

GDS removed the sales from opt-out customers in the assessment of technical, economic, and achievable potential reflected in this report. As a sensitivity (included in Appendix A), GDS also examined the full potential in the C&I sector if these customers were no longer able to opt-out of utility-funded electric energy efficiency programs.

4.1.2.3 Building Stock/Equipment Saturation

To assess the potential electric energy efficiency savings available, estimates of the current saturation of baseline equipment and energy efficiency measures are necessary.

4.1.2.3.1 Residential Sector

For the residential sector, GDS relied on the primary research efforts noted in Chapter 2 of this report, as well as the 2018 Residential Appliance Saturation Survey. The GDS-led market research results allowed for the GDS Team to characterize the baseline and efficiency saturations of the residential sector using housing-type specific data. Other data sources included ENERGY STAR unit shipment data, I&M evaluation reports, and the EIA Residential Energy Consumption Survey data from 2015. The ENERGY STAR unit shipment data filled data gaps related to the increased saturation of energy efficient equipment across the U.S. in the last decade.

4.1.2.3.2 Business Sector

For the commercial sector, building stock and equipment saturation data was informed from a combination of primary market research (online surveys noted in Section 2), as well as other available regional or national data. The survey data helped inform the disaggregation of the end-use sales forecast further into measure groups consistent with the measures included in the potential analysis as well as saturation of energy efficient equipment.

Beyond the primary data collection, EIA regional data, as well as national studies on commercial energy consumption were used to inform consumption in the remaining end-uses where data from the primary market research was even more limited.[7] These sources typically informed estimates of base equipment saturation for cooking, refrigeration, water heating, plug loads, and other miscellaneous end-uses.

For the industrial sector, the analysis employed a top-down analysis at the end-use level. Accordingly, it was not critical to disaggregate the industrial sales at a measure-level. Instead, measures were developed to estimate savings at a total end-use level.

4.1.2.4 Remaining Factor

The remaining factor is the proportion of a given market segment that is not yet efficient and can still be converted to an efficient alternative. It is the inverse of the saturation of an energy efficient measure, prior to any adjustments. In this study, two key adjustments were made in order to recognize that the energy efficient saturation does not necessarily always fully represent the state of market transformation. First, while a percentage of installed measures may already be efficient, some customers may backslide (i.e. revert to standard technologies, or otherwise less efficient alternatives in the future, based on considerations like measure cost and availability and customer preferences). For example, historically, some customers have disliked CFL light quality, and have reverted to incandescent and halogen bulbs after the CFLs burn out.

Second, for measures categorized as market opportunity (i.e. replace-on-burnout), we assumed that 50% of the instances in which an efficient measure is already installed, the burnout or failure of those measures would be eligible for inclusion in the estimate of future savings potential. This adjustment assumes that 50% of the market is transformed, and no future savings potential exists, whereas the remaining 50% of the market is not transformed and could backslide without the intervention of an I&M program and an incentive. Similarly, for retrofit measures, we assumed that only 10% of the instances in which an efficient measure is already installed, the burnout or failure of those measures would be eligible for inclusion in the estimate of future savings potential. This recognizes the more proactive nature of retrofit measures, as the implementation of these

[7] Examples of secondary research include: Energy Savings Potential RD&D Opportunities for Commercial Building Appliances. 2016. DOE and Energy Star Shipment Data.

measures are more likely to be elective in nature, compared to market opportunity measures, which are more likely to be needs-based. The uncertainty in these assumptions are appropriate, as they factor in a key component of natural customer decision making.

4.1.3 Measure Characterization

4.1.3.1 Measure Lists

The study's sector-level energy efficiency measure lists were informed by a range of sources including the MEMD, the Illinois and Indiana TRMs, current I&M Indiana program offerings, and commercially viable emerging technologies, among others. Measure list development was a collaborative effort in which GDS developed draft lists that were shared with I&M and stakeholders. The final measure lists ultimately included in the study reflected the informed comments and considerations from the parties that participated in the measure list review process.

In total, GDS analyzed 353 measure types for this study. Several measures were included with multiple permutations to account for different specific market segments, such as different building types, efficiency levels, and replacement options. In total, GDS developed 2,106 measure permutations for this study. Each permutation was screened for cost-effectiveness under the UCT cost test. The parameters for cost-effectiveness under the UCT are discussed in detail later in Section 4.1.6.

TABLE 4-2: NUMBER OF ELECTRIC MEASURES EVALUATED

	# of Measures	Total # of Measure Permutations
I&M Indiana		
Residential	168	673
Commercial	157	1,405
Industrial/Ag	28	28
Total	***353***	***2,106***

4.1.3.2 Emerging Technologies

GDS considered several specific emerging technologies as part of analyzing future potential. In the residential sector, these technologies include several smart technologies, including smart appliances, smart water heater (WH) tank controls, smart window coverings, smart TVs, heat pump dryers and smart vents/sensors. In the non-residential sector, specific emerging technologies that were considered as part of the analysis include AMI data presentment, building integrated energy management systems, advanced rooftop controls, variable refrigerant flow heat pumps, ozone commercial laundry, advanced lighting controls, power distribution equipment upgrades, server virtualization, escalator motor controls, and grow lighting. While this is likely not an exhaustive list of possible emerging technologies over the next twenty years it does consider many of the known technologies that are available today but may not yet have widespread market acceptance and/or product availability.

In addition to these specific technologies, GDS acknowledges that there could be future opportunities for new technologies as equipment standards improve and market trends occur. While this analysis does not make any explicit assumption about unknown future technologies, the methodology assumes that subsequent equipment replacement that occurs over the course of the 20-year study timeframe, and at the end of the initial equipment's useful life, will continue to achieve similar levels of energy savings, relative to improved baselines, at similar incremental costs.

4.1.3.3 Assumptions & Sources

A significant amount of data is needed to estimate the electric savings potential for individual energy efficiency measures or programs across the residential and nonresidential customer sectors. GDS utilized data specific to I&M

Indiana when it was available and current. GDS used the most recent I&M Indiana evaluation report findings (as well as I&M Indiana program planning documents), the Michigan Energy Measures Database ("MEMD"), the Indiana TRM, the Illinois TRM, for a large amount of the data requirements. Additional source documents included American Council for an Energy-Efficient Economy (ACEEE) research reports covering topics like emerging technologies.

Measure Savings: GDS relied on existing I&M Indiana evaluation report findings and the MEMD to inform calculations supporting estimates of annual measure savings as a percentage of base equipment usage. For custom measures and measures not included in the MEMD, GDS estimated savings from a variety of sources, including:

- Illinois TRM, IN TRM, and other regional/state TRMs
- Secondary sources such as the ACEEE, Department of Energy (DOE), 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 primarily from I&M Indiana evaluation report findings and the MEMD. GDS also used the following supplementary data sources:

- Illinois TRM, IN, and other regional/state TRMs
- Secondary sources such as the ACEEE, ENERGY STAR, and NREL

Costs and savings for new construction and replace on burnout measures were calculated as the incremental difference between the code minimum equipment and the energy efficiency measure. This approach was utilized because the consumer must select an efficiency level that is at least the code minimum equipment when purchasing new equipment. The incremental cost is calculated as the difference between the cost of high efficiency and standard efficiency (code compliant) equipment. However, for retrofit or direct install measures, the measure cost was the "full" cost of the measure, as the baseline scenario assumes the consumer would not make energy efficiency improvements in the absence of a program. 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 Life: Measure life represents the number of years that energy using equipment is expected to operate. GDS obtained measure life estimates from the I&M Indiana evaluation report findings and the MEMD:

- Illinois TRM, IN TRM, and other regional/state TRMs
- Manufacturer data
- Savings calculators and life-cycle cost analyses

All measure savings, costs, and useful life assumption sources are documented in the Appendices volume of this report.

4.1.3.4 Treatment of Codes & Standards

By law, the U.S. Department of Energy (DOE) is expected to review each national appliance standard every six years and publish either a proposed rule to update the standard or determine that no change to the existing standard is needed. As of January 2020, DOE has missed legal deadlines for twenty-eight product standards since 2016.[8] Given these delays in future standard updates, the initial start year of 2023 for this analysis, and that the analysis is not intended to predict how or when energy codes and standards will change over time, there are only limited known improvements to federal codes and standards to reasonably account for in this analysis.

[8] Missed Deadlines for Appliance Standards. Prepared by the Appliance Standards Awareness Project. Updated March 2021.

Although not exhaustive, other key adjustments include:

- The baseline efficiency for air source heat pumps (ASHP) is anticipated to improve to 15 SEER/8.8 HSPF[9] in 2023. As the new standards allow for a sell-through period, the baseline efficiency will be assumed to be the new federal standard, beginning in 2024.
- The baseline efficiency for split system central AC systems is anticipated to improve to 14 SEER in 2023. As the new standards allow for a sell-through period, the baseline efficiency will be assumed to be the new federal standard, beginning in 2024.
- DOE established the first national standards for pool pumps in 2017, becoming effective in 2021. The new standards will cut energy use for in-ground pool pumps by approximately 70% and can be met by switching from single-speed to variable-speed pool pumps.
- In 2019, the DOE established new standards effective for residential portable and whole-home dehumidifiers. The new standards are based on a new metric, integrated energy factor (IEF) and improves the test procedure to better reflect the actual energy consumption of dehumidifiers in the home. The new standards range from 1.30 L/kWh for small dehumidifiers up to 2.8 L/kWh for larger capacity dehumidifiers.
- In July 2019, the DOE established new standards effective for more efficient furnace fan/motors. The standards are expected to improve the efficiency by approximately 45% over the current baselines. To date, many furnaces are equipped with standard induction motors, which operate at about 60-65% efficiency. The new standard will create a shift to electronically commutated motors (ECMs).
- DOE established new standards for pre-rinse spray valves, setting maximum flow rates between 1.0 and 1.28 gallons per minute. The new standards took effect in early 2019 and are reflected in the analysis.

4.1.3.5 Net to Gross

All estimates of technical, economic, and achievable potential, as well as measure level cost-effectiveness screening were conducted in terms of gross savings to reflect the absence of program design considerations in these phases of the analysis. The impacts of free-riders (participants who would have installed the high efficiency option in the absence of the program) and spillover customers (participants who install efficiency measures due to program activities, but never receive a program incentive) were considered in the development of program potential (Chapter 7).

4.1.4 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 4-2 illustrates the types of energy efficiency potential considered in this analysis.

[9] SEER: Seasonal Energy Efficiency Ratio; HSPF: Heating Seasonal Performance Factor.

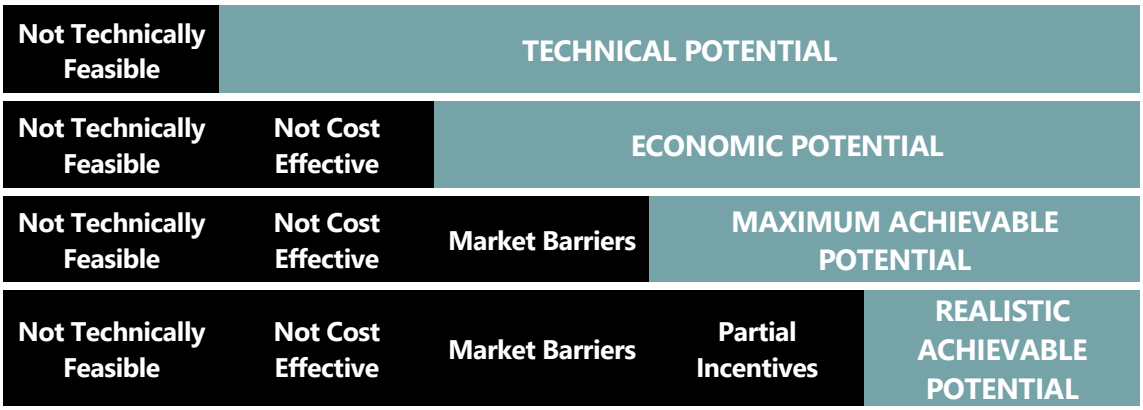


FIGURE 4-2 TYPE OF ENERGY EFFICIENCY POTENTIAL[10]

4.1.5 Technical Potential

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 4-1 below. The C&I sector employs a similar analytical approach.

EQUATION 4-1 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 a given 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.

10 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.

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.

4.1.5.1 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.

4.1.6 Economic Potential

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

4.1.6.1 Utility Cost Test & Incentive Levels

The economic potential assessment included a screen for cost-effectiveness using the UCT at the measure level. In the I&M territory, the UCT considers electric energy, capacity, and transmission & distribution (T&D) savings as benefits, and utility incentives and direct install equipment expenses as the cost. Consistent with application of economic potential according to the National Action Plan for Energy Efficiency, the measure level economic screening does not consider non-incentive/measure delivery costs (e.g. admin, marketing, evaluation etc.) in determining cost-effectiveness.[11]

Apart from the low-income segment of the residential sector, all measures were required to have a UCT benefit-cost ratio greater than 1.0 to be included in economic potential and all subsequent estimates of energy efficiency potential. Low-income measures were not required to be cost-effective.

For both the calculation of the measure-level UCT, as well as the determination of RAP, historical incentive levels (as a % of incremental measure cost) were calculated for current measure offerings. GDS relied on the prior I&M DSM plan estimates and historical I&M Indiana evaluation reports files to map current measure offerings to their historical incentive levels.

- In the residential sector, incentives by program ranged from 33% to 100% and averaged 68%.
- In the non-residential sector, prescriptive incentives averaged 31% of the measure cost for interior lighting, 6% for exterior lighting and 21% for non-lighting measures.

[11] National Action Plan for Energy Efficiency: Understanding Cost-Effectiveness of Energy Efficiency Programs. *Note: Non-incentive delivery costs are included in the assessment of achievable potential.*

- Custom measures received incentives equal to $0.052 per first-year kWh saved.
- In the MAP scenario, incentives were increased up to 100% of the incremental measure cost.[12]

4.1.6.2 Avoided Costs

Avoided energy supply costs are used to assess the value of energy savings. Avoided cost values for electric energy, electric capacity, and avoided T&D were provided by I&M as part of an initial data request. Electric energy is based on an annual system marginal cost. For years outside of the avoided cost forecast timeframe, future year avoided costs are escalated by the rate of inflation.

I&M provided the GDS Team with monthly on and off-peak avoided energy costs. GDS used this data to create 8,760 avoided cost values for each forecast year. GDS then applied these avoided costs to the 8,760 savings from each measure based on assigned end-use load shapes[13] to determine the value of measures that save more energy during peak periods than those that might saving during off-peak periods. In addition, the avoided capacity and T&D avoided costs were applied to the estimated coincident peak demand savings for each measure.

4.1.7 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 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.[14]
- ***RAP*** estimates achievable potential with I&M 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.

4.1.7.1 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 I&M Indiana-specific WTP market research. The I&M Indiana-specific 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. This research is discussed in additional detail in Section 2.4.

[12] The GDS team lowered MAP incentives to less than 100% of measure incremental cost in some cases if 100% incentives would preclude the measure from being cost-effective. MAP incentives were lowered to either 75% or 50% of the incremental measure cost if either of those incentive levels would allow for a measure to remain cost-effective.
[13] End-use load shapes were derived from building energy simulation models created by housing type and building type, specific to the I&M Indiana service area.
[14] ibid.

One caveat to this approach is that the WTP adoption score is generally a simple function of incentive levels and/or payback performance. There are other factors that may influence a customer's willingness to purchase an energy efficiency measure. For example, increased marketing and education programs can have a critical impact on the success of energy efficiency programs. To reflect market barriers beyond total and up-front costs, GDS also included a program awareness factor into the determination of the long-term adoption rate. The adoption rate was based on the WTP survey research as well as other market research conducted by I&M related to customer engagement and awareness of energy efficiency programs. Based on this data, the program awareness for the realistic achievable potential was set at 74% and increased in the maximum achievable scenario (85%) to reflect the likelihood of increase program and awareness under the maximum achievable scenario. Although we recognize this approach does not capture every possible factor in determining appropriate long-term adoption levels, it does assign some weight to non-financial considerations in the assessment of long-term energy efficiency potential.

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 4-3 presents the long-term market adoption rates at varied incentive levels used for the residential sector. Most end-uses are based on the WTP primary market research. Behavior was set to 100% to reflect that the program design is typically opt-out and participation levels are dictated by the utility. Awareness factors for this program was also modified accordingly. Last, GDS adjusted the I&M Indiana-specific adoption curves to reflect observed differences in WTP between the income-qualified and market-rate customers.[15]

TABLE 4-3 RESIDENTIAL LONG-TERM MARKET ADOPTION RATES AT DISCRETE INCENTIVE LEVELS

End Use	0% Incentive	25% Incentive	50% Incentive	75% Incentive	100% Incentive	RAP Awareness	MAP Awareness
Water Heat – MR	19%	28%	42%	55%	74%	74%	85%
Water Heat – LI	13%	26%	37%	49%	73%	74%	85%
HVAC Equip – MR	33%	43%	55%	67%	81%	74%	85%
HVAC Equip – LI	22%	32%	45%	59%	78%	74%	85%
Appliances – MR	19%	27%	42%	57%	73%	74%	85%
Appliances – LI	15%	23%	36%	51%	71%	74%	85%
HVAC Shell – MR	18%	31%	45%	59%	81%	74%	85%
HVAC Shell – LI	12%	21%	34%	50%	78%	74%	85%
Behavior	100%	100%	100%	100%	100%	100%	100%

Table 4-4 presents the long-term market adoption rates used in the nonresidential sector. Again, the adoption scores were primarily informed by the I&M Indiana-specific WTP research. GDS included a 20-year payback performance level to reflect reduced adoption rates for measures with extremely long payback performance levels. The 20-year payback performance was set to 2/3rd of the 10-year level. To reflect differences in delivery strategy, varying awareness factors were created for different C&I program offerings based on available market data collected by I&M and assumptions about trade ally involvement and impact on future adoption rates.

[15] I&M 2018 JD Customer Satisfaction Survey. This research indicated higher levels of program awareness and engagement than the WTP data and was considered to likely be more representative of the I&M customer population. The awareness factor was applied to the adjusted adoption rate to get a final adoption rate. For example, at 75% incentives the adjusted adoption rate is 62%. 62% * Awareness Factor (74%) = 46% final adoption rate in the RAP scenario.

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

End-Use	20 Year Payback Period	10 Year Payback Period	5 Year Payback Period	3 Year Payback Period	1 Year Payback Period	0 Year Payback Period	MAP Awareness Factor	RAP Awareness Factor
Lighting	34%	51%	61%	71%	79%	84%	74%	85%
HVAC	24%	36%	46%	56%	67%	74%	74%	85%
Refrigeration	20%	30%	39%	51%	63%	71%	74%	85%
Water Heat	35%	55%	64%	73%	82%	86%	74%	85%
Other	30%	46%	56%	66%	75%	81%	74%	85%

In the maximum achievable potential scenario, incentives were assumed to represent 100% of the measure cost (0-year payback) and awareness factor were set at a minimum of 85%.

GDS then estimated initial year adoption rates by reviewing the current saturation levels of efficient technologies and (if necessary) calibrating the estimates of 2023 annual potential to recent historical levels achieved by I&M's current DSM portfolio. The calibration was only considered if recent historical savings outpaced the estimated near-term potential. The most impactful example of this calibration was to front-load commercial lighting savings to achieve with I&M Indiana's recent program achievements related to LED lighting. To align with these efforts, it was necessary to move forward in time the estimated lighting potential savings. The GDS team did not scale back near-term potential in instances where historical savings were lower than the estimated potential in the I&M Indiana service area. 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.

4.1.7.2 Non-Incentive Costs

Consistent with National Action Plan for Energy Efficiency (NAPEE) guidelines[16], utility non-incentive costs were included in the overall assessment of cost-effectiveness at the RAP scenario. Non-incentive costs were calibrated to recent I&M Indiana levels and set at:

- $0.120 per first year kWh saved for the Home Energy Products Program
- $0.175 per first year kWh saved for the Home Appliance Recycling Program
- $0.023 per first year kWh saved for the Home Energy Reports Program
- $0.023 per first year kWh saved for the Low Income Home Energy Reports Program
- $0.75 per first year kWh saved for the Home Weatherproofing Program
- $0.928 per first year kWh saved for the Residential Income Qualified Program
- $0.009 per first year kWh saved for the Home Energy Engagement Program
- $1.598 per first year kWh saved for the Home Energy Management Program
- $0.171 per first year kWh saved for the School Education Program
- $0.151 per first year kWh saved for the Residential Online Energy Checkup Program
- $0.282 per first year kWh saved for the Residential New Construction Program
- $0.050 per first year kWh saved for prescriptive C&I measures
- $0.060 per first year kWh saved for custom C&I measures; and
- $0.040 per first year kWh saved for Streetlighting.

Non-incentive costs were then escalated annually at the rate of inflation.[17]

[16] 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.
[17] 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.

4.2 RESIDENTIAL ENERGY EFFICIENCY POTENTIAL FINDINGS

Figure 4-32 provides the technical, economic, MAP and RAP results for the 3-year, 10-year, and 20year timeframes. The cumulative annual 3-year technical potential is 12.0% of forecasted sales, and the economic potential is 9.6% of forecasted sales. The cumulative annual 3-year MAP is 3.8% and the RAP is 3.4%, as a percentage of forecasted sales. Over the duration of the study timeframe the technical and economic potential rise to 39% and 33% of forecasted sales, respectively. This indicates that a large portion of the technical potential is cost-effective. The MAP and RAP rise respectively to 19% and 15% 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.

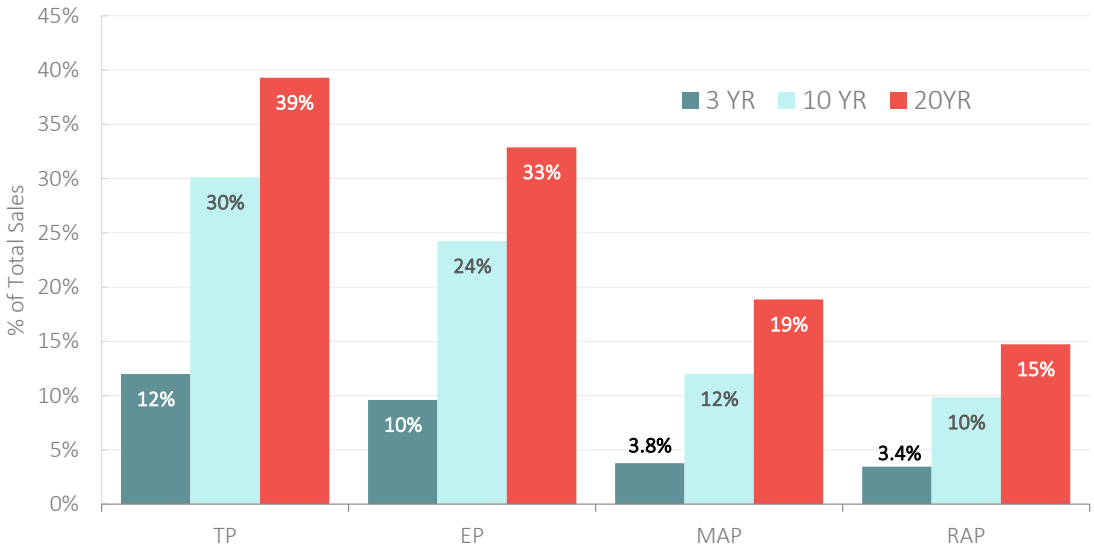


FIGURE 4-3: OVERVIEW OF RESIDENTIAL POTENTIAL

4.2.1 Technical/Economic Potential

Table 4-55 provides cumulative annual technical and economic potential results across the 2023-2027 (Years 1-5) timeframe, as well as for 2032 (10th-year) and 2042 (20th-year). The technical potential is more than 500,000 MWh by 2025 and rises to more than 1,740,000 MWh by 2042. Economic potential rises to nearly 1,460,000 MWh by 2042 as well. Peak demand savings associated with technical potential reach more than 135 MW by 2025 and reach 423 MW by 2042, and peak demand savings associated with economic potential reach 313 MW by 2042.

TABLE 4-5 TECHNICAL & ECONOMIC RESIDENTIAL POTENTIAL

	2023	2024	2025	2026	2027	2032	2042
Energy (MWh)							
Technical	202,959	368,233	511,100	649,734	783,433	1,294,838	1,744,269
Economic	178,920	298,870	409,797	518,152	625,391	1,042,513	1,459,637
Peak Demand (MW)							
Technical	49.3	93.8	135.1	172.0	207.8	332.2	423.2
Economic	36.6	66.3	94.9	119.8	144.5	229.2	313.1

Figure 4-43 shows a comparison of the technical and economic potential (20-year) by end use. HVAC Equipment is the leading end-use among technical and economic potential, followed by Appliances and Water Heating. Building Shell and Plug Loads also provide a significant amount of technical potential.[18]

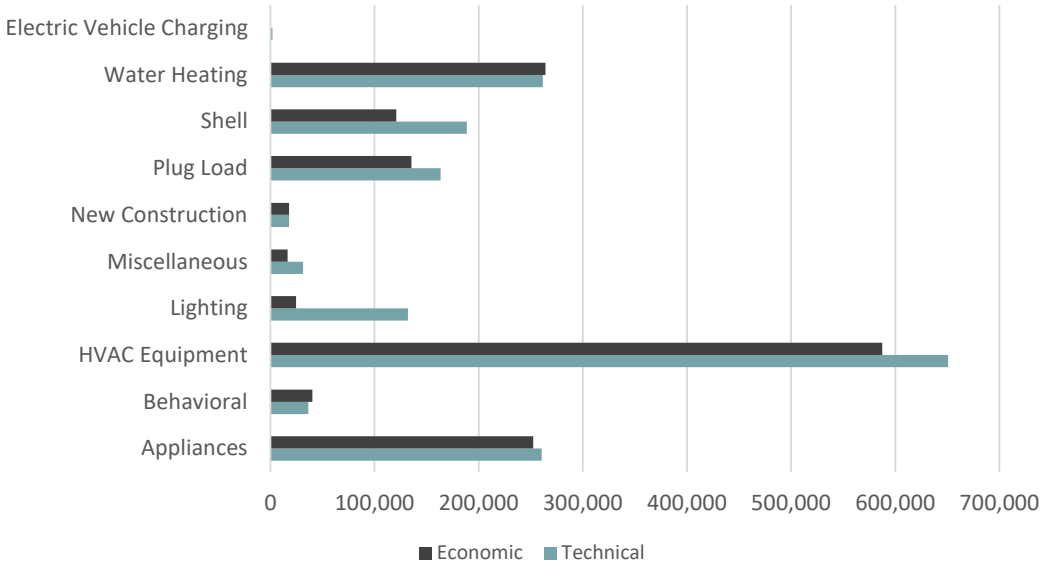


FIGURE 4-4: 20-YR RESIDENTIAL TECHNICAL & ECONOMIC POTENTIAL, BY END-USE

4.2.2 Achievable Potential

Figure 4-54 provides the MAP and RAP across the 20-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 sales. The MAP rises to 19% by 2042, and the RAP rises to 15%.

[18] Water Heating and Behavioral savings are greater in Economic Potential than Technical Potential due differences in interactive effects impacts.

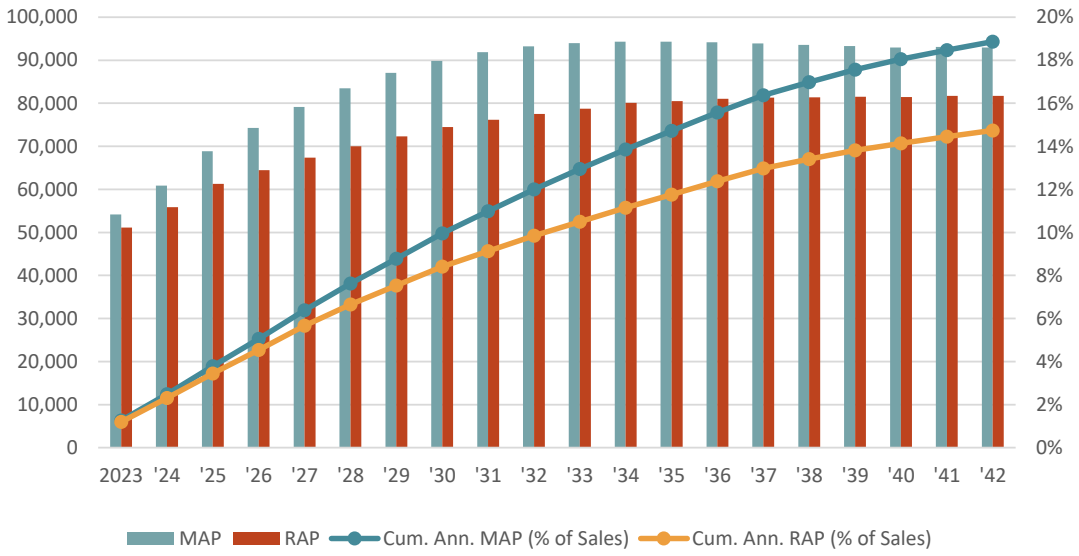


FIGURE 4-5: OVERVIEW OF RESIDENTIAL POTENTIAL – RAP 2042

Figure 4-65 provides a breakdown of the RAP potential in 2042 across end-uses and building type market segments. As in technical and economic potential, the HVAC Equipment is the leading end-use accounting for 29% of the total. The Building Shell, Water Heating and Appliances end-uses combine to account for an additional 52% of the RAP. The single-family housing segment represents 69% of the potential and the multifamily segment represents 9% of the potential. The new construction segment accounts for 4% of potential, and measures dedicated to low-income customers account for 19% of potential.

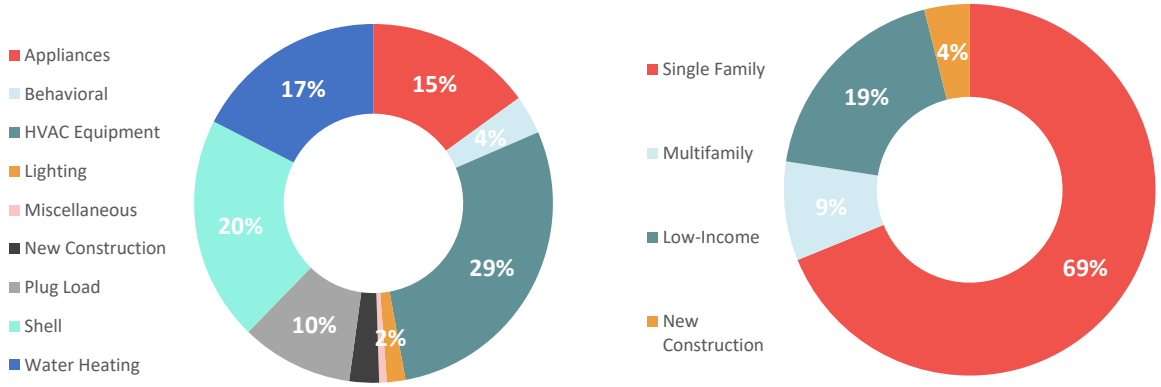


FIGURE 4-6: RESIDENTIAL POTENTIAL BY END-USE AND BUILDING TYPE – RAP 2042

Table 4-66 provides incremental and cumulative annual energy and demand savings for MAP and RAP across the next five years as well as over the 10-yr and 20-yr time horizons. Incremental RAP energy savings range from 51,000 MWh in 2023 to nearly 82,000 MWh by 2042, and cumulative RAP energy savings rise to more than 654,000 MWh by 2042.

TABLE 4-6 RESIDENTIAL MAP & RAP POTENTIAL

	2023	2024	2025	2026	2027	2032	2042
Incremental Annual Energy (MWh)							
MAP	54,178	60,854	68,856	74,284	79,181	93,219	92,961
RAP	51,137	55,857	61,248	64,477	67,382	77,504	81,753
Incremental Annual Energy (MW)							
MAP	12.6	14.2	16.0	17.3	18.3	20.6	20.5
RAP	11.3	12.3	13.2	13.9	14.4	16.2	17.0
Cumulative Annual Energy (MWh)							
MAP	54,178	106,390	161,163	215,487	272,022	516,067	837,342
RAP	51,137	98,599	146,823	193,585	241,112	423,566	654,240
Cumulative Annual Energy (MW)							
MAP	12.6	25.8	40.2	53.9	68.0	121.1	186.7
RAP	11.3	22.6	34.3	45.1	56.2	93.8	144.3

4.3 COMMERCIAL ENERGY EFFICIENCY POTENTIAL

Figure 4-76 provides the technical, economic, MAP and RAP results for the 3-year, 10-year, and 20-year timeframes. The cumulative annual 3-year technical potential is 11% of forecasted commercial sales, and the economic potential is also 11% of forecasted commercial sales.[19] The cumulative annual 3-year MAP is 6.6% and the RAP is 4.8%, as a percentage of forecasted commercial sales. Over the duration of the study timeframe the technical and economic potential rise to 37% of forecasted sales. The nearly identical technical and economic potential indicate that most measure are cost-effective under the UCT screen. The MAP and RAP rise respectively to 20% and 15% 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.

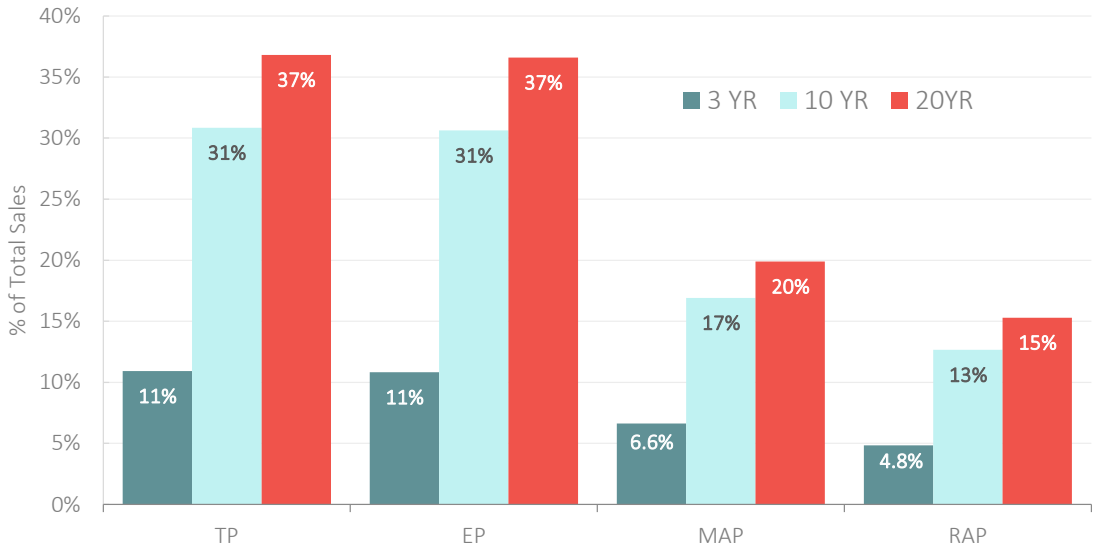


FIGURE 4-7: OVERVIEW OF COMMERCIAL POTENTIAL

[19] Streetlighting is included in the commercial sector savings and forecasted sales.

4.3.1 Technical/Economic Potential

Table 4-77 provides cumulative annual technical and economic potential results across the 2023-2027 (Years 1-5) timeframe, as well as for 2032 (10th-year) and 2042 (20th-year). The technical potential is just above 380,000 MWh by 2025 and rises to more than 1.4 million MWh by 2042. Economic potential rises to more than 1.4 million MWh by 2042 as well. Peak demand savings associated with technical potential reach 77 MW by 2025 and reach approximately 359 MW by 2042.

TABLE 4-7 TECHNICAL & ECONOMIC COMMERCIAL POTENTIAL

	2023	2024	2025	2026	2027	2032	2042
Energy (MWh)							
Technical	121,042	248,113	380,307	513,567	636,945	1,137,241	1,444,333
Economic	120,024	246,004	377,077	509,243	631,605	1.128,813	1,435,460
Peak Demand (MW)							
Technical	24	50	77	104	130	248	359
Economic	24	50	76	103	129	247	357

Figure 4-87 shows a comparison of the technical and economic potential (20-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.

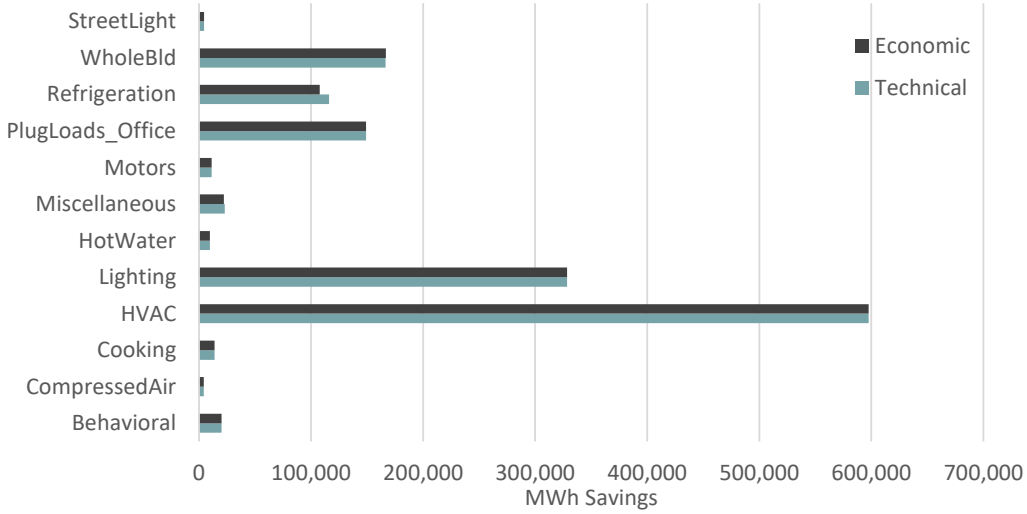


FIGURE 4-8: 20-YR COMMERCIAL TECHNICAL & ECONOMIC POTENTIAL, BY END-USE

4.3.2 Achievable Potential

Figure 4-98 provides the MAP and RAP across the 20-yr timeframe of the study. The green and red bars provide the respective incremental annual MAP and RAP in MWh per year energy savings.[20] 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 20% by 2042, and the RAP rises to 15%.

[20] The decrease in incremental MAP and RAP savings beginning in early years of the analysis is a result of decreased lighting retrofit opportunities in the business sector over time. As noted in Section 4.1.7.1, to calibrate initial year savings close to recent historical levels, the GDS Team had to effectively front-load lighting retrofit opportunities in the initial analysis timeframe. After a period of four to five years, other non-lighting opportunities ramp up to halt the decline in annual savings. The increase in annual savings in the second decade is a result of the early lighting opportunities needing to be replaced to maintain savings relative to the code frozen forecast. From a programmatic standpoint, a portion of these savings may be transformed in the market and difficult to claim.

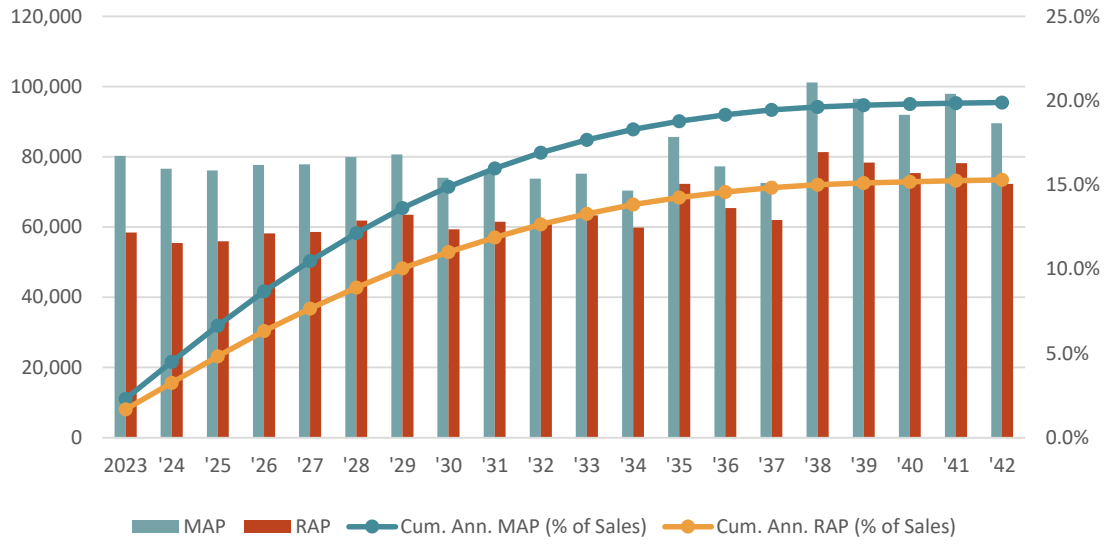


FIGURE 4-9: OVERVIEW OF COMMERCIAL POTENTIAL – RAP 2042

Figure 4-109 provides a breakdown of the RAP potential in 2042 across commercial end-uses and building type market segments.[21] In the RAP scenario, Lighting and HVAC account for greater than 50% of the potential. Across building types, "other" commercial buildings (defined as buildings that engage in several different activities in Section 3.3.2) represent roughly 28% of the remaining achievable potential. Office buildings, education, and warehouse represent another 48% of the achievable potential. The remaining building types each represent 9% (or less) of the achievable potential.

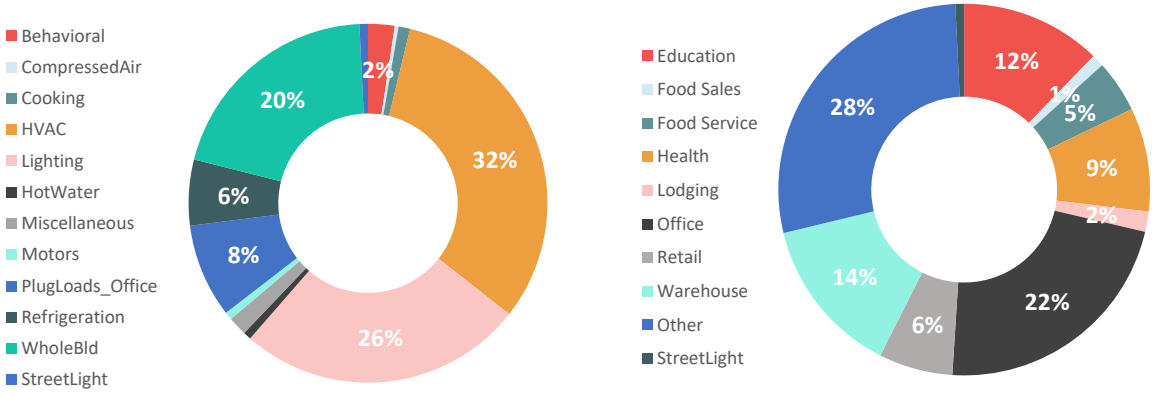


FIGURE 4-10: COMMERCIAL POTENTIAL BY END-USE AND BUILDING TYPE – RAP 2042

Table 4-88 provides incremental and cumulative annual commercial sector energy and demand savings for MAP and RAP across the next five years as well as over the 10-yr and 20-yr time horizons. Incremental RAP energy savings begin at roughly 80,200 MWh in 2023 followed by a steady decline over the next several years

[21] Segments with less than 3% of total end-use or building type share do not display a data label (%) in pie-charts to improve readability of data.

as commercial lighting savings become increasingly difficult to sustain. Cumulative RAP energy savings rise to approximately 600,000 MWh by 2042.

TABLE 4-8 COMMERCIAL SECTOR MAP & RAP POTENTIAL

	2023	2024	2025	2026	2027	2032	2042
Incremental Annual Energy (MWh)							
MAP	80,262	76,588	76,131	77,699	77,833	77,755	89,588
RAP	58,440	55,437	55,959	58,167	58,640	61,227	72,290
Incremental Annual Energy (MW)							
MAP	12.4	12.1	12.4	13.1	13.6	13.2	16.8
RAP	8.7	8.5	8.8	9.6	10.1	10.5	12.8
Cumulative Annual Energy (MWh)							
MAP	80,262	156,317	231,267	304,046	369,794	623,649	780,233
RAP	58,440	113,341	168,112	221,708	270,092	466,484	600,007
Cumulative Annual Energy (MW)							
MAP	12.4	24.6	36.9	49.3	61.1	112.2	166.9
RAP	8.7	17.2	26.0	34.9	43.6	82.6	124.4

4.4 INDUSTRIAL ENERGY EFFICIENCY POTENTIAL

Figure 4-110 provides the technical, economic, MAP and RAP results for the 3-year, 10-year, and 20-year timeframes. The cumulative annual 3-year technical and economic potential is 6% of forecasted industrial sales.[22] The cumulative annual 3-year MAP is 3.6% and the RAP is 2.6%, as a percentage of forecasted commercial sales. Over the duration of the study timeframe the technical and economic potential rise to 21% of forecasted sales. The identical technical and economic potential indicate that all industrial savings are cost-effective under the UCT screen based on the broader end-use analysis employed for this study. The MAP and RAP rise respectively to 14% and 10% of forecasted sales over the study timeframe. As with the commercial sector 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.

[22] Agriculture is included in the industrial sector savings and forecasted sales.

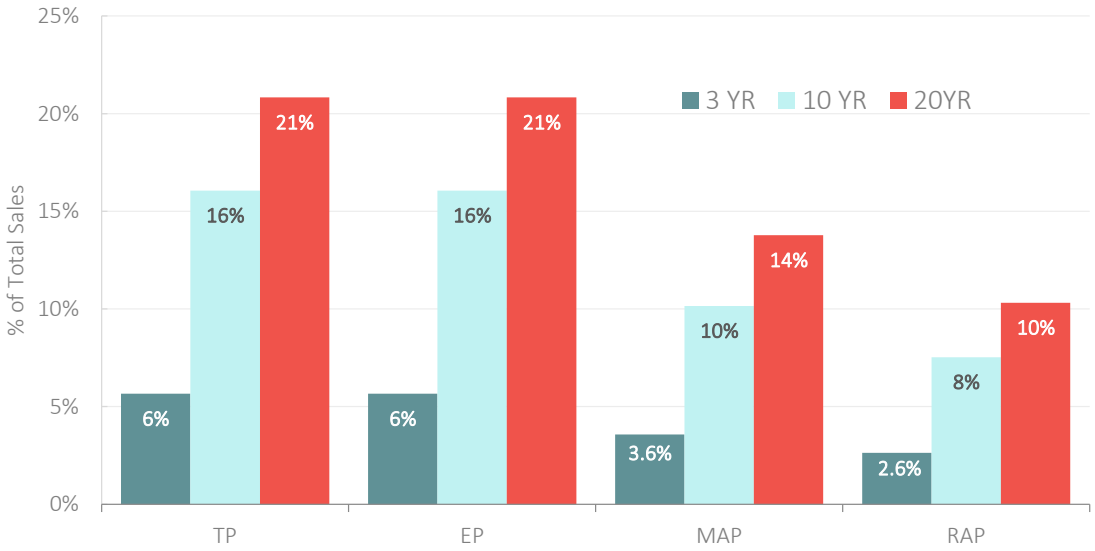


FIGURE 4-11: OVERVIEW OF INDUSTRIAL POTENTIAL

4.4.1 Technical/Economic Potential

Table 4-79 provides cumulative annual technical and economic potential results across the 2023-2027 (Years 1-5) timeframe, as well as for 2032 (10th-year) and 2042 (20th-year). Both technical and economic potential is nearly 194,000 MWh by 2025 and rises to approximately 752,500 MWh by 2042. Peak demand savings associated with technical and economic potential reach just under 34 MW by 2025 and reach approximately 130 MW by 2042.

TABLE 4-9 TECHNICAL & ECONOMIC INDUSTRIAL POTENTIAL

	2023	2024	2025	2026	2027	2032	2042
Energy (MWh)							
Technical	63,929	129,242	193,768	255,465	314,171	564,211	752,557
Economic	63,929	129,242	193,768	255,465	314,171	9,508	752,557
Peak Demand (MW)							
Technical	11.1	22.4	33.5	44.2	54.4	97.7	130.1
Economic	11.1	22.4	33.5	44.2	54.4	97.7	130.1

Figure 4-121 shows the technical and economic potential (20-year) by end use. Motors / Machine drive, which makes up nearly 40% of the industrial sector sales, also make up most of the technical/economic potential in the industrial segment. The remainder of the technical/economic potential savings are fairly evenly distributed across the remaining end-uses.

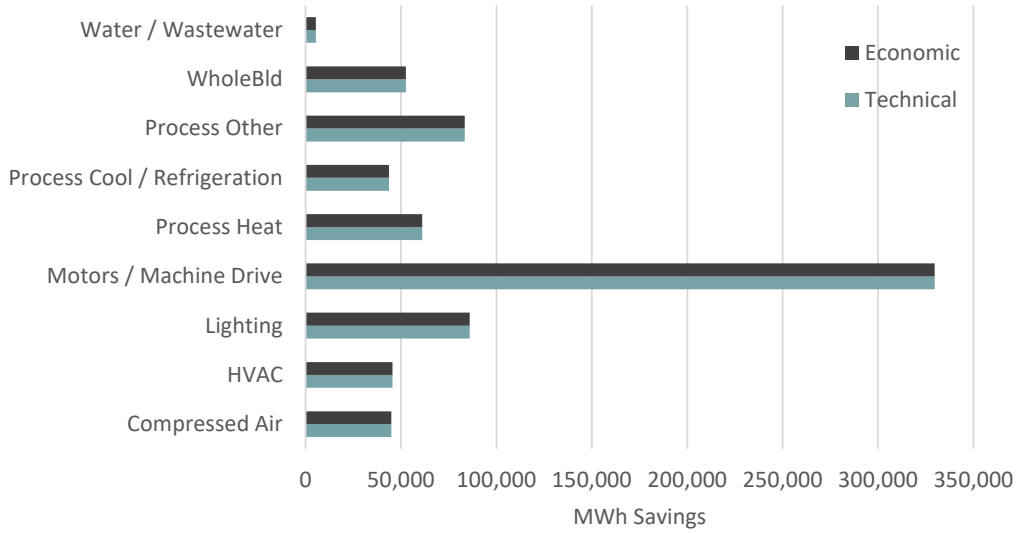


FIGURE 4-12: 20-YR INDUSTRIAL TECHNICAL & ECONOMIC POTENTIAL, BY END-USE

4.4.2 Achievable Potential

Figure 4-132 provides the MAP and RAP across the 20-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 14% by 2042, and the RAP rises to 10%.

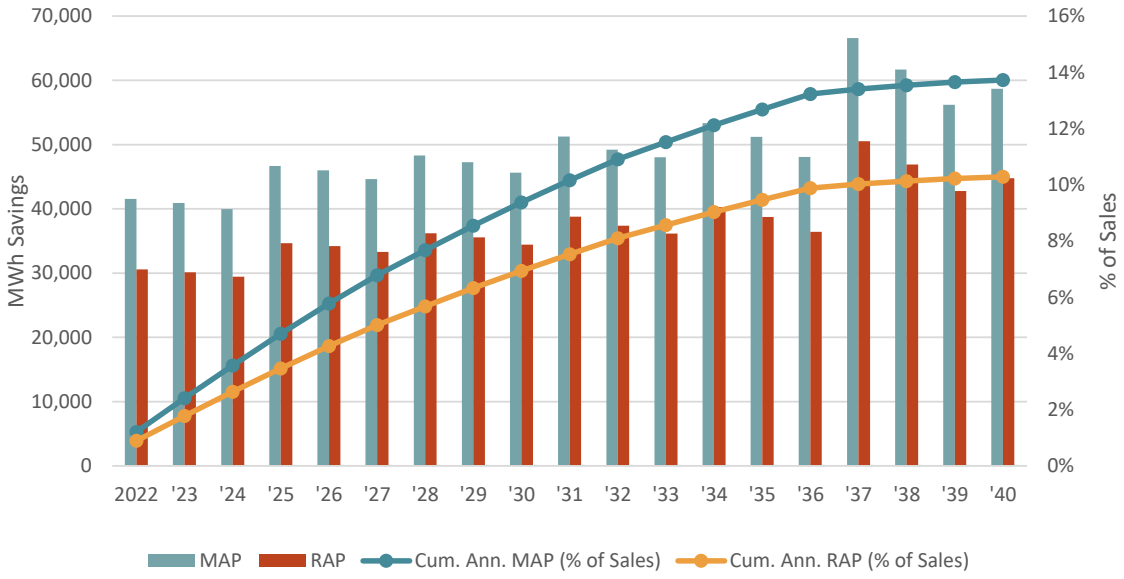


FIGURE 4-13: OVERVIEW OF INDUSTRIAL POTENTIAL – RAP 2042

Figure 4-143 provides a breakdown of the RAP potential in 2042 across commercial end-uses and building type market segments. Machine drive savings account for the largest share of savings (46%), followed by industrial

process savings (25% for all process heat, cool, and other combined) and lighting savings. SEM savings are represented by the Whole Building end-use and represent roughly 7% of the realistic achievable potential in the industrial sector.

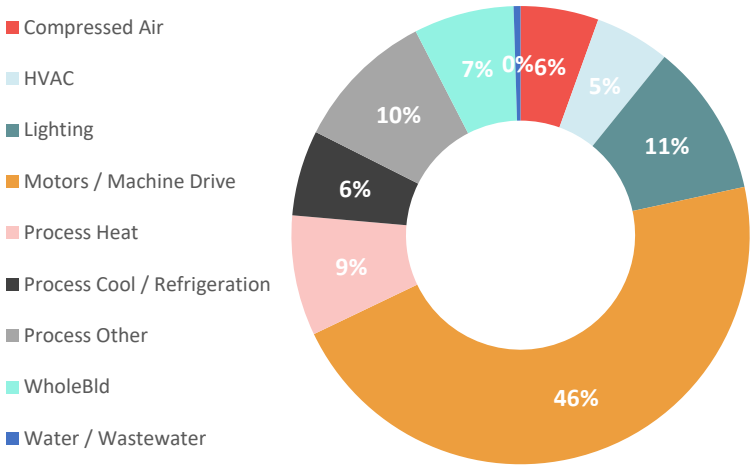


FIGURE 4-14: INDUSTRIAL POTENTIAL BY END-USE – RAP 2042

Table 4-1010 provides incremental and cumulative annual industrial sector energy and demand savings for MAP and RAP across the next five years as well as over the 10-yr and 20-yr time horizons. Incremental MAP energy savings begin at roughly 41,500 MWh and increase to just under 55,000 MWh by 2042. Cumulative annual RAP energy savings rise to approximately 373,000 MWh by 2042.

TABLE 4-10 INDUSTRIAL SECTOR MAP & RAP POTENTIAL

	2023	2024	2025	2026	2027	2032	2042
Incremental Annual Energy (MWh)							
MAP	41,551	40,892	39,948	46,691	46,013	51,231	54,938
RAP	30,573	30,109	29,461	34,639	34,201	38,798	51,949
Incremental Annual Energy (MW)							
MAP	7.2	7.1	6.9	8.0	7.9	8.8	9.4
RAP	5.3	5.2	5.1	6.0	5.9	6.7	7.2
Cumulative Annual Energy (MWh)							
MAP	41,551	82,444	122,392	161,140	198,771	356,788	497,824
RAP	30,573	60,682	90,143	118,779	146,623	264,537	373,038
Cumulative Annual Energy (MW)							
MAP	7.2	14.3	21.1	27.8	34.3	61.5	85.8
RAP	5.3	10.5	15.5	20.5	25.3	45.6	64.2

5 DR POTENTIAL RESULTS

5.1 ANALYSIS APPROACH

This section provides an overview of the demand response potential methodology. Summary results of the demand response analysis are provided in Section 5.2. Additional results details are provided in Appendix D.

5.1.1 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.

PJM defines a demand response program as providing end-use customers with the ability to manage their electricity use in response to conditions in the wholesale market. In short, resources must be dispatchable and measurable. Demand response rate options such as TOU rates do not meet these requirements. However, these rates can provide value for I&M by lowering their peak demand requirements.

This study uses the broader FERC definition of demand response so that all potential DR, including rate options, are identified. I&M's integrated resource planning team will analyze and adjust as necessary the identified DR potential for what can be counted in the PJM market and/or how DR potential will be used to construct alternative resource plans.

5.1.2 Demand Response Program Options

Table 5-1 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 I&M's current and/or planned offerings, offerings of other peer utilities, and market research into emerging DR technologies. The base case analysis includes direct load control (DLC), rate design, and aggregator options.

TABLE 5-1 DEMAND RESPONSE BASE CASE PROGRAM OPTIONS AND ELIGIBLE MARKETS

DR Program Option	Program Description	Eligible Markets
Central AC DLC	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 Low-Income Customers
Connected Thermostat	The system operator can remotely raise the AC's thermostat set point during peak load conditions, lowering AC and/or heating load.	Residential and C&I Customers
Smart Water Heater	The system operator can remotely change the water heater's set point or shut off the water heater during peak load conditions.	Residential and C&I Customers
DHW DLC	The water heater is remotely shut off by the system operator for periods normally ranging from 2 to 8 hours.	C&I Customers
Room AC DLC	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 Customers

DR Program Option	Program Description	Eligible Markets
Smart Appliance	Direct utility control of smart appliances.	Residential Customers
Electric Vehicle Charging Control	Direct utility control of electric vehicle charging stations.	Residential and C&I Customers
DLC Lighting	A portion of the lighting load is remotely shut off by the system operator for periods normally ranging from 2 to 4 hours.	C&I Customers
Connected Energy Management System	The system operator can remotely shut off or setback a portion of a building's loads controlled through the connected energy management system.	C&I Customers
Thermal Storage	The use of a cold storage medium such as ice, chilled water, or other liquids. Off-peak energy is used to produce chilled water or ice for use in cooling during peak hours. The cool storage process is limited to off-peak periods.	Residential and C&I Customers
Battery Storage	The system operator remotely calls for energy stored in batteries to be discharged to the grid during peak conditions.	Residential and C&I Customers
Behavioral	The system operator uses electronic messaging, like text messaging or email, to alert participating customers to an upcoming peak event. Customers receive incentives for reducing their usage during the peak window but are not penalized for lack of participation.	Residential Customers
Electric Vehicle Off-Peak Charging Rate	Special rate service for electric vehicles that charge off-peak.	Residential and C&I Customers
Time-of-use (TOU) Rate	A retail rate with different prices for usage during different blocks of time. Daily pricing blocks could include on-peak, mid-peak, and off-peak periods. Pricing is pre-defined, and once established, does not vary with actual cost conditions.	Residential and C&I Customers
Critical peak pricing (CPP) Rate	A retail rate in which an extra-high price for electricity is provided during a limited number of critical periods of the year. Market-based prices are typically provided on a day-ahead basis, or an hour ahead basis.	Residential and C&I Customers
Peak Time Rebates (PTR) Rate	A program where customers are rewarded if they reduce electricity consumption during peak times with monetary rebates.	Residential and C&I Customers
Capacity Bidding Programs (Large C&I Aggregator)	CBP is a flexible bidding program offering qualified businesses payments for agreeing to reduce when a CBP event is called. Businesses make monthly nominations and receive capacity payments based on the amount of capacity reduction nominated each month, plus energy payments based on your actual kilowatt-hour (kWh) energy reduction when an event is called. Penalties occur if load nominations are not met.	C&I Customers
Demand Bidding Programs (Small C&I Aggregator)	DBP is a year-round, flexible, Internet-based bidding program that offers business customers credits for voluntarily reducing power when a DBP event is called.	C&I Customers
Curtailable Rate	A discounted rate is offered to the customer for agreeing to interrupt or curtail load during peak period. The interruption is mandatory.	C&I Customers

DR Program Option	Program Description	Eligible Markets
Real Time Pricing (RTP) Rate	A retail rate with hourly energy prices closely matched to either the underlying wholesale electricity market or the utility's cost of production.	C&I Customers

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 direct load control (DLC) program of air conditioning and a rate program both assume load reduction of the customers' air conditioners. For this reason, it is typically assumed that customers cannot participate in programs that affect the same end uses.

5.1.3 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*.[23] Additionally, the GDS Team reviewed the May 2017 National Standard Practice Manual published by the National Efficiency Screening Project.[24] The GDS Team utilized this guide to define avoided ancillary services and energy and/or capacity price suppression benefits.

The demand response program potential for I&M was analyzed using a spreadsheet-based tool incorporating segment forecasts, program performance and economic definitions, and measure applicability estimates. 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. The GDS Team 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.

The UCT 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 incentive costs, increased supply costs, fixed program capital costs (such as the cost of a central controller), program administrative, marketing and evaluation costs.

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 practice" 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

[23] Study was prepared by Synapse Energy Economics and the Regulatory Assistance Project, February 2013.
[24] National Standard Practice Manual for Assessing Cost-Effectiveness of Energy Efficiency Resources, May 18, 2017, Prepared by The National Efficiency Screening Project

participation, therefore reducing savings that could be achieved. Both MAP and RAP include the impact of energy efficiency gains realized in the Energy Efficiency Potential study. These gains account for peak demand reductions achieved as the population adopts more energy efficient equipment. Yearly energy efficiency gains were developed for the space cooling end use and for whole building impacts, which were applied for rate programs that affect multiple end uses.

5.1.4 Avoided Costs

Demand response avoided costs are consistent with those utilized in the energy efficiency potential analysis and were provided by I&M. The primary benefit of demand response is avoided generation capacity, resulting from a reduction in the need for new peaking generation capacity and/or additional market-based capacity resources. Demand response also produces avoided energy related benefits and potentially delay the upgrade or new construction of transmission and distribution lines and facilities, reflected as 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. For demand response program options where event participation also results in energy savings, such as lighting control programs, the energy savings benefit was included in the analysis. The number of annual control hours for all direct load control programs was determined by the GDS Team in collaboration with I&M.

5.1.5 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 I&M evaluation reports, other peer program evaluation reports, 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 5-2 DEMAND RESPONSE LOAD REDUCTION IMPACTS

Program	Residential Load Reduction (kW)	C&I Load Reduction (kW)
Central AC DLC	0.80	N/A
Connected Thermostat	1.06	1.4
Smart Water Heater	0.50	1.3
DHW DLC	0.50	1.3
Room AC DLC	0.185	N/A
Smart Appliance	0.24	N/A
Electric Vehicle Charging Control	1.50	0.17
DLC Lighting	N/A	8.3%
Connected Energy Management System	N/A	10%
Thermal Storage	N/A	54
Battery Storage	2.71	11.25
Behavioral	SF: 0.15 MF: 0.08	N/A
Electric Vehicle Off-Peak Charging Rate	0.92	0.092
Time-of-use (TOU) Rate w/ tech	8.70%	3.80%

Program	Residential Load Reduction (kW)	C&I Load Reduction (kW)
Time-of-use (TOU) Rate w/o tech	5.40%	1.70%
Critical peak pricing (CPP) Rate w/ tech	23.90%	15.40%
Critical peak pricing (CPP) Rate w/o tech	12.40%	4.30%
Peak Time Rebates (PTR) Rate	18.90%	0.60%
Capacity Bidding Programs (Large C&I Aggregator)	N/A	20.80
Demand Bidding Programs (Small C&I Aggregator)	N/A	7.00%
Ancillary Services Bidding Programs	N/A	4.80%
Curtailable Rate	N/A	41.30
Real Time Pricing (RTP) Rate	N/A	14.10%

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 I&M's Indiana 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. For this study, the GDS Team used a useful life of 20 years for equipment and included O&M costs to account for equipment replacements required within the study period.

Equipment and Incentive Costs: Equipment costs as applicable 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 5-3 ASSUMED BASE CASE EQUIPMENT AND INCENTIVE COSTS

Sector	Program	Equipment & Installation Cost	RAP Incentive Cost
Residential	Connected Thermostat	$299	$15/peak period
	Central AC DLC	$100	$14/peak period
	Connected Water Heater	$300	$20/peak period
	DHW DLC	$200	$20/peak period
	Room AC DLC	$750	$17/peak period
	Smart Appliance		$10/peak period
	Battery Storage	$15,061	$3,850/battery
	Electric Vehicle Charging Control	$1,309	$15/peak period
	Time-of-use (TOU) Rate w/ enabling technology	$299	N/A
	Critical peak pricing (CPP) Rate w/ enabling technology	$299	N/A
	Electric Vehicle Off-Peak Charging Rate	$1,559	$500/Level 2 charger
C&I	Connected Thermostat	$299	$11/peak period
	Connected Water Heater	$700	$27/peak period

Sector	Program	Equipment & Installation Cost	RAP Incentive Cost
	Battery Storage	$33,200	$8.5/kW
	Thermal Storage	$45,000	$8.5/kW
	DLC Lighting	$19,494	$8.5/kW
	Connected Energy Management System	$47,084	$8.5/kW
	Electric Vehicle Charging Control	$1,309	$8.5/kW
	Time-of-use (TOU) Rate w/ enabling technology	$400	N/A
	Critical peak pricing (CPP) Rate w/ enabling technology	$400	N/A
	Electric Vehicle Off-Peak Charging Rate	$1,309	N/A

Program Costs: Program development costs of $332,298 were included in the first year of the analysis for new DLC programs, $100,000 for commercial rate programs, and $50,000 for residential rate programs. This cost was split between Indiana and Michigan based on the allocation of customers between the two territories. For residential program costs, Indiana took 79% of the program cost share and for C&I program costs, Indiana took 85% of the program cost share. No program development costs were included for existing I&M demand response programs. 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 I&M's customers by the saturation of the end use to be controlled. End use saturations were obtained from the I&M's RASS and primary research conducted by the GDS Team in the I&M service area to help inform the market potential studies.

I&M expects AMI infrastructure to be fully deployed in mid-2023. A forecast of AMI deployment rates for years 2021-2023 was provided by I&M and applied 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, the GDS Team assumed AMI meters were required to participate in the Time of Use, Critical Peak Pricing, and Peak Time Rebate programs.

5.1.6 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. The GDS Team used market research to determine steady state adoption rates for key program types. For the residential sector, the GDS Team collected data for direct load control of air conditioning/connected thermostats and rate programs. For the business sector, the GDS Team had data for direct load control of air conditioning and the CPP rate program. For rate programs, the residential survey included willingness to participate in time-of-use rates, while the business survey included Critical Peak Pricing rates. For programs where the GDS Team did not have primary data, other research or potential studies were used.

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 (see Figure 5-1). Table 5-4 provides the Base Case long-term adoption rates for MAP and RAP. Annual adoption rates, sources, and specific assumptions for each program are in Appendix D.

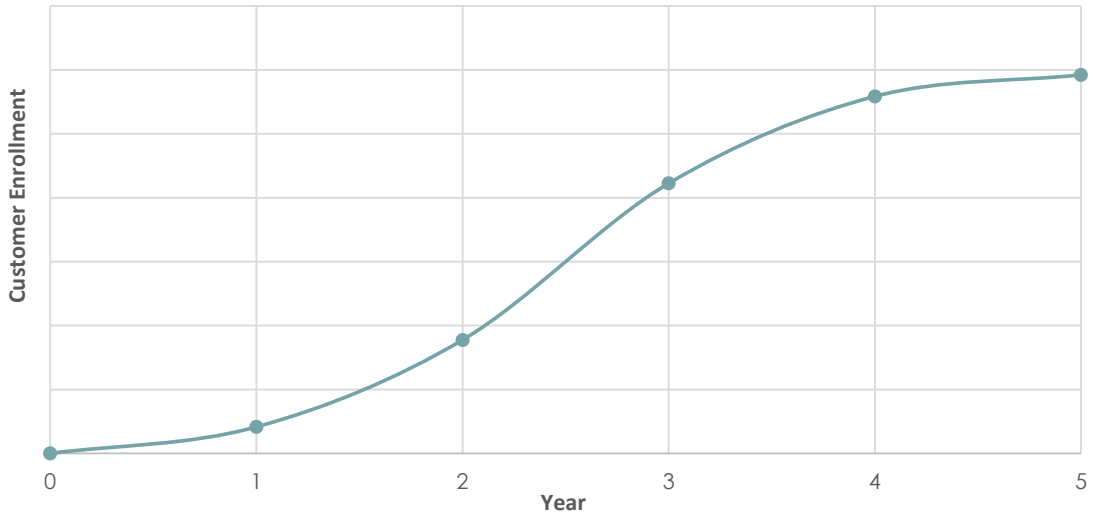


FIGURE 5-1 ILLUSTRATION OF S-SHAPED MARKET ADOPTION CURVE

TABLE 5-4 BASE CASE ADOPTION RATES

Sector	Program	Steady State MAP Adoption Rate		Steady State RAP Adoption Rate	
		Single Family	Multifamily	Single Family	Multifamily
Residential (MR)	Connected Thermostat	37%	31%	25%	26%
	Connected Water Heater	24%	24%	16%	16%
	DWH DLC	24%	24%	16%	16%
	Behavioral	25%	25%	20%	20%
	Room AC DLC	37%	31%	25%	26%
	Smart Appliance	24%	24%	16%	16%
	Electric Vehicle Charging Control	25%	25%	15%	15%
	Electric Vehicle Off-Peak Charging Rate	25%	25%	15%	15%
	Time-of-use (TOU) Rate w/o enabling technology	29%	17%	17%	11%
	Critical Peak Pricing (CPP) Rate w/o enabling technology	12%	7%	7%	5%
	Peak Time Rebate (PTR) Rate	8%	5%	5%	3%
Residential (IE)	Connected Thermostat	35%	35%	27%	27%
	Central AC DLC	32%	32%	27%	28%
	Connected Water Heater	25%	25%	16%	16%
	DWH DLC	25%	25%	16%	16%
	Behavioral	25%	25%	20%	20%
	Room AC DLC	35%	32%	27%	28%

Sector	Program	Steady State MAP Adoption Rate		Steady State RAP Adoption Rate	
		Single Family	Multifamily	Single Family	Multifamily
	Time-of-use (TOU) Rate w/o enabling technology	26%	28%	18%	19%
	Critical Peak Pricing (CPP) Rate w/o enabling technology	11%	12%	8%	8%
C/I	Connected Thermostat	30%	30%	24%	24%
	DWH DLC	30%	30%	24%	24%
	Real Time Pricing (RTP) Rate	8%	8%	4%	4%
	Critical Peak Pricing (CPP) Rate w/o enabling technology	32%	32%	18%	18%
	Critical Peak Pricing (CPP) Rate w/ enabling technology	0%	0%	13%	13%
	Time-of-use (TOU) Rate w/o enabling technology	15%	15%	10%	10%
	Capacity Bidding	10%	10%	5%	5%
	Curtailable Rate	25%	25%	20%	20%

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 5-5 shows the hierarchy for each sector, with 1 being the top priority.

TABLE 5-5 BASE CASE DR HIERARCHY FOR EACH SECTOR

Order	Residential Hierarchy	Commercial Hierarchy
1	Critical Peak Pricing (CPP) Rate w/ enabling technology	Connected Thermostat
2	Critical Peak Pricing (CPP) Rate w/o enabling technology	Battery Storage
3	Peak Time Rebates	Thermal Storage
4	Time-of-use (TOU) Rate w/ enabling technology	Connected Energy Management System
5	Time-of-use (TOU) Rate w/o enabling technology	Capacity Bidding
6	Connected Thermostat	Demand Bidding
7	Battery Storage	Ancillary Services
8	Behavioral	Curtailable Rate
9		Critical Peak Pricing (CPP) Rate w/ enabling technology
10		Real Time Pricing Rate
11		Critical Peak Pricing (CPP) Rate w/o enabling technology
12		Peak Time Rebates

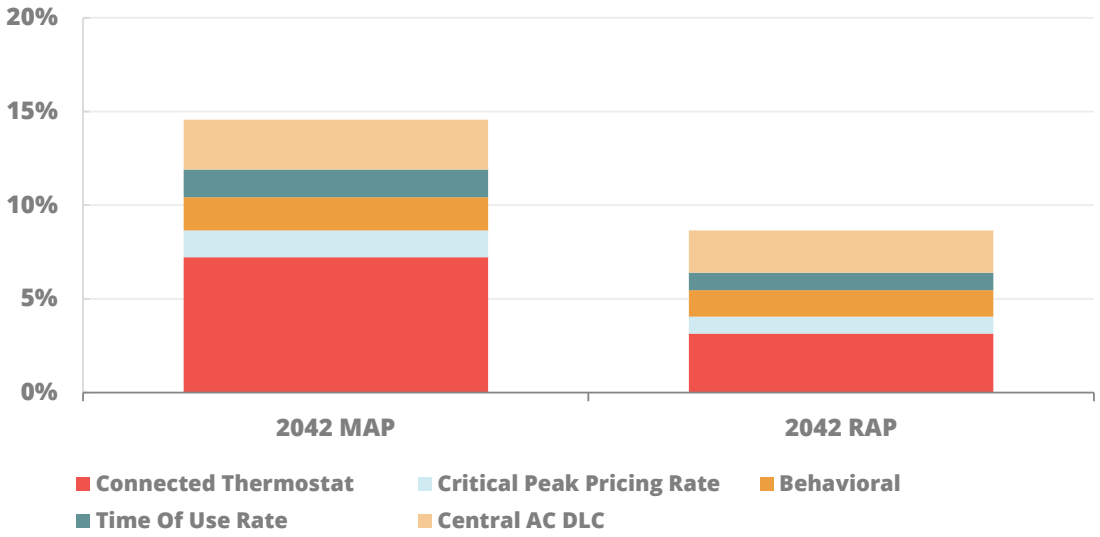
Order	Residential Hierarchy	Commercial Hierarchy
13		Time-of-use (TOU) Rate w/ enabling technology
14		Time-of-use (TOU) Rate w/o enabling technology

5.2 DEMAND RESPONSE POTENTIAL

5.2.1 Residential Potential

Figure 5-2 shows the 2042 residential market rate and income-eligible MAP and RAP demand response potential for Indiana. These demand reduction values are presented at the customer meter level.

FIGURE 5-2: SUMMER PEAK MW RESIDENTIAL SECTOR BASE CASE RESULTS AS % OF 2042 RESIDENTIAL CLASS LOAD (IN)



5.2.2 C&I Sector Potential

Figure 5-3 shows the 2042 C&I sector MAP and RAP demand response potential for Indiana. These demand reduction values are present at the customer meter level.

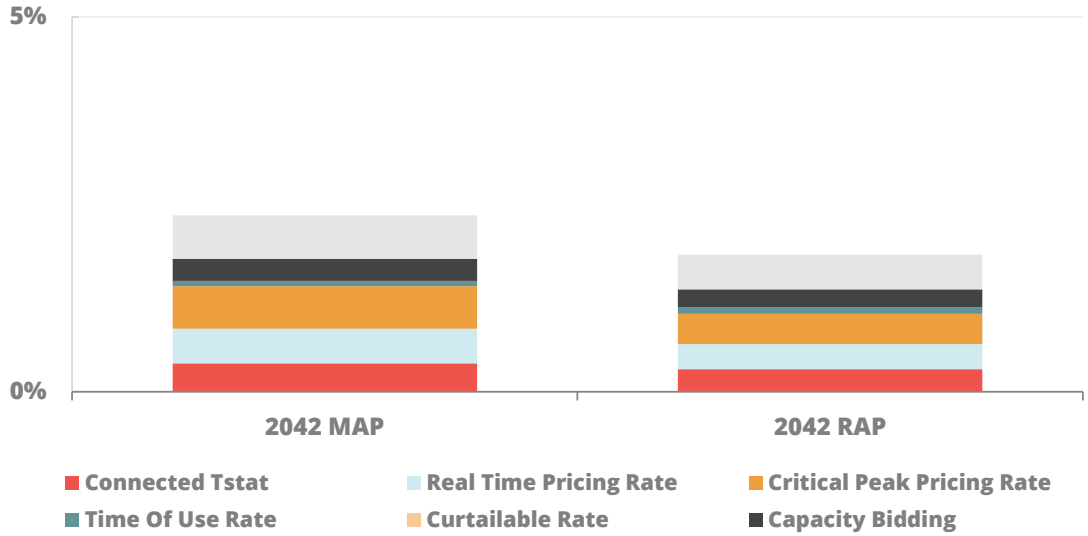


FIGURE 5-3 SUMMER PEAK MW C&I SECTOR BASE CASE RESULTS AS % OF 2042 C&I CLASS LOAD (IN)

5.2.3 Total Potential

Figure 5-4 shows the annual demand response RAP potential for the Base Case by sector in Indiana. These demand reduction values are present at the customer meter level.

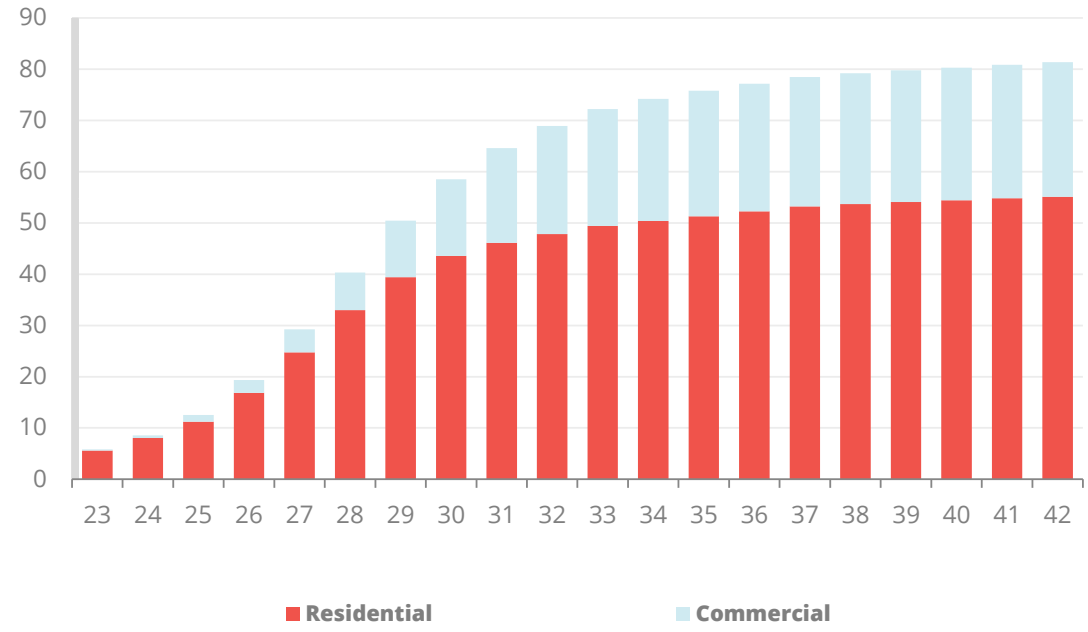


FIGURE 5-4 CUMULATIVE ANNUAL BASE CASE SUMMER PEAK MW RAP POTENTIAL BY SECTOR (IN)

5.2.4 Benefits/Costs of Program Potential

Cost-effectiveness of demand response measures was determined based on screening using the UCT test, which includes program administrative costs and incentives. Table 5-6 shows the residential and business benefits, costs, and UCT ratios for each program for MAP and Table 5-7 for RAP in the Base Case for Indiana.

TABLE 5-6 BASE CASE MAP BENEFITS, COSTS, AND UCT RATIOS

Sector	Program	NPV Benefits	NPV Costs	UCT Ratio
Residential	Connected Thermostat	$25,361,055	$13,307,610	1.9
	Central AC DLC	$15,082,389	$8,838,755	1.7
	Behavioral	$10,043,756	$6,827,219	1.5
	Time-of-use (TOU) Rate w/o enabling technology	$8,607,980	$1,879,045	4.6
	Critical Peak Pricing (CPP) Rate w/o enabling technology	$8,087,310	$1,628,564	5.0
C&I	Connected Thermostat	$3,263,490	$1,288,039	2.5
	DHW DLC	$6,898,832	$6,274,867	1.1
	Time-of-use (TOU) Rate w/o tech	$861,513	$498,073	1.7
	Critical peak pricing (CPP) Rate w/o tech	$6,899,243	$1,047,544	6.6
	Curtailable Rate	$3,592,335	$1,361,625	2.6
	Real Time Pricing (RTP) Rate	$5,655,774	$1,323,127	4.3

TABLE 5-7 BASE CASE RAP BENEFITS, COSTS, AND UCT RATIOS

Sector	Program	NPV Benefits	NPV Costs	UCT Ratio
Residential	Connected Thermostat	$14,361,923	$6,336,337	2.3
	Central AC DLC	$12,740,983	$5,976,588	2.1
	Behavioral	$8,021,777	$5,258,339	1.5
	Time-of-use (TOU) Rate w/o enabling technology	$5,422,071	$1,240,005	4.4
	Critical Peak Pricing (CPP) Rate w/o enabling technology	$5,053,400	$1,193,982	4.2
C&I	Connected Thermostat	$2,508,976	$904,827	2.8
	DHW DLC	$4,366,748	$4,223,246	1.0
	Time-of-use (TOU) Rate w/o tech	$877,886	$532,191	1.7
	Critical peak pricing (CPP) Rate w/o tech	$3,869,341	$1,160,279	3.3
	Curtailable Rate	$2,258,551	$1,357,150	1.7
	Real Time Pricing (RTP) Rate	$3,171,960	$1,351,310	2.4

6 DISTRIBUTED ENERGY RESOURCES POTENTIAL

As part of the overall potential modeling exercise, the GDS Team considered distributed energy resources (DER) as sources of behind-the-meter customer-sited generation. The DER potential study followed the same method as the energy efficiency potential study in that the DER analysis reviewed the opportunity for technical, economic, and achievable potential. We used the same forecast data as used in the energy efficiency study to assess DER potential. The analysis limited resources for this potential study to technologies that are behind-the-meter and owned by the customer and did not consider market potential for supply-side resources. Specifically, this market potential assessment for DER focused on solar photovoltaic (PV) and combined heat and power (CHP) systems for the period 2023 to 2042.

6.1 APPROACH

The following section discusses the methods used to conduct the DER potential analysis. We detail approaches used to assess technical, economic, and achievable potential for solar PV and CHP.

6.1.1 Technical Potential

6.1.1.1 Solar Photovoltaic

Photovoltaic systems utilize solar panels, a packaged collection of photovoltaic cells, to convert sunlight into electricity. A system is constructed with multiple solar panels, a DC/AC inverter(s), a racking system to hold the panels, and electrical system interconnections. These systems are often roof-mounted and face south-west, south, and/or, south-east.

The study analyzed the potential associated with roof-mounted systems installed on residential and non-residential sector buildings. For the non-residential sector, the analysis also estimated potential for ground mounted (or covered parking) systems for a few specific business types. The analysis included battery storage as an additional configuration with each solar PV system type; however, due to the uncertainty associated with battery dispatch schedules, potential battery generation is excluded from this analysis. As noted above, this study did not explore the market potential associated utility-scale solar PV installations.

The approach to estimating technical potential required calculating the total square footage of suitable rooftop area within the Indiana regions of I&M's territory and calculating solar PV system generation based on building and regional characteristics. Technical potential is computed using Equation 6-1.

EQUATION 6-1 SOLAR PV TECHNICAL POTENTIAL CALCULATION

$$PV\ Technical\ Potential = \Sigma(Suitable\ Rooftop\ Square\ Footage \times PV\ System\ Generation\ per\ Sq.Ft.)$$

The two key parameters in Equation 6-1 were estimated based on multiple data sources relevant to each state's region in the I&M territory. Methods for defining these parameters are discussed below.

The GDS Team estimated total rooftop square footage using the forecast disaggregation analysis to characterize the residential and non-residential building stocks. The building stocks were characterized based on relevant parameters such as number of facilities, average number of floors, average premise consumption, and premise EUI. The GDS Team used these parameters to estimate the total rooftop square footage.

To estimate the fraction of the total roof area that is suitable for rooftop solar PV, the GDS Team relied on research completed by the National Renewable Energy Laboratory (NREL). NREL has developed estimates of the portion of total rooftops across the country that are suitable for solar PV based on analysis of LIDAR data. NREL criteria for suitable roof area include:

- **Contiguous rooftop area size:** Rooftops with fewer than 10 square meters of contiguous roof area excluded.
- **Rooftop orientation (tilt and azimuth):** Northeast through northwest orientation and roof pitches greater than 60 degrees excluded.
- **Shading:** Roof areas that had a minimum solar exposure of less than 80% relative to an unshaded roof were excluded.

Based on NREL's data, the GDS Team was able to apply unique suitability factors to estimate the total square footage of suitable rooftop for residential and non-residential buildings across I&M's territory.

The second key parameter – PV system generation – was estimated by developing standardized solar PV system configurations. These included system sizes for residential premises ranging from 3 to 20 kW (DC) and 10 to 2,000 kW (DC) for non-residential premises. Additionally, the GDS Team selected battery system sizes for each solar PV system size to dispatch energy for 2-4 hours.

The Team relied on NREL's PVWatts[25] (Version 6.1.4) and System Advisor Model (SAM)26 tools to estimate system generation for both residential and non-residential sited systems. These tools model PV power density based on site specific data from NREL's LIDAR-based NSRDB to estimate total solar irradiance in conjunction with PV system specifications. The PV system simulations were generated based on Fort Wayne, IN and Niles, MI. The GDS Team based assumptions for PV system azimuth on rooftop orientation data sourced from Google's Project Sunroof also based on Fort Wayne, IN and Niles, MI. The analysis assumptions are summarized in Table 6-1.

TABLE 6-1 KEY ASSUMPTIONS IN SOLAR PV ANALYSIS

Parameter	Assumptions
Residential System Sizes (Nominal DC Capacity)	3 kW, 5 kW, 7.5 kW, 10 kW, 15 kW, 20 kW
Non-Residential System Sizes (Nominal DC Capacity)	10 kW, 15 kW, 20 kW, 25 kW, 50 kW, 100 kW, 250 kW, 500 kW, 1,000 kW, 2,000 kW
System losses	14.1%
Tilt	By region
Azimuth:	By region
DC to AC size ratio	1.2
Inverter efficiency	96% (micro-inverter)
Battery Round-Trip Efficiency	85%

Based on the simulations and resulting capacity factors for residential and non-residential buildings for the Indiana and Michigan regions, we applied the state-specific capacity factor to the system size to estimate annual electricity generation. These system generation values were used to calculate total energy generation per square foot of rooftop and extrapolated based on the total suitable rooftop square footage to estimate overall all technical potential. As a final step, the GDS Team removed from the technical potential for any generation occurring from existing systems. Data on existing systems was provided directly by I&M.

25 PVWatts estimates solar PV energy production and costs. Developed by the National Renewable Energy Laboratory. (NREL) http://pvwatts.nrel.gov/

26 SAM estimates hourly solar PV energy production and costs with more detailed inputs and outputs than PVwatts. Developed by the National Renewable Energy Laboratory. (NREL) http:// https://sam.nrel.gov/

6.1.1.2 Combined Heat and Power

CHP systems generate electric power and useful thermal energy in a single integrated system. Heat that is normally wasted in conventional power generation is recovered as useful thermal energy. Due to the integration of both power and thermal generation, CHP systems are more efficient than separate sources for electric power generation and thermal energy production.

In most CHP applications, a heat engine creates shaft power that drives an electrical generator (fuel cells can produce electrical power directly from electrochemical reactions). The waste heat from the engine is then recovered to provide steam or hot water to meet on-site needs. By combining the thermal and electrical energy generation in one process, the total efficiency of a CHP application far exceeds that of a separate plant and boiler system. Overall, the efficiency of CHP technologies can reach 80% or more, while simple-cycle electricity generation reaches only 30% and combined cycle generation typically achieves 50%. When considering both thermal and electric energy generation, CHP requires 40% less energy input to achieve the same energy output as a separate plant and boiler system. Figure 6-1**Error! Reference source not found.** illustrates this point.

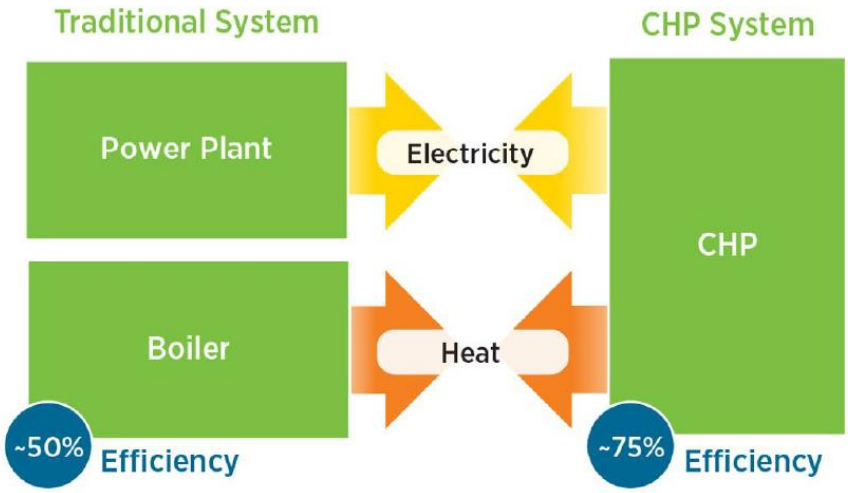


Figure courtesy of US DOE Energy Efficiency & Renewable Energy

FIGURE 6-1 CHP ENERGY FLOW DIAGRAM

Common technologies used in CHP applications and explored in this study include:

- Steam turbines
- Gas turbines
- Micro turbines
- Fuel Cells
- Reciprocating engines

Applications with steady demand for electricity and thermal energy are potentially good economic targets for CHP deployment. Industrial applications, particularly in industries with continuous processing and high steam requirements, are very economic and represent a large share of existing CHP capacity today. Commercial applications such as hospitals, nursing homes, laundries, and hotels with large hot water needs are well suited for CHP. Institutional applications such as colleges and schools, prisons, and residential and recreational facilities are also excellent prospects for CHP.

Selecting a specific CHP technology depends on several factors, which include but are not limited to power requirements, the duty cycle, space constraints, thermal energy needs, emission regulations, fuel availability, utility prices, and interconnection issues. Table 6-2 summarizes the CHP technologies evaluated in this study and their assumed operating parameters.

TABLE 6-2 CHP TECHNOLOGY COMPARISON[27]

Parameter	Reciprocating Engine	Gas Turbine	Steam Turbine	Micro-Turbine	Fuel Cell
Size (kW)	50-5,000	500-50,000	10-100,000	30-250	200-2,000
Electric Efficiency	28-39%	25-40% (simple) 40-60% (combined)	5-15%	25-28%	36-42%
Overall Efficiency	73-79%	64-72%	~80%	67-72%	62%-67%
Fuels	Natural gas, biogas, propane, liquid fuels	Natural gas, biogas, propane, distillate oil	All	Natural gas, biogas, propane, distillate oil	Hydrogen, natural gas, propane
NO_x Emissions (lb/MWh)	0.15-2.17	0.55-0.68	Function of boiler emissions	0.14-0.17	0.01-0.04
Uses for Heat Recovery	Hot water, low pressure steam, district heating	Direct heat, hot water-, low- or high-pressure steam, district heating	Low- or high-pressure steam, district heating	Direct heat, hot water, low pressure steam	Hot water-, low- or high-pressure steam
Thermal Output (Btu/kWh)	3,000-6,100	3,200-5,000	n/a	4,800-6,300	1,500-3,000
Useable Temp (°F)	200-500	500-1,100	n/a	400-650	140-700

To estimate technical potential for CHP, the GDS Team first developed a screening process based on the DOE's national technical potential study of CHP resources[28] to identify probable CHP candidate premises. First, customers with less than 50,000 kWh annual consumption were removed from eligibility as a CHP candidate. Second, we considered customer loads to assess if and what CHP system type and size may be a potential match to a customer. To effectively utilize CHP, a facility must have coincident electric and thermal energy requirements for a large load factor of the year. A continuous process industry with nearly constant steam or hot water demand electric load is an excellent target, such as a chemicals manufacturer or a hospital. Facilities with intermittent electric and thermal loads are progressively less attractive as the number of hours of coincident load diminishes. We therefore screened for eligible customers based on the customer's annual kWh usage and an approximate sized CHP system based on a thermal factor.

The Team calculated and applied a thermal factor to potential candidate customer loads to reflect thermal load considerations in CHP sizing. In most cases, on-site thermal energy demand is smaller than electrical demand. Thus, CHP size is usually dictated by the thermal load to achieve proper efficiencies and adequate

[27] Combined Heat and Power Market Assessment. ICF International for the California Energy Commission, April 2010.
[28] U.S. Department of Energy. Combined Heat and Power (CHP) Technical Potential in the United States, March 2016.

returns on investment. The Team used power to heat ratios[29] for both the CHP technology as well as different market segments to calculate the thermal factor as shown in following equation.

EQUATION 6-2 THERMAL FACTOR CALCULATION

$$Thermal\ Factor = \frac{P/H\ (CHP\ System)}{P/H\ (Customer\ Segment)}$$

A thermal factor of one (1.0) would result in the CHP system capacity being equal to the electric demand of the facility. A thermal factor of less than one would indicate that the application is thermally limited, and the resulting CHP system size would be below the electric demand of the facility. A thermal factor greater than one indicates that a CHP system sized to the thermal load would produce more electricity than can be used on-site, resulting in excess power that could be exported to the grid. Following the method applied in the DOE national technical potential study, the thermal factor was multiplied by each customer's annual consumption to estimate the appropriate CHP system size. The Team screened and removed any CHP technology that did not fall within +/- 15% generation of the customer's annual kWh consumption. A summary of the power to heat ratios by segment is listed in Table 6-3, as sourced from the DOE EPA CHP potential study.

TABLE 6-3 POWER TO HEAT RATIO BY SEGMENT

Industrial Segment	Heat to Power Ratio	Commercial Segment	Heat to Power Ratio
Utilities	1.29	Education	0.50
Smelting	0.26	Healthcare	0.75
Food Manufacturing	1.10	Institutions	0.94
Transportation Manufacturing	0.33	Grocery	0.62
Paper Manufacturing	2.37	Lodging	0.62
Plastics Manufacturing	0.31	Office	0.20
Misc. Manufacturing	1.34	Retail	0.84
Agriculture	0.25	Warehouse	0.68
Construction	0.25	Misc.	0.68
Metal Manufacturing	3.83		

After applying the screening method, we reviewed which CHP systems were eligible matches for given customer sites. In cases where multiple CHP technologies were viable for a single customer site, an applicability factor was assigned for each eligible CHP technology. After assigning applicability factors, the Team summed the total CHP generation across the population. The GDS Team removed from the technical potential any generation occurring from existing systems. Data on existing systems was provided directly by I&M.

6.1.2 Economic Potential

Economic potential represents the DER generation possible given full adoption of all cost-effective DER measures. For the cost effectiveness analysis on solar PV and CHP, the GDS Team used a Total Resource Cost (TRC) hurdle of 1.0. To assess the TRC, the GDS Team relied on the same avoided energy and capacity costs

[29] Power to heat ratios were sourced from a combination of the following sources:
- U.S. Environmental Protection Agency Combined Heat and Power Partnership. Catalog of CHP Technologies, September 2017.
- U.S. Environmental Protection Agency Combined Heat and Power Partnership. Spark Spread Estimator Version 1.2
- U.S. Department of Energy. Combined Heat and Power (CHP) Technical Potential in the United States, March 2016.

used in the energy efficiency analysis. These avoided costs serve as the benefits while the costs are represented as the installation and O&M costs of the modeled solar PV and CHP measures.

6.1.2.1 Solar Photovoltaic

To estimate economic potential for solar PV, we gathered pertinent data on system costs along with calculated generation benefits to use in the benefit-cost analysis, which we conducted at the system measure level. The GDS Team assessed system component costs based on data included in the National Renewable Energy Laboratory's (NREL) Q1 2020 Benchmarking report as well as public data files from Tracking the Sun[30] and compared these national cost parameters to I&M-specific values by using various market data provided by Energy Sage.[31] This analysis produced an estimated installation cost per watt installed, which we applied to each system size to estimate total installed cost. Additionally, the GDS Team included O&M costs that scale with system size[32]. Finally, we assumed the impact of the federal investment tax credit (ITC) to follow the existing schedule at the time of this report which equates to a 10% tax credit for commercial systems by 2024 and a 0% tax credit for residential systems by 2024.

In addition to modeling solar PV system costs, the GDS Team estimated cost impacts for solar PV systems coupled with battery storage based on analysis from NREL's Q1 2020 Benchmarking report and Lazard's Levelized Cost of Storage Analysis[33]. The GDS Team estimated an average lithium-ion battery installation cost of $1,093/kWh and $721/kWh for the residential and non-residential sectors, respectively, inclusive of the ITC.

TABLE 6-4 AVERAGE SOLAR PV INSTALLATION COST

Sector	System Cost ($/ DC W)[1]
Residential	$3.05
Non-Residential (<100 kW)	$2.56
Non-Residential (>100 kW)	$2.20
Non-Residential - Tracking (<100 kW)	$3.95
Non-Residential - Tracking (>100 kW)	$3.39

[1]Costs reflect impact of federal investment tax credit; battery systems not reflected in cost.

6.1.2.2 Combined Heat and Power

To assess costs for the various CHP technologies analyzed in the potential study, the GDS Team relied on data sourced from the EPA Catalog of CHP Technologies[34]. Costs were calculated for fuel cell, gas turbine, micro turbine, reciprocating engine, and steam turbine CHP configurations at various capacity sizes. These costs reflect the inclusion of the ITC based on the existing schedule at the time of this report which equates to a 10% tax credit for CHP through 2023.

Table 6-5 summarizes detailed CHP cost considerations and assumptions utilized in the cost-effectiveness screening. These costs reflect the inclusion of the ITC based on the existing schedule at the time of this report which equates to a 10% tax credit for CHP through 2023.

[30] Feldman, D, et. al., U.S. Solar Photovoltaic System and Energy Storage Cost Benchmark: Q1 2020. NREL, January 2021.
[31] https://www.energysage.com/solar-panels/in/; https://www.energysage.com/solar-panels/mi/ (accessed March 2021).
[32] Feldman, D, et. al., U.S. Solar Photovoltaic System and Energy Storage Cost Benchmark: Q1 2020. NREL, January 2021.
[33] Ibid.
[34] U.S. Environmental Protection Agency Combined Heat and Power Partnership. Catalog of CHP Technologies, September 2017.

TABLE 6-5 DETAILED CHP COST CONSIDERATION SUMMARY

Technology Type	Size (kW)	Installed System Cost ($/W)	O&M Costs ($/kWh)
Fuel Cell	125	$17.33	$0.35
	250	$12.42	$0.31
	500	$6.69	$0.27
	750	$6.10	$0.27
	1000	$5.50	$0.26
	1250	$4.91	$0.26
	1500	$4.32	$0.26
	2000	$3.13	$0.26
Gas Turbine	750	$3.84	$0.09
	1000	$3.77	$0.09
	1250	$3.69	$0.09
	1500	$3.62	$0.09
	2000	$3.48	$0.09
	2500	$3.34	$0.09
	3000	$3.20	$0.09
	3500	$3.06	$0.09
	4000	$2.92	$0.09
	4500	$2.78	$0.09
	5000	$2.64	$0.09
	5500	$2.50	$0.09
	6000	$2.36	$0.08
Micro Turbine	50	$3.50	$0.05
	100	$3.30	$0.05
	150	$3.10	$0.05
	200	$2.90	$0.05

Technology Type	Size (kW)	Installed System Cost ($/W)	O&M Costs ($/kWh)
Reciprocating Engine	125	$2.85	$0.07
	250	$2.81	$0.07
	500	$2.73	$0.07
	750	$2.64	$0.07
	1000	$2.55	$0.06
	1250	$2.47	$0.06
	1500	$2.38	$0.06
	2000	$2.21	$0.06
	2500	$2.04	$0.05
	3000	$1.86	$0.05
	3000	$1.86	$0.05
	4000	$1.74	$0.05
	4500	$1.71	$0.05
	5000	$1.68	$0.04
Steam Turbine	500	$4.95	$0.18
	750	$4.95	$0.18
	1000	$4.95	$0.18
	1250	$4.95	$0.18
	1500	$4.95	$0.18
	2000	$4.95	$0.18
	2500	$4.95	$0.18
	3000	$4.95	$0.18
	3500	$4.95	$0.18
	4000	$4.95	$0.18
	4500	$4.95	$0.18
	5000	$4.95	$0.18
	5500	$4.95	$0.18
	6000	$4.95	$0.18

6.1.3 Market Potential

Market potential is the amount of energy that can realistically be saved given likely future utility program intervention and various market barriers. The anticipated approach to assess achievable potential for the DER potential analysis was to follow the same logic and methods as used in the energy efficiency achievable potential analysis. However, as discussed in Section 6.2 below, market potential was not assessed as neither the solar PV nor CHP technologies passed a TRC screen of 1.0.

6.2 DER POTENTIAL FINDINGS

This section of the report presents the Technical, Economic, Achievable (MAP and RAP) for CHP and solar PV.

6.2.1 Solar Photovoltaics

Table 6-6 summarizes the solar PV cumulative annual potential estimates for electric demand and Table 6-7 for electric energy within I&M's Indiana territory. The residential 2042 technical market potential for solar PV represents 55.9% of the 2042 residential sector sales forecast. Additionally, the non-residential 2042 technical market potential represents 64.0% of the 2042 non-residential sector sales forecast.

TABLE 6-6 SUMMARY OF SOLAR PV ELECTRIC DEMAND MARKET POTENTIAL

Year	Technical DC Capacity (MW)	Technical Peak Capacity (MW)	Economic (MW)	MAP (MW)	RAP (MW)
2023	333	109	0	0	0
2027	1,918	601	0	0	0
2032	5,658	1,771	0	0	0
2042	6,628	2,074	0	0	0

TABLE 6-7 SUMMARY OF SOLAR ELECTRIC ENERGY MARKET POTENTIAL

Year	Technical (MWh)	Economic (MWh)	MAP (MWh)	RAP (MWh)
2023	433,828	0	0	0
2027	2,399,988	0	0	0
2032	7,069,659	0	0	0
2042	8,280,565	0	0	0

Table 6-8 summarizes the cost effectiveness results for each technology and for the TRC cost-effectiveness perspective.

TABLE 6-8 SUMMARY OF SOLAR PV COST-EFFECTIVENESS

Solar PV Technologies	TRC Test Range
Residential Roof-mounted (3 – 20 kW)	0.44
Residential Roof-mounted with Batteries (3 – 20 kW)	0.20 – 0.37
Non-residential Roof mounted (10 – 50 kW)	0.43
Non-residential Roof mounted with Batteries (10 – 50 kW)	0.33 – 0.36
Non-residential Ground mounted (100 kW – 2MW)	0.50
Non-residential Ground mounted with Batteries (100 kW – 2MW)	0.43 – 0.44
Non-residential Ground mounted Tracking (100 kW – 2MW)	0.46
Non-residential Ground mounted Tracking with Batteries (10 – 50 kW)	0.40 – 0.41

It is notable that no solar PV technologies pass cost-effectiveness screening under the TRC. This test is the primary cost-effectiveness criteria used to determine whether a utility sponsored program intervention is prudent. Low avoided costs serve as the primary driver behind the cost effectiveness results. At a technology level, the introduction of battery storage reduces cost effectiveness despite potential capacity benefit gains. Similarly, benefits achieved through additional generation using tracking-enabled systems are ultimately outweighed by the higher installation cost associated with the tracking technology.

The GDS Team conducted additional sensitivity analysis to understand how various cost parameters impact solar PV cost effectiveness and to what extent these costs are required to change in order for any of the modeled solar PV measures to pass a TRC of 1.0. Specifically, the Team reviewed mutually exclusively the impacts of:

- Transmission and distribution (T&D) costs
- Solar PV materials and installation cost

To simulate the locational benefits associated with DERs, the Team conducted the cost-effectiveness testing with an increase of 500% to the T&D values. Despite this increase, no solar PV measure permutation passed the TRC. T&D values would need to increase 1250% to allow a limited number of non-residential measures to pass cost-effectiveness. We also considered a 35% cost reduction and reassessed solar PV cost-effectiveness. However, we ultimately found a cost reduction of 55% was required for a limited number of measures to achieve a TRC ratio of 1.0 or greater.

6.2.2 Combined Heat & Power

Table 6-9 summarizes the CHP cumulative annual potential estimates for electric demand and Table 6-10 for electric energy within I&M's Indiana territory. 2042 technical market potential for CHP represents 17.3% of the 2042 non-residential sector sales forecast.

TABLE 6-9 SUMMARY OF CHP ELECTRIC DEMAND MARKET POTENTIAL

Year	Technical Peak Capacity (MW)	Economic (MW)	MAP (MW)	RAP (MW)
2023	8	0	0	0
2027	49	0	0	0
2032	154	0	0	0
2042	185	0	0	0

TABLE 6-10 SUMMARY OF CHP ELECTRIC ENERGY MARKET POTENTIAL

Year	Technical (MWh)	Economic (MWh)	MAP (MWh)	RAP (MWh)
2023	73,191	0	0	0
2027	426,286	0	0	0
2032	1,339,712	0	0	0
2042	1,608,618	0	0	0

Table 6-11 summarizes the cost effectiveness results for each technology and for the TRC cost-effectiveness perspective.

TABLE 6-11 SUMMARY OF CHP COST-EFFECTIVENESS

CHP Technologies	TRC Test Range
Fuel Cell (125 – 2,000 kW)	0.12 – 0.40
Gas Turbine (750 – 6,000 kW)	0.40 – 0.59
Micro-Turbine (50 – 200 kW)	0.22 – 0.26
Reciprocating Engine (125 – 5,000 kW)	0.30 – 0.53
Steam Turbine (500 – 6,000KW)	Less than 0.1

It is notable that no CHP technologies pass cost-effectiveness screening under the TRC. This test is the primary cost-effectiveness criteria used to determine whether a utility sponsored program intervention is prudent. Low avoided costs serve as the primary driver behind the cost effectiveness results. However, it may be the case that certain site location conditions have important performance parameters that allow for a favorable cost-effectiveness assessment for that specific site, even if the average system and facility is not cost-effective as analyzed.

7 PROGRAM DESIGN

The GDS Team conducted research and analysis to identify ideas for I&M to consider for potential improvements to their program portfolio. The objective was to highlight industry trends and best practices, as well as possible opportunities to close gaps between I&M's portfolio of offerings and other portfolios that are achieving higher volumes of savings, and/or are ranked among the nation's top DSM portfolios. The GDS Team then revised the concepts and suggested modifications to the market potential study program potential modeling inputs to reflect the outcomes of this analysis. This task was not a comprehensive portfolio optimization analysis. Rather it involved a high level, largely qualitative review of industry trends and comparison of utility portfolio characteristics. There may be additional factors beyond the scope of this analysis that would make certain considerations presented here infeasible for I&M to pursue or concepts that need to be tested with actual market conditions.

7.1 ANALYSIS APPROACH

The GDS Team sought to gather insight into the latest industry trends and best practices by reviewing literature (e.g., industry association trends report, conference papers, government agency white papers, evaluation reports, and DSM plans), as well as data associated with the program portfolios offered by peer utilities. Outcomes from the MPS market research and initial modeling outputs, as well as stakeholder input on the MPS and I&M's most recent DSM Plan submittals in Indiana and Michigan also were considered in the analysis.

The Team selected seven utilities for benchmarking comparison (Figure 7-1) based on a combination of proximate geography, availability of granular measure-level data, references to utilities included in stakeholder comments, and ranking as top programs in ACEEE's 2020 Utility Energy Efficiency Scorecard. For each of the comparison utilities, the Team assembled data regarding program and measure offerings, as well as program cost-effectiveness and related values. Data sources included DSM Plan filings, evaluation reports, program websites, and other sources where available.

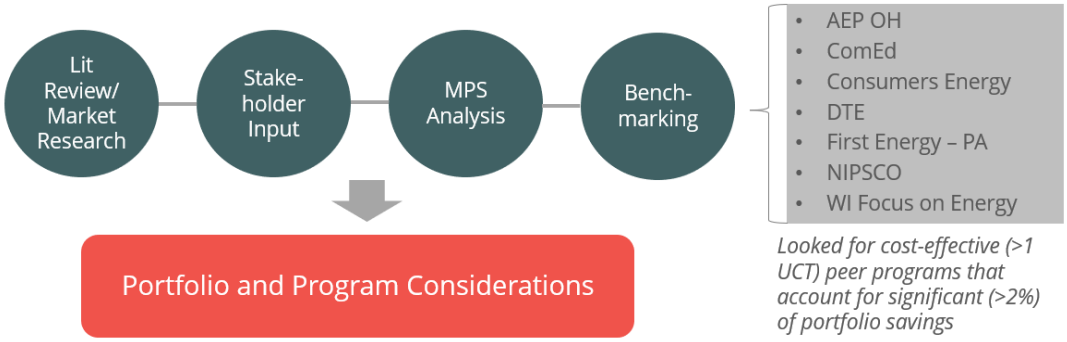


FIGURE 7-1: METHODS FOR DEVELOPING PROGRAM AND PORTFOLIO CONSIDERATIONS

Guiding principles for the analysis were to:

- Identify cost-effective program opportunities (>1 UCT) that can deliver significant energy savings (>2% of total portfolio savings based on comparison utility experiences);
- Look for opportunities to shape a portfolio that exhibits characteristics identified as optimal for advancing the long-term success of energy efficiency markets; and
- Consider program objectives I&M highlighted in its most recent DSM Plan filings.

ACEEE's 2020 Utility Energy Efficiency Scorecard served as a key reference for identifying the optimal DSM program characteristics that look beyond the basic components of high impact energy savings and cost-effectiveness. ACEEE's

Scorecard ranks DSM programs based on a variety of characteristics, recognizing that many factors shape the context for what a utility can offer, as well as the range of benefits a program may provide. Characteristics identified as optimal for utility energy efficiency portfolios include:[35]

- **Comprehensive** – serving the full spectrum of customer needs and end uses.
- **Responsive to market changes** - including emerging program areas and strategies that address major or growing end uses.
- **Innovative and engaging** - bringing in new technologies and strategies (e.g., geo-targeting, grid-interactive efficient buildings, bundling efficiency with other resources, emphasizing technologies with multi-benefits).
- **Simple, accessible, and hassle free** - to maximize customer participation.
- **Tailored** - to meet the unique needs of different customers and offering incentives at the most effective point in the supply chain for a given market.
- Operating in a jurisdiction with **policy support and enabling mechanisms**

It was through the lens of these guiding principles that the GDS Team considered potential refinements to I&M's current portfolio of programs. The considerations described in the following sections were the result of this analysis. The Team presents these considerations in an effort to help put I&M in the best position possible to achieve deeper savings cost-effectively over the long term. However, the Team recognizes the limitations of this analysis and that factors beyond the scope of this work may limit the applicability of these considerations. The GDS team would recommend that I&M gather program costs and measure details from market implementations contractors and vendors to validate these findings. Additionally, markets in the I&M service territory may not react immediately and/or the program may require time to mature operations; consequently, some of these findings should be implemented as a pilot or have cost effectiveness assessed after several years.

7.1.1 Application of Considerations to Program Potential

The GDS team applied the research findings to refine the realistic achievable potential into the program potential scenario. The program potential scenario simulates the expected program outcomes in forecasted years by included the following updated factors informed by best practice research:

- **Program Net-to-Gross values** (NTG)
  - Existing program offering utilize 2019/2020 program NTG estimates
  - New program offerings are defaulted to 0.8 unless research dictates otherwise
- **Incentive levels and structures**
  - Measures within existing I&M programs were modeled within their current framework unless research dictates otherwise
- **Program non-incentive costs (admin)**
- **Measure Assignments**
  - In some cases, achievable potential cost-effective measures were reassigned to new program types.

7.2 PROGRAM POTENTIAL RESULTS

This section provides an overview of the costs and savings associated with the program potential for energy efficiency. Residential and C&I sector results are provided.

Table 7-1 below shows the residential and C&I program potential. The first set of numbers shows the RAP, followed by the gross program potential, and then lastly the net program potential. The drop from RAP to Program RAP is driven

[35] *ACEEE 2020 Utility EE Scorecard, see "Practices of Leading Energy-Saving Utilities," p. 91.*

by changes in program mapping for certain measures, as well as programs being dropped from the program potential if not cost-effective at the program-level. The reduction from gross Program RAP to net Program RAP is due to the estimated prospective net-to-gross ratios of the measures and programs retained in the program potential analysis.

TABLE 7-1 PROGRAM POTENTIAL (MWH)

Program	RAP (gross)	Program RAP (gross)	Program RAP (net)
Residential	654,240	319,404	251,412
C&I	973,046	979,544	817,768
Total	1,627,285	1,298,947	1,069,180

Figure 7-2 provides the incremental program RAP in the residential sector across the next five, then ten and twenty years. The Home Energy Products program provides a steady contribution towards the total. The Home Energy Engagement and HVAC Midstream programs steadily increase in savings over time.

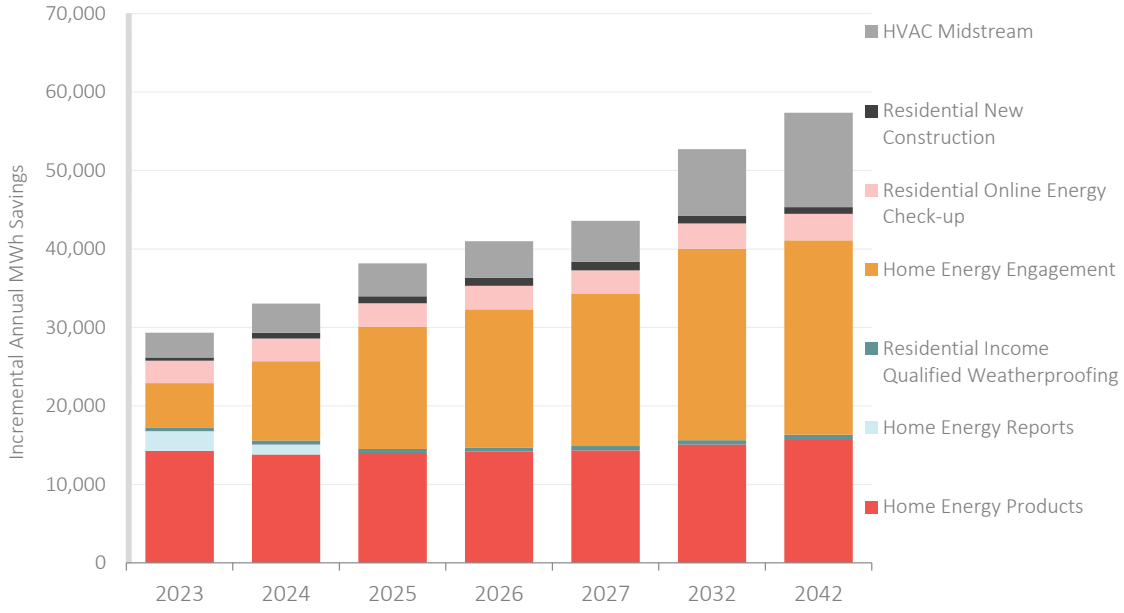


FIGURE 7-2: RESIDENTIAL PROGRAM POTENTIAL – GROSS MWH

Figure 7-2 provides the incremental program RAP in the C&I sector across the next five, then ten and twenty years. The Biz-Custom program provides a steady contribution towards the total. The Biz-Prescriptive program provides a large share of the savings in the early years, and then declines across the first decade of the study. The Biz-SEM and Biz-Industrial Systems programs savings increase gradually over time across the study timeframe.

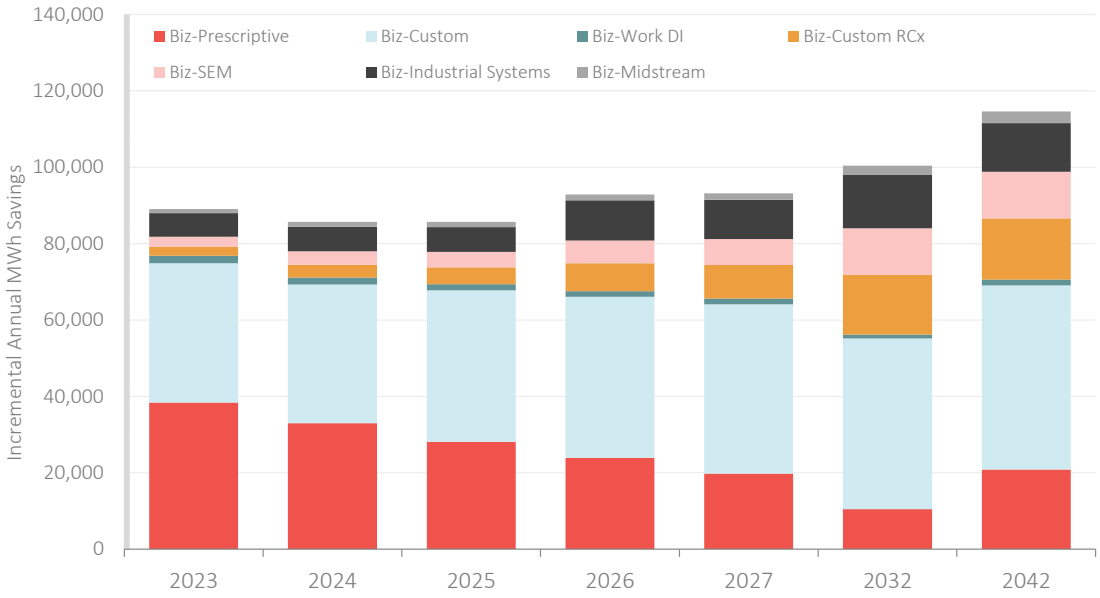


FIGURE 7-3: C&I PROGRAM POTENTIAL – GROSS MWH

Figure 7-4 provides the program RAP budgets for the residential sector. Total budgets increase from $7.0 million to $13.6 million, with incentive costs accounting for approximately 46% of the total budget on an annual basis on average.

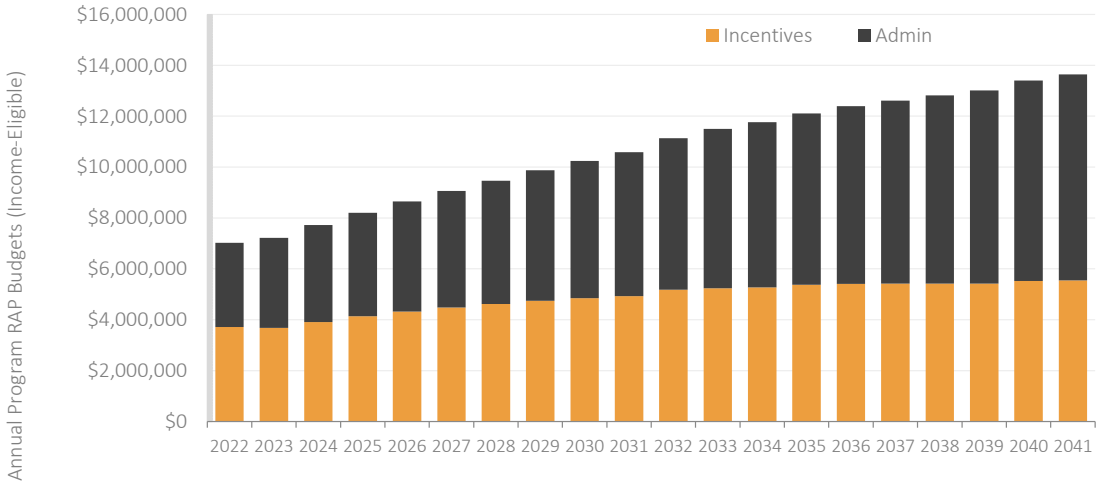


FIGURE 7-4: RESIDENTIAL PROGRAM POTENTIAL BUDGETS – INCENTIVES AND ADMIN

Table 7-2 provides the NPV benefits and costs by program in the residential sector. The overall UCT ratio in the residential sector is 1.80.

TABLE 7-2: RESIDENTIAL PROGRAM RAP UCT NPV BENEFITS AND COSTS –BY 2042 ($, IN MILLIONS)

Program	NPV Benefits	NPV Costs	UCT Ratio
Home Energy Products	$84.4	$49.4	1.7
Home Energy Reports	$0.1	$0.1	1.2
Residential Income Qualified Weatherproofing	$4.1	$9.9	0.4
Home Energy Engagement	$12.6	$2.9	4.4
Residential Online Energy Check-up	$11.1	$7.8	1.4
Residential New Construction	$12.5	$6.4	2.0
HVAC Midstream	$79.3	$34.5	2.3
Total	$204	$111	1.8

Figure 7-5 provides the program RAP budgets for the C&I sector. Total budgets increase from $10.7 million to $17.0 million, with incentive costs accounting for approximately 42% of the total budget on an annual basis on average.

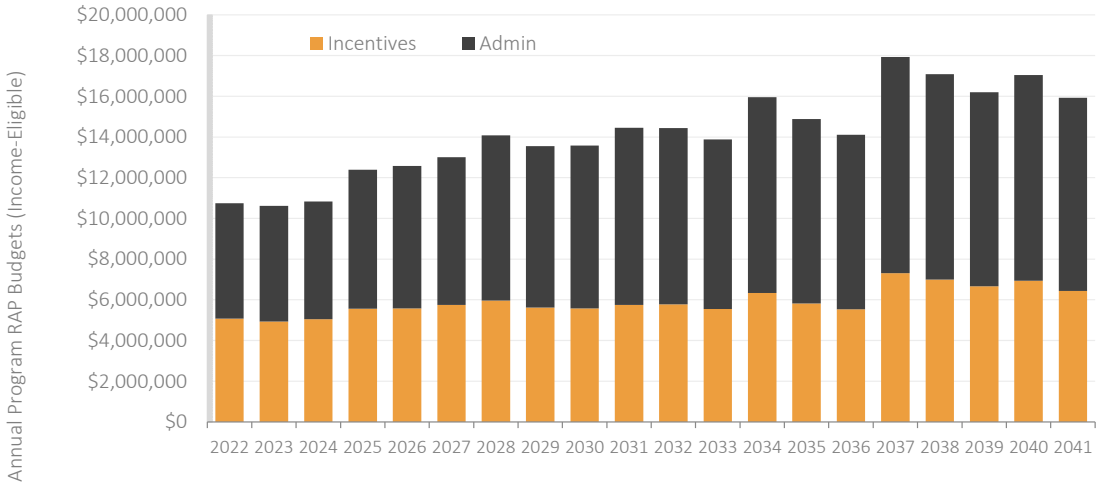


FIGURE 7-5: C&I PROGRAM POTENTIAL BUDGETS – INCENTIVES AND ADMIN

Table 7-3 provides the NPV benefits and costs by program in the C&I sector. The overall UCT ratio in the C&I sector is 2.9.

TABLE 7-3: C&I PROGRAM RAP UCT NPV BENEFITS AND COSTS –BY 2042 ($, IN MILLIONS)

Program	NPV Benefits	NPV Costs	UCT Ratio
Biz-Prescriptive	$95.9	$21.6	4.4
Biz-Work DI	$236.6	$58.4	4.0
Biz-Midstream	$7.1	$5.5	1.3
Biz-Custom	$14.6	$20.0	0.7
Biz-SEM	$32.5	$16.7	1.9
Biz-Industrial Systems	$23.5	$27.4	0.9
Biz-Custom RCx	$29.7	$2.8	10.8
Total	$439.8	$152.5	2.9

7.3 KEY CONSIDERATIONS

Figure 7-6 presents the top four considerations emerging from the analysis and is followed by a discussion of each.

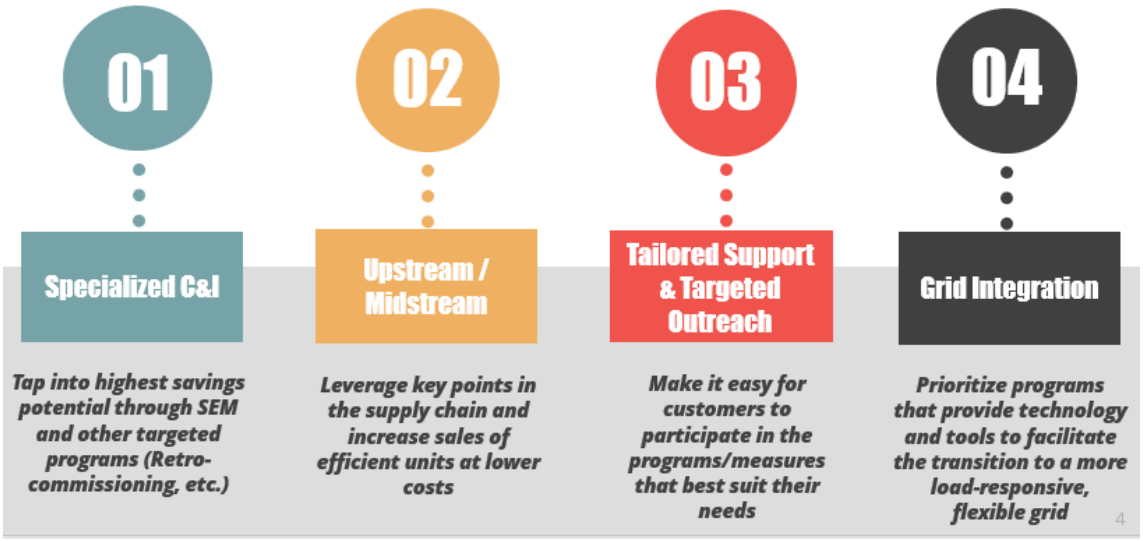


FIGURE 7-6: TOP CONSIDERATIONS

7.3.1 Specialized C&I: Introduce targeted C&I program offerings to tap into savings potential from large energy users.

The greatest volume of economic savings potential exists with C&I markets, and it is important to devote attention and strategic planning to ensure I&M is effectively tapping into that potential. The decreasing savings potential available from traditional energy efficiency measures, such as lighting, requires a shift to more innovative and targeted program activities that can provide deeper savings, boost participation by customers with high savings-potential, and provide overall value to ratepayers. Specifically, the Team believes I&M would benefit from carefully considering offering a Strategic Energy Management (SEM) program component within the broader Work Custom program. We also encourage I&M to consider offering an additional "large users – specialty program" component within the Work Custom program.

SEM programs take a holistic approach to managing energy use with a goal of continuously improving energy performance and achieving persistent energy and cost savings over the long term. SEM programs focus on changing business practices and organizational culture to reduce energy waste and use energy more effectively. SEM emphasizes equipping plant management and staff with the information and tools needed to reduce energy consumption through behavior and operational change. SEM activities may also include recommendations for equipment upgrades and capital investments.[36]

Several energy efficiency portfolios currently include an SEM program (e.g., Energy Trust of Oregon, ComEd, Nicor Gas, Efficiency Nova Scotia, NYSERDA, BPA) and these programs serve an increasingly wide range of customers (e.g., industrial, municipal, colleges and universities). A 2015 ACEEE analysis estimated that SEM could be applied to 20% of commercial load and 50% of industrial load in the United States.[37]

[36] Ethan Rogers, Andrew Whitlock, and Kelly Rohrer. 2019. "Features and Performance of Energy Management Programs." ACEEE, Report IE1901. Also see CEE's SEM platform: https://www.cee1.org/content/strategic-energy-management-platform
[37] ACEEE blog, February 2021: https://www.aceee.org/blog-post/2021/02/strategic-energy-management-programs-expand-serving-new-customers

An SEM program provides ongoing coordination and support that requires maintaining interaction and relationships with participants over a long duration. Thus, this type of program may warrant its own focused management attention and staffing. An additional program component could target large users with a focus on other high impact measures like retro-commissioning, improvements to industrial systems and networked lighting controls. Networked lighting controls hold a particularly strong promise given their ability to combine a variety of different control strategies deployed with the benefit of networked, intelligent operations. The majority of lighting equipment installed in the U.S. is not controlled, and this percentage may be higher in I&M's service territory as it has a significant population of older building stock.[38]

It is common among the comparison utilities to offer program components focusing on measures such as retro-commissioning and opportunities that are particularly beneficial for large users. All of the comparison utilities offer a retro-commissioning program, all but one offers networked lighting controls as a measure (though not necessarily offered as a focused program component), and four offer a program component focusing on industrial systems and/or process improvements.

7.3.2 Upstream / Midstream

Moving incentives upstream and leveraging a smaller number of key points in the supply chain (i.e., retailers and distributors rather than only focusing on contractors and installers) can greatly increase the number of units sold at a lower cost per unit than in a downstream program model, as evidenced through numerous utilities' experiences (e.g., California, Connecticut, Maine, Massachusetts, New York, Vermont).[39] The GDS Team encourages I&M to consider offering a range of upstream and midstream programs, including:

- Residential upstream non-lighting retail program component within the Home Energy Products program
- Residential midstream HVAC program component within the Home Energy Products program
- C&I midstream Lighting, HVAC, and Food Service program components, potentially within the Work Prescriptive program

An **upstream retail non-lighting program** could build on I&M's existing / previous relationships with retailers, transitioning to feature non-lighting products. This program model leverages a nationwide effort by utilities to boost consumer awareness and provide easy access to energy saving products at the locations where home products are purchased. The program can also help consumers build a trusted relationship with their utility as a source of information about energy saving opportunities (e.g., through in-store co-branding opportunities, etc.). Small incentives paid to the retailer increases their profit margins leading to prioritized stocking and product placement (supplemented with additional utility purchases of end cap placement, etc.). I&M could leverage the existing program model and resources available through the ENERGY STAR Retail Products Platform (RPP). The RPP is designed based on deep knowledge of retailer needs and motivations, how to best leverage retailer partnerships as the market evolves, and how other utilities are addressing evaluation challenges.[40]

[38] Reference to the proportion of buildings in the U.S. that lighting controls: Energy Savings Forecast of Solid-State Lighting in General Illumination Applications, Figure 4.7. https://www.energy.gov/sites/prod/files/2019/12/f69/2019_ssl-energy-savings-forecast.pdf.

[39] Gunn, Kelly, and Jim Fay. 2020. ComEd Energy Efficiency Program: Incorporating an Upstream and Midstream Strategy in Energy Efficiency. SAG Upstream Working Group; Backen, Dave, Christopher Burmester and Mary Ann Sheehan. 2017. Moving to the Middle – How to Navigate the ins and Outs of C&I Midstream Programs. [Blog post series]; Dunn, Alex, Joe Van Clock, Sara Conzemius, Scott Dimetrosky. 2016. Paradigm Shift Needed! Without it, Midstream Lift Yields NTG Woes for Plug Load Programs. ACEEE Summer Study on Energy Efficiency in Buildings; Vaidya, Rohit. 2019. The Great Migration: Moving Energy Efficiency Programs to Midstream. IEPEC.

[40] See: https://www.energystar.gov/partner_resources/energy_star_retail_products_platform. Also see "Pitch Deck"- https://www.energystar.gov/sites/default/files/asset/document/ESRPP%20Pitch%20Deck_Draft_06-23-2020_0.pdf)

The **midstream program** model has gained industry support for its ability to achieve higher participation rates with lower administrative costs due to requiring fewer points of contact to administer incentives than in a downstream program model (i.e., the program interacts directly with distributors, each of which reaches a relatively large share of the market through their operations). These programs also have an ability to employ more advanced and efficient data tracking systems since they are dealing with fewer, upstream market actors. This program model is also viewed favorably because research finds that distributors and supply houses serve as a key source of information for installers and contractors, giving them significant influence over equipment purchase decisions.[41]

Upstream and midstream program models seek to increase the stocking practices and availability of high-efficiency units, which consequently improves market awareness of these units. Therefore, these programs have both resource acquisition and market transformation components (i.e., causing permanent structural changes in the market in the form of increased stocking and awareness). Measuring program attribution through traditional means may not fully capture the savings resulting from the market transformation impacts / market effects resulting from these programs over time. It is important to work with regulators to ensure the full market transformation impacts of these programs can be captured. Evaluation methods are available for capturing market effects, but they require tracking changes in key market indicators over time (starting close to program launch), and the methods are improving with refinements over time.[42]

Lighting, HVAC, and Food Service are popular C&I equipment types to offer through midstream programs because they: a) rely on quick replacement when equipment breaks down, and b) those markets rely heavily on established relationships between contractors and their distributors/suppliers.[43]

I&M's Indiana DSM Plan filing settlement agreement calls for offering a residential HVAC midstream pilot starting in March 2021. Therefore, I&M will be gaining experience with the midstream program model that can help serve as a foundation for further considerations in additional technologies and markets. There are also opportunities for I&M to collaborate with NIPSCO and IPL on offering midstream incentive programs.

7.3.3 Targeted & Tailored Outreach

Customers prefer information that is tailored to their needs, and direct support can help overcome the inertia that keeps customers from taking action to address their energy saving opportunities. Tailored programs that provide direct customer support also align with I&M's commitment to offering programs that will educate, encourage, and entice customers. Tailoring and targeting program outreach to specific audiences also aligns with industry best practice guidance to make programs easy to participate in. Specifically, the GDS Team encourages I&M to consider taking the following steps:

- Offer a Multifamily program component and/or delivery stream, in particular, for the IQ residential sector.
- Resume the Work Direct Install program (small business audit and direct install).
- Take steps to improve customers' ability to be routed to the program offering that best serves their needs, such as through an Energy Advisor or Concierge service.
- Conduct targeted outreach to key market segments, including municipal customers, universities, K-12 schools, and hospitals.

Multifamily-focused program components are offered in all jurisdictions included in this study's benchmarking comparison. The multifamily market is unique in several ways, including building structural and energy use characteristics, property ownership arrangements, and the network of public and private entities that develop and

[41] Vaidya, Rohit (NMR), Ann Clarke (National Grid), James Fay (Commonwealth Edison), Jenna Bagnall-Reilly (NMR), Jared Powell (NMR), Sam Manning (NMR) 2019. "The Great Migration: Moving Energy Efficiency Programs to Midstream." IEPEC.
[42] Agapay-Reed, Laura, Jan Harris. 2020. Attributing Savings of Utility Midstream Energy Efficiency Programs: Standardizing a Protocol to Estimate Free Ridership. Energy Evaluation Europe.
[43] Daughton, Brysen. 2019. Upstream Program Designs for Different DSM Measures. ESource white paper.

maintain the facilities. Tailored marketing/outreach and measure offerings are appropriate for this unique market, serving both income qualified and market customers.

Resuming the **Work Direct Install program, a small business direct install program (SBDI),** is another way I&M could offer tailored support and outreach to better serve a key segment within its service territory. This would align with the practices of all seven of the peer utilities included in the benchmarking exercise, as well as I&M's mission of offering easy-to-access programs. I&M serves a large population of small businesses (Figure 7-7), and an energy assessment is an important first step to help set these businesses on a course to pursue energy saving opportunities.

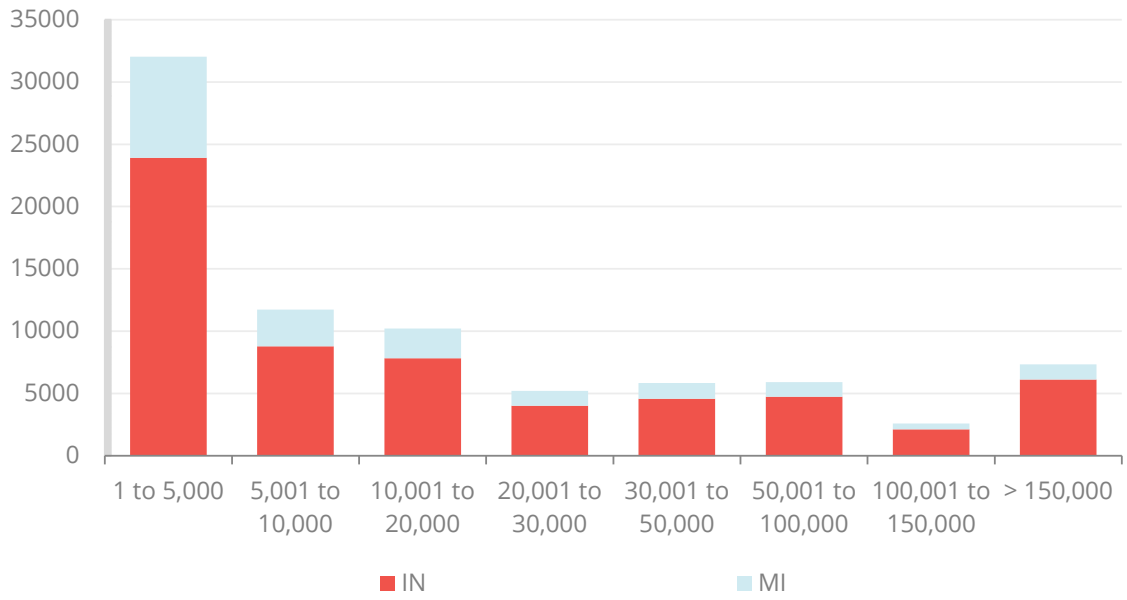


FIGURE 7-7. ANNUAL KWH USAGE OF ACTIVE BUSINESS CUSTOMERS

SBDI programs can have lower cost effectiveness than other program types, but of the four comparison utilities with cost effectiveness data available for their SBDI programs, all were cost effective under either the UCT or TRC. These programs also provide important benefits not easily captured in cost effectiveness analysis. Small businesses benefit from the educational aspects of the program, and the program can help build customer trust in their utility as a source of energy-related guidance. I&M can explore the program characteristics that make this program cost-effective in peer utility jurisdictions (e.g., measure offerings, incentive levels, program strategies that may improve cost-effectiveness).

Offering an **Energy Advisor or Concierge Service** would help overcome inertia by making it easier for customers to connect with the program that best suits their needs. Efforts to make program participation as convenient and seamless as possible become increasingly important as energy efficiency markets need to seek out "higher hanging fruit" and harder to reach customers. An Energy Advisor service could include dedicated staff available to answer more advanced questions about DSM programs than typical call center staff can answer, and more proactive engagement with customers to boost participation in program areas that have historically seen lower program participation rates. Four peer utilities offer some sort of Energy Advisor-related service to help their customers navigate participation in DSM programs.[44]

[44] AEP OH's Consolidated Outreach Program is designed to create a hub of communication and information around trained regional energy advisors to increase customer knowledge and enroll customers in the most appropriate program for their needs. ComEd's Small Business programs provide a "ComEd Energy Efficiency Service Provider (i.e., advisor) to fully manage the participation process for the customer, including all the paperwork". Consumers Energy offers "Assistance in specifying projects and preparing bid requests" for their Custom program. WI Focus on Energy assigns "Energy Advisors" to large users to help them identify savings opportunities.

I&M could also consider whether there are additional opportunities to **target outreach to key market segments such as municipal and other public entities, as well as universities**. These types of customers typically have high energy usage, unique energy needs, and a longer-term investment outlook that makes them good candidates for energy efficiency program participation. They also often experience staff capacity challenges that may make it difficult to be proactive in pursuing energy saving opportunities, meaning they could benefit from additional outreach and tailored support to encourage program participation. The surveys conducted for the MPS found that the respondents with office, government, and education building types had the top 3 highest average WTP scores for major energy efficiency investments with a 10-year payback period.

7.3.4 Grid Integration

AEP is working to reduce carbon emissions 80% by 2030 and to achieve net-zero emissions by 2050. Furthermore, AEP plans to add more than 16,500 MW of renewable energy by 2030.[45] These commitments will require I&M and other AEP utilities to leverage consumers as a resource in achieving greater load flexibility to accommodate a growing supply of intermittent renewable energy sources. I&M is already making progress in this direction with investments in advanced metering infrastructure (AMI), and demand-responsive program offerings.

In Indiana, I&M offers a Home Energy Engagement (HEE) program that leverages AMI data to inform behavioral changes, and in Indiana, I&M offers a Home Energy Management program that uses WiFi connected thermostats to control the timing of HVAC system operation and run time. The GDS Team encourages I&M to consider opportunities to offer both programs to customers in both states. These programs integrate demand-responsive functionality and mechanisms to facilitate more informed decisions about energy use behaviors. These are the types of programs that will prepare I&M to operate a more advanced electric grid capable of accommodating more renewable energy resources and making more efficient use of both supply and demand-side resources.

The HEE program includes AMI Data Portal, Home Energy Report and Online Energy Checkup components. The **AMI Data Portal** component aligns well with the ongoing transition to a more connected two-way power grid. There are opportunities to adapt the **Home Energy Report** program component to leverage insight arising from the availability of AMI data, and to use this communication channel to educate consumers about cost-effective energy saving opportunities and build consumer trust in their utility as a source of energy-related guidance. An AMI portal-type of program is currently offered by three peer utilities included in the benchmarking exercise and will likely be a component of a growing number of jurisdictions' DSM portfolios going forward. Home Energy Report programs are offered by all seven peer utilities. Direct load programs, like the Home Energy Management program, are offered in three of the peer utilities.

7.4 ADDITIONAL CONSIDERATIONS

In addition to the top four considerations presented previously, the GDS Team encourages I&M to consider making an on-going commitment to investing in pilot programs.

7.4.1 Pilot Investment: Dedicate funds for pilot programs to explore emerging technologies and business models.

Energy-related markets are rapidly evolving, and ongoing improvements in technology performance and costs, as well as regulatory factors will drive changes in the cost-benefit ratio of energy saving opportunities over time. It is important to continuously invest resources in exploring and preparing for new potential program offerings to serve the evolving market and tap available energy savings.

Agriculture-related programs could be another area of potential focus for pilot programs. The agriculture community can benefit both from increased awareness of traditional energy efficiency opportunities, as well as unique agriculture-

[45] https://www.indianamichiganpower.com/lib/docs/cleanenergy/renewable/2021TransitioningFleetUpdate.pdf

focused opportunities. Four of the benchmarked utilities currently offer an agriculture-focused program, and I&M's rural service territory in Indiana could be a strong candidate for such a program.

The Pay-for-Performance program model, or a related RFP-based project selection model could also prove promising to explore through a pilot. Pay-for-performance programs can motivate aggregators to employ innovative strategies to recruit customers with high savings potential. Pay-for-performance programs can present challenges (e.g., risk associated with energy savings commitments). However, the growing need to achieve deeper energy savings, along with advancements in metering capabilities may provide reason to consider a next generation of pay-for-performance programs.[46] Three of the peer utilities currently offer a pay-for-performance or RFP-based project selection program model.

[46] Polis, Hilary. 2019. "We Say We Want a Revolution… What is it Going to Take to Get There with Pay for Performance?" IEPEC.

APPENDIX A: SENSITIVITIES

The GDS Team conducted sensitivity analyses to assess the impacts of key input assumptions on the estimates of EE/DR/DER potential. The GDS Team coordinated with I&M to develop appropriate and reasonable sensitivity cases.

ENERGY EFFICIENCY SENSITIVITIES

Sensitivities Overview

Sensitivity 1. Hi-Touch Administration. This scenario explored the strategy of increasing marketing/high-touch administration to increase program participation. The intent of such an analysis is to help inform optimal program design.

To examine the impacts of hi-touch marketing, the sensitivity utilized the same data used to develop the MAP and RAP scenarios. The RAP scenario assumes historical incentive levels and that program awareness remains at current levels. The MAP scenario assumes up to 100% incentives and that program awareness increases to a maximum of 85%. The Hi-Touch marketing maintains the historical incentive levels but assumes that program awareness reaches the same level as the MAP scenario. As a result, the hi-touch marketing scenario produces a result between the current RAP and MAP levels and provide an indication which strategy (increased incentives or increased marketing) is likely to have a larger impact on adoption.

In addition to increased adoption levels, the hi-touch marketing scenario assumes that for every 1 percent increase in program awareness, non-incentive costs increase by 0.5% (on a cost per kWh basis) to recognize that in the absence of increased incentives, additional funding will be necessary to market programs and achieve awareness levels commensurate with a MAP scenario. In this scenario, the awareness adjustment resulted in a 15% increase to participation, and a corresponding 7.5% increase to the per-unit ($/kWh) non-incentive cost.

Sensitivity 2. Large Customer Opt-Outs. The base case excludes sales and savings from all eligible customers that currently opt out of I&M's energy efficiency programs. This sensitivity looks at the range of potential if no C&I customers were to opt out.

Sensitivity 3. 35% Reduced Technology Cost. This scenario assumes a 35% reduction for emerging technology costs. The cost reduction applies to both measure costs and incentives. The reduced incentive levels required a reassessment of measure-level cost-effectiveness. Although incentives were reduced, adoption levels were not significantly impacted due to the corresponding change to measure cost. The reduction in measure cost was assumed to happen "overnight." Although this is not expected to happen in practice, this scenario establishes the impact of alternative measures cost on the overall potential.

Sensitivity 4. Alternative Incentive. This scenario that established a floor of 50% incentives to examine the impact on measure mix and adoption rates. GDS did not reduce the incentive below 50% to keep measures cost-effective, nor did GDS lower the incentive in instances where the current incentive exceeds 50%. This scenario altered the economic potential as well as the RAP scenario.

Sensitivity Results

Figure A-1 below illustrates the magnitude of the 20-yr achievable potential (2042) in the base case (RAP) as well as the three sensitivities. The Large Customer Opt-Out sensitivity yields the greatest potential, followed next by the High Touch Administration and the 35% Reduced Technology Cost scenarios. The Alternative Incentive scenario is slightly less than RAP as some measures with savings in the RAP scenario fail the benefit-cost screening in the Alternative Incentive scenario.

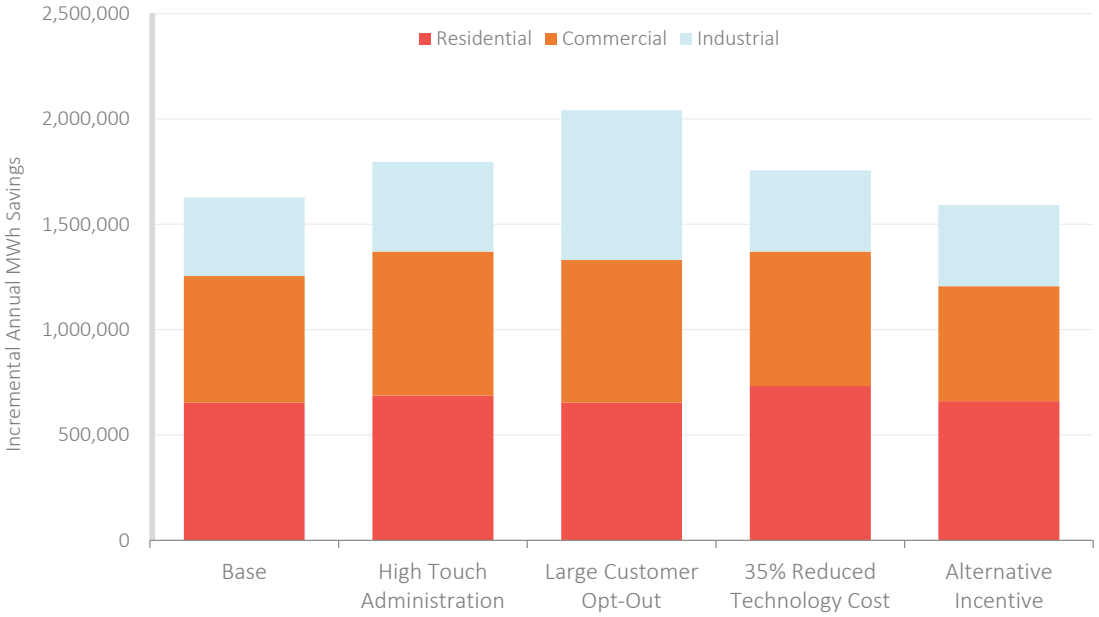


FIGURE A-1: ENERGY EFFICIENCY POTENTIAL SENSITIVITIES (2042)

Table A-1 below provides the NPV benefits and costs for the sensitivities. The Large Customer Opt-Out sensitivity yields the greatest NPV benefits and highest UCT ratio at 2.0. The Alternative Incentive scenario yields the lowest benefits and lowest UCT Ratio at 1.5.

TABLE A-1: NPV OF SENSITIVITIES

Scenario	NPV Benefits	NPV Costs	UCT Ratio
RAP	$889,733,066	$498,242,311	1.8
High Touch Administration	$965,971,991	$545,881,587	1.8
Large Customer Opt-Out	$1,110,830,407	$551,033,474	2.0
35% Reduced Technology Cost	$955,155,771	$507,788,168	1.9
Alternative Incentive	$861,379,467	$563,249,371	1.5

DEMAND RESPONSE SENSITIVITIES

As with the energy efficiency potential analysis, several sensitivities on the RAP base case were analyzed to determine the impact of uncertain conditions surrounding customer participation and/or cost-effectiveness. While many of the sensitivities are similar to those discussion in prior sections, there are some distinct differences. Notably, demand response includes a sensitivity that examines various demand response rate options on future peak savings potential.

Sensitivities Overview

Sensitivity 1. Avoided Costs. The GDS Team analyzed the impacts of varied avoided costs on the RAP potential.

High Sensitivity

- T&D costs were doubled, with no change to energy and capacity costs.

Low Sensitivity

- Avoided energy and generation capacity costs were decreased by 50%, with no change to T&D costs.

Sensitivity 2. Large Customer Opt-Outs. The base case excludes sales and savings from all eligible customers that currently opt out of I&M's demand response programs. This sensitivity looks at the range of potential if no C&I customers were to opt out.

High Sensitivity

- Includes currently opted-out customers in analysis.

Sensitivity 3. High Touch Marketing. A RAP-only sensitivity intended to explore strategy of increasing marketing/high-touch administration to increase participation.

High Sensitivity

- Assume historical incentive levels but raises the program awareness threshold to the MAP level. Non-incentive costs were estimated to be higher as well.

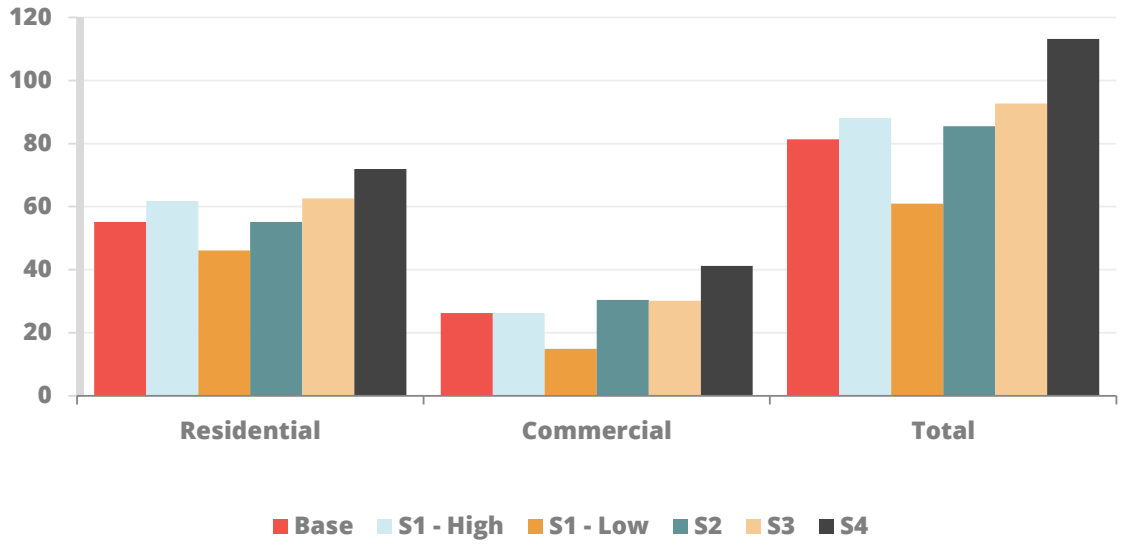
Sensitivity 4. 35% Reduced Technology Cost Scenario. Assume a 35% reduction for DR technology costs and reassess overall impact on cost-effectiveness and assumed adoption rates.

High Sensitivity

- 35% reduction in all technology costs. Reduction will be an overnight reduction.

Sensitivity Results

Figure A-2 shows the results of each sensitivity compared to the Base Case for each sector in Indiana. Sensitivities that led to a higher total RAP potential include the High Touch Marketing and 35% reduced technology cost sensitivities. Sensitivities that led to a lower total RAP potential include the low Avoided Cost Scenario #1 (50% decrease in energy and capacity avoided costs).



FIGUREA-2: DEMAND RESPONSE RAP MW POTENTIAL SENSITIVITIES 2042 (MI)

DER SENSITIVITIES

CHP Sensitivities Overview

The GDS Team conducted additional sensitivity analysis to understand how various cost parameters impact CHP cost effectiveness and to what extent these costs are required to change in order for any modeled CHP measures to pass a TRC of 1.0. Specifically, the Team reviewed mutually exclusively the impacts of:

- Transmission and distribution (T&D) costs
- CHP materials and installation cost

CHP Sensitivities Results

To simulate the locational benefits associated with DERs, the Team conducted the cost-effectiveness testing with an increase of 500% to the T&D values. Despite this increase, no CHP measure permutation passed the TRC. T&D values would need to increase 750% to allow a limited number of CHP measures to pass cost-effectiveness. We also considered a 35% cost reduction and reassessed CHP cost-effectiveness. However, we ultimately found a cost reduction of 55% was required for a limited number of measures to achieve a TRC ratio of 1.0 or greater.

Solar PV Sensitivities Overview

The GDS Team conducted additional sensitivity analysis to understand how various cost parameters impact solar PV cost effectiveness and to what extent these costs are required to change in order for any of the modeled solar PV measures to pass a TRC of 1.0. Specifically, the Team reviewed mutually exclusively the impacts of:

- Transmission and distribution (T&D) costs
- Solar PV materials and installation cost

Solar PV Sensitivities Results

In an attempt to simulate the locational benefits associated with DERs, the Team conducted the cost-effectiveness testing with an increase of 500% to the T&D values. Despite this increase, no solar PV measure permutation passed the TRC. T&D values would need to increase 1250% to allow a limited number of non-residential measures to pass cost-effectiveness. We also considered a 35% cost reduction and reassessed solar PV cost-effectiveness. However, we ultimately found a cost reduction of 55% was required for a limited number of measures to achieve a TRC ratio of 1.0 or greater.

APPENDIX B: RESIDENTIAL ENERGY EFFICIENCY DETAIL

Appendix B: Residential Energy Efficiency 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	MAP Incentive (%)	RAP Incentive (%)	PP Incentive (%)	Base Saturation	EE Saturation	MAP Adoption Rate	RAP Adoption Rate	PP Adoption Rate	UCT Score
1	Appliances	ENERGY STAR Air Purifier	Home Energy Products	SF	MO	733	67%	488	0.08	9	$70	100%	66%	36%	10%	29%	62.1%	37.6%	24.3%	4.0
2	Appliances	ENERGY STAR Refrigerator	Home Energy Products	SF	MO	534	9%	50	0.01	17	$40	66%	66%	13%	133%	33%	43.2%	37.6%	16.8%	1.1
3	Appliances	CEE Tier 2 Refrigerator	Home Energy Products	SF	MO	534	25%	134	0.02	17	$140	100%	66%	18%	133%	33%	62.1%	37.6%	18.2%	0.9
4	Appliances	Smart Refrigerator	Home Energy Products	SF	MO	534	12%	66	0.01	17	$680	100%	66%	4%	133%	33%	62.1%	37.6%	14.7%	0.1
5	Appliances	ENERGY STAR Refrigerator - early replacement	IQ Weatherproofing	SF	DI	1,696	53%	901	0.01	17	$600	100%	100%	100%	133%	33%	60.5%	52.7%	52.7%	0.6
6	Appliances	Refrigerator Recycling	Home Appliance Recycling	SF	Recycle	909	100%	909	0.11	8	$78	100%	100%	32%	8%	0%	62.1%	54.0%	22.9%	3.6
7	Appliances	ENERGY STAR Clothes Washer (Electrc WH/Dryer)	Home Energy Products	SF	MO	522	22%	112	0.01	14	$84	66%	66%	12%	32%	57%	43.2%	37.6%	16.6%	1.0
8	Appliances	ENERGY STAR Clothes Washer (NG WH/E Dryer)	Home Energy Products	SF	MO	384	27%	102	0.01	14	$84	100%	66%	12%	54%	57%	62.1%	37.6%	16.6%	0.9
9	Appliances	Smart/CEE Tier3 Clothes Washer (Electrc WH/Dryer)	Home Energy Products	SF	MO	522	40%	209	0.03	14	$141	66%	66%	14%	32%	57%	43.2%	37.6%	17.2%	1.1
10	Appliances	Smart/CEE Tier3 Clothes Washer (NG WH/E Dryer)	Home Energy Products	SF	MO	384	26%	101	0.01	14	$141	100%	66%	14%	54%	57%	62.1%	37.6%	17.2%	0.5
11	Appliances	ENERGY STAR Dishwasher (E WH)	Home Energy Products	SF	MO	307	12%	37	0.00	11	$76	100%	66%	66%	25%	83%	62.1%	37.6%	37.6%	0.3
12	Appliances	ENERGY STAR Dishwasher (NG WH)	Home Energy Products	SF	MO	135	12%	16	0.00	11	$79	100%	66%	66%	42%	83%	62.1%	37.6%	37.6%	0.1
13	Appliances	Smart Dishwasher (E WH)	Home Energy Products	SF	MO	307	15%	45	0.00	11	$395	100%	66%	66%	25%	83%	62.1%	37.6%	37.6%	0.1
14	Appliances	Smart Dishwasher (NG WH)	Home Energy Products	SF	MO	135	15%	20	0.00	11	$395	100%	66%	66%	42%	83%	62.1%	37.6%	37.6%	0.0
15	Appliances	ENERGY STAR Dehumidifier	Home Energy Products	SF	MO	1,005	19%	195	0.04	12	$45	100%	56%	56%	16%	92%	62.1%	33.1%	33.1%	4.0
16	Appliances	ENERGY STAR Most Efficient Dehumidifier	Home Energy Products	SF	MO	1,005	30%	306	0.07	12	$75	100%	66%	66%	16%	92%	62.1%	37.6%	37.6%	3.3
17	Appliances	ENERGY STAR Freezer	Home Energy Products	SF	MO	349	10%	35	0.01	22	$35	66%	66%	57%	57%	15%	43.2%	37.6%	33.8%	1.1
18	Appliances	Freezer Recycling	Home Appliance Recycling	SF	Recycle	758	100%	758	0.09	8	$78	100%	100%	32%	57%	0%	62.1%	54.0%	22.9%	3.0
19	Appliances	ENERGY STAR Clothes Dryer (Electric)	Home Energy Products	SF	MO	769	21%	160	0.02	16	$152	100%	66%	13%	69%	10%	62.1%	37.6%	17.0%	0.9
20	Appliances	Smart Clothes Dryer (Electric)	Home Energy Products	SF	MO	769	26%	203	0.03	16	$236	100%	66%	42%	69%	10%	62.1%	37.6%	27.2%	0.7
21	Appliances	Heat Pump Dryer	Home Energy Products	SF	MO	769	49%	378	0.14	16	$412	66%	66%	24%	69%	10%	43.2%	37.6%	20.1%	1.1
22	Appliances	ENERGY STAR Air Purifier	Home Energy Products	SF	NC	733	67%	488	0.08	9	$70	100%	66%	36%	10%	0%	62.1%	37.6%	24.3%	4.0
23	Appliances	ENERGY STAR Refrigerator	Home Energy Products	SF	NC	534	9%	50	0.01	17	$40	66%	66%	13%	133%	0%	43.2%	37.6%	16.8%	1.1
24	Appliances	CEE Tier 2 Refrigerator	Home Energy Products	SF	NC	534	25%	134	0.02	17	$140	100%	66%	18%	133%	0%	62.1%	37.6%	18.2%	0.9
25	Appliances	Smart Refrigerator	Home Energy Products	SF	NC	534	12%	66	0.01	17	$680	100%	66%	4%	133%	0%	62.1%	37.6%	14.7%	0.1
26	Appliances	ENERGY STAR Clothes Washer (Electrc WH/Dryer)	Home Energy Products	SF	NC	522	22%	112	0.01	14	$84	66%	66%	12%	32%	0%	43.2%	37.6%	16.6%	1.0
27	Appliances	ENERGY STAR Clothes Washer (NG WH/E Dryer)	Home Energy Products	SF	NC	384	27%	102	0.01	14	$84	100%	66%	12%	54%	0%	62.1%	37.6%	16.6%	0.9
28	Appliances	Smart/CEE Tier3 Clothes Washer (Electrc WH/Dryer)	Home Energy Products	SF	NC	522	40%	209	0.03	14	$141	66%	66%	14%	32%	0%	43.2%	37.6%	17.2%	1.1
29	Appliances	Smart/CEE Tier3 Clothes Washer (NG WH/E Dryer)	Home Energy Products	SF	NC	384	26%	101	0.01	14	$141	100%	66%	14%	54%	0%	62.1%	37.6%	17.2%	0.5
30	Appliances	ENERGY STAR Dishwasher (E WH)	Home Energy Products	SF	NC	307	12%	37	0.00	11	$76	100%	66%	66%	25%	0%	62.1%	37.6%	37.6%	0.3
31	Appliances	ENERGY STAR Dishwasher (NG WH)	Home Energy Products	SF	NC	135	12%	16	0.00	11	$79	100%	66%	66%	42%	0%	62.1%	37.6%	37.6%	0.1
32	Appliances	Smart Dishwasher (E WH)	Home Energy Products	SF	NC	307	15%	45	0.00	11	$395	100%	66%	66%	25%	0%	62.1%	37.6%	37.6%	0.1
33	Appliances	Smart Dishwasher (NG WH)	Home Energy Products	SF	NC	135	15%	20	0.00	11	$395	100%	66%	66%	42%	0%	62.1%	37.6%	37.6%	0.0
34	Appliances	ENERGY STAR Dehumidifier	Home Energy Products	SF	NC	1,005	19%	195	0.04	12	$45	100%	56%	56%	16%	0%	62.1%	33.1%	33.1%	4.0
35	Appliances	ENERGY STAR Most Efficient Dehumidifier	Home Energy Products	SF	NC	1,005	30%	306	0.07	12	$75	100%	66%	66%	16%	0%	62.1%	37.6%	37.6%	3.3
36	Appliances	ENERGY STAR Freezer	Home Energy Products	SF	NC	349	10%	35	0.01	22	$35	66%	66%	57%	57%	0%	43.2%	37.6%	33.8%	1.1
37	Appliances	ENERGY STAR Clothes Dryer (Electric)	Home Energy Products	SF	NC	769	21%	160	0.02	16	$152	100%	66%	13%	69%	0%	62.1%	37.6%	17.0%	0.9
38	Appliances	Smart Clothes Dryer (Electric)	Home Energy Products	SF	NC	769	26%	203	0.03	16	$236	100%	66%	42%	69%	0%	62.1%	37.6%	27.2%	0.7
39	Appliances	Heat Pump Dryer	Home Energy Products	SF	NC	769	49%	378	0.14	16	$412	66%	66%	24%	69%	0%	43.2%	37.6%	20.1%	1.1
40	Appliances	ENERGY STAR Air Purifier	Home Energy Products	MF	MO	733	67%	488	0.08	9	$70	100%	66%	36%	10%	29%	62.1%	37.6%	24.3%	4.0
41	Appliances	ENERGY STAR Refrigerator	Home Energy Products	MF	MO	534	9%	50	0.01	17	$40	66%	66%	13%	133%	33%	43.2%	37.6%	16.8%	1.1
42	Appliances	CEE Tier 2 Refrigerator	Home Energy Products	MF	MO	534	25%	134	0.02	17	$140	100%	66%	18%	133%	33%	62.1%	37.6%	18.2%	0.9
43	Appliances	Smart Refrigerator	Home Energy Products	MF	MO	534	12%	66	0.01	17	$680	100%	66%	4%	133%	33%	62.1%	37.6%	14.7%	0.1
44	Appliances	ENERGY STAR Refrigerator - early replacement	IQ Weatherproofing	MF	DI	1,696	53%	901	0.01	17	$600	100%	100%	100%	133%	33%	60.5%	52.7%	52.7%	0.6
45	Appliances	Refrigerator Recycling	Home Appliance Recycling	MF	Recycle	909	100%	909	0.11	8	$78	100%	100%	32%	8%	0%	62.1%	54.0%	22.9%	3.6
46	Appliances	ENERGY STAR Clothes Washer (Electrc WH/Dryer)	Home Energy Products	MF	MO	522	22%	112	0.01	14	$84	66%	66%	12%	22%	25%	43.2%	37.6%	16.6%	1.0
47	Appliances	ENERGY STAR Clothes Washer (NG WH/E Dryer)	Home Energy Products	MF	MO	384	27%	102	0.01	14	$84	100%	66%	12%	37%	25%	62.1%	37.6%	16.6%	0.9
48	Appliances	Smart/CEE Tier3 Clothes Washer (Electrc WH/Dryer)	Home Energy Products	MF	MO	522	40%	209	0.03	14	$141	66%	66%	14%	22%	25%	43.2%	37.6%	17.2%	1.1
49	Appliances	Smart/CEE Tier3 Clothes Washer (NG WH/E Dryer)	Home Energy Products	MF	MO	384	26%	101	0.01	14	$141	100%	66%	14%	37%	25%	62.1%	37.6%	17.2%	0.5
50	Appliances	ENERGY STAR Dishwasher (E WH)	Home Energy Products	MF	MO	307	12%	37	0.00	11	$76	100%	66%	66%	25%	83%	62.1%	37.6%	37.6%	0.3
51	Appliances	ENERGY STAR Dishwasher (NG WH)	Home Energy Products	MF	MO	135	12%	16	0.00	11	$79	100%	66%	66%	42%	83%	62.1%	37.6%	37.6%	0.1
52	Appliances	Smart Dishwasher (E WH)	Home Energy Products	MF	MO	307	15%	45	0.00	11	$395	100%	66%	66%	25%	83%	62.1%	37.6%	37.6%	0.1
53	Appliances	Smart Dishwasher (NG WH)	Home Energy Products	MF	MO	135	15%	20	0.00	11	$395	100%	66%	66%	42%	83%	62.1%	37.6%	37.6%	0.0
54	Appliances	ENERGY STAR Dehumidifier	Home Energy Products	MF	MO	1,005	19%	195	0.04	12	$45	100%	56%	56%	2%	92%	62.1%	33.1%	33.1%	4.0
55	Appliances	ENERGY STAR Most Efficient Dehumidifier	Home Energy Products	MF	MO	1,005	30%	306	0.07	12	$75	100%	66%	66%	2%	92%	62.1%	37.6%	37.6%	3.3
56	Appliances	ENERGY STAR Freezer	Home Energy Products	MF	MO	349	10%	35	0.01	22	$35	66%	66%	57%	57%	15%	43.2%	37.6%	33.8%	1.1
57	Appliances	Freezer Recycling	Home Appliance Recycling	MF	Recycle	758	100%	758	0.09	8	$78	100%	100%	32%	57%	0%	62.1%	54.0%	22.9%	3.0
58	Appliances	ENERGY STAR Clothes Dryer (Electric)	Home Energy Products	MF	MO	769	21%	160	0.02	16	$152	100%	66%	13%	55%	10%	62.1%	37.6%	17.0%	0.9
59	Appliances	Smart Clothes Dryer (Electric)	Home Energy Products	MF	MO	769	26%	203	0.03	16	$236	100%	66%	42%	55%	10%	62.1%	37.6%	27.2%	0.7
60	Appliances	Heat Pump Dryer	Home Energy Products	MF	MO	769	49%	378	0.14	16	$412	66%	66%	24%	55%	10%	43.2%	37.6%	20.1%	1.1
61	Appliances	ENERGY STAR Air Purifier	Home Energy Products	MF	NC	733	67%	488	0.08	9	$70	100%	66%	36%	10%	0%	62.1%	37.6%	24.3%	4.0
62	Appliances	ENERGY STAR Refrigerator	Home Energy Products	MF	NC	534	9%	50	0.01	17	$40	66%	66%	13%	133%	0%	43.2%	37.6%	16.8%	1.1
63	Appliances	CEE Tier 2 Refrigerator	Home Energy Products	MF	NC	534	25%	134	0.02	17	$140	100%	66%	18%	133%	0%	62.1%	37.6%	18.2%	0.9
64	Appliances	Smart Refrigerator	Home Energy Products	MF	NC	534	12%	66	0.01	17	$680	100%	66%	4%	133%	0%	62.1%	37.6%	14.7%	0.1
65	Appliances	ENERGY STAR Clothes Washer (Electrc WH/Dryer)	Home Energy Products	MF	NC	522	22%	112	0.01	14	$84	66%	66%	12%	22%	0%	43.2%	37.6%	16.6%	1.0
66	Appliances	ENERGY STAR Clothes Washer (NG WH/E Dryer)	Home Energy Products	MF	NC	384	27%	102	0.01	14	$84	100%	66%	12%	37%	0%	62.1%	37.6%	16.6%	0.9
67	Appliances	Smart/CEE Tier3 Clothes Washer (Electrc WH/Dryer)	Home Energy Products	MF	NC	522	40%	209	0.03	14	$141	66%	66%	14%	22%	0%	43.2%	37.6%	17.2%	1.1

Appendix B: Residential Energy Efficiency 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	MAP Incentive (%)	RAP Incentive (%)	PP Incentive (%)	Base Saturation	EE Saturation	MAP Adoption Rate	RAP Adoption Rate	PP Adoption Rate	UCT Score
68	Appliances	Smart/CEE Tier3 Clothes Washer (NG WH/E Dryer)	Home Energy Products	MF	NC	384	26%	101	0.01	14	$141	100%	66%	14%	37%	0%	62.1%	37.6%	17.2%	0.5
69	Appliances	ENERGY STAR Dishwasher (E WH)	Home Energy Products	MF	NC	307	12%	37	0.00	11	$76	100%	66%	66%	25%	0%	62.1%	37.6%	37.6%	0.3
70	Appliances	ENERGY STAR Dishwasher (NG WH)	Home Energy Products	MF	NC	135	12%	16	0.00	11	$79	100%	66%	66%	42%	0%	62.1%	37.6%	37.6%	0.1
71	Appliances	Smart Dishwasher (E WH)	Home Energy Products	MF	NC	307	15%	45	0.00	11	$395	100%	66%	66%	25%	0%	62.1%	37.6%	37.6%	0.1
72	Appliances	Smart Dishwasher (NG WH)	Home Energy Products	MF	NC	135	15%	20	0.00	11	$395	100%	66%	66%	42%	0%	62.1%	37.6%	37.6%	0.0
73	Appliances	ENERGY STAR Dehumidifier	Home Energy Products	MF	NC	1,005	19%	195	0.04	12	$45	100%	56%	56%	2%	0%	62.1%	33.1%	33.1%	4.0
74	Appliances	ENERGY STAR Most Efficient Dehumidifier	Home Energy Products	MF	NC	1,005	30%	306	0.07	12	$75	100%	66%	66%	2%	0%	62.1%	37.6%	37.6%	3.3
75	Appliances	ENERGY STAR Freezer	Home Energy Products	MF	NC	349	10%	35	0.01	22	$35	66%	66%	57%	57%	0%	43.2%	37.6%	33.8%	1.1
76	Appliances	ENERGY STAR Clothes Dryer (Electric)	Home Energy Products	MF	NC	769	21%	160	0.02	16	$152	100%	66%	13%	55%	0%	62.1%	37.6%	17.0%	0.9
77	Appliances	Smart Clothes Dryer (Electric)	Home Energy Products	MF	NC	769	26%	203	0.03	16	$236	100%	66%	42%	55%	0%	62.1%	37.6%	27.2%	0.7
78	Appliances	Heat Pump Dryer	Home Energy Products	MF	NC	769	49%	378	0.14	16	$412	66%	66%	24%	55%	0%	43.2%	37.6%	20.1%	1.1
79	Behavioral	Home Energy Reports	Home Energy Reports	SF	Retrofit	12,775	1%	126	0.01	1	$1	100%	100%	100%	100%	50%	100.0%	100.0%	100.0%	4.7
80	Behavioral	Customer Education	Home Weatherproofing	SF	Retrofit	12,775	1%	115	0.01	1	$0	100%	35%	35%	100%	0%	100.0%	100.0%	100.0%	1.0
81	Behavioral	Home Energy Reports	ow Income Home Energy Report	SF	Retrofit	12,775	1%	68	0.01	1	$1	100%	100%	100%	100%	3%	100.0%	100.0%	100.0%	2.5
82	Behavioral	Customer Education	IQ Weatherproofing	SF	Retrofit	12,775	1%	115	0.01	1	$0	100%	35%	35%	100%	0%	100.0%	100.0%	100.0%	1.0
83	Behavioral	Orchestrated Energy	Home Energy Engagement	SF	Retrofit	12,775	2%	203	0.24	15	$0	100%	35%	35%	100%	8%	81.4%	35.2%	35.2%	1.0
84	Behavioral	AMI Data Portal	Home Energy Engagement	SF	Retrofit	12,775	2%	256	0.03	1	$0	100%	100%	100%	100%	0%	100.0%	100.0%	100.0%	29.1
85	Behavioral	Home Energy Reports	Home Energy Reports	SF	NC	12,775	1%	126	0.01	1	$1	100%	100%	100%	100%	0%	100.0%	100.0%	100.0%	4.7
86	Behavioral	Orchestrated Energy	Home Energy Engagement	SF	NC	12,775	2%	203	0.24	15	$0	100%	35%	35%	100%	0%	81.4%	35.2%	35.2%	1.0
87	Behavioral	AMI Data Portal	Home Energy Engagement	SF	NC	12,775	2%	256	0.03	1	$0	100%	100%	100%	100%	0%	100.0%	100.0%	100.0%	29.1
88	Behavioral	Home Energy Reports	Home Energy Reports	MF	Retrofit	12,775	1%	126	0.01	1	$1	100%	100%	100%	100%	50%	100.0%	100.0%	100.0%	4.7
89	Behavioral	Customer Education	Home Weatherproofing	MF	Retrofit	12,775	1%	115	0.01	1	$0	100%	35%	35%	100%	0%	100.0%	100.0%	100.0%	1.0
90	Behavioral	Home Energy Reports	ow Income Home Energy Report	MF	Retrofit	12,775	1%	68	0.01	1	$1	100%	100%	100%	100%	3%	100.0%	100.0%	100.0%	2.5
91	Behavioral	Customer Education	IQ Weatherproofing	MF	Retrofit	12,775	1%	115	0.01	1	$0	100%	35%	35%	100%	0%	100.0%	100.0%	100.0%	1.0
92	Behavioral	Orchestrated Energy	Home Energy Engagement	MF	Retrofit	12,775	2%	203	0.24	15	$0	100%	35%	35%	100%	8%	81.4%	35.2%	35.2%	1.0
93	Behavioral	AMI Data Portal	Home Energy Engagement	MF	Retrofit	12,775	2%	256	0.03	1	$0	100%	100%	100%	100%	0%	100.0%	100.0%	100.0%	29.1
94	Behavioral	Home Energy Reports	Home Energy Reports	MF	NC	12,775	1%	126	0.01	1	$1	100%	100%	100%	100%	0%	100.0%	100.0%	100.0%	4.7
95	Behavioral	Orchestrated Energy	Home Energy Engagement	MF	NC	12,775	2%	203	0.24	15	$0	100%	35%	35%	100%	0%	81.4%	35.2%	35.2%	1.0
96	Behavioral	AMI Data Portal	Home Energy Engagement	MF	NC	12,775	2%	256	0.03	1	$0	100%	100%	100%	100%	0%	100.0%	100.0%	100.0%	29.1
97	HVAC Equipment	ASHP Tune Up	Home Weatherproofing	SF	Retrofit	7,507	4%	338	0.13	5	$64	100%	66%	25%	6%	70%	81.4%	46.2%	31.9%	2.4
98	HVAC Equipment	Air Source Heat Pump 16 SEER - Heat pump baseline	HVAC Midstream	SF	MO	6,506	4%	243	0.28	18	$384	100%	78%	78%	6%	27%	81.4%	50.7%	50.7%	1.5
99	HVAC Equipment	Air Source Heat Pump 17 SEER - Heat pump baseline	HVAC Midstream	SF	MO	6,506	9%	578	0.40	18	$572	100%	70%	70%	6%	27%	81.4%	47.6%	47.6%	1.9
100	HVAC Equipment	Air Source Heat Pump 18 SEER - Heat pump baseline	HVAC Midstream	SF	MO	6,506	14%	879	0.50	18	$811	100%	62%	62%	6%	27%	81.4%	44.6%	44.6%	2.0
101	HVAC Equipment	Air Source Heat Pump 21 SEER - Heat pump baseline	HVAC Midstream	SF	MO	6,506	25%	1,622	0.75	18	$811	100%	74%	74%	6%	27%	81.4%	49.1%	49.1%	2.7
102	HVAC Equipment	Ground Source Heat Pump 20 SEER - Heat pump baseline	HVAC Midstream	SF	MO	6,506	27%	1,767	0.68	18	$391	100%	92%	92%	6%	27%	81.4%	56.6%	56.6%	4.4
103	HVAC Equipment	Ground Source Heat Pump 21.5 SEER - Heat pump baseline	HVAC Midstream	SF	MO	6,506	32%	2,098	0.79	18	$391	100%	100%	100%	6%	27%	81.4%	60.2%	60.2%	4.8
104	HVAC Equipment	Ground Source Heat Pump 23.5 SEER - Heat pump baseline	HVAC Midstream	SF	MO	6,506	39%	2,521	0.89	18	$891	100%	67%	67%	6%	27%	81.4%	46.7%	46.7%	3.6
105	HVAC Equipment	Ground Source Heat Pump 29 SEER - Heat pump baseline	HVAC Midstream	SF	MO	6,506	41%	2,653	1.20	18	$1,291	100%	56%	56%	6%	27%	81.4%	42.7%	42.7%	3.7
106	HVAC Equipment	Ductless Heat Pump 17 SEER 9.5 HSPF - Heat pump baseline	HVAC Midstream	SF	MO	6,506	8%	530	0.37	18	$2,087	13%	13%	13%	6%	27%	38.0%	28.1%	28.1%	2.5
107	HVAC Equipment	Ductless Heat Pump 19 SEER 9.5 HSPF - Heat pump baseline	HVAC Midstream	SF	MO	6,506	9%	606	0.55	18	$2,087	16%	16%	16%	6%	27%	39.1%	28.9%	28.9%	2.8
108	HVAC Equipment	Ductless Heat Pump 21 SEER 10.0 HSPF - Heat pump baseline	HVAC Midstream	SF	MO	6,506	14%	903	0.69	18	$2,087	50%	18%	18%	6%	27%	55.1%	29.6%	29.6%	3.4
109	HVAC Equipment	Ductless Heat Pump 23 SEER 10.0 HSPF - Heat pump baseline	HVAC Midstream	SF	MO	6,506	15%	954	0.81	18	$2,087	50%	20%	20%	6%	27%	55.1%	30.2%	30.2%	3.4
110	HVAC Equipment	Air Source Heat Pump 16 SEER - Furnace baseline	HVAC Midstream	SF	MO	15,262	59%	8,999	0.28	18	$384	100%	78%	78%	8%	0%	81.4%	50.7%	50.7%	13.9
111	HVAC Equipment	Air Source Heat Pump 17 SEER - Furnace baseline	HVAC Midstream	SF	MO	15,262	61%	9,334	0.28	18	$572	100%	70%	70%	8%	0%	81.4%	47.6%	47.6%	10.8
112	HVAC Equipment	Air Source Heat Pump 18 SEER - Furnace baseline	HVAC Midstream	SF	MO	15,262	63%	9,635	0.28	18	$811	100%	62%	62%	8%	0%	81.4%	44.6%	44.6%	8.9
113	HVAC Equipment	Air Source Heat Pump 21 SEER - Furnace baseline	HVAC Midstream	SF	MO	15,262	68%	10,378	0.28	18	$811	100%	74%	74%	8%	0%	81.4%	49.1%	49.1%	7.9
114	HVAC Equipment	Ductless Heat Pump 17 SEER 9.5 HSPF - Electric resistance baseline	HVAC Midstream	SF	MO	15,262	31%	4,667	0.20	18	$2,087	100%	13%	13%	11%	0%	81.4%	28.1%	28.1%	8.1
115	HVAC Equipment	Ductless Heat Pump 19 SEER 9.5 HSPF - Electric resistance baseline	HVAC Midstream	SF	MO	15,262	31%	4,708	0.30	18	$2,087	100%	16%	16%	11%	0%	81.4%	28.9%	28.9%	7.2
116	HVAC Equipment	Ductless Heat Pump 21 SEER 10.0 HSPF - Electric resistance baseline	HVAC Midstream	SF	MO	15,262	32%	4,871	0.38	18	$2,087	100%	18%	18%	11%	0%	81.4%	29.6%	29.6%	6.8
117	HVAC Equipment	Ductless Heat Pump 23 SEER 10.0 HSPF - Electric resistance baseline	HVAC Midstream	SF	MO	15,262	32%	4,898	0.44	18	$2,087	100%	20%	20%	11%	0%	81.4%	30.2%	30.2%	6.4
118	HVAC Equipment	AC Tune Up	Home Weatherproofing	SF	Retrofit	1,168	4%	49	0.13	5	$64	100%	66%	25%	74%	70%	81.4%	46.2%	31.9%	1.5
119	HVAC Equipment	Central Air Conditioner 15 SEER	HVAC Midstream	SF	MO	959	7%	64	0.15	18	$150	100%	100%	100%	74%	17%	81.4%	60.2%	60.2%	1.5
120	HVAC Equipment	Central Air Conditioner 16 SEER	HVAC Midstream	SF	MO	959	13%	120	0.28	18	$267	100%	100%	100%	74%	17%	81.4%	60.2%	60.2%	1.5
121	HVAC Equipment	Central Air Conditioner 17 SEER	HVAC Midstream	SF	MO	959	18%	169	0.40	18	$664	75%	45%	45%	74%	17%	66.9%	38.9%	38.9%	1.9
122	HVAC Equipment	Central Air Conditioner 18 SEER	HVAC Midstream	SF	MO	959	22%	213	0.50	18	$664	100%	45%	45%	74%	17%	81.4%	38.9%	38.9%	2.4
123	HVAC Equipment	Smart Thermostat - Heat pump baseline	Home Energy Management	SF	Retrofit	5,005	9%	436	0.00	15	$250	56%	56%	56%	9%	8%	57.7%	42.7%	42.7%	1.2
124	HVAC Equipment	WIFI Thermostat - Heat pump baseline	HVAC Midstream	SF	Retrofit	5,005	9%	442	0.00	15	$140	100%	54%	54%	9%	8%	81.4%	41.9%	41.9%	2.2
125	HVAC Equipment	Programmable Thermostat - Heat pump baseline	Online Energy Check-Up	SF	Retrofit	5,005	3%	127	0.00	15	$30	100%	66%	66%	9%	8%	81.4%	46.2%	46.2%	2.4
126	HVAC Equipment	Smart Thermostat - Furnace baseline	Home Energy Management	SF	Retrofit	10,314	9%	898	0.00	15	$250	100%	56%	56%	12%	8%	81.4%	42.7%	42.7%	2.4
127	HVAC Equipment	WIFI Thermostat - Furnace baseline	HVAC Midstream	SF	Retrofit	10,314	9%	909	0.00	15	$140	100%	54%	54%	12%	8%	81.4%	41.9%	41.9%	4.5
128	HVAC Equipment	Programmable Thermostat - Furnace baseline	Online Energy Check-Up	SF	Retrofit	10,314	3%	265	0.00	15	$30	100%	66%	66%	12%	8%	81.4%	46.2%	46.2%	5.0
129	HVAC Equipment	Smart Thermostat - Gas/CAC baseline	Home Energy Management	SF	Retrofit	778	9%	69	0.00	15	$250	100%	56%	56%	102%	8%	81.4%	42.7%	42.7%	0.2
130	HVAC Equipment	WIFI Thermostat - Gas/CAC baseline	HVAC Midstream	SF	Retrofit	778	9%	70	0.00	15	$140	100%	54%	54%	102%	8%	81.4%	41.9%	41.9%	0.4
131	HVAC Equipment	Programmable Thermostat - Gas/CAC baseline	Online Energy Check-Up	SF	Retrofit	778	2%	17	0.00	15	$30	100%	66%	66%	102%	8%	81.4%	46.2%	46.2%	0.4

Appendix B: Residential Energy Efficiency 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	MAP Incentive (%)	RAP Incentive (%)	PP Incentive (%)	Base Saturation	EE Saturation	MAP Adoption Rate	RAP Adoption Rate	PP Adoption Rate	UCT Score
132	HVAC Equipment	PTHP Variable Speed SEER 17 11.9 HPSF Upgrade from PTHP Baseline SEER 10.5 HPSF 7.7	HVAC Midstream	SF	Retrofit	1,172	50%	586	0.43	18	$100	100%	100%	100%	4%	27%	81.4%	60.2%	60.2%	7.9
133	HVAC Equipment	PTHP Variable Speed SEER 17 11.9 HPSF Upgrade from PTAC SEER 10.5 Electric Resistance Heat	HVAC Midstream	SF	Retrofit	5,182	50%	2,591	0.43	18	$100	100%	100%	100%	11%	27%	81.4%	60.2%	60.2%	16.3
134	HVAC Equipment	ASHP Tune Up	IQ Weatherproofing	SF	DI	7,507	4%	338	0.13	5	$64	100%	100%	100%	6%	70%	66.2%	57.6%	57.6%	1.6
135	HVAC Equipment	Air Source Heat Pump 15 SEER - Heat pump baseline	IQ Weatherproofing	SF	DI	6,506	1%	64	0.15	18	$384	100%	78%	78%	6%	27%	66.2%	45.2%	45.2%	0.7
136	HVAC Equipment	Air Source Heat Pump 16 SEER - Heat pump baseline	IQ Weatherproofing	SF	DI	6,506	4%	243	0.28	18	$384	100%	78%	78%	6%	27%	66.2%	45.2%	45.2%	1.5
137	HVAC Equipment	Air Source Heat Pump 17 SEER - Heat pump baseline	IQ Weatherproofing	SF	DI	6,506	9%	578	0.40	18	$572	100%	70%	70%	6%	27%	66.2%	41.4%	41.4%	1.9
138	HVAC Equipment	Air Source Heat Pump 18 SEER - Heat pump baseline	IQ Weatherproofing	SF	DI	6,506	14%	879	0.50	18	$811	100%	62%	62%	6%	27%	66.2%	37.9%	37.9%	2.0
139	HVAC Equipment	Air Source Heat Pump 21 SEER - Heat pump baseline	IQ Weatherproofing	SF	DI	6,506	25%	1,622	0.75	18	$811	100%	74%	74%	6%	27%	66.2%	43.2%	43.2%	2.7
140	HVAC Equipment	Ground Source Heat Pump 20 SEER - Heat pump baseline	IQ Weatherproofing	SF	DI	6,506	27%	1,767	0.68	18	$391	100%	100%	100%	6%	27%	66.2%	57.6%	57.6%	4.1
141	HVAC Equipment	Ground Source Heat Pump 21.5 SEER - Heat pump baseline	IQ Weatherproofing	SF	DI	6,506	32%	2,098	0.79	18	$391	100%	100%	100%	6%	27%	66.2%	57.6%	57.6%	4.8
142	HVAC Equipment	Ground Source Heat Pump 23.5 SEER - Heat pump baseline	IQ Weatherproofing	SF	DI	6,506	39%	2,521	0.89	18	$891	100%	100%	100%	6%	27%	66.2%	57.6%	57.6%	2.4
143	HVAC Equipment	Ground Source Heat Pump 29 SEER - Heat pump baseline	IQ Weatherproofing	SF	DI	6,506	41%	2,653	1.20	18	$1,291	100%	100%	100%	6%	27%	66.2%	57.6%	57.6%	2.0
144	HVAC Equipment	Ductless Heat Pump 17 SEER 9.5 HSPF - Heat pump baseline	IQ Weatherproofing	SF	MO	6,506	8%	530	0.37	18	$2,087	50%	13%	13%	6%	27%	38.6%	19.6%	19.6%	2.5
145	HVAC Equipment	Ductless Heat Pump 19 SEER 9.5 HSPF - Heat pump baseline	IQ Weatherproofing	SF	MO	6,506	9%	606	0.55	18	$2,087	75%	16%	16%	6%	27%	50.1%	20.5%	20.5%	2.8
146	HVAC Equipment	Ductless Heat Pump 21 SEER 10.0 HSPF - Heat pump baseline	IQ Weatherproofing	SF	MO	6,506	14%	903	0.69	18	$2,087	100%	18%	18%	6%	27%	66.2%	21.1%	21.1%	3.4
147	HVAC Equipment	Ductless Heat Pump 23 SEER 10.0 HSPF - Heat pump baseline	IQ Weatherproofing	SF	MO	6,506	15%	954	0.81	18	$2,087	100%	20%	20%	6%	27%	66.2%	21.7%	21.7%	3.4
148	HVAC Equipment	Air Source Heat Pump 15 SEER - Furnace baseline	IQ Weatherproofing	SF	DI	15,262	58%	8,820	0.15	18	$384	100%	78%	78%	8%	0%	66.2%	45.2%	45.2%	13.1
149	HVAC Equipment	Air Source Heat Pump 16 SEER - Furnace baseline	IQ Weatherproofing	SF	DI	15,262	59%	8,999	0.28	18	$384	100%	78%	78%	8%	0%	66.2%	45.2%	45.2%	13.9
150	HVAC Equipment	Air Source Heat Pump 17 SEER - Furnace baseline	IQ Weatherproofing	SF	DI	15,262	61%	9,334	0.28	18	$572	100%	70%	70%	8%	0%	66.2%	41.4%	41.4%	10.8
151	HVAC Equipment	Air Source Heat Pump 18 SEER - Furnace baseline	IQ Weatherproofing	SF	DI	15,262	63%	9,635	0.28	18	$811	100%	62%	62%	8%	0%	66.2%	37.9%	37.9%	8.9
152	HVAC Equipment	Air Source Heat Pump 21 SEER - Furnace baseline	IQ Weatherproofing	SF	DI	15,262	68%	10,378	0.28	18	$811	100%	74%	74%	8%	0%	66.2%	43.2%	43.2%	7.9
153	HVAC Equipment	Ductless Heat Pump 17 SEER 9.5 HSPF - Electric resistance baseline	IQ Weatherproofing	SF	MO	15,262	31%	4,667	0.20	18	$2,087	100%	13%	13%	11%	0%	66.2%	19.6%	19.6%	8.1
154	HVAC Equipment	Ductless Heat Pump 19 SEER 9.5 HSPF - Electric resistance baseline	IQ Weatherproofing	SF	MO	15,262	31%	4,708	0.30	18	$2,087	100%	16%	16%	11%	0%	66.2%	20.5%	20.5%	7.2
155	HVAC Equipment	Ductless Heat Pump 21 SEER 10.0 HSPF - Electric resistance baseline	IQ Weatherproofing	SF	MO	15,262	32%	4,871	0.38	18	$2,087	100%	18%	18%	11%	0%	66.2%	21.1%	21.1%	6.8
156	HVAC Equipment	Ductless Heat Pump 23 SEER 10.0 HSPF - Electric resistance baseline	IQ Weatherproofing	SF	MO	15,262	32%	4,898	0.44	18	$2,087	100%	20%	20%	11%	0%	66.2%	21.7%	21.7%	6.4
157	HVAC Equipment	AC Tune Up	IQ Weatherproofing	SF	DI	1,168	4%	49	0.13	5	$64	100%	100%	100%	74%	70%	66.2%	57.6%	57.6%	1.0
158	HVAC Equipment	Central Air Conditioner 15 SEER	IQ Weatherproofing	SF	MO	959	7%	64	0.15	18	$150	100%	100%	100%	74%	17%	66.2%	57.6%	57.6%	1.5
159	HVAC Equipment	Central Air Conditioner 16 SEER	IQ Weatherproofing	SF	MO	959	13%	120	0.28	18	$267	100%	100%	100%	74%	17%	66.2%	57.6%	57.6%	1.5
160	HVAC Equipment	Central Air Conditioner 17 SEER	IQ Weatherproofing	SF	MO	959	18%	169	0.40	18	$664	100%	45%	45%	74%	17%	66.2%	31.4%	31.4%	1.9
161	HVAC Equipment	Central Air Conditioner 18 SEER	IQ Weatherproofing	SF	MO	959	22%	213	0.50	18	$664	100%	45%	45%	74%	17%	66.2%	31.4%	31.4%	2.4
162	HVAC Equipment	Smart Thermostat - Heat pump baseline	Home Energy Management	SF	DI	5,005	9%	436	0.00	15	$250	100%	56%	56%	9%	8%	66.2%	35.8%	35.8%	1.2
163	HVAC Equipment	WIFI Thermostat - Heat pump baseline	IQ Weatherproofing	SF	DI	5,005	9%	442	0.00	15	$140	100%	100%	100%	9%	8%	66.2%	57.6%	57.6%	1.2
164	HVAC Equipment	Programmable Thermostat - Heat pump baseline	Online Energy Check-Up	SF	DI	5,005	3%	127	0.00	15	$30	100%	66%	66%	9%	8%	66.2%	39.7%	39.7%	2.4
165	HVAC Equipment	Smart Thermostat - Furnace baseline	Home Energy Management	SF	DI	10,314	9%	898	0.00	15	$250	100%	56%	56%	12%	8%	66.2%	35.8%	35.8%	2.4
166	HVAC Equipment	WIFI Thermostat - Furnace baseline	IQ Weatherproofing	SF	DI	10,314	9%	909	0.00	15	$140	100%	100%	100%	12%	8%	66.2%	57.6%	57.6%	2.4
167	HVAC Equipment	Programmable Thermostat - Furnace baseline	Online Energy Check-Up	SF	DI	10,314	3%	265	0.00	15	$30	100%	66%	66%	12%	8%	66.2%	39.7%	39.7%	5.0
168	HVAC Equipment	Smart Thermostat - Gas/CAC baseline	Home Energy Management	SF	DI	778	9%	69	0.00	15	$250	100%	56%	56%	102%	8%	66.2%	35.8%	35.8%	0.2
169	HVAC Equipment	WIFI Thermostat - Gas/CAC baseline	IQ Weatherproofing	SF	DI	778	9%	70	0.00	15	$140	100%	100%	100%	102%	8%	66.2%	57.6%	57.6%	0.2
170	HVAC Equipment	Programmable Thermostat - Gas/CAC baseline	Online Energy Check-Up	SF	DI	778	2%	17	0.00	15	$30	100%	66%	66%	102%	8%	66.2%	39.7%	39.7%	0.4
171	HVAC Equipment	PTHP Variable Speed SEER 17 11.9 HPSF Upgrade from PTHP Baseline SEER 10.5 HPSF 7.7	HVAC Midstream	SF	Retrofit	1,172	50%	586	0.43	18	$100	100%	100%	100%	4%	27%	66.2%	57.6%	57.6%	7.9
172	HVAC Equipment	PTHP Variable Speed SEER 17 11.9 HPSF Upgrade from PTAC SEER 10.5 Electric Resistance Heat	HVAC Midstream	SF	Retrofit	5,182	50%	2,591	0.43	18	$100	100%	100%	100%	11%	27%	66.2%	57.6%	57.6%	16.3
173	HVAC Equipment	Air Filter Alarm	School Education	SF	Retrofit	1,032	2%	19	0.05	14	$1	100%	100%	100%	74%	70%	81.4%	60.2%	60.2%	43.3
174	HVAC Equipment	ECM HVAC Motor	HVAC Midstream	SF	Retrofit	1,383	30%	415	0.07	10	$280	50%	36%	36%	85%	32%	55.1%	35.5%	35.5%	1.7
175	HVAC Equipment	ENERGY STAR Room Air Conditioner	HVAC Midstream	SF	MO	411	9%	38	0.09	12	$40	100%	66%	25%	13%	41%	81.4%	46.2%	31.9%	3.7
176	HVAC Equipment	Smart Room AC	HVAC Midstream	SF	MO	411	3%	12	0.03	12	$40	75%	66%	50%	13%	41%	66.9%	46.2%	40.8%	1.2
177	HVAC Equipment	Smart Room AC - controls retrofit	HVAC Midstream	SF	Retrofit	411	3%	12	0.03	12	$80	100%	66%	25%	13%	41%	81.4%	46.2%	31.9%	0.6
178	HVAC Equipment	Room Air Conditioner Recycling	Home Appliance Recycling	SF	Recycle	581	100%	581	1.37	3	$129	100%	66%	19%	13%	0%	81.4%	46.2%	30.1%	5.0
179	HVAC Equipment	Smart Vents/Sensors - Gas/CAC baseline	Home Weatherproofing	SF	Retrofit	1,168	5%	58	0.14	15	$1,625	100%	66%	25%	68%	0%	81.4%	46.2%	31.9%	0.2
180	HVAC Equipment	Smart Vents/Sensors - Heat pump baseline	Home Weatherproofing	SF	Retrofit	7,507	5%	375	0.14	15	$1,625	100%	66%	25%	6%	0%	81.4%	46.2%	31.9%	0.3
181	HVAC Equipment	Smart Vents/Sensors - Furnace baseline	Home Weatherproofing	SF	Retrofit	15,471	5%	774	0.14	15	$1,625	100%	66%	25%	8%	0%	81.4%	46.2%	31.9%	0.4
182	HVAC Equipment	Whole House Attic Fan	Home Weatherproofing	SF	Retrofit	1,168	15%	171	0.00	20	$1,500	100%	66%	25%	74%	13%	81.4%	46.2%	31.9%	0.1
183	HVAC Equipment	Attic Fan	Home Weatherproofing	SF	Retrofit	1,168	9%	105	0.22	10	$600	100%	66%	25%	74%	13%	81.4%	46.2%	31.9%	0.5
184	HVAC Equipment	Efficient ceramic space heater	HVAC Midstream	SF	Retrofit	1,406	13%	178	0.00	18	$26	100%	66%	66%	20%	27%	81.4%	46.2%	46.2%	4.5
185	HVAC Equipment	Air Source Heat Pump 16 SEER - Heat pump baseline	HVAC Midstream	SF	NC	6,506	4%	243	0.28	18	$384	100%	78%	78%	6%	0%	81.4%	50.7%	50.7%	1.5
186	HVAC Equipment	Air Source Heat Pump 17 SEER - Heat pump baseline	HVAC Midstream	SF	NC	6,506	9%	578	0.40	18	$572	100%	70%	70%	6%	0%	81.4%	47.6%	47.6%	1.9
187	HVAC Equipment	Air Source Heat Pump 18 SEER - Heat pump baseline	HVAC Midstream	SF	NC	6,506	14%	879	0.50	18	$811	100%	62%	62%	6%	0%	81.4%	44.6%	44.6%	2.0
188	HVAC Equipment	Air Source Heat Pump 21 SEER - Heat pump baseline	HVAC Midstream	SF	NC	6,506	25%	1,622	0.75	18	$811	100%	74%	74%	6%	0%	81.4%	49.1%	49.1%	2.7
189	HVAC Equipment	Ground Source Heat Pump 20 SEER - Heat pump baseline	HVAC Midstream	SF	NC	6,506	27%	1,767	0.68	18	$391	100%	92%	92%	6%	0%	81.4%	56.6%	56.6%	4.4
190	HVAC Equipment	Ground Source Heat Pump 21.5 SEER - Heat pump baseline	HVAC Midstream	SF	NC	6,506	32%	2,098	0.79	18	$391	100%	100%	100%	6%	0%	81.4%	60.2%	60.2%	4.8
191	HVAC Equipment	Ground Source Heat Pump 23.5 SEER - Heat pump baseline	HVAC Midstream	SF	NC	6,506	39%	2,521	0.89	18	$891	100%	67%	67%	6%	0%	81.4%	46.7%	46.7%	3.6
192	HVAC Equipment	Ground Source Heat Pump 29 SEER - Heat pump baseline	HVAC Midstream	SF	NC	6,506	41%	2,653	1.20	18	$1,291	100%	56%	56%	6%	0%	81.4%	42.7%	42.7%	3.7

Appendix B: Residential Energy Efficiency 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	MAP Incentive (%)	RAP Incentive (%)	PP Incentive (%)	Base Saturation	EE Saturation	MAP Adoption Rate	RAP Adoption Rate	PP Adoption Rate	UCT Score
193	HVAC Equipment	Ductless Heat Pump 17 SEER 9.5 HSPF - Heat pump baseline	HVAC Midstream	SF	NC	6,506	8%	530	0.37	18	$2,087	13%	13%	13%	6%	0%	38.0%	28.1%	28.1%	2.5
194	HVAC Equipment	Ductless Heat Pump 19 SEER 9.5 HSPF - Heat pump baseline	HVAC Midstream	SF	NC	6,506	9%	606	0.55	18	$2,087	16%	16%	16%	6%	0%	39.1%	28.9%	28.9%	2.8
195	HVAC Equipment	Ductless Heat Pump 21 SEER 10.0 HSPF - Heat pump baseline	HVAC Midstream	SF	NC	6,506	14%	903	0.69	18	$2,087	50%	18%	18%	6%	0%	55.1%	29.6%	29.6%	3.4
196	HVAC Equipment	Ductless Heat Pump 23 SEER 10.0 HSPF - Heat pump baseline	HVAC Midstream	SF	NC	6,506	15%	954	0.81	18	$2,087	50%	20%	20%	6%	0%	55.1%	30.2%	30.2%	3.4
197	HVAC Equipment	Central Air Conditioner 15 SEER	HVAC Midstream	SF	NC	959	7%	64	0.15	18	$150	100%	100%	100%	74%	0%	81.4%	60.2%	60.2%	1.5
198	HVAC Equipment	Central Air Conditioner 16 SEER	HVAC Midstream	SF	NC	959	13%	120	0.28	18	$267	100%	100%	100%	74%	0%	81.4%	60.2%	60.2%	1.5
199	HVAC Equipment	Central Air Conditioner 17 SEER	HVAC Midstream	SF	NC	959	18%	169	0.40	18	$664	75%	45%	45%	74%	0%	66.9%	38.9%	38.9%	1.9
200	HVAC Equipment	Central Air Conditioner 18 SEER	HVAC Midstream	SF	NC	959	22%	213	0.50	18	$664	100%	45%	45%	74%	0%	81.4%	38.9%	38.9%	2.4
201	HVAC Equipment	ENERGY STAR Room Air Conditioner	HVAC Midstream	SF	NC	411	9%	38	0.09	12	$40	100%	66%	25%	13%	0%	81.4%	46.2%	31.9%	3.7
202	HVAC Equipment	Smart Room AC	HVAC Midstream	SF	NC	411	3%	12	0.03	12	$40	75%	66%	50%	13%	0%	66.9%	46.2%	40.8%	1.2
203	HVAC Equipment	Smart Thermostat - Heat pump baseline	Home Energy Management	SF	NC	4,338	9%	378	0.00	15	$250	56%	56%	56%	9%	0%	57.7%	42.7%	42.7%	1.0
204	HVAC Equipment	WIFI Thermostat - Heat pump baseline	HVAC Midstream	SF	NC	4,338	9%	383	0.00	15	$140	100%	54%	54%	9%	0%	81.4%	41.9%	41.9%	1.9
205	HVAC Equipment	Programmable Thermostat - Heat pump baseline	Online Energy Check-Up	SF	NC	4,338	3%	110	0.00	15	$30	100%	66%	66%	9%	0%	81.4%	46.2%	46.2%	2.1
206	HVAC Equipment	Smart Thermostat - Gas/CAC baseline	Home Energy Management	SF	NC	639	9%	56	0.00	15	$250	100%	56%	56%	102%	0%	81.4%	42.7%	42.7%	0.2
207	HVAC Equipment	WIFI Thermostat - Gas/CAC baseline	HVAC Midstream	SF	NC	639	9%	58	0.00	15	$140	100%	54%	54%	102%	0%	81.4%	41.9%	41.9%	0.3
208	HVAC Equipment	Programmable Thermostat - Gas/CAC baseline	Online Energy Check-Up	SF	NC	639	2%	14	0.00	15	$30	100%	66%	66%	102%	0%	81.4%	46.2%	46.2%	0.3
209	HVAC Equipment	Smart Vents/Sensors - Gas/CAC baseline	Home Weatherproofing	SF	NC	1,033	5%	52	0.14	15	$1,625	100%	66%	25%	68%	0%	81.4%	46.2%	31.9%	0.2
210	HVAC Equipment	Smart Vents/Sensors - Heat pump baseline	Home Weatherproofing	SF	NC	6,506	5%	325	0.14	15	$1,625	100%	66%	25%	6%	0%	81.4%	46.2%	31.9%	0.3
211	HVAC Equipment	ASHP Tune Up	Home Weatherproofing	MF	Retrofit	5,005	7%	338	0.13	5	$64	100%	66%	25%	6%	70%	81.4%	46.2%	31.9%	2.4
212	HVAC Equipment	Air Source Heat Pump 16 SEER - Heat pump baseline	HVAC Midstream	MF	MO	4,338	4%	162	0.19	18	$384	78%	78%	78%	6%	27%	68.6%	50.7%	50.7%	1.0
213	HVAC Equipment	Air Source Heat Pump 17 SEER - Heat pump baseline	HVAC Midstream	MF	MO	4,338	9%	385	0.27	18	$572	75%	70%	70%	6%	27%	66.9%	47.6%	47.6%	1.2
214	HVAC Equipment	Air Source Heat Pump 18 SEER - Heat pump baseline	HVAC Midstream	MF	MO	4,338	14%	586	0.34	18	$811	75%	62%	62%	6%	27%	66.9%	44.6%	44.6%	1.3
215	HVAC Equipment	Air Source Heat Pump 21 SEER - Heat pump baseline	HVAC Midstream	MF	MO	4,338	25%	1,081	0.50	18	$811	100%	74%	74%	6%	27%	81.4%	49.1%	49.1%	1.8
216	HVAC Equipment	Ground Source Heat Pump 20 SEER - Heat pump baseline	HVAC Midstream	MF	MO	4,338	27%	1,178	0.45	18	$391	100%	92%	92%	6%	27%	81.4%	56.6%	56.6%	3.0
217	HVAC Equipment	Ground Source Heat Pump 21.5 SEER - Heat pump baseline	HVAC Midstream	MF	MO	4,338	32%	1,398	0.53	18	$391	100%	100%	100%	6%	27%	81.4%	60.2%	60.2%	3.2
218	HVAC Equipment	Ground Source Heat Pump 23.5 SEER - Heat pump baseline	HVAC Midstream	MF	MO	4,338	39%	1,681	0.59	18	$891	100%	67%	67%	6%	27%	81.4%	46.7%	46.7%	2.4
219	HVAC Equipment	Ground Source Heat Pump 29 SEER - Heat pump baseline	HVAC Midstream	MF	MO	4,338	41%	1,769	0.80	18	$1,291	100%	56%	56%	6%	27%	81.4%	42.7%	42.7%	2.4
220	HVAC Equipment	Ductless Heat Pump 17 SEER 9.5 HSPF - Heat pump baseline	HVAC Midstream	MF	MO	4,338	8%	353	0.24	18	$2,087	13%	13%	13%	6%	27%	38.0%	28.1%	28.1%	1.7
221	HVAC Equipment	Ductless Heat Pump 19 SEER 9.5 HSPF - Heat pump baseline	HVAC Midstream	MF	MO	4,338	9%	404	0.36	18	$2,087	16%	16%	16%	6%	27%	39.1%	28.9%	28.9%	1.9
222	HVAC Equipment	Ductless Heat Pump 21 SEER 10.0 HSPF - Heat pump baseline	HVAC Midstream	MF	MO	4,338	14%	602	0.46	18	$2,087	18%	18%	18%	6%	27%	39.9%	29.6%	29.6%	2.2
223	HVAC Equipment	Ductless Heat Pump 23 SEER 10.0 HSPF - Heat pump baseline	HVAC Midstream	MF	MO	4,338	15%	636	0.54	18	$2,087	20%	20%	20%	6%	27%	40.8%	30.2%	30.2%	2.3
224	HVAC Equipment	Air Source Heat Pump 16 SEER - Furnace baseline	HVAC Midstream	MF	MO	10,175	59%	5,999	0.19	18	$384	100%	78%	78%	8%	0%	81.4%	50.7%	50.7%	9.2
225	HVAC Equipment	Air Source Heat Pump 17 SEER - Furnace baseline	HVAC Midstream	MF	MO	10,175	61%	6,222	0.19	18	$572	100%	70%	70%	8%	0%	81.4%	47.6%	47.6%	7.2
226	HVAC Equipment	Air Source Heat Pump 18 SEER - Furnace baseline	HVAC Midstream	MF	MO	10,175	63%	6,423	0.19	18	$811	100%	62%	62%	8%	0%	81.4%	44.6%	44.6%	5.9
227	HVAC Equipment	Air Source Heat Pump 21 SEER - Furnace baseline	HVAC Midstream	MF	MO	10,175	68%	6,919	0.19	18	$811	100%	74%	74%	8%	0%	81.4%	49.1%	49.1%	5.3
228	HVAC Equipment	Ductless Heat Pump 17 SEER 9.5 HSPF - Electric resistance baseline	HVAC Midstream	MF	MO	10,175	31%	3,111	0.13	18	$2,087	50%	13%	13%	11%	0%	55.1%	28.1%	28.1%	5.4
229	HVAC Equipment	Ductless Heat Pump 19 SEER 9.5 HSPF - Electric resistance baseline	HVAC Midstream	MF	MO	10,175	31%	3,139	0.20	18	$2,087	75%	16%	16%	11%	0%	66.9%	28.9%	28.9%	4.8
230	HVAC Equipment	Ductless Heat Pump 21 SEER 10.0 HSPF - Electric resistance baseline	HVAC Midstream	MF	MO	10,175	32%	3,247	0.25	18	$2,087	75%	18%	18%	11%	0%	66.9%	29.6%	29.6%	4.5
231	HVAC Equipment	Ductless Heat Pump 23 SEER 10.0 HSPF - Electric resistance baseline	HVAC Midstream	MF	MO	10,175	32%	3,266	0.30	18	$2,087	75%	20%	20%	11%	0%	66.9%	30.2%	30.2%	4.2
232	HVAC Equipment	AC Tune Up	Home Weatherproofing	MF	Retrofit	778	6%	49	0.13	5	$64	100%	66%	25%	74%	70%	81.4%	46.2%	31.9%	1.5
233	HVAC Equipment	Central Air Conditioner 15 SEER	HVAC Midstream	MF	MO	639	7%	43	0.10	18	$150	100%	100%	100%	74%	17%	81.4%	60.2%	60.2%	1.0
234	HVAC Equipment	Central Air Conditioner 16 SEER	HVAC Midstream	MF	MO	639	13%	80	0.19	18	$267	100%	100%	100%	74%	17%	81.4%	60.2%	60.2%	1.0
235	HVAC Equipment	Central Air Conditioner 17 SEER	HVAC Midstream	MF	MO	639	18%	113	0.27	18	$664	50%	45%	45%	74%	17%	55.1%	38.9%	38.9%	1.3
236	HVAC Equipment	Central Air Conditioner 18 SEER	HVAC Midstream	MF	MO	639	33%	213	0.34	18	$664	75%	45%	45%	74%	17%	66.9%	38.9%	38.9%	1.7
237	HVAC Equipment	Smart Thermostat - Heat pump baseline	Home Energy Management	MF	Retrofit	3,850	9%	336	0.00	15	$250	100%	56%	56%	6%	8%	81.4%	42.7%	42.7%	0.9
238	HVAC Equipment	WIFI Thermostat - Heat pump baseline	HVAC Midstream	MF	Retrofit	3,850	9%	340	0.00	15	$140	75%	54%	54%	6%	8%	66.9%	41.9%	41.9%	1.7
239	HVAC Equipment	Programmable Thermostat - Heat pump baseline	Online Energy Check-Up	MF	Retrofit	3,850	3%	98	0.00	15	$30	100%	66%	66%	6%	8%	81.4%	46.2%	46.2%	1.8
240	HVAC Equipment	Smart Thermostat - Furnace baseline	Home Energy Management	MF	Retrofit	7,934	9%	691	0.00	15	$250	100%	56%	56%	11%	8%	81.4%	42.7%	42.7%	1.8
241	HVAC Equipment	WIFI Thermostat - Furnace baseline	HVAC Midstream	MF	Retrofit	7,934	9%	699	0.00	15	$140	100%	54%	54%	11%	8%	81.4%	41.9%	41.9%	3.4
242	HVAC Equipment	Programmable Thermostat - Furnace baseline	Online Energy Check-Up	MF	Retrofit	7,934	3%	204	0.00	15	$30	100%	66%	66%	11%	8%	81.4%	46.2%	46.2%	3.8
243	HVAC Equipment	Smart Thermostat - Gas/CAC baseline	Home Energy Management	MF	Retrofit	599	9%	53	0.00	15	$250	100%	56%	56%	89%	8%	81.4%	42.7%	42.7%	0.2
244	HVAC Equipment	WIFI Thermostat - Gas/CAC baseline	HVAC Midstream	MF	Retrofit	599	9%	54	0.00	15	$140	100%	54%	54%	89%	8%	81.4%	41.9%	41.9%	0.3
245	HVAC Equipment	Programmable Thermostat - Gas/CAC baseline	Online Energy Check-Up	MF	Retrofit	599	2%	13	0.00	15	$30	100%	66%	66%	89%	8%	81.4%	46.2%	46.2%	0.3
246	HVAC Equipment	PTHP Variable Speed SEER 17 11.9 HPSF Upgrade from PTHP Baseline SEER 10.5 HPSF 7.7	IQ Weatherproofing	MF	Retrofit	1,172	50%	586	0.43	18	$100	100%	100%	100%	4%	27%	81.4%	60.2%	60.2%	7.9
247	HVAC Equipment	PTHP Variable Speed SEER 17 11.9 HPSF Upgrade from PTAC SEER 10.5 Electric Resistance Heat	IQ Weatherproofing	MF	Retrofit	5,182	50%	2,591	0.43	18	$100	100%	100%	100%	11%	27%	81.4%	60.2%	60.2%	16.3
248	HVAC Equipment	ASHP Tune Up	IQ Weatherproofing	MF	DI	5,005	7%	338	0.13	5	$64	100%	100%	100%	6%	70%	66.2%	57.6%	57.6%	1.6
249	HVAC Equipment	Air Source Heat Pump 15 SEER - Heat pump baseline	IQ Weatherproofing	MF	DI	4,338	1%	43	0.10	18	$384	100%	78%	78%	6%	27%	66.2%	45.2%	45.2%	0.5
250	HVAC Equipment	Air Source Heat Pump 16 SEER - Heat pump baseline	IQ Weatherproofing	MF	DI	4,338	4%	162	0.19	18	$384	100%	78%	78%	6%	27%	66.2%	45.2%	45.2%	1.0
251	HVAC Equipment	Air Source Heat Pump 17 SEER - Heat pump baseline	IQ Weatherproofing	MF	DI	4,338	9%	385	0.27	18	$572	100%	70%	70%	6%	27%	66.2%	41.4%	41.4%	1.2
252	HVAC Equipment	Air Source Heat Pump 18 SEER - Heat pump baseline	IQ Weatherproofing	MF	DI	4,338	14%	586	0.34	18	$811	100%	62%	62%	6%	27%	66.2%	37.9%	37.9%	1.3
253	HVAC Equipment	Air Source Heat Pump 21 SEER - Heat pump baseline	IQ Weatherproofing	MF	DI	4,338	25%	1,081	0.50	18	$811	100%	74%	74%	6%	27%	66.2%	43.2%	43.2%	1.8
254	HVAC Equipment	Ground Source Heat Pump 20 SEER - Heat pump baseline	IQ Weatherproofing	MF	DI	4,338	27%	1,178	0.45	18	$391	100%	92%	92%	6%	27%	66.2%	52.7%	52.7%	3.0
255	HVAC Equipment	Ground Source Heat Pump 21.5 SEER - Heat pump baseline	IQ Weatherproofing	MF	DI	4,338	32%	1,398	0.53	18	$391	100%	100%	100%	6%	27%	66.2%	57.6%	57.6%	3.2

Appendix B: Residential Energy Efficiency 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	MAP Incentive (%)	RAP Incentive (%)	PP Incentive (%)	Base Saturation	EE Saturation	MAP Adoption Rate	RAP Adoption Rate	PP Adoption Rate	UCT Score
256	HVAC Equipment	Ground Source Heat Pump 23.5 SEER - Heat pump baseline	IQ Weatherproofing	MF	DI	4,338	39%	1,681	0.59	18	$891	100%	67%	67%	6%	27%	66.2%	40.3%	40.3%	2.4
257	HVAC Equipment	Ground Source Heat Pump 29 SEER - Heat pump baseline	IQ Weatherproofing	MF	DI	4,338	41%	1,769	0.80	18	$1,291	100%	56%	56%	6%	27%	66.2%	35.7%	35.7%	2.4
258	HVAC Equipment	Ductless Heat Pump 17 SEER 9.5 HSPF - Heat pump baseline	IQ Weatherproofing	MF	MO	4,338	8%	353	0.24	18	$2,087	13%	13%	13%	6%	27%	22.6%	19.6%	19.6%	1.7
259	HVAC Equipment	Ductless Heat Pump 19 SEER 9.5 HSPF - Heat pump baseline	IQ Weatherproofing	MF	MO	4,338	9%	404	0.36	18	$2,087	50%	16%	16%	6%	27%	38.6%	20.5%	20.5%	1.9
260	HVAC Equipment	Ductless Heat Pump 21 SEER 10.0 HSPF - Heat pump baseline	IQ Weatherproofing	MF	MO	4,338	14%	602	0.46	18	$2,087	75%	18%	18%	6%	27%	50.1%	21.1%	21.1%	2.2
261	HVAC Equipment	Ductless Heat Pump 23 SEER 10.0 HSPF - Heat pump baseline	IQ Weatherproofing	MF	MO	4,338	15%	636	0.54	18	$2,087	75%	20%	20%	6%	27%	50.1%	21.7%	21.7%	2.3
262	HVAC Equipment	Air Source Heat Pump 15 SEER - Furnace baseline	IQ Weatherproofing	MF	DI	10,175	58%	5,880	0.10	18	$384	100%	78%	78%	8%	0%	66.2%	45.2%	45.2%	8.7
263	HVAC Equipment	Air Source Heat Pump 16 SEER - Furnace baseline	IQ Weatherproofing	MF	DI	10,175	59%	5,999	0.19	18	$384	100%	78%	78%	8%	0%	66.2%	45.2%	45.2%	9.2
264	HVAC Equipment	Air Source Heat Pump 17 SEER - Furnace baseline	IQ Weatherproofing	MF	DI	10,175	61%	6,222	0.19	18	$572	100%	70%	70%	8%	0%	66.2%	41.4%	41.4%	7.2
265	HVAC Equipment	Air Source Heat Pump 18 SEER - Furnace baseline	IQ Weatherproofing	MF	DI	10,175	63%	6,423	0.19	18	$811	100%	62%	62%	8%	0%	66.2%	37.9%	37.9%	5.9
266	HVAC Equipment	Air Source Heat Pump 21 SEER - Furnace baseline	IQ Weatherproofing	MF	DI	10,175	68%	6,919	0.19	18	$811	100%	74%	74%	8%	0%	66.2%	43.2%	43.2%	5.3
267	HVAC Equipment	Ductless Heat Pump 17 SEER 9.5 HSPF - Electric resistance baseline	IQ Weatherproofing	MF	MO	10,175	31%	3,111	0.13	18	$2,087	100%	13%	13%	11%	0%	66.2%	19.6%	19.6%	5.4
268	HVAC Equipment	Ductless Heat Pump 19 SEER 9.5 HSPF - Electric resistance baseline	IQ Weatherproofing	MF	MO	10,175	31%	3,139	0.20	18	$2,087	100%	16%	16%	11%	0%	66.2%	20.5%	20.5%	4.8
269	HVAC Equipment	Ductless Heat Pump 21 SEER 10.0 HSPF - Electric resistance baseline	IQ Weatherproofing	MF	MO	10,175	32%	3,247	0.25	18	$2,087	100%	18%	18%	11%	0%	66.2%	21.1%	21.1%	4.5
270	HVAC Equipment	Ductless Heat Pump 23 SEER 10.0 HSPF - Electric resistance baseline	IQ Weatherproofing	MF	MO	10,175	32%	3,266	0.30	18	$2,087	100%	20%	20%	11%	0%	66.2%	21.7%	21.7%	4.2
271	HVAC Equipment	AC Tune Up	IQ Weatherproofing	MF	DI	778	6%	49	0.13	5	$64	100%	100%	100%	74%	70%	66.2%	57.6%	57.6%	1.0
272	HVAC Equipment	Central Air Conditioner 15 SEER	IQ Weatherproofing	MF	MO	639	7%	43	0.10	18	$150	100%	100%	100%	74%	17%	66.2%	57.6%	57.6%	1.0
273	HVAC Equipment	Central Air Conditioner 16 SEER	IQ Weatherproofing	MF	MO	639	13%	80	0.19	18	$267	100%	100%	100%	74%	17%	66.2%	57.6%	57.6%	1.0
274	HVAC Equipment	Central Air Conditioner 17 SEER	IQ Weatherproofing	MF	MO	639	18%	113	0.27	18	$664	100%	45%	45%	74%	17%	66.2%	31.4%	31.4%	1.3
275	HVAC Equipment	Central Air Conditioner 18 SEER	IQ Weatherproofing	MF	MO	639	33%	213	0.34	18	$664	100%	45%	45%	74%	17%	66.2%	31.4%	31.4%	1.7
276	HVAC Equipment	Smart Thermostat - Heat pump baseline	Home Energy Management	MF	DI	3,850	9%	336	0.00	15	$250	100%	56%	56%	6%	8%	66.2%	35.8%	35.8%	0.9
277	HVAC Equipment	WIFI Thermostat - Heat pump baseline	IQ Weatherproofing	MF	DI	3,850	9%	340	0.00	15	$140	100%	100%	100%	6%	8%	66.2%	57.6%	57.6%	0.9
278	HVAC Equipment	Programmable Thermostat - Heat pump baseline	Online Energy Check-Up	MF	DI	3,850	3%	98	0.00	15	$30	100%	66%	66%	6%	8%	66.2%	39.7%	39.7%	1.8
279	HVAC Equipment	Smart Thermostat - Furnace baseline	Home Energy Management	MF	DI	7,934	9%	691	0.00	15	$250	100%	56%	56%	11%	8%	66.2%	35.8%	35.8%	1.8
280	HVAC Equipment	WIFI Thermostat - Furnace baseline	IQ Weatherproofing	MF	DI	7,934	9%	699	0.00	15	$140	100%	100%	100%	11%	8%	66.2%	57.6%	57.6%	1.8
281	HVAC Equipment	Programmable Thermostat - Furnace baseline	Online Energy Check-Up	MF	DI	7,934	3%	204	0.00	15	$30	100%	66%	66%	11%	8%	66.2%	39.7%	39.7%	3.8
282	HVAC Equipment	Smart Thermostat - Gas/CAC baseline	Home Energy Management	MF	DI	599	9%	53	0.00	15	$250	100%	56%	56%	89%	8%	66.2%	35.8%	35.8%	0.2
283	HVAC Equipment	WIFI Thermostat - Gas/CAC baseline	IQ Weatherproofing	MF	DI	599	9%	54	0.00	15	$140	100%	100%	100%	89%	8%	66.2%	57.6%	57.6%	0.2
284	HVAC Equipment	Programmable Thermostat - Gas/CAC baseline	Online Energy Check-Up	MF	DI	599	2%	13	0.00	15	$30	100%	66%	66%	89%	8%	66.2%	39.7%	39.7%	0.3
285	HVAC Equipment	PTHP Variable Speed SEER 17 11.9 HPSF Upgrade from PTHP Baseline SEER 10.5 HPSF 7.7	IQ Weatherproofing	MF	Retrofit	1,172	50%	586	0.43	18	$100	100%	100%	100%	4%	27%	66.2%	57.6%	57.6%	7.9
286	HVAC Equipment	PTHP Variable Speed SEER 17 11.9 HPSF Upgrade from PTAC SEER 10.5 Electric Resistance Heat	IQ Weatherproofing	MF	Retrofit	5,182	50%	2,591	0.43	18	$100	100%	100%	100%	11%	27%	66.2%	57.6%	57.6%	16.3
287	HVAC Equipment	Air Filter Alarm	School Education	MF	Retrofit	1,032	2%	19	0.05	14	$1	100%	100%	100%	74%	70%	81.4%	60.2%	60.2%	43.3
288	HVAC Equipment	ECM HVAC Motor	HVAC Midstream	MF	Retrofit	1,383	30%	415	0.07	10	$280	50%	36%	36%	85%	32%	55.1%	35.5%	35.5%	1.7
289	HVAC Equipment	ENERGY STAR Room Air Conditioner	HVAC Midstream	MF	MO	411	9%	38	0.09	12	$40	100%	66%	25%	13%	41%	81.4%	46.2%	31.9%	3.7
290	HVAC Equipment	Smart Room AC	HVAC Midstream	MF	MO	411	3%	12	0.03	12	$40	75%	66%	50%	13%	41%	66.9%	46.2%	40.8%	1.2
291	HVAC Equipment	Smart Room AC - controls retrofit	HVAC Midstream	MF	Retrofit	411	3%	12	0.03	12	$80	100%	66%	25%	13%	41%	81.4%	46.2%	31.9%	0.6
292	HVAC Equipment	Room Air Conditioner Recycling	Home Appliance Recycling	MF	Recycle	581	100%	581	1.37	3	$129	100%	66%	19%	13%	0%	81.4%	46.2%	30.1%	5.0
293	HVAC Equipment	Smart Vents/Sensors - Gas/CAC baseline	Home Weatherproofing	MF	Retrofit	778	5%	39	0.09	15	$1,219	100%	66%	25%	68%	0%	81.4%	46.2%	31.9%	0.1
294	HVAC Equipment	Smart Vents/Sensors - Heat pump baseline	Home Weatherproofing	MF	Retrofit	5,005	5%	250	0.09	15	$1,219	100%	66%	25%	6%	0%	81.4%	46.2%	31.9%	0.2
295	HVAC Equipment	Smart Vents/Sensors - Furnace baseline	Home Weatherproofing	MF	Retrofit	10,314	5%	516	0.09	15	$1,219	100%	66%	25%	8%	0%	81.4%	46.2%	31.9%	0.4
296	HVAC Equipment	Whole House Attic Fan	Home Weatherproofing	MF	Retrofit	778	22%	171	0.00	20	$1,500	100%	66%	25%	74%	13%	81.4%	46.2%	31.9%	0.1
297	HVAC Equipment	Attic Fan	Home Weatherproofing	MF	Retrofit	778	13%	105	0.22	10	$600	100%	66%	25%	74%	13%	81.4%	46.2%	31.9%	0.5
298	HVAC Equipment	Efficient ceramic space heater	HVAC Midstream	MF	Retrofit	1,406	13%	178	0.00	18	$26	100%	66%	66%	20%	27%	81.4%	46.2%	46.2%	4.5
299	HVAC Equipment	Air Source Heat Pump 16 SEER - Heat pump baseline	HVAC Midstream	MF	NC	4,338	4%	162	0.19	18	$384	78%	78%	78%	6%	0%	68.6%	50.7%	50.7%	1.0
300	HVAC Equipment	Air Source Heat Pump 17 SEER - Heat pump baseline	HVAC Midstream	MF	NC	4,338	9%	385	0.27	18	$572	75%	70%	70%	6%	0%	66.9%	47.6%	47.6%	1.2
301	HVAC Equipment	Air Source Heat Pump 18 SEER - Heat pump baseline	HVAC Midstream	MF	NC	4,338	14%	586	0.34	18	$811	75%	62%	62%	6%	0%	66.9%	44.6%	44.6%	1.3
302	HVAC Equipment	Air Source Heat Pump 21 SEER - Heat pump baseline	HVAC Midstream	MF	NC	4,338	25%	1,081	0.50	18	$811	100%	74%	74%	6%	0%	81.4%	49.1%	49.1%	1.8
303	HVAC Equipment	Ground Source Heat Pump 20 SEER - Heat pump baseline	HVAC Midstream	MF	NC	4,338	27%	1,178	0.45	18	$391	100%	92%	92%	6%	0%	81.4%	56.6%	56.6%	3.0
304	HVAC Equipment	Ground Source Heat Pump 21.5 SEER - Heat pump baseline	HVAC Midstream	MF	NC	4,338	32%	1,398	0.53	18	$391	100%	100%	100%	6%	0%	81.4%	60.2%	60.2%	3.2
305	HVAC Equipment	Ground Source Heat Pump 23.5 SEER - Heat pump baseline	HVAC Midstream	MF	NC	4,338	39%	1,681	0.59	18	$891	100%	67%	67%	6%	0%	81.4%	46.7%	46.7%	2.4
306	HVAC Equipment	Ground Source Heat Pump 29 SEER - Heat pump baseline	HVAC Midstream	MF	NC	4,338	41%	1,769	0.80	18	$1,291	100%	56%	56%	6%	0%	81.4%	42.7%	42.7%	2.4
307	HVAC Equipment	Ductless Heat Pump 17 SEER 9.5 HSPF - Heat pump baseline	HVAC Midstream	MF	NC	4,338	8%	353	0.24	18	$2,087	13%	13%	13%	6%	0%	38.0%	28.1%	28.1%	1.7
308	HVAC Equipment	Ductless Heat Pump 19 SEER 9.5 HSPF - Heat pump baseline	HVAC Midstream	MF	NC	4,338	9%	404	0.36	18	$2,087	16%	16%	16%	6%	0%	39.1%	28.9%	28.9%	1.9
309	HVAC Equipment	Ductless Heat Pump 21 SEER 10.0 HSPF - Heat pump baseline	HVAC Midstream	MF	NC	4,338	14%	602	0.46	18	$2,087	18%	18%	18%	6%	0%	39.9%	29.6%	29.6%	2.2
310	HVAC Equipment	Ductless Heat Pump 23 SEER 10.0 HSPF - Heat pump baseline	HVAC Midstream	MF	NC	4,338	15%	636	0.54	18	$2,087	20%	20%	20%	6%	0%	40.8%	30.2%	30.2%	2.3
311	HVAC Equipment	Central Air Conditioner 15 SEER	HVAC Midstream	MF	NC	639	7%	43	0.10	18	$150	100%	100%	100%	74%	0%	81.4%	60.2%	60.2%	1.0
312	HVAC Equipment	Central Air Conditioner 16 SEER	HVAC Midstream	MF	NC	639	13%	80	0.19	18	$267	100%	100%	100%	74%	0%	81.4%	60.2%	60.2%	1.0
313	HVAC Equipment	Central Air Conditioner 17 SEER	HVAC Midstream	MF	NC	639	18%	113	0.27	18	$664	50%	45%	45%	74%	0%	55.1%	38.9%	38.9%	1.3
314	HVAC Equipment	Central Air Conditioner 18 SEER	HVAC Midstream	MF	NC	639	33%	213	0.34	18	$664	75%	45%	45%	74%	0%	66.9%	38.9%	38.9%	1.7
315	HVAC Equipment	ENERGY STAR Room Air Conditioner	HVAC Midstream	MF	NC	411	9%	38	0.09	12	$40	100%	66%	25%	13%	0%	81.4%	46.2%	31.9%	3.7
316	HVAC Equipment	Smart Room AC	HVAC Midstream	MF	NC	411	3%	12	0.03	12	$40	75%	66%	50%	13%	0%	66.9%	46.2%	40.8%	1.2
317	HVAC Equipment	Smart Thermostat - Heat pump baseline	Home Energy Management	MF	NC	3,337	9%	291	0.00	15	$250	100%	56%	56%	6%	0%	81.4%	42.7%	42.7%	0.8
318	HVAC Equipment	WIFI Thermostat - Heat pump baseline	HVAC Midstream	MF	NC	3,337	9%	295	0.00	15	$140	75%	54%	54%	6%	0%	66.9%	41.9%	41.9%	1.5

Appendix B: Residential Energy Efficiency 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	MAP Incentive (%)	RAP Incentive (%)	PP Incentive (%)	Base Saturation	EE Saturation	MAP Adoption Rate	RAP Adoption Rate	PP Adoption Rate	UCT Score
319	HVAC Equipment	Programmable Thermostat - Heat pump baseline	Online Energy Check-Up	MF	NC	3,337	3%	85	0.00	15	$30	100%	66%	66%	6%	0%	81.4%	46.2%	46.2%	1.6
320	HVAC Equipment	Smart Thermostat - Gas/CAC baseline	Home Energy Management	MF	NC	492	9%	43	0.00	15	$250	100%	56%	56%	89%	0%	81.4%	42.7%	42.7%	0.1
321	HVAC Equipment	WIFI Thermostat - Gas/CAC baseline	HVAC Midstream	MF	NC	492	9%	44	0.00	15	$140	100%	54%	54%	89%	0%	81.4%	41.9%	41.9%	0.2
322	HVAC Equipment	Programmable Thermostat - Gas/CAC baseline	Online Energy Check-Up	MF	NC	492	3%	14	0.00	15	$30	100%	66%	66%	89%	0%	81.4%	46.2%	46.2%	0.3
323	HVAC Equipment	Smart Vents/Sensors - Gas/CAC baseline	Home Weatherproofing	MF	NC	689	5%	34	0.09	15	$1,219	100%	66%	25%	68%	0%	81.4%	46.2%	31.9%	0.1
324	HVAC Equipment	Smart Vents/Sensors - Heat pump baseline	Home Weatherproofing	MF	NC	4,338	5%	217	0.09	15	$1,219	100%	66%	25%	6%	0%	81.4%	46.2%	31.9%	0.2
325	Lighting	9W LED	Home Energy Products	SF	MO	32	9%	3	0.00	2	$1	15%	15%	15%	2041%	59%	20.2%	17.6%	17.6%	1.3
326	Lighting	9W LED	Home Weatherproofing	SF	DI	32	9%	3	0.00	2	$1	15%	15%	25%	2041%	59%	20.2%	17.6%	20.3%	1.3
327	Lighting	9W LED	Online Energy Check-Up	SF	DI	32	9%	3	0.00	2	$1	15%	15%	15%	2041%	59%	20.2%	17.6%	17.6%	1.3
328	Lighting	9W LED	School Education	SF	DI	32	9%	3	0.00	2	$1	15%	15%	15%	2041%	59%	20.2%	17.6%	17.6%	1.3
329	Lighting	13W LED	Home Energy Products	SF	MO	38	13%	5	0.00	2	$5	100%	44%	44%	2041%	59%	62.1%	28.0%	28.0%	0.2
330	Lighting	13W LED	Home Weatherproofing	SF	DI	38	13%	5	0.00	2	$5	100%	44%	25%	2041%	59%	62.1%	28.0%	20.3%	0.2
331	Lighting	9W LED	IQ Weatherproofing	SF	DI	75	9%	7	0.00	2	$2	100%	100%	100%	2041%	59%	60.5%	52.7%	52.7%	0.3
332	Lighting	13W LED	IQ Weatherproofing	SF	DI	38	13%	5	0.00	2	$5	100%	100%	100%	2041%	59%	60.5%	52.7%	52.7%	0.1
333	Lighting	LED 5W Globe	Home Energy Products	SF	MO	5	20%	1	0.00	2	$3	100%	69%	69%	587%	59%	62.1%	39.0%	39.0%	0.0
334	Lighting	LED R30 Dimmable	Home Energy Products	SF	MO	43	26%	11	0.00	2	$4	100%	88%	88%	547%	59%	62.1%	47.9%	47.9%	0.3
335	Lighting	LED Nightlights	Home Energy Products	SF	MO	15	93%	14	0.00	3	$1	100%	100%	100%	34%	59%	62.1%	54.0%	54.0%	1.4
336	Lighting	LED Nightlights	Online Energy Check-Up	SF	DI	15	93%	14	0.00	3	$1	100%	100%	100%	34%	59%	62.1%	54.0%	54.0%	1.4
337	Lighting	LED Nightlights	School Education	SF	DI	15	93%	14	0.00	3	$1	100%	100%	100%	34%	59%	62.1%	54.0%	54.0%	1.4
338	Lighting	Exterior LED Lamp	Home Energy Products	SF	MO	108	26%	28	0.00	6	$4	100%	88%	88%	500%	59%	62.1%	47.9%	47.9%	1.4
339	Lighting	Linear LED	Home Energy Products	SF	MO	24	53%	13	0.00	18	$16	100%	66%	66%	427%	59%	62.1%	37.6%	37.6%	0.7
340	Lighting	Smart LED	Home Energy Products	SF	MO	19	10%	2	0.00	3	$2	100%	100%	100%	2041%	59%	62.1%	54.0%	54.0%	0.1
341	Lighting	LED Fixture	Home Energy Products	SF	MO	16	82%	13	0.00	15	$13	100%	66%	66%	2041%	59%	62.1%	37.6%	37.6%	0.8
342	Lighting	Occupancy Sensor	Home Energy Products	SF	Retrofit	164	40%	66	0.00	10	$40	100%	66%	66%	100%	42%	62.1%	37.6%	37.6%	0.7
343	Lighting	Smart Lighting Switch	Home Energy Products	SF	Retrofit	19	10%	2	0.00	3	$2	100%	66%	66%	2041%	42%	62.1%	37.6%	37.6%	0.2
344	Lighting	Exterior Lighting Controls	Home Energy Products	SF	Retrofit	108	40%	43	0.00	10	$100	100%	66%	66%	500%	42%	62.1%	37.6%	37.6%	0.2
345	Lighting	9W LED	Home Energy Products	SF	NC	32	9%	3	0.00	2	$1	15%	15%	15%	2041%	0%	20.2%	17.6%	17.6%	1.3
346	Lighting	13W LED	Home Energy Products	SF	NC	38	13%	5	0.00	2	$5	100%	44%	44%	2041%	0%	62.1%	28.0%	28.0%	0.2
347	Lighting	LED 5W Globe	Home Energy Products	SF	NC	5	20%	1	0.00	2	$3	100%	69%	69%	587%	0%	62.1%	39.0%	39.0%	0.0
348	Lighting	LED R30 Dimmable	Home Energy Products	SF	NC	43	26%	11	0.00	2	$4	100%	88%	88%	547%	0%	62.1%	47.9%	47.9%	0.3
349	Lighting	LED Nightlights	Home Energy Products	SF	NC	15	93%	14	0.00	3	$1	100%	100%	100%	34%	0%	62.1%	54.0%	54.0%	1.4
350	Lighting	Exterior LED Lamp	Home Energy Products	SF	NC	108	26%	28	0.00	6	$4	100%	88%	88%	500%	0%	62.1%	47.9%	47.9%	1.4
351	Lighting	Linear LED	Home Energy Products	SF	NC	24	53%	13	0.00	18	$16	100%	66%	66%	427%	0%	62.1%	37.6%	37.6%	0.7
352	Lighting	Smart LED	Home Energy Products	SF	NC	19	10%	2	0.00	3	$2	100%	100%	100%	2041%	0%	62.1%	54.0%	54.0%	0.1
353	Lighting	LED Fixture	Home Energy Products	SF	NC	16	82%	13	0.00	15	$13	100%	66%	66%	2041%	0%	62.1%	37.6%	37.6%	0.8
354	Lighting	Occupancy Sensor	Home Energy Products	SF	NC	164	40%	66	0.00	10	$40	100%	66%	66%	100%	0%	62.1%	37.6%	37.6%	0.7
355	Lighting	Smart Lighting Switch	Home Energy Products	SF	NC	19	10%	2	0.00	3	$2	100%	66%	66%	2041%	0%	62.1%	37.6%	37.6%	0.2
356	Lighting	Exterior Lighting Controls	Home Energy Products	SF	NC	108	40%	43	0.00	10	$100	100%	66%	66%	500%	0%	62.1%	37.6%	37.6%	0.2
357	Lighting	9W LED	Home Energy Products	MF	MO	32	9%	3	0.00	2	$1	15%	15%	15%	1021%	59%	20.2%	17.6%	17.6%	1.3
358	Lighting	9W LED	Home Weatherproofing	MF	DI	32	9%	3	0.00	2	$1	15%	15%	25%	1021%	59%	20.2%	17.6%	20.3%	1.3
359	Lighting	9W LED	Online Energy Check-Up	MF	DI	32	9%	3	0.00	2	$1	15%	15%	15%	1021%	59%	20.2%	17.6%	17.6%	1.3
360	Lighting	9W LED	School Education	MF	DI	32	9%	3	0.00	2	$1	15%	15%	15%	1021%	59%	20.2%	17.6%	17.6%	1.3
361	Lighting	13W LED	Home Energy Products	MF	MO	38	13%	5	0.00	2	$5	100%	44%	44%	1021%	59%	62.1%	28.0%	28.0%	0.2
362	Lighting	13W LED	Home Weatherproofing	MF	DI	38	13%	5	0.00	2	$5	100%	44%	25%	1021%	59%	62.1%	28.0%	20.3%	0.2
363	Lighting	9W LED	IQ Weatherproofing	MF	DI	32	9%	3	0.00	2	$2	100%	100%	100%	1021%	59%	60.5%	52.7%	52.7%	0.2
364	Lighting	13W LED	IQ Weatherproofing	MF	DI	38	13%	5	0.00	2	$5	100%	100%	100%	1021%	59%	60.5%	52.7%	52.7%	0.1
365	Lighting	LED 5W Globe	Home Energy Products	MF	MO	5	20%	1	0.00	2	$3	100%	69%	69%	293%	59%	62.1%	39.0%	39.0%	0.0
366	Lighting	LED R30 Dimmable	Home Energy Products	MF	MO	43	26%	11	0.00	2	$4	100%	88%	88%	274%	59%	62.1%	47.9%	47.9%	0.3
367	Lighting	LED Nightlights	Home Energy Products	MF	MO	15	93%	14	0.00	3	$1	100%	100%	100%	34%	59%	62.1%	54.0%	54.0%	1.4
368	Lighting	LED Nightlights	Online Energy Check-Up	MF	DI	15	93%	14	0.00	3	$1	100%	100%	100%	34%	59%	62.1%	54.0%	54.0%	1.4
369	Lighting	LED Nightlights	School Education	MF	DI	15	93%	14	0.00	3	$1	100%	100%	100%	34%	59%	62.1%	54.0%	54.0%	1.4
370	Lighting	Exterior LED Lamp	Home Energy Products	MF	MO	108	26%	28	0.00	6	$4	100%	88%	88%	500%	59%	62.1%	47.9%	47.9%	1.4
371	Lighting	Linear LED	Home Energy Products	MF	MO	24	53%	13	0.00	18	$16	100%	66%	66%	427%	59%	62.1%	37.6%	37.6%	0.7
372	Lighting	Smart LED	Home Energy Products	MF	MO	19	10%	2	0.00	3	$2	100%	100%	100%	1021%	59%	62.1%	54.0%	54.0%	0.1
373	Lighting	LED Fixture	Home Energy Products	MF	MO	16	82%	13	0.00	15	$13	100%	66%	66%	1021%	59%	62.1%	37.6%	37.6%	0.8
374	Lighting	Occupancy Sensor	Home Energy Products	MF	Retrofit	164	40%	66	0.00	10	$40	100%	66%	66%	100%	57%	62.1%	37.6%	37.6%	0.7
375	Lighting	Smart Lighting Switch	Home Energy Products	MF	Retrofit	19	10%	2	0.00	3	$2	100%	66%	66%	1021%	57%	62.1%	37.6%	37.6%	0.2
376	Lighting	Exterior Lighting Controls	Home Energy Products	MF	Retrofit	108	40%	43	0.00	10	$100	100%	66%	66%	500%	57%	62.1%	37.6%	37.6%	0.2
377	Lighting	9W LED	Home Energy Products	MF	NC	32	9%	3	0.00	2	$1	15%	15%	15%	1021%	0%	20.2%	17.6%	17.6%	1.3
378	Lighting	13W LED	Home Energy Products	MF	NC	38	13%	5	0.00	2	$5	100%	44%	44%	1021%	0%	62.1%	28.0%	28.0%	0.2
379	Lighting	LED 5W Globe	Home Energy Products	MF	NC	5	20%	1	0.00	2	$3	100%	69%	69%	293%	0%	62.1%	39.0%	39.0%	0.0
380	Lighting	LED R30 Dimmable	Home Energy Products	MF	NC	43	26%	11	0.00	2	$4	100%	88%	88%	274%	0%	62.1%	47.9%	47.9%	0.3
381	Lighting	LED Nightlights	Home Energy Products	MF	NC	15	93%	14	0.00	3	$1	100%	100%	100%	34%	0%	62.1%	54.0%	54.0%	1.4
382	Lighting	Exterior LED Lamp	Home Energy Products	MF	NC	108	26%	28	0.00	6	$4	100%	88%	88%	500%	0%	62.1%	47.9%	47.9%	1.4
383	Lighting	Linear LED	Home Energy Products	MF	NC	24	53%	13	0.00	18	$16	100%	66%	66%	427%	0%	62.1%	37.6%	37.6%	0.7
384	Lighting	Smart LED	Home Energy Products	MF	NC	19	10%	2	0.00	3	$2	100%	100%	100%	1021%	0%	62.1%	54.0%	54.0%	0.1
385	Lighting	LED Fixture	Home Energy Products	MF	NC	16	82%	13	0.00	15	$13	100%	66%	66%	1021%	0%	62.1%	37.6%	37.6%	0.8

Appendix B: Residential Energy Efficiency 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	MAP Incentive (%)	RAP Incentive (%)	PP Incentive (%)	Base Saturation	EE Saturation	MAP Adoption Rate	RAP Adoption Rate	PP Adoption Rate	UCT Score
386	Lighting	Occupancy Sensor	Home Energy Products	MF	NC	164	40%	66	0.00	10	$40	100%	66%	66%	100%	0%	62.1%	37.6%	37.6%	0.7
387	Lighting	Smart Lighting Switch	Home Energy Products	MF	NC	19	10%	2	0.00	3	$2	100%	66%	66%	1021%	0%	62.1%	37.6%	37.6%	0.2
388	Lighting	Exterior Lighting Controls	Home Energy Products	MF	NC	108	40%	43	0.00	10	$100	100%	66%	66%	500%	0%	62.1%	37.6%	37.6%	0.2
389	Miscellaneous	Pool Heater	Online Energy Check-Up	SF	MO	2,260	20%	452	0.00	10	$640	100%	66%	66%	5%	21%	62.1%	37.6%	37.6%	0.3
390	Miscellaneous	Hot Tub/Spa	Online Energy Check-Up	SF	MO	2,738	15%	417	0.05	15	$350	100%	66%	66%	5%	21%	62.1%	37.6%	37.6%	0.9
391	Miscellaneous	Variable Speed Pool Pump	Home Energy Products	SF	MO	487	21%	104	0.05	10	$324	100%	62%	62%	6%	21%	62.1%	35.7%	35.7%	0.4
392	Miscellaneous	Pool Timer	Online Energy Check-Up	SF	Retrofit	2,098	20%	420	0.06	25	$115	100%	66%	66%	6%	21%	62.1%	37.6%	37.6%	4.1
393	Miscellaneous	Well Pump	Online Energy Check-Up	SF	MO	561	33%	187	0.02	20	$110	50%	66%	66%	16%	21%	35.5%	37.6%	37.6%	1.6
394	Miscellaneous	Pool Heater	Online Energy Check-Up	SF	NC	2,260	20%	452	0.00	10	$640	100%	66%	66%	5%	0%	62.1%	37.6%	37.6%	0.3
395	Miscellaneous	Hot Tub/Spa	Online Energy Check-Up	SF	NC	2,738	15%	417	0.05	15	$350	100%	66%	66%	5%	0%	62.1%	37.6%	37.6%	0.9
396	Miscellaneous	Variable Speed Pool Pump	Home Energy Products	SF	NC	487	21%	104	0.05	10	$324	100%	62%	62%	6%	0%	62.1%	35.7%	35.7%	0.4
397	Miscellaneous	Pool Timer	Online Energy Check-Up	SF	NC	2,098	20%	420	0.06	25	$115	100%	66%	66%	6%	0%	62.1%	37.6%	37.6%	4.1
398	Miscellaneous	Well Pump	Online Energy Check-Up	SF	NC	561	33%	187	0.02	20	$110	50%	66%	66%	16%	0%	35.5%	37.6%	37.6%	1.6
399	New Construction	Gold Star HERS 67- All Electric	Residential New Construction	SF	NC	24,479	33%	8,078	1.34	25	$3,319	100%	39%	39%	25%	0%	68.7%	28.2%	28.2%	4.8
400	New Construction	Gold Star HERS 67- Gas & Electric	Residential New Construction	SF	NC	5,030	33%	1,660	1.25	25	$3,319	75%	39%	39%	68%	0%	50.2%	28.2%	28.2%	2.1
401	New Construction	Platinum Star HERS 60 Gas & Electric	Residential New Construction	SF	NC	4,125	40%	1,650	1.23	25	$3,049	75%	26%	26%	68%	0%	50.2%	23.1%	23.1%	3.4
402	New Construction	Silver Star HERS 75 - Gas & Electric	Residential New Construction	SF	NC	5,724	25%	1,431	0.79	25	$3,049	50%	26%	26%	68%	0%	38.3%	23.1%	23.1%	2.4
403	New Construction	Gold Star HERS 67- All Electric	Residential New Construction	MF	NC	24,479	33%	8,078	1.34	25	$3,319	100%	39%	39%	25%	0%	68.7%	28.2%	28.2%	4.8
404	New Construction	Gold Star HERS 67- Gas & Electric	Residential New Construction	MF	NC	5,030	33%	1,660	1.25	25	$3,319	75%	39%	39%	68%	0%	50.2%	28.2%	28.2%	2.1
405	New Construction	Platinum Star HERS 60 Gas & Electric	Residential New Construction	MF	NC	4,125	40%	1,650	1.23	25	$3,049	75%	26%	26%	68%	0%	50.2%	23.1%	23.1%	3.4
406	New Construction	Silver Star HERS 75 - Gas & Electric	Residential New Construction	MF	NC	5,724	25%	1,431	0.79	25	$3,049	50%	26%	26%	68%	0%	38.3%	23.1%	23.1%	2.4
407	Plug Load	Smart Power Strips - Tier 1	Home Energy Products	SF	Retrofit	197	12%	23	0.00	4	$16	100%	66%	66%	198%	44%	62.1%	37.6%	37.6%	0.3
408	Plug Load	Smart Power Strips - Tier 2	Home Energy Products	SF	Retrofit	432	38%	162	0.02	8	$60	75%	17%	17%	227%	44%	48.3%	17.9%	17.9%	4.7
409	Plug Load	Smart Outlets	Home Energy Products	SF	Retrofit	432	6%	28	0.00	5	$50	100%	66%	66%	227%	44%	62.1%	37.6%	37.6%	0.2
410	Plug Load	Smart Television	Home Energy Products	SF	MO	208	67%	139	0.11	6	$10	100%	100%	100%	227%	62%	62.1%	54.0%	54.0%	8.0
411	Plug Load	Smart Power Strips - Tier 1	Home Energy Products	SF	NC	197	12%	23	0.00	4	$16	100%	66%	66%	198%	0%	62.1%	37.6%	37.6%	0.3
412	Plug Load	Smart Power Strips - Tier 2	Home Energy Products	SF	NC	432	38%	162	0.02	8	$60	75%	17%	17%	227%	0%	48.3%	17.9%	17.9%	4.7
413	Plug Load	Smart Outlets	Home Energy Products	SF	NC	432	6%	28	0.00	5	$50	100%	66%	66%	227%	0%	62.1%	37.6%	37.6%	0.2
414	Plug Load	Smart Television	Home Energy Products	SF	NC	208	67%	139	0.11	6	$10	100%	100%	100%	227%	0%	62.1%	54.0%	54.0%	8.0
415	Plug Load	Smart Power Strips - Tier 1	Home Energy Products	MF	Retrofit	197	12%	23	0.00	4	$16	100%	66%	66%	198%	46%	62.1%	37.6%	37.6%	0.3
416	Plug Load	Smart Power Strips - Tier 2	Home Energy Products	MF	Retrofit	432	38%	162	0.02	8	$60	75%	17%	17%	227%	46%	48.3%	17.9%	17.9%	4.7
417	Plug Load	Smart Outlets	Home Energy Products	MF	Retrofit	432	6%	28	0.00	5	$50	100%	66%	66%	227%	46%	62.1%	37.6%	37.6%	0.2
418	Plug Load	Smart Television	Home Energy Products	MF	MO	208	67%	139	0.11	6	$10	100%	100%	100%	227%	62%	62.1%	54.0%	54.0%	8.0
419	Plug Load	Smart Power Strips - Tier 1	Home Energy Products	MF	NC	197	12%	23	0.00	4	$16	100%	66%	66%	198%	0%	62.1%	37.6%	37.6%	0.3
420	Plug Load	Smart Power Strips - Tier 2	Home Energy Products	MF	NC	432	38%	162	0.02	8	$60	75%	17%	17%	227%	0%	48.3%	17.9%	17.9%	4.7
421	Plug Load	Smart Outlets	Home Energy Products	MF	NC	432	6%	28	0.00	5	$50	100%	66%	66%	227%	0%	62.1%	37.6%	37.6%	0.2
422	Plug Load	Smart Television	Home Energy Products	MF	NC	208	67%	139	0.11	6	$10	100%	100%	100%	227%	0%	62.1%	54.0%	54.0%	8.0
423	Shell	Duct Sealing - Average Sealing - Heat pump	Home Weatherproofing	SF	Retrofit	7,507	3%	248	0.10	20	$400	100%	100%	25%	6%	89%	68.7%	59.8%	22.7%	0.6
424	Shell	Duct Sealing - Inadequate Sealing - Heat pump	Home Weatherproofing	SF	Retrofit	7,507	7%	537	0.23	20	$400	100%	100%	25%	6%	82%	68.7%	59.8%	22.7%	1.4
425	Shell	Duct Sealing/Insulation - Poor Sealing - Heat pump	Home Weatherproofing	SF	Retrofit	7,507	9%	663	0.28	20	$400	100%	100%	25%	6%	97%	68.7%	59.8%	22.7%	1.7
426	Shell	Wall Insulation - Heat pump	Home Weatherproofing	SF	Retrofit	7,507	8%	625	0.03	25	$741	50%	50%	25%	6%	97%	38.3%	33.4%	22.7%	1.0
427	Shell	Air Sealing Average Sealing - Heat pump	Home Weatherproofing	SF	Retrofit	7,507	13%	947	0.05	15	$1,077	100%	50%	25%	6%	89%	68.7%	33.4%	22.7%	0.8
428	Shell	Air Sealing Inadequate Sealing - Heat pump	Home Weatherproofing	SF	Retrofit	7,507	26%	1,368	0.07	15	$1,077	50%	50%	25%	6%	82%	38.3%	33.4%	22.7%	1.1
429	Shell	Air Sealing Poor Sealing - Heat pump	Home Weatherproofing	SF	Retrofit	7,507	34%	2,526	0.12	15	$1,077	100%	50%	25%	6%	97%	68.7%	33.4%	22.7%	2.0
430	Shell	Attic Insulation - Average Insulation - Heat pump	Home Weatherproofing	SF	Retrofit	7,507	5%	343	0.02	25	$1,482	100%	49%	25%	6%	89%	68.7%	33.0%	22.7%	0.3
431	Shell	Attic Insulation - Inadequate Insulation - Heat pump	Home Weatherproofing	SF	Retrofit	7,507	9%	665	0.02	25	$1,482	100%	49%	25%	6%	82%	68.7%	33.0%	22.7%	0.5
432	Shell	Attic Insulation - Poor Insulation - Heat pump	Home Weatherproofing	SF	Retrofit	7,507	20%	1,499	0.06	25	$1,482	50%	49%	25%	6%	97%	38.3%	33.0%	22.7%	1.2
433	Shell	Duct Sealing - Average Sealing - Electric furnace	Home Weatherproofing	SF	Retrofit	15,471	3%	511	0.10	20	$400	100%	100%	25%	8%	89%	68.7%	59.8%	22.7%	0.9
434	Shell	Duct Sealing - Inadequate Sealing - Electric furnace	Home Weatherproofing	SF	Retrofit	15,471	7%	1,107	0.23	20	$400	100%	100%	25%	8%	82%	68.7%	59.8%	22.7%	2.0
435	Shell	Duct Sealing/Insulation - Poor Sealing - Electric furnace	Home Weatherproofing	SF	Retrofit	15,471	9%	1,367	0.28	20	$400	100%	100%	25%	8%	97%	68.7%	59.8%	22.7%	2.5
436	Shell	Wall Insulation - Electric furnace	Home Weatherproofing	SF	Retrofit	15,471	7%	1,020	0.03	25	$741	75%	50%	25%	19%	97%	50.2%	33.4%	22.7%	1.6
437	Shell	Air Sealing Average Sealing - Electric furnace	Home Weatherproofing	SF	Retrofit	15,471	9%	1,424	0.02	15	$1,077	50%	50%	25%	19%	89%	38.3%	33.4%	22.7%	1.0
438	Shell	Air Sealing Inadequate Sealing - Electric furnace	Home Weatherproofing	SF	Retrofit	15,471	13%	2,056	0.03	15	$1,077	50%	50%	25%	19%	82%	38.3%	33.4%	22.7%	1.5
439	Shell	Air Sealing Poor Sealing - Electric furnace	Home Weatherproofing	SF	Retrofit	15,471	25%	3,796	0.06	15	$1,077	100%	50%	25%	19%	97%	68.7%	33.4%	22.7%	2.7
440	Shell	Attic Insulation - Average Insulation - Electric furnace	Home Weatherproofing	SF	Retrofit	15,471	4%	551	0.02	25	$1,482	100%	49%	25%	19%	89%	68.7%	33.0%	22.7%	0.4
441	Shell	Attic Insulation - Inadequate Insulation - Electric furnace	Home Weatherproofing	SF	Retrofit	15,471	7%	1,038	0.04	25	$1,482	100%	49%	25%	19%	82%	68.7%	33.0%	22.7%	0.8
442	Shell	Attic Insulation - Poor Insulation - Electric furnace	Home Weatherproofing	SF	Retrofit	15,471	15%	2,314	0.09	25	$1,482	75%	49%	25%	19%	97%	50.2%	33.0%	22.7%	1.8
443	Shell	Duct Sealing - Average Sealing - Gas Heating	Home Weatherproofing	SF	Retrofit	1,168	3%	39	0.10	20	$400	100%	100%	25%	68%	89%	68.7%	59.8%	22.7%	0.4
444	Shell	Duct Sealing - Inadequate Sealing - Gas Heating	Home Weatherproofing	SF	Retrofit	1,168	7%	85	0.23	20	$400	100%	100%	25%	68%	82%	68.7%	59.8%	22.7%	0.8
445	Shell	Duct Sealing/Insulation - Poor Sealing - Gas Heating	Home Weatherproofing	SF	Retrofit	1,168	9%	105	0.28	20	$400	100%	100%	25%	68%	97%	68.7%	59.8%	22.7%	1.0
446	Shell	Wall Insulation - Gas Heating	Home Weatherproofing	SF	Retrofit	1,168	4%	43	0.03	25	$741	100%	50%	25%	68%	97%	68.7%	33.4%	22.7%	0.2
447	Shell	Air Sealing - Average Sealing - Gas Heating	Home Weatherproofing	SF	Retrofit	1,168	5%	55	0.02	15	$1,077	100%	50%	25%	68%	89%	68.7%	33.4%	22.7%	0.1
448	Shell	Air Sealing - Inadequate Sealing - Gas Heating	Home Weatherproofing	SF	Retrofit	1,168	7%	80	0.03	15	$1,077	100%	50%	25%	68%	82%	68.7%	33.4%	22.7%	0.1
449	Shell	Air Sealing - Poor Sealing - Gas Heating	Home Weatherproofing	SF	Retrofit	1,168	13%	147	0.06	15	$1,077	100%	50%	25%	68%	97%	68.7%	33.4%	22.7%	0.2
450	Shell	Attic Insulation - Average Insulation - Gas Heating	Home Weatherproofing	SF	Retrofit	1,168	2%	25	0.02	25	$1,482	100%	49%	25%	68%	89%	68.7%	33.0%	22.7%	0.1
451	Shell	Attic Insulation - Inadequate Insulation - Gas Heating	Home Weatherproofing	SF	Retrofit	1,168	4%	44	0.04	25	$1,482	100%	49%	25%	68%	82%	68.7%	33.0%	22.7%	0.1
452	Shell	Attic Insulation - Poor Insulation - Gas Heating	Home Weatherproofing	SF	Retrofit	1,168	9%	100	0.09	25	$1,482	100%	49%	25%	68%	97%	68.7%	33.0%	22.7%	0.2

Appendix B: Residential Energy Efficiency 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	MAP Incentive (%)	RAP Incentive (%)	PP Incentive (%)	Base Saturation	EE Saturation	MAP Adoption Rate	RAP Adoption Rate	PP Adoption Rate	UCT Score
453	Shell	Duct Sealing - Average Sealing - Heat pump	IQ Weatherproofing	SF	DI	7,507	3%	248	0.10	15	$400	100%	100%	100%	6%	89%	66.5%	57.9%	57.9%	0.5
454	Shell	Duct Sealing - Inadequate Sealing - Heat pump	IQ Weatherproofing	SF	DI	7,507	7%	537	0.23	15	$400	100%	100%	100%	6%	82%	66.5%	57.9%	57.9%	1.1
455	Shell	Duct Sealing/Insulation - Poor Sealing - Heat pump	IQ Weatherproofing	SF	DI	7,507	9%	663	0.28	15	$400	100%	100%	100%	6%	97%	66.5%	57.9%	57.9%	1.4
456	Shell	Wall Insulation - Heat pump	IQ Weatherproofing	SF	DI	7,507	2%	178	0.01	25	$77	100%	100%	100%	6%	97%	66.5%	57.9%	57.9%	1.4
457	Shell	Air Sealing Average Sealing - Heat pump	IQ Weatherproofing	SF	DI	7,507	13%	947	0.05	15	$620	100%	100%	100%	6%	89%	66.5%	57.9%	57.9%	0.7
458	Shell	Air Sealing Inadequate Sealing - Heat pump	IQ Weatherproofing	SF	DI	7,507	18%	1,368	0.07	15	$620	100%	100%	100%	6%	82%	66.5%	57.9%	57.9%	0.9
459	Shell	Air Sealing Poor Sealing - Heat pump	IQ Weatherproofing	SF	DI	7,507	34%	2,526	0.12	15	$620	100%	100%	100%	6%	97%	66.5%	57.9%	57.9%	1.7
460	Shell	Attic Insulation - Average Insulation - Heat pump	IQ Weatherproofing	SF	DI	7,507	4%	278	0.02	25	$1,225	100%	100%	100%	6%	89%	66.5%	57.9%	57.9%	0.1
461	Shell	Attic Insulation - Inadequate Insulation - Heat pump	IQ Weatherproofing	SF	DI	7,507	7%	537	0.02	25	$1,225	100%	100%	100%	6%	82%	66.5%	57.9%	57.9%	0.3
462	Shell	Attic Insulation - Poor Insulation - Heat pump	IQ Weatherproofing	SF	DI	7,507	16%	1,212	0.05	25	$1,225	100%	100%	100%	6%	97%	66.5%	57.9%	57.9%	0.6
463	Shell	Duct Sealing - Average Sealing - Electric furnace	IQ Weatherproofing	SF	Retrofit	15,471	3%	511	0.10	15	$400	100%	100%	100%	8%	89%	66.5%	57.9%	57.9%	0.8
464	Shell	Duct Sealing - Inadequate Sealing - Electric furnace	IQ Weatherproofing	SF	Retrofit	15,471	7%	1,107	0.23	15	$400	100%	100%	100%	8%	82%	66.5%	57.9%	57.9%	1.7
465	Shell	Duct Sealing/Insulation - Poor Sealing - Electric furnace	IQ Weatherproofing	SF	Retrofit	15,471	9%	1,367	0.28	15	$400	100%	100%	100%	8%	97%	66.5%	57.9%	57.9%	2.0
466	Shell	Wall Insulation - Electric furnace	IQ Weatherproofing	SF	Retrofit	15,471	2%	290	0.01	25	$77	100%	100%	100%	19%	97%	66.5%	57.9%	57.9%	2.1
467	Shell	Air Sealing Average Sealing - Electric furnace	IQ Weatherproofing	SF	Retrofit	15,471	9%	1,424	0.02	15	$620	100%	100%	100%	19%	89%	66.5%	57.9%	57.9%	0.9
468	Shell	Air Sealing Inadequate Sealing - Electric furnace	IQ Weatherproofing	SF	Retrofit	15,471	13%	2,056	0.03	15	$620	100%	100%	100%	19%	82%	66.5%	57.9%	57.9%	1.3
469	Shell	Air Sealing Poor Sealing - Electric furnace	IQ Weatherproofing	SF	DI	15,471	25%	3,796	0.06	15	$620	100%	100%	100%	19%	97%	66.5%	57.9%	57.9%	2.4
470	Shell	Attic Insulation - Average Insulation - Electric furnace	IQ Weatherproofing	SF	DI	15,471	3%	445	0.02	25	$1,225	100%	100%	100%	19%	89%	66.5%	57.9%	57.9%	0.2
471	Shell	Attic Insulation - Inadequate Insulation - Electric furnace	IQ Weatherproofing	SF	DI	15,471	5%	839	0.03	25	$1,225	100%	100%	100%	19%	82%	66.5%	57.9%	57.9%	0.4
472	Shell	Attic Insulation - Poor Insulation - Electric furnace	IQ Weatherproofing	SF	DI	15,471	12%	1,871	0.07	25	$1,225	100%	100%	100%	19%	97%	66.5%	57.9%	57.9%	0.9
473	Shell	Duct Sealing - Average Sealing - Gas Heating	IQ Weatherproofing	SF	DI	1,168	3%	39	0.10	15	$400	100%	100%	100%	68%	89%	66.5%	57.9%	57.9%	0.3
474	Shell	Duct Sealing - Inadequate Sealing - Gas Heating	IQ Weatherproofing	SF	DI	1,168	7%	85	0.23	15	$400	100%	100%	100%	68%	82%	66.5%	57.9%	57.9%	0.7
475	Shell	Duct Sealing/Insulation - Poor Sealing - Gas Heating	IQ Weatherproofing	SF	DI	1,168	9%	105	0.28	15	$400	100%	100%	100%	68%	97%	66.5%	57.9%	57.9%	0.9
476	Shell	Wall Insulation - Gas Heating	IQ Weatherproofing	SF	DI	1,168	1%	12	0.01	25	$77	100%	100%	100%	68%	97%	66.5%	57.9%	57.9%	0.2
477	Shell	Air Sealing - Average Sealing - Gas Heating	IQ Weatherproofing	SF	DI	1,168	5%	55	0.02	15	$620	100%	100%	100%	68%	89%	66.5%	57.9%	57.9%	0.1
478	Shell	Air Sealing - Inadequate Sealing - Gas Heating	IQ Weatherproofing	SF	DI	1,168	7%	80	0.03	15	$620	100%	100%	100%	68%	82%	66.5%	57.9%	57.9%	0.1
479	Shell	Air Sealing - Poor Sealing - Gas Heating	IQ Weatherproofing	SF	DI	1,168	13%	147	0.06	15	$620	100%	100%	100%	68%	97%	66.5%	57.9%	57.9%	0.2
480	Shell	Attic Insulation - Average Insulation - Gas Heating	IQ Weatherproofing	SF	DI	1,168	2%	20	0.02	25	$1,225	100%	100%	100%	68%	89%	66.5%	57.9%	57.9%	0.0
481	Shell	Attic Insulation - Inadequate Insulation - Gas Heating	IQ Weatherproofing	SF	DI	1,168	3%	35	0.03	25	$1,225	100%	100%	100%	68%	82%	66.5%	57.9%	57.9%	0.1
482	Shell	Attic Insulation - Poor Insulation - Gas Heating	IQ Weatherproofing	SF	DI	1,168	7%	81	0.07	25	$1,225	100%	100%	100%	68%	97%	66.5%	57.9%	57.9%	0.1
483	Shell	Attic Hatch Scuttle	Home Weatherproofing	SF	Retrofit	15,471	1%	88	0.01	20	$7	100%	100%	25%	19%	97%	68.7%	59.8%	22.7%	6.9
484	Shell	Radiant Barrier - Heat pump	Home Weatherproofing	SF	Retrofit	7,507	5%	375	0.34	20	$1,700	35%	27%	25%	6%	89%	30.4%	23.4%	22.7%	1.4
485	Shell	Cool Roof - Heat pump	Home Weatherproofing	SF	Retrofit	7,507	0%	-19	0.01	20	$765	100%	27%	25%	6%	40%	68.7%	23.4%	22.7%	0.0
486	Shell	ENERGY STAR Windows - Heat pump	Home Weatherproofing	SF	Retrofit	7,507	22%	1,652	0.69	25	$17,100	100%	27%	25%	6%	72%	68.7%	23.4%	22.7%	0.4
487	Shell	ENERGY STAR Windows - Heat pump	Home Weatherproofing	SF	MO	7,507	9%	676	0.28	25	$7,200	100%	27%	25%	6%	72%	68.7%	23.4%	22.7%	0.4
488	Shell	Basement Sidewall Insulation - Heat pump	Home Weatherproofing	SF	Retrofit	7,507	10%	753	-0.03	25	$690	50%	27%	25%	6%	76%	38.3%	23.4%	22.7%	1.9
489	Shell	Floor Insulation Above Crawlspace - Heat pump	Home Weatherproofing	SF	Retrofit	7,507	8%	585	-0.03	25	$690	35%	27%	25%	6%	69%	30.4%	23.4%	22.7%	1.4
490	Shell	ENERGY STAR Door - Heat pump	Home Weatherproofing	SF	Retrofit	7,507	4%	264	0.01	25	$2,325	100%	27%	25%	6%	89%	68.7%	23.4%	22.7%	0.2
491	Shell	Smart Window Coverings - Film/Transformer - Heat pump	Home Weatherproofing	SF	Retrofit	7,507	16%	1,164	0.49	7	$8,100	100%	27%	25%	6%	72%	68.7%	23.4%	22.7%	0.2
492	Shell	Radiant Barrier - Electric furnace	Home Weatherproofing	SF	Retrofit	15,471	5%	774	0.60	20	$1,700	75%	27%	25%	19%	89%	50.2%	23.4%	22.7%	2.5
493	Shell	Cool Roof - Electric furnace	Home Weatherproofing	SF	Retrofit	15,471	0%	-47	0.01	20	$765	100%	27%	25%	19%	40%	68.7%	23.4%	22.7%	0.0
494	Shell	ENERGY STAR Windows - Electric furnace	Home Weatherproofing	SF	Retrofit	15,471	22%	3,404	0.69	25	$17,100	100%	27%	25%	19%	72%	68.7%	23.4%	22.7%	0.6
495	Shell	ENERGY STAR Windows - Electric furnace	Home Weatherproofing	SF	MO	15,471	9%	1,392	0.28	25	$7,200	100%	27%	25%	19%	72%	68.7%	23.4%	22.7%	0.6
496	Shell	Basement Sidewall Insulation - Electric furnace	Home Weatherproofing	SF	Retrofit	15,471	7%	1,136	-0.04	25	$690	100%	27%	25%	19%	76%	68.7%	23.4%	22.7%	2.9
497	Shell	Floor Insulation Above Crawlspace - Electric furnace	Home Weatherproofing	SF	Retrofit	15,471	5%	848	-0.03	25	$690	75%	27%	25%	19%	69%	50.2%	23.4%	22.7%	2.2
498	Shell	ENERGY STAR Door - Electric furnace	Home Weatherproofing	SF	Retrofit	15,471	2%	367	0.02	25	$2,325	100%	27%	25%	19%	89%	68.7%	23.4%	22.7%	0.3
499	Shell	Smart Window Coverings - Film/Transformer - Electric furnace	Home Weatherproofing	SF	Retrofit	15,471	16%	2,398	0.49	7	$8,100	100%	27%	25%	19%	72%	68.7%	23.4%	22.7%	0.3
500	Shell	ENERGY STAR Windows - Gas Heating	Home Weatherproofing	SF	Retrofit	1,168	22%	257	0.69	25	$17,100	100%	27%	25%	68%	72%	68.7%	23.4%	22.7%	0.3
501	Shell	ENERGY STAR Windows - Gas Heating	Home Weatherproofing	SF	MO	1,168	9%	105	0.28	25	$7,200	100%	27%	25%	68%	72%	68.7%	23.4%	22.7%	0.2
502	Shell	Basement Sidewall Insulation - Gas Heating	Home Weatherproofing	SF	Retrofit	1,168	-1%	-12	-0.03	25	$690	100%	27%	25%	68%	76%	68.7%	23.4%	22.7%	0.0
503	Shell	Floor Insulation Above Crawlspace - Gas Heating	Home Weatherproofing	SF	Retrofit	1,168	-3%	-38	-0.03	25	$690	100%	27%	25%	68%	69%	68.7%	23.4%	22.7%	0.0
504	Shell	ENERGY STAR Door - Gas Heating	Home Weatherproofing	SF	Retrofit	1,168	2%	18	0.02	25	$2,325	100%	27%	25%	68%	89%	68.7%	23.4%	22.7%	0.1
505	Shell	Smart Window Coverings - Film/Transformer - Gas Heating	Home Weatherproofing	SF	Retrofit	1,168	16%	181	0.49	7	$8,100	100%	27%	25%	68%	72%	68.7%	23.4%	22.7%	0.2
506	Shell	Duct Sealing - Average Sealing - Heat pump	Home Weatherproofing	MF	Retrofit	5,005	3%	165	0.07	20	$400	100%	100%	25%	6%	55%	68.7%	59.8%	22.7%	0.4
507	Shell	Duct Sealing - Inadequate Sealing - Heat pump	Home Weatherproofing	MF	Retrofit	5,005	7%	358	0.15	20	$400	100%	100%	25%	6%	89%	68.7%	59.8%	22.7%	0.9
508	Shell	Duct Sealing/Insulation - Poor Sealing - Heat pump	Home Weatherproofing	MF	Retrofit	5,005	9%	442	0.19	20	$400	100%	100%	25%	6%	94%	68.7%	59.8%	22.7%	1.1
509	Shell	Wall Insulation - Heat pump	Home Weatherproofing	MF	Retrofit	5,005	12%	625	0.03	25	$741	50%	50%	25%	6%	87%	38.3%	33.4%	22.7%	1.0
510	Shell	Air Sealing Average Sealing - Heat pump	Home Weatherproofing	MF	Retrofit	5,005	13%	632	0.03	15	$1,077	100%	50%	25%	6%	55%	68.7%	33.4%	22.7%	0.5
511	Shell	Air Sealing Inadequate Sealing - Heat pump	Home Weatherproofing	MF	Retrofit	5,005	18%	912	0.04	15	$1,077	100%	50%	25%	6%	89%	68.7%	33.4%	22.7%	0.7
512	Shell	Air Sealing Poor Sealing - Heat pump	Home Weatherproofing	MF	Retrofit	5,005	34%	1,684	0.08	15	$1,077	50%	50%	25%	6%	94%	38.3%	33.4%	22.7%	1.3
513	Shell	Attic Insulation - Average Insulation - Heat pump	Home Weatherproofing	MF	Retrofit	5,005	5%	229	0.01	25	$1,482	100%	49%	25%	6%	55%	68.7%	33.0%	22.7%	0.2
514	Shell	Attic Insulation - Inadequate Insulation - Heat pump	Home Weatherproofing	MF	Retrofit	5,005	9%	443	0.01	25	$1,482	100%	49%	25%	6%	89%	68.7%	33.0%	22.7%	0.3
515	Shell	Attic Insulation - Poor Insulation - Heat pump	Home Weatherproofing	MF	Retrofit	5,005	20%	999	0.04	25	$1,482	100%	49%	25%	6%	94%	68.7%	33.0%	22.7%	0.8
516	Shell	Duct Sealing - Average Sealing - Electric furnace	Home Weatherproofing	MF	Retrofit	10,314	3%	341	0.07	20	$400	100%	100%	25%	8%	55%	68.7%	59.8%	22.7%	0.6
517	Shell	Duct Sealing - Inadequate Sealing - Electric furnace	Home Weatherproofing	MF	Retrofit	10,314	7%	738	0.15	20	$400	100%	100%	25%	8%	89%	68.7%	59.8%	22.7%	1.3
518	Shell	Duct Sealing/Insulation - Poor Sealing - Electric furnace	Home Weatherproofing	MF	Retrofit	10,314	9%	911	0.19	20	$400	100%	100%	25%	8%	94%	68.7%	59.8%	22.7%	1.7
519	Shell	Wall Insulation - Electric furnace	Home Weatherproofing	MF	Retrofit	10,314	10%	1,020	0.03	25	$741	75%	50%	25%	19%	87%	50.2%	33.4%	22.7%	1.6

Appendix B: Residential Energy Efficiency 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	MAP Incentive (%)	RAP Incentive (%)	PP Incentive (%)	Base Saturation	EE Saturation	MAP Adoption Rate	RAP Adoption Rate	PP Adoption Rate	UCT Score
520	Shell	Air Sealing Average Sealing - Electric furnace	Home Weatherproofing	MF	Retrofit	10,314	9%	949	0.02	15	$1,077	100%	50%	25%	19%	55%	68.7%	33.4%	22.7%	0.7
521	Shell	Air Sealing Inadequate Sealing - Electric furnace	Home Weatherproofing	MF	Retrofit	10,314	13%	1,371	0.02	15	$1,077	100%	50%	25%	19%	89%	68.7%	33.4%	22.7%	1.0
522	Shell	Air Sealing Poor Sealing - Electric furnace	Home Weatherproofing	MF	Retrofit	10,314	25%	2,531	0.04	15	$1,077	75%	50%	25%	19%	94%	50.2%	33.4%	22.7%	1.8
523	Shell	Attic Insulation - Average Insulation - Electric furnace	Home Weatherproofing	MF	Retrofit	10,314	4%	367	0.01	25	$1,482	100%	49%	25%	19%	55%	68.7%	33.0%	22.7%	0.3
524	Shell	Attic Insulation - Inadequate Insulation - Electric furnace	Home Weatherproofing	MF	Retrofit	10,314	7%	692	0.03	25	$1,482	100%	49%	25%	19%	89%	68.7%	33.0%	22.7%	0.6
525	Shell	Attic Insulation - Poor Insulation - Electric furnace	Home Weatherproofing	MF	Retrofit	10,314	15%	1,543	0.06	25	$1,482	50%	49%	25%	19%	94%	38.3%	33.0%	22.7%	1.2
526	Shell	Duct Sealing - Average Sealing - Gas Heating	Home Weatherproofing	MF	Retrofit	778	3%	26	0.07	20	$400	100%	100%	25%	68%	55%	68.7%	59.8%	22.7%	0.3
527	Shell	Duct Sealing - Inadequate Sealing - Gas Heating	Home Weatherproofing	MF	Retrofit	778	7%	57	0.15	20	$400	100%	100%	25%	68%	89%	68.7%	59.8%	22.7%	0.6
528	Shell	Duct Sealing/Insulation - Poor Sealing - Gas Heating	Home Weatherproofing	MF	Retrofit	778	9%	70	0.19	20	$400	100%	100%	25%	68%	94%	68.7%	59.8%	22.7%	0.7
529	Shell	Wall Insulation - Gas Heating	Home Weatherproofing	MF	Retrofit	778	5%	43	0.03	25	$741	100%	50%	25%	68%	87%	68.7%	33.4%	22.7%	0.2
530	Shell	Air Sealing - Average Sealing - Gas Heating	Home Weatherproofing	MF	Retrofit	778	5%	37	0.02	15	$1,077	100%	50%	25%	68%	55%	68.7%	33.4%	22.7%	0.1
531	Shell	Air Sealing - Inadequate Sealing - Gas Heating	Home Weatherproofing	MF	Retrofit	778	7%	53	0.02	15	$1,077	100%	50%	25%	68%	89%	68.7%	33.4%	22.7%	0.1
532	Shell	Air Sealing - Poor Sealing - Gas Heating	Home Weatherproofing	MF	Retrofit	778	13%	98	0.04	15	$1,077	100%	50%	25%	68%	94%	68.7%	33.4%	22.7%	0.2
533	Shell	Attic Insulation - Average Insulation - Gas Heating	Home Weatherproofing	MF	Retrofit	778	2%	17	0.01	25	$1,482	100%	49%	25%	68%	55%	68.7%	33.0%	22.7%	0.0
534	Shell	Attic Insulation - Inadequate Insulation - Gas Heating	Home Weatherproofing	MF	Retrofit	778	4%	29	0.03	25	$1,482	100%	49%	25%	68%	89%	68.7%	33.0%	22.7%	0.1
535	Shell	Attic Insulation - Poor Insulation - Gas Heating	Home Weatherproofing	MF	Retrofit	778	9%	67	0.06	25	$1,482	100%	49%	25%	68%	94%	68.7%	33.0%	22.7%	0.2
536	Shell	Duct Sealing - Average Sealing - Heat pump	IQ Weatherproofing	MF	DI	5,005	3%	165	0.07	15	$400	100%	100%	100%	6%	55%	66.5%	57.9%	57.9%	0.3
537	Shell	Duct Sealing - Inadequate Sealing - Heat pump	IQ Weatherproofing	MF	DI	5,005	7%	358	0.15	15	$400	100%	100%	100%	6%	89%	66.5%	57.9%	57.9%	0.8
538	Shell	Duct Sealing/Insulation - Poor Sealing - Heat pump	IQ Weatherproofing	MF	DI	5,005	9%	442	0.19	15	$400	100%	100%	100%	6%	94%	66.5%	57.9%	57.9%	0.9
539	Shell	Wall Insulation - Heat pump	IQ Weatherproofing	MF	DI	5,005	4%	178	0.01	25	$77	100%	100%	100%	6%	87%	66.5%	57.9%	57.9%	1.4
540	Shell	Air Sealing Average Sealing - Heat pump	IQ Weatherproofing	MF	DI	5,005	13%	632	0.03	15	$1,077	50%	50%	50%	6%	55%	28.9%	25.2%	25.2%	0.5
541	Shell	Air Sealing Inadequate Sealing - Heat pump	IQ Weatherproofing	MF	DI	5,005	18%	912	0.04	15	$620	100%	100%	100%	6%	89%	66.5%	57.9%	57.9%	0.6
542	Shell	Air Sealing Poor Sealing - Heat pump	IQ Weatherproofing	MF	DI	5,005	34%	1,684	0.08	15	$620	100%	100%	100%	6%	94%	66.5%	57.9%	57.9%	1.2
543	Shell	Attic Insulation - Average Insulation - Heat pump	IQ Weatherproofing	MF	DI	5,005	4%	185	0.01	25	$1,225	100%	100%	100%	6%	55%	66.5%	57.9%	57.9%	0.1
544	Shell	Attic Insulation - Inadequate Insulation - Heat pump	IQ Weatherproofing	MF	DI	5,005	7%	358	0.01	25	$1,225	100%	100%	100%	6%	89%	66.5%	57.9%	57.9%	0.2
545	Shell	Attic Insulation - Poor Insulation - Heat pump	IQ Weatherproofing	MF	DI	5,005	16%	808	0.03	25	$1,225	100%	100%	100%	6%	94%	66.5%	57.9%	57.9%	0.4
546	Shell	Duct Sealing - Average Sealing - Electric furnace	IQ Weatherproofing	MF	DI	10,314	3%	341	0.07	15	$400	100%	100%	100%	8%	55%	66.5%	57.9%	57.9%	0.5
547	Shell	Duct Sealing - Inadequate Sealing - Electric furnace	IQ Weatherproofing	MF	DI	10,314	7%	738	0.15	15	$400	100%	100%	100%	8%	89%	66.5%	57.9%	57.9%	1.1
548	Shell	Duct Sealing/Insulation - Poor Sealing - Electric furnace	IQ Weatherproofing	MF	DI	10,314	9%	911	0.19	15	$400	100%	100%	100%	8%	94%	66.5%	57.9%	57.9%	1.4
549	Shell	Wall Insulation - Electric furnace	IQ Weatherproofing	MF	DI	10,314	3%	290	0.01	25	$77	100%	100%	100%	19%	87%	66.5%	57.9%	57.9%	2.1
550	Shell	Air Sealing Average Sealing - Electric furnace	IQ Weatherproofing	MF	DI	10,314	9%	949	0.02	15	$620	100%	100%	100%	19%	55%	66.5%	57.9%	57.9%	0.6
551	Shell	Air Sealing Inadequate Sealing - Electric furnace	IQ Weatherproofing	MF	DI	10,314	13%	1,371	0.02	15	$620	100%	100%	100%	19%	89%	66.5%	57.9%	57.9%	0.9
552	Shell	Air Sealing Poor Sealing - Electric furnace	IQ Weatherproofing	MF	DI	10,314	25%	2,531	0.04	15	$620	100%	100%	100%	19%	94%	66.5%	57.9%	57.9%	1.6
553	Shell	Attic Insulation - Average Insulation - Electric furnace	IQ Weatherproofing	MF	DI	10,314	3%	297	0.01	25	$1,225	100%	100%	100%	19%	55%	66.5%	57.9%	57.9%	0.1
554	Shell	Attic Insulation - Inadequate Insulation - Electric furnace	IQ Weatherproofing	MF	DI	10,314	5%	559	0.02	25	$1,225	100%	100%	100%	19%	89%	66.5%	57.9%	57.9%	0.3
555	Shell	Attic Insulation - Poor Insulation - Electric furnace	IQ Weatherproofing	MF	DI	10,314	12%	1,247	0.05	25	$1,225	100%	100%	100%	19%	94%	66.5%	57.9%	57.9%	0.6
556	Shell	Duct Sealing - Average Sealing - Gas Heating	IQ Weatherproofing	MF	DI	778	3%	26	0.07	15	$400	100%	100%	100%	68%	55%	66.5%	57.9%	57.9%	0.2
557	Shell	Duct Sealing - Inadequate Sealing - Gas Heating	IQ Weatherproofing	MF	DI	778	7%	57	0.15	15	$400	100%	100%	100%	68%	89%	66.5%	57.9%	57.9%	0.5
558	Shell	Duct Sealing/Insulation - Poor Sealing - Gas Heating	IQ Weatherproofing	MF	DI	778	9%	70	0.19	15	$400	100%	100%	100%	68%	94%	66.5%	57.9%	57.9%	0.6
559	Shell	Wall Insulation - Gas Heating	IQ Weatherproofing	MF	DI	778	2%	12	0.01	25	$77	100%	100%	100%	68%	87%	66.5%	57.9%	57.9%	0.2
560	Shell	Air Sealing - Average Sealing - Gas Heating	IQ Weatherproofing	MF	DI	778	5%	37	0.02	15	$620	100%	100%	100%	68%	55%	66.5%	57.9%	57.9%	0.0
561	Shell	Air Sealing - Inadequate Sealing - Gas Heating	IQ Weatherproofing	MF	DI	778	7%	53	0.02	15	$620	100%	100%	100%	68%	89%	66.5%	57.9%	57.9%	0.1
562	Shell	Air Sealing - Poor Sealing - Gas Heating	IQ Weatherproofing	MF	DI	778	13%	98	0.04	15	$620	100%	100%	100%	68%	94%	66.5%	57.9%	57.9%	0.1
563	Shell	Attic Insulation - Average Insulation - Gas Heating	IQ Weatherproofing	MF	DI	778	2%	14	0.01	25	$1,225	100%	100%	100%	68%	55%	66.5%	57.9%	57.9%	0.0
564	Shell	Attic Insulation - Inadequate Insulation - Gas Heating	IQ Weatherproofing	MF	DI	778	3%	24	0.02	25	$1,225	100%	100%	100%	68%	89%	66.5%	57.9%	57.9%	0.0
565	Shell	Attic Insulation - Poor Insulation - Gas Heating	IQ Weatherproofing	MF	DI	778	7%	54	0.05	25	$1,225	100%	100%	100%	68%	94%	66.5%	57.9%	57.9%	0.1
566	Shell	Attic Hatch Scuttle	Home Weatherproofing	MF	Retrofit	10,314	0%	44	0.00	20	$7	100%	100%	25%	19%	94%	68.7%	59.8%	22.7%	3.5
567	Shell	Radiant Barrier - Heat pump	Home Weatherproofing	MF	Retrofit	5,005	5%	250	0.23	20	$1,700	100%	27%	25%	6%	55%	68.7%	23.4%	22.7%	0.9
568	Shell	Cool Roof - Heat pump	Home Weatherproofing	MF	Retrofit	5,005	-1%	-47	0.01	20	$765	100%	27%	25%	6%	33%	68.7%	23.4%	22.7%	0.0
569	Shell	ENERGY STAR Windows - Heat pump	Home Weatherproofing	MF	Retrofit	5,005	22%	1,101	0.69	25	$8,550	100%	27%	25%	6%	39%	68.7%	23.4%	22.7%	0.7
570	Shell	ENERGY STAR Windows - Heat pump	Home Weatherproofing	MF	MO	5,005	9%	450	0.28	25	$3,600	100%	27%	25%	6%	39%	68.7%	23.4%	22.7%	0.7
571	Shell	Basement Sidewall Insulation - Heat pump	Home Weatherproofing	MF	Retrofit	5,005	15%	753	-0.03	25	$690	50%	27%	25%	6%	85%	38.3%	23.4%	22.7%	1.9
572	Shell	Floor Insulation Above Crawlspace - Heat pump	Home Weatherproofing	MF	Retrofit	5,005	12%	585	-0.03	25	$690	35%	27%	25%	6%	88%	30.4%	23.4%	22.7%	1.4
573	Shell	Smart Window Coverings - Film/Transformer - Heat pump	Home Weatherproofing	MF	Retrofit	5,005	16%	776	0.49	7	$4,050	100%	27%	25%	6%	39%	68.7%	23.4%	22.7%	0.4
574	Shell	Radiant Barrier - Electric furnace	Home Weatherproofing	MF	Retrofit	10,314	5%	516	0.40	20	$1,700	50%	27%	25%	19%	55%	38.3%	23.4%	22.7%	1.7
575	Shell	Cool Roof - Electric furnace	Home Weatherproofing	MF	Retrofit	10,314	0%	-47	0.01	20	$765	100%	27%	25%	19%	33%	68.7%	23.4%	22.7%	0.0
576	Shell	ENERGY STAR Windows - Electric furnace	Home Weatherproofing	MF	Retrofit	10,314	22%	2,269	0.69	25	$8,550	100%	27%	25%	19%	39%	68.7%	23.4%	22.7%	1.0
577	Shell	ENERGY STAR Windows - Electric furnace	Home Weatherproofing	MF	MO	10,314	9%	928	0.28	25	$3,600	100%	27%	25%	19%	39%	68.7%	23.4%	22.7%	0.9
578	Shell	Basement Sidewall Insulation - Electric furnace	Home Weatherproofing	MF	Retrofit	10,314	11%	1,136	-0.04	25	$690	100%	27%	25%	19%	85%	68.7%	23.4%	22.7%	2.9
579	Shell	Floor Insulation Above Crawlspace - Electric furnace	Home Weatherproofing	MF	Retrofit	10,314	8%	848	-0.03	25	$690	75%	27%	25%	19%	88%	50.2%	23.4%	22.7%	2.2
580	Shell	Smart Window Coverings - Film/Transformer - Electric furnace	Home Weatherproofing	MF	Retrofit	10,314	16%	1,599	0.49	7	$4,050	100%	27%	25%	19%	39%	68.7%	23.4%	22.7%	0.6
581	Shell	ENERGY STAR Windows - Gas Heating	Home Weatherproofing	MF	Retrofit	778	22%	171	0.69	25	$8,550	100%	27%	25%	68%	39%	68.7%	23.4%	22.7%	0.5
582	Shell	ENERGY STAR Windows - Gas Heating	Home Weatherproofing	MF	MO	778	9%	70	0.28	25	$3,600	100%	27%	25%	68%	39%	68.7%	23.4%	22.7%	0.5
583	Shell	Basement Sidewall Insulation - Gas Heating	Home Weatherproofing	MF	Retrofit	778	-2%	-12	-0.03	25	$690	100%	27%	25%	68%	85%	68.7%	23.4%	22.7%	0.0
584	Shell	Floor Insulation Above Crawlspace - Gas Heating	Home Weatherproofing	MF	Retrofit	778	-5%	-38	-0.03	25	$690	100%	27%	25%	68%	88%	68.7%	23.4%	22.7%	0.0
585	Shell	Smart Window Coverings - Film/Transformer - Gas Heating	Home Weatherproofing	MF	Retrofit	778	16%	121	0.49	7	$4,050	100%	27%	25%	68%	39%	68.7%	23.4%	22.7%	0.3
586	Water Heating	Water Heater Temperature Setback	Home Weatherproofing	SF	Retrofit	3,460	2%	82	0.01	2	$5	50%	66%	25%	33%	54%	35.6%	36.9%	21.0%	1.9

Appendix B: Residential Energy Efficiency 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	MAP Incentive (%)	RAP Incentive (%)	PP Incentive (%)	Base Saturation	EE Saturation	MAP Adoption Rate	RAP Adoption Rate	PP Adoption Rate	UCT Score
587	Water Heating	Pipe Wrap	Home Weatherproofing	SF	Retrofit	3,460	1%	37	0.00	15	$1	100%	100%	25%	33%	17%	63.0%	54.8%	21.0%	12.9
588	Water Heating	Bathroom Aerator 1.0 gpm	Home Weatherproofing	SF	Retrofit	3,460	1%	36	0.00	10	$2	100%	100%	25%	123%	49%	63.0%	54.8%	21.0%	7.5
589	Water Heating	Bathroom Aerator 1.0 gpm	Online Energy Check-Up	SF	Retrofit	3,460	1%	36	0.00	10	$2	100%	100%	100%	123%	49%	63.0%	54.8%	54.8%	7.5
590	Water Heating	Bathroom Aerator 1.0 gpm	School Education	SF	Retrofit	3,460	1%	36	0.00	10	$2	100%	100%	100%	123%	49%	63.0%	54.8%	54.8%	7.5
591	Water Heating	Kitchen Flip Aerator 1.5 gpm	Home Weatherproofing	SF	Retrofit	3,460	5%	189	0.01	10	$2	100%	100%	25%	33%	49%	63.0%	54.8%	21.0%	36.8
592	Water Heating	Kitchen Flip Aerator 1.5 gpm	Online Energy Check-Up	SF	Retrofit	3,460	5%	189	0.01	10	$2	100%	100%	100%	33%	49%	63.0%	54.8%	54.8%	36.8
593	Water Heating	Kitchen Flip Aerator 1.5 gpm	School Education	SF	Retrofit	3,460	5%	189	0.01	10	$2	100%	100%	100%	33%	49%	63.0%	54.8%	54.8%	36.8
594	Water Heating	Low Flow Showerhead 1.5 gpm	Home Weatherproofing	SF	Retrofit	3,460	10%	360	0.02	5	$4	100%	100%	25%	53%	61%	63.0%	54.8%	21.0%	15.3
595	Water Heating	Low Flow Showerhead 1.5 gpm	Online Energy Check-Up	SF	Retrofit	3,460	10%	360	0.02	5	$4	100%	100%	100%	53%	61%	63.0%	54.8%	54.8%	15.3
596	Water Heating	Low Flow Showerhead 1.5 gpm	School Education	SF	Retrofit	3,460	10%	360	0.02	5	$4	100%	100%	100%	53%	61%	63.0%	54.8%	54.8%	15.3
597	Water Heating	Thermostatic Restrictor Shower Valve	Home Weatherproofing	SF	Retrofit	3,460	2%	78	0.01	10	$41	61%	61%	25%	53%	61%	40.1%	34.9%	21.0%	1.0
598	Water Heating	Heat Pump Water Heater-electric resistance heat	Home Energy Products	SF	MO	3,460	14%	499	0.07	10	$700	100%	50%	50%	33%	7%	63.0%	30.9%	30.9%	0.5
599	Water Heating	Heat Pump Water Heater-heat pump heat	Home Energy Products	SF	MO	3,460	60%	2,076	0.28	10	$700	100%	50%	50%	33%	7%	63.0%	30.9%	30.9%	2.3
600	Water Heating	Heat Pump Water Heater-gas heat	Home Energy Products	SF	MO	3,460	37%	1,297	0.18	10	$700	50%	50%	50%	33%	7%	35.6%	30.9%	30.9%	1.4
601	Water Heating	Water Heater Temperature Setback	IQ Weatherproofing	SF	DI	3,460	1%	25	0.00	2	$5	35%	66%	66%	33%	54%	25.6%	32.9%	32.9%	0.6
602	Water Heating	Pipe Wrap	IQ Weatherproofing	SF	DI	3,460	1%	48	0.01	15	$2	100%	100%	100%	33%	17%	62.1%	54.1%	54.1%	12.8
603	Water Heating	Bathroom Aerator 1.0 gpm	IQ Weatherproofing	SF	DI	3,460	1%	36	0.00	10	$2	100%	100%	100%	123%	49%	62.1%	54.1%	54.1%	7.5
604	Water Heating	Kitchen Flip Aerator 1.5 gpm	IQ Weatherproofing	SF	DI	3,460	5%	189	0.01	10	$2	100%	100%	100%	33%	49%	62.1%	54.1%	54.1%	36.8
605	Water Heating	Low Flow Showerhead 1.5 gpm	IQ Weatherproofing	SF	DI	3,460	10%	360	0.02	5	$4	100%	100%	100%	53%	61%	62.1%	54.1%	54.1%	15.3
606	Water Heating	Thermostatic Restrictor Shower Valve	IQ Weatherproofing	SF	DI	3,460	3%	87	0.01	10	$41	100%	61%	61%	53%	61%	62.1%	31.1%	31.1%	1.1
607	Water Heating	Heat Pump Water Heater-electric resistance heat	IQ Weatherproofing	SF	MO	3,460	14%	499	0.07	10	$1,500	100%	100%	100%	33%	7%	62.1%	54.1%	54.1%	0.1
608	Water Heating	Heat Pump Water Heater-heat pump heat	IQ Weatherproofing	SF	MO	3,460	60%	2,076	0.28	10	$1,500	100%	100%	100%	33%	7%	62.1%	54.1%	54.1%	0.5
609	Water Heating	Heat Pump Water Heater-gas heat	IQ Weatherproofing	SF	MO	3,460	37%	1,297	0.18	10	$1,000	100%	100%	100%	33%	7%	62.1%	54.1%	54.1%	0.5
610	Water Heating	Tankless Water Heater	HVAC Midstream	SF	MO	3,460	5%	166	0.00	20	$1,080	100%	66%	66%	33%	7%	63.0%	36.9%	36.9%	0.1
611	Water Heating	Smart Water Heater - Tank Controls and Sensors	HVAC Midstream	SF	Retrofit	3,460	15%	530	0.21	10	$120	100%	66%	66%	33%	7%	63.0%	36.9%	36.9%	4.0
612	Water Heating	Water Heater Timer	Home Weatherproofing	SF	Retrofit	3,460	9%	318	0.04	15	$60	100%	66%	25%	33%	8%	63.0%	36.9%	21.0%	4.0
613	Water Heating	Water Heater Wrap	IQ Weatherproofing	SF	Retrofit	3,460	2%	80	0.01	5	$20	35%	66%	66%	33%	7%	28.1%	36.9%	36.9%	1.1
614	Water Heating	Drain water Heat Recovery	Home Weatherproofing	SF	Retrofit	3,460	26%	884	0.10	20	$742	35%	66%	25%	33%	1%	28.1%	36.9%	21.0%	1.1
615	Water Heating	Shower Timer	Home Weatherproofing	SF	Retrofit	3,460	2%	54	0.01	2	$5	35%	66%	66%	53%	8%	28.1%	36.9%	36.9%	1.2
616	Water Heating	Water Heater Temperature Setback	Home Weatherproofing	SF	NC	3,460	2%	82	0.01	2	$5	50%	66%	25%	33%	0%	35.6%	36.9%	21.0%	1.9
617	Water Heating	Pipe Wrap	Home Weatherproofing	SF	NC	3,460	1%	37	0.00	15	$1	100%	66%	25%	33%	0%	63.0%	36.9%	21.0%	19.6
618	Water Heating	Bathroom Aerator 1.0 gpm	Online Energy Check-Up	SF	NC	3,460	1%	36	0.00	10	$2	100%	100%	100%	123%	0%	63.0%	54.8%	54.8%	7.5
619	Water Heating	Kitchen Flip Aerator 1.5 gpm	Online Energy Check-Up	SF	NC	3,460	5%	189	0.01	10	$2	100%	100%	100%	33%	0%	63.0%	54.8%	54.8%	36.8
620	Water Heating	Low Flow Showerhead 1.5 gpm	Online Energy Check-Up	SF	NC	3,460	10%	360	0.02	5	$4	100%	100%	100%	53%	0%	63.0%	54.8%	54.8%	15.3
621	Water Heating	Thermostatic Restrictor Shower Valve	Online Energy Check-Up	SF	NC	3,460	2%	78	0.01	10	$41	61%	61%	61%	53%	0%	40.1%	34.9%	34.9%	1.0
622	Water Heating	Heat Pump Water Heater-heat pump heat	Home Energy Products	SF	NC	3,460	60%	2,076	0.28	10	$700	100%	50%	50%	33%	0%	63.0%	30.9%	30.9%	2.3
623	Water Heating	Heat Pump Water Heater-gas heat	Home Energy Products	SF	NC	3,460	37%	1,297	0.18	10	$700	50%	50%	50%	33%	0%	35.6%	30.9%	30.9%	1.4
624	Water Heating	Tankless Water Heater	HVAC Midstream	SF	NC	3,460	5%	166	0.00	20	$1,080	100%	66%	66%	33%	0%	63.0%	36.9%	36.9%	0.1
625	Water Heating	Smart Water Heater - Tank Controls and Sensors	HVAC Midstream	SF	NC	3,460	15%	530	0.21	10	$120	100%	66%	66%	33%	0%	63.0%	36.9%	36.9%	4.0
626	Water Heating	Water Heater Timer	Home Weatherproofing	SF	NC	3,460	9%	318	0.04	15	$60	100%	66%	25%	33%	0%	63.0%	36.9%	21.0%	4.0
627	Water Heating	Drain water Heat Recovery	Home Weatherproofing	SF	NC	3,460	26%	884	0.10	20	$742	35%	66%	25%	33%	0%	28.1%	36.9%	21.0%	1.1
628	Water Heating	Shower Timer	Home Weatherproofing	SF	NC	3,460	2%	54	0.01	2	$5	35%	66%	66%	53%	0%	28.1%	36.9%	36.9%	1.2
629	Water Heating	Water Heater Temperature Setback	Home Weatherproofing	MF	Retrofit	2,595	3%	82	0.01	2	$5	50%	66%	25%	56%	54%	35.6%	36.9%	21.0%	1.9
630	Water Heating	Pipe Wrap	Home Weatherproofing	MF	Retrofit	2,595	1%	37	0.00	15	$1	100%	100%	25%	56%	17%	63.0%	54.8%	21.0%	12.9
631	Water Heating	Bathroom Aerator 1.0 gpm	Home Weatherproofing	MF	Retrofit	2,595	1%	36	0.00	10	$2	100%	100%	25%	160%	38%	63.0%	54.8%	21.0%	7.5
632	Water Heating	Bathroom Aerator 1.0 gpm	Online Energy Check-Up	MF	Retrofit	2,595	1%	36	0.00	10	$2	100%	100%	100%	160%	38%	63.0%	54.8%	54.8%	7.5
633	Water Heating	Bathroom Aerator 1.0 gpm	School Education	MF	Retrofit	2,595	1%	36	0.00	10	$2	100%	100%	100%	160%	38%	63.0%	54.8%	54.8%	7.5
634	Water Heating	Kitchen Flip Aerator 1.5 gpm	Home Weatherproofing	MF	Retrofit	2,595	7%	189	0.01	10	$2	100%	100%	25%	56%	38%	63.0%	54.8%	21.0%	36.8
635	Water Heating	Kitchen Flip Aerator 1.5 gpm	Online Energy Check-Up	MF	Retrofit	2,595	7%	189	0.01	10	$2	100%	100%	100%	56%	38%	63.0%	54.8%	54.8%	36.8
636	Water Heating	Kitchen Flip Aerator 1.5 gpm	School Education	MF	Retrofit	2,595	7%	189	0.01	10	$2	100%	100%	100%	56%	38%	63.0%	54.8%	54.8%	36.8
637	Water Heating	Low Flow Showerhead 1.5 gpm	Home Weatherproofing	MF	Retrofit	2,595	14%	360	0.02	5	$4	100%	100%	25%	74%	51%	63.0%	54.8%	21.0%	15.3
638	Water Heating	Low Flow Showerhead 1.5 gpm	Online Energy Check-Up	MF	Retrofit	2,595	14%	360	0.02	5	$4	100%	100%	100%	74%	51%	63.0%	54.8%	54.8%	15.3
639	Water Heating	Low Flow Showerhead 1.5 gpm	School Education	MF	Retrofit	2,595	14%	360	0.02	5	$4	100%	100%	100%	74%	51%	63.0%	54.8%	54.8%	15.3
640	Water Heating	Thermostatic Restrictor Shower Valve	Home Weatherproofing	MF	Retrofit	2,595	3%	78	0.01	10	$41	61%	61%	25%	74%	51%	40.1%	34.9%	21.0%	1.0
641	Water Heating	Heat Pump Water Heater-electric resistance heat	Home Energy Products	MF	MO	2,595	19%	499	0.07	10	$700	100%	50%	50%	56%	7%	63.0%	30.9%	30.9%	0.5
642	Water Heating	Heat Pump Water Heater-heat pump heat	Home Energy Products	MF	MO	2,595	80%	2,076	0.28	10	$700	100%	50%	50%	56%	7%	63.0%	30.9%	30.9%	2.3
643	Water Heating	Heat Pump Water Heater-gas heat	Home Energy Products	MF	MO	2,595	50%	1,297	0.18	10	$700	50%	50%	50%	56%	7%	35.6%	30.9%	30.9%	1.4
644	Water Heating	Water Heater Temperature Setback	IQ Weatherproofing	MF	DI	2,595	1%	25	0.00	2	$5	35%	66%	66%	56%	54%	25.6%	32.9%	32.9%	0.6
645	Water Heating	Pipe Wrap	IQ Weatherproofing	MF	DI	2,595	2%	48	0.01	15	$2	100%	100%	100%	56%	17%	62.1%	54.1%	54.1%	12.8
646	Water Heating	Bathroom Aerator 1.0 gpm	IQ Weatherproofing	MF	DI	2,595	1%	36	0.00	10	$2	100%	100%	100%	160%	38%	62.1%	54.1%	54.1%	7.5
647	Water Heating	Kitchen Flip Aerator 1.5 gpm	IQ Weatherproofing	MF	DI	2,595	7%	189	0.01	10	$2	100%	100%	100%	56%	38%	62.1%	54.1%	54.1%	36.8
648	Water Heating	Low Flow Showerhead 1.5 gpm	IQ Weatherproofing	MF	DI	2,595	14%	360	0.02	5	$4	100%	100%	100%	74%	51%	62.1%	54.1%	54.1%	15.3
649	Water Heating	Thermostatic Restrictor Shower Valve	IQ Weatherproofing	MF	DI	2,595	3%	87	0.01	10	$41	100%	61%	61%	74%	51%	62.1%	31.1%	31.1%	1.1
650	Water Heating	Heat Pump Water Heater-electric resistance heat	IQ Weatherproofing	MF	MO	2,595	19%	499	0.07	10	$1,500	100%	100%	100%	56%	7%	62.1%	54.1%	54.1%	0.1
651	Water Heating	Heat Pump Water Heater-heat pump heat	IQ Weatherproofing	MF	MO	2,595	80%	2,076	0.28	10	$1,500	100%	100%	100%	56%	7%	62.1%	54.1%	54.1%	0.5
652	Water Heating	Heat Pump Water Heater-gas heat	IQ Weatherproofing	MF	MO	2,595	50%	1,297	0.18	10	$1,000	100%	100%	100%	56%	7%	62.1%	54.1%	54.1%	0.5
653	Water Heating	Tankless Water Heater	HVAC Midstream	MF	MO	2,595	5%	125	0.00	20	$1,080	100%	66%	66%	56%	7%	63.0%	36.9%	36.9%	0.1

Appendix B: Residential Energy Efficiency 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	MAP Incentive (%)	RAP Incentive (%)	PP Incentive (%)	Base Saturation	EE Saturation	MAP Adoption Rate	RAP Adoption Rate	PP Adoption Rate	UCT Score
654	Water Heating	Smart Water Heater - Tank Controls and Sensors	HVAC Midstream	MF	Retrofit	2,595	15%	399	0.16	10	$120	100%	66%	66%	56%	7%	63.0%	36.9%	36.9%	3.0
655	Water Heating	Water Heater Timer	Home Weatherproofing	MF	Retrofit	2,595	9%	240	0.03	15	$60	100%	66%	25%	56%	8%	63.0%	36.9%	21.0%	3.0
656	Water Heating	Water Heater Wrap	IQ Weatherproofing	MF	Retrofit	2,595	2%	61	0.01	5	$20	100%	66%	66%	56%	7%	63.0%	36.9%	36.9%	0.8
657	Water Heating	Drain water Heat Recovery	Home Weatherproofing	MF	Retrofit	2,595	26%	666	0.08	20	$742	100%	66%	25%	56%	1%	63.0%	36.9%	21.0%	0.8
658	Water Heating	Shower Timer	Home Weatherproofing	MF	Retrofit	2,595	2%	57	0.01	2	$5	35%	66%	66%	79%	8%	28.1%	36.9%	36.9%	1.3
659	Water Heating	Water Heater Temperature Setback	Home Weatherproofing	MF	NC	2,595	3%	82	0.01	2	$5	50%	66%	25%	56%	0%	35.6%	36.9%	21.0%	1.9
660	Water Heating	Pipe Wrap	Home Weatherproofing	MF	NC	2,595	1%	37	0.00	15	$1	100%	66%	25%	56%	0%	63.0%	36.9%	21.0%	19.6
661	Water Heating	Bathroom Aerator 1.0 gpm	Online Energy Check-Up	MF	NC	2,595	1%	36	0.00	10	$2	100%	100%	100%	160%	0%	63.0%	54.8%	54.8%	7.5
662	Water Heating	Kitchen Flip Aerator 1.5 gpm	Online Energy Check-Up	MF	NC	2,595	7%	189	0.01	10	$2	100%	100%	100%	56%	0%	63.0%	54.8%	54.8%	36.8
663	Water Heating	Low Flow Showerhead 1.5 gpm	Online Energy Check-Up	MF	NC	2,595	14%	360	0.02	5	$4	100%	100%	100%	74%	0%	63.0%	54.8%	54.8%	15.3
664	Water Heating	Thermostatic Restrictor Shower Valve	Online Energy Check-Up	MF	NC	2,595	3%	78	0.01	10	$41	61%	61%	61%	74%	0%	40.1%	34.9%	34.9%	1.0
665	Water Heating	Heat Pump Water Heater-heat pump heat	Home Energy Products	MF	NC	2,595	80%	2,076	0.28	10	$700	100%	50%	50%	56%	0%	63.0%	30.9%	30.9%	2.3
666	Water Heating	Heat Pump Water Heater-gas heat	Home Energy Products	MF	NC	2,595	50%	1,297	0.18	10	$700	50%	50%	50%	56%	0%	35.6%	30.9%	30.9%	1.4
667	Water Heating	Tankless Water Heater	HVAC Midstream	MF	NC	2,595	5%	125	0.00	20	$1,080	100%	66%	66%	56%	0%	63.0%	36.9%	36.9%	0.1
668	Water Heating	Smart Water Heater - Tank Controls and Sensors	HVAC Midstream	MF	NC	2,595	15%	399	0.16	10	$120	100%	66%	66%	56%	0%	63.0%	36.9%	36.9%	3.0
669	Water Heating	Water Heater Timer	Home Weatherproofing	MF	NC	2,595	9%	240	0.03	15	$60	100%	66%	25%	56%	0%	63.0%	36.9%	21.0%	3.0
670	Water Heating	Drain water Heat Recovery	Home Weatherproofing	MF	NC	2,595	26%	666	0.08	20	$742	100%	66%	25%	56%	0%	63.0%	36.9%	21.0%	0.8
671	Water Heating	Shower Timer	Home Weatherproofing	MF	NC	2,595	2%	57	0.01	2	$5	35%	66%	66%	79%	0%	28.1%	36.9%	36.9%	1.3
672	Electric Vehicle Charging	L2 ESVE	No program	SF	Retrofit	2,733	31%	836	0.00	10	$900	100%	66%	66%	2%	20%	62.1%	37.6%	37.6%	0.4
673	Electric Vehicle Charging	L2 ESVE	No program	SF	NC	2,733	31%	836	0.00	10	$900	100%	66%	66%	2%	0%	62.1%	37.6%	37.6%	0.4

APPENDIX C: COMMERCIAL & INDUSTRIAL ENERGY EFFICIENCY DETAIL

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Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	Base (Existing) Annual Electric	Base (Standard) Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	MAP Incentive (%)	RAP Incentive (%)	PP Incentive (%)	End Use Measure Group	Base Saturation	EE Saturation	MAP Adoption Rate	RAP Adoption Rate	PP Adoption Rate	UCT Score
1	Cooking	Commercial Combination Oven (Electric)	Biz-Prescriptive	Education	ROB	38,561	38,561	48%	18,432	0.00	12	$16,884	50%	6%	3%	1	17%	53%	62.4%	62.4%	62.4%	9.8
2	Cooking	Commercial Electric Convection Oven	Biz-Prescriptive	Education	ROB	12,193	12,193	15%	1,879	0.00	12	$1,706	50%	15%	11%	1	17%	53%	62.4%	62.4%	62.4%	4.1
3	Cooking	Commercial Electric Griddle	Biz-Prescriptive	Education	ROB	17,056	17,056	15%	2,596	0.00	12	$3,604	25%	7%	7%	2	14%	53%	62.4%	62.4%	62.4%	4.3
4	Cooking	Commercial Electric Steam Cooker	Biz-Prescriptive	Education	ROB	19,549	19,549	67%	13,162	0.00	12	$3,500	100%	12%	14%	3	6%	42%	68.6%	53.6%	53.6%	16.4
5	Cooking	Dishwasher Low Temp Door (Energy Star)	Biz-Prescriptive	Education	ROB	39,279	39,279	41%	16,153	0.00	15	$770	100%	49%	65%	4	26%	61%	68.8%	68.8%	68.8%	19.7
6	Cooking	Dishwasher High Temp Door (Energy Star)	Biz-Prescriptive	Education	ROB	39,825	39,825	30%	11,853	0.00	15	$770	100%	49%	65%	4	26%	61%	68.8%	68.8%	68.8%	14.5
7	Cooking	Energy efficient electric fryer	Biz-Prescriptive	Education	ROB	18,182	18,182	14%	2,572	0.00	12	$1,706	50%	1%	15%	5	27%	23%	55.0%	39.3%	40.7%	99.9
8	Cooking	Insulated Holding Cabinets (Full Size)	Biz-Prescriptive	Education	ROB	7,665	7,665	69%	5,278	0.00	12	$1,200	100%	6%	42%	6	3%	23%	68.6%	52.4%	54.9%	33.1
9	Cooking	Insulated Holding Cabinets (Half-Size)	Biz-Prescriptive	Education	ROB	3,066	3,066	58%	1,788	0.00	12	$1,500	50%	8%	12%	6	3%	23%	52.9%	38.7%	39.1%	7.0
10	HotWater	Faucet Aerator	Biz-Custom	Education	Retro	1,624	1,624	66%	1,070	0.00	10	$3	100%	26%	100%	4	25%	80%	84.0%	84.0%	84.0%	606.3
11	HotWater	Heat Pump Water Heater	Biz-Custom	Education	ROB	5,415	5,415	35%	1,871	0.00	10	$1,574	25%	6%	5%	1	100%	9%	52.5%	43.4%	43.2%	6.3
12	HotWater	Hot Water Pipe Insulation	Biz-Custom	Education	Retro	5,415	5,415	2%	108	0.00	20	$60	100%	9%	7%	2	100%	80%	84.0%	84.0%	84.0%	11.7
13	HotWater	Low Flow Pre-Rinse Sprayers	Biz-Custom	Education	ROB	2,991	2,991	26%	764	0.00	5	$35	100%	71%	87%	3	25%	80%	84.0%	84.0%	84.0%	6.8
14	HotWater	ENERGY STAR Commercial Washing Machines	Biz-Custom	Education	ROB	1,552	1,552	43%	671	0.00	7	$250	50%	14%	11%	5	25%	35%	66.5%	53.7%	53.3%	4.1
15	HotWater	Ozone Commercial Laundry	Biz-Custom	Education	Retro	2,984	2,984	25%	746	0.00	10	$20,310	0%	0%	0%	6	0%	50%	60.0%	60.0%	60.0%	5.3
16	InteriorLighting	LED T8 Tube Replacement	Biz-Prescriptive Light	Education	Retro	138	138	59%	82	0.00	15	$7	100%	49%	49%	1	85%	32%	71.1%	60.5%	60.5%	12.8
17	InteriorLighting	LED troffer retrofit kit, 2'X2' and 2'X4'	Biz-Prescriptive Light	Education	Retro	310	310	50%	155	0.00	18	$67	100%	26%	9%	1	85%	32%	71.1%	52.9%	50.8%	5.8
18	InteriorLighting	LED troffer, 2'X2' and 2'X4'	Biz-Prescriptive Light	Education	Retro	223	223	50%	112	0.00	18	$67	100%	26%	7%	1	85%	32%	71.1%	49.3%	45.8%	4.2
19	InteriorLighting	LED high bay fixture	Biz-Prescriptive Light	Education	Retro	1,080	1,080	76%	821	0.00	12	$323	100%	12%	10%	2	1%	16%	71.1%	52.5%	52.2%	10.8
20	InteriorLighting	LED Mogul-base HID Lamp Replacing High Bay HID	Biz-Prescriptive Light	Education	Retro	1,080	1,080	79%	855	0.00	12	$110	100%	21%	31%	2	1%	16%	71.1%	58.8%	59.2%	19.6
21	InteriorLighting	LED low bay fixture	Biz-Prescriptive Light	Education	Retro	1,080	1,080	76%	821	0.00	12	$196	100%	20%	17%	3	1%	16%	71.1%	56.5%	56.2%	10.8
22	InteriorLighting	LED Mogul-base HID Lamp Replacing Low Bay HID	Biz-Prescriptive Light	Education	Retro	1,080	1,080	79%	855	0.00	12	$60	100%	38%	57%	3	1%	16%	71.1%	60.6%	61.0%	19.6
23	InteriorLighting	LED downlight, screwin lamp, 1-3W, interior Average 2 Watts	Biz-Prescriptive Light	Education	ROB	67	67	88%	59	0.00	4	$4	100%	25%	59%	4	2%	32%	71.1%	60.3%	61.0%	10.4
24	InteriorLighting	LED downlight fixture	Biz-Prescriptive Light	Education	Retro	174	174	82%	142	0.00	4	$13	100%	39%	44%	5	11%	32%	71.1%	60.2%	60.3%	5.0
25	InteriorLighting	LED downlight, screwin lamp, 4-20W, interior Average 11 Watts	Biz-Prescriptive Light	Education	ROB	134	134	84%	113	0.00	4	$2	100%	61%	100%	5	11%	32%	71.1%	61.7%	61.9%	20.0
26	InteriorLighting	DeLamp Fluorescent Fixture Average Lamp Wattage 28W	Biz-Custom Light	Education	Retro	53	53	100%	53	0.00	15	$4	100%	69%	53%	6	85%	0%	71.1%	61.1%	60.8%	11.2
27	InteriorLighting	Daylighting Controls	Biz-Custom Light	Education	Retro	8,810	8,810	30%	2,643	0.00	12	$3,000	25%	5%	4%	7	85%	8%	48.3%	39.1%	39.0%	10.0
28	InteriorLighting	Occupancy Sensors	Biz-Prescriptive Light	Education	Retro	1,523	1,523	30%	457	0.00	8	$54	100%	37%	34%	7	85%	8%	71.1%	59.3%	59.2%	5.9
29	InteriorLighting	Central Lighting Monitoring & Controls (non-networked)	Biz-Custom Light	Education	Retro	41,703	41,703	20%	8,341	0.00	12	$3,700	100%	12%	17%	7	85%	8%	71.1%	50.8%	51.5%	9.5
30	InteriorLighting	Network Lighting Controls - Wireless (WiFi)	Biz-Custom Light	Education	Retro	16,277	16,277	47%	7,650	0.00	8	$1,683	100%	24%	34%	7	85%	8%	71.1%	56.9%	57.6%	6.8
31	InteriorLighting	Bi-Level Lighting Fixture – Stairwells, Hallways, and Garages	Biz-Custom Light	Education	Retro	1,034	1,034	50%	517	0.00	10	$274	50%	10%	8%	8	15%	8%	62.0%	47.4%	47.1%	7.2
32	InteriorLighting	LED Exit Sign - 4 Watt Fixture (2 lamp)	Biz-Prescriptive Light	Education	Retro	236	236	85%	201	0.00	15	$60	100%	8%	13%	9	1%	75%	80.0%	80.0%	80.0%	20.4
33	ExteriorLighting	LED wallpack (existing W<250)	Biz-Prescriptive Light	Education	Retro	856	856	66%	567	0.00	12	$248	50%	10%	9%	1	13%	46%	62.7%	56.8%	56.8%	6.6
34	ExteriorLighting	LED parking lot fixture (existing W≥250)	Biz-Prescriptive Light	Education	Retro	1,589	1,589	60%	959	0.00	12	$756	25%	3%	5%	2	13%	41%	52.8%	52.8%	52.8%	11.2
35	ExteriorLighting	LED parking lot fixture (existing W<250)	Biz-Prescriptive Light	Education	Retro	856	856	66%	567	0.00	12	$248	50%	10%	9%	3	13%	41%	62.7%	52.8%	52.8%	6.6
36	ExteriorLighting	LED fuel pump canopy fixture (existing W<250)	Biz-Prescriptive Light	Education	Retro	0	0	0%	0	0.00	12	$0	0%	0%		4	0%	41%	71.1%	61.9%	61.9%	0.0
37	ExteriorLighting	LED fuel pump canopy fixture (existing W≥250)	Biz-Prescriptive Light	Education	Retro	0	0	0%	0	0.00	12	$0	0%	0%		5	0%	41%	71.1%	61.9%	61.9%	0.0
38	ExteriorLighting	LED outdoor pole decorative fixture (existing W≥250)	Biz-Prescriptive Light	Education	Retro	1,589	1,589	60%	959	0.00	12	$756	25%	3%	5%	6	13%	41%	52.8%	52.8%	52.8%	11.2
39	ExteriorLighting	LED parking garage fixture (existing W≥250)	Biz-Prescriptive Light	Education	Retro	3,235	3,235	60%	1,953	0.00	6	$756	25%	3%	10%	7	13%	41%	60.2%	52.8%	52.8%	11.8
40	ExteriorLighting	LED parking garage fixture (existing W<250)	Biz-Prescriptive Light	Education	Retro	1,742	1,742	66%	1,154	0.00	6	$248	50%	10%	19%	8	13%	41%	66.7%	55.4%	56.0%	7.0
41	ExteriorLighting	LED Mogul-base HID Lamp Replacing Exterior HID (existing W≥250)	Biz-Prescriptive Light	Education	Retro	1,589	1,589	60%	959	0.00	12	$756	25%	3%	5%	9	13%	41%	52.8%	52.8%	52.8%	11.2
42	ExteriorLighting	LED Mogul-base HID Lamp Replacing Exterior HID (existing W<250)	Biz-Prescriptive Light	Education	Retro	856	856	66%	567	0.00	12	$248	50%	10%	9%	10	13%	41%	62.7%	52.8%	52.8%	6.6
43	Cooling	Air Conditioner - 16 SEER (5-20 Tons)	Biz-Prescriptive	Education	ROB	5,057	5,057	13%	632	0.00	15	$3,570	25%	5%	2%	1	23%	20%	36.0%	34.1%	34.1%	7.6
44	Cooling	Air Conditioner - 17 SEER (5-20 Tons)	Biz-Prescriptive	Education	ROB	5,057	5,057	13%	632	0.00	15	$4,760	25%	5%	1%	1	23%	20%	36.0%	34.1%	34.1%	5.7
45	Cooling	Air Conditioner - 18 SEER (5-20 Tons)	Biz-Prescriptive	Education	ROB	5,057	5,057	19%	953	0.00	15	$5,960	25%	5%	2%	1	23%	20%	36.0%	34.1%	34.1%	6.9
46	Cooling	Air Conditioner - 21 SEER (5-20 Tons)	Biz-Prescriptive	Education	ROB	5,057	5,057	24%	1,230	0.00	15	$9,080	25%	5%	1%	1	23%	20%	36.0%	34.1%	34.1%	5.8
47	Cooling	Air Conditioner - 16 SEER (20+ Tons)	Biz-Prescriptive	Education	ROB	10,298	10,298	8%	858	0.00	15	$7,140	25%	5%	1%	2	23%	20%	36.0%	34.1%	34.1%	5.2
48	Cooling	Air Conditioner - 17 SEER (20+ Tons)	Biz-Prescriptive	Education	ROB	10,298	10,298	8%	858	0.00	15	$9,520	5%	5%	1%	2	23%	20%	36.0%	34.1%	34.1%	3.9
49	Cooling	Air Conditioner - 18 SEER (20+ Tons)	Biz-Prescriptive	Education	ROB	10,298	10,298	15%	1,584	0.00	15	$11,920	25%	5%	1%	2	23%	20%	36.0%	34.1%	34.1%	5.7
50	Cooling	Air Conditioner - 21 SEER (20+ Tons)	Biz-Prescriptive	Education	ROB	10,298	10,298	21%	2,207	0.00	15	$18,160	25%	5%	1%	2	23%	20%	36.0%	34.1%	34.1%	5.2
51	Cooling	Comprehensive Rooftop Unit Quality Maintenance (AC Tune-up)	Biz-Custom	Education	Retro	27,878	27,878	6%	1,762	0.00	3	$500	100%	18%	26%	3	47%	50%	63.2%	60.0%	60.0%	7.3
52	Cooling	Air Side Economizer	Biz-Custom	Education	Retro	2,832	2,832	3%	82	0.00	5	$170	3%	3%	4%	4	47%	33%	46.4%	44.8%	44.8%	3.4
53	Cooling	Advanced Rooftop Controls	Biz-Custom	Education	Retro	2,360	2,360	39%	925	0.00	10	$3,412	25%	1%	2%	5	47%	3%	22.0%	19.7%	19.7%	22.1
54	Cooling	Air Conditioner - 16 SEER (<5 Tons)	Biz-Prescriptive	Education	ROB	2,178	2,178	19%	408	0.00	15	$1,785	25%	5%	2%	6	2%	20%	36.0%	34.1%	34.1%	9.8
55	Cooling	Air Conditioner - 17 SEER (<5 Tons)	Biz-Prescriptive	Education	ROB	2,178	2,178	24%	513	0.00	15	$2,380	25%	5%	2%	6	2%	20%	36.0%	34.1%	34.1%	9.2
56	Cooling	Air Conditioner - 18 SEER(<5 Tons)	Biz-Prescriptive	Education	ROB	2,178	2,178	28%	605	0.00	15	$2,980	25%	5%	2%	6	2%	20%	36.0%	34.1%	34.1%	8.7
57	Cooling	Air Conditioner - 21 SEER(<5 Tons)	Biz-Prescriptive	Education	ROB	2,178	2,178	38%	830	0.00	15	$4,540	25%	5%	2%	6	2%	20%	36.0%	34.1%	34.1%	7.8
58	Cooling	Centrifugal Chiller - Average kW/Ton = 0.626	Biz-Custom	Education	ROB	17,005	17,005	26%	4,460	0.00	20	$10,067	25%	2%	3%	7	27%	20%	36.0%	34.7%	34.8%	21.7
59	Cooling	Reciprocating Chiller - Average kW/Ton = 0.99	Biz-Custom	Education	ROB	20,908	20,908	27%	5,576	0.00	20	$8,071	100%	4%	5%	8	23%	20%	63.2%	36.0%	36.0%	35.0
60	Cooling	Screw Chiller - Average kW/Ton = 0.675	Biz-Custom	Education	ROB	24,418	24,418	23%	5,601	0.00	20	$8,055	100%	4%	5%	9	0%	20%	63.2%	36.0%	36.0%	34.5
61	Cooling	HVAC/Chiller Custom	Biz-Custom	Education	Retro	5	5	20%	1	0.00	12	$1	50%	6%	9%	10	50%	20%	42.7%	36.0%	36.0%	8.3
62	Cooling	Chiller Tune-up	Biz-Custom	Education	Retro	33,450	33,450	8%	2,676	0.00	5	$836	100%	17%	24%	11	50%	50%	63.2%	60.0%	60.0%	8.8
63	Cooling	PTAC - <7,000 Btuh - lodging	Biz-Prescriptive	Education	ROB	238	238	9%	22	0.00	15	$22	100%	50%	10%	12	0%	20%	63.2%	40.5%	36.0%	4.2
64	Cooling	PTAC - 7,000 to 15,000 Btuh - lodging	Biz-Prescriptive	Education	ROB	529	529	9%	49	0.00	15	$41	100%	50%	12%	13	0%	20%	63.2%	43.0%	36.0%	5.1
65	Cooling	PTAC - >15,000 Btuh - lodging	Biz-Prescriptive	Education	ROB	894	894	10%	85	0.00	15	$56	100%	50%	15%	14	0%	20%	63.2%	45.2%	39.4%	6.5
66	Cooling	HVAC Occupancy Controls	Biz-Custom	Education	ROB	1,012	1,012	20%	202	0.00	15	$538	2%	2%	0%	15	47%	25%	40.0%	38.2%	38.2%	8.9
67	Cooling	Smart Thermostat	Biz-Custom	Education	ROB	2,749	2,749	18%	486	0.00	10	$128	100%	20%	15%	16	57%	9%	63.2%	45.2%	44.7%	6.7
68	Cooling	Window Film	Biz-Custom	Education	Retro	27,878	0	5%	1,311	0.00	10	$1,092	75%	6%	5%	17	100%	25%	53.5%	40.0%	40.0%	14.1
69	Cooling	Energy Recovery Ventilator	Biz-Custom	Education	Retro	2	2	50%	1	0.00	20	$1	75%	8%	12%	18	100%	5%	54.9%	33.4%	33.7%	11.5
70	Heating	Heat Pump - 16 SEER (<5 Tons)	Biz-Prescriptive	Education	ROB	12,230	12,230	19%	2,313	0.00	15	$2,055	75%	20%	11%	1	2%	20%	53.4%	36.0%	36.0%	3.8
71	Heating	Heat Pump - 17 SEER (<5 Tons)	Biz-Prescriptive	Education	ROB	12,230	12,230	21%	2,585	0.00	15	$2,740	50%	20%	9%	1	2%	20%	42.5%	36.0%	36.0%	3.4
72	Heating	Heat Pump - 18 SEER(<5 Tons)	Biz-Prescriptive	Education	ROB	12,230	12,230	24%	2,917	0.00	15	$3,425	50%	20%	9%	1	2%	20%	40.7%	36.0%	36.0%	3.1
73	Heating	Heat Pump - 21 SEER(<5 Tons)	Biz-Prescriptive	Education	ROB	12,230	12,230	27%	3,294	0.00	15	$4,500	50%	20%	7%	1	2%	20%	38.8%	36.0%	36.0%	3.0
74	Heating	Geothermal HP - SEER 20.3 (<5 Tons)	Biz-Prescriptive	Education	ROB	12,230	12,230	36%	4,412	0.00	15	$4,700	50%	11%	9%	1	2%	20%	42.0%	36.0%	36.0%	6.0
75	Heating	Geothermal HP - SEER 21.5 (<5 Tons)	Biz-Prescriptive	Education	ROB	12,230	12,230	40%	4,945	0.00	15	$4,700	50%	11%	11%	1	2%	20%	44.0%	36.0%	36.0%	6.7

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Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	Base (Existing) Annual Electric	Base (Standard) Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	MAP Incentive (%)	RAP Incentive (%)	PP Incentive (%)	End Use Measure Group	Base Saturation	EE Saturation	MAP Adoption Rate	RAP Adoption Rate	PP Adoption Rate	UCT Score
76	Heating	Geothermal HP - SEER 23.1 (<5 Tons)	Biz-Prescriptive	Education	ROB	12,230	12,230	46%	5,627	0.00	15	$7,300	50%	7%	7%	1	2%	20%	38.5%	36.0%	36.0%	7.6
77	Heating	Geothermal HP - SEER 29.3 (<5 Tons)	Biz-Prescriptive	Education	ROB	12,230	12,230	48%	5,909	0.00	15	$9,200	25%	8%	5%	1	2%	20%	36.0%	36.0%	36.0%	5.2
78	Heating	Heat Pump - 16 SEER (5-20 Tons)	Biz-Prescriptive	Education	ROB	51,966	51,966	9%	4,648	0.00	15	$4,110	50%	20%	11%	2	42%	20%	44.5%	36.0%	36.0%	3.5
79	Heating	Heat Pump - 17 SEER (5-20 Tons)	Biz-Prescriptive	Education	ROB	51,966	51,966	13%	6,901	0.00	15	$5,480	50%	20%	9%	2	42%	20%	45.3%	36.0%	36.0%	3.4
80	Heating	Heat Pump - 18 SEER (5-20 Tons)	Biz-Prescriptive	Education	ROB	51,966	51,966	19%	10,124	0.00	15	$6,850	75%	20%	7%	2	42%	20%	54.7%	36.0%	36.0%	4.0
81	Heating	Heat Pump - 21 SEER (5-20 Tons)	Biz-Prescriptive	Education	ROB	51,966	51,966	25%	12,917	0.00	15	$9,000	75%	20%	6%	2	42%	20%	54.5%	36.0%	36.0%	3.9
82	Heating	Geothermal HP - SEER 20.3 (5-20 Tons)	Biz-Prescriptive	Education	ROB	18,897	18,897	17%	3,205	0.00	15	$7,700	50%	6%	4%	2	42%	20%	37.2%	36.0%	36.0%	10.2
83	Heating	Geothermal HP - SEER 21.5 (5-20 Tons)	Biz-Prescriptive	Education	ROB	18,897	18,897	23%	4,273	0.00	15	$10,300	50%	5%	4%	2	42%	20%	36.1%	36.0%	36.0%	11.6
84	Heating	Geothermal HP - SEER 23.1 (5-20 Tons)	Biz-Prescriptive	Education	ROB	18,897	18,897	30%	5,643	0.00	15	$12,800	50%	4%	4%	2	42%	20%	36.0%	36.0%	36.0%	13.4
85	Heating	Geothermal HP - SEER 29.3 (5-20 Tons)	Biz-Prescriptive	Education	ROB	18,897	18,897	33%	6,215	0.00	15	$17,700	25%	4%	3%	2	42%	20%	36.0%	36.0%	36.0%	10.4
86	Heating	Heat Pump - 16 SEER (20+ Tons)	Biz-Prescriptive	Education	ROB	107,048	107,048	11%	11,823	0.00	15	$8,220	50%	20%	6%	3	42%	20%	47.0%	36.0%	36.0%	3.6
87	Heating	Heat Pump - 17 SEER (20+ Tons)	Biz-Prescriptive	Education	ROB	107,048	107,048	15%	16,327	0.00	15	$10,960	50%	20%	5%	3	42%	20%	47.1%	36.0%	36.0%	3.5
88	Heating	Heat Pump - 18 SEER (20+ Tons)	Biz-Prescriptive	Education	ROB	107,048	107,048	21%	22,859	0.00	15	$13,700	75%	20%	4%	3	42%	20%	55.3%	36.2%	36.0%	4.2
89	Heating	Heat Pump - 21 SEER (20+ Tons)	Biz-Prescriptive	Education	ROB	107,048	107,048	27%	28,513	0.00	15	$18,000	75%	20%	3%	3	42%	20%	55.1%	36.0%	36.0%	4.1
90	Heating	Geothermal HP - SEER 20.3 (20+ Tons)	Biz-Prescriptive	Education	ROB	38,650	38,650	19%	7,266	0.00	15	$10,700	75%	9%	5%	3	42%	20%	52.6%	36.0%	36.0%	10.6
91	Heating	Geothermal HP - SEER 21.5 (20+ Tons)	Biz-Prescriptive	Education	ROB	38,650	38,650	24%	9,403	0.00	15	$13,300	75%	8%	4%	3	42%	20%	52.2%	36.0%	36.0%	11.9
92	Heating	Geothermal HP - SEER 23.1 (20+ Tons)	Biz-Prescriptive	Education	ROB	38,650	38,650	31%	12,142	0.00	15	$18,300	75%	5%	3%	3	42%	20%	50.8%	36.0%	36.0%	13.7
93	Heating	Geothermal HP - SEER 29.3 (20+ Tons)	Biz-Prescriptive	Education	ROB	38,650	38,650	34%	13,287	0.00	15	$26,200	50%	4%	2%	3	42%	20%	37.4%	36.0%	36.0%	15.9
94	Heating	PTHP - <7,000 Btuh - lodging	Biz-Prescriptive	Education	ROB	2,583	2,583	8%	217	0.00	15	$13	100%	100%	100%	4	0%	20%	63.2%	55.0%	55.0%	9.5
95	Heating	PTHP - 7,000 to 15,000 Btuh - lodging	Biz-Prescriptive	Education	ROB	5,523	5,523	11%	620	0.00	15	$45	100%	100%	100%	5	0%	20%	63.2%	55.0%	55.0%	7.1
96	Heating	PTHP - >15,000 Btuh - lodging	Biz-Prescriptive	Education	ROB	8,901	8,901	14%	1,263	0.00	15	$35	100%	100%	100%	6	0%	20%	63.2%	55.0%	55.0%	17.7
97	Heating	Mini Split Ductless Heat Pump Cold Climate (Tiers & sizes TBD)	Biz-Prescriptive	Education	ROB	4	4	25%	1	0.00	12	$0	100%	35%	67%	7	2%	20%	63.2%	52.8%	53.9%	33.8
98	Heating	Variable Refrigerant Flow Heat Pump	Biz-Custom	Education	NC	11	11	25%	3	0.00	20	$3	100%	5%	3%	2	42%	0%	63.2%	36.6%	36.4%	47.8
99	Ventilation	Kitchen Exhaust Hood Demand Ventilation Control System	Biz-Custom	Education	ROB	5	5	50%	3	0.00	20	$2	75%	8%	11%	1	16%	24%	54.6%	39.2%	39.2%	11.1
100	Ventilation	Demand Controlled Ventilation	Biz-Custom	Education	Retro	2,041	2,041	20%	408	0.00	15	$227	100%	9%	14%	2	84%	5%	63.2%	36.4%	37.1%	11.3
101	Ventilation	Pump and Fan Variable Frequency Drive Controls (Fans)	Biz-Prescriptive	Education	Retro	2,258	2,258	41%	923	0.00	15	$375	100%	16%	18%	2	84%	25%	63.2%	42.0%	42.4%	9.5
102	Refrigeration	Strip Curtains	Biz-Custom	Education	Retro	334	334	81%	270	0.00	4	$9	100%	100%	100%	1	12%	26%	60.2%	52.4%	52.4%	4.1
103	Refrigeration	Bare Suction Line	Biz-Custom	Education	Retro	23	23	93%	21	0.00	15	$4	100%	27%	39%	2	0%	25%	60.2%	45.7%	46.7%	9.1
104	Refrigeration	Floating Head Pressure Controls	Biz-Prescriptive	Education	Retro	2,653	2,653	50%	1,327	0.00	15	$80	100%	25%	8%	3	8%	20%	60.2%	50.1%	49.6%	31.2
105	Refrigeration	Saturated Suction Controls	Biz-Custom	Education	Retro	831	831	50%	416	0.00	15	$559	50%	4%	6%	4	2%	20%	36.0%	36.0%	36.0%	15.6
106	Refrigeration	Compressor Retrofit	Biz-Custom	Education	Retro	813	813	20%	163	0.00	15	$477	25%	2%	3%	5	27%	15%	32.0%	27.4%	27.4%	15.7
107	Refrigeration	Electronically Commutated (EC) Walk-In Evaporator Fan Motor	Biz-Prescriptive	Education	Retro	1,268	1,268	65%	824	0.00	15	$78	100%	45%	42%	6	8%	33%	60.2%	49.8%	49.7%	11.1
108	Refrigeration	Evaporator Fan Motor Controls	Biz-Prescriptive	Education	Retro	1,912	1,912	25%	478	0.00	13	$291	50%	15%	7%	7	8%	10%	44.5%	30.1%	28.3%	4.7
109	Refrigeration	Variable Speed Condenser Fan	Biz-Custom	Education	Retro	2,960	2,960	50%	1,480	0.00	15	$1,170	25%	7%	9%	8	10%	20%	36.0%	36.0%	36.0%	6.8
110	Refrigeration	Refrigeration Economizer	Biz-Custom	Education	Retro	67,850	67,850	2%	1,357	0.00	15	$2,558	3%	3%	4%	9	38%	0%	20.0%	15.7%	15.9%	6.8
111	Refrigeration	Anti-Sweat Heater Controls MT	Biz-Prescriptive	Education	Retro	1,313	1,313	55%	722	0.00	12	$250	75%	10%	12%	10	13%	36%	54.7%	48.8%	48.8%	8.6
112	Refrigeration	Auto Door Closer, Cooler	Biz-Prescriptive	Education	Retro	471,500	471,500	0%	943	0.00	8	$157	100%	16%	24%	11	9%	58%	66.4%	66.4%	66.4%	11.5
113	Refrigeration	Display Case Door Retrofit, Medium Temp	Biz-Prescriptive	Education	Retro	1,584	1,584	36%	578	0.00	12	$686	25%	22%	3%	12	4%	55%	64.0%	64.0%	64.0%	1.7
114	Refrigeration	Electronically Commutated (EC) Reach-In Evaporator Fan Motor	Biz-Prescriptive	Education	Retro	1,268	1,268	65%	824	0.00	15	$78	100%	45%	42%	13	2%	33%	60.2%	49.8%	49.7%	11.1
115	Refrigeration	Q-Sync Motor for Walk-In and Reach-in Evaporator Fan Motor	Biz-Prescriptive	Education	Retro	993	993	51%	504	0.00	10	$96	100%	36%	21%	13	2%	33%	60.2%	46.4%	46.4%	5.0
116	Refrigeration	Energy Star Reach-In Refrigerator, Glass Doors	Biz-Prescriptive	Education	ROB	1,546	1,546	27%	410	0.00	12	$600	25%	5%	3%	14	12%	10%	28.0%	28.0%	27.9%	5.1
117	Refrigeration	Energy Star Reach-In Refrigerator, Solid Doors	Biz-Prescriptive	Education	ROB	1,112	1,112	25%	283	0.00	12	$600	5%	5%	2%	15	12%	55%	64.0%	62.1%	61.9%	3.5
118	Refrigeration	Anti-Sweat Heater Controls LT	Biz-Prescriptive	Education	Retro	3,147	3,147	55%	1,731	0.00	12	$250	100%	10%	28%	16	4%	36%	60.2%	48.8%	48.8%	27.5
119	Refrigeration	Auto Door Closer, Freezer	Biz-Prescriptive	Education	Retro	419,455	419,455	1%	2,307	0.00	8	$157	100%	16%	59%	17	4%	58%	66.4%	66.4%	66.4%	27.4
120	Refrigeration	Display Case Door Retrofit, Low Temp	Biz-Prescriptive	Education	Retro	2,922	2,922	50%	1,453	0.00	12	$686	75%	22%	8%	17	4%	55%	64.0%	64.0%	64.0%	4.3
121	Refrigeration	Energy Star Reach-In Freezer, Glass Doors	Biz-Prescriptive	Education	ROB	3,234	3,234	15%	488	0.00	12	$450	25%	15%	4%	18	4%	55%	64.0%	64.0%	64.0%	2.8
122	Refrigeration	Energy Star Reach-In Freezer, Solid Doors	Biz-Prescriptive	Education	ROB	4,676	4,676	20%	935	0.00	12	$450	75%	15%	8%	19	4%	55%	64.0%	64.0%	64.0%	5.5
123	Refrigeration	Refrigeration - Custom	Biz-Custom	Education	ROB	7	7	15%	1	0.00	12	$0	100%	50%	72%	20	90%	20%	60.2%	50.0%	51.0%	9.0
124	Refrigeration	Retro-commissioning_Refrigerator Optimization	Biz-Custom RCx	Education	Retro	33	33	3%	1	0.00	3	$0	100%	67%	22%	21	90%	10%	60.2%	51.0%	49.0%	1.9
125	Refrigeration	Energy Star Ice Machine	Biz-Prescriptive	Education	ROB	6,993	6,993	10%	721	0.00	15	$1,426	3%	3%	2%	22	4%	49%	59.2%	57.3%	57.2%	8.8
126	Refrigeration	LED Refrigerated Display Case Lighting Average 6W/LF	Biz-Prescriptive	Education	Retro	1,573	1,573	37%	574	0.00	12	$1,010	34%	34%	2%	23	8%	30%	44.0%	44.0%	43.1%	0.9
127	PlugLoads_Office	ENERGY STAR Uninterrupted Power Supply	Biz-Custom	Education	ROB	3,096	3,096	3%	85	0.00	15	$59	75%	7%	11%	1	0%	70%	76.0%	76.0%	76.0%	10.7
128	PlugLoads_Office	Smart Power Strip – Commercial Use	Biz-Custom	Education	Retro	64	64	100%	64	0.00	5	$50	7%	7%	10%	2	50%	10%	44.3%	38.5%	38.9%	3.3
129	PlugLoads_Office	Plug Load Occupancy Sensor	Biz-Custom	Education	Retro	1,126	1,126	15%	169	0.00	8	$70	50%	13%	18%	2	50%	10%	59.4%	46.1%	47.0%	4.3
130	PlugLoads_Office	Electrically Commutated Plug Fans in data centers	Biz-Custom	Education	Retro	86,783	86,783	18%	15,778	0.00	15	$480	100%	100%	100%	3	5%	33%	68.6%	59.7%	59.7%	16.3
131	PlugLoads_Office	High Efficiency CRAC unit	Biz-Custom	Education	ROB	541	541	30%	162	0.00	15	$63	100%	14%	19%	3	5%	33%	68.6%	48.5%	49.2%	9.9
132	PlugLoads_Office	Computer Room Air Conditioner Economizer	Biz-Custom	Education	Retro	418	418	86%	358	0.00	15	$82	100%	23%	33%	3	5%	33%	68.6%	52.8%	53.6%	7.2
133	PlugLoads_Office	Energy Star Laptop	Biz-Custom	Education	ROB	126	126	33%	41	0.00	4	$0	0%			4	17%	85%	88.0%	88.0%	88.0%	0.0
134	PlugLoads_Office	Energy Star Monitor	Biz-Custom	Education	ROB	72	72	21%	15	0.00	4	$0	0%			5	17%	95%	96.0%	96.0%	96.0%	0.0
135	PlugLoads_Office	Energy Star Printer/Copier/Fax	Biz-Custom	Education	ROB	551	551	40%	223	0.00	6	$0	0%			6	17%	95%	96.0%	96.0%	96.0%	0.0
136	PlugLoads_Office	Energy Star Server	Biz-Custom	Education	ROB	691	691	13%	90	0.00	15	$156	25%	3%	4%	7	15%	20%	36.3%	36.0%	36.0%	9.6
137	PlugLoads_Office	Server Virtualization	Biz-Custom	Education	Retro	691	691	13%	90	0.00	15	$156	25%	3%	4%	7	15%	20%	36.3%	36.0%	36.0%	9.6
138	PlugLoads_Office	Data Center Hot/Cold Aisle Configuration	Biz-Custom	Education	Retro	691	691	13%	90	0.00	15	$156	25%	3%	4%	7	15%	20%	36.3%	36.0%	36.0%	9.6
139	Motors	Cogged V-Belt	Biz-Custom	Education	Retro	17,237	17,237	3%	534	0.00	15	$384	75%	7%	10%	1	40%	10%	61.5%	40.1%	40.4%	10.7
140	Motors	Pump and Fan Variable Frequency Drive Controls (Pumps)	Biz-Prescriptive	Education	Retro	1,902	1,902	38%	731	0.00	15	$200	100%	30%	27%	2	50%	25%	68.6%	53.3%	53.0%	7.0
141	Motors	Escalators Motor Efficiency Controllers	Biz-Custom	Education	Retro	7,500	7,500	20%	1,500	0.00	10	$5,000	2%	2%	2%	3	4%	10%	28.0%	28.0%	28.0%	8.6
142	CompressedAir	Efficient Air Compressors	Biz-Custom	Education	ROB	4,004	4,004	31%	1,223	0.00	15	$100	100%	64%	100%	1	100%	33%	68.6%	58.6%	59.7%	10.7
143	CompressedAir	Retro-commissioning_Compressed Air Optimization	Biz-Custom RCx	Education	Retro	7	7	15%	1	0.00	5	$0	100%	67%	100%	2	100%	33%	68.6%	58.8%	59.7%	4.1
144	CompressedAir	Compressed Air - Custom	Biz-Custom	Education	Retro	7	7	15%	1	0.00	8	$0	100%	50%	100%	3	100%	33%	68.6%	57.5%	59.7%	4.3
145	Miscellaneous	Power Distribution Equipment Upgrades	Biz-Custom	Education	Retro	1,150	1,150	1%	6	0.00	30	$8	75%	4%	6%	1	35%	20%	58.1%	36.0%	36.0%	18.4
146	Miscellaneous	Vending Machine Controller - Non-Refrigerated	Biz-Custom	Education	Retro	745	745	46%	343	0.00	5	$80	63%	63%	32%	2	3%	66%	72.8%	72.8%	72.8%	0.9
147	Miscellaneous	Vending Machine Controller - Refrigerated	Biz-Custom	Education	Retro	1,739	1,739	46%	800	0.00	10	$216	100%	35%	28%	3	11%	66%	72.8%	72.8%	72.8%	3.4
148	Miscellaneous	Miscellaneous Custom	Biz-Custom	Education	Retro	5	5	20%	1	0.00	10	$0	100%	50%	72%	4	65%	20%	68.6%	57.8%	58.7%	8.1
149	Whole Building_HVAC	HVAC - Energy Management System	Biz-Prescriptive	Education	Retro	6,960	6,960	15%	1,044	0.00	15	$4,000	3%	3%	2%	1	100%	1%	20.8%	18.4%	18.4%	4.4
150	Whole Building_HVAC	Guest room energy management system	Biz-Custom	Education	Retro	0	0	0%	0	0.00	8	$0	0%	0%		2	0%	0%	63.2%	55.0%	55.0%	0.0

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Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	Base (Existing) Annual Electric	Base (Standard) Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	MAP Incentive (%)	RAP Incentive (%)	PP Incentive (%)	End Use Measure Group	Base Saturation	EE Saturation	MAP Adoption Rate	RAP Adoption Rate	PP Adoption Rate	UCT Score
151	Whole Building_HVAC	Retro-commissioning_Bld Optimization	Biz-Custom RCx	Education	Retro	7	7	15%	1	0.00	3	$0	100%	67%	22%	3	100%	10%	63.2%	53.6%	51.6%	2.3
152	WholeBld	WholeBlg - Com RET	Biz-NC	Education	Retro	7	7	15%	1	0.00	12	$0	100%	50%	19%	4	40%	0%	68.6%	57.7%	56.5%	9.7
153	Whole Building_NC	WholeBlg - Com NC	Biz-NC	Education	NC	4	4	25%	1	0.00	12	$0	100%	50%	72%	5	100%	60%	68.6%	68.0%	68.0%	9.7
154	Behavioral	AMI Data Presentment & Engagement	Biz-Behavior	Education	Retro	100	100	1%	1	0.00	1	$0	100%	100%	87%	1	100%	10%	50.0%	50.0%	50.0%	1.3
155	Behavioral	BIEMS	Biz-Behavior	Education	Retro	36	36	3%	1	0.00	3	$0	12%	12%	5%	1	100%	5%	42.5%	50.0%	50.0%	1.7
156	Behavioral	Building Operator Certification	Biz-Behavior	Education	Retro	11,000	11,000	1%	88	0.00	3	$15	50%	30%	12%	1	100%	5%	42.5%	50.0%	50.0%	2.2
157	Cooking	Commercial Combination Oven (Electric)	Biz-Prescriptive	Food Sales	ROB	38,561	38,561	48%	18,432	0.00	12	$16,884	50%	6%	3%	1	17%	53%	62.4%	62.4%	62.4%	9.3
158	Cooking	Commercial Electric Convection Oven	Biz-Prescriptive	Food Sales	ROB	12,193	12,193	15%	1,879	0.00	12	$1,706	50%	15%	11%	1	17%	53%	62.4%	62.4%	62.4%	3.9
159	Cooking	Commercial Electric Griddle	Biz-Prescriptive	Food Sales	ROB	17,056	17,056	15%	2,596	0.00	12	$3,604	25%	14%	7%	2	14%	17%	39.3%	33.6%	33.6%	2.0
160	Cooking	Commercial Electric Steam Cooker	Biz-Prescriptive	Food Sales	ROB	19,549	19,549	67%	13,162	0.00	12	$3,500	100%	12%	14%	3	6%	42%	68.6%	53.6%	53.6%	15.6
161	Cooking	Dishwasher Low Temp Door (Energy Star)	Biz-Prescriptive	Food Sales	ROB	39,279	39,279	41%	16,153	0.00	15	$770	100%	49%	65%	4	26%	61%	68.8%	68.8%	68.8%	18.5
162	Cooking	Dishwasher High Temp Door (Energy Star)	Biz-Prescriptive	Food Sales	ROB	39,825	39,825	30%	11,853	0.00	15	$770	100%	49%	65%	4	26%	61%	68.8%	68.8%	68.8%	13.6
163	Cooking	Energy efficient electric fryer	Biz-Prescriptive	Food Sales	ROB	18,182	18,182	14%	2,572	0.00	12	$1,706	50%	1%	15%	5	27%	23%	55.0%	39.3%	40.7%	93.3
164	Cooking	Insulated Holding Cabinets (Full Size)	Biz-Prescriptive	Food Sales	ROB	7,665	7,665	69%	5,278	0.00	12	$1,200	100%	6%	42%	6	3%	23%	68.6%	52.4%	54.9%	31.3
165	Cooking	Insulated Holding Cabinets (Half-Size)	Biz-Prescriptive	Food Sales	ROB	3,066	3,066	58%	1,788	0.00	12	$1,500	50%	8%	12%	6	3%	23%	52.9%	38.7%	39.1%	6.6
166	HotWater	Faucet Aerator	Biz-Custom	Food Sales	Retro	2,162	2,162	66%	1,425	0.00	10	$3	100%	26%	100%	4	25%	80%	84.0%	84.0%	84.0%	777.8
167	HotWater	Heat Pump Water Heater	Biz-Custom	Food Sales	ROB	10,967	10,967	35%	3,788	0.00	10	$1,574	75%	13%	10%	1	100%	30%	69.5%	52.6%	52.2%	6.0
168	HotWater	Hot Water Pipe Insulation	Biz-Custom	Food Sales	Retro	10,967	10,967	2%	219	0.00	20	$60	100%	19%	15%	2	100%	80%	84.0%	84.0%	84.0%	11.4
169	HotWater	Low Flow Pre-Rinse Sprayers	Biz-Custom	Food Sales	ROB	2,991	2,991	26%	764	0.00	5	$35	100%	71%	87%	3	25%	80%	84.0%	84.0%	84.0%	6.6
170	HotWater	ENERGY STAR Commercial Washing Machines	Biz-Custom	Food Sales	ROB	1,552	1,552	43%	671	0.00	7	$250	50%	14%	11%	5	25%	35%	66.5%	53.7%	53.3%	3.9
171	HotWater	Ozone Commercial Laundry	Biz-Custom	Food Sales	Retro	2,984	2,984	25%	746	0.00	10	$20,310	0%	0%	0%	6	0%	50%	60.0%	60.0%	60.0%	5.1
172	InteriorLighting	LED T8 Tube Replacement	Biz-Prescriptive Light	Food Sales	Retro	138	138	59%	82	0.00	15	$7	100%	49%	49%	1	89%	32%	71.1%	60.5%	60.5%	12.1
173	InteriorLighting	LED troffer retrofit kit, 2'X2' and 2'X4'	Biz-Prescriptive Light	Food Sales	Retro	310	310	50%	155	0.00	18	$67	100%	26%	9%	1	89%	32%	71.1%	52.9%	50.8%	5.6
174	InteriorLighting	LED troffer, 2'X2' and 2'X4'	Biz-Prescriptive Light	Food Sales	Retro	223	223	50%	112	0.00	18	$67	100%	26%	7%	1	89%	32%	71.1%	49.3%	45.8%	4.0
175	InteriorLighting	LED high bay fixture	Biz-Prescriptive Light	Food Sales	Retro	1,080	1,080	76%	821	0.00	12	$323	100%	12%	10%	2	0%	16%	71.1%	52.5%	52.2%	10.3
176	InteriorLighting	LED Mogul-base HID Lamp Replacing High Bay HID	Biz-Prescriptive Light	Food Sales	Retro	1,080	1,080	79%	855	0.00	12	$110	100%	21%	31%	2	0%	16%	71.1%	58.8%	59.2%	18.7
177	InteriorLighting	LED low bay fixture	Biz-Prescriptive Light	Food Sales	Retro	1,080	1,080	76%	821	0.00	12	$196	100%	20%	17%	3	0%	16%	71.1%	56.5%	56.2%	10.3
178	InteriorLighting	LED Mogul-base HID Lamp Replacing Low Bay HID	Biz-Prescriptive Light	Food Sales	Retro	1,080	1,080	79%	855	0.00	12	$60	100%	38%	57%	3	0%	16%	71.1%	60.6%	61.0%	18.7
179	InteriorLighting	LED downlight, screwin lamp, 1-3W, interior Average 2 Watts	Biz-Prescriptive Light	Food Sales	ROB	67	67	88%	59	0.00	4	$4	100%	25%	59%	4	2%	32%	71.1%	60.3%	61.0%	9.8
180	InteriorLighting	LED downlight fixture	Biz-Prescriptive Light	Food Sales	Retro	174	174	82%	142	0.00	4	$13	100%	39%	44%	5	9%	32%	71.1%	60.2%	60.3%	4.7
181	InteriorLighting	LED downlight, screwin lamp, 4-20W, interior Average 11 Watts	Biz-Prescriptive Light	Food Sales	ROB	134	134	84%	113	0.00	4	$2	100%	61%	100%	5	9%	32%	71.1%	61.7%	61.9%	18.8
182	InteriorLighting	DeLamp Fluorescent Fixture Average Lamp Wattage 28W	Biz-Custom Light	Food Sales	Retro	53	53	100%	53	0.00	15	$4	100%	69%	53%	6	89%	0%	71.1%	61.1%	60.8%	10.7
183	InteriorLighting	Daylighting Controls	Biz-Custom Light	Food Sales	Retro	8,810	8,810	30%	2,643	0.00	12	$3,000	25%	5%	4%	7	99%	8%	48.3%	39.1%	39.0%	9.6
184	InteriorLighting	Occupancy Sensors	Biz-Prescriptive Light	Food Sales	Retro	1,523	1,523	30%	457	0.00	8	$54	100%	37%	34%	7	99%	8%	71.1%	59.3%	59.2%	5.4
185	InteriorLighting	Central Lighting Monitoring & Controls (non-networked)	Biz-Custom Light	Food Sales	Retro	41,703	41,703	20%	8,341	0.00	12	$3,700	100%	12%	17%	7	99%	8%	71.1%	50.8%	51.5%	9.0
186	InteriorLighting	Network Lighting Controls - Wireless (WiFi)	Biz-Custom Light	Food Sales	Retro	16,277	16,277	47%	7,650	0.00	8	$1,683	100%	24%	34%	7	99%	8%	71.1%	56.9%	57.6%	6.4
187	InteriorLighting	Bi-Level Lighting Fixture – Stairwells, Hallways, and Garages	Biz-Custom Light	Food Sales	Retro	1,034	1,034	50%	517	0.00	10	$274	50%	10%	8%	8	1%	8%	62.0%	47.4%	47.1%	6.7
188	InteriorLighting	LED Exit Sign - 4 Watt Fixture (2 lamp)	Biz-Prescriptive Light	Food Sales	Retro	236	236	85%	201	0.00	15	$60	100%	8%	13%	9	1%	75%	80.0%	80.0%	80.0%	19.3
189	ExteriorLighting	LED wallpack (existing W<250)	Biz-Prescriptive Light	Food Sales	Retro	856	856	66%	567	0.00	12	$248	50%	10%	9%	1	13%	46%	62.7%	56.8%	56.8%	6.6
190	ExteriorLighting	LED parking lot fixture (existing W≥250)	Biz-Prescriptive Light	Food Sales	Retro	1,589	1,589	60%	959	0.00	12	$756	25%	3%	5%	2	13%	41%	52.8%	52.8%	52.8%	11.1
191	ExteriorLighting	LED parking lot fixture (existing W<250)	Biz-Prescriptive Light	Food Sales	Retro	856	856	66%	567	0.00	12	$248	50%	10%	9%	3	13%	41%	62.7%	52.8%	52.8%	6.6
192	ExteriorLighting	LED fuel pump canopy fixture (existing W<250)	Biz-Prescriptive Light	Food Sales	Retro	0	0	0%	0	0.00	12	$0	0%	0%		4	0%	41%	71.1%	61.9%	61.9%	0.0
193	ExteriorLighting	LED fuel pump canopy fixture (existing W≥250)	Biz-Prescriptive Light	Food Sales	Retro	0	0	0%	0	0.00	12	$0	0%	0%		5	0%	41%	71.1%	61.9%	61.9%	0.0
194	ExteriorLighting	LED outdoor pole decorative fixture (existing W≥250)	Biz-Prescriptive Light	Food Sales	Retro	1,589	1,589	60%	959	0.00	12	$756	25%	3%	5%	6	13%	41%	52.8%	52.8%	52.8%	11.1
195	ExteriorLighting	LED parking garage fixture (existing W≥250)	Biz-Prescriptive Light	Food Sales	Retro	3,235	3,235	60%	1,953	0.00	6	$756	25%	3%	10%	7	13%	41%	60.2%	52.8%	52.8%	11.7
196	ExteriorLighting	LED parking garage fixture (existing W<250)	Biz-Prescriptive Light	Food Sales	Retro	1,742	1,742	66%	1,154	0.00	6	$248	50%	10%	19%	8	13%	41%	66.7%	55.4%	56.0%	6.9
197	ExteriorLighting	LED Mogul-base HID Lamp Replacing Exterior HID (existing W≥250)	Biz-Prescriptive Light	Food Sales	Retro	1,589	1,589	60%	959	0.00	12	$756	25%	3%	5%	9	13%	41%	52.8%	52.8%	52.8%	11.1
198	ExteriorLighting	LED Mogul-base HID Lamp Replacing Exterior HID (existing W<250)	Biz-Prescriptive Light	Food Sales	Retro	856	856	66%	567	0.00	12	$248	50%	10%	9%	10	13%	41%	62.7%	52.8%	52.8%	6.6
199	Cooling	Air Conditioner - 16 SEER (5-20 Tons)	Biz-Prescriptive	Food Sales	ROB	11,421	11,421	13%	1,428	0.00	15	$3,570	25%	5%	4%	1	18%	20%	36.0%	35.0%	34.9%	9.2
200	Cooling	Air Conditioner - 17 SEER (5-20 Tons)	Biz-Prescriptive	Food Sales	ROB	11,421	11,421	13%	1,428	0.00	15	$4,760	25%	5%	3%	1	18%	20%	36.0%	34.1%	34.1%	6.9
201	Cooling	Air Conditioner - 18 SEER (5-20 Tons)	Biz-Prescriptive	Food Sales	ROB	11,421	11,421	19%	2,152	0.00	15	$5,960	25%	5%	4%	1	18%	20%	36.0%	34.1%	34.1%	8.4
202	Cooling	Air Conditioner - 21 SEER (5-20 Tons)	Biz-Prescriptive	Food Sales	ROB	11,421	11,421	24%	2,778	0.00	15	$9,080	25%	5%	3%	1	18%	20%	36.0%	34.1%	34.1%	7.1
203	Cooling	Air Conditioner - 16 SEER (20+ Tons)	Biz-Prescriptive	Food Sales	ROB	23,258	23,258	8%	1,938	0.00	15	$7,140	25%	5%	3%	2	18%	20%	36.0%	34.1%	34.1%	6.3
204	Cooling	Air Conditioner - 17 SEER (20+ Tons)	Biz-Prescriptive	Food Sales	ROB	23,258	23,258	8%	1,938	0.00	15	$9,520	5%	5%	2%	2	18%	20%	36.0%	34.1%	34.1%	4.7
205	Cooling	Air Conditioner - 18 SEER (20+ Tons)	Biz-Prescriptive	Food Sales	ROB	23,258	23,258	15%	3,578	0.00	15	$11,920	25%	5%	3%	2	18%	20%	36.0%	34.1%	34.1%	7.0
206	Cooling	Air Conditioner - 21 SEER (20+ Tons)	Biz-Prescriptive	Food Sales	ROB	23,258	23,258	21%	4,984	0.00	15	$18,160	25%	5%	3%	2	18%	20%	36.0%	34.1%	34.1%	6.4
207	Cooling	Comprehensive Rooftop Unit Quality Maintenance (AC Tune-up)	Biz-Custom	Food Sales	Retro	11,353	11,353	6%	718	0.00	3	$500	25%	7%	11%	3	36%	50%	60.0%	60.0%	60.0%	4.1
208	Cooling	Air Side Economizer	Biz-Custom	Food Sales	Retro	6,396	6,396	3%	186	0.00	5	$170	6%	6%	8%	4	36%	33%	46.4%	46.4%	46.4%	3.0
209	Cooling	Advanced Rooftop Controls	Biz-Custom	Food Sales	Retro	5,330	5,330	28%	1,493	0.00	10	$3,412	25%	2%	3%	5	36%	3%	25.8%	20.5%	20.7%	12.7
210	Cooling	Air Conditioner - 16 SEER (<5 Tons)	Biz-Prescriptive	Food Sales	ROB	4,920	4,920	19%	923	0.00	15	$1,785	50%	5%	5%	6	29%	20%	36.0%	36.0%	36.0%	12.0
211	Cooling	Air Conditioner - 17 SEER (<5 Tons)	Biz-Prescriptive	Food Sales	ROB	4,920	4,920	24%	1,158	0.00	15	$2,380	50%	5%	5%	6	29%	20%	36.0%	36.0%	36.0%	11.3
212	Cooling	Air Conditioner - 18 SEER(<5 Tons)	Biz-Prescriptive	Food Sales	ROB	4,920	4,920	28%	1,367	0.00	15	$2,980	50%	5%	5%	6	29%	20%	36.0%	36.0%	36.0%	10.6
213	Cooling	Air Conditioner - 21 SEER(<5 Tons)	Biz-Prescriptive	Food Sales	ROB	4,920	4,920	38%	1,874	0.00	15	$4,540	25%	5%	4%	6	29%	20%	36.0%	35.5%	35.3%	9.6
214	Cooling	Centrifugal Chiller - Average kW/Ton = 0.626	Biz-Custom	Food Sales	ROB	6,925	6,925	26%	1,816	0.00	20	$4,100	25%	2%	3%	7	0%	20%	36.0%	34.9%	35.1%	20.6
215	Cooling	Reciprocating Chiller - Average kW/Ton = 0.99	Biz-Custom	Food Sales	ROB	8,515	8,515	27%	2,271	0.00	20	$3,287	100%	4%	5%	8	0%	20%	63.2%	36.0%	36.0%	34.0
216	Cooling	Screw Chiller - Average kW/Ton = 0.675	Biz-Custom	Food Sales	ROB	9,944	9,944	23%	2,281	0.00	20	$3,280	100%	4%	5%	9	0%	20%	63.2%	36.0%	36.0%	33.4
217	Cooling	HVAC/Chiller Custom	Biz-Custom	Food Sales	Retro	5	5	20%	1	0.00	12	$1	25%	6%	9%	10	0%	20%	37.0%	36.0%	36.0%	7.5
218	Cooling	Chiller Tune-up	Biz-Custom	Food Sales	Retro	13,625	13,625	8%	1,090	0.00	5	$151	100%	38%	54%	11	0%	50%	63.2%	60.0%	60.0%	5.3
219	Cooling	PTAC - <7,000 Btuh - lodging	Biz-Prescriptive	Food Sales	ROB	537	537	9%	49	0.00	15	$22	100%	50%	22%	12	0%	20%	63.2%	46.5%	42.5%	5.1
220	Cooling	PTAC - 7,000 to 15,000 Btuh - lodging	Biz-Prescriptive	Food Sales	ROB	1,196	1,196	9%	111	0.00	15	$41	100%	50%	27%	13	0%	20%	63.2%	47.9%	45.2%	6.3
221	Cooling	PTAC - >15,000 Btuh - lodging	Biz-Prescriptive	Food Sales	ROB	2,020	2,020	10%	192	0.00	15	$56	100%	50%	34%	14	0%	20%	63.2%	49.1%	47.7%	7.9
222	Cooling	HVAC Occupancy Controls	Biz-Custom	Food Sales	ROB	2,636	2,636	20%	527	0.00	15	$538	75%	5%	0%	15	36%	25%	51.2%	40.0%	40.0%	14.9
223	Cooling	Smart Thermostat	Biz-Custom	Food Sales	ROB	5,330	5,330	18%	943	0.00	10	$128	100%	20%	16%	16	37%	9%	63.2%	49.3%	49.1%	11.2
224	Cooling	Window Film	Biz-Custom	Food Sales	Retro	11,353	0	5%	622	0.00	10	$518	75%	6%	5%	17	100%	25%	53.6%	40.0%	40.0%	13.3
225	Cooling	Energy Recovery Ventilator	Biz-Custom	Food Sales	Retro	2	2	50%	1	0.00	20	$1	75%	8%	12%	18	100%	5%	54.9%	33.4%	33.7%	10.9

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Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	Base (Existing) Annual Electric	Base (Standard) Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	MAP Incentive (%)	RAP Incentive (%)	PP Incentive (%)	End Use Measure Group	Base Saturation	EE Saturation	MAP Adoption Rate	RAP Adoption Rate	PP Adoption Rate	UCT Score
226	Heating	Heat Pump - 16 SEER (<5 Tons)	Biz-Prescriptive	Food Sales	ROB	9,338	9,338	19%	1,760	0.00	15	$2,055	50%	20%	9%	1	20%	20%	41.4%	36.0%	36.0%	3.2
227	Heating	Heat Pump - 17 SEER (<5 Tons)	Biz-Prescriptive	Food Sales	ROB	9,338	9,338	22%	2,069	0.00	15	$2,740	50%	20%	8%	1	20%	20%	39.1%	36.0%	36.0%	2.9
228	Heating	Heat Pump - 18 SEER(<5 Tons)	Biz-Prescriptive	Food Sales	ROB	9,338	9,338	26%	2,383	0.00	15	$3,425	50%	20%	7%	1	20%	20%	38.4%	36.0%	36.0%	2.7
229	Heating	Heat Pump - 21 SEER(<5 Tons)	Biz-Prescriptive	Food Sales	ROB	9,338	9,338	32%	2,957	0.00	15	$4,500	50%	20%	7%	1	20%	20%	38.1%	36.0%	36.0%	2.7
230	Heating	Geothermal HP - SEER 20.3 (<5 Tons)	Biz-Prescriptive	Food Sales	ROB	9,338	9,338	36%	3,371	0.00	15	$4,700	50%	11%	7%	1	20%	20%	38.5%	36.0%	36.0%	5.1
231	Heating	Geothermal HP - SEER 21.5 (<5 Tons)	Biz-Prescriptive	Food Sales	ROB	9,338	9,338	40%	3,742	0.00	15	$7,300	25%	7%	5%	1	20%	20%	36.0%	36.0%	36.0%	5.6
232	Heating	Geothermal HP - SEER 23.1 (<5 Tons)	Biz-Prescriptive	Food Sales	ROB	9,338	9,338	46%	4,250	0.00	15	$7,300	25%	7%	6%	1	20%	20%	36.0%	36.0%	36.0%	6.4
233	Heating	Geothermal HP - SEER 29.3 (<5 Tons)	Biz-Prescriptive	Food Sales	ROB	9,338	9,338	52%	4,838	0.00	15	$9,200	25%	8%	5%	1	20%	20%	36.0%	36.0%	36.0%	4.5
234	Heating	Heat Pump - 16 SEER (5-20 Tons)	Biz-Prescriptive	Food Sales	ROB	32,040	32,040	10%	3,193	0.00	15	$4,110	50%	20%	8%	2	25%	20%	38.8%	36.0%	36.0%	2.7
235	Heating	Heat Pump - 17 SEER (5-20 Tons)	Biz-Prescriptive	Food Sales	ROB	32,040	32,040	13%	4,183	0.00	15	$5,480	25%	20%	8%	2	25%	20%	36.0%	36.0%	36.0%	2.4
236	Heating	Heat Pump - 18 SEER (5-20 Tons)	Biz-Prescriptive	Food Sales	ROB	32,040	32,040	19%	6,183	0.00	15	$6,850	50%	20%	7%	2	25%	20%	40.7%	36.0%	36.0%	2.8
237	Heating	Heat Pump - 21 SEER (5-20 Tons)	Biz-Prescriptive	Food Sales	ROB	32,040	32,040	25%	7,915	0.00	15	$9,000	50%	20%	6%	2	25%	20%	40.2%	36.0%	36.0%	2.7
238	Heating	Geothermal HP - SEER 20.3 (5-20 Tons)	Biz-Prescriptive	Food Sales	ROB	17,672	17,672	32%	5,610	0.00	15	$7,700	75%	6%	6%	2	25%	20%	51.5%	36.0%	36.0%	11.8
239	Heating	Geothermal HP - SEER 21.5 (5-20 Tons)	Biz-Prescriptive	Food Sales	ROB	17,672	17,672	36%	6,361	0.00	15	$10,300	50%	5%	5%	2	25%	20%	38.5%	36.0%	36.0%	12.9
240	Heating	Geothermal HP - SEER 23.1 (5-20 Tons)	Biz-Prescriptive	Food Sales	ROB	17,672	17,672	42%	7,386	0.00	15	$12,800	50%	4%	4%	2	25%	20%	37.7%	36.0%	36.0%	14.4
241	Heating	Geothermal HP - SEER 29.3 (5-20 Tons)	Biz-Prescriptive	Food Sales	ROB	17,672	17,672	49%	8,586	0.00	15	$17,700	25%	4%	3%	2	25%	20%	36.0%	36.0%	36.0%	11.4
242	Heating	Heat Pump - 16 SEER (20+ Tons)	Biz-Prescriptive	Food Sales	ROB	65,783	65,783	10%	6,757	0.00	15	$8,220	25%	20%	6%	3	25%	20%	36.0%	36.0%	36.0%	2.4
243	Heating	Heat Pump - 17 SEER (20+ Tons)	Biz-Prescriptive	Food Sales	ROB	65,783	65,783	13%	8,737	0.00	15	$10,960	25%	20%	5%	3	25%	20%	36.0%	36.0%	36.0%	2.1
244	Heating	Heat Pump - 18 SEER (20+ Tons)	Biz-Prescriptive	Food Sales	ROB	65,783	65,783	20%	12,929	0.00	15	$13,700	50%	20%	4%	3	25%	20%	40.9%	36.0%	36.0%	2.7
245	Heating	Heat Pump - 21 SEER (20+ Tons)	Biz-Prescriptive	Food Sales	ROB	65,783	65,783	25%	16,546	0.00	15	$18,000	50%	20%	3%	3	25%	20%	40.6%	36.0%	36.0%	2.7
246	Heating	Geothermal HP - SEER 20.3 (20+ Tons)	Biz-Prescriptive	Food Sales	ROB	35,720	35,720	32%	11,597	0.00	15	$10,700	100%	9%	5%	3	25%	20%	63.2%	36.0%	36.0%	12.0
247	Heating	Geothermal HP - SEER 21.5 (20+ Tons)	Biz-Prescriptive	Food Sales	ROB	35,720	35,720	37%	13,099	0.00	15	$13,300	75%	8%	4%	3	25%	20%	53.9%	36.0%	36.0%	13.0
248	Heating	Geothermal HP - SEER 23.1 (20+ Tons)	Biz-Prescriptive	Food Sales	ROB	35,720	35,720	42%	15,148	0.00	15	$18,300	75%	5%	3%	3	25%	20%	52.3%	36.0%	36.0%	14.6
249	Heating	Geothermal HP - SEER 29.3 (20+ Tons)	Biz-Prescriptive	Food Sales	ROB	35,720	35,720	49%	17,549	0.00	15	$26,200	50%	4%	2%	3	25%	20%	39.0%	36.0%	36.0%	17.2
250	Heating	PTHP - <7,000 Btuh - lodging	Biz-Prescriptive	Food Sales	ROB	1,568	1,568	9%	135	0.00	15	$13	100%	100%	100%	4	0%	20%	63.2%	55.0%	55.0%	6.8
251	Heating	PTHP - 7,000 to 15,000 Btuh - lodging	Biz-Prescriptive	Food Sales	ROB	3,390	3,390	11%	362	0.00	15	$45	100%	100%	80%	5	0%	20%	63.2%	55.0%	53.9%	4.7
252	Heating	PTHP - >15,000 Btuh - lodging	Biz-Prescriptive	Food Sales	ROB	5,539	5,539	13%	710	0.00	15	$35	100%	100%	100%	6	0%	20%	63.2%	55.0%	55.0%	11.3
253	Heating	Mini Split Ductless Heat Pump Cold Climate (Tiers & sizes TBD)	Biz-Prescriptive	Food Sales	ROB	4	4	25%	1	0.00	12	$0	100%	35%	67%	7	20%	20%	63.2%	51.8%	53.4%	18.1
254	Heating	Variable Refrigerant Flow Heat Pump	Biz-Custom	Food Sales	NC	11	11	25%	3	0.00	20	$3	100%	5%	3%	2	25%	0%	63.2%	32.0%	31.8%	25.7
255	Ventilation	Kitchen Exhaust Hood Demand Ventilation Control System	Biz-Custom	Food Sales	ROB	5	5	50%	3	0.00	20	$2	75%	8%	11%	1	9%	24%	54.6%	39.2%	39.2%	10.6
256	Ventilation	Demand Controlled Ventilation	Biz-Custom	Food Sales	Retro	2,523	2,523	20%	505	0.00	15	$227	100%	12%	17%	2	91%	5%	63.2%	41.5%	42.2%	14.4
257	Ventilation	Pump and Fan Variable Frequency Drive Controls (Fans)	Biz-Prescriptive	Food Sales	Retro	2,258	2,258	41%	923	0.00	15	$375	100%	16%	18%	2	91%	25%	63.2%	42.0%	42.4%	9.1
258	Refrigeration	Strip Curtains	Biz-Custom	Food Sales	Retro	334	334	81%	270	0.00	4	$9	100%	100%	100%	1	16%	26%	60.2%	52.4%	52.4%	4.2
259	Refrigeration	Bare Suction Line	Biz-Custom	Food Sales	Retro	23	23	93%	21	0.00	15	$4	100%	27%	39%	2	0%	25%	60.2%	45.6%	46.6%	9.2
260	Refrigeration	Floating Head Pressure Controls	Biz-Prescriptive	Food Sales	Retro	2,653	2,653	50%	1,327	0.00	15	$80	100%	25%	41%	3	8%	45%	60.2%	56.0%	56.0%	31.6
261	Refrigeration	Saturated Suction Controls	Biz-Custom	Food Sales	Retro	831	831	50%	416	0.00	15	$559	50%	4%	6%	4	2%	45%	56.0%	56.0%	56.0%	15.7
262	Refrigeration	Compressor Retrofit	Biz-Custom	Food Sales	Retro	813	813	20%	163	0.00	15	$477	25%	2%	3%	5	37%	15%	32.0%	27.4%	27.4%	15.8
263	Refrigeration	Electronically Commutated (EC) Walk-In Evaporator Fan Motor	Biz-Prescriptive	Food Sales	Retro	1,268	1,268	65%	824	0.00	15	$78	100%	45%	42%	6	10%	33%	60.2%	49.8%	49.6%	11.2
264	Refrigeration	Evaporator Fan Motor Controls	Biz-Prescriptive	Food Sales	Retro	1,912	1,912	25%	478	0.00	13	$291	50%	15%	7%	7	10%	10%	44.4%	30.0%	28.3%	4.7
265	Refrigeration	Variable Speed Condenser Fan	Biz-Custom	Food Sales	Retro	2,960	2,960	50%	1,480	0.00	15	$1,170	25%	7%	9%	8	14%	20%	36.0%	36.0%	36.0%	6.9
266	Refrigeration	Refrigeration Economizer	Biz-Custom	Food Sales	Retro	67,850	67,850	2%	1,357	0.00	15	$2,558	3%	3%	4%	9	52%	0%	20.0%	15.7%	15.9%	6.9
267	Refrigeration	Anti-Sweat Heater Controls MT	Biz-Prescriptive	Food Sales	Retro	1,313	1,313	55%	722	0.00	12	$250	75%	10%	12%	10	8%	36%	54.7%	48.8%	48.8%	8.7
268	Refrigeration	Auto Door Closer, Cooler	Biz-Prescriptive	Food Sales	Retro	471,500	471,500	0%	943	0.00	8	$157	100%	16%	24%	11	6%	32%	60.2%	45.7%	46.3%	11.6
269	Refrigeration	Display Case Door Retrofit, Medium Temp	Biz-Prescriptive	Food Sales	Retro	1,584	1,584	36%	578	0.00	12	$686	25%	22%	3%	12	2%	55%	64.0%	64.0%	64.0%	1.7
270	Refrigeration	Electronically Commutated (EC) Reach-In Evaporator Fan Motor	Biz-Prescriptive	Food Sales	Retro	1,268	1,268	65%	824	0.00	15	$78	100%	45%	42%	13	1%	33%	60.2%	49.8%	49.6%	11.2
271	Refrigeration	Q-Sync Motor for Walk-In and Reach-in Evaporator Fan Motor	Biz-Prescriptive	Food Sales	Retro	993	993	51%	504	0.00	10	$96	100%	36%	21%	13	1%	33%	60.2%	46.4%	46.4%	5.1
272	Refrigeration	Energy Star Reach-In Refrigerator, Glass Doors	Biz-Prescriptive	Food Sales	ROB	1,546	1,546	27%	410	0.00	12	$600	25%	5%	3%	14	8%	55%	64.0%	64.0%	63.9%	5.1
273	Refrigeration	Energy Star Reach-In Refrigerator, Solid Doors	Biz-Prescriptive	Food Sales	ROB	1,112	1,112	25%	283	0.00	12	$600	5%	5%	2%	15	8%	55%	64.0%	62.1%	61.9%	3.5
274	Refrigeration	Anti-Sweat Heater Controls LT	Biz-Prescriptive	Food Sales	Retro	3,147	3,147	55%	1,731	0.00	12	$250	100%	10%	28%	16	3%	36%	60.2%	48.8%	48.8%	27.8
275	Refrigeration	Auto Door Closer, Freezer	Biz-Prescriptive	Food Sales	Retro	419,455	419,455	1%	2,307	0.00	8	$157	100%	16%	59%	17	3%	32%	60.2%	49.6%	51.0%	27.7
276	Refrigeration	Display Case Door Retrofit, Low Temp	Biz-Prescriptive	Food Sales	Retro	2,922	2,922	50%	1,453	0.00	12	$686	75%	22%	8%	17	3%	55%	64.0%	64.0%	64.0%	4.3
277	Refrigeration	Energy Star Reach-In Freezer, Glass Doors	Biz-Prescriptive	Food Sales	ROB	3,234	3,234	15%	488	0.00	12	$450	25%	15%	4%	18	3%	55%	64.0%	64.0%	64.0%	2.9
278	Refrigeration	Energy Star Reach-In Freezer, Solid Doors	Biz-Prescriptive	Food Sales	ROB	4,676	4,676	20%	935	0.00	12	$450	75%	15%	8%	19	3%	55%	64.0%	64.0%	64.0%	5.5
279	Refrigeration	Refrigeration - Custom	Biz-Custom	Food Sales	ROB	7	7	15%	1	0.00	12	$0	100%	50%	72%	20	90%	20%	60.2%	49.9%	51.0%	9.1
280	Refrigeration	Retro-commissioning_Refrigerator Optimization	Biz-Custom RCx	Food Sales	Retro	33	33	3%	1	0.00	3	$0	100%	67%	22%	21	90%	10%	60.2%	50.9%	49.0%	2.0
281	Refrigeration	Energy Star Ice Machine	Biz-Prescriptive	Food Sales	ROB	6,993	6,993	10%	721	0.00	15	$1,426	3%	3%	2%	22	0%	49%	59.2%	57.2%	57.2%	8.9
282	Refrigeration	LED Refrigerated Display Case Lighting Average 6W/LF	Biz-Prescriptive	Food Sales	Retro	1,573	1,573	37%	574	0.00	12	$1,010	34%	34%	2%	23	5%	30%	44.0%	44.0%	43.1%	0.8
283	PlugLoads_Office	ENERGY STAR Uninterrupted Power Supply	Biz-Custom	Food Sales	ROB	3,096	3,096	3%	85	0.00	15	$59	75%	7%	11%	1	0%	70%	76.0%	76.0%	76.0%	10.5
284	PlugLoads_Office	Smart Power Strip – Commercial Use	Biz-Custom	Food Sales	Retro	64	64	100%	64	0.00	5	$50	7%	7%	10%	2	50%	10%	44.3%	38.5%	38.9%	3.2
285	PlugLoads_Office	Plug Load Occupancy Sensor	Biz-Custom	Food Sales	Retro	1,126	1,126	15%	169	0.00	8	$70	50%	13%	18%	2	50%	10%	59.4%	46.1%	47.0%	4.1
286	PlugLoads_Office	Electrically Commutated Plug Fans in data centers	Biz-Custom	Food Sales	Retro	86,783	86,783	18%	15,778	0.00	15	$480	100%	100%	100%	3	0%	33%	68.6%	59.7%	59.7%	15.9
287	PlugLoads_Office	High Efficiency CRAC unit	Biz-Custom	Food Sales	ROB	541	541	30%	162	0.00	15	$63	100%	14%	19%	3	0%	33%	68.6%	48.5%	49.2%	9.7
288	PlugLoads_Office	Computer Room Air Conditioner Economizer	Biz-Custom	Food Sales	Retro	418	418	86%	358	0.00	15	$82	100%	23%	33%	3	0%	33%	68.6%	52.8%	53.6%	7.0
289	PlugLoads_Office	Energy Star Laptop	Biz-Custom	Food Sales	ROB	126	126	33%	41	0.00	4	$0	0%			4	17%	85%	88.0%	88.0%	88.0%	0.0
290	PlugLoads_Office	Energy Star Monitor	Biz-Custom	Food Sales	ROB	72	72	21%	15	0.00	4	$0	0%			5	17%	95%	96.0%	96.0%	96.0%	0.0
291	PlugLoads_Office	Energy Star Printer/Copier/Fax	Biz-Custom	Food Sales	ROB	551	551	40%	223	0.00	6	$0	0%			6	17%	95%	96.0%	96.0%	96.0%	0.0
292	PlugLoads_Office	Energy Star Server	Biz-Custom	Food Sales	ROB	691	691	13%	90	0.00	15	$156	25%	3%	4%	7	0%	20%	36.3%	36.0%	36.0%	9.3
293	PlugLoads_Office	Server Virtualization	Biz-Custom	Food Sales	Retro	691	691	13%	90	0.00	15	$156	25%	3%	4%	7	0%	20%	36.3%	36.0%	36.0%	9.3
294	PlugLoads_Office	Data Center Hot/Cold Aisle Configuration	Biz-Custom	Food Sales	Retro	691	691	13%	90	0.00	15	$156	25%	3%	4%	7	0%	20%	36.3%	36.0%	36.0%	9.3
295	Motors	Cogged V-Belt	Biz-Custom	Food Sales	Retro	19,471	19,471	3%	604	0.00	15	$384	75%	8%	12%	1	70%	10%	62.1%	41.0%	41.4%	10.2
296	Motors	Pump and Fan Variable Frequency Drive Controls (Pumps)	Biz-Prescriptive	Food Sales	Retro	1,902	1,902	38%	731	0.00	15	$200	100%	30%	27%	2	4%	25%	68.6%	53.3%	53.0%	7.0
297	Motors	Escalators Motor Efficiency Controllers	Biz-Custom	Food Sales	Retro	7,500	7,500	20%	1,500	0.00	10	$5,000	2%	2%	2%	3	4%	10%	28.0%	28.0%	28.0%	8.6
298	CompressedAir	Efficient Air Compressors	Biz-Custom	Food Sales	ROB	4,004	4,004	31%	1,223	0.00	15	$100	100%	64%	100%	1	100%	33%	68.6%	58.6%	59.7%	10.5
299	CompressedAir	Retro-commissioning_Compressed Air Optimization	Biz-Custom RCx	Food Sales	Retro	7	7	15%	1	0.00	5	$0	100%	67%	100%	2	100%	33%	68.6%	58.8%	59.7%	4.0
300	CompressedAir	Compressed Air - Custom	Biz-Custom	Food Sales	Retro	7	7	15%	1	0.00	8	$0	100%	50%	100%	3	100%	33%	68.6%	57.5%	59.7%	4.1

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Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	Base (Existing) Annual Electric	Base (Standard) Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	MAP Incentive (%)	RAP Incentive (%)	PP Incentive (%)	End Use Measure Group	Base Saturation	EE Saturation	MAP Adoption Rate	RAP Adoption Rate	PP Adoption Rate	UCT Score
301	Miscellaneous	Power Distribution Equipment Upgrades	Biz-Custom	Food Sales	Retro	1,150	1,150	1%	6	0.00	30	$8	75%	4%	6%	1	86%	20%	58.1%	36.0%	36.0%	18.1
302	Miscellaneous	Vending Machine Controller - Non-Refrigerated	Biz-Custom	Food Sales	Retro	745	745	46%	343	0.00	5	$80	63%	63%	32%	2	1%	66%	72.8%	72.8%	72.8%	0.9
303	Miscellaneous	Vending Machine Controller - Refrigerated	Biz-Custom	Food Sales	Retro	1,739	1,739	46%	800	0.00	10	$216	100%	35%	28%	3	2%	66%	72.8%	72.8%	72.8%	3.3
304	Miscellaneous	Miscellaneous Custom	Biz-Custom	Food Sales	Retro	5	5	20%	1	0.00	10	$0	100%	50%	72%	4	14%	20%	68.6%	57.8%	58.7%	7.9
305	Whole Building_HVAC	HVAC - Energy Management System	Biz-Prescriptive	Food Sales	Retro	6,960	6,960	15%	1,044	0.00	15	$4,000	3%	3%	2%	1	100%	1%	20.8%	18.4%	18.4%	4.1
306	Whole Building_HVAC	Guest room energy management system	Biz-Custom	Food Sales	Retro	0	0	0%	0	0.00	8	$0	0%	0%		2	0%	0%	63.2%	55.0%	55.0%	0.0
307	Whole Building_HVAC	Retro-commissioning_Bld Optimization	Biz-Custom RCx	Food Sales	Retro	7	7	15%	1	0.00	3	$0	100%	67%	22%	3	100%	10%	63.2%	53.6%	51.7%	2.1
308	WholeBld	WholeBlg - Com RET	Biz-NC	Food Sales	Retro	7	7	15%	1	0.00	12	$0	100%	50%	19%	4	40%	0%	68.6%	57.8%	56.6%	9.2
309	Whole Building_NC	WholeBlg - Com NC	Biz-NC	Food Sales	NC	4	4	25%	1	0.00	12	$0	100%	50%	72%	5	100%	60%	68.6%	68.0%	68.0%	9.2
310	Behavioral	AMI Data Presentment & Engagement	Biz-Behavior	Food Sales	Retro	100	100	1%	1	0.00	1	$0	100%	100%	87%	1	100%	10%	50.0%	50.0%	50.0%	1.2
311	Behavioral	BIEMS	Biz-Behavior	Food Sales	Retro	88	88	1%	1	0.00	3	$0	12%	12%	5%	1	100%	5%	42.5%	50.0%	50.0%	1.5
312	Behavioral	Building Operator Certification	Biz-Behavior	Food Sales	Retro	48,700	48,700	1%	390	0.00	3	$67	50%	30%	12%	1	100%	5%	42.5%	50.0%	50.0%	2.1
313	Cooking	Commercial Combination Oven (Electric)	Biz-Prescriptive	Food Service	ROB	38,561	38,561	48%	18,432	0.00	12	$16,884	50%	6%	3%	1	17%	53%	62.4%	62.4%	62.4%	9.3
314	Cooking	Commercial Electric Convection Oven	Biz-Prescriptive	Food Service	ROB	12,193	12,193	15%	1,879	0.00	12	$1,706	50%	15%	11%	1	17%	53%	62.4%	62.4%	62.4%	3.9
315	Cooking	Commercial Electric Griddle	Biz-Prescriptive	Food Service	ROB	17,056	17,056	15%	2,596	0.00	12	$3,604	25%	14%	7%	2	14%	17%	39.3%	33.6%	33.6%	2.0
316	Cooking	Commercial Electric Steam Cooker	Biz-Prescriptive	Food Service	ROB	19,549	19,549	67%	13,162	0.00	12	$3,500	100%	12%	14%	3	6%	42%	68.6%	53.6%	53.6%	15.7
317	Cooking	Dishwasher Low Temp Door (Energy Star)	Biz-Prescriptive	Food Service	ROB	39,279	39,279	41%	16,153	0.00	15	$770	100%	49%	65%	4	26%	61%	68.8%	68.8%	68.8%	18.6
318	Cooking	Dishwasher High Temp Door (Energy Star)	Biz-Prescriptive	Food Service	ROB	39,825	39,825	30%	11,853	0.00	15	$770	100%	49%	65%	4	26%	61%	68.8%	68.8%	68.8%	13.7
319	Cooking	Energy efficient electric fryer	Biz-Prescriptive	Food Service	ROB	18,182	18,182	14%	2,572	0.00	12	$1,706	50%	1%	15%	5	27%	23%	55.0%	39.3%	40.7%	94.0
320	Cooking	Insulated Holding Cabinets (Full Size)	Biz-Prescriptive	Food Service	ROB	7,665	7,665	69%	5,278	0.00	12	$1,200	100%	6%	42%	6	3%	23%	68.6%	52.4%	54.9%	31.5
321	Cooking	Insulated Holding Cabinets (Half-Size)	Biz-Prescriptive	Food Service	ROB	3,066	3,066	58%	1,788	0.00	12	$1,500	50%	8%	12%	6	3%	23%	52.9%	38.7%	39.1%	6.6
322	HotWater	Faucet Aerator	Biz-Custom	Food Service	Retro	2,162	2,162	66%	1,425	0.00	10	$3	100%	26%	100%	4	25%	80%	84.0%	84.0%	84.0%	772.3
323	HotWater	Heat Pump Water Heater	Biz-Custom	Food Service	ROB	5,033	5,033	35%	1,738	0.00	10	$1,574	25%	6%	4%	1	100%	30%	51.7%	44.0%	44.0%	5.9
324	HotWater	Hot Water Pipe Insulation	Biz-Custom	Food Service	Retro	5,033	5,033	2%	101	0.00	20	$60	75%	9%	7%	2	100%	80%	84.0%	84.0%	84.0%	11.3
325	HotWater	Low Flow Pre-Rinse Sprayers	Biz-Custom	Food Service	ROB	2,991	2,991	26%	764	0.00	5	$35	100%	71%	87%	3	25%	80%	84.0%	84.0%	84.0%	6.6
326	HotWater	ENERGY STAR Commercial Washing Machines	Biz-Custom	Food Service	ROB	1,552	1,552	43%	671	0.00	7	$250	50%	14%	11%	5	25%	35%	66.5%	53.7%	53.3%	3.9
327	HotWater	Ozone Commercial Laundry	Biz-Custom	Food Service	Retro	2,984	2,984	25%	746	0.00	10	$20,310	0%	0%	0%	6	0%	50%	60.0%	60.0%	60.0%	5.0
328	InteriorLighting	LED T8 Tube Replacement	Biz-Prescriptive Light	Food Service	Retro	138	138	59%	82	0.00	15	$7	100%	49%	50%	1	56%	32%	71.1%	60.5%	60.6%	12.3
329	InteriorLighting	LED troffer retrofit kit, 2'X2' and 2'X4'	Biz-Prescriptive Light	Food Service	Retro	310	310	50%	155	0.00	18	$67	100%	26%	50%	1	56%	32%	71.1%	52.9%	55.7%	5.7
330	InteriorLighting	LED troffer, 2'X2' and 2'X4'	Biz-Prescriptive Light	Food Service	Retro	223	223	50%	112	0.00	18	$67	100%	26%	50%	1	56%	32%	71.1%	49.3%	53.4%	4.1
331	InteriorLighting	LED high bay fixture	Biz-Prescriptive Light	Food Service	Retro	1,080	1,080	76%	821	0.00	12	$323	100%	12%	50%	2	0%	16%	71.1%	52.5%	56.3%	10.5
332	InteriorLighting	LED Mogul-base HID Lamp Replacing High Bay HID	Biz-Prescriptive Light	Food Service	Retro	1,080	1,080	79%	855	0.00	12	$110	100%	21%	50%	2	0%	16%	71.1%	58.8%	60.0%	19.0
333	InteriorLighting	LED low bay fixture	Biz-Prescriptive Light	Food Service	Retro	1,080	1,080	76%	821	0.00	12	$196	100%	20%	50%	3	0%	16%	71.1%	56.5%	58.3%	10.5
334	InteriorLighting	LED Mogul-base HID Lamp Replacing Low Bay HID	Biz-Prescriptive Light	Food Service	Retro	1,080	1,080	79%	855	0.00	12	$60	100%	38%	50%	3	0%	16%	71.1%	60.6%	60.8%	19.0
335	InteriorLighting	LED downlight, screwin lamp, 1-3W, interior Average 2 Watts	Biz-Prescriptive Light	Food Service	ROB	67	67	88%	59	0.00	4	$4	100%	25%	50%	4	4%	32%	71.1%	60.3%	60.8%	10.0
336	InteriorLighting	LED downlight fixture	Biz-Prescriptive Light	Food Service	Retro	174	174	82%	142	0.00	4	$13	100%	39%	50%	5	40%	32%	71.1%	60.2%	60.5%	4.8
337	InteriorLighting	LED downlight, screwin lamp, 4-20W, interior Average 11 Watts	Biz-Prescriptive Light	Food Service	ROB	134	134	84%	113	0.00	4	$2	100%	61%	50%	5	40%	32%	71.1%	61.7%	61.6%	19.2
338	InteriorLighting	DeLamp Fluorescent Fixture Average Lamp Wattage 28W	Biz-Custom Light	Food Service	Retro	53	53	100%	53	0.00	15	$4	100%	69%	50%	6	56%	0%	71.1%	61.1%	60.7%	10.8
339	InteriorLighting	Daylighting Controls	Biz-Custom Light	Food Service	Retro	8,810	8,810	30%	2,643	0.00	12	$3,000	25%	5%	50%	7	99%	8%	48.3%	39.1%	46.0%	9.7
340	InteriorLighting	Occupancy Sensors	Biz-Prescriptive Light	Food Service	Retro	1,523	1,523	30%	457	0.00	8	$54	100%	37%	50%	7	99%	8%	71.1%	59.3%	59.8%	5.6
341	InteriorLighting	Central Lighting Monitoring & Controls (non-networked)	Biz-Custom Light	Food Service	Retro	41,703	41,703	20%	8,341	0.00	12	$3,700	100%	12%	17%	7	99%	8%	71.1%	50.8%	51.5%	9.2
342	InteriorLighting	Network Lighting Controls - Wireless (WiFi)	Biz-Custom Light	Food Service	Retro	16,277	16,277	47%	7,650	0.00	8	$1,683	100%	24%	34%	7	99%	8%	71.1%	56.9%	57.6%	6.5
343	InteriorLighting	Bi-Level Lighting Fixture – Stairwells, Hallways, and Garages	Biz-Custom Light	Food Service	Retro	1,034	1,034	50%	517	0.00	10	$274	50%	10%	50%	8	1%	8%	62.0%	47.4%	53.9%	6.9
344	InteriorLighting	LED Exit Sign - 4 Watt Fixture (2 lamp)	Biz-Prescriptive Light	Food Service	Retro	236	236	85%	201	0.00	15	$60	100%	8%	50%	9	1%	75%	80.0%	80.0%	80.0%	19.6
345	ExteriorLighting	LED wallpack (existing W<250)	Biz-Prescriptive Light	Food Service	Retro	856	856	66%	567	0.00	12	$248	50%	10%	9%	1	13%	46%	62.7%	56.8%	56.8%	6.6
346	ExteriorLighting	LED parking lot fixture (existing W≥250)	Biz-Prescriptive Light	Food Service	Retro	1,589	1,589	60%	959	0.00	12	$756	25%	3%	5%	2	13%	41%	52.8%	52.8%	52.8%	11.1
347	ExteriorLighting	LED parking lot fixture (existing W<250)	Biz-Prescriptive Light	Food Service	Retro	856	856	66%	567	0.00	12	$248	50%	10%	9%	3	13%	41%	62.7%	52.8%	52.8%	6.6
348	ExteriorLighting	LED fuel pump canopy fixture (existing W<250)	Biz-Prescriptive Light	Food Service	Retro	0	0	0%	0	0.00	12	$0	0%	0%		4	0%	41%	71.1%	61.9%	61.9%	0.0
349	ExteriorLighting	LED fuel pump canopy fixture (existing W≥250)	Biz-Prescriptive Light	Food Service	Retro	0	0	0%	0	0.00	12	$0	0%	0%		5	0%	41%	71.1%	61.9%	61.9%	0.0
350	ExteriorLighting	LED outdoor pole decorative fixture (existing W≥250)	Biz-Prescriptive Light	Food Service	Retro	1,589	1,589	60%	959	0.00	12	$756	25%	3%	5%	6	13%	41%	52.8%	52.8%	52.8%	11.1
351	ExteriorLighting	LED parking garage fixture (existing W≥250)	Biz-Prescriptive Light	Food Service	Retro	3,235	3,235	60%	1,953	0.00	6	$756	25%	3%	10%	7	13%	41%	60.2%	52.8%	52.8%	11.7
352	ExteriorLighting	LED parking garage fixture (existing W<250)	Biz-Prescriptive Light	Food Service	Retro	1,742	1,742	66%	1,154	0.00	6	$248	50%	10%	19%	8	13%	41%	66.7%	55.4%	56.0%	6.9
353	ExteriorLighting	LED Mogul-base HID Lamp Replacing Exterior HID (existing W≥250)	Biz-Prescriptive Light	Food Service	Retro	1,589	1,589	60%	959	0.00	12	$756	25%	3%	5%	9	13%	41%	52.8%	52.8%	52.8%	11.1
354	ExteriorLighting	LED Mogul-base HID Lamp Replacing Exterior HID (existing W<250)	Biz-Prescriptive Light	Food Service	Retro	856	856	66%	567	0.00	12	$248	50%	10%	9%	10	13%	41%	62.7%	52.8%	52.8%	6.6
355	Cooling	Air Conditioner - 16 SEER (5-20 Tons)	Biz-Prescriptive	Food Service	ROB	7,484	7,484	12%	935	0.00	15	$3,570	25%	5%	3%	1	18%	20%	36.0%	34.1%	34.1%	8.1
356	Cooling	Air Conditioner - 17 SEER (5-20 Tons)	Biz-Prescriptive	Food Service	ROB	7,484	7,484	12%	935	0.00	15	$4,760	25%	5%	2%	1	18%	20%	36.0%	34.1%	34.1%	6.1
357	Cooling	Air Conditioner - 18 SEER (5-20 Tons)	Biz-Prescriptive	Food Service	ROB	7,484	7,484	19%	1,410	0.00	15	$5,960	25%	5%	2%	1	18%	20%	36.0%	34.1%	34.1%	7.3
358	Cooling	Air Conditioner - 21 SEER (5-20 Tons)	Biz-Prescriptive	Food Service	ROB	7,484	7,484	24%	1,820	0.00	15	$9,080	25%	5%	2%	1	18%	20%	36.0%	34.1%	34.1%	6.2
359	Cooling	Air Conditioner - 16 SEER (20+ Tons)	Biz-Prescriptive	Food Service	ROB	15,240	15,240	8%	1,270	0.00	15	$7,140	25%	5%	2%	2	18%	20%	36.0%	34.1%	34.1%	5.5
360	Cooling	Air Conditioner - 17 SEER (20+ Tons)	Biz-Prescriptive	Food Service	ROB	15,240	15,240	8%	1,270	0.00	15	$9,520	5%	5%	1%	2	18%	20%	36.0%	34.1%	34.1%	4.1
361	Cooling	Air Conditioner - 18 SEER (20+ Tons)	Biz-Prescriptive	Food Service	ROB	15,240	15,240	15%	2,345	0.00	15	$11,920	25%	5%	2%	2	18%	20%	36.0%	34.1%	34.1%	6.1
362	Cooling	Air Conditioner - 21 SEER (20+ Tons)	Biz-Prescriptive	Food Service	ROB	15,240	15,240	21%	3,266	0.00	15	$18,160	25%	5%	2%	2	18%	20%	36.0%	34.1%	34.1%	5.6
363	Cooling	Comprehensive Rooftop Unit Quality Maintenance (AC Tune-up)	Biz-Custom	Food Service	Retro	5,029	5,029	6%	318	0.00	3	$500	3%	3%	5%	3	36%	50%	60.0%	60.0%	60.0%	5.3
364	Cooling	Air Side Economizer	Biz-Custom	Food Service	Retro	4,191	4,191	3%	122	0.00	5	$170	4%	4%	5%	4	36%	33%	46.4%	46.4%	46.4%	3.0
365	Cooling	Advanced Rooftop Controls	Biz-Custom	Food Service	Retro	3,493	3,493	30%	1,045	0.00	10	$3,412	25%	2%	2%	5	36%	3%	22.0%	19.7%	19.7%	16.3
366	Cooling	Air Conditioner - 16 SEER (<5 Tons)	Biz-Prescriptive	Food Service	ROB	3,224	3,224	19%	604	0.00	15	$1,785	50%	5%	3%	6	28%	20%	36.0%	34.8%	34.6%	10.5
367	Cooling	Air Conditioner - 17 SEER (<5 Tons)	Biz-Prescriptive	Food Service	ROB	3,224	3,224	24%	759	0.00	15	$2,380	25%	5%	3%	6	28%	20%	36.0%	34.1%	34.1%	9.9
368	Cooling	Air Conditioner - 18 SEER(<5 Tons)	Biz-Prescriptive	Food Service	ROB	3,224	3,224	28%	896	0.00	15	$2,980	25%	5%	3%	6	28%	20%	36.0%	34.1%	34.1%	9.3
369	Cooling	Air Conditioner - 21 SEER(<5 Tons)	Biz-Prescriptive	Food Service	ROB	3,224	3,224	38%	1,228	0.00	15	$4,540	25%	5%	3%	6	28%	20%	36.0%	34.1%	34.1%	8.4
370	Cooling	Centrifugal Chiller - Average kW/Ton = 0.626	Biz-Custom	Food Service	ROB	3,068	3,068	26%	805	0.00	20	$1,816	25%	2%	3%	7	0%	20%	36.0%	35.2%	35.3%	20.6
371	Cooling	Reciprocating Chiller - Average kW/Ton = 0.99	Biz-Custom	Food Service	ROB	3,772	3,772	27%	1,006	0.00	20	$1,456	100%	4%	5%	8	0%	20%	63.2%	36.0%	36.0%	33.9
372	Cooling	Screw Chiller - Average kW/Ton = 0.675	Biz-Custom	Food Service	ROB	4,405	4,405	23%	1,010	0.00	20	$1,453	100%	4%	5%	9	0%	20%	63.2%	36.0%	36.0%	33.4
373	Cooling	HVAC/Chiller Custom	Biz-Custom	Food Service	Retro	5	5	20%	1	0.00	12	$1	25%	6%	9%	10	36%	20%	37.0%	36.0%	36.0%	7.4
374	Cooling	Chiller Tune-up	Biz-Custom	Food Service	Retro	6,038	6,038	8%	483	0.00	5	$102	100%	25%	36%	11	36%	50%	63.2%	60.0%	60.0%	6.6
375	Cooling	PTAC - <7,000 Btuh - lodging	Biz-Prescriptive	Food Service	ROB	352	352	9%	32	0.00	15	$22	100%	50%	14%	12	0%	20%	63.2%	44.2%	37.6%	4.4

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Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	Base (Existing) Annual Electric	Base (Standard) Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	MAP Incentive (%)	RAP Incentive (%)	PP Incentive (%)	End Use Measure Group	Base Saturation	EE Saturation	MAP Adoption Rate	RAP Adoption Rate	PP Adoption Rate	UCT Score
376	Cooling	PTAC - 7,000 to 15,000 Btuh - lodging	Biz-Prescriptive	Food Service	ROB	783	783	9%	73	0.00	15	$41	100%	50%	18%	13	0%	20%	63.2%	46.0%	41.1%	5.5
377	Cooling	PTAC - >15,000 Btuh - lodging	Biz-Prescriptive	Food Service	ROB	1,323	1,323	10%	126	0.00	15	$56	100%	50%	22%	14	0%	20%	63.2%	47.7%	44.3%	7.0
378	Cooling	HVAC Occupancy Controls	Biz-Custom	Food Service	ROB	2,636	2,636	20%	527	0.00	15	$538	75%	5%	0%	15	36%	25%	51.4%	40.0%	40.0%	14.9
379	Cooling	Smart Thermostat	Biz-Custom	Food Service	ROB	3,493	3,493	18%	618	0.00	10	$128	100%	31%	24%	16	57%	9%	63.2%	47.9%	47.3%	4.8
380	Cooling	Window Film	Biz-Custom	Food Service	Retro	5,029	0	5%	256	0.00	10	$213	75%	6%	5%	17	100%	25%	53.8%	40.0%	40.0%	13.3
381	Cooling	Energy Recovery Ventilator	Biz-Custom	Food Service	Retro	2	2	50%	1	0.00	20	$1	75%	8%	12%	18	100%	5%	54.9%	33.4%	33.7%	11.0
382	Heating	Heat Pump - 16 SEER (<5 Tons)	Biz-Prescriptive	Food Service	ROB	13,868	13,868	19%	2,621	0.00	15	$2,055	75%	20%	13%	1	19%	20%	54.2%	36.0%	36.0%	4.0
383	Heating	Heat Pump - 17 SEER (<5 Tons)	Biz-Prescriptive	Food Service	ROB	13,868	13,868	21%	2,953	0.00	15	$2,740	50%	20%	11%	1	19%	20%	44.4%	36.0%	36.0%	3.5
384	Heating	Heat Pump - 18 SEER(<5 Tons)	Biz-Prescriptive	Food Service	ROB	13,868	13,868	24%	3,344	0.00	15	$3,425	50%	20%	10%	1	19%	20%	42.8%	36.0%	36.0%	3.3
385	Heating	Heat Pump - 21 SEER(<5 Tons)	Biz-Prescriptive	Food Service	ROB	13,868	13,868	28%	3,837	0.00	15	$4,500	50%	20%	9%	1	19%	20%	41.0%	36.0%	36.0%	3.1
386	Heating	Geothermal HP - SEER 20.3 (<5 Tons)	Biz-Prescriptive	Food Service	ROB	13,868	13,868	36%	5,003	0.00	15	$4,700	50%	11%	11%	1	19%	20%	43.9%	36.0%	36.0%	6.3
387	Heating	Geothermal HP - SEER 21.5 (<5 Tons)	Biz-Prescriptive	Food Service	ROB	13,868	13,868	40%	5,599	0.00	15	$7,300	25%	7%	7%	1	19%	20%	36.0%	36.0%	36.0%	7.0
388	Heating	Geothermal HP - SEER 23.1 (<5 Tons)	Biz-Prescriptive	Food Service	ROB	13,868	13,868	46%	6,370	0.00	15	$7,300	50%	7%	7%	1	19%	20%	40.0%	36.0%	36.0%	7.9
389	Heating	Geothermal HP - SEER 29.3 (<5 Tons)	Biz-Prescriptive	Food Service	ROB	13,868	13,868	49%	6,775	0.00	15	$9,200	25%	8%	5%	1	19%	20%	36.0%	36.0%	36.0%	5.5
390	Heating	Heat Pump - 16 SEER (5-20 Tons)	Biz-Prescriptive	Food Service	ROB	57,157	57,157	9%	5,188	0.00	15	$4,110	50%	20%	12%	2	25%	20%	46.0%	36.0%	36.0%	3.6
391	Heating	Heat Pump - 17 SEER (5-20 Tons)	Biz-Prescriptive	Food Service	ROB	57,157	57,157	13%	7,573	0.00	15	$5,480	50%	20%	9%	2	25%	20%	46.6%	36.0%	36.0%	3.5
392	Heating	Heat Pump - 18 SEER (5-20 Tons)	Biz-Prescriptive	Food Service	ROB	57,157	57,157	19%	11,122	0.00	15	$6,850	75%	20%	7%	2	25%	20%	55.3%	36.1%	36.0%	4.1
393	Heating	Heat Pump - 21 SEER (5-20 Tons)	Biz-Prescriptive	Food Service	ROB	57,157	57,157	25%	14,196	0.00	15	$9,000	75%	20%	6%	2	25%	20%	55.1%	36.0%	36.0%	4.0
394	Heating	Geothermal HP - SEER 20.3 (5-20 Tons)	Biz-Prescriptive	Food Service	ROB	22,178	22,178	20%	4,366	0.00	15	$7,700	50%	6%	6%	2	25%	20%	38.8%	36.0%	36.0%	10.9
395	Heating	Geothermal HP - SEER 21.5 (5-20 Tons)	Biz-Prescriptive	Food Service	ROB	22,178	22,178	25%	5,563	0.00	15	$10,300	50%	5%	5%	2	25%	20%	37.7%	36.0%	36.0%	12.3
396	Heating	Geothermal HP - SEER 23.1 (5-20 Tons)	Biz-Prescriptive	Food Service	ROB	22,178	22,178	32%	7,111	0.00	15	$12,800	50%	4%	4%	2	25%	20%	37.4%	36.0%	36.0%	14.3
397	Heating	Geothermal HP - SEER 29.3 (5-20 Tons)	Biz-Prescriptive	Food Service	ROB	22,178	22,178	36%	7,936	0.00	15	$17,700	25%	4%	3%	2	25%	20%	36.0%	36.0%	36.0%	11.1
398	Heating	Heat Pump - 16 SEER (20+ Tons)	Biz-Prescriptive	Food Service	ROB	117,690	117,690	11%	12,880	0.00	15	$8,220	50%	20%	6%	3	25%	20%	48.0%	36.0%	36.0%	3.7
399	Heating	Heat Pump - 17 SEER (20+ Tons)	Biz-Prescriptive	Food Service	ROB	117,690	117,690	15%	17,650	0.00	15	$10,960	50%	20%	5%	3	25%	20%	48.1%	36.0%	36.0%	3.6
400	Heating	Heat Pump - 18 SEER (20+ Tons)	Biz-Prescriptive	Food Service	ROB	117,690	117,690	21%	24,873	0.00	15	$13,700	75%	20%	4%	3	25%	20%	55.8%	37.4%	36.0%	4.3
401	Heating	Heat Pump - 21 SEER (20+ Tons)	Biz-Prescriptive	Food Service	ROB	117,690	117,690	26%	31,122	0.00	15	$18,000	75%	20%	3%	3	25%	20%	55.6%	36.8%	36.0%	4.2
402	Heating	Geothermal HP - SEER 20.3 (20+ Tons)	Biz-Prescriptive	Food Service	ROB	45,262	45,262	21%	9,639	0.00	15	$10,700	100%	9%	5%	3	25%	20%	63.2%	36.0%	36.0%	11.3
403	Heating	Geothermal HP - SEER 21.5 (20+ Tons)	Biz-Prescriptive	Food Service	ROB	45,262	45,262	27%	12,032	0.00	15	$13,300	75%	8%	4%	3	25%	20%	53.5%	36.0%	36.0%	12.7
404	Heating	Geothermal HP - SEER 23.1 (20+ Tons)	Biz-Prescriptive	Food Service	ROB	45,262	45,262	33%	15,128	0.00	15	$18,300	75%	5%	3%	3	25%	20%	52.3%	36.0%	36.0%	14.6
405	Heating	Geothermal HP - SEER 29.3 (20+ Tons)	Biz-Prescriptive	Food Service	ROB	45,262	45,262	37%	16,779	0.00	15	$26,200	50%	4%	2%	3	25%	20%	38.8%	36.0%	36.0%	16.9
406	Heating	PTHP - <7,000 Btuh - lodging	Biz-Prescriptive	Food Service	ROB	2,836	2,836	8%	239	0.00	15	$13	100%	100%	100%	4	0%	20%	63.2%	55.0%	55.0%	9.8
407	Heating	PTHP - 7,000 to 15,000 Btuh - lodging	Biz-Prescriptive	Food Service	ROB	6,071	6,071	11%	677	0.00	15	$45	100%	100%	100%	5	0%	20%	63.2%	55.0%	55.0%	7.3
408	Heating	PTHP - >15,000 Btuh - lodging	Biz-Prescriptive	Food Service	ROB	9,802	9,802	14%	1,373	0.00	15	$35	100%	100%	100%	6	0%	20%	63.2%	55.0%	55.0%	18.2
409	Heating	Mini Split Ductless Heat Pump Cold Climate (Tiers & sizes TBD)	Biz-Prescriptive	Food Service	ROB	4	4	25%	1	0.00	12	$0	100%	35%	67%	7	19%	20%	63.2%	52.3%	53.7%	24.5
410	Heating	Variable Refrigerant Flow Heat Pump	Biz-Custom	Food Service	NC	11	11	25%	3	0.00	20	$3	100%	5%	3%	2	25%	0%	63.2%	33.5%	33.4%	34.8
411	Ventilation	Kitchen Exhaust Hood Demand Ventilation Control System	Biz-Custom	Food Service	ROB	2	2	50%	1	0.00	20	$2	25%	4%	5%	1	8%	24%	39.2%	39.2%	39.2%	8.6
412	Ventilation	Demand Controlled Ventilation	Biz-Custom	Food Service	Retro	2,442	2,442	20%	488	0.00	15	$227	100%	11%	16%	2	92%	5%	63.2%	38.6%	39.4%	9.4
413	Ventilation	Pump and Fan Variable Frequency Drive Controls (Fans)	Biz-Prescriptive	Food Service	Retro	2,258	2,258	41%	923	0.00	15	$375	100%	16%	18%	2	92%	25%	63.2%	42.0%	42.4%	9.1
414	Refrigeration	Strip Curtains	Biz-Custom	Food Service	Retro	334	334	81%	270	0.00	4	$9	100%	100%	100%	1	6%	26%	60.2%	52.4%	52.4%	4.2
415	Refrigeration	Bare Suction Line	Biz-Custom	Food Service	Retro	23	23	93%	21	0.00	15	$4	100%	27%	39%	2	0%	25%	60.2%	45.6%	46.6%	9.2
416	Refrigeration	Floating Head Pressure Controls	Biz-Prescriptive	Food Service	Retro	2,653	2,653	50%	1,327	0.00	15	$80	100%	25%	41%	3	8%	20%	60.2%	50.1%	50.6%	31.6
417	Refrigeration	Saturated Suction Controls	Biz-Custom	Food Service	Retro	831	831	50%	416	0.00	15	$559	50%	4%	6%	4	2%	20%	36.0%	36.0%	36.0%	15.7
418	Refrigeration	Compressor Retrofit	Biz-Custom	Food Service	Retro	813	813	20%	163	0.00	15	$477	25%	2%	3%	5	14%	15%	32.0%	27.4%	27.4%	15.8
419	Refrigeration	Electronically Commutated (EC) Walk-In Evaporator Fan Motor	Biz-Prescriptive	Food Service	Retro	1,268	1,268	65%	824	0.00	15	$78	100%	45%	42%	6	4%	33%	60.2%	49.8%	49.6%	11.2
420	Refrigeration	Evaporator Fan Motor Controls	Biz-Prescriptive	Food Service	Retro	1,912	1,912	25%	478	0.00	13	$291	50%	15%	7%	7	4%	10%	44.4%	30.0%	28.3%	4.7
421	Refrigeration	Variable Speed Condenser Fan	Biz-Custom	Food Service	Retro	2,960	2,960	50%	1,480	0.00	15	$1,170	25%	7%	9%	8	5%	20%	36.0%	36.0%	36.0%	6.9
422	Refrigeration	Refrigeration Economizer	Biz-Custom	Food Service	Retro	67,850	67,850	2%	1,357	0.00	15	$2,558	3%	3%	4%	9	19%	0%	20.0%	15.7%	15.9%	6.9
423	Refrigeration	Anti-Sweat Heater Controls MT	Biz-Prescriptive	Food Service	Retro	1,313	1,313	55%	722	0.00	12	$250	75%	10%	12%	10	19%	36%	54.7%	48.8%	48.8%	8.7
424	Refrigeration	Auto Door Closer, Cooler	Biz-Prescriptive	Food Service	Retro	471,500	471,500	0%	943	0.00	8	$157	100%	16%	24%	11	14%	54%	63.2%	63.2%	63.2%	11.6
425	Refrigeration	Display Case Door Retrofit, Medium Temp	Biz-Prescriptive	Food Service	Retro	1,584	1,584	36%	578	0.00	12	$686	25%	22%	3%	12	6%	55%	64.0%	64.0%	64.0%	1.7
426	Refrigeration	Electronically Commutated (EC) Reach-In Evaporator Fan Motor	Biz-Prescriptive	Food Service	Retro	1,268	1,268	65%	824	0.00	15	$78	100%	45%	42%	13	3%	33%	60.2%	49.8%	49.6%	11.2
427	Refrigeration	Q-Sync Motor for Walk-In and Reach-in Evaporator Fan Motor	Biz-Custom	Food Service	Retro	993	993	51%	504	0.00	10	$96	100%	36%	21%	13	3%	33%	60.2%	46.4%	46.4%	5.1
428	Refrigeration	Energy Star Reach-In Refrigerator, Glass Doors	Biz-Prescriptive	Food Service	ROB	1,546	1,546	27%	410	0.00	12	$600	25%	5%	3%	14	19%	55%	64.0%	64.0%	63.9%	5.1
429	Refrigeration	Energy Star Reach-In Refrigerator, Solid Doors	Biz-Prescriptive	Food Service	ROB	1,112	1,112	25%	283	0.00	12	$600	5%	5%	2%	15	19%	55%	64.0%	62.1%	61.9%	3.5
430	Refrigeration	Anti-Sweat Heater Controls LT	Biz-Prescriptive	Food Service	Retro	3,147	3,147	55%	1,731	0.00	12	$250	100%	10%	28%	16	6%	36%	60.2%	48.8%	48.8%	27.9
431	Refrigeration	Auto Door Closer, Freezer	Biz-Prescriptive	Food Service	Retro	419,455	419,455	1%	2,307	0.00	8	$157	100%	16%	59%	17	6%	54%	63.2%	63.2%	63.2%	27.7
432	Refrigeration	Display Case Door Retrofit, Low Temp	Biz-Prescriptive	Food Service	Retro	2,922	2,922	50%	1,453	0.00	12	$686	75%	22%	8%	17	6%	55%	64.0%	64.0%	64.0%	4.3
433	Refrigeration	Energy Star Reach-In Freezer, Glass Doors	Biz-Prescriptive	Food Service	ROB	3,234	3,234	15%	488	0.00	12	$450	25%	15%	4%	18	6%	55%	64.0%	64.0%	64.0%	2.9
434	Refrigeration	Energy Star Reach-In Freezer, Solid Doors	Biz-Prescriptive	Food Service	ROB	4,676	4,676	20%	935	0.00	12	$450	75%	15%	8%	19	6%	55%	64.0%	64.0%	64.0%	5.5
435	Refrigeration	Refrigeration - Custom	Biz-Custom	Food Service	ROB	7	7	15%	1	0.00	12	$0	100%	50%	72%	20	90%	20%	60.2%	49.9%	51.0%	9.1
436	Refrigeration	Retro-commissioning_Refrigerator Optimization	Biz-Custom RCx	Food Service	Retro	33	33	3%	1	0.00	3	$0	100%	67%	22%	21	90%	10%	60.2%	50.9%	49.0%	2.0
437	Refrigeration	Energy Star Ice Machine	Biz-Prescriptive	Food Service	ROB	6,993	6,993	10%	721	0.00	15	$1,426	3%	3%	2%	22	4%	49%	59.2%	57.2%	57.2%	8.9
438	Refrigeration	LED Refrigerated Display Case Lighting Average 6W/LF	Biz-Prescriptive	Food Service	Retro	1,573	1,573	37%	574	0.00	12	$1,010	34%	34%	2%	23	11%	30%	44.0%	44.0%	43.1%	0.9
439	PlugLoads_Office	ENERGY STAR Uninterrupted Power Supply	Biz-Custom	Food Service	ROB	3,096	3,096	3%	85	0.00	15	$59	75%	7%	11%	1	2%	70%	76.0%	76.0%	76.0%	10.5
440	PlugLoads_Office	Smart Power Strip – Commercial Use	Biz-Custom	Food Service	Retro	64	64	100%	64	0.00	5	$50	7%	7%	10%	2	50%	10%	44.3%	38.5%	38.9%	3.2
441	PlugLoads_Office	Plug Load Occupancy Sensor	Biz-Custom	Food Service	Retro	1,126	1,126	15%	169	0.00	8	$70	50%	13%	18%	2	50%	10%	59.4%	46.1%	47.0%	4.2
442	PlugLoads_Office	Electrically Commutated Plug Fans in data centers	Biz-Custom	Food Service	Retro	86,783	86,783	18%	15,778	0.00	15	$480	100%	100%	100%	3	0%	33%	68.6%	59.7%	59.7%	16.0
443	PlugLoads_Office	High Efficiency CRAC unit	Biz-Custom	Food Service	ROB	541	541	30%	162	0.00	15	$63	100%	14%	19%	3	0%	33%	68.6%	48.5%	49.2%	9.7
444	PlugLoads_Office	Computer Room Air Conditioner Economizer	Biz-Custom	Food Service	Retro	418	418	86%	358	0.00	15	$82	100%	23%	33%	3	0%	33%	68.6%	52.8%	53.6%	7.0
445	PlugLoads_Office	Energy Star Laptop	Biz-Custom	Food Service	ROB	126	126	33%	41	0.00	4	$0	0%			4	17%	85%	88.0%	88.0%	88.0%	0.0
446	PlugLoads_Office	Energy Star Monitor	Biz-Custom	Food Service	ROB	72	72	21%	15	0.00	4	$0	0%			5	17%	95%	96.0%	96.0%	96.0%	0.0
447	PlugLoads_Office	Energy Star Printer/Copier/Fax	Biz-Custom	Food Service	ROB	551	551	40%	223	0.00	6	$0	0%			6	17%	95%	96.0%	96.0%	96.0%	0.0
448	PlugLoads_Office	Energy Star Server	Biz-Custom	Food Service	ROB	691	691	13%	90	0.00	15	$156	25%	3%	4%	7	0%	20%	36.3%	36.0%	36.0%	9.4
449	PlugLoads_Office	Server Virtualization	Biz-Custom	Food Service	Retro	691	691	13%	90	0.00	15	$156	25%	3%	4%	7	0%	20%	36.3%	36.0%	36.0%	9.4
450	PlugLoads_Office	Data Center Hot/Cold Aisle Configuration	Biz-Custom	Food Service	Retro	691	691	13%	90	0.00	15	$156	25%	3%	4%	7	0%	20%	36.3%	36.0%	36.0%	9.4

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Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	Base (Existing) Annual Electric	Base (Standard) Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	MAP Incentive (%)	RAP Incentive (%)	PP Incentive (%)	End Use Measure Group	Base Saturation	EE Saturation	MAP Adoption Rate	RAP Adoption Rate	PP Adoption Rate	UCT Score
451	Motors	Cogged V-Belt	Biz-Custom	Food Service	Retro	17,237	17,237	3%	534	0.00	15	$384	75%	7%	10%	1	76%	10%	61.5%	40.1%	40.4%	10.7
452	Motors	Pump and Fan Variable Frequency Drive Controls (Pumps)	Biz-Prescriptive	Food Service	Retro	1,902	1,902	38%	731	0.00	15	$200	100%	30%	27%	2	4%	25%	68.6%	53.3%	53.0%	7.0
453	Motors	Escalators Motor Efficiency Controllers	Biz-Custom	Food Service	Retro	7,500	7,500	20%	1,500	0.00	10	$5,000	2%	2%	2%	3	0%	10%	28.0%	28.0%	28.0%	8.6
454	CompressedAir	Efficient Air Compressors	Biz-Custom	Food Service	ROB	4,004	4,004	31%	1,223	0.00	15	$100	100%	64%	100%	1	100%	33%	68.6%	58.6%	59.7%	10.5
455	CompressedAir	Retro-commissioning_Compressed Air Optimization	Biz-Custom RCx	Food Service	Retro	7	7	15%	1	0.00	5	$0	100%	67%	100%	2	100%	33%	68.6%	58.8%	59.7%	4.1
456	CompressedAir	Compressed Air - Custom	Biz-Custom	Food Service	Retro	7	7	15%	1	0.00	8	$0	100%	50%	100%	3	100%	33%	68.6%	57.5%	59.7%	4.2
457	Miscellaneous	Power Distribution Equipment Upgrades	Biz-Custom	Food Service	Retro	1,150	1,150	1%	6	0.00	30	$8	75%	4%	6%	1	78%	20%	58.1%	36.0%	36.0%	18.2
458	Miscellaneous	Vending Machine Controller - Non-Refrigerated	Biz-Custom	Food Service	Retro	745	745	46%	343	0.00	5	$80	63%	63%	32%	2	1%	66%	72.8%	72.8%	72.8%	0.9
459	Miscellaneous	Vending Machine Controller - Refrigerated	Biz-Custom	Food Service	Retro	1,739	1,739	46%	800	0.00	10	$216	100%	35%	28%	3	4%	66%	72.8%	72.8%	72.8%	3.3
460	Miscellaneous	Miscellaneous Custom	Biz-Custom	Food Service	Retro	5	5	20%	1	0.00	10	$0	100%	50%	72%	4	22%	20%	68.6%	57.8%	58.7%	7.9
461	Whole Building_HVAC	HVAC - Energy Management System	Biz-Prescriptive	Food Service	Retro	6,960	6,960	15%	1,044	0.00	15	$4,000	3%	3%	2%	1	100%	1%	20.8%	18.4%	18.4%	4.2
462	Whole Building_HVAC	Guest room energy management system	Biz-Custom	Food Service	Retro	0	0	0%	0	0.00	8	$0	0%	0%		2	0%	0%	63.2%	55.0%	55.0%	0.0
463	Whole Building_HVAC	Retro-commissioning_Bld Optimization	Biz-Custom RCx	Food Service	Retro	7	7	15%	1	0.00	3	$0	100%	67%	22%	3	100%	10%	63.2%	53.6%	51.7%	2.2
464	WholeBld	WholeBlg - Com RET	Biz-NC	Food Service	Retro	7	7	15%	1	0.00	12	$0	100%	50%	19%	4	40%	0%	68.6%	57.8%	56.6%	9.3
465	Whole Building_NC	WholeBlg - Com NC	Biz-NC	Food Service	NC	4	4	25%	1	0.00	12	$0	100%	50%	72%	5	100%	60%	68.6%	68.0%	68.0%	9.3
466	Behavioral	AMI Data Presentment & Engagement	Biz-Behavior	Food Service	Retro	100	100	1%	1	0.00	1	$0	100%	100%	87%	1	100%	10%	50.0%	50.0%	50.0%	1.2
467	Behavioral	BIEMS	Biz-Behavior	Food Service	Retro	59	59	2%	1	0.00	3	$0	12%	12%	5%	1	100%	5%	42.5%	50.0%	50.0%	1.6
468	Behavioral	Building Operator Certification	Biz-Behavior	Food Service	Retro	44,900	44,900	1%	359	0.00	3	$61	50%	30%	12%	1	100%	5%	42.5%	50.0%	50.0%	2.1
469	Cooking	Commercial Combination Oven (Electric)	Biz-Prescriptive	Health	ROB	38,561	38,561	48%	18,432	0.00	12	$16,884	50%	6%	3%	1	17%	53%	62.4%	62.4%	62.4%	9.2
470	Cooking	Commercial Electric Convection Oven	Biz-Prescriptive	Health	ROB	12,193	12,193	15%	1,879	0.00	12	$1,706	50%	15%	11%	1	17%	53%	62.4%	62.4%	62.4%	3.9
471	Cooking	Commercial Electric Griddle	Biz-Prescriptive	Health	ROB	17,056	17,056	15%	2,596	0.00	12	$3,604	25%	14%	7%	2	14%	17%	39.3%	33.6%	33.6%	2.0
472	Cooking	Commercial Electric Steam Cooker	Biz-Prescriptive	Health	ROB	19,549	19,549	67%	13,162	0.00	12	$3,500	100%	12%	14%	3	6%	42%	68.6%	53.6%	53.6%	15.6
473	Cooking	Dishwasher Low Temp Door (Energy Star)	Biz-Prescriptive	Health	ROB	39,279	39,279	41%	16,153	0.00	15	$770	100%	49%	65%	4	26%	61%	68.8%	68.8%	68.8%	18.5
474	Cooking	Dishwasher High Temp Door (Energy Star)	Biz-Prescriptive	Health	ROB	39,825	39,825	30%	11,853	0.00	15	$770	100%	49%	65%	4	26%	61%	68.8%	68.8%	68.8%	13.5
475	Cooking	Energy efficient electric fryer	Biz-Prescriptive	Health	ROB	18,182	18,182	14%	2,572	0.00	12	$1,706	50%	1%	15%	5	27%	23%	55.0%	39.3%	40.7%	93.0
476	Cooking	Insulated Holding Cabinets (Full Size)	Biz-Prescriptive	Health	ROB	7,665	7,665	69%	5,278	0.00	12	$1,200	100%	6%	42%	6	3%	23%	68.6%	52.4%	54.9%	31.2
477	Cooking	Insulated Holding Cabinets (Half-Size)	Biz-Prescriptive	Health	ROB	3,066	3,066	58%	1,788	0.00	12	$1,500	50%	8%	12%	6	3%	23%	52.9%	38.7%	39.1%	6.6
478	HotWater	Faucet Aerator	Biz-Custom	Health	Retro	303	303	66%	200	0.00	10	$3	100%	26%	100%	4	25%	80%	84.0%	84.0%	84.0%	110.1
479	HotWater	Heat Pump Water Heater	Biz-Custom	Health	ROB	15,809	15,809	35%	5,460	0.00	10	$1,574	100%	18%	14%	1	43%	31%	73.5%	56.6%	56.2%	6.1
480	HotWater	Hot Water Pipe Insulation	Biz-Custom	Health	Retro	15,809	15,809	2%	316	0.00	20	$60	100%	27%	21%	2	100%	80%	84.0%	84.0%	84.0%	11.5
481	HotWater	Low Flow Pre-Rinse Sprayers	Biz-Custom	Health	ROB	2,991	2,991	26%	764	0.00	5	$35	100%	71%	87%	3	25%	80%	84.0%	84.0%	84.0%	6.7
482	HotWater	ENERGY STAR Commercial Washing Machines	Biz-Custom	Health	ROB	1,552	1,552	43%	671	0.00	7	$250	50%	14%	11%	5	25%	35%	66.5%	53.7%	53.3%	4.0
483	HotWater	Ozone Commercial Laundry	Biz-Custom	Health	Retro	2,984	2,984	25%	746	0.00	10	$20,310	0%	0%	0%	6	57%	50%	60.0%	60.0%	60.0%	5.2
484	InteriorLighting	LED T8 Tube Replacement	Biz-Prescriptive Light	Health	Retro	138	138	59%	82	0.00	15	$7	100%	49%	49%	1	78%	32%	71.1%	60.5%	60.5%	12.4
485	InteriorLighting	LED troffer retrofit kit, 2'X2' and 2'X4'	Biz-Prescriptive Light	Health	Retro	310	310	50%	155	0.00	18	$67	100%	26%	9%	1	78%	32%	71.1%	52.9%	50.8%	5.7
486	InteriorLighting	LED troffer, 2'X2' and 2'X4'	Biz-Prescriptive Light	Health	Retro	223	223	50%	112	0.00	18	$67	100%	26%	7%	1	78%	32%	71.1%	49.3%	45.8%	4.1
487	InteriorLighting	LED high bay fixture	Biz-Prescriptive Light	Health	Retro	1,080	1,080	76%	821	0.00	12	$323	100%	12%	10%	2	1%	16%	71.1%	52.5%	52.2%	10.5
488	InteriorLighting	LED Mogul-base HID Lamp Replacing High Bay HID	Biz-Prescriptive Light	Health	Retro	1,080	1,080	79%	855	0.00	12	$110	100%	21%	31%	2	1%	16%	71.1%	58.8%	59.2%	19.1
489	InteriorLighting	LED low bay fixture	Biz-Prescriptive Light	Health	Retro	1,080	1,080	76%	821	0.00	12	$196	100%	20%	17%	3	1%	16%	71.1%	56.5%	56.2%	10.5
490	InteriorLighting	LED Mogul-base HID Lamp Replacing Low Bay HID	Biz-Prescriptive Light	Health	Retro	1,080	1,080	79%	855	0.00	12	$60	100%	38%	57%	3	1%	16%	71.1%	60.6%	61.0%	19.1
491	InteriorLighting	LED downlight, screwin lamp, 1-3W, interior Average 2 Watts	Biz-Prescriptive Light	Health	ROB	67	67	88%	59	0.00	4	$4	100%	25%	59%	4	3%	32%	71.1%	60.3%	61.0%	10.1
492	InteriorLighting	LED downlight fixture	Biz-Prescriptive Light	Health	Retro	174	174	82%	142	0.00	4	$13	100%	39%	44%	5	18%	32%	71.1%	60.2%	60.3%	4.8
493	InteriorLighting	LED downlight, screwin lamp, 4-20W, interior Average 11 Watts	Biz-Prescriptive Light	Health	ROB	134	134	84%	113	0.00	4	$2	100%	61%	100%	5	18%	32%	71.1%	61.7%	61.9%	19.3
494	InteriorLighting	DeLamp Fluorescent Fixture Average Lamp Wattage 28W	Biz-Custom Light	Health	Retro	53	53	100%	53	0.00	15	$4	100%	69%	53%	6	78%	0%	71.1%	61.1%	60.8%	10.9
495	InteriorLighting	Daylighting Controls	Biz-Custom Light	Health	Retro	8,810	8,810	30%	2,643	0.00	12	$3,000	25%	5%	4%	7	85%	8%	48.3%	39.1%	39.0%	9.8
496	InteriorLighting	Occupancy Sensors	Biz-Prescriptive Light	Health	Retro	1,523	1,523	30%	457	0.00	8	$54	100%	37%	34%	7	85%	8%	71.1%	59.3%	59.2%	5.6
497	InteriorLighting	Central Lighting Monitoring & Controls (non-networked)	Biz-Custom Light	Health	Retro	41,703	41,703	20%	8,341	0.00	12	$3,700	100%	12%	17%	7	85%	8%	71.1%	50.8%	51.5%	9.2
498	InteriorLighting	Network Lighting Controls - Wireless (WiFi)	Biz-Custom Light	Health	Retro	16,277	16,277	47%	7,650	0.00	8	$1,683	100%	24%	34%	7	85%	8%	71.1%	56.9%	57.6%	6.5
499	InteriorLighting	Bi-Level Lighting Fixture – Stairwells, Hallways, and Garages	Biz-Custom Light	Health	Retro	1,034	1,034	50%	517	0.00	10	$274	50%	10%	8%	8	15%	8%	62.0%	47.4%	47.1%	6.9
500	InteriorLighting	LED Exit Sign - 4 Watt Fixture (2 lamp)	Biz-Prescriptive Light	Health	Retro	236	236	85%	201	0.00	15	$60	100%	8%	13%	9	1%	75%	80.0%	80.0%	80.0%	19.7
501	ExteriorLighting	LED wallpack (existing W<250)	Biz-Prescriptive Light	Health	Retro	856	856	66%	567	0.00	12	$248	50%	10%	9%	1	13%	46%	62.7%	56.8%	56.8%	6.6
502	ExteriorLighting	LED parking lot fixture (existing W≥250)	Biz-Prescriptive Light	Health	Retro	1,589	1,589	60%	959	0.00	12	$756	25%	3%	5%	2	13%	41%	52.8%	52.8%	52.8%	11.2
503	ExteriorLighting	LED parking lot fixture (existing W<250)	Biz-Prescriptive Light	Health	Retro	856	856	66%	567	0.00	12	$248	50%	10%	9%	3	13%	41%	62.7%	52.8%	52.8%	6.6
504	ExteriorLighting	LED fuel pump canopy fixture (existing W<250)	Biz-Prescriptive Light	Health	Retro	0	0	0%	0	0.00	12	$0	0%	0%		4	0%	41%	71.1%	61.9%	61.9%	0.0
505	ExteriorLighting	LED fuel pump canopy fixture (existing W≥250)	Biz-Prescriptive Light	Health	Retro	0	0	0%	0	0.00	12	$0	0%	0%		5	0%	41%	71.1%	61.9%	61.9%	0.0
506	ExteriorLighting	LED outdoor pole decorative fixture (existing W≥250)	Biz-Prescriptive Light	Health	Retro	1,589	1,589	60%	959	0.00	12	$756	25%	3%	5%	6	13%	41%	52.8%	52.8%	52.8%	11.2
507	ExteriorLighting	LED parking garage fixture (existing W≥250)	Biz-Prescriptive Light	Health	Retro	3,235	3,235	60%	1,953	0.00	6	$756	25%	3%	10%	7	13%	41%	60.2%	52.8%	52.8%	11.8
508	ExteriorLighting	LED parking garage fixture (existing W<250)	Biz-Prescriptive Light	Health	Retro	1,742	1,742	66%	1,154	0.00	6	$248	50%	10%	19%	8	13%	41%	66.7%	55.4%	56.0%	7.0
509	ExteriorLighting	LED Mogul-base HID Lamp Replacing Exterior HID (existing W≥250)	Biz-Prescriptive Light	Health	Retro	1,589	1,589	60%	959	0.00	12	$756	25%	3%	5%	9	13%	41%	52.8%	52.8%	52.8%	11.2
510	ExteriorLighting	LED Mogul-base HID Lamp Replacing Exterior HID (existing W<250)	Biz-Prescriptive Light	Health	Retro	856	856	66%	567	0.00	12	$248	50%	10%	9%	10	13%	41%	62.7%	52.8%	52.8%	6.6
511	Cooling	Air Conditioner - 16 SEER (5-20 Tons)	Biz-Prescriptive	Health	ROB	11,239	11,239	13%	1,405	0.00	15	$3,570	25%	5%	4%	1	25%	20%	36.0%	36.0%	36.0%	9.1
512	Cooling	Air Conditioner - 17 SEER (5-20 Tons)	Biz-Prescriptive	Health	ROB	11,239	11,239	13%	1,405	0.00	15	$4,760	25%	5%	3%	1	25%	20%	36.0%	34.1%	34.1%	6.8
513	Cooling	Air Conditioner - 18 SEER (5-20 Tons)	Biz-Prescriptive	Health	ROB	11,239	11,239	19%	2,118	0.00	15	$5,960	25%	5%	4%	1	25%	20%	36.0%	34.9%	34.7%	8.2
514	Cooling	Air Conditioner - 21 SEER (5-20 Tons)	Biz-Prescriptive	Health	ROB	11,239	11,239	24%	2,734	0.00	15	$9,080	25%	5%	3%	1	25%	20%	36.0%	34.1%	34.1%	7.0
515	Cooling	Air Conditioner - 16 SEER (20+ Tons)	Biz-Prescriptive	Health	ROB	22,887	22,887	8%	1,907	0.00	15	$7,140	25%	5%	3%	2	25%	20%	36.0%	34.1%	34.1%	6.2
516	Cooling	Air Conditioner - 17 SEER (20+ Tons)	Biz-Prescriptive	Health	ROB	22,887	22,887	8%	1,907	0.00	15	$9,520	5%	5%	2%	2	25%	20%	36.0%	34.1%	34.1%	4.6
517	Cooling	Air Conditioner - 18 SEER (20+ Tons)	Biz-Prescriptive	Health	ROB	22,887	22,887	15%	3,521	0.00	15	$11,920	25%	5%	3%	2	25%	20%	36.0%	34.1%	34.1%	6.8
518	Cooling	Air Conditioner - 21 SEER (20+ Tons)	Biz-Prescriptive	Health	ROB	22,887	22,887	21%	4,904	0.00	15	$18,160	25%	5%	3%	2	25%	20%	36.0%	34.1%	34.1%	6.2
519	Cooling	Comprehensive Rooftop Unit Quality Maintenance (AC Tune-up)	Biz-Custom	Health	Retro	55,597	55,597	6%	3,514	0.00	3	$500	100%	37%	53%	3	50%	50%	63.2%	60.0%	60.0%	4.1
520	Cooling	Air Side Economizer	Biz-Custom	Health	Retro	6,294	6,294	3%	183	0.00	5	$170	6%	6%	8%	4	50%	33%	46.4%	46.4%	46.4%	2.8
521	Cooling	Advanced Rooftop Controls	Biz-Custom	Health	Retro	5,245	5,245	31%	1,642	0.00	10	$3,412	25%	3%	4%	5	50%	3%	28.2%	22.0%	22.0%	12.6
522	Cooling	Air Conditioner - 16 SEER (<5 Tons)	Biz-Prescriptive	Health	ROB	4,842	4,842	19%	908	0.00	15	$1,785	50%	5%	5%	6	0%	20%	36.0%	36.0%	36.0%	11.8
523	Cooling	Air Conditioner - 17 SEER (<5 Tons)	Biz-Prescriptive	Health	ROB	4,842	4,842	24%	1,139	0.00	15	$2,380	50%	5%	5%	6	0%	20%	36.0%	36.0%	36.0%	11.1
524	Cooling	Air Conditioner - 18 SEER(<5 Tons)	Biz-Prescriptive	Health	ROB	4,842	4,842	28%	1,345	0.00	15	$2,980	50%	5%	5%	6	0%	20%	36.0%	36.0%	36.0%	10.4
525	Cooling	Air Conditioner - 21 SEER(<5 Tons)	Biz-Prescriptive	Health	ROB	4,842	4,842	38%	1,844	0.00	15	$4,540	25%	5%	4%	6	0%	20%	36.0%	36.0%	36.0%	9.4

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Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	Base (Existing) Annual Electric	Base (Standard) Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	MAP Incentive (%)	RAP Incentive (%)	PP Incentive (%)	End Use Measure Group	Base Saturation	EE Saturation	MAP Adoption Rate	RAP Adoption Rate	PP Adoption Rate	UCT Score
526	Cooling	Centrifugal Chiller - Average kW/Ton = 0.626	Biz-Custom	Health	ROB	33,914	33,914	26%	8,896	0.00	20	$20,077	25%	2%	3%	7	28%	20%	36.0%	35.9%	36.0%	20.3
527	Cooling	Reciprocating Chiller - Average kW/Ton = 0.99	Biz-Custom	Health	ROB	41,698	41,698	27%	11,119	0.00	20	$16,096	100%	4%	5%	8	22%	20%	63.2%	36.0%	36.0%	33.7
528	Cooling	Screw Chiller - Average kW/Ton = 0.675	Biz-Custom	Health	ROB	48,698	48,698	23%	11,170	0.00	20	$16,064	100%	4%	5%	9	0%	20%	63.2%	36.0%	36.0%	33.1
529	Cooling	HVAC/Chiller Custom	Biz-Custom	Health	Retro	5	5	20%	1	0.00	12	$1	25%	6%	9%	10	50%	20%	37.0%	36.0%	36.0%	7.2
530	Cooling	Chiller Tune-up	Biz-Custom	Health	Retro	66,713	66,713	8%	5,337	0.00	5	$750	100%	37%	53%	11	50%	50%	63.2%	60.0%	60.0%	5.3
531	Cooling	PTAC - <7,000 Btuh - lodging	Biz-Prescriptive	Health	ROB	529	529	9%	48	0.00	15	$22	100%	50%	22%	12	0%	20%	63.2%	47.2%	43.4%	5.0
532	Cooling	PTAC - 7,000 to 15,000 Btuh - lodging	Biz-Prescriptive	Health	ROB	1,176	1,176	9%	110	0.00	15	$41	100%	50%	27%	13	0%	20%	63.2%	48.4%	45.9%	6.2
533	Cooling	PTAC - >15,000 Btuh - lodging	Biz-Prescriptive	Health	ROB	1,988	1,988	10%	189	0.00	15	$56	100%	50%	34%	14	0%	20%	63.2%	49.5%	48.2%	7.8
534	Cooling	HVAC Occupancy Controls	Biz-Custom	Health	ROB	1,046	1,046	20%	209	0.00	15	$538	50%	2%	0%	15	50%	25%	40.0%	40.0%	40.0%	28.9
535	Cooling	Smart Thermostat	Biz-Custom	Health	ROB	5,245	5,245	18%	928	0.00	10	$128	100%	20%	15%	16	57%	9%	63.2%	49.2%	49.0%	10.9
536	Cooling	Window Film	Biz-Custom	Health	Retro	55,597	0	4%	2,083	0.00	10	$1,735	75%	6%	5%	17	100%	25%	54.2%	40.0%	40.0%	13.1
537	Cooling	Energy Recovery Ventilator	Biz-Custom	Health	Retro	2	2	50%	1	0.00	20	$1	75%	8%	12%	18	100%	5%	54.9%	33.4%	33.7%	11.0
538	Heating	Heat Pump - 16 SEER (<5 Tons)	Biz-Prescriptive	Health	ROB	10,732	10,732	19%	2,024	0.00	15	$2,055	50%	20%	10%	1	0%	20%	45.1%	36.0%	36.0%	3.5
539	Heating	Heat Pump - 17 SEER (<5 Tons)	Biz-Prescriptive	Health	ROB	10,732	10,732	22%	2,354	0.00	15	$2,740	50%	20%	9%	1	0%	20%	43.2%	36.0%	36.0%	3.1
540	Heating	Heat Pump - 18 SEER(<5 Tons)	Biz-Prescriptive	Health	ROB	10,732	10,732	25%	2,700	0.00	15	$3,425	50%	20%	8%	1	0%	20%	41.8%	36.0%	36.0%	2.9
541	Heating	Heat Pump - 21 SEER(<5 Tons)	Biz-Prescriptive	Health	ROB	10,732	10,732	31%	3,288	0.00	15	$4,500	50%	20%	7%	1	0%	20%	41.0%	36.0%	36.0%	2.9
542	Heating	Geothermal HP - SEER 20.3 (<5 Tons)	Biz-Prescriptive	Health	ROB	10,732	10,732	36%	3,873	0.00	15	$4,700	50%	11%	8%	1	0%	20%	42.0%	36.0%	36.0%	5.5
543	Heating	Geothermal HP - SEER 21.5 (<5 Tons)	Biz-Prescriptive	Health	ROB	10,732	10,732	40%	4,310	0.00	15	$7,300	25%	7%	6%	1	0%	20%	36.0%	36.0%	36.0%	6.0
544	Heating	Geothermal HP - SEER 23.1 (<5 Tons)	Biz-Prescriptive	Health	ROB	10,732	10,732	46%	4,896	0.00	15	$7,300	25%	7%	7%	1	0%	20%	36.0%	36.0%	36.0%	6.9
545	Heating	Geothermal HP - SEER 29.3 (<5 Tons)	Biz-Prescriptive	Health	ROB	10,732	10,732	51%	5,479	0.00	15	$9,200	25%	8%	5%	1	0%	20%	36.0%	36.0%	36.0%	4.9
546	Heating	Heat Pump - 16 SEER (5-20 Tons)	Biz-Prescriptive	Health	ROB	38,730	38,730	10%	3,759	0.00	15	$4,110	50%	20%	9%	2	21%	20%	43.0%	36.0%	36.0%	3.0
547	Heating	Heat Pump - 17 SEER (5-20 Tons)	Biz-Prescriptive	Health	ROB	38,730	38,730	13%	5,079	0.00	15	$5,480	50%	20%	9%	2	21%	20%	41.9%	36.0%	36.0%	2.7
548	Heating	Heat Pump - 18 SEER (5-20 Tons)	Biz-Prescriptive	Health	ROB	38,730	38,730	19%	7,492	0.00	15	$6,850	50%	20%	7%	2	21%	20%	44.9%	36.0%	36.0%	3.2
549	Heating	Heat Pump - 21 SEER (5-20 Tons)	Biz-Prescriptive	Health	ROB	38,730	38,730	25%	9,583	0.00	15	$9,000	50%	20%	6%	2	21%	20%	44.5%	36.0%	36.0%	3.1
550	Heating	Geothermal HP - SEER 20.3 (5-20 Tons)	Biz-Prescriptive	Health	ROB	19,500	19,500	29%	5,658	0.00	15	$7,700	75%	6%	6%	2	21%	20%	53.1%	36.0%	36.0%	11.9
551	Heating	Geothermal HP - SEER 21.5 (5-20 Tons)	Biz-Prescriptive	Health	ROB	19,500	19,500	34%	6,538	0.00	15	$10,300	50%	5%	5%	2	21%	20%	41.4%	36.0%	36.0%	13.1
552	Heating	Geothermal HP - SEER 23.1 (5-20 Tons)	Biz-Prescriptive	Health	ROB	19,500	19,500	40%	7,721	0.00	15	$12,800	50%	4%	4%	2	21%	20%	39.6%	36.0%	36.0%	14.7
553	Heating	Geothermal HP - SEER 29.3 (5-20 Tons)	Biz-Prescriptive	Health	ROB	19,500	19,500	46%	8,909	0.00	15	$17,700	25%	4%	3%	2	21%	20%	36.0%	36.0%	36.0%	11.5
554	Heating	Heat Pump - 16 SEER (20+ Tons)	Biz-Prescriptive	Health	ROB	79,587	79,587	10%	8,333	0.00	15	$8,220	50%	20%	6%	3	21%	20%	42.9%	36.0%	36.0%	2.7
555	Heating	Heat Pump - 17 SEER (20+ Tons)	Biz-Prescriptive	Health	ROB	79,587	79,587	14%	10,973	0.00	15	$10,960	25%	20%	5%	3	21%	20%	36.5%	36.0%	36.0%	2.5
556	Heating	Heat Pump - 18 SEER (20+ Tons)	Biz-Prescriptive	Health	ROB	79,587	79,587	20%	15,989	0.00	15	$13,700	50%	20%	4%	3	21%	20%	45.2%	36.0%	36.0%	3.1
557	Heating	Heat Pump - 21 SEER (20+ Tons)	Biz-Prescriptive	Health	ROB	79,587	79,587	26%	20,321	0.00	15	$18,000	50%	20%	3%	3	21%	20%	44.9%	36.0%	36.0%	3.1
558	Heating	Geothermal HP - SEER 20.3 (20+ Tons)	Biz-Prescriptive	Health	ROB	39,503	39,503	30%	11,818	0.00	15	$10,700	100%	9%	5%	3	21%	20%	63.2%	36.0%	36.0%	12.1
559	Heating	Geothermal HP - SEER 21.5 (20+ Tons)	Biz-Prescriptive	Health	ROB	39,503	39,503	34%	13,577	0.00	15	$13,300	75%	8%	4%	3	21%	20%	55.2%	36.0%	36.0%	13.2
560	Heating	Geothermal HP - SEER 23.1 (20+ Tons)	Biz-Prescriptive	Health	ROB	39,503	39,503	40%	15,943	0.00	15	$18,300	75%	5%	3%	3	21%	20%	53.8%	36.0%	36.0%	14.9
561	Heating	Geothermal HP - SEER 29.3 (20+ Tons)	Biz-Prescriptive	Health	ROB	39,503	39,503	46%	18,321	0.00	15	$26,200	50%	4%	2%	3	21%	20%	42.6%	36.0%	36.0%	17.5
562	Heating	PTHP - <7,000 Btuh - lodging	Biz-Prescriptive	Health	ROB	1,903	1,903	9%	163	0.00	15	$13	100%	100%	100%	4	0%	20%	63.2%	55.0%	55.0%	7.6
563	Heating	PTHP - 7,000 to 15,000 Btuh - lodging	Biz-Prescriptive	Health	ROB	4,103	4,103	11%	444	0.00	15	$45	100%	100%	98%	5	0%	20%	63.2%	55.0%	55.0%	5.4
564	Heating	PTHP - >15,000 Btuh - lodging	Biz-Prescriptive	Health	ROB	6,680	6,680	13%	879	0.00	15	$35	100%	100%	100%	6	0%	20%	63.2%	55.0%	55.0%	13.1
565	Heating	Mini Split Ductless Heat Pump Cold Climate (Tiers & sizes TBD)	Biz-Prescriptive	Health	ROB	4	4	25%	1	0.00	12	$0	100%	35%	67%	7	0%	20%	63.2%	52.3%	53.7%	18.3
566	Heating	Variable Refrigerant Flow Heat Pump	Biz-Custom	Health	NC	11	11	25%	3	0.00	20	$3	100%	5%	3%	2	21%	0%	63.2%	33.5%	33.4%	26.0
567	Ventilation	Kitchen Exhaust Hood Demand Ventilation Control System	Biz-Custom	Health	ROB	5	5	50%	3	0.00	20	$2	75%	8%	11%	1	12%	24%	54.6%	39.2%	39.2%	10.7
568	Ventilation	Demand Controlled Ventilation	Biz-Custom	Health	Retro	2,428	2,428	20%	486	0.00	15	$227	100%	11%	16%	2	88%	5%	63.2%	39.5%	40.3%	11.4
569	Ventilation	Pump and Fan Variable Frequency Drive Controls (Fans)	Biz-Prescriptive	Health	Retro	2,258	2,258	41%	923	0.00	15	$375	100%	16%	18%	2	88%	25%	63.2%	42.0%	42.4%	9.2
570	Refrigeration	Strip Curtains	Biz-Custom	Health	Retro	334	334	81%	270	0.00	4	$9	100%	100%	100%	1	6%	26%	60.2%	52.4%	52.4%	4.2
571	Refrigeration	Bare Suction Line	Biz-Custom	Health	Retro	23	23	93%	21	0.00	15	$4	100%	27%	39%	2	0%	25%	60.2%	45.6%	46.6%	9.2
572	Refrigeration	Floating Head Pressure Controls	Biz-Prescriptive	Health	Retro	2,653	2,653	50%	1,327	0.00	15	$80	100%	25%	41%	3	8%	20%	60.2%	50.1%	50.6%	31.6
573	Refrigeration	Saturated Suction Controls	Biz-Custom	Health	Retro	831	831	50%	416	0.00	15	$559	50%	4%	6%	4	2%	20%	36.0%	36.0%	36.0%	15.7
574	Refrigeration	Compressor Retrofit	Biz-Custom	Health	Retro	813	813	20%	163	0.00	15	$477	25%	2%	3%	5	14%	15%	32.0%	27.4%	27.4%	15.8
575	Refrigeration	Electronically Commutated (EC) Walk-In Evaporator Fan Motor	Biz-Prescriptive	Health	Retro	1,268	1,268	65%	824	0.00	15	$78	100%	45%	42%	6	4%	33%	60.2%	49.8%	49.6%	11.2
576	Refrigeration	Evaporator Fan Motor Controls	Biz-Prescriptive	Health	Retro	1,912	1,912	25%	478	0.00	13	$291	50%	15%	7%	7	4%	10%	44.4%	30.0%	28.3%	4.7
577	Refrigeration	Variable Speed Condenser Fan	Biz-Custom	Health	Retro	2,960	2,960	50%	1,480	0.00	15	$1,170	25%	7%	9%	8	5%	20%	36.0%	36.0%	36.0%	6.9
578	Refrigeration	Refrigeration Economizer	Biz-Custom	Health	Retro	67,850	67,850	2%	1,357	0.00	15	$2,558	3%	3%	4%	9	19%	0%	20.0%	15.7%	15.9%	6.9
579	Refrigeration	Anti-Sweat Heater Controls MT	Biz-Prescriptive	Health	Retro	1,313	1,313	55%	722	0.00	12	$250	75%	10%	12%	10	19%	36%	54.7%	48.8%	48.8%	8.7
580	Refrigeration	Auto Door Closer, Cooler	Biz-Prescriptive	Health	Retro	471,500	471,500	0%	943	0.00	8	$157	100%	16%	24%	11	14%	27%	60.2%	45.7%	46.3%	11.6
581	Refrigeration	Display Case Door Retrofit, Medium Temp	Biz-Prescriptive	Health	Retro	1,584	1,584	36%	578	0.00	12	$686	25%	22%	3%	12	6%	55%	64.0%	64.0%	64.0%	1.7
582	Refrigeration	Electronically Commutated (EC) Reach-In Evaporator Fan Motor	Biz-Prescriptive	Health	Retro	1,268	1,268	65%	824	0.00	15	$78	100%	45%	42%	13	3%	33%	60.2%	49.8%	49.6%	11.2
583	Refrigeration	Q-Sync Motor for Walk-In and Reach-in Evaporator Fan Motor	Biz-Prescriptive	Health	Retro	993	993	51%	504	0.00	10	$96	100%	36%	21%	13	3%	33%	60.2%	46.4%	46.4%	5.1
584	Refrigeration	Energy Star Reach-In Refrigerator, Glass Doors	Biz-Prescriptive	Health	ROB	1,546	1,546	27%	410	0.00	12	$600	25%	5%	3%	14	19%	55%	64.0%	64.0%	63.9%	5.1
585	Refrigeration	Energy Star Reach-In Refrigerator, Solid Doors	Biz-Prescriptive	Health	ROB	1,112	1,112	25%	283	0.00	12	$600	5%	5%	2%	15	19%	55%	64.0%	62.1%	61.9%	3.5
586	Refrigeration	Anti-Sweat Heater Controls LT	Biz-Prescriptive	Health	Retro	3,147	3,147	55%	1,731	0.00	12	$250	100%	10%	28%	16	6%	36%	60.2%	48.8%	48.8%	27.8
587	Refrigeration	Auto Door Closer, Freezer	Biz-Prescriptive	Health	Retro	419,455	419,455	1%	2,307	0.00	8	$157	100%	16%	59%	17	6%	27%	60.2%	49.6%	51.0%	27.7
588	Refrigeration	Display Case Door Retrofit, Low Temp	Biz-Prescriptive	Health	Retro	2,922	2,922	50%	1,453	0.00	12	$686	75%	22%	8%	17	6%	55%	64.0%	64.0%	64.0%	4.3
589	Refrigeration	Energy Star Reach-In Freezer, Glass Doors	Biz-Prescriptive	Health	ROB	3,234	3,234	15%	488	0.00	12	$450	25%	15%	4%	18	6%	55%	64.0%	64.0%	64.0%	2.9
590	Refrigeration	Energy Star Reach-In Freezer, Solid Doors	Biz-Prescriptive	Health	ROB	4,676	4,676	20%	935	0.00	12	$450	75%	15%	8%	19	6%	55%	64.0%	64.0%	64.0%	5.5
591	Refrigeration	Refrigeration - Custom	Biz-Custom	Health	ROB	7	7	15%	1	0.00	12	$0	100%	50%	72%	20	90%	20%	60.2%	49.9%	51.0%	9.1
592	Refrigeration	Retro-commissioning_Refrigerator Optimization	Biz-Custom RCx	Health	Retro	33	33	3%	1	0.00	3	$0	100%	67%	22%	21	90%	10%	60.2%	50.9%	49.0%	2.0
593	Refrigeration	Energy Star Ice Machine	Biz-Prescriptive	Health	ROB	6,993	6,993	10%	721	0.00	15	$1,426	3%	3%	2%	22	5%	49%	59.2%	57.2%	57.2%	8.9
594	Refrigeration	LED Refrigerated Display Case Lighting Average 6W/LF	Biz-Prescriptive	Health	Retro	1,573	1,573	37%	574	0.00	12	$1,010	34%	34%	2%	23	11%	30%	44.0%	44.0%	43.1%	0.9
595	PlugLoads_Office	ENERGY STAR Uninterrupted Power Supply	Biz-Custom	Health	ROB	3,096	3,096	3%	85	0.00	15	$59	75%	7%	11%	1	1%	70%	76.0%	76.0%	76.0%	10.7
596	PlugLoads_Office	Smart Power Strip – Commercial Use	Biz-Custom	Health	Retro	64	64	100%	64	0.00	5	$50	7%	7%	10%	2	50%	10%	44.3%	38.5%	38.9%	3.3
597	PlugLoads_Office	Plug Load Occupancy Sensor	Biz-Custom	Health	Retro	1,126	1,126	15%	169	0.00	8	$70	50%	13%	18%	2	50%	10%	59.4%	46.1%	47.0%	4.3
598	PlugLoads_Office	Electrically Commutated Plug Fans in data centers	Biz-Custom	Health	Retro	86,783	86,783	18%	15,778	0.00	15	$480	100%	100%	100%	3	50%	33%	68.6%	59.7%	59.7%	16.3
599	PlugLoads_Office	High Efficiency CRAC unit	Biz-Custom	Health	ROB	541	541	30%	162	0.00	15	$63	100%	14%	19%	3	50%	33%	68.6%	48.5%	49.2%	9.9
600	PlugLoads_Office	Computer Room Air Conditioner Economizer	Biz-Custom	Health	Retro	418	418	86%	358	0.00	15	$82	100%	23%	33%	3	50%	33%	68.6%	52.8%	53.6%	7.2

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Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	Base (Existing) Annual Electric	Base (Standard) Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	MAP Incentive (%)	RAP Incentive (%)	PP Incentive (%)	End Use Measure Group	Base Saturation	EE Saturation	MAP Adoption Rate	RAP Adoption Rate	PP Adoption Rate	UCT Score
601	PlugLoads_Office	Energy Star Laptop	Biz-Custom	Health	ROB	126	126	33%	41	0.00	4	$0	0%			4	17%	85%	88.0%	88.0%	88.0%	0.0
602	PlugLoads_Office	Energy Star Monitor	Biz-Custom	Health	ROB	72	72	21%	15	0.00	4	$0	0%			5	17%	95%	96.0%	96.0%	96.0%	0.0
603	PlugLoads_Office	Energy Star Printer/Copier/Fax	Biz-Custom	Health	ROB	551	551	40%	223	0.00	6	$0	0%			6	17%	95%	96.0%	96.0%	96.0%	0.0
604	PlugLoads_Office	Energy Star Server	Biz-Custom	Health	ROB	691	691	13%	90	0.00	15	$156	25%	3%	4%	7	15%	20%	36.3%	36.0%	36.0%	9.5
605	PlugLoads_Office	Server Virtualization	Biz-Custom	Health	Retro	691	691	13%	90	0.00	15	$156	25%	3%	4%	7	15%	20%	36.3%	36.0%	36.0%	9.5
606	PlugLoads_Office	Data Center Hot/Cold Aisle Configuration	Biz-Custom	Health	Retro	691	691	13%	90	0.00	15	$156	25%	3%	4%	7	15%	20%	36.3%	36.0%	36.0%	9.5
607	Motors	Cogged V-Belt	Biz-Custom	Health	Retro	17,237	17,237	3%	534	0.00	15	$384	75%	7%	10%	1	12%	10%	61.5%	40.1%	40.4%	11.2
608	Motors	Pump and Fan Variable Frequency Drive Controls (Pumps)	Biz-Prescriptive	Health	Retro	1,902	1,902	38%	731	0.00	15	$200	100%	30%	27%	2	80%	25%	68.6%	53.3%	53.1%	7.3
609	Motors	Escalators Motor Efficiency Controllers	Biz-Custom	Health	Retro	7,500	7,500	20%	1,500	0.00	10	$5,000	2%	2%	2%	3	0%	10%	28.0%	28.0%	28.0%	9.1
610	CompressedAir	Efficient Air Compressors	Biz-Custom	Health	ROB	4,004	4,004	31%	1,223	0.00	15	$100	100%	64%	100%	1	100%	33%	68.6%	58.6%	59.7%	10.7
611	CompressedAir	Retro-commissioning_Compressed Air Optimization	Biz-Custom RCx	Health	Retro	7	7	15%	1	0.00	5	$0	100%	67%	100%	2	100%	33%	68.6%	58.8%	59.7%	4.1
612	CompressedAir	Compressed Air - Custom	Biz-Custom	Health	Retro	7	7	15%	1	0.00	8	$0	100%	50%	100%	3	100%	33%	68.6%	57.5%	59.7%	4.3
613	Miscellaneous	Power Distribution Equipment Upgrades	Biz-Custom	Health	Retro	1,150	1,150	1%	6	0.00	30	$8	75%	4%	6%	1	50%	20%	58.1%	36.0%	36.0%	18.4
614	Miscellaneous	Vending Machine Controller - Non-Refrigerated	Biz-Custom	Health	Retro	745	745	46%	343	0.00	5	$80	63%	63%	32%	2	1%	66%	72.8%	72.8%	72.8%	0.9
615	Miscellaneous	Vending Machine Controller - Refrigerated	Biz-Custom	Health	Retro	1,739	1,739	46%	800	0.00	10	$216	100%	35%	28%	3	3%	66%	72.8%	72.8%	72.8%	3.4
616	Miscellaneous	Miscellaneous Custom	Biz-Custom	Health	Retro	5	5	20%	1	0.00	10	$0	100%	50%	72%	4	50%	20%	68.6%	57.8%	58.7%	8.1
617	Whole Building_HVAC	HVAC - Energy Management System	Biz-Prescriptive	Health	Retro	6,960	6,960	15%	1,044	0.00	15	$4,000	3%	3%	2%	1	100%	1%	20.8%	18.4%	18.4%	4.3
618	Whole Building_HVAC	Guest room energy management system	Biz-Custom	Health	Retro	0	0	0%	0	0.00	8	$0	0%	0%		2	0%	0%	63.2%	55.0%	55.0%	0.0
619	Whole Building_HVAC	Retro-commissioning_Bld Optimization	Biz-Custom RCx	Health	Retro	7	7	15%	1	0.00	3	$0	100%	67%	22%	3	100%	10%	63.2%	53.6%	51.8%	2.2
620	WholeBld	WholeBlg - Com RET	Biz-NC	Health	Retro	7	7	15%	1	0.00	12	$0	100%	50%	19%	4	40%	0%	68.6%	57.8%	56.6%	9.4
621	Whole Building_NC	WholeBlg - Com NC	Biz-NC	Health	NC	4	4	25%	1	0.00	12	$0	100%	50%	72%	5	100%	60%	68.6%	68.0%	68.0%	9.4
622	Behavioral	AMI Data Presentment & Engagement	Biz-Behavior	Health	Retro	100	100	1%	1	0.00	1	$0	100%	100%	87%	1	100%	10%	50.0%	50.0%	50.0%	1.2
623	Behavioral	BIEMS	Biz-Behavior	Health	Retro	46	46	2%	1	0.00	3	$0	12%	12%	5%	1	100%	5%	42.5%	50.0%	50.0%	1.6
624	Behavioral	Building Operator Certification	Biz-Behavior	Health	Retro	25,800	25,800	1%	206	0.00	3	$35	50%	30%	12%	1	100%	5%	42.5%	50.0%	50.0%	2.2
625	Cooking	Commercial Combination Oven (Electric)	Biz-Prescriptive	Lodging	ROB	38,561	38,561	48%	18,432	0.00	12	$16,884	50%	6%	3%	1	17%	53%	62.4%	62.4%	62.4%	9.2
626	Cooking	Commercial Electric Convection Oven	Biz-Prescriptive	Lodging	ROB	12,193	12,193	15%	1,879	0.00	12	$1,706	50%	15%	11%	1	17%	53%	62.4%	62.4%	62.4%	3.9
627	Cooking	Commercial Electric Griddle	Biz-Prescriptive	Lodging	ROB	17,056	17,056	15%	2,596	0.00	12	$3,604	25%	14%	7%	2	14%	17%	39.3%	33.6%	33.6%	2.0
628	Cooking	Commercial Electric Steam Cooker	Biz-Prescriptive	Lodging	ROB	19,549	19,549	67%	13,162	0.00	12	$3,500	100%	12%	14%	3	6%	42%	68.6%	53.6%	53.6%	15.6
629	Cooking	Dishwasher Low Temp Door (Energy Star)	Biz-Prescriptive	Lodging	ROB	39,279	39,279	41%	16,153	0.00	15	$770	100%	49%	65%	4	26%	61%	68.8%	68.8%	68.8%	18.4
630	Cooking	Dishwasher High Temp Door (Energy Star)	Biz-Prescriptive	Lodging	ROB	39,825	39,825	30%	11,853	0.00	15	$770	100%	49%	65%	4	26%	61%	68.8%	68.8%	68.8%	13.5
631	Cooking	Energy efficient electric fryer	Biz-Prescriptive	Lodging	ROB	18,182	18,182	14%	2,572	0.00	12	$1,706	50%	1%	15%	5	27%	23%	55.0%	39.3%	40.7%	92.8
632	Cooking	Insulated Holding Cabinets (Full Size)	Biz-Prescriptive	Lodging	ROB	7,665	7,665	69%	5,278	0.00	12	$1,200	100%	6%	42%	6	3%	23%	68.6%	52.4%	54.9%	31.2
633	Cooking	Insulated Holding Cabinets (Half-Size)	Biz-Prescriptive	Lodging	ROB	3,066	3,066	58%	1,788	0.00	12	$1,500	50%	8%	12%	6	3%	23%	52.9%	38.7%	39.1%	6.6
634	HotWater	Faucet Aerator	Biz-Custom	Lodging	Retro	303	303	66%	200	0.00	10	$3	100%	26%	100%	4	25%	80%	84.0%	84.0%	84.0%	108.0
635	HotWater	Heat Pump Water Heater	Biz-Custom	Lodging	ROB	10,967	10,967	35%	3,788	0.00	10	$1,574	50%	13%	10%	1	65%	33%	66.0%	52.6%	52.2%	5.9
636	HotWater	Hot Water Pipe Insulation	Biz-Custom	Lodging	Retro	10,967	10,967	2%	219	0.00	20	$60	100%	19%	15%	2	100%	80%	84.0%	84.0%	84.0%	11.3
637	HotWater	Low Flow Pre-Rinse Sprayers	Biz-Custom	Lodging	ROB	2,991	2,991	26%	764	0.00	5	$35	100%	71%	87%	3	25%	80%	84.0%	84.0%	84.0%	6.6
638	HotWater	ENERGY STAR Commercial Washing Machines	Biz-Custom	Lodging	ROB	1,552	1,552	43%	671	0.00	7	$250	50%	14%	11%	5	25%	35%	66.5%	53.7%	53.3%	3.9
639	HotWater	Ozone Commercial Laundry	Biz-Custom	Lodging	Retro	2,984	2,984	25%	746	0.00	10	$20,310	0%	0%	0%	6	35%	50%	60.0%	60.0%	60.0%	5.0
640	InteriorLighting	LED T8 Tube Replacement	Biz-Prescriptive Light	Lodging	Retro	138	138	59%	82	0.00	15	$7	100%	49%	49%	1	46%	32%	71.1%	60.5%	60.5%	12.3
641	InteriorLighting	LED troffer retrofit kit, 2'X2' and 2'X4'	Biz-Prescriptive Light	Lodging	Retro	310	310	50%	155	0.00	18	$67	100%	26%	9%	1	46%	32%	71.1%	52.9%	50.8%	5.6
642	InteriorLighting	LED troffer, 2'X2' and 2'X4'	Biz-Prescriptive Light	Lodging	Retro	223	223	50%	112	0.00	18	$67	100%	26%	7%	1	46%	32%	71.1%	49.3%	45.8%	4.1
643	InteriorLighting	LED high bay fixture	Biz-Prescriptive Light	Lodging	Retro	1,080	1,080	76%	821	0.00	12	$323	100%	12%	10%	2	1%	16%	71.1%	52.5%	52.2%	10.4
644	InteriorLighting	LED Mogul-base HID Lamp Replacing High Bay HID	Biz-Prescriptive Light	Lodging	Retro	1,080	1,080	79%	855	0.00	12	$110	100%	21%	31%	2	1%	16%	71.1%	58.8%	59.2%	18.9
645	InteriorLighting	LED low bay fixture	Biz-Prescriptive Light	Lodging	Retro	1,080	1,080	76%	821	0.00	12	$196	100%	20%	17%	3	1%	16%	71.1%	56.5%	56.2%	10.4
646	InteriorLighting	LED Mogul-base HID Lamp Replacing Low Bay HID	Biz-Prescriptive Light	Lodging	Retro	1,080	1,080	79%	855	0.00	12	$60	100%	38%	57%	3	1%	16%	71.1%	60.6%	61.0%	18.9
647	InteriorLighting	LED downlight, screwin lamp, 1-3W, interior Average 2 Watts	Biz-Prescriptive Light	Lodging	ROB	67	67	88%	59	0.00	4	$4	100%	25%	59%	4	8%	32%	71.1%	60.3%	61.0%	10.0
648	InteriorLighting	LED downlight fixture	Biz-Prescriptive Light	Lodging	Retro	174	174	82%	142	0.00	4	$13	100%	39%	44%	5	45%	32%	71.1%	60.2%	60.3%	4.8
649	InteriorLighting	LED downlight, screwin lamp, 4-20W, interior Average 11 Watts	Biz-Prescriptive Light	Lodging	ROB	134	134	84%	113	0.00	4	$2	100%	61%	100%	5	45%	32%	71.1%	61.7%	61.9%	19.1
650	InteriorLighting	DeLamp Fluorescent Fixture Average Lamp Wattage 28W	Biz-Custom Light	Lodging	Retro	53	53	100%	53	0.00	15	$4	100%	69%	53%	6	46%	0%	71.1%	61.1%	60.8%	10.8
651	InteriorLighting	Daylighting Controls	Biz-Custom Light	Lodging	Retro	8,810	8,810	30%	2,643	0.00	12	$3,000	25%	5%	4%	7	85%	8%	48.3%	39.1%	39.0%	9.7
652	InteriorLighting	Occupancy Sensors	Biz-Prescriptive Light	Lodging	Retro	1,523	1,523	30%	457	0.00	8	$54	100%	37%	34%	7	85%	8%	71.1%	59.3%	59.2%	5.5
653	InteriorLighting	Central Lighting Monitoring & Controls (non-networked)	Biz-Custom Light	Lodging	Retro	41,703	41,703	20%	8,341	0.00	12	$3,700	100%	12%	17%	7	85%	8%	71.1%	50.8%	51.5%	9.1
654	InteriorLighting	Network Lighting Controls - Wireless (WiFi)	Biz-Custom Light	Lodging	Retro	16,277	16,277	47%	7,650	0.00	8	$1,683	100%	24%	34%	7	85%	8%	71.1%	56.9%	57.6%	6.5
655	InteriorLighting	Bi-Level Lighting Fixture – Stairwells, Hallways, and Garages	Biz-Custom Light	Lodging	Retro	1,034	1,034	50%	517	0.00	10	$274	50%	10%	8%	8	15%	8%	62.0%	47.4%	47.1%	6.8
656	InteriorLighting	LED Exit Sign - 4 Watt Fixture (2 lamp)	Biz-Prescriptive Light	Lodging	Retro	236	236	85%	201	0.00	15	$60	100%	8%	13%	9	1%	75%	80.0%	80.0%	80.0%	19.6
657	ExteriorLighting	LED wallpack (existing W<250)	Biz-Prescriptive Light	Lodging	Retro	856	856	66%	567	0.00	12	$248	50%	10%	9%	1	13%	46%	62.7%	56.8%	56.8%	6.6
658	ExteriorLighting	LED parking lot fixture (existing W≥250)	Biz-Prescriptive Light	Lodging	Retro	1,589	1,589	60%	959	0.00	12	$756	25%	3%	5%	2	13%	41%	52.8%	52.8%	52.8%	11.1
659	ExteriorLighting	LED parking lot fixture (existing W<250)	Biz-Prescriptive Light	Lodging	Retro	856	856	66%	567	0.00	12	$248	50%	10%	9%	3	13%	41%	62.7%	52.8%	52.8%	6.6
660	ExteriorLighting	LED fuel pump canopy fixture (existing W<250)	Biz-Prescriptive Light	Lodging	Retro	0	0	0%	0	0.00	12	$0	0%	0%		4	0%	41%	71.1%	61.9%	61.9%	0.0
661	ExteriorLighting	LED fuel pump canopy fixture (existing W≥250)	Biz-Prescriptive Light	Lodging	Retro	0	0	0%	0	0.00	12	$0	0%	0%		5	0%	41%	71.1%	61.9%	61.9%	0.0
662	ExteriorLighting	LED outdoor pole decorative fixture (existing W≥250)	Biz-Prescriptive Light	Lodging	Retro	1,589	1,589	60%	959	0.00	12	$756	25%	3%	5%	6	13%	41%	52.8%	52.8%	52.8%	11.1
663	ExteriorLighting	LED parking garage fixture (existing W≥250)	Biz-Prescriptive Light	Lodging	Retro	3,235	3,235	60%	1,953	0.00	6	$756	25%	3%	10%	7	13%	41%	60.2%	52.8%	52.8%	11.7
664	ExteriorLighting	LED parking garage fixture (existing W<250)	Biz-Prescriptive Light	Lodging	Retro	1,742	1,742	66%	1,154	0.00	6	$248	50%	10%	19%	8	13%	41%	66.7%	55.4%	56.0%	6.9
665	ExteriorLighting	LED Mogul-base HID Lamp Replacing Exterior HID (existing W≥250)	Biz-Prescriptive Light	Lodging	Retro	1,589	1,589	60%	959	0.00	12	$756	25%	3%	5%	9	13%	41%	52.8%	52.8%	52.8%	11.1
666	ExteriorLighting	LED Mogul-base HID Lamp Replacing Exterior HID (existing W<250)	Biz-Prescriptive Light	Lodging	Retro	856	856	66%	567	0.00	12	$248	50%	10%	9%	10	13%	41%	62.7%	52.8%	52.8%	6.6
667	Cooling	Air Conditioner - 16 SEER (5-20 Tons)	Biz-Prescriptive	Lodging	ROB	7,961	7,961	12%	995	0.00	15	$3,570	25%	5%	3%	1	19%	20%	36.0%	34.1%	34.1%	8.2
668	Cooling	Air Conditioner - 17 SEER (5-20 Tons)	Biz-Prescriptive	Lodging	ROB	7,961	7,961	12%	995	0.00	15	$4,760	25%	5%	2%	1	19%	20%	36.0%	34.1%	34.1%	6.2
669	Cooling	Air Conditioner - 18 SEER (5-20 Tons)	Biz-Prescriptive	Lodging	ROB	7,961	7,961	19%	1,500	0.00	15	$5,960	25%	5%	3%	1	19%	20%	36.0%	34.1%	34.1%	7.4
670	Cooling	Air Conditioner - 21 SEER (5-20 Tons)	Biz-Prescriptive	Lodging	ROB	7,961	7,961	24%	1,936	0.00	15	$9,080	25%	5%	2%	1	19%	20%	36.0%	34.1%	34.1%	6.3
671	Cooling	Air Conditioner - 16 SEER (20+ Tons)	Biz-Prescriptive	Lodging	ROB	16,211	16,211	8%	1,351	0.00	15	$7,140	25%	5%	2%	2	19%	20%	36.0%	34.1%	34.1%	5.6
672	Cooling	Air Conditioner - 17 SEER (20+ Tons)	Biz-Prescriptive	Lodging	ROB	16,211	16,211	8%	1,351	0.00	15	$9,520	5%	5%	1%	2	19%	20%	36.0%	34.1%	34.1%	4.2
673	Cooling	Air Conditioner - 18 SEER (20+ Tons)	Biz-Prescriptive	Lodging	ROB	16,211	16,211	15%	2,494	0.00	15	$11,920	25%	5%	2%	2	19%	20%	36.0%	34.1%	34.1%	6.2
674	Cooling	Air Conditioner - 21 SEER (20+ Tons)	Biz-Prescriptive	Lodging	ROB	16,211	16,211	21%	3,474	0.00	15	$18,160	25%	5%	2%	2	19%	20%	36.0%	34.1%	34.1%	5.6
675	Cooling	Comprehensive Rooftop Unit Quality Maintenance (AC Tune-up)	Biz-Custom	Lodging	Retro	61,688	61,688	6%	3,899	0.00	3	$500	100%	41%	58%	3	38%	50%	63.2%	60.0%	60.0%	5.1

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Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	Base (Existing) Annual Electric	Base (Standard) Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	MAP Incentive (%)	RAP Incentive (%)	PP Incentive (%)	End Use Measure Group	Base Saturation	EE Saturation	MAP Adoption Rate	RAP Adoption Rate	PP Adoption Rate	UCT Score
676	Cooling	Air Side Economizer	Biz-Custom	Lodging	Retro	4,458	4,458	3%	130	0.00	5	$170	4%	4%	6%	4	38%	33%	46.4%	46.4%	46.4%	2.9
677	Cooling	Advanced Rooftop Controls	Biz-Custom	Lodging	Retro	3,715	3,715	42%	1,568	0.00	10	$3,412	25%	2%	3%	5	38%	3%	27.6%	22.0%	22.0%	15.6
678	Cooling	Air Conditioner - 16 SEER (<5 Tons)	Biz-Prescriptive	Lodging	ROB	3,429	3,429	19%	643	0.00	15	$1,785	50%	5%	4%	6	0%	20%	36.0%	35.1%	34.9%	10.7
679	Cooling	Air Conditioner - 17 SEER (<5 Tons)	Biz-Prescriptive	Lodging	ROB	3,429	3,429	24%	807	0.00	15	$2,380	50%	5%	3%	6	0%	20%	36.0%	34.3%	34.1%	10.0
680	Cooling	Air Conditioner - 18 SEER(<5 Tons)	Biz-Prescriptive	Lodging	ROB	3,429	3,429	28%	953	0.00	15	$2,980	25%	5%	3%	6	0%	20%	36.0%	34.1%	34.1%	9.4
681	Cooling	Air Conditioner - 21 SEER(<5 Tons)	Biz-Prescriptive	Lodging	ROB	3,429	3,429	38%	1,306	0.00	15	$4,540	25%	5%	3%	6	0%	20%	36.0%	34.1%	34.1%	8.5
682	Cooling	Centrifugal Chiller - Average kW/Ton = 0.626	Biz-Custom	Lodging	ROB	37,629	37,629	26%	9,870	0.00	20	$22,276	25%	2%	3%	7	0%	20%	36.0%	35.1%	35.2%	20.5
683	Cooling	Reciprocating Chiller - Average kW/Ton = 0.99	Biz-Custom	Lodging	ROB	46,266	46,266	27%	12,338	0.00	20	$17,859	100%	4%	5%	8	31%	20%	63.2%	36.0%	36.0%	33.8
684	Cooling	Screw Chiller - Average kW/Ton = 0.675	Biz-Custom	Lodging	ROB	54,033	54,033	23%	12,394	0.00	20	$17,824	100%	4%	5%	9	15%	20%	63.2%	36.0%	36.0%	33.3
685	Cooling	HVAC/Chiller Custom	Biz-Custom	Lodging	Retro	5	5	20%	1	0.00	12	$1	25%	6%	9%	10	46%	20%	37.0%	36.0%	36.0%	7.4
686	Cooling	Chiller Tune-up	Biz-Custom	Lodging	Retro	74,025	74,025	8%	5,922	0.00	5	$1,175	100%	26%	38%	11	46%	50%	63.2%	60.0%	60.0%	6.3
687	Cooling	PTAC - <7,000 Btuh - lodging	Biz-Prescriptive	Lodging	ROB	375	375	9%	34	0.00	15	$22	100%	50%	15%	12	5%	20%	63.2%	44.5%	38.2%	4.5
688	Cooling	PTAC - 7,000 to 15,000 Btuh - lodging	Biz-Prescriptive	Lodging	ROB	833	833	9%	78	0.00	15	$41	100%	50%	19%	13	5%	20%	63.2%	46.2%	41.6%	5.6
689	Cooling	PTAC - >15,000 Btuh - lodging	Biz-Prescriptive	Lodging	ROB	1,408	1,408	10%	134	0.00	15	$56	100%	50%	24%	14	5%	20%	63.2%	47.8%	44.7%	7.0
690	Cooling	HVAC Occupancy Controls	Biz-Custom	Lodging	ROB	9,061	9,061	20%	1,812	0.00	15	$538	100%	18%	0%	15	38%	25%	63.2%	44.7%	42.8%	12.7
691	Cooling	Smart Thermostat	Biz-Custom	Lodging	ROB	3,715	3,715	18%	658	0.00	10	$128	100%	20%	15%	16	57%	9%	63.2%	47.4%	47.0%	7.8
692	Cooling	Window Film	Biz-Custom	Lodging	Retro	61,688	0	5%	2,838	0.00	10	$2,364	75%	6%	5%	17	100%	25%	53.7%	40.0%	40.0%	13.2
693	Cooling	Energy Recovery Ventilator	Biz-Custom	Lodging	Retro	2	2	50%	1	0.00	20	$1	75%	8%	12%	18	100%	5%	54.9%	33.4%	33.7%	10.7
694	Heating	Heat Pump - 16 SEER (<5 Tons)	Biz-Prescriptive	Lodging	ROB	13,045	13,045	19%	2,465	0.00	15	$2,055	75%	20%	12%	1	0%	20%	62.9%	54.2%	54.1%	3.8
695	Heating	Heat Pump - 17 SEER (<5 Tons)	Biz-Prescriptive	Lodging	ROB	13,045	13,045	21%	2,789	0.00	15	$2,740	50%	20%	10%	1	0%	20%	62.6%	54.1%	54.0%	3.4
696	Heating	Heat Pump - 18 SEER(<5 Tons)	Biz-Prescriptive	Lodging	ROB	13,045	13,045	24%	3,164	0.00	15	$3,425	50%	20%	9%	1	0%	20%	62.5%	54.0%	53.9%	3.1
697	Heating	Heat Pump - 21 SEER(<5 Tons)	Biz-Prescriptive	Lodging	ROB	13,045	13,045	28%	3,663	0.00	15	$4,500	50%	20%	8%	1	0%	20%	62.5%	54.1%	53.9%	3.0
698	Heating	Geothermal HP - SEER 20.3 (<5 Tons)	Biz-Prescriptive	Lodging	ROB	13,045	13,045	36%	4,707	0.00	15	$4,700	50%	11%	10%	1	0%	20%	62.5%	53.9%	53.9%	6.0
699	Heating	Geothermal HP - SEER 21.5 (<5 Tons)	Biz-Prescriptive	Lodging	ROB	13,045	13,045	40%	5,263	0.00	15	$7,300	25%	7%	7%	1	0%	20%	61.6%	53.3%	53.3%	6.7
700	Heating	Geothermal HP - SEER 23.1 (<5 Tons)	Biz-Prescriptive	Lodging	ROB	13,045	13,045	46%	5,986	0.00	15	$7,300	50%	7%	7%	1	0%	20%	62.3%	53.5%	53.5%	7.6
701	Heating	Geothermal HP - SEER 29.3 (<5 Tons)	Biz-Prescriptive	Lodging	ROB	13,045	13,045	49%	6,413	0.00	15	$9,200	25%	8%	5%	1	0%	20%	61.4%	53.1%	53.1%	5.2
702	Heating	Heat Pump - 16 SEER (5-20 Tons)	Biz-Prescriptive	Lodging	ROB	52,833	52,833	9%	4,837	0.00	15	$4,110	50%	20%	12%	2	20%	20%	62.4%	53.9%	53.8%	3.4
703	Heating	Heat Pump - 17 SEER (5-20 Tons)	Biz-Prescriptive	Lodging	ROB	52,833	52,833	13%	6,991	0.00	15	$5,480	50%	20%	9%	2	20%	20%	62.2%	53.5%	53.3%	3.2
704	Heating	Heat Pump - 18 SEER (5-20 Tons)	Biz-Prescriptive	Lodging	ROB	52,833	52,833	19%	10,273	0.00	15	$6,850	75%	20%	7%	2	20%	20%	62.8%	53.8%	53.6%	3.8
705	Heating	Heat Pump - 21 SEER (5-20 Tons)	Biz-Prescriptive	Lodging	ROB	52,833	52,833	25%	13,116	0.00	15	$9,000	75%	20%	6%	2	20%	20%	62.8%	53.8%	53.6%	3.8
706	Heating	Geothermal HP - SEER 20.3 (5-20 Tons)	Biz-Prescriptive	Lodging	ROB	21,256	21,256	21%	4,492	0.00	15	$7,700	50%	6%	6%	2	20%	20%	62.8%	54.3%	54.3%	11.0
707	Heating	Geothermal HP - SEER 21.5 (5-20 Tons)	Biz-Prescriptive	Lodging	ROB	21,256	21,256	26%	5,610	0.00	15	$10,300	50%	5%	5%	2	20%	20%	62.7%	54.2%	54.2%	12.3
708	Heating	Geothermal HP - SEER 23.1 (5-20 Tons)	Biz-Prescriptive	Lodging	ROB	21,256	21,256	33%	7,063	0.00	15	$12,800	50%	4%	4%	2	20%	20%	62.6%	54.0%	54.0%	14.1
709	Heating	Geothermal HP - SEER 29.3 (5-20 Tons)	Biz-Prescriptive	Lodging	ROB	21,256	21,256	37%	7,933	0.00	15	$17,700	25%	4%	3%	2	20%	20%	62.2%	53.9%	53.9%	11.0
710	Heating	Heat Pump - 16 SEER (20+ Tons)	Biz-Prescriptive	Lodging	ROB	108,761	108,761	11%	11,839	0.00	15	$8,220	50%	20%	6%	3	20%	20%	62.1%	53.4%	53.1%	3.4
711	Heating	Heat Pump - 17 SEER (20+ Tons)	Biz-Prescriptive	Lodging	ROB	108,761	108,761	15%	16,148	0.00	15	$10,960	50%	20%	5%	3	20%	20%	61.7%	52.9%	52.5%	3.3
712	Heating	Heat Pump - 18 SEER (20+ Tons)	Biz-Prescriptive	Lodging	ROB	108,761	108,761	21%	22,845	0.00	15	$13,700	75%	20%	4%	3	20%	20%	62.7%	53.6%	53.3%	4.0
713	Heating	Heat Pump - 21 SEER (20+ Tons)	Biz-Prescriptive	Lodging	ROB	108,761	108,761	26%	28,638	0.00	15	$18,000	75%	20%	3%	3	20%	20%	62.7%	53.6%	53.3%	3.9
714	Heating	Geothermal HP - SEER 20.3 (20+ Tons)	Biz-Prescriptive	Lodging	ROB	43,332	43,332	23%	9,804	0.00	15	$10,700	100%	9%	5%	3	20%	20%	63.2%	54.6%	54.6%	11.3
715	Heating	Geothermal HP - SEER 21.5 (20+ Tons)	Biz-Prescriptive	Lodging	ROB	43,332	43,332	28%	12,039	0.00	15	$13,300	75%	8%	4%	3	20%	20%	63.1%	54.5%	54.5%	12.6
716	Heating	Geothermal HP - SEER 23.1 (20+ Tons)	Biz-Prescriptive	Lodging	ROB	43,332	43,332	34%	14,946	0.00	15	$18,300	75%	5%	3%	3	20%	20%	63.0%	54.3%	54.3%	14.4
717	Heating	Geothermal HP - SEER 29.3 (20+ Tons)	Biz-Prescriptive	Lodging	ROB	43,332	43,332	39%	16,685	0.00	15	$26,200	50%	4%	2%	3	20%	20%	62.7%	54.2%	54.2%	16.8
718	Heating	PTHP - <7,000 Btuh - lodging	Biz-Prescriptive	Lodging	ROB	2,618	2,618	8%	221	0.00	15	$13	100%	100%	100%	4	3%	20%	63.2%	55.0%	55.0%	9.1
719	Heating	PTHP - 7,000 to 15,000 Btuh - lodging	Biz-Prescriptive	Lodging	ROB	5,610	5,610	11%	624	0.00	15	$45	100%	100%	100%	5	3%	20%	63.2%	55.0%	55.0%	6.8
720	Heating	PTHP - >15,000 Btuh - lodging	Biz-Prescriptive	Lodging	ROB	9,067	9,067	14%	1,260	0.00	15	$35	100%	100%	100%	6	3%	20%	63.2%	55.0%	55.0%	16.7
721	Heating	Mini Split Ductless Heat Pump Cold Climate (Tiers & sizes TBD)	Biz-Prescriptive	Lodging	ROB	4	4	25%	1	0.00	12	$0	100%	35%	67%	7	0%	20%	63.2%	55.0%	55.0%	23.3
722	Heating	Variable Refrigerant Flow Heat Pump	Biz-Custom	Lodging	NC	11	11	25%	3	0.00	20	$3	100%	5%	3%	2	20%	0%	63.2%	54.7%	54.7%	33.1
723	Ventilation	Kitchen Exhaust Hood Demand Ventilation Control System	Biz-Custom	Lodging	ROB	5	5	50%	3	0.00	20	$2	75%	8%	11%	1	20%	24%	54.6%	39.2%	39.2%	10.4
724	Ventilation	Demand Controlled Ventilation	Biz-Custom	Lodging	Retro	2,455	2,455	20%	491	0.00	15	$227	100%	11%	16%	2	80%	5%	63.2%	39.7%	40.5%	11.1
725	Ventilation	Pump and Fan Variable Frequency Drive Controls (Fans)	Biz-Prescriptive	Lodging	Retro	2,258	2,258	41%	923	0.00	15	$375	100%	16%	18%	2	80%	25%	63.2%	42.0%	42.4%	8.9
726	Refrigeration	Strip Curtains	Biz-Custom	Lodging	Retro	334	334	81%	270	0.00	4	$9	100%	100%	100%	1	12%	26%	60.2%	52.4%	52.4%	4.2
727	Refrigeration	Bare Suction Line	Biz-Custom	Lodging	Retro	23	23	93%	21	0.00	15	$4	100%	27%	39%	2	0%	25%	60.2%	45.6%	46.6%	9.2
728	Refrigeration	Floating Head Pressure Controls	Biz-Prescriptive	Lodging	Retro	2,653	2,653	50%	1,327	0.00	15	$80	100%	25%	41%	3	8%	20%	60.2%	50.1%	50.6%	31.6
729	Refrigeration	Saturated Suction Controls	Biz-Custom	Lodging	Retro	831	831	50%	416	0.00	15	$559	50%	4%	6%	4	2%	20%	36.0%	36.0%	36.0%	15.7
730	Refrigeration	Compressor Retrofit	Biz-Custom	Lodging	Retro	813	813	20%	163	0.00	15	$477	25%	2%	3%	5	27%	15%	32.0%	27.4%	27.4%	15.8
731	Refrigeration	Electronically Commutated (EC) Walk-In Evaporator Fan Motor	Biz-Prescriptive	Lodging	Retro	1,268	1,268	65%	824	0.00	15	$78	100%	45%	42%	6	8%	33%	60.2%	49.8%	49.6%	11.2
732	Refrigeration	Evaporator Fan Motor Controls	Biz-Prescriptive	Lodging	Retro	1,912	1,912	25%	478	0.00	13	$291	50%	15%	7%	7	8%	10%	44.4%	30.0%	28.3%	4.7
733	Refrigeration	Variable Speed Condenser Fan	Biz-Custom	Lodging	Retro	2,960	2,960	50%	1,480	0.00	15	$1,170	25%	7%	9%	8	10%	20%	36.0%	36.0%	36.0%	6.9
734	Refrigeration	Refrigeration Economizer	Biz-Custom	Lodging	Retro	67,850	67,850	2%	1,357	0.00	15	$2,558	3%	3%	4%	9	38%	0%	20.0%	15.7%	15.9%	6.9
735	Refrigeration	Anti-Sweat Heater Controls MT	Biz-Prescriptive	Lodging	Retro	1,313	1,313	55%	722	0.00	12	$250	75%	10%	12%	10	13%	36%	54.7%	48.8%	48.8%	8.7
736	Refrigeration	Auto Door Closer, Cooler	Biz-Prescriptive	Lodging	Retro	471,500	471,500	0%	943	0.00	8	$157	100%	16%	24%	11	9%	27%	60.2%	45.7%	46.3%	11.6
737	Refrigeration	Display Case Door Retrofit, Medium Temp	Biz-Prescriptive	Lodging	Retro	1,584	1,584	36%	578	0.00	12	$686	25%	22%	3%	12	4%	55%	64.0%	64.0%	64.0%	1.7
738	Refrigeration	Electronically Commutated (EC) Reach-In Evaporator Fan Motor	Biz-Prescriptive	Lodging	Retro	1,268	1,268	65%	824	0.00	15	$78	100%	45%	42%	13	2%	33%	60.2%	49.8%	49.6%	11.2
739	Refrigeration	Q-Sync Motor for Walk-In and Reach-in Evaporator Fan Motor	Biz-Prescriptive	Lodging	Retro	993	993	51%	504	0.00	10	$96	100%	36%	21%	13	2%	33%	60.2%	46.4%	46.4%	5.1
740	Refrigeration	Energy Star Reach-In Refrigerator, Glass Doors	Biz-Prescriptive	Lodging	ROB	1,546	1,546	27%	410	0.00	12	$600	25%	5%	3%	14	12%	55%	64.0%	64.0%	63.9%	5.1
741	Refrigeration	Energy Star Reach-In Refrigerator, Solid Doors	Biz-Prescriptive	Lodging	ROB	1,112	1,112	25%	283	0.00	12	$600	5%	5%	2%	15	12%	55%	64.0%	62.1%	61.9%	3.5
742	Refrigeration	Anti-Sweat Heater Controls LT	Biz-Prescriptive	Lodging	Retro	3,147	3,147	55%	1,731	0.00	12	$250	100%	10%	28%	16	4%	36%	60.2%	48.8%	48.8%	27.8
743	Refrigeration	Auto Door Closer, Freezer	Biz-Prescriptive	Lodging	Retro	419,455	419,455	1%	2,307	0.00	8	$157	100%	16%	59%	17	4%	27%	60.2%	49.6%	51.0%	27.7
744	Refrigeration	Display Case Door Retrofit, Low Temp	Biz-Prescriptive	Lodging	Retro	2,922	2,922	50%	1,453	0.00	12	$686	75%	22%	8%	17	4%	55%	64.0%	64.0%	64.0%	4.3
745	Refrigeration	Energy Star Reach-In Freezer, Glass Doors	Biz-Prescriptive	Lodging	ROB	3,234	3,234	15%	488	0.00	12	$450	25%	15%	4%	18	4%	55%	64.0%	64.0%	64.0%	2.9
746	Refrigeration	Energy Star Reach-In Freezer, Solid Doors	Biz-Prescriptive	Lodging	ROB	4,676	4,676	20%	935	0.00	12	$450	75%	15%	8%	19	4%	55%	64.0%	64.0%	64.0%	5.5
747	Refrigeration	Refrigeration - Custom	Biz-Custom	Lodging	ROB	7	7	15%	1	0.00	12	$0	100%	50%	72%	20	90%	20%	60.2%	49.9%	51.0%	9.1
748	Refrigeration	Retro-commissioning_Refrigerator Optimization	Biz-Custom RCx	Lodging	Retro	33	33	3%	1	0.00	3	$0	100%	67%	22%	21	90%	10%	60.2%	50.9%	49.0%	2.0
749	Refrigeration	Energy Star Ice Machine	Biz-Prescriptive	Lodging	ROB	6,993	6,993	10%	721	0.00	15	$1,426	3%	3%	2%	22	6%	49%	59.2%	57.2%	57.2%	8.9
750	Refrigeration	LED Refrigerated Display Case Lighting Average 6W/LF	Biz-Prescriptive	Lodging	Retro	1,573	1,573	37%	574	0.00	12	$1,010	34%	34%	2%	23	8%	30%	44.0%	44.0%	43.1%	0.9

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Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	Base (Existing) Annual Electric	Base (Standard) Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	MAP Incentive (%)	RAP Incentive (%)	PP Incentive (%)	End Use Measure Group	Base Saturation	EE Saturation	MAP Adoption Rate	RAP Adoption Rate	PP Adoption Rate	UCT Score
751	PlugLoads_Office	ENERGY STAR Uninterrupted Power Supply	Biz-Custom	Lodging	ROB	3,096	3,096	3%	85	0.00	15	$59	75%	7%	11%	1	1%	70%	76.0%	76.0%	76.0%	10.4
752	PlugLoads_Office	Smart Power Strip – Commercial Use	Biz-Custom	Lodging	Retro	64	64	100%	64	0.00	5	$50	7%	7%	10%	2	50%	10%	44.3%	38.5%	38.9%	3.1
753	PlugLoads_Office	Plug Load Occupancy Sensor	Biz-Custom	Lodging	Retro	1,126	1,126	15%	169	0.00	8	$70	50%	13%	18%	2	50%	10%	59.4%	46.1%	47.0%	4.1
754	PlugLoads_Office	Electrically Commutated Plug Fans in data centers	Biz-Custom	Lodging	Retro	86,783	86,783	18%	15,778	0.00	15	$480	100%	100%	100%	3	0%	33%	68.6%	59.7%	59.7%	15.8
755	PlugLoads_Office	High Efficiency CRAC unit	Biz-Custom	Lodging	ROB	541	541	30%	162	0.00	15	$63	100%	14%	19%	3	0%	33%	68.6%	48.5%	49.2%	9.6
756	PlugLoads_Office	Computer Room Air Conditioner Economizer	Biz-Custom	Lodging	Retro	418	418	86%	358	0.00	15	$82	100%	23%	33%	3	0%	33%	68.6%	52.8%	53.6%	6.9
757	PlugLoads_Office	Energy Star Laptop	Biz-Custom	Lodging	ROB	126	126	33%	41	0.00	4	$0	0%			4	17%	85%	88.0%	88.0%	88.0%	0.0
758	PlugLoads_Office	Energy Star Monitor	Biz-Custom	Lodging	ROB	72	72	21%	15	0.00	4	$0	0%			5	17%	95%	96.0%	96.0%	96.0%	0.0
759	PlugLoads_Office	Energy Star Printer/Copier/Fax	Biz-Custom	Lodging	ROB	551	551	40%	223	0.00	6	$0	0%			6	17%	95%	96.0%	96.0%	96.0%	0.0
760	PlugLoads_Office	Energy Star Server	Biz-Custom	Lodging	ROB	691	691	13%	90	0.00	15	$156	25%	3%	4%	7	0%	20%	36.3%	36.0%	36.0%	9.3
761	PlugLoads_Office	Server Virtualization	Biz-Custom	Lodging	Retro	691	691	13%	90	0.00	15	$156	25%	3%	4%	7	0%	20%	36.3%	36.0%	36.0%	9.3
762	PlugLoads_Office	Data Center Hot/Cold Aisle Configuration	Biz-Custom	Lodging	Retro	691	691	13%	90	0.00	15	$156	25%	3%	4%	7	0%	20%	36.3%	36.0%	36.0%	9.3
763	Motors	Cogged V-Belt	Biz-Custom	Lodging	Retro	29,207	29,207	3%	905	0.00	15	$384	100%	12%	18%	1	20%	10%	68.6%	47.0%	47.7%	9.0
764	Motors	Pump and Fan Variable Frequency Drive Controls (Pumps)	Biz-Prescriptive	Lodging	Retro	1,902	1,902	38%	731	0.00	15	$200	100%	30%	27%	2	18%	25%	68.6%	53.3%	53.0%	7.0
765	Motors	Escalators Motor Efficiency Controllers	Biz-Custom	Lodging	Retro	7,500	7,500	20%	1,500	0.00	10	$5,000	2%	2%	2%	3	0%	10%	28.0%	28.0%	28.0%	8.6
766	CompressedAir	Efficient Air Compressors	Biz-Custom	Lodging	ROB	4,004	4,004	31%	1,223	0.00	15	$100	100%	64%	100%	1	100%	33%	68.6%	58.6%	59.7%	10.4
767	CompressedAir	Retro-commissioning_Compressed Air Optimization	Biz-Custom RCx	Lodging	Retro	7	7	15%	1	0.00	5	$0	100%	67%	100%	2	100%	33%	68.6%	58.8%	59.7%	4.0
768	CompressedAir	Compressed Air - Custom	Biz-Custom	Lodging	Retro	7	7	15%	1	0.00	8	$0	100%	50%	100%	3	100%	33%	68.6%	57.5%	59.7%	4.1
769	Miscellaneous	Power Distribution Equipment Upgrades	Biz-Custom	Lodging	Retro	1,150	1,150	1%	6	0.00	30	$8	75%	4%	6%	1	62%	20%	58.1%	36.0%	36.0%	18.0
770	Miscellaneous	Vending Machine Controller - Non-Refrigerated	Biz-Custom	Lodging	Retro	745	745	46%	343	0.00	5	$80	63%	63%	32%	2	3%	66%	72.8%	72.8%	72.8%	0.9
771	Miscellaneous	Vending Machine Controller - Refrigerated	Biz-Custom	Lodging	Retro	1,739	1,739	46%	800	0.00	10	$216	100%	35%	28%	3	9%	66%	72.8%	72.8%	72.8%	3.2
772	Miscellaneous	Miscellaneous Custom	Biz-Custom	Lodging	Retro	5	5	20%	1	0.00	10	$0	100%	50%	72%	4	38%	20%	68.6%	57.8%	58.7%	7.8
773	Whole Building_HVAC	HVAC - Energy Management System	Biz-Prescriptive	Lodging	Retro	6,960	6,960	15%	1,044	0.00	15	$4,000	3%	3%	2%	1	0%	1%	20.8%	18.4%	18.4%	4.2
774	Whole Building_HVAC	Guest room energy management system	Biz-Custom	Lodging	Retro	3	3	30%	1	0.00	8	$0	100%	19%	27%	2	60%	10%	63.2%	45.6%	46.5%	6.5
775	Whole Building_HVAC	Retro-commissioning_Bld Optimization	Biz-Custom RCx	Lodging	Retro	7	7	15%	1	0.00	3	$0	100%	67%	22%	3	100%	10%	63.2%	53.6%	51.7%	2.2
776	WholeBld	WholeBlg - Com RET	Biz-NC	Lodging	Retro	7	7	15%	1	0.00	12	$0	100%	50%	19%	4	40%	0%	68.6%	57.8%	56.6%	9.3
777	Whole Building_NC	WholeBlg - Com NC	Biz-NC	Lodging	NC	4	4	25%	1	0.00	12	$0	100%	50%	72%	5	100%	60%	68.6%	68.0%	68.0%	9.3
778	Behavioral	AMI Data Presentment & Engagement	Biz-Behavior	Lodging	Retro	100	100	1%	1	0.00	1	$0	100%	100%	87%	1	100%	10%	50.0%	50.0%	50.0%	1.2
779	Behavioral	BIEMS	Biz-Behavior	Lodging	Retro	28	28	4%	1	0.00	3	$0	12%	12%	5%	1	100%	5%	42.5%	50.0%	50.0%	1.6
780	Behavioral	Building Operator Certification	Biz-Behavior	Lodging	Retro	15,300	15,300	1%	122	0.00	3	$21	50%	30%	12%	1	100%	5%	42.5%	50.0%	50.0%	2.1
781	Cooking	Commercial Combination Oven (Electric)	Biz-Prescriptive	Retail	ROB	38,561	38,561	48%	18,432	0.00	12	$16,884	50%	6%	3%	1	17%	53%	62.4%	62.4%	62.4%	9.5
782	Cooking	Commercial Electric Convection Oven	Biz-Prescriptive	Retail	ROB	12,193	12,193	15%	1,879	0.00	12	$1,706	50%	15%	11%	1	17%	53%	62.4%	62.4%	62.4%	4.0
783	Cooking	Commercial Electric Griddle	Biz-Prescriptive	Retail	ROB	17,056	17,056	15%	2,596	0.00	12	$3,604	25%	14%	7%	2	14%	17%	39.3%	33.6%	33.6%	2.1
784	Cooking	Commercial Electric Steam Cooker	Biz-Prescriptive	Retail	ROB	19,549	19,549	67%	13,162	0.00	12	$3,500	100%	12%	14%	3	6%	42%	68.6%	53.6%	53.6%	16.0
785	Cooking	Dishwasher Low Temp Door (Energy Star)	Biz-Prescriptive	Retail	ROB	39,279	39,279	41%	16,153	0.00	15	$770	100%	49%	65%	4	26%	61%	68.8%	68.8%	68.8%	19.1
786	Cooking	Dishwasher High Temp Door (Energy Star)	Biz-Prescriptive	Retail	ROB	39,825	39,825	30%	11,853	0.00	15	$770	100%	49%	65%	4	26%	61%	68.8%	68.8%	68.8%	14.0
787	Cooking	Energy efficient electric fryer	Biz-Prescriptive	Retail	ROB	18,182	18,182	14%	2,572	0.00	12	$1,706	50%	1%	15%	5	27%	23%	55.0%	39.3%	40.7%	96.4
788	Cooking	Insulated Holding Cabinets (Full Size)	Biz-Prescriptive	Retail	ROB	7,665	7,665	69%	5,278	0.00	12	$1,200	100%	6%	42%	6	3%	23%	68.6%	52.4%	54.9%	32.2
789	Cooking	Insulated Holding Cabinets (Half-Size)	Biz-Prescriptive	Retail	ROB	3,066	3,066	58%	1,788	0.00	12	$1,500	50%	8%	12%	6	3%	23%	52.9%	38.7%	39.1%	6.8
790	HotWater	Faucet Aerator	Biz-Custom	Retail	Retro	2,162	2,162	66%	1,425	0.00	10	$3	100%	26%	100%	4	25%	80%	84.0%	84.0%	84.0%	785.3
791	HotWater	Heat Pump Water Heater	Biz-Custom	Retail	ROB	10,967	10,967	35%	3,788	0.00	10	$1,574	75%	13%	10%	1	57%	23%	69.5%	52.6%	52.2%	6.1
792	HotWater	Hot Water Pipe Insulation	Biz-Custom	Retail	Retro	10,967	10,967	2%	219	0.00	20	$60	100%	19%	15%	2	100%	80%	84.0%	84.0%	84.0%	11.5
793	HotWater	Low Flow Pre-Rinse Sprayers	Biz-Custom	Retail	ROB	2,991	2,991	26%	764	0.00	5	$35	100%	71%	87%	3	25%	80%	84.0%	84.0%	84.0%	6.7
794	HotWater	ENERGY STAR Commercial Washing Machines	Biz-Custom	Retail	ROB	1,552	1,552	43%	671	0.00	7	$250	50%	14%	11%	5	25%	35%	66.5%	53.7%	53.3%	4.0
795	HotWater	Ozone Commercial Laundry	Biz-Custom	Retail	Retro	2,984	2,984	25%	746	0.00	10	$20,310	0%	0%	0%	6	43%	50%	60.0%	60.0%	60.0%	5.1
796	InteriorLighting	LED T8 Tube Replacement	Biz-Prescriptive Light	Retail	Retro	138	138	59%	82	0.00	15	$7	100%	49%	50%	1	75%	32%	71.1%	60.5%	60.6%	12.5
797	InteriorLighting	LED troffer retrofit kit, 2'X2' and 2'X4'	Biz-Prescriptive Light	Retail	Retro	310	310	50%	155	0.00	18	$67	100%	26%	50%	1	75%	32%	71.1%	52.9%	55.7%	5.7
798	InteriorLighting	LED troffer, 2'X2' and 2'X4'	Biz-Prescriptive Light	Retail	Retro	223	223	50%	112	0.00	18	$67	100%	26%	50%	1	75%	32%	71.1%	49.3%	53.4%	4.1
799	InteriorLighting	LED high bay fixture	Biz-Prescriptive Light	Retail	Retro	1,080	1,080	76%	821	0.00	12	$323	100%	12%	50%	2	2%	16%	71.1%	52.5%	56.3%	10.6
800	InteriorLighting	LED Mogul-base HID Lamp Replacing High Bay HID	Biz-Prescriptive Light	Retail	Retro	1,080	1,080	79%	855	0.00	12	$110	100%	21%	50%	2	2%	16%	71.1%	58.8%	60.0%	19.2
801	InteriorLighting	LED low bay fixture	Biz-Prescriptive Light	Retail	Retro	1,080	1,080	76%	821	0.00	12	$196	100%	20%	50%	3	2%	16%	71.1%	56.5%	58.3%	10.6
802	InteriorLighting	LED Mogul-base HID Lamp Replacing Low Bay HID	Biz-Prescriptive Light	Retail	Retro	1,080	1,080	79%	855	0.00	12	$60	100%	38%	50%	3	2%	16%	71.1%	60.6%	60.8%	19.2
803	InteriorLighting	LED downlight, screwin lamp, 1-3W, interior Average 2 Watts	Biz-Prescriptive Light	Retail	ROB	67	67	88%	59	0.00	4	$4	100%	25%	50%	4	3%	32%	71.1%	60.3%	60.8%	10.2
804	InteriorLighting	LED downlight fixture	Biz-Prescriptive Light	Retail	Retro	174	174	82%	142	0.00	4	$13	100%	39%	50%	5	19%	32%	71.1%	60.2%	60.5%	4.9
805	InteriorLighting	LED downlight, screwin lamp, 4-20W, interior Average 11 Watts	Biz-Prescriptive Light	Retail	ROB	134	134	84%	113	0.00	4	$2	100%	61%	50%	5	19%	32%	71.1%	61.7%	61.6%	19.5
806	InteriorLighting	DeLamp Fluorescent Fixture Average Lamp Wattage 28W	Biz-Custom Light	Retail	Retro	53	53	100%	53	0.00	15	$4	100%	69%	50%	6	75%	0%	71.1%	61.1%	60.7%	11.0
807	InteriorLighting	Daylighting Controls	Biz-Custom Light	Retail	Retro	8,810	8,810	30%	2,643	0.00	12	$3,000	25%	5%	50%	7	95%	8%	48.3%	39.1%	46.0%	9.8
808	InteriorLighting	Occupancy Sensors	Biz-Prescriptive Light	Retail	Retro	1,523	1,523	30%	457	0.00	8	$54	100%	37%	50%	7	95%	8%	71.1%	59.3%	59.8%	5.7
809	InteriorLighting	Central Lighting Monitoring & Controls (non-networked)	Biz-Custom Light	Retail	Retro	41,703	41,703	20%	8,341	0.00	12	$3,700	100%	12%	17%	7	95%	8%	71.1%	50.8%	51.5%	9.3
810	InteriorLighting	Network Lighting Controls - Wireless (WiFi)	Biz-Custom Light	Retail	Retro	16,277	16,277	47%	7,650	0.00	8	$1,683	100%	24%	34%	7	95%	8%	71.1%	56.9%	57.6%	6.6
811	InteriorLighting	Bi-Level Lighting Fixture – Stairwells, Hallways, and Garages	Biz-Custom Light	Retail	Retro	1,034	1,034	50%	517	0.00	10	$274	50%	10%	50%	8	5%	8%	62.0%	47.4%	53.9%	7.0
812	InteriorLighting	LED Exit Sign - 4 Watt Fixture (2 lamp)	Biz-Prescriptive Light	Retail	Retro	236	236	85%	201	0.00	15	$60	100%	8%	50%	9	1%	75%	80.0%	80.0%	80.0%	19.9
813	ExteriorLighting	LED wallpack (existing W<250)	Biz-Prescriptive Light	Retail	Retro	856	856	66%	567	0.00	12	$248	50%	10%	9%	1	13%	46%	62.7%	56.8%	56.8%	6.6
814	ExteriorLighting	LED parking lot fixture (existing W≥250)	Biz-Prescriptive Light	Retail	Retro	1,589	1,589	60%	959	0.00	12	$756	25%	3%	5%	2	13%	41%	52.8%	52.8%	52.8%	11.2
815	ExteriorLighting	LED parking lot fixture (existing W<250)	Biz-Prescriptive Light	Retail	Retro	856	856	66%	567	0.00	12	$248	50%	10%	9%	3	13%	41%	62.7%	52.8%	52.8%	6.6
816	ExteriorLighting	LED fuel pump canopy fixture (existing W<250)	Biz-Prescriptive Light	Retail	Retro	0	0	0%	0	0.00	12	$0	0%	0%		4	0%	41%	71.1%	61.9%	61.9%	0.0
817	ExteriorLighting	LED fuel pump canopy fixture (existing W≥250)	Biz-Prescriptive Light	Retail	Retro	0	0	0%	0	0.00	12	$0	0%	0%		5	0%	41%	71.1%	61.9%	61.9%	0.0
818	ExteriorLighting	LED outdoor pole decorative fixture (existing W≥250)	Biz-Prescriptive Light	Retail	Retro	1,589	1,589	60%	959	0.00	12	$756	25%	3%	5%	6	13%	41%	52.8%	52.8%	52.8%	11.2
819	ExteriorLighting	LED parking garage fixture (existing W≥250)	Biz-Prescriptive Light	Retail	Retro	3,235	3,235	60%	1,953	0.00	6	$756	25%	3%	10%	7	13%	41%	60.2%	52.8%	52.8%	11.8
820	ExteriorLighting	LED parking garage fixture (existing W<250)	Biz-Prescriptive Light	Retail	Retro	1,742	1,742	66%	1,154	0.00	6	$248	50%	10%	19%	8	13%	41%	66.7%	55.4%	56.0%	7.0
821	ExteriorLighting	LED Mogul-base HID Lamp Replacing Exterior HID (existing W≥250)	Biz-Prescriptive Light	Retail	Retro	1,589	1,589	60%	959	0.00	12	$756	25%	3%	5%	9	13%	41%	52.8%	52.8%	52.8%	11.2
822	ExteriorLighting	LED Mogul-base HID Lamp Replacing Exterior HID (existing W<250)	Biz-Prescriptive Light	Retail	Retro	856	856	66%	567	0.00	12	$248	50%	10%	9%	10	13%	41%	62.7%	52.8%	52.8%	6.6
823	Cooling	Air Conditioner - 16 SEER (5-20 Tons)	Biz-Prescriptive	Retail	ROB	10,955	10,955	12%	1,369	0.00	15	$3,570	25%	5%	4%	1	14%	20%	36.0%	34.4%	34.2%	9.2
824	Cooling	Air Conditioner - 17 SEER (5-20 Tons)	Biz-Prescriptive	Retail	ROB	10,955	10,955	12%	1,369	0.00	15	$4,760	25%	5%	3%	1	14%	20%	36.0%	34.1%	34.1%	6.9
825	Cooling	Air Conditioner - 18 SEER (5-20 Tons)	Biz-Prescriptive	Retail	ROB	10,955	10,955	19%	2,064	0.00	15	$5,960	25%	5%	3%	1	14%	20%	36.0%	34.1%	34.1%	8.3

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Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	Base (Existing) Annual Electric	Base (Standard) Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	MAP Incentive (%)	RAP Incentive (%)	PP Incentive (%)	End Use Measure Group	Base Saturation	EE Saturation	MAP Adoption Rate	RAP Adoption Rate	PP Adoption Rate	UCT Score
826	Cooling	Air Conditioner - 21 SEER (5-20 Tons)	Biz-Prescriptive	Retail	ROB	10,955	10,955	24%	2,665	0.00	15	$9,080	25%	5%	3%	1	14%	20%	36.0%	34.1%	34.1%	7.1
827	Cooling	Air Conditioner - 16 SEER (20+ Tons)	Biz-Prescriptive	Retail	ROB	22,309	22,309	8%	1,859	0.00	15	$7,140	25%	5%	3%	2	14%	20%	36.0%	34.1%	34.1%	6.3
828	Cooling	Air Conditioner - 17 SEER (20+ Tons)	Biz-Prescriptive	Retail	ROB	22,309	22,309	8%	1,859	0.00	15	$9,520	5%	5%	2%	2	14%	20%	36.0%	34.1%	34.1%	4.7
829	Cooling	Air Conditioner - 18 SEER (20+ Tons)	Biz-Prescriptive	Retail	ROB	22,309	22,309	15%	3,432	0.00	15	$11,920	25%	5%	3%	2	14%	20%	36.0%	34.1%	34.1%	6.9
830	Cooling	Air Conditioner - 21 SEER (20+ Tons)	Biz-Prescriptive	Retail	ROB	22,309	22,309	21%	4,781	0.00	15	$18,160	25%	5%	3%	2	14%	20%	36.0%	34.1%	34.1%	6.3
831	Cooling	Comprehensive Rooftop Unit Quality Maintenance (AC Tune-up)	Biz-Custom	Retail	Retro	38,651	38,651	6%	2,443	0.00	3	$500	100%	25%	37%	3	28%	50%	63.2%	60.0%	60.0%	4.3
832	Cooling	Air Side Economizer	Biz-Custom	Retail	Retro	6,135	6,135	3%	179	0.00	5	$170	5%	5%	8%	4	28%	33%	46.4%	46.4%	46.4%	3.1
833	Cooling	Advanced Rooftop Controls	Biz-Custom	Retail	Retro	5,113	5,113	28%	1,422	0.00	10	$3,412	25%	2%	3%	5	28%	3%	25.0%	19.7%	19.7%	13.2
834	Cooling	Air Conditioner - 16 SEER (<5 Tons)	Biz-Prescriptive	Retail	ROB	4,719	4,719	19%	885	0.00	15	$1,785	50%	5%	5%	6	22%	20%	36.0%	36.0%	36.0%	11.9
835	Cooling	Air Conditioner - 17 SEER (<5 Tons)	Biz-Prescriptive	Retail	ROB	4,719	4,719	24%	1,110	0.00	15	$2,380	50%	5%	5%	6	22%	20%	36.0%	36.0%	36.0%	11.2
836	Cooling	Air Conditioner - 18 SEER(<5 Tons)	Biz-Prescriptive	Retail	ROB	4,719	4,719	28%	1,311	0.00	15	$2,980	50%	5%	4%	6	22%	20%	36.0%	36.0%	36.0%	10.6
837	Cooling	Air Conditioner - 21 SEER(<5 Tons)	Biz-Prescriptive	Retail	ROB	4,719	4,719	38%	1,798	0.00	15	$4,540	25%	5%	4%	6	22%	20%	36.0%	34.8%	34.7%	9.5
838	Cooling	Centrifugal Chiller - Average kW/Ton = 0.626	Biz-Custom	Retail	ROB	23,577	23,577	26%	6,184	0.00	20	$13,957	25%	2%	3%	7	20%	20%	36.0%	34.8%	34.9%	20.9
839	Cooling	Reciprocating Chiller - Average kW/Ton = 0.99	Biz-Custom	Retail	ROB	28,988	28,988	27%	7,730	0.00	20	$11,190	100%	4%	5%	8	12%	20%	63.2%	36.0%	36.0%	34.2
840	Cooling	Screw Chiller - Average kW/Ton = 0.675	Biz-Custom	Retail	ROB	33,854	33,854	23%	7,765	0.00	20	$11,168	100%	4%	5%	9	0%	20%	63.2%	36.0%	36.0%	33.7
841	Cooling	HVAC/Chiller Custom	Biz-Custom	Retail	Retro	5	5	20%	1	0.00	12	$1	25%	6%	9%	10	33%	20%	37.0%	36.0%	36.0%	7.7
842	Cooling	Chiller Tune-up	Biz-Custom	Retail	Retro	46,375	46,375	8%	3,710	0.00	5	$535	100%	36%	52%	11	33%	50%	63.2%	60.0%	60.0%	5.5
843	Cooling	PTAC - <7,000 Btuh - lodging	Biz-Prescriptive	Retail	ROB	516	516	9%	47	0.00	15	$22	100%	50%	21%	12	0%	20%	63.2%	46.2%	41.8%	5.1
844	Cooling	PTAC - 7,000 to 15,000 Btuh - lodging	Biz-Prescriptive	Retail	ROB	1,147	1,147	9%	107	0.00	15	$41	100%	50%	26%	13	0%	20%	63.2%	47.6%	44.6%	6.2
845	Cooling	PTAC - >15,000 Btuh - lodging	Biz-Prescriptive	Retail	ROB	1,937	1,937	10%	185	0.00	15	$56	100%	50%	33%	14	0%	20%	63.2%	48.9%	47.2%	7.9
846	Cooling	HVAC Occupancy Controls	Biz-Custom	Retail	ROB	2,636	2,636	20%	527	0.00	15	$538	75%	5%	0%	15	28%	25%	51.2%	40.0%	40.0%	15.1
847	Cooling	Smart Thermostat	Biz-Custom	Retail	ROB	5,113	5,113	18%	905	0.00	10	$128	100%	14%	10%	16	48%	9%	63.2%	48.8%	48.6%	16.5
848	Cooling	Window Film	Biz-Custom	Retail	Retro	38,651	0	4%	1,523	0.00	10	$1,269	75%	6%	5%	17	100%	25%	53.5%	40.0%	40.0%	13.5
849	Cooling	Energy Recovery Ventilator	Biz-Custom	Retail	Retro	2	2	50%	1	0.00	20	$1	75%	8%	12%	18	100%	5%	54.9%	33.4%	33.7%	11.1
850	Heating	Heat Pump - 16 SEER (<5 Tons)	Biz-Prescriptive	Retail	ROB	10,976	10,976	19%	2,070	0.00	15	$2,055	50%	20%	10%	1	18%	20%	43.7%	36.0%	36.0%	3.5
851	Heating	Heat Pump - 17 SEER (<5 Tons)	Biz-Prescriptive	Retail	ROB	10,976	10,976	22%	2,401	0.00	15	$2,740	50%	20%	9%	1	18%	20%	41.4%	36.0%	36.0%	3.2
852	Heating	Heat Pump - 18 SEER(<5 Tons)	Biz-Prescriptive	Retail	ROB	10,976	10,976	25%	2,750	0.00	15	$3,425	50%	20%	8%	1	18%	20%	39.8%	36.0%	36.0%	3.0
853	Heating	Heat Pump - 21 SEER(<5 Tons)	Biz-Prescriptive	Retail	ROB	10,976	10,976	30%	3,331	0.00	15	$4,500	50%	20%	7%	1	18%	20%	38.9%	36.0%	36.0%	2.9
854	Heating	Geothermal HP - SEER 20.3 (<5 Tons)	Biz-Prescriptive	Retail	ROB	10,976	10,976	36%	3,961	0.00	15	$4,700	50%	11%	8%	1	18%	20%	40.3%	36.0%	36.0%	5.6
855	Heating	Geothermal HP - SEER 21.5 (<5 Tons)	Biz-Prescriptive	Retail	ROB	10,976	10,976	40%	4,410	0.00	15	$7,300	25%	7%	6%	1	18%	20%	36.0%	36.0%	36.0%	6.1
856	Heating	Geothermal HP - SEER 23.1 (<5 Tons)	Biz-Prescriptive	Retail	ROB	10,976	10,976	46%	5,011	0.00	15	$7,300	25%	7%	7%	1	18%	20%	36.0%	36.0%	36.0%	7.0
857	Heating	Geothermal HP - SEER 29.3 (<5 Tons)	Biz-Prescriptive	Retail	ROB	10,976	10,976	51%	5,580	0.00	15	$9,200	25%	8%	5%	1	18%	20%	36.0%	36.0%	36.0%	4.9
858	Heating	Heat Pump - 16 SEER (5-20 Tons)	Biz-Prescriptive	Retail	ROB	40,155	40,155	10%	3,870	0.00	15	$4,110	50%	20%	9%	2	23%	20%	41.8%	36.0%	36.0%	3.0
859	Heating	Heat Pump - 17 SEER (5-20 Tons)	Biz-Prescriptive	Retail	ROB	40,155	40,155	13%	5,271	0.00	15	$5,480	50%	20%	9%	2	23%	20%	41.2%	36.0%	36.0%	2.7
860	Heating	Heat Pump - 18 SEER (5-20 Tons)	Biz-Prescriptive	Retail	ROB	40,155	40,155	19%	7,773	0.00	15	$6,850	50%	20%	7%	2	23%	20%	44.3%	36.0%	36.0%	3.3
861	Heating	Heat Pump - 21 SEER (5-20 Tons)	Biz-Prescriptive	Retail	ROB	40,155	40,155	25%	9,940	0.00	15	$9,000	50%	20%	6%	2	23%	20%	43.8%	36.0%	36.0%	3.2
862	Heating	Geothermal HP - SEER 20.3 (5-20 Tons)	Biz-Prescriptive	Retail	ROB	19,712	19,712	28%	5,561	0.00	15	$7,700	75%	6%	6%	2	23%	20%	51.5%	36.0%	36.0%	11.9
863	Heating	Geothermal HP - SEER 21.5 (5-20 Tons)	Biz-Prescriptive	Retail	ROB	19,712	19,712	33%	6,465	0.00	15	$10,300	50%	5%	5%	2	23%	20%	38.6%	36.0%	36.0%	13.0
864	Heating	Geothermal HP - SEER 23.1 (5-20 Tons)	Biz-Prescriptive	Retail	ROB	19,712	19,712	39%	7,676	0.00	15	$12,800	50%	4%	4%	2	23%	20%	37.9%	36.0%	36.0%	14.7
865	Heating	Geothermal HP - SEER 29.3 (5-20 Tons)	Biz-Prescriptive	Retail	ROB	19,712	19,712	45%	8,838	0.00	15	$17,700	25%	4%	3%	2	23%	20%	36.0%	36.0%	36.0%	11.6
866	Heating	Heat Pump - 16 SEER (20+ Tons)	Biz-Prescriptive	Retail	ROB	82,534	82,534	11%	8,684	0.00	15	$8,220	50%	20%	6%	3	23%	20%	42.5%	36.0%	36.0%	2.8
867	Heating	Heat Pump - 17 SEER (20+ Tons)	Biz-Prescriptive	Retail	ROB	82,534	82,534	14%	11,488	0.00	15	$10,960	50%	20%	5%	3	23%	20%	41.8%	36.0%	36.0%	2.6
868	Heating	Heat Pump - 18 SEER (20+ Tons)	Biz-Prescriptive	Retail	ROB	82,534	82,534	20%	16,675	0.00	15	$13,700	50%	20%	4%	3	23%	20%	44.9%	36.0%	36.0%	3.2
869	Heating	Heat Pump - 21 SEER (20+ Tons)	Biz-Prescriptive	Retail	ROB	82,534	82,534	26%	21,156	0.00	15	$18,000	50%	20%	3%	3	23%	20%	44.5%	36.0%	36.0%	3.2
870	Heating	Geothermal HP - SEER 20.3 (20+ Tons)	Biz-Prescriptive	Retail	ROB	39,957	39,957	29%	11,655	0.00	15	$10,700	100%	9%	5%	3	23%	20%	63.2%	36.0%	36.0%	12.1
871	Heating	Geothermal HP - SEER 21.5 (20+ Tons)	Biz-Prescriptive	Retail	ROB	39,957	39,957	34%	13,463	0.00	15	$13,300	75%	8%	4%	3	23%	20%	54.1%	36.0%	36.0%	13.2
872	Heating	Geothermal HP - SEER 23.1 (20+ Tons)	Biz-Prescriptive	Retail	ROB	39,957	39,957	40%	15,886	0.00	15	$18,300	75%	5%	3%	3	23%	20%	52.6%	36.0%	36.0%	14.9
873	Heating	Geothermal HP - SEER 29.3 (20+ Tons)	Biz-Prescriptive	Retail	ROB	39,957	39,957	46%	18,209	0.00	15	$26,200	50%	4%	2%	3	23%	20%	39.6%	36.0%	36.0%	17.5
874	Heating	PTHP - <7,000 Btuh - lodging	Biz-Prescriptive	Retail	ROB	1,976	1,976	9%	169	0.00	15	$13	100%	100%	100%	4	0%	20%	63.2%	55.0%	55.0%	7.8
875	Heating	PTHP - 7,000 to 15,000 Btuh - lodging	Biz-Prescriptive	Retail	ROB	4,255	4,255	11%	462	0.00	15	$45	100%	100%	100%	5	0%	20%	63.2%	55.0%	55.0%	5.6
876	Heating	PTHP - >15,000 Btuh - lodging	Biz-Prescriptive	Retail	ROB	6,922	6,922	13%	917	0.00	15	$35	100%	100%	100%	6	0%	20%	63.2%	55.0%	55.0%	13.6
877	Heating	Mini Split Ductless Heat Pump Cold Climate (Tiers & sizes TBD)	Biz-Prescriptive	Retail	ROB	4	4	25%	1	0.00	12	$0	100%	35%	67%	7	18%	20%	63.2%	51.8%	53.4%	18.7
878	Heating	Variable Refrigerant Flow Heat Pump	Biz-Custom	Retail	NC	11	11	25%	3	0.00	20	$3	100%	5%	3%	2	23%	0%	63.2%	32.1%	32.0%	26.6
879	Ventilation	Kitchen Exhaust Hood Demand Ventilation Control System	Biz-Custom	Retail	ROB	0	0	0%	0	0.00	20	$0	0%	0%		1	0%	24%	63.2%	55.0%	55.0%	0.0
880	Ventilation	Demand Controlled Ventilation	Biz-Custom	Retail	Retro	2,579	2,579	20%	516	0.00	15	$227	100%	12%	17%	2	100%	5%	63.2%	41.0%	41.8%	12.8
881	Ventilation	Pump and Fan Variable Frequency Drive Controls (Fans)	Biz-Prescriptive	Retail	Retro	2,258	2,258	41%	923	0.00	15	$375	100%	16%	18%	2	100%	25%	63.2%	42.0%	42.4%	9.2
882	Refrigeration	Strip Curtains	Biz-Custom	Retail	Retro	334	334	81%	270	0.00	4	$9	100%	100%	100%	1	6%	26%	60.2%	52.4%	52.4%	4.2
883	Refrigeration	Bare Suction Line	Biz-Custom	Retail	Retro	23	23	93%	21	0.00	15	$4	100%	27%	39%	2	0%	25%	60.2%	45.6%	46.6%	9.2
884	Refrigeration	Floating Head Pressure Controls	Biz-Prescriptive	Retail	Retro	2,653	2,653	50%	1,327	0.00	15	$80	100%	25%	41%	3	8%	20%	60.2%	50.1%	50.6%	31.6
885	Refrigeration	Saturated Suction Controls	Biz-Custom	Retail	Retro	831	831	50%	416	0.00	15	$559	50%	4%	6%	4	2%	20%	36.0%	36.0%	36.0%	15.7
886	Refrigeration	Compressor Retrofit	Biz-Custom	Retail	Retro	813	813	20%	163	0.00	15	$477	25%	2%	3%	5	14%	15%	32.0%	27.4%	27.4%	15.8
887	Refrigeration	Electronically Commutated (EC) Walk-In Evaporator Fan Motor	Biz-Prescriptive	Retail	Retro	1,268	1,268	65%	824	0.00	15	$78	100%	45%	42%	6	4%	33%	60.2%	49.8%	49.6%	11.2
888	Refrigeration	Evaporator Fan Motor Controls	Biz-Prescriptive	Retail	Retro	1,912	1,912	25%	478	0.00	13	$291	50%	15%	7%	7	4%	10%	44.4%	30.0%	28.3%	4.7
889	Refrigeration	Variable Speed Condenser Fan	Biz-Custom	Retail	Retro	2,960	2,960	50%	1,480	0.00	15	$1,170	25%	7%	9%	8	5%	20%	36.0%	36.0%	36.0%	6.9
890	Refrigeration	Refrigeration Economizer	Biz-Custom	Retail	Retro	67,850	67,850	2%	1,357	0.00	15	$2,558	3%	3%	4%	9	19%	0%	20.0%	15.7%	15.9%	6.9
891	Refrigeration	Anti-Sweat Heater Controls MT	Biz-Prescriptive	Retail	Retro	1,313	1,313	55%	722	0.00	12	$250	75%	10%	12%	10	19%	36%	54.7%	48.8%	48.8%	8.7
892	Refrigeration	Auto Door Closer, Cooler	Biz-Prescriptive	Retail	Retro	471,500	471,500	0%	943	0.00	8	$157	100%	16%	24%	11	14%	27%	60.2%	45.7%	46.3%	11.6
893	Refrigeration	Display Case Door Retrofit, Medium Temp	Biz-Prescriptive	Retail	Retro	1,584	1,584	36%	578	0.00	12	$686	25%	22%	3%	12	6%	55%	64.0%	64.0%	64.0%	1.7
894	Refrigeration	Electronically Commutated (EC) Reach-In Evaporator Fan Motor	Biz-Prescriptive	Retail	Retro	1,268	1,268	65%	824	0.00	15	$78	100%	45%	42%	13	3%	33%	60.2%	49.8%	49.6%	11.2
895	Refrigeration	Q-Sync Motor for Walk-In and Reach-in Evaporator Fan Motor	Biz-Prescriptive	Retail	Retro	993	993	51%	504	0.00	10	$96	100%	36%	21%	13	3%	33%	60.2%	46.4%	46.4%	5.1
896	Refrigeration	Energy Star Reach-In Refrigerator, Glass Doors	Biz-Prescriptive	Retail	ROB	1,546	1,546	27%	410	0.00	12	$600	25%	5%	3%	14	19%	55%	64.0%	64.0%	63.9%	5.1
897	Refrigeration	Energy Star Reach-In Refrigerator, Solid Doors	Biz-Prescriptive	Retail	ROB	1,112	1,112	25%	283	0.00	12	$600	5%	5%	2%	15	19%	55%	64.0%	62.1%	61.9%	3.5
898	Refrigeration	Anti-Sweat Heater Controls LT	Biz-Prescriptive	Retail	Retro	3,147	3,147	55%	1,731	0.00	12	$250	100%	10%	28%	16	6%	36%	60.2%	48.8%	48.8%	27.9
899	Refrigeration	Auto Door Closer, Freezer	Biz-Prescriptive	Retail	Retro	419,455	419,455	1%	2,307	0.00	8	$157	100%	16%	59%	17	6%	27%	60.2%	49.6%	51.0%	27.8
900	Refrigeration	Display Case Door Retrofit, Low Temp	Biz-Prescriptive	Retail	Retro	2,922	2,922	50%	1,453	0.00	12	$686	75%	22%	8%	17	6%	55%	64.0%	64.0%	64.0%	4.3

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Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	Base (Existing) Annual Electric	Base (Standard) Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	MAP Incentive (%)	RAP Incentive (%)	PP Incentive (%)	End Use Measure Group	Base Saturation	EE Saturation	MAP Adoption Rate	RAP Adoption Rate	PP Adoption Rate	UCT Score
901	Refrigeration	Energy Star Reach-In Freezer, Glass Doors	Biz-Prescriptive	Retail	ROB	3,234	3,234	15%	488	0.00	12	$450	25%	15%	4%	18	6%	55%	64.0%	64.0%	64.0%	2.9
902	Refrigeration	Energy Star Reach-In Freezer, Solid Doors	Biz-Prescriptive	Retail	ROB	4,676	4,676	20%	935	0.00	12	$450	75%	15%	8%	19	6%	55%	64.0%	64.0%	64.0%	5.5
903	Refrigeration	Refrigeration - Custom	Biz-Custom	Retail	ROB	7	7	15%	1	0.00	12	$0	100%	50%	72%	20	90%	20%	60.2%	49.9%	51.0%	9.1
904	Refrigeration	Retro-commissioning_Refrigerator Optimization	Biz-Custom RCx	Retail	Retro	33	33	3%	1	0.00	3	$0	100%	67%	22%	21	90%	10%	60.2%	50.9%	49.0%	2.0
905	Refrigeration	Energy Star Ice Machine	Biz-Prescriptive	Retail	ROB	6,993	6,993	10%	721	0.00	15	$1,426	3%	3%	2%	22	2%	49%	59.2%	57.2%	57.2%	8.9
906	Refrigeration	LED Refrigerated Display Case Lighting Average 6W/LF	Biz-Prescriptive	Retail	Retro	1,573	1,573	37%	574	0.00	12	$1,010	34%	34%	2%	23	11%	30%	44.0%	44.0%	43.1%	0.9
907	PlugLoads_Office	ENERGY STAR Uninterrupted Power Supply	Biz-Custom	Retail	ROB	3,096	3,096	3%	85	0.00	15	$59	75%	7%	11%	1	1%	70%	76.0%	76.0%	76.0%	10.6
908	PlugLoads_Office	Smart Power Strip – Commercial Use	Biz-Custom	Retail	Retro	64	64	100%	64	0.00	5	$50	7%	7%	10%	2	50%	10%	44.3%	38.5%	38.9%	3.2
909	PlugLoads_Office	Plug Load Occupancy Sensor	Biz-Custom	Retail	Retro	1,126	1,126	15%	169	0.00	8	$70	50%	13%	18%	2	50%	10%	59.4%	46.1%	47.0%	4.2
910	PlugLoads_Office	Electrically Commutated Plug Fans in data centers	Biz-Custom	Retail	Retro	86,783	86,783	18%	15,778	0.00	15	$480	100%	100%	100%	3	0%	33%	68.6%	59.7%	59.7%	16.2
911	PlugLoads_Office	High Efficiency CRAC unit	Biz-Custom	Retail	ROB	541	541	30%	162	0.00	15	$63	100%	14%	19%	3	0%	33%	68.6%	48.5%	49.2%	9.8
912	PlugLoads_Office	Computer Room Air Conditioner Economizer	Biz-Custom	Retail	Retro	418	418	86%	358	0.00	15	$82	100%	23%	33%	3	0%	33%	68.6%	52.8%	53.6%	7.1
913	PlugLoads_Office	Energy Star Laptop	Biz-Custom	Retail	ROB	126	126	33%	41	0.00	4	$0	0%			4	17%	85%	88.0%	88.0%	88.0%	0.0
914	PlugLoads_Office	Energy Star Monitor	Biz-Custom	Retail	ROB	72	72	21%	15	0.00	4	$0	0%			5	17%	95%	96.0%	96.0%	96.0%	0.0
915	PlugLoads_Office	Energy Star Printer/Copier/Fax	Biz-Custom	Retail	ROB	551	551	40%	223	0.00	6	$0	0%			6	17%	95%	96.0%	96.0%	96.0%	0.0
916	PlugLoads_Office	Energy Star Server	Biz-Custom	Retail	ROB	691	691	13%	90	0.00	15	$156	25%	3%	4%	7	0%	20%	36.3%	36.0%	36.0%	9.5
917	PlugLoads_Office	Server Virtualization	Biz-Custom	Retail	Retro	691	691	13%	90	0.00	15	$156	25%	3%	4%	7	0%	20%	36.3%	36.0%	36.0%	9.5
918	PlugLoads_Office	Data Center Hot/Cold Aisle Configuration	Biz-Custom	Retail	Retro	691	691	13%	90	0.00	15	$156	25%	3%	4%	7	0%	20%	36.3%	36.0%	36.0%	9.5
919	Motors	Cogged V-Belt	Biz-Custom	Retail	Retro	14,670	14,670	3%	455	0.00	15	$384	50%	6%	9%	1	77%	10%	53.3%	38.7%	39.0%	11.4
920	Motors	Pump and Fan Variable Frequency Drive Controls (Pumps)	Biz-Prescriptive	Retail	Retro	1,902	1,902	38%	731	0.00	15	$200	100%	30%	27%	2	4%	25%	68.6%	53.3%	53.0%	7.0
921	Motors	Escalators Motor Efficiency Controllers	Biz-Custom	Retail	Retro	7,500	7,500	20%	1,500	0.00	10	$5,000	2%	2%	2%	3	0%	10%	28.0%	28.0%	28.0%	8.6
922	CompressedAir	Efficient Air Compressors	Biz-Custom	Retail	ROB	4,004	4,004	31%	1,223	0.00	15	$100	100%	64%	100%	1	100%	33%	68.6%	58.6%	59.7%	10.6
923	CompressedAir	Retro-commissioning_Compressed Air Optimization	Biz-Custom RCx	Retail	Retro	7	7	15%	1	0.00	5	$0	100%	67%	100%	2	100%	33%	68.6%	58.8%	59.7%	4.1
924	CompressedAir	Compressed Air - Custom	Biz-Custom	Retail	Retro	7	7	15%	1	0.00	8	$0	100%	50%	100%	3	100%	33%	68.6%	57.5%	59.7%	4.2
925	Miscellaneous	Power Distribution Equipment Upgrades	Biz-Custom	Retail	Retro	1,150	1,150	1%	6	0.00	30	$8	75%	4%	6%	1	52%	20%	58.1%	36.0%	36.0%	18.3
926	Miscellaneous	Vending Machine Controller - Non-Refrigerated	Biz-Custom	Retail	Retro	745	745	46%	343	0.00	5	$80	63%	63%	32%	2	9%	66%	72.8%	72.8%	72.8%	0.9
927	Miscellaneous	Vending Machine Controller - Refrigerated	Biz-Custom	Retail	Retro	1,739	1,739	46%	800	0.00	10	$216	100%	35%	28%	3	29%	66%	72.8%	72.8%	72.8%	3.3
928	Miscellaneous	Miscellaneous Custom	Biz-Custom	Retail	Retro	5	5	20%	1	0.00	10	$0	100%	50%	72%	4	48%	20%	68.6%	57.8%	58.7%	8.0
929	Whole Building_HVAC	HVAC - Energy Management System	Biz-Prescriptive	Retail	Retro	6,960	6,960	15%	1,044	0.00	15	$4,000	3%	3%	2%	1	100%	1%	20.8%	18.4%	18.4%	4.3
930	Whole Building_HVAC	Guest room energy management system	Biz-Custom	Retail	Retro	0	0	0%	0	0.00	8	$0	0%	0%		2	0%	0%	63.2%	55.0%	55.0%	0.0
931	Whole Building_HVAC	Retro-commissioning_Bld Optimization	Biz-Custom RCx	Retail	Retro	7	7	15%	1	0.00	3	$0	100%	67%	22%	3	100%	10%	63.2%	53.6%	51.7%	2.2
932	WholeBld	WholeBlg - Com RET	Biz-NC	Retail	Retro	7	7	15%	1	0.00	12	$0	100%	50%	19%	4	40%	0%	68.6%	57.8%	56.6%	9.5
933	Whole Building_NC	WholeBlg - Com NC	Biz-NC	Retail	NC	4	4	25%	1	0.00	12	$0	100%	50%	72%	5	100%	60%	68.6%	68.0%	68.0%	9.5
934	Behavioral	AMI Data Presentment & Engagement	Biz-Behavior	Retail	Retro	100	100	1%	1	0.00	1	$0	100%	100%	87%	1	100%	10%	50.0%	50.0%	50.0%	1.2
935	Behavioral	BIEMS	Biz-Behavior	Retail	Retro	37	37	3%	1	0.00	3	$0	12%	12%	5%	1	100%	5%	42.5%	50.0%	50.0%	1.6
936	Behavioral	Building Operator Certification	Biz-Behavior	Retail	Retro	18,300	18,300	1%	146	0.00	3	$25	50%	30%	12%	1	100%	5%	42.5%	50.0%	50.0%	2.2
937	Cooking	Commercial Combination Oven (Electric)	Biz-Prescriptive	Office	ROB	38,561	38,561	48%	18,432	0.00	12	$16,884	50%	6%	3%	1	17%	53%	62.4%	62.4%	62.4%	9.6
938	Cooking	Commercial Electric Convection Oven	Biz-Prescriptive	Office	ROB	12,193	12,193	15%	1,879	0.00	12	$1,706	50%	15%	11%	1	17%	53%	62.4%	62.4%	62.4%	4.0
939	Cooking	Commercial Electric Griddle	Biz-Prescriptive	Office	ROB	17,056	17,056	15%	2,596	0.00	12	$3,604	25%	14%	7%	2	14%	17%	39.3%	33.6%	33.6%	2.1
940	Cooking	Commercial Electric Steam Cooker	Biz-Prescriptive	Office	ROB	19,549	19,549	67%	13,162	0.00	12	$3,500	100%	12%	14%	3	6%	42%	68.6%	53.6%	53.6%	16.1
941	Cooking	Dishwasher Low Temp Door (Energy Star)	Biz-Prescriptive	Office	ROB	39,279	39,279	41%	16,153	0.00	15	$770	100%	49%	65%	4	26%	61%	68.8%	68.8%	68.8%	19.3
942	Cooking	Dishwasher High Temp Door (Energy Star)	Biz-Prescriptive	Office	ROB	39,825	39,825	30%	11,853	0.00	15	$770	100%	49%	65%	4	26%	61%	68.8%	68.8%	68.8%	14.1
943	Cooking	Energy efficient electric fryer	Biz-Prescriptive	Office	ROB	18,182	18,182	14%	2,572	0.00	12	$1,706	50%	1%	15%	5	27%	23%	55.0%	39.3%	40.7%	97.4
944	Cooking	Insulated Holding Cabinets (Full Size)	Biz-Prescriptive	Office	ROB	7,665	7,665	69%	5,278	0.00	12	$1,200	100%	6%	42%	6	3%	23%	68.6%	52.4%	54.9%	32.4
945	Cooking	Insulated Holding Cabinets (Half-Size)	Biz-Prescriptive	Office	ROB	3,066	3,066	58%	1,788	0.00	12	$1,500	50%	8%	12%	6	3%	23%	52.9%	38.7%	39.1%	6.8
946	HotWater	Faucet Aerator	Biz-Custom	Office	Retro	2,162	2,162	66%	1,425	0.00	10	$3	100%	26%	100%	4	25%	80%	84.0%	84.0%	84.0%	814.2
947	HotWater	Heat Pump Water Heater	Biz-Custom	Office	ROB	9,674	9,674	35%	3,341	0.00	10	$1,574	50%	11%	8%	1	100%	16%	65.0%	50.8%	50.4%	6.3
948	HotWater	Hot Water Pipe Insulation	Biz-Custom	Office	Retro	9,674	9,674	2%	193	0.00	20	$60	100%	17%	13%	2	100%	80%	84.0%	84.0%	84.0%	11.8
949	HotWater	Low Flow Pre-Rinse Sprayers	Biz-Custom	Office	ROB	2,991	2,991	26%	764	0.00	5	$35	100%	71%	87%	3	25%	80%	84.0%	84.0%	84.0%	6.9
950	HotWater	ENERGY STAR Commercial Washing Machines	Biz-Custom	Office	ROB	1,552	1,552	43%	671	0.00	7	$250	50%	14%	11%	5	25%	35%	66.5%	53.7%	53.3%	4.2
951	HotWater	Ozone Commercial Laundry	Biz-Custom	Office	Retro	2,984	2,984	25%	746	0.00	10	$20,310	0%	0%	0%	6	0%	50%	60.0%	60.0%	60.0%	5.4
952	InteriorLighting	LED T8 Tube Replacement	Biz-Prescriptive Light	Office	Retro	138	138	59%	82	0.00	15	$7	100%	49%	49%	1	79%	32%	71.1%	60.5%	60.5%	12.9
953	InteriorLighting	LED troffer retrofit kit, 2'X2' and 2'X4'	Biz-Prescriptive Light	Office	Retro	310	310	50%	155	0.00	18	$67	100%	26%	9%	1	79%	32%	71.1%	52.9%	50.8%	5.9
954	InteriorLighting	LED troffer, 2'X2' and 2'X4'	Biz-Prescriptive Light	Office	Retro	223	223	50%	112	0.00	18	$67	100%	26%	7%	1	79%	32%	71.1%	49.3%	45.8%	4.2
955	InteriorLighting	LED high bay fixture	Biz-Prescriptive Light	Office	Retro	1,080	1,080	76%	821	0.00	12	$323	100%	12%	10%	2	1%	16%	71.1%	52.5%	52.2%	10.9
956	InteriorLighting	LED Mogul-base HID Lamp Replacing High Bay HID	Biz-Prescriptive Light	Office	Retro	1,080	1,080	79%	855	0.00	12	$110	100%	21%	31%	2	1%	16%	71.1%	58.8%	59.2%	19.8
957	InteriorLighting	LED low bay fixture	Biz-Prescriptive Light	Office	Retro	1,080	1,080	76%	821	0.00	12	$196	100%	20%	17%	3	1%	16%	71.1%	56.5%	56.2%	10.9
958	InteriorLighting	LED Mogul-base HID Lamp Replacing Low Bay HID	Biz-Prescriptive Light	Office	Retro	1,080	1,080	79%	855	0.00	12	$60	100%	38%	57%	3	1%	16%	71.1%	60.6%	61.0%	19.8
959	InteriorLighting	LED downlight, screwin lamp, 1-3W, interior Average 2 Watts	Biz-Prescriptive Light	Office	ROB	67	67	88%	59	0.00	4	$4	100%	25%	59%	4	3%	32%	71.1%	60.3%	61.0%	10.5
960	InteriorLighting	LED downlight fixture	Biz-Prescriptive Light	Office	Retro	174	174	82%	142	0.00	4	$13	100%	39%	44%	5	16%	32%	71.1%	60.2%	60.3%	5.1
961	InteriorLighting	LED downlight, screwin lamp, 4-20W, interior Average 11 Watts	Biz-Prescriptive Light	Office	ROB	134	134	84%	113	0.00	4	$2	100%	61%	100%	5	16%	32%	71.1%	61.7%	61.9%	20.2
962	InteriorLighting	DeLamp Fluorescent Fixture Average Lamp Wattage 28W	Biz-Custom Light	Office	Retro	53	53	100%	53	0.00	15	$4	100%	69%	53%	6	79%	0%	71.1%	61.1%	60.8%	11.3
963	InteriorLighting	Daylighting Controls	Biz-Custom Light	Office	Retro	8,810	8,810	30%	2,643	0.00	12	$3,000	25%	5%	4%	7	85%	8%	48.3%	39.1%	39.0%	10.1
964	InteriorLighting	Occupancy Sensors	Biz-Prescriptive Light	Office	Retro	1,523	1,523	30%	457	0.00	8	$54	100%	37%	34%	7	85%	8%	71.1%	59.3%	59.2%	5.9
965	InteriorLighting	Central Lighting Monitoring & Controls (non-networked)	Biz-Custom Light	Office	Retro	41,703	41,703	20%	8,341	0.00	12	$3,700	100%	12%	17%	7	85%	8%	71.1%	50.8%	51.5%	9.6
966	InteriorLighting	Network Lighting Controls - Wireless (WiFi)	Biz-Custom Light	Office	Retro	16,277	16,277	47%	7,650	0.00	8	$1,683	100%	24%	34%	7	85%	8%	71.1%	56.9%	57.6%	6.8
967	InteriorLighting	Bi-Level Lighting Fixture – Stairwells, Hallways, and Garages	Biz-Custom Light	Office	Retro	1,034	1,034	50%	517	0.00	10	$274	50%	10%	8%	8	15%	8%	62.0%	47.4%	47.1%	7.2
968	InteriorLighting	LED Exit Sign - 4 Watt Fixture (2 lamp)	Biz-Prescriptive Light	Office	Retro	236	236	85%	201	0.00	15	$60	100%	8%	13%	9	1%	75%	80.0%	80.0%	80.0%	20.6
969	ExteriorLighting	LED wallpack (existing W<250)	Biz-Prescriptive Light	Office	Retro	856	856	66%	567	0.00	12	$248	50%	10%	9%	1	13%	46%	62.7%	56.8%	56.8%	6.6
970	ExteriorLighting	LED parking lot fixture (existing W>250)	Biz-Prescriptive Light	Office	Retro	1,589	1,589	60%	959	0.00	12	$756	25%	3%	5%	2	13%	41%	52.8%	52.8%	52.8%	11.2
971	ExteriorLighting	LED parking lot fixture (existing W<250)	Biz-Prescriptive Light	Office	Retro	856	856	66%	567	0.00	12	$248	50%	10%	9%	3	13%	41%	62.7%	52.8%	52.8%	6.6
972	ExteriorLighting	LED fuel pump canopy fixture (existing W<250)	Biz-Prescriptive Light	Office	Retro	0	0	0%	0	0.00	12	$0	0%	0%		4	0%	41%	71.1%	61.9%	61.9%	0.0
973	ExteriorLighting	LED fuel pump canopy fixture (existing W≥250)	Biz-Prescriptive Light	Office	Retro	0	0	0%	0	0.00	12	$0	0%	0%		5	0%	41%	71.1%	61.9%	61.9%	0.0
974	ExteriorLighting	LED outdoor pole decorative fixture (existing W≥250)	Biz-Prescriptive Light	Office	Retro	1,589	1,589	60%	959	0.00	12	$756	25%	3%	5%	6	13%	41%	52.8%	52.8%	52.8%	11.2
975	ExteriorLighting	LED parking garage fixture (existing W≥250)	Biz-Prescriptive Light	Office	Retro	3,235	3,235	60%	1,953	0.00	6	$756	25%	3%	10%	7	13%	41%	60.2%	52.8%	52.8%	11.8

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Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	Base (Existing) Annual Electric	Base (Standard) Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	MAP Incentive (%)	RAP Incentive (%)	PP Incentive (%)	End Use Measure Group	Base Saturation	EE Saturation	MAP Adoption Rate	RAP Adoption Rate	PP Adoption Rate	UCT Score
976	ExteriorLighting	LED parking garage fixture (existing W<250)	Biz-Prescriptive Light	Office	Retro	1,742	1,742	66%	1,154	0.00	6	$248	50%	10%	19%	8	13%	41%	66.7%	55.4%	56.0%	7.0
977	ExteriorLighting	LED Mogul-base HID Lamp Replacing Exterior HID (existing W≥250)	Biz-Prescriptive Light	Office	Retro	1,589	1,589	60%	959	0.00	12	$756	25%	3%	5%	9	13%	41%	52.8%	52.8%	52.8%	11.2
978	ExteriorLighting	LED Mogul-base HID Lamp Replacing Exterior HID (existing W<250)	Biz-Prescriptive Light	Office	Retro	856	856	66%	567	0.00	12	$248	50%	10%	9%	10	13%	41%	62.7%	52.8%	52.8%	6.6
979	Cooling	Air Conditioner - 16 SEER (5-20 Tons)	Biz-Prescriptive	Office	ROB	11,239	11,239	13%	1,405	0.00	15	$3,570	25%	5%	4%	1	24%	20%	36.0%	35.8%	35.6%	9.3
980	Cooling	Air Conditioner - 17 SEER (5-20 Tons)	Biz-Prescriptive	Office	ROB	11,239	11,239	13%	1,405	0.00	15	$4,760	25%	5%	3%	1	24%	20%	36.0%	34.1%	34.1%	7.0
981	Cooling	Air Conditioner - 18 SEER (5-20 Tons)	Biz-Prescriptive	Office	ROB	11,239	11,239	19%	2,118	0.00	15	$5,960	25%	5%	4%	1	24%	20%	36.0%	34.4%	34.1%	8.5
982	Cooling	Air Conditioner - 21 SEER (5-20 Tons)	Biz-Prescriptive	Office	ROB	11,239	11,239	24%	2,734	0.00	15	$9,080	25%	5%	3%	1	24%	20%	36.0%	34.1%	34.1%	7.2
983	Cooling	Air Conditioner - 16 SEER (20+ Tons)	Biz-Prescriptive	Office	ROB	22,887	22,887	8%	1,907	0.00	15	$7,140	25%	5%	3%	2	24%	20%	36.0%	34.1%	34.1%	6.4
984	Cooling	Air Conditioner - 17 SEER (20+ Tons)	Biz-Prescriptive	Office	ROB	22,887	22,887	8%	1,907	0.00	15	$9,520	5%	5%	2%	2	24%	20%	36.0%	34.1%	34.1%	4.8
985	Cooling	Air Conditioner - 18 SEER (20+ Tons)	Biz-Prescriptive	Office	ROB	22,887	22,887	15%	3,521	0.00	15	$11,920	25%	5%	3%	2	24%	20%	36.0%	34.1%	34.1%	7.0
986	Cooling	Air Conditioner - 21 SEER (20+ Tons)	Biz-Prescriptive	Office	ROB	22,887	22,887	21%	4,904	0.00	15	$18,160	25%	5%	3%	2	24%	20%	36.0%	34.1%	34.1%	6.4
987	Cooling	Comprehensive Rooftop Unit Quality Maintenance (AC Tune-up)	Biz-Custom	Office	Retro	35,220	35,220	6%	2,226	0.00	3	$500	75%	23%	33%	3	48%	50%	60.4%	60.0%	60.0%	4.3
988	Cooling	Air Side Economizer	Biz-Custom	Office	Retro	6,294	6,294	3%	183	0.00	5	$170	6%	6%	8%	4	48%	33%	46.4%	46.4%	46.4%	3.1
989	Cooling	Advanced Rooftop Controls	Biz-Custom	Office	Retro	5,245	5,245	41%	2,132	0.00	10	$3,412	25%	3%	5%	5	48%	3%	31.0%	24.3%	24.5%	13.2
990	Cooling	Air Conditioner - 16 SEER (<5 Tons)	Biz-Prescriptive	Office	ROB	4,842	4,842	19%	908	0.00	15	$1,785	50%	5%	5%	6	8%	20%	36.0%	36.0%	36.0%	12.1
991	Cooling	Air Conditioner - 17 SEER (<5 Tons)	Biz-Prescriptive	Office	ROB	4,842	4,842	24%	1,139	0.00	15	$2,380	50%	5%	5%	6	8%	20%	36.0%	36.0%	36.0%	11.4
992	Cooling	Air Conditioner - 18 SEER(<5 Tons)	Biz-Prescriptive	Office	ROB	4,842	4,842	28%	1,345	0.00	15	$2,980	50%	5%	5%	6	8%	20%	36.0%	36.0%	36.0%	10.7
993	Cooling	Air Conditioner - 21 SEER(<5 Tons)	Biz-Prescriptive	Office	ROB	4,842	4,842	38%	1,844	0.00	15	$4,540	25%	5%	4%	6	8%	20%	36.0%	36.0%	36.0%	9.7
994	Cooling	Centrifugal Chiller - Average kW/Ton = 0.626	Biz-Custom	Office	ROB	21,484	21,484	26%	5,635	0.00	20	$12,718	25%	2%	3%	7	13%	20%	36.0%	35.5%	35.7%	21.1
995	Cooling	Reciprocating Chiller - Average kW/Ton = 0.99	Biz-Custom	Office	ROB	26,415	26,415	27%	7,044	0.00	20	$10,196	100%	4%	5%	8	22%	20%	63.2%	36.0%	36.0%	34.4
996	Cooling	Screw Chiller - Average kW/Ton = 0.675	Biz-Custom	Office	ROB	30,850	30,850	23%	7,076	0.00	20	$10,177	100%	4%	5%	9	1%	20%	63.2%	36.0%	36.0%	33.9
997	Cooling	HVAC/Chiller Custom	Biz-Custom	Office	Retro	5	5	20%	1	0.00	12	$1	25%	6%	9%	10	36%	20%	37.0%	36.0%	36.0%	7.8
998	Cooling	Chiller Tune-up	Biz-Custom	Office	Retro	42,263	42,263	8%	3,381	0.00	5	$475	100%	37%	53%	11	36%	50%	63.2%	60.0%	60.0%	5.5
999	Cooling	PTAC - <7,000 Btuh - lodging	Biz-Prescriptive	Office	ROB	529	529	9%	48	0.00	15	$22	100%	50%	22%	12	0%	20%	63.2%	46.9%	43.0%	5.1
1000	Cooling	PTAC - 7,000 to 15,000 Btuh - lodging	Biz-Prescriptive	Office	ROB	1,176	1,176	9%	110	0.00	15	$41	100%	50%	27%	13	0%	20%	63.2%	48.2%	45.6%	6.3
1001	Cooling	PTAC - >15,000 Btuh - lodging	Biz-Prescriptive	Office	ROB	1,988	1,988	10%	189	0.00	15	$56	100%	50%	34%	14	0%	20%	63.2%	49.4%	47.9%	8.0
1002	Cooling	HVAC Occupancy Controls	Biz-Custom	Office	ROB	2,636	2,636	20%	527	0.00	15	$538	75%	5%	0%	15	48%	25%	51.6%	40.0%	40.0%	15.3
1003	Cooling	Smart Thermostat	Biz-Custom	Office	ROB	5,245	5,245	18%	928	0.00	10	$128	100%	13%	10%	16	53%	9%	63.2%	48.9%	48.7%	18.1
1004	Cooling	Window Film	Biz-Custom	Office	Retro	35,220	0	5%	1,608	0.00	10	$1,340	75%	6%	5%	17	100%	25%	54.0%	40.0%	40.0%	13.6
1005	Cooling	Energy Recovery Ventilator	Biz-Custom	Office	Retro	2	2	50%	1	0.00	20	$1	75%	8%	12%	18	100%	5%	54.8%	33.2%	33.5%	11.6
1006	Heating	Heat Pump - 16 SEER (<5 Tons)	Biz-Prescriptive	Office	ROB	10,732	10,732	19%	2,024	0.00	15	$2,055	50%	20%	10%	1	5%	20%	43.4%	36.0%	36.0%	3.6
1007	Heating	Heat Pump - 17 SEER (<5 Tons)	Biz-Prescriptive	Office	ROB	10,732	10,732	22%	2,354	0.00	15	$2,740	50%	20%	9%	1	5%	20%	41.1%	36.0%	36.0%	3.2
1008	Heating	Heat Pump - 18 SEER(<5 Tons)	Biz-Prescriptive	Office	ROB	10,732	10,732	25%	2,700	0.00	15	$3,425	50%	20%	8%	1	5%	20%	39.5%	36.0%	36.0%	3.0
1009	Heating	Heat Pump - 21 SEER(<5 Tons)	Biz-Prescriptive	Office	ROB	10,732	10,732	31%	3,288	0.00	15	$4,500	50%	20%	7%	1	5%	20%	38.8%	36.0%	36.0%	3.0
1010	Heating	Geothermal HP - SEER 20.3 (<5 Tons)	Biz-Prescriptive	Office	ROB	10,732	10,732	36%	3,873	0.00	15	$4,700	50%	11%	8%	1	5%	20%	40.0%	36.0%	36.0%	5.6
1011	Heating	Geothermal HP - SEER 21.5 (<5 Tons)	Biz-Prescriptive	Office	ROB	10,732	10,732	40%	4,310	0.00	15	$7,300	25%	7%	6%	1	5%	20%	36.0%	36.0%	36.0%	6.2
1012	Heating	Geothermal HP - SEER 23.1 (<5 Tons)	Biz-Prescriptive	Office	ROB	10,732	10,732	46%	4,896	0.00	15	$7,300	25%	7%	7%	1	5%	20%	36.0%	36.0%	36.0%	7.0
1013	Heating	Geothermal HP - SEER 29.3 (<5 Tons)	Biz-Prescriptive	Office	ROB	10,732	10,732	51%	5,479	0.00	15	$9,200	25%	8%	5%	1	5%	20%	36.0%	36.0%	36.0%	5.0
1014	Heating	Heat Pump - 16 SEER (5-20 Tons)	Biz-Prescriptive	Office	ROB	38,730	38,730	10%	3,759	0.00	15	$4,110	50%	20%	9%	2	28%	20%	41.3%	36.0%	36.0%	3.1
1015	Heating	Heat Pump - 17 SEER (5-20 Tons)	Biz-Prescriptive	Office	ROB	38,730	38,730	13%	5,079	0.00	15	$5,480	50%	20%	9%	2	28%	20%	40.5%	36.0%	36.0%	2.8
1016	Heating	Heat Pump - 18 SEER (5-20 Tons)	Biz-Prescriptive	Office	ROB	38,730	38,730	19%	7,492	0.00	15	$6,850	50%	20%	7%	2	28%	20%	43.7%	36.0%	36.0%	3.3
1017	Heating	Heat Pump - 21 SEER (5-20 Tons)	Biz-Prescriptive	Office	ROB	38,730	38,730	25%	9,583	0.00	15	$9,000	50%	20%	6%	2	28%	20%	43.3%	36.0%	36.0%	3.2
1018	Heating	Geothermal HP - SEER 20.3 (5-20 Tons)	Biz-Prescriptive	Office	ROB	19,500	19,500	29%	5,658	0.00	15	$7,700	75%	6%	6%	2	28%	20%	51.6%	36.0%	36.0%	12.1
1019	Heating	Geothermal HP - SEER 21.5 (5-20 Tons)	Biz-Prescriptive	Office	ROB	19,500	19,500	34%	6,538	0.00	15	$10,300	50%	5%	5%	2	28%	20%	38.6%	36.0%	36.0%	13.3
1020	Heating	Geothermal HP - SEER 23.1 (5-20 Tons)	Biz-Prescriptive	Office	ROB	19,500	19,500	40%	7,721	0.00	15	$12,800	50%	4%	4%	2	28%	20%	37.9%	36.0%	36.0%	15.0
1021	Heating	Geothermal HP - SEER 29.3 (5-20 Tons)	Biz-Prescriptive	Office	ROB	19,500	19,500	46%	8,909	0.00	15	$17,700	25%	4%	3%	2	28%	20%	36.0%	36.0%	36.0%	11.8
1022	Heating	Heat Pump - 16 SEER (20+ Tons)	Biz-Prescriptive	Office	ROB	79,587	79,587	10%	8,333	0.00	15	$8,220	50%	20%	6%	3	28%	20%	41.8%	36.0%	36.0%	2.8
1023	Heating	Heat Pump - 17 SEER (20+ Tons)	Biz-Prescriptive	Office	ROB	79,587	79,587	14%	10,973	0.00	15	$10,960	50%	20%	5%	3	28%	20%	41.0%	36.0%	36.0%	2.6
1024	Heating	Heat Pump - 18 SEER (20+ Tons)	Biz-Prescriptive	Office	ROB	79,587	79,587	20%	15,989	0.00	15	$13,700	50%	20%	4%	3	28%	20%	44.3%	36.0%	36.0%	3.2
1025	Heating	Heat Pump - 21 SEER (20+ Tons)	Biz-Prescriptive	Office	ROB	79,587	79,587	26%	20,321	0.00	15	$18,000	50%	20%	3%	3	28%	20%	43.9%	36.0%	36.0%	3.2
1026	Heating	Geothermal HP - SEER 20.3 (20+ Tons)	Biz-Prescriptive	Office	ROB	39,503	39,503	30%	11,818	0.00	15	$10,700	100%	9%	5%	3	28%	20%	63.2%	36.0%	36.0%	12.3
1027	Heating	Geothermal HP - SEER 21.5 (20+ Tons)	Biz-Prescriptive	Office	ROB	39,503	39,503	34%	13,577	0.00	15	$13,300	100%	8%	4%	3	28%	20%	63.2%	36.0%	36.0%	13.5
1028	Heating	Geothermal HP - SEER 23.1 (20+ Tons)	Biz-Prescriptive	Office	ROB	39,503	39,503	40%	15,943	0.00	15	$18,300	75%	5%	3%	3	28%	20%	52.6%	36.0%	36.0%	15.2
1029	Heating	Geothermal HP - SEER 29.3 (20+ Tons)	Biz-Prescriptive	Office	ROB	39,503	39,503	46%	18,321	0.00	15	$26,200	50%	4%	2%	3	28%	20%	39.6%	36.0%	36.0%	17.9
1030	Heating	PTHP - <7,000 Btuh - lodging	Biz-Prescriptive	Office	ROB	1,903	1,903	9%	163	0.00	15	$13	100%	100%	100%	4	0%	20%	63.2%	55.0%	55.0%	7.8
1031	Heating	PTHP - 7,000 to 15,000 Btuh - lodging	Biz-Prescriptive	Office	ROB	4,103	4,103	11%	444	0.00	15	$45	100%	100%	98%	5	0%	20%	63.2%	55.0%	55.0%	5.6
1032	Heating	PTHP - >15,000 Btuh - lodging	Biz-Prescriptive	Office	ROB	6,680	6,680	13%	879	0.00	15	$35	100%	100%	100%	6	0%	20%	63.2%	55.0%	55.0%	13.6
1033	Heating	Mini Split Ductless Heat Pump Cold Climate (Tiers & sizes TBD)	Biz-Prescriptive	Office	ROB	4	4	25%	1	0.00	12	$0	100%	35%	67%	7	5%	20%	63.2%	51.8%	53.4%	18.6
1034	Heating	Variable Refrigerant Flow Heat Pump	Biz-Custom	Office	NC	11	11	25%	3	0.00	20	$3	100%	5%	3%	2	28%	0%	63.2%	32.0%	31.9%	26.5
1035	Ventilation	Kitchen Exhaust Hood Demand Ventilation Control System	Biz-Custom	Office	ROB	0	0	0%	0	0.00	20	$0	0%	0%		1	0%	24%	63.2%	55.0%	55.0%	0.0
1036	Ventilation	Demand Controlled Ventilation	Biz-Custom	Office	Retro	2,531	2,531	20%	506	0.00	15	$227	100%	12%	17%	2	100%	5%	63.2%	38.2%	39.1%	8.6
1037	Ventilation	Pump and Fan Variable Frequency Drive Controls (Fans)	Biz-Prescriptive	Office	Retro	2,258	2,258	41%	923	0.00	15	$375	100%	16%	18%	2	100%	25%	63.2%	41.5%	41.9%	9.6
1038	Refrigeration	Strip Curtains	Biz-Custom	Office	Retro	334	334	81%	270	0.00	4	$9	100%	100%	100%	1	12%	26%	60.2%	52.4%	52.4%	4.2
1039	Refrigeration	Bare Suction Line	Biz-Custom	Office	Retro	23	23	93%	21	0.00	15	$4	100%	27%	39%	2	0%	25%	60.2%	45.6%	46.6%	9.2
1040	Refrigeration	Floating Head Pressure Controls	Biz-Prescriptive	Office	Retro	2,653	2,653	50%	1,327	0.00	15	$80	100%	25%	41%	3	8%	20%	60.2%	50.1%	50.6%	31.6
1041	Refrigeration	Saturated Suction Controls	Biz-Custom	Office	Retro	831	831	50%	416	0.00	15	$559	50%	4%	6%	4	2%	20%	36.0%	36.0%	36.0%	15.7
1042	Refrigeration	Compressor Retrofit	Biz-Custom	Office	Retro	813	813	20%	163	0.00	15	$477	25%	2%	3%	5	27%	15%	32.0%	27.4%	27.4%	15.8
1043	Refrigeration	Electronically Commutated (EC) Walk-In Evaporator Fan Motor	Biz-Prescriptive	Office	Retro	1,268	1,268	65%	824	0.00	15	$78	100%	45%	42%	6	8%	33%	60.2%	49.8%	49.6%	11.2
1044	Refrigeration	Evaporator Fan Motor Controls	Biz-Prescriptive	Office	Retro	1,912	1,912	25%	478	0.00	13	$291	50%	15%	7%	7	8%	10%	44.4%	30.0%	28.3%	4.7
1045	Refrigeration	Variable Speed Condenser Fan	Biz-Custom	Office	Retro	2,960	2,960	50%	1,480	0.00	15	$1,170	25%	7%	9%	8	10%	20%	36.0%	36.0%	36.0%	6.9
1046	Refrigeration	Refrigeration Economizer	Biz-Custom	Office	Retro	67,850	67,850	2%	1,357	0.00	15	$2,558	3%	3%	4%	9	38%	0%	20.0%	15.7%	15.9%	6.9
1047	Refrigeration	Anti-Sweat Heater Controls MT	Biz-Prescriptive	Office	Retro	1,313	1,313	55%	722	0.00	12	$250	75%	10%	12%	10	24%	36%	54.7%	48.8%	48.8%	8.7
1048	Refrigeration	Auto Door Closer, Cooler	Biz-Prescriptive	Office	Retro	471,500	471,500	0%	943	0.00	8	$157	100%	16%	24%	11	17%	27%	60.2%	45.7%	46.3%	11.6
1049	Refrigeration	Display Case Door Retrofit, Medium Temp	Biz-Prescriptive	Office	Retro	1,584	1,584	36%	578	0.00	12	$686	25%	22%	3%	12	7%	55%	64.0%	64.0%	64.0%	1.7
1050	Refrigeration	Electronically Commutated (EC) Reach-In Evaporator Fan Motor	Biz-Prescriptive	Office	Retro	1,268	1,268	65%	824	0.00	15	$78	100%	45%	42%	13	4%	33%	60.2%	49.8%	49.6%	11.2

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Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	Base (Existing) Annual Electric	Base (Standard) Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	MAP Incentive (%)	RAP Incentive (%)	PP Incentive (%)	End Use Measure Group	Base Saturation	EE Saturation	MAP Adoption Rate	RAP Adoption Rate	PP Adoption Rate	UCT Score
1051	Refrigeration	Q-Sync Motor for Walk-In and Reach-in Evaporator Fan Motor	Biz-Prescriptive	Office	Retro	993	993	51%	504	0.00	10	$96	100%	36%	21%	13	4%	33%	60.2%	46.4%	46.4%	5.1
1052	Refrigeration	Energy Star Reach-In Refrigerator, Glass Doors	Biz-Prescriptive	Office	ROB	1,546	1,546	27%	410	0.00	12	$600	25%	5%	3%	14	24%	55%	64.0%	64.0%	63.9%	5.1
1053	Refrigeration	Energy Star Reach-In Refrigerator, Solid Doors	Biz-Prescriptive	Office	ROB	1,112	1,112	25%	283	0.00	12	$600	5%	5%	2%	15	24%	55%	64.0%	62.1%	61.9%	3.5
1054	Refrigeration	Anti-Sweat Heater Controls LT	Biz-Prescriptive	Office	Retro	3,147	3,147	55%	1,731	0.00	12	$250	100%	10%	28%	16	8%	36%	60.2%	48.8%	48.8%	27.9
1055	Refrigeration	Auto Door Closer, Freezer	Biz-Prescriptive	Office	Retro	419,455	419,455	1%	2,307	0.00	8	$157	100%	16%	59%	17	8%	27%	60.2%	49.6%	51.0%	27.8
1056	Refrigeration	Display Case Door Retrofit, Low Temp	Biz-Prescriptive	Office	Retro	2,922	2,922	50%	1,453	0.00	12	$686	75%	22%	8%	17	8%	55%	64.0%	64.0%	64.0%	4.3
1057	Refrigeration	Energy Star Reach-In Freezer, Glass Doors	Biz-Prescriptive	Office	ROB	3,234	3,234	15%	488	0.00	12	$450	25%	15%	4%	18	8%	55%	64.0%	64.0%	64.0%	2.9
1058	Refrigeration	Energy Star Reach-In Freezer, Solid Doors	Biz-Prescriptive	Office	ROB	4,676	4,676	20%	935	0.00	12	$450	75%	15%	8%	19	8%	55%	64.0%	64.0%	64.0%	5.5
1059	Refrigeration	Refrigeration - Custom	Biz-Custom	Office	ROB	7	7	15%	1	0.00	12	$0	100%	50%	72%	20	90%	20%	60.2%	49.9%	51.0%	9.1
1060	Refrigeration	Retro-commissioning_Refrigerator Optimization	Biz-Custom RCx	Office	Retro	33	33	3%	1	0.00	3	$0	100%	67%	22%	21	90%	10%	60.2%	50.9%	49.0%	2.0
1061	Refrigeration	Energy Star Ice Machine	Biz-Prescriptive	Office	ROB	6,993	6,993	10%	721	0.00	15	$1,426	3%	3%	2%	22	9%	49%	59.2%	57.2%	57.2%	8.9
1062	Refrigeration	LED Refrigerated Display Case Lighting Average 6W/LF	Biz-Prescriptive	Office	Retro	1,573	1,573	37%	574	0.00	12	$1,010	34%	34%	2%	23	14%	30%	44.0%	44.0%	43.1%	0.9
1063	PlugLoads_Office	ENERGY STAR Uninterrupted Power Supply	Biz-Custom	Office	ROB	3,096	3,096	3%	85	0.00	15	$59	75%	7%	11%	1	2%	70%	76.0%	76.0%	76.0%	10.8
1064	PlugLoads_Office	Smart Power Strip – Commercial Use	Biz-Custom	Office	Retro	64	64	100%	64	0.00	5	$50	7%	7%	10%	2	50%	10%	44.3%	38.5%	38.9%	3.3
1065	PlugLoads_Office	Plug Load Occupancy Sensor	Biz-Custom	Office	Retro	1,126	1,126	15%	169	0.00	8	$70	50%	13%	18%	2	50%	10%	59.4%	46.1%	47.0%	4.4
1066	PlugLoads_Office	Electrically Commutated Plug Fans in data centers	Biz-Custom	Office	Retro	86,783	86,783	18%	15,778	0.00	15	$480	100%	100%	100%	3	50%	33%	68.6%	59.7%	59.7%	16.6
1067	PlugLoads_Office	High Efficiency CRAC unit	Biz-Custom	Office	ROB	541	541	30%	162	0.00	15	$63	100%	14%	19%	3	50%	33%	68.6%	48.5%	49.2%	10.0
1068	PlugLoads_Office	Computer Room Air Conditioner Economizer	Biz-Custom	Office	Retro	418	418	86%	358	0.00	15	$82	100%	23%	33%	3	50%	33%	68.6%	52.8%	53.6%	7.3
1069	PlugLoads_Office	Energy Star Laptop	Biz-Custom	Office	ROB	126	126	33%	41	0.00	4	$0	0%			4	17%	85%	88.0%	88.0%	88.0%	0.0
1070	PlugLoads_Office	Energy Star Monitor	Biz-Custom	Office	ROB	72	72	21%	15	0.00	4	$0	0%			5	17%	95%	96.0%	96.0%	96.0%	0.0
1071	PlugLoads_Office	Energy Star Printer/Copier/Fax	Biz-Custom	Office	ROB	551	551	40%	223	0.00	6	$0	0%			6	17%	95%	96.0%	96.0%	96.0%	0.0
1072	PlugLoads_Office	Energy Star Server	Biz-Custom	Office	ROB	691	691	13%	90	0.00	15	$156	25%	3%	4%	7	15%	20%	36.3%	36.0%	36.0%	9.7
1073	PlugLoads_Office	Server Virtualization	Biz-Custom	Office	Retro	691	691	13%	90	0.00	15	$156	25%	3%	4%	7	15%	20%	36.3%	36.0%	36.0%	9.7
1074	PlugLoads_Office	Data Center Hot/Cold Aisle Configuration	Biz-Custom	Office	Retro	691	691	13%	90	0.00	15	$156	25%	3%	4%	7	15%	20%	36.3%	36.0%	36.0%	9.7
1075	Motors	Cogged V-Belt	Biz-Custom	Office	Retro	9,092	9,092	3%	282	0.00	15	$384	50%	4%	6%	1	69%	10%	46.9%	33.7%	33.9%	15.2
1076	Motors	Pump and Fan Variable Frequency Drive Controls (Pumps)	Biz-Prescriptive	Office	Retro	1,902	1,902	38%	731	0.00	15	$200	100%	30%	27%	2	12%	25%	68.6%	53.2%	53.0%	7.6
1077	Motors	Escalators Motor Efficiency Controllers	Biz-Custom	Office	Retro	7,500	7,500	20%	1,500	0.00	10	$5,000	2%	2%	2%	3	0%	10%	28.0%	28.0%	28.0%	9.4
1078	CompressedAir	Efficient Air Compressors	Biz-Custom	Office	ROB	4,004	4,004	31%	1,223	0.00	15	$100	100%	64%	100%	1	100%	33%	68.6%	58.6%	59.7%	10.8
1079	CompressedAir	Retro-commissioning_Compressed Air Optimization	Biz-Custom RCx	Office	Retro	7	7	15%	1	0.00	5	$0	100%	67%	100%	2	100%	33%	68.6%	58.8%	59.7%	4.2
1080	CompressedAir	Compressed Air - Custom	Biz-Custom	Office	Retro	7	7	15%	1	0.00	8	$0	100%	50%	100%	3	100%	33%	68.6%	57.5%	59.7%	4.4
1081	Miscellaneous	Power Distribution Equipment Upgrades	Biz-Custom	Office	Retro	1,150	1,150	1%	6	0.00	30	$8	75%	4%	6%	1	41%	20%	58.1%	36.0%	36.0%	18.6
1082	Miscellaneous	Vending Machine Controller - Non-Refrigerated	Biz-Custom	Office	Retro	745	745	46%	343	0.00	5	$80	63%	63%	32%	2	1%	66%	72.8%	72.8%	72.8%	0.9
1083	Miscellaneous	Vending Machine Controller - Refrigerated	Biz-Custom	Office	Retro	1,739	1,739	46%	800	0.00	10	$216	100%	35%	28%	3	3%	66%	72.8%	72.8%	72.8%	3.4
1084	Miscellaneous	Miscellaneous Custom	Biz-Custom	Office	Retro	5	5	20%	1	0.00	10	$0	100%	50%	72%	4	59%	20%	68.6%	57.8%	58.7%	8.2
1085	Whole Building_HVAC	HVAC - Energy Management System	Biz-Prescriptive	Office	Retro	6,960	6,960	15%	1,044	0.00	15	$4,000	3%	3%	2%	1	100%	1%	20.8%	18.4%	18.4%	4.5
1086	Whole Building_HVAC	Guest room energy management system	Biz-Custom	Office	Retro	0	0	0%	0	0.00	8	$0	0%	0%		2	0%	0%	63.2%	55.0%	55.0%	0.0
1087	Whole Building_HVAC	Retro-commissioning_Bld Optimization	Biz-Custom RCx	Office	Retro	7	7	15%	1	0.00	3	$0	100%	67%	22%	3	100%	10%	63.2%	53.6%	51.7%	2.3
1088	WholeBld	WholeBlg - Com RET	Biz-NC	Office	Retro	7	7	15%	1	0.00	12	$0	100%	50%	19%	4	40%	0%	68.6%	57.8%	56.6%	9.8
1089	Whole Building_NC	WholeBlg - Com NC	Biz-NC	Office	NC	4	4	25%	1	0.00	12	$0	100%	50%	72%	5	100%	60%	68.6%	68.0%	68.0%	9.8
1090	Behavioral	AMI Data Presentment & Engagement	Biz-Behavior	Office	Retro	100	100	1%	1	0.00	1	$0	100%	100%	87%	1	100%	10%	50.0%	50.0%	50.0%	1.3
1091	Behavioral	BIEMS	Biz-Behavior	Office	Retro	40	40	3%	1	0.00	3	$0	12%	12%	5%	1	100%	5%	42.5%	50.0%	50.0%	1.7
1092	Behavioral	Building Operator Certification	Biz-Behavior	Office	Retro	15,900	15,900	1%	127	0.00	3	$22	50%	30%	12%	1	100%	5%	42.5%	50.0%	50.0%	2.3
1093	Cooking	Commercial Combination Oven (Electric)	Biz-Prescriptive	Warehouse	ROB	38,561	38,561	48%	18,432	0.00	12	$16,884	50%	6%	3%	1	17%	53%	62.4%	62.4%	62.4%	9.6
1094	Cooking	Commercial Electric Convection Oven	Biz-Prescriptive	Warehouse	ROB	12,193	12,193	15%	1,879	0.00	12	$1,706	50%	15%	11%	1	17%	53%	62.4%	62.4%	62.4%	4.0
1095	Cooking	Commercial Electric Griddle	Biz-Prescriptive	Warehouse	ROB	17,056	17,056	15%	2,596	0.00	12	$3,604	25%	14%	7%	2	14%	17%	39.3%	33.6%	33.6%	2.1
1096	Cooking	Commercial Electric Steam Cooker	Biz-Prescriptive	Warehouse	ROB	19,549	19,549	67%	13,162	0.00	12	$3,500	100%	12%	14%	3	6%	42%	68.6%	53.6%	53.6%	16.1
1097	Cooking	Dishwasher Low Temp Door (Energy Star)	Biz-Prescriptive	Warehouse	ROB	39,279	39,279	41%	16,153	0.00	15	$770	100%	49%	65%	4	26%	61%	68.8%	68.8%	68.8%	19.3
1098	Cooking	Dishwasher High Temp Door (Energy Star)	Biz-Prescriptive	Warehouse	ROB	39,825	39,825	30%	11,853	0.00	15	$770	100%	49%	65%	4	26%	61%	68.8%	68.8%	68.8%	14.1
1099	Cooking	Energy efficient electric fryer	Biz-Prescriptive	Warehouse	ROB	18,182	18,182	14%	2,572	0.00	12	$1,706	50%	1%	15%	5	27%	23%	55.0%	39.3%	40.7%	97.4
1100	Cooking	Insulated Holding Cabinets (Full Size)	Biz-Prescriptive	Warehouse	ROB	7,665	7,665	69%	5,278	0.00	12	$1,200	100%	6%	42%	6	3%	23%	68.6%	52.4%	54.9%	32.4
1101	Cooking	Insulated Holding Cabinets (Half-Size)	Biz-Prescriptive	Warehouse	ROB	3,066	3,066	58%	1,788	0.00	12	$1,500	50%	8%	12%	6	3%	23%	52.9%	38.7%	39.1%	6.8
1102	HotWater	Faucet Aerator	Biz-Custom	Warehouse	Retro	2,162	2,162	66%	1,425	0.00	10	$3	100%	26%	100%	4	25%	80%	84.0%	84.0%	84.0%	805.6
1103	HotWater	Heat Pump Water Heater	Biz-Custom	Warehouse	ROB	10,967	10,967	35%	3,788	0.00	10	$1,574	75%	13%	10%	1	100%	0%	69.5%	52.6%	52.2%	6.2
1104	HotWater	Hot Water Pipe Insulation	Biz-Custom	Warehouse	Retro	10,967	10,967	2%	219	0.00	20	$60	100%	19%	15%	2	100%	80%	84.0%	84.0%	84.0%	11.7
1105	HotWater	Low Flow Pre-Rinse Sprayers	Biz-Custom	Warehouse	ROB	2,991	2,991	26%	764	0.00	5	$35	100%	71%	87%	3	25%	80%	84.0%	84.0%	84.0%	6.8
1106	HotWater	ENERGY STAR Commercial Washing Machines	Biz-Custom	Warehouse	ROB	1,552	1,552	43%	671	0.00	7	$250	50%	14%	11%	5	25%	35%	66.5%	53.7%	53.3%	4.1
1107	HotWater	Ozone Commercial Laundry	Biz-Custom	Warehouse	Retro	2,984	2,984	25%	746	0.00	10	$20,310	0%	0%	0%	6	0%	50%	60.0%	60.0%	60.0%	5.3
1108	InteriorLighting	LED T8 Tube Replacement	Biz-Prescriptive Light	Warehouse	Retro	138	138	59%	82	0.00	15	$7	100%	49%	49%	1	78%	32%	71.1%	60.5%	60.5%	12.7
1109	InteriorLighting	LED troffer retrofit kit, 2'X2' and 2'X4'	Biz-Prescriptive Light	Warehouse	Retro	310	310	50%	155	0.00	18	$67	100%	26%	9%	1	78%	32%	71.1%	52.9%	50.8%	5.8
1110	InteriorLighting	LED troffer, 2'X2' and 2'X4'	Biz-Prescriptive Light	Warehouse	Retro	223	223	50%	112	0.00	18	$67	100%	26%	7%	1	78%	32%	71.1%	49.3%	45.8%	4.2
1111	InteriorLighting	LED high bay fixture	Biz-Prescriptive Light	Warehouse	Retro	1,080	1,080	76%	821	0.00	12	$323	100%	12%	10%	2	3%	16%	71.1%	52.5%	52.2%	10.8
1112	InteriorLighting	LED Mogul-base HID Lamp Replacing High Bay HID	Biz-Prescriptive Light	Warehouse	Retro	1,080	1,080	79%	855	0.00	12	$110	100%	21%	31%	2	3%	16%	71.1%	58.8%	59.2%	19.5
1113	InteriorLighting	LED low bay fixture	Biz-Prescriptive Light	Warehouse	Retro	1,080	1,080	76%	821	0.00	12	$196	100%	20%	17%	3	3%	16%	71.1%	56.5%	56.2%	10.8
1114	InteriorLighting	LED Mogul-base HID Lamp Replacing Low Bay HID	Biz-Prescriptive Light	Warehouse	Retro	1,080	1,080	79%	855	0.00	12	$60	100%	38%	57%	3	3%	16%	71.1%	60.6%	61.0%	19.5
1115	InteriorLighting	LED downlight, screwin lamp, 1-3W, interior Average 2 Watts	Biz-Prescriptive Light	Warehouse	ROB	67	67	88%	59	0.00	4	$4	100%	25%	59%	4	2%	32%	71.1%	60.3%	61.0%	10.4
1116	InteriorLighting	LED downlight fixture	Biz-Prescriptive Light	Warehouse	Retro	174	174	82%	142	0.00	4	$13	100%	39%	44%	5	15%	32%	71.1%	60.2%	60.3%	5.0
1117	InteriorLighting	LED downlight, screwin lamp, 4-20W, interior Average 11 Watts	Biz-Prescriptive Light	Warehouse	ROB	134	134	84%	113	0.00	4	$2	100%	61%	100%	5	15%	32%	71.1%	61.7%	61.9%	19.9
1118	InteriorLighting	DeLamp Fluorescent Fixture Average Lamp Wattage 28W	Biz-Custom Light	Warehouse	Retro	53	53	100%	53	0.00	15	$4	100%	69%	53%	6	78%	0%	71.1%	61.1%	60.8%	11.1
1119	InteriorLighting	Daylighting Controls	Biz-Custom Light	Warehouse	Retro	8,810	8,810	30%	2,643	0.00	12	$3,000	25%	5%	4%	7	95%	8%	48.3%	39.1%	39.0%	10.0
1120	InteriorLighting	Occupancy Sensors	Biz-Prescriptive Light	Warehouse	Retro	1,523	1,523	30%	457	0.00	8	$54	100%	37%	34%	7	95%	8%	71.1%	59.3%	59.2%	5.8
1121	InteriorLighting	Central Lighting Monitoring & Controls (non-networked)	Biz-Custom Light	Warehouse	Retro	41,703	41,703	20%	8,341	0.00	12	$3,700	100%	12%	17%	7	95%	8%	71.1%	50.8%	51.5%	9.4
1122	InteriorLighting	Network Lighting Controls - Wireless (WiFi)	Biz-Custom Light	Warehouse	Retro	16,277	16,277	47%	7,650	0.00	8	$1,683	100%	24%	34%	7	95%	8%	71.1%	56.9%	57.6%	6.7
1123	InteriorLighting	Bi-Level Lighting Fixture – Stairwells, Hallways, and Garages	Biz-Custom Light	Warehouse	Retro	1,034	1,034	50%	517	0.00	10	$274	50%	10%	8%	8	5%	8%	62.0%	47.4%	47.1%	7.1
1124	InteriorLighting	LED Exit Sign - 4 Watt Fixture (2 lamp)	Biz-Prescriptive Light	Warehouse	Retro	236	236	85%	201	0.00	15	$60	100%	8%	13%	9	1%	75%	80.0%	80.0%	80.0%	20.3
1125	ExteriorLighting	LED wallpack (existing W<250)	Biz-Prescriptive Light	Warehouse	Retro	856	856	66%	567	0.00	12	$248	50%	10%	9%	1	13%	46%	62.7%	56.8%	56.8%	6.6

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Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	Base (Existing) Annual Electric	Base (Standard) Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	MAP Incentive (%)	RAP Incentive (%)	PP Incentive (%)	End Use Measure Group	Base Saturation	EE Saturation	MAP Adoption Rate	RAP Adoption Rate	PP Adoption Rate	UCT Score
1126	ExteriorLighting	LED parking lot fixture (existing W≥250)	Biz-Prescriptive Light	Warehouse	Retro	1,589	1,589	60%	959	0.00	12	$756	25%	3%	5%	2	13%	41%	52.8%	52.8%	52.8%	11.2
1127	ExteriorLighting	LED parking lot fixture (existing W<250)	Biz-Prescriptive Light	Warehouse	Retro	856	856	66%	567	0.00	12	$248	50%	10%	9%	3	13%	41%	62.7%	52.8%	52.8%	6.6
1128	ExteriorLighting	LED fuel pump canopy fixture (existing W<250)	Biz-Prescriptive Light	Warehouse	Retro	0	0	0%	0	0.00	12	$0	0%	0%		4	0%	41%	71.1%	61.9%	61.9%	0.0
1129	ExteriorLighting	LED fuel pump canopy fixture (existing W≥250)	Biz-Prescriptive Light	Warehouse	Retro	0	0	0%	0	0.00	12	$0	0%	0%		5	0%	41%	71.1%	61.9%	61.9%	0.0
1130	ExteriorLighting	LED outdoor pole decorative fixture (existing W≥250)	Biz-Prescriptive Light	Warehouse	Retro	1,589	1,589	60%	959	0.00	12	$756	25%	3%	5%	6	13%	41%	52.8%	52.8%	52.8%	11.2
1131	ExteriorLighting	LED parking garage fixture (existing W≥250)	Biz-Prescriptive Light	Warehouse	Retro	3,235	3,235	60%	1,953	0.00	6	$756	25%	3%	10%	7	13%	41%	60.2%	52.8%	52.8%	11.8
1132	ExteriorLighting	LED parking garage fixture (existing W<250)	Biz-Prescriptive Light	Warehouse	Retro	1,742	1,742	66%	1,154	0.00	6	$248	50%	10%	19%	8	13%	41%	66.7%	55.4%	56.0%	7.0
1133	ExteriorLighting	LED Mogul-base HID Lamp Replacing Exterior HID (existing W≥250)	Biz-Prescriptive Light	Warehouse	Retro	1,589	1,589	60%	959	0.00	12	$756	25%	3%	5%	9	13%	41%	52.8%	52.8%	52.8%	11.2
1134	ExteriorLighting	LED Mogul-base HID Lamp Replacing Exterior HID (existing W<250)	Biz-Prescriptive Light	Warehouse	Retro	856	856	66%	567	0.00	12	$248	50%	10%	9%	10	13%	41%	62.7%	52.8%	52.8%	6.6
1135	Cooling	Air Conditioner - 16 SEER (5-20 Tons)	Biz-Prescriptive	Warehouse	ROB	6,943	6,943	12%	868	0.00	15	$3,570	25%	5%	2%	1	25%	20%	36.0%	34.1%	34.1%	8.3
1136	Cooling	Air Conditioner - 17 SEER (5-20 Tons)	Biz-Prescriptive	Warehouse	ROB	6,943	6,943	12%	868	0.00	15	$4,760	25%	5%	2%	1	25%	20%	36.0%	34.1%	34.1%	6.3
1137	Cooling	Air Conditioner - 18 SEER (5-20 Tons)	Biz-Prescriptive	Warehouse	ROB	6,943	6,943	19%	1,308	0.00	15	$5,960	25%	5%	2%	1	25%	20%	36.0%	34.1%	34.1%	7.5
1138	Cooling	Air Conditioner - 21 SEER (5-20 Tons)	Biz-Prescriptive	Warehouse	ROB	6,943	6,943	24%	1,689	0.00	15	$9,080	25%	5%	2%	1	25%	20%	36.0%	34.1%	34.1%	6.4
1139	Cooling	Air Conditioner - 16 SEER (20+ Tons)	Biz-Prescriptive	Warehouse	ROB	14,138	14,138	8%	1,178	0.00	15	$7,140	25%	5%	2%	2	25%	20%	36.0%	34.1%	34.1%	5.7
1140	Cooling	Air Conditioner - 17 SEER (20+ Tons)	Biz-Prescriptive	Warehouse	ROB	14,138	14,138	8%	1,178	0.00	15	$9,520	5%	5%	1%	2	25%	20%	36.0%	34.1%	34.1%	4.3
1141	Cooling	Air Conditioner - 18 SEER (20+ Tons)	Biz-Prescriptive	Warehouse	ROB	14,138	14,138	15%	2,175	0.00	15	$11,920	25%	5%	2%	2	25%	20%	36.0%	34.1%	34.1%	6.3
1142	Cooling	Air Conditioner - 21 SEER (20+ Tons)	Biz-Prescriptive	Warehouse	ROB	14,138	14,138	21%	3,030	0.00	15	$18,160	25%	5%	2%	2	25%	20%	36.0%	34.1%	34.1%	5.7
1143	Cooling	Comprehensive Rooftop Unit Quality Maintenance (AC Tune-up)	Biz-Custom	Warehouse	Retro	7,533	7,533	6%	476	0.00	3	$500	25%	5%	7%	3	50%	50%	60.0%	60.0%	60.0%	6.0
1144	Cooling	Air Side Economizer	Biz-Custom	Warehouse	Retro	3,888	3,888	3%	113	0.00	5	$170	3%	3%	5%	4	50%	33%	46.4%	46.4%	46.4%	3.7
1145	Cooling	Advanced Rooftop Controls	Biz-Custom	Warehouse	Retro	3,240	3,240	23%	746	0.00	10	$3,412	1%	1%	2%	5	50%	3%	22.0%	19.7%	19.7%	18.4
1146	Cooling	Air Conditioner - 16 SEER (<5 Tons)	Biz-Prescriptive	Warehouse	ROB	2,991	2,991	19%	561	0.00	15	$1,785	50%	5%	3%	6	50%	20%	36.0%	34.1%	34.1%	10.8
1147	Cooling	Air Conditioner - 17 SEER (<5 Tons)	Biz-Prescriptive	Warehouse	ROB	2,991	2,991	24%	704	0.00	15	$2,380	50%	5%	3%	6	50%	20%	36.0%	34.1%	34.1%	10.2
1148	Cooling	Air Conditioner - 18 SEER(<5 Tons)	Biz-Prescriptive	Warehouse	ROB	2,991	2,991	28%	831	0.00	15	$2,980	25%	5%	3%	6	50%	20%	36.0%	34.1%	34.1%	9.6
1149	Cooling	Air Conditioner - 21 SEER(<5 Tons)	Biz-Prescriptive	Warehouse	ROB	2,991	2,991	38%	1,139	0.00	15	$4,540	25%	5%	3%	6	50%	20%	36.0%	34.1%	34.1%	8.6
1150	Cooling	Centrifugal Chiller - Average kW/Ton = 0.626	Biz-Custom	Warehouse	ROB	4,595	4,595	26%	1,205	0.00	20	$2,720	50%	2%	3%	7	0%	20%	36.0%	34.1%	34.1%	22.4
1151	Cooling	Reciprocating Chiller - Average kW/Ton = 0.99	Biz-Custom	Warehouse	ROB	5,650	5,650	27%	1,507	0.00	20	$2,181	100%	4%	5%	8	0%	20%	63.2%	36.0%	36.0%	35.7
1152	Cooling	Screw Chiller - Average kW/Ton = 0.675	Biz-Custom	Warehouse	ROB	6,598	6,598	23%	1,513	0.00	20	$2,177	100%	4%	5%	9	0%	20%	63.2%	36.0%	36.0%	35.2
1153	Cooling	HVAC/Chiller Custom	Biz-Custom	Warehouse	Retro	5	5	20%	1	0.00	12	$1	50%	6%	9%	10	0%	20%	42.6%	36.0%	36.0%	8.9
1154	Cooling	Chiller Tune-up	Biz-Custom	Warehouse	Retro	9,038	9,038	8%	723	0.00	5	$164	100%	23%	33%	11	0%	50%	63.2%	60.0%	60.0%	7.6
1155	Cooling	PTAC - <7,000 Btuh - lodging	Biz-Prescriptive	Warehouse	ROB	327	327	9%	30	0.00	15	$22	100%	50%	13%	12	0%	20%	63.2%	41.7%	36.0%	4.6
1156	Cooling	PTAC - 7,000 to 15,000 Btuh - lodging	Biz-Prescriptive	Warehouse	ROB	727	727	9%	68	0.00	15	$41	100%	50%	16%	13	0%	20%	63.2%	44.0%	37.6%	5.7
1157	Cooling	PTAC - >15,000 Btuh - lodging	Biz-Prescriptive	Warehouse	ROB	1,228	1,228	10%	117	0.00	15	$56	100%	50%	21%	14	0%	20%	63.2%	46.0%	41.5%	7.2
1158	Cooling	HVAC Occupancy Controls	Biz-Custom	Warehouse	ROB	387	387	20%	77	0.00	15	$538	1%	1%	0%	15	50%	25%	40.0%	38.2%	38.2%	9.5
1159	Cooling	Smart Thermostat	Biz-Custom	Warehouse	ROB	3,240	3,240	18%	573	0.00	10	$128	100%	21%	16%	16	57%	9%	63.2%	46.5%	46.1%	8.0
1160	Cooling	Window Film	Biz-Custom	Warehouse	Retro	7,533	0	2%	151	0.00	10	$126	75%	6%	5%	17	100%	25%	53.0%	40.0%	40.0%	14.6
1161	Cooling	Energy Recovery Ventilator	Biz-Custom	Warehouse	Retro	2	2	50%	1	0.00	20	$1	75%	8%	12%	18	100%	5%	54.9%	33.4%	33.7%	11.3
1162	Heating	Heat Pump - 16 SEER (<5 Tons)	Biz-Prescriptive	Warehouse	ROB	12,489	12,489	19%	2,361	0.00	15	$2,055	75%	20%	11%	1	13%	20%	53.5%	36.0%	36.0%	3.9
1163	Heating	Heat Pump - 17 SEER (<5 Tons)	Biz-Prescriptive	Warehouse	ROB	12,489	12,489	21%	2,662	0.00	15	$2,740	50%	20%	10%	1	13%	20%	43.0%	36.0%	36.0%	3.4
1164	Heating	Heat Pump - 18 SEER(<5 Tons)	Biz-Prescriptive	Warehouse	ROB	12,489	12,489	24%	3,015	0.00	15	$3,425	50%	20%	9%	1	13%	20%	41.3%	36.0%	36.0%	3.2
1165	Heating	Heat Pump - 21 SEER(<5 Tons)	Biz-Prescriptive	Warehouse	ROB	12,489	12,489	28%	3,467	0.00	15	$4,500	50%	20%	8%	1	13%	20%	39.3%	36.0%	36.0%	3.0
1166	Heating	Geothermal HP - SEER 20.3 (<5 Tons)	Biz-Prescriptive	Warehouse	ROB	12,489	12,489	36%	4,506	0.00	15	$4,700	50%	11%	10%	1	13%	20%	42.3%	36.0%	36.0%	6.1
1167	Heating	Geothermal HP - SEER 21.5 (<5 Tons)	Biz-Prescriptive	Warehouse	ROB	12,489	12,489	40%	5,042	0.00	15	$7,300	25%	7%	7%	1	13%	20%	36.0%	36.0%	36.0%	6.7
1168	Heating	Geothermal HP - SEER 23.1 (<5 Tons)	Biz-Prescriptive	Warehouse	ROB	12,489	12,489	46%	5,736	0.00	15	$7,300	50%	7%	7%	1	13%	20%	38.7%	36.0%	36.0%	7.6
1169	Heating	Geothermal HP - SEER 29.3 (<5 Tons)	Biz-Prescriptive	Warehouse	ROB	12,489	12,489	49%	6,111	0.00	15	$9,200	25%	8%	5%	1	13%	20%	36.0%	36.0%	36.0%	5.3
1170	Heating	Heat Pump - 16 SEER (5-20 Tons)	Biz-Prescriptive	Warehouse	ROB	51,270	51,270	9%	4,663	0.00	15	$4,110	50%	20%	11%	2	13%	20%	44.5%	36.0%	36.0%	3.4
1171	Heating	Heat Pump - 17 SEER (5-20 Tons)	Biz-Prescriptive	Warehouse	ROB	51,270	51,270	13%	6,791	0.00	15	$5,480	50%	20%	9%	2	13%	20%	45.1%	36.0%	36.0%	3.3
1172	Heating	Heat Pump - 18 SEER (5-20 Tons)	Biz-Prescriptive	Warehouse	ROB	51,270	51,270	19%	9,975	0.00	15	$6,850	75%	20%	7%	2	13%	20%	54.6%	36.0%	36.0%	3.9
1173	Heating	Heat Pump - 21 SEER (5-20 Tons)	Biz-Prescriptive	Warehouse	ROB	51,270	51,270	25%	12,733	0.00	15	$9,000	75%	20%	6%	2	13%	20%	54.4%	36.0%	36.0%	3.8
1174	Heating	Geothermal HP - SEER 20.3 (5-20 Tons)	Biz-Prescriptive	Warehouse	ROB	20,060	20,060	20%	4,017	0.00	15	$7,700	50%	6%	5%	2	13%	20%	38.4%	36.0%	36.0%	10.8
1175	Heating	Geothermal HP - SEER 21.5 (5-20 Tons)	Biz-Prescriptive	Warehouse	ROB	20,060	20,060	25%	5,093	0.00	15	$10,300	50%	5%	5%	2	13%	20%	37.2%	36.0%	36.0%	12.2
1176	Heating	Geothermal HP - SEER 23.1 (5-20 Tons)	Biz-Prescriptive	Warehouse	ROB	20,060	20,060	32%	6,486	0.00	15	$12,800	50%	4%	4%	2	13%	20%	36.8%	36.0%	36.0%	14.0
1177	Heating	Geothermal HP - SEER 29.3 (5-20 Tons)	Biz-Prescriptive	Warehouse	ROB	20,060	20,060	36%	7,251	0.00	15	$17,700	25%	4%	3%	2	13%	20%	36.0%	36.0%	36.0%	10.9
1178	Heating	Heat Pump - 16 SEER (20+ Tons)	Biz-Prescriptive	Warehouse	ROB	105,563	105,563	11%	11,539	0.00	15	$8,220	50%	20%	6%	3	13%	20%	46.7%	36.0%	36.0%	3.5
1179	Heating	Heat Pump - 17 SEER (20+ Tons)	Biz-Prescriptive	Warehouse	ROB	105,563	105,563	15%	15,796	0.00	15	$10,960	50%	20%	5%	3	13%	20%	46.7%	36.0%	36.0%	3.4
1180	Heating	Heat Pump - 18 SEER (20+ Tons)	Biz-Prescriptive	Warehouse	ROB	105,563	105,563	21%	22,279	0.00	15	$13,700	75%	20%	4%	3	13%	20%	55.2%	36.0%	36.0%	4.1
1181	Heating	Heat Pump - 21 SEER (20+ Tons)	Biz-Prescriptive	Warehouse	ROB	105,563	105,563	26%	27,888	0.00	15	$18,000	75%	20%	3%	3	13%	20%	54.9%	36.0%	36.0%	4.0
1182	Heating	Geothermal HP - SEER 20.3 (20+ Tons)	Biz-Prescriptive	Warehouse	ROB	40,929	40,929	22%	8,843	0.00	15	$10,700	100%	9%	5%	3	13%	20%	63.2%	36.0%	36.0%	11.1
1183	Heating	Geothermal HP - SEER 21.5 (20+ Tons)	Biz-Prescriptive	Warehouse	ROB	40,929	40,929	27%	10,994	0.00	15	$13,300	75%	8%	4%	3	13%	20%	53.0%	36.0%	36.0%	12.5
1184	Heating	Geothermal HP - SEER 23.1 (20+ Tons)	Biz-Prescriptive	Warehouse	ROB	40,929	40,929	34%	13,782	0.00	15	$18,300	75%	5%	3%	3	13%	20%	51.7%	36.0%	36.0%	14.3
1185	Heating	Geothermal HP - SEER 29.3 (20+ Tons)	Biz-Prescriptive	Warehouse	ROB	40,929	40,929	37%	15,310	0.00	15	$26,200	50%	4%	2%	3	13%	20%	38.2%	36.0%	36.0%	16.6
1186	Heating	PTHP - <7,000 Btuh - lodging	Biz-Prescriptive	Warehouse	ROB	2,543	2,543	8%	215	0.00	15	$13	100%	100%	100%	4	0%	20%	63.2%	55.0%	55.0%	9.3
1187	Heating	PTHP - 7,000 to 15,000 Btuh - lodging	Biz-Prescriptive	Warehouse	ROB	5,445	5,445	11%	607	0.00	15	$45	100%	100%	100%	5	0%	20%	63.2%	55.0%	55.0%	6.9
1188	Heating	PTHP - >15,000 Btuh - lodging	Biz-Prescriptive	Warehouse	ROB	8,794	8,794	14%	1,230	0.00	15	$35	100%	100%	100%	6	0%	20%	63.2%	55.0%	55.0%	17.2
1189	Heating	Mini Split Ductless Heat Pump Cold Climate (Tiers & sizes TBD)	Biz-Prescriptive	Warehouse	ROB	4	4	25%	1	0.00	12	$0	100%	35%	67%	7	13%	20%	63.2%	52.4%	53.7%	26.2
1190	Heating	Variable Refrigerant Flow Heat Pump	Biz-Custom	Warehouse	NC	11	11	25%	3	0.00	20	$3	100%	5%	3%	2	13%	0%	63.2%	33.8%	33.7%	37.2
1191	Ventilation	Kitchen Exhaust Hood Demand Ventilation Control System	Biz-Custom	Warehouse	ROB	0	0	0%	0	0.00	20	$0	0%	0%		1	0%	24%	63.2%	55.0%	55.0%	0.0
1192	Ventilation	Demand Controlled Ventilation	Biz-Custom	Warehouse	Retro	2,158	2,158	20%	432	0.00	15	$227	100%	10%	14%	2	100%	5%	63.2%	37.1%	37.9%	10.7
1193	Ventilation	Pump and Fan Variable Frequency Drive Controls (Fans)	Biz-Prescriptive	Warehouse	Retro	2,258	2,258	41%	923	0.00	15	$375	100%	16%	18%	2	100%	25%	63.2%	42.0%	42.4%	9.4
1194	Refrigeration	Strip Curtains	Biz-Custom	Warehouse	Retro	334	334	81%	270	0.00	4	$9	100%	100%	100%	1	14%	26%	60.2%	52.4%	52.4%	4.2
1195	Refrigeration	Bare Suction Line	Biz-Custom	Warehouse	Retro	23	23	93%	21	0.00	15	$4	100%	27%	39%	2	0%	25%	60.2%	45.6%	46.6%	9.2
1196	Refrigeration	Floating Head Pressure Controls	Biz-Prescriptive	Warehouse	Retro	2,653	2,653	50%	1,327	0.00	15	$80	100%	25%	41%	3	8%	20%	60.2%	50.1%	50.6%	31.6
1197	Refrigeration	Saturated Suction Controls	Biz-Custom	Warehouse	Retro	831	831	50%	416	0.00	15	$559	50%	4%	6%	4	2%	20%	36.0%	36.0%	36.0%	15.7
1198	Refrigeration	Compressor Retrofit	Biz-Custom	Warehouse	Retro	813	813	20%	163	0.00	15	$477	25%	2%	3%	5	32%	15%	32.0%	27.4%	27.4%	15.8
1199	Refrigeration	Electronically Commutated (EC) Walk-In Evaporator Fan Motor	Biz-Prescriptive	Warehouse	Retro	1,268	1,268	65%	824	0.00	15	$78	100%	45%	42%	6	9%	33%	60.2%	49.8%	49.6%	11.2
1200	Refrigeration	Evaporator Fan Motor Controls	Biz-Prescriptive	Warehouse	Retro	1,912	1,912	25%	478	0.00	13	$291	50%	15%	7%	7	9%	10%	44.4%	30.0%	28.3%	4.7

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Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	Base (Existing) Annual Electric	Base (Standard) Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	MAP Incentive (%)	RAP Incentive (%)	PP Incentive (%)	End Use Measure Group	Base Saturation	EE Saturation	MAP Adoption Rate	RAP Adoption Rate	PP Adoption Rate	UCT Score
1201	Refrigeration	Variable Speed Condenser Fan	Biz-Custom	Warehouse	Retro	2,960	2,960	50%	1,480	0.00	15	$1,170	25%	7%	9%	8	12%	20%	36.0%	36.0%	36.0%	6.9
1202	Refrigeration	Refrigeration Economizer	Biz-Custom	Warehouse	Retro	67,850	67,850	2%	1,357	0.00	15	$2,558	3%	3%	4%	9	45%	0%	20.0%	15.7%	15.9%	6.9
1203	Refrigeration	Anti-Sweat Heater Controls MT	Biz-Prescriptive	Warehouse	Retro	1,313	1,313	55%	722	0.00	12	$250	75%	10%	12%	10	10%	36%	54.7%	48.8%	48.8%	8.7
1204	Refrigeration	Auto Door Closer, Cooler	Biz-Prescriptive	Warehouse	Retro	471,500	471,500	0%	943	0.00	8	$157	100%	16%	24%	11	7%	27%	60.2%	45.7%	46.3%	11.6
1205	Refrigeration	Display Case Door Retrofit, Medium Temp	Biz-Prescriptive	Warehouse	Retro	1,584	1,584	36%	578	0.00	12	$686	25%	22%	3%	12	3%	55%	64.0%	64.0%	64.0%	1.7
1206	Refrigeration	Electronically Commutated (EC) Reach-In Evaporator Fan Motor	Biz-Prescriptive	Warehouse	Retro	1,268	1,268	65%	824	0.00	15	$78	100%	45%	42%	13	2%	33%	60.2%	49.8%	49.6%	11.2
1207	Refrigeration	Q-Sync Motor for Walk-In and Reach-In Evaporator Fan Motor	Biz-Prescriptive	Warehouse	Retro	993	993	51%	504	0.00	10	$96	100%	36%	21%	13	2%	33%	60.2%	46.4%	46.4%	5.1
1208	Refrigeration	Energy Star Reach-In Refrigerator, Glass Doors	Biz-Prescriptive	Warehouse	ROB	1,546	1,546	27%	410	0.00	12	$600	25%	5%	3%	14	10%	55%	64.0%	64.0%	63.9%	5.1
1209	Refrigeration	Energy Star Reach-In Refrigerator, Solid Doors	Biz-Prescriptive	Warehouse	ROB	1,112	1,112	25%	283	0.00	12	$600	5%	5%	2%	15	10%	55%	64.0%	62.1%	61.9%	3.5
1210	Refrigeration	Anti-Sweat Heater Controls LT	Biz-Prescriptive	Warehouse	Retro	3,147	3,147	55%	1,731	0.00	12	$250	100%	10%	28%	16	3%	36%	60.2%	48.8%	48.8%	27.9
1211	Refrigeration	Auto Door Closer, Freezer	Biz-Prescriptive	Warehouse	Retro	419,455	419,455	1%	2,307	0.00	8	$157	100%	16%	59%	17	3%	27%	60.2%	49.6%	51.0%	27.8
1212	Refrigeration	Display Case Door Retrofit, Low Temp	Biz-Prescriptive	Warehouse	Retro	2,922	2,922	50%	1,453	0.00	12	$686	75%	22%	8%	17	3%	55%	64.0%	64.0%	64.0%	4.3
1213	Refrigeration	Energy Star Reach-In Freezer, Glass Doors	Biz-Prescriptive	Warehouse	ROB	3,234	3,234	15%	488	0.00	12	$450	25%	15%	4%	18	3%	55%	64.0%	64.0%	64.0%	2.9
1214	Refrigeration	Energy Star Reach-In Freezer, Solid Doors	Biz-Prescriptive	Warehouse	ROB	4,676	4,676	20%	935	0.00	12	$450	75%	15%	8%	19	3%	55%	64.0%	64.0%	64.0%	5.5
1215	Refrigeration	Refrigeration - Custom	Biz-Custom	Warehouse	ROB	7	7	15%	1	0.00	12	$0	100%	50%	72%	20	90%	20%	60.2%	49.9%	51.0%	9.1
1216	Refrigeration	Retro-commissioning_Refrigerator Optimization	Biz-Custom RCx	Warehouse	Retro	33	33	3%	1	0.00	3	$0	100%	67%	22%	21	90%	10%	60.2%	50.9%	49.0%	2.0
1217	Refrigeration	Energy Star Ice Machine	Biz-Prescriptive	Warehouse	ROB	6,993	6,993	10%	721	0.00	15	$1,426	3%	3%	2%	22	0%	49%	59.2%	57.2%	57.2%	8.9
1218	Refrigeration	LED Refrigerated Display Case Lighting Average 6W/LF	Biz-Prescriptive	Warehouse	Retro	1,573	1,573	37%	574	0.00	12	$1,010	34%	34%	2%	23	6%	30%	44.0%	44.0%	43.1%	0.9
1219	PlugLoads_Office	ENERGY STAR Uninterrupted Power Supply	Biz-Custom	Warehouse	ROB	3,096	3,096	3%	85	0.00	15	$59	75%	7%	11%	1	8%	70%	76.0%	76.0%	76.0%	10.9
1220	PlugLoads_Office	Smart Power Strip – Commercial Use	Biz-Custom	Warehouse	Retro	64	64	100%	64	0.00	5	$50	7%	7%	10%	2	50%	10%	44.3%	38.5%	38.9%	3.4
1221	PlugLoads_Office	Plug Load Occupancy Sensor	Biz-Custom	Warehouse	Retro	1,126	1,126	15%	169	0.00	8	$70	50%	13%	18%	2	50%	10%	59.4%	46.1%	47.0%	4.4
1222	PlugLoads_Office	Electrically Commutated Plug Fans in data centers	Biz-Custom	Warehouse	Retro	86,783	86,783	18%	15,778	0.00	15	$480	100%	100%	100%	3	50%	33%	68.6%	59.7%	59.7%	16.7
1223	PlugLoads_Office	High Efficiency CRAC unit	Biz-Custom	Warehouse	ROB	541	541	30%	162	0.00	15	$63	100%	14%	19%	3	50%	33%	68.6%	48.5%	49.2%	10.1
1224	PlugLoads_Office	Computer Room Air Conditioner Economizer	Biz-Custom	Warehouse	Retro	418	418	86%	358	0.00	15	$82	100%	23%	33%	3	50%	33%	68.6%	52.8%	53.6%	7.4
1225	PlugLoads_Office	Energy Star Laptop	Biz-Custom	Warehouse	ROB	126	126	33%	41	0.00	4	$0	0%			4	17%	85%	88.0%	88.0%	88.0%	0.0
1226	PlugLoads_Office	Energy Star Monitor	Biz-Custom	Warehouse	ROB	72	72	21%	15	0.00	4	$0	0%			5	17%	95%	96.0%	96.0%	96.0%	0.0
1227	PlugLoads_Office	Energy Star Printer/Copier/Fax	Biz-Custom	Warehouse	ROB	551	551	40%	223	0.00	6	$0	0%			6	17%	95%	96.0%	96.0%	96.0%	0.0
1228	PlugLoads_Office	Energy Star Server	Biz-Custom	Warehouse	ROB	691	691	13%	90	0.00	15	$156	25%	3%	4%	7	15%	20%	36.3%	36.0%	36.0%	9.7
1229	PlugLoads_Office	Server Virtualization	Biz-Custom	Warehouse	Retro	691	691	13%	90	0.00	15	$156	25%	3%	4%	7	15%	20%	36.3%	36.0%	36.0%	9.7
1230	PlugLoads_Office	Data Center Hot/Cold Aisle Configuration	Biz-Custom	Warehouse	Retro	691	691	13%	90	0.00	15	$156	25%	3%	4%	7	15%	20%	36.3%	36.0%	36.0%	9.7
1231	Motors	Cogged V-Belt	Biz-Custom	Warehouse	Retro	20,965	20,965	3%	650	0.00	15	$384	75%	9%	13%	1	40%	10%	62.5%	41.9%	42.7%	10.0
1232	Motors	Pump and Fan Variable Frequency Drive Controls (Pumps)	Biz-Prescriptive	Warehouse	Retro	1,902	1,902	38%	731	0.00	15	$200	100%	30%	27%	2	4%	25%	68.6%	53.3%	53.0%	7.0
1233	Motors	Escalators Motor Efficiency Controllers	Biz-Custom	Warehouse	Retro	7,500	7,500	20%	1,500	0.00	10	$5,000	2%	2%	2%	3	0%	10%	28.0%	28.0%	28.0%	8.6
1234	CompressedAir	Efficient Air Compressors	Biz-Custom	Warehouse	ROB	4,004	4,004	31%	1,223	0.00	15	$100	100%	64%	100%	1	100%	33%	68.6%	58.6%	59.7%	10.9
1235	CompressedAir	Retro-commissioning_Compressed Air Optimization	Biz-Custom RCx	Warehouse	Retro	7	7	15%	1	0.00	5	$0	100%	67%	100%	2	100%	33%	68.6%	58.8%	59.7%	4.2
1236	CompressedAir	Compressed Air - Custom	Biz-Custom	Warehouse	Retro	7	7	15%	1	0.00	8	$0	100%	50%	100%	3	100%	33%	68.6%	57.5%	59.7%	4.4
1237	Miscellaneous	Power Distribution Equipment Upgrades	Biz-Custom	Warehouse	Retro	1,150	1,150	1%	6	0.00	30	$8	75%	4%	6%	1	18%	20%	58.1%	36.0%	36.0%	18.6
1238	Miscellaneous	Vending Machine Controller - Non-Refrigerated	Biz-Custom	Warehouse	Retro	745	745	46%	343	0.00	5	$80	63%	63%	32%	2	5%	66%	72.8%	72.8%	72.8%	1.0
1239	Miscellaneous	Vending Machine Controller - Refrigerated	Biz-Custom	Warehouse	Retro	1,739	1,739	46%	800	0.00	10	$216	100%	35%	28%	3	17%	66%	72.8%	72.8%	72.8%	3.4
1240	Miscellaneous	Miscellaneous Custom	Biz-Custom	Warehouse	Retro	5	5	20%	1	0.00	10	$0	100%	50%	72%	4	82%	20%	68.6%	57.8%	58.7%	8.2
1241	Whole Building_HVAC	HVAC - Energy Management System	Biz-Prescriptive	Warehouse	Retro	6,960	6,960	15%	1,044	0.00	15	$4,000	3%	3%	2%	1	100%	1%	20.8%	18.4%	18.4%	4.3
1242	Whole Building_HVAC	Guest room energy management system	Biz-Custom	Warehouse	Retro	0	0	0%	0	0.00	8	$0	0%	0%		2	0%	0%	63.2%	55.0%	55.0%	0.0
1243	Whole Building_HVAC	Retro-commissioning_Bld Optimization	Biz-Custom RCx	Warehouse	Retro	7	7	15%	1	0.00	3	$0	100%	67%	22%	3	100%	10%	63.2%	53.6%	51.7%	2.2
1244	WholeBld	WholeBlg - Com RET	Biz-NC	Warehouse	Retro	7	7	15%	1	0.00	12	$0	100%	50%	19%	4	40%	0%	68.6%	57.8%	56.5%	9.5
1245	Whole Building_NC	WholeBlg - Com NC	Biz-NC	Warehouse	NC	4	4	25%	1	0.00	12	$0	100%	50%	72%	5	100%	60%	68.6%	68.0%	68.0%	9.5
1246	Behavioral	AMI Data Presentment & Engagement	Biz-Behavior	Warehouse	Retro	100	100	1%	1	0.00	1	$0	100%	100%	87%	1	100%	10%	50.0%	50.0%	50.0%	1.3
1247	Behavioral	BIEMS	Biz-Behavior	Warehouse	Retro	0	0	0%	0	0.00	3	$0	0%	0%		1	100%	5%	42.5%	50.0%	50.0%	0.0
1248	Behavioral	Building Operator Certification	Biz-Behavior	Warehouse	Retro	6,600	6,600	1%	53	0.00	3	$9	50%	30%	12%	1	100%	5%	42.5%	50.0%	50.0%	2.2
1249	Cooking	Commercial Combination Oven (Electric)	Biz-Prescriptive	Other	ROB	38,561	38,561	48%	18,432	0.00	12	$16,884	50%	6%	3%	1	17%	53%	62.4%	62.4%	62.4%	9.6
1250	Cooking	Commercial Electric Convection Oven	Biz-Prescriptive	Other	ROB	12,193	12,193	15%	1,879	0.00	12	$1,706	50%	15%	11%	1	17%	53%	62.4%	62.4%	62.4%	4.0
1251	Cooking	Commercial Electric Griddle	Biz-Prescriptive	Other	ROB	17,056	17,056	15%	2,596	0.00	12	$3,604	25%	14%	7%	2	14%	17%	39.3%	33.6%	33.6%	2.1
1252	Cooking	Commercial Electric Steam Cooker	Biz-Prescriptive	Other	ROB	19,549	19,549	67%	13,162	0.00	12	$3,500	100%	12%	14%	3	6%	42%	68.6%	53.6%	53.6%	16.1
1253	Cooking	Dishwasher Low Temp Door (Energy Star)	Biz-Prescriptive	Other	ROB	39,279	39,279	41%	16,153	0.00	15	$770	100%	49%	65%	4	26%	61%	68.8%	68.8%	68.8%	19.3
1254	Cooking	Dishwasher High Temp Door (Energy Star)	Biz-Prescriptive	Other	ROB	39,825	39,825	30%	11,853	0.00	15	$770	100%	49%	65%	4	26%	61%	68.8%	68.8%	68.8%	14.1
1255	Cooking	Energy efficient electric fryer	Biz-Prescriptive	Other	ROB	18,182	18,182	14%	2,572	0.00	12	$1,706	50%	1%	15%	5	27%	23%	55.0%	39.3%	40.7%	97.4
1256	Cooking	Insulated Holding Cabinets (Full Size)	Biz-Prescriptive	Other	ROB	7,665	7,665	69%	5,278	0.00	12	$1,200	100%	6%	42%	6	3%	23%	68.6%	52.4%	54.9%	32.4
1257	Cooking	Insulated Holding Cabinets (Half-Size)	Biz-Prescriptive	Other	ROB	3,066	3,066	58%	1,788	0.00	12	$1,500	50%	8%	12%	6	3%	23%	52.9%	38.7%	39.1%	6.8
1258	HotWater	Faucet Aerator	Biz-Custom	Other	Retro	2,162	2,162	66%	1,425	0.00	10	$3	100%	26%	100%	4	25%	80%	84.0%	84.0%	84.0%	792.1
1259	HotWater	Heat Pump Water Heater	Biz-Custom	Other	ROB	10,967	10,967	35%	3,788	0.00	10	$1,574	75%	13%	10%	1	100%	56%	69.5%	64.8%	64.8%	6.1
1260	HotWater	Hot Water Pipe Insulation	Biz-Custom	Other	Retro	10,967	10,967	2%	219	0.00	20	$60	100%	19%	15%	2	100%	80%	84.0%	84.0%	84.0%	11.6
1261	HotWater	Low Flow Pre-Rinse Sprayers	Biz-Custom	Other	ROB	2,991	2,991	26%	764	0.00	5	$35	100%	71%	87%	3	25%	80%	84.0%	84.0%	84.0%	6.7
1262	HotWater	ENERGY STAR Commercial Washing Machines	Biz-Custom	Other	ROB	1,552	1,552	43%	671	0.00	7	$250	50%	14%	11%	5	25%	35%	66.5%	53.7%	53.3%	4.0
1263	HotWater	Ozone Commercial Laundry	Biz-Custom	Other	Retro	2,984	2,984	25%	746	0.00	10	$20,310	0%	0%	0%	6	0%	50%	60.0%	60.0%	60.0%	5.2
1264	InteriorLighting	LED T8 Tube Replacement	Biz-Prescriptive Light	Other	Retro	138	138	59%	82	0.00	15	$7	100%	49%	49%	1	75%	32%	71.1%	60.5%	60.5%	12.6
1265	InteriorLighting	LED troffer retrofit kit, 2'X2' and 2'X4'	Biz-Prescriptive Light	Other	Retro	310	310	50%	155	0.00	18	$67	100%	26%	9%	1	75%	32%	71.1%	52.9%	50.8%	5.8
1266	InteriorLighting	LED troffer, 2'X2' and 2'X4'	Biz-Prescriptive Light	Other	Retro	223	223	50%	112	0.00	18	$67	100%	26%	7%	1	75%	32%	71.1%	49.3%	45.8%	4.1
1267	InteriorLighting	LED high bay fixture	Biz-Prescriptive Light	Other	Retro	1,080	1,080	76%	821	0.00	12	$323	100%	12%	10%	2	1%	16%	71.1%	52.5%	52.2%	10.7
1268	InteriorLighting	LED Mogul-base HID Lamp Replacing High Bay HID	Biz-Prescriptive Light	Other	Retro	1,080	1,080	79%	855	0.00	12	$110	100%	21%	31%	2	1%	16%	71.1%	58.8%	59.2%	19.4
1269	InteriorLighting	LED low bay fixture	Biz-Prescriptive Light	Other	Retro	1,080	1,080	76%	821	0.00	12	$196	100%	20%	17%	3	1%	16%	71.1%	56.5%	56.2%	10.7
1270	InteriorLighting	LED Mogul-base HID Lamp Replacing Low Bay HID	Biz-Prescriptive Light	Other	Retro	1,080	1,080	79%	855	0.00	12	$60	100%	38%	57%	3	1%	16%	71.1%	60.6%	61.0%	19.4
1271	InteriorLighting	LED downlight, screwin lamp, 1-3W, interior Average 2 Watts	Biz-Prescriptive Light	Other	ROB	67	67	88%	59	0.00	4	$4	100%	25%	59%	4	3%	32%	71.1%	60.3%	61.0%	10.3
1272	InteriorLighting	LED downlight fixture	Biz-Prescriptive Light	Other	Retro	174	174	82%	142	0.00	4	$13	100%	78%	44%	5	19%	32%	71.1%	61.3%	60.3%	2.5
1273	InteriorLighting	LED downlight, screwin lamp, 4-20W, interior Average 11 Watts	Biz-Prescriptive Light	Other	ROB	134	134	84%	113	0.00	4	$2	100%	61%	100%	5	19%	32%	71.1%	61.7%	61.9%	19.7
1274	InteriorLighting	DeLamp Fluorescent Fixture Average Lamp Wattage 28W	Biz-Custom Light	Other	Retro	53	53	100%	53	0.00	15	$4	100%	69%	53%	6	75%	0%	71.1%	61.1%	60.8%	11.0
1275	InteriorLighting	Daylighting Controls	Biz-Custom Light	Other	Retro	8,810	8,810	30%	2,643	0.00	12	$3,000	25%	5%	4%	7	90%	8%	48.3%	39.1%	39.0%	9.9

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Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	Base (Existing) Annual Electric	Base (Standard) Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	MAP Incentive (%)	RAP Incentive (%)	PP Incentive (%)	End Use Measure Group	Base Saturation	EE Saturation	MAP Adoption Rate	RAP Adoption Rate	PP Adoption Rate	UCT Score
1276	InteriorLighting	Occupancy Sensors	Biz-Prescriptive Light	Other	Retro	1,523	1,523	30%	457	0.00	8	$54	100%	37%	34%	7	90%	8%	71.1%	59.3%	59.2%	5.8
1277	InteriorLighting	Central Lighting Monitoring & Controls (non-networked)	Biz-Custom Light	Other	Retro	41,703	41,703	20%	8,341	0.00	12	$3,700	100%	12%	17%	7	90%	8%	71.1%	50.8%	51.5%	9.4
1278	InteriorLighting	Network Lighting Controls - Wireless (WiFi)	Biz-Custom Light	Other	Retro	16,277	16,277	47%	7,650	0.00	8	$1,683	100%	24%	34%	7	90%	8%	71.1%	56.9%	57.6%	6.7
1279	InteriorLighting	Bi-Level Lighting Fixture – Stairwells, Hallways, and Garages	Biz-Custom Light	Other	Retro	1,034	1,034	50%	517	0.00	10	$274	50%	10%	8%	8	10%	8%	62.0%	47.4%	47.1%	7.0
1280	InteriorLighting	LED Exit Sign - 4 Watt Fixture (2 lamp)	Biz-Prescriptive Light	Other	Retro	236	236	85%	201	0.00	15	$60	100%	8%	13%	9	1%	75%	80.0%	80.0%	80.0%	20.1
1281	ExteriorLighting	LED wallpack (existing W<250)	Biz-Prescriptive Light	Other	Retro	856	856	66%	567	0.00	12	$248	50%	10%	9%	1	10%	46%	62.7%	56.8%	56.8%	6.6
1282	ExteriorLighting	LED parking lot fixture (existing W≥250)	Biz-Prescriptive Light	Other	Retro	1,589	1,589	60%	959	0.00	12	$756	25%	3%	5%	2	10%	41%	52.8%	52.8%	52.8%	11.2
1283	ExteriorLighting	LED parking lot fixture (existing W<250)	Biz-Prescriptive Light	Other	Retro	856	856	66%	567	0.00	12	$248	50%	10%	9%	3	10%	41%	62.7%	52.8%	52.8%	6.6
1284	ExteriorLighting	LED fuel pump canopy fixture (existing W<250)	Biz-Prescriptive Light	Other	Retro	856	856	66%	567	0.00	12	$248	50%	10%	9%	4	10%	41%	62.7%	52.8%	52.8%	6.6
1285	ExteriorLighting	LED fuel pump canopy fixture (existing W≥250)	Biz-Prescriptive Light	Other	Retro	1,589	1,589	60%	959	0.00	12	$756	25%	3%	5%	5	10%	41%	52.8%	52.8%	52.8%	11.2
1286	ExteriorLighting	LED outdoor pole decorative fixture (existing W≥250)	Biz-Prescriptive Light	Other	Retro	1,589	1,589	60%	959	0.00	12	$756	25%	3%	5%	6	10%	41%	52.8%	52.8%	52.8%	11.2
1287	ExteriorLighting	LED parking garage fixture (existing W≥250)	Biz-Prescriptive Light	Other	Retro	3,235	3,235	60%	1,953	0.00	6	$756	25%	3%	10%	7	10%	41%	60.2%	52.8%	52.8%	11.8
1288	ExteriorLighting	LED parking garage fixture (existing W<250)	Biz-Prescriptive Light	Other	Retro	1,742	1,742	66%	1,154	0.00	6	$248	50%	10%	19%	8	10%	41%	66.7%	55.4%	56.0%	7.0
1289	ExteriorLighting	LED Mogul-base HID Lamp Replacing Exterior HID (existing W≥250)	Biz-Prescriptive Light	Other	Retro	1,589	1,589	60%	959	0.00	12	$756	25%	3%	5%	9	10%	41%	52.8%	52.8%	52.8%	11.2
1290	ExteriorLighting	LED Mogul-base HID Lamp Replacing Exterior HID (existing W<250)	Biz-Prescriptive Light	Other	Retro	856	856	66%	567	0.00	12	$248	50%	10%	9%	10	10%	41%	62.7%	52.8%	52.8%	6.6
1291	Cooling	Air Conditioner - 16 SEER (5-20 Tons)	Biz-Prescriptive	Other	ROB	7,961	7,961	12%	995	0.00	15	$3,570	25%	5%	3%	1	21%	20%	36.0%	34.1%	34.1%	8.2
1292	Cooling	Air Conditioner - 17 SEER (5-20 Tons)	Biz-Prescriptive	Other	ROB	7,961	7,961	12%	995	0.00	15	$4,760	25%	5%	2%	1	21%	20%	36.0%	34.1%	34.1%	6.2
1293	Cooling	Air Conditioner - 18 SEER (5-20 Tons)	Biz-Prescriptive	Other	ROB	7,961	7,961	19%	1,500	0.00	15	$5,960	25%	5%	3%	1	21%	20%	36.0%	34.1%	34.1%	7.4
1294	Cooling	Air Conditioner - 21 SEER (5-20 Tons)	Biz-Prescriptive	Other	ROB	7,961	7,961	24%	1,936	0.00	15	$9,080	25%	5%	2%	1	21%	20%	36.0%	34.1%	34.1%	6.3
1295	Cooling	Air Conditioner - 16 SEER (20+ Tons)	Biz-Prescriptive	Other	ROB	16,211	16,211	8%	1,351	0.00	15	$7,140	25%	5%	2%	2	21%	20%	36.0%	34.1%	34.1%	5.6
1296	Cooling	Air Conditioner - 17 SEER (20+ Tons)	Biz-Prescriptive	Other	ROB	16,211	16,211	8%	1,351	0.00	15	$9,520	5%	5%	1%	2	21%	20%	36.0%	34.1%	34.1%	4.2
1297	Cooling	Air Conditioner - 18 SEER (20+ Tons)	Biz-Prescriptive	Other	ROB	16,211	16,211	15%	2,494	0.00	15	$11,920	25%	5%	2%	2	21%	20%	36.0%	34.1%	34.1%	6.2
1298	Cooling	Air Conditioner - 21 SEER (20+ Tons)	Biz-Prescriptive	Other	ROB	16,211	16,211	21%	3,474	0.00	15	$18,160	25%	5%	2%	2	21%	20%	36.0%	34.1%	34.1%	5.6
1299	Cooling	Comprehensive Rooftop Unit Quality Maintenance (AC Tune-up)	Biz-Custom	Other	Retro	25,578	25,578	6%	1,617	0.00	3	$500	75%	17%	24%	3	42%	50%	60.0%	60.0%	60.0%	5.0
1300	Cooling	Air Side Economizer	Biz-Custom	Other	Retro	4,458	4,458	3%	130	0.00	5	$170	4%	4%	6%	4	42%	33%	46.4%	46.4%	46.4%	2.9
1301	Cooling	Advanced Rooftop Controls	Biz-Custom	Other	Retro	3,715	3,715	40%	1,493	0.00	10	$3,412	25%	2%	3%	5	42%	3%	27.7%	22.0%	22.0%	15.6
1302	Cooling	Air Conditioner - 16 SEER (<5 Tons)	Biz-Prescriptive	Other	ROB	3,429	3,429	19%	643	0.00	15	$1,785	50%	5%	4%	6	22%	20%	36.0%	36.0%	35.9%	10.6
1303	Cooling	Air Conditioner - 17 SEER (<5 Tons)	Biz-Prescriptive	Other	ROB	3,429	3,429	24%	807	0.00	15	$2,380	25%	5%	3%	6	22%	20%	36.0%	35.3%	35.1%	10.0
1304	Cooling	Air Conditioner - 18 SEER(<5 Tons)	Biz-Prescriptive	Other	ROB	3,429	3,429	28%	953	0.00	15	$2,980	25%	5%	3%	6	22%	20%	36.0%	34.5%	34.2%	9.4
1305	Cooling	Air Conditioner - 21 SEER(<5 Tons)	Biz-Prescriptive	Other	ROB	3,429	3,429	38%	1,306	0.00	15	$4,540	25%	5%	3%	6	22%	20%	36.0%	34.1%	34.1%	8.5
1306	Cooling	Centrifugal Chiller - Average kW/Ton = 0.626	Biz-Custom	Other	ROB	15,602	15,602	26%	4,092	0.00	20	$9,236	25%	2%	3%	7	0%	20%	36.0%	35.6%	35.7%	20.5
1307	Cooling	Reciprocating Chiller - Average kW/Ton = 0.99	Biz-Custom	Other	ROB	19,183	19,183	27%	5,116	0.00	20	$7,405	100%	4%	5%	8	25%	20%	63.2%	36.0%	36.0%	33.8
1308	Cooling	Screw Chiller - Average kW/Ton = 0.675	Biz-Custom	Other	ROB	22,404	22,404	23%	5,139	0.00	20	$7,391	100%	4%	5%	9	11%	20%	63.2%	36.0%	36.0%	33.3
1309	Cooling	HVAC/Chiller Custom	Biz-Custom	Other	Retro	5	5	20%	1	0.00	12	$1	25%	6%	9%	10	35%	20%	37.0%	36.0%	36.0%	7.3
1310	Cooling	Chiller Tune-up	Biz-Custom	Other	Retro	30,688	30,688	8%	2,455	0.00	5	$487	100%	26%	38%	11	35%	50%	63.2%	60.0%	60.0%	6.3
1311	Cooling	PTAC - <7,000 Btuh - lodging	Biz-Prescriptive	Other	ROB	375	375	9%	34	0.00	15	$22	100%	50%	15%	12	0%	20%	63.2%	45.1%	39.2%	4.5
1312	Cooling	PTAC - 7,000 to 15,000 Btuh - lodging	Biz-Prescriptive	Other	ROB	833	833	9%	78	0.00	15	$41	100%	50%	19%	13	0%	20%	63.2%	46.7%	42.4%	5.6
1313	Cooling	PTAC - >15,000 Btuh - lodging	Biz-Prescriptive	Other	ROB	1,408	1,408	10%	134	0.00	15	$56	100%	50%	24%	14	0%	20%	63.2%	48.2%	45.3%	7.0
1314	Cooling	HVAC Occupancy Controls	Biz-Custom	Other	ROB	2,636	2,636	20%	527	0.00	15	$538	75%	5%	0%	15	42%	25%	51.6%	40.0%	40.0%	14.7
1315	Cooling	Smart Thermostat	Biz-Custom	Other	ROB	3,715	3,715	18%	658	0.00	10	$128	100%	20%	15%	16	57%	9%	63.2%	47.4%	47.0%	7.7
1316	Cooling	Window Film	Biz-Custom	Other	Retro	25,578	0	5%	1,330	0.00	10	$1,107	75%	6%	5%	17	100%	25%	54.0%	40.0%	40.0%	13.2
1317	Cooling	Energy Recovery Ventilator	Biz-Custom	Other	Retro	2	2	50%	1	0.00	20	$1	75%	8%	12%	18	100%	5%	55.1%	33.6%	33.9%	11.3
1318	Heating	Heat Pump - 16 SEER (<5 Tons)	Biz-Prescriptive	Other	ROB	13,045	13,045	19%	2,465	0.00	15	$2,055	75%	20%	12%	1	13%	20%	59.0%	44.9%	44.1%	3.9
1319	Heating	Heat Pump - 17 SEER (<5 Tons)	Biz-Prescriptive	Other	ROB	13,045	13,045	21%	2,789	0.00	15	$2,740	50%	20%	10%	1	13%	20%	54.8%	44.1%	42.9%	3.5
1320	Heating	Heat Pump - 18 SEER(<5 Tons)	Biz-Prescriptive	Other	ROB	13,045	13,045	24%	3,164	0.00	15	$3,425	50%	20%	9%	1	13%	20%	54.3%	43.4%	42.0%	3.2
1321	Heating	Heat Pump - 21 SEER(<5 Tons)	Biz-Prescriptive	Other	ROB	13,045	13,045	28%	3,663	0.00	15	$4,500	50%	20%	8%	1	13%	20%	54.3%	43.4%	41.8%	3.1
1322	Heating	Geothermal HP - SEER 20.3 (<5 Tons)	Biz-Prescriptive	Other	ROB	13,045	13,045	36%	4,707	0.00	15	$4,700	50%	11%	10%	1	13%	20%	54.2%	42.0%	42.0%	6.1
1323	Heating	Geothermal HP - SEER 21.5 (<5 Tons)	Biz-Prescriptive	Other	ROB	13,045	13,045	40%	5,263	0.00	15	$7,300	25%	7%	7%	1	13%	20%	45.9%	36.8%	36.8%	6.8
1324	Heating	Geothermal HP - SEER 23.1 (<5 Tons)	Biz-Prescriptive	Other	ROB	13,045	13,045	46%	5,986	0.00	15	$7,300	50%	7%	7%	1	13%	20%	52.4%	38.7%	38.7%	7.7
1325	Heating	Geothermal HP - SEER 29.3 (<5 Tons)	Biz-Prescriptive	Other	ROB	13,045	13,045	49%	6,413	0.00	15	$9,200	25%	8%	5%	1	13%	20%	44.6%	36.0%	36.0%	5.4
1326	Heating	Heat Pump - 16 SEER (5-20 Tons)	Biz-Prescriptive	Other	ROB	52,833	52,833	9%	4,837	0.00	15	$4,110	50%	20%	12%	2	24%	20%	54.2%	43.3%	42.2%	3.5
1327	Heating	Heat Pump - 17 SEER (5-20 Tons)	Biz-Prescriptive	Other	ROB	52,833	52,833	13%	6,991	0.00	15	$5,480	50%	20%	9%	2	24%	20%	53.2%	41.8%	40.2%	3.3
1328	Heating	Heat Pump - 18 SEER (5-20 Tons)	Biz-Prescriptive	Other	ROB	52,833	52,833	19%	10,273	0.00	15	$6,850	75%	20%	7%	2	24%	20%	58.5%	43.7%	42.1%	3.9
1329	Heating	Heat Pump - 21 SEER (5-20 Tons)	Biz-Prescriptive	Other	ROB	52,833	52,833	25%	13,116	0.00	15	$9,000	75%	20%	6%	2	24%	20%	58.4%	43.5%	41.6%	3.8
1330	Heating	Geothermal HP - SEER 20.3 (5-20 Tons)	Biz-Prescriptive	Other	ROB	21,256	21,256	21%	4,492	0.00	15	$7,700	50%	6%	6%	2	24%	20%	56.4%	45.0%	45.0%	11.1
1331	Heating	Geothermal HP - SEER 21.5 (5-20 Tons)	Biz-Prescriptive	Other	ROB	21,256	21,256	26%	5,610	0.00	15	$10,300	50%	5%	5%	2	24%	20%	55.2%	42.9%	42.9%	12.4
1332	Heating	Geothermal HP - SEER 23.1 (5-20 Tons)	Biz-Prescriptive	Other	ROB	21,256	21,256	33%	7,063	0.00	15	$12,800	50%	4%	4%	2	24%	20%	54.4%	41.5%	41.5%	14.3
1333	Heating	Geothermal HP - SEER 29.3 (5-20 Tons)	Biz-Prescriptive	Other	ROB	21,256	21,256	37%	7,933	0.00	15	$17,700	25%	4%	3%	2	24%	20%	48.9%	39.6%	39.4%	11.1
1334	Heating	Heat Pump - 16 SEER (20+ Tons)	Biz-Prescriptive	Other	ROB	108,761	108,761	11%	11,839	0.00	15	$8,220	50%	20%	6%	3	24%	20%	53.2%	41.9%	39.9%	3.5
1335	Heating	Heat Pump - 17 SEER (20+ Tons)	Biz-Prescriptive	Other	ROB	108,761	108,761	15%	16,148	0.00	15	$10,960	50%	20%	5%	3	24%	20%	52.2%	40.5%	38.1%	3.4
1336	Heating	Heat Pump - 18 SEER (20+ Tons)	Biz-Prescriptive	Other	ROB	108,761	108,761	21%	22,845	0.00	15	$13,700	75%	20%	4%	3	24%	20%	58.3%	43.3%	41.2%	4.1
1337	Heating	Heat Pump - 21 SEER (20+ Tons)	Biz-Prescriptive	Other	ROB	108,761	108,761	26%	28,638	0.00	15	$18,000	75%	20%	3%	3	24%	20%	58.3%	43.3%	41.1%	4.0
1338	Heating	Geothermal HP - SEER 20.3 (20+ Tons)	Biz-Prescriptive	Other	ROB	43,332	43,332	23%	9,804	0.00	15	$10,700	100%	9%	5%	3	24%	20%	63.2%	47.9%	47.6%	11.4
1339	Heating	Geothermal HP - SEER 21.5 (20+ Tons)	Biz-Prescriptive	Other	ROB	43,332	43,332	28%	12,039	0.00	15	$13,300	75%	8%	4%	3	24%	20%	60.5%	47.0%	46.7%	12.7
1340	Heating	Geothermal HP - SEER 23.1 (20+ Tons)	Biz-Prescriptive	Other	ROB	43,332	43,332	34%	14,946	0.00	15	$18,300	75%	5%	3%	3	24%	20%	59.8%	45.2%	45.0%	14.6
1341	Heating	Geothermal HP - SEER 29.3 (20+ Tons)	Biz-Prescriptive	Other	ROB	43,332	43,332	39%	16,685	0.00	15	$26,200	50%	4%	2%	3	24%	20%	55.5%	43.2%	43.0%	17.0
1342	Heating	PTHP - <7,000 Btuh - lodging	Biz-Prescriptive	Other	ROB	2,618	2,618	8%	221	0.00	15	$13	100%	100%	100%	4	0%	20%	63.2%	55.0%	55.0%	9.4
1343	Heating	PTHP - 7,000 to 15,000 Btuh - lodging	Biz-Prescriptive	Other	ROB	5,610	5,610	11%	624	0.00	15	$45	100%	100%	100%	5	0%	20%	63.2%	55.0%	55.0%	6.9
1344	Heating	PTHP - >15,000 Btuh - lodging	Biz-Prescriptive	Other	ROB	9,067	9,067	14%	1,260	0.00	15	$35	100%	100%	100%	6	0%	20%	63.2%	55.0%	55.0%	17.2
1345	Heating	Mini Split Ductless Heat Pump Cold Climate (Tiers & sizes TBD)	Biz-Prescriptive	Other	ROB	4	4	25%	1	0.00	12	$0	100%	35%	67%	7	13%	20%	63.2%	54.5%	54.7%	23.5
1346	Heating	Variable Refrigerant Flow Heat Pump	Biz-Custom	Other	NC	11	11	25%	3	0.00	20	$3	100%	5%	3%	2	24%	0%	63.2%	49.1%	49.1%	33.4
1347	Ventilation	Kitchen Exhaust Hood Demand Ventilation Control System	Biz-Custom	Other	ROB	0	0	0%	0	0.00	20	$0	0%	0%		1	0%	24%	63.2%	55.0%	55.0%	0.0
1348	Ventilation	Demand Controlled Ventilation	Biz-Custom	Other	Retro	2,455	2,455	20%	491	0.00	15	$227	100%	11%	16%	2	100%	5%	63.2%	40.3%	41.0%	11.6
1349	Ventilation	Pump and Fan Variable Frequency Drive Controls (Fans)	Biz-Prescriptive	Other	Retro	2,258	2,258	41%	923	0.00	15	$375	100%	16%	18%	2	100%	25%	63.2%	42.6%	42.9%	9.3
1350	Refrigeration	Strip Curtains	Biz-Custom	Other	Retro	334	334	81%	270	0.00	4	$9	100%	100%	100%	1	12%	26%	60.2%	52.4%	52.4%	4.2

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Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	Base (Existing) Annual Electric	Base (Standard) Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	MAP Incentive (%)	RAP Incentive (%)	PP Incentive (%)	End Use Measure Group	Base Saturation	EE Saturation	MAP Adoption Rate	RAP Adoption Rate	PP Adoption Rate	UCT Score
1351	Refrigeration	Bare Suction Line	Biz-Custom	Other	Retro	23	23	93%	21	0.00	15	$4	100%	27%	39%	2	0%	25%	60.2%	45.6%	46.6%	9.2
1352	Refrigeration	Floating Head Pressure Controls	Biz-Prescriptive	Other	Retro	2,653	2,653	50%	1,327	0.00	15	$80	100%	25%	41%	3	8%	20%	60.2%	50.1%	50.6%	31.6
1353	Refrigeration	Saturated Suction Controls	Biz-Custom	Other	Retro	831	831	50%	416	0.00	15	$559	50%	4%	6%	4	2%	20%	36.0%	36.0%	36.0%	15.7
1354	Refrigeration	Compressor Retrofit	Biz-Custom	Other	Retro	813	813	20%	163	0.00	15	$477	25%	2%	3%	5	27%	15%	32.0%	27.4%	27.4%	15.8
1355	Refrigeration	Electronically Commutated (EC) Walk-In Evaporator Fan Motor	Biz-Prescriptive	Other	Retro	1,268	1,268	65%	824	0.00	15	$78	100%	45%	42%	6	8%	33%	60.2%	49.8%	49.6%	11.2
1356	Refrigeration	Evaporator Fan Motor Controls	Biz-Prescriptive	Other	Retro	1,912	1,912	25%	478	0.00	13	$291	50%	15%	7%	7	8%	10%	44.4%	30.0%	28.3%	4.7
1357	Refrigeration	Variable Speed Condenser Fan	Biz-Custom	Other	Retro	2,960	2,960	50%	1,480	0.00	15	$1,170	25%	7%	9%	8	10%	20%	36.0%	36.0%	36.0%	6.9
1358	Refrigeration	Refrigeration Economizer	Biz-Custom	Other	Retro	67,850	67,850	2%	1,357	0.00	15	$2,558	3%	3%	4%	9	38%	0%	20.0%	15.7%	15.9%	6.9
1359	Refrigeration	Anti-Sweat Heater Controls MT	Biz-Prescriptive	Other	Retro	1,313	1,313	55%	722	0.00	12	$250	75%	10%	12%	10	13%	36%	54.7%	48.8%	48.8%	8.7
1360	Refrigeration	Auto Door Closer, Cooler	Biz-Prescriptive	Other	Retro	471,500	471,500	0%	943	0.00	8	$157	100%	16%	24%	11	9%	27%	60.2%	45.7%	46.3%	11.6
1361	Refrigeration	Display Case Door Retrofit, Medium Temp	Biz-Prescriptive	Other	Retro	1,584	1,584	36%	578	0.00	12	$686	25%	22%	3%	12	4%	55%	64.0%	64.0%	64.0%	1.7
1362	Refrigeration	Electronically Commutated (EC) Reach-In Evaporator Fan Motor	Biz-Prescriptive	Other	Retro	1,268	1,268	65%	824	0.00	15	$78	100%	45%	42%	13	2%	33%	60.2%	49.8%	49.6%	11.2
1363	Refrigeration	Q-Sync Motor for Walk-In and Reach-in Evaporator Fan Motor	Biz-Prescriptive	Other	Retro	993	993	51%	504	0.00	10	$96	100%	36%	21%	13	2%	33%	60.2%	46.4%	46.4%	5.1
1364	Refrigeration	Energy Star Reach-In Refrigerator, Glass Doors	Biz-Prescriptive	Other	ROB	1,546	1,546	27%	410	0.00	12	$600	25%	5%	3%	14	12%	55%	64.0%	64.0%	63.9%	5.1
1365	Refrigeration	Energy Star Reach-In Refrigerator, Solid Doors	Biz-Prescriptive	Other	ROB	1,112	1,112	25%	283	0.00	12	$600	5%	5%	2%	15	12%	55%	64.0%	62.1%	61.9%	3.5
1366	Refrigeration	Anti-Sweat Heater Controls LT	Biz-Prescriptive	Other	Retro	3,147	3,147	55%	1,731	0.00	12	$250	100%	10%	28%	16	4%	36%	60.2%	48.8%	48.8%	27.9
1367	Refrigeration	Auto Door Closer, Freezer	Biz-Prescriptive	Other	Retro	419,455	419,455	1%	2,307	0.00	8	$157	100%	16%	59%	17	4%	27%	60.2%	49.6%	51.0%	27.8
1368	Refrigeration	Display Case Door Retrofit, Low Temp	Biz-Prescriptive	Other	Retro	2,922	2,922	50%	1,453	0.00	12	$686	75%	22%	8%	17	4%	55%	64.0%	64.0%	64.0%	4.3
1369	Refrigeration	Energy Star Reach-In Freezer, Glass Doors	Biz-Prescriptive	Other	ROB	3,234	3,234	15%	488	0.00	12	$450	25%	15%	4%	18	4%	55%	64.0%	64.0%	64.0%	2.9
1370	Refrigeration	Energy Star Reach-In Freezer, Solid Doors	Biz-Prescriptive	Other	ROB	4,676	4,676	20%	935	0.00	12	$450	75%	15%	8%	19	4%	55%	64.0%	64.0%	64.0%	5.5
1371	Refrigeration	Refrigeration - Custom	Biz-Custom	Other	ROB	7	7	15%	1	0.00	12	$0	100%	50%	72%	20	90%	20%	60.2%	49.9%	51.0%	9.1
1372	Refrigeration	Retro-commissioning_Refrigerator Optimization	Biz-Custom RCx	Other	Retro	33	33	3%	1	0.00	3	$0	100%	67%	22%	21	90%	10%	60.2%	50.9%	49.0%	2.0
1373	Refrigeration	Energy Star Ice Machine	Biz-Prescriptive	Other	ROB	6,993	6,993	10%	721	0.00	15	$1,426	3%	3%	2%	22	6%	49%	59.2%	57.2%	57.2%	8.9
1374	Refrigeration	LED Refrigerated Display Case Lighting Average 6W/LF	Biz-Prescriptive	Other	Retro	1,573	1,573	37%	574	0.00	12	$1,010	34%	34%	2%	23	8%	30%	44.0%	44.0%	43.1%	0.9
1375	PlugLoads_Office	ENERGY STAR Uninterrupted Power Supply	Biz-Custom	Other	ROB	3,096	3,096	3%	85	0.00	15	$59	75%	7%	11%	1	2%	70%	76.0%	76.0%	76.0%	10.7
1376	PlugLoads_Office	Smart Power Strip – Commercial Use	Biz-Custom	Other	Retro	64	64	100%	64	0.00	5	$50	7%	7%	10%	2	50%	10%	44.3%	38.5%	38.9%	3.3
1377	PlugLoads_Office	Plug Load Occupancy Sensor	Biz-Custom	Other	Retro	1,126	1,126	15%	169	0.00	8	$70	50%	13%	18%	2	50%	10%	59.4%	46.1%	47.0%	4.3
1378	PlugLoads_Office	Electrically Commutated Plug Fans in data centers	Biz-Custom	Other	Retro	86,783	86,783	18%	15,778	0.00	15	$480	100%	100%	100%	3	0%	33%	68.6%	59.7%	59.7%	16.3
1379	PlugLoads_Office	High Efficiency CRAC unit	Biz-Custom	Other	ROB	541	541	30%	162	0.00	15	$63	100%	14%	19%	3	0%	33%	68.6%	48.5%	49.2%	9.9
1380	PlugLoads_Office	Computer Room Air Conditioner Economizer	Biz-Custom	Other	Retro	418	418	86%	358	0.00	15	$82	100%	23%	33%	3	0%	33%	68.6%	52.8%	53.6%	7.2
1381	PlugLoads_Office	Energy Star Laptop	Biz-Custom	Other	ROB	126	126	33%	41	0.00	4	$0	0%			4	17%	85%	88.0%	88.0%	88.0%	0.0
1382	PlugLoads_Office	Energy Star Monitor	Biz-Custom	Other	ROB	72	72	21%	15	0.00	4	$0	0%			5	17%	95%	96.0%	96.0%	96.0%	0.0
1383	PlugLoads_Office	Energy Star Printer/Copier/Fax	Biz-Custom	Other	ROB	551	551	40%	223	0.00	6	$0	0%			6	17%	95%	96.0%	96.0%	96.0%	0.0
1384	PlugLoads_Office	Energy Star Server	Biz-Custom	Other	ROB	691	691	13%	90	0.00	15	$156	25%	3%	4%	7	0%	20%	36.3%	36.0%	36.0%	9.5
1385	PlugLoads_Office	Server Virtualization	Biz-Custom	Other	Retro	691	691	13%	90	0.00	15	$156	25%	3%	4%	7	0%	20%	36.3%	36.0%	36.0%	9.5
1386	PlugLoads_Office	Data Center Hot/Cold Aisle Configuration	Biz-Custom	Other	Retro	691	691	13%	90	0.00	15	$156	25%	3%	4%	7	0%	20%	36.3%	36.0%	36.0%	9.5
1387	Motors	Cogged V-Belt	Biz-Custom	Other	Retro	17,237	17,237	3%	534	0.00	15	$384	75%	7%	10%	1	82%	10%	61.6%	40.2%	40.5%	11.3
1388	Motors	Pump and Fan Variable Frequency Drive Controls (Pumps)	Biz-Prescriptive	Other	Retro	1,902	1,902	38%	731	0.00	15	$200	100%	30%	27%	2	4%	25%	68.6%	53.3%	53.1%	7.4
1389	Motors	Escalators Motor Efficiency Controllers	Biz-Custom	Other	Retro	7,500	7,500	20%	1,500	0.00	10	$5,000	2%	2%	2%	3	0%	10%	28.0%	28.0%	28.0%	9.2
1390	CompressedAir	Efficient Air Compressors	Biz-Custom	Other	ROB	4,004	4,004	31%	1,223	0.00	15	$100	100%	64%	100%	1	100%	33%	68.6%	58.6%	59.7%	10.7
1391	CompressedAir	Retro-commissioning_Compressed Air Optimization	Biz-Custom RCx	Other	Retro	7	7	15%	1	0.00	5	$0	100%	67%	100%	2	100%	33%	68.6%	58.8%	59.7%	4.1
1392	CompressedAir	Compressed Air - Custom	Biz-Custom	Other	Retro	7	7	15%	1	0.00	8	$0	100%	50%	100%	3	100%	33%	68.6%	57.5%	59.7%	4.3
1393	Miscellaneous	Power Distribution Equipment Upgrades	Biz-Custom	Other	Retro	1,150	1,150	1%	6	0.00	30	$8	75%	4%	6%	1	34%	20%	58.1%	36.0%	36.0%	18.4
1394	Miscellaneous	Vending Machine Controller - Non-Refrigerated	Biz-Custom	Other	Retro	745	745	46%	343	0.00	5	$80	63%	63%	32%	2	1%	66%	72.8%	72.8%	72.8%	0.9
1395	Miscellaneous	Vending Machine Controller - Refrigerated	Biz-Custom	Other	Retro	1,739	1,739	46%	800	0.00	10	$216	100%	35%	28%	3	4%	66%	72.8%	72.8%	72.8%	3.3
1396	Miscellaneous	Miscellaneous Custom	Biz-Custom	Other	Retro	5	5	20%	1	0.00	10	$0	100%	50%	72%	4	66%	20%	68.6%	57.8%	58.7%	8.1
1397	Whole Building_HVAC	HVAC - Energy Management System	Biz-Prescriptive	Other	Retro	6,960	6,960	15%	1,044	0.00	15	$4,000	3%	3%	2%	1	100%	1%	20.8%	18.4%	18.4%	4.3
1398	Whole Building_HVAC	Guest room energy management system	Biz-Custom	Other	Retro	0	0	0%	0	0.00	8	$0	0%	0%		2	0%	0%	63.2%	55.0%	55.0%	0.0
1399	Whole Building_HVAC	Retro-commissioning_Bld Optimization	Biz-Custom RCx	Other	Retro	7	7	15%	1	0.00	3	$0	100%	67%	22%	3	100%	10%	63.2%	53.6%	51.7%	2.2
1400	WholeBld	WholeBlg - Com RET	Biz-NC	Other	Retro	7	7	15%	1	0.00	12	$0	100%	50%	19%	4	40%	0%	68.6%	57.8%	56.6%	9.5
1401	Whole Building_NC	WholeBlg - Com NC	Biz-NC	Other	NC	4	4	25%	1	0.00	12	$0	100%	50%	72%	5	100%	60%	68.6%	68.0%	68.0%	9.5
1402	Behavioral	AMI Data Presentment & Engagement	Biz-Behavior	Other	Retro	100	100	1%	1	0.00	1	$0	100%	100%	87%	1	100%	10%	50.0%	50.0%	50.0%	1.3
1403	Behavioral	BIEMS	Biz-Behavior	Other	Retro	50	50	2%	1	0.00	3	$0	12%	12%	5%	1	100%	5%	42.5%	50.0%	50.0%	1.6
1404	Behavioral	Building Operator Certification	Biz-Behavior	Other	Retro	28,300	28,300	1%	226	0.00	3	$39	50%	30%	12%	1	100%	5%	42.5%	50.0%	50.0%	2.2
1405	Compressed Air	Efficient Air Compressor Equipment	Biz-Custom	Industrial	ROB	9	9	11%	1	0.00	13	$0	100%	13%	37%	1	100%	33%	68.6%	46.4%	46.4%	9.5
1406	Compressed Air	Efficient Air Compressor Controls	Biz-Custom RCx	Industrial	Retro	15	15	7%	1	0.00	3	$0	100%	49%	100%	2	100%	25%	68.6%	56.0%	59.7%	2.1
1407	HVAC	Efficient HVAC Equipment	Biz-Custom	Industrial	ROB	8	8	13%	1	0.00	15	$0	100%	27%	39%	1	100%	33%	63.2%	46.4%	47.1%	10.4
1408	HVAC	Efficient HVAC O&M	Biz-Custom RCx	Industrial	Retro	33	33	3%	1	0.00	3	$0	100%	63%	100%	2	100%	25%	63.2%	52.4%	55.0%	2.0
1409	Lighting	Efficient Lighting Equipment	Biz-Custom Light	Industrial	Retro	2	2	42%	1	0.00	15	$0	100%	30%	23%	1	100%	50%	71.1%	60.0%	60.0%	10.6
1410	Lighting	Efficient Lighting O&M	Biz-Custom Light	Industrial	Retro	33	33	3%	1	0.00	3	$0	100%	75%	100%	2	100%	25%	71.1%	61.0%	61.9%	2.4
1411	Machine Drive	Efficient MachDr Equipment	Biz-Custom	Industrial	ROB	5	5	20%	1	0.00	15	$0	100%	30%	44%	1	100%	33%	68.6%	53.1%	54.3%	10.2
1412	Machine Drive	Efficient MachDr O&M	Biz-Custom RCx	Industrial	Retro	33	33	3%	1	0.00	3	$0	100%	55%	100%	2	100%	25%	68.6%	57.2%	59.7%	2.3
1413	Process Heat	Efficient ProcHeat Equipment	Biz-Custom	Industrial	ROB	10	10	10%	1	0.00	15	$0	100%	30%	43%	1	100%	33%	68.6%	53.1%	54.2%	10.6
1414	Process Heat	Efficient ProcHeat O&M	Biz-Custom RCx	Industrial	Retro	33	33	3%	1	0.00	3	$0	100%	68%	100%	2	100%	25%	68.6%	58.3%	59.7%	2.4
1415	Process Ref	Efficient ProcRefrig Equipment	Biz-Custom	Industrial	ROB	6	6	16%	1	0.00	15	$0	100%	29%	42%	1	100%	33%	68.6%	52.9%	54.0%	10.4
1416	Process Ref	Efficient ProcRefrig O&M	Biz-Custom RCx	Industrial	Retro	33	33	3%	1	0.00	3	$0	100%	49%	100%	2	100%	25%	68.6%	56.6%	59.7%	2.4
1417	Other Process	Efficient Other Facility Process Equipment	Biz-Custom	Industrial	ROB	4	4	26%	1	0.00	11	$0	100%	15%	22%	1	100%	33%	68.6%	46.4%	46.4%	8.4
1418	Other Process	Efficient Other Facility Process O&M	Biz-Custom RCx	Industrial	Retro	14	14	7%	1	0.00	11	$0	100%	17%	49%	2	100%	25%	68.6%	46.3%	51.3%	8.4
1419	WholeBld	Power Distribution (Transformers)	Biz-Custom	Industrial	Retro	179	179	1%	1	0.00	30	$1	75%	4%	6%	1	100%	25%	52.1%	40.0%	40.0%	18.3
1420	WholeBld	Strategic Energy Management	Biz-Behavior	Industrial	Retro	33	33	3%	1	0.00	3	$0	100%	59%	23%	2	100%	10%	68.6%	57.6%	55.6%	2.4
1421	WaterWasteWater	Water Supply & Wastewater treatment pumps and process efficiency	Biz-Custom	Industrial	Retro	5	5	19%	1	0.00	11	$0	75%	12%	33%	1	100%	10%	61.4%	40.3%	44.0%	8.0
1422	Motors	Efficient Motor Pmp Equipment - Q1 Cost	Biz-Custom	Agriculture	ROB	8	8	13%	1	0.00	15	$0	100%	100%	100%	1	100%	25%	68.6%	59.7%	59.7%	119.2
1423	Motors	Efficient Motor Pmp Equipment - Q2 Cost	Biz-Custom	Agriculture	ROB	8	8	13%	1	0.00	15	$0	100%	100%	100%	1	100%	25%	68.6%	59.7%	59.7%	39.7
1424	Motors	Efficient Motor Pmp Equipment - Q3 Cost	Biz-Custom	Agriculture	ROB	8	8	13%	1	0.00	15	$0	100%	100%	100%	1	100%	25%	68.6%	59.7%	59.7%	14.3
1425	Motors	Efficient Motor Pmp O&M	Biz-Custom RCx	Agriculture	Retro	33	33	3%	1	0.00	15	$0	100%	55%	79%	2	100%	25%	68.6%	57.6%	58.7%	13.7

]

Appendix C: C&I Measure Assumptions

Measure #	End-Use	Measure Name	Program	Building Type	Replacement Type	Base (Existing) Annual Electric	Base (Standard) Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer kW	EE EUL	Measure Cost	MAP Incentive (%)	RAP Incentive (%)	PP Incentive (%)	End Use Measure Group	Base Saturation	EE Saturation	MAP Adoption Rate	RAP Adoption Rate	PP Adoption Rate	UCT Score
1426	Refrigeration	Efficient Refrigeration Equipment	Biz-Custom	Agriculture	ROB	7	7	15%	1	0.00	15	$0	100%	29%	42%	1	100%	25%	60.2%	43.9%	45.3%	11.6
1427	Refrigeration	Refrigeration Equipment O&M	Biz-Custom RCx	Agriculture	Retro	33	33	3%	1	0.00	3	$0	100%	49%	71%	2	100%	25%	60.2%	48.5%	50.2%	2.7
1428	Lighting	Efficient Lighting	Biz-Prescriptive Light	Agriculture	ROB	2	2	42%	1	0.00	15	$0	100%	30%	23%	1	100%	25%	71.1%	55.3%	54.7%	8.2
1429	Lighting	Grow Lighting	Biz-Custom Light	Agriculture	Retro	3	3	39%	1	0.00	15	$0	100%	19%	15%	2	100%	25%	71.1%	50.4%	49.7%	8.2
1430	Ventilation	Efficient Ventilation	Biz-Custom	Agriculture	ROB	2	2	54%	1	0.00	10	$0	100%	16%	23%	1	100%	25%	63.2%	40.0%	40.9%	8.5
1431	HVAC	Efficient Dehumidification	Biz-Custom	Agriculture	ROB	4	4	27%	1	0.00	10	$0	100%	27%	39%	1	100%	25%	63.2%	45.2%	46.6%	8.6
1432	HVAC	Efficient HVAC	Biz-Custom	Agriculture	ROB	8	8	13%	1	0.00	15	$0	100%	27%	39%	2	100%	25%	63.2%	46.5%	47.7%	11.6
1433	Exterior Lighting	LED Streetlighting	Biz-StreetLight	StreetLight	Retro	1,269	1,269	45%	577	0.00	20	$506	25%	10%	9%	1	100%	80%	85.0%	100.0%	100.0%	4.9

GDS Associates, Inc.
ENGINEERS & CONSULTANTS

INDIANA MICHIGAN POWER℠
An AEP Company

2021 POTENTIAL STUDY

FINAL REPORT

September 2021

prepared by
GDS ASSOCIATES INC
BRIGHTLINE GROUP
ACEEE

GDS Associates, Inc.
ENGINEERS & CONSULTANTS
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prepared for

INDIANA MICHIGAN POWER COMPANY

INDIANA MICHIGAN POWER℠
An AEP Company

2021 POTENTIAL STUDY

EXECUTIVE SUMMARY

September
2021

prepared by
GDS ASSOCIATES INC
BRIGHTLINE GROUP

1 EXECUTIVE SUMMARY

1.1 BACKGROUND & STUDY SCOPE

As part of their larger 2021 Integrated Resource Plan (IRP), Indiana-Michigan Power ("I&M") commissioned GDS Associates ("GDS") and Brightline Group, collectively "the GDS Team", to assess energy savings potential in both the Indiana and Michigan jurisdictions of the I&M service area to help inform future planning efforts. Separate estimates of electric energy efficiency, demand response, and distributed energy resource (DER) potential were developed.

In addition, I&M also requested that GDS conduct limited primary market research to help inform key inputs in the market potential analysis. The final research plan focused on 1) collecting updated equipment penetration, saturation, and efficiency characteristics, 2) site conditions related to distributed energy resources, and 3) customer willingness to participate (WTP) in program offerings across select end-uses/measures.

This report focuses on the presentation of the overall combined potential savings for the entire I&M service area across both Indiana and Michigan. Separate reports present the findings for the I&M Indiana and I&M Michigan service areas.

1.2 MARKET RESEARCH

The initial step in the assessment of future potential is to develop a clear understanding of the current market segments, as well as a clear understanding of the market research data available in the I&M service area. In late 2020 I&M requested the GDS team to conduct market research that would inform critical elements of the market potential study. The research objectives were developed in coordination with I&M and the potential study team. Primary market research activities were focused on collecting updated equipment penetration, saturation, and efficiency characteristics; and customer willingness to participate (WTP) in program offerings across select end-uses/measures.

The resulting data was used to develop updated estimates of baseline and efficient equipment saturation estimates in the market potential study and develop expected long-term adoption rates for energy efficiency, demand response, and DERs over the study horizon. The GDS Team conducted surveys of business and residential customers during January and February of 2021 with the objectives of gathering primary data on the following topics:

- Willingness to participate in a variety of energy efficiency, demand response and distributed energy resource (DER) program scenarios
- Baseline / Saturation of energy-using equipment
- Program awareness
- Barriers

Survey results served as inputs for the market potential model, enabling the market potential analysis to take into consideration the specific market conditions that exist in I&M's service territory. Figure 1-1 presents a summary of the specific technologies and Demand Side Management (DSM) topic areas addressed within the business and residential surveys.

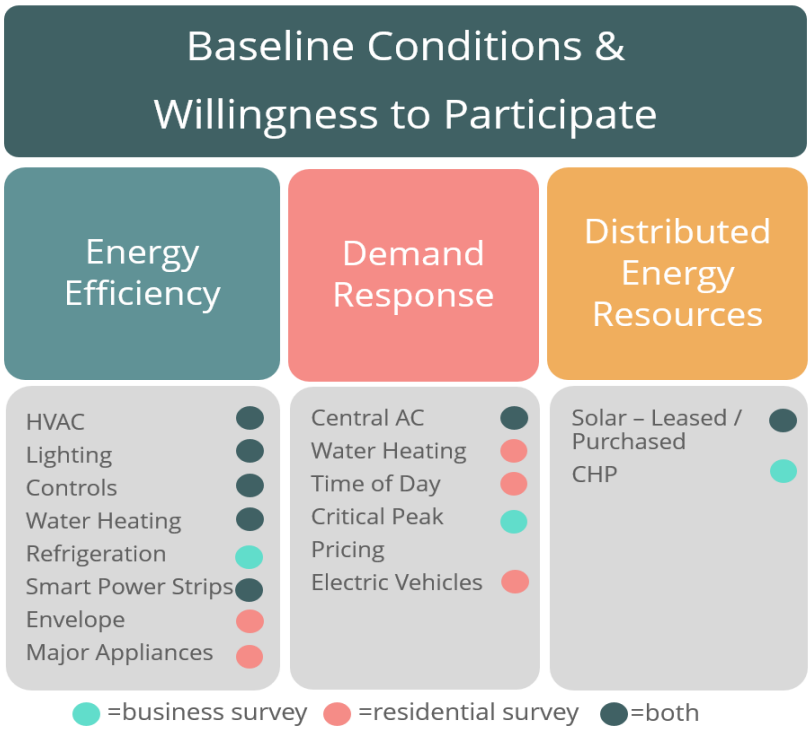

FIGURE 1-1 SURVEY SCOPE

Data collection results across the entire I&M service area are provided below.

1.2.1 Primary Data Collection

The following subsections provide an overview of the primary data collection activities conducted by the GDS team to support the market potential analysis of energy efficiency, demand response, and DER potential. The GDS team conducted survey research in the residential and nonresidential sectors.

1.2.1.1 Survey Administration

Surveys were administered in an online format, with email recruitment followed by two reminder emails sent at approximately one-week increments. VuPoint Research administered the business and residential online surveys and conducted telephone follow up to businesses who had initiated but not completed the survey after the initial email recruitment period. BrightLine Group administered the online multifamily property owner and manager survey and conducted both email and telephone follow up recruitment.

Respondents who completed the survey were entered into a drawing to win an electronic gift card. $100 gift cards were awarded to ten randomly selected business survey respondents and five randomly selected residential survey respondents. All four multifamily property owner / manager respondents received a $100 gift card.

1.2.1.2 Sampling Approach

The team developed a sampling approach with an objective of achieving industry-standard statistical significance (90% confidence, 10% relative precision, or 90/10) at the strata level for all questions, taking into consideration there would be variation in the WTP modules included in each survey to keep survey length manageable for respondents. The sample design assumed a coefficient of variation (CV) of 0.5 for the residential sample, and 0.7 for the business sample, assuming there would likely be greater variation among business responses.

Overall, the response outcomes were positive, and the survey effort produced a robust set of primary data. The team set aggressive sampling targets, with a goal of having high levels of statistical significance for detailed sub-groups within the population. The response fell short on some of those targets, but the team gathered a strong data set that meets the needs of the analysis. Table 1-1 sampling targets and response outcomes.

The business survey achieved 90/10 at the strata level for the baseline questions, and at the state level for other questions (i.e., 189 business respondents started the survey and completed the baseline questions but did not complete the survey in its entirety).[1] The residential survey achieved 90/10 for all strata except multifamily (see Table 1-2).[2]

TABLE 1-1 SURVEY SAMPLING TARGETS AND RESPONSE SUMMARY

State	Target Completes	Completes (Entire Survey)	Completes (Baseline Questions)
Nonresidential Customer Survey *Stratification: state, small /large*			
Indiana	**530**	**375**	504
Michigan	522	158	218
Total	**1,052**	533	722
Residential Customer Survey *Stratification: state, single / multifamily, and income-qualified / market rate*			
Indiana	**544**	820	1,085
Michigan	544	829	1,114
Total	1,088	1,649	2,199

1.2.1.3 Residential Online Survey

The residential customer research targeted homeowners and tenants in the following key segments: income-eligible and market-rate customers, and customers occupying single family and multifamily homes. Income-eligible was defined by household size as 200% of the federal poverty threshold.

A residential online customer survey collected home characteristics, equipment penetration for key end-uses – such as heating, cooling, water heating, insulation, smart power strips, thermostats, major appliances, solar PV systems, pool pumps, and electric vehicles – and information on barriers and willingness to adopt a range of energy efficient measures at varying incentive levels. Table 1-2 provides the targeted and completed residential online surveys in both the Indiana and Michigan territories.

TABLE 1-2 TARGETED AND COMPLETED RESIDENTIAL SECTOR ONLINE SURVEYS

Strata	State	Target Sample Size	Total Completed
Single Family – Market Rate	**Indiana**	**136**	**289**
Multifamily – Market Rate	**Indiana**	**136**	**6**
Single Family - IQ	**Indiana**	**136**	**441**

[1] The response to business baseline questions would meet 90/10 for IN assuming a CV of 0.7, and for MI assuming a CV of 0.6.
[2] The residential survey achieved 90/10 at the strata level for Indiana multifamily – income qualified, but not for other multifamily strata.

Strata	State	Target Sample Size	Total Completed
Multifamily - IQ	Indiana	136	84
Single Family – Market Rate	Michigan	136	515
Multifamily – Market Rate	Michigan	136	10
Single Family - IQ	Michigan	136	270
Multifamily - IQ	Michigan	136	34

1.2.1.4 Business Sector Online Survey

Primary data collection was also conducted in the nonresidential sector via an online survey with business customers. The survey collected business and facility characteristics, as well as equipment penetrations for key end-uses, such as lighting, heating, cooling, water heating, refrigeration, thermostats, and on-site generation (including solar PV systems). The nonresidential online survey also collected information on barriers to energy efficiency and willingness-to-adopt energy efficient measures under various incentive offerings. In total, GDS collected survey data from 722 commercial customers, with 504 in the I&M Indiana service area and 218 from the I&M Michigan service area. GDS examined the annual energy consumption data from the survey participants and developed a weighting adjustment based on the sample's consumption by building type relative to the I&M population in both the Indiana and Michigan service area.

The state-specific reports provide additional detail on the residential and business market research data as well as the adoption curve data for both sectors.

1.3 BASELINE FORECAST

The load forecast is a critical input into I&M's 2021 DSM Market Potential Study, having various uses in estimation of residential and business sector potential. Therefore, the GDS team carefully reviewed I&M's most recently completed load forecast models and documentation to produce the various forecast components necessary as inputs into this analysis. The chapter describes the various ways in which the forecast is used for this study, presents the baseline and disaggregated forecasts, and describes the methodology and data sources used by GDS for the purposes of generating the load forecasts that were used in the potential analysis.

1.3.1 I&M Load Forecasting System

I&M employs a sophisticated load forecasting system that uses econometric and Statistically Adjusted End-Use ("SAE") models to project number of consumers, average consumption per consumer, and total energy sales by class. Residential, Commercial, and Industrial consumers are projected using traditional econometric techniques. Residential average usage and commercial energy sales are projected using SAE model specifications. Industrial energy sales are projected using econometric techniques.

A residential SAE model specification takes end-use data drawn from utility, regional, and even national sources and develops monthly end-use indices designed to predict average household consumption. The end-use data includes market share of key electric consuming appliances, average device efficiency trends, average building shell efficiency trends, price elasticity of demand, income elasticity of demand, and elasticity associated with the average number of people per household. A cooling index is developed to represent space cooling load and is further modified by Cooling Degree Days to incorporate summer weather into the model. Likewise, a heating index representing space heating is modified by Heating Degree Days. Finally, a base index is developed to represent consumption of all other end-uses in the home.

A commercial SAE model specification is very similar to a residential specification, with end-use energy intensity indices developed based on area employment in various industry codes. National and regional commercial data is used to estimate end-use consumption for various industries (for example, restaurants will have higher cooking usage shares than offices).

I&M also projects the impacts of DSM programs it has run in the past. The DSM impacts included in the load forecast are inputs derived from the previous IRP study conducted by I&M in 2018 and 2019.

1.3.2 Adjustments to the I&M Load Forecast

Before assessing the future potential for energy efficiency, demand response, or distributed energy resources in the I&M service area, a few modifications to the 2020-vintage I&M forecast were necessary to create an adjusted baseline forecast. These modifications are addressed in more detail below.

1.3.2.1 Code Frozen Efficiency Adjustments

The base case forecast I&M developed uses the appliance efficiency forecast published in the Energy Information Administration's (EIA) Annual Energy Outlook (AEO) as inputs for the various end-use indices contained within the SAE models. While this is the best practice for developing a base case forecast, to determine potential impacts of DSM/EE programs it is helpful to understand how energy sales would be impacted if appliance efficiencies were held constant at the prevailing U.S. code level. If the base case efficiency level is below code in a given year, the base case forecasted energy sales will be adjusted downward in said year, and if the base case efficiency level is above code in a given year, forecasted energy sales will be adjusted upward. The process for the code frozen efficiency adjustments follows, using residential cooling load as an example.

The forecasted number of consumers is multiplied by the cooling end-use market share saturation to determine the number of cooling end-use appliances in the service territory, as well as the year over year change in the number of appliances. The change in the number of appliances from year to year is then multiplied by the prevailing U.S code efficiency level in that year, while the number of existing appliances is multiplied by the base year efficiency level. The result is a weighted average of existing and new stock appliances and their efficiencies, creating the code frozen efficiency level for the I&M service territory. Next, the percent difference between the base case efficiency level and the code frozen efficiency level is multiplied by the base case energy consumption for cooling load, resulting in the adjustment that should be applied to the base case forecast for cooling load. The results of the code frozen efficiency adjustments can be seen below in Figure 1-2 and Figure 1-3 for Indiana and Figure 1-4 and Figure 1-5 for Michigan.

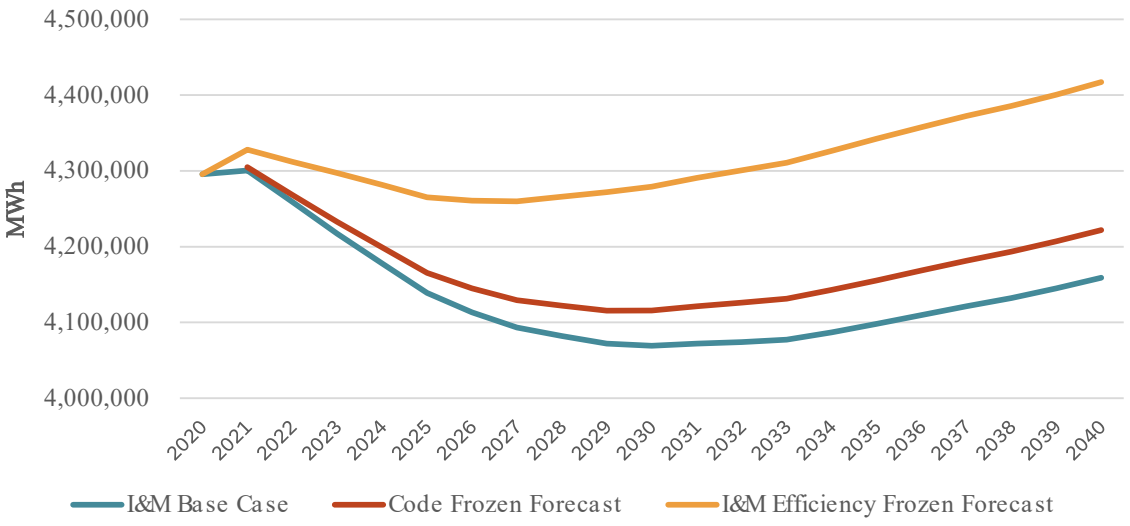

FIGURE 1-2. INDIANA RESIDENTIAL SECTOR FORECAST TRENDS

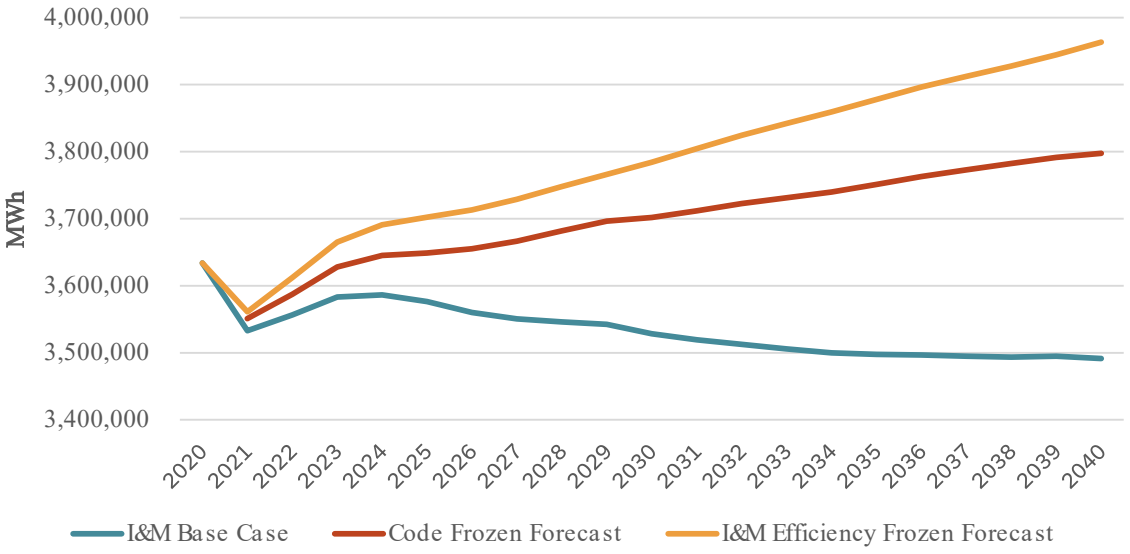

FIGURE 1-3. INDIANA COMMERCIAL SECTOR FORECAST TRENDS

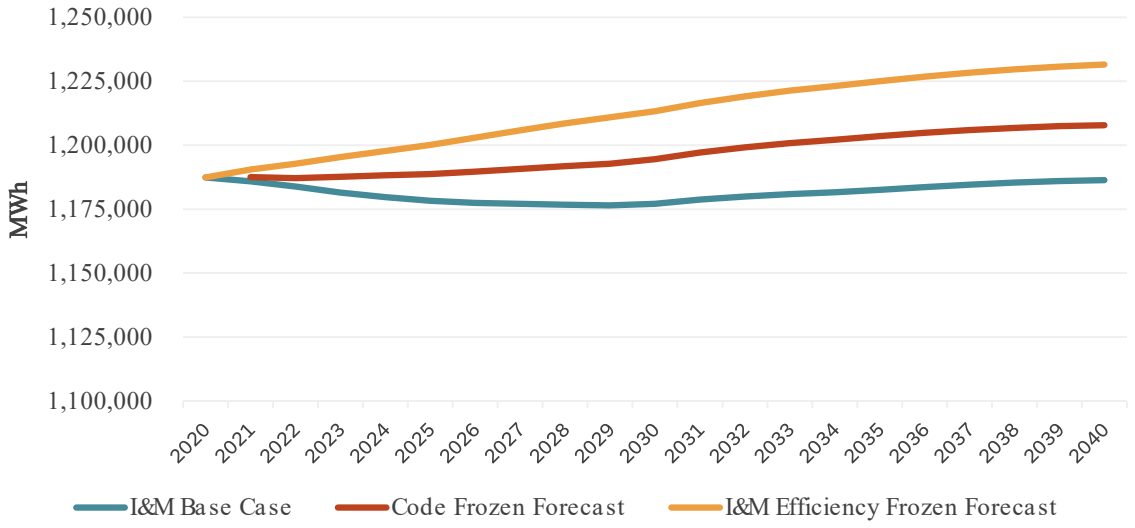

FIGURE 1-4. MICHIGAN RESIDENTIAL SECTOR FORECAST TRENDS

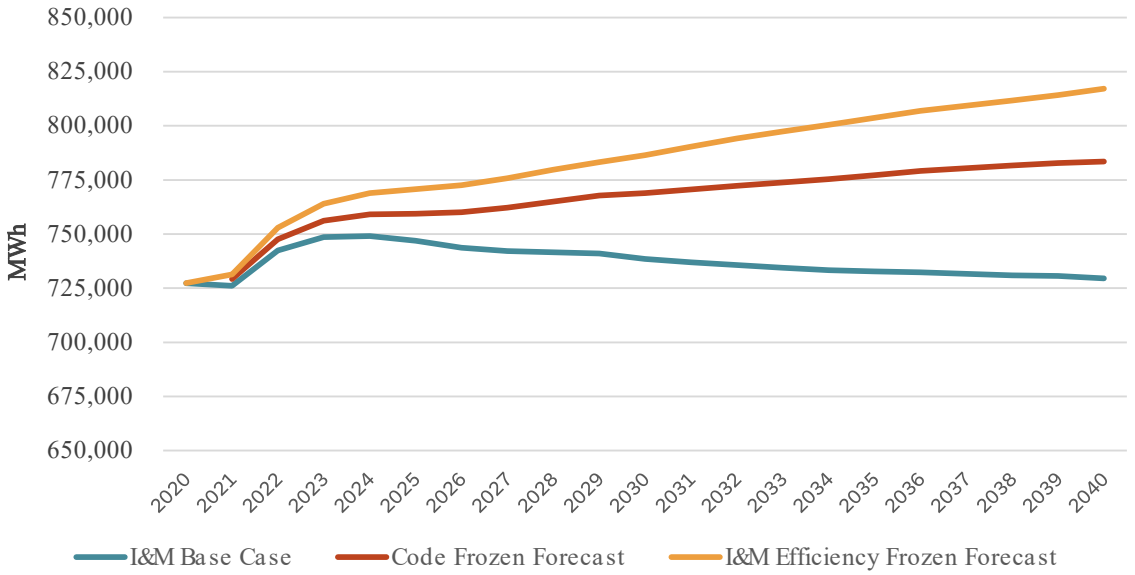

FIGURE 1-5. MICHIGAN COMMERCIAL SECTOR FORECAST TRENDS

1.3.3 Adjustment for Large C&I Opt-Out Customers

The 2019 I&M Indiana business sector customer database containing all C&I customers and whether the customer had opted-out of DSM/EE programs was utilized to determine how to adjust for opt-out customers. The number of customers and total energy was calculated both including and excluding opt-out customers. The load forecast for the C&I sectors was adjusted down by the percent of load attributed to opt-out customers from the customer database, in effect excluding any load of opt-out customers. The opt-out adjustment was held constant for all years of the load forecast. Approximately 9% of commercial energy sales and 50% of industrial energy sales were removed due to customer opt-outs.

I&M Michigan jurisdiction regulations do not contain a provision for any large C&I customer opt-out of DSM/EE programs, so no adjustments were necessary to exclude such load for the I&M Michigan specific load shape analysis.

1.3.4 Reclassification of Load

Last, the 2019 I&M business sector customer database designated commercial and industrial rate codes based on current tariff definition. When only using the account type/tariff definition to classify customers as either commercial or industrial, there were several manufacturing type premises classified as commercial, as well as several typically commercial customers classified as industrial, (i.e. a retail service building coded as an industrial account).

Conversely, the dataset also identified each business by Standard Industry Code (SIC). The GDS team mapped these industry codes to a specified building type and classified the building type as either commercial or industrial. Customers with a building type classified as "Industrial Manufacturing" were coded as Industrial customers, while all other building types were coded as Commercial. In Indiana, the result of this reclassification was a shift of approximately 0.5% of industrial sector sales, or 32,925 MWh, to the commercial sector. In Michigan, the result of this reclassification was a shift of approximately 0.3% of industrial sector sales, or 2,430 MWh, to the commercial sector. The 0.5% shift for Indiana and 0.3% shift for Michigan were then applied to the I&M base case forecasted sales for the commercial and industrial classes. Although specific accounts were reclassified from both commercial and industrial to the opposing class, only the overall magnitude of the shift of energy sales from this analysis was used as an input for the potential analysis.

1.4 TYPES OF POTENTIAL ANALYZED

This potential study provides a roadmap for both I&M and policy makers to develop strategies and programs for energy efficiency (EE), demand response (DR), and distributed energy resources (DERs) in the I&M service territories. In addition to technical and economic potential estimates, the development of achievable and program potential estimates for a range of feasible measures is useful for program planning and modification purposes. Unlike achievable and program potential estimates, technical and economic potential estimates do not include customer acceptance considerations for measures, which are often among the most important factors when estimating the likely customer response to new programs. For this study, the GDS Team produced the following estimates of demand side management potential:

- Technical potential
- Economic potential
- Achievable potential
  - Maximum achievable potential ("MAP")
  - Realistically achievable potential ('RAP")
- Program potential
  - Based off RAP

This executive summary provides overall energy efficiency technical, economic, and achievable potential as well as demand response and distributed energy resource achievable potential. The state-specific reports each have chapters describing program potential.

1.5 APPROACH SUMMARY

The purpose of this market potential study is to provide a foundation for the continuation of utility-administered energy efficiency and demand response programs in the I&M service territories and to determine the remaining opportunities for cost-effective energy savings, demand savings, and distributed energy resources for the I&M service territories. This study examined a full array of technologies, programs, and energy efficient building practices that are technically achievable.

1.5.1 Energy Efficiency

For the residential sector, GDS utilized a bottom-up approach to the modeling of energy efficiency potential, 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, taking into consideration incentives and estimates of annual adoption rates. For the C&I sector, GDS employed a bottom-up modeling approach to first estimate measure-level savings, costs, and cost-effectiveness, and then applied measure savings to all applicable shares of energy load.

1.5.1.1 Market Characterization

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

1.5.1.2 Measure Characterization

The study's sector-level energy efficiency measure lists were informed by a range of sources including the MEMD, the Illinois and Indiana TRMs, current I&M program offerings, and commercially viable emerging technologies, among others. Measure list development was a collaborative effort in which GDS developed draft lists that were shared with I&M and stakeholders. The final measure lists ultimately included in the study reflected the informed comments and considerations from the parties that participated in the measure list review process.

In total, GDS analyzed 353 measure types for I&M. Many measures were included in the study as multiple permutations to account for different specific market segments, such as different building types, efficiency levels, and replacement options. GDS developed a total of 2,106 measure permutations for this study. Each permutation was, screened for cost-effectiveness according to the UCT.

TABLE 1-3: NUMBER OF ELECTRIC MEASURES EVALUATED

	# of Measures	Total # of Measure Permutations
I&M		
Residential	168	673
Commercial	157	1,405
Industrial/Ag	28	28
Total	***353***	***2,106***

1.5.1.3 Types of 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 may realistically be achieved through market interventions, when it can be captured, and how much it would cost to do so. Figure 1-6 illustrates the types of energy efficiency potential considered in this analysis.

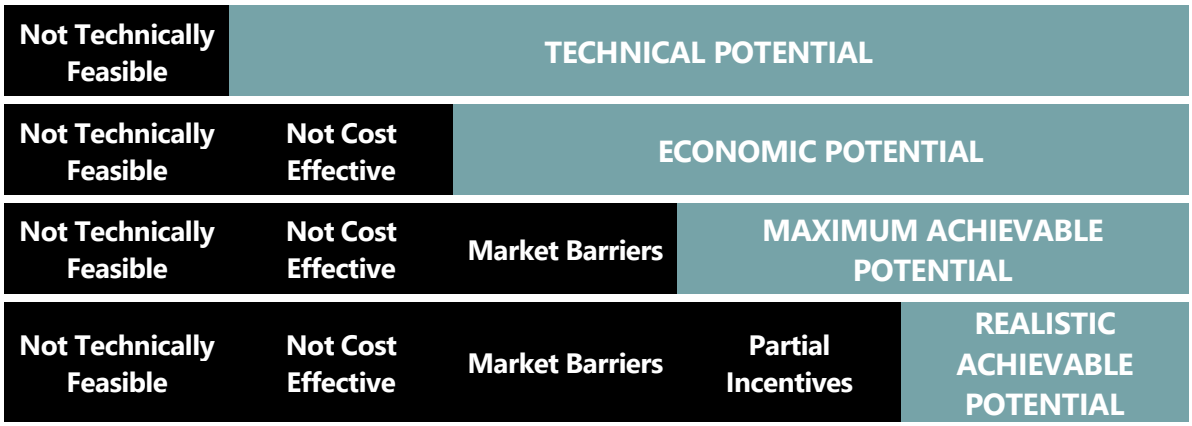

FIGURE 1-6 TYPE OF ENERGY EFFICIENCY POTENTIAL[3]

1.5.1.4 Technical Potential

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 1-1 below. The C&I sector employs a similar analytical approach.

EQUATION 1-1 CORE EQUATION FOR RESIDENTIAL SECTOR TECHNICAL POTENTIAL

$$\text{TECHNICAL POTENTIAL OF EFFICIENT MEASURES} = \text{Total Number of Households} \times \text{Base Case End Use Intensity (kWh/unit)} \times \text{Saturation Share} \times \text{Remaining Factor} \times \text{Feasibility Factor} \times \text{Savings Factor}$$

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 a given 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.

3 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.

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.

1.5.1.5 Economic Potential

Economic potential refers to the subset of the technical potential that is economically cost-effective (based on screening with the UCT) as compared to conventional supply-side energy resources. Refer to the state-specific reports for additional details on how measures were evaluated for cost-effectiveness.

1.5.1.6 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 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 up to 100% of measure incremental costs and aggressive adoption rates.[4]
- ***RAP*** estimates achievable potential with I&M 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.

1.5.2 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.

PJM defines a demand response program as providing end-use customers with the ability to manage their electricity use in response to conditions in the wholesale market. In short, resources must be dispatchable and measurable. Demand response rate options such as TOU rates do not meet these requirements. However, these rates can provide value for I&M by lowering their peak demand requirements.

This study uses the broader FERC definition of demand response so that all potential DR, including rate options, are identified. I&M's integrated resource planning team will analyze and adjust as necessary the identified DR potential for what can be counted in the PJM market and/or how DR potential will be used to construct alternative resource plans.

1.5.2.1 Demand Response Program Options

Table 1-4 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

[4] The GDS team lowered MAP incentives to less than 100% of measure incremental cost in some cases if 100% incentives would preclude the measure from being cost-effective. MAP incentives were lowered to either 75% or 50% of the incremental measure cost if either of those incentive levels would allow for a measure to remain cost-effective.

be considered in this study. The list of DR options was determined based on a review of the I&M's current and/or planned offerings, offerings of other peer utilities, and market research into emerging DR technologies. The base case analysis includes direct load control (DLC), rate design, and aggregator options.

TABLE 1-4 DEMAND RESPONSE BASE CASE PROGRAM OPTIONS AND ELIGIBLE MARKETS

DR Program Option	Program Description	Eligible Markets
Central AC DLC	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 Low-Income Customers
Connected Thermostat	The system operator can remotely raise the AC's thermostat set point during peak load conditions, lowering AC and/or heating load.	Residential and C&I Customers
Smart Water Heater	The system operator can remotely change the water heater's set point or shut off the water heater during peak load conditions.	Residential and C&I Customers
DHW DLC	The water heater is remotely shut off by the system operator for periods normally ranging from 2 to 8 hours.	C&I Customers
Room AC DLC	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 Customers
Smart Appliance	Direct utility control of smart appliances.	Residential Customers
Electric Vehicle Charging Control	Direct utility control of electric vehicle charging stations.	Residential and C&I Customers
DLC Lighting	A portion of the lighting load is remotely shut off by the system operator for periods normally ranging from 2 to 4 hours.	C&I Customers
Connected Energy Management System	The system operating can remotely shut off or setback a portion of a building's loads controlled through the connected energy management system.	C&I Customers
Thermal Storage	The use of a cold storage medium such as ice, chilled water, or other liquids. Off-peak energy is used to produce chilled water or ice for use in cooling during peak hours. The cool storage process is limited to off-peak periods.	Residential and C&I Customers
Battery Storage	The system operator remotely calls for energy stored in batteries to be discharged to the grid during peak conditions.	Residential and C&I Customers
Behavioral	The system operator uses electronic messaging, like text messaging or email, to alert participating customers to an upcoming peak event. Customers receive incentives for reducing their usage during the peak window but are not penalized for lack of participation.	Residential Customers
Electric Vehicle Off-Peak Charging Rate	Special rate service for electric vehicles that charge off-peak.	Residential and C&I Customers
Time-of-use (TOU) Rate	A retail rate with different prices for usage during different blocks of time. Daily pricing blocks could include on-peak, mid-peak, and off-peak periods. Pricing is pre-defined, and once established, does not vary with actual cost conditions.	Residential and C&I Customers

DR Program Option	Program Description	Eligible Markets
Critical peak pricing (CPP) Rate	A retail rate in which an extra-high price for electricity is provided during a limited number of critical periods of the year. Market-based prices are typically provided on a day-ahead basis, or an hour ahead basis.	Residential and C&I Customers
Peak Time Rebates (PTR) Rate	A program where customers are rewarded if they reduce electricity consumption during peak times with monetary rebates.	Residential and C&I Customers
Capacity Bidding Programs (Large C&I Aggregator)	CBP is a flexible bidding program offering qualified businesses payments for agreeing to reduce when a CBP event is called. Businesses make monthly nominations and receive capacity payments based on the amount of capacity reduction nominated each month, plus energy payments based on your actual kilowatt-hour (kWh) energy reduction when an event is called. Penalties occur if load nominations are not met.	C&I Customers
Demand Bidding Programs (Small C&I Aggregator)	DBP is a year-round, flexible, Internet-based bidding program that offers business customers credits for voluntarily reducing power when a DBP event is called.	C&I Customers
Curtailable Rate	A discounted rate is offered to the customer for agreeing to interrupt or curtail load during peak period. The interruption is mandatory.	C&I Customers
Real Time Pricing (RTP) Rate	A retail rate with hourly energy prices closely matched to either the underlying wholesale electricity market or the utility's cost of production.	C&I Customers

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 direct load control (DLC) program of air conditioning and a rate program both assume load reduction of the customers' air conditioners. For this reason, it is typically assumed that customers cannot participate in programs that affect the same end uses.

1.5.2.2 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*.[5] Additionally, the GDS Team reviewed the May 2017 National Standard Practice Manual published by the National Efficiency Screening Project.[6] The GDS Team utilized this guide to define avoided ancillary services and energy and/or capacity price suppression benefits.

The demand response program potential for I&M was analyzed using a spreadsheet-based tool incorporating segment forecasts, program performance and economic definitions, and measure applicability estimates. 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. The GDS Team 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.

[5] Study was prepared by Synapse Energy Economics and the Regulatory Assistance Project, February 2013.
[6] National Standard Practice Manual for Assessing Cost-Effectiveness of Energy Efficiency Resources, May 18, 2017, Prepared by The National Efficiency Screening Project

The UCT 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 incentive costs, increased supply costs, fixed program capital costs (such as the cost of a central controller), program administrative, marketing and evaluation costs.

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 practice" 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. Both MAP and RAP include the impact of energy efficiency gains realized in the Energy Efficiency Potential study. These gains include the changes that occur when old equipment is replaced with high efficiency equipment. Yearly impacts were developed for the space cooling end use and for whole building impacts, applied for rate programs that affect multiple measures.

1.5.3 Distributed Energy Resources

As part of the overall potential modeling exercise, the GDS Team considered distributed energy resources (DER) as sources of behind-the-meter customer-sited generation. The DER potential study followed the same method as the energy efficiency potential study in that the DER analysis reviewed the opportunity for technical, economic, and achievable potential. We used the same forecast data as used in the energy efficiency study to assess DER potential. The analysis limited resources for this potential study to technologies that are behind-the-meter and owned by the customer and did not consider market potential for supply-side resources. Specifically, this market potential assessment for DER focused on solar photovoltaic (PV) and combined heat and power (CHP) systems.

1.5.3.1 Technical Potential – Solar Photovoltaic

Photovoltaic systems utilize solar panels, a packaged collection of photovoltaic cells, to convert sunlight into electricity. A system is constructed with multiple solar panels, a DC/AC inverter(s), a racking system to hold the panels, and electrical system interconnections. These systems are often roof-mounted and face south-west, south, and/or, south-east.

The study analyzed the potential associated with roof-mounted systems installed on residential and non-residential sector buildings. For the non-residential sector, the analysis also estimated potential for ground mounted (or covered parking) systems for a few specific business types. The analysis included battery storage as an additional configuration with each solar PV system type; however, due to the uncertainty associated with battery dispatch schedules, potential battery generation is excluded from this analysis. As noted above, this study did not explore the market potential associated utility-scale solar PV installations.

The approach to estimating technical potential required calculating the total square footage of suitable rooftop area within the I&M's territory and calculating solar PV system generation based on building and regional characteristics. Technical potential is computed using Equation 1-2.

EQUATION 1-2 SOLAR PV TECHNICAL POTENTIAL CALCULATION

$$PV\ Technical\ Potential = \Sigma(Suitable\ Rooftop\ Square\ Footage \times PV\ System\ Generation\ per\ Sq.Ft.)$$

The two key parameters in Equation 1-2 were estimated based on multiple data sources relevant to each state's region in the I&M territory. Methods for defining these parameters are discussed below.

The GDS Team estimated total rooftop square footage using the forecast disaggregation analysis to characterize the residential and non-residential building stocks. The building stocks were characterized based on relevant parameters such as number of facilities, average number of floors, average premise consumption, and premise EUI. The GDS Team used these parameters to estimate the total rooftop square footage.

To estimate the fraction of the total roof area that is suitable for rooftop solar PV, the GDS Team relied on research completed by the National Renewable Energy Laboratory (NREL). NREL has developed estimates of the portion of total rooftops across the country that are suitable for solar PV based on analysis of LIDAR data. NREL criteria for suitable roof area include:

- **Contiguous rooftop area size:** Rooftops with fewer than 10 square meters of contiguous roof area excluded.
- **Rooftop orientation (tilt and azimuth):** Northeast through northwest orientation and roof pitches greater than 60 degrees excluded.
- **Shading:** Roof areas that had a minimum solar exposure of less than 80% relative to an unshaded roof were excluded.

Based on NREL's data, the GDS Team was able to apply unique suitability factors to estimate the total square footage of suitable rooftop for residential and non-residential buildings across I&M's territory.

The second key parameter – PV system generation – was estimated by developing standardized solar PV system configurations. These included system sizes for residential premises ranging from 3 to 20 kW (DC) and 10 to 2,000 kW (DC) for non-residential premises. Additionally, the GDS Team selected battery system sizes for each solar PV system size to dispatch energy for 2-4 hours.

The Team relied on NREL's PVWatts[7] (Version 6.1.4) and System Advisor Model (SAM)8 tools to estimate system generation for both residential and non-residential sited systems. These tools model PV power density based on site specific data from NREL's LIDAR-based NSRDB to estimate total solar irradiance in conjunction with PV system specifications. The PV system simulations were generated based on Fort Wayne, IN and Niles, MI. The GDS Team based assumptions for PV system azimuth on rooftop orientation data sourced from Google's Project Sunroof also based on Fort Wayne, IN and Niles, MI. The analysis assumptions are summarized in Table 1-5.

TABLE 1-5 KEY ASSUMPTIONS IN SOLAR PV ANALYSIS

Parameter	Assumptions
Residential System Sizes (Nominal DC Capacity)	3 kW, 5 kW, 7.5 kW, 10 kW, 15 kW, 20 kW
Non-Residential System Sizes (Nominal DC Capacity)	10 kW, 15 kW, 20 kW, 25 kW, 50 kW, 100 kW, 250 kW, 500 kW, 1,000 kW, 2,000 kW
System losses	14.1%

7 PVWatts estimates solar PV energy production and costs. Developed by the National Renewable Energy Laboratory. (NREL) http://pvwatts.nrel.gov/

8 SAM estimates hourly solar PV energy production and costs with more detailed inputs and outputs than PVwatts. Developed by the National Renewable Energy Laboratory. (NREL) http:// https://sam.nrel.gov/

Parameter	Assumptions
Tilt	By region
Azimuth:	By region
DC to AC size ratio	1.2
Inverter efficiency	96% (micro-inverter)
Battery Round-Trip Efficiency	85%

Based on the simulations and resulting capacity factors for residential and non-residential buildings for the Indiana and Michigan regions, we applied the state-specific capacity factor to the system size to estimate annual electricity generation. These system generation values were used to calculate total energy generation per square foot of rooftop and extrapolated based on the total suitable rooftop square footage to estimate overall all technical potential. As a final step, the GDS Team removed from the technical potential for any generation occurring from existing systems. Data on existing systems was provided directly by I&M.

1.5.3.2 Technical Potential – Combined Heat and Power

CHP systems generate electric power and useful thermal energy in a single integrated system. Heat that is normally wasted in conventional power generation is recovered as useful thermal energy. Due to the integration of both power and thermal generation, CHP systems are more efficient than separate sources for electric power generation and thermal energy production.

In most CHP applications, a heat engine creates shaft power that drives an electrical generator (fuel cells can produce electrical power directly from electrochemical reactions). The waste heat from the engine is then recovered to provide steam or hot water to meet on-site needs. By combining the thermal and electrical energy generation in one process, the total efficiency of a CHP application far exceeds that of a separate plant and boiler system. Overall, the efficiency of CHP technologies can reach 80% or more, while simple-cycle electricity generation reaches only 30% and combined cycle generation typically achieves 50%. When considering both thermal and electric energy generation, CHP requires 40% less energy input to achieve the same energy output as a separate plant and boiler system. Figure 1-7 illustrates this point.

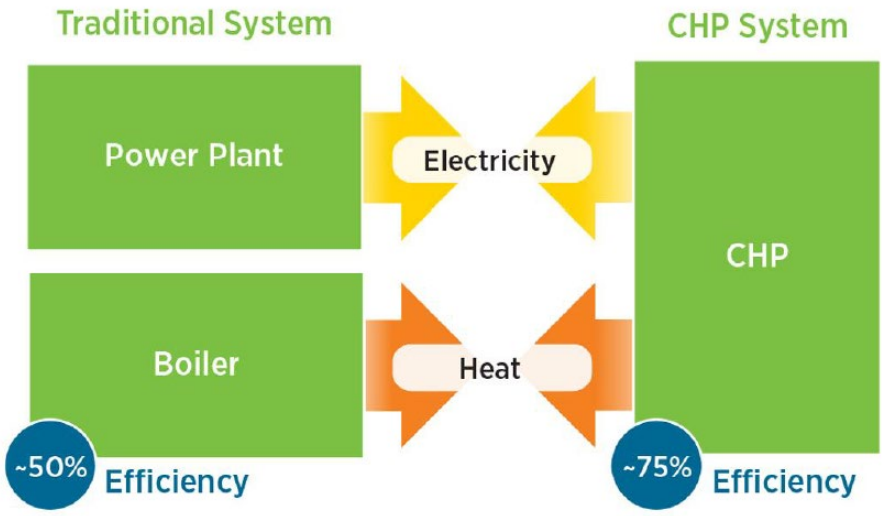

Figure courtesy of US DOE Energy Efficiency & Renewable Energy

FIGURE 1-7 CHP ENERGY FLOW DIAGRAM

Common technologies used in CHP applications and explored in this study include:

- Steam turbines
- Gas turbines
- Micro turbines
- Fuel Cells
- Reciprocating engines

Applications with steady demand for electricity and thermal energy are potentially good economic targets for CHP deployment. Industrial applications, particularly in industries with continuous processing and high steam requirements, are very economic and represent a large share of existing CHP capacity today. Commercial applications such as hospitals, nursing homes, laundries, and hotels with large hot water needs are well suited for CHP. Institutional applications such as colleges and schools, prisons, and residential and recreational facilities are also excellent prospects for CHP.

Selecting a specific CHP technology depends on several factors, which include but are not limited to power requirements, the duty cycle, space constraints, thermal energy needs, emission regulations, fuel availability, utility prices, and interconnection issues. Table 1-6 summarizes the CHP technologies evaluated in this study and their assumed operating parameters.

TABLE 1-6 CHP TECHNOLOGY COMPARISON[9]

Parameter	Reciprocating Engine	Gas Turbine	Steam Turbine	Micro-Turbine	Fuel Cell
Size (kW)	50-5,000	500-50,000	10-100,000	30-250	200-2,000
Electric Efficiency	28-39%	25-40% (simple) 40-60% (combined)	5-15%	25-28%	36-42%
Overall Efficiency	73-79%	64-72%	~80%	67-72%	62%-67%
Fuels	Natural gas, biogas, propane, liquid fuels	Natural gas, biogas, propane, distillate oil	All	Natural gas, biogas, propane, distillate oil	Hydrogen, natural gas, propane
NO_x Emissions (lb/MWh)	0.15-2.17	0.55-0.68	Function of boiler emissions	0.14-0.17	0.01-0.04
Uses for Heat Recovery	Hot water, low pressure steam, district heating	Direct heat, hot water-, low- or high-pressure steam, district heating	Low- or high-pressure steam, district heating	Direct heat, hot water, low pressure steam	Hot water-, low- or high-pressure steam
Thermal Output (Btu/kWh)	3,000-6,100	3,200-5,000	n/a	4,800-6,300	1,500-3,000
Useable Temp (°F)	200-500	500-1,100	n/a	400-650	140-700

To estimate technical potential for CHP, the GDS Team first developed a screening process based on the DOE's national technical potential study of CHP resources[10] to identify probable CHP candidate premises. First,

[9] Combined Heat and Power Market Assessment. ICF International for the California Energy Commission, April 2010.
[10] U.S. Department of Energy. Combined Heat and Power (CHP) Technical Potential in the United States, March 2016.

customers with less than 50,000 kWh annual consumption were removed from eligibility as a CHP candidate. Second, we considered customer loads to assess if and what CHP system type and size may be a potential match to a customer. To effectively utilize CHP, a facility must have coincident electric and thermal energy requirements for a large load factor of the year. A continuous process industry with nearly constant steam or hot water demand electric load is an excellent target, such as a chemicals manufacturer or a hospital. Facilities with intermittent electric and thermal loads are progressively less attractive as the number of hours of coincident load diminishes. We therefore screened for eligible customers based on the customer's annual kWh usage and an approximate sized CHP system based on a thermal factor.

The Team calculated and applied a thermal factor to potential candidate customer loads to reflect thermal load considerations in CHP sizing. In most cases, on-site thermal energy demand is smaller than electrical demand. Thus, CHP size is usually dictated by the thermal load to achieve proper efficiencies and adequate returns on investment. The Team used power to heat ratios[11] for both the CHP technology as well as different market segments to calculate the thermal factor as shown in following equation.

EQUATION 1-3 THERMAL FACTOR CALCULATION

$$Thermal\ Factor = \frac{P/H\ (CHP\ System)}{P/H\ (Customer\ Segment)}$$

A thermal factor of one (1.0) would result in the CHP system capacity being equal to the electric demand of the facility. A thermal factor of less than one would indicate that the application is thermally limited, and the resulting CHP system size would be below the electric demand of the facility. A thermal factor greater than one indicates that a CHP system sized to the thermal load would produce more electricity than can be used on-site, resulting in excess power that could be exported to the grid. Following the method applied in the DOE national technical potential study, the thermal factor was multiplied by each customer's annual consumption to estimate the appropriate CHP system size. The Team screened and removed any CHP technology that did not fall within +/- 15% generation of the customer's annual kWh consumption. A summary of the power to heat ratios by segment is listed in Table 1-7, as sourced from the DOE EPA CHP potential study.

TABLE 1-7 POWER TO HEAT RATIO BY SEGMENT

Industrial Segment	Heat to Power Ratio	Commercial Segment	Heat to Power Ratio
Utilities	1.29	Education	0.50
Smelting	0.26	Healthcare	0.75
Food Manufacturing	1.10	Institutions	0.94
Transportation Manufacturing	0.33	Grocery	0.62
Paper Manufacturing	2.37	Lodging	0.62
Plastics Manufacturing	0.31	Office	0.20
Misc. Manufacturing	1.34	Retail	0.84
Agriculture	0.25	Warehouse	0.68
Construction	0.25	Misc.	0.68
Metal Manufacturing	3.83		

[11] Power to heat ratios were sourced from a combination of the following sources:
•U.S. Environmental Protection Agency Combined Heat and Power Partnership. Catalog of CHP Technologies, September 2017.
•U.S. Environmental Protection Agency Combined Heat and Power Partnership. Spark Spread Estimator Version 1.2
•U.S. Department of Energy. Combined Heat and Power (CHP) Technical Potential in the United States, March 2016.

After applying the screening method, we reviewed which CHP systems were eligible matches for given customer sites. In cases where multiple CHP technologies were viable for a single customer site, an applicability factor was assigned for each eligible CHP technology. After assigning applicability factors, the Team summed the total CHP generation across the population. The GDS Team removed from the technical potential any generation occurring from existing systems. Data on existing systems was provided directly by I&M.

1.5.3.3 Economic Potential

Economic potential represents the DER generation possible given full adoption of all cost-effective DER measures. For the cost effectiveness analysis on solar PV and CHP, the GDS Team used a Total Resource Cost (TRC) hurdle of 1.0. To assess the TRC, the GDS Team relied on the same avoided energy and capacity costs used in the energy efficiency analysis. These avoided costs serve as the benefits while the costs are represented as the installation and O&M costs of the modeled solar PV and CHP measures. The study did not find any economic or achievable DER potential. Refer to the state-specific reports for additional detail on the DER economic potential analysis.

1.6 POTENTIAL SAVINGS OVERVIEW

The following several sub-sections provide an overview of the energy efficiency potential as well as summary demand response potential and distributed energy resource potential. The state-specific reports provide additional summary data and methodological considerations and descriptions.

1.6.1 Energy Efficiency Potential for Residential Customers

Figure 1-8 provides the I&M system-level residential technical, economic, MAP and RAP savings estimates by 2025, 2028, and 2040. The 2025 technical potential is 12.7% of forecasted sales, and the economic potential is 10.2% of forecasted sales. The 2025 MAP is 4.4% and the RAP is 4.0%, as a percentage of forecasted sales. By 2040 the technical and economic potential rise to 38% and 32% of forecasted sales, respectively. This indicates that a large portion of the technical potential is cost-effective. The MAP and RAP rise respectively to 18% and 14% of forecasted sales by 2040. 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.

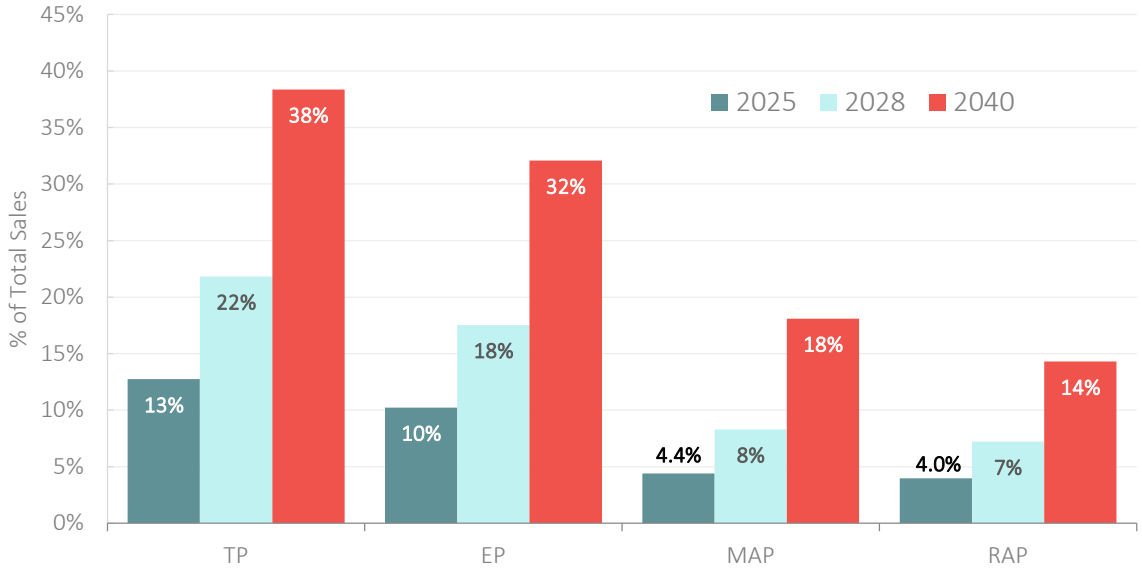

FIGURE 1-8: OVERVIEW OF I&M SYSTEM-LEVEL RESIDENTIAL ENERGY EFFICIENCY POTENTIAL

Table 1-8 provides I&M system-level residential incremental annual energy and demand savings for MAP and RAP across the next six years as well as the potential by 2040. Incremental RAP energy savings range from 71,870 MWh in 2023 to 109,238 MWh by 2040, and cumulative RAP energy savings rise to 807,284 MWh by 2040.[12]

TABLE 1-8 I&M SYSTEM-LEVEL RESIDENTIAL MAP & RAP POTENTIAL

	2023	2024	2025	2026	2027	2032	2040
Incremental Annual Energy (MWh)							
MAP	76,858	87,930	97,328	103,872	109,462	114,177	123,563
RAP	71,870	80,315	86,505	90,420	93,807	96,797	109,238
Incremental Annual Energy (MW)							
MAP	18.0	20.5	22.6	24.1	25.4	26.3	27.6
RAP	16.1	17.6	18.7	19.5	20.2	20.8	23.0
Cumulative Annual Energy (MWh)							
MAP	92,827	166,091	239,548	312,099	385,492	454,505	1,022,305
RAP	86,441	152,415	216,435	278,301	339,472	394,754	807,284
Cumulative Annual Energy (MW)							
MAP	22.3	40.9	60.0	78.3	96.3	112.7	230.4
RAP	19.8	35.6	51.0	65.5	79.4	91.6	176.3

1.6.2 Energy Efficiency Potential for Commercial Customers

Figure 1-9 provides the I&M system-level commercial technical, economic, MAP and RAP savings estimates by 2025, 2028, and 2040. The 2025 technical potential is 11.5% of forecasted sales, and the economic potential is 11.4% of forecasted sales. The 2025 MAP is 6.9% and the RAP is 5.0%, as a percentage of forecasted sales. By 2040 the technical and economic potential rise to 36% of forecasted sales. This indicates that essentially all the technical potential is cost-effective. The MAP and RAP rise respectively to 19% and 15% of forecasted sales by 2040. 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.

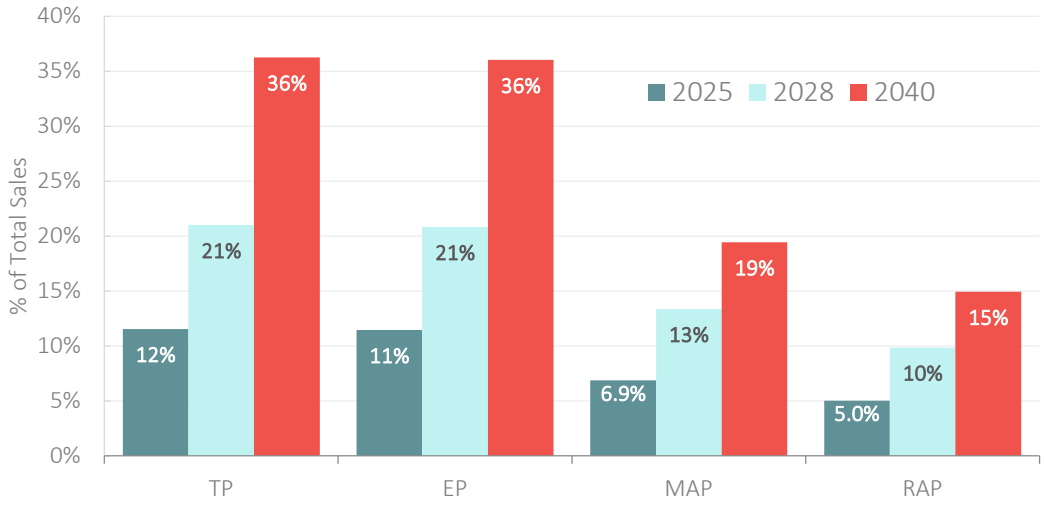

FIGURE 1-9: OVERVIEW OF I&M SYSTEM-LEVEL COMMERCIAL ENERGY EFFICIENCY POTENTIAL

[12] Cumulative annual potential in 2023 is greater than the incremental annual potential because the study timeframe for I&M Michigan begins in 2022. This is the case for all sectors.

Table 1-9 provides I&M system-level commercial incremental and cumulative annual energy and demand savings for MAP and RAP across the next six years as well as the potential by 2040. Incremental RAP energy savings range from 71,143 MWh in 2023 to 90,931 MWh by 2040, and cumulative RAP energy savings rise to 703,768 MWh by 2040.

TABLE 1-9 I&M SYSTEM-LEVEL COMMCERCIAL MAP & RAP POTENTIAL

	2023	2024	2025	2026	2027	2032	2040
Incremental Annual Energy (MWh)							
MAP	97,484	92,092	89,467	90,942	91,633	94,480	111,780
RAP	71,143	66,859	65,858	68,130	69,255	73,191	90,931
Incremental Annual Energy (MW)							
MAP	15.2	14.7	14.8	15.6	16.1	16.5	20.4
RAP	10.7	10.3	10.6	11.5	11.9	12.5	15.7
Cumulative Annual Energy (MWh)							
MAP	116,196	207,636	295,128	379,096	455,737	528,967	917,027
RAP	84,991	151,194	215,134	277,089	333,742	388,951	703,768
Cumulative Annual Energy (MW)							
MAP	18.2	32.9	47.6	62.2	76.1	89.9	191.6
RAP	12.8	23.1	33.6	44.1	54.4	64.8	143.4

1.6.3 Energy Efficiency Potential for Industrial Customers

Figure 1-10 provides the I&M system-level industrial technical, economic, MAP and RAP savings estimates by 2025, 2028, and 2040. The 2025 technical potential is 6.1% of forecasted sales, and the economic potential is also 6.1% of forecasted sales. The 2025 MAP is 3.8% and the RAP is 2.8%, as a percentage of forecasted sales. By 2040 the technical and economic potential rise to 21% of forecasted sales. This indicates that essentially all the technical potential is cost-effective. The MAP and RAP rise respectively to 14% and 10% of forecasted sales by 2040. 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.

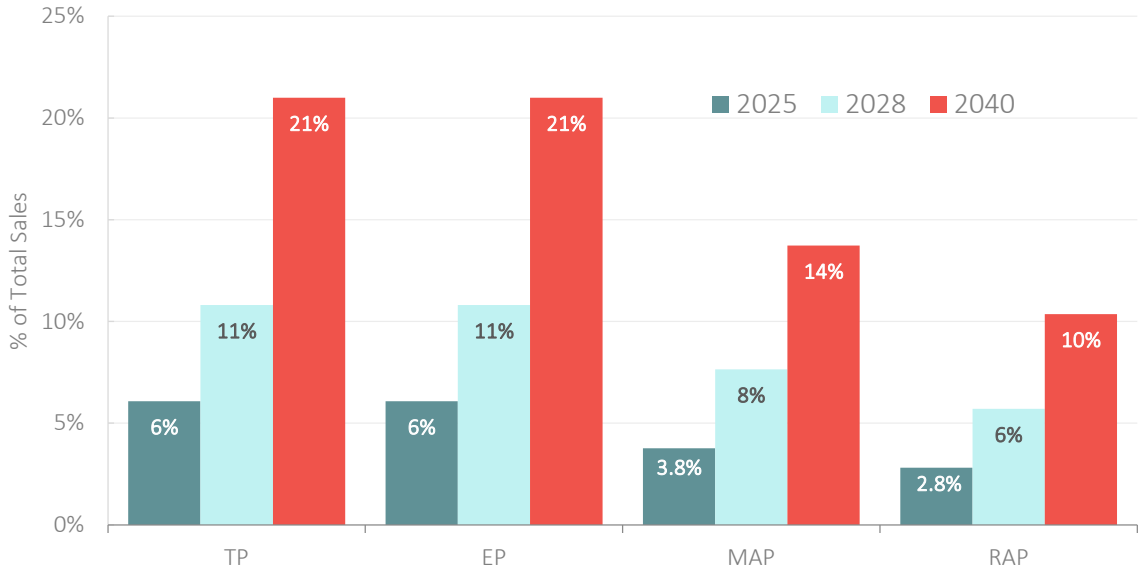

FIGURE 1-10: OVERVIEW OF I&M SYSTEM-LEVEL INDUSTRIAL ENERGY EFFICIENCY POTENTIAL

Table 1-10 provides I&M system-level industrial incremental and cumulative annual energy and demand savings for MAP and RAP across the next six years as well as the potential by 2040. Incremental RAP energy savings range from 37,876 MWh in 2023 to 53,389 MWh by 2040, and cumulative RAP energy savings rise to 454,863 MWh by 2040.

TABLE 1-10 I&M SYSTEM-LEVEL INDUSTRIAL MAP & RAP POTENTIAL

	2023	2024	2025	2026	2027	2032	2040
Incremental Annual Energy (MWh)							
MAP	50,976	50,011	50,573	57,090	55,030	55,301	69,526
RAP	37,876	37,164	37,716	42,721	41,198	41,641	53,389
Incremental Annual Energy (MW)							
MAP	8.8	8.7	8.7	9.8	9.7	9.2	11.9
RAP	6.5	6.4	6.5	7.4	7.3	6.9	9.1
Cumulative Annual Energy (MWh)							
MAP	60,606	110,618	159,376	206,596	251,304	294,393	602,574
RAP	45,361	82,525	118,799	153,983	187,274	219,478	454,863
Cumulative Annual Energy (MW)							
MAP	10.5	19.2	27.6	35.7	43.5	50.9	103.8
RAP	7.8	14.3	20.5	26.6	32.3	37.9	78.2

1.6.4 Demand Response Potential for All Customers

1.6.4.1 Residential Potential

Figure 1-11 shows the 2040 I&M system-level residential market rate and income-eligible MAP and RAP demand response potential for I&M. These demand reduction values are presented at the customer meter level.

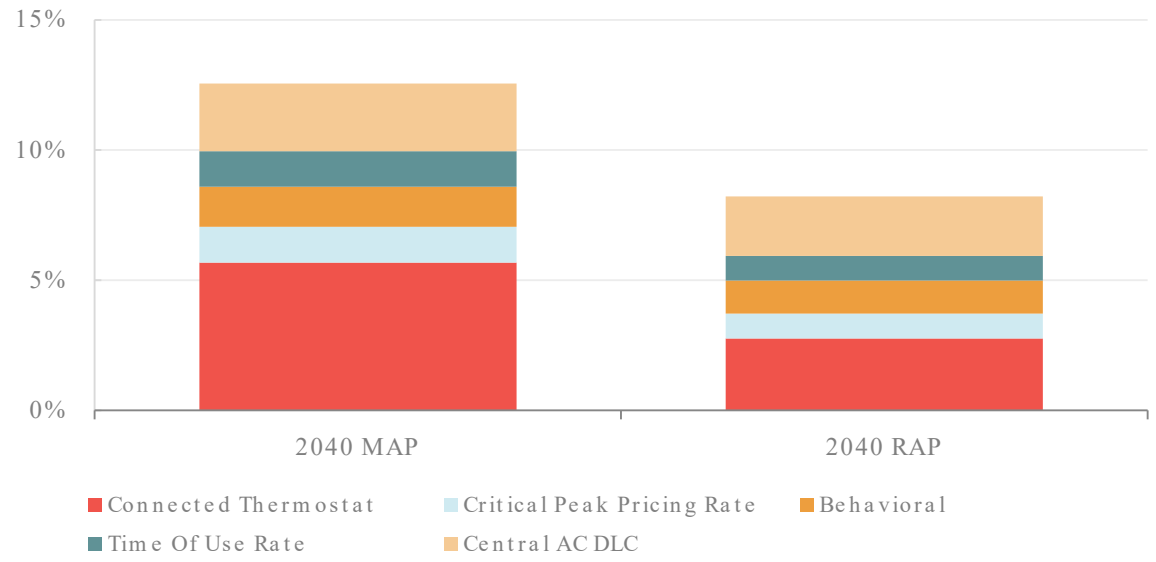

FIGURE 1-11: I&M SYSTEM-LEVEL SUMMER PEAK MW RESIDENTIAL SECTOR BASE CASE RESULTS AS % OF 2040 RESIDENTIAL CLASS LOAD

1.6.4.2 C&I Sector Potential

Figure 1-12 shows the 2040 I&M system-level C&I sector MAP and RAP demand response potential for I&M. These demand reduction values are presented at the customer meter level.

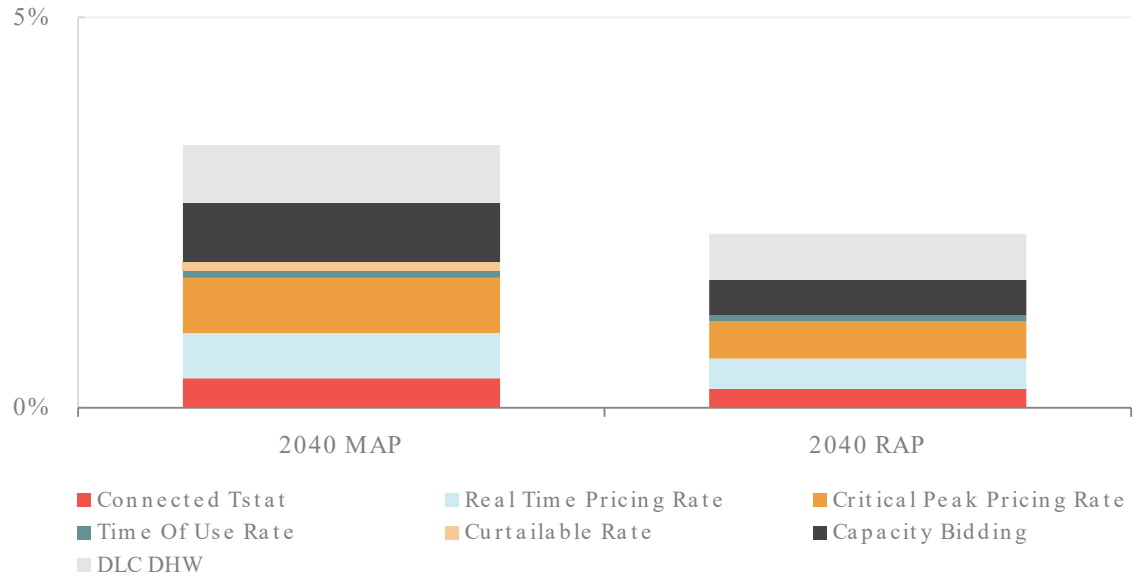

FIGURE 1-12 I&M SYSTEM-LEVEL SUMMER PEAK MW C&I SECTOR BASE CASE RESULTS AS % OF 2040 C&I CLASS LOAD

Figure 1-13 shows the I&M system-level annual demand response RAP potential for the Base Case by sector for I&M. These demand reduction values are present at the customer meter level.

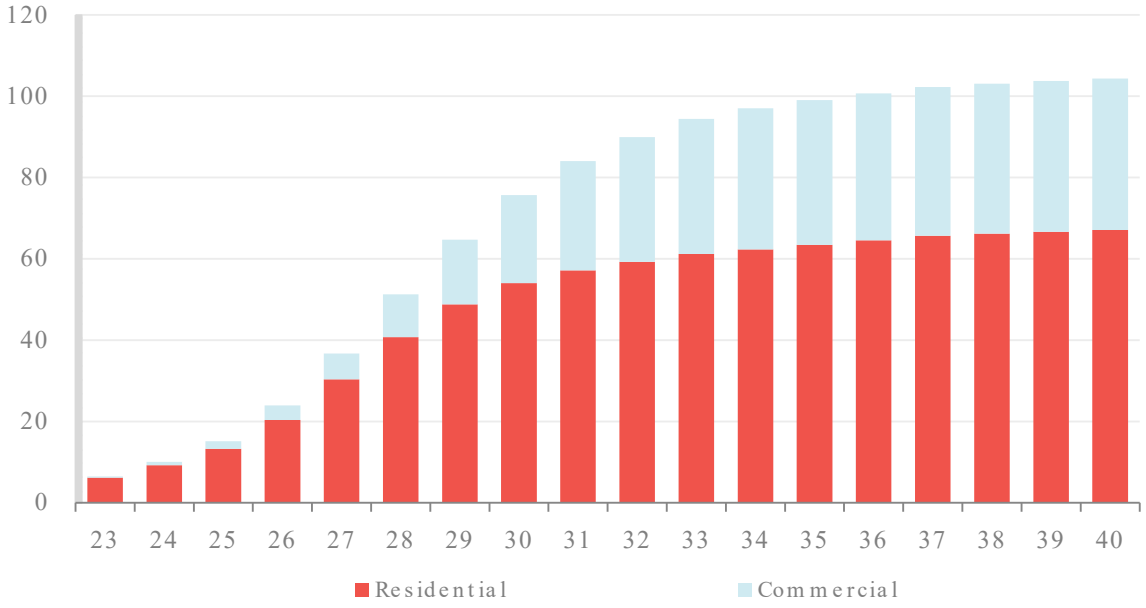

FIGURE 1-13: I&M SYSTEM-LEVEL CUMULATIVE ANNUAL BASE CASE SUMMER PEAK MW RAP POTENTIAL BY SECTOR

1.6.5 Distributed Energy Resource Potential for All Customers

1.6.5.1 Solar Photovoltaics

Table 1-11 summarizes the I&M system-level solar PV cumulative annual potential estimates for electric demand and Table 1-12 for electric energy within I&M's territory. The 2040 technical potential for solar PV is more than 8.3 million MWh.

TABLE 1-11: SUMMARY OF I&M SYSTEM-LEVEL SOLAR PV ELECTRIC DEMAND MARKET POTENTIAL

Year	Technical DC Capacity (MW)	Technical Peak Capacity (MW)	Economic (MW)	MAP (MW)	RAP (MW)
2025	1,054	329	0	0	0
2028	3,126	976	0	0	0
2040	7,824	2,440	0	0	0

TABLE 1-12: SUMMARY OF I&M SYSTEM-LEVEL SOLAR ELECTRIC ENERGY MARKET POTENTIAL

Year	Technical (MWh)	Economic (MWh)	MAP (MWh)	RAP (MWh)
2025	1,117,122	0	0	0
2028	3,306,381	0	0	0
2040	8,249,617	0	0	0

1.6.5.2 Combined Heat and Power

Table 1-13 summarizes the I&M system-level CHP cumulative annual potential estimates for electric demand and Table 1-14 for electric energy within I&M's service territories. The 2040 technical potential for CHP is more than 2 million MWh.

TABLE 1-13: SUMMARY OF I&M SYSTEM-LEVEL CHP ELECTRIC DEMAND MARKET POTENTIAL

Year	Technical DC Capacity (MW)	Technical Peak Capacity (MW)	Economic (MW)	MAP (MW)	RAP (MW)
2025	41	29	0	0	0
2028	125	89	0	0	0
2040	336	239	0	0	0

TABLE 1-14: SUMMARY OF I&M SYSTEM-LEVEL CHP ELECTRIC ENERGY MARKET POTENTIAL

Year	Technical (MWh)	Economic (MWh)	MAP (MWh)	RAP (MWh)
2025	252,376	0	0	0
2028	771,121	0	0	0
2040	2,079,016	0	0	0

1.7 STUDY LIMITATIONS AND CAVEATS

As with any assessment of potential, this study necessarily builds on various assumptions and data sources, including the following:

- Energy efficiency measure lives, savings, and costs (total measure costs, incremental costs, and incentive costs)
- Projected penetration rates for energy efficiency measures
- Projections of energy avoided costs
- Future known changes to codes and standards
- End-use saturations and fuel shares

While the GDS Team has sought to use the best and most current available data (including the use of new primary market research in key market subsegments of interest based on stakeholder feedback) there are often reasonable alternative assumptions which would yield slightly different results. For instance, the analysis assumes that many existing measures, regardless of their current efficiency levels, can be eligible for future installation and savings opportunities. Other studies may select a narrower viewpoint, limiting the amount of potential from equipment that is already considered to be energy efficient. Additionally, the models used in this analysis must make several assumptions regarding program delivery and the timing of equipment replacement that may ultimately occur more rapidly (or more slowly) than currently forecasted.

Furthermore, while the lists of energy efficiency measures examined in this study analysis represent technologies available on the market today as well as a limited number of emerging technologies not currently offered by I&M, these measure lists may not be exhaustive. The GDS Team acknowledges that new efficient technologies may become available over the course of the 20-year study timeframe that could produce efficiency gains and costs at different levels than those currently assumed.

Last, where possible, the GDS Team and I&M collaborated to ensure consistency with assumptions and methodological considerations that are expected to be employed by during the program planning process. However, final program designs and implementation strategies may need additional flexibility to target specific or underserved markets, address equity concerns, or react to changing customer preferences.

GDS Associates, Inc.
ENGINEERS & CONSULTANTS

INDIANA MICHIGAN POWER℠
An AEP Company

2021 POTENTIAL STUDY

EXECUTIVE SUMMARY

September
2021

prepared by
GDS ASSOCIATES INC
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