Indiana Michigan Power Company
Energy Efficiency Market Potential Study

Executive Summary

Final Report

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Introduction

Indiana Michigan Power Company (I&M) contracted with Applied Energy Group (AEG) to conduct an Energy Efficiency Market Potential Study to assess the future potential for savings through its programs, to identify opportunities that will enhance savings and create program designs that assist I&M in the planning process. Key objectives for the study include:

- Develop credible and transparent energy efficiency potential estimates for 2017 through 2036 within the Indiana and Michigan service territory.
- Assess potential energy savings (including kW and kWh) associated with each potential area by measure or bundled measure and sector.
- Perform the analysis for Indiana and Michigan separately and present the results separately and for both together.
- Conduct sensitivity analysis that excludes opt-out customer load within the I&M Indiana Commercial and Industrial sectors.
- Provide an executable dynamic model that will support the potential assessment and allow for testing of sensitivity of all model inputs and assumptions.
- Develop a final report including summary data tables and graphs reporting incremental and cumulative potential by year from 2017 through 2036.
- Develop an energy efficiency portfolio for 2017-2036 based on the potential study results using high, medium, and low spending levels.

The study assesses various tiers of energy efficiency potential including technical, economic, maximum achievable, and realistic achievable. The study developed updated baseline projection by measure and end use with the latest information on federal, state, and local codes and standards for improving energy efficiency. The baseline projection is only used for modeling purposes; in the final report, potential estimates are compared against the official I&M forecast that AEG received from I&M. This intermediate process provides foundation for the development of measure-level potential and program portfolios for I&M's future Integrated Resource Planning (IRP) process.

This report presents the study results summarized for Indiana Michigan's entire service territory.

Abbreviations and Acronyms

Throughout the report we use several abbreviations and acronyms. Table 1-1 shows the abbreviation or acronym, along with an explanation.

Table 1-1 Explanation of Abbreviations and Acronyms

Acronym	Explanation
AEO	Annual Energy Outlook forecast developed by EIA
B/C Ratio	Benefit to Cost Ratio
BEST	AEG's Building Energy Simulation Tool
DSM	Demand Side Management
EE	Energy Efficiency
EIA	Energy Information Administration
EUI	Energy Usage Intensity (kWh/sq. ft.)
HH	Household
HVAC	Heating Ventilation and Air Conditioning
LoadMAP	AEG's Load Management Analysis and Planning™ tool
MW	Megawatt
RTU	Roof Top Unit
TRC	Total Resource Cost test
UEC	Unit Energy Consumption

Analysis Approach

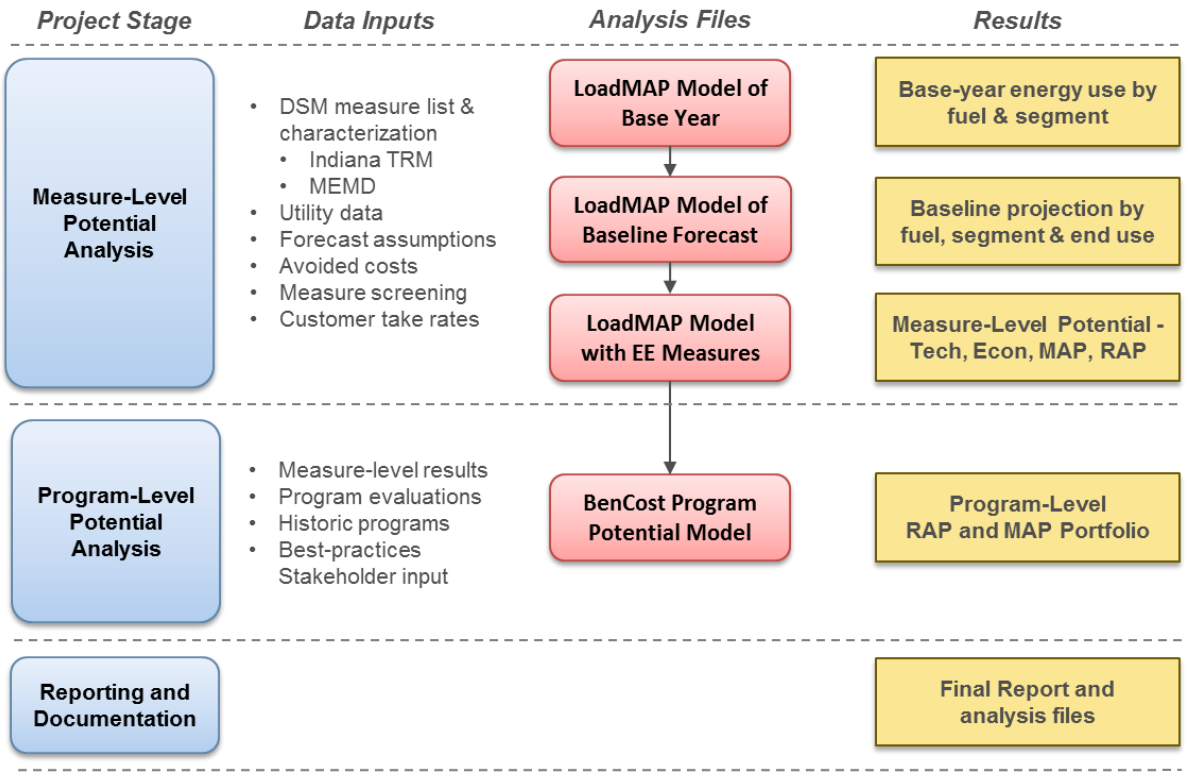
This section describes the analysis approach taken for the study to develop the potential estimates and program design.

Overview of Analysis Approach

To perform the analysis, AEG used a bottom-up approach, illustrated in Figure 2-1, following the major steps listed below. We describe these steps in more detail throughout the remainder of this chapter.

1. Perform a market characterization to describe sector-level electricity use for the residential, commercial and industrial sectors for the base year, 2015.
2. Develop a baseline projection of energy consumption and peak demand by sector, segment, and end use for 2017 through 2036. The baseline projection is an intermediate step for estimating potential and is not presented in the report. For purposes of comparing potential savings to the load forecast, we use the official I&M load forecast.
3. Define and characterize energy efficiency measures to be applied to all sectors, segments, and end uses.
4. Estimate measure-level technical, economic, and achievable potential in terms of energy and peak demand impacts from EE measures for 2017-2036.
5. Develop estimates of program-level potential based on the measure-level potential.

Figure 2-1 Analysis Framework



Definitions of Potential

In this study, the energy efficiency potential estimates represent net savings[1] developed into several levels of potential. At the measure-level, before delivery mechanisms and program costs are considered, there are four levels: technical potential, economic potential, maximum achievable potential, and realistic achievable potential. Technical and economic potential are both theoretical limits to efficiency savings and would not be realizable in actual programs. Achievable potential embodies a set of assumptions about the decisions consumers make regarding the efficiency of the equipment they purchase, the maintenance activities they undertake, the controls they use for energy-consuming equipment, and the elements of building construction. These levels are described in more detail below.

- **Technical Potential** is the theoretical upper limit of energy efficiency potential, assuming that customers adopt all feasible measures regardless of cost or customer preference. At the time of existing equipment failure, customers replace their equipment with the most efficient option available. In new construction, customers and developers also choose the most efficient equipment option.
- **Economic Potential**, represents the adoption of all ***cost-effective*** energy efficiency measures. Cost-effectiveness is measured by the total resource cost (TRC) test, which compares lifetime energy and capacity benefits to the costs of the delivering the measure. If the benefits outweigh the costs (the TRC ratio is equal to or greater than 1.0), a given measure is included in the economic potential. Customers are then assumed to purchase the most cost-effective option applicable to them at any decision juncture. Economic potential is still a hypothetical upper-boundary of savings potential as it represents only measures that are economic but does not yet consider customer acceptance and other factors.
- **Maximum Achievable Potential (MAP)** estimates customer adoption of economic measures when delivered through DSM programs under ideal market, implementation, and customer preference conditions and an appropriate regulatory framework. Information channels are assumed to be established and efficient for marketing, educating consumers, and coordinating with trade allies and delivery partners. Maximum Achievable Potential establishes a maximum target for the savings that an administrator can hope to achieve through its DSM programs and involves incentives that represent a substantial portion of the incremental cost combined with high administrative and marketing costs.
- **Realistic Achievable Potential (RAP)** reflects expected program participation given barriers to customer acceptance, non-ideal implementation conditions, and limited program budgets.

At the program-level, there are three levels of potential: high, mid and low.

- **High Scenario** reflects expected program participation given ideal market implementation and few barriers to customer adoption. Information channels are assumed to be established and efficient for marketing, educating consumers, and coordinating with dealers and delivery partners. Under this scenario, incentives represent a substantial portion of the incremental cost combined with high administrative and marketing costs.
- **Mid Scenario** reflects expected program participation given barriers to customer acceptance and non-ideal implementation conditions. These measures are delivered under less than ideal market conditions, however, there are less barriers and less limitations on budgets than there would be under the low scenario.
- **Low Scenario** reflects low program participation given high barriers to customer acceptance, non-ideal implementation conditions, limited program budgets and limited access to support for implementation as well as education and outreach.

[1] "Net" savings mean that the baseline forecast includes naturally occurring efficiency. In other words, the baseline assumes that energy efficiency levels reflect that some customers are already purchasing the more efficient option.

LoadMAP Model

For the measure-level energy efficiency potential analysis, AEG used its Load Management Analysis and Planning tool (LoadMAP™) version 4.0 to develop both the baseline projection and the estimates of potential. AEG developed LoadMAP in 2007 and has enhanced it over time, using it for more than 50 potential studies in the past five years. Built in Microsoft Excel®, the LoadMAP framework is both accessible and transparent and has the following key features.

- Embodies the basic principles of rigorous end-use models (such as EPRI's REEPS and COMMEND) but in a more simplified, accessible form.
- Includes stock-accounting algorithms that treat older, less efficient appliance/equipment stock separately from newer, more efficient equipment. Equipment is replaced according to the measure life and appliance vintage distributions defined by the user.
- Balances the competing needs of simplicity and robustness by incorporating important modeling details related to equipment saturations, efficiencies, vintage, and the like, where market data are available, and treats end uses separately to account for varying importance and availability of data resources.
- Isolates new construction from existing equipment and buildings and treats purchase decisions for new construction and existing buildings separately.
- Uses a simple logic for appliance and equipment decisions. Other models available for this purpose embody complex decision choice algorithms or diffusion assumptions, and the model parameters tend to be difficult to estimate or observe and sometimes produce anomalous results that require calibration or even overriding. The LoadMAP approach allows the user to drive the appliance and equipment choices year by year directly in the model. This flexible approach allows users to import the results from diffusion models or to input individual assumptions. The framework also facilitates sensitivity analysis.
- Includes appliance and equipment models customized by end use. For example, the logic for lighting is distinct from refrigerators and freezers.
- Can accommodate various levels of segmentation. Analysis can be performed at the sector level (e.g., total residential) or for customized segments within sectors (e.g., housing type, income level, or business type).

Consistent with the segmentation scheme and the market profiles we describe below, the LoadMAP model provides forecasts of baseline energy use by sector, segment, end use, and technology for existing and new buildings. It also provides forecasts of total energy use and energy-efficiency savings associated with the various types of potential.[2]

BenCost Model

For the program-level potential analysis, AEG used its BenCost™ tool. BenCost is a Microsoft Excel®-based modeling platform that uses the fundamental principles of cost-effectiveness economics and is consistent with industry best-practices, including the California Standard Practice Manual. Key features of the BenCost model include:

- BenCost is customized to accommodate inputs provided directly from the utility client. BenCost uses avoided costs, discounts rates, and DSM performance data provided by the client and can directly use client-specific results from AEG's LoadMAP model.
- BenCost is not a "black-box" that obscures analysis details from users. The methodology, inputs, calculations, and assumptions used in the cost-effectiveness modeling are fully contained and populated when the model is delivered to our clients, along with training, in order to ensure understanding and transparency.

[2] The model computes energy and peak-demand forecasts for each type of potential for each end use as an intermediate calculation. Annual energy and peak demand savings are calculated as the difference between the I&M forecast and the value in the potential forecast (e.g., the technical potential forecast).

- AEG has submitted results from BenCost to regulatory agencies and stakeholder groups as part of formal DSM proceedings across multiple jurisdictions and regions of the country. Outputs are tailored to meet the precise reporting requirements established by regulatory commissions. For example, we routinely report results using various timeframes (annual, cumulative, etc.) and scenarios (net, gross, etc.).
- The model calculates all major benefit-cost tests and variants for each measure, program, and portfolio in each year examined; including the Total Resource Cost Test, Societal Cost Test, Participant Cost Test, Utility Cost Test (also known as the Program Administrator Cost Test) and Ratepayer Impact Measure Test.

Market Characterization

In order to estimate the savings potential from energy-efficient measures, it is necessary to understand how much energy is used today and what equipment is currently being used.

Segmentation for Modeling Purposes

The characterization begins with a segmentation of I&M's electricity footprint to quantify energy use by sector, segment, end-use application, and the current set of technologies used. The segmentation scheme for this project is presented in Table 2-1.

Table 2-1 Overview of I&M Analysis Segmentation Scheme

Dimension	Segmentation Variable	Description
1	Sector	Residential, Commercial and Industrial
2	Segment	**Residential**: single family, multi-family, mobile home/manufactured, low income **Commercial**: office, restaurant, retail, grocery, college, school, health, lodging, warehouse, public/government, miscellaneous **Industrial:** food products, chemical, primary metal, manufacturing, plastics/stone, and other industrial
3	Vintage	Existing and new construction
4	End uses	Cooling, lighting, water heat, motors, etc. (as appropriate)
5	Appliances/end uses and technologies	Technologies such as lamp type, air conditioning equipment, motors by application, etc.
6	Equipment efficiency levels for new purchases	Baseline and higher-efficiency options as appropriate for each technology

With the segmentation scheme defined, we then performed a high-level market characterization of electricity sales in the base year, 2015, to allocate sales to each customer segment. We used I&M billing and customer data, I&M market research and secondary sources to allocate energy use and customers to the various sectors and segments such that the total customer count, energy consumption, and peak demand matched the I&M system totals from 2015 billing data. This information provided control totals at a sector level for calibrating the LoadMAP model to known data for the base-year.

Market Profiles

The next step was to develop market profiles for each sector, customer segment, end use, and technology. A market profile includes the following elements:

- **Market size** is a representation of the number of customers in the segment. For the residential sector, it is number of households. The commercial sector is floor space measured in square feet and the industrial sector is number of employees.
- **Saturations** define the fraction of homes, square feet, or employees with the various technologies (e.g., homes with electric space heating).

- **UEC (unit energy consumption) or EUI (energy-use index)** describes the amount of energy consumed annually by a specific technology in buildings that have the technology. The UECs are expressed in kWh per household for the residential sector and EUIs are expressed in kWh per square foot or employees for the commercial and industrial sectors.
- **Annual energy intensity** represents the average energy use for the technology across all homes, floor space, or employees in 2015. The residential sector intensity is computed as the product of the saturation and the UEC. The commercial and industrial sector intensity is computed as the product of the saturation and the EUI.
- **Annual usage** is the annual energy use by an end-use technology in the segment. It is the product of the market size and intensity and is quantified in GWh.
- **Summer peak demand** for each technology are calculated using peak fractions of annual energy use developed using I&M's system peak data and AEG's EnergyShape end-use load shape library.

The market characterization results and the market profiles are presented in Chapter 4.

Baseline Projection

The next step was to develop the baseline projection of annual electricity use and summer peak demand for 2015 through 2036 by customer segment and end use without new utility programs. The end-use projection includes the relatively certain impacts of codes and standards that will unfold over the study timeframe. All such mandates that were defined as of December 2015 are included in the baseline.

Inputs to the baseline projection include:

- Customer growth forecast from I&M's load forecast
- Trends in fuel shares and equipment saturations
- Existing and approved changes to building codes and equipment standards

We also developed a baseline projection for summer peak by applying the peak factors from the energy market profiles to the annual energy forecast in each year.

The baseline projection is an intermediate analysis step for estimating potential and is not presented in the report. For purposes of comparing savings to the load forecast without future energy efficiency programs, we use the official Indiana Michigan load forecasts.

Energy Efficiency Measure Analysis

This section describes the framework for the energy efficiency measure analysis. The framework, shown in Figure 2-2, involves identifying a list of energy efficiency measures to include in the analysis, determining their applicability to each market sector and segment, fully characterizing each measure, and performing cost-effectiveness screening.

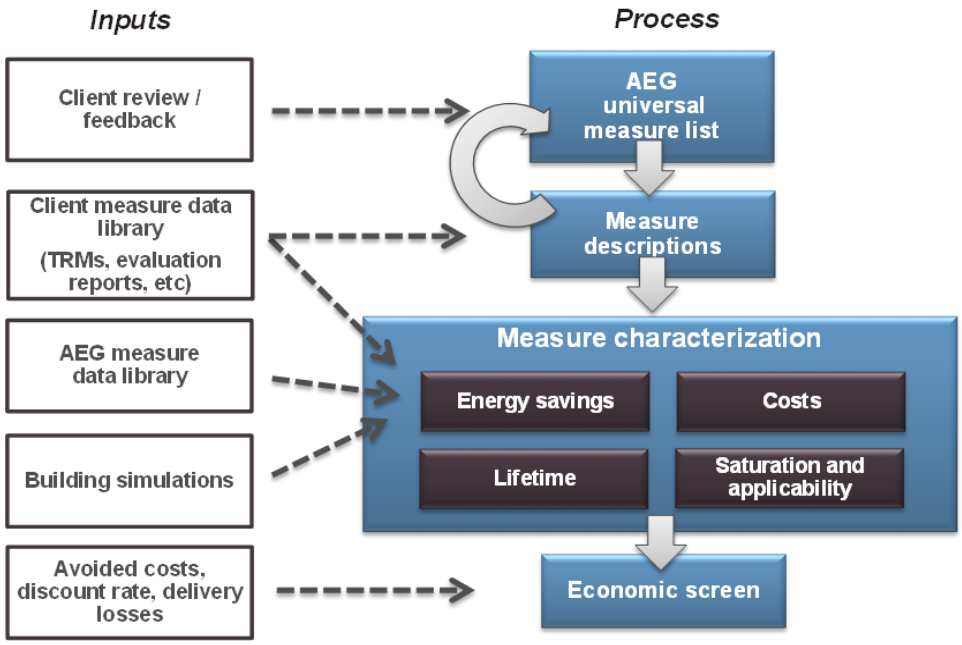
A comprehensive list of energy efficiency measures was developed for each customer sector, drawing upon I&M's current programs, AEG's measure database and measure lists developed from previous studies. The list of measures covers all major types of end-use equipment, as well as devices and actions to reduce energy consumption.[3] Indiana Michigan and their stakeholders reviewed the measure list.

Each measure was characterized with energy and demand savings, incremental cost, service life, and other performance factors, drawing upon data from the Indiana Technical Reference Manual, Michigan Energy Measure Database, AEG measure database and well-vetted national and regional sources.[4] We performed an economic screening of each measure, which serves as the

[3] Behavioral measures were not included in the potential analysis as they are not installable measures.
[4] Data sources are detailed in Section 3.

basis for developing the economic and achievable potential, utilizing the measure information along with I&M's avoided cost data.

Figure 2-2 Approach for Energy-Efficiency Measure Assessment



The selected measures are categorized into two types according to the LoadMAP taxonomy:

- **Equipment measures** are efficient energy-consuming pieces of equipment that save energy by providing the same service with a lower energy requirement than a standard unit. An example is an ENERGY STAR refrigerator that replaces a standard efficiency refrigerator. For equipment measures, many efficiency levels may be available for a given technology, ranging from the baseline unit (often determined by code or standard) up to the most efficient product commercially available. For instance, in the case of central air conditioners, this list begins with the current federal standard SEER 13 unit and spans a broad spectrum up to a maximum efficiency of a SEER 24 unit.
- **Non-equipment measures** save energy by reducing the need for delivered energy, but do not involve replacement or purchase of major end-use equipment (such as a refrigerator). An example would be a programmable thermostat that is pre-set to run heating and cooling systems only when people are home. Non-equipment measures can apply to more than one end use. For instance, wall insulation will affect the energy use of both space heating and cooling. Non-equipment measures typically fall into one of the following categories:
  - Building shell (windows, insulation, roofing material)
  - Equipment controls (thermostat, energy management system)
  - Equipment maintenance (cleaning filters, changing set-points)
  - Whole-building design (building orientation, passive solar lighting)
  - Commissioning and retro commissioning (monitoring of building energy systems)

Screening Energy-Efficiency Measures for Cost-Effectiveness

Only measures that are cost-effective were included in economic and achievable measure-level potential. Measures were first screened for cost-effectiveness within LoadMAP for inclusion in the economic and achievable potential scenarios. LoadMAP utilized the TRC test for measure-level cost-effectiveness screening (i.e., a TRC benefit-cost ratio of at least 1.0). The LoadMAP model performs this screening dynamically, taking into account changing savings and cost data over

time. Thus, some measures pass the economic screen for some — but not all — of the years in the projection.

The Total Resource Cost Test (TRC) is the primary method of assessing the cost-effectiveness of energy efficient measures. The TRC test is a widely-accepted methodology that has been used across the United States for over twenty-five years. TRC measures the net costs and benefits of an energy efficiency program as a resource option based on the total costs of the program, including both the participant's and the utility's costs. This test represents the combination of the effects of a program on both participating and non-participating customers.

Three other benefit-cost tests were utilized to analyze program-level cost-effectiveness from different perspectives:

- *Participant Cost Test* quantifies the benefits and costs to the customer due to program participation.
- *Ratepayer Impact Measure Cost Test* measures what happens to a customer's rates due to changes in utility revenues and operating costs.
- *Utility Cost Test* measures the net costs of a program as a resource option based on the costs incurred by the program administrator, excluding any net costs incurred by the participant.

It is important to note the following about the economic screen within LoadMAP:

- The economic evaluation of every measure in the screen is conducted relative to a baseline condition. For instance, in order to determine the kilowatt-hour (kWh) savings potential of a measure, kWh consumption with the measure applied must be compared to the kWh consumption of a baseline condition.
- The economic screening was conducted only for measures that are applicable to each building type and vintage. Thus, if a measure is deemed to be irrelevant to a particular building type and vintage, it is excluded from the respective economic screen.
- If multiple equipment measures have B/C ratios greater than or equal to 1.0, the most efficient technology is selected by the economic screen.

Measures that were cost-effective within LoadMAP were included in the economic and achievable potential.

Calculation of Energy Efficiency Potential

The approach we used to calculate the energy efficiency potential adheres to the approaches and conventions outlined in the National Action Plan for Energy-Efficiency (NAPEE) Guide for Conducting Potential Studies.[5] The NAPEE Guide represents the most credible and comprehensive industry practice for specifying energy efficiency potential.

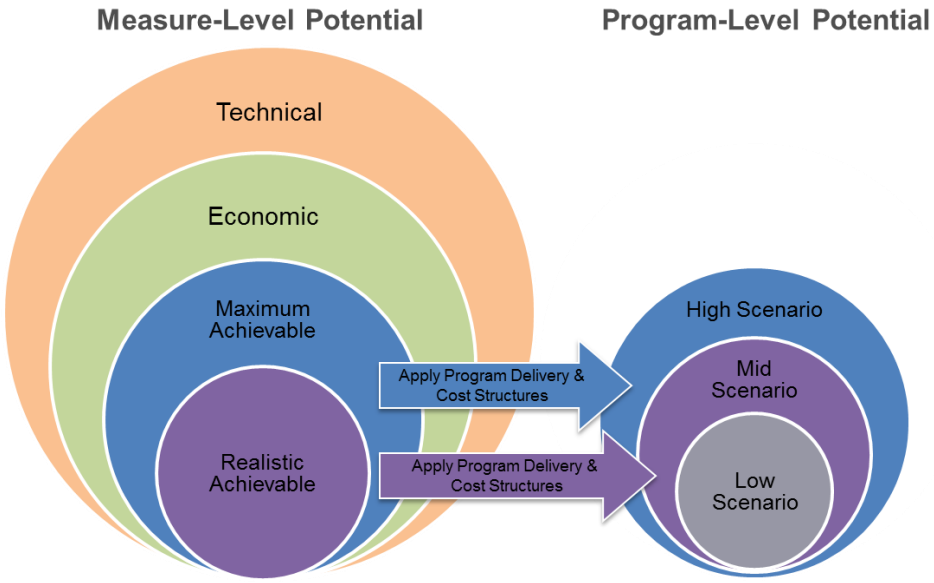
The calculation of **Technical** and **Economic Potential** is a straightforward algorithm, phasing in the theoretical maximum efficiency units and screening them for cost-effective economics. To develop estimates for **Achievable Potential**, we develop market adoption rates for each measure that specify the percentage of customers that will select the highest–efficiency economic option.

Development of Program Potential

The maximum achievable potential (MAP) and realistic achievable potential (RAP) results were vetted for inclusion in a DSM program. Measure input data was exported into BenCost, including gross savings, measure life and incremental cost. Measures were bundled into programs and re-screened for cost-effectiveness. The program design screened programs utilizing all four benefit-cost tests but relied on the UCT test to determine cost-effectiveness.

[5] National Action Plan for Energy Efficiency (2007). *National Action Plan for Energy Efficiency Vision for 2025: Developing a Framework for Change*. www.epa.gov/eeactionplan.

Figure 2-3 Program Potential Levels



General considerations when translating from measure-level potential to program-level potential:

- Consider programs that include measures that are not cost-effective on a stand-alone basis.
- Consider multiple efficiency levels for a particular technology.
- May exclude some measures that have very small potential or are challenging to implement.
- Application of net-to-gross ratios may affect savings.
- The addition of program administrative & delivery costs may render certain measure bundles/programs not cost-effective.
- May adjust participation rates to reflect priorities.

Data Development

This section details the data sources used in this study and describes how these sources were applied. In general, data was adapted to local conditions, for example, by using local sources for measure data and local weather for building simulations.

Data Sources

The data sources are organized into the following categories:

- Indiana Michigan Power Company data
- Energy efficiency measure data
- AEG's databases and analysis tools
- Other secondary data and reports

Indiana Michigan Power Company (I&M) Data

Our highest priority data sources for this study were those that were specific to I&M.

- **I&M customer data:** I&M provided 2015 residential customers and usage data as well as nonresidential billing data. The nonresidential billing data was utilized to develop customer counts and energy use for each commercial and industrial segment.
- **Load forecasts:** I&M provided its most recent load and peak forecasts. I&M also provided an economic growth forecast by sector and electric load forecast by sector.
- **Economic information:** I&M provided a forecast of avoided costs, forecast of retail electricity rates by sector, discount rate, and line loss factor.
- **Residential saturation survey:** In 2013 and 2016, I&M conducted residential customer surveys to characterize equipment and measure saturation.
- **Indiana Michigan program data**: I&M provided information about past and current DSM programs, including program descriptions, goals, and achievements to date.

Energy Efficiency Measure Data

Several sources of data were used to characterize the energy efficiency measures. We used the following national and well-vetted regional data sources and supplemented with AEG's data sources to fill in any gaps.

- **Appliance and Equipment Standards.** The study utilized data from the U.S. Department of Energy,[6] Energy Star[7] and the Consortium for Energy Efficiency[8] to determine baseline savings as well as efficient savings.
- **Indiana Technical Reference Manual.** Indiana Demand Side Management Coordination Committee, EM&V Subcommittee. Version 2.2, dated July 28, 2015. Prepared by Cadmus Group, Inc.
- **Michigan Energy Measures Database.** Michigan Public Service Commission (2016). Prepared by Morgan Marketing Partners.

[6] U.S. Department of Energy. Current Rulemakings and Notices. http://energy.gov/eere/buildings/current-rulemakings-and-notices
[7] Energy Star. Product Specifications and Partner Commitments Search. http://www.energystar.gov/products/spec/
[8] Consortium for Energy Efficiency. Program Resources. https://www.cee1.org/

AEG Data

AEG maintains several databases and modeling tools that we use for forecasting and potential studies. Relevant data from these tools has been incorporated into the analysis and deliverables for this study.

- **AEG Energy Market Profiles**: For more than 10 years, AEG staff has maintained profiles of end-use consumption for the residential, commercial and industrial sectors. These profiles include market size, fuel shares, unit consumption estimates, and annual energy use, customer segment and end use for 10 regions in the United States. The Energy Information Administration surveys (RECS, CBECS and MECS) as well as state-level statistics and local customer research provide the foundation for these regional profiles.
- **Building Energy Simulation Tool (BEST)**. AEG's BEST is a derivative of the DOE 2.2 building simulation model, used to estimate base-year UECs and EUIs, as well as measure savings for the HVAC-related measures.
- **AEG's EnergyShape™:** This database of load shapes includes the following:
  - Residential – electric load shapes for ten regions, three housing types, 13 end uses
  - Nonresidential – electric load shapes for nine regions, 54 building types, ten end uses
- **AEG's Database of Energy Efficiency Measures (DEEM):** AEG maintains an extensive database of measure data for our studies. Our database draws upon reliable sources including the California Database for Energy Efficient Resources (DEER), the EIA Technology Forecast Updates – Residential and Nonresidential Building Technologies – Reference Case, RS Means cost data, and Grainger Catalog Cost data.
- **Recent studies**. AEG has conducted numerous studies of EE potential in the last five years. We checked our input assumptions and analysis results against the results from these other studies, which include NIPSCO, Indianapolis Power & Light, PacifiCorp, Vectren Energy, and Ameren Illinois. In addition, we used the information about impacts of building codes and appliance standards from recent reports for the Edison Electric Institute.[9]

Other Secondary Data and Reports

Finally, a variety of secondary data sources and reports were used for this study. The main sources are identified below.

- **Annual Energy Outlook**. The Annual Energy Outlook (AEO), conducted each year by the U.S. Energy Information Administration (EIA), presents yearly projections and analysis of energy topics. For this study, we used data from the 2015 AEO.
- **American Community Survey.** The US Census American Community Survey is an ongoing survey that provides data every year on household characteristics.
- **Local Weather Data:** Weather from NOAA's National Climatic Data Center for Indiana was used as the basis for building simulations.
- **Other relevant regional sources:** These include reports from the Consortium for Energy Efficiency, the EPA, and the American Council for an Energy-Efficient Economy.

[9] AEG staff has prepared three white papers on the topic of factors that affect U.S. electricity consumption, including appliance standards and building codes. Links to all three white papers are provided:
http://www.edisonfoundation.net/IEE/Documents/IEE_RohmundApplianceStandardsEfficiencyCodes1209.pdf
http://www.edisonfoundation.net/iee/Documents/IEE_CodesandStandardsAssessment_2010-2025_UPDATE.pdf.
http://www.edisonfoundation.net/iee/Documents/IEE_FactorsAffectingUSElecConsumption_Final.pdf

Data Application

We now discuss how the data sources described above were used for each step of the study.

Data Application for Market Characterization

To construct the high-level market characterization of electricity use and households/floor space for the residential, commercial and industrial sectors, we used I&M billing data and residential customer surveys as well as secondary data.

- For the residential sector, AEG estimated the numbers of customers and the average energy use per customer for each segment based on I&M's 2013 and 2016 customer survey and 2015 residential sales data. Low income customers were identified from the American Community Survey and allocated to a housing type based upon I&M-specific data on customers that receive energy assistance.
- For the commercial and industrial sectors, AEG estimated the sales by segment based on I&M 2015 customer billing data.

Data Application for Market Profiles

The specific data elements for the market profiles, together with the key data sources, are shown in Table 3-1. To develop the market profiles for each segment, we used the following approach:

1. Develop control totals for each segment. These include market size, segment-level annual electricity use, and annual intensity.
2. Utilize the results of the 2013 and 2016 residential saturation survey and AEG's Energy Market Profiles database to develop existing appliance saturations, appliance and equipment characteristics, and building characteristics. We also incorporated secondary sources to supplement and corroborate the data.
3. Ensure calibration to control totals for annual electricity sales in each sector and segment.
4. Compare and cross-check with other recent AEG studies.
5. Work with I&M staff to vet the data against their knowledge and experience.

Table 3-1 Data Applied for the Market Profiles

Model Inputs	Description	Key Sources
Market size	Base-year residential dwellings and commercial floor space, industrial employment	I&M billing data I&M residential survey AEO 2015
Annual intensity	Residential: Annual use per household Commercial: Annual use per square foot Industrial: Annual use per employee	I&M billing data AEG's Energy Market Profiles AEO 2015 Other recent studies
Appliance/equipment saturations	Fraction of dwellings with an appliance/technology Percentage of commercial floor space/employment with technology	I&M residential survey AEG's Energy Market Profiles Other recent studies
UEC/EUI for each end-use technology	UEC: Annual electricity use in homes and buildings that have the technology EUI: Annual electricity use per square foot/employee for a technology in floor space that has the technology	HVAC uses: BEST simulations using prototypes developed for Indiana Engineering analysis AEG's DEEM Recent AEG studies AEO 2015
Appliance/equipment age distribution	Age distribution for each technology	AEG's DEEM Recent AEG studies
Efficiency options for each technology	List of available efficiency options and annual energy use for each technology	I&M DSM program Indiana TRM Michigan MEMD AEG's DEEM AEO 2015 Previous studies
Peak factors	Share of technology energy use that occurs during the system peak hour	I&M system peak EnergyShape database

Data Application for Baseline Projection

Table 3-2 summarizes the LoadMAP model inputs required for the baseline projection. These inputs are required for each segment within each sector for existing dwellings/buildings as well as new construction.

We implemented assumptions for known future equipment standards as of December 2015, as shown in Table 3-3 and Table 3-4. The assumptions tables here extend through 2025, after which all standards are assumed to hold steady. However, the residential water heater federal standard effective April 2015 is incrementally phased into effect as the baseline over a two year period. Additionally, nonresidential T12s are incremental phased-out as the baseline over a two year baseline. These incremental changes reflect the availability of equipment on the market for a short period of time after federal standards are enacted. The baseline projection is an intermediate analysis step for estimating potential and is not presented in the report. For purposes of comparing savings to the load forecast without future energy efficiency programs, we use the official I&M forecast.

Table 3-2 Data Needs for the Baseline Projection and Potentials Estimation in LoadMAP

Model Inputs	Description	Key Sources
Customer growth forecasts	Forecasts of new construction in residential, commercial and industrial sectors	I&M load forecast AEO 2015 economic growth forecast
Equipment purchase shares for baseline projection	For each equipment/technology, purchase shares for each efficiency level; specified separately for existing equipment replacement and new construction	Shipments data from AEO AEO 2015 regional forecast assumptions[10] Appliance/efficiency standards analysis I&M DSM program and evaluation reports
Electricity prices	Forecast of average energy and capacity avoided costs and retail prices	I&M forecast

Table 3-3 Residential Electric Equipment Standards[11]

Technology	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Central AC	SEER 13										
Room AC	EER 11.0										
Electric Resistance	Space Heating										
Heat Pump	SEER 14.0/HSPF 8.0										
Water Heater (<=55 gallons)	EF 0.95										
Water Heater (>55 gallons)	Heat Pump Water Heater										
Screw-in/Pin Lamps	Advanced Incandescent (20 lumens/watt)					Advanced Incandescent (45 lumens/watt)					
Linear Fluorescent	T8 (89 lumens/watt)				T8 (92.5 lumens/watt)						
Refrigerator	25% more efficient										
Freezer	25% more efficient										
Clothes Washer	MEF 1.72 for top loader				MEF 2.0 for top loader						
Clothes Dryer	5% more efficient (EF 3.17)										
Furnace Fans	Conventional				40% more efficient						

Table 3-4 Nonresidential Electric Equipment Standards

Technology	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Chillers	2007 ASHRAE 90.1										
Roof Top Units	EER 11.0/11.2										
PTAC	EER 11.7		EER 11.9								
Heat Pump	EER 11.0/COP 3.3										
PTHP	EER 11.9/COP 3.3										
Ventilation	Constant Air Volume/Variable Air Volume										
Screw-in/Pin Lamps	Advanced Incandescent (20					Advanced Incandescent (45 lumens/watt)					
Linear Fluorescent	T8 (89 lumens/watt)			T8 (92.5 lumens/watt)							
High Intensity Discharge	EPACT 2005		Metal Halide Ballast Improvement								
Water Heater	EF 0.97										
Walk-in Refrigerator/Freezer	EISA 2007		10-38% more efficient								
Reach-in	EPACT 2005		40% more efficient								
Glass Door Display	EPACT 2005		12-28% more efficient								
Open Display Case	EPACT 2005		10-20% more efficient								
Ice maker	EPACT 2005				15% more efficient						
Pre-rinse Spray Valve	1.6 GPM					1.0 GPM					
Motors	EISA 2007	Expanded EISA 2007									

[10] We developed baseline purchase decisions using the Energy Information Agency's AEO 2015, which utilizes the National Energy Modeling System (NEMS) to produce a self-consistent supply and demand economic model. We calibrated equipment purchase options to match manufacturer shipment data for recent years and then held values constant for the study period. This removes any effects of naturally occurring conservation or effects of future programs that may be embedded in the AEO forecasts.

[11] The assumptions tables here extend through 2025, after which all standards are assumed to hold steady.

Energy Efficiency Measure Data Application

Table 3-5 details the energy-efficiency data inputs to the LoadMAP model. It describes each input and identifies the key sources used in the I&M analysis.

Table 3-5 Data Needs for the Measure Characteristics in LoadMAP

Model Inputs	Description	Key Sources
Energy Impacts	The annual reduction in consumption attributable to each specific measure. Savings were developed as a percentage of the energy end use that the measure affects.	Michigan MEMD Indiana TRM BEST AEG's DEEM AEO 2015 California DEER Other secondary sources
Peak Demand Impacts	Savings during the peak demand periods are specified for each electric measure. These impacts relate to the energy savings and depend on the extent to which each measure is coincident with the system peak.	Michigan MEMD Indiana TRM BEST AEG's DEEM AEG EnergyShape
Costs	Equipment Measures: Includes the full cost of purchasing and installing the equipment on a per-unit basis. Non-equipment measures: Existing buildings – full installed cost. New Construction - the costs may be either the full cost of the measure, or as appropriate, it may be the incremental cost of upgrading from a standard level to a higher efficiency level.	Michigan MEMD Indiana TRM AEG's DEEM AEO 2015 California DEER RS Means Other secondary sources
Measure Lifetimes	Estimates derived from the technical data and secondary data sources that support the measure demand and energy savings analysis.	Michigan MEMD Indiana TRM AEG's DEEM AEO 2015 California DEER Other secondary sources
Applicability	Estimate of the percentage of dwellings in the residential sector, square feet in the commercial sector or employees in the industrial sector where the measure is applicable and where it is technically feasible to implement.	I&M measure data AEG's DEEM California DEER Other secondary sources
On Market and Off Market Availability	Expressed as years for equipment measures to reflect when the equipment technology is available or no longer available in the market.	AEG appliance standards and building codes analysis

Data Application for Cost-effectiveness Screening

To perform the cost-effectiveness screening, a number of economic assumptions were needed. All cost and benefit values were analyzed as real 2015 dollars. We applied a discount rate of 7.29% in in real dollars. All impacts in this report are presented at the customer meter.

Achievable Potential Estimation

To estimate achievable potential, two sets of parameters are needed to represent customer decision making behavior with respect to energy-efficiency choices.

- **Technical diffusion curves for non-equipment measures**. Equipment measures are installed when existing units fail. Non-equipment measures do not have this natural periodicity, so rather than installing all available non-equipment measures in the first year of the projection (instantaneous potential), they are phased in according to adoption schedules that generally align with the diffusion of similar equipment measures.
- **Achievable adoption rates** Customer adoption rates or take rates are applied to Economic potential to estimate two levels of Achievable Potential, as described Section 2. These rates were developed from program interest surveys conducted by AEG in nearby regions. AEG mapped these rates to each equipment and non-equipment measure. These rates are then compared with the recent I&M program results and adjustments were made, if necessary. For example, if the program had been running for several years and had achieved higher results in the previous year, the ramp rate started further along in the curve. These rates represent customer adoption of economic measures when delivered through a best-practice portfolio of well-operated efficiency programs under a reasonable policy or regulatory framework. Information channels are assumed to be established and efficient for marketing, educating consumers, and coordinating with trade allies and delivery partners. The primary barrier to adoption reflected in this case is customer preferences. Achievable adoption rates are presented in Appendix A.

Market Characterization and Market Profiles

In this section, we describe how customers in the I&M service territory use electricity in the base year of the study, 2015. It begins with a high-level summary of energy use across all sectors and then delves into each sector in more detail.

Energy Use Summary

Total electricity use for the residential, commercial and industrial sectors within the I&M service territory in 2015 was 16,164 GWh. As shown in Table 4-1, the industrial sector accounts for approximately thirty five percent (35%) of annual energy use, followed closely by residential with 34%. Summer peak coincident demand was developed utilizing peak fractions of annual energy use developed using I&M's system peak data and AEG research.

Table 4-1 I&M Sector Control Totals (2015)

Sector	Annual Electricity Use (GWh)	% of Annual Use	Summer Peak Coincident Demand (MW)	% of Summer Peak
Residential	5,562	34%	1,947	48%
Commercial	4,933	31%	1,100	27%
Industrial[12]	5,669	35%	1,042	25%
Total	**16,164**	**100%**	**4,089**	**100%**

Residential Sector

The total number of households and electricity sales for the service territory were obtained from I&M's customer database. In 2015, there were 510,491 households within the I&M service territory. Customers used a total of 5,562 GWh with peak demand of 1,947 MW. The average use per household is 10,896 kWh. We allocated these totals into four residential segments and the values are shown in Table 4-2.

Table 4-2 Residential Sector Control Totals (2015)

Segment	Number of Customers	Electricity Use (GWh)	% of Total Usage	Avg. Use/Customer (kWh-yr)	Summer Peak Coincident Demand (MW)
Single Family	388,067	4,483	81%	11,553	1,616
Multifamily	38,644	293	5%	7,593	78
Mobile Home	27,653	251	5%	9,072	87
Low Income	56,127	535	10%	9,525	167
Total	**510,491**	**5,562**	**100%**	**10,896**	**1,947**

[12] A special contract customer in Indiana is excluded from the analysis.

Energy Market Profile

As we describe in the previous chapter, the market profiles provide the foundation for development of the baseline projection and the potential estimates. The average market profile for the residential sector is presented in Table 4-3. Segment-specific market profiles are presented in Appendix A in the reports for each individual state.

Figure 4-1 shows the distribution of annual electricity use by end use for all customers. Two main electricity end uses — appliances, heating and interior lighting — account for 55% of total use. Appliances include refrigerators, freezers, stoves, clothes washers, clothes dryers, dishwashers, microwaves, dehumidifiers and air purifiers. The remainder of the energy falls into the cooling, electronics, exterior lighting, water heating, and the miscellaneous category – which is comprised of furnace fans, pool pumps, and other "plug" loads (all other usage not covered by those listed in Table 4-3, such as hair dryers, power tools, coffee makers, etc.).

Figure 4-1 Residential Percent of Electricity Use by End Use (Annual, 2015)

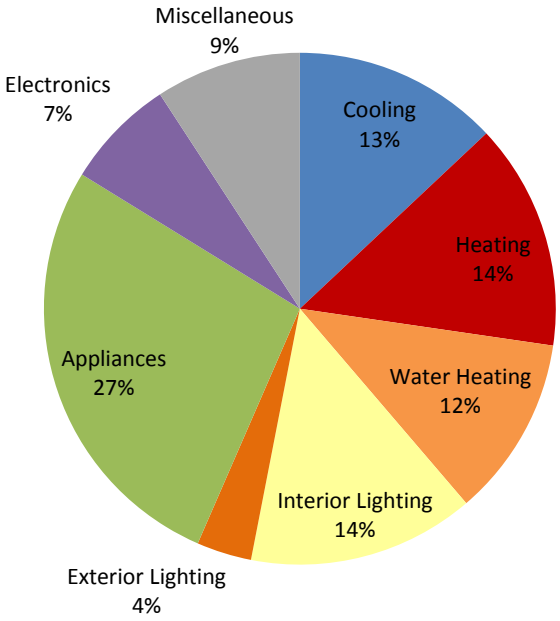


Table 4-3 Average Electric Market Profile for the Residential Sector, 2015

End Use	Technology	Saturation	EUI (kWh)	Intensity (kWh/HH)	Usage (GWh)	Summer Peak (MW)
Cooling	Central AC	72.58%	1,723	1,250	638	1,163
Cooling	Room AC	14.42%	514	74	38	45
Cooling	Air-Source Heat Pump	4.49%	1,605	72	37	67
Cooling	Geothermal Heat Pump	1.09%	1,739	19	10	17
Heating	Air-Source Heat Pump	4.49%	6,921	311	159	0
Heating	Geothermal Heat Pump	1.09%	6,087	66	34	0
Heating	Electric Room Heat	4.32%	6,967	301	154	0
Heating	Electric Furnace	8.19%	10,755	881	450	0
Water Heating	Water Heater (<= 55 Gal)	29.11%	2,899	844	431	60
Water Heating	Water Heater (> 55 Gal)	13.01%	3,089	402	205	29
Interior Lighting	General Service Screw-In	100.00%	1,147	1,147	585	66
Interior Lighting	Linear Lighting	100.00%	43	43	22	2
Interior Lighting	Exempted Screw-In	100.00%	372	372	190	22
Exterior Lighting	Screw-in	100.00%	378	378	193	22
Appliances	Clothes Washer	88.76%	81	72	37	6
Appliances	Clothes Dryer	74.25%	726	539	275	49
Appliances	Dishwasher	69.24%	366	253	129	23
Appliances	Refrigerator	100.00%	686	686	350	62
Appliances	Freezer	48.68%	546	266	136	27
Appliances	Second Refrigerator	44.78%	984	441	225	40
Appliances	Stove	69.14%	426	295	150	46
Appliances	Microwave	100.00%	120	120	61	19
Appliances	Dehumidifier	29.15%	570	166	85	15
Appliances	Air Purifier	12.87%	1,019	131	67	12
Electronics	Personal Computers	61.76%	163	101	51	9
Electronics	Monitor	73.18%	69	50	26	4
Electronics	Laptops	83.09%	43	36	18	3
Electronics	TVs	205.01%	147	302	154	27
Electronics	Printer/Fax/Copier	82.05%	56	46	23	4
Electronics	Set top Boxes/DVRs	129.73%	102	132	67	12
Electronics	Devices and Gadgets	100.00%	98	98	50	9
Miscellaneous	Pool Pump	8.03%	1,295	104	53	9
Miscellaneous	Pool Heater	1.06%	1,301	14	7	1
Miscellaneous	Furnace Fan	77.03%	688	530	270	47
Miscellaneous	Bathroom Exhaust Fan	35.84%	134	48	25	4
Miscellaneous	Well pump	9.72%	533	52	26	5
Miscellaneous	Miscellaneous	100.00%	255	255	130	23
	Total			**10,896**	**5,562**	**1,947**

Commercial Sector

The total electric energy consumed by commercial customers in I&M's service area in 2015 was 4,933 GWh. I&M billing data and secondary data were used to allocate this energy usage to building type segments and to develop estimates of average use per customer which, in turn, were used to estimate floor space. Summer peak coincident demand was developed utilizing peak fractions of annual energy use developed using I&M's system peak data and AEG research. The values are shown in Table 4-4.

Certain commercial and industrial customers in Indiana have the option to opt-out of the DSM program charge and, correspondingly, from participating in I&M DSM programs. I&M is required to consider those customers when assessing potential savings. The load from commercial and industrial opt-out customers was included in the analysis presented in Section 4 and 5. Results from a sensitivity analysis in which Indiana opt-out customer load was removed from the forecast are presented in Section 6.

Table 4-4 Commercial Sector Control Totals (2015)

Segment	Electricity Use (GWh)	% of Total Usage	Floor Space (Million Square Feet)	Avg. Use / Square Foot (kWh)	Summer Peak Coincident Demand (MW)
Office	698	14%	42.3	16.5	122
Restaurant	352	7%	9.9	35.5	62
Retail	886	18%	60.7	14.6	210
Grocery	223	5%	4.6	48.6	35
College	363	7%	31.3	11.6	85
School	466	9%	60.8	7.7	153
Health	635	13%	24.0	26.5	112
Lodging	186	4%	11.9	15.6	26
Warehouse	235	5%	36.6	6.4	77
Miscellaneous	593	12%	62.3	9.5	149
Public/Gov't	297	6%	17.0	17.5	71
Total	**4,933**	**100%**	**361.3**	**13.7**	**1,100**

Energy Market Profile

Figure 4-2 shows the distribution of annual electricity consumption by end use across all commercial buildings. Electric usage is dominated by cooling and lighting, which comprise 49% of annual electricity usage. Cooling and lighting are the major uses across all segments.

Figure 4-2 Commercial Electricity Usage by End Use Segment (Annual, 2015)

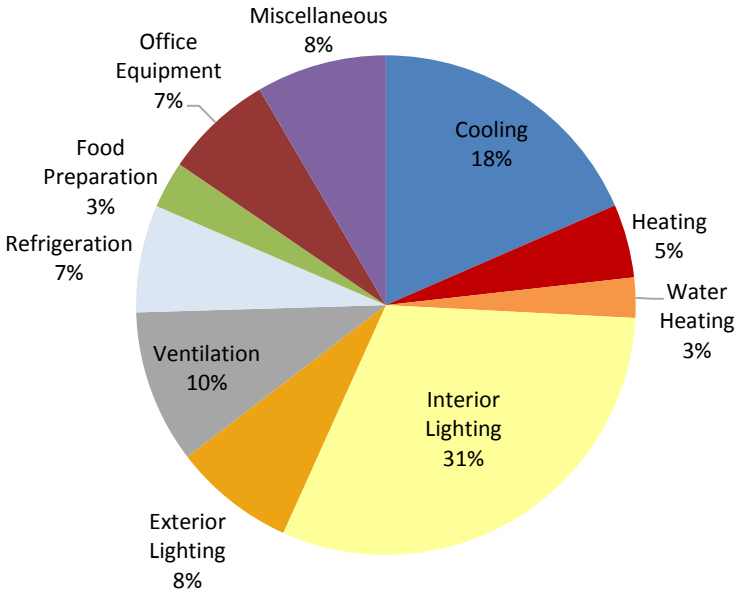


Table 4-5 shows the average market profile for electricity of the commercial sector as a whole, representing a composite of all segments and buildings. Market profiles for each segment are presented in Appendix A in the reports for each individual state.

Table 4-5 Average Electric Market Profile for the Commercial Sector, 2015

End Use	Technology	Saturation	EUI (kWh)	Intensity (kWh/SqFt)	Usage (GWh)	Summer Peak (MW)
Cooling	Air-Cooled Chiller	12.78%	4.37	0.56	202	117
Cooling	Water-Cooled Chiller	13.47%	5.75	0.77	280	130
Cooling	RTU	18.26%	4.36	0.80	288	204
Cooling	Central AC	3.42%	4.68	0.16	58	33
Cooling	Room AC	2.34%	4.32	0.10	36	19
Cooling	Air-Source Heat Pump	0.68%	5.20	0.04	13	6
Cooling	Geothermal Heat Pump	1.27%	2.53	0.03	12	8
Cooling	PTHP	1.30%	4.95	0.06	23	9
Heating	Electric Furnace	5.54%	6.70	0.37	134	0
Heating	Electric Room Heat	1.84%	6.87	0.13	46	0
Heating	Air-Source Heat Pump	0.68%	5.51	0.04	14	0
Heating	Geothermal Heat Pump	1.27%	4.19	0.05	19	0
Heating	PTHP	1.30%	4.74	0.06	22	0
Ventilation	Ventilation	100.00%	1.35	1.35	489	58
Water Heating	Water Heater	29.09%	1.22	0.35	128	17
Interior Lighting	Screw-in	100.00%	0.58	0.58	208	40
Interior Lighting	High-Bay Fixtures	100.00%	2.22	2.22	802	154
Interior Lighting	Linear Lighting	100.00%	1.43	1.43	515	103
Exterior Lighting	Screw-in	100.00%	0.09	0.09	34	0
Exterior Lighting	Area Lighting	100.00%	0.72	0.72	260	4
Exterior Lighting	Linear Lighting	100.00%	0.26	0.26	95	1
Refrigeration	Walk-in Refrigerator/Freezer	8.24%	1.35	0.11	40	6
Refrigeration	Reach-in Refrigerator/Freezer	15.18%	0.37	0.06	20	3
Refrigeration	Glass Door Display	43.99%	0.38	0.17	60	9
Refrigeration	Open Display Case	6.55%	6.24	0.41	148	21
Refrigeration	Icemaker	30.43%	0.52	0.16	57	9
Refrigeration	Vending Machine	16.55%	0.28	0.05	17	3
Food Preparation	Oven	15.86%	0.32	0.05	18	3
Food Preparation	Fryer	7.79%	0.83	0.06	23	4
Food Preparation	Dishwasher	31.50%	0.71	0.22	81	14
Food Preparation	Hot Food Container	13.26%	0.09	0.01	4	1
Food Preparation	Steamer	4.34%	0.55	0.02	9	2
Food Preparation	Griddle	11.14%	0.36	0.04	14	3
Office Equipment	Desktop Computer	100.00%	0.55	0.55	197	29
Office Equipment	Laptop	99.54%	0.06	0.06	22	3
Office Equipment	Server	73.79%	0.22	0.16	58	8
Office Equipment	Monitor	100.00%	0.10	0.10	35	5
Office Equipment	Printer/Copier/Fax	100.00%	0.07	0.07	25	4
Office Equipment	POS Terminal	44.75%	0.06	0.03	10	1
Miscellaneous	Non-HVAC Motors	9.04%	0.24	0.02	8	1
Miscellaneous	Other Miscellaneous	100.00%	1.13	1.13	408	67
	Total			**13.65**	**4,933**	**1,100**

Industrial Sector

The total electric energy consumed by Industrial customers in the I&M service area in 2015 was 5,669 GWh. I&M billing data and secondary data were used to allocate this energy usage to building type segments by SIC codes. Summer peak coincident demand was developed utilizing peak fractions of annual energy use developed using I&M's system peak data and AEG research. The values are shown in Table 4-6.

Certain commercial and industrial customers in Indiana have the option to opt-out of the DSM program charge and, correspondingly, from participating in I&M DSM programs. I&M is required to consider those customers when assessing potential savings. The load from commercial and industrial opt-out customers was included in the analysis presented in Section 4 and 5. Results from a sensitivity analysis in which Indiana opt-out customer load was removed from the forecast are presented in Section 6.

Table 4-6 Industrial Sector Control Totals (2015)

Segment	Electricity Use (GWh)	% of Total Usage	Summer Peak Coincident Demand (MW)
Food Products	436	8%	78
Chemical	784	14%	137
Primary Metal	1,483	26%	238
Manufacturing	1,522	27%	288
Plastics/Stone	1,049	18%	196
Other Industrial	396	7%	104
Total	**5,669**	**100%**	**1,042**

Energy Market Profile

Figure 4-3 shows the distribution of annual electricity consumption by end use across all industrial segments. Electric usage is dominated by motors, which comprises 50% of annual electricity usage. Motors and process are the major uses across all segments.

Figure 4-3 Industrial Electricity Usage by End Use Segment (Annual, 2015)

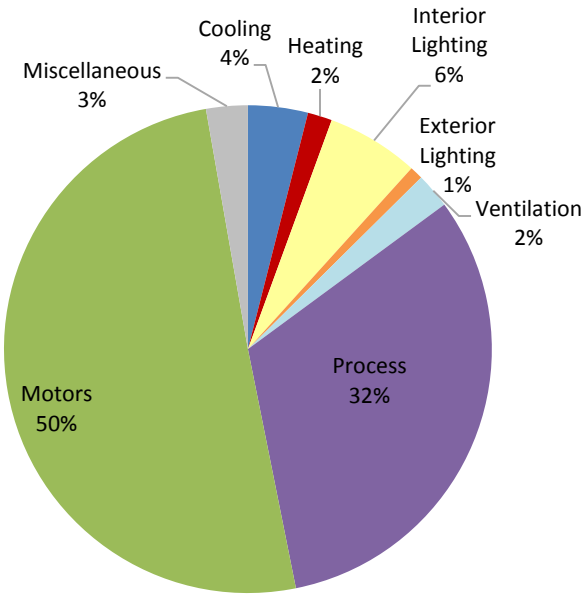


Table 4-7 shows the average market profile for electricity of the industrial sector as a whole, representing a composite of all segments and buildings. Market profiles for each segment are presented in Appendix A in the reports for each individual state.

Table 4-7 Average Electric Market Profile for the Industrial Sector, 2015

End Use	Technology	Saturation	EUI (kWh)	Intensity (kWh/employee)	Usage (GWh)	Summer Peak (MW)
Cooling	Air-Cooled Chiller	2.15%	14,765	318.1	33.1	42.1
Cooling	Water-Cooled Chiller	2.00%	16,801	336.0	34.9	44.5
Cooling	RTU	10.28%	14,675	1,508.3	156.9	199.8
Cooling	Air-Source Heat Pump	0.00%	0	0.0	0.0	0.0
Cooling	Geothermal Heat Pump	0.00%	0	0.0	0.0	0.0
Heating	Electric Furnace	1.68%	37,604	631.2	65.6	0.0
Heating	Electric Room Heat	0.70%	35,813	250.1	26.0	0.0
Heating	Air-Source Heat Pump	0.00%	0	0.0	0.0	0.0
Heating	Geothermal Heat Pump	0.00%	0	0.0	0.0	0.0
Ventilation	Ventilation	100.00%	1,269	1,269.2	132.0	11.9
Interior Lighting	Screw-in	100.00%	153	153.4	16.0	2.8
Interior Lighting	High-Bay Fixtures	100.00%	2,737	2,736.6	284.6	50.4
Interior Lighting	Linear Lighting	100.00%	446	445.8	46.4	8.2
Exterior Lighting	Screw-in	100.00%	20	19.9	2.1	0.0
Exterior Lighting	Area Lighting	100.00%	378	377.7	39.3	0.4
Exterior Lighting	Linear Lighting	100.00%	77	77.4	8.0	0.1
Motors	Pumps	100.00%	8,216	8,215.8	854.4	120.0
Motors	Fans & Blowers	100.00%	4,409	4,408.8	458.5	64.3
Motors	Compressed Air	100.00%	4,226	4,226.5	439.5	61.8
Motors	Conveyors	100.00%	9,808	9,808.1	1,020.0	143.0
Motors	Other Motors	100.00%	813	812.6	84.5	11.9
Process	Process Heating	100.00%	9,844	9,843.6	1,023.7	143.5
Process	Process Cooling	100.00%	1,870	1,870.0	194.5	27.2
Process	Process Refrigeration	100.00%	1,870	1,870.0	194.5	27.2
Process	Process Electrochemical	100.00%	3,227	3,226.9	335.6	47.0
Process	Process Other	100.00%	600	600.1	62.4	8.8
Miscellaneous	Miscellaneous	100.00%	1,503	1,503.1	156.3	26.8
	Total			**54,509.25**	**5,668.7**	**1,042.0**

Energy Efficiency Potential

This section presents the energy efficiency potential within the I&M service territory. This includes every possible measure that is considered in the measure list, regardless of program implementation concerns.

We present the summer coincident peak demand savings in MW and the annual energy savings in GWh. Year-by-year savings for annual energy and peak demand are available in the LoadMAP model, which was provided to I&M at the conclusion of the study.

We begin with a summary of summer coincident peak demand and annual energy savings. Then we provide details for each sector. Please note that all savings are provided at the customer meter.

Overall Summary of Energy Efficiency Potential

Table 5-1, Figure 5-1, and Figure 5-2 summarize the EE savings in terms of annual energy use for all measures for four levels of potential relative to the I&M load forecast.[13]

- **Technical potential** reflects the adoption of all EE measures regardless of cost-effectiveness. First-year savings are 470 GWh, or 2.8% of the I&M load forecast. Cumulative savings in 2036 are 4,828 GWh, or 27.6% of the forecast.
- **Economic potential** reflects the savings when the most efficient cost-effective measures are taken by all customers. The first-year savings in 2017 are 346 GWh, or 2.1% of the load forecast. By 2036, cumulative savings reach 3,851 GWh, or 22.0% of the forecast.
- **Maximum achievable potential** (MAP) represents savings that are possible through utility programs under ideal market, implementation, and customer preference conditions and an appropriate regulatory framework. It shows 207 GWh savings in the first year, or 1.2% of the load forecast and by 2036 cumulative achievable savings reach 2,833 GWh, or 16.2% of the forecast.
- **Realistic achievable potential** (RAP) represents savings that are possible through utility programs. It shows 140 GWh savings in the first year, or 0.8% of the load forecast and by 2036 cumulative achievable savings reach 2,122 GWh, or 12.1% of the forecast.

[13] The MAP and RAP potential results were exported into the program-level analysis. The measures were vetted for inclusion in a DSM program and measures were bundled into programs and re-screened for cost-effectiveness. The High Scenario program design corresponds to MAP and the Mid Scenario program design corresponds to RAP.

Table 5-1 Summary of Cumulative EE Potential (GWh)

	2017	2018	2019	2026	2036
I&M Load Forecast (GWh)	16,587	16,628	16,664	16,974	17,491
Cumulative Savings (GWh)					
Realistic Achievable Potential	140	273	403	1,066	2,122
Maximum Achievable Potential	207	403	592	1,481	2,833
Economic Potential	346	669	966	2,172	3,851
Technical Potential	470	910	1,306	2,950	4,828
Cumulative Savings as a % of Load Forecast					
Realistic Achievable Potential	0.8%	1.6%	2.4%	6.3%	12.1%
Maximum Achievable Potential	1.2%	2.4%	3.6%	8.7%	16.2%
Economic Potential	2.1%	4.0%	5.8%	12.8%	22.0%
Technical Potential	2.8%	5.5%	7.8%	17.4%	27.6%

Figure 5-1 Cumulative EE Energy Potential Savings as % of I&M Load Forecast

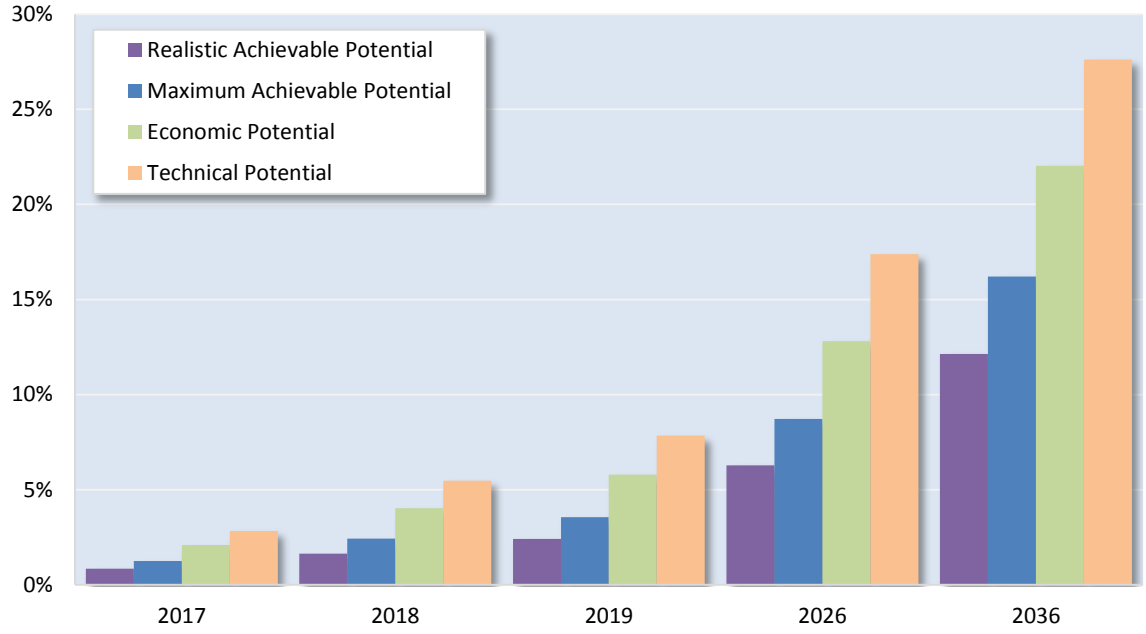


Figure 5-2 I&M Load Forecast with EE Potential Cases (GWh)

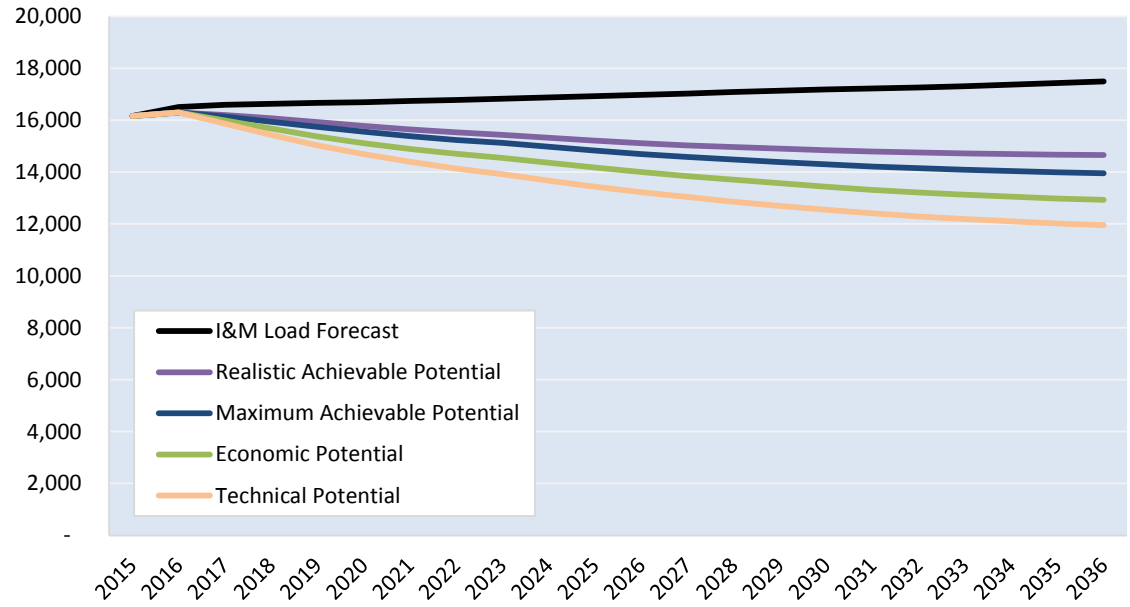


Table 5-2 summarizes the range of achievable potential by sector. The commercial sector contributes the most savings amount of potential savings.

Table 5-2 Realistic Achievable Cumulative EE Potential by Sector (Annual Use and Summer Peak)

	2017	2018	2019	2026	2036
Cumulative Annual Electricity Savings (GWh)					
Residential	56	112	168	340	650
Commercial	64	122	177	497	971
Industrial	20	39	58	229	501
Total	**140**	**273**	**403**	**1,066**	**2,122**
Cumulative Annual Coincident Peak Demand Savings (MW)					
Residential	8	16	25	65	138
Commercial	12	23	33	94	184
Industrial	3	6	8	28	55
Total	**23**	**45**	**67**	**187**	**377**

Residential Potential

Table 5-3 and Figure 5-3 present estimates for measure-level EE potential for the residential sector in terms of annual energy savings. Realistic achievable potential in the first year, 2017 is 56 GWh, or 1.0% of the I&M forecast. By 2036, cumulative achievable savings are 650 GWh, or 11.3% of the forecast.

Table 5-3 Residential EE Potential (GWh)

	2017	2018	2019	2026	2036
I&M Residential Load Forecast (GWh)	5,724	5,712	5,693	5,678	5,771
Cumulative Savings (GWh)					
Realistic Achievable Potential	56	112	168	340	650
Maximum Achievable Potential	85	169	253	471	866
Economic Potential	160	314	457	743	1,268
Technical Potential	213	418	598	1,086	1,709
Cumulative Savings as a % of Residential Load Forecast					
Realistic Achievable Potential	1.0%	1.9%	3.0%	6.0%	11.3%
Maximum Achievable Potential	1.5%	2.9%	4.4%	8.3%	15.0%
Economic Potential	2.8%	5.5%	8.0%	13.1%	22.0%
Technical Potential	3.7%	7.3%	10.5%	19.1%	29.6%

Figure 5-3 Cumulative Residential EE Savings as a % of the Baseline

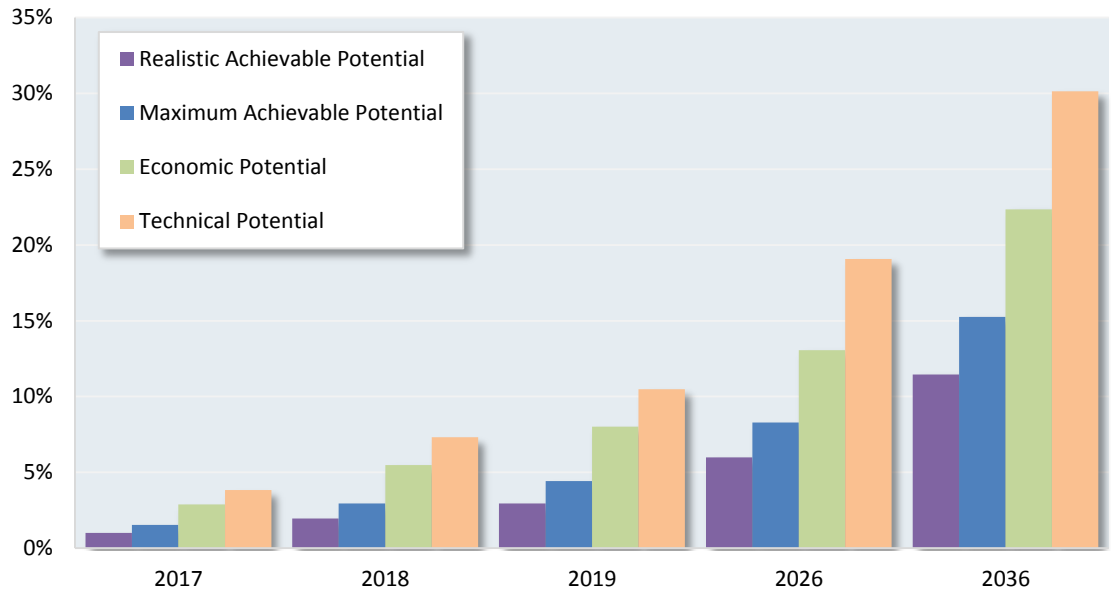


Table 5-4 identifies the top 20 residential measures from the perspective of cumulative annual energy savings in 2019.[14] The top measures are interior and exterior lighting as a result of purchases of LED lamps, which are cost-effective throughout the forecast horizon. Wifi or "smart" thermostats also contribute a large amount to potential savings.

[14] The table is not an exhaustive list of all measures that are cost-effective and/or has potential savings.

Table 5-4 Residential Top Measures in 2019 (Annual Energy, MWh)

Rank	Residential Measure	2019 Cumulative Energy Savings (MWh)	% of Total
1	Interior Lighting - LED Screw-In Lamps	71,419	42.5%
2	Exterior Lighting - LED Screw-in Lamps	29,857	17.8%
3	Thermostat - WIFI	17,324	10.3%
4	Interior Lighting - Exempted LED Screw-In Lamp[15]	17,242	10.3%
5	Refrigerator - Decommissioning and Recycling	6,201	3.7%
6	Water Heating - Water Heater - ES 2.0 Heat Pump	4,595	2.7%
7	Freezer - Decommisioning and Recycling	3,851	2.3%
8	Windows - High Efficiency	2,065	1.2%
9	Windows - Install Reflective Film	1,509	0.9%
10	Appliances - Air Purifier – ENERGY STAR	1,462	0.9%
11	Water Heater - Temperature Setback	1,061	0.6%
12	Cooling - Central AC – SEER 14	995	0.6%
13	Central AC - Maintenance	988	0.6%
14	Whole-House Fan - Installation	887	0.5%
15	Water Heater - Low-Flow Showerheads	815	0.5%
16	Water Heater - Pipe Insulation	775	0.5%
17	Appliances – Refrigerator – CEE TIER 1	696	0.4%
18	Insulation - Ceiling	693	0.4%
19	Appliances – Dehumidifier – ENERGY STAR	611	0.4%
20	Electronics - Personal Computers	553	0.3%
	Total Top Measures	**163,598**	**97.4%**
	Total Cumulative savings in 2019	**168,038**	**100%**

Figure 5-4 and Figure 5-5 present forecasts of energy savings by end use as a percent of total annual savings and cumulative savings. Lighting savings account for a substantial portion of the savings throughout the forecast horizon, but the share declines over time as the market is transformed. The same is true for exterior lighting. Water heater savings increase after 2021 as a result of heat pump water heaters becoming cost-effective. Savings from cooling measures and appliances steadily increase throughout the forecast horizon.

[15] Specialty LED bulbs.

Figure 5-4 Residential Realistic Achievable Savings Forecast (Annual Energy, % of Sales)

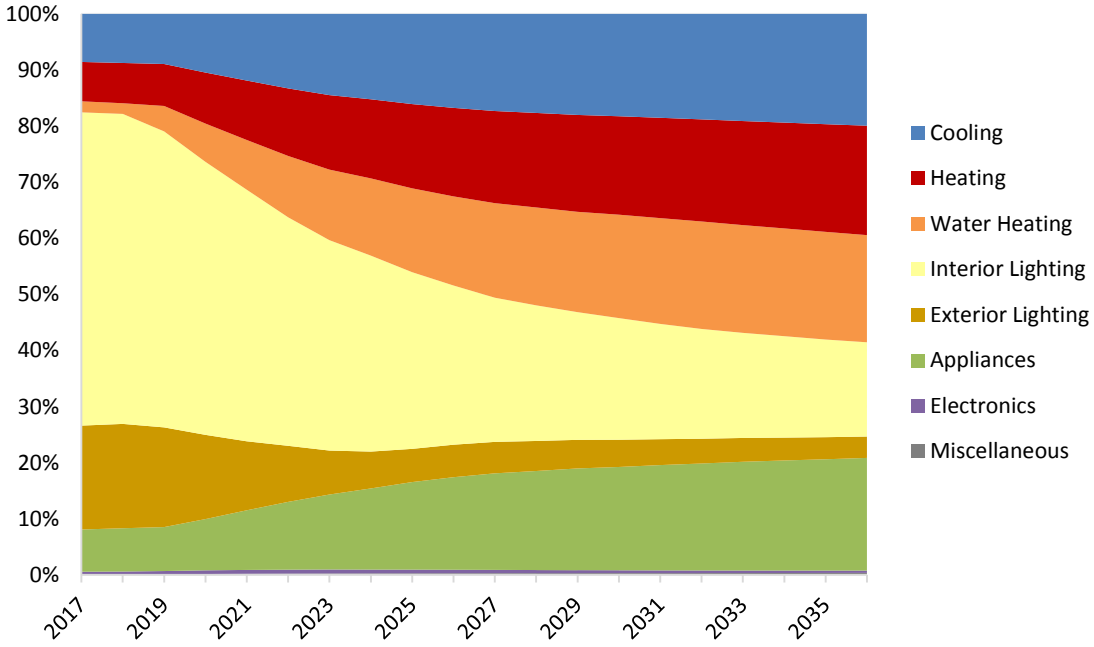


Figure 5-5 Residential Realistic Achievable Savings Forecast (Annual Energy, Cumulative GWh)

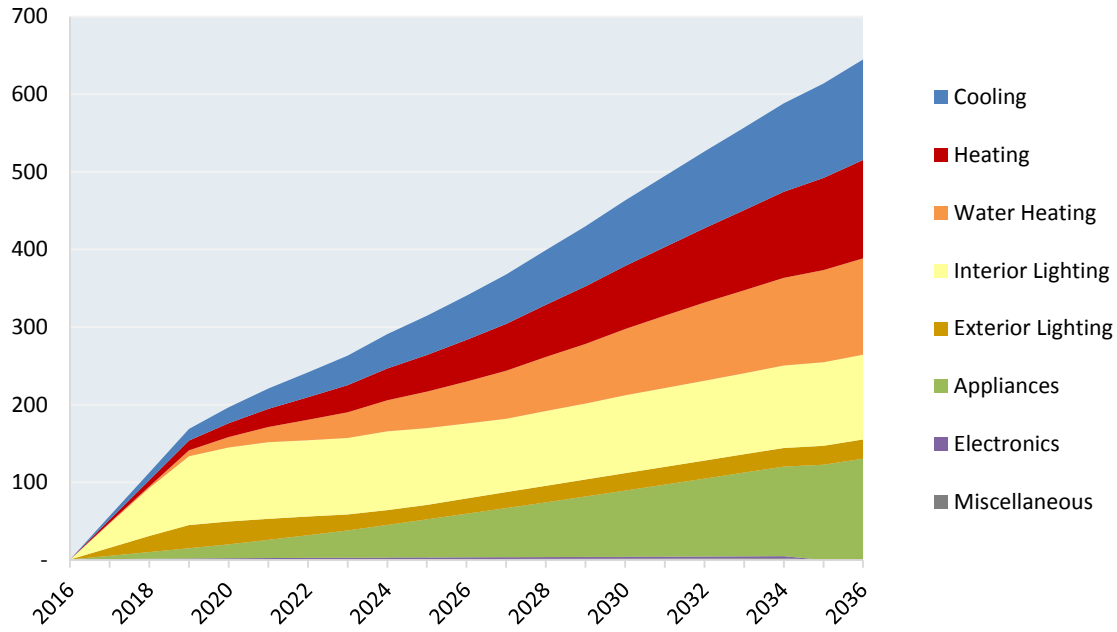


Table 5-5 and Figure 5-6 show residential EE potential in terms of summer peak savings. In the first year, 2017, realistic achievable summer peak savings are 8 MW. By 2036, cumulative realistic achievable summer coincident peak savings are 138 MW. Figure 5-7 presents forecasts of summer coincident peak savings by end use. Savings from cooling measures dominate throughout the forecast horizon.

Table 5-5 Residential EE Potential (Summer Coincident Peak Demand, MW)

	2017	2018	2019	2026	2036
I&M Residential Load Projection (MW)	1,995	1,995	1,988	1,969	2,048
Cumulative Savings (MW)					
Realistic Achievable Potential	8	16	25	65	138
Maximum Achievable Potential	13	26	39	95	197
Economic Potential	25	50	74	166	321
Technical Potential	40	80	117	306	556
Cumulative Savings as a % of Residential Load Forecast					
Realistic Achievable Potential	0.4%	0.8%	1.3%	3.3%	6.7%
Maximum Achievable Potential	0.6%	1.3%	2.0%	4.8%	9.6%
Economic Potential	1.3%	2.5%	3.7%	8.4%	15.7%
Technical Potential	2.0%	4.0%	5.9%	15.6%	27.1%

Figure 5-6 Cumulative Residential EE Coincident Peak Savings as a % of the Baseline

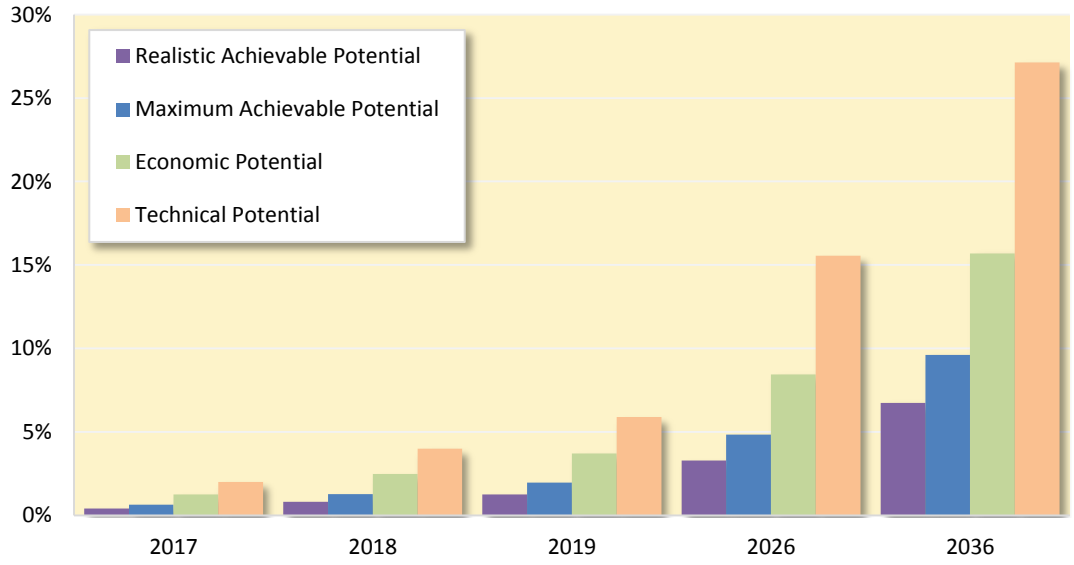
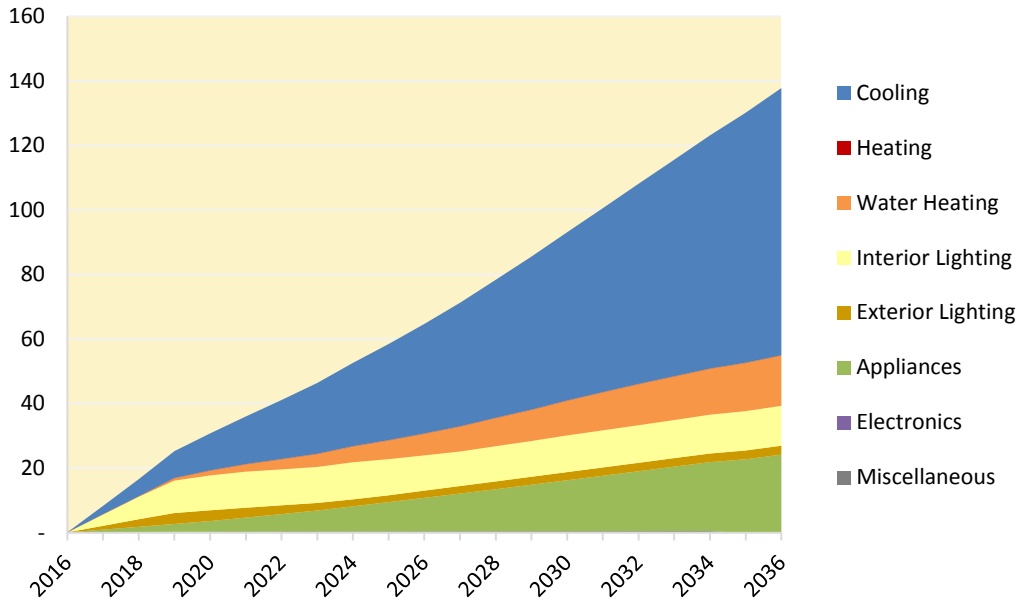


Figure 5-7 Residential Realistic Achievable Savings Forecast (Summer Coincident Peak, Cumulative MW)



Commercial Potential

Table 5-6 and Figure 5-8 provide estimates for the four levels of EE potential for the commercial sector from the perspective of cumulative annual energy savings. In 2017, the first year of the projection, realistic achievable potential is 64 GWh, or 1.3% of the I&M load forecast. By 2036, savings are 971 GWh, or 17.6% of the forecast.

Table 5-6 Commercial EE Potential (Energy Savings)

	2017	2018	2019	2026	2036
I&M Commercial Load Forecast (GWh)	5,041	5,058	5,072	5,233	5,506
Cumulative Savings (GWh)					
Realistic Achievable Potential	64	122	177	497	971
Maximum Achievable Potential	96	183	263	709	1,323
Economic Potential	146	276	392	993	1,714
Technical Potential	184	350	497	1,222	1,974
Cumulative Savings as a % of Commercial Load Forecast					
Realistic Achievable Potential	1.3%	2.4%	3.5%	9.5%	17.6%
Maximum Achievable Potential	1.9%	3.6%	5.2%	13.6%	24.0%
Economic Potential	2.9%	5.4%	7.7%	19.0%	31.1%
Technical Potential	3.6%	6.9%	9.8%	23.4%	35.9%

Figure 5-8 Cumulative Commercial EE Savings as a % of the Baseline

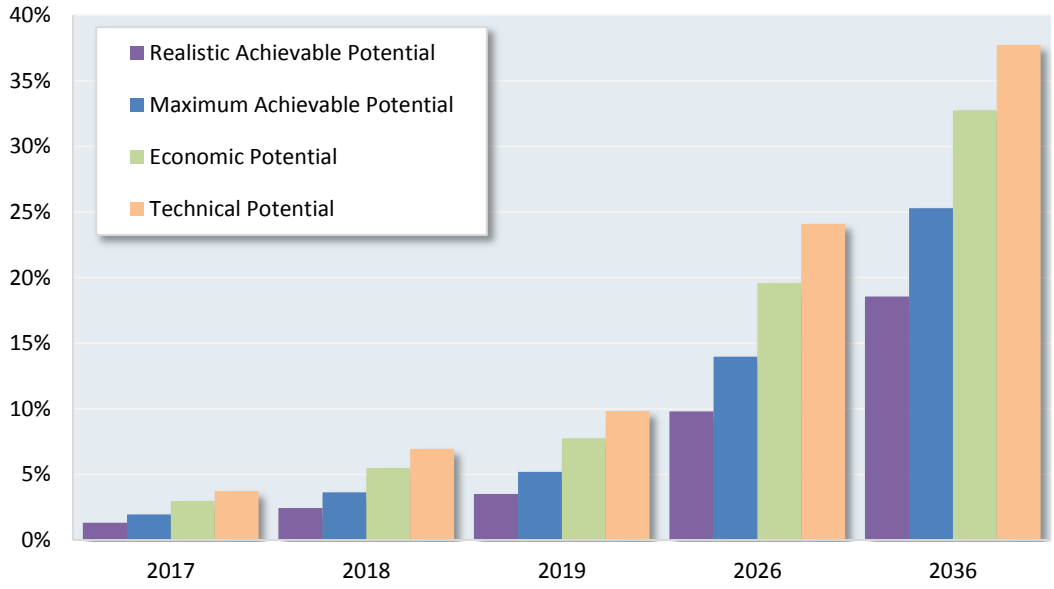


Table 5-7 identifies the top 20 commercial sector measures from the perspective of cumulative annual energy savings in 2019.[16] The top measure is interior screw-in lighting. Lighting dominates the top four measures, followed by retrocommissioning, exterior lighting, water heating and HVAC measures.

Table 5-7 Commercial Top Measures in 2019 (Annual Energy, MWh)

Rank	Commercial Measure	2019 Realistic Achievable Cumulative Savings (MWh)	% of Total
1	Interior Lighting – LED Screw-in Lamps	38,341	21.7%
2	Interior Lighting - LED High-Bay Fixtures	17,291	9.8%
3	Interior Lighting - Occupancy Sensors	14,131	8.0%
4	Interior Lighting - Linear Lighting	10,192	5.8%
5	Retrocommissioning	9,326	5.3%
6	Exterior Lighting - LED Area Lighting	7,938	4.5%
7	Water Heating - Water Heater EF 2.0 - Heat Pump	6,247	3.5%
8	Cooling - Water-Cooled Chiller - COP 9.77 (0.36 kW/TR)	6,113	3.5%
9	Interior Fluorescent - Delamp and Install Reflectors	4,731	2.7%
10	Exterior Lighting - LED Screw-in Lamps	4,704	2.7%
11	Ventilation - Ventilation	4,586	2.6%
12	Office Equipment - Desktop Computer	4,568	2.6%
13	Chiller - Chilled Water Reset	4,340	2.5%
14	HVAC - Economizer	4,334	2.4%
15	Office Equipment - Server	4,019	2.3%
16	Cooling - Air-Cooled Chiller - COP 4.40 (EER 15.0)	3,907	2.2%
17	Ventilation - Demand Controlled	2,861	1.6%
18	Ventilation - Variable Speed Control	2,330	1.3%
19	RTU - Advanced Controls	2,111	1.2%
20	Refrigeration - High Efficiency Compressor	1,849	1.0%
	Total Top Measures	**153,922**	**87.0%**
	Total Cumulative savings in 2019	**176,999**	**100%**

Figure 5-9 and Figure 5-10 present forecasts of energy savings by end use as a percent of total annual savings and cumulative savings. Lighting savings from interior and exterior applications account for a substantial portion of the savings throughout the forecast horizon. Cooling savings are also significant throughout the forecast.

[16] The table is not an exhaustive list of all measures that are cost-effective and/or has potential savings.

Figure 5-9 Commercial Achievable Savings Forecast (Annual Energy, % of Sales)

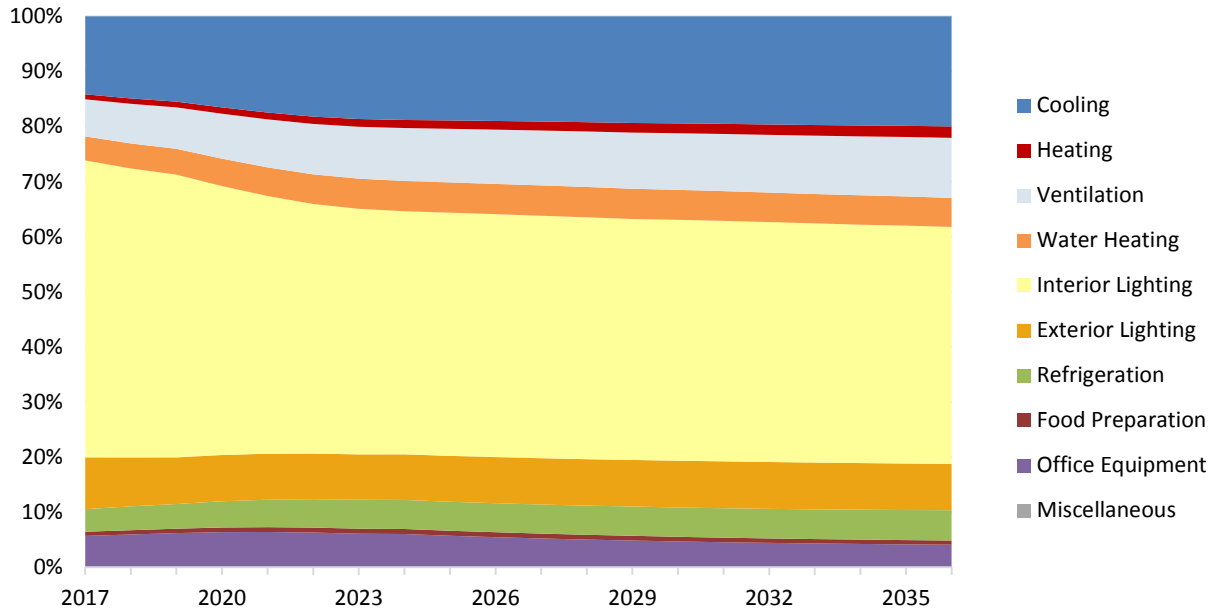


Figure 5-10 Commercial Achievable Savings Forecast (Annual Energy, GWh)

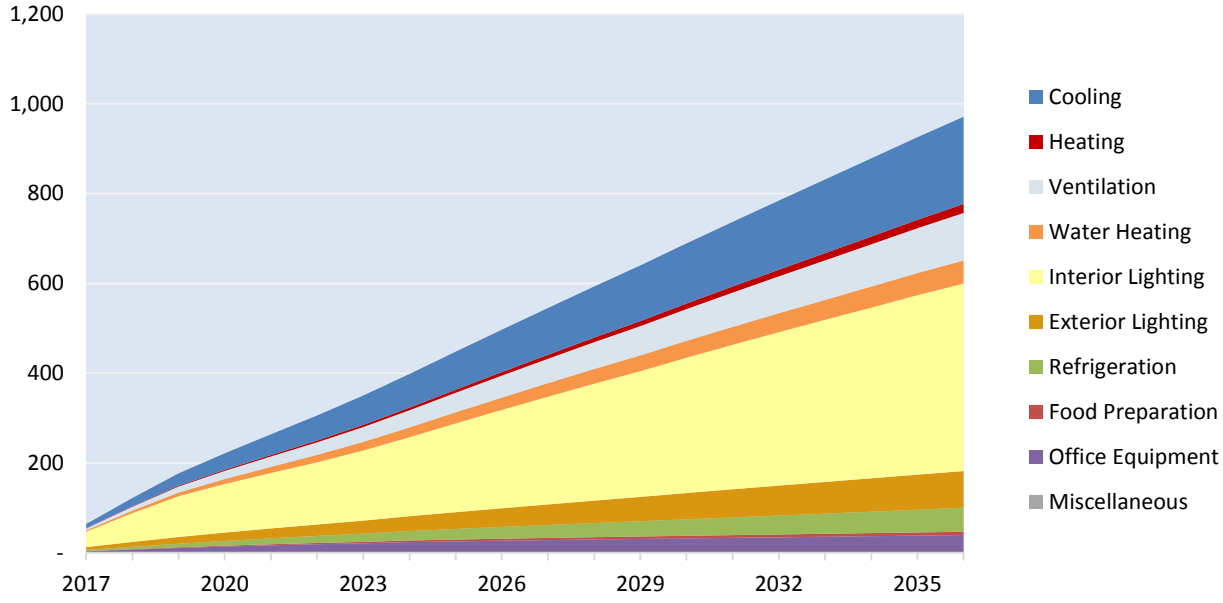


Table 5-8 and Figure 5-11present savings estimates from the perspective of summer coincident peak demand. In 2017, the first year of the projection, realistic achievable potential is 12 MW. By 2036, savings are 184 MW.

Table 5-8 Commercial EE Potential (Summer Coincident Peak Demand)

	2017	2018	2019	2026	2036
I&M Commercial Load Projection (MW)	1,108	1,105	1,102	1,080	1,115
Cumulative Savings (MW)					
Realistic Achievable Potential	12	23	33	94	184
Maximum Achievable Potential	18	34	49	134	252
Economic Potential	27	52	74	191	334
Technical Potential	34	64	92	237	395
Cumulative Savings as a % of Commercial Load Forecast					
Realistic Achievable Potential	1.1%	2.1%	3.0%	8.7%	16.5%
Maximum Achievable Potential	1.6%	3.1%	4.5%	12.4%	22.6%
Economic Potential	2.5%	4.7%	6.7%	17.7%	30.0%
Technical Potential	3.0%	5.8%	8.4%	21.9%	35.4%

Figure 5-11 Cumulative Commercial EE Coincident Peak Savings as a % of the Baseline

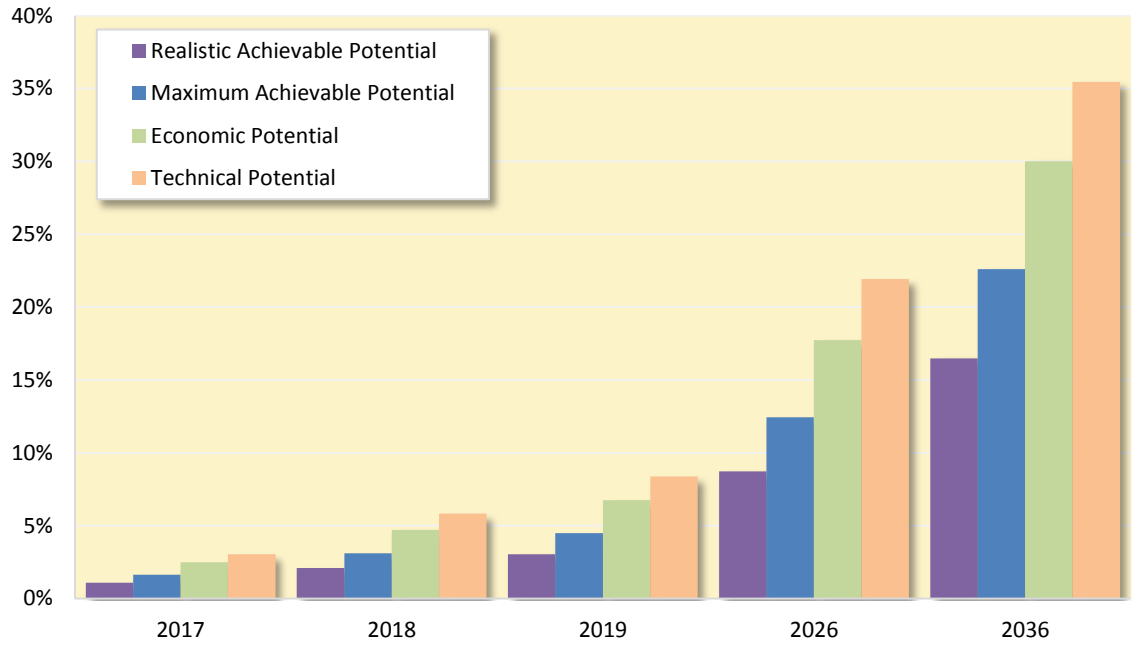
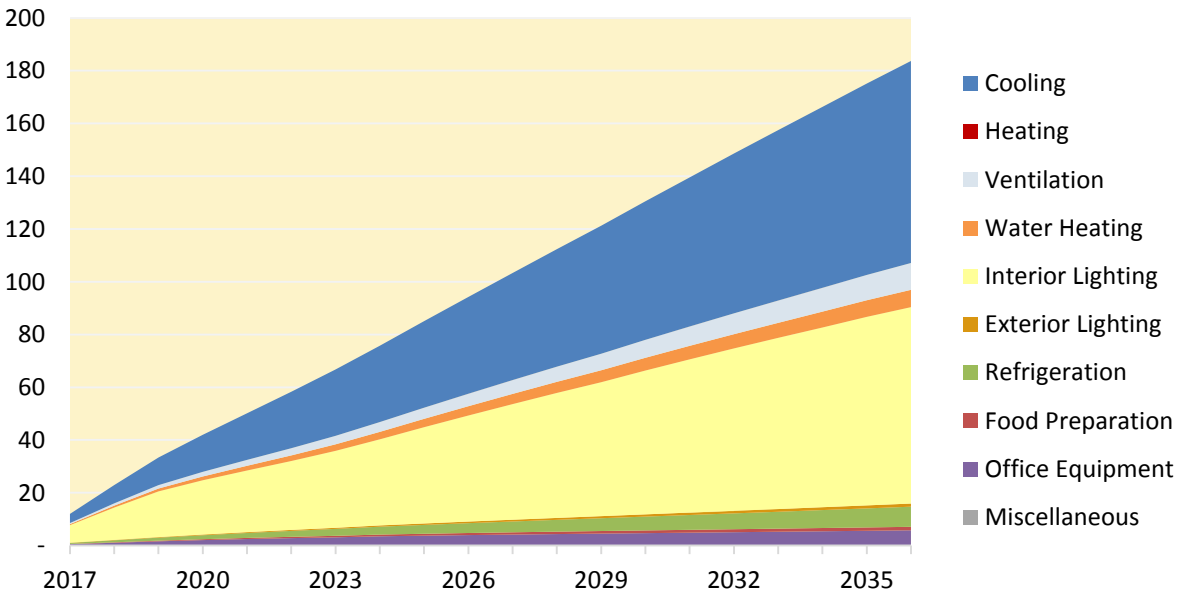


Figure 5-12 presents forecasts of summer peak savings by end use. Savings from interior lighting measures dominate throughout the forecast horizon.

Figure 5-12 Commercial Achievable Savings Forecast (Summer Peak, Cumulative MW)



Industrial Potential

Table 5-9 and Figure 5-13 provide estimates for the four levels of EE potential for the industrial sector from the perspective of cumulative annual energy savings. In 2017, the first year of the projection, realistic achievable potential is 20 GWh, or 0.3% of the I&M load forecast. By 2036, savings are 501 GWh, or 8.1% of the forecast.

Table 5-9 Industrial EE Potential (Energy Savings)

	2017	2018	2019	2026	2036
I&M Industrial Load Forecast (GWh)	5,821	5,858	5,899	6,064	6,214
Cumulative Savings (GWh)					
Realistic Achievable Potential	20	39	58	229	501
Maximum Achievable Potential	26	51	76	301	644
Economic Potential	40	79	117	437	869
Technical Potential	73	143	211	642	1,144
Cumulative Savings as a % of Industrial Load Forecast					
Realistic Achievable Potential	0.3%	0.7%	1.0%	3.8%	8.1%
Maximum Achievable Potential	0.4%	0.9%	1.3%	5.0%	10.4%
Economic Potential	0.7%	1.4%	2.0%	7.2%	14.0%
Technical Potential	1.2%	2.4%	3.6%	10.6%	18.4%

Figure 5-13 Cumulative Industrial EE Savings as a % of the Baseline

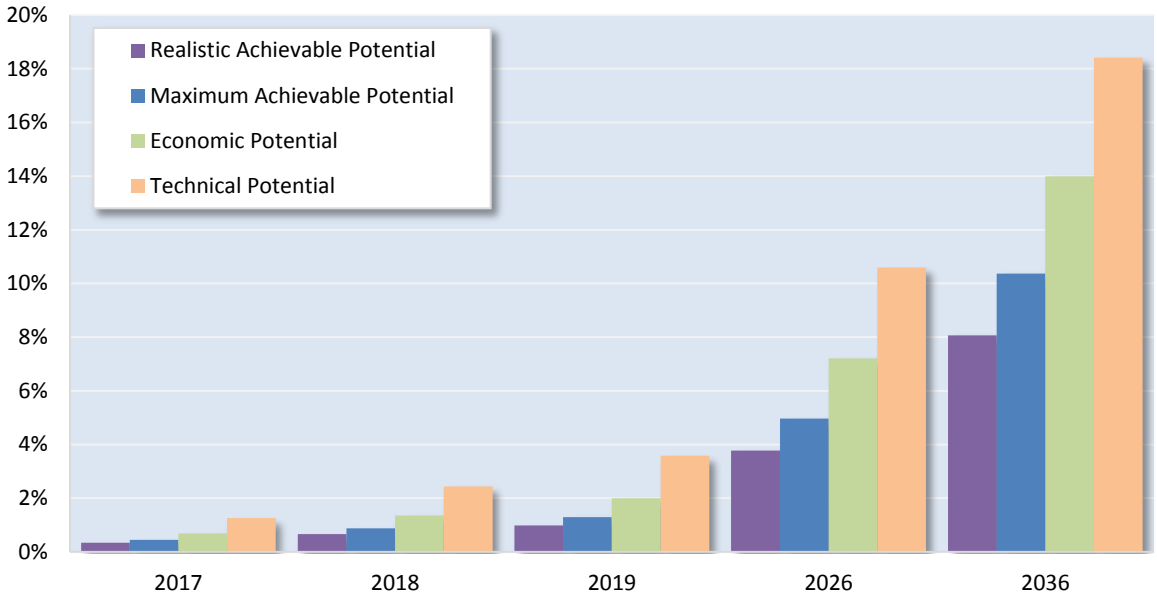


Figure 5-10 identifies the top 20 industrial sector measures from the perspective of cumulative annual energy savings in 2019.[17] The top measure is interior high bay fixtures. Variable speed drives on pumping systems is the second highest contributing measure. Other lighting, motor and cooling measures make up the majority of the remaining savings.

Table 5-10 Industrial Top Measures in 2019 (Annual Energy, MWh)

Rank	Industrial Measure	2019 Realistic Achievable Cumulative Savings (MWh)	% of Total
1	Interior Lighting – LED High-Bay Fixtures Lamps	13,133	22.7%
2	Pumping System - Variable Speed Drive	12,156	21.0%
3	Process - Timers and Controls	4,045	7.0%
4	Pumping System - System Optimization	3,815	6.6%
5	Interior Lighting – LED Screw-in Lamps	3,724	6.4%
6	Compressed Air - Variable Speed Drive	2,987	5.2%
7	HVAC - Economizer	2,249	3.9%
8	Compressed Air - Leak Management Program	1,973	3.4%
9	Exterior Lighting - LED Area Lighting Lamps	1,864	3.2%
10	Fan System - Flow Optimization	1,783	3.1%
11	Cooling - Water-Cooled Chiller - COP 9.77 (0.36 kW/TR)	1,137	2.0%
12	Destratification Fans (HVLS)	1,045	1.8%
13	Insulation - Wall Cavity	1,013	1.8%
14	Interior Lighting – Linear Lighting - T8 - F28 High Eff.	961	1.7%
15	Cooling - Air-Cooled Chiller - COP 4.40 (EER 15.0)	952	1.6%
16	Ventilation - Variable Speed Control	762	1.3%
17	Compressed Air - System Controls	698	1.2%
18	Chiller - Chilled Water Reset	629	1.1%
19	Interior Lighting - Occupancy Sensors	600	1.0%
20	Interior Fluorescent - Delamp and Install Reflectors	431	0.7%
	Total Top Measures	**55,956**	**96.8%**
	Total Cumulative savings in 2019	**57,809**	**100%**

Figure 5-14 and Figure 5-15 present forecasts of energy savings by end use as a percent of total annual savings and cumulative savings. Motor savings from pumping system and fan system applications dominate the savings. Lighting savings from interior applications also account for a substantial portion of the savings throughout the forecast horizon.

[17] The table is not an exhaustive list of all measures that are cost-effective and/or has potential savings.

Figure 5-14 Industrial Achievable Savings Forecast (Annual Energy, % of Sales)

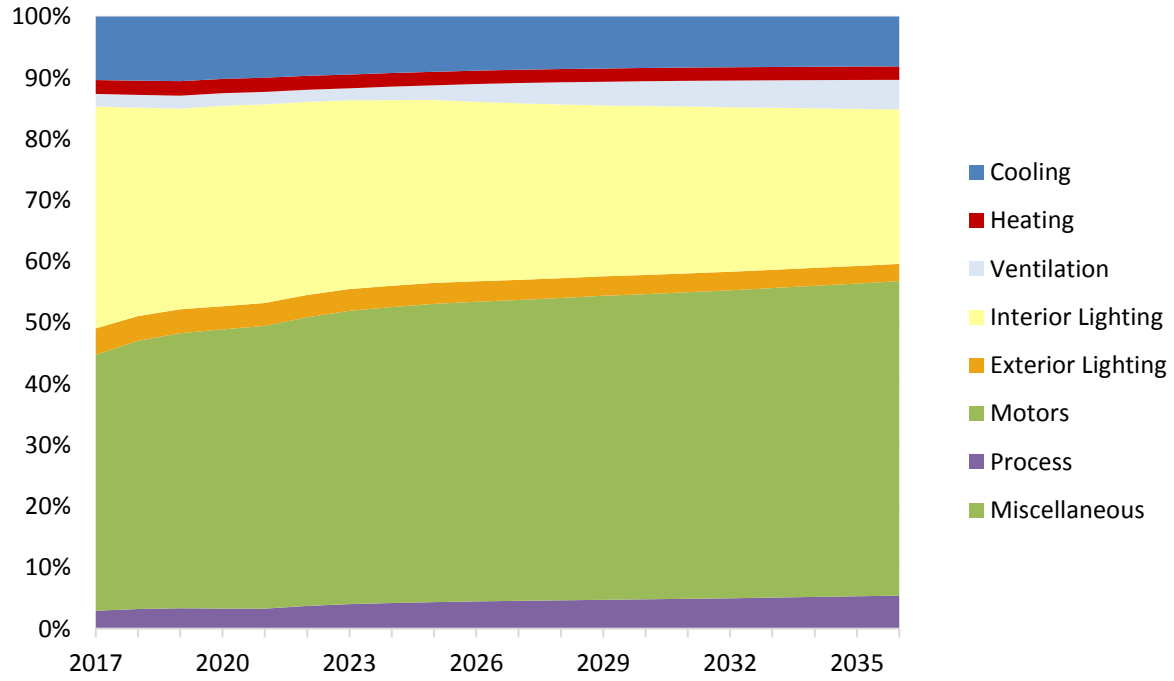


Figure 5-15 Industrial Achievable Savings Forecast (Annual Energy, GWh)

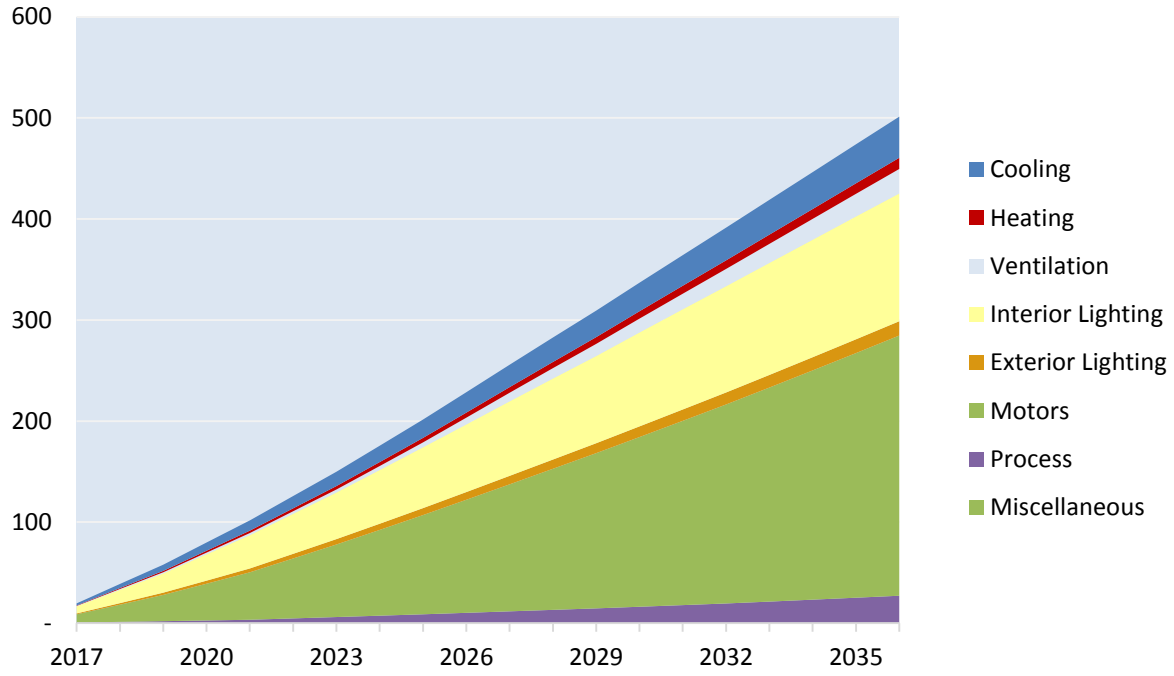


Table 5-11 and Figure 5-16 present savings estimates from the perspective of summer coincident peak demand. In 2017, the first year of the projection, realistic achievable potential is 2.9 MW. By 2036, savings are 54.7 MW.

Table 5-11 Industrial EE Potential (Summer Peak Demand)

	2017	2018	2019	2026	2036
I&M Industrial Load Projection (MW)	1,075	1,079	1,085	1,105	1,131
Cumulative Savings (MW)					
Realistic Achievable Potential	2.9	5.6	8.2	27.8	54.7
Maximum Achievable Potential	3.3	6.4	9.4	32.3	63.0
Economic Potential	5.2	10.0	14.7	47.7	87.4
Technical Potential	9.2	17.9	26.4	78.3	132.0
Cumulative Savings as a % of Industrial Load Forecast					
Realistic Achievable Potential	0.3%	0.5%	0.8%	2.5%	4.8%
Maximum Achievable Potential	0.3%	0.6%	0.9%	2.9%	5.6%
Economic Potential	0.5%	0.9%	1.4%	4.3%	7.7%
Technical Potential	0.9%	1.7%	2.4%	7.1%	11.7%

Figure 5-16 Cumulative Industrial EE Coincident Peak Savings as a % of the Baseline

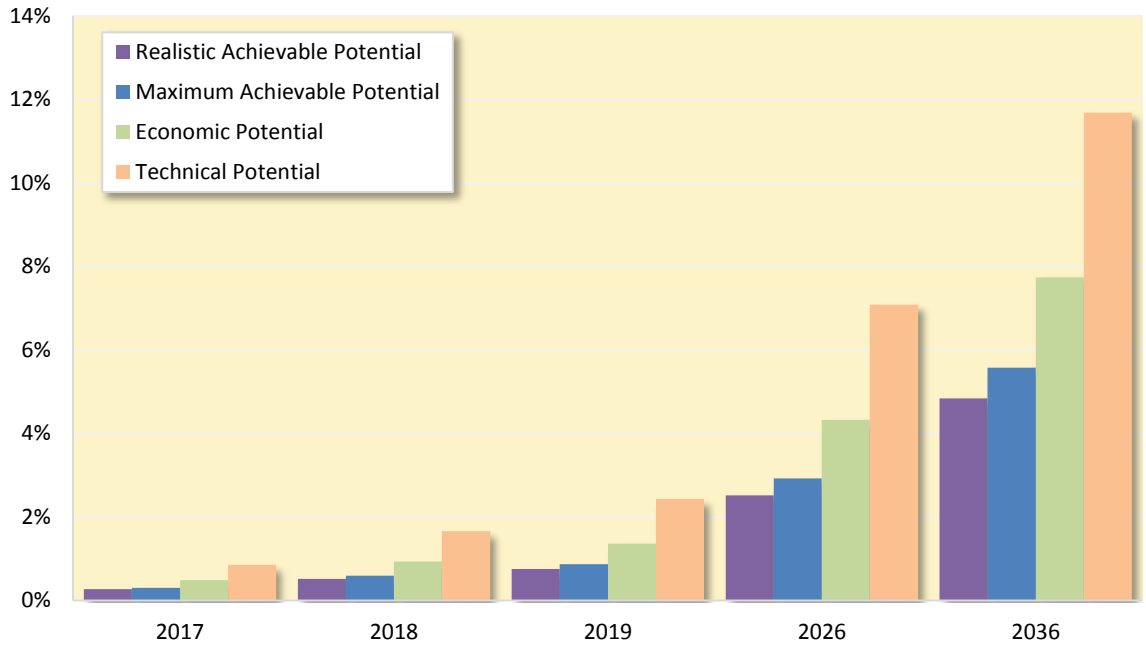
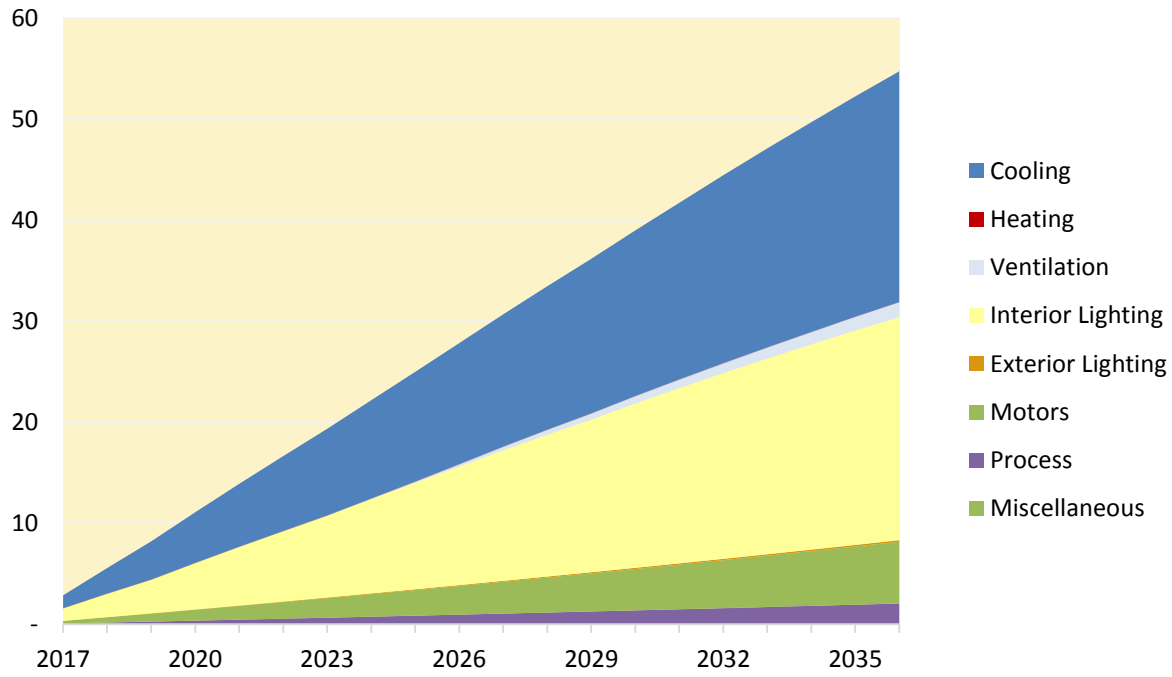


Figure 5-17 presents forecasts of summer coincident peak savings by end use. Savings from interior lighting and cooling measures dominate throughout the forecast horizon.

Figure 5-17 Industrial Achievable Savings Forecast (Summer Peak, Cumulative MW)



Indiana Opt-Out Customer Sensitivity

I&M's Indiana commercial and industrial customers may opt-out of utility programs. To better understand the implications of opt-out customers on EE potential, AEG conducted a sensitivity analysis excluding known I&M opt-out customer load in Indiana. This section presents EE potential results only for those C&I customers that are eligible to participate in I&M's DSM programs, thereby providing a better understanding of the commercial and industrial potential that can be achieved through EE programs. Stated differently, the sensitivity analysis excludes the C&I opt-out customer loads from the potential analysis.

AEG removed the known opt-out customer load from the appropriate customer segment in the base year, in alignment with data provided by I&M. The total load reduction was assumed to remain consistent from 2017 through 2036 (i.e., the opt-out customer load growth was assumed to remain constant throughout the study time horizon). Overall, C&I load was decreased by 9.3% after removing the C&I opt-out customer load. The effect is largest within the Industrial sector.

Table 6-1 Summary of Commercial and Industrial Sector Energy Use by Customer Type

Sector	Opt-Out Customers (GWh)	Total Sector Usage (GWh)	Opt-Out Usage as a Percent of Total Load
Commercial	33	4,122	0.8%
Industrial	802	4,825	16.6%
C&I Total	**834**	**8,947**	**9.3%**

The potential results from the sensitivity analysis are presented below for the Indiana commercial and industrial sectors within the I&M service territory.

Summary of C&I Potential Excluding Opt-Out Customers

Table 6-2 summarizes the EE potential savings for the commercial and industrial sector both including and excluding opt-out customers. As shown in the table, excluding opt-out customers from the EE potential has a small impact in the near future but a larger impact in future years. In 2017, the first year of the projection realistic achievable potential is 73 GWh for the C&I sector including opt-out customers and 71 GWh for the C&I sector excluding opt-out customers. By 2036, the cumulative realistic achievable potential is 1,283 GWh for the C&I sector including opt-out customers and 1,216 GWh for the C&I sector excluding opt-out customers.

Table 6-2 C&I Cumulative EE Potential (GWh) Excluding Opt-Out Customers

	2017	2018	2019	2026	2036
Indiana C&I Cumulative Savings *Including* Opt-Outs (GWh)					
Realistic Achievable Potential	70	135	197	610	1,237
Maximum Achievable Potential	102	195	283	849	1,652
Economic Potential	156	296	425	1,201	2,169
Technical Potential	215	413	594	1,568	2,620
Indiana C&I Cumulative Savings *Excluding* Opt-Outs (GWh)					
Realistic Achievable Potential	67	128	186	572	1,157
Maximum Achievable Potential	97	187	270	798	1,547
Economic Potential	148	282	404	1,127	2,026
Technical Potential	204	388	558	1,461	2,431

Table 6-3 summarizes the EE potential savings for the commercial and industrial sector both including and excluding opt-out customers from the perspective of summer coincident peak savings. As shown in the table, excluding opt-out customers from the EE potential has negligible impact in the near future but a larger impact in future years. In 2036, the cumulative realistic achievable potential is 198 MW for the C&I sector including opt-out customers and 190 MW for the C&I sector excluding opt-out customers.

Table 6-3 C&I Cumulative EE Potential (Summer Coincident Peak) Excluding Opt-Out Customers

	2017	2018	2019	2026	2036
Indiana C&I Cumulative Savings *Including* Opt-Outs (MW)					
Realistic Achievable Potential	12	24	35	101	198
Maximum Achievable Potential	18	33	49	138	261
Economic Potential	27	51	73	198	350
Technical Potential	36	68	98	262	438
Indiana C&I Cumulative Savings *Excluding* Opt-Outs (MW)					
Realistic Achievable Potential	12	23	33	97	190
Maximum Achievable Potential	17	33	47	134	251
Economic Potential	26	49	71	191	336
Technical Potential	34	65	94	250	419

Commercial Potential Excluding Opt-Out Customers

Table 6-4 provides a comparison of the four levels of EE potential for the commercial sector including and excluding opt-out customers. Approximately 0.8% of the I&M Indiana commercial customer load was attributed to opt-out customers. Therefore, the impact of excluding opt-out customers is not as significant as the impact on the industrial sector. Excluding opt-out customers has a negligible impact on realistic achievable potential in the near future. In 2013, the cumulative realistic achievable potential is 811 GWh including opt-out customers and 802 GWh excluding opt-out customers, for a 1.1% reduction in realistic achievable potential.

Table 6-4 Comparison of Commercial EE Potential (Energy Savings) Including and Excluding Opt-Out Customers

	2017	2018	2019	2026	2036
Indiana Commercial Cumulative Savings *Including* Opt-Outs (GWh)					
Realistic Achievable Potential	53	102	148	416	811
Maximum Achievable Potential	80	152	219	593	1,104
Economic Potential	122	229	326	830	1,429
Technical Potential	153	292	415	1,022	1,646
Indiana Commercial Cumulative Savings *Excluding* Opt-Outs (GWh)					
Realistic Achievable Potential	53	101	146	413	804
Maximum Achievable Potential	80	151	217	589	1,095
Economic Potential	121	228	323	823	1,417
Technical Potential	152	289	412	1,014	1,633

Figure 6-1 presents estimates for the four levels of EE potential for the commercial sector excluding opt-out customers from the perspective of cumulative annual energy savings.

Figure 6-1 Cumulative Commercial EE Potential Excluding Opt-Out Customers (GWh)

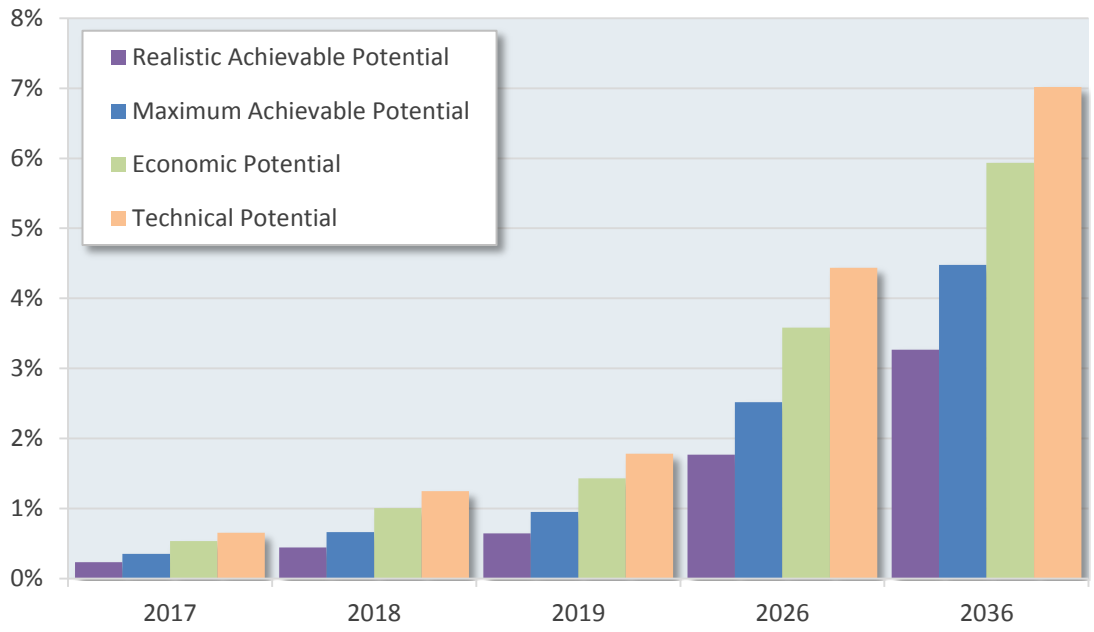


Table 6-5 provides a comparison of the four levels of EE potential for the commercial sector from the perspective of summer coincident peak demand, including and excluding opt-out customers. Excluding opt-out customers has a negligible impact on realistic achievable potential in the near future. In 2036, the cumulative realistic achievable potential is 152 MW including opt-out

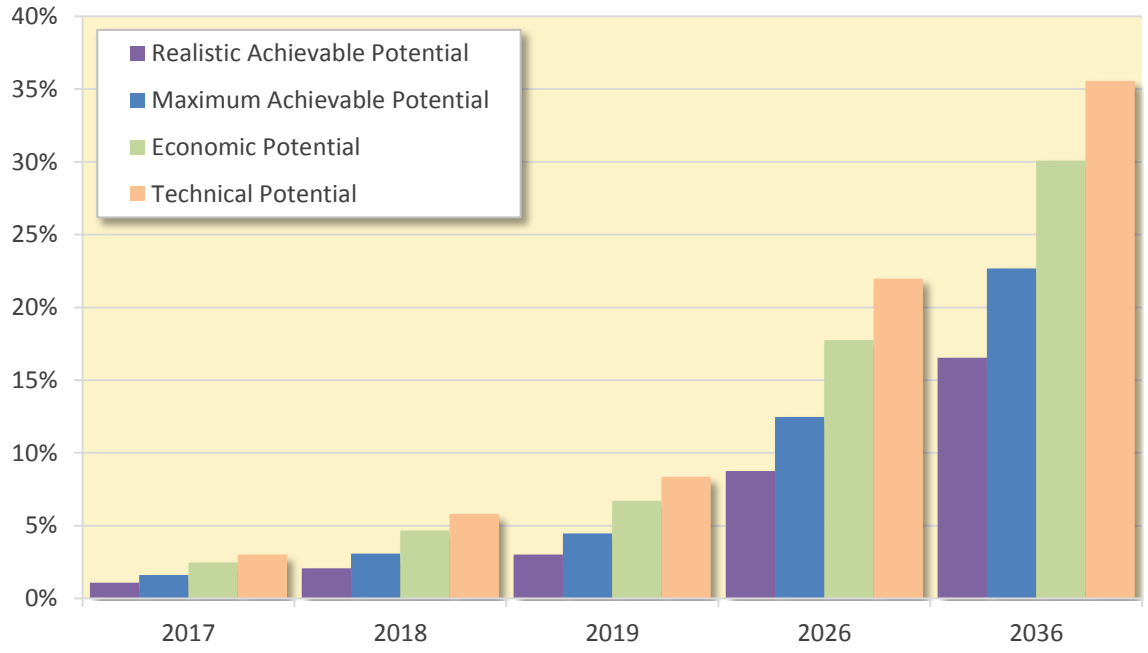
customers and 150 MW excluding opt-out customers, for a 1.3% reduction in realistic achievable potential peak coincident savings.

Table 6-5 Comparison of Commercial EE Potential (Coincident Peak Savings) Including and Excluding Opt-Out Customers

	2017	2018	2019	2026	2036
Indiana Commercial Cumulative Savings *Including* Opt-Outs (MW)					
Realistic Achievable Potential	10	19	28	78	152
Maximum Achievable Potential	15	28	41	111	208
Economic Potential	23	43	61	158	276
Technical Potential	28	53	76	196	326
Indiana Commercial Cumulative Savings *Excluding* Opt-Outs (MW)					
Realistic Achievable Potential	10	19	27	77	150
Maximum Achievable Potential	15	28	40	110	205
Economic Potential	22	42	60	156	272
Technical Potential	27	52	75	193	322

Figure 6-2 presents estimates for the four levels of EE potential for the commercial sector excluding opt-out customers from the perspective of cumulative summer coincident peak.

Figure 6-2 Cumulative Commercial EE Potential Excluding Opt-Out Customers (Coincident Peak Savings)



Industrial Potential

Table 6-6 provides a comparison of the four levels of EE potential for the industrial sector including and excluding opt-out customers. Approximately 16.6% of the industrial customer load was attributed to opt-out customers. Therefore, the impact of excluding opt-out customers is larger in the industrial sector than the commercial sector. In 2017, realistic achievable potential excluding opt-out customers is approximately 17% less than the realistic achievable potential including opt-out customers. This difference remains consistent through 2036.

Table 6-6 Comparison of Industrial EE Potential (Energy Savings) Including and Excluding Opt-Out Customers

	2017	2018	2019	2026	2036
Indiana Industrial Cumulative Savings *Including* Opt-Outs (GWh)					
Realistic Achievable Potential	17	33	49	194	426
Maximum Achievable Potential	22	43	64	256	548
Economic Potential	34	67	99	371	740
Technical Potential	62	121	179	546	974
Indiana Industrial Cumulative Savings *Excluding* Opt-Outs (GWh)					
Realistic Achievable Potential	14	27	40	161	355
Maximum Achievable Potential	18	36	53	211	454
Economic Potential	28	55	82	306	613
Technical Potential	52	100	148	450	802

Figure 6-3 presents estimates for the four levels of EE potential for the industrial sector excluding opt-out customers from the perspective of cumulative annual energy savings.

Figure 6-3 Cumulative Industrial EE Potential Excluding Opt-Out Customers (GWh)

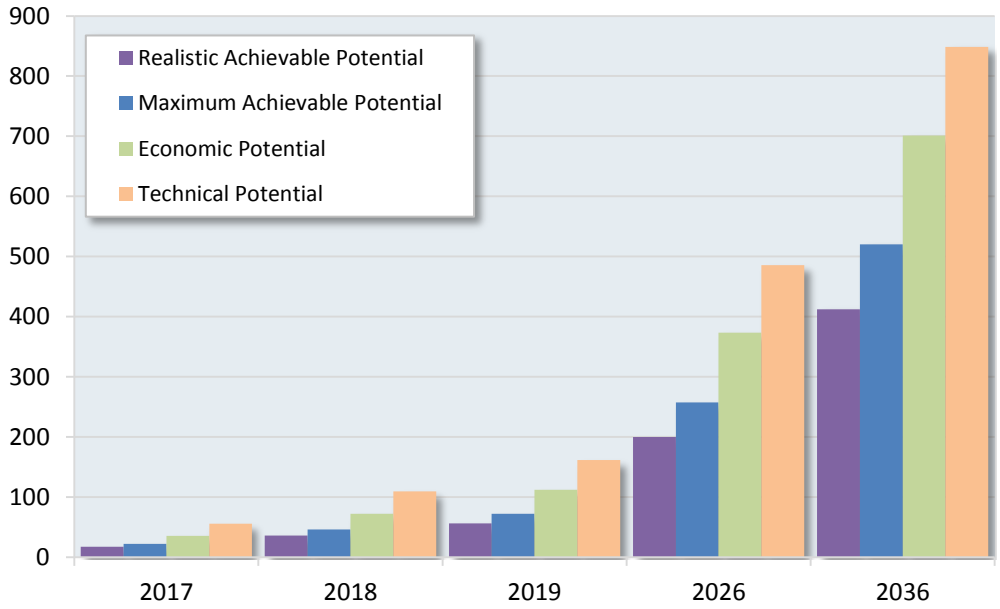


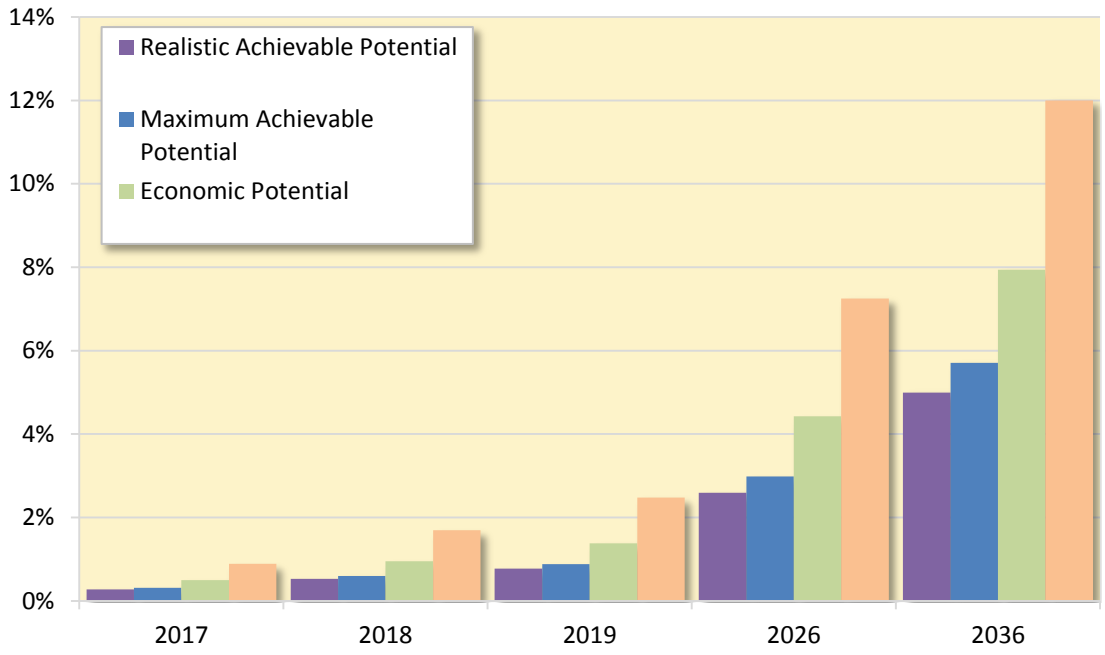
Table 6-7 provides a comparison of the four levels of EE potential for the industrial sector from the perspective of summer coincident peak demand, including and excluding opt-out customers. Excluding opt-out customers has a negligible impact on realistic achievable potential in the near future. In 2036, the cumulative realistic achievable potential is 46 MW including opt-out customers and 40 MW excluding opt-out customers, for a 13.0% reduction in realistic achievable potential peak coincident savings.

Table 6-7 Comparison of Industrial EE Potential (Coincident Peak Savings) Including and Excluding Opt-Out Customers

	2017	2018	2019	2026	2036
Indiana Industrial Cumulative Savings *Including* Opt-Outs (MW)					
Realistic Achievable Potential	2	5	7	23	46
Maximum Achievable Potential	3	5	8	27	53
Economic Potential	4	8	12	40	74
Technical Potential	8	15	22	66	112
Indiana Industrial Cumulative Savings *Excluding* Opt-Outs (MW)					
Realistic Achievable Potential	2	4	6	20	40
Maximum Achievable Potential	2	5	7	24	46
Economic Potential	4	7	11	35	64
Technical Potential	7	13	19	57	97

Figure 6-4 presents estimates for the four levels of EE potential for the industrial sector excluding opt-out customers from the perspective of cumulative summer coincident peak.

Figure 6-4 Cumulative Industrial EE Potential Excluding Opt-Out Customers (Coincident Peak Savings)



Program Design

This section covers the program design, or program-level potential, where the components of energy efficiency measure-level potential discussed in Chapter 5 are integrated and bundled to develop multiple EE portfolio scenarios.

Development of Program Potential

Program potential is defined as the portion of the achievable potential that might be reasonably achieved given the realities of implementation and the constraints of program resources. It is a subset of measure potential that is aligned with recent I&M implementation accomplishments and long-term goals.

When translating from the measure-level potential to program-level potential, AEG applied the following adjustments:

- Applied net-to-gross ratios based upon historic I&M EM&V findings.[18]
- Reviewed measures that did not pass the TRC screen to determine if they should remain in the program. Non cost-effective measures may have been included in the program for market continuity purposes and to provide a robust portfolio.
- Excluded measures with small potential or that are challenging to implement (e.g., residential whole house fans).
- As appropriate, considered multiple efficiency levels for technology (e.g., residential central air conditioners).
- Evaluated program cost-effectiveness incorporating delivery, administration and EM&V costs. The program-level potential relied primarily on the UCT test to determine cost-effectiveness.

AEG developed three EE portfolio scenarios:

- **High Scenario** reflects expected program participation given ideal market implementation and few barriers to customer adoption. Information channels are assumed to be established and efficient for marketing, educating consumers, and coordinating with dealers and delivery partners. Under this scenario, incentives represent a substantial portion of the incremental cost combined with high administrative and marketing costs.
- **Mid Scenario** reflects expected program participation given barriers to customer acceptance and non-ideal implementation conditions. These measures are delivered under less than ideal market conditions, however, there are less barriers and less limitations on budgets than there would be under the low scenario.
- **Low Scenario** reflects low program participation given high barriers to customer acceptance, non-ideal implementation conditions, limited program budgets and limited access to support for implementation as well as education and outreach.

The proposed EE programs deliver an effective and balanced portfolio of energy savings opportunities across all customer segments. Program eligibility has been defined broadly to make programs as inclusive as possible. In general, participation guidelines are designed to include all customer sectors and end uses.[19] Each program was designed to leverage the optimal mix of

[18] LoadMAP potential results are net of naturally occurring efficiency (i.e., reflects that some customers are already purchasing the more efficient option). BenCost program-level results are presented as gross as well as net of free riders and spillover (determined from I&M EM&V reports). BenCost and LoadMAP utilize a bottom-up approach, with gross measure inputs.
[19] Customer sectors account for only those sectors that would pay a DSIM charge.

best-practice measures and technologies, delivery strategies, and target markets in order to most effectively deliver programs and measures to I&M customers.

I&M's program portfolio uses a combination of education and customer incentives to advance energy efficiency. Customer incentives are the primary mechanism for program delivery. Customers receive rebates to purchase energy efficient equipment and services through existing market actors, including equipment dealers and retailers. To achieve the portfolio's long-term savings goals, it will be necessary for I&M to engage customers, retailers, and state and local agencies. Targeting retailers and leveraging I&M's relationship with its stakeholders will increase program awareness among consumers and promote the market adoption of high efficiency equipment. Creative and sustained marketing is important to a successful and robust energy efficiency program portfolio.

I&M's Indiana and Michigan programs have been aligned to offer customers consistent programs and incentives.[20] This will allow I&M to streamline implementation and marketing activities and provide equitable programs to all of their customers, regardless of whether they receive service in Indiana or Michigan.

The programs are listed with a brief description in Table 7-1.[21]

[20] Incentives were structured to match by the 2019 program year.
[21] Note that the programs only include EE options, per the scope of work.

Table 7-1 Proposed EE Program Descriptions

Program	Description
Efficient Products	Customers may receive upstream incentives for efficient lighting as well as incentives for efficient appliances and HVAC equipment via a rebate application.
Appliance Recycling	Customers may receive an incentive for recycling an operating refrigerator and freezer. Customer may also recycle room air conditioners at no cost during a scheduled refrigerator or freezer pickup.
Home Weatherproofing	The program consists of two components: 1) Home energy audit and installation of low-cost measures at no cost to the customer. 2) Air sealing, insulation and other weatherization improvement incentives that cover up to 50% of insulation measure and installation costs, up to $3,000 per home.
Income Qualified Weatherproofing	The program consists of two components: 1) Home energy audit and installation of low-cost measures at no cost to the customer. 2) Air sealing and insulation incentives that cover up to 100% of insulation measure and installation costs.
Home Online Energy Checkup	Educate customers on the benefits of energy efficiency and opportunities for reducing energy usage with an online audit and measures kit.
Schools Education Program	Educate elementary school students about energy conservation and efficiency. Provide teacher lesson plans as well as student energy kits.
Residential New Construction	Builders and developers receive incentives based upon the level of efficiency achieved in new construction.
Home Energy Reports	Customers receive reports containing energy consumption information and tips to conserve energy.
C&I Prescriptive and Custom	Customers may receive: • Pre-qualified prescriptive measure rebates. • Custom rebates for all equipment and projects that do not qualify for a prescriptive measure rebate. Projects must be pre-approved and be cost-effective based upon the TRC test.
Small Business Direct Install	Customers with monthly demand of less than 150 kW per site may receive an on-site energy evaluation and incentives that cover up to 70% of the measure and installation cost of qualifying lighting and refrigeration measures.
Small Business Energy Tool	Online audit tool provides recommendations and tips. Opportunity to lead customers to participate in the Small Business Direct Install.

Portfolio Impacts and Budgets

Figure 7-1 presents the proposed annual cumulative energy savings for each of the EE portfolios scenarios (i.e., program-level potential scenarios) in comparison to the RAP and MAP measure-level potential results. The measure-level potential analysis did not include behavioral programs whereas the program design includes a Home Energy Reports program which accounts for behavioral savings. Therefore, program savings appear greater than the RAP and MAP potential results.[22]

Figure 7-1 Proposed Annual Cumulative Energy Savings by Scenario (Net MWh)

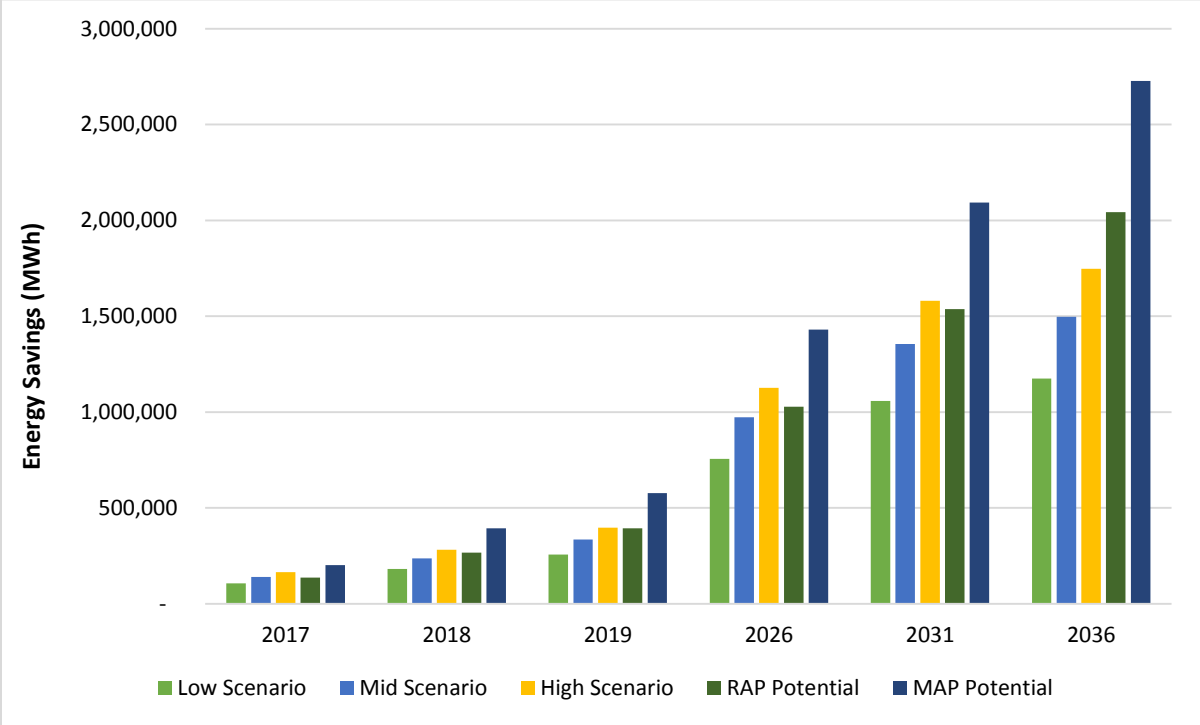


Table 7-2, Table 7-3, and Table 7-4 present summary tables of each proposed energy efficiency portfolio.

Table 7-2 Proposed EE Portfolio Summary, Low Scenario

	2017	2018	2019	2026	2031	2036
Net Incremental MWh Savings	**98,309**	**98,386**	**98,885**	**100,870**	**109,536**	**119,743**
Net Incremental MW Savings	**13.2**	**13.2**	**13.3**	**13.6**	**14.7**	**16.1**
Utility Cost Test	**8.83**	**9.39**	**9.92**	**12.55**	**14.09**	**15.15**
Incentives	$3,843,073	$3,890,151	$3,966,083	$4,270,255	$4,666,455	$5,132,586
Delivery	$4,119,175	$4,183,777	$4,282,359	$5,004,632	$5,645,618	$6,427,273
Administration	$609,701	$621,313	$638,136	$731,326	$813,066	$912,474
Education & Marketing	$560,161	$572,983	$590,057	$687,217	$763,540	$858,953
Evaluation	$456,608	$463,411	$473,834	$534,674	$594,436	$666,568
Total Budget	**$9,561,792**	**$9,695,221**	**$9,909,909**	**$11,141,387**	**$12,673,109**	**$14,475,765**

[22] LoadMAP potential results are net of naturally occurring efficiency (i.e., reflects that some customers are already purchasing the more efficient option). BenCost program-level results are net of free riders and spillover (determined from I&M EM&V reports).

Table 7-3 Proposed EE Portfolio Summary, Mid Scenario

	2017	2018	2019	2026	2031	2036
Net Incremental MWh Savings	**128,698**	**129,278**	**129,334**	**130,884**	**141,909**	**153,806**
Net Incremental MW Savings	**17.3**	**17.4**	**17.5**	**17.8**	**19.5**	**21.4**
Utility Cost Test	**7.25**	**7.68**	**8.15**	**10.40**	**11.71**	**12.63**
Incentives	$6,776,274	$6,891,347	$6,937,053	$7,497,760	$8,268,233	$9,186,292
Delivery	$4,965,361	$5,093,150	$5,191,152	$5,951,755	$6,608,744	$7,366,904
Administration	$950,639	$973,509	$990,043	$1,114,131	$1,242,011	$1,391,754
Education & Marketing	$922,857	$945,299	$964,830	$1,090,083	$1,216,144	$1,362,842
Evaluation	$680,758	$695,166	$704,154	$782,688	$866,760	$965,393
Total Budget	**$14,243,756**	**$14,541,961**	**$14,726,446**	**$16,303,232**	**$18,565,159**	**$21,121,830**

Table 7-4 Proposed EE Portfolio Summary, High Scenario

	2017	2018	2019	2026	2031	2036
Net Incremental MWh Savings	**149,688**	**149,583**	**149,289**	**148,138**	**161,145**	**175,835**
Net Incremental MW Savings	**20.5**	**20.5**	**20.5**	**20.5**	**22.5**	**24.7**
Utility Cost Test	**6.67**	**7.11**	**7.56**	**9.77**	**10.99**	**11.72**
Incentives	$10,118,902	$10,240,536	$10,294,340	$10,849,014	$11,834,930	$13,196,286
Delivery	$5,227,266	$5,302,443	$5,391,138	$5,958,792	$6,648,246	$7,594,641
Administration	$1,262,186	$1,285,520	$1,305,169	$1,420,745	$1,556,615	$1,741,394
Education & Marketing	$1,258,083	$1,285,470	$1,311,801	$1,448,666	$1,584,729	$1,768,291
Evaluation	$893,324	$905,701	$915,125	$983,864	$1,081,229	$1,215,033
Total Budget	**$18,674,156**	**$18,916,848**	**$19,105,798**	**$20,418,914**	**$23,229,565**	**$26,764,694**

The tables below present summarize the program budgets, energy savings, demand savings and UCT results for selected years for each of the three portfolio scenarios.

Low Scenario Portfolio Detail

Table 7-5 Proposed EE Program Budget (thousands), Low Scenario

	2017	2018	2019	2026	2031	2036
Efficient Products	$1,527	$1,536	$1,614	$1,792	$2,213	$2,657
Appliance Recycling	$477	$498	$529	$831	$960	$1,152
Home Weatherproofing	$290	$295	$301	$348	$383	$416
Income Qualified Weatherproofing	$456	$459	$465	$534	$597	$642
Home Online Energy Checkup	$613	$639	$666	$898	$1,120	$1,404
Schools Education Program	$848	$879	$912	$1,189	$1,453	$1,791
New Construction	$349	$371	$397	$532	$533	$533
Home Energy Reports	$1,063	$1,056	$1,047	$1,029	$1,029	$1,029
C&I Prescriptive	$1,174	$1,191	$1,204	$1,209	$1,426	$1,751
C&I Custom	$2,009	$2,009	$2,009	$2,009	$2,094	$2,094
Small Business Direct Install	$477	$483	$487	$493	$586	$731
Small Business Efficiency	$278	$278	$278	$278	$278	$278
Total Portfolio:	**$9,562**	**$9,695**	**$9,910**	**$11,141**	**$12,673**	**$14,476**

Table 7-6 Proposed EE Program Net Incremental Electric Savings (MWh), Low Scenario

	2017	2018	2019	2026	2031	2036
Efficient Products	8,399	8,213	8,443	7,131	8,042	9,009
Appliance Recycling	1,982	2,076	2,203	3,377	3,915	4,670
Home Weatherproofing	566	576	591	679	745	807
Income Qualified Weatherproofing	734	738	769	881	982	1,060
Home Online Energy Checkup	1,818	1,887	1,959	2,578	3,169	3,923
Schools Education Program	4,802	4,956	5,119	6,508	7,835	9,529
New Construction	343	371	406	555	559	559
Home Energy Reports	31,663	31,483	31,243	30,763	30,763	30,763
C&I Prescriptive	18,988	19,096	19,192	19,666	23,385	28,808
C&I Custom	26,781	26,781	26,781	26,781	27,917	27,917
Small Business Direct Install	2,233	2,209	2,179	1,950	2,224	2,698
Small Business Efficiency	-	-	-	-	-	-
Total Portfolio:	**98,309**	**98,386**	**98,885**	**100,870**	**109,536**	**119,743**

Table 7-7 Proposed EE Program Net Incremental Demand Savings (MW), Low Scenario

	2017	2018	2019	2026	2031	2036
Efficient Products	1.09	1.07	1.12	0.98	1.18	1.43
Appliance Recycling	0.29	0.31	0.33	0.52	0.60	0.73
Home Weatherproofing	0.04	0.04	0.04	0.05	0.06	0.06
Income Qualified Weatherproofing	0.07	0.07	0.07	0.08	0.09	0.10
Home Online Energy Checkup	0.17	0.18	0.18	0.24	0.30	0.37
Schools Education Program	0.37	0.38	0.39	0.48	0.57	0.68
New Construction	0.23	0.24	0.26	0.34	0.34	0.34
Home Energy Reports	3.61	3.59	3.57	3.51	3.51	3.51
C&I Prescriptive	2.64	2.65	2.66	2.71	3.22	3.95
C&I Custom	4.40	4.40	4.40	4.40	4.59	4.59
Small Business Direct Install	0.31	0.31	0.30	0.25	0.29	0.34
Small Business Efficiency	-	-	-	-	-	-
Total Portfolio:	**13.24**	**13.24**	**13.32**	**13.58**	**14.74**	**16.10**

Mid Scenario Portfolio Detail

Table 7-8 Proposed EE Program Budget (thousands), Mid Scenario

	2017	2018	2019	2026	2031	2036
Efficient Products	$2,323	$2,427	$2,444	$2,789	$3,337	$4,061
Appliance Recycling	$670	$701	$729	$1,022	$1,147	$1,328
Home Weatherproofing	$406	$420	$435	$578	$756	$932
Income Qualified Weatherproofing	$674	$710	$740	$943	$1,159	$1,429
Home Online Energy Checkup	$720	$732	$744	$836	$926	$1,009
Schools Education Program	$1,041	$1,080	$1,120	$1,387	$1,493	$1,586
New Construction	$526	$566	$600	$837	$1,015	$1,254
Home Energy Reports	$1,103	$1,093	$1,079	$1,052	$1,052	$1,052
C&I Prescriptive	$2,206	$2,227	$2,244	$2,251	$2,658	$3,260
C&I Custom	$3,664	$3,664	$3,664	$3,664	$3,949	$3,949
Small Business Direct Install	$633	$645	$649	$666	$795	$985
Small Business Efficiency	$278	$278	$278	$278	$278	$278
Total Portfolio:	**$14,244**	**$14,542**	**$14,726**	**$16,303**	**$18,565**	**$21,122**

Table 7-9 Proposed EE Program Net Incremental Electric Savings (MWh), Mid Scenario

	2017	2018	2019	2026	2031	2036
Efficient Products	10,488	10,720	10,614	8,990	9,805	11,012
Appliance Recycling	2,596	2,712	2,808	3,858	4,325	4,972
Home Weatherproofing	740	768	800	1,056	1,383	1,699
Income Qualified Weatherproofing	1,096	1,156	1,203	1,538	1,911	2,361
Home Online Energy Checkup	2,202	2,236	2,270	2,523	2,718	2,928
Schools Education Program	5,860	6,053	6,257	7,655	8,247	8,883
New Construction	517	577	606	887	1,087	1,388
Home Energy Reports	42,568	42,298	41,938	41,218	41,218	41,218
C&I Prescriptive	25,250	25,381	25,501	26,096	31,248	38,725
C&I Custom	34,410	34,410	34,410	34,410	36,925	36,925
Small Business Direct Install	2,971	2,968	2,927	2,652	3,042	3,697
Small Business Efficiency	-	-	-	-	-	-
Total Portfolio:	**128,698**	**129,278**	**129,334**	**130,884**	**141,909**	**153,806**

Table 7-10 Proposed EE Program Net Incremental Demand Savings (MW), Mid Scenario

	2017	2018	2019	2026	2031	2036
Efficient Products	1.38	1.43	1.43	1.31	1.56	2.00
Appliance Recycling	0.39	0.40	0.42	0.59	0.67	0.78
Home Weatherproofing	0.06	0.06	0.06	0.08	0.10	0.13
Income Qualified Weatherproofing	0.10	0.11	0.11	0.14	0.18	0.22
Home Online Energy Checkup	0.20	0.21	0.21	0.23	0.25	0.27
Schools Education Program	0.45	0.46	0.48	0.57	0.61	0.66
New Construction	0.32	0.34	0.36	0.50	0.61	0.76
Home Energy Reports	4.86	4.83	4.79	4.71	4.71	4.71
C&I Prescriptive	3.51	3.53	3.54	3.61	4.31	5.33
C&I Custom	5.65	5.65	5.65	5.65	6.07	6.07
Small Business Direct Install	0.42	0.41	0.40	0.35	0.39	0.47
Small Business Efficiency	-	-	-	-	-	-
Total Portfolio:	**17.34**	**17.43**	**17.45**	**17.75**	**19.47**	**21.40**

High Scenario Portfolio Detail

Table 7-11 Proposed EE Program Budget (thousands), High Scenario

	2017	2018	2019	2026	2031	2036
Efficient Products	$3,592	$3,698	$3,718	$3,868	$4,619	$5,814
Appliance Recycling	$829	$836	$858	$1,127	$1,220	$1,496
Home Weatherproofing	$613	$631	$649	$852	$1,097	$1,342
Income Qualified Weatherproofing	$940	$977	$1,037	$1,350	$1,703	$2,181
Home Online Energy Checkup	$815	$828	$842	$945	$1,043	$1,134
Schools Education Program	$401	$406	$411	$443	$474	$485
New Construction	$688	$729	$777	$1,021	$1,068	$1,144
Home Energy Reports	$1,130	$1,117	$1,101	$1,067	$1,067	$1,067
C&I Prescriptive	$3,328	$3,349	$3,367	$3,380	$4,019	$4,963
C&I Custom	$5,300	$5,300	$5,300	$5,300	$5,704	$5,704
Small Business Direct Install	$760	$767	$769	$788	$938	$1,157
Small Business Efficiency	$278	$278	$278	$278	$278	$278
Total Portfolio:	**$18,674**	**$18,917**	**$19,106**	**$20,419**	**$23,230**	**$26,765**

Table 7-12 Proposed EE Program Net Incremental Electric Savings (MWh), High Scenario

	2017	2018	2019	2026	2031	2036
Efficient Products	15,161	15,071	14,838	11,652	12,954	15,009
Appliance Recycling	3,045	3,059	3,135	4,021	4,370	5,326
Home Weatherproofing	1,077	1,113	1,149	1,496	1,929	2,348
Income Qualified Weatherproofing	1,519	1,585	1,679	2,213	2,795	3,597
Home Online Energy Checkup	2,565	2,600	2,639	2,930	3,161	3,407
Schools Education Program	2,739	2,762	2,787	3,016	3,250	3,507
New Construction	684	737	781	1,055	1,119	1,240
Home Energy Reports	48,195	47,865	47,425	46,545	46,545	46,545
C&I Prescriptive	30,229	30,364	30,494	31,187	37,453	46,533
C&I Custom	40,903	40,903	40,903	40,903	43,986	43,986
Small Business Direct Install	3,572	3,524	3,458	3,120	3,582	4,338
Small Business Efficiency	-	-	-	-	-	-
Total Portfolio:	**149,688**	**149,583**	**149,289**	**148,138**	**161,145**	**175,835**

Table 7-13 Proposed EE Program Net Incremental Demand Savings (MW), High Scenario

	2017	2018	2019	2026	2031	2036
Efficient Products	2.03	2.04	2.02	1.70	2.02	2.62
Appliance Recycling	0.46	0.46	0.47	0.63	0.68	0.83
Home Weatherproofing	0.08	0.08	0.08	0.11	0.14	0.17
Income Qualified Weatherproofing	0.14	0.15	0.16	0.21	0.26	0.33
Home Online Energy Checkup	0.24	0.24	0.24	0.27	0.29	0.31
Schools Education Program	0.25	0.25	0.26	0.27	0.29	0.32
New Construction	0.39	0.41	0.44	0.58	0.61	0.65
Home Energy Reports	5.50	5.46	5.41	5.31	5.31	5.31
C&I Prescriptive	4.20	4.21	4.23	4.31	5.16	6.40
C&I Custom	6.72	6.72	6.72	6.72	7.23	7.23
Small Business Direct Install	0.50	0.49	0.48	0.41	0.46	0.56
Small Business Efficiency	-	-	-	-	-	-
Total Portfolio:	**20.51**	**20.53**	**20.51**	**20.51**	**22.46**	**24.74**

Proposed Energy Efficiency Programs

This section details the proposed EE programs. Each program description includes: the program objective, target market, program description, implementation, and eligible measures.

Residential Efficient Products Program

Objective	The overall objectives of the program include: • Encourage the purchase and installation of energy efficient measures. • Educate customers on opportunities to decrease their overall energy usage. • Encourage contractors to actively market eligible technologies to customers.
Target Market	Residential customers that own or rent a residence, including owners of rental properties and new construction. All residence types are eligible (e.g., single family, multi-family, etc.). The program also targets contractors, local retailers and lighting manufacturers.
Description	The program incentivizes the purchase and installation of efficient products. • *Lighting Incentives*. Customers receive an instant incentive at the point-of-purchase for the purchase of qualified CFL and LED bulbs.[23] Incentives may vary depending upon the type of lighting, manufacturer and associated retail cost. • *Product Incentives*. Customers submit an application via mail, email or online to receive an incentive for the purchase of an ENERGY STAR® appliance, thermostat or efficiency HVAC equipment.
Implementation	For the *Lighting Incentives*, the implementation activities will include: • Establish and maintain relationships with lighting manufacturers and retailers throughout I&M's service territory. • Provide in-store promotional materials and retail sales staff training. • Track program performance, audit sales data, and process payments to retailers/manufacturers. • Periodically report program activities, progress towards goals and opportunities for improvement. For the *Product Incentives*, the implementation activities will include: • Establish relationships with local contractors to promote the program and raise awareness of eligible energy efficient equipment. • Process rebate applications, including review and verification of applications and payment of customer rebates. • Track program performance, including customer and contractor participation. • Quality assurance/quality control (QA/QC) activities will include a review of customer applications to ensure the equipment meets the program requirements. Additional steps may be taken if fraud is suspected (e.g., site visits to confirm installation). • Periodically report program progress. The program will be marketed to residential customers and contractors. Partnerships with contractors will be developed through education and training seminars, presentations at Chamber of Commerce meetings, and other contractor informational events. Customer marketing activities may include, but not be limited to bill inserts, bill messaging and community events.

[23] CFLs will be removed from the program beginning in 2021. Savings decrease substantially due to federal lighting standards (EISA).

Eligible Measures

Incentive	Measure
Lighting Incentive	CFL Bulb
	LED Bulb
Product Incentive	ENERGY STAR Ceiling Fan
	ENERGY STAR Dehumidifier
	ENERGY STAR Pool Pump, Variable Speed
	ENERGY STAR Refrigerator
	ECM Furnace
	Heat Pump Water Heater
	Programmable Thermostat (must have CAC or ASHP)
	Wi-Fi Connected Smart Thermostat (must have electric heat)
	ASHP SEER 15, HSPF 8.2
	ASHP SEER 16, HSPF 8.7
	ASHP SEER 17, HSPF 9.2
	ASHP SEER 18, HSPF 10.1
	CAC SEER 15, EER 12
	CAC SEER 16, EER 13
	CAC SEER 17, EER 13
	Ductless HP Replace HP - SEER≥17, HSPF≥9.5
	Ductless HP Replace HP - SEER≥19, HSPF≥9.5
	Ductless HP Replace HP - SEER≥21, HSPF≥10
	Ductless HP Replace HP - SEER≥23, HSPF≥10
	Ductless HP Replace Elec Resistance - SEER≥17, HSPF≥9.5
	Ductless HP Replace Elec Resistance - SEER≥19, HSPF≥9.5
	Ductless HP Replace Elec Resistance - SEER≥21, HSPF≥10
	Ductless HP Replace Elec Resistance - SEER≥23, HSPF≥10

Residential Appliance Recycling Program

Objective	Promote the removal and retirement of inefficient appliances.
Target Market	All residential customers.
Description	The program incentivizes residential customers to remove inefficient refrigerators and freezers from the electric system and dispose of them in an environmentally safe and responsible manner. The refrigerator/freezer must be in working conditioner and a minimum of 10 cubic feet in size.[24] The refrigerators and freezers are picked-up at no cost to the customer. Customers may recycle a room air conditioner or dehumidifier at no cost during a scheduled refrigerator or freezer pick-up. Incentives will be offered for refrigerators and freezers only. An educational component will attempt to influence consumer behavior by encouraging customers to avoid replacing recycled secondary refrigerators or freezers.
Implementation	Implementation activities will include: • Schedule pickups from customer homes, verify customer eligibility and appliance qualification, remove appliance from customer homes as well as recycle / responsibly dispose of appliances. • Rebate processing. • Program tracking. • Periodically report progress towards program goals and opportunities for improvement. • Marketing plan to achieve program goals. Marketing may include, but not be limited to, bill inserts, newspaper/community newsletter advertisements, community events, billboards and I&M's website. The program includes an educational component that informs customers about the benefits of recycling their inefficient appliances and environmentally responsible disposal of appliances. Actual energy and demand savings could be lowered if a customer recycles a secondary appliance and begins utilizing their former primary unit as a secondary unit. Appliance recycling programs typically have higher free ridership rates than other programs, primarily due to: • Customers that were planning to replace their appliance prior to participating in the program. • Customers that were not using their appliance prior to participating in the program. In an effort to reduce free ridership, the program should emphasize and enforce the requirement that the appliance is plugged in and in operating condition at the time of pick-up. In an effort to increase spillover, the program should be cross-marketed with other residential programs.
Eligible Measures	Incentives will be offered for refrigerators and freezers only. **Measure** Refrigerator Freezer Room Air Conditioner Dehumidifier

[24] Only residential size appliances qualify.

Home Weatherproofing Program

<table>
<tr><td>Objective</td><td>Encourage residential long-term electric savings.</td></tr>
<tr><td>Target Market</td><td>Residential customers with electric heat that own or rent a residence, including owners of rental properties.</td></tr>
<tr><td>Description</td><td>The program will consist of two components:
1) Audit & Direct Install. Once every three years, customers will receive an in-home energy audit and installation of low-cost measures at no cost. The energy audit will identify potential efficiency improvements and educate homeowners on opportunities to decrease energy use. All customer home types will be eligible.
2) Incentives. Once customers have completed the audit, they will be eligible for insulation and air sealing incentives that cover up to 50% of the cost to purchase and installation of qualifying measures, up to $3,000 per home. Customers must sign an authorization form permitting the contractor to install measures in their home. The contractor submits paperwork to I&M detailing the work completed and receives payment. The customer is responsible for any payment not covered by the I&M incentives; payment is provided directly to the contractor. Customers with single family homes, mobile homes and multi-family end-units with an attic will be eligible to receive incentives.</td></tr>
<tr><td>Implementation</td><td>. Implementation activities will include:
Hire staff and/or engage local contractors to conduct audits and install measures.
Engage customers and schedule audit appointments.
Provide customer service support.
Process contractor payment, including review and verification of customer and contractor eligibility.
Track program performance, including customer and contractor participation as well as quality assurance/quality control (QA/QC).
Periodically report program progress.
Customer marketing activities may include, but not be limited to bill inserts, direct mail, email blasts, bill messaging, referrals and community events.
It is important that the measures are properly installed and customer satisfaction is high. Program QA/QC shold be completed on a random group of completed projects by contractor. The QA/QC process should include verification of the installation and customer satisfaction with the contractor and the program.</td></tr>
<tr><td>Eligible Measures</td><td>
<table>
<tr><th>Component</th><th>Measure</th></tr>
<tr><td>Direct Install Measure</td><td>LED Bulb</td></tr>
<tr><td>Direct Install Measure</td><td>Showerhead</td></tr>
<tr><td>Direct Install Measure</td><td>Shower Start with Shower Head</td></tr>
<tr><td>Direct Install Measure</td><td>Faucet Aerators</td></tr>
<tr><td>Direct Install Measure</td><td>Hot Water Tank Wrap</td></tr>
<tr><td>Direct Install Measure</td><td>Hot Water Pipe Insulation</td></tr>
<tr><td>Direct Install Measure</td><td>Re-Program Thermostat</td></tr>
<tr><td>Incentive</td><td>Air Sealing</td></tr>
<tr><td>Incentive</td><td>Ceiling Insulation</td></tr>
<tr><td>Incentive</td><td>Sidewall Insulation</td></tr>
<tr><td>Incentive</td><td>Kneewall Insulation</td></tr>
<tr><td>Incentive</td><td>Duct Insulation & Sealing</td></tr>
</table>
</td></tr>
</table>

Income Qualified Weatherproofing Program

Objective	Encourage long-term electric savings and bill reductions for income-qualified customers.
Target Market	Residential customers with electric heat and an annual income up to 200% Federal poverty level.
Description	The program will consist of two components: **1) Audit & Direct Install**. Once every three years, customers will receive an in-home energy audit and installation of low-cost measures at no cost. The energy audit will identify potential efficiency improvements and educate homeowners on the opportunities to decrease energy use. Customers with all homes types will be eligible. **2) Incentives.** Once customers have completed the audit, they will be eligible for incentives that cover up to 100% of the cost to purchase and installation of qualifying measures. Measures installed will vary depending upon the needs of the home. Customers must sign an authorization form permitting the contractor to install measures in their home. The contractor submits paperwork to I&M detailing the work completed and receives payment. Customers with single family homes, mobile homes and multi-family end-units with an attic will be eligible to receive incentives.
Implementation	Implementation activities will include: • Hire staff and/or engage local contractors to conduct audits and install measures. • Engage customers and schedule audit appointments. • Provide customer service support. • Process contractor payment, including review and verification of customer and contractor eligibility. • Track program performance, including customer and contractor participation as well as quality assurance/quality control (QA/QC). • Periodically report program progress. Customer marketing activities may include, but not be limited to bill inserts, direct mail, email blasts, bill messaging, referrals and community events. It is important that the measures are properly installed and customer satisfaction is high. Program QA/QC should be completed on a random group of completed projects by contractor. The QA/QC process should include verification of the installation and customer satisfaction with the contractor and the program.
Eligible Measures	

Component	Measure
Direct Install Measure	LED Bulb
Direct Install Measure	Showerhead
Direct Install Measure	Shower Start with Shower Head
Direct Install Measure	Faucet Aerators
Direct Install Measure	Hot Water Tank Wrap
Direct Install Measure	Hot Water Pipe Insulation
Direct Install Measure	Re-Program Thermostat
Incentive	Air Sealing
Incentive	Ceiling Insulation
Incentive	Sidewall Insulation
Incentive	Kneewall Insulation
Incentive	Duct Insulation & Sealing
Incentive	Wi-Fi Connected Smart Thermostat
Incentive	ENERGY STAR Refrigerator
Incentive	HVAC Maintenance (CAC/ASHP)

Home Online Energy Checkup Program

Objective	Educate customers on the benefits of energy efficiency and opportunities for reducing energy usage with an online audit and measures kit.
Target Market	All residential customers.
Description	Residential customers have access to an online tool that provides energy reduction recommendations and tips tailored to their home based on their usage history profile and information inputted into the audit tool. Upon completion of the online audit, I&M will mail the participant a kit of low-cost measures for self-installation. Customers may receive one kit every three years. The online audit tool is an entry-level degree of customer engagement, providing a way for customers to obtain tips and direct information regarding actions they can take to make their home more energy efficient.
Implementation	Implementation activities will include: • Develop and maintain the online audit tool. • Obtain and mail kits to customer homes. • Provide customer service support. • Track program performance and periodically report program progress. Customer marketing activities may include, but not be limited to bill inserts, direct mail, email blasts, bill messaging and community events.
Eligible Measures	Customers identified as having electric water heating will receive LED bulbs, LED nightlight, low-flow showerhead, and faucet aerators. Customers identified as having non-electric water heaters will receive LED bulbs and an LED nightlight.

School Education Program

Objective	Educate elementary school students about energy conservation and efficiency.
Target Market	School administrators (including teachers), 5th grade students and parents.
Description	The program offers a set of classroom activities and a kit of low-cost energy and water efficiency products to 5th grade students. The program helps build awareness of energy conservation. Teachers will receive education materials, including lesson plans, and students will receive a kit of low-cost efficiency measures to self-install in their residence.
Implementation	Implementation activities will include: • Recruit and train teachers. • Supply student kits and educational materials. • Track program performance and periodically report program progress. • Market the program to elementary schools and teachers.
Eligible Measures	Student kits will contain CFL and LED bulbs, LED nightlight, low-flow showerhead, and low-flow kitchen aerators.

Residential New Construction

Objective	Encourage energy efficiency achievements in new construction of residential homes.
Target Market	Homeowners, home builders/developers and raters. Single-family homes and duplexes qualify for rebates.
Description	Home builders and developers may receive a rebate for efficient new construction of single family and duplex dwellings.[25] Three energy efficiency tiers will be available: • Silver Star (HERS Score 75) • Gold Star (HERS Score 67) • Platinum Star (HERS Score 60) Incentives will vary depending upon HERS scores and the home heating and cooling type, only all electric or central air conditioner/natural gas homes qualify.
Implementation	Implementation activities will include: • Engage and establish relationships with builders, developers and raters to participate in the program. • Provide customer service support. • Process rebate applications, including review and verification of applications and payment of rebates. • Track program performance. • Quality assurance/quality control (QA/QC) activities will include application reviews and random site visits to verify measure installation. • Periodically report program progress. I&M will market the program to residential customers and builders/developers. Partnerships with builders, developers and raters will be developed via education and training seminars, presentations at Home Builder Association meetings, and other informational events. Customer marketing activities may include, but not be limited to bill inserts, email blasts, bill messaging and community events.
Eligible Measures	n/a

Home Energy Reports

Objective	Reduce consumption via socially- and information-driven behavioral change and raise general awareness of energy efficiency.
Target Market	Residential customers.
Description	Provide individualized energy use information to customers while simultaneously offering recommendations on how to save energy and money by making small changes to energy consuming behaviors. Energy reports will be periodically mailed/emailed to customer households to increase self-awareness and a provide peer comparison of their energy usage. Social competitiveness increases behavior to reduce energy consumption.
Implementation	I&M will select an implementation contractor that specializes in developing and issuing residential energy reports. Program participation and control groups will be completed in collaboration with I&M and their third-party evaluation contractor. Reports may be developed with customized energy reduction tips and cross-promotion of I&M's DSM portfolio.
Eligible Measures	n/a

[25] Multi-family new construction would not be eligible for the Residential New Construction Program, but could participate through the C&I Rebates Program.

C&I Prescriptive and Custom Rebates Program

Objective	Encourage purchase and installation of energy efficient equipment by providing incentives to lower the cost of purchasing efficient equipment for commercial and industrial facilities.
Target Market	Commercial and industrial customers.
Description	The program provides incentives to lower the cost of purchasing energy efficient equipment for commercial and industrial facilities. The program consists of prescriptive and custom rebates. Projects with a rebate >$10,000 requires pre-approval. **Prescriptive**. Pre-qualified prescriptive rebates are available for retrofit projects. The measure list and incentive levels may be updated annually to reflect changes to the market. **Custom**. Equipment that does not qualify for a prescriptive rebate will be eligible for a custom rebate. Applications must be pre-approved by I&M before equipment is purchased and installed and must produce a TRC benefit-cost ratio of at least 1.0. A component of the custom program will be targeting large users, offering a tailored approach to energy efficiency projects. I&M will work closely with customers to determine the opportunities for energy efficiency and how I&M can support progress on these projects. Engagement with these customers will rely on personal discussions and one-on-one meetings. Indiana incentives will be capped at 75% of total project costs, $150,000 per site and $300,000 per customer. Michigan incentives will be capped at 75% of total project costs, $50,000 per site and $100,000 per customer. The cap may be exceeded if the program pipeline shows funding available. Multiple rebate applications for different measures may be submitted.
Implementation	Implementation activities will include: • Process customer applications, verify customer and project eligibility (including pre-approval of custom projects) and process customer rebates. • Quality assurance/quality control (QA/QC) activities will include application reviews and random site visits to verify equipment installation. • Provide customer service support. • Track program performance. • Periodically report progress towards program goals and opportunities for improvement. The program will be marketed through partnerships with contractors as well as direct mail, email blasts or targeted mailings to customers and contractors, bill inserts, and advertising in trade publications. The custom program will rely on targeted customer engagement with one-on-one meetings/discussions.
Eligible Measures	Prescriptive measures largely target kitchen equipment, refrigeration, variable frequency drives, and lighting. Custom projects vary significantly but may include compressed air optimization, refrigeration optimization, retrocommissioning, HVAC equipment, lighting and variable frequency drives.

Small Business Direct Install Program

Objective	Encourage small business customers to adopt more efficiency lighting and refrigeration.
Target Market	Small business customers with less than 150 kW demand per site.
Description	The program will offer small commercial customers an energy audit that includes information on potential energy savings and anticipated payback as well as incentives that cover up to 70% percent of the equipment and installation costs. Eligible measures include lighting and refrigeration measures.
Implementation	Implementation activities will include: • Recruit/engage qualified trade allies to conduct audits and install efficient equipment. • Process applications, verify customer eligibility, and process rebates. • Quality assurance/quality control (QA/QC) activities will include application reviews and random site visits to verify equipment installation. • Provide customer service support. • Track program performance. • Periodically report progress towards program goals and opportunities for improvement. The marketing and outreach strategies will include direct customer marketing such as bill inserts, newsletters, email, and on-bill messaging. The auditors market the program directly to customers. Successful projects should be highlighted to display the benefits of the program.
Eligible Measures	n/a

Small Business Efficiency Program

Objective	Educate and engage small business customers on the benefits of energy efficiency and opportunities for reducing energy usage with an online audit.
Target Market	Small business customers with less than 150 kW demand per site.
Description	The program seeks to engage these small businesses to better understand how they can reduce their energy related operational costs. The program currently serves as an entry point for customers, providing tips and program information regarding actions customers can take to reduce energy consumption at their business. The program is still in the pilot phase and does not offer customer incentives. However, the program does estimate the potential SBDI rebates a customer may be eligible to receive. This may change at some point in the near future as additional information is gathered.
Implementation	Implementation activities will include: • Develop and maintain the online audit tool. • Provide customer service support. • Track program performance. Customer marketing activities may include, but not be limited to bill inserts, email blasts, bill messaging and community events.
Eligible Measures	n/a

Outreach, Marketing and Communications

Outreach, marketing and communications are critical mechanisms for ensuring customers and dealers are aware of, and participate in, the portfolio of programs. The DSM program portfolio relies on a combination of education and customer incentives to advance energy efficiency. The programs have been designed to maximize participation given best practices. Educating customers and contractors on the benefits of energy efficiency can speed the adoption of energy efficient measures and promote market transformation.

Customer incentives are the primary mechanism for program delivery. Through this mechanism, customers receive rebates to purchase energy efficient equipment and services through existing market actors including contractors, equipment dealers and retailers. To achieve the portfolio's long-term savings goals, it is be necessary for I&M and the implementation contractors to continue to engage customers, contractors, and state and local agencies. Targeting contractors and leveraging relationships with stakeholders increases program awareness and promotes the market adoption of high efficiency equipment/systems.

DSM program outreach, marketing and communication activities may include a mix of:

- The I&M website, which should act as a central location and portal for customer and contractor participation, providing up-to-date access on programs, incentive offerings, rebate applications, etc.
- Television, radio, print, direct mail, and magazine advertisements.
- News story press releases resulting in newspaper.
- Brochures and literature.
- Outreach, education seminars, and speaking events.
- E-mails, newsletters, and customizable brochures.

Outreach, marketing and communications will be discussed in more detail within the program descriptions later in this chapter.

Minimize Net-to-Gross Impacts

Net-to-Gross (NTG) ratios adjust the gross energy and demand savings associated with a program to reflect the overall effectiveness of the program, taking into account free riders and spillover. Free riders and spillover, as determined from an impact evaluation, are defined as:

- **Free Riders**: Customers who participate in energy efficiency programs that would have engaged in the efficient behavior in the absence of the program. The inclusion of free riders overestimates the energy and demand savings associated with a program.
- **Spillover**: Customers who engage in energy efficient behavior due to some influence of a program but who do not participate in a program. For example, if a customer purchases an LED bulb through the Efficient Products Program and then chooses to purchase an ENERGY STAR® clothes dryer after learning about the benefits of energy efficiency.

Spillover and free ridership act in opposing directions, with spillover increasing a program's energy and demand savings while free ridership diminishes a program's savings.

I&M should make an effort to minimize free ridership and maximize spillover by,

- Modifying incentives to respond to market conditions, as needed and practical.
- Verifying customer eligibility to ensure the customer is an I&M customer, as practical.
- Increasing marketing of I&M's DSM portfolio.

I&M program adjustments to address free ridership and spillover should not negatively impact program implementation or continuity (e.g. I&M should not modify incentive levels with a frequency that would compromise program stability and the customer experience). I&M staff

should work with program implementation contractors as well as the evaluation contractor(s) to determine if additional action is needed to minimize free ridership and maximize spillover.

Market Adoption Rates

Appendix B -
Market Adoption Ra

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