VOLUME 2: APPENDICES

2012 TO 2014

ENERGY EFFICIENCY / PEAK DEMAND REDUCTION (EE/PDR) ACTION PLAN

APPENDIX A: EE/PDR POTENTIAL STUDY

APPENDIX B: EE/PDR BENCHMARKING

APPENDIX C: EE/PDR MEASURES

November 29, 2011

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A. INTRODUCTION

Pursuant to the requirements in 2008 Senate Bill (SB) 221, AEP Ohio developed an EE/PDR Action Plan for calendar years 2012 to 2014. This appendix describes the inputs and tasks involved in developing the potential estimates for the Plan.

Study Goals and Approach

The overall goals of the EE/PDR potential study are the following:

- Assess the technical, economic, and achievable potential for the residential, commercial and industrial sectors.
- Develop high-level EE/PDR program plans.

AEP Ohio undertook the EE/PDR potential study in the following key tasks:

- Conduct a customer market baseline study using telephone and on-site customer surveys to profile AEP Ohio's residential and non-residential customers.
- Develop baseline consumption profiles, and develop initial building simulation model specifications.
- Characterize the EE/PDR measures.
- Conduct an EE benchmarking analysis.
- Conduct benefit-cost analysis.
- Estimate EE/PDR potentials.

This EE/PDR potential study and the supporting tasks are discussed in detail in this appendix.

Appendix A 2012 to 2031 EE/PDR Potential Study Report Organization

The remainder of AEP Ohio's Appendix A 2012 to 2031 EE/PDR Potential Study is divided into the following sections:

- **Section 2: Baseline Consumptions Profiles** discusses baseline consumption profiles and initial building simulation model specifications for AEP Ohio.
- **Section 3: EE/PDR Measure Characterizations** provides details on the EE/PDR measures and sources for measure statistics.
- **Section 4: EE Benchmarking Results** presents the results of the EE benchmarking study of AEP Ohio's EE programs and other utilities' EE programs in Ohio and in neighboring states; benchmarking results are used to calibrate the potential model.
- **Section 5: EE/PDR Measure Cost-effectiveness Analysis** presents the cost effectiveness analyses.
- **Section 6: EE/PDR Potential Methodology and Results** presents the approach used to conduct the EE/PDR potential analysis and the results of different scenarios.
- **Section 7: Glossary** defines key terms used in the report.
- **Appendices**: other appendices are provided, including detailed Benchmarking results for 2009 and 2010 programs (Appendix B) and EE/PDR Measure Descriptions and Characterizations (Appendix C).

A.1. EE/PDR Measure Characterizations

After estimating baseline consumption, characterization of EE/PDR measures requires: 1) determining the list of measures to evaluate, 2) estimating the incremental savings from each measure – improving from the baseline to the new technology, and 3) determining the incremental costs and lifetimes for each of the new technologies.

A.1.1. EE/PDR Measure List

The first step in the EE/PDR measure characterization process is to develop appropriate sets of measures for inclusion in this study. The measures selected for analysis are based on the experience of Navigant (consultant to AEP Ohio) professionals to balance the need for thoroughness in examining the "measure universe" and the need for timely

completion of the analysis. The analyzed measures frequently pass various benefit-cost (B/C) tests in other areas; are widespread in their potential application, and thus garnering a large portion of the EE/PDR potential. Most energy efficiency measures that were known not to be cost-effective were pre-screened and eliminated from all potential scenarios.

Navigant then developed estimates of energy and demand savings, costs, and lifetimes in the residential and non-residential sectors.

The measures and descriptions of the technologies are provided in Appendix C. Three different program design options are included.

- **Replace on Burnout (ROB)** means that an EE/PDR measure is not implemented until the existing technology it is replacing fails. An example would be an energy efficient clothes washer being purchased after the failure of the existing clothes washer.
- **Retrofit** means that the EE/PDR measure could be implemented immediately. For instance, installing a low flow showerhead is usually implemented before an existing showerhead fails. Replacing incandescent lamps may be replaced on burnout, but these can be treated as a retrofit because of the relatively short lifetime for incandescent bulbs.
- **New Construction** means measures that are installed at the time of new construction. Baseline technologies may be different in the new construction market.

These design options affect the savings estimates and measure costs.

The energy savings of ROB measures is the incremental difference in energy use between the efficient measure and standard or code-compliant alternatives.[1] The incremental measure cost is likewise the difference between a standard code-compliant unit and the efficient measure. However, ROB does not include incremental labor cost for the delivery and installation of the replace on burnout unit since the customer would have borne those costs, regardless, when replacing the failed unit.

New construction measures share many of the same characteristics of ROB, since the baseline is code-compliant. If R-30 ceiling insulation is the current code, then the R-38 measure savings is only the difference between insulating with R-30 versus insulating with R-38 insulation. The incremental cost is mostly material cost for thicker blankets

[1] For example, while an old refrigerator (1500 kWh/year) uses considerably more energy than current code-compliant refrigerators (500 kWh), a measure that replaces an old refrigerator on burn-out with an ENERGY STAR® refrigerator (425 kWh/year) will result in attributable energy savings of 75 kWh/year.

and the incremental labor cost can be as low as $0, since the labor to roll out two R-19 blankets is roughly the same as rolling out R-11 on top of R-19.

For retrofit measures, the characterization can claim full savings between the existing inefficient equipment and the measure, since the customer could have left the baseline equipment as-is indefinitely. A typical example of this is adding insulation to existing homes. Similarly, the incremental measure cost is the full measure material cost plus the full labor cost of installation.

A.1.2. Energy Savings Estimates

Navigant used measure-appropriate methods for estimating savings for climate-dependent measures and for climate-independent measures, such as water heating, and appliances. Although lighting use is typically climate independent, Navigant used climate dependent methods (primarily hourly computer simulations) for lighting installed in conditioned areas because lighting use contributes to cooling loads and supplements heating equipment.

A.1.2.1. Climate-Dependent Measures

For climate-dependent measures, Navigant used a combination of building simulation modeling using the eQUEST model and engineering estimates to estimate EE/PDR measure per unit savings. Navigant first developed building prototypes based on the AEP Ohio customer information and baseline study results.

For the residential sector, Navigant used two prototypes: existing single-family and new single-family residences. For these two prototypes, Navigant modeled measures with respect to three different heating and cooling configurations: electric resistance with central air conditioning (AC), air source heat pump heating and cooling, and gas furnace with central AC.

Navigant chose to use four prototype buildings to represent the commercial sector: office, retail, schools, and "other commercial". These four segments include a significant portion of the commercial floor area and consumption (see Market Profile) and diverse energy end-uses. The office and retail segments were further segmented to investigate impacts on small and large facilities.

Navigant simulated measure savings for each market segment with up to four cooling and heating configurations: chilled water and boiler heat, direct expansion (DX) cooling with electric resistance heat, DX cooling with gas furnace and air-source heat pump. The chilled water and boiler configurations were applied only to the simulated large facilities.

Navigant did not model industrial measures with the eQUEST simulation tool since Navigant assume less climate dependence within this sector; thus, engineering calculations are sufficient.

With all prototypes, Navigant calibrated the eQUEST simulation for electric use to the market profiles developed with AEP Ohio's data, Ohio weather data; Navigant then estimated the EE/PDR measure savings impacts using the building simulation software.

A.1.2.2. Climate-Independent Measures

For the climate-independent EE/PDR measures, Navigant used many resources. Residential lighting, appliances, hot water, and other measures are evaluated using engineering calculations and secondary research. Lighting estimates are primarily based on differences in installed lamp wattage and residential usage patterns combined with HVAC interactive effects as determined with simulation models. Savings for appliances are based on secondary sources such as ENERGY STAR calculators and commercial product reports. Domestic hot water usage is estimated with Building American Benchmark (BABM) equations based on the number of bedrooms for a given home. Savings for each service territory vary based on water mains temperatures estimated from American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) climate data.

A.1.2.3. Direct Load Control Measures

The previous two sections describe methods used for conservation and efficiency measures. The study also looks at load control measures for demand response. AEP Ohio is a summer peaking utility. The summer peak is associated with air conditioning loads on hot summer days. Navigant characterized direct load control (DLC) measures for devices – primarily residential and small commercial air conditioning in the summer. Estimates for costs and savings are based on ex post results from other utilities using a 50 percent cycling regimen.

A.1.2.4. EE/PDR Measure Costs and Lifetimes

For EE/PDR measure costs, Navigant used a variety of sources, primarily the DEER database, adjusted by geographic multiplier factors contained in industry sources, such as the RS Means Mechanical Cost Data. Measures can either be installed as retrofits or RO). In the former, the cost includes labor and material costs. In the latter, the measure costs generally exclude labor costs since those would still be incurred in the event of replacement with non-qualifying equipment. Some measures are strictly ROB applications.

For EE/PDR measure lifetimes, a combination of resources was used, including manufacturer data, typical economic depreciation assumptions, the DEER database, and various studies reviewed for this project.

Results of the EE/PDR measure characterizations are presented in Appendix C with the measure descriptions.

A.2. Baseline Consumption Profiles

This section describes the development of baseline market profiles and baseline technology profiles.

A.2.1. Baseline Market Profiles

Navigant developed profiles for each sector — residential, commercial and industrial — for the AEP Ohio service territory. Key data sources included:

- 2010 Baseline study survey data for residential, commercial, and industrial sectors.
- 2009 Commercial and Industrial electricity sales data provided by AEP Ohio.
- Utility-level electricity sales data by sector from Form EIA-861, 2009 Annual Electric Power Industry Report, file 2. http://www.eia.gov/cneaf/electricity/page/eia861.html.
- 2007 Buildings Energy Data Book, U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy. http://buildingsdatabook.eere.energy.gov/.
- 2005 Residential Energy Consumption Survey (RECS), Energy Information Administration. http://www.eia.doe.gov/emeu/recs/recs2005/hc2005_tables/detailed_tables2005.html East North Central[2] census division.
- 2003 Commercial Buildings Energy Consumption Survey (CBECS), by census division produced by the Energy Information Agency (EIA), US Department of Energy (US-DoE), http://www.eia.doe.gov/emeu/cbecs/ East North Central[1] census division.
- 2006 Manufacturing Energy Consumption Survey (MECS), by census region produced by the Energy Information Agency (EIA), US Department of Energy (US-DoE), http://www.eia.gov/emeu/mecs/mecs2006/2006tables.html Midwest Census Region.[3]

[2] Includes the states of WI, IL, IN, OH and MI.

[3] Includes the states of WI, IL, IN, OH, MI, ND, SD, NE, KS, MO, IA and MN.

- 2008 Building America Benchmark (BABM). http://apps1.eere.energy.gov/buildings/publications/pdfs/building_america/42662.pdf.

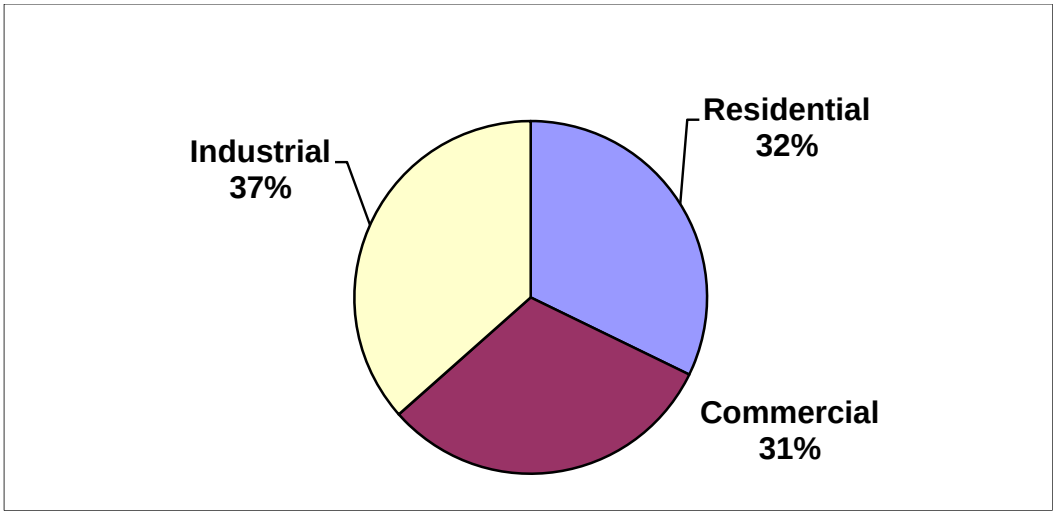
The methodology used started with sales and customer count data from AEP Ohio. The sales data were cross-verified and adjusted with 2009 EIA reported data. The following table and figures are based on AEP Ohio sales data for 2009.

Table 1. AEP-Ohio Market Profile – Electricity (2009)

Market Sector	Sales MWh	Customers	kWh per Customer
Residential	14,642	1,274,824	11,486
Commercial	14,208	173,451	81,913
Industrial	16,612	10,616	1,564,813
Total Billed	**45,462**	**1,458,891**	

Source: 2009 Annual Electric Power Industry Report, US-DOE, EIA

Figure 1. AEP-Ohio Market Profile – Electricity



A.2.1.1. Residential Sector Market Profile

The residential sector market profile is built up out of four major sources. AEP Ohio total consumption and customer number data for 2009 were used for baseline annual electricity consumption. Combined AEP Ohio monthly residential load data for 2007 and 2008 was used to generate the monthly electricity consumption profile. The 2010 AEP Ohio residential baseline study survey data was used for technology saturation data. The 2008 Building America Benchmark (BABM) and a California lighting survey were used for generating annual end use estimates and seasonal electricity consumption profiles.

Residential Electricity Market Profile

The derivation of the residential electricity market profile relied on monthly consumption data and benchmark monthly profiles of end-uses to derive annual electricity consumption for seasonal and non-seasonal uses. The starting point in this exercise was the AEP Ohio system-level residential electricity consumption by month for 2007-2008. The household total electricity consumption by month was calculated from this data. There are four seasonal end uses that were tabulated (heating, cooling, hot water, and lighting) in addition to the non-seasonal end uses (includes appliances, plug loads, and other).

Hot Water. Seasonal hot water end use was calculated using the hot water end use profiles from the 2008 Building America Benchmark (BABM) multiplied by the saturations of the various hot water end uses. Monthly electricity consumption for homes with electric domestic hot water was then calculated using seasonally-adjusted mains water temperatures. This monthly domestic hot water electricity profile was then multiplied by the electric domestic hot water saturation to derive the average household monthly domestic hot water electricity profile.

Lighting. Annual lighting consumption per household was estimated using the BABM. Lighting use increases during the winter months when there is less daylight. The seasonal lighting variation profile was derived from a recent California CFL monitoring study, with an addition to December for holiday lighting. The average household monthly lighting electricity consumption was calculated by multiplying the profile by the annual lighting consumption estimate.

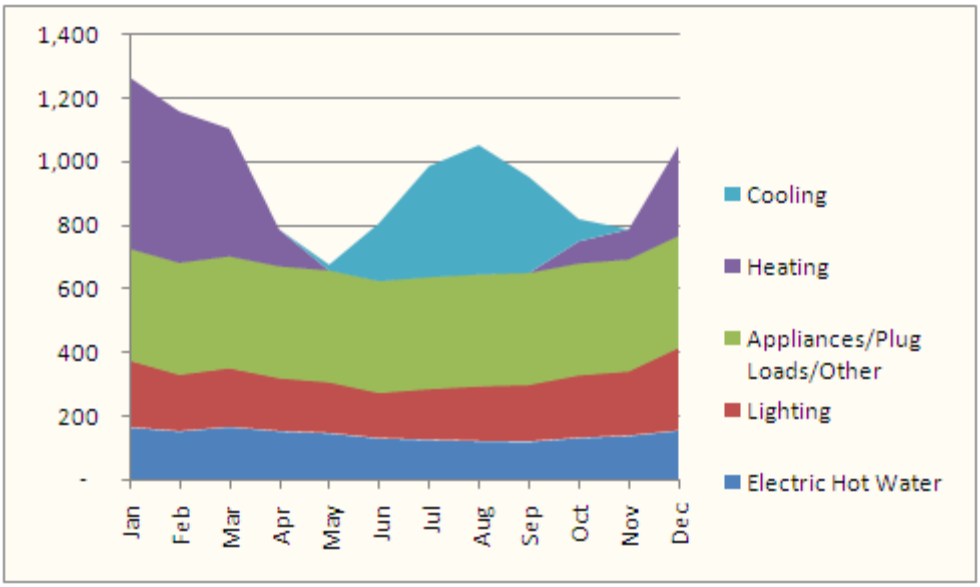
Non-Seasonal End uses (Appliances, Plug Loads, Other). After subtracting the hot water and lighting end uses from the annual household electricity consumption profile, the remaining profile has two local minima, one in the spring and one in the fall. It was assumed that during the minimum consumption month (April), heating and cooling each make up 5 percent of the total electricity consumed for that month. The base, non-seasonal monthly electricity consumption was then calculated as the total consumption for April minus the seasonal end uses for April. This includes all appliances, plug loads, and other non-seasonal end uses.

Heating and Cooling. Navigant's experience has shown that heating and cooling energy make up 10 percent of total electricity consumption in typical homes in the minimum consumption month. After assuming that the minimum consumption month included 5 percent heating and 5 percent cooling, the monthly heating and cooling electricity was calculated by subtracting the hot water, lighting, and base end uses from the total for each month. For May to September, all of the heating and cooling electricity is assumed to be cooling. For November to March, all of the heating and

cooling electricity is assumed to be heating. For the last month, October, it is assumed that half the heating and cooling electricity is used for cooling and half is used for heating. The annual heating and cooling end uses were then calculated by summing the monthly heating and cooling end uses.

The resulting annual end-use profiles are shown in the following figures and table.

Figure 2. Residential Monthly Electricity End use Breakdown

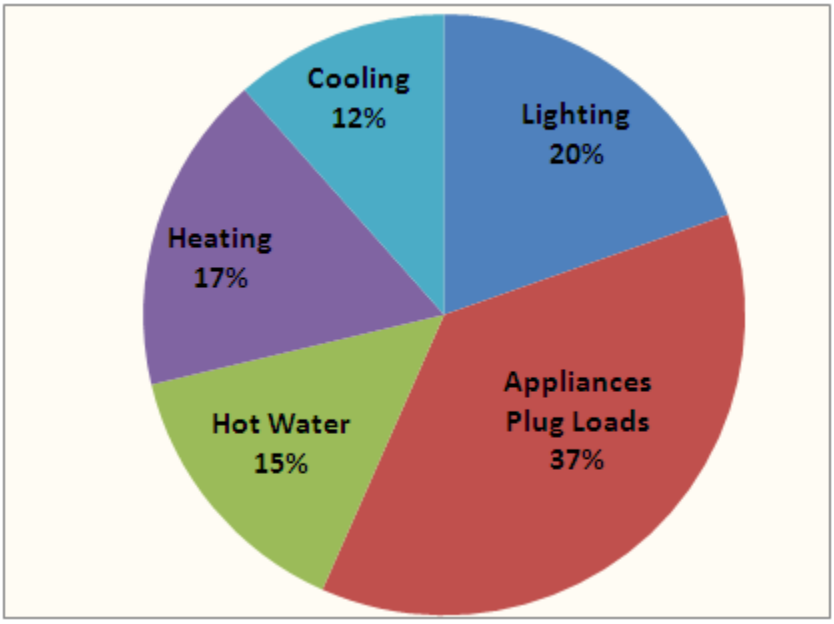


The saturation rates of electric end uses among electricity customers are indicated in the table below. These reflect the saturation rate of an end use among only AEP Ohio residential electricity customer households (HH below). The intensity of each electric end use was calculated by multiplying the Unit Energy Consumption (UEC) for each end use by the saturation rates among AEP Ohio *residential electricity* customers. Ultimately, this gives the amount of electricity sold by AEP Ohio that is used for a given end use.

Table 2. Residential Market Profile – Electricity

End use	Saturation (% of electric customer HH)	UECs (kWh/SQFT)	Intensity (kWh/SQFT)	AEP Ohio Sales (MWh)
Lighting	100%	1.25	1.25	2,862
Appliances/Plug Loads	100%	2.36	2.36	5,409
Hot Water	44%	2.12	0.93	2,138
Heating	31%	3.53	1.09	2,511
Cooling	93%	0.79	0.73	1,686
Total		**10.04**	**6.73**	**14,606**

Figure 3. Residential Market Profile – Electricity



A.2.1.2. Commercial and Industrial Sector Market Profiles

Commercial and Industrial sector profiles were built starting with segment-level sales data provided by AEP Ohio. The data were generated by AEP Ohio to facilitate

sampling for the baseline study, and therefore do not present a census of the customer base. The data represent 37% of all commercial customers, but almost 79% of all commercial sales when compared to 2009 EIA data. Likewise, the data represent 54% of industrial customers and 59% of industrial sales. Navigant assumed the rest of the commercial and industrial sectors are represented proportionally to the data provided.

For the commercial sector, the AEP Ohio and EIA sales data were used with the 2007 Buildings Energy Data Book (BEDB). This resource is national in scope and does not differentiate for climate and facility size data that are specific to the AEP Ohio service territory. The BEDB is very useful for parsing out *climate independent* electricity loads at the segment level. The Energy Consumption Surveys (ECSs) for each sector are more specific to the AEP Ohio region. Differences between BEDB and ECSs were attributed to climate with a greater emphasis on heating for the AEP Ohio service territory. These two resources effectively generate the Unit Energy Consumption (UEC) for each end use. Commercial "sales by end use" are directly derived from the energy intensity estimates from BEDB and CBECS and sales data from AEP Ohio.

Secondary resources for manufacturing market shares are much less regionally specific. The 2006 Manufacturing Energy Consumption Survey (MECS) publishes census region data at a highly aggregated level and manufacturing segment data on a national level. However, the consumption data are broken out into useful end-use bins. By combining the MECS breakouts with the industrial segment sales data for AEP Ohio, we were able to produce good resolution of consumption by end-use for the entire AEP Ohio industrial sector.

The table below shows the share of electricity consumed by the commercial sector broken out by nine segments. Offices, Educational facilities, Retail and Health facilities together comprise 75% of commercial sales.

Table 3. Commercial Sector Breakout – Electricity

End use	AEP Ohio Sales Share	AEP Ohio Sales (MWh)
Offices	33%	4,636,097
Education	17%	2,461,545
Retail Trade	15%	2,192,597
Health	11%	1,564,090
Restaurants	8%	1,095,003
Grocery Stores	6%	864,759
Other	6%	897,238
Hotels/Motels	3%	392,314
Entertainment	1%	104,357
Total	**100%**	**14,207,800**

Figure 4. Commercial Sector Breakout - Electricity

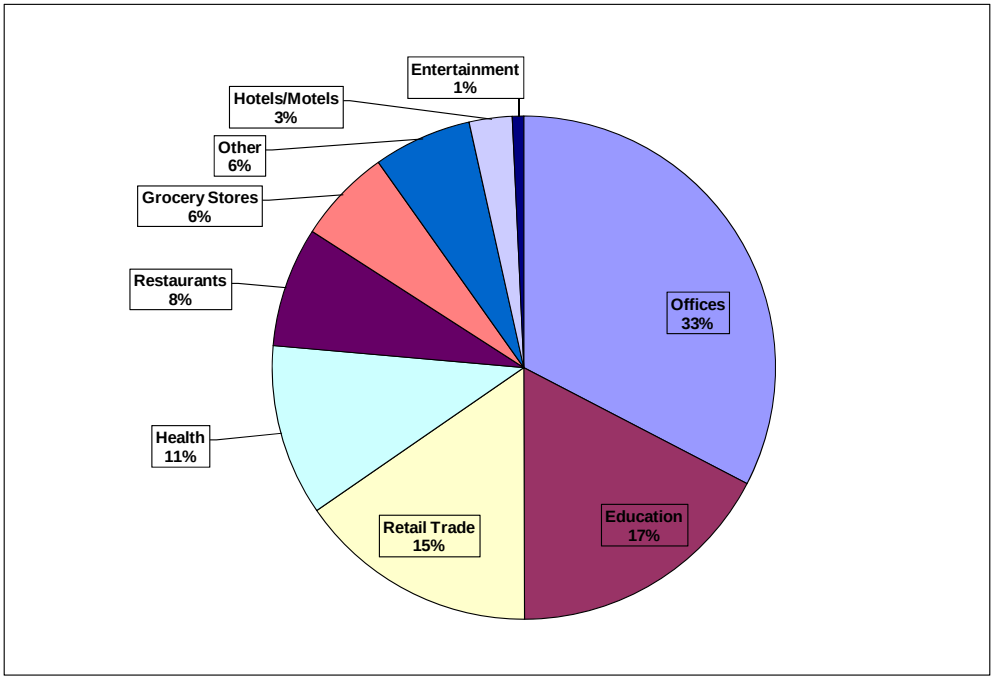
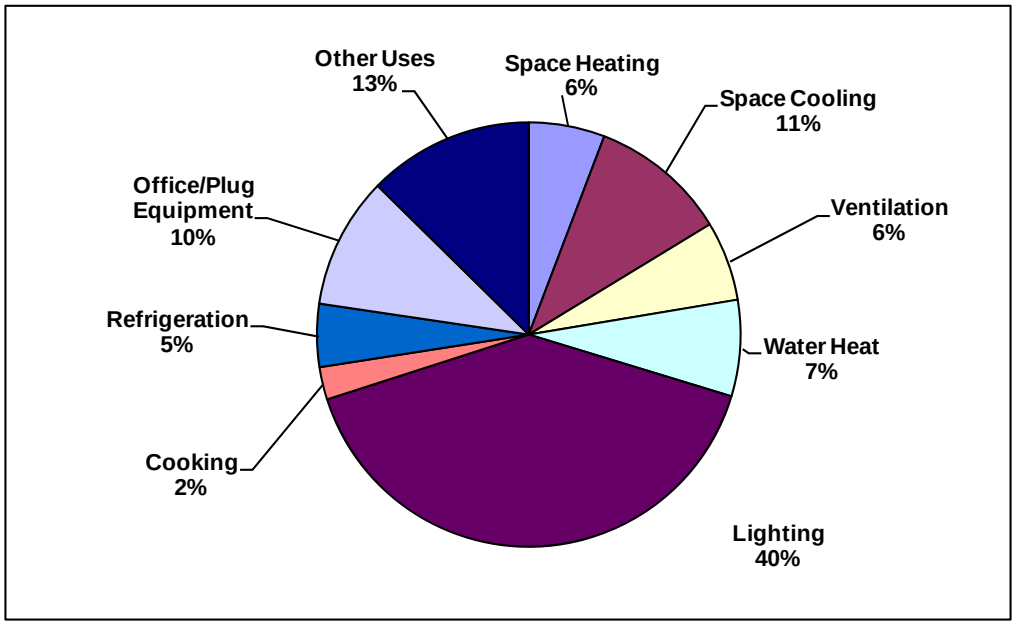


Table 4. Commercial Market Profile – Electricity

End use	Share (% of sq.ft.)	UECs (kWh/sq.ft.)	Intensity (kWh/sq.ft.)	AEP Ohio Sales (GWh)
Space Heating	13%	8.9	1.1	824.4
Space Cooling	57%	3.6	2.1	1,493.4
Ventilation	100%	1.2	1.2	860.3
Water Heat	35%	4.1	1.5	1,041.9
Lighting	100%	8.0	8.0	5,733.8
Cooking	25%	1.9	0.5	352.8
Refrigeration	33%	2.9	0.9	681.4
Office/Plug Equipment	84%	2.4	2.0	1,424.0
Other Uses	100%	2.5	2.5	1,795.8
Total			**19.8**	**14,208**

Figure 5. Commercial Market Profile - Electricity

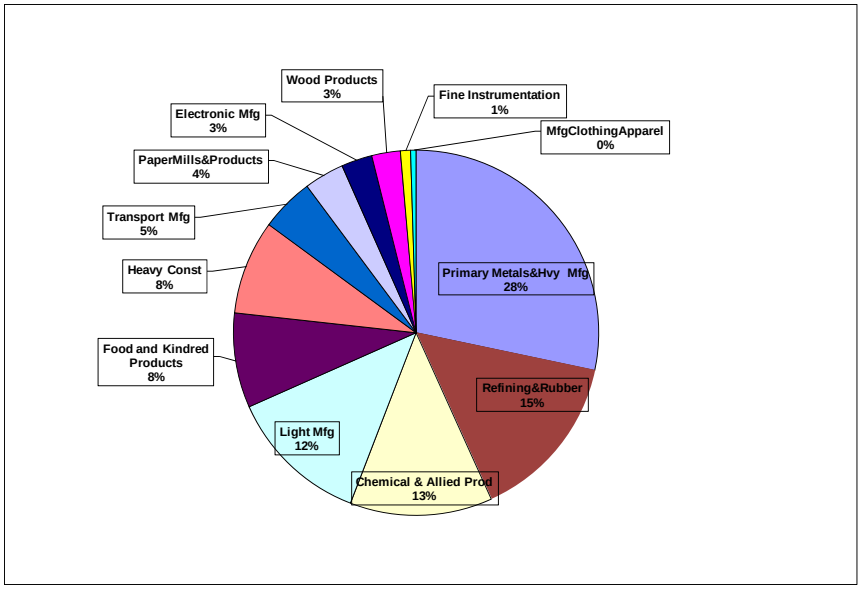


AEP Ohio provided customer consumption data for over 54% of industrial customers. Navigant aggregated the usage by industry type based on 2-digit SIC codes into 17 market segments shown below. The sector is dominated by Primary Metals with more than 28% followed by Refining and Rubber (15%) and Chemicals (13%). These three segments account for providing over one-half of industrial sales.

Table 5. Industrial Sector Breakout – Electricity

End use	AEP Ohio Sales Share	AEP Ohio Sales (MWh)
Primary Metals & Hvy Mfg	28.3%	4,702,898
Refining & Rubber	14.9%	2,480,554
Chemical & Allied Prod	12.6%	2,094,975
Light Mfg	12.5%	2,076,558
Food and Kindred Products	8.4%	1,393,153
Heavy Const	8.3%	1,386,279
Transport Mfg	4.7%	785,937
Paper Mills & Products	3.5%	588,845
Electronic Mfg	2.7%	452,802
Wood Products	2.5%	421,811
Fine Instrumentation	0.9%	148,765
Mfg Clothing Apparel	0.5%	79,423
Total	**100.0%**	**16,612,000**

Figure 6. Industrial Sector Breakout – Electricity

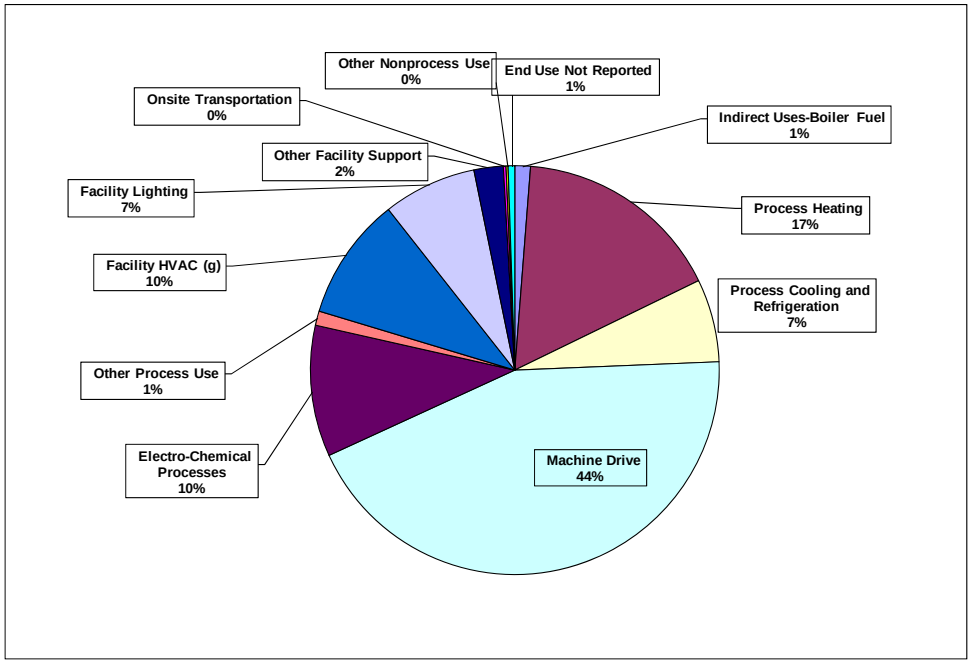


On an end-use basis, machine drives dominate the profile with substantial contributions from process heating and electrochemical processes.

Table 6. Industrial Market Profile – Electricity

End use	Midwest Electricity Shares	AEP Ohio Sales (GWh)
Indirect Uses-Boiler Fuel	1.2%	204
Process Heating	16.5%	2,750
Process Cooling and Refrigeration	6.5%	1,091
Machine Drive	43.6%	7,278
Electro-Chemical Processes	10.3%	1,724
Other Process Use	1.1%	187
Facility HVAC (g)	9.7%	1,616
Facility Lighting	7.4%	1,229
Other Facility Support	2.3%	384
Onsite Transportation	0.2%	36
Other Nonprocess Use	0.2%	27
End Use Not Reported	0.5%	87
Total	**100.0%**	**16,612**

Figure 7. Industrial Market Profile – Electricity



A.2.2. Baseline Technology Profiles

To estimate the potential for energy savings, it is desirable to have a snapshot of the appliance and equipment inventory in the area of study, including type of equipment and efficiency level. For the residential sector, Navigant conducted and used the results of a baseline survey study of AEP Ohio in 2010 for equipment age, saturation data, and building characteristics. Other sources, including publicly-available utility studies, statewide studies, and research papers, also have some limited information about efficiency levels where data were not available by inspection. Navigant used a variety of sources, together with our experience and judgment, to develop technology profiles for the key end uses presented below.

These sources include:

- 2010 Baseline study survey data for residential, commercial, and industrial sectors.
- 2005 Residential Energy Consumption Survey (RECS), Energy Information Administration. http://www.eia.doe.gov/emeu/recs/recs2005/hc2005_tables/detailed_tables2005.html. East North Central census division.
- 2003 Commercial Buildings Energy Consumption Survey (CBECS), by census division produced by the Energy Information Agency (EIA), US Department of Energy (US-DoE), http://www.eia.doe.gov/emeu/cbecs/. East North Central census division.

- 2007 Buildings Energy Data Book, Department of Energy, Energy Efficiency and Renewable Energy, September 2007. http://buildingsdatabook.eere.energy.gov/.
- 2006 Characteristics of New Housing, U.S. Census Bureau. http://www.census.gov/const/www/charindex.html.

The estimate of the fraction of inefficient equipment for the residential and non-residential sectors is based on Navigant's baseline study for AEP Ohio. These fractions are consistent with Navigant observations of commercial equipment in operation coupled with average equipment age data detailed in the Buildings Energy Data Book.

Table 7. Residential Technology Shares

End use	Technology	Electric Customer Technology Share	Fraction Not Efficient
Cooling	Heat pump	18%	78%
	Central AC	60%	86%
	Room AC	15%	64%
	None	7%	0%
Space heat	Heat Pump	18%	97%
	Electric Furnace	13%	0%
	Natural Gas furnace/Boiler	61%	73%
	Other Fuel	7%	NA
Lighting*	Incandescent	56%	100%
	Compact Fluorescent Light (CFL)	26%	0%
	Halogen	3%	100%
	Fluorescent	14%	90%
Water Heater	Electric	44%	95%
	Gas/Propane/LPG	55%	90%
Appliances	Dishwasher	51%	79%
	Clothes Washer	87%	77%
	Electric Clothes Dryer	87%	NA
	Primary Freezer	66%	89%
	Second Freezer	11%	89%
	1st Refrigerator	100%	93%
	2nd Refrigerator	28%	100%

Data for saturation of non-residential technology, fuel share, and fraction of inefficient equipment were based on Navigant's baseline study for AEP Ohio.

Table 8. Non-Residential Technology Shares

End use	Technology	Electric Customer Technology Share		Fraction Not Efficient	
		Commercial	Industrial	Commercial	Industrial
Space heat	Heat Pump	37%	0%	36%	--
	Other Electric	28%	22%	0%	0%
	Gas Furnace	26%	52%	54%	54%
	Gas Boiler	4%	5%	97%	96%
	Other	5%	21%		
Cooling	Heat Pump	28%	<1%	52%	80%
	Packaged Direct Expansion (DX)	69%	88%	52%	80%
	Chiller	2%	8%	52%	80%
	Other	1%	4%		
Lighting	Incandescent	15%	3%	100%	
	Fluorescent	55%	72%	27%	58%
	Compact Fluorescent Light (CFL)	15%	2%	0%	0%
	High Intensity Discharge (HID)	7%	23%	29%	43%
	Halogen	4%	<1%		
	LED	3%	1%	0%	0%

The technology share applies only to those customers who have a particular end use. Thus, of the portion of commercial floor space that has cooling, 69% employ packaged direct expansion (DX) equipment. Inefficient HID lighting only includes mercury vapor systems.

A.3. EE/PDR Benchmarking Results

To ensure that the EE/PDR potential estimates that Navigant develop are reasonable and appropriate, and to identify the best practices of EE/PDR programs, Navigant conducted a benchmarking assessment on other utilities' EE/PDPR programs, in Ohio and in neighboring states, that have relatively new EE/PDR requirements and portfolios and available data. To identify common best practices and costs of top performers, the analysis compares detailed program results by customer sector of those utilities identified as achieving high levels of EE/PDR savings for below-median costs. This section presents a high-level summary of the benchmarking. Complete benchmarking results are included in Appendix B.

The next section discusses the organizations included in the analysis.

A.3.1. Organizations Reviewed

Navigant collected data and information for EE/PDR program results for ten investor-owned utilities (IOUs) in Ohio and neighboring states (Table 9). The utilities were selected as having relatively new EE/PDR requirements, portfolios, and available data. Navigant benchmarked EE/PDR programs in 2009 and 2010, as data were available.

Table 9. Benchmarked Utilities and Agencies

State	Organization	2009	2010
OH	AEP	X	X
	Dayton P&L	X	X
	First Energy	X	X
IL	Ameren	X	X
	ComEd	X	X
MI	Consumers Energy	X	X
	Detroit Edison	X	X
PA[4]	Allegheny	X	
	First Energy	X	
	PECO	X	

[4] 2010 EE/PDR Reports were not available for the PA utilities. They are scheduled to be published in November 2011.

A.3.2. Benchmarking Methodology

This section describes the methodology used to collect data and information, analyze and compare impacts and costs overall and by customer sector and by program.

The benchmarking data for each organization were prepared as follows:
Collected reported incremental EE/PDR program results for 2009 and 2010 where available:

- Expenditures
- Energy savings
- Peak demand savings
- Program descriptions

The sources for almost all of the EE/PDR program data were the utilities' and agencies' annual reports on their 2009 and 2010 EE/PDR programs.

Collected baseline data for 2009 and 2010:

- Revenues
- Energy sales
- Peak demand

The main source for the baseline data was FERC Form 861 and Form 826 from the Energy Information Administration's web site (www.eia.doe.gov).

Categorized reported EE/PDR program results and baseline data by major customer sector:

- Residential
- Commercial and industrial (C&I)

Normalized incremental results and expenditures overall and for the two major customer sectors:

- Expenditures as a percentage of revenue
- Energy savings as a percentage of energy sales
- Peak demand savings as a percentage of peak demand

Calculated costs of savings on a first year basis:

- Divided EE/PDR expenditures by EE/PDR program energy savings, $/kWh, first year.
- Divided EE/PDR expenditures by EE/PDR peak demand savings, $/kW.
- Identified median of normalized spending, savings, and costs of saving.
- Identified organizations with above-median savings at median or below-median costs of savings.
- Analyzed EE/PDR portfolios of those organizations at the program level.

The cost of energy savings is calculated on a first year basis. It is not levelized cost of lifetime savings, thus not comparable to supply side $/kWh. The cost of first year energy savings is used in this benchmarking analysis simply to identify 1) typical costs on a first year basis and 2) organizations that achieved high energy savings at first year costs below the typical.

Although every effort is made to collect comparable data, given the inherent variation in organizations' evaluation and reporting practices and in their program offerings, the results cannot be considered a strictly "apples-to-apples" comparison. For example, not every utility offers low income programs. Also, utilities may report estimated savings at meter, busbar, or generator; some utilities' methods for estimating savings may be more accurate than other utilities'; only some annual EE/PDR reports included savings that were verified; and few distinguish net savings from gross savings. However, despite these variations in programming, reporting, and evaluation, the results provide calibration targets for EE/PDR potential estimates and identify key programs and results for top-performing portfolios.

To mitigate these reporting variations, whenever possible, Navigant collected savings that were *verified, gross, and at the meter.* Table 10 shows these attributes for the IOUs' reported savings data.

Due to wide variation in reporting load management programs among this group (some utilities reported cumulative savings rather than annual incremental and some utilities included rate discounts in program costs), this benchmarking does not include load management programs.

Table 10. Savings Attributes[5]

State	Organization	Savings Verified	EE/PDR GWh At Meter or Generator	Net or Gross
OH	AEP	Yes	Meter	Gross
	Dayton P&L	Yes	Meter	Gross
	First Energy	No	Meter	Gross
IL	Ameren 09	Yes	NS[6]	NS
	Ameren 10	Yes	Meter	Gross
	ComEd 09	Yes	Meter	kWh Gross, kW Net
	ComEd 10	Yes	Meter	Gross
MI	Consumers Energy	Yes	Generator	Gross
	Detroit Edison	Yes	Generator	NS
PA[7]	Allegheny	2 of 7[8]	NS	Gross
	First Energy	NS	NS	Gross
	PECO	Yes	Meter	Gross

Note that several programs launched after January 2009, thus data for those programs represent ramp-up costs and less than 12 months' effort for 2009. Table 11 shows program launch dates.

Table 11. Utilities' EE/PDR Program Launch Dates

State	Organization	C&I Launch Date	Residential Launch Date	Program Calendar
OH	AEP OH	Jun-09	Apr-09	Jan - Dec
	Dayton P&L	Apr-09	Feb-09	Jan - Dec
	First Energy OH	Partial Year 09	Partial Year 09	Jan - Dec
IL	Ameren IL	Jun-08	Aug-08	June - May
	ComEd IL	Jun-08	Jun-08	June - May
MI	Consumers Energy MI	Jul-09	Jul-09	Jan - Dec
	Detroit Edison	Jul-09	Aug-09	Jan - Dec
PA	Allegheny PA	Apr-10	Jan-10	June - May
	First Energy PA	Jun-10	March-May 2010	June - May
	PECO	Mar-10	Oct-09	June – May

[5] Where possible, Navigant collected savings data that were verified, gross, and at the meter.

[6] NS = not specified

[7] Savings attributes for the PA utilities are only for the 2009 program year as EE/PDR data for the 2010 program year were not available.

[8] Savings for two of Allegheny's seven programs were verified.

A.3.3. Benchmarking Summary

Table 12 shows the 2009 and 2010 median results for EE/PDR for all the reviewed utilities, as well as AEP Ohio's 2009 and 2010's results for EE/PDR spending, savings, costs, and energy costs over all customer sectors.

Table 12. 2009 and 2010 Electricity EE/PDR Results

	Spending as % of Revenue	Energy Savings as % of Sales	Peak Demand Savings as % of Peak Demand	Retail Cost of Energy $/kWh	Cost of First Year Savings	
					$/kWh	$/kW
All Region Median 2009	0.4%	0.4%	0.1%	$0.09	$0.11	$1,081
AEP Ohio 2009	0.4%	0.6%	0.4%	$0.07	$0.05	$412
All Region Median 2010	0.8%	0.7%	0.5%	$0.09	$0.11	$478
AEP Ohio 2010	0.8%	0.7%	0.5%	$0.08	$0.09	$709

(1) Note: Cost of First Year Savings is not comparable to a supply-side investment and is only used to compare programs and portfolios at a high level for reasonableness of cost.

A.3.3.1. All Region Results

For 2009, the utilities with the largest relative energy savings and below-median costs achieved energy savings at about 0.6 percent of annual sales. The utilities with the largest relative peak demand savings and below-median costs saved about 0.4 percent of peak demand. AEP Ohio saved more than the median amount of savings from the utilities' benchmarked in 2009, and AEP Ohio's program costs were lower than the median program costs.

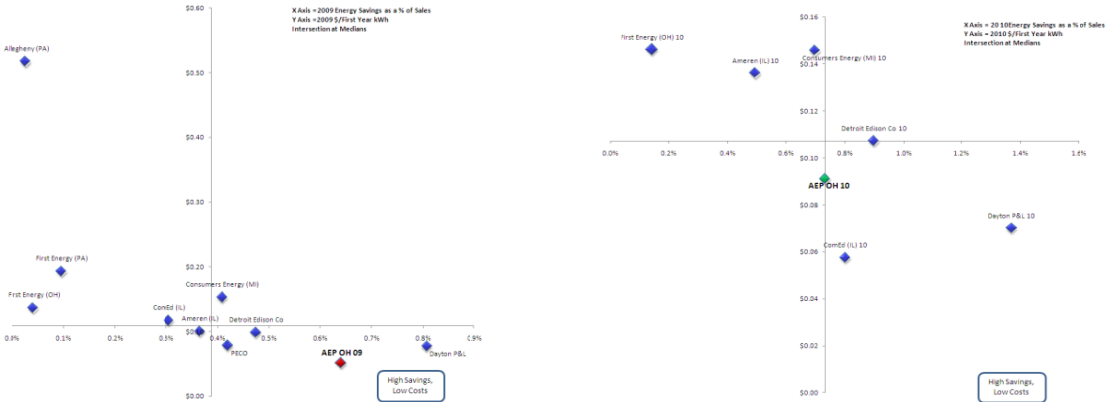
For 2010, the utilities with the largest relative energy savings and below-median costs achieved energy savings at about 0.9 percent of annual sales. The utilities with the largest peak demand savings and below-median costs saved about 0.9 percent of peak demand, over twice that for 2009. AEP Ohio saved about the median amount of savings of the utilities benchmarked in 2010.

The two scatter plots in Figure 8 below illustrate where each utility falls relative to median energy savings and median cost of savings for 2009 (on the left) and 2010 (on the right). Energy savings as a percentage of sales is on the horizontal axis; first year cost of energy savings is on the vertical axis; and the axes are set at the median values. Thus, the utilities in the bottom right quadrant of a scatter plot are the ones that

achieved above median energy savings at costs below the median, i.e., high savings, low costs.

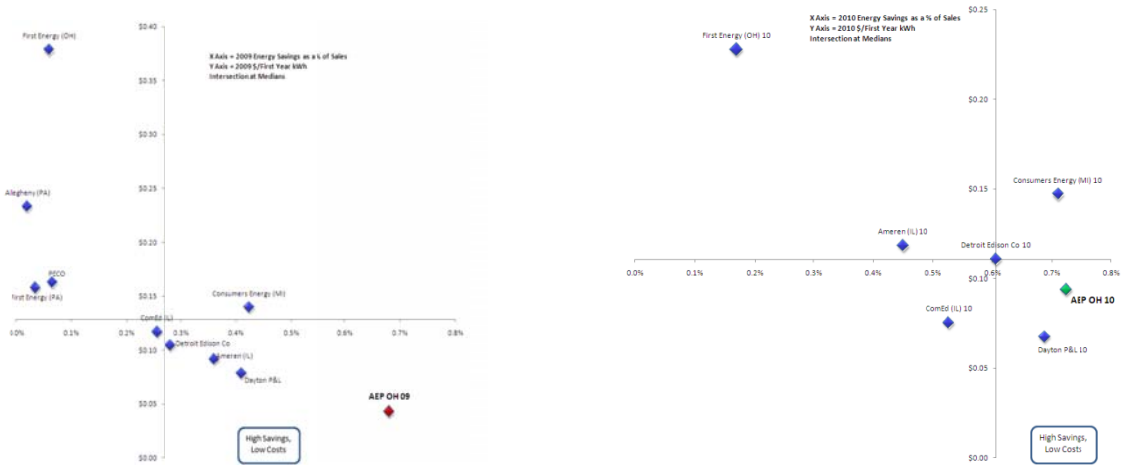
AEP Ohio's results are indicated by red for 2009 and green for 2010.

Figure 8. 2009 and 2010 Energy Savings as a Percentage of Sales and First Year Costs $/kWh for All Sectors.



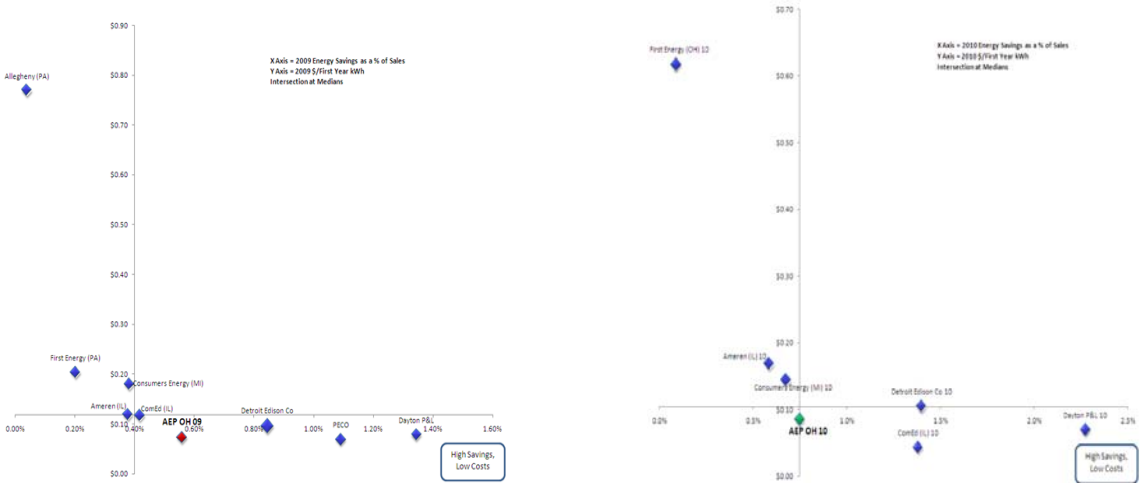
In the C&I sector, five utilities achieved above-median relative energy savings at costs near or below the median in 2009: AEP Ohio, Ameren IL, Consumers Energy MI, Dayton P&L, and Detroit Edison Co. These utilities achieved most of their energy savings with prescriptive and custom incentives and self direct programs. In 2010, AEP Ohio, Dayton P&L, and Detroit Edison Co. also achieved median or above median savings at costs near or below the median. Figure 9 below shows where each utility falls relative to median energy savings and median cost of savings for 2009 and 2010.

Figure 9. 2009 and 2010 C&I Energy Savings as a Percentage of Sales and First Year Costs $/kWh.



In the residential sector, several utilities achieved above median energy savings as a percentage of sales at low costs in 2009: AEP Ohio, ComEd IL, Detroit Edison Co, PECO, and Dayton P&L. These utilities achieved most of their energy savings with prescriptive incentives, especially lighting, and appliance recycling programs. In 2010, AEP Ohio, ComEd IL, Dayton P&L, and Detroit Edison Co also achieved median or above median energy savings as a percentage of sales at low costs. Figure 10 below shows where each utility falls relative to median energy savings and median cost of savings for 2009 and 2010.

Figure 10. 2009 and 2010 Residential Energy Savings as a Percentage of Sales and First Year Costs $/kWh[9].



A.3.3.2. AEP Ohio 2009 and 2010 EE/PDR Results

AEP Ohio's results over all customer sectors put them in the high savings – low cost quadrant for 2009 and 2010. AEP Ohio achieved above median energy savings as a percentage of sales in 2009 and median energy savings as a percentage of sales in 2010. AEP Ohio achieved these savings at first year costs below the median (about $0.10/kWh) in 2009 and 2010: $0.05/kWh and $0.09/kWh, respectively.

Peak demand savings and costs of savings for AEP Ohio in 2009 are better than typical results for the utilities reviewed. AEP Ohio saved 0.4 percent of peak demand, well above the median (0.1%) at $412/kW, costs well below the median ($1,081/kW). In 2010, AEP Ohio's achieved median peak demand savings (0.5% of peak demand) at $709/kW, costs above the median ($478/kW).

AEP Ohio's sector-level results reflect a similar pattern over 2009 and 2010.

[9] First Energy (OH) is not included in the 2009 scatter plot as to not skew the scale (0.01%, $2.69/kWh)

In the C&I sector, AEP Ohio achieved the highest energy savings as a percentage of sales (about 0.7%) of all the utilities in 2009 and 2010, at below median costs. The median cost of first year energy savings in 2009 and 2010 is about $0.10/kWh while AEP Ohio's cost of first year energy savings is $0.04/kWh for 2009 and $0.09/kWh for 2010.

In the residential sector, AEP Ohio's energy savings as a percentage of sales in 2009 and 2010 are about 0.7 percent, which is above the median (0.4%) in 2009 and is the median (0.7%) in 2010. AEP Ohio achieved costs of first year residential energy savings in 2009 and 2010 (about $0.08/kWh) that are below the median in 2009 and 2010 median (about $0.11/kWh).

AEP Ohio's C&I peak demand savings in 2009 and 2010 (about 0.6% of C&I peak demand) are above the median (0.1% and 0.5%, respectively). AEP Ohio costs for conserved peak demand in 2009 ($298/kW) are below the median ($678/kW) while its costs in 2010 ($601/kW) are above the median of the group ($414/kW).

In the residential sector, the AEP Ohio's 2009 peak demand savings (0.2% of residential peak demand) is the median, and its costs for conserved peak demand ($962/kW) are below the median ($1,466/kW).

In 2010, AEP Ohio's residential peak demand savings as a percentage of peak demand for 2010 (0.3%) is below the median (0.7%) while its 2010 costs of conserved peak demand ($1,160/kW) are practically the median ($1,151).

Appendix B includes detailed results of the benchmarking.

A.4. EE/PDR MEASURE Cost-Effectiveness Analysis

The cost-effectiveness analysis of the energy conservation and demand response measures involved developing a list of possible measures, quantifying the necessary data inputs, and applying tests to determine the cost-effectiveness of each measure given the input parameters. This section of the report summarizes this procedure and presents the results of the cost-effectiveness analysis.

The discussion begins with a brief overview of the inputs into the model.

A.4.1. Model Inputs

Model inputs include general inputs, measure inputs, and program inputs.

A.4.1.1. General Inputs

Key general inputs are as follows:

- **Avoided energy costs**. These reflect costs for new energy avoided or deferred by EE/PDR measures.
- **Avoided capacity cost**. These reflect the capital costs of new capacity avoided or deferred by EE/PDR measures and were provided by AEP Ohio.
- **Electricity prices**. These reflect the average retail price paid by AEP Ohio customers. Navigant used a value of $0.1073/kWh for residential, and $0.0443/kWh and $10.87/kW for non-residential, escalated at 3.0 percent and 5.0 percent, respectively, per AEP Ohio's projections.

In line with standard industry practice, Navigant used the Total resource cost (TRC) test to determine which EE/PDR programs to include in AEP Ohio's portfolio of EE/PDR programs. The ratepayer impact measure (RIM) test is a more restrictive test that is used as the main EE/PDR benefit-cost test in very few states.[10] As shown in Table 13 the proposed AEP Ohio EE/PDR 2012 to 2014 portfolio of programs passes the total resource cost test with a ratio of 2.1.

[10] Florida and Georgia, for example, require EE/PDR programs to pass the RIM test.

Table 13. Summary of Program Benefit-Cost Test Results – 2012 to 2014

Consumer Sector	Total Resource Cost Test (TRC)	Utility Cost Test (UCT)	Participant Cost Test (PCT)	Rate Impact Measure Test (RIM)
Efficient Products	2.3	4.0	8.4	0.3
Home Retrofit	1.4	0.9	21.2	0.2
Appliance Recycling	3.7	1.7	NA	0.3
Behavior Change	1.2	1.2	NA	0.3
New Home	1.0	1.1	5.0	0.2
e^{3}smart^{SM}	1.9	2.6	NA	0.4
Community Assistance	0.5	0.5	NA	0.2
Consumer Sector Total	**1.7**	**2.0**	**9.7**	**0.3**
Business Sector	**Total Resource Cost Test (TRC)**	**Utility Cost Test (UCT)**	**Participant Cost Test (PCT)**	**Rate Impact Measure Test (RIM)**
Prescriptive	2.0	5.2	2.9	0.7
Custom	1.4	4.5	2.1	0.7
New Construction	12.8	31.6	7.0	2.8
Express	1.2	1.3	4.3	0.5
Self Direct	2.1	4.1	4.6	0.7
Demand Response	23.8	6.0	NA	6.0
Retro-commissioning	1.5	2.1	7.2	0.6
Continuous Improvement	2.3	4.0	5.6	0.8
Energy Efficiency Auction	2.3	3.9	5.6	0.8
Data Center	1.4	2.0	5.3	0.6
Business Sector Total	**1.9**	**4.6**	**3.6**	**0.8**
	Total Resource Cost Test (TRC)	**Utility Cost Test (UCT)**	**Participant Cost Test (PCT)**	**Rate Impact Measure Test (RIM)**
PLAN TOTAL	**1.7**	**2.9**	**4.2**	**0.5**

A.4.1.2. Measure-Specific Inputs

The key inputs into the cost-effectiveness analysis that are measure-specific are the measure's energy and demand savings, incremental cost, and lifetime. These inputs are described in the EE/PDR measure characterization appendix.

A.4.1.3. Program Cost Inputs

The final input into the cost-effectiveness analysis is the program cost. For incentive costs, Navigant assumes an incentive cost per unit of 50 percent of the per unit technology cost for all residential measures, 33 percent for all C&I lighting measures, and 25 percent for all other C&I measures. Program-specific administrative costs are based on costs from AEP Ohio's 2010 programs and the program benchmarking results.

For each program, the administrative cost changes as market potential approaches economic potential.

The technology costs per unit are based on data from ongoing AEP Ohio programs, the draft Ohio Statewide TRM for climate dependent data, and values from the California DEER database, adjusted by geographic multiplier factors contained in industry sources, such as the RS Means Mechanical Cost Data. Using all of the above information, Navigant generated the cost-effectiveness numbers for each measure.

A.4.2. Cost-Effectiveness Results

This section summarizes the results of the cost-effectiveness analysis at the measure level. AEP Ohio evaluated cost-effectiveness of the measures on the following standard test:[11]

1. Participant test: a measure is cost-effective from this perspective if the resulting reduction in electric costs to the participating customer exceeds the participant's after-rebate cost of the measure.
2. Utility (or Program administrator) cost (UCT) test: a measure is cost-effective from this perspective if the costs avoided by the resulting energy and demand savings are greater than the utility EE/PDR program costs to promote the measure, including customer rebates.

[11] California Public Utilities Commission. California Standard Practice Manual Economic Analysis of Demand-Side Programs and Projects, October 2001.

3. RIM test: a measure is cost effective from this perspective if the avoided costs are greater than the sum of the measure's EE/PDR program costs and the measure's resulting "lost revenues."
4. TRC test: a measure is cost effective from this perspective if the avoided costs are greater than the sum of the measure costs and the EE/PDR program administrative costs.

In line with standard industry practice, Navigant primarily uses the TRC test to determine which EE/PDR programs to include in a portfolio of EE/PDR programs. Table 14 shows benefit-cost tests commonly utilized in the energy efficiency industry, each of which addresses different perspectives. The PUCO established that the TRC test be used as the key perspective for judging the cost-effectiveness of the EE/PDR programs. Regardless of which perspective is used, benefit- cost ratios greater than or equal to 1.0 are considered beneficial. While various perspectives are often referred to as tests, the following list of criteria demonstrates that decisions on program development go beyond a simple pass/fail test.

Table 14. Cost-Effectiveness Tests

	PARTICIPANT TEST (PCT)	RATE IMPACT MEASURE TEST (RIM)	TOTAL RESOURCE COST TEST (TRC)	UTILITY COST TEST (UCT)
Reduction in Customer's Utility Bill	X			
Incentive Paid by Utility/Program Administrator	X			
Any Tax Credit Received	X		X	
Avoided Supply Costs		X	X	X
Avoided Participant Costs			X	
Participant Payment to Utility (if any)		X		X
Utility Admin Costs		X	X	X
Participant Costs	X		X	
Incentive Costs		X		X
Lost Revenues		X		

A.4.2.1. Residential Measures

The cost-effectiveness for each of the measures was analyzed for each residential segment. For incentive costs, Navigant assumes an incentive cost per unit of 50 percent of the per unit technology cost for all residential measures, 33 percent for all C&I lighting measures, and 25 percent for all other C&I measures. Exceptions were the Appliance Recycling Program, Consumer Behavior Program, and the Community Assistance Program.

Program-specific administrative costs are based on costs from AEP Ohio's 2010 programs and the program benchmarking results.

Navigant applied an initial screening to all residential measures, requiring a TRC greater than or equal to 0.70; about 60 percent of measures passed the initial screening and were included in the potential analysis. In some instances a measure with a TRC less than 0.70 was included where deemed appropriate to do so, particularly where a measure might be bundled with other measures. Table 15 and Table 16 show the residential measures that passed this initial TRC screen and those that did not, respectively. In these two tables, a TRC value of "1,000" indicates that the measure has theoretical TRC value of infinity because the retail cost of the efficient technology is less than that of the standard one (e.g., CFLs being cheaper than incandescents).

Table 15. Residential Measures that Passed Initial TRC Screening – 2012 to 2014

Program	End Use	Measure	Measure TRC	Include in Analysis? (default is "Y" is TRC>=.7)
Products	Appliances	Clothes Washer - Tier 3 >= 2.2 MEF-w/elec dry	0.9	Y
Products	Appliances	Clothes Washer - Tier 3 >= 2.2 MEF-w/gas or no dry	0.8	Y
Products	Appliances	Convection Oven	0.7	Y
Products	Appliances	ENERGY STAR Freezer	0.9	Y
Products	Appliances	ENERGY STAR TV	5.4	Y
Products	Appliances	ENERGY STAR® Ceiling Fan	0.6	Y
Products	Appliances	ENERGY STAR® Dehumidifier	1.5	Y
Products	Appliances	VSD Pool Pumps	1.2	Y
Products	HVAC/Shell	Ductless Mini Split HP SEER 13	2.5	Y
Products	HVAC/Shell	Ductless Mini Split HP SEER 15	2.6	Y
Products	HVAC/Shell	ECM Fan Motor - Central A/C - EL Heat	0.8	Y
Products	HVAC/Shell	ECM Fan Motor - Central A/C - Non-EL Heat	0.8	Y
Products	HVAC/Shell	ECM Fan Motor - Heat Pump	1.1	Y
Products	HVAC/Shell	GSHP, No ER Backup (SEER 13.8)	0.9	Y
Products	HVAC/Shell	GSHP, SEER 14.5, COP 2.49	0.9	Y
Products	Lighting	CFL: >25W Screw-In Indoor	11.0	Y
Products	Lighting	CFL: >25W Screw-In Outdoor	11.0	Y
Products	Lighting	CFL: 13W Screw-In Indoor	1000.0	Y
Products	Lighting	CFL: 13W Screw-In Outdoor	1000.0	Y
Products	Lighting	CFL: 18W Screw-In Indoor	1000.0	Y
Products	Lighting	CFL: 18W Screw-In Outdoor	1000.0	Y
Products	Lighting	CFL: 23W Screw-In Indoor	1000.0	Y
Products	Lighting	CFL: 23W Screw-In Outdoor	1000.0	Y
Products	Lighting	CFL: 7W Screw-In Indoor	1000.0	Y
Products	Lighting	CFL: 7W Screw-In Outdoor	1000.0	Y
Products	Lighting	LED Lighting 13W - Indoor	2.0	Y
Products	Lighting	LED Lighting 13W - Outdoor	2.0	Y
Products	Lighting	LED Lighting 7W - Outdoor	3.9	Y
Products	Lighting	LED Lighting 7W - Indoor	3.9	Y
Products	Water Heat	Drain Water Heat Recovery (42% efficient or higher)	2.2	Y
Products	Water Heat	Heat Pump WH - 2.0 EF	1.0	Y
Products	Water Heat	High Eff. Elec. Water Heat - Tank - .95 EF	1.5	Y
Retrofit (RER)	HVAC/Shell	Reduced ACH 0.3 - Central A/C - EL Heat	1.0	Y
Retrofit (RER)	HVAC/Shell	Reduced ACH 0.3 - Heat Pump	0.8	Y
Retrofit (RER)	HVAC/Shell	Reduced ACH 0.5 - Central A/C - EL Heat	0.9	Y
Retrofit (RER)	HVAC/Shell	Reduced ACH 0.5 - Heat Pump	0.8	Y
Retrofit (RER)	Lighting	CFL: Pin-Based (<25W) Indoor	6.3	Y
Retrofit (RER)	Lighting	CFL: Pin-Based (<25W) Outdoor	1.4	Y
Retrofit (RER)	Lighting	CFL: Pin-Based (>=25W) Indoor	3.4	Y
Retrofit (RER)	Lighting	CFL: Pin-Based (>=25W) Outdoor	3.4	Y
Retrofit (RER)	Lighting	LED Holiday Lights (300 bulb string)	0.8	Y
Retrofit (RER)	Lighting	LED night light	0.8	Y
Retrofit (RER)	Water Heat	Faucet Aerator - 3	0.5	Y
Retrofit (RER)	Water Heat	Low Flow Shower	0.5	Y
Retrofit (RER)	Water Heat	Pipe Wrap	1.2	Y
Retrofit (RER)	Water Heat	Shower Start/Stop	0.5	Y
Recycle	Appliances	Freezer Recycling	4.2	Y
Recycle	Appliances	Refrigerator Recycling	5.2	Y
Recycle	HVAC/Shell	Room A/C Recycling	1.7	Y
Schools	HVAC/Shell	Air Sealing Package	2.3	Y
Schools	Lighting	CFL: 13W Screw-In Indoor - 2	6.2	Y
Schools	Lighting	CFL: 23W Screw-In Indoor - 2	6.1	Y
Schools	Lighting	LED night light	1.4	Y
Schools	Water Heat	Faucet Aerator - 2	1.7	Y
Schools	Water Heat	Low Flow Shower	1.7	Y
New Constructior	New Constructior	Energy Star Qualified 3.0 - Central A/C - EL Heat	1.2	Y
New Constructior	New Constructior	Energy Star Qualified 3.0 - Central A/C - Non-EL Heat	1.4	Y
New Constructior	New Constructior	Energy Star Qualified 3.0 - Heat Pump	1.1	Y
Low Income	Appliances	Energy Star Refrigerator	0.1	Y
Low Income	Appliances	Freezer Recycling	0.1	Y
Low Income	Appliances	Refrigerator Recycling	0.2	Y
Low Income	Lighting	CFL: >25W Screw-In Indoor	0.3	Y
Low Income	Lighting	CFL: >25W Screw-In Outdoor	0.3	Y
Low Income	Lighting	CFL: 18W Screw-In Indoor	0.3	Y
Low Income	Lighting	CFL: 18W Screw-In Outdoor	0.3	Y
Low Income	Lighting	CFL: 23W Screw-In Indoor	0.3	Y
Low Income	Lighting	CFL: 23W Screw-In Outdoor	0.3	Y
Low Income	Lighting	LED night light	0.3	Y
Low Income	Water Heat	Faucet Aerator	0.2	Y
Low Income	Water Heat	Heat Pump WH - 2.0 EF	0.3	Y
Low Income	Water Heat	High Eff. Elec. Water Heat - Tank - .95 EF	0.3	Y
Low Income	Water Heat	Low Flow Shower	0.2	Y
Low Income	Water Heat	Pipe Wrap	0.4	Y
Behavior	House	Home Energy Report	1.7	Y

Table 16. Residential Measures that Did Not Pass Initial TRC Screening – 2012 to 2014

Program	End Use	Measure	Measure TRC	Include in Analysis? (default is "Y" is TRC>=.7)
Products	Appliances	Energy Star Dishwasher (EFO 0.68)	0.1	N
Products	Appliances	ENERGY STAR Monitor	0.6	N
Products	Appliances	Energy Star Refrigerator	0.6	N
Products	HVAC/Shell	Energy Star Window AC	0.4	N
Products	HVAC/Shell	GSHP, Constant Loop Flow	0.7	N
Products	HVAC/Shell	GSHP, Variable Loop Flow	0.6	N
Products	Water Heat	Instantaneous WH - .99 EF	0.3	N
Products	HVAC/Shell	SEER 15 CAC - Central A/C - EL Heat	0.3	N
Products	HVAC/Shell	SEER 15 CAC - Central A/C - Non-EL Heat	0.3	N
Products	Water Heat	Solar Water Heat	0.6	N
Retrofit	HVAC/Shell	(Double replace) Single Pane Windows - Central A/C - EL Heat	0.3	N
Retrofit	HVAC/Shell	(Double replace) Single Pane Windows - Central A/C - Non-EL Heat	0.1	N
Retrofit	HVAC/Shell	(Double replace) Single Pane Windows - Heat Pump	0.3	N
Retrofit	HVAC/Shell	CAC tune-up - charge & airflow - Central A/C - EL Heat	0.3	N
Retrofit	HVAC/Shell	CAC tune-up - charge & airflow - Central A/C - Non-EL Heat	0.3	N
Retrofit	HVAC/Shell	CAC tune-up - charge & airflow - Heat Pump	0.3	N
Retrofit	HVAC/Shell	Ceiling Insul R-45 - Central A/C - EL Heat	0.3	N
Retrofit	HVAC/Shell	Ceiling Insul R-45 - Central A/C - Non-EL Heat	0.0	N
Retrofit	HVAC/Shell	Ceiling Insul R-45 - Heat Pump	0.2	N
Retrofit	HVAC/Shell	Celing Insu. R-30 - Central A/C - EL Heat	0.2	N
Retrofit	HVAC/Shell	Celing Insu. R-30 - Central A/C - Non-EL Heat	0.0	N
Retrofit	HVAC/Shell	Celing Insu. R-30 - Heat Pump	0.2	N
Retrofit	HVAC/Shell	Duct Sealing Insulation Unconditioned - Central A/C - EL Heat	0.1	N
Retrofit	HVAC/Shell	Duct Sealing Insulation Unconditioned - Central A/C - Non-EL Heat	0.1	N
Retrofit	HVAC/Shell	Duct Sealing Insulation Unconditioned - Heat Pump	0.1	N
Retrofit	Appliances	ENERGY STAR Cable Boxes	0.2	N
Retrofit	HVAC/Shell	Low-e Window Film - Central A/C - EL Heat	0.4	N
Retrofit	HVAC/Shell	Low-e Window Film - Central A/C - Non-EL Heat	0.1	N
Retrofit	HVAC/Shell	Low-e Window Film - Heat Pump	0.3	N
Retrofit	HVAC/Shell	Reduced ACH 0.3 - Central A/C - Non-EL Heat	0.1	N
Retrofit	HVAC/Shell	Reduced ACH 0.5 - Central A/C - Non-EL Heat	0.2	N
Retrofit	Appliances	Smart Strip Power Bar	0.3	N
Retrofit	HVAC/Shell	Triple Pane Windows - Central A/C - EL Heat	0.6	N
Retrofit	HVAC/Shell	Triple Pane Windows - Central A/C - Non-EL Heat	0.3	N
Retrofit	HVAC/Shell	Triple Pane Windows - Heat Pump	0.6	N
Retrofit	HVAC/Shell	Wall Insul. R-11 - Central A/C - EL Heat	0.6	N
Retrofit	HVAC/Shell	Wall Insul. R-11 - Central A/C - Non-EL Heat	0.1	N
Retrofit	HVAC/Shell	Wall Insul. R-11 - Heat Pump	0.5	N
Schools	Water Heat	Hot Water Temp Gauge	0.6	N
Low Income	Water Heat	Instantaneous WH - .99 EF	0.1	N

Some measures that failed the initial TRC screen are included in the analysis because of their value when bundled with other measures into a program. Table 17 to Table 20 show results for the four main cost-effectiveness tests for those residential measures determined to be included in the portfolio, organized by end-use type. In these four tables, measures with a theoretical TRC value of infinity are indicated by "0.0"; these values are not used to calculate the program-level or portfolio-level TRC.

Table 17. Residential Cost-Effectiveness Ratios – 2012 to 2014, Lighting

Program Type	Lighting Measure	UCT Utility Cost Test	PCT Participant Cost Test	RIM Rate Impact Measure Test	TRC Total Resource Cost Test
Low Income	CFL: >25W Screw-In Indoor	0.2	58.2	0.1	0.2
Low Income	CFL: >25W Screw-In Outdoor	0.2	58.2	0.1	0.2
Low Income	CFL: 18W Screw-In Indoor	13.6	0.0	0.3	0.0
Low Income	CFL: 18W Screw-In Outdoor	13.7	0.0	0.3	0.0
Low Income	CFL: 23W Screw-In Indoor	16.4	0.0	0.3	0.0
Low Income	CFL: 23W Screw-In Outdoor	16.4	0.0	0.3	0.0
Low Income	LED night light	0.2	10.2	0.1	0.2
Products	CFL: >25W Screw-In Indoor	7.7	43.4	0.3	6.3
Products	CFL: >25W Screw-In Outdoor	7.7	43.4	0.3	6.3
Products	CFL: 13W Screw-In Indoor	5.7	0.0	0.3	0.0
Products	CFL: 13W Screw-In Outdoor	5.7	0.0	0.3	0.0
Products	CFL: 18W Screw-In Indoor	7.5	0.0	0.3	0.0
Products	CFL: 18W Screw-In Outdoor	7.5	0.0	0.3	0.0
Products	CFL: 23W Screw-In Indoor	8.6	0.0	0.3	0.0
Products	CFL: 23W Screw-In Outdoor	8.6	0.0	0.3	0.0
Products	CFL: 7W Screw-In Indoor	4.2	0.0	0.3	0.0
Products	CFL: 7W Screw-In Outdoor	4.2	0.0	0.3	0.0
Products	LED Lighting 13W - Indoor	2.3	5.5	0.2	1.1
Products	LED Lighting 13W - Outdoor	2.3	5.5	0.2	1.1
Products	LED Lighting 7W - Outdoor	4.2	10.7	0.2	2.1
Products	LED Lighting 7W - Indoor	4.2	10.7	0.2	2.1
Retrofit	CFL: Pin-Based (<25W) Indoor	1.1	0.0	0.2	0.0
Retrofit	CFL: Pin-Based (<25W) Outdoor	0.6	0.0	0.2	0.0
Retrofit	CFL: Pin-Based (>=25W) Indoor	1.9	0.0	0.2	0.0
Retrofit	CFL: Pin-Based (>=25W) Outdoor	1.1	0.0	0.2	0.0
Retrofit	LED Holiday Lights (300 bulb string)	0.7	10.8	0.2	0.6
Retrofit	LED night light	0.7	9.7	0.2	0.6
Schools	CFL: 13W Screw-In Indoor - 2	2.4	0.0	0.3	0.0
Schools	CFL: 23W Screw-In Indoor - 2	2.5	0.0	0.3	0.0
Schools	LED night light	3.1	7.0	0.2	1.1

Table 18. Residential Cost-Effectiveness Ratios – 2012 to 2014, Appliances and Pool Pumps

Program Type	Appliances and Pool Pumps Measure	UCT Utility Cost Test	PCT Participant Cost Test	RIM Rate Impact Measure Test	TRC Total Resource Cost Test
Low Income	Energy Star Refrigerator	0.2	1.7	0.1	0.2
Low Income	Freezer Recycling	0.1	56.8	0.1	0.1
Low Income	Refrigerator Recycling	0.2	66.1	0.1	0.2
Products	Clothes Washer - Tier 3 >= 2.2 MEF-w/elec dry	5.2	1.0	0.7	0.8
Products	Clothes Washer - Tier 3 >= 2.2 MEF-w/gas or no dry	4.7	0.8	0.8	0.7
Products	Convection Oven	1.1	2.6	0.2	0.5
Products	ENERGY STAR Freezer	2.1	2.7	0.3	0.7
Products	ENERGY STAR TV	3.9	14.2	0.4	4.6
Products	ENERGY STAR® Ceiling Fan	0.9	1.9	0.3	0.5
Products	ENERGY STAR® Dehumidifier	1.1	5.1	0.2	1.2
Products	VSD Pool Pumps	4.4	1.4	0.7	1.0
Recycle	Freezer Recycling	1.4	974.6	0.3	3.5
Recycle	Refrigerator Recycling	1.7	1114.1	0.3	4.5

Table 19. Residential Cost-Effectiveness Ratios – 2012 to 2014, Hot Water

Program Type	Hot Water Measure	UCT Utility Cost Test	PCT Participant Cost Test	RIM Rate Impact Measure Test	TRC Total Resource Cost Test
Low Income	Faucet Aerator	0.2	5.8	0.1	0.2
Low Income	Heat Pump WH - 2.0 EF	0.2	5.3	0.1	0.2
Low Income	High Eff. Elec. Water Heat - Tank - .95 EF	0.2	2.7	0.1	0.2
Low Income	Low Flow Shower	0.1	14.7	0.1	0.1
Low Income	Pipe Wrap	0.3	18.0	0.2	0.3
Products	Drain Water Heat Recovery (42% efficient or higher)	5.1	6.3	0.3	1.7
Products	Heat Pump WH - 2.0 EF	1.7	3.4	0.3	0.9
Products	High Eff. Elec. Water Heat - Tank - .95 EF	2.3	4.7	0.3	1.2
Retrofit	Faucet Aerator - 3	0.5	5.3	0.2	0.4
Retrofit	Low Flow Shower	0.4	14.2	0.2	0.4
Retrofit	Pipe Wrap	1.0	105.3	0.2	1.0
Retrofit	Shower Start/Stop	0.5	4.4	0.2	0.5
Schools	Faucet Aerator - 2	2.0	7.5	0.4	1.5
Schools	Low Flow Shower	1.7	10.7	0.3	1.4

Table 20. Residential Cost-Effectiveness Ratios – 2012 to 2014, HVAC & Shell

Program Type	HVAC & Shell Measure	UCT Utility Cost Test	PCT Participant Cost Test	RIM Rate Impact Measure Test	TRC Total Resource Cost Test
Products	Ductless Mini Split HP SEER 13	3.8	7.1	0.3	2.0
Products	Ductless Mini Split HP SEER 15	4.0	7.4	0.3	2.1
Products	ECM Fan Motor - Central A/C - EL Heat	1.2	2.3	0.3	0.6
Products	ECM Fan Motor - Central A/C - Non-EL Heat	0.8	1.6	0.2	0.4
Products	ECM Fan Motor - Heat Pump	1.6	3.2	0.3	0.8
Products	GSHP, No ER Backup (SEER 13.8)	0.9	3.6	0.2	0.7
Products	GSHP, SEER 14.5, COP 2.49	1.3	2.9	0.3	0.7
Recycle	Room A/C Recycling	3.7	0.5	1.6	0.8
Retrofit	Reduced ACH 0.3 - Central A/C - EL Heat	0.9	9.5	0.2	0.7
Retrofit	Reduced ACH 0.3 - Heat Pump	0.8	7.6	0.2	0.6
Retrofit	Reduced ACH 0.5 - Central A/C - EL Heat	0.8	7.5	0.2	0.7
Retrofit	Reduced ACH 0.5 - Heat Pump	0.6	6.4	0.2	0.6
Schools	Air Sealing Package	9.9	2.1	1.0	1.9
New Construction	Energy Star Qualified 3.0 - Central A/C - Non-EL Heat	1.1	5.5	0.2	1.1
New Construction	Energy Star Qualified 3.0 - Heat Pump	1.3	4.3	0.2	0.8
Behavior	Home Energy Report	1.2	0.0	0.3	0.0

The results for all residential segments combined show that the majority of the measures are cost-effective from the perspective of the PCT and UCT tests. About half of the measures passed the TRC test while very few passed the RIM test[12].

Most measures for water heating failed the TRC test in the initial screening or in the analysis across all segments, mostly due to high incremental costs and/or low energy and peak demand savings. Almost two-thirds of the HVAC and shell measures failed the TRC test due mostly to the high cost, labor-intensive retrofitting of cooling and heating measures in existing construction.

AEP Ohio's relatively low estimated avoided costs also play a significant role in the benefit-cost test results. The low avoided costs tend to lower the portion of measures passing.

[12] Results ratios less than one for the RIM test are typical for energy efficiency measures.

A.4.2.2. Non-Residential Measures

The cost-effectiveness for each measure was analyzed for each of the five C&I segments/building types:

- Industrial
- Office
- Retail
- Schools
- Other Commercial

Over 800 measures were initially screened, and about 540 passed with a TRC greater than or equal to 0.62. Some measures that failed the initial TRC screen are included in the analysis because of their value when bundled with other measures into a program. For those measures determined to be included in the portfolio, Navigant performed four cost-effectiveness tests for each of the five building types.

As a sample, Table 16 to Table 27 show for these measures by end-use type and by program for offices. Similar data were developed for four additional building types: retail non-food, schools, commercial other, and industrial.

Table 21. Commercial Cost-Effectiveness Ratios – 2012 to 2031, Lighting

Program Type	Lighting Measure	UCT Utility Cost Test	PCT Participant Cost Test	RIM Rate Impact Measure Test	TRC Total Resource Cost Test
Prescriptive	CFL: Pin-Based (<25W) Indoor	13.3	15.8	0.8	7.8
Direct Install	CFL: Pin-Based (<25W) Indoor	2.0	16.2	0.6	2.0
Prescriptive	CFL: Pin-Based (>=25W) Indoor	13.3	15.8	0.8	7.8
Direct Install	CFL: Pin-Based (>=25W) Indoor	2.0	16.2	0.6	2.0
Prescriptive	CFL: Screw-In (<10W) Indoor	2.7	2.9	0.6	1.4
Direct Install	CFL: Screw-In (<10W) Indoor	0.4	3.3	0.3	0.4
Prescriptive	CFL: Screw-In (>26W) Indoor	2.1	6.2	0.5	1.4
Direct Install	CFL: Screw-In (>26W) Indoor	0.4	7.6	0.2	0.4
Prescriptive	CFL: Screw-In (>26W) Outdoor	3.4	40.2	0.6	3.1
Direct Install	CFL: Screw-In (>26W) Outdoor	0.4	40.5	0.3	0.4
Prescriptive	CFL: Screw-In (10-15W) Indoor	3.1	4.0	0.7	1.8
Direct Install	CFL: Screw-In (10-15W) Indoor	0.4	4.4	0.3	0.4
Prescriptive	CFL: Screw-In (10-15W) Outdoor	3.6	17.0	0.6	3.0
Direct Install	CFL: Screw-In (10-15W) Outdoor	0.4	18.1	0.3	0.4
Prescriptive	CFL: Screw-In (16-21W) Indoor	3.2	4.5	0.7	1.9
Direct Install	CFL: Screw-In (16-21W) Indoor	0.4	4.9	0.3	0.4
Prescriptive	CFL: Screw-In (22-26W) Outdoor	3.9	26.6	0.7	3.5
Direct Install	CFL: Screw-In (22-26W) Outdoor	0.5	27.1	0.3	0.5
Custom	Daylighting Controls	2.5	1.3	0.7	0.9
Prescriptive	Delamping	7.0	4.7	0.8	3.1
Direct Install	Delamping	1.4	5.2	0.5	1.3
Prescriptive	Dimmable Electronic Ballasts	6.2	3.7	0.8	2.7
Direct Install	Dimmable Electronic Ballasts	1.3	4.2	0.6	1.2
Prescriptive	High Performance T8 Lighting	8.3	9.7	0.9	5.1
Direct Install	High Performance T8 Lighting	1.2	10.2	0.5	1.2
Prescriptive	High Performance T8 Lighting	2.0	1.1	0.6	0.7
Prescriptive	LED Exit Signs - from Incand.	6.6	5.2	0.6	2.8
Direct Install	LED Exit Signs - from Incand.	1.5	5.6	0.5	1.4
Prescriptive	LED Lighting <10W - Indoor	5.6	3.4	0.8	2.3
Direct Install	LED Lighting <10W - Indoor	1.3	3.9	0.5	1.2
Prescriptive	LED Lighting >=10W - Indoor	3.0	1.9	0.7	1.2
Direct Install	LED Lighting >=10W - Indoor	0.7	2.4	0.4	0.6
Prescriptive	Occupancy Sensor	2.2	1.4	0.6	0.8
Direct Install	Occupancy Sensor	0.7	1.9	0.4	0.6
Prescriptive	Photocell	1.5	1.1	0.5	0.5
Prescriptive	Screw in cold cathode CFL	11.3	11.9	0.8	6.4
Direct Install	Screw in cold cathode CFL	1.8	12.4	0.6	1.7
Prescriptive	T5 Lighting	6.4	4.4	0.6	2.5
Direct Install	T5 Lighting	1.6	4.9	0.5	1.4
Prescriptive	Time clock	1.7	1.1	0.5	0.6

Table 22. Commercial Cost-Effectiveness Results – 2012 to 2014, Cooking & Other

Program Type	Cooking & Other Measure	UCT Utility Cost Test	PCT Participant Cost Test	RIM Rate Impact Measure Test	TRC Total Resource Cost Test
Prescriptive	Advanced Pre-Rinse Spray Nozzle	6.3	6.5	0.8	3.3
Direct Install	Advanced Pre-Rinse Spray Nozzle	0.9	7.0	0.4	0.8
Prescriptive	ENERGY STAR Connectionless Steamer	5.1	2.5	0.7	1.6
Prescriptive	ENERGY STAR Oven (Convection)	4.4	2.1	0.7	1.3
Prescriptive	Insulated Hot Food Holding Cabinet: Half Size <=0.3 kW	2.8	1.3	0.6	0.8
Prescriptive	PC Power Management Software	3.0	1.8	0.7	1.2

Table 23. Commercial Cost-Effectiveness Results – 2012 to 2014, HVAC & Shell

Program Type	HVAC & Shell Measure	UCT Utility Cost Test	PCT Participant Cost Test	RIM Rate Impact Measure Test	TRC Total Resource Cost Test
Custom	<150 tons Centrifugal Water Cooled Chiller COP = 6.0 - Chiller / Elec Resist	2.3	1.4	0.4	0.6
Custom	<150 tons Centrifugal Water Cooled Chiller COP = 6.0 - Chiller / Gas Heat	2.7	1.6	0.5	0.7
Custom	Air Cooled Chiller COP = 3.2 - Chiller / Elec Resist	1.8	1.1	0.4	0.5
Custom	Air Cooled Chiller COP = 3.2 - Chiller / Gas Heat	2.0	1.3	0.4	0.5
Custom	Code minimum R-20ci or R-38 batt - Chiller / Elec Resist	2.9	1.2	0.7	0.8
Custom	Code minimum R-20ci or R-38 batt - Direct Exp / Elec Resist	1.6	0.9	0.5	0.4
Prescriptive	Economizer - Chiller / Elec Resist	1.6	0.9	0.5	0.4
Custom	High Performance Glazing - Chiller / Elec Resist	7.9	5.2	0.5	2.6
Custom	High Performance Glazing - Chiller / Gas Heat	4.6	2.6	0.5	1.3
Custom	High Performance Glazing - Direct Exp / Elec Resist	5.0	2.4	0.6	1.4
Custom	High Performance Glazing - Direct Exp / Gas Heat	4.4	1.9	0.6	1.2
Custom	High Performance Glazing - Heat Pump	4.7	2.0	0.7	1.3
Prescriptive	Programmable Thermostat - Chiller / Elec Resist	3.9	2.3	0.6	1.2
Direct Install	Programmable Thermostat - Chiller / Elec Resist	0.8	2.8	0.4	0.7
Prescriptive	Programmable Thermostat - Direct Exp / Elec Resist	4.7	2.9	0.6	1.5
Direct Install	Programmable Thermostat - Direct Exp / Elec Resist	1.0	3.4	0.4	0.9
Prescriptive	Programmable Thermostat - Direct Exp / Gas Heat	8.7	8.9	0.6	3.9
Direct Install	Programmable Thermostat - Direct Exp / Gas Heat	1.3	9.5	0.4	1.3
Custom	Refrigerant Charge	6.6	3.6	0.6	2.1
Prescriptive	Split/Package system A/C (< 5.4 tons, 14 SEER) - Direct Exp / Elec Resist	3.0	0.9	0.9	0.8
Prescriptive	Split/Package system A/C (< 5.4 tons, 14 SEER) - Direct Exp / Gas Heat	3.0	1.0	0.8	0.8
Prescriptive	Split/Packaged Heat Pump (<65 kBtu/h) SEER 14 - Heat Pump	2.7	0.9	0.8	0.7
Custom	Window Films on Double Pane - Chiller / Elec Resist	11.7	22.1	0.7	7.5
Custom	Window Films on Double Pane - Chiller / Gas Heat	13.9	23.5	0.8	8.9
Custom	Window Films on Double Pane - Direct Exp / Elec Resist	16.7	8.9	1.1	7.6
Custom	Window Films on Double Pane - Direct Exp / Gas Heat	16.3	15.8	0.9	9.1
Custom	Window Films on Double Pane - Heat Pump	17.9	11.9	1.0	8.8
Custom	Window Films on Single Pane - Chiller / Elec Resist	11.3	18.3	0.7	6.8
Custom	Window Films on Single Pane - Chiller / Gas Heat	13.7	20.3	0.8	8.4
Custom	Window Films on Single Pane - Direct Exp / Elec Resist	16.1	7.2	1.2	6.8
Custom	Window Films on Single Pane - Direct Exp / Gas Heat	15.9	14.1	0.9	8.5
Custom	Window Films on Single Pane - Heat Pump	17.4	10.0	1.1	8.0
Prescriptive	VFD on centrif load - Process or HVAC	5.8	2.0	0.8	1.7

Table 24. Commercial Cost-Effectiveness Results – 2012 to 2014, Refrigeration

Program Type	Refrigeration Measure	UCT Utility Cost Test	PCT Participant Cost Test	RIM Rate Impact Measure Test	TRC Total Resource Cost Test
Prescriptive	EC Motor: Walk-In Enclosure	17.7	38.9	0.7	11.8
Direct Install	EC Motor: Walk-In Enclosure	2.3	39.5	0.5	2.2
Prescriptive	Evap Fan Controller for Med. Temp Walk-in	18.4	63.8	0.7	13.9
Direct Install	Evap Fan Controller for Med. Temp Walk-in	2.3	64.4	0.5	2.2
Prescriptive	Floating Head Pressure Controls	12.0	12.5	0.7	6.0
Custom	High efficiency, low temperature compressor	2.4	1.2	0.6	0.6

Table 25. Commercial Cost-Effectiveness Results – 2012 to 2014, Plug Load

Program Type	Plug Load Measure	UCT Utility Cost Test	PCT Participant Cost Test	RIM Rate Impact Measure Test	TRC Total Resource Cost Test
Prescriptive	Advanced Power Strips - Occupancy Sensors	3.3	1.5	0.7	1.0
Prescriptive	Advanced Power Strips - Timer Plug Strip	8.6	6.5	0.8	3.9
Prescriptive	Advanced Power Strips - Load Sensor	4.7	2.4	0.7	1.6
Prescriptive	Vending Machine Controller - Cold Drink	8.5	6.2	0.6	3.2
Direct Install	Vending Machine Controller - Cold Drink	1.5	6.8	0.4	1.4

Table 26. Commercial Cost-Effectiveness Results – 2012 to 2014, Hot Water

Program Type	Water Heater Measure	UCT Utility Cost Test	PCT Participant Cost Test	RIM Rate Impact Measure Test	TRC Total Resource Cost Test
Prescriptive	Heat Pump Water Heater	4.1	2.1	0.6	1.3
Prescriptive	Hot Water Circulation Pump Time Clock	4.8	2.7	0.6	1.5
Direct Install	Hot Water Circulation Pump Time Clock	1.0	3.3	0.4	0.9

Of the C&I measures screened, a majority passed the TRC test. These results indicate that most common commercial EE/PDR measures are cost effective in AEP Ohio's service area.

Table 27 to Table 29 show, by program, the measures that were not included in the potential analysis because these failed the initial screen.

Table 27. Non-Residential Prescriptive Measures Not Included in Analysis

Program	Measure	Building Type	Measure TRC
Prescriptive	Economizer	Industrial	0.4
Prescriptive	Economizer	Industrial	0.4
Prescriptive	Split/Packaged Air Conditioner (135 - 240 kBtu/h) 11.5 EER	Industrial	0.4
Prescriptive	Dimmable Electronic Ballasts	Industrial	0.5
Prescriptive	Induction Lighting	Industrial	0.6
Prescriptive	Occupancy Sensor	Industrial	0.6
Prescriptive	T8 to High Performance T8	Industrial	0.4
Prescriptive	Economizer - Chiller / Gas Heat	Office	0.4
Prescriptive	Economizer - Direct Exp / Elec Resist	Office	0.6
Prescriptive	Economizer - Direct Exp / Gas Heat	Office	0.4
Prescriptive	Economizer - Heat Pump	Office	0.6
Prescriptive	Ground Source Heat Pump (<65 kBtu/h) EER 16 - Chiller / Elec Resist	Office	0.0
Prescriptive	Ground Source Heat Pump (<65 kBtu/h) EER 16 - Chiller / Gas Heat	Office	0.0
Prescriptive	Ground Source Heat Pump (<65 kBtu/h) EER 16 - Direct Exp / Elec Resis	Office	0.0
Prescriptive	Ground Source Heat Pump (<65 kBtu/h) EER 16 - Direct Exp / Gas Heat	Office	0.0
Prescriptive	Ground Source Heat Pump (<65 kBtu/h) EER 16 - Heat Pump	Office	0.0
Prescriptive	Package system A/C (>=63.3 tons, 10.2 EER) - Chiller / Elec Resist	Office	0.0
Prescriptive	Package system A/C (>=63.3 tons, 10.2 EER) - Chiller / Gas Heat	Office	0.0
Prescriptive	Package system A/C (>=63.3 tons, 10.2 EER) - Heat Pump	Office	0.0
Prescriptive	Packaged terminal air-conditioner (< 7kbtuh)	Office	0.0
Prescriptive	Programmable Thermostat - Chiller / Gas Heat	Office	0.1
Prescriptive	Programmable Thermostat - Heat Pump	Office	0.0
Prescriptive	Split/Package system A/C (< 5.4 tons, 14 SEER) - Chiller / Elec Resist	Office	0.0
Prescriptive	Split/Package system A/C (< 5.4 tons, 14 SEER) - Chiller / Gas Heat	Office	0.0
Prescriptive	Split/Package system A/C (< 5.4 tons, 14 SEER) - Heat Pump	Office	0.0
Prescriptive	Split/Packaged Air Conditioner (135 - 240 kBtu/h) 11.5 EER - Chiller / Elec	Office	0.0
Prescriptive	Split/Packaged Air Conditioner (135 - 240 kBtu/h) 11.5 EER - Chiller / Gas	Office	0.0
Prescriptive	Split/Packaged Air Conditioner (135 - 240 kBtu/h) 11.5 EER - Direct Exp /	Office	0.6
Prescriptive	Split/Packaged Air Conditioner (135 - 240 kBtu/h) 11.5 EER - Direct Exp /	Office	0.6
Prescriptive	Split/Packaged Air Conditioner (135 - 240 kBtu/h) 11.5 EER - Heat Pump	Office	0.0
Prescriptive	Split/Packaged Air Conditioner (240 - 760 kBtu/h) 11 EER - Chiller / Elec R	Office	0.0
Prescriptive	Split/Packaged Air Conditioner (240 - 760 kBtu/h) 11 EER - Chiller / Gas H	Office	0.0
Prescriptive	Split/Packaged Air Conditioner (240 - 760 kBtu/h) 11 EER - Heat Pump	Office	0.0
Prescriptive	Split/Packaged Air Conditioner (65 - 135 kBtu/h) 12 EER - Chiller / Elec Re	Office	0.0
Prescriptive	Split/Packaged Air Conditioner (65 - 135 kBtu/h) 12 EER - Chiller / Gas He	Office	0.0
Prescriptive	Split/Packaged Air Conditioner (65 - 135 kBtu/h) 12 EER - Direct Exp / Ele	Office	0.6
Prescriptive	Split/Packaged Air Conditioner (65 - 135 kBtu/h) 12 EER - Direct Exp / Gas	Office	0.6
Prescriptive	Split/Packaged Air Conditioner (65 - 135 kBtu/h) 12 EER - Heat Pump	Office	0.0
Prescriptive	Split/Packaged Heat Pump (<65 kBtu/h) SEER 14 - Chiller / Elec Resist	Office	0.0
Prescriptive	Split/Packaged Heat Pump (<65 kBtu/h) SEER 14 - Chiller / Gas Heat	Office	0.0
Prescriptive	Split/Packaged Heat Pump (<65 kBtu/h) SEER 14 - Direct Exp / Elec Resi	Office	0.0
Prescriptive	Split/Packaged Heat Pump (<65 kBtu/h) SEER 14 - Direct Exp / Gas Heat	Office	0.0
Prescriptive	Split/Packaged Heat Pump (135 - 240 kBtu/h) EER 11.5 - Chiller / Elec Re	Office	0.0
Prescriptive	Split/Packaged Heat Pump (135 - 240 kBtu/h) EER 11.5 - Chiller / Gas He	Office	0.0
Prescriptive	Split/Packaged Heat Pump (135 - 240 kBtu/h) EER 11.5 - Direct Exp / Ele	Office	0.0
Prescriptive	Split/Packaged Heat Pump (135 - 240 kBtu/h) EER 11.5 - Direct Exp / Gas	Office	0.0
Prescriptive	Split/Packaged Heat Pump (240 - 760 kBtu/h) EER 10.8 - Chiller / Elec Re	Office	0.0
Prescriptive	Split/Packaged Heat Pump (240 - 760 kBtu/h) EER 10.8 - Chiller / Gas He	Office	0.0
Prescriptive	Split/Packaged Heat Pump (240 - 760 kBtu/h) EER 10.8 - Direct Exp / Ele	Office	0.0
Prescriptive	Split/Packaged Heat Pump (240 - 760 kBtu/h) EER 10.8 - Direct Exp / Gas	Office	0.0
Prescriptive	Split/Packaged Heat Pump (65 - 135 kBtu/h) EER 12 - Chiller / Elec Resis	Office	0.0
Prescriptive	Split/Packaged Heat Pump (65 - 135 kBtu/h) EER 12 - Chiller / Gas Heat	Office	0.0
Prescriptive	Split/Packaged Heat Pump (65 - 135 kBtu/h) EER 12 - Direct Exp / Elec R	Office	0.0
Prescriptive	Split/Packaged Heat Pump (65 - 135 kBtu/h) EER 12 - Direct Exp / Gas H	Office	0.0

Prescriptive	Water Source Heat Pump (<65 kBtu/h) EER 15 - Heat Pump	Office	0.0
Prescriptive	T8 to High Performance T8	Office	0.4
Prescriptive	Glass Doors on Low and Med. Temperature Displays	Office	0.5
Prescriptive	High Efficiency, Electric Water Heater	Office	0.2
Prescriptive	Economizer - Direct Exp / Elec Resist	Other Commercial	0.0
Prescriptive	Ground Source Heat Pump (<65 kBtu/h) EER 16 - Direct Exp / Elec Resis	Other Commercial	0.0
Prescriptive	Ground Source Heat Pump (<65 kBtu/h) EER 16 - Direct Exp / Gas Heat	Other Commercial	0.0
Prescriptive	Ground Source Heat Pump (<65 kBtu/h) EER 16 - Heat Pump	Other Commercial	0.0
Prescriptive	Package system A/C (>=63.3 tons, 10.2 EER) - Heat Pump	Other Commercial	0.0
Prescriptive	Programmable Thermostat - Direct Exp / Gas Heat	Other Commercial	0.0
Prescriptive	Programmable Thermostat - Heat Pump	Other Commercial	0.0
Prescriptive	Split/Package system A/C (< 5.4 tons, 14 SEER) - Heat Pump	Other Commercial	0.0
Prescriptive	Split/Packaged Air Conditioner (135 - 240 kBtu/h) 11.5 EER - Heat Pump	Other Commercial	0.0
Prescriptive	Split/Packaged Air Conditioner (240 - 760 kBtu/h) 11 EER - Heat Pump	Other Commercial	0.0
Prescriptive	Split/Packaged Air Conditioner (65 - 135 kBtu/h) 12 EER - Heat Pump	Other Commercial	0.0
Prescriptive	Split/Packaged Heat Pump (<65 kBtu/h) SEER 14 - Direct Exp / Elec Resi	Other Commercial	0.0
Prescriptive	Split/Packaged Heat Pump (<65 kBtu/h) SEER 14 - Direct Exp / Gas Heat	Other Commercial	0.0
Prescriptive	Split/Packaged Heat Pump (135 - 240 kBtu/h) EER 11.5 - Direct Exp / Ele	Other Commercial	0.0
Prescriptive	Split/Packaged Heat Pump (135 - 240 kBtu/h) EER 11.5 - Direct Exp / Gas	Other Commercial	0.0
Prescriptive	Split/Packaged Heat Pump (240 - 760 kBtu/h) EER 10.8 - Direct Exp / Ele	Other Commercial	0.0
Prescriptive	Split/Packaged Heat Pump (240 - 760 kBtu/h) EER 10.8 - Direct Exp / Gas	Other Commercial	0.0
Prescriptive	Split/Packaged Heat Pump (65 - 135 kBtu/h) EER 12 - Direct Exp / Elec R	Other Commercial	0.0
Prescriptive	Split/Packaged Heat Pump (65 - 135 kBtu/h) EER 12 - Direct Exp / Gas He	Other Commercial	0.0
Prescriptive	Water Source Heat Pump (<65 kBtu/h) EER 15 - Direct Exp / Elec Resist	Other Commercial	0.0
Prescriptive	Water Source Heat Pump (<65 kBtu/h) EER 15 - Direct Exp / Gas Heat	Other Commercial	0.0
Prescriptive	Water Source Heat Pump (<65 kBtu/h) EER 15 - Heat Pump	Other Commercial	0.0
Prescriptive	Occupancy Sensor	Other Commercial	0.5
Prescriptive	T8 to High Performance T8	Other Commercial	0.4
Prescriptive	Glass Doors on Low and Med. Temperature Displays	Other Commercial	0.5
Prescriptive	High Efficiency, Electric Water Heater	Other Commercial	0.2
Prescriptive	Economizer - Chiller / Elec Resist	Retail Non-Food	0.4
Prescriptive	Economizer - Chiller / Gas Heat	Retail Non-Food	0.1
Prescriptive	Economizer - Direct Exp / Elec Resist	Retail Non-Food	0.3
Prescriptive	Economizer - Direct Exp / Gas Heat	Retail Non-Food	0.3
Prescriptive	Economizer - Heat Pump	Retail Non-Food	0.4
Prescriptive	Ground Source Heat Pump (<65 kBtu/h) EER 16 - Chiller / Elec Resist	Retail Non-Food	0.0
Prescriptive	Ground Source Heat Pump (<65 kBtu/h) EER 16 - Chiller / Gas Heat	Retail Non-Food	0.0
Prescriptive	Ground Source Heat Pump (<65 kBtu/h) EER 16 - Direct Exp / Elec Resis	Retail Non-Food	0.0
Prescriptive	Ground Source Heat Pump (<65 kBtu/h) EER 16 - Direct Exp / Gas Heat	Retail Non-Food	0.0
Prescriptive	Ground Source Heat Pump (<65 kBtu/h) EER 16 - Heat Pump	Retail Non-Food	0.0
Prescriptive	Package system A/C (>=63.3 tons, 10.2 EER) - Chiller / Elec Resist	Retail Non-Food	0.0
Prescriptive	Package system A/C (>=63.3 tons, 10.2 EER) - Chiller / Gas Heat	Retail Non-Food	0.0
Prescriptive	Package system A/C (>=63.3 tons, 10.2 EER) - Heat Pump	Retail Non-Food	0.0
Prescriptive	Programmable Thermostat - Heat Pump	Retail Non-Food	0.2
Prescriptive	Split/Package system A/C (< 5.4 tons, 14 SEER) - Chiller / Elec Resist	Retail Non-Food	0.0
Prescriptive	Split/Package system A/C (< 5.4 tons, 14 SEER) - Chiller / Gas Heat	Retail Non-Food	0.0
Prescriptive	Split/Package system A/C (< 5.4 tons, 14 SEER) - Heat Pump	Retail Non-Food	0.0
Prescriptive	Split/Packaged Air Conditioner (135 - 240 kBtu/h) 11.5 EER - Chiller / Elec	Retail Non-Food	0.0
Prescriptive	Split/Packaged Air Conditioner (135 - 240 kBtu/h) 11.5 EER - Chiller / Gas	Retail Non-Food	0.0

Prescriptive	Split/Packaged Air Conditioner (135 - 240 kBtu/h) 11.5 EER - Direct Exp /	Retail Non-Food	0.5
Prescriptive	Split/Packaged Air Conditioner (135 - 240 kBtu/h) 11.5 EER - Direct Exp /	Retail Non-Food	0.6
Prescriptive	Split/Packaged Air Conditioner (135 - 240 kBtu/h) 11.5 EER - Heat Pump	Retail Non-Food	0.0
Prescriptive	Split/Packaged Air Conditioner (240 - 760 kBtu/h) 11 EER - Chiller / Elec R	Retail Non-Food	0.0
Prescriptive	Split/Packaged Air Conditioner (240 - 760 kBtu/h) 11 EER - Chiller / Gas H	Retail Non-Food	0.0
Prescriptive	Split/Packaged Air Conditioner (240 - 760 kBtu/h) 11 EER - Heat Pump	Retail Non-Food	0.0
Prescriptive	Split/Packaged Air Conditioner (65 - 135 kBtu/h) 12 EER - Chiller / Elec Re	Retail Non-Food	0.0
Prescriptive	Split/Packaged Air Conditioner (65 - 135 kBtu/h) 12 EER - Chiller / Gas He	Retail Non-Food	0.0
Prescriptive	Split/Packaged Air Conditioner (65 - 135 kBtu/h) 12 EER - Direct Exp / Ele	Retail Non-Food	0.5
Prescriptive	Split/Packaged Air Conditioner (65 - 135 kBtu/h) 12 EER - Direct Exp / Gas	Retail Non-Food	0.6
Prescriptive	Split/Packaged Air Conditioner (65 - 135 kBtu/h) 12 EER - Heat Pump	Retail Non-Food	0.0
Prescriptive	Split/Packaged Heat Pump (<65 kBtu/h) SEER 14 - Chiller / Elec Resist	Retail Non-Food	0.0
Prescriptive	Split/Packaged Heat Pump (<65 kBtu/h) SEER 14 - Chiller / Gas Heat	Retail Non-Food	0.0
Prescriptive	Split/Packaged Heat Pump (<65 kBtu/h) SEER 14 - Direct Exp / Elec Resi	Retail Non-Food	0.0
Prescriptive	Split/Packaged Heat Pump (<65 kBtu/h) SEER 14 - Direct Exp / Gas Heat	Retail Non-Food	0.0
Prescriptive	Split/Packaged Heat Pump (135 - 240 kBtu/h) EER 11.5 - Chiller / Elec Re	Retail Non-Food	0.0
Prescriptive	Split/Packaged Heat Pump (135 - 240 kBtu/h) EER 11.5 - Chiller / Gas He	Retail Non-Food	0.0
Prescriptive	Split/Packaged Heat Pump (135 - 240 kBtu/h) EER 11.5 - Direct Exp / Ele	Retail Non-Food	0.0
Prescriptive	Split/Packaged Heat Pump (135 - 240 kBtu/h) EER 11.5 - Direct Exp / Gas	Retail Non-Food	0.0
Prescriptive	Split/Packaged Heat Pump (240 - 760 kBtu/h) EER 10.8 - Chiller / Elec Re	Retail Non-Food	0.0
Prescriptive	Split/Packaged Heat Pump (240 - 760 kBtu/h) EER 10.8 - Chiller / Gas He	Retail Non-Food	0.0
Prescriptive	Split/Packaged Heat Pump (240 - 760 kBtu/h) EER 10.8 - Direct Exp / Ele	Retail Non-Food	0.0
Prescriptive	Split/Packaged Heat Pump (240 - 760 kBtu/h) EER 10.8 - Direct Exp / Gas	Retail Non-Food	0.0
Prescriptive	Split/Packaged Heat Pump (65 - 135 kBtu/h) EER 12 - Chiller / Elec Resis	Retail Non-Food	0.0
Prescriptive	Split/Packaged Heat Pump (65 - 135 kBtu/h) EER 12 - Chiller / Gas Heat	Retail Non-Food	0.0
Prescriptive	Split/Packaged Heat Pump (65 - 135 kBtu/h) EER 12 - Direct Exp / Elec R	Retail Non-Food	0.0
Prescriptive	Split/Packaged Heat Pump (65 - 135 kBtu/h) EER 12 - Direct Exp / Gas He	Retail Non-Food	0.0
Prescriptive	Split/Packaged Heat Pump (65 - 135 kBtu/h) EER 12 - Heat Pump	Retail Non-Food	0.6
Prescriptive	Water Source Heat Pump (<65 kBtu/h) EER 15 - Chiller / Elec Resist	Retail Non-Food	0.0
Prescriptive	Water Source Heat Pump (<65 kBtu/h) EER 15 - Chiller / Gas Heat	Retail Non-Food	0.0
Prescriptive	Water Source Heat Pump (<65 kBtu/h) EER 15 - Direct Exp / Elec Resist	Retail Non-Food	0.0
Prescriptive	Water Source Heat Pump (<65 kBtu/h) EER 15 - Direct Exp / Gas Heat	Retail Non-Food	0.0
Prescriptive	Occupancy Sensor	Retail Non-Food	0.4
Prescriptive	T8 to High Performance T8	Retail Non-Food	0.4
Prescriptive	Glass Doors on Low and Med. Temperature Displays	Retail Non-Food	0.5
Prescriptive	High Efficiency, Electric Water Heater	Retail Non-Food	0.2
Prescriptive	Code minimum R-20ci or R-38 batt - WLHP	Schools	0.1
Prescriptive	Economizer - Direct Exp / Gas Boiler	Schools	0.3
Prescriptive	Economizer - WLHP	Schools	0.5
Prescriptive	Ground Source Heat Pump (<65 kBtu/h) EER 16 - Direct Exp / Gas Boile	Schools	0.0
Prescriptive	Ground Source Heat Pump (<65 kBtu/h) EER 16 - WLHP	Schools	0.0
Prescriptive	Package system A/C (>=63.3 tons, 10.2 EER) - WLHP	Schools	0.0
Prescriptive	Split/Package system A/C (< 5.4 tons, 14 SEER) - WLHP	Schools	0.0
Prescriptive	Split/Packaged Air Conditioner (135 - 240 kBtu/h) 11.5 EER - Direct Exp /	Schools	0.6
Prescriptive	Split/Packaged Air Conditioner (135 - 240 kBtu/h) 11.5 EER - WLHP	Schools	0.0
Prescriptive	Split/Packaged Air Conditioner (240 - 760 kBtu/h) 11 EER - WLHP	Schools	0.0
Prescriptive	Split/Packaged Air Conditioner (65 - 135 kBtu/h) 12 EER - Direct Exp / Gas	Schools	0.6
Prescriptive	Split/Packaged Air Conditioner (65 - 135 kBtu/h) 12 EER - WLHP	Schools	0.0
Prescriptive	Split/Packaged Heat Pump (<65 kBtu/h) SEER 14 - Direct Exp / Gas Boile	Schools	0.0
Prescriptive	Split/Packaged Heat Pump (<65 kBtu/h) SEER 14 - WLHP	Schools	0.0
Prescriptive	Split/Packaged Heat Pump (135 - 240 kBtu/h) EER 11.5 - Direct Exp / Gas	Schools	0.0
Prescriptive	Split/Packaged Heat Pump (135 - 240 kBtu/h) EER 11.5 - WLHP	Schools	0.0
Prescriptive	Split/Packaged Heat Pump (240 - 760 kBtu/h) EER 10.8 - Direct Exp / Gas	Schools	0.0
Prescriptive	Split/Packaged Heat Pump (240 - 760 kBtu/h) EER 10.8 - WLHP	Schools	0.0
Prescriptive	Split/Packaged Heat Pump (65 - 135 kBtu/h) EER 12 - Direct Exp / Gas Bo	Schools	0.0
Prescriptive	Split/Packaged Heat Pump (65 - 135 kBtu/h) EER 12 - WLHP	Schools	0.0
Prescriptive	High Performance T8 Lighting	Schools	0.6
Prescriptive	Occupancy Sensor	Schools	0.3
Prescriptive	T8 to High Performance T8	Schools	0.3
Prescriptive	Glass Doors on Low and Med. Temperature Displays	Schools	0.5
Prescriptive	High Efficiency, Electric Water Heater	Schools	0.2

Table 28. Non-Residential Express Program Measures Not Included in Analysis

Program	Measure	Building Type	Measure TRC
Direct Install	Economizer	Industrial	0.4
Direct Install	CFL: Screw-In (>26W) Indoor	Industrial	0.8
Direct Install	CFL: Screw-In (>26W) Outdoor	Industrial	0.8
Direct Install	CFL: Screw-In (10-15W) Indoor	Industrial	0.7
Direct Install	CFL: Screw-In (16-21W) Indoor	Industrial	0.8
Direct Install	CFL: Screw-In (22-26W) Indoor	Industrial	0.8
Direct Install	CFL: Screw-In (22-26W) Outdoor	Industrial	0.8
Direct Install	Dimmable Electronic Ballasts	Industrial	0.4
Direct Install	High Performance T8 Lighting	Industrial	0.6
Direct Install	High Performance T8 Lighting	Industrial	0.6
Direct Install	Induction Lighting	Industrial	0.5
Direct Install	LED Lighting >=10W - Indoor	Industrial	0.7
Direct Install	Occupancy Sensor	Industrial	0.5
Direct Install	Photocell	Industrial	0.5
Direct Install	T8 to High Performance T8	Industrial	0.3
Direct Install	Time clock	Industrial	0.5
Direct Install	Economizer - Chiller / Elec Resist	Office	0.5
Direct Install	Economizer - Chiller / Gas Heat	Office	0.4
Direct Install	Economizer - Direct Exp / Elec Resist	Office	0.5
Direct Install	Economizer - Direct Exp / Gas Heat	Office	0.4
Direct Install	Economizer - Heat Pump	Office	0.4
Direct Install	Programmable Thermostat - Chiller / Gas Heat	Office	0.1
Direct Install	Programmable Thermostat - Heat Pump	Office	0.0
Direct Install	High Performance T8 Lighting	Office	0.6
Direct Install	Photocell	Office	0.5
Direct Install	T8 to High Performance T8	Office	0.3
Direct Install	Time clock	Office	0.5
Direct Install	Glass Doors on Low and Med. Temperature Displays	Office	0.4
Direct Install	Economizer - Direct Exp / Elec Resist	Other Commerc	0.0
Direct Install	Economizer - Direct Exp / Gas Heat	Other Commerc	0.6
Direct Install	Economizer - Heat Pump	Other Commerc	0.6
Direct Install	Programmable Thermostat - Direct Exp / Gas Heat	Other Commerc	0.0
Direct Install	Programmable Thermostat - Heat Pump	Other Commerc	0.0
Direct Install	High Performance T8 Lighting	Other Commerc	0.6
Direct Install	Occupancy Sensor	Other Commerc	0.4
Direct Install	Photocell	Other Commerc	0.5
Direct Install	T8 to High Performance T8	Other Commerc	0.3
Direct Install	Time clock	Other Commerc	0.5
Direct Install	Glass Doors on Low and Med. Temperature Displays	Other Commerc	0.4
Direct Install	Economizer - Chiller / Elec Resist	Retail Non-Food	0.3
Direct Install	Economizer - Chiller / Gas Heat	Retail Non-Food	0.1
Direct Install	Economizer - Direct Exp / Elec Resist	Retail Non-Food	0.3
Direct Install	Economizer - Direct Exp / Gas Heat	Retail Non-Food	0.3
Direct Install	Economizer - Heat Pump	Retail Non-Food	0.3
Direct Install	Programmable Thermostat - Heat Pump	Retail Non-Food	0.2
Direct Install	High Performance T8 Lighting	Retail Non-Food	0.5
Direct Install	Occupancy Sensor	Retail Non-Food	0.4
Direct Install	Photocell	Retail Non-Food	0.5
Direct Install	T8 to High Performance T8	Retail Non-Food	0.3
Direct Install	Time clock	Retail Non-Food	0.5
Direct Install	Glass Doors on Low and Med. Temperature Displays	Retail Non-Food	0.4
Direct Install	Economizer - Direct Exp / Gas Boiler	Schools	0.2
Direct Install	Economizer - WLHP	Schools	0.4
Direct Install	CFL: Screw-In (<10W) Indoor	Schools	0.7
Direct Install	CFL: Screw-In (10-15W) Indoor	Schools	0.8
Direct Install	LED Lighting >=10W - Indoor	Schools	0.7
Direct Install	CFL: Screw-In (16-21W) Indoor	Schools	0.8
Direct Install	CFL: Screw-In (16-21W) Outdoor	Schools	0.8
Direct Install	CFL: Screw-In (22-26W) Indoor	Schools	0.8
Direct Install	CFL: Screw-In (22-26W) Outdoor	Schools	0.8
Direct Install	High Performance T8 Lighting	Schools	0.4
Direct Install	LED Exit Signs - from CFL	Schools	1.0
Direct Install	Occupancy Sensor	Schools	0.3
Direct Install	Photocell	Schools	0.5
Direct Install	T8 to High Performance T8	Schools	0.3
Direct Install	Time clock	Schools	0.5
Direct Install	Glass Doors on Low and Med. Temperature Displays	Schools	0.4
Direct Install	Night Covers	Schools	0.5

Table 29. Non-Residential Custom Program Measures Not Included in Analysis

Program	End Use	Building Type	Measure TRC
Cool Roof	Custom	Industrial	0.2
Improved Ceiling Insulation R24ci or R44 batt	Custom	Industrial	0.2
Daylighting Controls	Custom	Industrial	0.1
Induction Lighting	Custom	Industrial	0.6
<150 tons Centrifugal Water Cooled Chiller COP = 6.0 - Direct Exp / Elec Resist	Custom	Office	0.0
<150 tons Centrifugal Water Cooled Chiller COP = 6.0 - Direct Exp / Gas Heat	Custom	Office	0.0
<150 tons Centrifugal Water Cooled Chiller COP = 6.0 - Heat Pump	Custom	Office	0.0
Air Cooled Chiller COP = 3.2 - Direct Exp / Elec Resist	Custom	Office	0.0
Air Cooled Chiller COP = 3.2 - Direct Exp / Gas Heat	Custom	Office	0.0
Air Cooled Chiller COP = 3.2 - Heat Pump	Custom	Office	0.0
Code minimum R-20ci or R-38 batt - Chiller / Gas Heat	Custom	Office	0.0
Code minimum R-20ci or R-38 batt - Direct Exp / Gas Heat	Custom	Office	0.2
Code minimum R-20ci or R-38 batt - Heat Pump	Custom	Office	0.4
Cool Roof - Chiller / Elec Resist	Custom	Office	0.0
Cool Roof - Chiller / Gas Heat	Custom	Office	0.2
Cool Roof - Direct Exp / Elec Resist	Custom	Office	0.2
Cool Roof - Direct Exp / Gas Heat	Custom	Office	0.3
Cool Roof - Heat Pump	Custom	Office	0.2
EMS System	Custom	Office	0.0
Improved Ceiling Insulation R24ci or R44 batt - Chiller / Elec Resist	Custom	Office	0.2
Improved Ceiling Insulation R24ci or R44 batt - Chiller / Gas Heat	Custom	Office	0.0
Improved Ceiling Insulation R24ci or R44 batt - Direct Exp / Elec Resist	Custom	Office	0.1
Improved Ceiling Insulation R24ci or R44 batt - Direct Exp / Gas Heat	Custom	Office	0.0
Improved Ceiling Insulation R24ci or R44 batt - Heat Pump	Custom	Office	0.0
Screw Chillers, Water-Cooled COP = 5.7 - Direct Exp / Elec Resist	Custom	Office	0.0
Screw Chillers, Water-Cooled COP = 5.7 - Direct Exp / Gas Heat	Custom	Office	0.0
Screw Chillers, Water-Cooled COP = 5.7 - Heat Pump	Custom	Office	0.0
Induction Lighting	Custom	Office	0.5
Multiplex Compressor	Custom	Office	0.1
Multiplex system with oversized condenser	Custom	Office	0.1
<150 tons Centrifugal Water Cooled Chiller COP = 6.0 - Direct Exp / Elec Resist	Custom	Other Commercial	0.0
<150 tons Centrifugal Water Cooled Chiller COP = 6.0 - Direct Exp / Gas Heat	Custom	Other Commercial	0.0
<150 tons Centrifugal Water Cooled Chiller COP = 6.0 - Heat Pump	Custom	Other Commercial	0.0
Air Cooled Chiller COP = 3.2 - Direct Exp / Elec Resist	Custom	Other Commercial	0.0
Air Cooled Chiller COP = 3.2 - Direct Exp / Gas Heat	Custom	Other Commercial	0.0
Air Cooled Chiller COP = 3.2 - Heat Pump	Custom	Other Commercial	0.0
Code minimum R-20ci or R-38 batt - Direct Exp / Elec Resist	Custom	Other Commercial	0.0
Code minimum R-20ci or R-38 batt - Direct Exp / Gas Heat	Custom	Other Commercial	0.0
Code minimum R-20ci or R-38 batt - Heat Pump	Custom	Other Commercial	0.3
Cool Roof - Direct Exp / Elec Resist	Custom	Other Commercial	0.2
Cool Roof - Direct Exp / Gas Heat	Custom	Other Commercial	0.4
Cool Roof - Heat Pump	Custom	Other Commercial	0.2
EMS System	Custom	Other Commercial	0.0
Improved Ceiling Insulation R24ci or R44 batt - Direct Exp / Gas Heat	Custom	Other Commercial	0.0
Improved Ceiling Insulation R24ci or R44 batt - Heat Pump	Custom	Other Commercial	0.0
Screw Chillers, Water-Cooled COP = 5.7 - Direct Exp / Elec Resist	Custom	Other Commercial	0.0
Screw Chillers, Water-Cooled COP = 5.7 - Direct Exp / Gas Heat	Custom	Other Commercial	0.0
Screw Chillers, Water-Cooled COP = 5.7 - Heat Pump	Custom	Other Commercial	0.0
Induction Lighting	Custom	Other Commercial	0.5
Multiplex Compressor	Custom	Other Commercial	0.1
Multiplex system with oversized condenser	Custom	Other Commercial	0.1

<150 tons Centrifugal Water Cooled Chiller COP = 6.0 - Direct Exp / Elec Resist	Custom	Retail Non-Food	0.0
<150 tons Centrifugal Water Cooled Chiller COP = 6.0 - Direct Exp / Gas Heat	Custom	Retail Non-Food	0.0
<150 tons Centrifugal Water Cooled Chiller COP = 6.0 - Heat Pump	Custom	Retail Non-Food	0.0
Air Cooled Chiller COP = 3.2 - Direct Exp / Elec Resist	Custom	Retail Non-Food	0.0
Air Cooled Chiller COP = 3.2 - Direct Exp / Gas Heat	Custom	Retail Non-Food	0.0
Air Cooled Chiller COP = 3.2 - Heat Pump	Custom	Retail Non-Food	0.0
Code minimum R-20ci or R-38 batt - Chiller / Gas Heat	Custom	Retail Non-Food	0.5
Code minimum R-20ci or R-38 batt - Direct Exp / Gas Heat	Custom	Retail Non-Food	0.1
Code minimum R-20ci or R-38 batt - Heat Pump	Custom	Retail Non-Food	0.6
Cool Roof - Chiller / Elec Resist	Custom	Retail Non-Food	0.0
Cool Roof - Chiller / Gas Heat	Custom	Retail Non-Food	0.3
Cool Roof - Direct Exp / Elec Resist	Custom	Retail Non-Food	0.0
Cool Roof - Direct Exp / Gas Heat	Custom	Retail Non-Food	0.3
Cool Roof - Heat Pump	Custom	Retail Non-Food	0.1
EMS System	Custom	Retail Non-Food	0.0
Improved Ceiling Insulation R24ci or R44 batt - Chiller / Elec Resist	Custom	Retail Non-Food	0.2
Improved Ceiling Insulation R24ci or R44 batt - Chiller / Gas Heat	Custom	Retail Non-Food	0.0
Improved Ceiling Insulation R24ci or R44 batt - Direct Exp / Elec Resist	Custom	Retail Non-Food	0.1
Improved Ceiling Insulation R24ci or R44 batt - Direct Exp / Gas Heat	Custom	Retail Non-Food	0.0
Improved Ceiling Insulation R24ci or R44 batt - Heat Pump	Custom	Retail Non-Food	0.0
Screw Chillers, Water-Cooled COP = 5.7 - Direct Exp / Elec Resist	Custom	Retail Non-Food	0.0
Screw Chillers, Water-Cooled COP = 5.7 - Direct Exp / Gas Heat	Custom	Retail Non-Food	0.0
Screw Chillers, Water-Cooled COP = 5.7 - Heat Pump	Custom	Retail Non-Food	0.0
Window Films on Double Pane - Chiller / Elec Resist	Custom	Retail Non-Food	0.0
Window Films on Single Pane - Chiller / Elec Resist	Custom	Retail Non-Food	0.0
Window Films on Single Pane - Chiller / Gas Heat	Custom	Retail Non-Food	0.0
Induction Lighting	Custom	Retail Non-Food	0.5
Multiplex Compressor	Custom	Retail Non-Food	0.1
Multiplex system with oversized condenser	Custom	Retail Non-Food	0.1
<150 tons Centrifugal Water Cooled Chiller COP = 6.0 - Direct Exp / Gas Boiler	Custom	Schools	0.0
<150 tons Centrifugal Water Cooled Chiller COP = 6.0 - WLHP	Custom	Schools	0.0
Air Cooled Chiller COP = 3.2 - Direct Exp / Gas Boiler	Custom	Schools	0.0
Air Cooled Chiller COP = 3.2 - WLHP	Custom	Schools	0.0
Code minimum R-20ci or R-38 batt - Direct Exp / Gas Boiler	Custom	Schools	0.2
Code minimum R-20ci or R-38 batt - WLHP	Custom	Schools	0.1
Cool Roof - Direct Exp / Gas Boiler	Custom	Schools	0.1
Cool Roof - WLHP	Custom	Schools	0.6
EMS System	Custom	Schools	0.0
Improved Ceiling Insulation R24ci or R44 batt - Direct Exp / Gas Boiler	Custom	Schools	0.0
Improved Ceiling Insulation R24ci or R44 batt - WLHP	Custom	Schools	0.0
Screw Chillers, Water-Cooled COP = 5.7 - Direct Exp / Gas Boiler	Custom	Schools	0.0
Screw Chillers, Water-Cooled COP = 5.7 - WLHP	Custom	Schools	0.0
Daylighting Controls	Custom	Schools	0.6
Induction Lighting	Custom	Schools	0.5
Multiplex Compressor	Custom	Schools	0.1
Multiplex system with oversized condenser	Custom	Schools	0.1

A.5. EE/PDR Potential Methodology and Results

This section presents a summary of the methodology and results for the EE/PDR potential aspect of the project. All results reported in this chapter are based on a summer peak analysis.

A.5.1. Methodology – EERAM

The Energy Efficiency Resource Assessment Model (EERAM) is an energy efficiency potential model designed to estimate technical, economic, and market energy efficiency potential for a utility's service area. Developed by Navigant, the model forecasts energy savings and demand reduction potential within the residential, commercial, and industrial sectors over a forecast period of typically 20 years.

EERAM is an Excel spreadsheet model based on the integration of energy efficiency and demand response measure impacts and costs, utility customer characteristics, utility load forecasts, and utility avoided costs and rate schedules. Excel is used as the modeling platform to provide transparency to the estimation process. Using Excel also allows the model to be customized to each client's unique characteristics and can accommodate their ability to provide either detailed or more general model input data. The model utilizes a "bottoms-up" approach in that the starting points are the study area building stocks and equipment saturation estimates, forecasts of building stock decay and new construction, energy efficiency technology data, past energy efficiency program accomplishments, and decision maker variables that help drive the market scenarios.

For energy efficiency measures, EERAM does not estimate annual market energy efficiency potential based on a diffusion curve, instead the model calculates market potential based on a decision maker adoption rate algorithm. This algorithm is primarily a measure by measure elasticity response to measure payback. However, a diffusion curve methodology is used for measures identified as emerging technologies and for Demand Response (DR) programs. DR participation is considered more responsive to utility marketing efforts than to consumer payback. Emerging technologies are considered to follow a Bass diffusion curve methodology rather than a measure payback methodology. The Bass diffusion model was developed by Frank Bass and describes the process of how new products are adopted as an interaction between users and potential users.

EERAM estimates energy efficiency resource potential for three perspectives. Each perspective provides "net" estimates of resource potential:

- Technical energy efficiency potential represents the amount of energy efficiency savings that could be achieved when not considering economic and market barriers to customers' installing energy efficiency measures. Technical potential is calculated as the product of the energy efficiency measures' savings per unit, the quantity of applicable equipment in each facility, and the number of facilities in a utility's service area. Technical potential estimates include energy efficiency measures that may not be cost effective, and technical potential does not consider market barriers such as customers' lack of awareness of or willingness to implement energy efficiency measures. Therefore, technical energy efficiency potential represents the upper bound of efficiency potential but not necessarily a realistic basis for setting energy efficiency program goals. A feature of the EERAM calculation of technical potential is its treatment of mutually exclusive measures. Mutually exclusive measures are a set of available technologies (such as several residential hot water measures including energy efficient tanks, heat pump water heaters, tankless water heaters, and solar water heat) that serve the same function. Only one of them can be installed. EERAM identifies which of these competing, mutually exclusive technologies offers the most energy savings and uses these saving to estimate technical potential for all potential applications.
- Economic energy efficiency potential represents the amount of technical energy efficiency potential that is "cost-effective," as defined by the results of the Total Resource Cost (TRC) test. The program benefits for the TRC test include the avoided costs of generation, transmission and distribution investments and avoided fuel costs due to the energy conserved by the energy efficiency programs. The costs for the TRC test are the energy efficiency measure costs plus the energy efficiency program administration costs. The TRC test does not consider market barriers to customers' installing energy efficiency measures. Mutually exclusive measures are treated uniquely when estimating economic potential. Unlike technical potential, economic potential recognizes that not all potential comes from the most efficient option. For mutually exclusive measures that pass the TRC screen, measure applicability represents each measure's share of the available application. The measure applicability share by mutually exclusive measure represents a weighted share based on each measure's TRC value. Equal TRC values would mean equal applicability shares among the measures. The greater the delta in TRC between measures, the greater the applicability for the measure with the larger TRC value.
- Achievable energy efficiency market potential is an estimate of the amount of economic energy efficiency potential that could be captured by utility energy efficiency programs over the forecast period. Achievable energy efficiency potential varies with energy efficiency program parameters, such as the magnitude of rebates or incentives offered to customers for installing energy

efficiency measures, and, thus, many different scenarios for achievable market potential can be modeled.

Within the achievable energy efficiency potential assessment, the individual measures are modeled by expected type of energy efficiency program design. Five program design options are included in EERAM:

- **ROB** means that an energy efficiency measure is implemented after the existing equipment fails. An example would be purchasing an energy efficient clothes washer after the existing clothes washer fails. Measure life is used to identify the available share of stock each year. Generally, the baseline energy use is current code or standard and the equipment cost is incremental cost. Incremental cost is the delta between the equipment cost of the energy efficiency measure and the baseline measure. Labor costs are not included.

- **Early Retirement (Early)** means that an energy efficiency measure normally regarded as replace on burnout are retired early before their effective measure lives are reached. For these measures, the baseline is the average efficiency of the existing technology being replaced. Equipment cost is generally full cost of the energy efficiency measure, including labor. Measure life is shorter to account for the remaining life of the equipment being replaced. The default measure life is two-thirds of the measure life if the design option were replace on burnout.

- **Retrofit (RET)** means that an energy efficiency measure could be implemented immediately. For instance, installing a low flow showerhead is usually implemented before the existing showerhead fails. Replacing incandescent lamps may be an RET but can be treated as a ROB because of the relatively short lifetime for incandescent bulbs. Generally RET measures do not replace existing technology but rather improve the efficiency of existing technology and the energy impact is the amount of that improvement. Equipment cost is generally full cost of the energy efficiency measure, including labor.

- **Emerging Technology (Emerge)** means that an energy efficiency measure is just entering or about to enter the market place. Energy savings can be calculated considering the measure to be any of the three types described above. However, market potential is calculated differently than for any of these three. The Bass diffusion model, developed by Frank Bass, is used rather than measure payback. The model describes the process of how new products are adopted as an interaction between users and potential users.

- **New Construction (New)** means that a measure is installed at the time of new construction. The baseline technology for new construction measures is

generally current code or standard and the equipment cost is the incremental cost between the baseline technology and the energy efficient technology.

For the program design options using codes and standards as the baseline, EERAM accommodates changes to those codes and standards. These changes can occur in any year of the forecast period and can be specified by each individual measure. Changes can also occur multiple times within the forecast period.

Within EERAM, several financial tests are calculated.

- **TRC Test**. The primary test is the TRC test. The TRC is the most commonly used measure of cost effectiveness for assessing energy efficiency resources by state public utility commissions and electric utilities. The TRC includes all quantifiable costs and benefits regardless of who accrues them. The present value of avoided costs (the benefits) is divided by the technology cost and the program administrative costs. A TRC value greater than or equal to 1.0 indicates that the resource is cost effective.

  EERAM utilizes the TRC test to identify those measures included in the Technical Potential that are economically achievable. Measures with a TRC of 1.0 or higher are included in Economic Potential. The same TRC screen is used to determine the measures to include in a utility's program offerings. However, if a utility decides to include in its programs a measure with a TRC less than 1.0, then that measure is added to both the Economic Potential and the Market Potential. Conversely, if a utility decides not to include a measure in its programs, even if the measure has a TRC of 1.0 or greater, then that measure is removed from both Economic Potential and Market Potential. Other tests that are calculated are listed below. The financial test values are available by measure for the forecast period. By building sector, the test values are available for each forecast year.
- **UCT** - The UCT measures the net costs of an energy efficiency program as a resource option based on the costs incurred by the program administrator (including incentive costs) and excluding any net costs incurred by the participant. The benefits are similar to the TRC benefits. However, the costs are defined more narrowly. In the TRC, the full incremental measure cost is included, along with program administrative costs. In the UCT, the program administrative costs are included but only the incentive paid by the utility is included as the measure cost.
- **RIM** - The RIM is the measure of what happens to customer bills or rates due to changes in utility revenue and operating cost caused by the program. The present value of avoided costs are divided by the sum of the present values of the utility bill reduction over the life of the energy efficiency measure plus the

value of the incentive received and the administrative cost associated with the measure. Rates will go down if the changes in revenues from the program are greater than the change in utility costs.

- **PCT** - The PCT is the measure of the quantifiable benefits and costs to the customer due to participation in a program. The present value of the utility bill reduction over the life of the energy efficiency measure plus the value of the incentive received is divided by the incremental cost of the energy efficiency measure. However, since many customers do not base their decision to participate in a program entirely on quantifiable variables, this test cannot be a complete measure of the benefits and costs of a program to a customer.
- **Simple Customer Payback** – Because many customers consider payback in their decision to participate, EERAM incorporates payback in its decision maker adoption rate algorithm. The payback calculation takes measure cost less the incentive received and divides it by first year energy bill savings.
- **Levelized Measure Cost / kWh** – Is calculated by multiplying energy efficiency measure costs by the Capital Recovery Factor (CRF) then dividing by the first year kWh savings.

Included in the financial test formulas is the ability to account for the benefits of any water conservation that is also achieved. For example, with efficient clothes washers, there are both energy savings and water savings. If water rates are input as well as avoided water costs, the associated benefits will be included in the appropriate tests. This feature is especially attractive to municipal utilities that include both energy and water and may make the difference for a measure passing or not passing a particular financial test.

Figure 11 illustrates the flow of information in and out of EERAM. The model can be segregated into three sections.

Utility Service Area Inputs

- Utility specific information on rates, avoided costs, load and building stock forecasts, and historical levels of EE/PDR achievement.
- Customer data including building/equipment characteristics, decision maker awareness of conservation measures and if aware, willingness to install.
- Technology data including measure level impacts and costs, measure life, incentive levels, administrative costs, and net-to-gross estimates.

Model Calculations

- Develop Technical Potential based on the inputs above.
- Develop Economic Potential by screening Technical Potential with the TRC test.
- Develop Market Potential based on available economic potential, calibration targets, and the decision adoption methodology, detailed in the sections below.

Model Outputs

- Tables and graphs on Technical, Economic, and Market Potentials.
- Both cumulative and incremental market potential estimates by planning year. The incremental values are used to define annual goals.
- Both cumulative and incremental administrative and incentive cost estimates by measure and planning year

Figure 12 illustrates the seven sections of the model and a short description of each section. The model consists of 39 worksheets.

Figure 11. EERAM Input Information, Model Calculation, and Model Output Flow

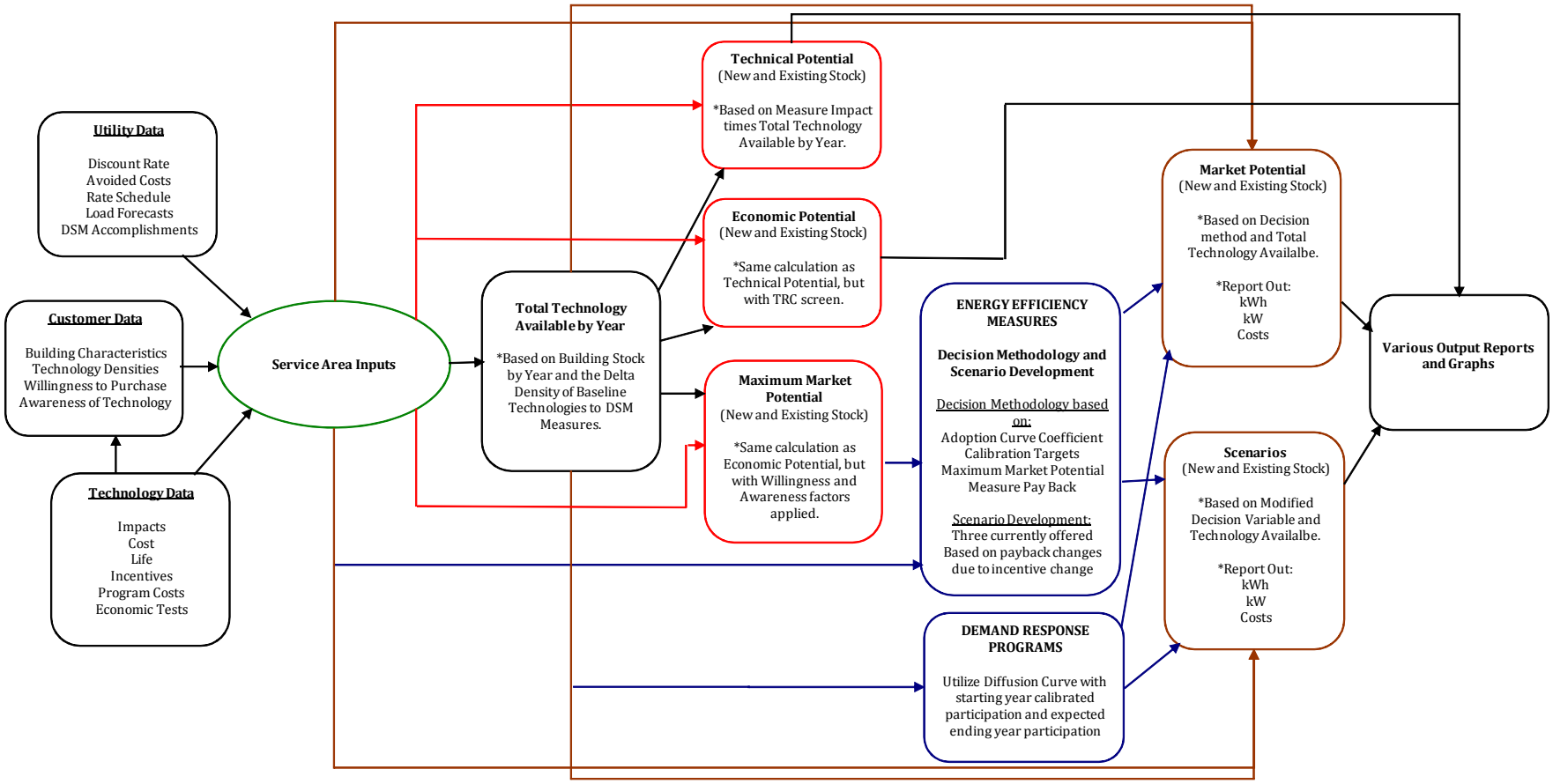


Figure 12. EERAM Model Sections

Energy Efficiency Resource Assessment Model - Electricity

(EERAM)

EERAM is an Excel spreadsheet model based on the integration of DSM measure impacts and costs, utility customer characteristics, utility load forecasts, utility avoided costs, and rate schedules.

The model is arranged into eight sections, each of which are multiple sheets and color coded by section. There are 39 total worksheets.

SECTION 1 "Introduction and Reporting "(blue tabs)
Section 1 includes two worksheets:

worksheet "Introduction": Is this Introductory worksheet

worksheet "Summary Report": Is a compilation of summary tables and charts for quick review

SECTION 2 "Model Inputs" (yellow tabs)
Section 2 includes five worksheets:

The two worksheets "Res Decision Inputs" and "Non-Res Decision Inputs" include sector specific input variables.
* Consumer payback methodology variables
* Calibration variables
* Historical achievement inputs
* Scenario modifiers
* Net-to-gross inputs by measure
* "Yes" or "No" measure inclusion decision variables

The two worksheets "Res-Summary Parameters" and "Non-Res Summary Parameters" include utility input variables.
* Time parameters
* Financial & rate inputs
* Avoided costs
* Forecast data - energy & demand
* Building stock forecast
* Line loss assumptions
* End-Use Saturations
* Administrative costs

The worksheet "Diffusion"
* For Emerging Technologies, a Bass Diffusion Curve can be utilized
* Diffusion curve variables are explained and values set

SECTION 3 "Summary Output" (light red tabs)
Section 3 includes two worksheets:

worksheet "Tech&Econ Potential": Provides tables identifying the technical and economic potential results by sector, building type, and end-use

worksheet "Market Potential": Provides tables identifying the technical and economic potential results by sector, building type, and end-use

SECTION 4 "Supply Curves" (light purple tabs)
Section 4 includes four worksheets:

worksheet "Res-Sup Curve": Provides tables identifying residential supply curve information and the top 15 measures for the sector

worksheet "Non-Res-Sup Curve": Provides tables identifying non-residential supply curve information and the top 15 measures for the sector

worksheet "All-Sup Curve": Provides combined residential and non-residential tables identifying supply curve information and the top 15 measures for the utility

worksheet "Sup-Curve Graphs": Provides combined residential and non-residential supply curve graphs.

SECTION 5 "Costs and Cost Tests" (brown tabs)
Section 5 includes two worksheets:

worksheet "Market Potential Costs": Provides tables identifying the administrative and incentive costs for the market potential run

worksheet "Financial Costs and Tests": Provides tables for the forecast period at the measure level for the following financial tests: UCT, PCT, RIM, and TRC.

At the sector level, values are provided for each forecast year for the UCT and the TRC tests along with levelized cost.

SECTION 6 "Model Calculation Sheets" (Residential red tabs and Non-Residential green tabs)
Section 6 includes twenty two worksheets; Eleven each for the Residential and Non-Residential Sectors

Each sector's set of eleven worksheets are formatted in the same fashion and each represent steps in the modeling process

* The first worksheet by sector is for measure inputs
* The second worksheet by sector provides Technical Potential resulkts by measure
* The third worksheet by sector provides Economic Potential results by measure
* The fourth worksheet by sector is where base year calibration parameters are set for estimating Market Potential
* The fifth worksheet by sector is where the number of units participating by year and measures is calculated for Market Potential
* The sixth worksheet by sector provides Cumulative Market Potential results by measure
* The seventh worksheet by sector provides Incremental New Participant Market Potential results by measure
* The eigth worksheet by sector provides Incremental Re-Participant Market Potential results by measure.
* The nineth worksheet by sector identifies the number of units implemented each year under the Market Potential Scenario
* The tenth worksheet by sector identifies the amount of water savings (if provided in the measure input page) each year under the Market Potential Scenario
* The eleventh worksheet by sector provides summary results by building type, sector, and program for Technical, Economic, and Market Potential

SECTION 7 "Demand Response Program Calculation Sheets" (purple tabs)
Section 7 includes two worksheets:

Each worksheet calculates market potential for demand response programs. The first, "DR-Res" is for residential sector demand response programs. The second, "DR-Com", is for non-residential demand response programs.

Unlike the DSM measures, DR market potential by year is estimated using a diffusion curve.

For both the residential and non-residential sectors, there are separate calculations for both summer and winter DR programs

A.5.1.1. Model Methodology

EERAM's "bottom's up" approach uses the input data identified in Figure 5 to calculate Technical, Economic, and Market Potentials. Calculating the estimates of Technical and Economic Potential is relatively straightforward: the estimates are the product of available building stocks, technology densities, and measure impacts. For Technical Potential, it is assumed that all measures can be implemented in all available applications at the same time. Technical potential changes by small amounts over time to reflect changes in the amount of building stocks over time caused by new construction. Economic Potential is the subset of Technical Potential that includes only the efficient technologies that pass the TRC screen. However, the measures included in Economic Potential can be modified by the user to include some measures that do not pass TRC but are included within a utility's portfolio or measures that do pass the TRC test, but the utility does not want to offer or consider the measures. An example of a measure some utilities decide to include, though it may not pass the TRC are efficient clothes washers. Here, other fuel and water savings may drive the decision to include the measure. An example of a measure some utilities may decide not to offer is CFLs. Here, free ridership is becoming a significant issue as well as upcoming federal lighting standards.

A.5.1.2. Mutual Exclusivity

The treatment of mutually exclusive measures differs when calculating Technical vs. Economic/Market Potentials. Mutually exclusive measures are a set of available technologies (such as several residential hot water measures including energy efficient tanks, heat pump water heaters, tankless water heaters, and solar water heat) that serve the same function. However, only one of them can be installed and care must be taken to not only not double count potential but also to identify which measures or what share of each measure should be part of the calculations. EERAM identifies which of these competing, mutually exclusive technologies offers the most energy savings and uses only the savings from this specific measure to estimate technical potential.

Unlike Technical Potential, Economic Potential recognizes that not all potential comes from the most efficient option. For mutually exclusive measures that pass the TRC screen, measure applicability represents each measure's share of the available application. The measure applicability share by mutually exclusive measure represents a weighted share based on each measure's TRC value. Equal TRC values would mean equal applicability shares among the measures. The greater the delta in TRC between measures, the greater the applicability for the measure with the larger TRC value.

A.5.1.3. Interactive Affects

The treatment of interactive affects within an end-use also differs between Technical vs. Economic/Market Potentials. Energy savings that derive from interactive measures, on a single measure basis, differ if one vs. multiple interactive measures are installed in the same home/building. As an example, if wall insulation, ceiling insulation, windows, and infiltration control measures were installed individually, they would have a certain savings estimate. Combining these four individual savings estimates would give a total savings estimate that is higher than what would be actually achieved by installing all four as a package. Some models use a loading order that has each successive measure installed have a reduced savings level. The first measure in the loading order approach always has full savings and each successive measure lower savings with the last having small savings relative to its original individual measure savings. EERAM does not use a loading order system. Rather, each measure within a package receives a proportional share of savings based on their share of the summed individual measure total. Technical Potential includes all of the identified interactive affect measures. Economic and Market Potential only include those measures that pass the TRC test.

Table 30 illustrates treatment of interactive affects among four measures for the purposes of Technical Potential and for Economic and Market Potential. The "Unadjusted Savings" column identifies the measure savings if they were stand alone measures with the package measure total representing the total impact if all four measures are implemented. The measure savings identified in the "Adjusted Savings for Tech Potential" column identify the measure savings used when Technical Potential is calculated. If during the economic screening, should a measure fail to pass the TRC test, then the savings are adjusted again, but only for the measures that pass the TRC test. To do this, the "Adjusted Savings for Tech Potential" need to be adjusted up to a higher value. This is done using the values in columns "New Unadjusted Savings" (which are the Tech Potential savings for the measures that pass TRC) and "Percentage of Individual Measure TRC Total". The Package Measure Total" for the measures passing TRC are the sum of the Tech Potential measure savings for the measures that pass TRC plus for the measures that do not pass TRC and the delta between the "Unadjusted savings" and the "Adjusted Savings for Tech Potential".

In the example provided in Table 30, the "Package Measure Total" of 208.4 is calculated as:

- ☐ 35.4 + 57.5 + 106.2 + (80.0 – 70.8) = 208.4

Table 30. Interactive Effects Treatment

	Unadjusted Savings	% of Individual Measure Total	Adjusted Savings for Tech Potential	Pass TRC?	New Unadjusted Savings	% of Individual Measure TRC Total	Adjusted Savings for Econ & Market Potential
Measure 1	40.0	13.1%	35.4	Yes	35.4	17.8%	37.0
Measure 2	65.0	21.3%	57.5	Yes	57.5	28.9%	60.2
Measure 3	120.0	39.3%	106.2	Yes	106.2	53.3%	111.1
Measure 4	80.0	26.2%	70.8	No		0.0%	0.0
Individual Measure Total	305.0	100.0%	270.0		199.2	100.0%	208.4
Package Measure Total	270.0	88.5%			208.4		

A.5.2. Market Potential

Calculating Market Potential is unlike calculating Technical and Economic Potential. For energy efficiency measures, it relies on a calibrated decision adoption methodology (for currently existing measures) or a Bass diffusion curve (for emerging technologies) and an accounting system that adjusts for potential double counting and for recurring participation of efficient technologies once measure life is passed. For demand response programs, it relies on a calibrated starting program participation level, an expected end year participation level, and a diffusion curve.

Decision Adoption Methodology for Existing Measures
One of the key features of EERAM is use of a decision maker based energy efficiency measure adoption rate algorithm. The algorithm simulates consumer choice based on simple measure payback and other decision components. For each measure, by building type and by year, the algorithm estimates the number of measures implemented. The algorithm has two parts with the overall formula having the following form:

(1) Number of measures implemented =
total available measure units * binary logit function * market factor *
decision-maker measure awareness and willingness to install the measure

The "total available measure units" is a variable that changes with each forecast year and is different depending if the measure is considered a replace on burnout, early retirement, new construction, or a retrofit. For early retirement, new construction, and retrofit measures, the calculation has the following form:

(2) Total available measure units =
Available building stock *
(maximum density for the competing technologies – base year efficient technology density) –
running sum of previous years of efficient technology units installed

For replace on burnout measures, the calculation has the following form:

(3) Total available measure units =
Available building stock / measure life *
(maximum density for the competing technologies – base year efficient technology density) –
running sum of previous years of efficient technology units installed

The "binary logit function" identifies the share of the efficiency measures implemented each year. It helps determine implementation elasticity for each measure. The logit function has the following form:

(4) Share of Efficiency Measures Implemented =
Exp (0.0 – Beta Constant * Measure Payback)

Where:

- The Beta constant represents the average influence of all excluded (non-payback) factors.
- The Beta constant is allowed to be modified at the end use level (within bounds):
  - Larger number representing influences that speed up adoption.
  - Lower number representing influences slowing down adoption (such as a recession).
  - Measure payback is simple measure payback and is calculated for each measure, each forecast year.

The "market factor" is a calibration constant that is computed in the first simulation year to adjust computed participation shares to equal the calibration targets. The calibration target needs to be a value that can be reasonably expected to occur given incentive levels, the cost effectiveness of the measure, and the available resource. Navigant estimates calibration targets at the measure level based on a combination of the estimates of economic potential by measure, past program accomplishments by the utility in providing this or a similar measure, and a review of other similar type utilities to see what level of accomplishments they are achieving.

In the base year, the market factor is calculated using the following form:

(5) Market factor =
total available measure units * binary logit function *
market factor *
decision maker measure awareness and willingness to install the measure /
number of measures implemented

In each forecast year, this market factor is constant and the number of measures implemented uses formula (1).

The "decision maker measure awareness and willingness to install the measure" function is an exponential curve function based on the forecast year and the two input variables of decision maker awareness of a measure and corresponding willingness to purchase.

- Awareness is the percentage of decision makers who are aware that a specific energy efficient technology exists.

- Willingness is the subset of the aware group who are willing to install the energy efficient measure.

The values for decision maker awareness and willingness by measure come either from utility specific decision maker surveys or from a combination of decision maker survey results gathered by Navigant from other utility customer survey efforts. EERAM assumes that the initial estimates of awareness and willingness are not static, but improve over time as consumers become both more aware of energy efficiency and more willing to purchase as technology improves. The speed by which these variables approach 100 percent is determined by the starting values for Awareness and Willingness and a decision maker curve function. The decision maker curve function takes the form:

(6) The Decision Maker Curve =
Min(1, Awareness * Willingness +
(1+EXP(curve midpoint in years-years into the forecast))^-1)

Where:

- Decision Maker Awareness = The baseline percent of the population of eligible consumers who are aware of the technology
- Decision Maker Willingness = The baseline percent of the population of eligible consumers who are both aware of the technology and willing to purchase it

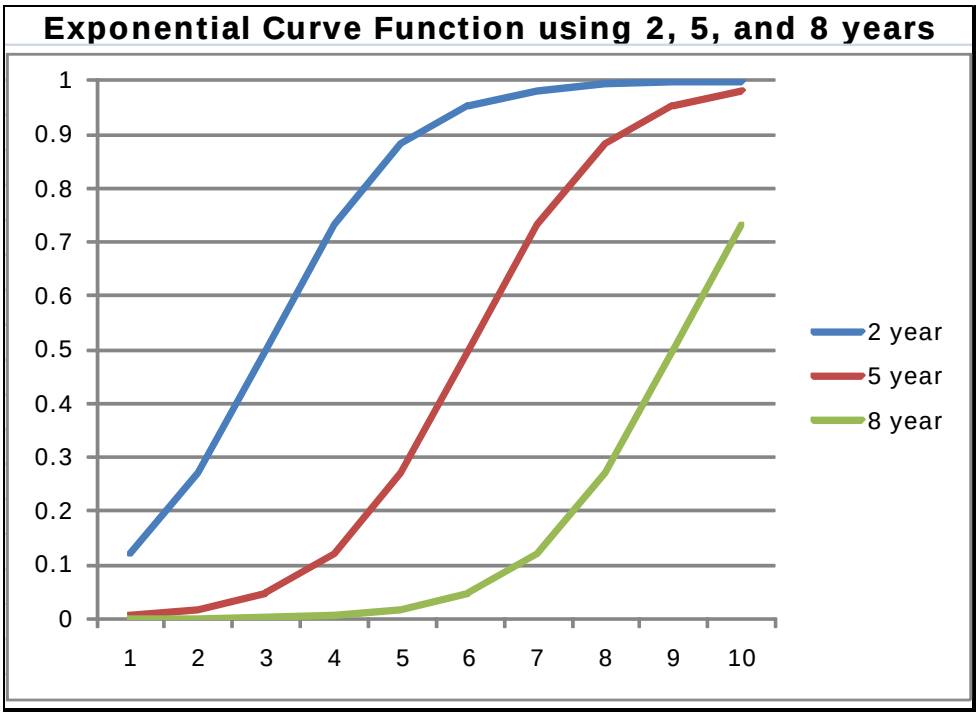
- Program year = The number of years after the start of the forecast
- Adoption curve tipping point year = Within a measure's lifetime, the point of time on an "S" curve where the curve is at its midpoint. These values are an input in the Decision-Input worksheets.

The "S" curve diffusion portion of the willingness and awareness algorithm is based on changing consumer awareness and willingness over time. Where a measure is along the curve depends on its baseline estimates of consumer awareness and willingness. If a measure is well known and with a high level of willingness to install, then the starting point is very high on the curve with little change over time expected from this portion of the decision maker algorithm. However, if both awareness and willingness are low, then this portion of the decision maker algorithm will experience change over time. The current assumption is that over time, every measure will reach 100 percent consumer awareness and willingness. It is possible to modify at the measure level the maximum value for consumer awareness and willingness.

The change over time and the speed of that change depend on the initial baseline estimates and the curve midpoint year. For new technologies, both awareness and willingness are typically low, simply because the technology is new. A program can be designed not only to provide incentives but also to increase awareness and promote the technology's reliability and superiority. Such a program typically has low initial participation that ramps up over time before leveling out. In contrast, a mature technology typically has high initial willingness and awareness, and, thus, participation that follow a flatter trend over time.

Figure 13 illustrates the shape of the "S" curve over the ten-year forecast period using different curve midpoint years. The Figure 13 illustration shows the curves for midpoint years of 2, 5, and 8 years. Note in this example that the curve with the earliest midpoint year achieves saturation near year 8 where the curves with later midpoint years do not achieve saturation by year 10.

Figure 13. Decision Maker "S" Curve for Midpoint Years 2, 5, and 8



The following example illustrates the year-to-year impacts of the decision maker measure awareness and willingness algorithm:

- Baseline awareness = 50%
- Baseline willingness = 80%
- Base year adjustment due to awareness and willingness = 50% * 80% = 40%
- The five year midpoint "S" curve has the following values in its first four years:
  - Year 1 = 0.7%
  - Year 2 = 1.8%
  - Year 3 = 4.7%
  - Year 4 = 11.9%
- Each forecast year adjustment due to awareness and willingness is the previous year's awareness and willingness value plus the "S" curve value:
  - Base Year = 40%
  - Year 1 = 40% + 0.7% = 40.7%
  - Year 2 = 40.7% + 1.8% = 42.5%
  - Year 3 = 42.5% + 4.7% = 47.2%

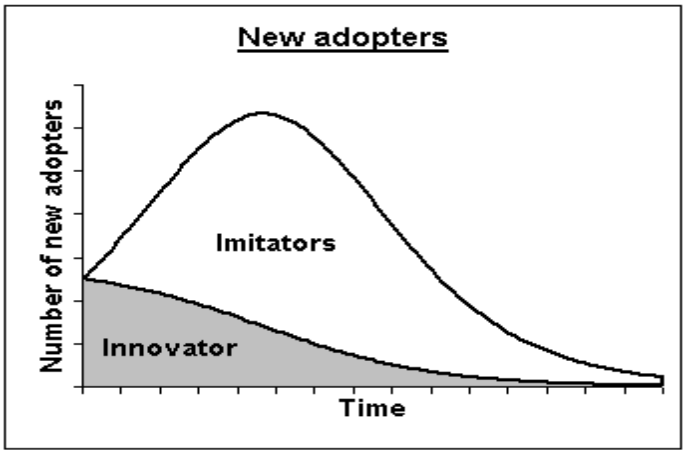
- Year 4 = 47.2% + 11.9% = 59.1%

- The function has a maximum value of 100%, when the measure achieves total saturation.

Bass Diffusion Curve for Emerging Technologies

The Bass diffusion model was developed by Frank Bass and describes the process of how new products get adopted as an interaction between users and potential users. It has been described as one of the most famous empirical generalizations in marketing. The model is widely used in forecasting, especially product forecasting and technology forecasting. Mathematically, the basic Bass diffusion is a Riccati equation with constant coefficients. Frank Bass published his paper "A new product growth model for consumer durables" in 1969[13]. Figure 14 illustrates the Bass Diffusion Model, differentiating between the early "Innovators" and the later "Imitators".

Figure 14. Bass Diffusion Model



Within EERAM, the Bass Diffusion Model takes the form:

(7) Measure Adoptions (t) = (p + q * (X(t-1) / m)) * (m - X(t-1))

Where:

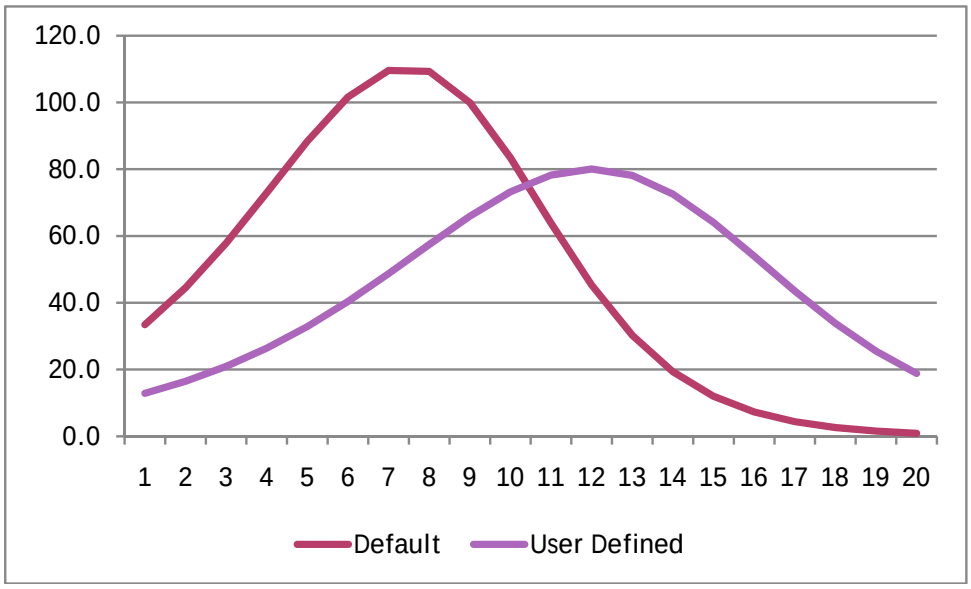
- t = time
- p = The coefficient p is called the coefficient of innovation, external influence or advertising effect.
- q = The coefficient q is called the coefficient of imitation, internal influence or word-of-mouth effect.

[13] Bass, Frank (1969). "A new product growth model for consumer durables". Management Science 15 (5): p215–227

- X(t-1) = Cumulative adoptions up to time "t"'
- m = the number of potential adopters

Typical values[14] for "p" have been found to be 0.03, and often less than 0.01 and for "q" to be 0.38, with a typical range between 0.3 and 0.5. Within EERAM, the values for both "p" and "q" are user input values. Figure 15 illustrates two curves using common input values for "p" and "q".

Figure 15. Bass Diffusion Model Examples



Using the average default values along with population assumptions provides the blue default line:

- p = 0.03
- q = 0.38
- X(t-1) = 10
- m = 1000

[14] Mahajan, Vijay; Muller, Eitan and Bass, Frank (1995). "Diffusion of new products: Empirical generalizations and managerial uses". Marketing Science 14 (3): G79–G88

The user defined curve uses the following values:

- p = 0.01
- q = 0.3
- X(t-1) = 10
- m = 1000

Recurring Participation

Each measure included in the analysis has an expected measure life. Some of these measure life estimates extend beyond the planning horizon while others end within the planning horizon. The model assumes that each measure implemented will be replaced at the end of its measure life by another technology at least as efficient as the originally installed efficiency measure. Given that the replacement technologies are not known now, it is assumed that the replacement technology is the same as the current efficient technology.

These assumptions result in accounting for the continuation of the originally installed energy efficient impacts throughout the ten-year planning horizon. This is unlike other models that assume that, at the end of measure life, all or a portion of all installations return to the original baseline technology.

The impact of this assumption affects Market Potential results in two ways. First, the cumulative Market Potential may fall at the end of measure life. The impacts would fall if the baseline technology were assumed to have changed, such as for early retirement and appliance recycling measures as well as to changes to codes and standards. Second, future year incentive and administrative costs are affected. At the end of measure life, the model assumes that original participants re-participate. Thus cumulate energy and demand impacts are sustained (or partially reduced) with no increase in first year participant incremental impacts. Re-participation, however, incurs incentive and administrative costs. Therefore, for measures with measure life less than the planning horizon, such as CFLs, the total incentive and administrative costs will rise more quickly than the incremental energy impacts.

Early Retirement Measures

Early retirement measures often utilize a different base technology than do ROB measures. ROB measures generally use as the base technology those that meet minimum current codes and standards. Early retirement measures generally utilize the average efficiency of the currently in-place technologies as their base technology. Often, early retirement based programs have substantially higher per unit energy savings as compared to ROB based programs for the same efficient technology.

However, effective measure life is shorter for early retirement measures compared to ROB measures.

Recurring participation is treated differently for early retirement measures as compared to ROB, RET, new construction, or emerging technology measures. At the end of early retirement measure life, it is assumed that the baseline changes to being the same as it would be for the equivalent ROB measure. Thus, cumulative Market Potential is reduced by the delta between using the ROB baseline and the early retirement baseline.

Appliance Recycling Measures

Appliance re-cycling measures are handled as early retirement measures. At the end of an appliance recycling measure life, the energy savings does disappear from cumulative potential and there are no re-curing incentive and administrative costs, since the appliance cannot be re-cycled more than once.

Baseline Changes Resulting From Codes and Standards

Replace on burnout and new construction measures use current codes and standards efficiency levels as the baseline. For several measures, it is known that the codes and standards become more stringent in future years. To accommodate these future codes and standards changes, EERAM allows for changes to the baseline by measure and by forecast year. EERAM can accommodate these code and standard changes multiple times at any year within the forecast period. The effect is to change the impacts from energy efficiency technologies for both new implementations and for any recurring participation.

A.5.3. Overall EE/PDR Potential Results

Based on AEP Ohio's summer peak, the cumulative annual EE/PDR potential savings at meter (Base Case Scenario Market Potential) in 2031 is estimated to be 9,062 GWh, about 18 percent of forecast sales, and 1,703 MW, about 18 percent of peak demand, as shown in Table 31. In 2031, the cumulative annual energy and demand savings, as a percentage of sector forecast sales and peak demand, are greater for the non-residential sector than for the residential sector. These results assume a net-to-gross impact ratio of 1.0, whereby free ridership is assumed for this analysis to be offset by spillover impacts.

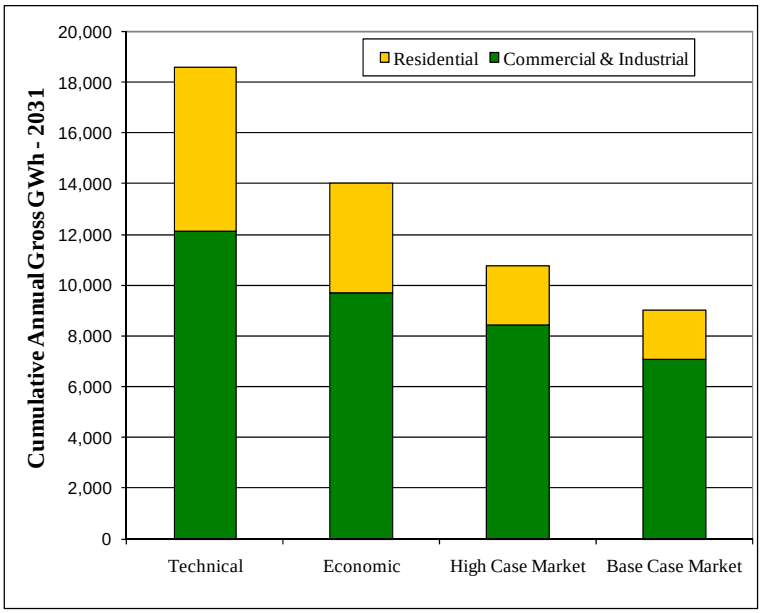
Table 31. Projected Cumulative Annual Savings at Meter and Costs – 2031

Potential Scenario	Cumulative Annual Gross Energy Savings (1) at Meter (2031)		Cumulative Annual Gross Summer Peak Demand Savings (1) at Meter (2031)		Total Cost (Energy Efficiency Only) (2)
Sector	GWh	Percent of 2031 Forecast Sales	MW	Percent of 2031 Forecast Sales	20 Year Cost (2012 to 2031) million 2012$
Residential					
Technical	6,484	42%	1,307	33%	-
Economic	4,301	28%	835	21%	-
High Case	2,325	15%	446	11%	$5,288
Base Case	1,946	13%	407	10%	$1,272
Commercial & Industrial					
Technical	12,131	37%	2,078	38%	-
Economic	9,740	30%	1,737	31%	-
High Case	8,454	26%	1,517	27%	$2,364
Base Case	7,116	22%	1,296	23%	$1,229
Total					
Technical	18,615	38%	3,385	33%	-
Economic	14,041	29%	2,571	28%	-
High Case	10,779	22%	1,963	21%	$7,652
Base Case	9,062	19%	1,703	18%	$2,501

(1) Savings are not projected for Research and Development, Business Behavior Change, Codes and Standards Support, Transmission and Distribution (T&D) System Efficiency Improvements, gridSMART[SM] Demonstration Project EE/PDR Savings, or Customer Power System Efficiency. AEP Ohio also will conduct program evaluation and other essential program support functions, such as compliance and reporting, database management, contracting and payables, and portfolio cost-benefit analysis.
(2) Other Costs include support and other services, including Research and Development, General Education and Training, Targeted Advertising, Business Behavior Change, Codes and Standards, T&D System Efficiency Improvements, gridSMART[SM] Demonstration Project EE/PDR Savings, or Customer Power System Efficiency.

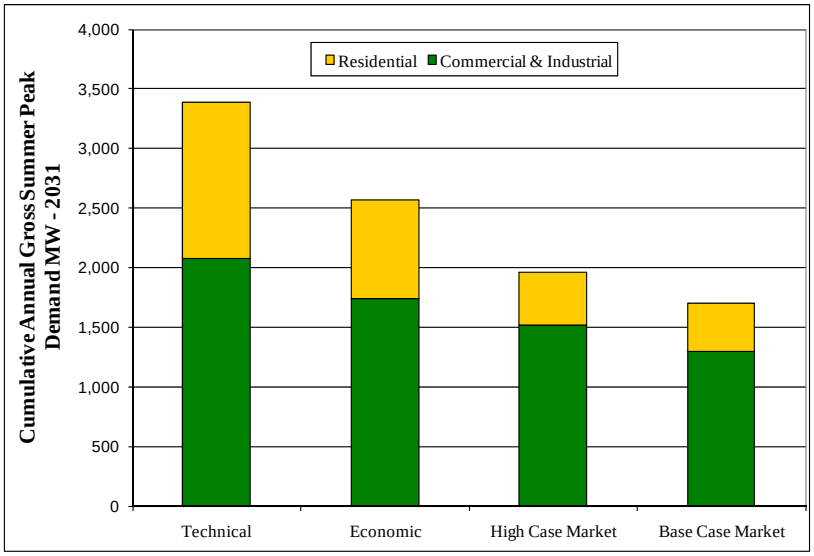
Figure 16 and Figure 17 show the cumulative annual energy and summer peak demand savings in 2031 for each of the four potential analysis scenarios. These results assume a net-to-gross impact ratio of 1.0 in most instances whereby free ridership is assumed for this analysis to be offset by spillover impacts. The Base Case market potential meets the SB 221 savings targets in the short term, from 2012 to 2014. The high case market potential meets the SB 221 cumulative savings targets over the long term, through 2031. The Base Case market potential includes incentives at 50 percent of incremental measure costs in most instances for residential measures, and mostly 25 percent for nonresidential measures. The High Case market potential includes incentives at 75 percent of incremental measure costs in most instances for residential measures, and 50 percent for nonresidential measures.

Figure 16. Cumulative Annual GWh Energy Savings in 2031



(1) Savings are not projected for Research and Development, Business Behavior Change, Codes and Standards Support, Transmission and Distribution (T&D) System Efficiency Improvements, gridSMART[SM] Demonstration Project EE/PDR Savings, or Customer Power System Efficiency. AEP Ohio also will conduct program evaluation and other essential program support functions, such as compliance and reporting, database management, contracting and payables, and portfolio cost-benefit analysis.

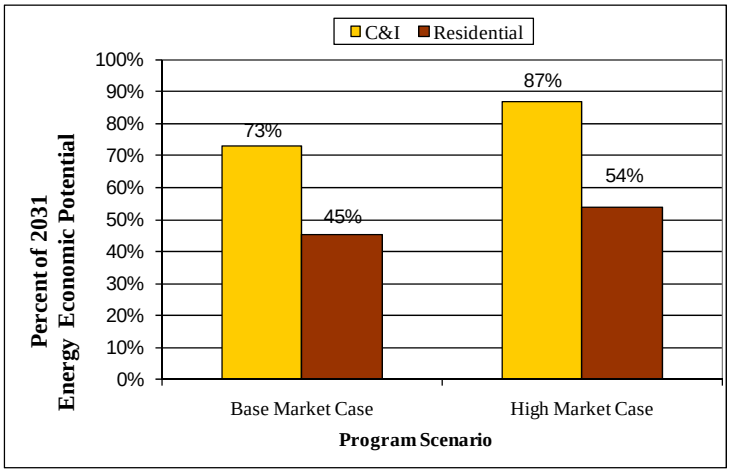
Figure 17. Cumulative Annual Summer Peak MW Demand Savings in 2031



(1) Savings are not projected for Research and Development, Business Behavior Change, Codes and Standards Support, Transmission and Distribution (T&D) System Efficiency Improvements, gridSMART[SM] Demonstration Project EE/PDR Savings, or Customer Power System Efficiency. AEP Ohio also will conduct program evaluation and other essential program support functions, such as compliance and reporting, database management, contracting and payables, and portfolio cost-benefit analysis.

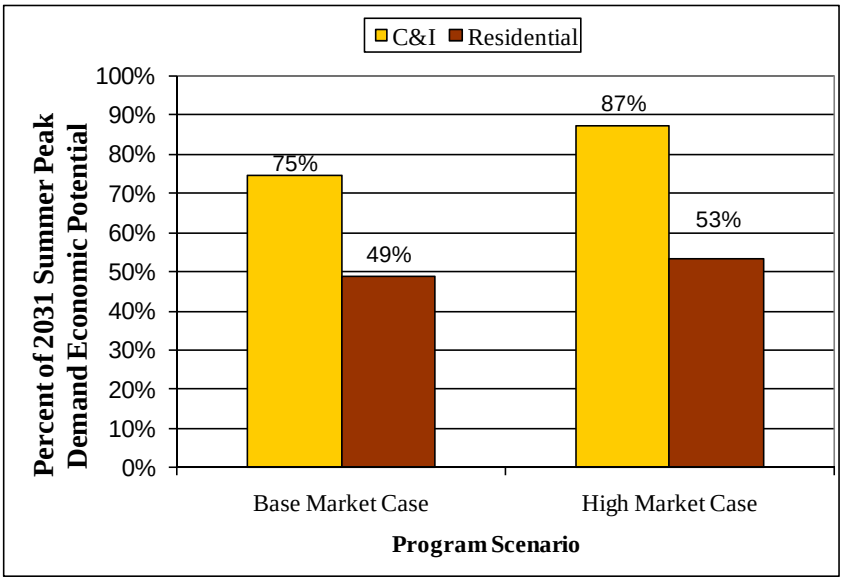
Figure 18 and Figure 19 show the cumulative Market Potential as a percent of the Economic Potential for energy efficiency.

Figure 18. Market Potential Annual Energy Savings at Meter as Percent of Economic Potential in 2031



(1) Savings are not projected for Research and Development, Business Behavior Change, Codes and Standards Support, Transmission and Distribution (T&D) System Efficiency Improvements, gridSMART[SM] Demonstration Project EE/PDR Savings, or Customer Power System Efficiency. AEP Ohio also will conduct program evaluation and other essential program support functions, such as compliance and reporting, database management, contracting and payables, and portfolio cost-benefit analysis.

Figure 19. Market Potential Annual Peak Demand Savings at Meter as Percent of Economic Potential in 2031



(1) Savings are not projected for Research and Development, Business Behavior Change, Codes and Standards Support, Transmission and Distribution (T&D) System Efficiency Improvements, gridSMART[SM] Demonstration Project EE/PDR Savings, or Customer Power System Efficiency. AEP Ohio also will conduct program evaluation and other essential program support functions, such as compliance and reporting, database management, contracting and payables, and portfolio cost-benefit analysis.

A.5.3.1. Residential EE/PDR Potential Results

This section provides the EE/PDR potential results for the residential sector. The total and annual incremental residential achievable EE/PDR potential results for twenty years (2012-2031) are shown in Table 32 to Table 39. The energy values shown below are for the measures' first-year savings at meter, the incremental demand savings are the summer peak coincident demand savings, and the program costs are the total estimated EE/PDR program budgets for a given year, including rebate or other customer incentive costs as well as administrative and implementation costs.

The total twenty-year estimated residential base case market potential in 2031 is about 1,946 GWh in cumulative annual savings at meter and about 407 MW of cumulative annual summer peak demand. The annual incremental energy savings at meter starts at 1.4 percent, and peaks out in 2016 at about 1.6 percent of AEP Ohio's forecast annual residential energy sales; annual impacts begin to decline slowly thereafter as markets become saturated. Savings are predominantly from lighting and appliances, followed by hot water, HVAC, and new construction, and house measures. These results assume a net-to-gross impact ratio of 1.0, whereby free ridership is assumed for this analysis to be offset by spillover impacts.

The base case market potential projects savings for 2012 to 2014 are consistent with meeting the requirements of SB 221. However, to meet the full SB 221 requirements through 2025 of 22.2 percent cumulative energy savings, AEP Ohio would need to meet the projected savings in the high case market potential scenario.

Table 32. Base Case Scenario: 2012 – 2031 Residential Cumulative Annual Savings at Meter

Residential Cumulative Market Potential																				
Energy Potential (MWh)	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Lighting	125,703	248,094	341,060	435,775	530,426	581,128	631,787	640,728	633,377	624,697	646,476	668,012	689,261	708,355	727,133	747,196	766,069	784,264	802,034	819,513
Water Heat	8,548	18,380	30,885	42,705	56,475	70,645	84,487	98,021	110,997	123,761	136,263	148,415	160,908	173,248	185,442	197,595	209,629	221,531	233,321	244,989
Appliances	36,092	77,684	126,829	177,201	244,849	312,042	370,310	416,014	446,469	465,509	482,765	498,154	512,907	528,953	546,100	563,850	577,122	583,643	584,395	582,299
HVAC/Shell	4,137	8,624	13,910	20,148	26,665	33,005	39,104	44,975	50,724	56,365	61,903	67,338	72,676	77,878	82,990	88,006	92,986	97,884	102,703	107,444
NewC	1,581	3,134	4,675	6,207	7,734	9,257	10,777	12,295	13,811	15,326	16,839	18,352	19,863	22,437	26,994	34,235	44,800	58,958	77,091	99,205
House	35,099	40,586	46,338	52,193	57,973	63,499	68,615	73,207	77,210	80,606	83,422	85,709	87,536	88,975	90,096	90,962	91,626	92,132	92,517	92,808
Total	**211,159**	**396,502**	**563,696**	**734,229**	**924,122**	**1,069,576**	**1,205,081**	**1,285,239**	**1,332,587**	**1,366,264**	**1,427,668**	**1,485,979**	**1,543,151**	**1,599,847**	**1,658,755**	**1,721,842**	**1,782,231**	**1,838,412**	**1,892,060**	**1,946,258**
Percent of Sector Forecast	1.41%	2.67%	3.82%	5.00%	6.33%	7.37%	8.32%	8.89%	9.22%	9.51%	9.95%	10.33%	10.68%	10.98%	11.28%	11.60%	11.87%	12.12%	12.31%	12.52%
Demand Potential (KW)	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Lighting	7,828	15,444	21,219	27,098	32,976	36,197	39,419	40,049	39,731	39,319	40,800	42,268	43,721	45,044	46,351	47,737	49,053	50,329	51,581	52,816
Water Heat	1,021	2,129	3,421	4,540	5,710	6,860	7,953	8,997	9,989	10,949	11,879	12,775	13,674	14,553	15,414	16,265	17,101	17,923	18,732	19,528
Appliances	7,591	16,557	28,112	42,342	61,690	82,560	102,285	120,397	136,539	151,181	165,582	179,842	194,089	208,498	223,048	237,475	251,259	261,927	266,985	269,208
HVAC/Shell	2,428	4,169	6,619	9,894	13,707	16,817	18,856	19,879	20,778	21,630	22,442	23,216	23,955	24,657	25,333	25,987	26,630	27,255	27,865	28,460
NewC	388	770	1,149	1,525	1,900	2,275	2,648	3,021	3,394	3,766	4,138	4,509	4,881	5,513	6,633	8,412	11,008	14,487	18,943	24,377
House	4,680	5,412	6,178	6,959	7,730	8,467	9,149	9,761	10,295	10,747	11,123	11,428	11,671	11,863	12,013	12,128	12,217	12,284	12,336	12,374
Total	**23,936**	**44,480**	**66,698**	**92,358**	**123,713**	**153,175**	**180,309**	**202,105**	**220,725**	**237,593**	**255,964**	**274,039**	**291,991**	**310,129**	**328,792**	**348,004**	**367,268**	**384,207**	**396,441**	**406,765**
Percent of Sector Forecast	0.67%	1.25%	1.91%	2.64%	3.54%	4.39%	5.16%	5.77%	6.27%	6.77%	7.26%	7.74%	8.21%	8.45%	8.85%	9.25%	9.63%	9.96%	10.15%	10.27%

Table 33. Base Case Scenario: 2012 – 2031 Residential Incremental Annual Savings at Meter

Residential Incremental Market Potential																				
Energy Potential (MWh)	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Lighting	125,703	122,391	92,967	94,714	94,652	50,702	50,659	47,908	24,234	21,957	21,779	21,536	21,249	20,936	20,620	20,063	18,874	18,195	17,771	17,479
Water Heat	8,548	9,832	12,505	11,820	13,770	14,170	13,842	13,534	13,282	13,068	12,884	12,711	12,555	12,412	12,278	12,153	12,034	11,920	11,812	11,709
Appliances	36,092	41,592	49,184	67,385	85,254	87,158	82,472	78,217	74,353	70,846	67,593	61,168	57,661	55,196	52,994	49,356	42,035	32,868	24,348	19,373
HVAC/Shell	4,137	4,606	5,405	6,380	6,690	6,583	6,445	6,314	6,189	6,071	5,958	5,845	5,737	5,634	5,533	5,436	5,343	5,252	5,163	5,078
NewC	1,581	1,554	1,540	1,532	1,527	1,523	1,520	1,518	1,516	1,515	1,513	1,512	1,512	2,574	4,557	7,241	10,565	14,158	18,133	22,114
House	35,099	35,488	35,751	35,855	35,780	35,526	35,116	34,592	34,002	33,397	32,816	32,287	31,827	31,439	31,121	30,866	30,664	30,506	30,385	30,291
Total	**211,159**	**215,463**	**197,352**	**217,687**	**237,673**	**195,661**	**190,054**	**182,082**	**153,577**	**146,854**	**142,542**	**135,060**	**130,540**	**128,191**	**127,104**	**125,115**	**119,513**	**112,899**	**107,612**	**106,044**
Percent of Sector Forecast	1.41%	1.45%	1.34%	1.48%	1.63%	1.35%	1.31%	1.26%	1.06%	1.02%	0.99%	0.94%	0.90%	0.88%	0.86%	0.84%	0.80%	0.74%	0.70%	0.68%
Demand Potential (KW)	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Lighting	7,828	7,616	5,776	5,878	5,878	3,221	3,222	3,057	1,625	1,489	1,481	1,468	1,453	1,436	1,418	1,386	1,316	1,276	1,252	1,236
Water Heat	1,021	1,108	1,292	1,119	1,170	1,149	1,093	1,045	1,006	974	948	924	903	884	867	851	836	822	809	796
Appliances	7,591	8,966	11,559	16,426	21,616	23,440	22,834	22,283	21,783	21,329	20,910	20,180	19,747	19,424	19,133	18,521	17,511	14,087	8,109	4,999
HVAC/Shell	2,428	2,786	3,495	4,510	5,333	5,227	5,057	4,899	4,751	4,613	4,483	4,356	4,237	4,123	4,015	3,911	3,812	3,716	3,625	3,536
NewC	388	382	378	377	375	374	374	373	373	372	372	372	371	633	1,120	1,779	2,596	3,479	4,456	5,434
House	4,680	4,732	4,767	4,781	4,771	4,737	4,682	4,612	4,534	4,453	4,375	4,305	4,244	4,192	4,149	4,115	4,089	4,068	4,051	4,039
Total	**23,936**	**25,589**	**27,268**	**33,091**	**39,144**	**38,148**	**37,261**	**36,269**	**34,072**	**33,231**	**32,569**	**31,606**	**30,955**	**30,691**	**30,702**	**30,564**	**30,159**	**27,448**	**22,301**	**20,040**
Percent of Sector Forecast	0.67%	0.72%	0.78%	0.95%	1.12%	1.09%	1.07%	1.04%	0.97%	0.95%	0.92%	0.89%	0.87%	0.84%	0.83%	0.81%	0.79%	0.71%	0.57%	0.51%

Table 34. Base Case Scenario: 2012 – 2031 Residential Incremental Market Potential Costs

Residential - Administative ($) by End-Use																				
Administative ($)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Lighting	$5,486,119	$6,224,146	$6,257,554	$7,008,069	$7,808,077	$5,202,277	$5,618,810	$11,489,408	$10,778,448	$13,021,525	$15,422,477	$14,824,231	$16,014,607	$17,930,348	$17,271,369	$18,950,363	$20,792,927	$21,783,940	$24,257,293	$27,251,141
Water Heat	$2,097,685	$2,426,007	$3,088,248	$4,600,289	$5,100,393	$5,290,387	$5,335,238	$5,547,231	$5,540,237	$5,454,351	$5,406,307	$5,407,668	$5,470,540	$5,832,771	$5,840,225	$5,893,987	$5,928,657	$6,230,227	$6,465,406	$6,729,401
Appliances	$3,386,441	$3,913,026	$4,377,569	$5,730,296	$7,140,712	$7,522,525	$7,460,713	$7,297,850	$7,180,943	$7,075,397	$6,970,612	$6,780,229	$6,918,423	$6,982,387	$7,068,533	$8,032,251	$7,708,797	$8,110,839	$8,566,757	$8,087,045
HVAC/Shell	$1,106,214	$1,205,692	$1,415,409	$1,491,800	$1,482,836	$1,462,159	$1,441,024	$1,420,449	$1,400,478	$1,424,249	$1,405,301	$1,385,948	$1,366,992	$1,403,881	$1,381,321	$1,355,370	$1,343,461	$1,335,619	$2,674,184	$2,672,564
NewC	$237,097	$261,909	$302,409	$364,312	$457,373	$596,489	$803,980	$1,113,126	$1,573,480	$2,258,777	$3,278,719	$4,796,488	$7,054,800	$2,328,567	$1,709,525	$1,999,994	$2,614,891	$3,447,523	$4,870,854	$6,169,749
House	$1,736,418	$2,039,462	$2,368,570	$2,716,800	$3,074,758	$3,431,369	$3,775,148	$4,095,687	$4,384,975	$4,638,167	$4,853,676	$5,033,403	$5,179,833	$5,297,139	$5,389,857	$5,462,382	$5,518,675	$5,562,135	$5,595,576	$5,621,270
Total Residential	**$14,049,973**	**$16,070,242**	**$17,809,758**	**$21,911,566**	**$25,064,148**	**$23,505,205**	**$24,434,913**	**$30,963,752**	**$30,858,561**	**$33,872,465**	**$37,337,092**	**$38,227,967**	**$42,005,196**	**$39,775,094**	**$38,660,830**	**$41,694,347**	**$43,907,408**	**$46,470,284**	**$52,430,070**	**$56,531,170**
Residential - Incentive ($) by End-Use																				
Incentive ($)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Lighting	$7,396,996	$5,723,503	$4,696,959	$5,148,426	$5,112,909	$4,207,595	$4,174,908	$5,380,898	$5,070,277	$5,232,044	$5,838,976	$5,083,913	$5,030,291	$6,548,143	$5,628,528	$6,484,555	$6,014,809	$6,335,797	$6,678,601	$6,579,878
Water Heat	$1,076,426	$1,348,647	$1,908,037	$1,954,651	$2,459,793	$2,610,723	$2,601,590	$2,634,307	$2,888,841	$2,864,115	$2,926,760	$3,100,227	$3,498,608	$3,510,611	$3,793,779	$3,931,104	$3,915,194	$4,008,555	$4,070,509	$4,154,408
Appliances	$10,490,560	$11,762,252	$11,532,670	$14,319,568	$16,773,734	$17,119,497	$16,966,999	$16,583,274	$16,983,350	$17,271,692	$17,328,903	$15,668,546	$16,372,868	$16,940,617	$17,558,182	$19,981,516	$18,381,178	$19,311,017	$19,671,429	$18,178,507
HVAC/Shell	$1,349,263	$1,510,986	$1,801,900	$2,200,102	$2,256,911	$2,221,016	$2,177,996	$2,136,049	$2,095,132	$2,067,085	$2,028,110	$1,988,835	$1,950,475	$2,840,438	$2,802,425	$2,684,289	$2,772,461	$2,944,497	$3,774,195	$3,787,174
NewC	$743,951	$731,299	$724,972	$721,177	$718,646	$716,839	$715,483	$714,429	$713,585	$712,895	$712,320	$711,833	$711,416	$1,211,605	$2,144,714	$3,407,951	$4,972,392	$6,663,623	$9,240,564	$11,114,153
House	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Residential	**$21,057,197**	**$21,076,686**	**$20,664,539**	**$24,343,924**	**$27,321,994**	**$26,875,670**	**$26,636,976**	**$27,448,957**	**$27,751,186**	**$28,147,831**	**$28,835,069**	**$26,553,355**	**$27,563,659**	**$31,051,414**	**$31,927,627**	**$36,489,414**	**$36,056,034**	**$39,263,489**	**$43,435,297**	**$43,814,121**
Residential - Administative ($) + Incentive ($) by End-Use																				
Administative ($) + Incentive ($)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Lighting	$12,883,115	$11,947,649	$10,954,513	$12,156,495	$12,920,986	$9,409,872	$9,793,719	$16,870,306	$15,848,725	$18,253,569	$21,261,453	$19,908,144	$21,044,898	$24,478,491	$22,899,897	$25,434,917	$26,807,736	$28,119,737	$30,935,894	$33,831,020
Water Heat	$3,174,111	$3,774,654	$4,996,284	$6,554,941	$7,560,186	$7,901,110	$7,936,828	$8,181,538	$8,429,078	$8,318,466	$8,333,067	$8,507,894	$8,969,149	$9,343,382	$9,634,004	$9,825,091	$9,843,851	$10,238,782	$10,535,915	$10,883,810
Appliances	$13,877,001	$15,675,279	$15,910,239	$20,049,864	$23,914,446	$24,642,022	$24,427,712	$23,881,124	$24,164,293	$24,347,089	$24,299,515	$22,448,775	$23,291,292	$23,923,004	$24,626,715	$28,013,767	$26,089,975	$27,421,856	$28,238,186	$26,265,552
HVAC/Shell	$2,455,476	$2,716,677	$3,217,309	$3,691,902	$3,739,747	$3,683,175	$3,619,020	$3,556,499	$3,495,610	$3,491,333	$3,433,410	$3,374,784	$3,317,467	$4,244,319	$4,183,747	$4,039,658	$4,115,922	$4,280,116	$6,448,379	$6,459,738
NewC	$981,048	$993,207	$1,027,382	$1,085,489	$1,176,019	$1,313,327	$1,519,463	$1,827,555	$2,287,065	$2,971,672	$3,991,039	$5,508,322	$7,766,217	$3,540,172	$3,854,238	$5,407,945	$7,587,282	$10,111,146	$14,111,418	$17,283,902
House	$1,736,418	$2,039,462	$2,368,570	$2,716,800	$3,074,758	$3,431,369	$3,775,148	$4,095,687	$4,384,975	$4,638,167	$4,853,676	$5,033,403	$5,179,833	$5,297,139	$5,389,857	$5,462,382	$5,518,675	$5,562,135	$5,595,576	$5,621,270
Total Residential	**$35,107,170**	**$37,146,928**	**$38,474,297**	**$46,255,491**	**$52,386,142**	**$50,380,875**	**$51,071,889**	**$58,412,709**	**$58,609,747**	**$62,020,296**	**$66,172,160**	**$64,781,322**	**$69,568,856**	**$70,826,508**	**$70,588,458**	**$78,183,761**	**$79,963,442**	**$85,733,772**	**$95,865,367**	**$100,345,291**

Table 35. Residential Technical Potential Scenario: 2012 – 2031 Savings at Meter

Residential Technical Potential																				
Energy Potential (MWh)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Lighting	2,698,838	2,273,887	1,885,008	1,884,897	1,884,785	1,884,674	1,884,563	1,884,452	1,884,341	1,884,230	1,884,119	1,883,158	1,882,198	1,881,238	1,880,278	1,879,319	1,878,361	1,877,403	1,876,445	1,875,488
Water Heat	1,728,091	1,727,983	1,727,875	1,493,964	1,493,871	1,493,778	1,493,686	1,493,593	1,493,500	1,493,407	1,493,315	1,492,553	1,491,792	1,491,031	1,490,271	1,489,511	1,488,751	1,487,992	1,487,233	1,486,474
Appliances	2,089,392	2,089,250	2,003,142	2,003,009	2,002,877	2,002,745	2,002,612	2,002,480	2,002,348	2,002,216	2,002,084	2,001,063	2,000,043	1,999,023	1,998,003	1,996,984	1,995,966	1,994,948	1,993,930	1,992,913
HVAC/Shell	979,064	978,977	948,638	948,553	948,468	948,383	948,299	948,214	948,129	948,045	947,960	947,477	946,994	946,511	946,028	945,545	945,063	944,581	944,099	943,618
NewC	3,998	3,930	3,896	3,876	3,862	3,853	3,845	3,840	3,835	3,832	3,828	3,826	3,824	6,512	11,527	18,316	26,725	35,814	45,870	55,940
House	130,614	130,602	130,590	130,578	130,566	130,554	130,542	130,530	130,518	130,506	130,494	130,428	130,361	130,295	130,228	130,162	130,096	130,029	129,963	129,897
TOTAL	**7,629,998**	**7,204,630**	**6,699,149**	**6,464,877**	**6,464,430**	**6,463,987**	**6,463,547**	**6,463,109**	**6,462,672**	**6,462,236**	**6,461,801**	**6,458,505**	**6,455,211**	**6,454,609**	**6,456,335**	**6,459,838**	**6,464,961**	**6,470,767**	**6,477,541**	**6,484,330**
Percent of Sector Forecast	50.92%	48.58%	45.35%	43.99%	44.26%	44.51%	44.64%	44.71%	44.71%	44.96%	45.02%	44.91%	44.67%	44.29%	43.90%	43.51%	43.06%	42.67%	42.15%	41.71%
Demand Potential (KW)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Lighting	154,308	128,692	104,794	104,789	104,784	104,779	104,774	104,769	104,763	104,758	104,753	104,700	104,646	104,593	104,540	104,486	104,433	104,380	104,327	104,273
Water Heat	311,969	311,969	311,969	267,418	267,418	267,418	267,418	267,418	267,418	267,418	267,418	267,281	267,145	267,009	266,873	266,737	266,601	266,465	266,329	266,193
Appliances	463,262	463,230	455,157	455,125	455,094	455,063	455,031	455,000	454,968	454,937	454,906	454,674	454,442	454,210	453,979	453,747	453,516	453,284	453,053	452,822
HVAC/Shell	459,021	458,995	454,625	454,600	454,574	454,549	454,524	454,499	454,474	454,449	454,424	454,192	453,961	453,729	453,498	453,267	453,035	452,804	452,573	452,343
NewC	983	966	957	952	949	947	945	944	942	941	941	940	940	1,600	2,832	4,501	6,567	8,800	11,271	13,746
House	17,415	17,414	17,412	17,410	17,409	17,407	17,406	17,404	17,402	17,401	17,399	17,390	17,382	17,373	17,364	17,355	17,346	17,337	17,328	17,320
TOTAL	**1,406,958**	**1,381,266**	**1,344,914**	**1,300,295**	**1,300,228**	**1,300,163**	**1,300,098**	**1,300,033**	**1,299,969**	**1,299,905**	**1,299,841**	**1,299,178**	**1,298,515**	**1,298,514**	**1,299,085**	**1,300,092**	**1,301,498**	**1,303,071**	**1,304,882**	**1,306,696**
Percent of Sector Forecast	39.11%	38.69%	38.47%	37.19%	37.21%	37.26%	37.24%	37.10%	36.94%	37.06%	36.89%	36.68%	36.51%	35.38%	34.95%	34.55%	34.12%	33.77%	33.40%	32.99%

Table 36. Residential Economic Potential Scenario: 2012 – 2031 Savings at Meter

Residential Economic Potential

Energy Potential (MWh)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Lighting	2,361,146	1,953,282	1,658,342	1,658,230	1,658,119	1,658,008	1,657,897	1,657,785	1,657,674	1,657,563	1,657,453	1,656,607	1,655,762	1,654,918	1,654,074	1,653,230	1,652,387	1,651,544	1,650,702	1,649,860
Water Heat	739,867	739,794	739,721	659,275	659,212	659,149	659,086	659,023	658,960	658,897	658,834	658,498	658,163	657,827	657,491	657,156	656,821	656,486	656,151	655,817
Appliances	1,512,327	1,512,210	1,456,570	1,456,466	1,456,361	1,456,257	1,456,152	1,456,048	1,455,943	1,455,839	1,455,735	1,454,992	1,454,250	1,453,509	1,452,767	1,452,026	1,451,286	1,450,546	1,449,806	1,449,067
HVAC/Shell	406,724	406,688	399,036	399,001	398,967	398,932	398,898	398,864	398,829	398,795	398,761	398,557	398,354	398,151	397,948	397,745	397,542	397,339	397,137	396,934
NewC	3,998	3,930	3,896	3,876	3,862	3,853	3,845	3,840	3,835	3,832	3,828	3,826	3,824	6,512	11,527	18,316	26,725	35,814	45,870	55,940
House	93,697	93,689	93,680	93,671	93,663	93,654	93,646	93,637	93,629	93,620	93,611	93,564	93,516	93,468	93,421	93,373	93,325	93,278	93,230	93,183
Total Residential	**5,117,759**	**4,709,593**	**4,351,245**	**4,270,520**	**4,270,184**	**4,269,853**	**4,269,524**	**4,269,197**	**4,268,871**	**4,268,546**	**4,268,222**	**4,266,045**	**4,263,869**	**4,264,385**	**4,267,228**	**4,271,847**	**4,278,086**	**4,285,008**	**4,292,896**	**4,300,800**
Percent of Sector Forecast	34.15%	31.75%	29.46%	29.06%	29.23%	29.40%	29.49%	29.53%	29.53%	29.70%	29.74%	29.66%	29.51%	29.26%	29.01%	28.77%	28.50%	28.25%	27.94%	27.66%

Demand Potential (KW)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Lighting	137,818	112,949	94,739	94,732	94,725	94,718	94,711	94,704	94,697	94,690	94,683	94,635	94,586	94,538	94,490	94,442	94,394	94,345	94,297	94,249
Water Heat	49,620	49,618	49,616	46,456	46,454	46,453	46,451	46,449	46,447	46,446	46,444	46,420	46,397	46,373	46,349	46,326	46,302	46,278	46,255	46,231
Appliances	438,951	438,913	432,483	432,447	432,410	432,374	432,337	432,300	432,264	432,227	432,191	431,970	431,750	431,530	431,310	431,090	430,870	430,650	430,431	430,211
HVAC/Shell	240,376	240,371	238,956	238,951	238,946	238,940	238,935	238,930	238,924	238,919	238,914	238,792	238,670	238,549	238,427	238,305	238,184	238,062	237,941	237,819
NewC	983	966	957	952	949	947	945	944	942	941	941	940	940	1,600	2,832	4,501	6,567	8,800	11,271	13,746
House	12,493	12,492	12,491	12,490	12,488	12,487	12,486	12,485	12,484	12,483	12,482	12,475	12,469	12,462	12,456	12,450	12,443	12,437	12,431	12,424
TOTAL	**880,240**	**855,308**	**829,243**	**826,028**	**825,973**	**825,918**	**825,865**	**825,812**	**825,759**	**825,706**	**825,654**	**825,233**	**824,812**	**825,052**	**825,864**	**827,113**	**828,759**	**830,574**	**832,625**	**834,681**
Percent of Sector Forecast	24.47%	23.96%	23.72%	23.63%	23.64%	23.67%	23.65%	23.57%	23.46%	23.54%	23.43%	23.30%	23.19%	22.48%	22.22%	21.98%	21.73%	21.53%	21.31%	21.07%

Table 37. High Case Scenario: 2012 – 2031 Residential Cumulative Annual Savings at Meter

Residential Cumulative Market Potential																				
Energy Potential (MWh)	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Lighting	126,918	250,724	345,251	441,476	537,553	589,601	641,530	651,669	645,449	637,837	660,622	683,107	705,248	725,181	744,749	765,553	785,122	803,969	822,350	840,400
Water Heat	13,094	28,511	48,810	71,922	97,567	123,853	149,618	174,980	199,710	224,153	247,829	270,937	294,851	318,443	341,784	365,094	388,202	411,100	433,810	453,816
Appliances	41,680	89,606	145,391	204,728	283,409	361,898	426,609	474,216	506,575	527,519	538,203	549,584	561,170	573,477	584,108	590,971	595,295	594,616	591,844	588,033
HVAC/Shell	9,580	19,909	31,948	45,776	59,951	73,520	86,394	98,620	110,355	121,640	132,507	142,673	151,908	160,752	169,268	177,403	185,367	192,986	200,258	207,272
NewC	2,268	4,498	6,709	8,908	11,099	13,285	15,467	17,645	19,821	21,995	24,167	26,338	28,507	32,201	38,741	49,133	64,295	84,614	110,638	142,375
House	35,099	40,586	46,338	52,193	57,973	63,499	68,615	73,207	77,210	80,606	83,422	85,709	87,536	88,975	90,096	90,962	91,626	92,132	92,517	92,808
Total	**228,640**	**433,835**	**624,447**	**825,003**	**1,047,553**	**1,225,654**	**1,388,233**	**1,490,337**	**1,559,120**	**1,613,750**	**1,686,751**	**1,758,347**	**1,829,218**	**1,899,028**	**1,968,746**	**2,039,116**	**2,109,906**	**2,179,417**	**2,251,417**	**2,324,704**
Percent of Sector Forecast	1.53%	2.93%	4.23%	5.61%	7.17%	8.44%	9.59%	10.31%	10.79%	11.23%	11.75%	12.23%	12.66%	13.03%	13.39%	13.73%	14.05%	14.37%	14.65%	14.95%
Demand Potential (KW)	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Lighting	7,828	15,444	21,219	27,098	32,976	36,197	39,419	40,049	39,731	39,319	40,800	42,268	43,721	45,044	46,351	47,737	49,053	50,329	51,581	52,816
Water Heat	1,386	2,922	4,779	6,877	8,852	10,753	12,565	14,314	16,000	17,643	19,226	20,757	22,304	23,814	25,291	26,755	28,192	29,603	30,991	32,218
Appliances	8,738	19,064	32,326	49,017	71,628	96,127	119,002	139,816	158,660	176,002	192,330	208,777	225,292	241,830	257,966	265,944	270,055	271,597	272,026	271,918
HVAC/Shell	3,319	6,072	9,781	14,451	19,777	24,212	27,317	29,171	30,845	32,434	33,946	35,372	36,709	37,979	39,196	40,354	41,488	42,566	43,589	44,574
NewC	507	1,006	1,501	1,993	2,483	2,972	3,460	3,947	4,434	4,920	5,406	5,892	6,377	7,203	8,666	10,991	14,382	18,927	24,749	31,848
House	4,680	5,412	6,178	6,959	7,730	8,467	9,149	9,761	10,295	10,747	11,123	11,428	11,671	11,863	12,013	12,128	12,217	12,284	12,336	12,374
Total	**26,459**	**49,919**	**75,785**	**106,394**	**143,446**	**178,728**	**210,912**	**237,059**	**259,964**	**281,066**	**302,831**	**324,494**	**346,074**	**367,734**	**389,483**	**403,909**	**415,386**	**425,307**	**435,271**	**445,749**
Percent of Sector Forecast	0.74%	1.40%	2.17%	3.04%	4.10%	5.12%	6.04%	6.77%	7.39%	8.01%	8.59%	9.16%	9.73%	10.02%	10.48%	10.73%	10.89%	11.02%	11.14%	11.25%

Table 38. High Case Scenario: 2012 – 2031 Residential Incremental Annual Savings at Meter

Residential Incremental Market Potential																				
Energy Potential (MWh)	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Lighting	126,918	123,806	94,526	96,225	96,077	52,047	51,930	49,106	25,365	23,025	22,785	22,484	22,141	21,776	21,410	20,804	19,569	18,847	18,382	18,050
Water Heat	13,094	15,416	20,300	23,112	25,644	26,286	25,766	25,361	25,035	24,748	24,484	24,222	23,976	23,743	23,521	23,310	23,108	22,916	22,733	20,046
Appliances	41,680	47,926	55,824	76,349	96,288	98,454	88,914	80,120	76,257	72,749	61,022	57,160	54,493	51,457	47,173	38,470	33,086	25,668	20,824	17,658
HVAC/Shell	9,580	10,449	12,158	13,997	14,383	13,857	13,285	12,752	12,255	11,791	11,357	10,643	9,698	9,335	8,995	8,675	8,375	8,018	7,660	7,390
NewC	2,268	2,230	2,211	2,199	2,191	2,186	2,182	2,178	2,176	2,174	2,172	2,171	2,169	3,694	6,540	10,392	15,162	20,319	26,024	31,737
House	35,099	35,488	35,751	35,855	35,780	35,526	35,116	34,592	34,002	33,397	32,816	32,287	31,827	31,439	31,121	30,866	30,664	30,506	30,385	30,291
Total	**228,640**	**235,315**	**220,771**	**247,737**	**270,364**	**228,356**	**217,193**	**204,111**	**175,090**	**167,883**	**154,636**	**148,967**	**144,304**	**141,444**	**138,760**	**132,516**	**129,964**	**126,275**	**126,008**	**125,173**
Percent of Sector Forecast	1.53%	1.59%	1.49%	1.69%	1.85%	1.57%	1.50%	1.41%	1.21%	1.17%	1.08%	1.04%	1.00%	0.97%	0.94%	0.89%	0.87%	0.83%	0.82%	0.81%
Demand Potential (KW)	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Lighting	7,828	7,616	5,776	5,878	5,878	3,221	3,222	3,057	1,625	1,489	1,481	1,468	1,453	1,436	1,418	1,386	1,316	1,276	1,252	1,236
Water Heat	1,386	1,536	1,857	2,098	1,975	1,901	1,812	1,749	1,700	1,658	1,621	1,585	1,552	1,521	1,491	1,463	1,437	1,412	1,388	1,227
Appliances	8,738	10,326	13,267	18,887	24,880	27,069	25,983	24,985	24,485	24,030	22,838	22,367	22,015	21,553	20,782	12,073	7,837	4,961	3,481	2,668
HVAC/Shell	3,319	3,798	4,755	6,149	7,145	6,961	6,699	6,453	6,224	6,008	5,805	5,596	5,388	5,212	5,044	4,885	4,733	4,572	4,414	4,277
NewC	507	499	494	492	490	489	488	487	487	486	486	486	485	826	1,463	2,325	3,392	4,545	5,821	7,099
House	4,680	4,732	4,767	4,781	4,771	4,737	4,682	4,612	4,534	4,453	4,375	4,305	4,244	4,192	4,149	4,115	4,089	4,068	4,051	4,039
Total	**26,459**	**28,506**	**30,916**	**38,284**	**45,138**	**44,379**	**42,886**	**41,343**	**39,053**	**38,125**	**36,605**	**35,806**	**35,136**	**34,740**	**34,349**	**26,247**	**22,803**	**20,834**	**20,407**	**20,545**
Percent of Sector Forecast	0.74%	0.80%	0.88%	1.10%	1.29%	1.27%	1.23%	1.18%	1.11%	1.09%	1.04%	1.01%	0.99%	0.95%	0.92%	0.70%	0.60%	0.54%	0.52%	0.52%

Table 39. High Case Scenario: 2012 – 2031 Residential Incremental Market Potential Costs

Residential - Administative ($) by End-Use																				
Administative ($)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Lighting	$6,161,398	$7,024,500	$7,157,724	$7,882,203	$8,651,808	$6,016,200	$6,403,528	$12,245,526	$11,506,576	$13,722,276	$16,096,465	$15,471,532	$16,635,844	$18,573,141	$17,900,597	$20,284,717	$22,319,265	$23,408,611	$25,832,902	$28,763,942
Water Heat	$2,841,990	$3,249,504	$4,091,431	$6,015,489	$6,330,939	$7,228,583	$7,310,370	$7,656,845	$7,994,417	$7,605,456	$7,495,346	$7,444,272	$7,545,457	$7,919,344	$7,995,350	$8,078,961	$8,098,262	$8,402,353	$8,638,495	$8,766,309
Appliances	$3,505,205	$4,062,050	$4,553,783	$6,004,488	$7,542,115	$8,008,157	$7,780,317	$7,429,331	$7,341,543	$7,261,067	$6,826,109	$6,768,318	$7,006,365	$7,097,364	$7,231,991	$8,000,454	$7,563,275	$7,987,817	$8,615,736	$8,262,563
HVAC/Shell	$3,012,613	$3,222,915	$3,716,126	$3,808,682	$3,671,990	$3,515,237	$3,361,587	$3,213,688	$3,071,891	$2,979,536	$2,850,310	$2,709,995	$2,561,898	$2,513,398	$2,400,974	$2,370,349	$2,298,199	$2,240,511	$3,777,482	$3,741,658
NewC	$367,411	$479,123	$734,264	$1,311,462	$2,625,923	$5,639,047	$12,578,352	$28,608,425	$65,708,295	$151,667,519	$350,955,377	$813,125,549	$1,885,068,943	$80,586,195	$14,968,738	$9,779,417	$10,228,102	$13,038,414	$18,492,582	$26,184,582
House	$1,736,418	$2,039,462	$2,368,570	$2,716,800	$3,074,758	$3,431,369	$3,775,148	$4,095,687	$4,384,975	$4,638,167	$4,853,676	$5,033,403	$5,179,833	$5,297,139	$5,389,857	$5,462,382	$5,518,675	$5,562,135	$5,595,576	$5,621,270
Total Residential	**$17,625,036**	**$20,077,554**	**$22,621,897**	**$27,739,123**	**$31,897,533**	**$33,838,593**	**$41,209,303**	**$63,249,502**	**$100,007,697**	**$187,874,022**	**$389,077,282**	**$850,553,070**	**$1,923,998,340**	**$121,986,581**	**$55,887,506**	**$53,976,280**	**$56,025,777**	**$60,639,841**	**$70,952,771**	**$81,340,324**
Residential - Incentive ($) by End-Use																				
Incentive ($)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Lighting	$11,266,739	$8,784,498	$7,264,890	$7,931,991	$7,867,220	$6,498,360	$6,439,005	$8,238,192	$7,762,958	$7,996,769	$8,898,761	$7,758,044	$7,669,879	$9,939,292	$8,552,853	$9,986,167	$9,316,782	$9,813,023	$10,313,170	$10,149,771
Water Heat	$2,767,252	$3,493,215	$4,997,293	$5,254,866	$6,600,977	$7,093,053	$7,069,786	$7,119,427	$7,594,421	$7,450,619	$8,155,744	$8,593,128	$9,820,785	$10,282,215	$11,332,312	$11,828,773	$11,828,484	$12,021,407	$12,125,032	$11,573,323
Appliances	$18,654,436	$20,952,283	$20,713,567	$26,105,903	$30,899,521	$31,510,342	$27,636,084	$23,381,460	$23,981,709	$24,414,359	$22,842,321	$23,020,202	$25,025,612	$26,176,455	$27,496,071	$29,701,158	$25,660,888	$26,938,304	$28,928,098	$28,303,930
HVAC/Shell	$5,063,925	$5,526,363	$6,444,603	$7,558,111	$7,563,511	$7,244,665	$6,915,278	$6,606,148	$6,315,889	$6,061,040	$5,804,773	$5,342,187	$4,708,327	$5,882,442	$5,676,601	$6,870,849	$7,080,774	$7,545,556	$9,208,567	$9,187,568
NewC	$1,452,478	$1,427,776	$1,415,425	$1,408,015	$1,403,074	$1,399,545	$1,396,899	$1,394,840	$1,393,193	$1,391,846	$1,390,723	$1,389,773	$1,388,959	$2,365,519	$4,187,307	$6,653,631	$9,708,023	$13,009,958	$17,721,757	$21,379,725
House	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Residential	**$39,204,831**	**$40,184,135**	**$40,835,778**	**$48,258,886**	**$54,334,303**	**$53,745,965**	**$49,457,052**	**$46,740,067**	**$47,048,172**	**$47,314,632**	**$47,092,322**	**$46,103,333**	**$48,613,561**	**$54,645,922**	**$57,245,143**	**$65,040,579**	**$63,594,951**	**$69,328,248**	**$78,296,624**	**$80,594,316**
Residential - Administative ($) + Incentive ($) by End-Use																				
Administative ($) + Incentive ($)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Lighting	$17,428,137	$15,808,999	$14,422,614	$15,814,194	$16,519,028	$12,514,560	$12,842,533	$20,483,718	$19,269,535	$21,719,045	$24,995,225	$23,229,576	$24,305,723	$28,512,432	$26,453,449	$30,270,884	$31,636,047	$33,221,634	$36,146,072	$38,913,713
Water Heat	$5,609,242	$6,742,718	$9,088,723	$11,270,355	$12,931,916	$14,321,636	$14,380,157	$14,776,272	$15,588,839	$15,056,075	$15,651,090	$16,037,400	$17,366,242	$18,201,559	$19,327,662	$19,907,734	$19,926,745	$20,423,761	$20,763,526	$20,339,632
Appliances	$22,159,642	$25,014,333	$25,267,350	$32,110,391	$38,441,635	$39,518,499	$35,416,401	$30,810,790	$31,323,252	$31,675,426	$29,668,430	$29,788,520	$32,031,977	$33,273,819	$34,728,061	$37,701,612	$33,224,163	$34,926,121	$37,543,834	$36,566,492
HVAC/Shell	$8,076,538	$8,749,277	$10,160,729	$11,366,793	$11,235,501	$10,759,902	$10,276,865	$9,819,836	$9,387,780	$9,040,576	$8,655,083	$8,052,182	$7,270,225	$8,395,840	$8,077,574	$9,241,197	$9,378,972	$9,786,067	$12,986,049	$12,929,226
NewC	$1,819,890	$1,906,899	$2,149,689	$2,719,477	$4,028,997	$7,038,592	$13,975,250	$30,003,265	$67,101,488	$153,059,365	$352,346,100	$814,515,322	$1,886,457,901	$82,951,714	$19,156,045	$16,433,048	$19,936,125	$26,048,371	$36,214,339	$47,564,307
House	$1,736,418	$2,039,462	$2,368,570	$2,716,800	$3,074,758	$3,431,369	$3,775,148	$4,095,687	$4,384,975	$4,638,167	$4,853,676	$5,033,403	$5,179,833	$5,297,139	$5,389,857	$5,462,382	$5,518,675	$5,562,135	$5,595,576	$5,621,270
Total Residential	**$56,829,867**	**$60,261,689**	**$63,457,675**	**$75,998,010**	**$86,231,836**	**$87,584,558**	**$90,666,354**	**$109,989,569**	**$147,055,869**	**$235,188,654**	**$436,169,605**	**$896,656,403**	**$1,972,611,902**	**$176,632,504**	**$113,132,649**	**$119,016,858**	**$119,620,728**	**$129,968,089**	**$149,249,396**	**$161,934,640**

Residential Energy Efficiency Results by End Use

Figure 20 to Figure 23 show residential sector Base Case Market Potential energy and peak demand savings for the first year (2012) and in year twenty (2031). Residential lighting measures, primarily CFLs in high-use and medium-use fixtures, account for most of the total estimated residential energy efficiency potential initially, shifting over time to new construction and appliance measures. Residential lighting and appliance measures account for most of the total estimated residential peak demand potential initially, shifting over time to a mix of new construction, appliance, and HVAC and shell measures.

Figure 20. Residential Base Case Market Potential Incremental Annual Energy Savings at Meter – 2012 by End Use

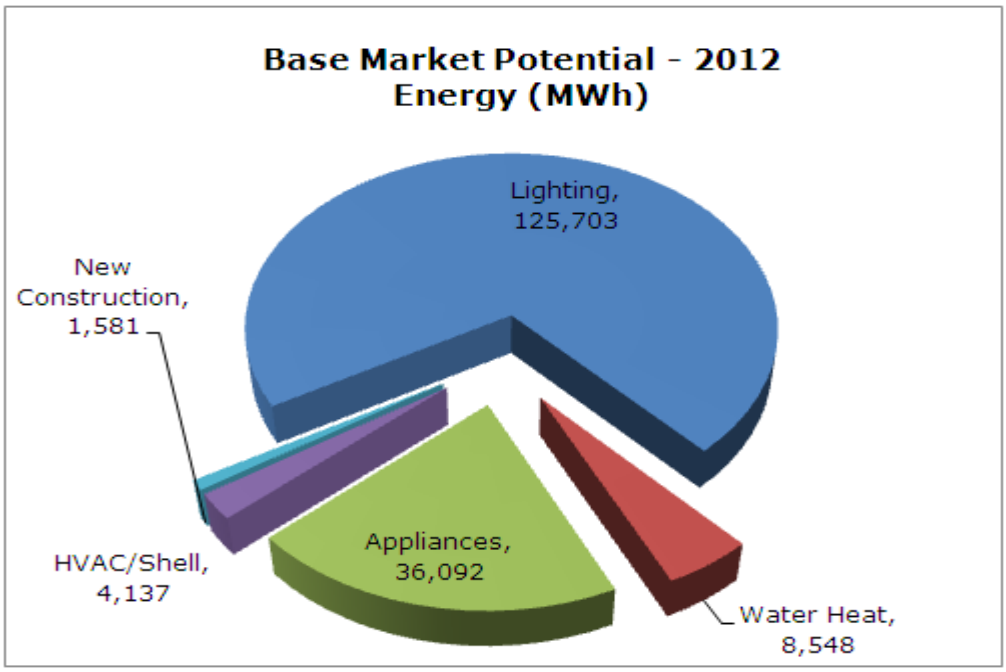


Figure 21. Residential Base Case Market Potential Incremental Annual Summer Peak Demand Savings at Meter – 2012 by End Use

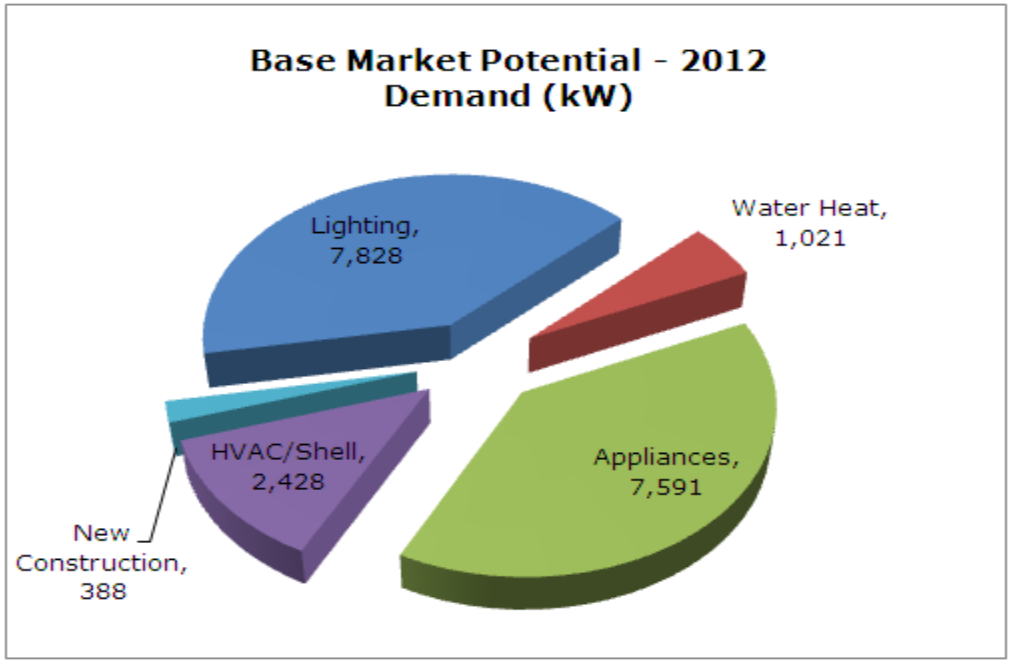


Figure 22. Residential Base Case Market Potential Incremental Annual Energy Savings at Meter – 2031 by End Use

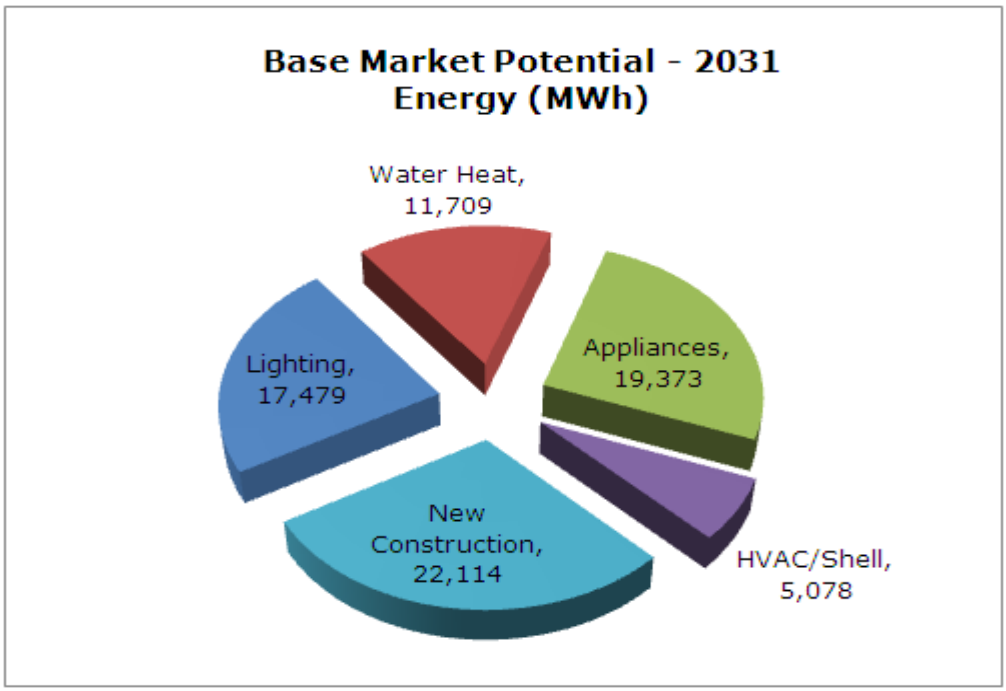


Figure 23. Residential Base Case Market Potential Incremental Annual Summer Peak Demand Savings at Meter – 2031 by End Use

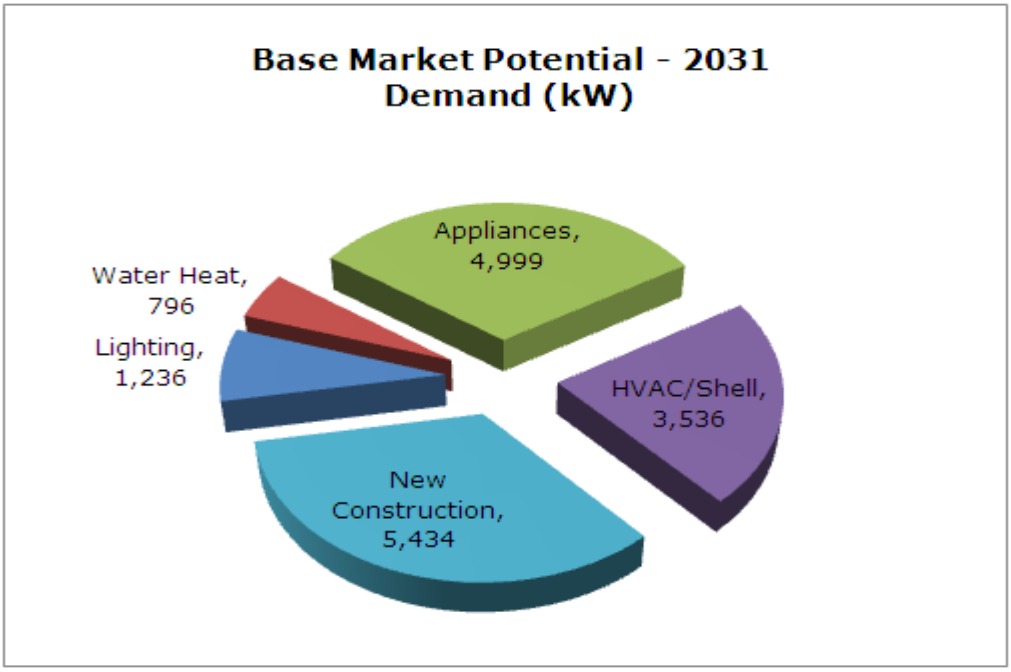


Figure 24 to Figure 29 present residential sector results for the Base Case Market , Economic, and Technical Potentials for the twenty year period (2012 to 2031) and in year twenty (2031). In 2031, lighting and appliance energy savings account for most of the economic and market potential. Appliance and HVAC/Shell measures account for most of the projected demand savings for economic and market potential. Lighting measures also account for a substantial amount of projected demand savings for market potential in 2031.

Total residential technical and economic potential energy savings through 2031 are projected primarily from appliance, lighting, and hot water measures with the other end uses providing less savings. Total residential technical and economic potential demand savings through 2031 are projected primarily from appliance and HVAC and shell measures with the other end uses providing less savings.

Figure 24. Residential Base Case Market and Economic Potential Energy Savings at Meter – 2031 by End Use

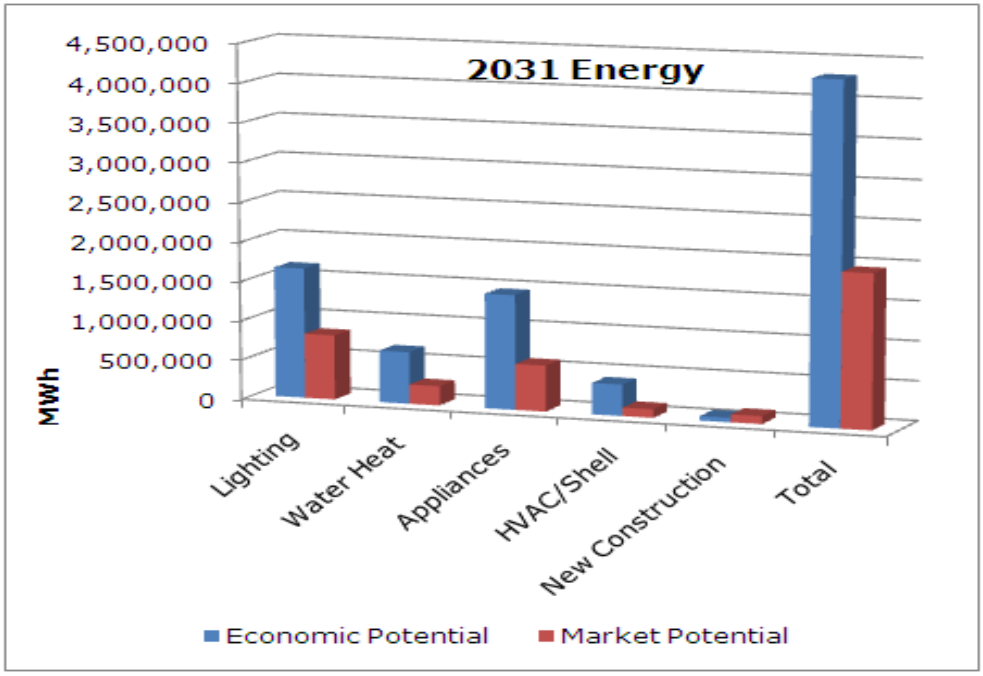


Figure 25. Residential Base Case Market and Economic Potential Summer Peak Demand Savings at Meter – 2031 by End Use

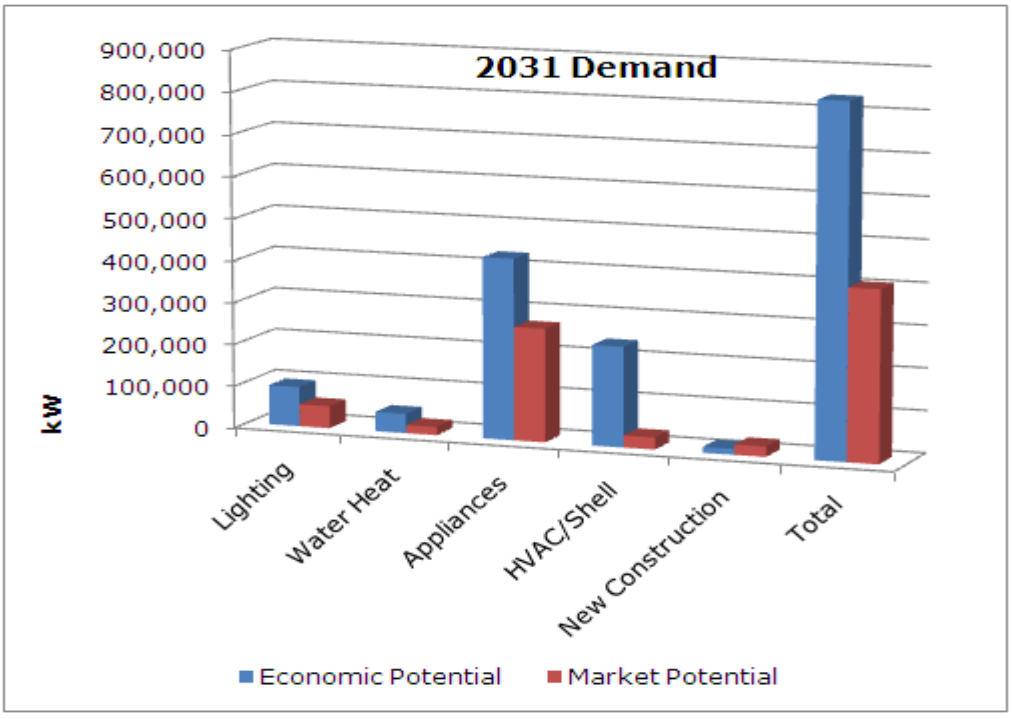


Figure 26. Residential Technical and Economic Potential Energy Savings at Meter – 2031 by End Use

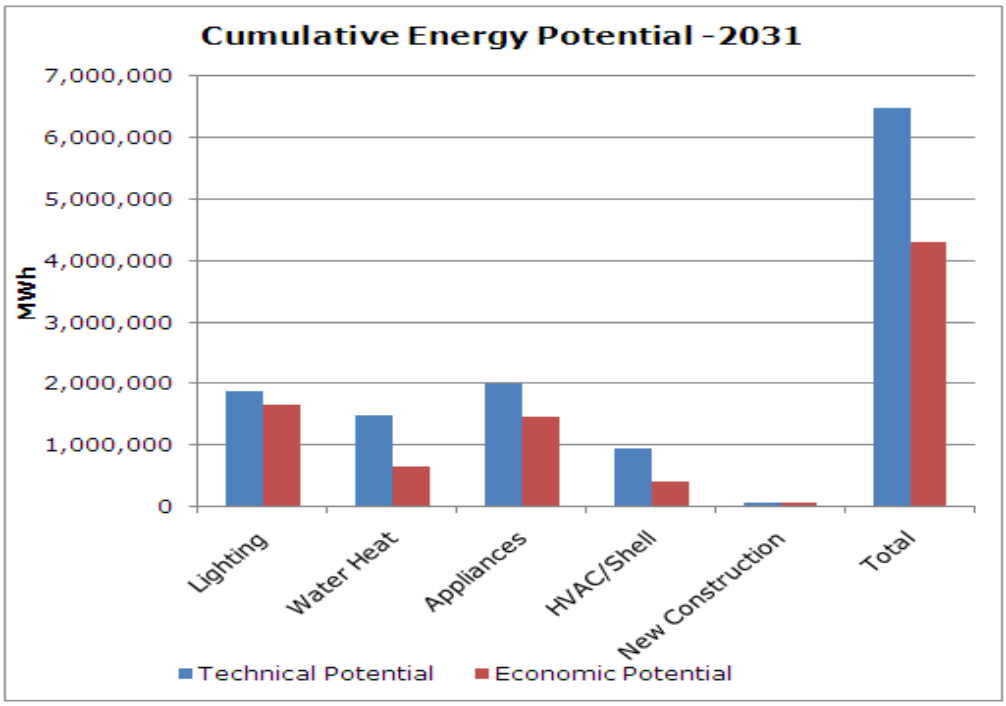


Figure 27. Residential Technical and Economic Potential Summer Peak Demand Savings at Meter – 2031 by End Use

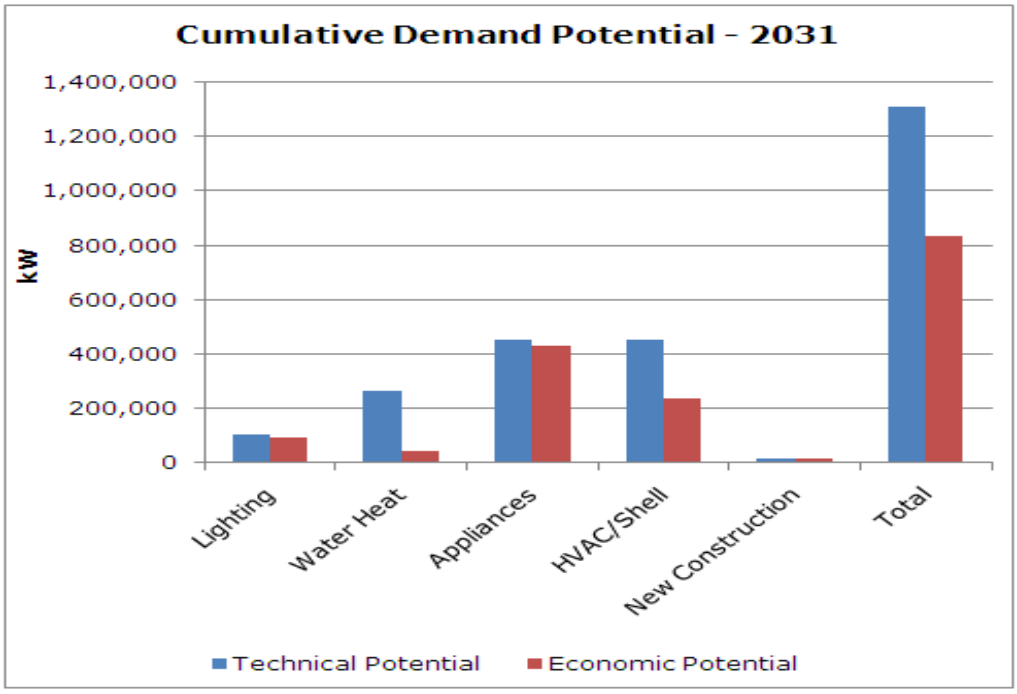


Figure 28. Residential Economic Potential Energy Savings at Meter – 2031 by End Use

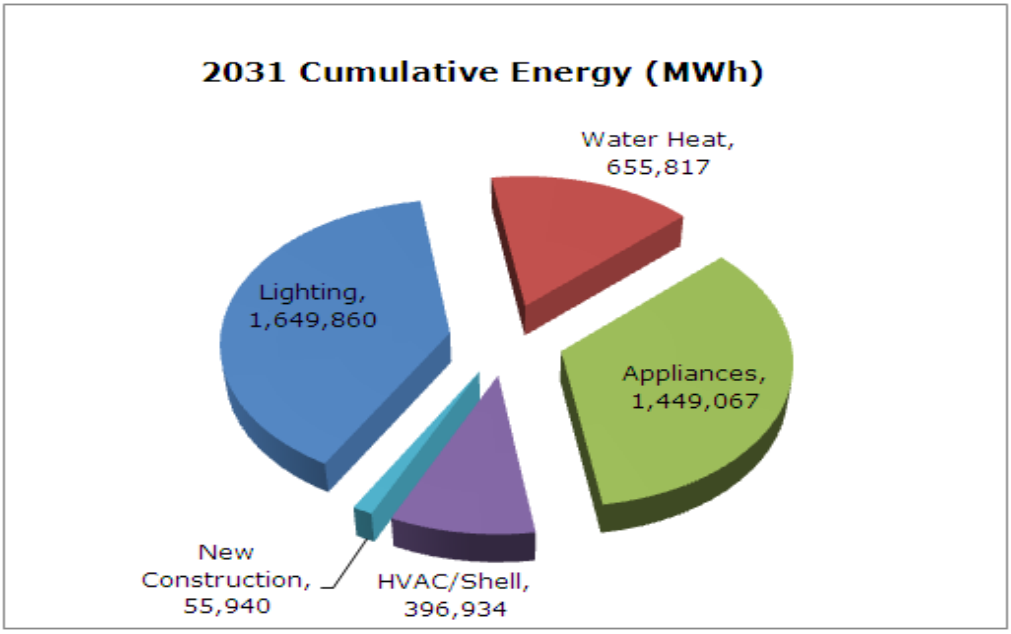
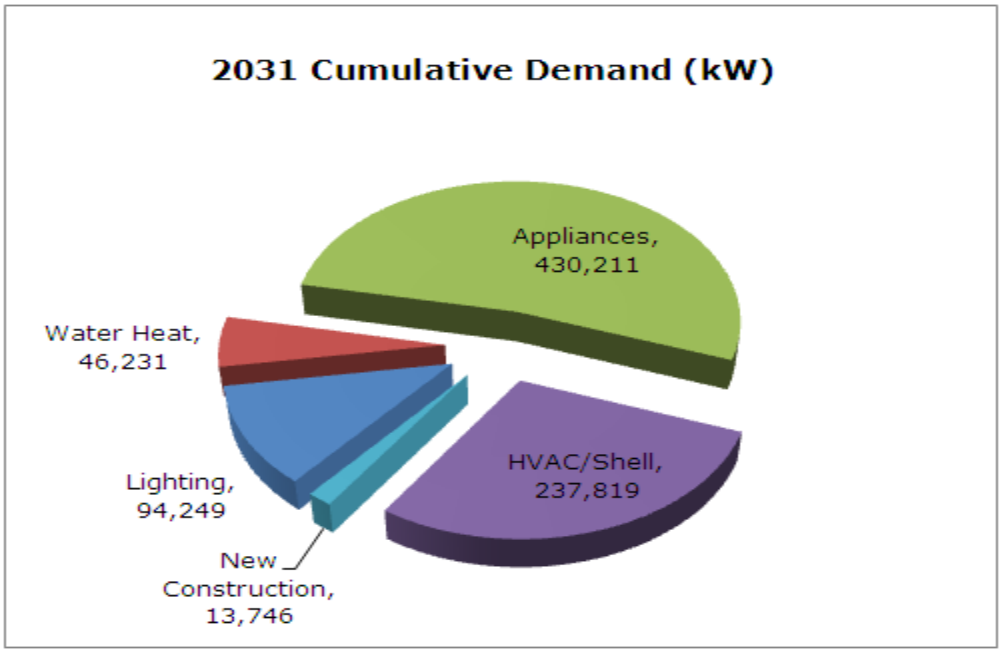


Figure 29. Residential Economic Potential Summer Peak Demand Savings at Meter – 2031 by End Use



A.5.4. Commercial and Industrial EE/PDR Potential Results

This section provides the EE/PDR potential results for the non-residential sector. The total and annual incremental non-residential achievable EE/PDR potential results for the twenty years (2012 to 2031) are shown in Table 40 through Table 47. The energy values shown are for the EE/PDR measures' first-year at meter energy savings, the incremental demand savings are the summer peak demand savings, and the program costs are the total estimated EE/PDR program budgets for a given year, including rebate or other customer incentive costs, as well as administrative and implementation costs.

The total twenty-year estimated non-residential base case market potential in 2031 is about 7,116 GWh in cumulative annual savings at meter and about 1,296 MW of cumulative annual summer peak demand. The annual incremental energy savings at meter starts at 0.9 percent, and peaks out in 2020 at about 1.5 percent of AEP Ohio's forecast annual non-residential energy sales (annual impacts begin to decline slowly thereafter as markets are saturated). Savings are predominantly from lighting, and HVAC and shell, followed by refrigeration, plug load, motors, cooking, and hot water measures. These results assume a net-to-gross impact ratio of 1.0, whereby free ridership is assumed for this analysis to be offset by spillover impacts.

The base case market potential projects savings for 2012 to 2014 are consistent with meeting the requirements of SB 221. However, to meet the full SB 221 requirements through 2025 of 22.2 percent cumulative energy savings, AEP Ohio would need to meet the projected savings in the high case market potential scenario.

Table 40. Base Case Scenario: 2012 – 2031 Commercial and Industrial Cumulative Annual Savings at Meter

Non-Residential Cumulative Market Potential																				
Energy Potential (MWh)	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Lighting	211,609	434,569	661,067	888,269	1,144,344	1,457,925	1,842,051	2,244,949	2,616,632	2,957,332	3,270,652	3,559,763	3,804,719	4,030,977	4,224,825	4,389,383	4,534,737	4,666,097	4,785,861	4,895,913
Motors	3,495	7,238	11,055	14,729	18,402	22,093	25,933	30,364	36,542	46,285	61,183	80,420	101,130	119,961	137,099	152,718	166,945	179,933	191,780	202,590
Refrigeration	13,981	28,851	43,896	58,247	72,439	86,461	100,612	116,084	136,036	165,234	207,812	261,603	315,746	365,879	412,126	454,868	494,387	531,066	565,137	596,042
Water Heat	502	1,044	1,606	2,089	2,609	3,220	4,049	5,327	7,278	9,866	12,748	15,470	18,082	20,566	22,935	25,202	27,374	29,462	31,473	33,414
HVAC/Shell	40,764	82,527	123,286	161,103	198,322	236,638	279,998	335,243	407,476	487,727	562,764	620,781	670,079	705,755	734,079	757,796	777,655	794,685	809,056	821,330
Plug Load	8,298	17,181	26,234	34,942	43,639	52,364	61,412	71,798	86,163	108,657	142,902	187,022	234,266	277,231	316,341	351,997	384,479	414,141	441,206	465,910
Cooking/Other	1,594	3,318	5,095	6,824	8,566	10,323	12,135	14,168	16,871	20,971	27,221	35,605	44,886	54,142	63,340	72,528	81,704	90,880	99,465	100,776
Total	**280,244**	**574,728**	**872,240**	**1,166,203**	**1,488,321**	**1,869,026**	**2,326,190**	**2,817,933**	**3,306,999**	**3,796,071**	**4,285,282**	**4,760,665**	**5,188,908**	**5,574,513**	**5,910,744**	**6,204,491**	**6,467,281**	**6,706,265**	**6,923,978**	**7,115,974**
Percent of Sector Forecast	0.86%	1.74%	2.64%	3.54%	4.53%	5.69%	7.08%	8.62%	10.20%	11.76%	13.32%	14.82%	16.15%	17.33%	18.33%	19.17%	19.93%	20.57%	21.17%	21.68%
Demand Potential (KW)	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Lighting	40,753	83,719	127,421	171,213	220,456	280,632	354,168	430,645	500,815	564,970	623,824	677,998	723,654	765,708	802,012	832,935	860,283	885,008	907,535	928,207
Motors	1,574	3,260	4,979	6,633	8,288	9,950	11,679	13,675	16,457	20,845	27,554	36,218	45,545	54,025	61,743	68,778	75,185	81,034	86,369	91,238
Refrigeration	904	1,865	2,836	3,762	4,676	5,580	6,492	7,491	8,783	10,683	13,462	16,977	20,504	23,783	26,809	29,602	32,178	34,561	36,766	38,781
Water Heat	6	12	18	22	27	32	39	51	68	92	120	148	176	205	234	263	292	321	350	380
HVAC/Shell	11,425	22,989	34,128	44,316	54,179	64,113	75,027	88,495	105,512	123,804	140,935	154,160	165,463	172,884	178,485	183,097	186,889	190,118	192,784	195,023
Plug Load	563	1,165	1,780	2,372	2,963	3,557	4,175	4,889	5,884	7,452	9,851	12,948	16,283	19,315	22,074	24,589	26,879	28,971	30,878	32,619
Cooking/Other	155	323	497	665	835	1,007	1,184	1,382	1,647	2,048	2,660	3,482	4,392	5,300	6,203	7,105	8,006	8,907	9,752	9,880
Total	**55,379**	**113,334**	**171,659**	**228,983**	**291,424**	**364,871**	**452,764**	**546,627**	**639,166**	**729,894**	**818,406**	**901,931**	**976,017**	**1,041,221**	**1,097,560**	**1,146,370**	**1,189,713**	**1,228,921**	**1,264,434**	**1,296,127**
Percent of Sector Forecast	1.00%	2.00%	3.03%	4.05%	5.18%	6.48%	8.04%	9.76%	11.54%	13.23%	14.89%	16.43%	18.11%	19.24%	20.23%	21.07%	21.82%	22.40%	22.95%	23.43%

Table 41. Base Case Scenario: 2012 – 2031 Commercial and Industrial Incremental Annual Savings at Meter

Non-Residential Incremental Market Potential																				
Energy Potential (MWh)	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Lighting	211,609	222,960	227,093	227,722	256,365	313,582	384,125	402,898	371,684	340,700	313,320	289,111	244,956	226,258	193,848	164,559	145,354	131,360	119,764	110,052
Motors	3,495	3,743	3,817	3,674	3,673	3,691	3,839	4,432	6,178	9,742	14,899	19,237	20,710	18,831	17,137	15,620	14,226	12,988	11,847	10,811
Refrigeration	13,981	14,869	15,045	14,351	14,192	14,023	14,151	15,472	19,952	29,198	42,578	53,791	54,143	50,133	46,247	42,741	39,519	36,679	34,071	30,905
Water Heat	502	542	562	483	520	611	830	1,278	1,981	2,617	2,912	2,755	2,612	2,484	2,369	2,267	2,172	2,089	2,011	1,940
HVAC/Shell	40,764	41,763	40,759	37,818	37,219	38,316	43,360	55,245	72,233	80,252	75,037	58,017	49,297	35,677	28,323	23,717	19,860	17,030	14,371	12,273
Plug Load	8,298	8,883	9,054	8,707	8,697	8,726	9,048	10,386	14,365	22,493	34,245	44,121	47,243	42,966	39,110	35,655	32,482	29,662	27,064	24,705
Cooking/Other	1,594	1,724	1,777	1,729	1,742	1,757	1,812	2,033	2,703	4,100	6,250	8,384	9,282	9,256	9,197	9,188	9,176	9,176	8,585	1,311
Total	**280,244**	**294,484**	**298,108**	**294,483**	**322,407**	**380,705**	**457,165**	**491,743**	**489,095**	**489,102**	**489,240**	**475,416**	**428,243**	**385,605**	**336,232**	**293,747**	**262,790**	**238,983**	**217,713**	**191,996**
Percent of Sector Forecast	0.86%	0.89%	0.90%	0.89%	0.98%	1.16%	1.39%	1.50%	1.51%	1.52%	1.52%	1.48%	1.33%	1.20%	1.04%	0.91%	0.81%	0.73%	0.67%	0.58%
Demand Potential (KW)	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Lighting	40,753	42,967	43,781	43,863	49,284	60,176	73,536	76,476	70,171	64,155	58,854	54,174	45,656	42,054	36,303	30,923	27,349	24,725	22,527	20,673
Motors	1,574	1,686	1,719	1,655	1,654	1,662	1,729	1,996	2,782	4,388	6,710	8,664	9,327	8,481	7,718	7,035	6,407	5,849	5,335	4,869
Refrigeration	904	961	971	926	915	903	912	999	1,293	1,900	2,779	3,515	3,527	3,279	3,027	2,793	2,576	2,383	2,205	2,015
Water Heat	6	6	6	4	5	5	7	11	18	25	29	29	29	29	29	29	29	29	29	29
HVAC/Shell	11,425	11,565	11,139	10,188	9,863	9,934	10,914	13,468	17,017	18,293	17,130	13,225	11,302	7,422	5,601	4,612	3,791	3,230	2,665	2,239
Plug Load	563	603	615	592	591	594	618	714	995	1,569	2,399	3,097	3,334	3,032	2,759	2,515	2,291	2,091	1,907	1,741
Cooking/Other	155	168	173	169	170	171	177	199	264	401	612	822	910	908	903	902	901	901	844	128
Total	**55,379**	**57,955**	**58,405**	**57,396**	**62,481**	**73,447**	**87,894**	**93,862**	**92,540**	**90,729**	**88,512**	**83,526**	**74,086**	**65,204**	**56,340**	**48,809**	**43,344**	**39,208**	**35,513**	**31,693**
Percent of Sector Forecast	1.00%	1.02%	1.03%	1.02%	1.11%	1.30%	1.56%	1.68%	1.67%	1.64%	1.61%	1.52%	1.37%	1.21%	1.04%	0.90%	0.79%	0.71%	0.64%	0.57%

Table 42. Base Case Scenario: 2012 – 2031 Commercial and Industrial Incremental Market Potential Costs

Non-Residential - Administative ($) by End-Use																				
Administative ($)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Lighting	$7,007,917	$7,440,465	$7,683,194	$7,772,370	$9,050,309	$11,132,181	$19,170,984	$20,083,243	$19,518,794	$19,077,344	$18,739,604	$18,341,570	$18,250,786	$19,643,328	$21,108,826	$20,985,575	$20,717,436	$19,564,214	$18,567,114	$17,742,668
Motors	$89,752	$96,122	$98,029	$94,344	$94,325	$94,785	$98,591	$113,811	$158,641	$250,186	$382,595	$494,017	$531,827	$573,908	$530,420	$490,869	$461,457	$431,557	$398,572	$371,942
Refrigeration	$510,458	$545,019	$553,835	$550,663	$546,863	$542,263	$549,404	$598,450	$918,256	$1,255,629	$1,807,281	$2,251,960	$2,291,102	$2,460,145	$2,365,562	$2,284,912	$2,239,538	$2,193,927	$2,162,831	$2,173,418
Water Heat	$20,594	$22,284	$23,128	$21,076	$22,740	$26,816	$36,525	$56,494	$92,237	$121,582	$136,437	$131,411	$127,487	$136,630	$132,793	$129,785	$129,195	$130,192	$132,903	$137,258
HVAC/Shell	$1,056,748	$1,090,046	$1,071,712	$1,002,001	$993,735	$1,031,658	$1,177,974	$1,513,499	$2,231,073	$2,462,961	$2,319,598	$1,912,675	$1,675,126	$1,589,393	$1,391,899	$1,285,344	$1,265,232	$1,330,820	$2,011,305	$2,087,377
Plug Load	$217,321	$232,663	$237,178	$228,138	$227,907	$228,665	$419,215	$454,171	$556,962	$782,242	$1,093,490	$1,345,045	$1,427,286	$1,354,482	$1,262,622	$1,203,785	$1,214,701	$1,327,080	$1,525,265	$1,688,677
Cooking/Other	$41,419	$44,809	$47,655	$48,031	$48,372	$48,811	$50,367	$56,022	$73,267	$109,380	$202,998	$258,332	$282,167	$286,228	$288,575	$289,620	$290,833	$290,397	$275,776	$93,638
Total Non-Residential	**$8,944,210**	**$9,471,408**	**$9,714,731**	**$9,716,623**	**$10,984,251**	**$13,105,179**	**$21,503,061**	**$22,875,690**	**$23,549,230**	**$24,059,325**	**$24,682,003**	**$24,735,010**	**$24,585,780**	**$26,044,112**	**$27,080,696**	**$26,669,891**	**$26,318,392**	**$25,268,186**	**$25,073,766**	**$24,294,979**
Non-Residential - Incentive ($) by End-Use																				
Incentive ($)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Lighting	$15,002,069	$15,838,087	$16,176,203	$16,231,812	$18,658,770	$22,743,696	$39,011,361	$40,424,628	$38,263,876	$36,564,113	$34,925,608	$33,479,847	$31,558,364	$33,911,244	$36,888,142	$36,746,715	$36,260,851	$33,094,345	$30,286,395	$28,056,272
Motors	$413,897	$443,275	$452,070	$435,074	$434,990	$437,112	$454,660	$524,851	$731,586	$1,153,757	$1,764,373	$2,278,203	$2,452,569	$2,646,626	$2,446,078	$2,263,689	$2,128,049	$1,990,163	$1,838,051	$1,715,246
Refrigeration	$1,101,615	$1,171,097	$1,184,405	$1,161,894	$1,148,594	$1,133,956	$1,144,225	$1,244,926	$2,179,975	$2,883,355	$3,979,622	$4,851,597	$4,806,957	$4,885,695	$4,596,745	$4,346,514	$4,177,375	$4,067,724	$4,074,548	$4,262,488
Water Heat	$42,369	$45,809	$47,501	$40,209	$43,316	$50,990	$69,296	$106,863	$175,669	$229,435	$254,958	$243,354	$234,460	$248,199	$239,629	$232,977	$231,456	$233,997	$241,029	$251,192
HVAC/Shell	$4,780,434	$4,864,165	$4,711,449	$4,335,699	$4,227,360	$4,298,997	$4,786,627	$5,993,060	$7,996,187	$8,704,987	$8,117,369	$6,626,841	$5,710,231	$5,013,117	$4,212,020	$3,742,255	$3,461,701	$3,327,595	$7,124,851	$7,072,275
Plug Load	$274,374	$293,712	$299,378	$287,934	$287,618	$288,564	$532,629	$576,860	$706,859	$991,972	$1,385,412	$1,702,617	$1,806,064	$1,709,232	$1,592,076	$1,517,201	$1,531,393	$1,675,773	$1,930,381	$2,140,247
Cooking/Other	$98,647	$106,806	$111,715	$109,266	$110,117	$110,963	$114,000	$126,352	$164,687	$244,699	$463,747	$586,932	$632,336	$641,697	$643,920	$643,165	$644,723	$645,564	$513,655	$184,815
Total Non-Residential	**$21,713,406**	**$22,762,952**	**$22,982,721**	**$22,601,889**	**$24,910,764**	**$29,064,279**	**$46,112,799**	**$48,997,539**	**$50,218,838**	**$50,772,319**	**$50,891,089**	**$49,769,391**	**$47,200,981**	**$49,055,810**	**$50,618,609**	**$49,492,516**	**$48,435,547**	**$45,035,161**	**$46,008,909**	**$43,682,535**
Non-Residential - Administative ($) + Incentive ($) by End-Use																				
Administative ($) + Incentive ($)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Lighting	$22,009,986	$23,278,553	$23,859,397	$24,004,183	$27,709,078	$33,875,877	$58,182,345	$60,507,872	$57,782,670	$55,641,458	$53,665,212	$51,821,416	$49,809,150	$53,554,571	$57,996,968	$57,732,289	$56,978,287	$52,658,559	$48,853,509	$45,798,940
Motors	$503,649	$539,397	$550,099	$529,418	$529,315	$531,897	$553,251	$638,662	$890,227	$1,403,944	$2,146,969	$2,772,220	$2,984,396	$3,220,534	$2,976,497	$2,754,559	$2,589,505	$2,421,719	$2,236,623	$2,087,188
Refrigeration	$1,612,074	$1,716,116	$1,738,239	$1,712,557	$1,695,457	$1,676,219	$1,693,630	$1,843,375	$3,098,231	$4,138,985	$5,786,902	$7,103,556	$7,098,059	$7,345,840	$6,962,307	$6,631,427	$6,416,913	$6,261,651	$6,237,379	$6,435,906
Water Heat	$62,964	$68,092	$70,628	$61,285	$66,056	$77,806	$105,821	$163,356	$267,906	$351,017	$391,395	$374,765	$361,947	$384,829	$372,422	$362,762	$360,651	$364,188	$373,932	$388,450
HVAC/Shell	$5,837,182	$5,954,211	$5,783,162	$5,337,700	$5,221,095	$5,330,655	$5,964,601	$7,506,558	$10,227,260	$11,167,948	$10,436,967	$8,539,516	$7,385,357	$6,602,510	$5,603,919	$5,027,599	$4,726,933	$4,658,415	$9,136,156	$9,159,652
Plug Load	$491,696	$526,375	$536,556	$516,072	$515,525	$517,229	$951,845	$1,031,031	$1,263,821	$1,774,214	$2,478,902	$3,047,662	$3,233,350	$3,063,714	$2,854,697	$2,720,986	$2,746,094	$3,002,854	$3,455,646	$3,828,924
Cooking/Other	$140,065	$151,615	$159,370	$157,297	$158,489	$159,775	$164,367	$182,374	$237,954	$354,079	$666,745	$845,265	$914,503	$927,925	$932,495	$932,785	$935,556	$935,961	$789,430	$278,453
Total Non-Residential	**$30,657,616**	**$32,234,360**	**$32,697,452**	**$32,318,512**	**$35,895,016**	**$42,169,458**	**$67,615,860**	**$71,873,229**	**$73,768,069**	**$74,831,644**	**$75,573,092**	**$74,504,401**	**$71,786,761**	**$75,099,923**	**$77,699,305**	**$76,162,406**	**$74,753,939**	**$70,303,347**	**$71,082,675**	**$67,977,513**

Table 43. Commercial & Industrial Technical Potential Scenario: 2012 – 2031 Savings at Meter

Non-Residential Technical Potential

Energy Potential (MWh)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Lighting	8,429,282	8,455,112	8,445,615	8,445,615	8,445,615	8,445,615	8,445,959	8,445,959	8,445,959	8,445,959	8,445,959	8,445,959	8,446,271	8,452,041	8,461,743	8,477,592	8,488,987	8,508,447	8,523,184	8,537,947
Motors	308,439	309,748	309,849	309,849	309,849	309,849	309,862	309,862	309,862	309,862	309,862	309,862	309,873	310,085	310,441	311,022	311,441	312,154	312,695	313,237
Refrigeration	992,707	996,922	997,247	997,247	997,247	997,247	997,287	997,287	997,287	997,287	997,287	997,287	997,324	998,005	999,151	1,001,022	1,002,368	1,004,666	1,006,406	1,008,149
Water Heat	53,675	53,903	53,920	51,297	51,297	51,297	51,299	51,299	51,299	51,299	51,299	51,299	51,301	51,336	51,395	51,491	51,561	51,679	51,768	51,858
HVAC/Shell	1,291,578	1,297,062	1,297,482	1,297,482	1,297,482	1,297,482	1,297,535	1,297,535	1,297,535	1,297,535	1,297,535	1,297,535	1,297,583	1,298,469	1,299,960	1,302,395	1,304,145	1,307,135	1,309,399	1,311,667
Plug Load	791,002	794,361	794,619	794,619	794,619	794,619	794,652	794,652	794,652	794,652	794,652	794,652	794,681	795,224	796,137	797,628	798,700	800,531	801,917	803,306
Cooking/Other	102,767	103,204	103,237	103,237	103,237	103,237	103,241	103,241	103,241	103,241	103,241	103,241	103,245	103,316	103,434	103,628	103,767	104,005	104,185	104,366
TOTAL	**11,969,450**	**12,010,311**	**12,001,970**	**11,999,347**	**11,999,347**	**11,999,347**	**11,999,835**	**11,999,835**	**11,999,835**	**11,999,835**	**11,999,835**	**11,999,835**	**12,000,278**	**12,008,476**	**12,022,260**	**12,044,779**	**12,060,969**	**12,088,617**	**12,109,555**	**12,130,530**
Percent of Sector Forecast	36.59%	36.40%	36.35%	36.42%	36.49%	36.51%	36.51%	36.69%	37.01%	37.18%	37.29%	37.36%	37.36%	37.33%	37.29%	37.22%	37.17%	37.08%	37.02%	36.95%
Demand Potential (KW)	2,012	2,013	2,014	2,015	2,016	2,017	2,018	2,019	2,020	2,021	2,022	2,023	2,024	2,025	2,026	2,027	2,028	2,029	2,030	2,031
Lighting	1,551,313	1,556,547	1,555,340	1,555,340	1,555,340	1,555,340	1,555,403	1,555,403	1,555,403	1,555,403	1,555,403	1,555,403	1,555,461	1,556,523	1,558,310	1,561,229	1,563,327	1,566,911	1,569,625	1,572,344
Motors	138,908	139,498	139,543	139,543	139,543	139,543	139,549	139,549	139,549	139,549	139,549	139,549	139,554	139,649	139,810	140,071	140,260	140,581	140,825	141,069
Refrigeration	65,750	66,029	66,051	66,051	66,051	66,051	66,053	66,053	66,053	66,053	66,053	66,053	66,056	66,101	66,177	66,301	66,390	66,542	66,657	66,773
Water Heat	490	492	492	415	415	415	415	415	415	415	415	415	415	416	416	417	418	419	419	420
HVAC/Shell	228,646	229,617	229,690	229,690	229,690	229,690	229,699	229,699	229,699	229,699	229,699	229,699	229,708	229,865	230,128	230,560	230,869	231,399	231,799	232,201
Plug Load	54,466	54,698	54,715	54,715	54,715	54,715	54,718	54,718	54,718	54,718	54,718	54,718	54,720	54,757	54,820	54,922	54,996	55,122	55,218	55,314
Cooking/Other	10,058	10,100	10,104	10,104	10,104	10,104	10,104	10,104	10,104	10,104	10,104	10,104	10,104	10,111	10,123	10,142	10,156	10,179	10,196	10,214
TOTAL	**2,049,630**	**2,056,980**	**2,055,935**	**2,055,858**	**2,055,858**	**2,055,858**	**2,055,942**	**2,055,942**	**2,055,942**	**2,055,942**	**2,055,942**	**2,055,942**	**2,056,017**	**2,057,422**	**2,059,784**	**2,063,642**	**2,066,416**	**2,071,153**	**2,074,740**	**2,078,334**
Percent of Sector Forecast	37.02%	36.35%	36.30%	36.37%	36.55%	36.49%	36.51%	36.71%	37.12%	37.27%	37.42%	37.44%	38.15%	38.03%	37.96%	37.93%	37.90%	37.76%	37.66%	37.57%

Table 44. Commercial & Industrial Economic Potential Scenario: 2021 – 2031 Savings at Meter

Non-Residential Economic Potential

Energy Potential (MWh)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Lighting	6,578,709	6,596,682	6,588,253	6,588,253	6,588,253	6,588,253	6,588,521	6,588,521	6,588,521	6,588,521	6,588,521	6,588,521	6,588,764	6,593,265	6,600,833	6,613,197	6,622,086	6,637,266	6,648,763	6,660,279
Motors	308,439	309,748	309,849	309,849	309,849	309,849	309,862	309,862	309,862	309,862	309,862	309,862	309,873	310,085	310,441	311,022	311,441	312,154	312,695	313,237
Refrigeration	939,217	943,205	943,512	943,512	943,512	943,512	943,550	943,550	943,550	943,550	943,550	943,550	943,585	944,230	945,314	947,084	948,357	950,531	952,178	953,827
Water Heat	53,675	53,903	53,920	51,297	51,297	51,297	51,299	51,299	51,299	51,299	51,299	51,299	51,301	51,336	51,395	51,491	51,561	51,679	51,768	51,858
HVAC/Shell	920,248	924,155	924,454	924,454	924,454	924,454	924,491	924,491	924,491	924,491	924,491	924,491	924,526	925,157	926,219	927,954	929,201	931,331	932,944	934,560
Plug Load	711,237	714,257	714,489	714,489	714,489	714,489	714,518	714,518	714,518	714,518	714,518	714,518	714,545	715,033	715,854	717,195	718,159	719,805	721,052	722,301
Cooking/Other	102,767	103,204	103,237	103,237	103,237	103,237	103,241	103,241	103,241	103,241	103,241	103,241	103,245	103,316	103,434	103,628	103,767	104,005	104,185	104,366
TOTAL	**9,614,292**	**9,645,153**	**9,637,714**	**9,635,091**	**9,635,091**	**9,635,091**	**9,635,484**	**9,635,484**	**9,635,484**	**9,635,484**	**9,635,484**	**9,635,484**	**9,635,839**	**9,642,422**	**9,653,490**	**9,671,572**	**9,684,572**	**9,706,772**	**9,723,585**	**9,740,427**
Percent of Sector Forecast	29.39%	29.23%	29.19%	29.24%	29.30%	29.32%	29.32%	29.46%	29.71%	29.85%	29.95%	30.00%	30.00%	29.98%	29.94%	29.89%	29.85%	29.78%	29.72%	29.67%
Demand Potential (KW)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Lighting	1,236,732	1,240,631	1,239,576	1,239,576	1,239,576	1,239,576	1,239,626	1,239,626	1,239,626	1,239,626	1,239,626	1,239,626	1,239,672	1,240,519	1,241,943	1,244,269	1,245,941	1,248,798	1,250,961	1,253,127
Motors	138,908	139,498	139,543	139,543	139,543	139,543	139,549	139,549	139,549	139,549	139,549	139,549	139,554	139,649	139,810	140,071	140,260	140,581	140,825	141,069
Refrigeration	64,233	64,506	64,527	64,527	64,527	64,527	64,529	64,529	64,529	64,529	64,529	64,529	64,532	64,576	64,650	64,771	64,858	65,007	65,119	65,232
Water Heat	490	492	492	415	415	415	415	415	415	415	415	415	415	416	416	417	418	419	419	420
HVAC/Shell	212,814	213,718	213,786	213,786	213,786	213,786	213,794	213,794	213,794	213,794	213,794	213,794	213,802	213,948	214,194	214,595	214,883	215,376	215,749	216,123
Plug Load	49,661	49,872	49,888	49,888	49,888	49,888	49,890	49,890	49,890	49,890	49,890	49,890	49,892	49,926	49,984	50,077	50,144	50,259	50,346	50,434
Cooking/Other	10,058	10,100	10,104	10,104	10,104	10,104	10,104	10,104	10,104	10,104	10,104	10,104	10,104	10,111	10,123	10,142	10,156	10,179	10,196	10,214
TOTAL	**1,712,896**	**1,718,816**	**1,717,915**	**1,717,838**	**1,717,838**	**1,717,838**	**1,717,908**	**1,717,908**	**1,717,908**	**1,717,908**	**1,717,908**	**1,717,908**	**1,717,972**	**1,719,145**	**1,721,119**	**1,724,342**	**1,726,660**	**1,730,618**	**1,733,616**	**1,736,619**
Percent of Sector Forecast	30.94%	30.37%	30.33%	30.39%	30.54%	30.49%	30.51%	30.68%	31.01%	31.14%	31.27%	31.29%	31.88%	31.77%	31.72%	31.69%	31.67%	31.55%	31.47%	31.39%

Table 45. High Case Scenario: 2012 – 2031 Commercial & Industrial Cumulative Annual Savings at Meter

Non-Residential Cumulative Market Potential																				
Energy Potential (MWh)	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Lighting	325,984	656,380	983,916	1,309,813	1,671,005	2,107,352	2,633,691	3,172,359	3,652,487	4,045,354	4,392,908	4,676,261	4,895,116	5,077,183	5,235,237	5,374,610	5,497,234	5,606,609	5,703,850	5,790,717
Motors	5,768	11,747	17,738	23,517	29,250	34,996	40,984	47,905	57,452	72,284	94,413	121,857	149,766	173,485	193,670	210,890	225,568	238,134	248,880	258,084
Refrigeration	24,736	49,958	74,869	98,627	121,838	144,634	167,637	192,777	224,765	270,799	336,266	415,828	491,963	558,717	617,205	666,396	703,006	734,663	762,044	785,793
Water Heat	919	1,877	2,851	3,727	4,664	5,768	7,278	9,613	13,149	17,719	22,627	27,104	31,267	35,117	38,702	40,272	41,644	42,848	43,906	44,836
HVAC/Shell	67,396	132,140	192,479	247,244	299,665	352,657	412,045	486,773	581,089	660,576	721,577	765,060	796,220	818,828	835,484	848,073	857,636	865,244	871,308	876,250
Plug Load	13,733	27,955	42,191	55,910	69,504	83,100	97,223	113,453	135,658	169,902	220,754	283,672	347,305	401,410	447,475	486,793	520,327	549,053	573,637	594,704
Cooking/Other	2,631	5,405	8,234	11,011	13,809	16,642	19,593	22,934	27,374	34,106	44,359	58,096	73,221	88,287	102,351	102,643	102,893	103,109	103,295	103,456
Total	**441,168**	**885,461**	**1,322,277**	**1,749,849**	**2,209,736**	**2,745,150**	**3,378,450**	**4,045,814**	**4,691,974**	**5,270,739**	**5,832,903**	**6,347,878**	**6,784,857**	**7,153,026**	**7,470,123**	**7,729,677**	**7,948,309**	**8,139,660**	**8,306,921**	**8,453,840**
Percent of Sector Forecast	1.35%	2.68%	4.01%	5.31%	6.72%	8.35%	10.28%	12.37%	14.47%	16.33%	18.13%	19.76%	21.12%	22.24%	23.17%	23.89%	24.49%	24.97%	25.39%	25.75%
Demand Potential (KW)	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Lighting	62,695	126,265	189,324	251,979	321,195	404,498	504,539	605,774	695,317	768,052	832,110	884,753	925,436	959,438	988,940	1,014,915	1,037,751	1,058,102	1,076,173	1,092,290
Motors	2,598	5,290	7,988	10,591	13,173	15,761	18,457	21,574	25,874	32,554	42,519	54,879	67,448	78,130	87,221	94,976	101,586	107,245	112,085	116,230
Refrigeration	1,613	3,254	4,874	6,418	7,925	9,404	10,900	12,541	14,644	17,695	22,059	27,374	32,459	36,924	40,823	44,150	46,818	49,132	51,137	52,879
Water Heat	9	19	29	37	45	54	67	88	119	163	214	265	317	369	421	421	421	421	421	421
HVAC/Shell	18,852	36,595	52,785	67,170	80,643	93,927	108,379	126,050	147,746	164,274	176,308	184,633	190,388	194,397	197,222	199,266	200,742	201,877	202,747	203,434
Plug Load	929	1,891	2,856	3,786	4,710	5,635	6,599	7,713	9,250	11,638	15,201	19,620	24,114	27,932	31,182	33,955	36,318	38,341	40,072	41,554
Cooking/Other	256	527	803	1,074	1,347	1,623	1,911	2,238	2,672	3,332	4,336	5,683	7,169	8,648	10,032	10,060	10,083	10,104	10,122	10,137
Total	**86,951**	**173,843**	**258,659**	**341,054**	**429,037**	**530,902**	**650,853**	**775,979**	**895,624**	**997,708**	**1,092,747**	**1,177,207**	**1,247,330**	**1,305,840**	**1,355,842**	**1,397,743**	**1,433,721**	**1,465,223**	**1,492,756**	**1,516,946**
Percent of Sector Forecast	1.57%	3.07%	4.57%	6.03%	7.63%	9.42%	11.56%	13.86%	16.17%	18.09%	19.89%	21.44%	23.15%	24.14%	24.99%	25.69%	26.30%	26.71%	27.10%	27.42%

Table 46. High Case Scenario: 2012 – 2031 Commercial & Industrial Incremental Annual Savings at Meter

Non-Residential Incremental Market Potential																				
Energy Potential (MWh)	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Lighting	325,984	330,396	328,131	326,654	361,613	436,347	526,339	538,668	480,128	392,867	347,554	283,353	218,855	182,067	158,054	139,373	122,624	109,375	97,241	86,867
Motors	5,768	5,979	5,991	5,779	5,734	5,745	5,988	6,921	9,547	14,832	22,129	27,444	27,909	23,719	20,185	17,220	14,678	12,566	10,747	9,203
Refrigeration	24,736	25,222	24,911	23,758	23,211	22,796	23,002	25,140	31,988	46,034	65,467	79,562	76,134	66,754	58,488	49,192	36,610	31,656	27,381	23,749
Water Heat	919	957	975	875	937	1,104	1,510	2,335	3,566	4,600	4,957	4,530	4,162	3,850	3,585	1,570	1,372	1,205	1,058	930
HVAC/Shell	67,396	64,744	60,339	54,765	52,421	52,992	59,388	74,728	94,315	79,487	61,001	43,483	31,160	22,608	16,656	12,590	9,563	7,608	6,064	4,942
Plug Load	13,733	14,222	14,236	13,719	13,594	13,596	14,123	16,229	22,206	34,243	50,853	62,917	63,634	54,104	46,065	39,318	33,534	28,726	24,584	21,067
Cooking/Other	2,631	2,774	2,829	2,777	2,798	2,833	2,950	3,341	4,440	6,732	10,253	13,737	15,124	15,066	14,064	292	250	216	186	161
Total	**441,168**	**444,294**	**437,412**	**428,327**	**460,308**	**535,414**	**633,299**	**667,364**	**646,190**	**578,795**	**562,213**	**515,028**	**436,979**	**368,169**	**317,097**	**259,554**	**218,632**	**191,351**	**167,261**	**146,919**
Percent of Sector Forecast	1.35%	1.35%	1.32%	1.30%	1.40%	1.63%	1.93%	2.04%	1.99%	1.79%	1.75%	1.60%	1.36%	1.14%	0.98%	0.80%	0.67%	0.59%	0.51%	0.45%
Demand Potential (KW)	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Lighting	62,695	63,571	63,138	62,760	69,275	83,303	100,041	101,235	89,543	72,735	64,057	52,643	40,683	34,002	29,502	25,975	22,836	20,351	18,071	16,118
Motors	2,598	2,693	2,698	2,603	2,582	2,588	2,697	3,117	4,299	6,680	9,966	12,360	12,569	10,682	9,091	7,755	6,610	5,659	4,840	4,145
Refrigeration	1,613	1,642	1,620	1,544	1,507	1,480	1,495	1,641	2,103	3,051	4,364	5,316	5,084	4,466	3,899	3,327	2,668	2,313	2,005	1,742
Water Heat	9	10	10	7	8	9	13	21	33	45	52	52	52	52	52	0	0	0	0	0
HVAC/Shell	18,852	17,743	16,190	14,385	13,474	13,283	14,453	17,671	21,696	16,527	12,035	8,325	5,755	4,009	2,825	2,044	1,476	1,135	870	687
Plug Load	929	963	965	930	923	925	964	1,114	1,537	2,388	3,563	4,419	4,494	3,819	3,250	2,773	2,363	2,023	1,730	1,482
Cooking/Other	256	270	276	271	273	277	288	327	434	659	1,005	1,347	1,485	1,480	1,383	28	24	21	18	15
Total	**86,951**	**86,891**	**84,896**	**82,500**	**88,041**	**101,865**	**119,951**	**125,126**	**119,646**	**102,085**	**95,041**	**84,461**	**70,123**	**58,510**	**50,002**	**41,902**	**35,977**	**31,502**	**27,534**	**24,189**
Percent of Sector Forecast	1.57%	1.54%	1.50%	1.46%	1.57%	1.81%	2.13%	2.23%	2.16%	1.85%	1.73%	1.54%	1.30%	1.08%	0.92%	0.77%	0.66%	0.57%	0.50%	0.44%

Table 47. High Case Scenario: 2012 – 2031 Commercial & Industrial Incremental Market Potential Costs

Non-Residential - Administative ($) by End-Use																				
Administative ($)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Lighting	$13,686,910	$13,851,502	$13,914,345	$14,156,377	$16,120,737	$19,799,759	$29,981,524	$31,305,699	$34,665,296	$31,980,821	$30,718,369	$28,940,799	$27,806,303	$29,065,226	$32,057,511	$32,091,579	$30,323,289	$27,451,672	$25,579,546	$23,469,847
Motors	$148,116	$153,543	$153,847	$148,406	$147,238	$147,543	$153,769	$177,740	$245,163	$380,881	$568,269	$704,766	$716,704	$699,442	$608,684	$590,317	$530,478	$476,536	$424,383	$383,572
Refrigeration	$1,216,609	$1,223,845	$1,206,273	$1,184,806	$1,163,150	$1,190,179	$1,209,798	$1,319,608	$1,801,752	$2,472,360	$3,594,026	$4,327,467	$4,233,889	$4,125,122	$3,805,941	$3,992,304	$3,609,014	$3,409,437	$3,256,057	$3,211,656
Water Heat	$54,481	$55,536	$56,075	$54,081	$57,960	$68,614	$94,724	$147,940	$230,075	$295,388	$320,018	$291,849	$268,115	$258,955	$239,886	$208,769	$196,948	$190,277	$189,133	$192,097
HVAC/Shell	$1,780,959	$1,729,535	$1,631,004	$1,498,933	$1,450,387	$1,481,025	$1,674,036	$2,119,780	$2,926,430	$2,587,192	$2,209,287	$1,718,305	$1,359,197	$1,402,395	$1,232,902	$1,373,020	$1,382,919	$1,501,280	$2,231,603	$2,278,194
Plug Load	$367,386	$379,989	$380,243	$366,757	$363,478	$363,670	$559,999	$616,217	$891,711	$1,223,112	$1,666,679	$1,979,444	$1,997,853	$1,784,981	$1,586,124	$1,488,795	$1,473,693	$1,619,778	$1,885,239	$2,066,039
Cooking/Other	$68,584	$72,288	$75,174	$75,463	$76,910	$79,155	$82,234	$92,212	$120,511	$179,765	$308,913	$399,289	$461,108	$465,282	$444,190	$92,562	$93,058	$91,187	$91,564	$99,007
Total Non-Residential	**$17,323,045**	**$17,466,239**	**$17,416,960**	**$17,484,824**	**$19,379,861**	**$23,129,945**	**$33,756,086**	**$35,779,195**	**$40,880,938**	**$39,119,518**	**$39,385,562**	**$38,361,918**	**$36,843,169**	**$37,801,402**	**$39,975,239**	**$39,837,347**	**$37,609,399**	**$34,740,167**	**$33,657,524**	**$31,700,411**
Non-Residential - Incentive ($) by End-Use																				
Incentive ($)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Lighting	$36,654,951	$37,139,328	$36,977,091	$36,955,898	$41,593,902	$50,240,998	$77,863,311	$79,539,125	$83,091,846	$71,704,440	$66,888,388	$62,141,551	$59,851,895	$63,134,871	$69,484,653	$68,691,702	$64,477,341	$56,103,418	$51,020,207	$45,261,329
Motors	$1,366,098	$1,416,158	$1,418,955	$1,368,779	$1,358,005	$1,360,819	$1,418,242	$1,639,325	$2,261,183	$3,512,931	$5,241,247	$6,500,187	$6,610,288	$6,451,076	$5,614,007	$5,444,603	$4,892,690	$4,395,174	$3,914,159	$3,537,753
Refrigeration	$4,362,437	$4,413,363	$4,344,501	$4,219,439	$4,121,135	$4,141,897	$4,183,591	$4,553,314	$6,898,670	$9,269,575	$13,534,226	$15,858,835	$15,091,162	$14,199,054	$12,785,579	$12,717,676	$11,776,442	$11,183,967	$11,013,786	$11,421,809
Water Heat	$182,109	$187,697	$190,353	$171,426	$183,584	$216,693	$297,612	$462,323	$724,509	$926,433	$1,005,322	$917,159	$846,094	$823,390	$766,944	$585,423	$557,658	$550,766	$566,424	$595,077
HVAC/Shell	$15,809,346	$15,011,340	$13,821,327	$12,391,256	$11,711,617	$11,667,940	$12,855,123	$15,904,796	$20,344,977	$17,471,927	$13,779,867	$10,154,519	$7,571,994	$7,504,764	$6,266,051	$6,623,951	$6,263,075	$6,239,571	$14,139,373	$14,188,526
Plug Load	$913,729	$945,898	$946,741	$912,620	$904,342	$904,606	$1,406,562	$1,546,653	$2,242,344	$3,070,364	$4,176,279	$4,951,775	$4,994,682	$4,451,266	$3,951,065	$3,690,501	$3,659,580	$4,041,286	$4,728,716	$5,198,277
Cooking/Other	$325,659	$343,795	$354,124	$349,076	$353,730	$358,716	$371,934	$416,230	$542,446	$805,910	$1,403,333	$1,808,290	$2,071,346	$2,091,868	$1,662,405	$373,014	$374,170	$373,828	$382,892	$423,238
Total Non-Residential	**$59,614,328**	**$59,457,580**	**$58,053,092**	**$56,368,494**	**$60,226,316**	**$68,891,670**	**$98,396,374**	**$104,061,765**	**$116,105,975**	**$106,761,580**	**$106,028,663**	**$102,332,316**	**$97,037,461**	**$98,656,289**	**$100,530,704**	**$98,126,870**	**$92,000,956**	**$82,888,009**	**$85,765,556**	**$80,626,008**
Non-Residential - Administative ($) + Incentive ($) by End-Use																				
Administative ($) + Incentive ($)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Lighting	$50,341,862	$50,990,830	$50,891,436	$51,112,275	$57,714,639	$70,040,757	$107,844,835	$110,844,824	$117,757,143	$103,685,261	$97,606,757	$91,082,350	$87,658,198	$92,200,096	$101,542,164	$100,783,280	$94,800,630	$83,555,091	$76,599,753	$68,731,175
Motors	$1,514,213	$1,569,702	$1,572,801	$1,517,185	$1,505,243	$1,508,363	$1,572,011	$1,817,065	$2,506,346	$3,893,811	$5,809,516	$7,204,953	$7,326,992	$7,150,517	$6,222,692	$6,034,921	$5,423,168	$4,871,709	$4,338,542	$3,921,325
Refrigeration	$5,579,046	$5,637,207	$5,550,774	$5,404,245	$5,284,285	$5,332,077	$5,393,389	$5,872,921	$8,700,422	$11,741,935	$17,128,251	$20,186,302	$19,325,050	$18,324,175	$16,591,520	$16,709,980	$15,385,457	$14,593,404	$14,269,842	$14,633,465
Water Heat	$236,590	$243,233	$246,428	$225,508	$241,544	$285,307	$392,336	$610,263	$954,584	$1,221,821	$1,325,340	$1,209,008	$1,114,209	$1,082,344	$1,006,830	$794,192	$754,606	$741,043	$755,557	$787,174
HVAC/Shell	$17,590,306	$16,740,876	$15,452,331	$13,890,189	$13,162,005	$13,148,965	$14,529,160	$18,024,576	$23,271,407	$20,059,119	$15,989,155	$11,872,824	$8,931,191	$8,907,160	$7,498,953	$7,996,971	$7,645,994	$7,740,851	$16,370,976	$16,466,720
Plug Load	$1,281,115	$1,325,887	$1,326,984	$1,279,376	$1,267,821	$1,268,275	$1,966,561	$2,162,870	$3,134,055	$4,293,476	$5,842,959	$6,931,219	$6,992,535	$6,236,247	$5,537,189	$5,179,296	$5,133,273	$5,661,064	$6,613,954	$7,264,316
Cooking/Other	$394,242	$416,083	$429,298	$424,539	$430,640	$437,870	$454,168	$508,442	$662,956	$985,675	$1,712,246	$2,207,579	$2,532,454	$2,557,150	$2,106,595	$465,576	$467,228	$465,015	$474,456	$522,244
Total Non-Residential	**$76,937,374**	**$76,923,819**	**$75,470,052**	**$73,853,318**	**$79,606,177**	**$92,021,615**	**$132,152,460**	**$139,840,960**	**$156,986,913**	**$145,881,098**	**$145,414,225**	**$140,694,235**	**$133,880,630**	**$136,457,690**	**$140,505,943**	**$137,964,217**	**$129,610,355**	**$117,628,177**	**$119,423,080**	**$112,326,420**

A.5.5. Commercial and Industrial Energy Efficiency Results by End Use

Figure 30 through Figure 33 show energy and peak demand savings for the first year (2012) and in year twenty (2031) for different potential scenarios. Non-residential lighting measures, primarily high performance fluorescent fixtures, account for most of the total estimated non-residential energy and demand conservation potential throughout the twenty year (2012 to 2031) forecast period.

Figure 30. Commercial and Industrial Market Potential Incremental Annual Energy Savings by End Use 2012

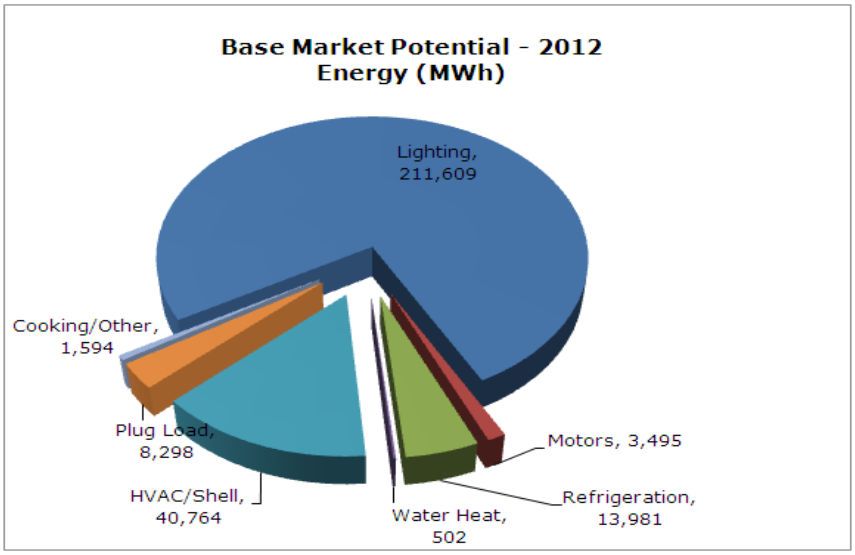


Figure 31. Commercial and Industrial Market Potential Incremental Annual Summer Peak Demand Savings by End Use 2012

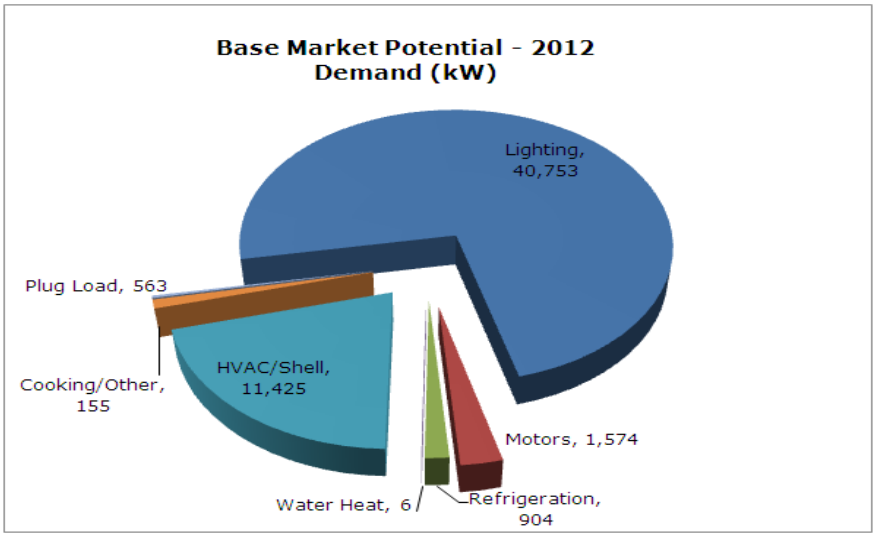


Figure 32. Commercial and Industrial Market Potential Incremental Annual Energy Savings at Meter by End Use 2031

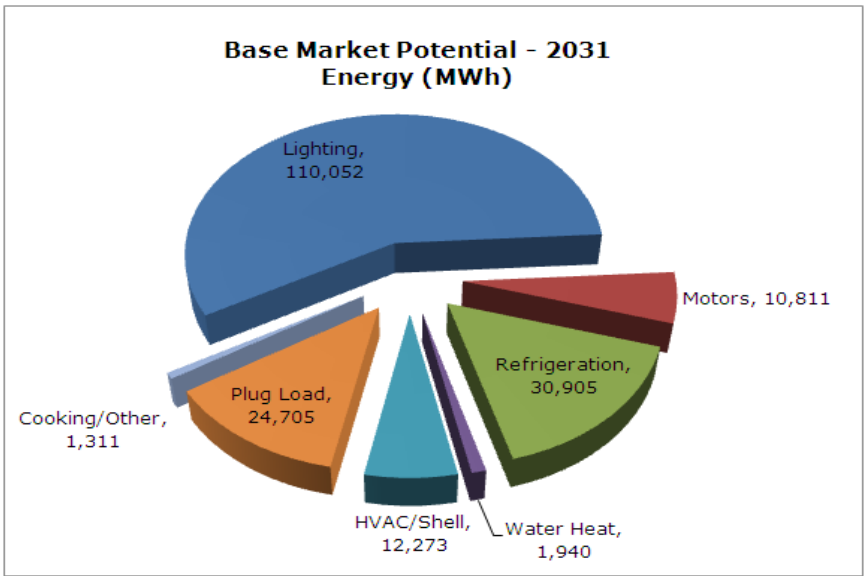


Figure 33. Commercial and Industrial Market Potential Incremental Annual Summer Peak Demand Savings at Meter by End Use 2031

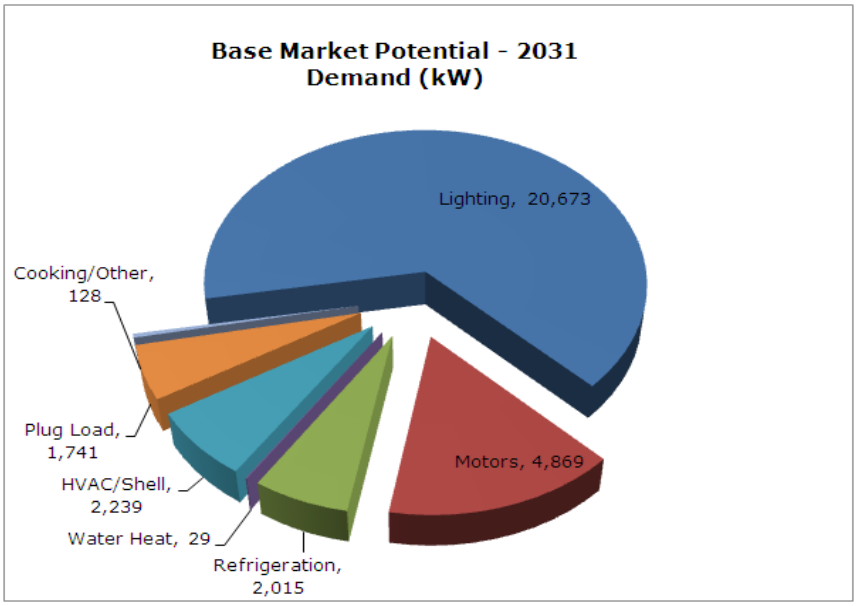


Figure 34 through Figure 39 present commercial and industrial sector results for the Base Case Market, Economic and Technical Potentials for the twenty-year period (2012 to 2031) and in year twenty (2031). In 2031, lighting measures account for most of the economic and market potential energy and demand savings.

Total technical and economic potential energy and demand savings through 2031 are projected primarily from lighting measures with the other end uses providing less savings. The end use contribution to economic potential energy savings in 2031 is projected to be mostly from lighting measures, followed by refrigeration and HVAC and shell measures. The end use contribution to economic potential peak demand savings in 2031 is projected to be predominantly from lighting measures, followed by HVAC and shell and motors measures.

Figure 34. Commercial and Industrial Cumulative Base Case Market and Economic Potential Energy Savings at Meter – 2031 by End Use

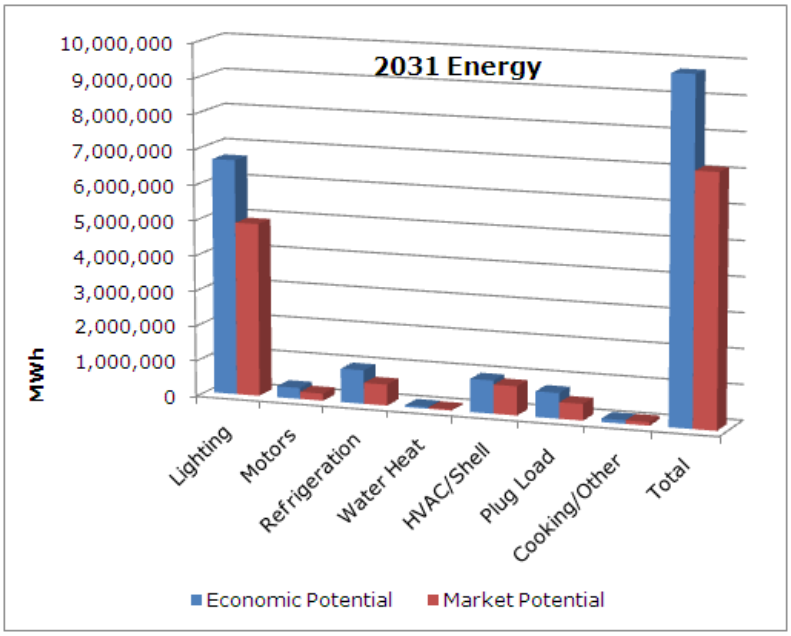


Figure 35. Commercial and Industrial Base Case Market and Economic Potential Summer Peak Demand Savings at Meter – 2031 by End Use

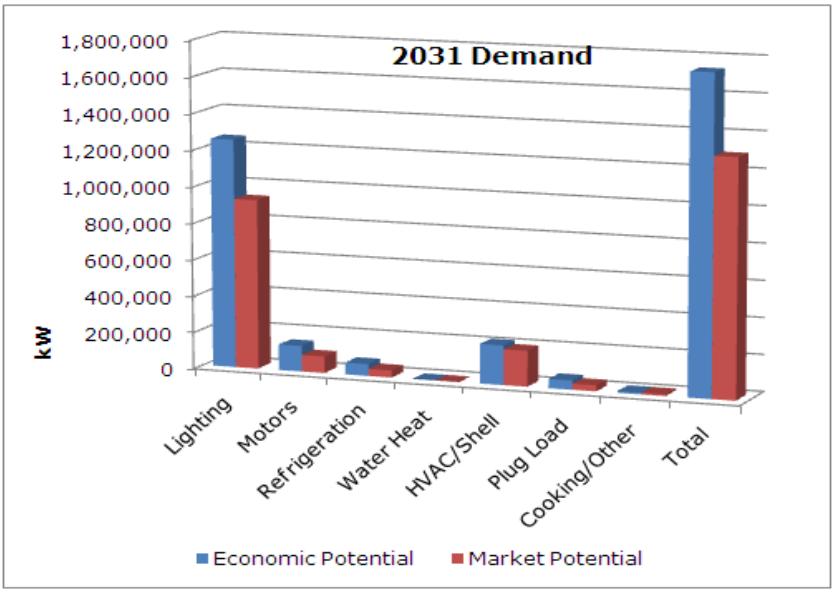


Figure 36. Commercial and Industrial Technical and Economic Potential Energy Savings at Meter – 2031 by End Use

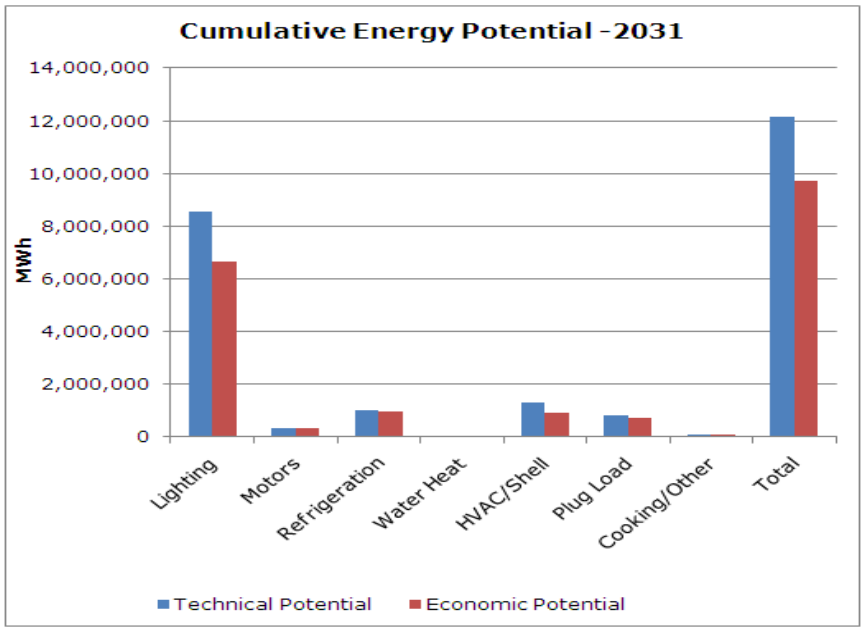


Figure 37. Commercial and Industrial Technical and Economic Potential Summer Peak Demand Savings at Meter – 2031 by End Use

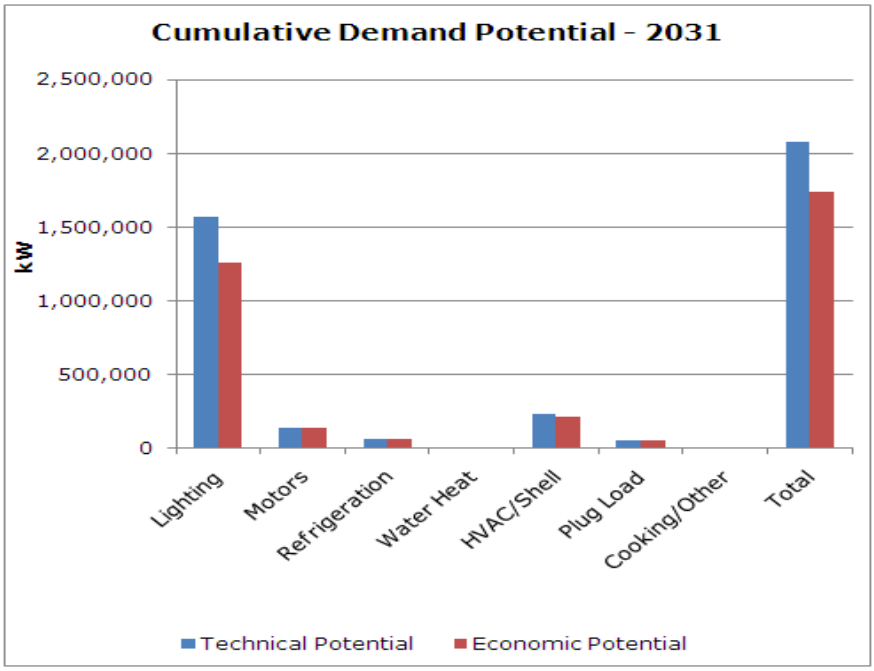


Figure 38. Commercial and Industrial Economic Potential Annual Energy Savings at Meter by End Use 2031

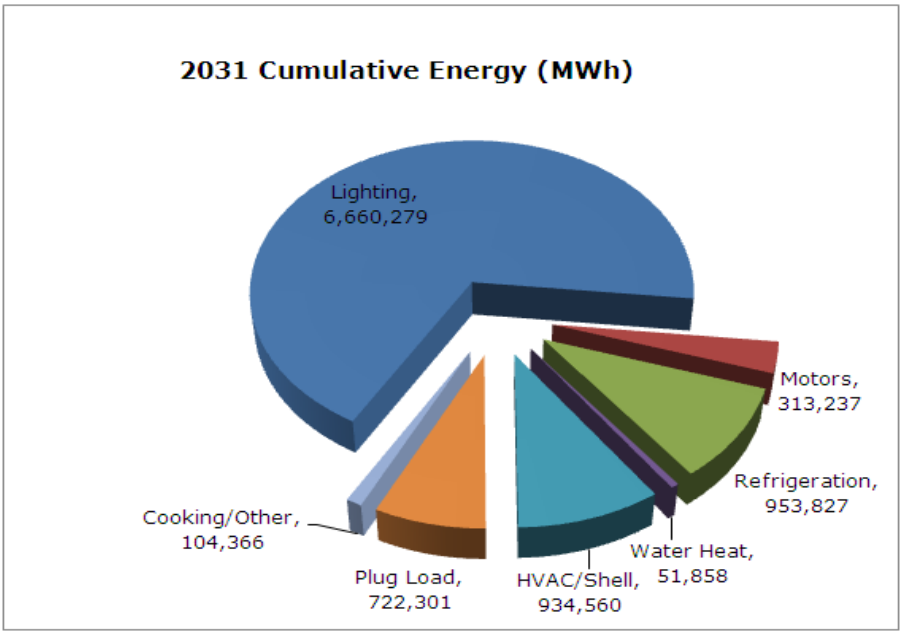
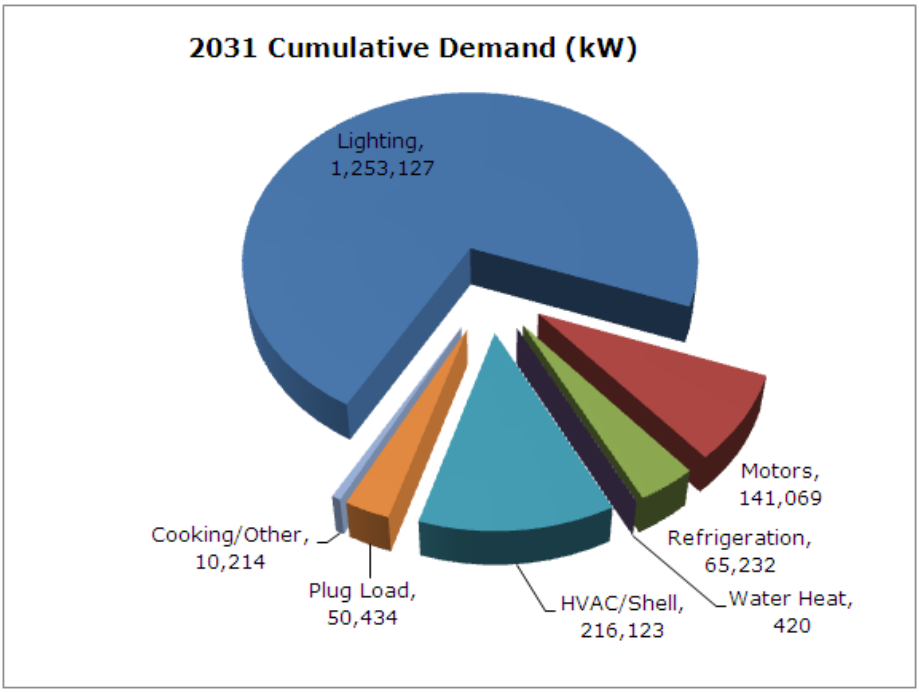


Figure 39. Commercial and Industrial Economic Potential Annual Summer Peak Demand Savings at Meter by End Use 2031



B. BENCHMARKING EE/PDR PROGRAMS PRESENTATION

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Benchmarking EE/PDR Programs

- Benchmarking Methodology and Scope
- 2009 EE/PDR Programs
- 2010 EE/PDR Programs
- References

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EE/PDR Benchmarking

- To ensure that the EE/PDR potential estimates that we develop are reasonable and appropriate, and to identify the best practices regarding EE/PDR programs, we conducted a benchmarking assessment on other utilities' EE/PDR programs, including those in neighboring Ohio states that have relatively new EE/PDR requirements and portfolios and available data.

- To identify common best practices of top performers, the analysis compares detailed program results by customer sector of those utilities identified as achieving high levels of EE/PDR savings for below-median costs.

- Navigant benchmarked EE/PDR programs from 2009 and 2010, as available.

Navigant benchmarked ten IOUs in the Midwest or neighboring Ohio states that have relatively new EE/PDR requirements and portfolios and available data.

State	Organization	2009	2010
OH	AEP	X	X
	Dayton P&L	X	X
	First Energy	X	X
IL	Ameren	X	X
	ComEd	X	X
MI	Consumers Energy	X	X
	Detroit Edison	X	X
PA	Allegheny	X	**
	First Energy	X	**
	PECO	X	**

** PA EE data will not be made public until 11/11.

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2009 and 2010 EE/PDR Benchmarking Data Collection

- EE/PDR program spending and savings results were collected from ten utilities' annual report to regulatory agency.

- Baseline sales and revenue were collected from FERC Form 861 from www.eia.doe.gov.

- EE/PDR savings and spending were normalized of the same program year baseline sales and revenue.

- Due to wide reporting variances for PDR programs, they are not included in the benchmarking. All peak demand savings shown here are from EE programs only.

EE/PDR reporting practices vary, for example, by savings attributes. Wherever possible we collected savings that are verified, at meter, and gross.

State	Organization	Savings Verified	EE GWh At meter or generator	Net or Gross
OH	AEP	Yes	Meter	Gross
	Dayton P&L	Yes	Meter	Gross
	First Energy	No	Meter	Gross
IL	Ameren 09	Yes	NS	NS
	Ameren 10	Yes	Meter	Gross
	ComEd 09	Yes	Meter	kWh Gross, kW Net
	ComEd 10	Yes	Meter	Gross
MI	Consumers Energy	Yes	Generator	Gross
	Detroit Edison	Yes	Generator	NS
PA*	Allegheny	2 of 7**	NS	Gross
	First Energy	NS	NS	Gross
	PECO	Yes	Meter	Gross

NS = not specified

* = Savings attributes for PA utilities are only for the 2009 program year as EE data for 2010 program year were not available.

** = savings for 2 of Allegheny's 7 programs were verified.

Many utilities launched programs mid-year 2009.

State	Organization	C&I Launch Date	Residential Launch Date	Program Calendar
OH	AEP OH	Jun-09	Apr-09	Jan - Dec
	Dayton P&L	Apr-09	Feb-09	Jan - Dec
	First Energy OH	Partial Year 09	Partial Year 09	Jan - Dec
IL	Ameren IL	Jun-08	Aug-08	June - May
	ComEd IL	Jun-08	Jun-08	June - May
MI	Consumers Energy MI	Jul-09	Jul-09	Jan - Dec
	Detroit Edison	Jul-09	Aug-09	Jan - Dec
PA	Allegheny PA	Apr-10	Jan-10	June - May
	First Energy PA	Jun-10	March-May 2010	June - May
	PECO	Mar-10	Oct-09	June - May

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Benchmarking is not a horse race.

- Given variation in program offerings and reporting practices across EE/PDR portfolios, no benchmarking can achieve strict apples-to-apples comparison.
- Benchmarking is, however, useful to identify which organizations and programs to analyze more closely.
- This close analysis affords better understanding to inform cost-effective program design.
- **Most importantly, the analysis identifies performance benchmarks, based on actual program results, to calibrate the potential model.**

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2009 Overall Results

	Spending as % of Revenue	Energy Savings as % of Sales	Peak Demand Savings as % of Peak Demand	Retail Cost of Energy $/kWh	Cost of First Year Savings	
					$/kWh	$/kW
All Region Median	0.4%	0.4%	0.1%	$0.09	$0.11	$1,081
AEP OH 09	0.4%	0.6%	0.4%	$0.07	$0.05	$412

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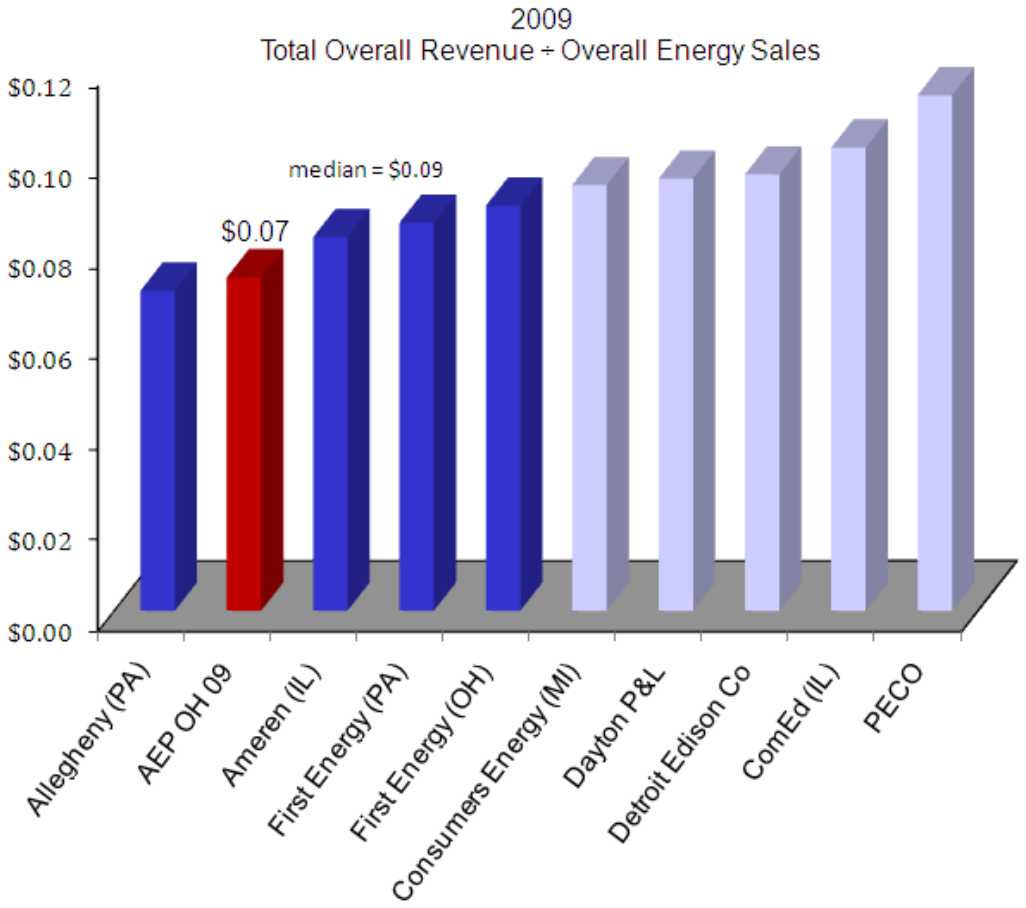
Retail costs of energy vary widely, from $0.06/kWh to $0.14/kWh. AEP Ohio's retail cost of energy is low in 2009.



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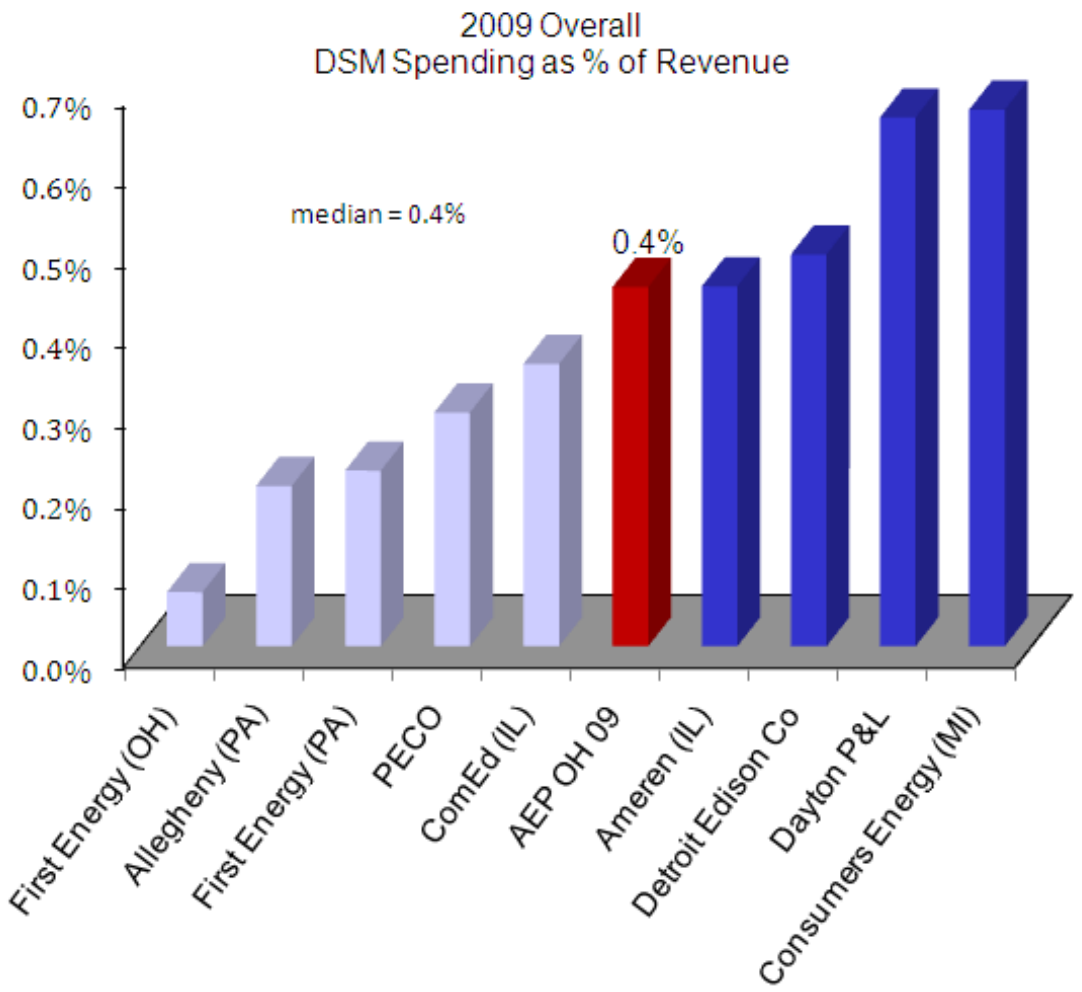
The median is between light blue bars and dark blue bars.
The red bar indicates AEP Ohio's 2009 results.

AEP Ohio's EE spending over all sectors (as a percentage of revenue) is just above the median.



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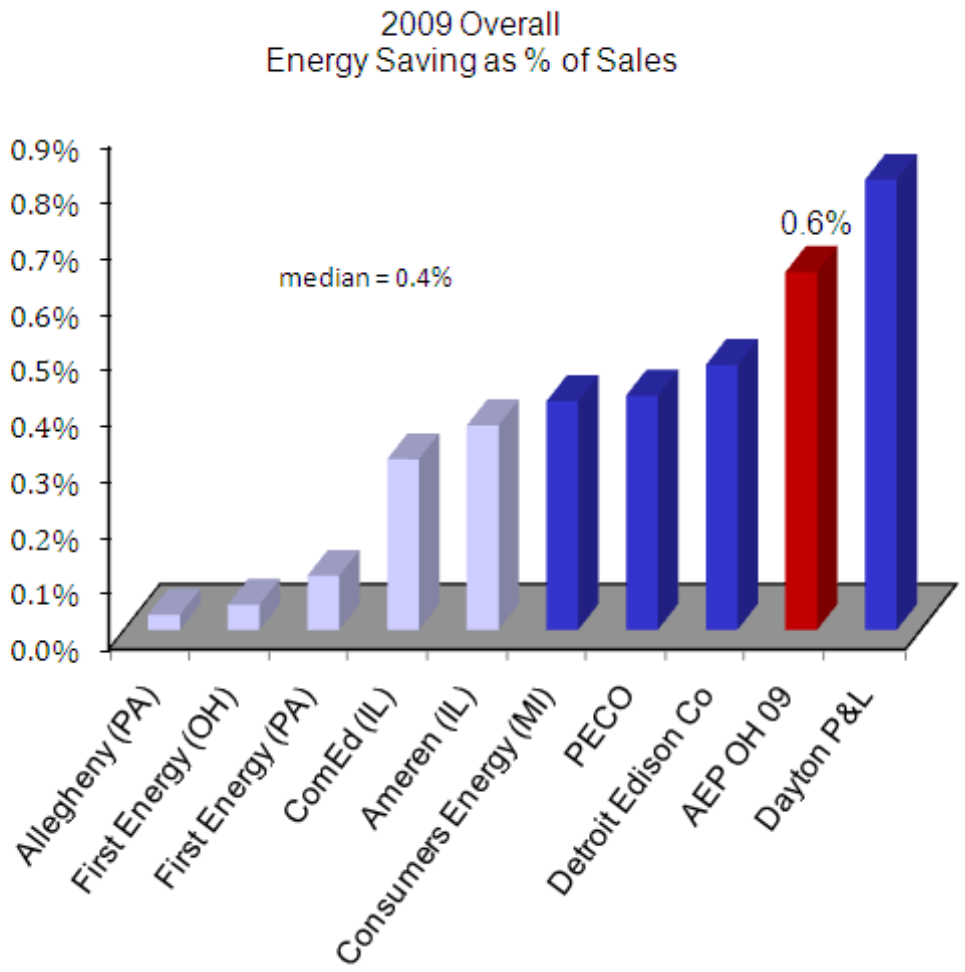
AEP Ohio's energy savings over all sectors (as a percentage of sales) is the second highest.



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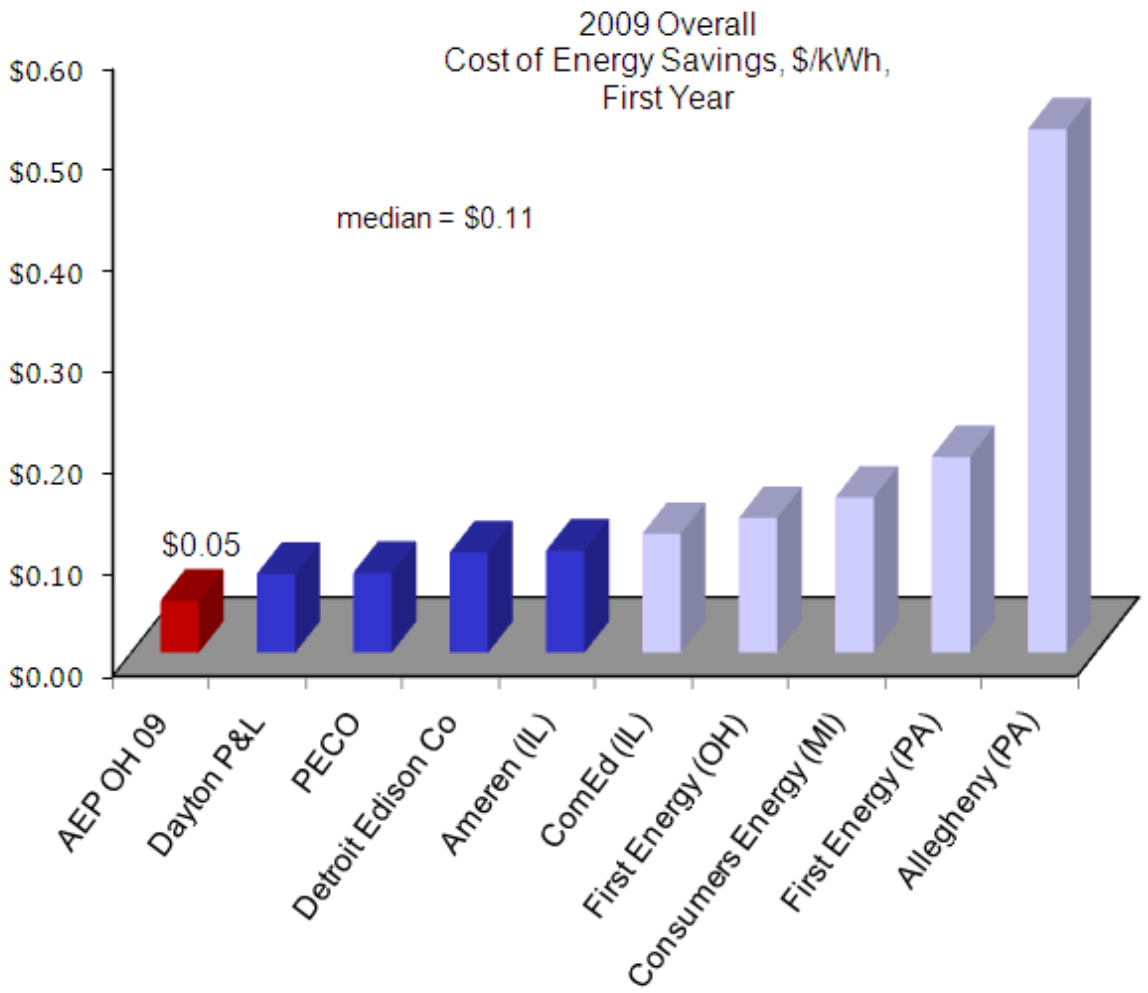
AEP Ohio has the lowest cost of energy savings per first year kWh.



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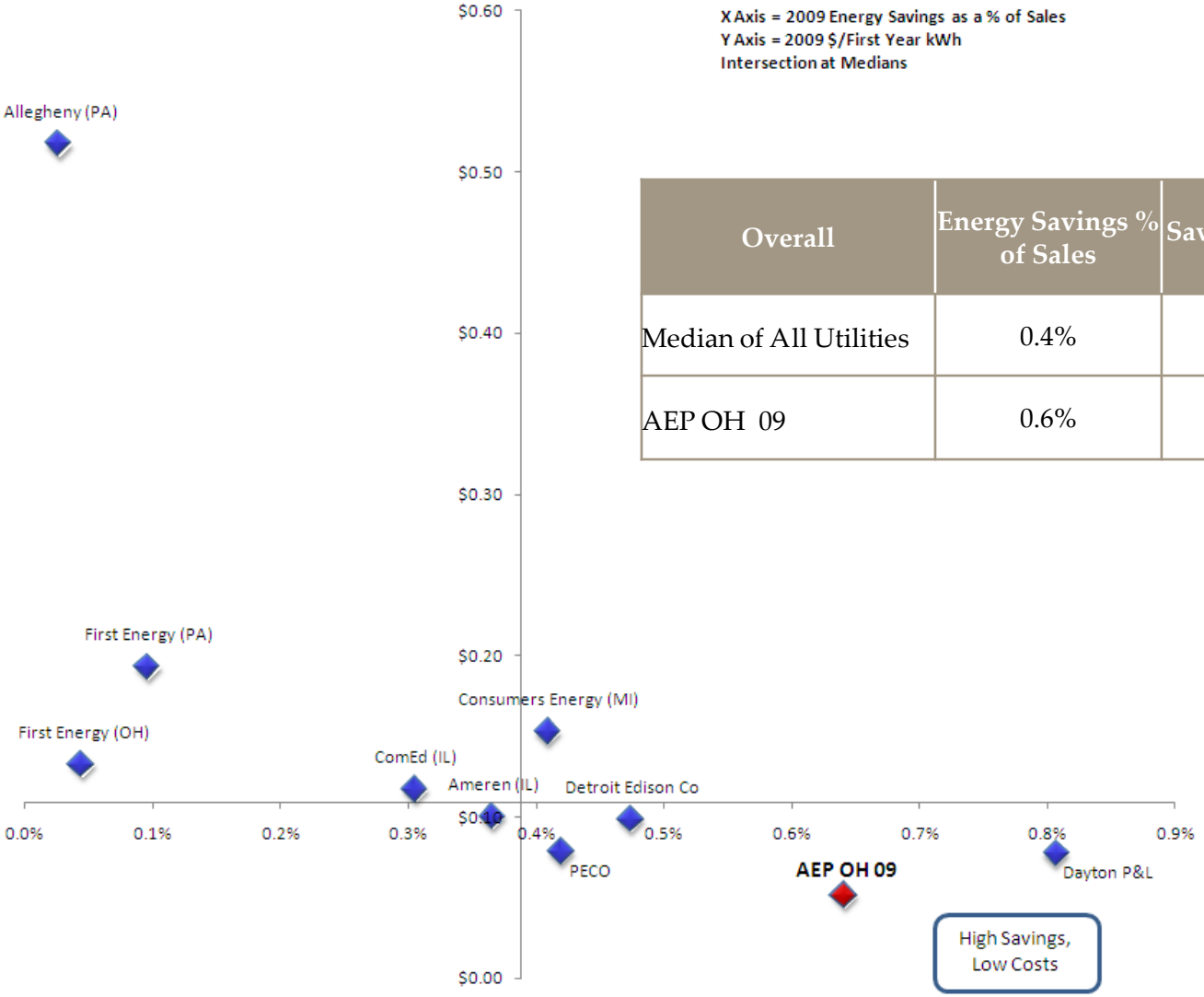
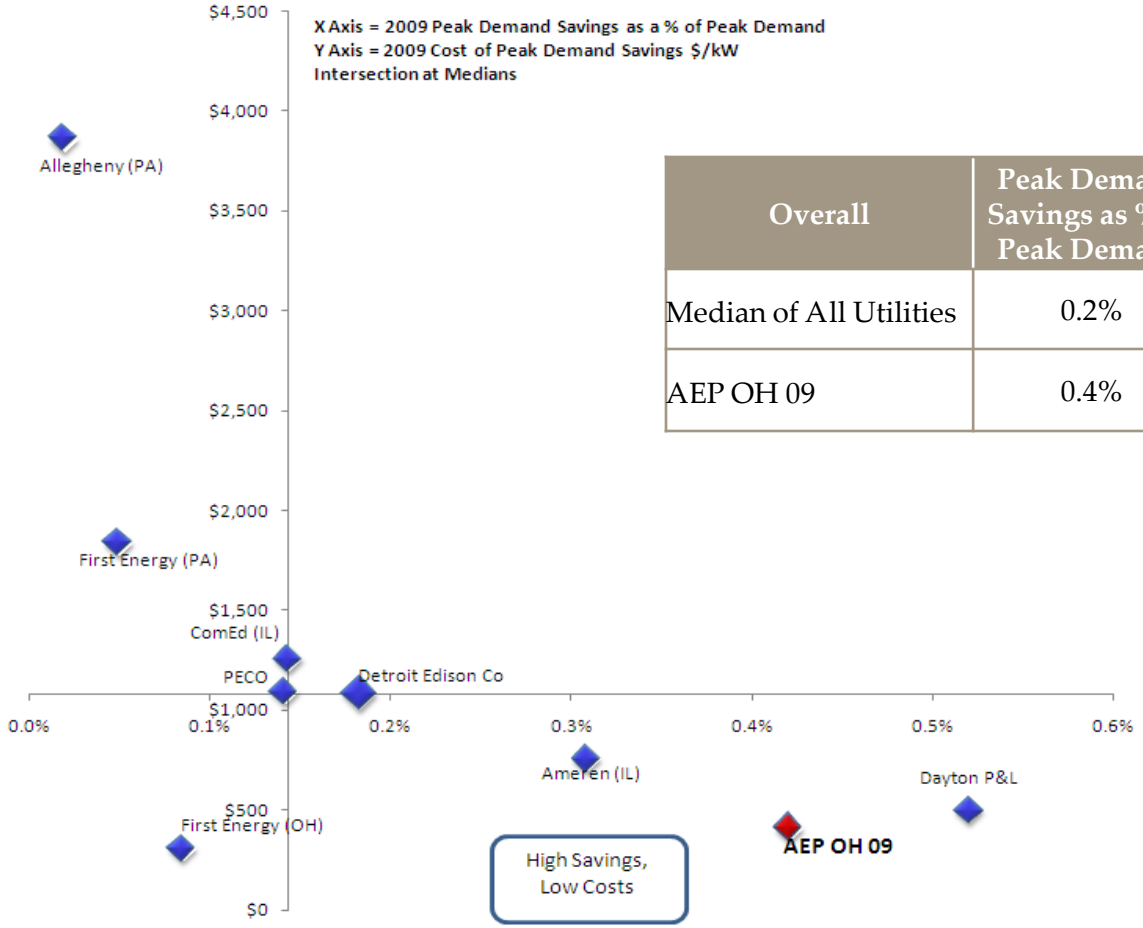
AEP Ohio achieved very high energy savings (as a percentage of sales) at the lowest costs.



Overall	Energy Savings % of Sales	Cost of Energy Savings ($/kWh) First Year
Median of All Utilities	0.4%	$0.11/kWh
AEP OH 09	0.6%	$0.05/kWh

AEP Ohio achieved above median peak demand savings (as a percentage of peak demand) at below median costs.



Overall	Peak Demand Savings as % of Peak Demand	Cost of Peak Demand Savings ($/kW)
Median of All Utilities	0.2%	$806/kW
AEP OH 09	0.4%	$412/kW

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Dayton P&L achieved high peak demand savings at low costs with its residential lighting and C&I prescriptive programs.

AEP Ohio achieved high peak demand savings at low costs with its self direct program.

2009 C&I Results

	Spending as % of Revenue	Energy Savings as % of Sales	Peak Demand Savings as % of Peak Demand	Retail Cost of Energy $/kWh	Cost of First Year Savings	
					$/kWh	$/kW
All Region Median	0.3%	0.3%	0.1%	$0.08	$0.11	$755
AEP OH 09	0.5%	0.7%	0.5%	$0.06	$0.04	$298

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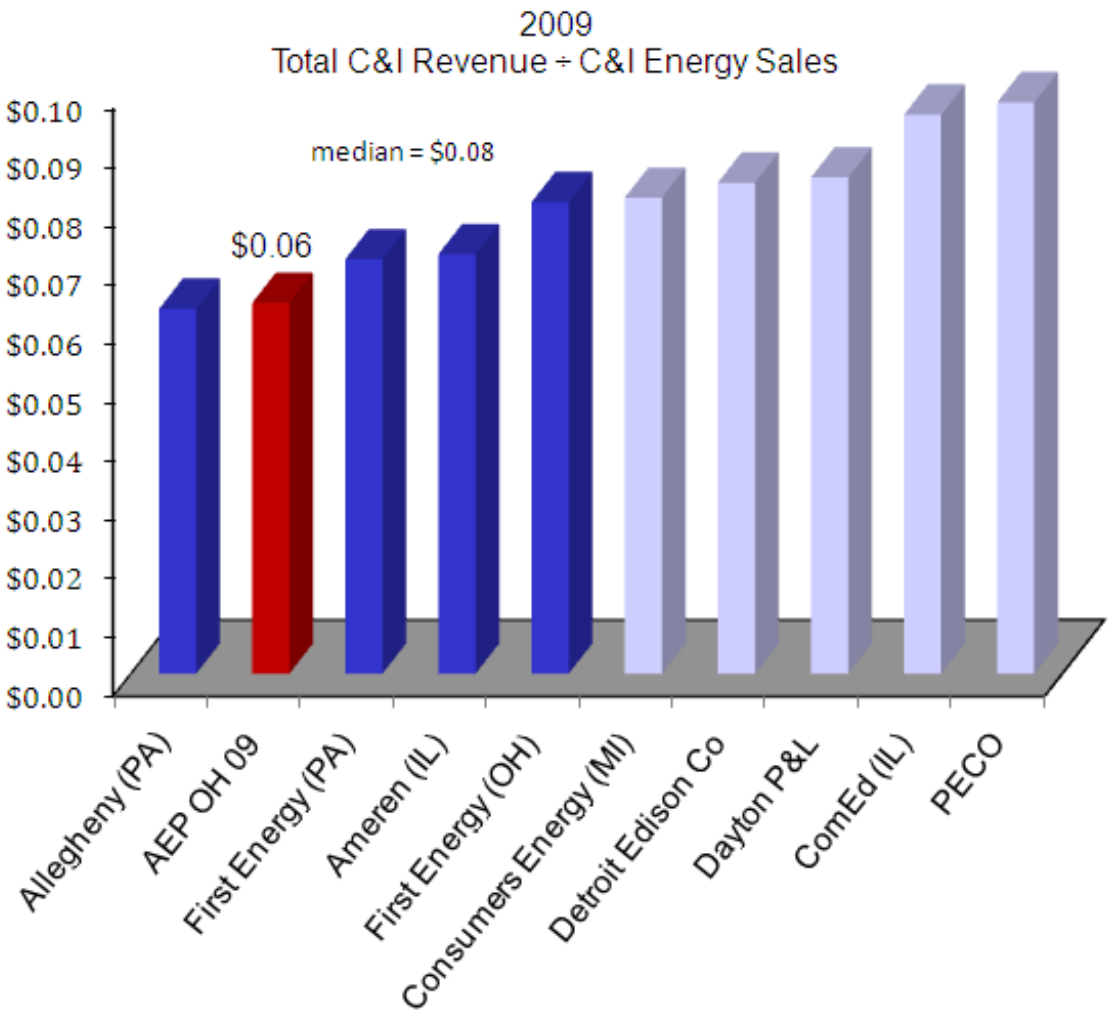
AEP Ohio's C&I simple retail cost of energy is low for 2009.



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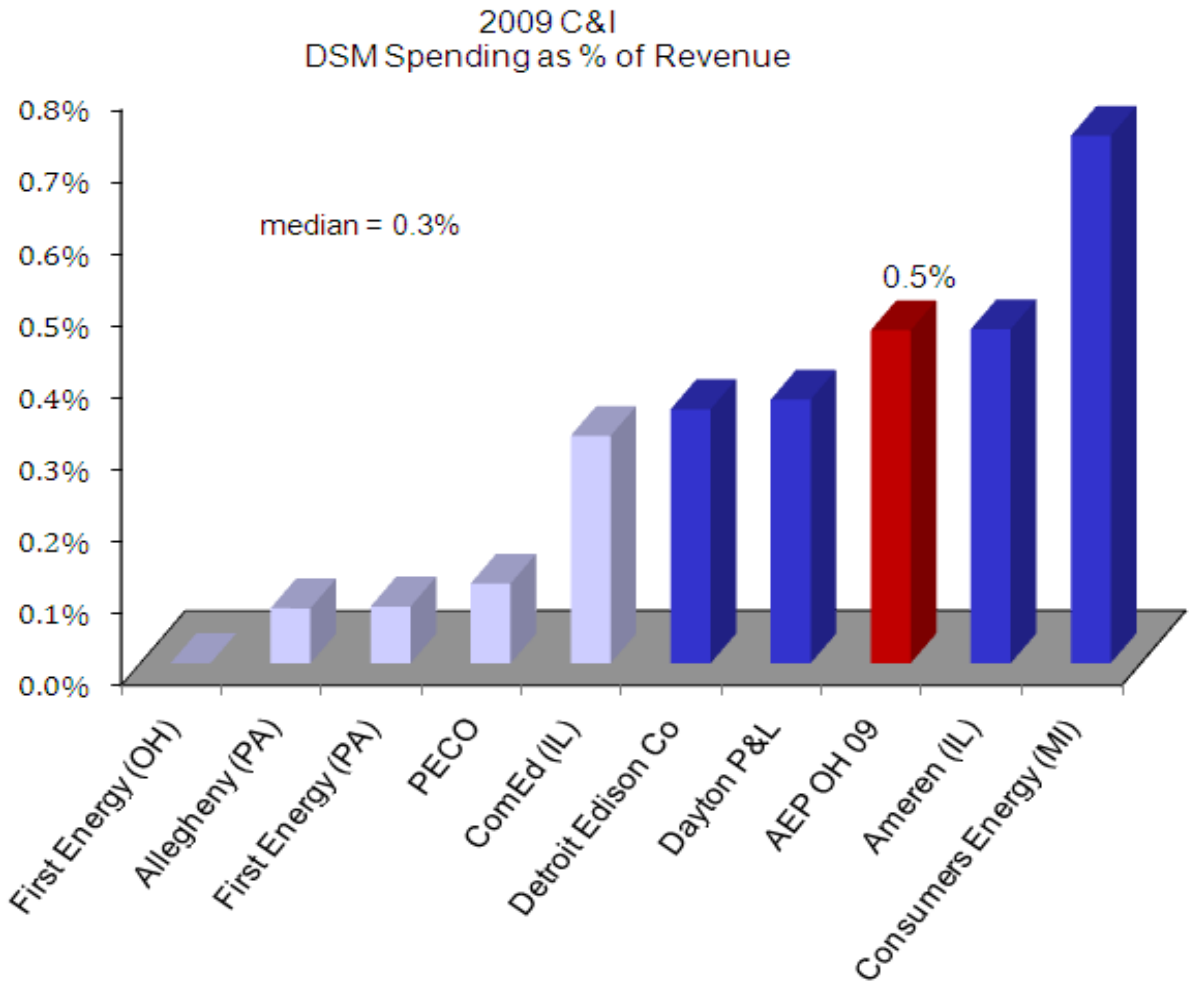
AEP Ohio spent a higher percentage of C&I revenue on EE programs than median.



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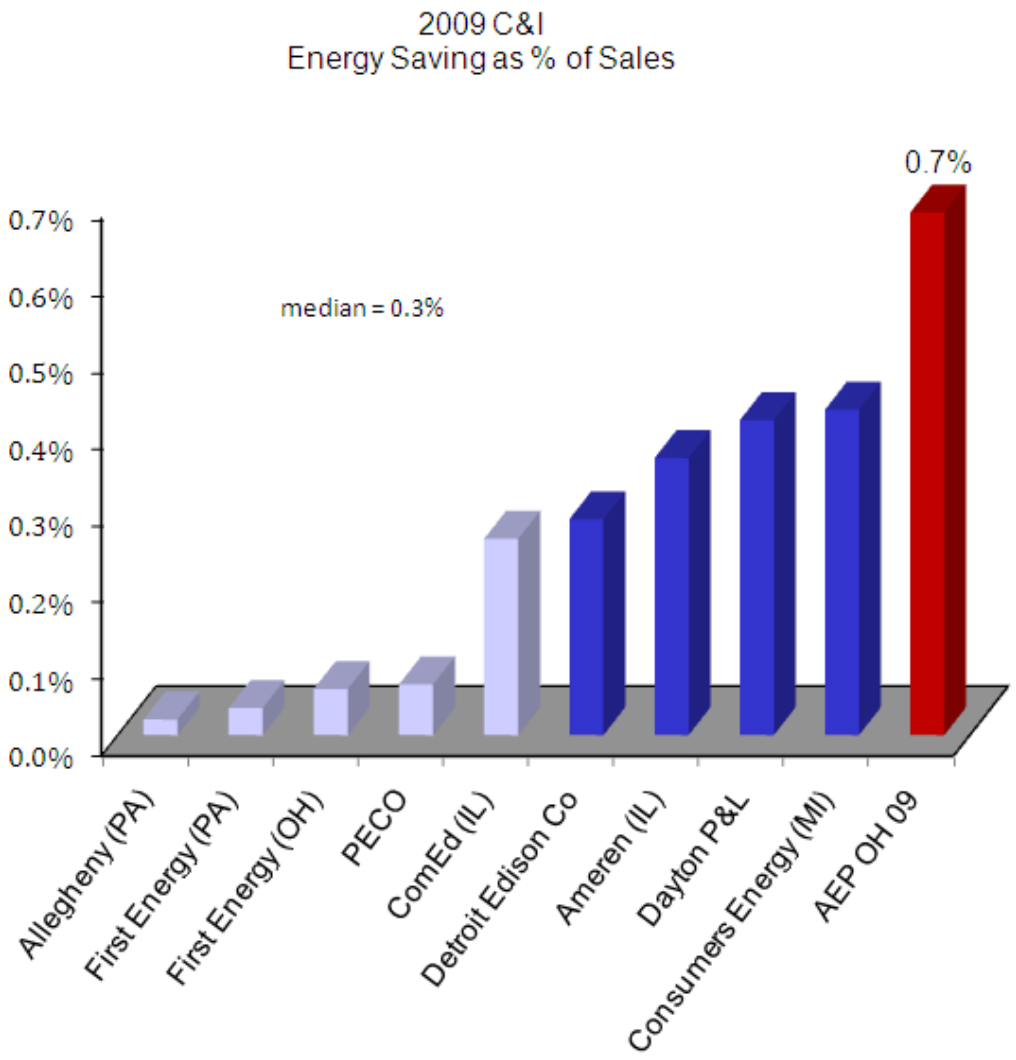
AEP Ohio achieved the highest C&I energy savings (as a percentage of sales).



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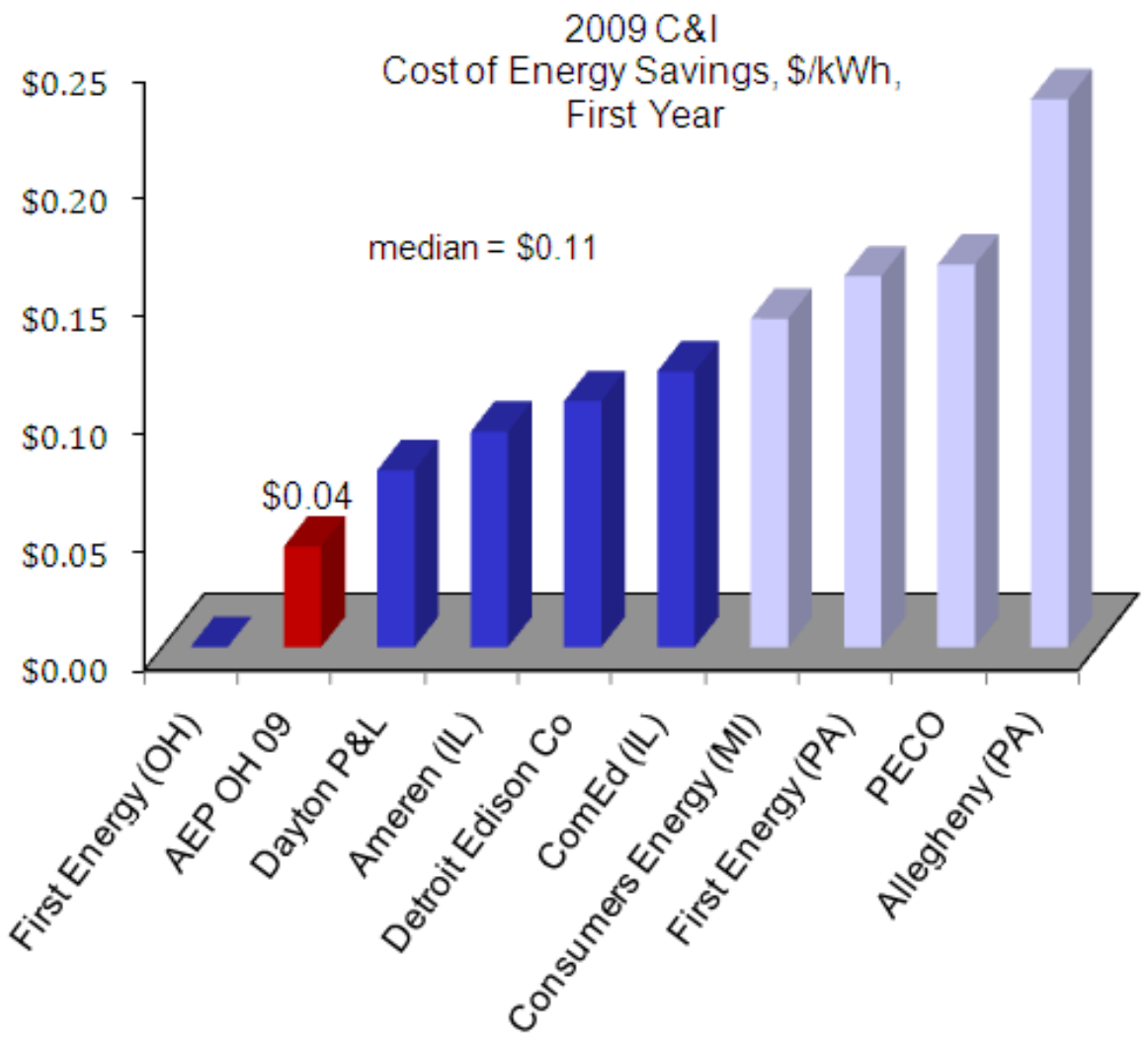
AEP Ohio achieved the second lowest cost of C&I energy savings per first year kWh.



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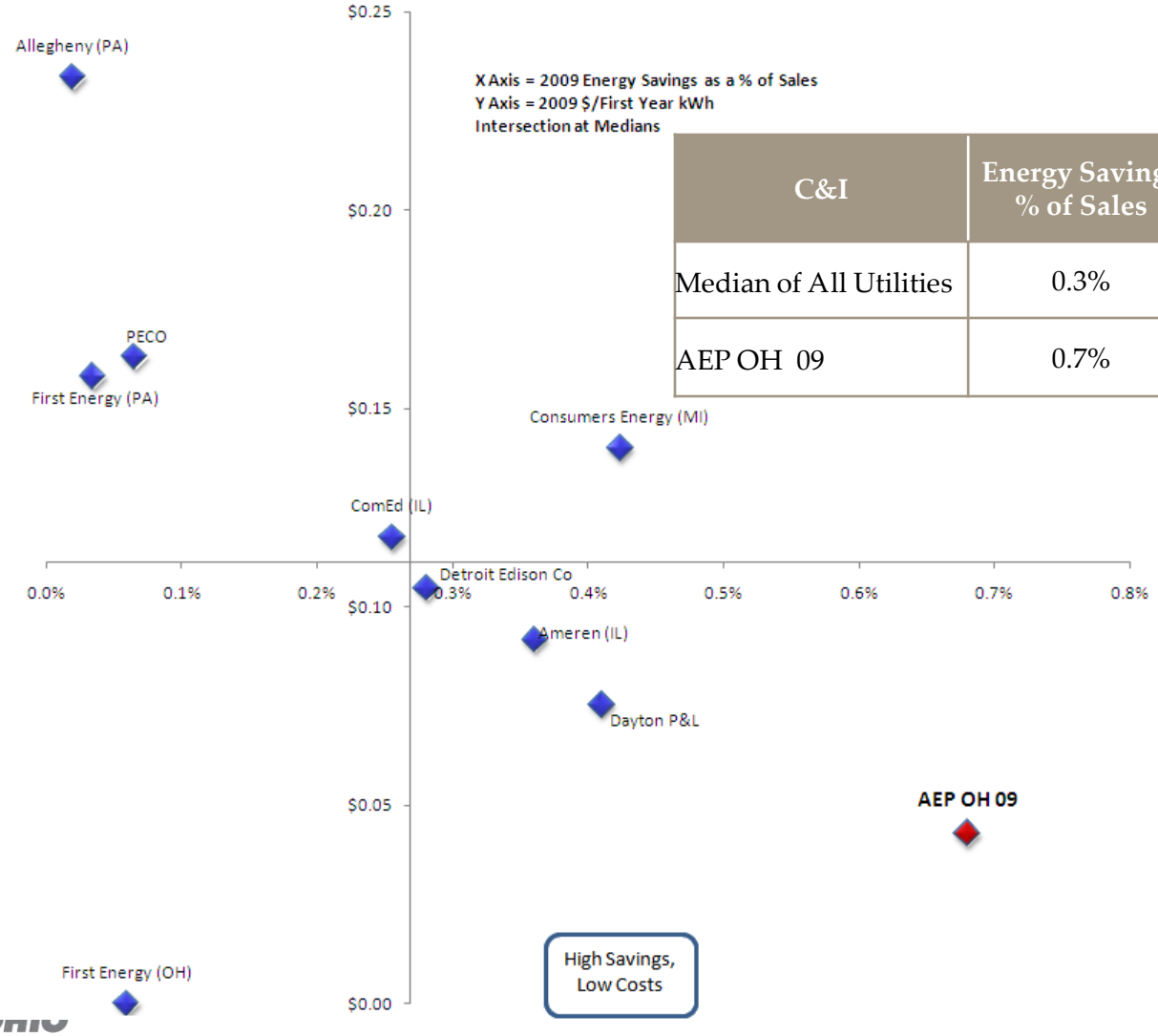
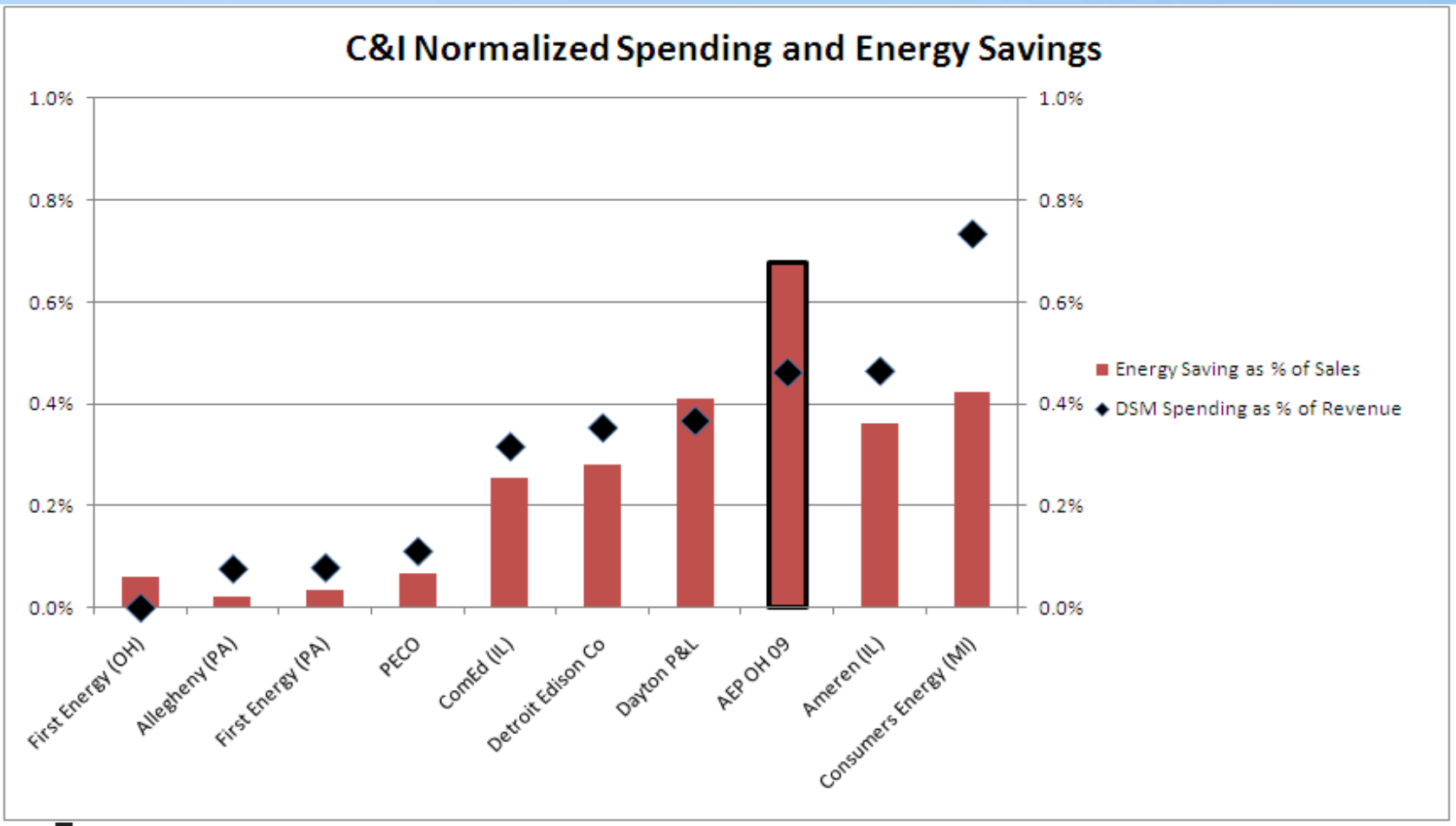
AEP Ohio achieved the highest C&I energy savings (as a percentage of sales) at the low costs of C&I energy savings.



C&I	Energy Savings % of Sales	Cost of Energy Savings ($/kWh) First Year
Median of All Utilities	0.3%	$0.11/kWh
AEP OH 09	0.7%	$0.04/kWh

2009 C&I EE Spending and Energy Savings



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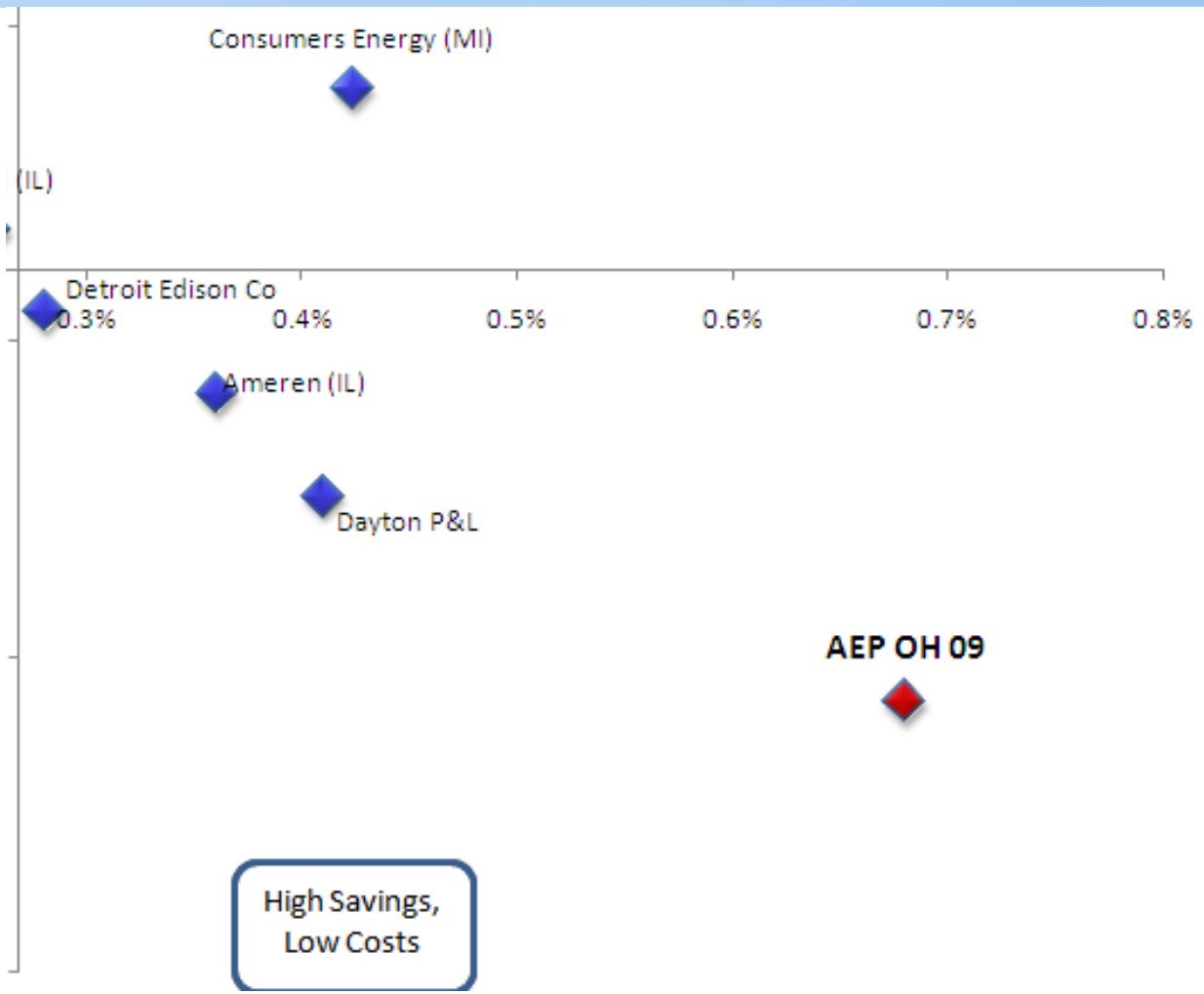
These utilities achieved high C&I energy savings at low costs in 2009. We examined this groups' performance closely.



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For this group with high C&I savings and low costs, savings are achieved principally by prescriptive, custom, and self-direct programs.

2009 Distribution of C&I EE/PDR Energy Savings by Program

C&I					
	AEP OH 09	Ameren (IL)	Consumers Energy (MI)	Dayton P&L	Detroit Edison Co
Program/Measures					
Lighting	8%				
Prescriptive		**31%**	**55%**	**91%**	**63%**
Custom Rebates	**<1%**	**68%**	**9%**	**9%**	**19%**
Retrocommissioning		1%			
Small Business Direct Install			**18%**		
Self Direct	**92%**		**12%**		**16%**
Education			2%		2%
Pilot			4%	<1%	<1%
Total C&I Savings (GWh)	208.8	85.8	97.4	28.5	79.1
Annual C&I Sales (GWh)	30,688	23,783	22,966	6,947	28,123
C&I Savings as % of C&I Sales	0.68%	0.36%	0.42%	0.41%	0.28%

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This group's prescriptive and self direct programs first year kWh costs are below the median cost, $0.11/kWh. Custom program first year kWh costs for this group are generally close to the median.

2009 C&I EE/PDR Cost of Energy Savings by Program

C&I					
	AEP OH 09	Ameren (IL)	Consumers Energy (MI)	Dayton P&L	Detroit Edison Co
Program/Measures					
Lighting	$0.09				
Prescriptive		**$0.09**	*	**$0.06**	**$0.11**
Combination			*$0.13		
Custom Rebates	$0.30	**$0.07**	*	**$0.11**	**$0.18**
Retrocommissioning		$0.09			
Small Business Direct Install			**$0.11**		
Self Direct	**$0.03**		**<$0.01**		**<$0.01**
Education					$0.04
Pilot			$0.19		$0.16
Total C&I Savings (GWh)	208.8	85.8	97.4	28.5	79.1
Total Costs ($M)	$8.95	$7.9	$13.6	$2.15	$8.29
Costs of C&I Savings ($/kWh)	$0.04	$0.09	$0.14	$0.08	$0.10

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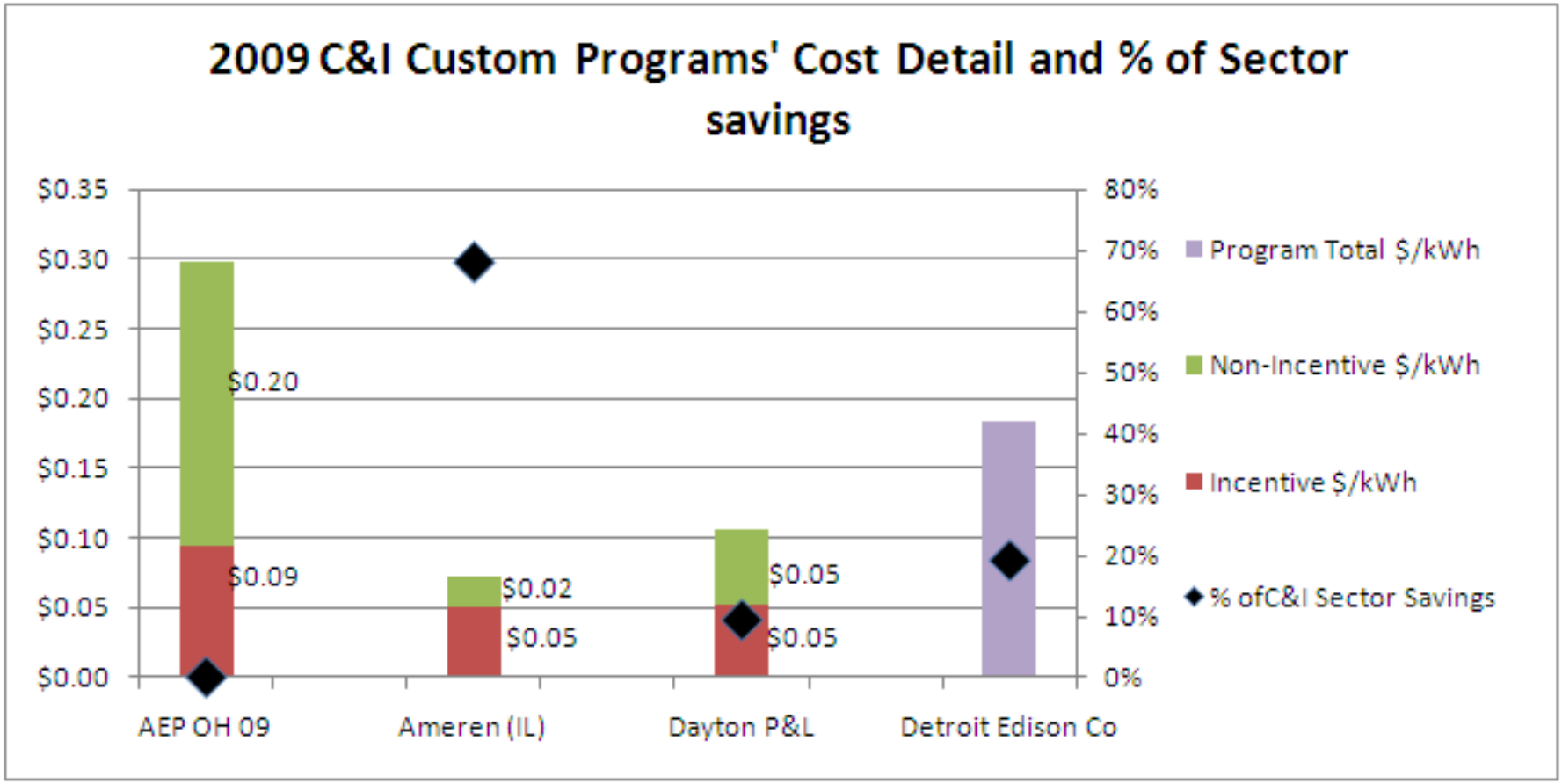
"*" Expenditure data for Consumers Energy (MI)'s prescriptive and custom programs were available only combined.

Cost Detail for Key C&I Programs for This Group in 2009

The following slides review this groups' custom and prescriptive programs in detail:

- Incentive of Cost Detail
- Non-Incentive Cost Detail
- Percentage Sector Sales

For this group, custom programs achieved at least 9% of total C&I sector savings, except AEP Ohio which achieved most of its C&I sector savings through its Self Direct program. Incentives comprised at least 32% the custom programs' cost.



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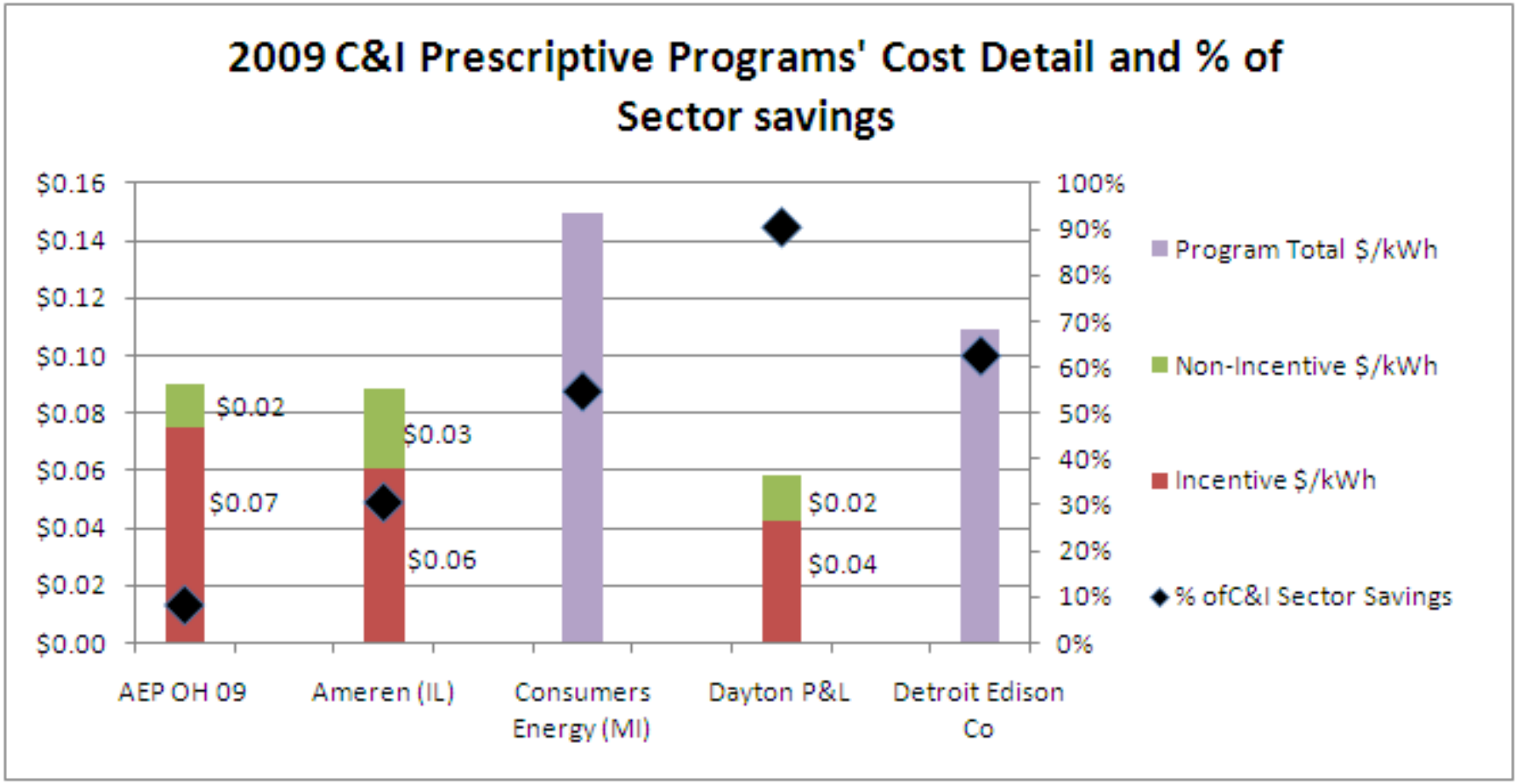
Consumers Energy (MI) is not shown in the bar chart as to not skew the scale. It's custom program achieved 9 percent of its total C&I sector savings at $0.93/kWh.

Cost detail (for incentive and non-incentive costs) was not available for the Michigan utilities.

This groups' prescriptive programs achieved at least 30 percent of total C&I sector savings; except AEP Ohio which achieved most of its C&I sector savings through its Self Direct program. Incentives comprised at least 69 percent of the prescriptive programs' cost.



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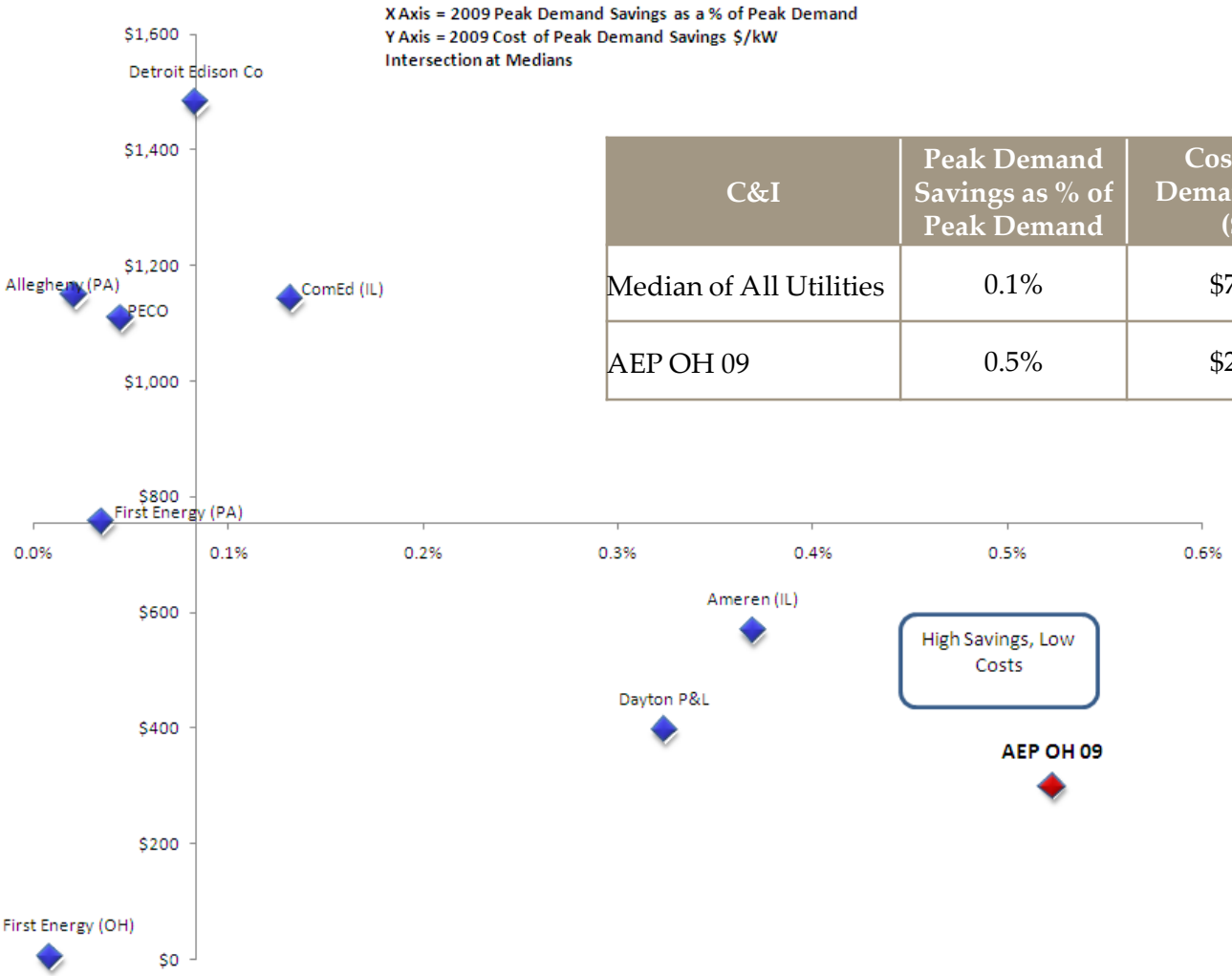
Cost detail (for incentive and non-incentive costs) was not available for the Michigan utilities.

AEP Ohio achieved the highest C&I peak demand savings (as percentage of peak demand) at below median costs.



C&I	Peak Demand Savings as % of Peak Demand	Cost of Peak Demand Savings ($/kW)
Median of All Utilities	0.1%	$755/kW
AEP OH 09	0.5%	$298/kW

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Consumers Energy MI is not included as no demand savings were reported.

AEP Ohio achieved high C&I peak demand savings at low costs with its self direct programs.

Summary of High Savings and Low Costs Results for C&I EE/PDR Portfolios in 2009

Summary of High Savings and Low Costs Utilities' C&I EE Portfolios 2009	
EE Spending	AEP Ohio and the other utilities achieved C&I EE spending of 0.5 percent (as a percentage of C&I revenue) in 2009.
EE Savings	AEP Ohio achieved C&I energy savings of about 0.7 percent (as a percentage of C&I sales) in 2009 while the other utilities in this group achieved energy savings of about 0.35 percent.
EE Costs	Energy savings generally cost about 9 ¢/kWh (first year costs), except AEP Ohio with 4 ¢/kWh.
Top Programs	Prescriptive Incentives, Custom Incentives, and Self Direct programs.

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2009 Residential Results

	Spending as % of Revenue	Energy Savings as % of Sales	Peak Demand Savings as % of Peak Demand	Retail Cost of Energy $/kWh	Cost of First Year Savings	
					$/kWh	$/kW
All Region Median	0.4%	0.4%	0.2%	$0.11	$0.12	$1,466
AEP OH 09	0.4%	0.6%	0.2%	$0.09	$0.07	$962

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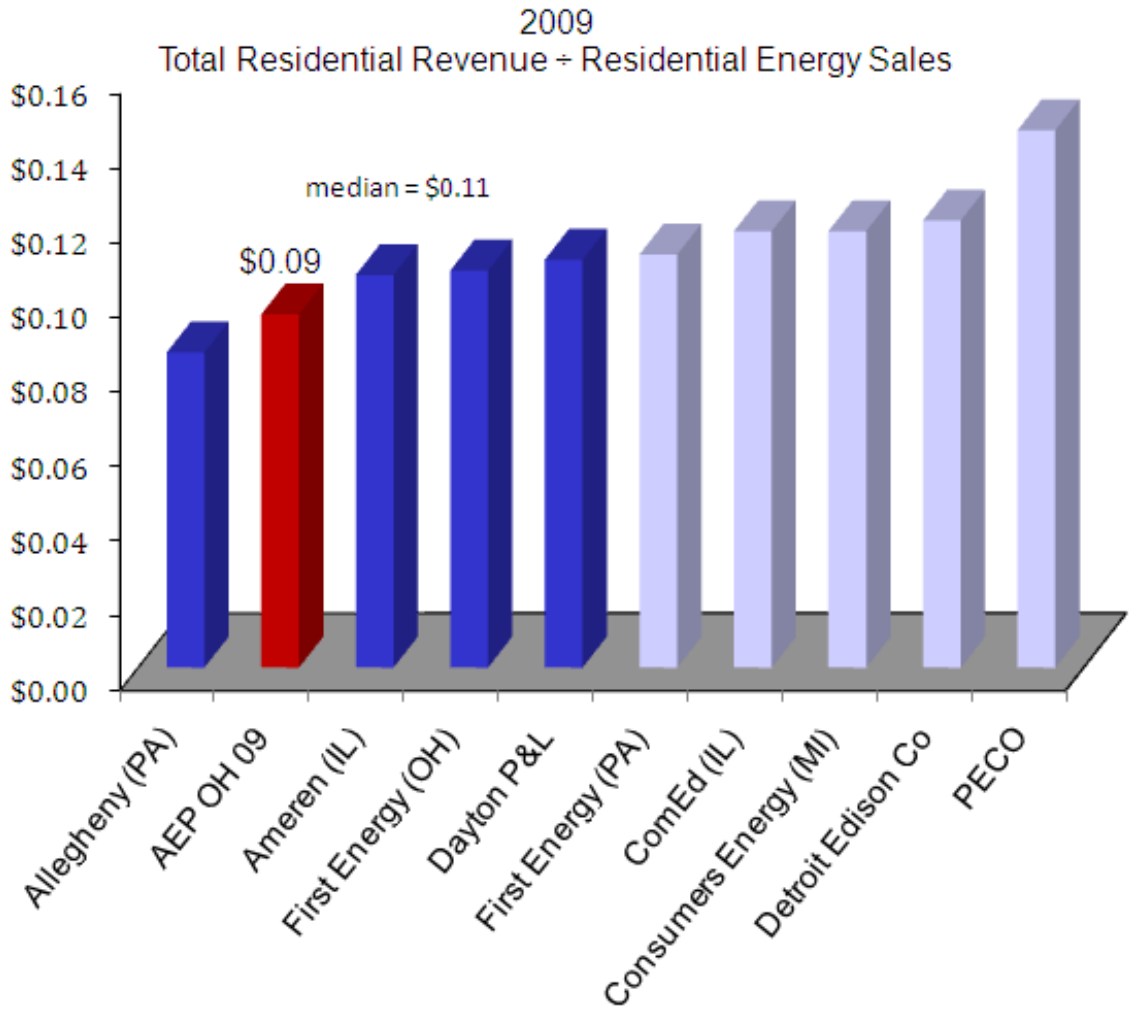
AEP Ohio's residential retail cost of energy is low for 2009.



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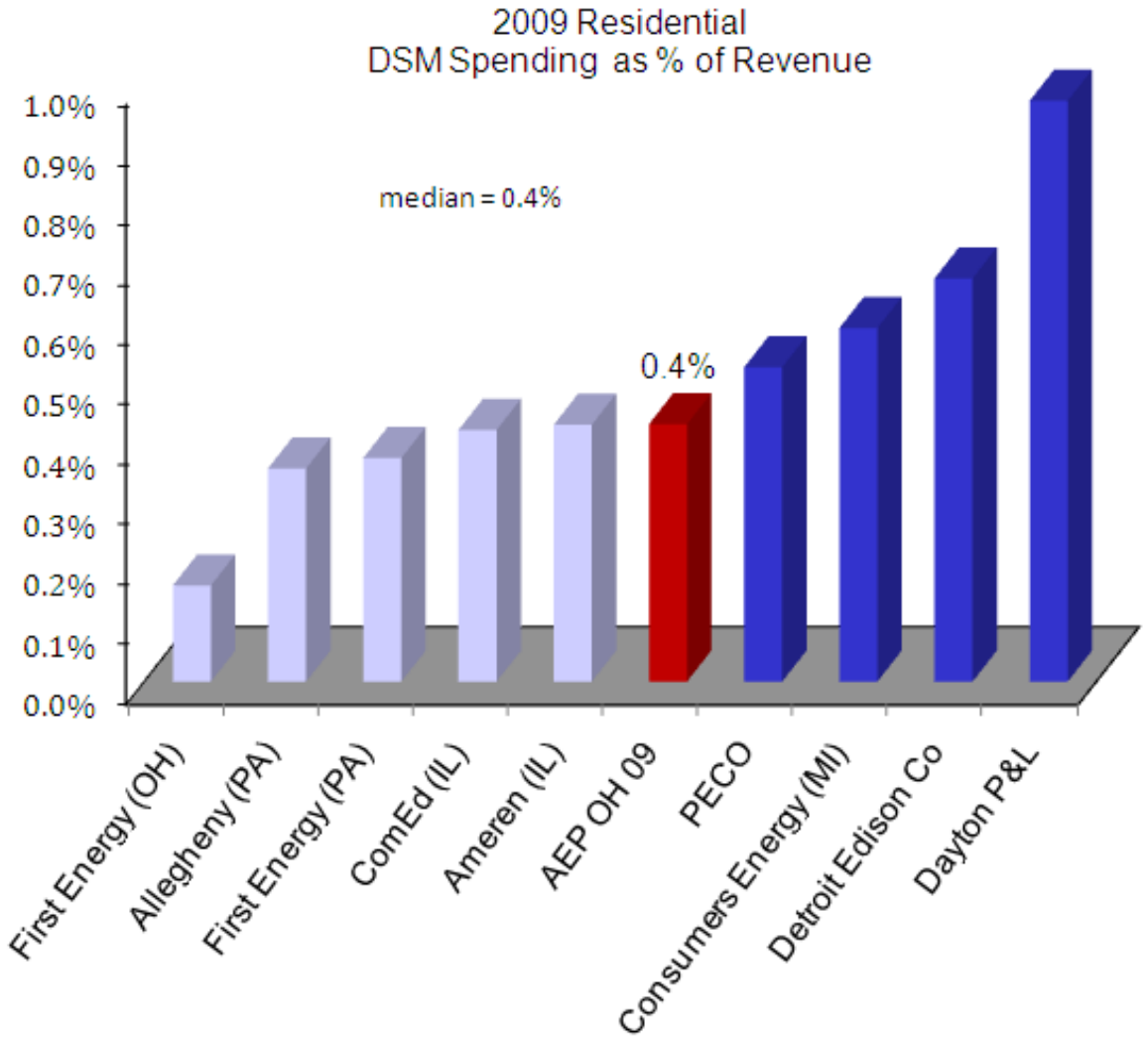
AEP Ohio's residential spending (as a percentage of revenue) is above the median.



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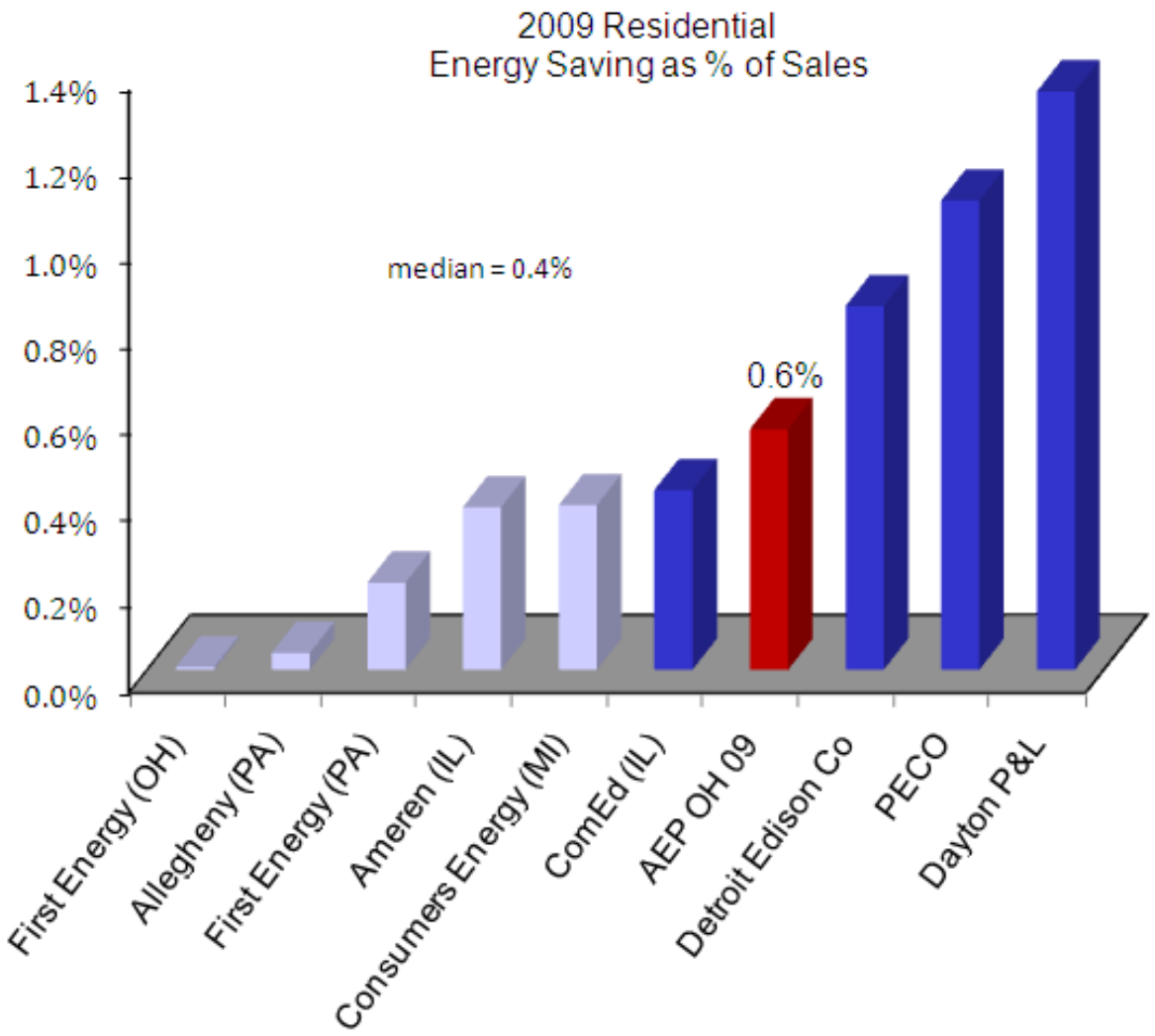
AEP Ohio's residential energy savings (as a percentage of sales) is above the median.



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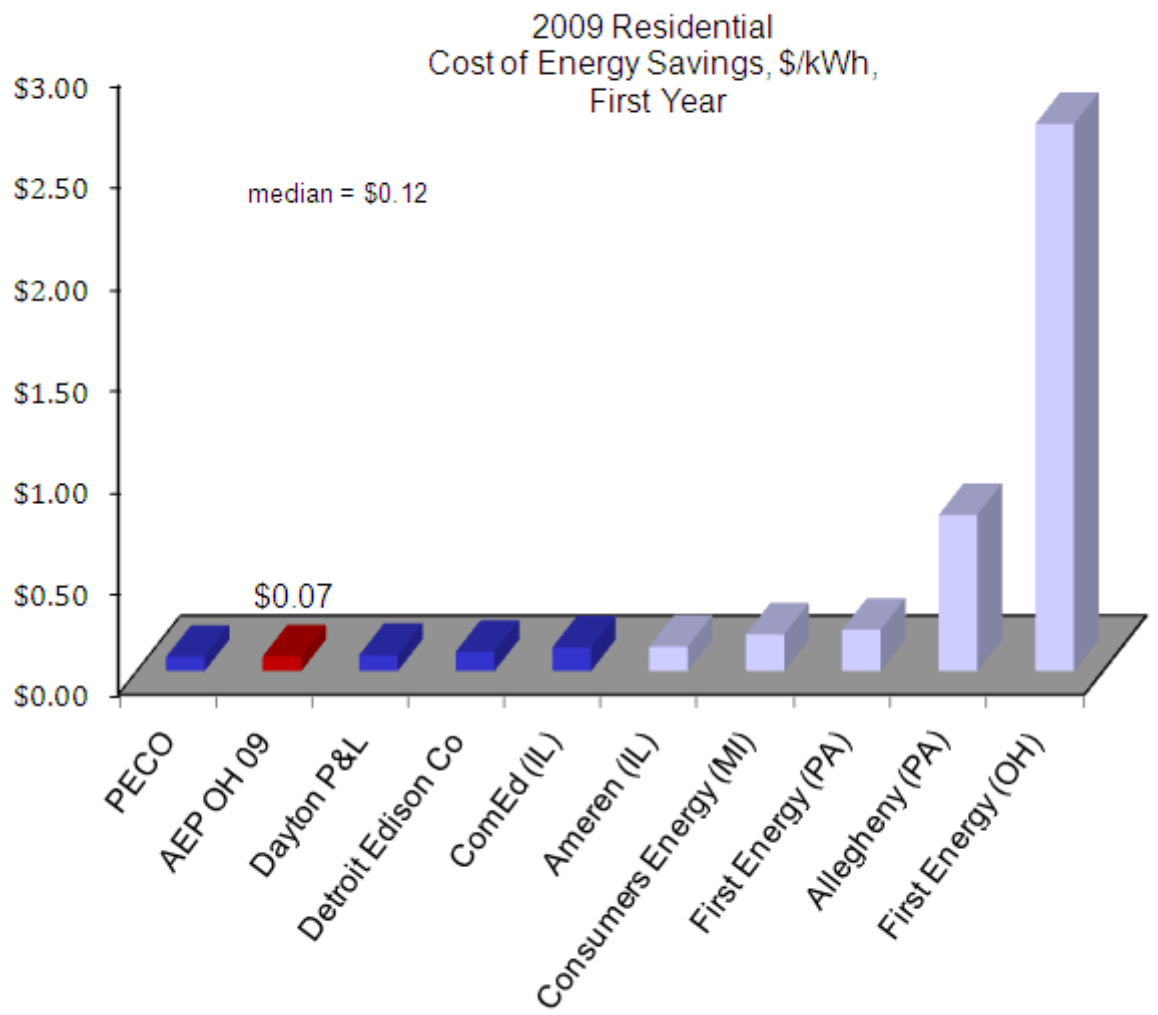
AEP Ohio's cost of residential energy savings per first year kWh is below the median.



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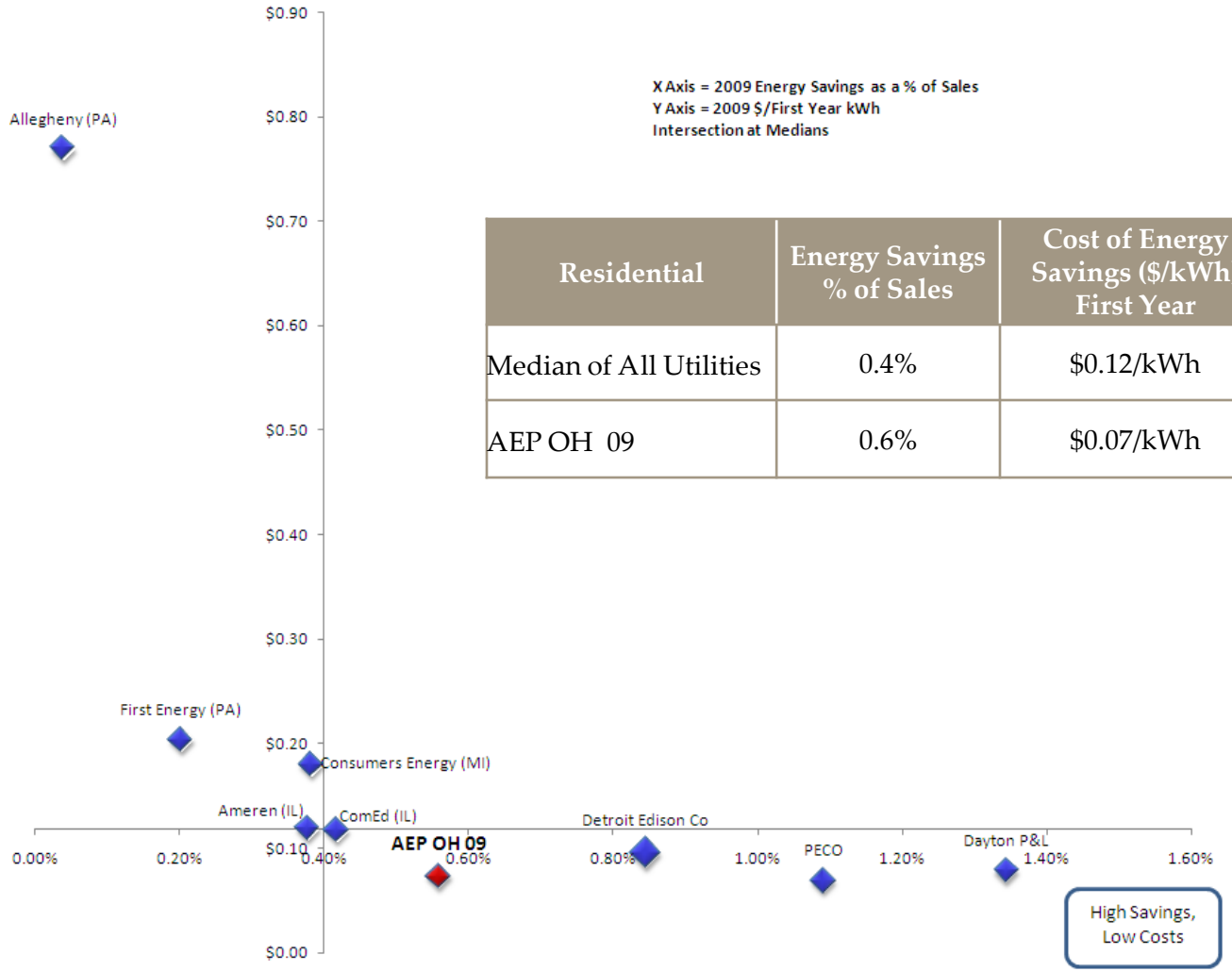
AEP Ohio achieved above median energy savings (as a percentage of sales) at below median costs in the residential sector.



Residential	Energy Savings % of Sales	Cost of Energy Savings ($/kWh) First Year
Median of All Utilities	0.4%	$0.12/kWh
AEP OH 09	0.6%	$0.07/kWh

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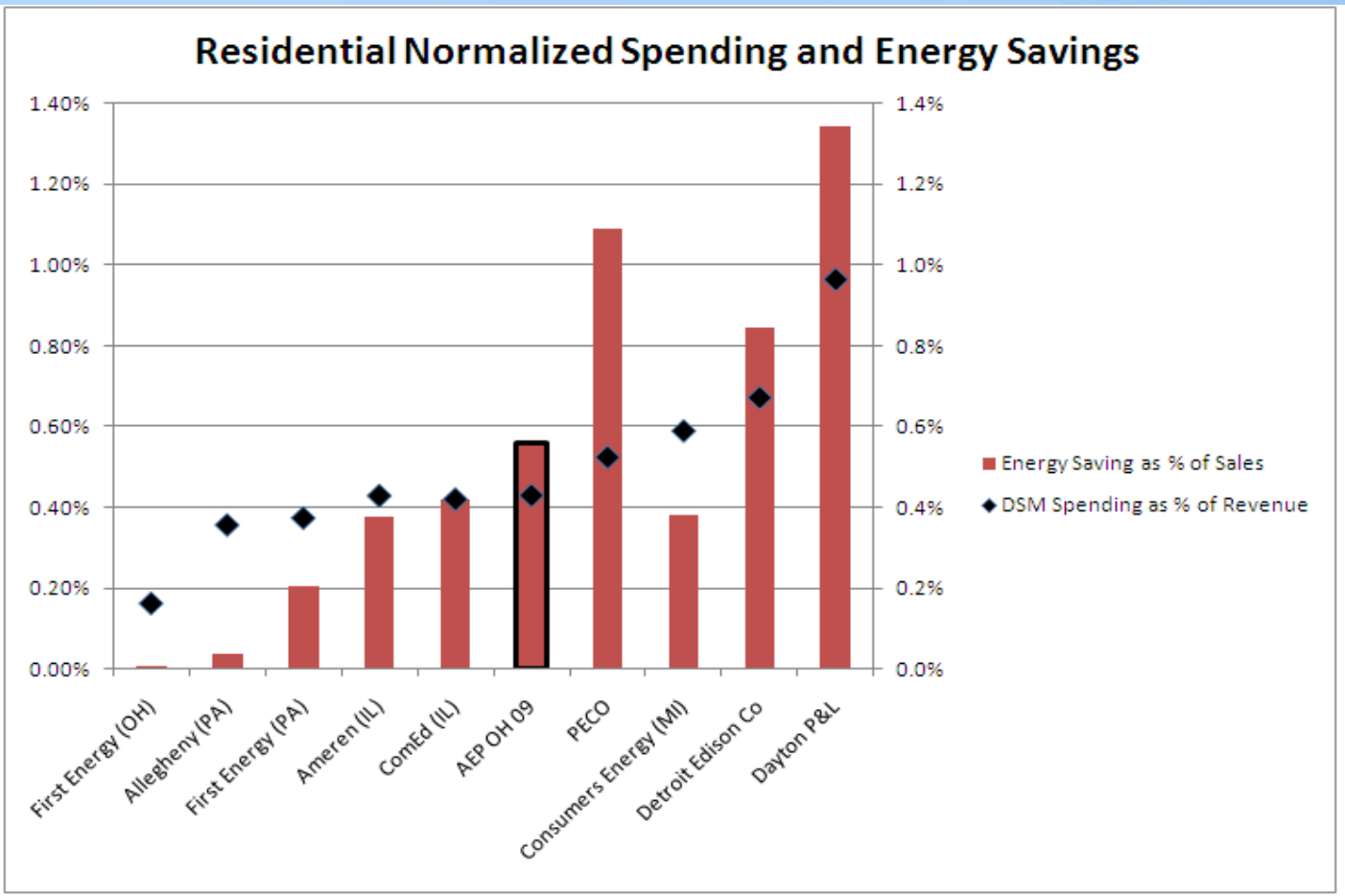
First Energy (OH) is not included so as not to skew the scale (0.01%, $2.69/kWh).

2009 Residential EE/PDR Spending and Energy Savings



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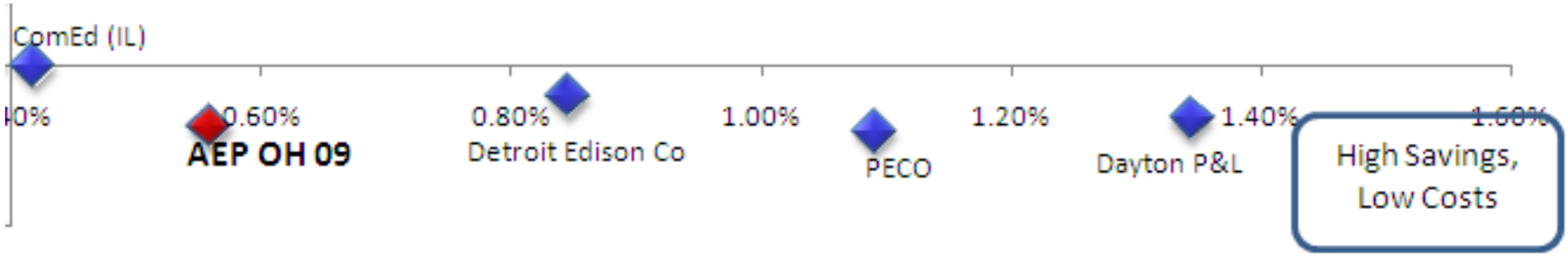
These utilities achieved high residential energy savings at low costs in 2009. We examined this groups' performance closely.



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Among this groups' residential portfolios, savings are achieved principally by prescriptive (especially lighting) and appliance recycling programs.

2009 Distribution of Residential EE/PDR Energy Savings by Program

Residential					
	AEP OH 09	ComEd (IL)	Dayton P&L	Detroit Edison Co	PECO
Program/Measures					
Lighting	90%	80%	92%		95%
Cooling/Heating/Roofing			4%	1%	
Prescriptive				75%	2%
Refrigerator/Freezer Removal	6%	14%	4%	11%	3%
Retrofit				2%	
Multifamily		2%		6%	
Low Income	3%	4%		3%	
Education				2%	
Total Residential Savings (GWh)	81.9	111.1	68.8	123.6	140.7
Annual Residential Sales (GWh)	14,642	26,620	5,120	14,625	12,893
Residential Savings as % of Residential	0.56%	0.42%	1.34%	0.85%	1.09%

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All the lighting programs' first year kWh costs for this group are about half the median while most of the prescriptive and appliance recycling programs first year kWh costs are below or close to the median.

2009 Residential EE/PDR Cost of Energy Savings by Program

Residential					
	AEP OH 09	ComEd (IL)	Dayton P&L	Detroit Edison Co	PECO
Program/Measures					
Lighting	**$0.05**	**$0.07**	**$0.05**		**$0.04**
Cooling/Heating/Roofing			$0.43	$1.03	
Prescriptive				**$0.05**	$1.22
Refrigerator/Freezer Removal	$0.16	**$0.14**	$0.11	**$0.12**	$0.14
Retrofit				$0.18	
Multifamily		$0.32		$0.18	
Low Income	$0.20	$0.37		$0.63	
Education				$0.23	
Total Residential Savings (GWh)	81.9	111.1	68.8	123.6	140.7
Total Costs ($M)	$5.9	$13.1	$5.4	$11.8	$9.7
Costs of Residential Savings ($/kWh)	$0.07	$0.12	$0.08	$0.10	$0.07

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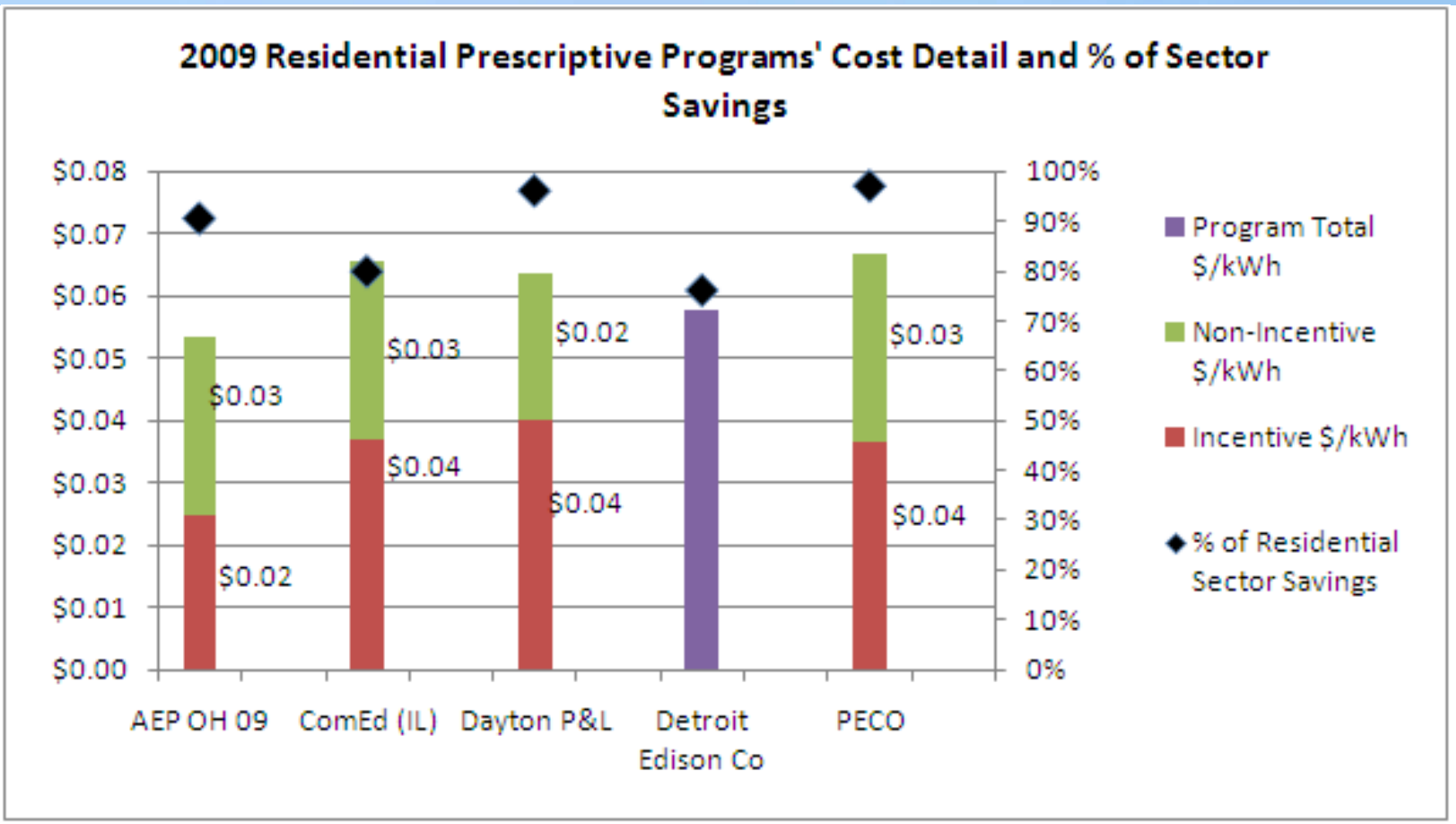
Cost Detail for Key Residential Programs for This Group in 2009

The following slides review this groups' prescriptive and appliance recycling programs in detail:

- Incentive Cost Detail
- Non-Incentive Cost Detail
- Percentage of Sector Sales

This groups' prescriptive programs achieved at least 76 percent of total residential sector savings. Incentives comprised at least 47 percent of the prescriptive programs' cost.



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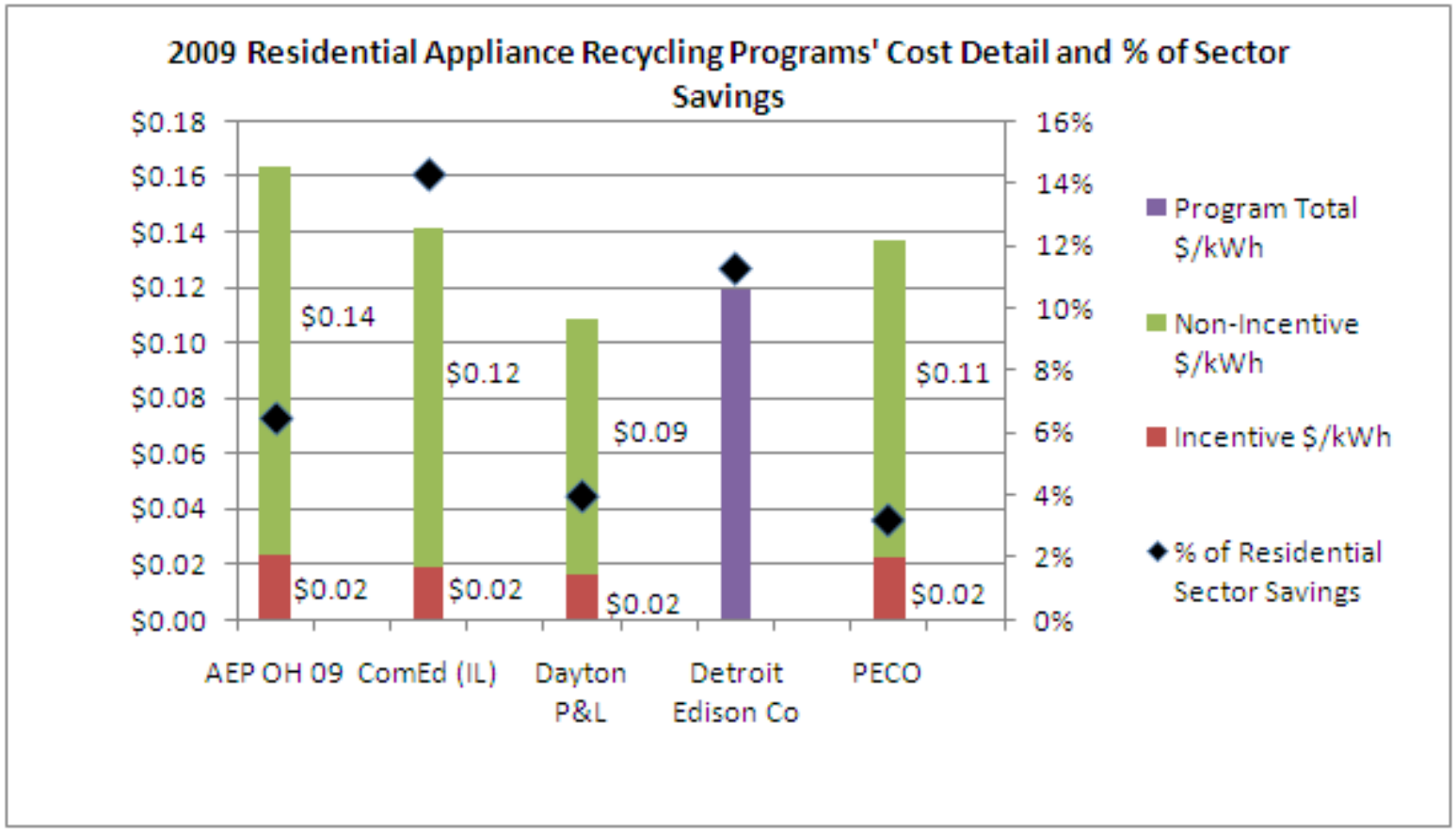
Cost detail (for incentive and non-incentive costs) was not available for Detroit Edison Co.

Two of the utilities' appliance recycling programs achieved between 11 percent and 14 percent of total residential sector savings while the other three achieved between 3 percent and 6 percent. Incentives comprised at least 13 percent of the appliance recycling programs' cost.



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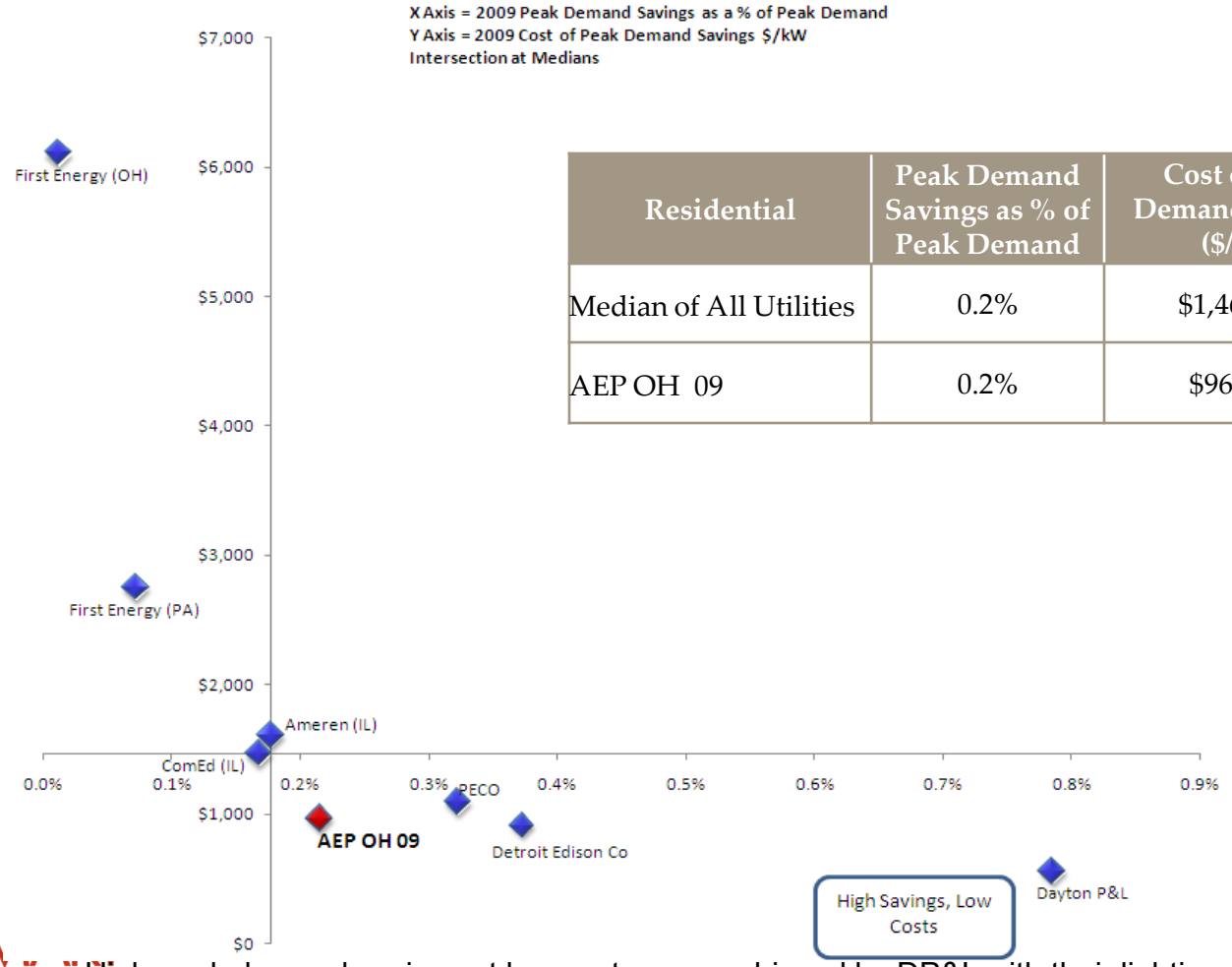
Cost detail (for incentive and non-incentive costs) was not available for Detroit Edison Co.

AEP Ohio achieved above median residential peak demand savings (as a percentage of peak demand) at below median costs.



Residential	Peak Demand Savings as % of Peak Demand	Cost of Peak Demand Savings ($/kW)
Median of All Utilities	0.2%	$1,466/kW
AEP OH 09	0.2%	$962/kW

High peak demand savings at low costs were achieved by DP&L with their lighting program and by DE with their prescriptive program.

Allegheny (PA) is not included so as not to skew the scale (0.01%, $10,639/kW).

Consumers Energy reported no demand savings.

Summary of High Savings and Low Costs Results for Residential EE/PDR Portfolios in 2009

Summary of High Savings and Low Costs Results for Residential EE Portfolios	
EE Spending	AEP Ohio achieved residential EE spending of about 0.4% (as a % of revenue) in 2009 while other utilities achieved between 0.4-1.0% of revenues.
EE Savings	AEP Ohio achieved residential energy savings of 0.6% (as a % of residential sales) while the other utilities in this group achieved between 0.4-1.3% of residential sales
EE Costs	Energy savings generally cost about 9 ¢/kWh (first year costs)
Top Programs	Prescriptive Incentives, especially Lighting
	Appliance Recycling

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2009 EE/PDR Results by State

2009 DSM Results by State

Customer Sector	Utility	2009 Incremental DSM Results			2009 Retail				Cost of Energy	Normalized DSM Results				
		GWh	MW	Costs $M	Customers	Annual GWh	Peak MW	Revenue $M	Cost of Energy	Spending as % of Revenue	Energy Savings as % of Sales	Demand Savings as % of Peak	Cost of Savings	
									$/kWh				$/kWh	$/kW
Residential	**Median**	**58.1**	**4.6**	**$5.68**	**1,339,362**	**12,640**	**2,683**	**$1,419**	**$0.11**	**0.43%**	**0.40%**	**0.18%**	**$0.12**	**$1,466**
OH	AEP OH 09	81.9	6.2	$5.95	1,274,824	14,642	2,868	$1,387	$0.09	0.43%	0.56%	0.22%	$0.07	$962
	Dayton P&L	68.8	9.7	$5.42	456,152	5,120	1,234	$560	$0.11	0.97%	1.34%	0.79%	$0.08	$559
	First Energy (OH)	1.1	0.5	$2.87	1,862,871	16,807	3,864	$1,790	$0.11	0.16%	0.01%	0.01%	$2.69	$6,101
IL	Ameren (IL)	41.9	3.1	$4.99	1,063,646	11,089	1,752	$1,168	$0.11	0.43%	0.38%	0.18%	$0.12	$1,606
	ComEd (IL)	111.1	8.9	$13.05	3,425,778	26,620	5,298	$3,116	$0.12	0.42%	0.42%	0.17%	$0.12	$1,466
MI	Consumers Energy (MI)	47.4	0.0	$8.53	1,566,980	12,386	2,607	$1,450	$0.12	0.59%	0.38%	-	$0.18	-
	Detroit Edison Co	123.6	13.0	$11.77	1,932,344	14,625	3,475	$1,754	$0.12	0.67%	0.85%	0.37%	$0.10	$908
PA	Allegheny (PA)	2.8	0.2	$2.13	618,849	7,090	1,356	$599	$0.08	0.36%	0.04%	0.01%	$0.77	$10,639
	First Energy (PA)	23.3	1.7	$4.75	1,125,836	11,521	2,381	$1,276	$0.11	0.37%	0.20%	0.07%	$0.20	$2,746
	PECO	140.7	8.9	$9.73	1,403,900	12,893	2,759	$1,859	$0.14	0.52%	1.09%	0.32%	$0.07	$1,092
C&I	**Median**	**53.8**	**3.9**	**$5.25**	**147,503**	**24,124**	**5,034**	**$1,897**	**$0.08**	**0.33%**	**0.27%**	**0.08%**	**$0.11**	**$755**
OH	AEP OH 09	208.8	30.0	$8.95	184,067	30,688	5,736	$1,935	$0.06	0.46%	0.68%	0.52%	$0.04	$298
	Dayton P&L	28.5	5.4	$2.15	58,014	6,947	1,675	$586	$0.08	0.37%	0.41%	0.32%	$0.08	$396
	First Energy (OH)	19.9	0.7	$0.00	115,262	33,156	7,622	$2,659	$0.08	0.00%	0.06%	0.01%	$0.00	$3
IL	Ameren (IL)	85.8	13.9	$7.88	131,705	23,783	3,759	$1,697	$0.07	0.46%	0.36%	0.37%	$0.09	$567
	ComEd (IL)	152.5	15.7	$17.91	366,515	59,633	11,867	$5,671	$0.10	0.32%	0.26%	0.13%	$0.12	$1,140
MI	Consumers Energy (MI)	97.4	0.0	$13.62	221,181	22,966	4,833	$1,859	$0.08	0.73%	0.42%	-	$0.14	-
	Detroit Edison Co	79.1	5.6	$8.29	2,445	28,123	6,682	$2,348	$0.08	0.35%	0.28%	0.08%	$0.10	$1,480
PA	Allegheny (PA)	2.5	0.5	$0.57	96,114	12,097	2,315	$751	$0.06	0.08%	0.02%	0.02%	$0.23	$1,146
	First Energy (PA)	6.9	1.5	$1.10	168,967	19,721	4,075	$1,390	$0.07	0.08%	0.04%	0.04%	$0.16	$755
	PECO	16.2	2.4	$2.63	163,301	24,465	5,235	$2,378	$0.10	0.11%	0.07%	0.05%	$0.16	$1,106
Overall	**Median**	**136.2**	**13.2**	**$12.61**	**1,513,046**	**36,355**	**7,717**	**$3,316**	**$0.09**	**0.40%**	**0.39%**	**0.14%**	**$0.11**	**$1,095**
OH	AEP OH 09	290.6	36.2	$14.90	1,458,891	45,330	8,604	$3,323	$0.07	0.45%	0.64%	0.42%	$0.05	$412
	Dayton P&L	97.3	15.1	$7.57	514,166	12,067	2,909	$1,147	$0.10	0.66%	0.81%	0.52%	$0.08	$500
	First Energy (OH)	21.0	1.2	$2.87	1,978,133	49,963	11,486	$4,450	$0.09	0.06%	0.04%	0.01%	$0.14	$2,453
IL	Ameren (IL)	127.7	17.0	$12.87	1,195,351	34,872	5,511	$2,865	$0.08	0.45%	0.37%	0.31%	$0.10	$757
	ComEd (IL)	263.7	24.6	$30.97	3,792,293	86,254	17,165	$8,787	$0.10	0.35%	0.31%	0.14%	$0.12	$1,258
MI	Consumers Energy (MI)	144.7	0.0	$22.16	1,788,161	35,352	7,440	$3,309	$0.09	0.67%	0.41%	-	$0.15	-
	Detroit Edison Co	202.7	18.6	$20.06	1,934,789	42,748	10,157	$4,102	$0.10	0.49%	0.47%	0.18%	$0.10	$1,081
PA	Allegheny (PA)	5.2	0.7	$2.70	714,963	19,186	3,671	$1,350	$0.07	0.20%	0.03%	0.02%	$0.52	$3,858
	First Energy (PA)	30.2	3.2	$5.85	1,294,803	31,243	6,456	$2,667	$0.09	0.22%	0.10%	0.05%	$0.19	$1,838
	PECO	156.8	11.3	$12.36	1,567,201	37,358	7,994	$4,236	$0.11	0.29%	0.42%	0.14%	$0.08	$1,095

ComEd and Ameren IL's C&I retail revenue data include both energy and delivery statistics from EIA's 861 report. Because not all delivery revenue was reported, we applied the ratio of energy's $/kWh (revenue ÷ retail kWh sales) to delivery's retail kWh sales to estimate the C&I revenue.

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2010 Overall Results

	Spending as % of Revenue	Energy Savings as % of Sales	Peak Demand Savings as % of Peak Demand	Retail Cost of Energy $/kWh	Cost of First Year Savings	
					$/kWh	$/kW
All Region Median	0.8%	0.7%	0.5%	$0.09	$0.11	$478
AEP OH 10	0.8%	0.7%	0.5%	$0.08	$0.09	$709

The PA utilities are not included in the 2010 analysis as their 2010 annual reports will not be available until November 2011.

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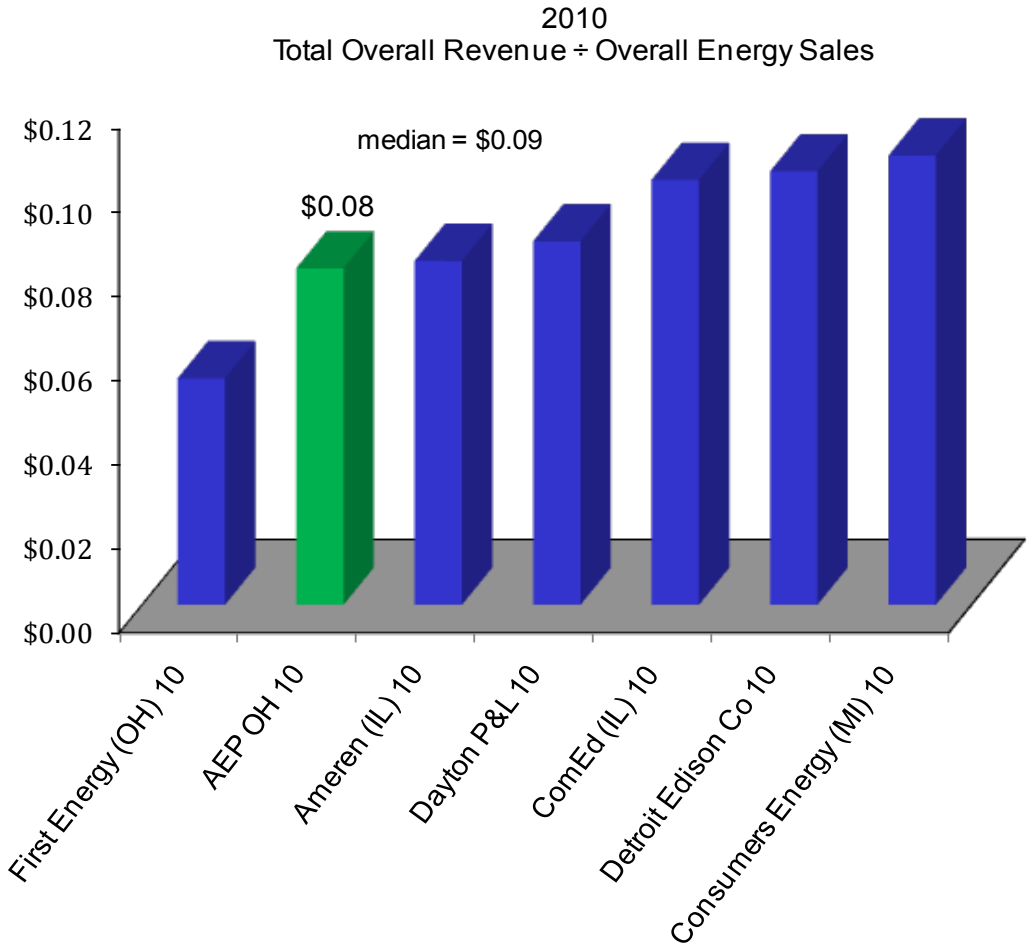
AEP Ohio's retail cost of energy is low in 2010.



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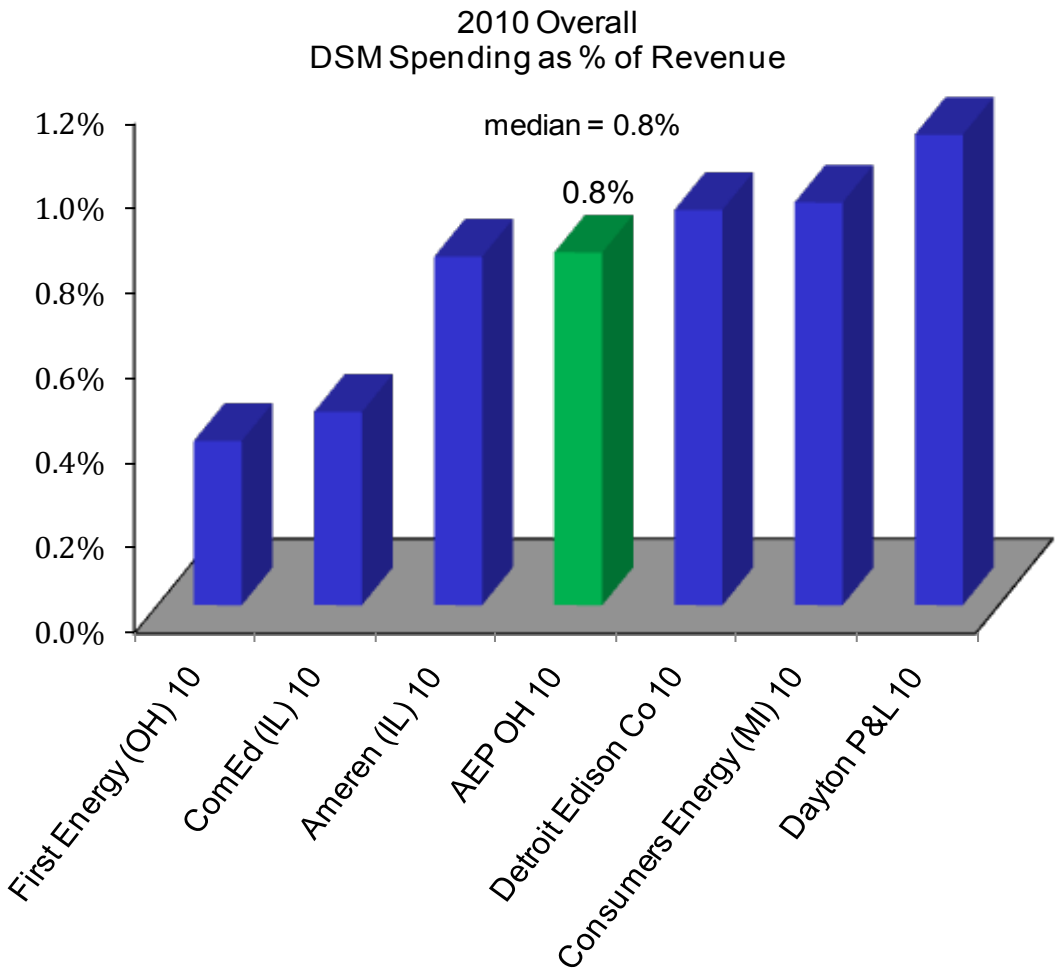
The green bar indicates AEP Ohio's 2010 results.

AEP Ohio's EE/PDR spending over all sectors (as a percentage of revenue) is the median.



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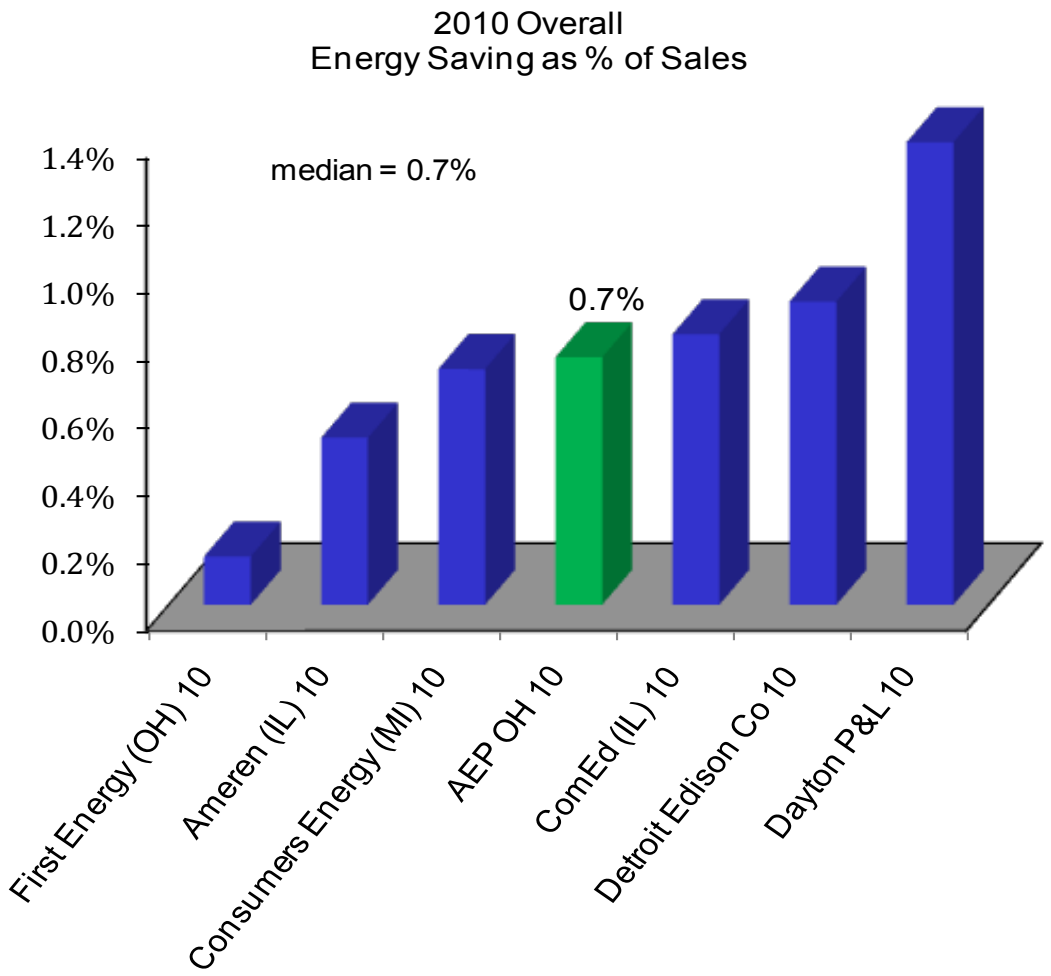
AEP Ohio's energy savings over all sectors (as a percentage of sales) is the median.



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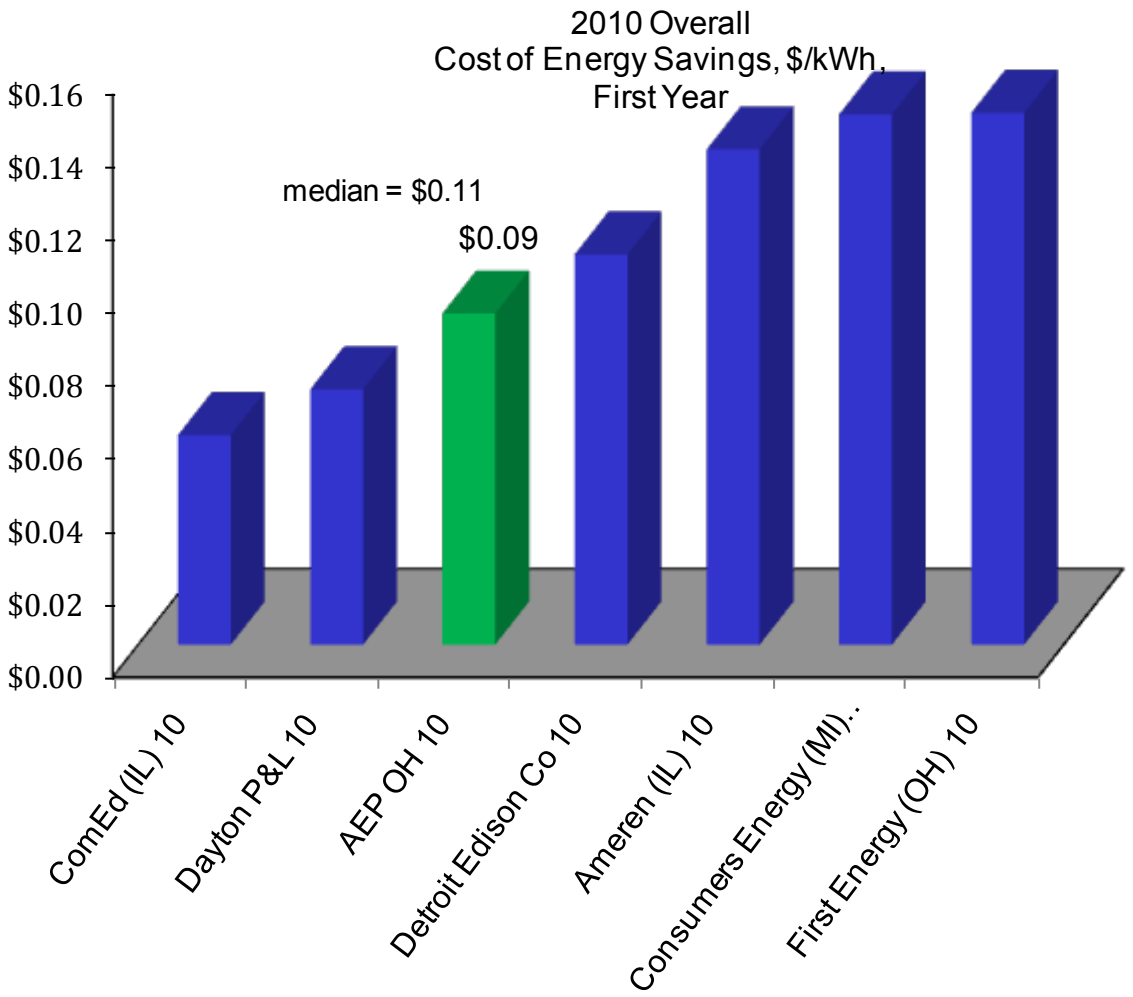
AEP Ohio's cost of energy savings per first year kWh is below the median.



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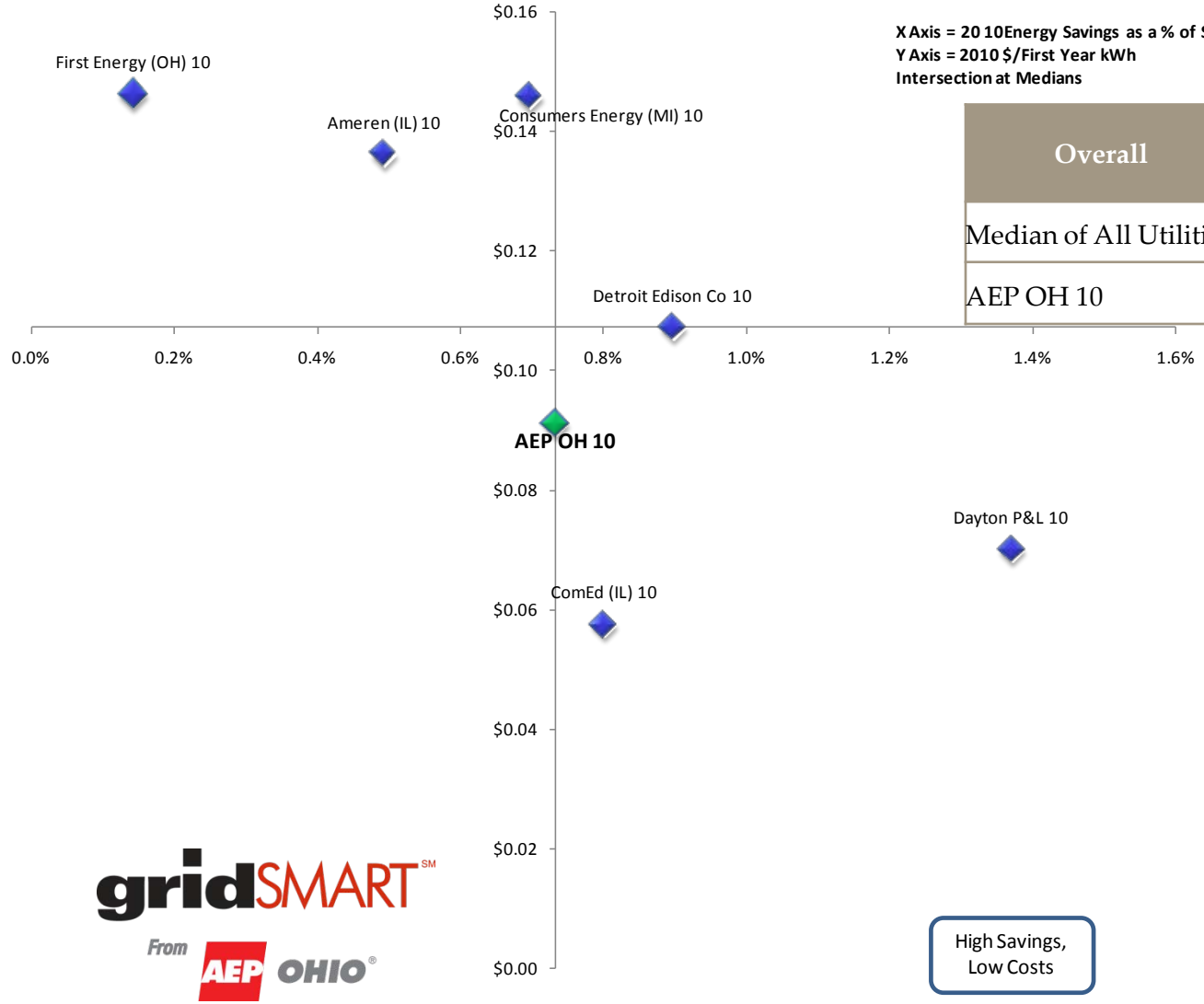
AEP Ohio achieved median energy savings (as a percentage of sales) at below median costs.



X Axis = 2010 Energy Savings as a % of Sales
Y Axis = 2010 $/First Year kWh
Intersection at Medians

Overall	Energy Savings % of Sales	Cost of Energy Savings ($/kWh) First Year
Median of All Utilities	0.7%	$0.11/kWh
AEP OH 10	0.7%	$0.09/kWh

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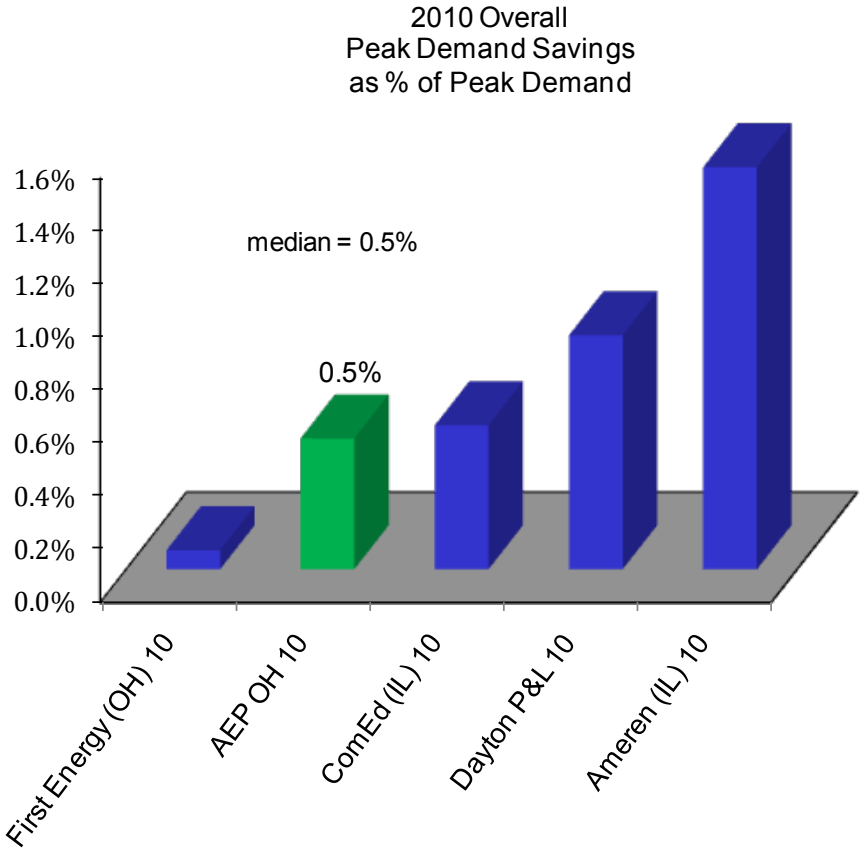
High Savings, Low Costs

AEP Ohio achieved below median peak demand savings (as a percentage of peak demand).

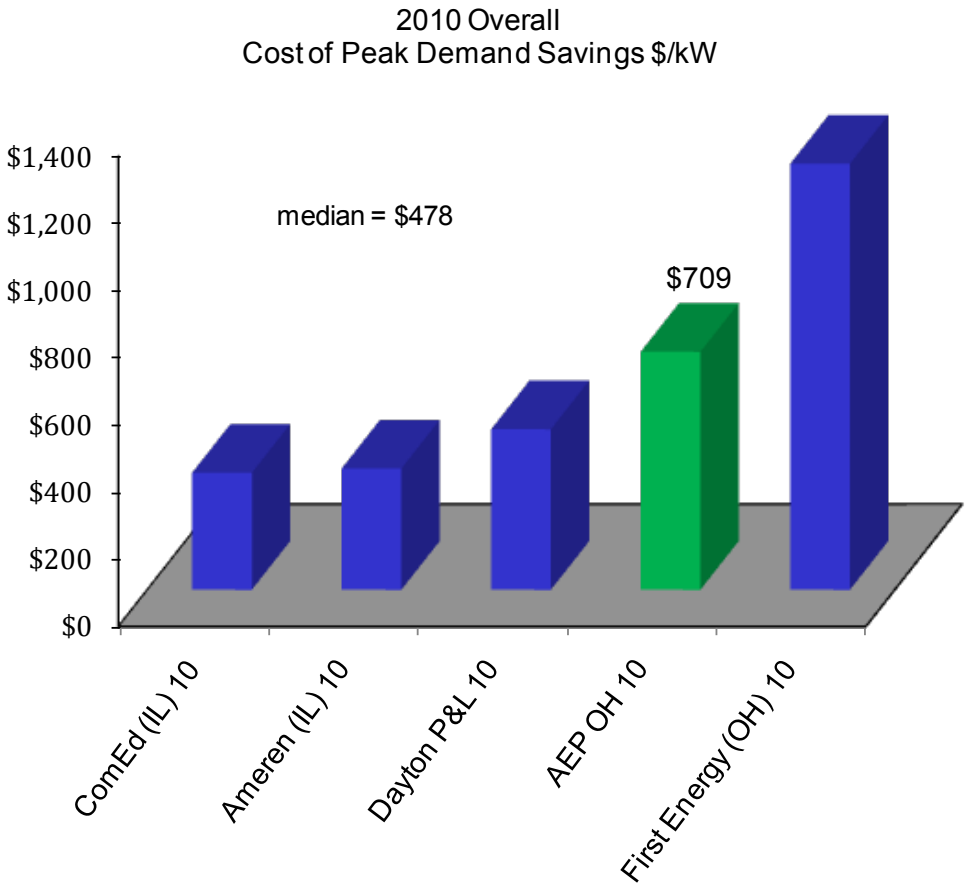


Consumers Energy and Detroit Edison are not included in any peak demand graphic as they did not reported kW savings in their 2010 annual reports.

Ameren IL achieved high peak demand savings with its Custom Incentives program.

Dayton P&L achieved high peak demand savings with its residential Lighting and C&I prescriptive programs.

AEP Ohio's cost of peak demand savings is above the median.



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ComEd IL achieved low cost peak demand savings with its residential Lighting and Business Prescriptive programs.

Ameren IL achieved low cost peak demand savings with its Custom Incentives program.

2010 C&I Results

	Spending as % of Revenue	Energy Savings as % of Sales	Peak Demand Savings as % of Peak Demand	Retail Cost of Energy $/kWh	Cost of First Year Savings	
					$/kWh	$/kW
All Region Median	0.8%	0.6%	0.5%	$0.07	$0.09	$414
AEP OH 10	1.0%	0.7%	0.6%	$0.07	$0.09	$601

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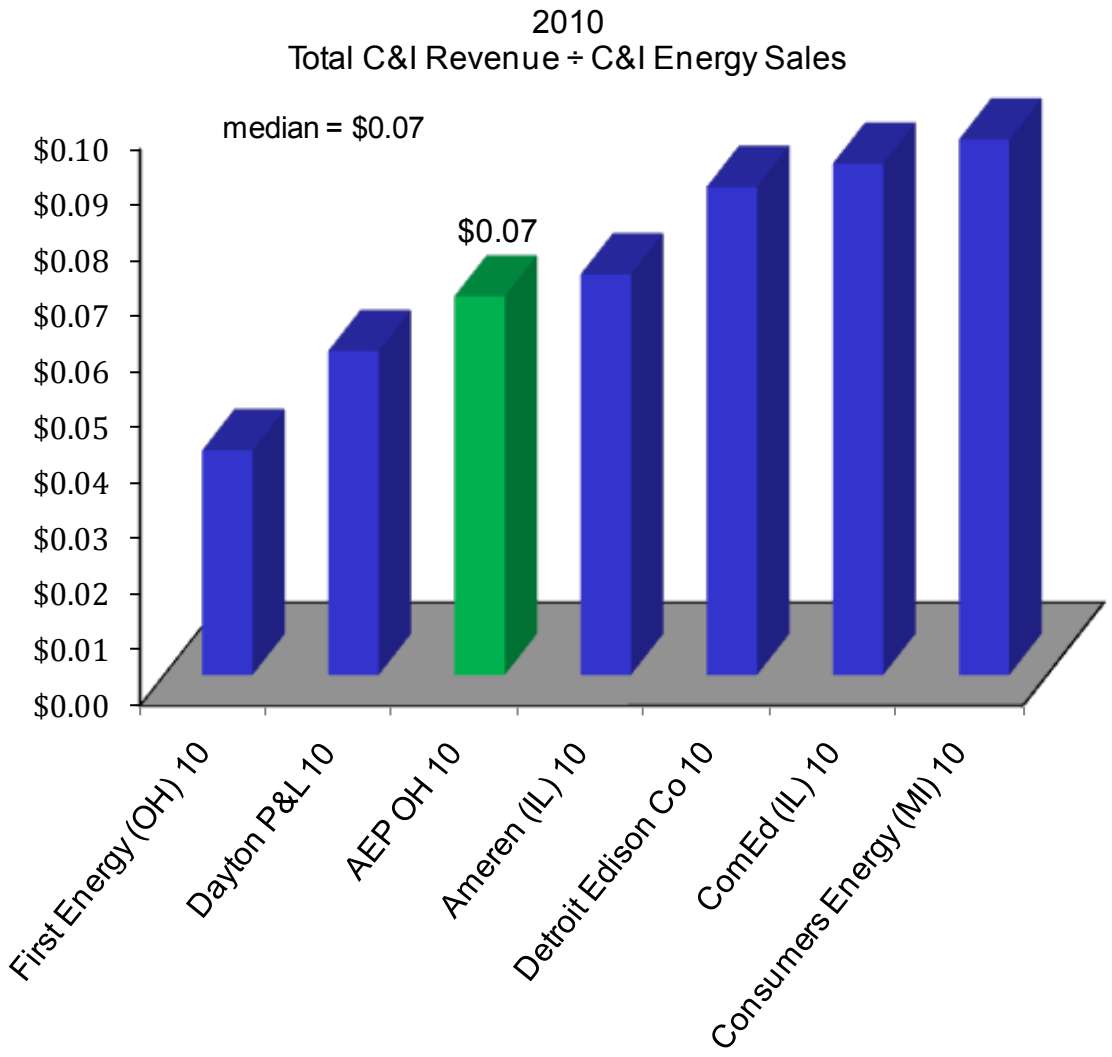
AEP Ohio's C&I retail cost of energy is below the median.



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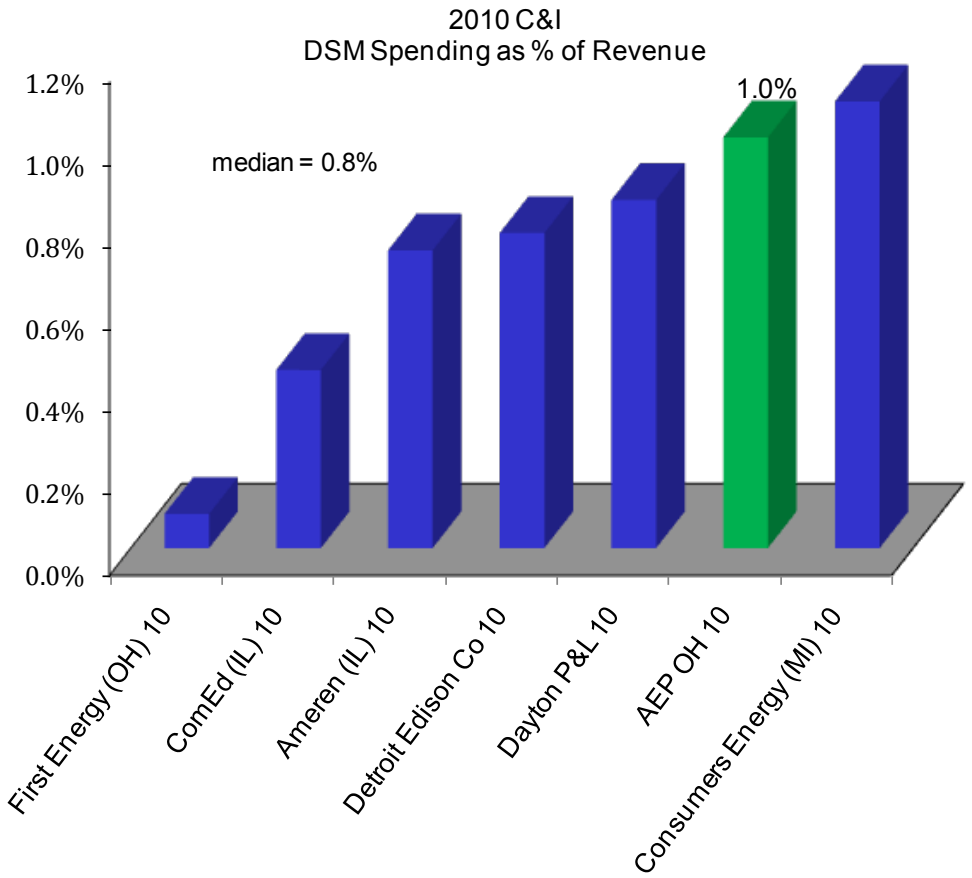
AEP Ohio spent a higher percentage of C&I revenue on EE/PDR programs than the median.



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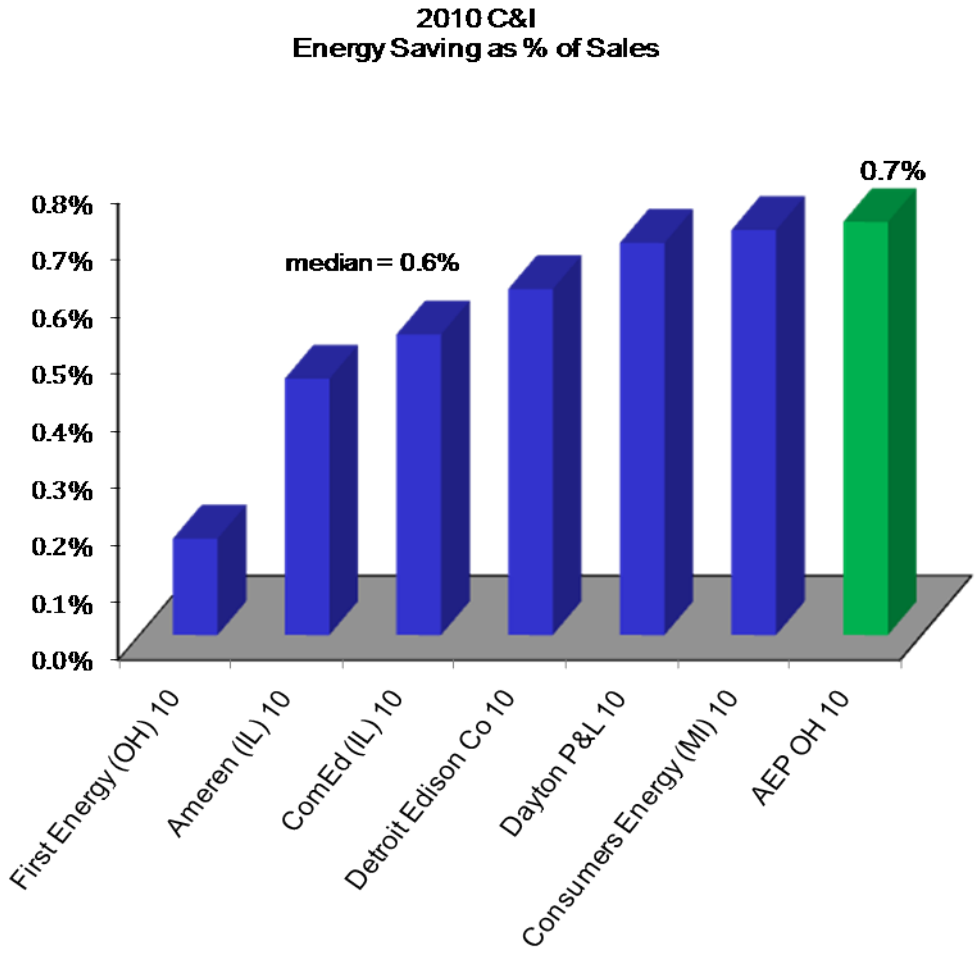
AEP Ohio achieved the highest C&I energy savings (as a percentage of sales).



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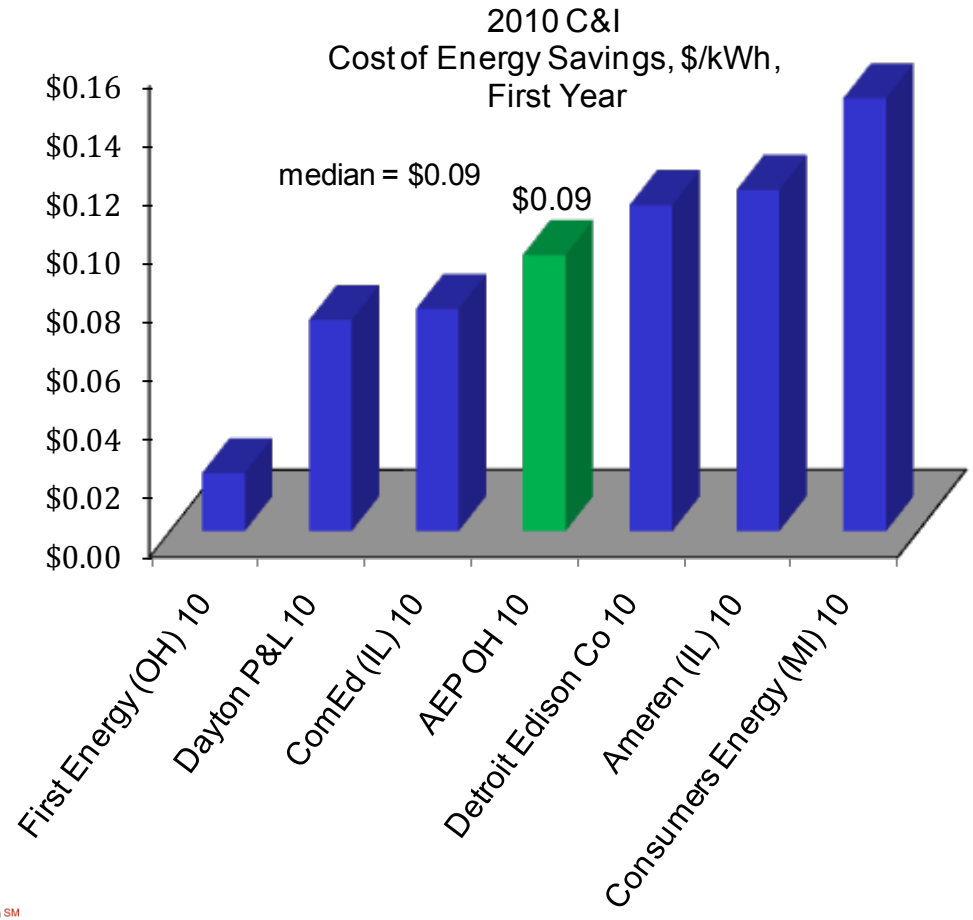
AEP Ohio's cost of C&I energy savings per first year kWh is the median.



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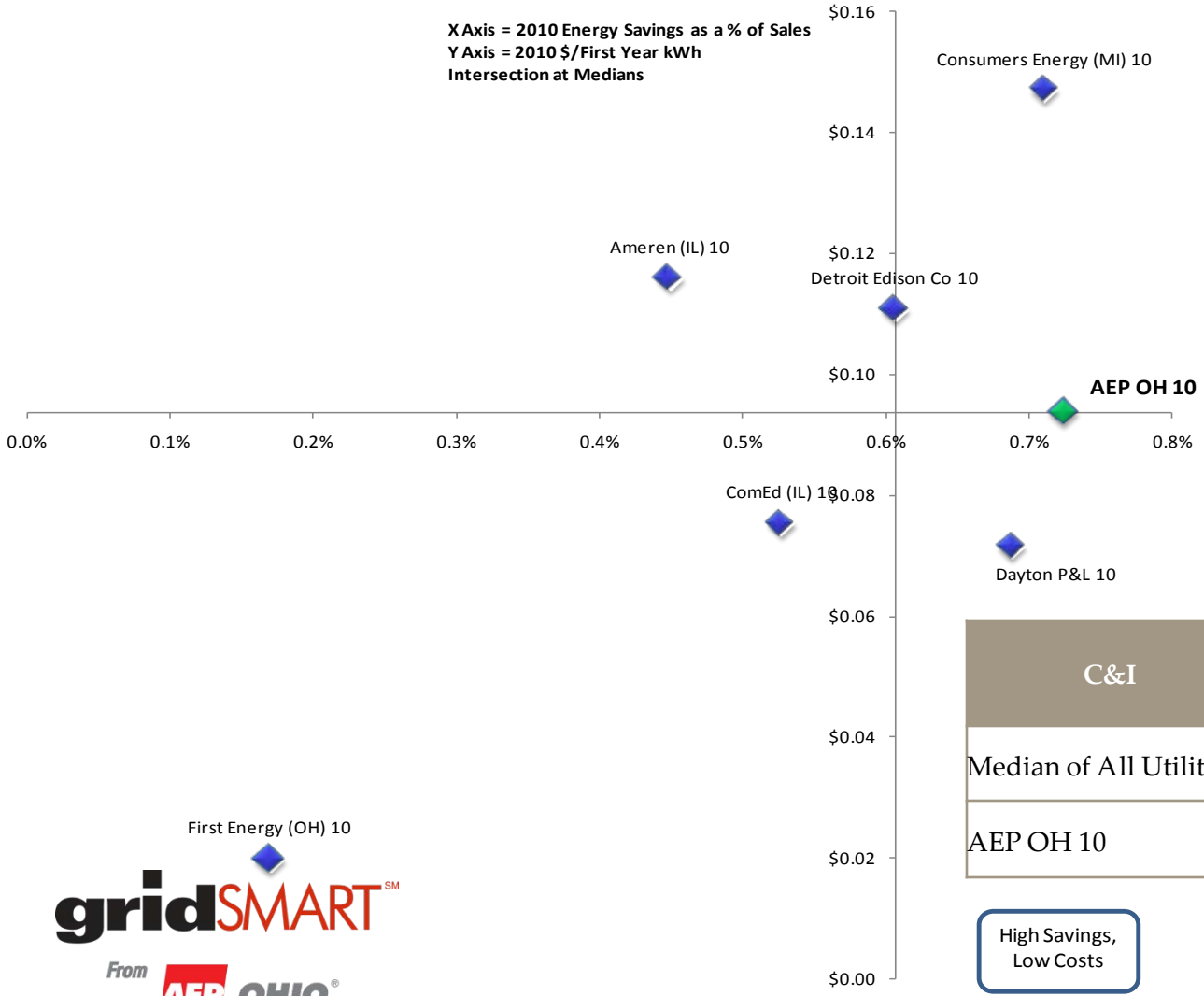
AEP Ohio achieved the highest C&I energy savings (as a percentage of sales) at median costs.



C&I	Energy Savings % of Sales	Cost of Energy Savings ($/kWh) First Year
Median of All Utilities	0.6%	$0.09/kWh
AEP OH 10	0.7%	$0.09/kWh

High Savings, Low Costs

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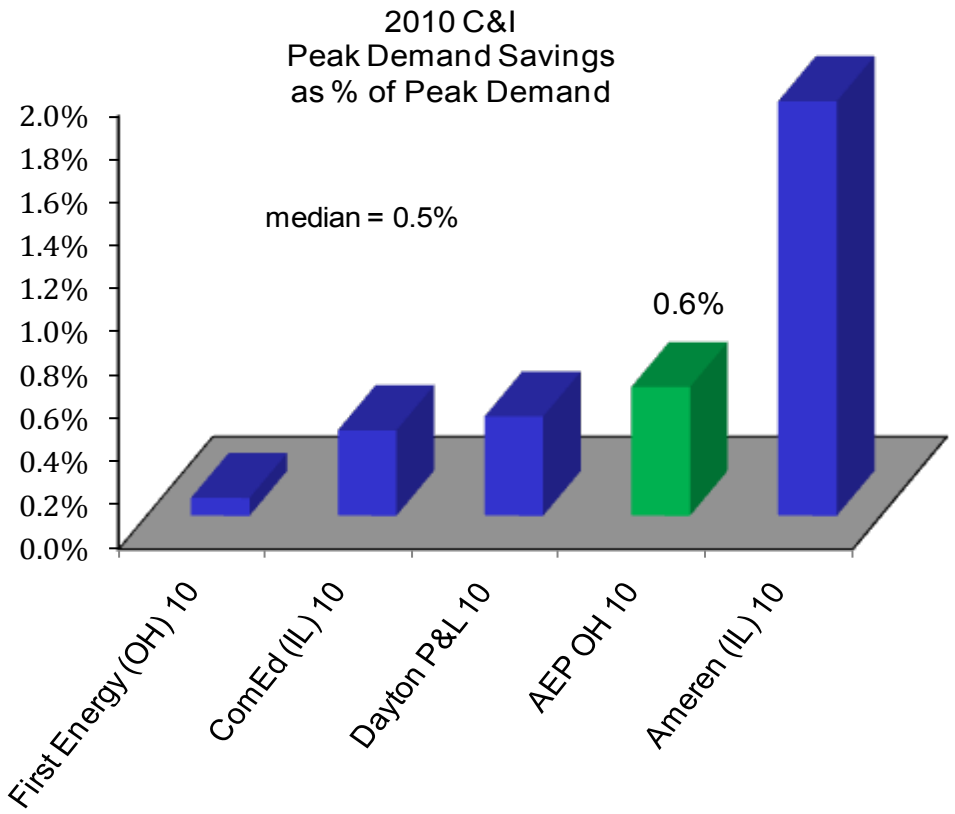
AEP Ohio's peak demand savings (as a percentage of peak demand) is above the median.



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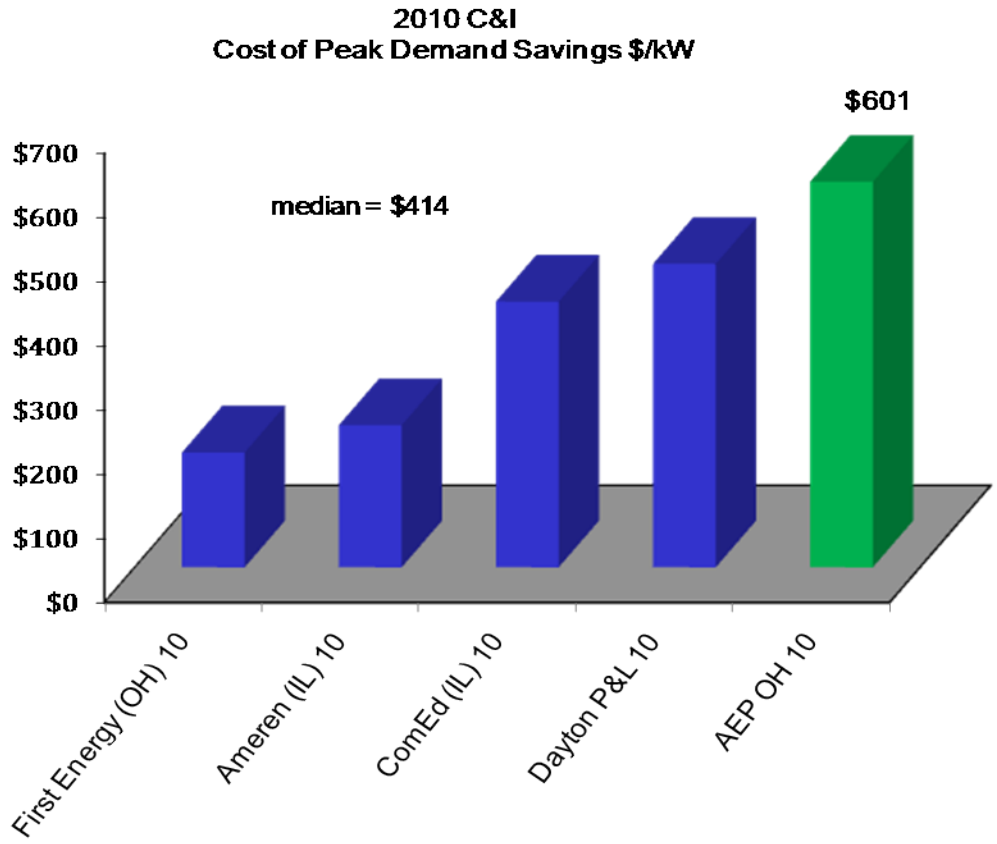
Ameren IL achieved high peak demand savings with its Custom Incentives program.

AEP Ohio achieved high peak demand savings with its Prescriptive program.

Cost of C&I peak demand savings ranges from $200-600/kW.



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First Energy OH achieved low cost peak demand savings with its self direct program.

Ameren IL achieved low cost peak demand savings with its Custom Incentives program.

2010 Residential Results

	Spending as % of Revenue	Energy Savings as % of Sales	Peak Demand Savings as % of Peak Demand	Retail Cost of Energy $/kWh	Cost of First Year Savings	
					$/kWh	$/kW
All Region Median	0.8%	0.7%	0.7%	$0.12	$0.10	$1,151
AEP OH 10	0.6%	0.7%	0.3%	$0.11	$0.09	$1,160

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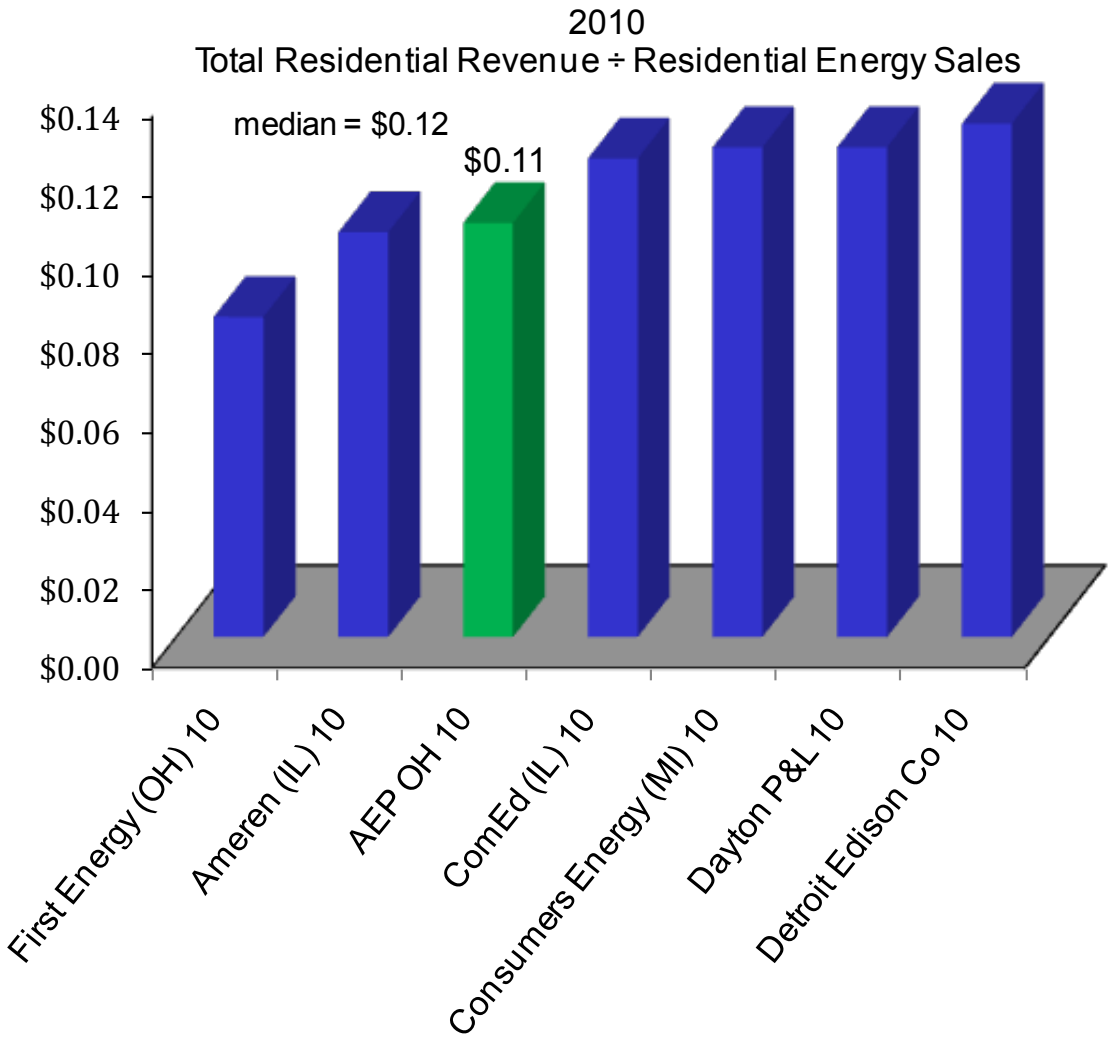
AEP Ohio's residential retail cost of energy savings is below the median.



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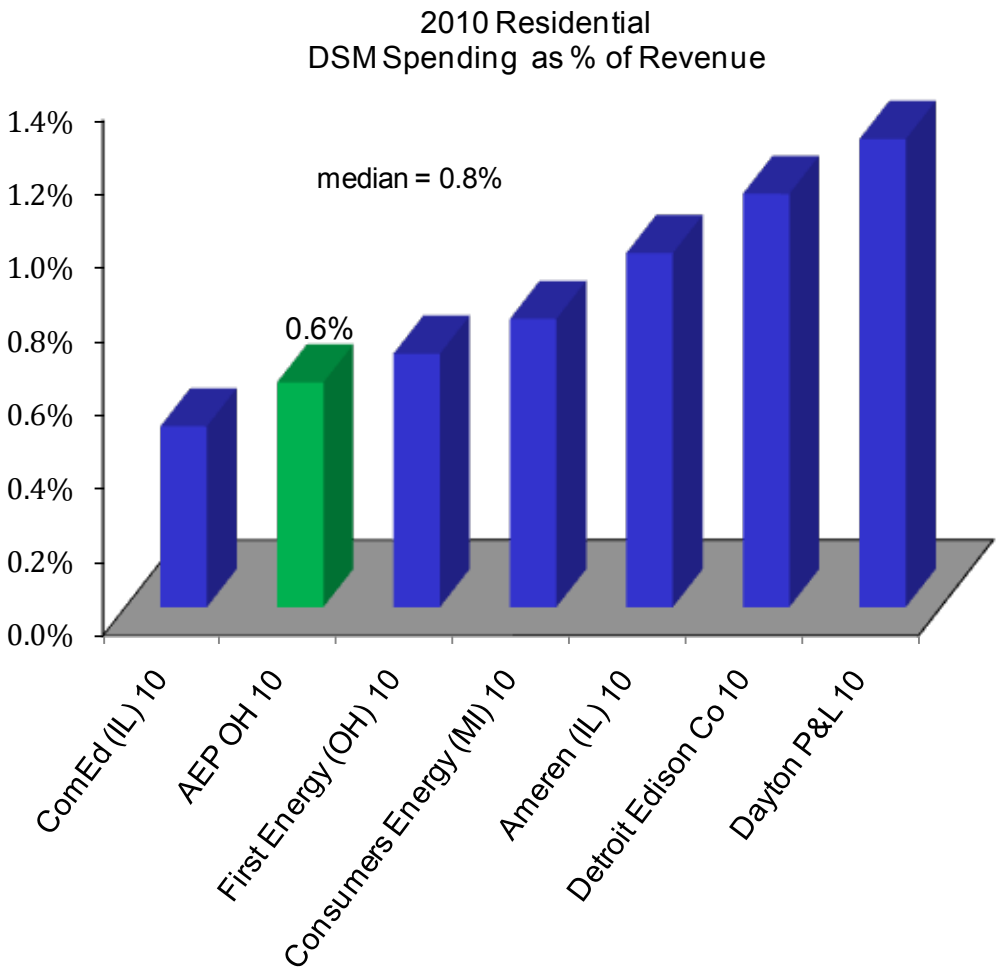
AEP Ohio's residential spending (as a percentage of revenue) is below the median.



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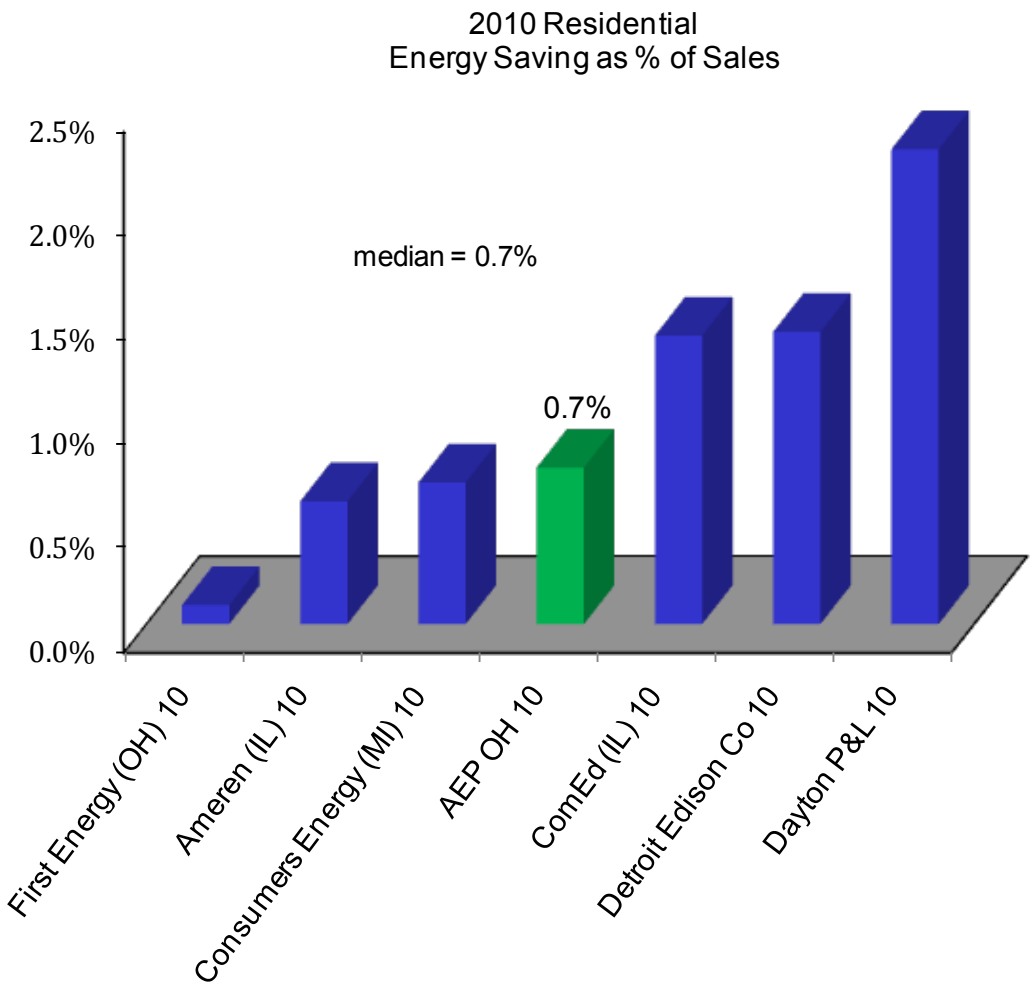
AEP Ohio's residential energy savings (as a percentage of sales) is the median.



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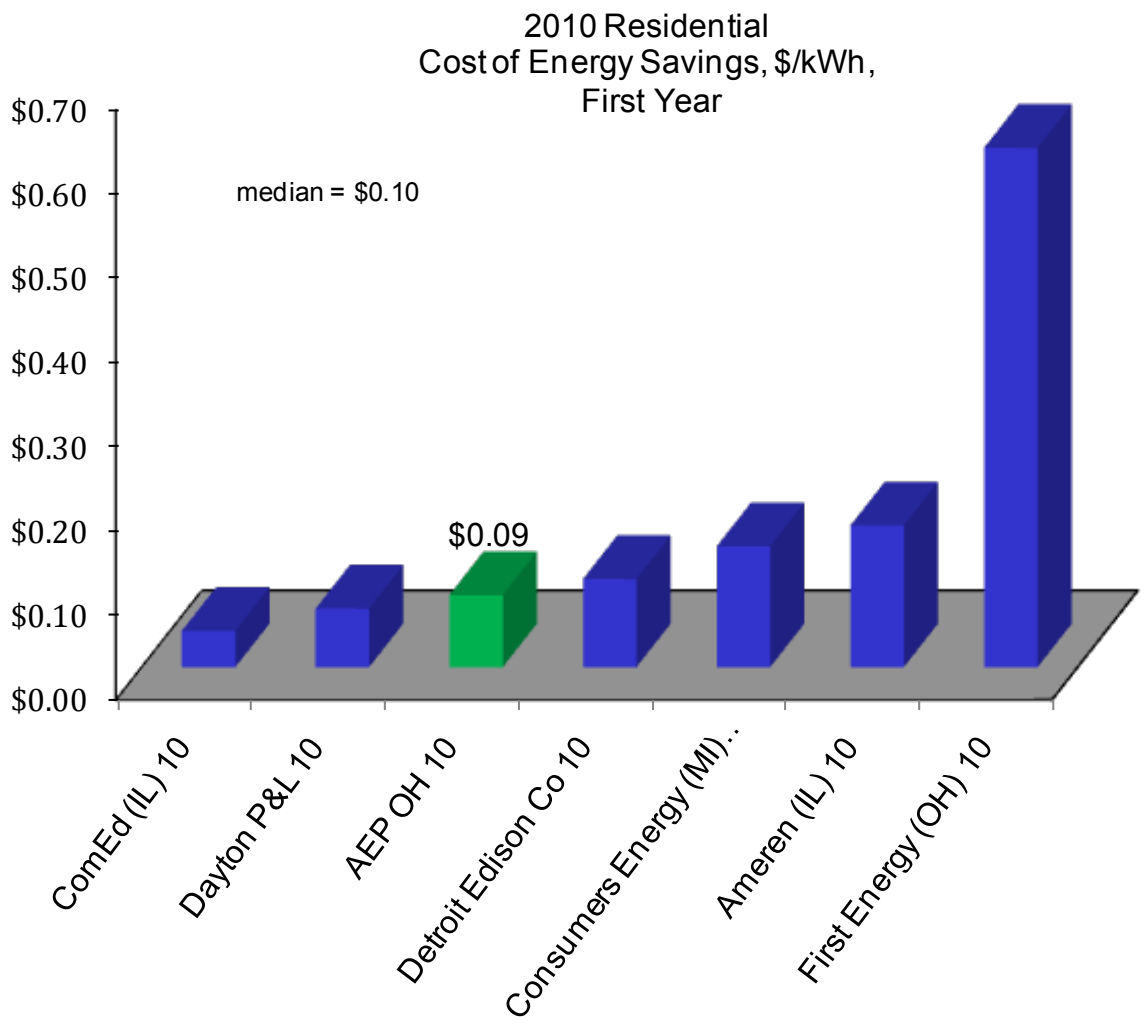
AEP Ohio's cost of residential energy savings per first year kWh is below the median.



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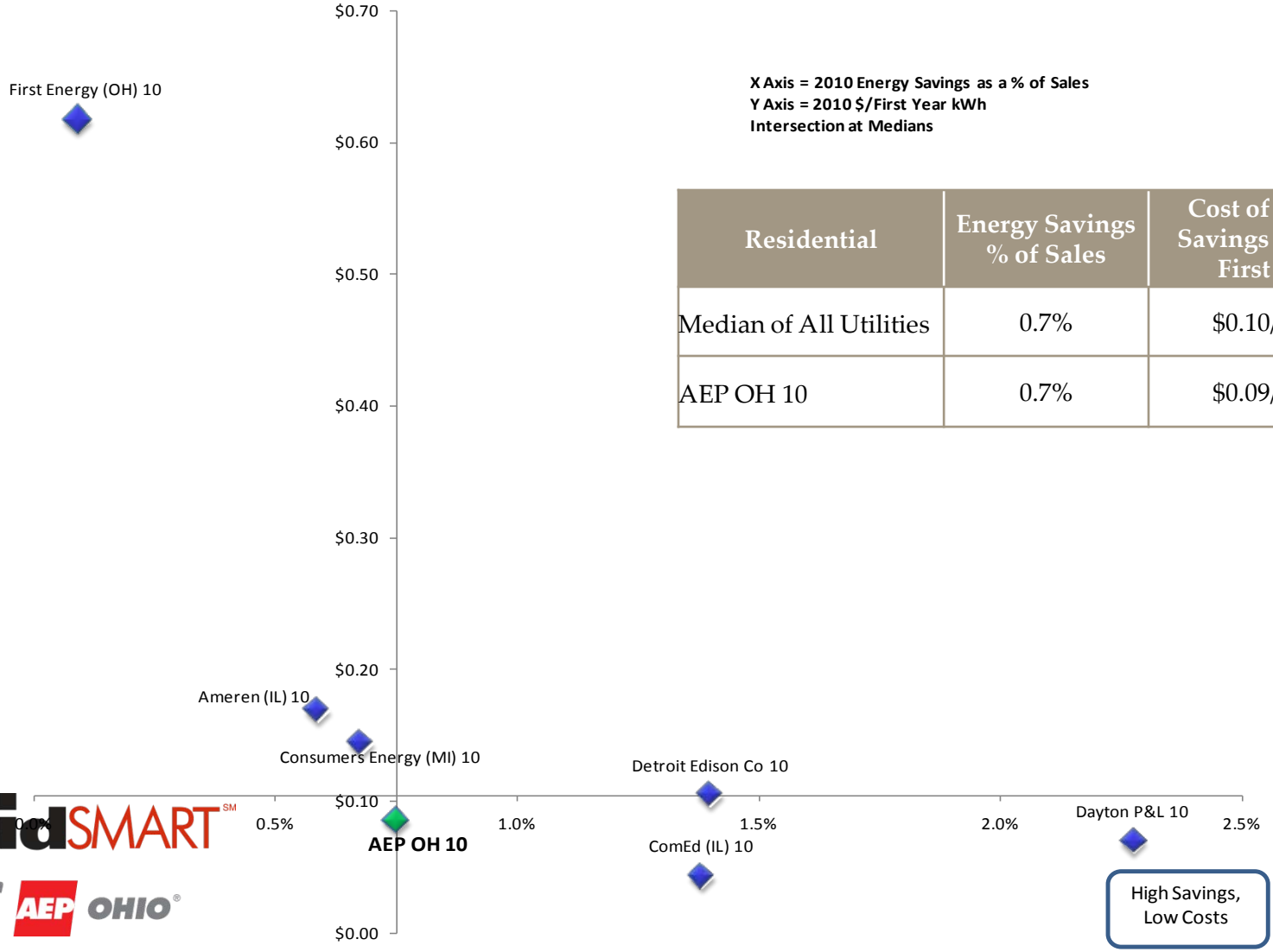
AEP Ohio achieved median residential energy savings (as a percentage of sales) at below median costs.



Residential	Energy Savings % of Sales	Cost of Energy Savings ($/kWh) First Year
Median of All Utilities	0.7%	$0.10/kWh
AEP OH 10	0.7%	$0.09/kWh

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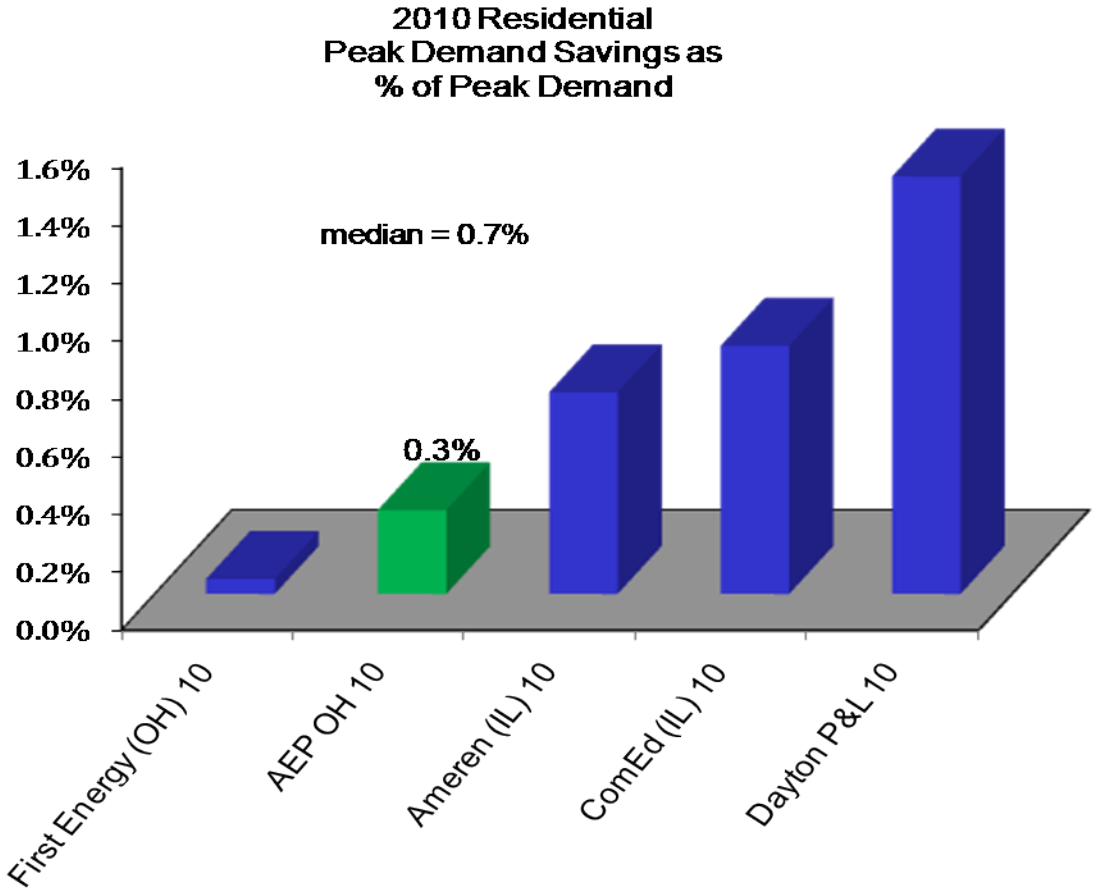
AEP Ohio's residential peak demand savings (as a percentage of peak demand) is below the median.



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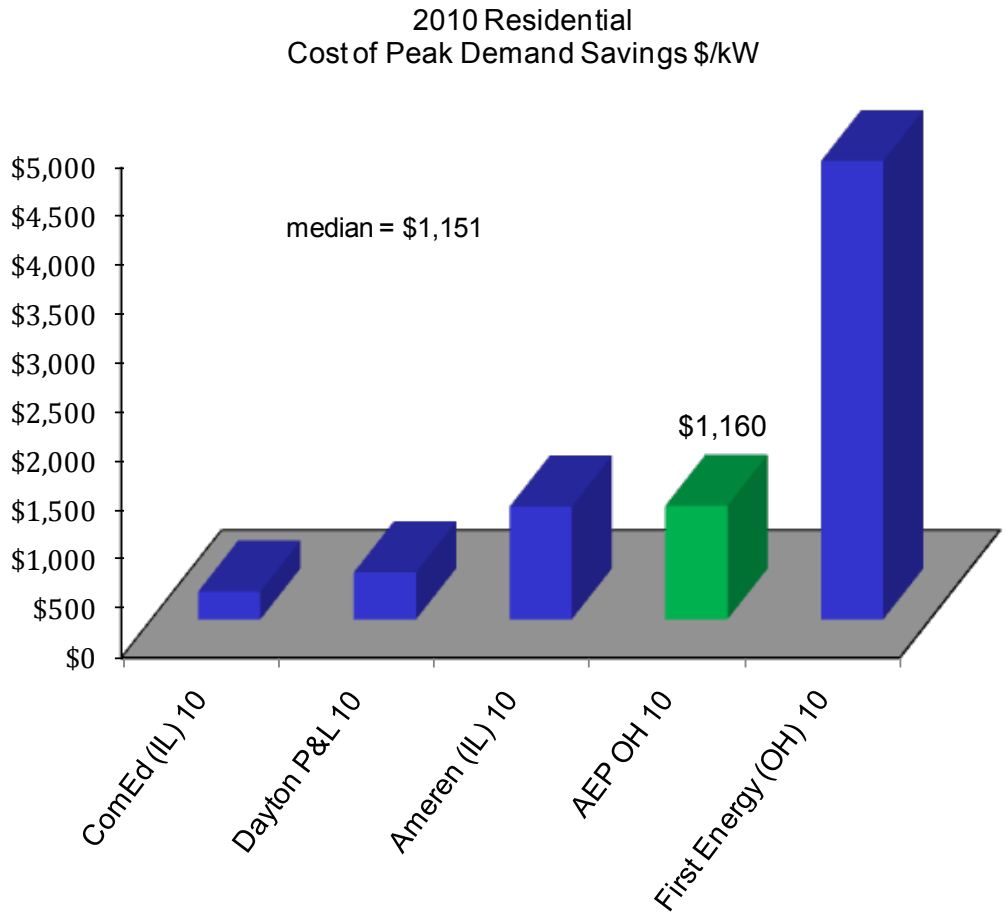
Dayton P&L and ComEd IL achieved high peak demand savings with their lighting programs.

AEP Ohio's cost of peak demand savings $/kW is close to the median.



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Dayton P&L and ComEd achieved low cost peak demand savings with their lighting programs.

2010 EE/PDR Results by State

2010 DSM Results by State														
		2010 Incremental DSM Results			2010 Retail					Normalized DSM Results				
Customer Sector	Utility	GWh	MW	Costs $M	Customers	Annual GWh	Peak MW	Revenue $M	Cost of Energy	Spending as % of Revenue	Energy Savings as % of Sales	Demand Savings as % of Peak	Cost of Savings	
									$/kWh				$/kWh	$/kW
Residential	**Median**	**115.4**	**10.6**	**12.2**	**1,286,907**	**15,386**	**2,928**	**$1,614**	**$0.12**	**0.8%**	**0.7%**	**0.7%**	**$0.10**	**$1,151**
OH	AEP OH 10	115.4	8.5	$9.87	1,286,907	15,386	2,928	$1,619	$0.11	0.6%	0.7%	0.3%	$0.09	$1,160
	Dayton P&L 10	125.6	18.2	$8.74	456,796	5,522	1,257	$688	$0.12	1.3%	2.3%	1.4%	$0.07	$480
	First Energy (OH) 10	16.2	2.1	$9.97	1,023,362	17,808	4,067	$1,449	$0.08	0.7%	0.1%	0.1%	$0.62	$4,679
IL	Ameren (IL) 10	72.6	10.6	$12.21	1,054,220	12,341	1,517	$1,270	$0.10	1.0%	0.6%	0.7%	$0.17	$1,151
	ComEd (IL) 10	403.3	61.2	$17.42	3,443,162	29,171	7,111	$3,548	$0.12	0.5%	1.4%	0.9%	$0.04	$285
MI	Consumers Energy (MI) 10	88.0	NA	$12.63	1,594,617	12,968	2,607	$1,614	$0.12	0.8%	0.7%	-	$0.14	-
	Detroit Edison Co 10	220.2	NA	$23.03	1,927,963	15,726	4,291	$2,053	$0.13	1.1%	1.4%	-	$0.10	-
C&I	**Median**	**144.4**	**35.5**	**$18.20**	**186,615**	**27,105**	**5,978**	**$1,955**	**$0.07**	**0.8%**	**0.6%**	**0.5%**	**$0.09**	**$414**
OH	AEP OH 10	227.5	35.5	$21.33	186,615	31,418	5,978	$2,138	$0.07	1.0%	0.7%	0.6%	$0.09	$601
	Dayton P&L 10	50.3	7.6	$3.61	57,649	7,323	1,667	$426	$0.06	0.8%	0.7%	0.5%	$0.07	$473
	First Energy (OH) 10	60.2	6.7	$1.19	119,735	35,552	8,120	$1,435	$0.04	0.1%	0.2%	0.1%	$0.02	$179
IL	Ameren (IL) 10	114.7	60.0	$13.29	117,124	25,532	3,138	$1,838	$0.07	0.7%	0.4%	1.9%	$0.12	$222
	ComEd (IL) 10	326.2	59.4	$24.60	314,361	61,894	15,089	$5,687	$0.09	0.4%	0.5%	0.4%	$0.08	$414
MI	Consumers Energy (MI) 10	144.4	NA	$21.21	224,818	20,322	4,833	$1,955	$0.10	1.1%	0.7%	-	$0.15	-
	Detroit Edison Co 10	164.4	NA	$18.20	197,513	27,105	7,396	$2,377	$0.09	0.8%	0.6%	-	$0.11	-
Overall	**Median**	**232.3**	**44.0**	**$31.21**	**1,473,522**	**42,831**	**8,906**	**$3,569**	**$0.09**	**0.8%**	**0.7%**	**0.5%**	**$0.11**	**$478**
OH	AEP OH 10	342.9	44.0	$31.21	1,473,522	46,804	8,906	$3,757	$0.08	0.8%	0.7%	0.5%	$0.09	$709
	Dayton P&L 10	175.9	25.8	$12.35	514,445	12,845	2,924	$1,114	$0.09	1.1%	1.4%	0.9%	$0.07	$478
	First Energy (OH) 10	76.4	8.8	$11.16	1,143,097	53,360	12,187	$2,885	$0.05	0.4%	0.1%	0.1%	$0.15	$1,269
IL	Ameren (IL) 10	187.3	70.6	$25.50	1,171,344	37,873	4,655	$3,108	$0.08	0.8%	0.5%	1.5%	$0.14	$361
	ComEd (IL) 10	729.5	120.6	$42.03	3,757,523	91,065	22,200	$9,235	$0.10	0.5%	0.8%	0.5%	$0.06	$349
MI	Consumers Energy (MI) 10	232.3	NA	$33.84	1,819,435	33,290	7,440	$3,569	$0.11	0.9%	0.7%	-	$0.15	-
	Detroit Edison Co 10	384.5	NA	$41.23	2,125,476	42,831	11,687	$4,430	$0.10	0.9%	0.9%	-	$0.11	-

ComEd and Ameren IL's C&I retail revenue data include both energy and delivery statistics from EIA's 861 report. Because not all delivery revenue was reported, we applied the ratio of energy's $/kWh (revenue ÷ retail kWh sales) to delivery's retail kWh sales to estimate the C&I revenue.

Table of Contents

References

Allegheny Energy. (2010, September 15). Annual Report to the Pennsylvania Public Utility Commission. For Act 129 of 2009 energy efficiency and conservation program. Plan year 1. From http://www.puc.state.pa.us/electric/Act129/EEC_Program.aspx

Ameren Illinois Utilities. (2009, December 30). Portfolio Cost-Effectiveness Evaluation. From http://ilsag.org/evaluation_documents

Ameren Illinois Utilities. (2010, September -January). Multiple Residential Programs Draft Evaluations – PY 2. From http://ilsag.org/evaluation_documents

Ameren Illinois Utilities. (2011, January 28). Impact & Process Evaluation of 2009 Ameren Illinois Utilities Commercial and Industrial Electric EE Programs. From http://ilsag.org/evaluation_documents

Ameren Illinois Utilities. (2011, July 17). Rider EDR-Energy Efficiency and Demand-Response Cost Recovery. Rider EDR Annual Reconciliation. From personal correspondence with Heidi Merchant at Ameren Illinois.

American Electric Power Ohio. (2010, March 15). 2009 Portfolio Status Report of Energy Efficiency and Peak Demand Response Programs. Case No. 10-318_EL-EEC From http://dis.puc.state.oh.us/CasesByIndustryPurposeStatus.aspx

American Electric Power Ohio. (2011, March 15). 2010 Portfolio Status Report of Energy Efficiency and Peak Demand Response Programs. Case No. 11-1299-EL-EEC From http://dis.puc.state.oh.us/CasesByIndustryPurposeStatus.aspx

Commonwealth Edison Company. (2009, December 23). Energy Efficiency/Demand Response Plan. Plan year 1. Evaluation report. From http://ilsag.org/evaluation_documents

Commonwealth Edison Company. (2010, February). Energy Efficiency/Demand Response Plan Annual Report. Plan year 1. From http://ilsag.org/evaluation_documents

References

Commonwealth Edison Company. (2010, December 21). Energy Efficiency/Demand Response Plan. Plan year 2. Evaluation report. From http://ilsag.org/evaluation_documents

Commonwealth Edison Company. (2010, December 21). Energy Efficiency/Demand Response Plan. Evaluation reports for multiple programs. From http://ilsag.org/evaluation_documents

Commonwealth Edison Company. (2011, February 2). Exelon Corp Form 10-K. From http://www.exeloncorp.com/performance/investors/secfilings.aspx

Consumers Energy. (2010, April 30). Consumers Energy Company's Application for Reconciliation of its Energy Optimization Plan. Case No. U-16302. From http://efile.mpsc.state.mi.us/efile/

Consumers Energy. (2011, April 29). Consumers Energy 2010 Energy Optimization Annual Report. Case No. U-15805. From http://efile.mpsc.state.mi.us/efile/

Dayton Power and Light. (2010, March 12). 2009 Energy Efficiency and Demand Reduction/Response Portfolio Status Report. Case No. 10-0303-EL-POR From http://dis.puc.state.oh.us/CasesByIndustryPurposeStatus.aspx

Dayton Power and Light. (2011, March 15). 2010 Energy Efficiency and Demand Reduction/Response Portfolio Status Report. Case No. 11-1276-EL-POR From http://dis.puc.state.oh.us/CasesByIndustryPurposeStatus.aspx

Detroit Edison. (2010, April 15). The Detroit Edison Company's Application for Approval of the Reconciliation of its 2009 Energy Optimization Plan Expenses for the Plan Year 2009. Case No. U-16358. From http://efile.mpsc.state.mi.us/efile/

Detroit Edison. (2011, April 15). The Detroit Edison Company's Application for Approval of the Reconciliation of its 2009 Energy Optimization Plan Expenses for the Plan Year 2010. Case No. U-16359. From http://efile.mpsc.state.mi.us/efile/

References

Energy Information Administration, Department of Energy. (2010, December). *Form EIA-861 data file – final – YR 2009*. From http://www.eia.doe.gov/cneaf/electricity/page/eia861.html

Energy Information Administration, Department of Energy. (2011, June 10). *Form EIA-826 data file – YR 2009*. From http://www.eia.gov/cneaf/electricity/page/eia826.html

First Energy Ohio. (2010, March 8). Energy Efficiency and Peak Demand Reduction Program Portfolio Status Report. Docket No. 10-0227-EL-EEC. From http://dis.puc.state.oh.us/CasesByIndustryPurposeStatus.aspx

First Energy Ohio (2011). FERC Financial Report. FERC Form 1. From http://investors.firstenergycorp.com/phoenix.zhtml?c=102230&p=irol-ferc

First Energy Ohio. (2011, May 13). Energy Efficiency and Peak Demand Reduction Program Portfolio Status Report. Docket No. 11-2956-EL-EEC. From http://dis.puc.state.oh.us/CasesByIndustryPurposeStatus.aspx

First Energy Pennsylvania. (2010, September 15). Annual Report to the Pennsylvania Public Utility Commission. For Act 129 of 2009 energy efficiency and conservation program. Plan year 1. From http://www.puc.state.pa.us/electric/Act129/EEC_Program.aspx

PECO. (2010, September 15). Annual Report to the Pennsylvania Public Utility Commission. For Act 129 of 2009 energy efficiency and conservation program. Program year 2009. From http://www.puc.state.pa.us/electric/Act129/EEC_Program.aspx

C. EE/PDR Measure Descriptions and Characterizations

C.1. Overview

This Appendix describes the DSM measures analyzed for this study and the methods used to estimate savings. For EE/PDR measures having impacts that do not vary with climate, data was used from several different sources, including: ongoing AEP Ohio programs, the 2011 residential and nonresidential baseline studies, the draft Ohio Statewide TRM for climate-dependent measures, and engineering estimates, as well as publicly available and well-respected sources, such as the California Database on Energy-Efficiency Resources (DEER) database. The approach adjusted the DEER energy and demand impacts for AEP Ohio's customer operating parameters as necessary based on the local weather. In addition to using data from ongoing AEP Ohio programs, or the draft Ohio Statewide TRM for climate-dependent measures, the analysis used a combination of building simulation modeling and engineering estimates specifically developed for AEP Ohio to estimate EE/PDR measure per unit savings.

These sources were supplemented by emerging technologies and regionally relevant measures. Each measure record includes energy savings, gross demand savings, cost, and measure life. Residential and Non-Residential measures were analyzed with similar methods.

This section reports common elements of the analysis. Subsequent sections discuss the residential and non-residential measures and analysis methods in more detail.

Measure characterizations for all sectors include the following parameters:

- **Measure Description** – A unique and brief description of the efficient technology
- **Baseline Description** – A brief description of the assumed baseline technology
- **Normalization Unit** – Unit by which savings and costs are reported
- **Measure Life** – Expected number of years of normal use before failure. Values primarily sourced from DEER 2008
- **Energy Impact (kWh/Unit)** – Energy savings for one unit of the measure in kilowatt-hours per year. For the residential sector, there are separate values for building type (existing single-family and new single-family). For the commercial and industrial sectors, there are values for office buildings, retail businesses,

schools, other commercial and the industrial segments. All savings estimates are "at meter".

- **Coincident Summer Peak Impact (W/Unit)** – Coincident peak demand savings for one unit of the measure in Watts per year. For the residential sector, there are separate values for building type (existing single-family and new single-family). For the commercial and industrial sectors, there are values for office buildings, retail businesses, schools, other commercial and the industrial segments. All savings estimates are "at meter". It is assumed that system peak for AEP Ohio is 4:00 p.m. during a weekday in July.

- **Base Incentive ($/Unit)** – Incentive, in dollars, for one unit of the measure

- **Technology Cost ($/Unit)** – Per-unit cost of the technology. For Replace-on-Burnout scenarios, this is the incremental difference between the retail cost of the baseline technology and the retail cost of the efficient option. For all other cases (Low Income, early replacement, and retrofit), this is the full retail cost of the efficient option plus any labor costs for installation. AEP Ohio researched material and labor costs for each measure and calculated incremental costs. Incremental costs are mostly based on the DEER database adjusted with 'location factors' from RS Means Mechanical Data to reflect AEP Ohio service area labor and/or equipment costs.[15] Where measures can be purchased from national retailers, such as room air conditioners, the retailer prices are the basis of incremental costs.

- **Administrative Cost ($/Unit)** – Per-unit cost to administer the primary program of this measure.

The measures in this analysis are selected based on the experience of AEP Ohio and its consultant, Navigant. The measures typically pass various benefit-cost tests in other jurisdictions and are widespread in their potential application, thus these typically contribute a large portion of the EE/PDR potential.

C.2. Residential Measure Characterizations

Residential measure analysis is reported for new single-family homes and existing single-family homes. Savings for each housing type was evaluated for three heating, ventilation and air-conditioning (HVAC) systems: gas furnace/air conditioning (AC), electric resistance/AC, and air source heat pump. A combination of DOE2 simulations, engineering calculations, and secondary resources was used to estimate measure savings.

[15] RS Means Mechanical Cost Databook, 2006.

Weather Dependent Measures

To calculate savings for weather-dependent measures, (grouped as "HVAC and Shell" and "New Construction" in the reporting document) building energy simulation models were created using eQUEST[16]. Navigant created four aggregate calibrated buildings, each with three heating types. These homes were created based on the Building America Benchmark (BABM), Buildings Energy Databook (2007) plus Navigant engineering judgment. The homes then were calibrated to annual end use consumption data for each building type generated using the same methodology as the Market Profiles, which combines monthly consumption data, and BABM assumptions to estimate annual end uses.

Non-Weather Dependent Measures

Lighting, appliances, hot water, and other measures are evaluated using engineering calculations and secondary research. Lighting estimates are primarily based on differences in installed lamp wattage and residential usage patterns combined with HVAC interactive effects as determined with simulation models. Savings for appliances are based on secondary sources such as ENERGY STAR® calculators and commercial product reports. Domestic hot water usage is estimated with BABM equations based on the number of bedrooms for a given home. Savings for each service territory vary based on water mains temperatures estimated from American Society of Heating, Refrigerating and Air-conditioning Engineers, Inc. (ASHRAE) climate data.

C.2.1. Lighting Measures – Residential

The following lighting measures often are part of utilities' prescriptive residential lighting energy efficiency programs. Measure costs and measure lives are based on the California Database of Energy Efficiency Resources (DEER) database. Costs are adjusted to the AEP Ohio service territory by regional cost factors from RS Means Cost Data.

Compact Fluorescent Lamp – Screw-in and Hard-wired Fixtures

Compact fluorescent lamps (CFLs) are the most common alternatives to standard incandescent lamps. CFLs generally are about four times as efficient as incandescent lamps, and last about ten times as long. CFLs can either be screw-in replacements for incandescent lamps or plug-in lamps in fixtures specifically designed around CFL technology. Savings is determined by subtracting the input CFL Wattage from the lamp or fixture Wattage of the incandescent lamps being replaced. The measure life for an indoor and outdoor CFLs is based on standard residential usage and estimated at nine years.

[16] eQUEST simulation software is a graphical user interface for the DOE2.2 simulation engine. Simulation inputs include hourly weather data and usage profiles, and results are reported hourly to facilitate peak demand and annual energy use.

LED Lights

New generation light emitting diode (LED) general purpose lights are entering the market in the same applications as some CFLs, though mostly as replacements for directional incandescent lights, such as flood lights and parabolic aluminized reflector (PAR) lamps. Screw in versions of LED lights have the "throw" of incandescent lights, but have a measure life of 10-15 times incandescent equivalents. LED lamps are good in hard-to-reach applications such as high-ceiling recessed downlights.

LED Night Lights

LED night lights are highly efficient, often consuming less than 1 Watt of power. The analysis retrofits a 7W incandescent bulb with a 1W LED night light, and assumes 8 hours of operation per day.

LED Holiday Lights

LED holiday lights have a number of advantages over standard incandescent lights. An LED C7 bulb consumes 0.08W compared to 0.48W for a comparable incandescent. In addition, the lifetime of an LED bulb is rated at 100,000 hours for indoor use, and 50,000 hours for outdoor use. The analysis assumes a string of 300 lights, operated for 5 hours per day for 30 days annually.

C.2.2. Residential Water Heating Measures

Hot water savings can occur through reducing the amount of hot water consumed or by improving the efficiency of the water heating/storage/distribution process. Total hot water energy use is based on Baseline Market Profiles described in Appendix A.

Efficient Water Heaters

Traditional electric water heaters have an overall efficiency of about 90% including standby and distribution losses. High efficiency units achieve 95% efficiency with improved insulation and heat traps that minimize convection into under-insulated distribution pipes. The savings estimate for the high-efficiency unit is calculated from the total hot water energy use and the unit efficiencies. Base case electric energy factors/efficiencies are assumed to be 0.904 respectively, with efficient cases of 0.95.

Low-Flow Shower Heads

Low flow shower heads use an orifice plate inside the fixture to restrict the water flow to a maximum 2.5 gallons per minute versus a 3.5 gallon per minute permitted with standard new shower heads. Water flow from older showerheads typically exceeds 5.0 gallons per minute. Engineering methods were used to estimate savings between the 2.5 and 3.5 gpm (gallons per minute) showerheads assuming baseline consumption sourced from BABM.

Faucet Aerators
Faucet aerators introduce air into the water as it leaves the faucet. The result is perceived full flow at a much reduced actual flow rate. The analysis estimated that a faucet aerator reduces flow from 4 gallons per minute to 1.5 gallons per minute using baseline consumption sourced from BABM.

Hot Water Pipe Insulation
Pre-formed segments of foam insulation are placed around hot water distribution pipes to minimize heat loss. While useful for the entire length of hot water piping, it is most cost-effective in the first 5-10 feet of pipe extending from the hot water heater. Engineering estimates of steady state heat loss from the pipes to conditioned indoor air were used to estimate savings.

Drain Water Heat Recovery
These systems recover some of the heat from drain pipe hot water. Savings were based on US Department of Energy information and manufacturer case studies. Engineering calculations based on the effectiveness of an average of six commercially-available drain water heat recovery systems were used to estimate savings. Water consumptions is based on residential usage for showers and sinks sourced from the BABM.

ENERGY STAR Clothes Washers
ENERGY STAR clothes washers must exceed the minimum energy efficiency standards by at least 37 percent and, since January 1, 2007, meet water efficiency criteria. The federal standard sets the minimum Modified Energy Factor (MEF) at 1.26, ENERGY STAR sets the minimum MEF at 2.0 with a maximum water factor of 6.0. Savings is not climate dependent and is based on DEER estimates. Estimates were calculated for Tier 3 clothes washers with MEF ratings of 2.2. Baseline consumption is based on BABM.

ENERGY STAR Dishwashers
Since August 11, 2009, federal standard requires a minimum Energy Factor (EF) of 0.46 for standard models and 0.62 for compact models, and since then ENERGY STAR qualifies dishwashers according to new criteria: annual water and energy consumption. Standard-size models must consume ≤324 kWh/year and compact models must consume ≤260 kWh/year. Savings is not climate dependent and is based on ENERGY STAR estimates.

C.2.3. Residential HVAC & Shell Measures

HVAC savings can be achieved by improving the building shell, optimizing thermostat settings, and/or improving the efficiency of the equipment and distribution process.

Since HVAC savings are climate dependent, most of the savings for the following measures were determined by modifying the baseline simulation model first to reflect the less efficient option then to reflect the improved efficiency measure. Savings are

calculated as the difference between the two. Incremental costs are mostly based on the DEER database adjusted with 'location factors' to reflect AEP Ohio service area labor and/or equipment costs. Where measures can be purchased from national retailers, such as window air conditioners, the retailer prices are the basis of incremental costs.

ENERGY STAR Residential Window Air Conditioners
ENERGY STAR room air conditioners must be at least 10 percent more efficient than standard U.S. models, which are defined as units with a minimum Energy Efficiency Ratio (EER) rating of 8.0-9.8 depending upon the size and type of the unit. Minimum efficiency standards for room air conditioners range from 9.4 EER to 10.8 EER depending on the unit size and type. Savings is determined by simulation models improving equipment from 9.8 to 10.7 EER.

ENERGY STAR Residential Air Source Heat Pumps
ENERGY STAR air source heat pumps are units with minimum ratings of 14 Seasonal Energy Efficient Rating (SEER), EER ratings of 11-12, and heating system performance factors of 8.0-8.2 or higher. Since 2006, minimum efficiency standards for heat pumps are 13 SEER and 7.7 HSPF. Savings is determined by modeling.

High Efficiency Central Air Conditioning
Since 2006, the minimum efficiency standard for central air conditioners is 13 SEER. More efficient models are available in the market. Savings is determined by modeling SEER 14 equipment versus the minimum efficiency.

HVAC Diagnostic Repair, Testing, and Maintenance
Many residential and commercial HVAC systems are not operating as efficiently as possible due to inadequate maintenance. The package of services includes ensuring proper refrigerant charge, lubrication, cleanliness and fan operation. The savings estimate assumes that the tune-up improves efficiency by 10 percent, which is consistent with refrigerant over-charge and undercharge savings.

HVAC Duct Sealing, Operations and Maintenance
Many HVAC ducts are not sealed well and leak conditioned air into conditioned and unconditioned spaces such as basements and attics failing to properly deliver heating and cooling to the occupied areas of the home. Duct sealing reduces such heat loss and reduces required fan power. Savings estimates are determined by modeling well sealed ductwork vs. systems with typical leakage, about five percent.

Ceiling Insulation
Ceiling insulation includes both insulating uninsulated and under-insulated roof areas. Savings are calculated from simulations replacing R-19 with R-38.

Wall Insulation
Wall insulation is most cost-effective when insulating un-insulated wall areas. Savings are determined from simulations replacing R-4 insulation with R-11.

Efficient Windows
Efficient windows are generally considered to be either triple paned windows, windows with a radiant barrier to reflect heat back into the conditioned space, or double-pane windows with low "shading coefficients". Reducing the shading coefficients of glass will reduce the amount of solar heat gain into the building. The reduced solar gain will decrease the cooling load for the building, but may increase the heating load. These windows usually have a higher R-value than the windows they replace, thus heating energy can decrease. Savings are determined from modeling the replacement of baseline windows with a U-Value of 0.65 and Solar Heat Gain Coefficient (SHGC) of 0.62 with windows with a U-Value of 0.35 and a SHGC of 0.55.

Comprehensive Shell Air Sealing
The measure includes caulking, weather stripping, and sealing other visible cracks and penetrations in the building shell. A house should be able to breathe to purge contaminants so a lower limit of 0.35 air-changes per hour (ACH) is advised without the addition of mechanical ventilation. Savings is determined for two levels of sealing by modeling a base case of 0.6 ACH and efficient cases of 0.5 ACH versus 0.35 ACH.

Ground Source Heat Pumps
Ground source heat pumps use the ground instead of the air as their thermal source and sink. Ground temperatures are much more even over the course of the year, so ground source heat pumps can operate much more efficiently than air source heat pumps during the hottest and coldest parts of the year. Savings are determined by simulating a 4.6 Coefficient of Performance (COP) ground source heat pump against a standard SEER 13 air source heat pump.

C.2.4. Residential Appliance and Additional Measures

Minimum refrigerator and freezer efficiency has progressed substantially in the past 20 years, with older units consuming at least twice as much energy as a comparable new machine. Other home appliances have also become more efficient and the federal ENERGY STAR rating program indentifies equipment that significantly improve on minimum standards

ENERGY STAR Refrigerators and Freezers
ENERGY STAR refrigerators must exceed current federal energy efficiency standards by at least 20 percent (for full- and compact-sized refrigerators). ENERGY STAR freezers

must exceed minimum energy efficiency standards by at least 10 percent for full-sized units and 20 percent for compact units.

Remove Secondary Refrigerators and Freezers
Second refrigerators and freezers that customers own are often older and less efficient appliances. For example, the most common refrigerator sold in 1990 used between 60-70 kWh per cubic foot, compared to typical current models that use less than 26 kWh per cubic foot.

Smart Power Strips
Smart power strips automatically shuts down devices that are not in use. A smart power strip typically has a control outlet, several slave outlets, and a few that are always on. A primary appliance is plugged in to the control outlet and its peripherals are plugged into the slave outlets so that when the primary appliance is shut down, the smart power strip automatically shuts down the power to the peripherals. In an office environment, a computer could be plugged into the control outlet, and a monitor, printer, speakers, and task lamp could be plugged into the slave outlets.

Variable Speed Drive Pool Pumps
This measure replaces a standard efficiency (84.7 percent) single speed pool pump and motor with a new high efficiency (90 percent) variable speed pump and motor. Savings are sourced using the Pentair Pool Pump Energy Savings Calculator. The analysis assumes operation for 3.6 hours and 10 hours, with load factors of 1.0 and 0.36 for the base and efficient cases respectively.

Convection Oven
Convection ovens replace traditional ovens in the home. Convection ovens have a small fan within the oven that circulates hot oven air, thus enhancing heat transfer to food and reducing cook times and permitting use of slightly lower cooking temperatures.

ENERGY STAR Home Electronics: Cable Boxes, Computer Monitors & TVs
Home electronics represent an increasing proportion of home electricity use. These devices can consume significant power while in use and continue to use significant power while "shut-down" or in "stand-by." ENERGY STAR equipment must have lower operating power use and must reduce power use substantially when "off" and not in use. Different ENERGY STAR standards apply by size and component type.

C.2.5. New Construction / ENERGY STAR Homes

As part of the analysis, eQUEST simulations were used to determine energy and demand savings for ENERGY STAR homes. Baseline models constructed for weather-dependent measures were modified to estimate savings on two tiers. The first tier consists of 40 percent reduction of lighting power density, infiltration reduction to 0.35 ACH, R38 roof insulation, window upgrades, and R19 wall insulation. Tier 2 homes

employ the previous measures as well as a higher efficiency HVAC system. Costs were sourced from DEER 2008 data.

C.3. Residential Measure Characteristics by Program

Table 48. Residential Measure Characteristics (at meter savings)

Efficiency Measure	Base Measure	Category	Program	Units	Energy Impact (kWh/Unit)	Coincident Summer Peak Impact (W/Unit)	Measure Life	Base Incentive ($/unit)	Technology Cost ($/unit)	Administrative Cost ($/unit)
Lighting										
LED Lighting 7W - Indoor	40W Incandescent	Lighting	Products	Lamp	17.1	1.0	20.0	$2.09	$4.17	$0.46
CFL: 7W Screw-In Indoor	40W Incandescent	Lighting	Products	Lamp	17.1	1.0	9.0	$1.00	-$3.30	$0.46
LED Lighting 13W - Indoor	60W Incandescent	Lighting	Products	Lamp	31.7	1.9	20.0	$7.83	$15.66	$0.85
CFL: 13W Screw-In Indoor	60W Incandescent	Lighting	Products	Lamp	31.7	1.9	9.0	$1.00	-$3.30	$0.85
CFL: 18W Screw-In Indoor	75W Incandescent	Lighting	Products	Lamp	46.4	2.8	9.0	$1.00	-$4.43	$1.24
CFL: 23W Screw-In Indoor	100W Incandescent	Lighting	Products	Lamp	56.1	3.4	9.0	$1.00	-$5.78	$1.50
CFL: >25W Screw-In Indoor	>=120W Incandescent	Lighting	Products	Lamp	61.0	3.7	9.0	$1.00	$1.61	$1.63
LED Lighting 7W - Outdoor	40W Incandescent	Lighting	Products	Lamp	17.1	1.0	20.0	$2.09	$4.17	$0.46
CFL: 7W Screw-In Outdoor	40W Incandescent	Lighting	Products	Lamp	17.1	1.0	9.0	$1.00	-$3.30	$0.46
LED Lighting 13W - Outdoor	60W Incandescent	Lighting	Products	Lamp	31.7	1.9	20.0	$7.83	$15.66	$0.85
CFL: 13W Screw-In Outdoor	60W Incandescent	Lighting	Products	Lamp	31.7	1.9	9.0	$1.00	-$3.30	$0.85
CFL: 18W Screw-In Outdoor	75W Incandescent	Lighting	Products	Lamp	46.4	2.8	9.0	$1.00	-$4.43	$1.24
CFL: 23W Screw-In Outdoor	100W Incandescent	Lighting	Products	Lamp	56.1	3.4	9.0	$1.00	-$5.78	$1.50
CFL: >25W Screw-In Outdoor	>=120W Incandescent	Lighting	Products	Lamp	61.0	3.7	9.0	$1.00	$1.61	$1.63
CFL: Pin-Based (<25W) Indoor	Incandescent	Lighting	Retrofit	Lamp	33.0	2.0	15.0	$20.00	-$4.43	$18.15
CFL: Pin-Based (>=25W) Indoor	Incandescent	Lighting	Retrofit	Lamp	74.8	4.5	15.0	$20.00	-$5.78	$18.15
CFL: Pin-Based (<25W) Outdoor	Incandescent	Lighting	Retrofit	Lamp	33.0	2.0	15.0	$35.00	-$4.43	$18.15
CFL: Pin-Based (>=25W) Outdoor	Incandescent	Lighting	Retrofit	Lamp	74.8	4.5	15.0	$35.00	-$5.78	$18.15
LED night light	7W Incandescent Light	Lighting	Retrofit	Light	13.6	0.0	16.0	$1.50	$3.00	$7.50
LED Holiday Lights (300 bulb string)	300 x 0.48 W Incandescent Lights	Lighting	Retrofit	)0 bulb strin	54.0	0.0	15.0	$5.00	$10.00	$29.70
CFL: 13W Screw-In Indoor - 2	60W Incandescent	Lighting	Schools	2 Lamps	63.5	3.8	9.0	$2.09	-$3.30	$7.61
CFL: 23W Screw-In Indoor - 2	100W Incandescent	Lighting	Schools	2 Lamps	112.2	6.8	9.0	$3.70	-$5.78	$13.46
LED night light	7W Incandescent Light	Lighting	Schools	Light	10.2	0.0	16.0	$0.34	$3.00	$1.23
CFL: 18W Screw-In Indoor	75W Incandescent	Lighting	Low Income	Lamp	61.8	5.6	9.0	$1.70	-$4.43	$105.06
CFL: 23W Screw-In Indoor	100W Incandescent	Lighting	Low Income	Lamp	74.8	6.8	9.0	$1.70	-$5.78	$127.16
CFL: >25W Screw-In Indoor	>=120W Incandescent	Lighting	Low Income	Lamp	81.3	7.4	9.0	$1.70	$1.61	$138.21
CFL: 18W Screw-In Outdoor	75W Incandescent	Lighting	Low Income	Lamp	61.8	5.6	9.0	$1.70	-$4.43	$105.06
CFL: 23W Screw-In Outdoor	100W Incandescent	Lighting	Low Income	Lamp	74.8	6.8	9.0	$1.70	-$5.78	$127.16
CFL: >25W Screw-In Outdoor	>=120W Incandescent	Lighting	Low Income	Lamp	81.3	7.4	9.0	$1.70	$1.61	$138.21
LED night light	7W Incandescent Light	Lighting	Low Income	Light	13.6	0.0	16.0	$3.00	$3.00	$23.19
Appliances										
Clothes Washer - Tier 3 >= 2.2 MEF-w/elec dry	Fed Standard 1.26 MEF	Appliances	Products	Home	233.0	53.6	11.0	$50.00	$370.00	$4.66
Clothes Washer - Tier 3 >= 2.2 MEF-w/gas or no dry	Fed Standard 1.26 MEF	Appliances	Products	Home	179.9	41.4	11.0	$50.00	$370.00	$3.60
Energy Star Dishwasher (EFO 0.68)	Standard Dishwasher	Appliances	Products	Dishwasher	42.5	10.0	11.0	$25.00	$358.00	$0.85
Energy Star Refrigerator	Refrigerator meeting 2001 standard	Appliances	Products	Refrigerator	177.0	21.8	17.0	$50.00	$220.53	$3.54
Convection Oven	Regular Oven	Appliances	Products	Oven	86.0	8.5	19.0	$50.00	$100.00	$1.72
ENERGY STAR® Dehumidifier	Non-Energy Star Dehumidifier	Appliances	Products	Dehumidifier	117.0	10.0	12.0	$50.00	$45.00	$2.34
ENERGY STAR® Ceiling Fan	ghting, thus the small applicability to avoid c	Appliances	Products	Fan	97.0	9.6	10.0	$43.00	$86.00	$1.94
VSD Pool Pumps	One speed pump	Appliances	Products	Pump	850.0	1186.9	10.0	$200.00	$925.00	$17.00
ENERGY STAR Freezer	Freezer meeting 2001 standard	Appliances	Products	Freezer	195.3	17.8	14.0	$50.00	$141.50	$3.91
ENERGY STAR TV	Standard TV	Appliances	Products	TV	102.0	28.1	8.0	$10.00	$8.00	$2.04
ENERGY STAR Monitor	standard monitor	Appliances	Products	monitor	166.0	23.2	5.0	$39.00	$78.00	$3.32
Smart Strip Power Bar	No sensor power strip	Appliances	Retrofit	Power Strip	82.0	0.0	5.0	$10.00	$20.00	$45.10
ENERGY STAR Cable Boxes	Non-ENERGY STAR Cable Boxes	Appliances	Retrofit	Box	40.0	3.7	4.0	$9.51	$19.02	$21.98
Refrigerator Recycling	Old Appliance	Appliances	Recycle	Refrigerator	1534.0	203.0	5.0	$140.00	$1.00	$84.37
Freezer Recycling	Old Appliance	Appliances	Recycle	Freezer	1643.0	199.0	4.0	$140.00	$1.00	$90.37
Energy Star Refrigerator	Refrigerator meeting 2001 standard	Appliances	Low Income	Refrigerator	409.0	65.0	17.0	$1,251.44	$1,251.44	$406.24
Refrigerator Recycling	Old Appliance	Appliances	Low Income	Refrigerator	1534.0	203.0	5.0	$15.00	$15.00	$2,607.80
Freezer Recycling	Old Appliance	Appliances	Low Income	Freezer	1643.0	199.0	4.0	$15.00	$15.00	$2,793.10

Table 49. Residential Measure Characteristics (at meter savings)

Efficiency Measure	Base Measure	Category	Program	Units	Energy Impact (kWh/Unit)	Coincident Summer Peak Impact (W/Unit)	Measure Life	Base Incentive ($/unit)	Technology Cost ($/unit)	Administrative Cost ($/unit)
HVAC & Shell										
ECM Fan Motor - Central A/C - EL Heat	Std PSC motor	HVAC/Shell	Products	Home	167.9	49.7	15	$87.50	$175.00	$3.36
Energy Star Window AC	EER 9.8 window AC	HVAC/Shell	Products	ton	66.9	83.9	12	$50.00	$220.00	$1.34
SEER 15 CAC - Central A/C - EL Heat	SEER 13.0 CAC	HVAC/Shell	Products	Ton	72.6	21.5	15	$100.00	$198.00	$1.45
ECM Fan Motor - Central A/C - Non-EL Heat	Std PSC motor	HVAC/Shell	Products	Home	104.7	31.0	15	$87.50	$175.00	$3.36
SEER 15 CAC - Central A/C - Non-EL Heat	SEER 13.0 CAC	HVAC/Shell	Products	Ton	45.3	13.4	15	$100.00	$198.00	$1.45
ECM Fan Motor - Heat Pump	Std PSC motor	HVAC/Shell	Products	Home	239.7	47.3	15	$87.50	$175.00	$5.07
Ductless Mini Split HP SEER 13	Ductless Mini Split HP SEER 10	HVAC/Shell	Products	Ton	628.2	129.0	15	$90.00	$180.00	$12.56
Ductless Mini Split HP SEER 15	Ductless Mini Split HP SEER 10	HVAC/Shell	Products	Ton	840.7	173.5	15	$115.00	$230.00	$16.81
GSHP, Constant Loop Flow	SEER 13 Air-to-Air Heat pump	HVAC/Shell	Products	Ton	2091.9	251.7	15	$1,050.00	$2,100.00	$41.84
GSHP, Variable Loop Flow	SEER 13 Air-to-Air Heat pump	HVAC/Shell	Products	Ton	2218.6	259.3	15	$1,150.00	$2,300.00	$44.37
No ER Backup (SEER 13.8)	SEER 13 Air-to-Air Heat pump ER back-up	HVAC/Shell	Products	Ton	660.8	27.1	15	$350.00	$440.00	$13.22
SEER 14.5, COP 2.49	SEER 13.0 COP 2.19 HP	HVAC/Shell	Products	Ton	215.4	45.8	15	$100.00	$180.00	$4.56
ole replace) Single Pane Windows - Central A/C - EL	Single Pane Windows	HVAC/Shell	Retrofit	sqft window	648.2	58.9	20	$200.00	$1,392.00	$356.51
Ceiling Insul R-45 - Central A/C - EL Heat	R-25 Ceiling	HVAC/Shell	Retrofit	00 sqft footpı	378.6	28.8	20	$200.00	$890.00	$208.22
Celing Insu. R-30 - Central A/C - EL Heat	R-25 Ceiling	HVAC/Shell	Retrofit	00 sqft footpı	255.5	21.7	20	$200.00	$700.00	$140.54
Reduced ACH 0.3 - Central A/C - EL Heat	ACH 0.6	HVAC/Shell	Retrofit	Home	1896.6	214.1	20	$265.00	$530.00	$1,043.11
Reduced ACH 0.5 - Central A/C - EL Heat	ACH 0.6	HVAC/Shell	Retrofit	Home	722.5	67.8	20	$130.00	$260.00	$397.38
AC tune-up - charge & airflow - Central A/C - EL He	Standard Tune-up	HVAC/Shell	Retrofit	ton	103.0	69.6	5	$50.00	$90.00	$56.65
Sealing Insulation Unconditioned - Central A/C - EL	Leaky un-insulated Ducts	HVAC/Shell	Retrofit	home	103.5	69.6	10	$150.00	$760.00	$56.93
Triple Pane Windows - Central A/C - EL Heat	Double Pane Windows	HVAC/Shell	Retrofit	sqft window	269.4	28.7	20	$200.00	$210.00	$148.19
Wall Insul. R-11 - Central A/C - EL Heat	Un-Insulated Wall	HVAC/Shell	Retrofit	00 sqft wall a	1538.8	174.9	20	$200.00	$1,300.00	$846.36
Low-e Window Film - Central A/C - EL Heat	Single Pane Clear	HVAC/Shell	Retrofit	sqft window	366.0	36.3	10	$200.00	$280.00	$201.31
e replace) Single Pane Windows - Central A/C - Non-I	Single Pane Windows	HVAC/Shell	Retrofit	sqft window	66.8	54.7	20	$200.00	$1,392.00	$36.72
Ceiling Insul R-45 - Central A/C - Non-EL Heat	R-25 Ceiling	HVAC/Shell	Retrofit	00 sqft footpı	3.8	7.1	20	$200.00	$890.00	$3.31
Celing Insu. R-30 - Central A/C - Non-EL Heat	R-25 Ceiling	HVAC/Shell	Retrofit	00 sqft footpı	2.5	5.3	20	$200.00	$700.00	$2.18
Reduced ACH 0.3 - Central A/C - Non-EL Heat	ACH 0.6	HVAC/Shell	Retrofit	Home	0.1	42.2	20	$265.00	$530.00	$0.06
Reduced ACH 0.5 - Central A/C - Non-EL Heat	ACH 0.6	HVAC/Shell	Retrofit	Home	0.1	32.3	20	$130.00	$260.00	$0.06
tune-up - charge & airflow - Central A/C - Non-EL H	Standard Tune-up	HVAC/Shell	Retrofit	ton	64.3	43.4	5	$50.00	$90.00	$56.65
ealing Insulation Unconditioned - Central A/C - Non-E	Leaky un-insulated Ducts	HVAC/Shell	Retrofit	home	64.6	43.5	10	$150.00	$760.00	$56.93
Triple Pane Windows - Central A/C - Non-EL Heat	Double Pane Windows	HVAC/Shell	Retrofit	sqft window	35.9	23.7	20	$200.00	$210.00	$31.64
Wall Insul. R-11 - Central A/C - Non-EL Heat	Un-Insulated Wall	HVAC/Shell	Retrofit	00 sqft wall a	36.4	48.9	20	$200.00	$1,300.00	$32.08
Low-e Window Film - Central A/C - Non-EL Heat	Single Pane Clear	HVAC/Shell	Retrofit	sqft window	35.9	35.6	10	$200.00	$280.00	$19.75
(Double replace) Single Pane Windows - Heat Pump	Single Pane Windows	HVAC/Shell	Retrofit	sqft window	568.3	54.1	20	$200.00	$1,392.00	$312.54
Ceiling Insul R-45 - Heat Pump	R-25 Ceiling	HVAC/Shell	Retrofit	00 sqft footpı	294.3	10.9	20	$200.00	$890.00	$171.29
Celing Insu. R-30 - Heat Pump	R-25 Ceiling	HVAC/Shell	Retrofit	00 sqft footpı	197.6	8.2	20	$200.00	$700.00	$115.01
Reduced ACH 0.3 - Heat Pump	ACH 0.6	HVAC/Shell	Retrofit	Home	1472.3	66.6	20	$200.00	$530.00	$856.87
Reduced ACH 0.5 - Heat Pump	ACH 0.6	HVAC/Shell	Retrofit	Home	563.3	26.3	20	$200.00	$260.00	$327.80
CAC tune-up - charge & airflow - Heat Pump	Standard Tune-up	HVAC/Shell	Retrofit	ton	97.3	65.7	5	$50.00	$90.00	$56.65
Duct Sealing Insulation Unconditioned - Heat Pump	Leaky un-insulated Ducts	HVAC/Shell	Retrofit	home	97.8	65.8	10	$150.00	$760.00	$56.93
Triple Pane Windows - Heat Pump	Double Pane Windows	HVAC/Shell	Retrofit	sqft window	232.9	35.5	20	$200.00	$210.00	$135.57
Wall Insul. R-11 - Heat Pump	Un-Insulated Wall	HVAC/Shell	Retrofit	00 sqft wall a	1226.4	74.0	20	$200.00	$1,300.00	$713.72
Low-e Window Film - Heat Pump	Single Pane Clear	HVAC/Shell	Retrofit	sqft window	318.2	35.2	10	$200.00	$280.00	$175.00
Room A/C Recycling	Old Appliance	HVAC/Shell	Recycle	AC Unit	103.6	906.0	3.0	$25.00	$129.00	$5.70
Air Sealing Package		HVAC/Shell	Schools	Home	15.0	28.0	11	$0.50	$10.00	$1.80
Other										
Home Energy Report		House	Behavior	Home	200.0	26.7	1.0	$0.00	$0.00	$9.76
New Construction										
Energy Star Qualified 3.0 - Central A/C - EL Heat	Code Construction	New Construction	New Construction	home	6253.9	914.0	20	$1,785.90	$3,571.79	$938.08
nergy Star Qualified 3.0 - Central A/C - Non-EL Hea	Code Construction	New Construction	New Construction	home	3172.9	926.8	20	$1,785.90	$1,785.90	$475.93
Energy Star Qualified 3.0 - Heat Pump	Code Construction	New Construction	New Construction	home	5475.0	947.5	20	$1,785.90	$3,571.79	$821.24
Water Heating										
Heat Pump WH - 2.0 EF	Standard Water Heater - .904 EF	Water Heat	Products	Home	2076.0	96.9	10.0	$462.50	$925.00	$41.52
Instantaneous WH - .99 EF	Standard Water Heater - .904 EF	Water Heat	Products	Home	473.3	18.7	20.0	$603.00	$1,205.99	$9.47
High Eff. Elec. Water Heat - Tank - .95 EF	Standard Water Heater - .904 EF	Water Heat	Products	Home	182.4	13.9	13.0	$36.15	$72.30	$3.65
Solar Water Heat	Standard Water Heater	Water Heat	Products	Home	3100.0	675.8	15.0	$2,250.00	$4,500.00	$62.00
Drain Water Heat Recovery (42% efficient or higher)	No Heat Recovery	Water Heat	Products	Home	1550.0	202.1	15.0	$150.00	$500.00	$31.00
Faucet Aerator - 3	No Aerator	Water Heat	Retrofit	Home	99.9	22.4	5.0	$6.62	$13.24	$54.95
Low Flow Shower	Standard Shower	Water Heat	Retrofit	Home	130.0	13.6	5.0	$3.00	$6.00	$71.50
Pipe Wrap	No Wrap	Water Heat	Retrofit	Home	133.3	12.0	15.0	$1.21	$2.42	$73.32
Shower Start/Stop	No Start/Stop on Shower	Water Heat	Retrofit	Home	75.0	6.2	9.0	$25.00	$24.95	$41.25
Hot Water Temp Gauge	No Aerator	Water Heat	Schools	Gage	21.8	0.0	2.0	$0.72	$1.00	$2.61
Faucet Aerator - 2	No Aerator	Water Heat	Schools	2 Aerators	37.5	11.2	5.0	$1.24	$3.31	$4.50
Low Flow Shower	Standard Shower	Water Heat	Schools	Home	97.5	13.6	5.0	$3.22	$6.00	$11.70
Faucet Aerator	No Aerator	Water Heat	Low Income	Home	99.9	22.4	5.0	$13.24	$13.24	$169.83
Low Flow Shower	Standard Shower	Water Heat	Low Income	Home	130.0	13.6	5.0	$6.00	$6.00	$221.00
Pipe Wrap	No Wrap	Water Heat	Low Income	Home	133.3	12.0	15.0	$14.92	$14.92	$226.61
Heat Pump WH - 2.0 EF	Standard Water Heater - .904 EF	Water Heat	Low Income	Home	2076.0	0.0	19.0	$1,175.00	$1,175.00	$3,529.20
Instantaneous WH - .99 EF	Standard Water Heater - .904 EF	Water Heat	Low Income	Home	473.3	18.7	20.0	$1,699.99	$1,699.99	$804.64
High Eff. Elec. Water Heat - Tank - .95 EF	Standard Water Heater - .904 EF	Water Heat	Low Income	Home	352.3	13.9	20.0	$525.97	$525.97	$598.94

C.4. Non-Residential DSM Measure Characterizations

C.4.1. Sources Used for the Analysis

- ASHRAE standard 90.1 – 2007[17] Energy Standard for Buildings Except Low-Rise Residential Buildings
- Draft Ohio Technical Resource Manual
- eQUEST (DOE-2.2 engine) simulations based on the market profiles. http://www.doe2.com/equest/
- Advance Transformer 1 catalog: http://www.advancetransformer.com/resources/literature.jsp, 2008
- California Database for Energy Efficient Resources (DEER), 2004-2005 version 2.01: http://www.energy.ca.gov/deer/cost and savings estimates
- California Database for Energy Efficient Resources (DEER), 2008 update, cost and savings estimates.
- Efficiency Nova Scotia 2012 DSM Plan
- Arizona Public Service - Measure Analysis Spreadsheets
- Michigan Deemed Savings Database
- RS Means Mechanical Cost Data, 2009
- 2007 ASHRAE Fundamentals Handbook, HVAC applications

This section describes the non-residential energy efficiency measures analyzed for this study and the methods used to estimate savings. The section is organized by major end-uses such as lighting, heating, ventilation and air-conditioning (HVAC), and refrigeration. This section focuses on prescriptive measures, which are generally straight-forward measures that have largely uniform energy and peak demand savings on a per unit basis from application to application. However, even prescriptive measures' savings will have some variability, depending on the specific application and baseline equipment replaced.

Navigant chose to represent the commercial sector with four segments: office buildings, retail, schools and "other commercial" which included some commercial refrigeration. These four segments include a significant portion of the commercial floor area and consumption (see Market Profile in Appendix A) and diverse energy end-uses. The office and retail segments were further segmented to investigate impacts on small and large facilities.

[17] At the time of this study, the 2004 version of the study is the basis of the Ohio Energy Code. Using the 2007 version anticipates updates to the Energy Code during the time period considered in this study.

Navigant simulated measure savings for each market segment with up to four cooling/heating configurations: chilled water and boiler heat, direct expansion (DX) cooling with electric resistance heat, DX cooling with gas furnace and air-source heat-pump. The chilled water and boiler configurations were only applied to the simulated large facilities.

Savings estimates are based on secondary resources such as evaluations and deemed savings estimates from several jurisdictions (OH, CA, Nova Scotia, AZ, and MI), and engineering calculations for climate independent measures. For measures that are climate dependent, Navigant used hourly simulations executed with eQUEST simulation software. For indoor lighting measures a combination of the techniques is used. Engineering calculations estimate direct energy savings from lighting measures and simulations are used to estimate the indirect savings from interaction with HVAC equipment. Measures were modeled with appropriate weather sites and the baseline models were calibrated against the Market Profiles developed earlier in the project.

In the industrial sector the measure focus is on lighting, compressed air, drivepower and HVAC for process measures. Other measures are aggregated into the custom line item. Custom Measures have more variable energy and peak demand savings on a per unit basis from application to application and might involve any qualifying technology. *Ex post* results from a large Midwestern utility company's market-mature Custom Program were used to calibrate the custom measure savings estimates. Custom measures might include, process or control improvements and holistic renovations of systems. There are no HVAC interactive effects assumed for industrial indoor lighting.

Cost estimates are largely based on the CA-Database of Energy Efficient Resources (DEER) with costs adjusted with RS Means Mechanical Cost Data factors for Ohio. Measures can either be installed as retrofits or replace on burn-out (ROB). In the former the cost includes labor and material costs. In the latter, the measure costs generally exclude labor costs since those would still be incurred in the event of replacement with non-qualifying equipment. Some measures are strictly ROB applications.

C.4.2. Lighting Measures – Non-Residential

The following lighting measures are often part of utilities' prescriptive non-residential lighting energy efficiency programs. The major inputs for the impact estimates are the same for both baseline and efficient technologies: equipment connected Watts, hours of operation and interaction with HVAC equipment for commercial applications.

Measure costs and measure lives are based on the California DEER database. Costs are adjusted to the AEP Ohio area by regional cost factors from RS Means Cost Data.

Compact Fluorescent Lamp – Screw-in and Hard-wired Fixtures
CFLs are the most common alternatives to standard incandescent lamps. CFLs are generally about four times as efficient as incandescent lamps, and last about ten times as long. CFLs can either be screw-in replacements for incandescent lamps or plug-in lamps in fixtures specifically designed around CFL technology. The measure life for a screw-in CFL is the life of the bulb or two to three years depending on the application. Plug-in lamps in CFL fixtures are assumed to last the life of the fixture, because failed lamps must be replaced with comparable CFLs.

T8 Lamps and Electronic Ballasts – High-Performance (HPT8)
HPT8 lamps and electronic ballasts have the same market as regular T8 systems. HPT8 systems gain efficiency over regular T8 systems by the co-development of lamps and ballasts that optimize the efficiency of the system when used together. HPT8 technology is compared versus both a T12 and standard T8 baseline. This measure qualifies under the general lighting category, and indirect heating and cooling impacts are included and are estimated by eQUEST simulations.

T5 Lamps and Electronic Ballasts
T5 lamps and electronic ballasts are a newer linear fluorescent lighting system. T5 fluorescent lamps are 5/8 of an inch in diameter, thinner than both T8 lamps and T12 lamps. T5 lighting systems are primarily used in new construction, and are not appropriate for most retrofit situations, as the lamps are generally available only in metric lengths. This measure qualifies under the general lighting category, and indirect heating and cooling impacts for the Commercial sector are included and are estimated by eQUEST simulations.

Daylight Sensors
Lighting systems are designed assuming no contribution from ambient daylight. In areas where daylight is available, artificial light may be unnecessary and possibly detrimental to occupant comfort. Daylight sensors measure the contribution of ambient daylight and either turn-off or dim the lamps of the artificial lighting system. Savings were determined by eQUEST simulations, assuming that perimeter zone (less than 12 feet from an exterior fenestrated wall) lighting is controlled by daylight sensors to maintain required lighting levels with continuous lighting level control. eQUEST input data include location specification for the solar incidence angles and hourly cloud cover to describe available sunlight. Commercial HVAC interactions are included in the estimates.

Occupancy Sensors
Occupancy sensors automatically turn off the lights in a room or an area when the area is unoccupied. Occupancy sensors are an alternative to standard wall mounted on/off lighting switches. Savings estimates are based on assumptions that 10 percent of lights are controlled by occupancy sensors with an average reduction of four hours of use per day. Interaction factors from eQUEST simulations are included with direct savings.

Time Clocks and Photocells
Time clocks and photocells are controls generally used for exterior lighting. These controls turn off lights based on daily or weekly schedules and/or ambient lighting levels. Savings estimates are based on a per fixture basis.

Delamping
The definition of delamping used for this project is replacing a removing one lamp in a three-lamp, four-foot fluorescent lighting fixture, and re-aligning the lamps in the fixture. This measure is intended for areas that are currently over-lit. Lighting reflectors are often used as part of delamping projects. The measure life for this measure is shorter because the fixture is assumed to have been in place for a period of time already. Savings from Commercial HVAC interactions were determined by eQUEST simulation.

LED Exit Signs
LED exit signs are among the most efficient types of exit signs on the market. They generally only draw about two to three watts of power, compared to 15 Watts or more for CFLs, or 25 Watts or more for incandescent exit signs. Weighting of the baseline technologies was based on primary data collected for this project. Savings from Commercial HVAC interactions were determined by eQUEST simulation.

High-Bay Fluorescent Lights
High-bay lighting is used in industrial settings for general ambient light. T5 and T8 fluorescent lamps can be used in place of more traditional high-intensity discharge (HID) lamps in specially designed fixtures. The advantages include higher efficacy (lumens/Watt), greater lumen maintenance over the lamp life and better controllability. Savings are determined with engineering calculations, no HVAC interactive effects and 20 percent fewer operating hours due to control benefits.

Pulse-Start HIDs
Metal Halide pulse-start technology is a slightly more efficient type of HID lighting compared to traditional metal halide and high-pressure sodium HIDs. Special lamps and ballasts generate equivalent illumination in the same light fixture at lower power requirements. Savings are determined with engineering calculations and no HVAC interactive effects.

C.4.3. Non-Residential Motors and Other

The following measures are either common and cut across end-use categories or they are specialized but generally found to be cost effective.

VFDs for HVAC Application

VFDs for HVAC applications take advantage of the fluid affinity laws that show a cube relationship between speed and power. These applications also have a more predictable use pattern than VFDs in industrial processes and conveyance applications. The latter examples would be included with custom measures. The baseline technologies for HVAC VFDs is flow bypass (constant flow) and throttling for liquid systems and vortex dampers for air applications.

Compressed Air Controls
Frequently called the fourth utility (after electricity, gas, and water), compressed air systems have many savings opportunities, including: leak repair, efficient motors and compressors and staging, pressure optimization and receiver installation. Navigant has estimated savings for compressed air with benchmarks from the Compressed Air Challenge program run by the U.S. Department of Energy, and on a Midwestern utility's custom compressed air program results. Savings are listed per system horsepower.

VFD on Air Compressors
VFDs on air compressors are more efficient unloaders for the most common kinds of industrial air compressors – rotary screw and centrifugal. Since compressed air is used in so many diverse processes at a site, use of the machines is considered more predictable than stand-alone VFD applications. The baseline technologies for air compressor VFDs is flow modulation with slide or "pop-it" valves.

C.4.4. Non-Residential Food Service Measures

Energy use in restaurants is very high. In response to this the U.S. Department of Energy has developed guidelines for best practices to reduce equipment energy costs. The ENERGY STAR program now identifies equipment that uses significantly less energy than standard practice.

Convection Ovens
These ovens circulate air inside the oven to enhance heat transfer to the food. As a result cooking times are shorter and lower temperatures are needed to cook food. These ovens are frequently used in commercial kitchens and replace traditional ovens.

ENERGY STAR Cooking Equipment
Several kinds of equipment in commercial kitchens has been addressed by the ENERGY STAR program. In addition to convection ovens, noted above, griddles, steamers, holding cabinets and fryers have ENERGY STAR alternatives.

Spray Nozzles
Pre-wash nozzles remove excess food debris from plates and reduce the use of hot water inside the dish washer.

Vending Machine Controls

Vending machine controls can be integrated with built-in and/or after-market occupancy sensors to reduce display lighting and optimize refrigeration cycles to reduce energy use during periods of low use. Beverage companies have contributed input to make these devices effective while maintaining product quality and market visibility.

Hot Water Circulation Pump Control
Small pumps will circulate domestic hot water throughout a facility continuously so that hot water is almost immediately available at the tap. Controls, which turn off the pump at night, save pumping energy and reduce stand by losses in the water distribution system.

C.4.5. Non-Residential HVAC Measures

In the AEP Ohio Commercial and Industrial sectors, space heating is split between natural gas and electric heat – primarily heat pumps with some electric resistance. Navigant analyzed savings for the market segments using each heating type. HVAC savings can occur by reducing the amount of heating/cooling required with insulation and setting back thermostats or by improving the efficiency of the equipment and/or distribution process.

Since HVAC savings are climate dependent, all of the savings for the following measures were determined with eQUEST computer energy simulations. The measure baselines are derived from the calibrated models derived with the Market Profile. Savings are the difference between the simulation with the efficient technology and the simulation with the standard or code-compliant technology. Incremental costs are mostly based on the DEER database adjusted with RS Means Mechanical Cost Data 'location factors' to reflect Ohio labor and/or equipment costs. Measure life for these items are based on the American Society of Heating Refrigeration and Air-Conditioning Engineers, Inc. (ASHRAE) depreciation lives and the California DEER database.

Efficient Packaged Commercial Air Conditioning and Heat Pump Systems
Standard efficiency units are specified as units complying with ASHREA standard 90.1-2007. Navigant specified efficient units as those with EER ratings of 0.8 – 1.6 EER higher depending on the equipment and market availability of efficient equipment.

Energy Management Systems (EMS)
EMSs can effectively reduce energy consumption by optimizing equipment operation and/or scheduling equipment use by the time of day and/or time of year. Savings vary based on controlled equipment and the comprehensiveness of the EMS hardware and programming.

Economizers
Economizers use outside air for cooling instead of operating the air conditioning compressors on mild days, particularly during the spring and early fall seasons. The

analysis assumed an integrated economizer where 100 percent outdoor air is used up to 65°F ambient temperature. During peak summer conditions economizers produce no peak demand savings.

Programmable Thermostats
Programmable thermostats allow temperatures to be automatically set warmer or colder during unoccupied periods to reduce heating and cooling energy use when facilities are unoccupied. Navigant analyzed 5°F setbacks (set-ups in the summer). Since the impact of set-backs is typically off-peak, these thermostats have minimal peak benefits.

Window Film
Polymer films are applied to the interior of glazing to enhance the glazing attributes. Films will have any combination of the following effects: reduced visible and radiant energy from the sun (solar heat gain and shading), lower glazing U-factor and lower emissivity to keep heat in the building in the winter.

High-Performance Glazing
High-performance glazing is a category of glazing that includes combinations of attributes that reduce solar heat gain and thermal losses through windows through the use of tints, multiple glass panes, low-emissive films and other coatings and gases between panes. The baseline technology is tinted double-pane glass.

Cool Roof
Light-colored or white roofs have a lower solar absorptance, thereby reducing the energy gains through the roof in the summer. This attribute reduces summer cooling loads, but can increase winter heating requirements.

Efficient Water Chillers
Minimum efficiency standards for water chillers are established by state codes based on ASHRAE standard 90.1. Primarily through the use of variable speed drives and over-sized heat exchangers, standard equipment can be made more efficient for energy savings.

C.4.6. Refrigeration and Custom Non-Residential Measures

Refrigeration Measures improve the efficiency of the cooling plant and/or reduce the cooling loads that the system must satisfy. Measures that do not fit in the categories listed above or that have savings that are highly project-specific are grouped in this category. Custom measures is a catch-all category that might include special lighting systems, building controls, exceptional HVAC equipment or process improvements at a factory, for a few examples. Experience of other utilities informs this measure category.

ECM motors

Electronically commutated motors (ECM) are fractional horsepower DC motors that are more efficient than the permanent split capacitor motors they replace. Since these are used inside refrigeration cases they have the indirect effect of reducing refrigeration loads.

Multi-Line Compressors
Instead of one compressor per refrigeration unit, a multi-line system has several compressors that stage optimally to serve many pieces of equipment or display cases on the retail floor.

Oversized Condensers
Oversized condensers more efficiently reject heat from the refrigeration system and reduce the compressor loads. They increase the system efficiency or coefficient of performance versus standard equipment.

High Efficiency Compressors
HE compressors provide gains over standard machines, primarily through the use of VFDs to modulate compressors to match loads. They increase the system efficiency or coefficient of performance vs. standard equipment.

Evaporator Fan Controllers
Most walk-in cooler evaporator fan motors run continuously. Controllers allow the fans to cycle based on cooling demand.

Strip Curtains, Night Covers and Glass Doors
Strip curtains, night covers and glass doors are used to reduce losses from the refrigerated zones and products to the rest of the retail zones. They are particularly deployed at night when they do not inhibit access to refrigerated products.

Anti-Sweat Heater Controls (ASHC)
To keep glass clear of condensation so the merchandise is visible, anti-sweat heaters typically run continuously. Controls cycle heaters based on humidity sensors or on a timed basis, thus maintaining glass clarity with a reduced energy cost. A portion of the ASH energy becomes load on the refrigeration compressors. Use of ASHC reduces refrigeration loads.

Floating Head and Suction Pressure Controls
When outdoor temperatures are mild, condensed refrigerant can be cooled below default settings to reduce the loads on compressors.

Cooler Economizers
At low ambient temperatures outside air can be used directly for keeping walk-in coolers at setpoint, thus savings compressor power. The hours of opportunity are limited by the climate and the desired cooler temperature.

Zero Energy Doors
Zero energy doors have a high insulation value, eliminating the need for door/frame heaters. They are typically installed during new construction or major renovations.

LED Display Case Lighting
Lighting equipment inside coolers adds heat. Where lighting operates for hours at a time, replacing fluorescent lighting with LED lighting will save energy directly and can reduce heat gain and refrigeration demands, thus saving additional electricity.

Intelligent Defrost Controls
Defrost controllers eliminate unnecessary defrost cycles by sensing the need for actual defrost rather than using scheduled timing for defrost cycles.

Custom Efficiency
"Custom" is a generic name for consumer-specific conservation projects. The magnitude of estimated potential savings is scaled to kW saved and is based on Midwestern utility custom program results and conservation plan. Costs and measure lives are based on the same source.

C.5. Commercial Measure Characteristics by Program

Table 50. Commercial Measure Characteristics (at meter savings), Office

Efficiency Measure	Base Measure	Building Type	Category	Program	Units	Energy Impact (kWh/Unit)	Coincident Summer Peak Impact (W/Unit)	Measure Life	Base Incentive ($/unit)	Technology Cost ($/unit)	Administrative Cost ($/unit)
Compressed Air - Controls	business as usual	Office	Cooking/Other	Custom	Compressor HP	696.0	151.4	15	$46.25	$185.00	$13.92
Variable speed HE compressor	constant speed rotary-screw compressor	Office	Cooking/Other	Custom	Motor	902.3	65.9	15	$65.61	$262.44	$18.05
Advanced Pre-Rinse Spray Nozzle	Existing Rinse Spray Nozzle	Office	Cooking/Other	Direct Install	Unit	3703.1	144.6	5	$124.45	$155.57	$833.20
Compressed Air - Air Entraining Air Nozzle	Standard high-volume nozzles	Office	Cooking/Other	Prescriptive	Nozzle	759.0	165.1	10	$3.50	$14.00	$18.98
Compressed Air - Air Receiver for Load/No-Load Compressors (5 gal/CFM)	Current storage capacity	Office	Cooking/Other	Prescriptive	Compressor HP	368.0	80.0	10	$20.00	$80.00	$9.20
Compressed Air - Cycling Air Dryer	Continuous Air Dryer	Office	Cooking/Other	Prescriptive	Compressor HP	40.9	8.9	10	$7.50	$30.00	$1.02
Advanced Pre-Rinse Spray Nozzle	Existing Rinse Spray Nozzle	Office	Cooking/Other	Prescriptive	Unit	3703.1	144.6	5	$38.89	$155.57	$92.58
ENERGY STAR Connectionless Steamer	Connected Steamer	Office	Cooking/Other	Prescriptive	Unit	6995.7	630.9	12	$500.00	$2,000.00	$174.89
ENERGY STAR Fryer	Baseline Fryer	Office	Cooking/Other	Prescriptive	Unit	982.7	103.4	12	$125.00	$500.00	$24.57
ENERGY STAR Griddle	Baseline Griddle	Office	Cooking/Other	Prescriptive	Unit	9464.1	852.6	12	$522.50	$2,090.00	$236.60
ENERGY STAR Oven (Convection)	Baseline Oven	Office	Cooking/Other	Prescriptive	Unit	3235.0	291.4	12	$278.25	$1,113.00	$80.88
Insulated Hot Food Holding Cabinet: Half Size <=0.3 kW	stand hot food holding cabinet	Office	Cooking/Other	Prescriptive	Cabinet	1862.0	136.3	12	$277.50	$1,110.00	$46.55
PC Power Management Software	No Management Software	Office	Cooking/Other	Prescriptive	Unit	113.3	13.2	4	$3.04	$12.14	$2.83
<150 tons Centrifugal Water Cooled Chiller COP = 6.0 - Chiller / Elec Resist	ASHRAE 90.1-2007 5.0 COP	Office	HVAC/Shell	Custom	Tons Cooling	102.9	0.0	20	$23.00	$92.00	$2.62
<150 tons Centrifugal Water Cooled Chiller COP = 6.0 - Chiller / Gas Heat	ASHRAE 90.1-2007 5.0 COP	Office	HVAC/Shell	Custom	Tons Cooling	118.3	0.0	20	$23.00	$92.00	$2.97
<150 tons Centrifugal Water Cooled Chiller COP = 6.0 - Direct Exp / Elec Resist	ASHRAE 90.1-2007 5.0 COP	Office	HVAC/Shell	Custom	Tons Cooling	0.0	0.0	20	$23.00	$92.00	$0.00
<150 tons Centrifugal Water Cooled Chiller COP = 6.0 - Direct Exp / Gas Heat	ASHRAE 90.1-2007 5.0 COP	Office	HVAC/Shell	Custom	Tons Cooling	0.0	0.0	20	$23.00	$92.00	$0.00
<150 tons Centrifugal Water Cooled Chiller COP = 6.0 - Heat Pump	ASHRAE 90.1-2007 5.0 COP	Office	HVAC/Shell	Custom	Tons Cooling	0.0	0.0	20	$23.00	$92.00	$0.00
Air Cooled Chiller COP = 3.2 - Chiller / Elec Resist	ASHRAE 90.1-2007 2.8 COP	Office	HVAC/Shell	Custom	Tons Cooling	104.9	0.0	20	$31.50	$126.00	$2.67
Air Cooled Chiller COP = 3.2 - Chiller / Gas Heat	ASHRAE 90.1-2007 2.8 COP	Office	HVAC/Shell	Custom	Tons Cooling	120.0	0.0	20	$31.50	$126.00	$3.01
Air Cooled Chiller COP = 3.2 - Direct Exp / Elec Resist	ASHRAE 90.1-2007 2.8 COP	Office	HVAC/Shell	Custom	Tons Cooling	0.0	0.0	20	$31.50	$126.00	$0.00
Air Cooled Chiller COP = 3.2 - Direct Exp / Gas Heat	ASHRAE 90.1-2007 2.8 COP	Office	HVAC/Shell	Custom	Tons Cooling	0.0	0.0	20	$31.50	$126.00	$0.00
Air Cooled Chiller COP = 3.2 - Heat Pump	ASHRAE 90.1-2007 2.8 COP	Office	HVAC/Shell	Custom	Tons Cooling	0.0	0.0	20	$31.50	$126.00	$0.00
Code minimum R-20ci or R-38 batt - Chiller / Elec Resist	Existing R-value	Office	HVAC/Shell	Custom	1000 sqft roof	975.1	424.2	20	$292.50	$1,170.00	$24.84
Code minimum R-20ci or R-38 batt - Chiller / Gas Heat	Existing R-value	Office	HVAC/Shell	Custom	1000 sqft roof	0.0	0.0	20	$292.50	$1,170.00	$0.00
Code minimum R-20ci or R-38 batt - Direct Exp / Elec Resist	Existing R-value	Office	HVAC/Shell	Custom	1000 sqft roof	693.1	103.8	20	$292.50	$1,170.00	$17.54
Code minimum R-20ci or R-38 batt - Direct Exp / Gas Heat	Existing R-value	Office	HVAC/Shell	Custom	1000 sqft roof	42.7	131.6	20	$292.50	$1,170.00	$0.85
Code minimum R-20ci or R-38 batt - Heat Pump	Existing R-value	Office	HVAC/Shell	Custom	1000 sqft roof	400.8	104.4	20	$292.50	$1,170.00	$9.88
Cool Roof - Chiller / Elec Resist	black membrane or built-up	Office	HVAC/Shell	Custom	1000 sqft roof	7.3	0.0	15	$166.25	$665.00	$0.15
Cool Roof - Chiller / Gas Heat	black membrane or built-up	Office	HVAC/Shell	Custom	1000 sqft roof	166.1	17.0	15	$166.25	$665.00	$3.32
Cool Roof - Direct Exp / Elec Resist	black membrane or built-up	Office	HVAC/Shell	Custom	1000 sqft roof	70.1	83.6	15	$166.25	$665.00	$1.40
Cool Roof - Direct Exp / Gas Heat	black membrane or built-up	Office	HVAC/Shell	Custom	1000 sqft roof	186.4	83.7	15	$166.25	$665.00	$3.73
Cool Roof - Heat Pump	black membrane or built-up	Office	HVAC/Shell	Custom	1000 sqft roof	104.4	83.6	15	$166.25	$665.00	$2.09
EMS System	No EMS	Office	HVAC/Shell	Custom	1,000 SF	0.0	0.0	15	$126.90	$507.58	$0.00
High Performance Glazing - Chiller / Elec Resist	U=0.45 SHGC=0.40	Office	HVAC/Shell	Custom	100 sqft glazed	6612.8	310.5	20	$349.00	$1,396.00	$168.48
High Performance Glazing - Chiller / Gas Heat	U=0.45 SHGC=0.40	Office	HVAC/Shell	Custom	100 sqft glazed	3025.3	194.5	20	$349.00	$1,396.00	$75.99
High Performance Glazing - Direct Exp / Elec Resist	U=0.45 SHGC=0.40	Office	HVAC/Shell	Custom	100 sqft glazed	2669.1	621.5	20	$349.00	$1,396.00	$67.54
High Performance Glazing - Direct Exp / Gas Heat	U=0.45 SHGC=0.40	Office	HVAC/Shell	Custom	100 sqft glazed	2097.0	624.4	20	$349.00	$1,396.00	$52.49
High Performance Glazing - Heat Pump	U=0.45 SHGC=0.40	Office	HVAC/Shell	Custom	100 sqft glazed	2093.1	637.8	20	$349.00	$1,396.00	$51.61
Improved Ceiling Insulation R24ci or R44 batt - Chiller / Elec Resist	R20 above deck R-38 attic	Office	HVAC/Shell	Custom	1000 sqft roof	103.8	37.5	20	$187.65	$750.61	$2.08
Improved Ceiling Insulation R24ci or R44 batt - Chiller / Gas Heat	R20 above deck R-38 attic	Office	HVAC/Shell	Custom	1000 sqft roof	0.0	0.0	20	$187.65	$750.61	$0.00
Improved Ceiling Insulation R24ci or R44 batt - Direct Exp / Elec Resist	R20 above deck R-38 attic	Office	HVAC/Shell	Custom	1000 sqft roof	64.0	6.0	20	$187.65	$750.61	$1.28
Improved Ceiling Insulation R24ci or R44 batt - Direct Exp / Gas Heat	R20 above deck R-38 attic	Office	HVAC/Shell	Custom	1000 sqft roof	0.3	6.1	20	$187.65	$750.61	$0.01
Improved Ceiling Insulation R24ci or R44 batt - Heat Pump	R20 above deck R-38 attic	Office	HVAC/Shell	Custom	1000 sqft roof	19.9	-7.3	20	$187.65	$750.61	$0.40
Refrigerant Charge	poor refrigerant charge	Office	HVAC/Shell	Custom	Tons Cooling	83.7	4.0	15	$4.98	$19.93	$1.72
Screw Chillers, Water-Cooled COP = 5.7 - Chiller / Elec Resist	ASHRAE 90.1-2007 4.90 COP	Office	HVAC/Shell	Custom	Tons Cooling	73.8	0.0	20	$22.50	$90.00	$1.88
Screw Chillers, Water-Cooled COP = 5.7 - Chiller / Gas Heat	ASHRAE 90.1-2007 4.90 COP	Office	HVAC/Shell	Custom	Tons Cooling	82.9	0.0	20	$22.50	$90.00	$2.08
Screw Chillers, Water-Cooled COP = 5.7 - Direct Exp / Elec Resist	ASHRAE 90.1-2007 4.90 COP	Office	HVAC/Shell	Custom	Tons Cooling	0.0	0.0	20	$22.50	$90.00	$0.00
Screw Chillers, Water-Cooled COP = 5.7 - Direct Exp / Gas Heat	ASHRAE 90.1-2007 4.90 COP	Office	HVAC/Shell	Custom	Tons Cooling	0.0	0.0	20	$22.50	$90.00	$0.00
Screw Chillers, Water-Cooled COP = 5.7 - Heat Pump	ASHRAE 90.1-2007 4.90 COP	Office	HVAC/Shell	Custom	Tons Cooling	0.0	0.0	20	$22.50	$90.00	$0.00

Table 50. Commercial Measure Characteristics (at meter savings), Office (Continued)

Efficiency Measure	Base Measure	Building Type	Category	Program	Units	Energy Impact (kWh/Unit)	Coincident Summer Peak Impact (W/Unit)	Measure Life	Base Incentive ($/unit)	Technology Cost ($/unit)	Administrative Cost ($/unit)
Window Films on Double Pane - Chiller / Elec Resist	Double-Pane Clear	Office	HVAC/Shell	Custom	100 sqft glazed	6490.4	-189.5	10	$38.50	$154.00	$165.36
Window Films on Double Pane - Chiller / Gas Heat	Double-Pane Clear	Office	HVAC/Shell	Custom	100 sqft glazed	6625.1	423.0	10	$38.50	$154.00	$166.41
Window Films on Double Pane - Direct Exp / Elec Resist	Double-Pane Clear	Office	HVAC/Shell	Custom	100 sqft glazed	2281.4	1220.7	10	$38.50	$154.00	$57.73
Window Films on Double Pane - Direct Exp / Gas Heat	Double-Pane Clear	Office	HVAC/Shell	Custom	100 sqft glazed	4291.9	1223.7	10	$38.50	$154.00	$107.43
Window Films on Double Pane - Heat Pump	Double-Pane Clear	Office	HVAC/Shell	Custom	100 sqft glazed	2942.9	1252.7	10	$38.50	$154.00	$72.56
Window Films on Single Pane - Chiller / Elec Resist	Single-Pane Clear	Office	HVAC/Shell	Custom	100 sqft glazed	5367.4	-137.7	10	$38.50	$154.00	$136.75
Window Films on Single Pane - Chiller / Gas Heat	Single-Pane Clear	Office	HVAC/Shell	Custom	100 sqft glazed	5685.3	410.4	10	$38.50	$154.00	$142.81
Window Films on Single Pane - Direct Exp / Elec Resist	Single-Pane Clear	Office	HVAC/Shell	Custom	100 sqft glazed	1793.1	1114.1	10	$38.50	$154.00	$45.37
Window Films on Single Pane - Direct Exp / Gas Heat	Single-Pane Clear	Office	HVAC/Shell	Custom	100 sqft glazed	3804.9	1116.0	10	$38.50	$154.00	$95.24
Window Films on Single Pane - Heat Pump	Single-Pane Clear	Office	HVAC/Shell	Custom	100 sqft glazed	2462.5	1138.0	10	$38.50	$154.00	$60.71
Economizer - Chiller / Elec Resist	No Economizer	Office	HVAC/Shell	Direct Install	Tons Cooling	202.6	-0.2	10	$136.00	$170.00	$58.07
Economizer - Chiller / Gas Heat	No Economizer	Office	HVAC/Shell	Direct Install	Tons Cooling	162.1	0.1	10	$136.00	$170.00	$36.47
Economizer - Direct Exp / Elec Resist	No Economizer	Office	HVAC/Shell	Direct Install	Tons Cooling	175.7	0.0	10	$136.00	$170.00	$50.02
Economizer - Direct Exp / Gas Heat	No Economizer	Office	HVAC/Shell	Direct Install	Tons Cooling	172.1	0.0	10	$136.00	$170.00	$38.73
Economizer - Heat Pump	No Economizer	Office	HVAC/Shell	Direct Install	Tons Cooling	173.4	0.0	10	$136.00	$170.00	$48.11
Programmable Thermostat - Chiller / Elec Resist	Manual Thermostat	Office	HVAC/Shell	Direct Install	Thermostat	373.1	1.8	15	$116.00	$145.00	$106.92
Programmable Thermostat - Chiller / Gas Heat	Manual Thermostat	Office	HVAC/Shell	Direct Install	Thermostat	33.7	0.0	15	$116.00	$145.00	$7.58
Programmable Thermostat - Direct Exp / Elec Resist	Manual Thermostat	Office	HVAC/Shell	Direct Install	Thermostat	474.4	-0.3	15	$116.00	$145.00	$135.05
Programmable Thermostat - Direct Exp / Gas Heat	Manual Thermostat	Office	HVAC/Shell	Direct Install	Thermostat	1602.8	-61.3	15	$116.00	$145.00	$451.34
Programmable Thermostat - Heat Pump	Manual Thermostat	Office	HVAC/Shell	Direct Install	Thermostat	9.7	-0.4	15	$116.00	$145.00	$2.19
Economizer - Chiller / Elec Resist	No Economizer	Office	HVAC/Shell	Prescriptive	Tons Cooling	202.6	-0.2	10	$42.50	$170.00	$6.45
Economizer - Chiller / Gas Heat	No Economizer	Office	HVAC/Shell	Prescriptive	Tons Cooling	129.0	0.1	10	$42.50	$170.00	$4.05
Economizer - Direct Exp / Elec Resist	No Economizer	Office	HVAC/Shell	Prescriptive	Tons Cooling	175.7	0.0	10	$42.50	$170.00	$5.56
Economizer - Direct Exp / Gas Heat	No Economizer	Office	HVAC/Shell	Prescriptive	Tons Cooling	137.5	0.0	10	$42.50	$170.00	$4.30
Economizer - Heat Pump	No Economizer	Office	HVAC/Shell	Prescriptive	Tons Cooling	173.4	0.0	10	$42.50	$170.00	$5.35
Ground Source Heat Pump (<65 kBtu/h) EER 16 - Chiller / Elec Resist	ASHRAE 90.1-2007 EER 13.4	Office	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$328.25	$1,312.98	$0.00
Ground Source Heat Pump (<65 kBtu/h) EER 16 - Chiller / Gas Heat	ASHRAE 90.1-2007 EER 13.4	Office	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$328.25	$1,312.98	$0.00
Ground Source Heat Pump (<65 kBtu/h) EER 16 - Direct Exp / Elec Resist	ASHRAE 90.1-2007 EER 13.4	Office	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$328.25	$1,312.98	$0.00
Ground Source Heat Pump (<65 kBtu/h) EER 16 - Direct Exp / Gas Heat	ASHRAE 90.1-2007 EER 13.4	Office	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$328.25	$1,312.98	$0.00
Ground Source Heat Pump (<65 kBtu/h) EER 16 - Heat Pump	ASHRAE 90.1-2007 EER 13.4	Office	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$328.25	$1,312.98	$0.00
Package system A/C (>=63.3 tons, 10.2 EER) - Chiller / Elec Resist	ASHRAE 90.1-2007 9.5 EER	Office	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$27.62	$110.48	$0.00
Package system A/C (>=63.3 tons, 10.2 EER) - Chiller / Gas Heat	ASHRAE 90.1-2007 9.5 EER	Office	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$27.62	$110.48	$0.00
Package system A/C (>=63.3 tons, 10.2 EER) - Direct Exp / Elec Resist	ASHRAE 90.1-2007 9.5 EER	Office	HVAC/Shell	Prescriptive	Tons Cooling	45.7	37.5	15	$27.62	$110.48	$1.44
Package system A/C (>=63.3 tons, 10.2 EER) - Direct Exp / Gas Heat	ASHRAE 90.1-2007 9.5 EER	Office	HVAC/Shell	Prescriptive	Tons Cooling	49.1	37.0	15	$27.62	$110.48	$1.54
Package system A/C (>=63.3 tons, 10.2 EER) - Heat Pump	ASHRAE 90.1-2007 9.5 EER	Office	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$27.62	$110.48	$0.00
Packaged terminal air-conditioner (< 7kbtuh)	ASHRAE 90.1-2007 EER 9.5	Office	HVAC/Shell	Prescriptive	Tons Cooling	314.6	98.3	15	$27.62	$110.48	$7.87
Programmable Thermostat - Chiller / Elec Resist	Manual Thermostat	Office	HVAC/Shell	Prescriptive	Thermostat	373.1	1.8	15	$36.25	$145.00	$11.88
Programmable Thermostat - Chiller / Gas Heat	Manual Thermostat	Office	HVAC/Shell	Prescriptive	Thermostat	33.7	0.0	15	$36.25	$145.00	$0.84
Programmable Thermostat - Direct Exp / Elec Resist	Manual Thermostat	Office	HVAC/Shell	Prescriptive	Thermostat	474.4	-0.3	15	$36.25	$145.00	$15.01
Programmable Thermostat - Direct Exp / Gas Heat	Manual Thermostat	Office	HVAC/Shell	Prescriptive	Thermostat	1602.8	-61.3	15	$36.25	$145.00	$50.15
Programmable Thermostat - Heat Pump	Manual Thermostat	Office	HVAC/Shell	Prescriptive	Thermostat	9.7	-0.4	15	$36.25	$145.00	$0.24
Split/Package system A/C (< 5.4 tons, 14 SEER) - Chiller / Elec Resist	Split/Package A/C (< 5.4 tons, 13.0 SEER)	Office	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$13.89	$55.57	$0.00
Split/Package system A/C (< 5.4 tons, 14 SEER) - Chiller / Gas Heat	Split/Package A/C (< 5.4 tons, 13.0 SEER)	Office	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$13.89	$55.57	$0.00
Split/Package system A/C (< 5.4 tons, 14 SEER) - Direct Exp / Elec Resist	Split/Package A/C (< 5.4 tons, 13.0 SEER)	Office	HVAC/Shell	Prescriptive	Tons Cooling	40.0	32.9	15	$13.89	$55.57	$1.27
Split/Package system A/C (< 5.4 tons, 14 SEER) - Direct Exp / Gas Heat	Split/Package A/C (< 5.4 tons, 13.0 SEER)	Office	HVAC/Shell	Prescriptive	Tons Cooling	43.1	32.4	15	$13.89	$55.57	$1.35
Split/Package system A/C (< 5.4 tons, 14 SEER) - Heat Pump	Split/Package A/C (< 5.4 tons, 13.0 SEER)	Office	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$13.89	$55.57	$0.00

Table 50. Commercial Measure Characteristics (at meter savings), Office (Continued)

Efficiency Measure	Base Measure	Building Type	Category	Program	Units	Energy Impact (kWh/Unit)	Coincident Summer Peak Impact (W/Unit)	Measure Life	Base Incentive ($/unit)	Technology Cost ($/unit)	Administrative Cost ($/unit)
Daylighting Controls	No controls	Office	Lighting	Custom	Fixture	1272.1	311.9	8	$195.61	$592.77	$25.44
Induction Lighting	Outdoor HIDs	Office	Lighting	Custom	Fixture	306.6	38.4	18	$158.97	$481.74	$6.13
CFL: Screw-In (<10W) Indoor	40W Incandescent	Office	Lighting	Direct Install	Lamp	103.1	14.4	3	$4.37	$5.46	$23.19
LED Lighting <10W - Indoor	40W Incandescent	Office	Lighting	Direct Install	Lamp	151.1	22.9	10	$21.34	$26.68	$34.01
CFL: Screw-In (10-15W) Indoor	60W Incandescent	Office	Lighting	Direct Install	Lamp	147.7	20.6	3	$4.37	$5.46	$33.23
LED Lighting >=10W - Indoor	60W Incandescent	Office	Lighting	Direct Install	Lamp	135.0	6.6	6	$21.34	$26.68	$30.38
CFL: Screw-In (<10W) Outdoor	40W Incandescent	Office	Lighting	Direct Install	Lamp	118.8	7.1	3	$1.15	$1.44	$26.74
CFL: Screw-In (10-15W) Outdoor	60W Incandescent	Office	Lighting	Direct Install	Lamp	180.2	10.8	3	$1.15	$1.44	$40.53
CFL: Pin-Based (<25W) Indoor	<=100W Incandescent Fixture	Office	Lighting	Direct Install	Lamp	240.5	33.6	12	$8.00	$10.00	$54.10
CFL: Pin-Based (>=25W) Indoor	>100W Incandescent Fixture	Office	Lighting	Direct Install	Lamp	240.5	33.6	12	$8.00	$10.00	$54.10
CFL: Screw-In (>26W) Indoor	>100W Incandescent	Office	Lighting	Direct Install	Lamp	316.0	44.2	3	$4.37	$5.46	$71.10
CFL: Screw-In (>26W) Outdoor	>100W Incandescent	Office	Lighting	Direct Install	Lamp	437.0	26.2	3	$1.15	$1.44	$98.32
CFL: Screw-In (16-21W) Indoor	75W Incandescent	Office	Lighting	Direct Install	Lamp	188.9	26.4	3	$4.37	$5.46	$42.51
CFL: Screw-In (16-21W) Outdoor	75W Incandescent	Office	Lighting	Direct Install	Lamp	218.5	13.1	3	$1.15	$1.44	$49.16
CFL: Screw-In (22-26W) Indoor	100W Incandescent	Office	Lighting	Direct Install	Lamp	233.6	32.6	3	$4.37	$5.46	$52.56
CFL: Screw-In (22-26W) Outdoor	100W Incandescent	Office	Lighting	Direct Install	Lamp	287.5	17.3	3	$1.15	$1.44	$64.68
Delamping	Avg. T8 Lamp	Office	Lighting	Direct Install	Fixture	109.9	15.4	10	$10.66	$13.33	$24.73
Dimmable Electronic Ballasts	T8 Fixtures	Office	Lighting	Direct Install	Fixture	1208.1	254.2	8	$124.40	$155.50	$271.83
High Performance T8 Lighting	Indoor Metal Halides	Office	Lighting	Direct Install	Fixture	796.9	111.4	6	$21.82	$27.27	$179.31
High Performance T8 Lighting	T12 Lamps	Office	Lighting	Direct Install	Fixture	68.7	9.6	6	$21.82	$27.27	$15.46
LED Exit Signs - from CFL	CFL Exit Sign	Office	Lighting	Direct Install	Fixture	112.7	5.3	16	$44.08	$55.10	$25.37
LED Exit Signs - from Incand.	Incandescent Exit Signs	Office	Lighting	Direct Install	Fixture	317.7	14.9	16	$44.08	$55.10	$71.49
Occupancy Sensor	No sensor	Office	Lighting	Direct Install	Sensor	302.9	19.2	8	$96.75	$120.94	$68.16
Photocell	No Photocell (Outdoor Lighting)	Office	Lighting	Direct Install	380 W	106.0	0.0	8	$47.85	$59.81	$23.85
Screw in cold cathode CFL	Avg. Incandescent Wattage	Office	Lighting	Direct Install	Fixture	137.4	19.2	10	$5.09	$6.36	$30.92
T5 Lighting	Indoor Metal Halides	Office	Lighting	Direct Install	Fixture	769.4	107.5	18	$144.80	$181.00	$173.12
T8 to High Performance T8	Standard T8 Lamps	Office	Lighting	Direct Install	Fixture	34.4	4.8	6	$21.82	$27.27	$7.73
Time clock	Time clock (Outdoor Lighting)	Office	Lighting	Direct Install	380 W	474.0	0.0	8	$193.68	$242.10	$106.65
CFL: Screw-In (<10W) Indoor	40W Incandescent	Office	Lighting	Prescriptive	Lamp	103.1	14.4	3	$1.80	$5.46	$2.58
LED Lighting <10W - Indoor	40W Incandescent	Office	Lighting	Prescriptive	Lamp	151.1	22.9	10	$8.80	$26.68	$3.78
CFL: Screw-In (10-15W) Indoor	60W Incandescent	Office	Lighting	Prescriptive	Lamp	147.7	20.6	3	$1.80	$5.46	$3.69
LED Lighting >=10W - Indoor	60W Incandescent	Office	Lighting	Prescriptive	Lamp	135.0	6.6	6	$8.80	$26.68	$3.38
CFL: Screw-In (<10W) Outdoor	40W Incandescent	Office	Lighting	Prescriptive	Lamp	118.8	7.1	3	$0.48	$1.44	$2.97
CFL: Screw-In (10-15W) Outdoor	60W Incandescent	Office	Lighting	Prescriptive	Lamp	180.2	10.8	3	$0.48	$1.44	$4.50
CFL: Pin-Based (<25W) Indoor	<=100W Incandescent Fixture	Office	Lighting	Prescriptive	Lamp	240.5	33.6	12	$3.30	$10.00	$6.01
CFL: Pin-Based (>=25W) Indoor	>100W Incandescent Fixture	Office	Lighting	Prescriptive	Lamp	240.5	33.6	12	$3.30	$10.00	$6.01
CFL: Screw-In (>26W) Indoor	>100W Incandescent	Office	Lighting	Prescriptive	Lamp	316.0	44.2	3	$1.80	$5.46	$7.90
CFL: Screw-In (>26W) Outdoor	>100W Incandescent	Office	Lighting	Prescriptive	Lamp	437.0	26.2	3	$0.48	$1.44	$10.92
CFL: Screw-In (16-21W) Indoor	75W Incandescent	Office	Lighting	Prescriptive	Lamp	188.9	26.4	3	$1.80	$5.46	$4.72
CFL: Screw-In (16-21W) Outdoor	75W Incandescent	Office	Lighting	Prescriptive	Lamp	218.5	13.1	3	$0.48	$1.44	$5.46
CFL: Screw-In (22-26W) Indoor	100W Incandescent	Office	Lighting	Prescriptive	Lamp	233.6	32.6	3	$1.80	$5.46	$5.84
CFL: Screw-In (22-26W) Outdoor	100W Incandescent	Office	Lighting	Prescriptive	Lamp	287.5	17.3	3	$0.48	$1.44	$7.19
Delamping	Avg. T8 Lamp	Office	Lighting	Prescriptive	Fixture	109.9	15.4	10	$4.40	$13.33	$2.75
Dimmable Electronic Ballasts	T8 Fixtures	Office	Lighting	Prescriptive	Fixture	1208.1	254.2	8	$51.32	$155.50	$30.20
High Performance T8 Lighting	Indoor Metal Halides	Office	Lighting	Prescriptive	Fixture	796.9	111.4	6	$9.00	$27.27	$19.92
High Performance T8 Lighting	T12 Lamps	Office	Lighting	Prescriptive	Fixture	68.7	9.6	6	$9.00	$27.27	$1.72
LED Exit Signs - from CFL	CFL Exit Sign	Office	Lighting	Prescriptive	Fixture	112.7	5.3	16	$18.18	$55.10	$2.82
LED Exit Signs - from Incand.	Incandescent Exit Signs	Office	Lighting	Prescriptive	Fixture	317.7	14.9	16	$18.18	$55.10	$7.94
Occupancy Sensor	No sensor	Office	Lighting	Prescriptive	Sensor	302.9	19.2	8	$39.91	$120.94	$7.57
Photocell	No Photocell (Outdoor Lighting)	Office	Lighting	Prescriptive	380 W	106.0	0.0	8	$19.74	$59.81	$2.65
Screw in cold cathode CFL	Avg. Incandescent Wattage	Office	Lighting	Prescriptive	Fixture	137.4	19.2	10	$2.10	$6.36	$3.44
T5 Lighting	Indoor Metal Halides	Office	Lighting	Prescriptive	Fixture	769.4	107.5	18	$59.73	$181.00	$19.24
T8 to High Performance T8	Standard T8 Lamps	Office	Lighting	Prescriptive	Fixture	34.4	4.8	6	$9.00	$27.27	$0.86
Time clock	Time clock (Outdoor Lighting)	Office	Lighting	Prescriptive	380 W	474.0	0.0	8	$79.89	$242.10	$11.85

Table 51. Commercial Measure Characteristics (at meter savings), Office

Efficiency Measure	Base Measure	Building Type	Category	Program	Units	Energy Impact (kWh/Unit)	Coincident Summer Peak Impact (W/Unit)	Measure Life	Base Incentive ($/unit)	Technology Cost ($/unit)	Administrative Cost ($/unit)
VFD on centrif load - Process or HVAC	Baseline Process or HVAC	Office	Motors	Prescriptive	HP	356.8	160.7	15	$42.26	$169.04	$8.92
Vending Machine Controller - Cold Drink	Existing Controls	Office	Plug Load	Direct Install	Unit	1646.9	0.0	15	$172.40	$215.50	$370.55
Advanced Power Strips - Occupancy Sensors	Power Strip - No controls	Office	Plug Load	Prescriptive	power strip	262.9	23.5	8	$22.50	$90.00	$6.57
Advanced Power Strips - Timer Plug Strip	Power Strip - No controls	Office	Plug Load	Prescriptive	power strip	283.2	23.5	8	$4.75	$19.00	$7.08
Advanced Power Strips - Load Sensor	Power Strip - No controls	Office	Plug Load	Prescriptive	power strip	164.5	9.4	8	$7.99	$31.96	$4.11
Vending Machine Controller - Cold Drink	Existing Controls	Office	Plug Load	Prescriptive	Unit	1646.9	0.0	15	$53.88	$215.50	$41.17
High efficiency, low temperature compressor	1.0 COP	Office	Refrigeration	Custom	Compressor	1100.1	41.6	12	$191.85	$767.41	$22.00
Multiplex Compressor	Single Line refrigeration	Office	Refrigeration	Custom	Compressor	560.4	33.7	12	$551.51	$2,206.03	$11.21
Multiplex system with oversized condenser	Multi-plex system standard Condenser	Office	Refrigeration	Custom	Compressor	67.8	9.9	12	$107.12	$428.49	$1.36
Anti-Sweat Heat (ASH) Controls (or Humidistat Controls)	No Controls- continuous operation	Office	Refrigeration	Direct Install	per 36 ln.ft. of case	1878.9	257.1	12	$471.88	$589.85	$422.76
EC Motor: Reach-In Enclosure	PSC Motor	Office	Refrigeration	Direct Install	Motor	859.0	56.3	15	$21.80	$27.25	$193.28
EC Motor: Walk-In Enclosure	PSC Motor	Office	Refrigeration	Direct Install	Motor	1333.0	87.4	15	$21.80	$27.25	$299.93
Evap Fan Controller for Med. Temp Walk-in	Existing Controls Continuous Operation	Office	Refrigeration	Direct Install	Fan	11782.2	538.0	15	$116.60	$145.75	$2,651.00
Glass Doors on Low and Med. Temperature Displays	single pane glass doors	Office	Refrigeration	Direct Install	Case Door	159.6	3.7	12	$140.00	$175.00	$35.92
Intelligent Defrost Control	fixed interval defrost	Office	Refrigeration	Direct Install	Control	842.7	286.6	10	$400.00	$500.00	$189.60
Night Covers	No Night Covers	Office	Refrigeration	Direct Install	ln. ft. of case	107.5	0.0	5	$7.40	$9.25	$24.19
Anti-Sweat Heat (ASH) Controls (or Humidistat Controls)	No Controls- continuous operation	Office	Refrigeration	Prescriptive	per 36 ln.ft. of case	1878.9	257.1	12	$147.46	$589.85	$46.97
EC Motor: Reach-In Enclosure	PSC Motor	Office	Refrigeration	Prescriptive	Motor	859.0	56.3	15	$6.81	$27.25	$21.48
EC Motor: Walk-In Enclosure	PSC Motor	Office	Refrigeration	Prescriptive	Motor	1333.0	87.4	15	$6.81	$27.25	$33.33
Evap Fan Controller for Med. Temp Walk-in	Existing Controls Continuous Operation	Office	Refrigeration	Prescriptive	Fan	11782.2	538.0	15	$36.44	$145.75	$294.56
Floating Head Pressure Controls	Fixed head pressure controls	Office	Refrigeration	Prescriptive	Tons	1804.6	82.4	12	$23.24	$92.95	$45.11
Glass Doors on Low and Med. Temperature Displays	single pane glass doors	Office	Refrigeration	Prescriptive	Case Door	159.6	3.7	12	$43.75	$175.00	$3.99
Intelligent Defrost Control	fixed interval defrost	Office	Refrigeration	Prescriptive	Control	842.7	286.6	10	$125.00	$500.00	$21.07
Night Covers	No Night Covers	Office	Refrigeration	Prescriptive	ln. ft. of case	107.5	0.0	5	$2.31	$9.25	$2.69
Outside Air Economizer for Coolers	No OA for coolers	Office	Refrigeration	Prescriptive	Unit	5840.4	467.1	10	$669.75	$2,679.00	$146.01
Refrigerated Display LED Lighting Strips	Fluorescent T12HO Case Lighting System	Office	Refrigeration	Prescriptive	Case Door	577.4	78.8	8	$62.50	$250.00	$14.44
Zero Energy Door	Standard Case door	Office	Refrigeration	Prescriptive	Case Door	1885.0	74.3	10	$72.50	$290.00	$47.13
Hot Water Circulation Pump Time Clock	No Time Clock	Office	Water Heat	Direct Install	Unit	991.0	0.0	15	$249.85	$312.31	$222.98
Heat Pump Water Heater	Baseline Electric Water Heater	Office	Water Heat	Prescriptive	Water Heater	7542.7	220.8	10	$540.00	$2,160.00	$188.57
High Efficiency, Electric Water Heater	Baseline Electric Water Heater	Office	Water Heat	Prescriptive	Water Heater	65.4	3.8	15	$70.31	$281.22	$1.63
Hot Water Circulation Pump Time Clock	No Time Clock	Office	Water Heat	Prescriptive	Unit	991.0	0.0	15	$78.08	$312.31	$24.78

Table 52. Commercial Measure Characteristics (at meter savings), Retail Non-Food

Efficiency Measure	Base Measure	Building Type	Category	Program	Units	Energy Impact (kWh/Unit)	Coincident Summer Peak Impact (W/Unit)	Measure Life	Base Incentive ($/unit)	Technology Cost ($/unit)	Administrative Cost ($/unit)
Compressed Air - Controls	business as usual	Retail Non-Food	Cooking/Other	Custom	Compressor HP	696.0	151.4	15	$46.25	$185.00	$13.92
Variable speed HE compressor	constant speed rotary-screw compressor	Retail Non-Food	Cooking/Other	Custom	Motor	902.3	65.9	15	$65.61	$262.44	$18.05
Advanced Pre-Rinse Spray Nozzle	Existing Rinse Spray Nozzle	Retail Non-Food	Cooking/Other	Direct Install	Unit	3703.1	196.9	5	$124.45	$155.57	$833.20
Compressed Air - Air Entraining Air Nozzle	Standard high-volume nozzles	Retail Non-Food	Cooking/Other	Prescriptive	Nozzle	759.0	165.1	10	$3.50	$14.00	$18.98
Compressed Air - Air Receiver for Load/No-Load Compressors (5 gal/CFM)	Current storage capacity	Retail Non-Food	Cooking/Other	Prescriptive	Compressor HP	368.0	80.0	10	$20.00	$80.00	$9.20
Compressed Air - Cycling Air Dryer	Continuous Air Dryer	Retail Non-Food	Cooking/Other	Prescriptive	Compressor HP	40.9	8.9	10	$7.50	$30.00	$1.02
Advanced Pre-Rinse Spray Nozzle	Existing Rinse Spray Nozzle	Retail Non-Food	Cooking/Other	Prescriptive	Unit	3703.1	196.9	5	$38.89	$155.57	$92.58
ENERGY STAR Connectionless Steamer	Connected Steamer	Retail Non-Food	Cooking/Other	Prescriptive	Unit	29692.0	3592.9	12	$500.00	$2,000.00	$742.30
ENERGY STAR Fryer	Baseline Fryer	Retail Non-Food	Cooking/Other	Prescriptive	Unit	1166.0	105.5	12	$125.00	$500.00	$29.15
ENERGY STAR Griddle	Baseline Griddle	Retail Non-Food	Cooking/Other	Prescriptive	Unit	8497.0	105.5	12	$522.50	$2,090.00	$212.43
ENERGY STAR Oven (Convection)	Baseline Oven	Retail Non-Food	Cooking/Other	Prescriptive	Unit	5786.0	700.1	12	$278.25	$1,113.00	$144.65
Insulated Hot Food Holding Cabinet: Half Size <=0.3 kW	stand hot food holding cabinet	Retail Non-Food	Cooking/Other	Prescriptive	Cabinet	1200.0	116.1	12	$277.50	$1,110.00	$30.00
PC Power Management Software	No Management Software	Retail Non-Food	Cooking/Other	Prescriptive	Unit	113.3	13.2	4	$3.04	$12.14	$2.83
<150 tons Centrifugal Water Cooled Chiller COP = 6.0 - Chiller / Elec Resist	ASHRAE 90.1-2007 5.0 COP	Retail Non-Food	HVAC/Shell	Custom	Tons Cooling	168.5	0.0	20	$23.00	$92.00	$4.47
<150 tons Centrifugal Water Cooled Chiller COP = 6.0 - Chiller / Gas Heat	ASHRAE 90.1-2007 5.0 COP	Retail Non-Food	HVAC/Shell	Custom	Tons Cooling	132.5	0.0	20	$23.00	$92.00	$3.46
<150 tons Centrifugal Water Cooled Chiller COP = 6.0 - Direct Exp / Elec Resist	ASHRAE 90.1-2007 5.0 COP	Retail Non-Food	HVAC/Shell	Custom	Tons Cooling	0.0	0.0	20	$23.00	$92.00	$0.00
<150 tons Centrifugal Water Cooled Chiller COP = 6.0 - Direct Exp / Gas Heat	ASHRAE 90.1-2007 5.0 COP	Retail Non-Food	HVAC/Shell	Custom	Tons Cooling	0.0	0.0	20	$23.00	$92.00	$0.00
<150 tons Centrifugal Water Cooled Chiller COP = 6.0 - Heat Pump	ASHRAE 90.1-2007 5.0 COP	Retail Non-Food	HVAC/Shell	Custom	Tons Cooling	0.0	0.0	20	$23.00	$92.00	$0.00
Air Cooled Chiller COP = 3.2 - Chiller / Elec Resist	ASHRAE 90.1-2007 2.8 COP	Retail Non-Food	HVAC/Shell	Custom	Tons Cooling	191.0	0.0	20	$31.50	$126.00	$5.06
Air Cooled Chiller COP = 3.2 - Chiller / Gas Heat	ASHRAE 90.1-2007 2.8 COP	Retail Non-Food	HVAC/Shell	Custom	Tons Cooling	147.2	0.0	20	$31.50	$126.00	$3.85
Air Cooled Chiller COP = 3.2 - Direct Exp / Elec Resist	ASHRAE 90.1-2007 2.8 COP	Retail Non-Food	HVAC/Shell	Custom	Tons Cooling	0.0	0.0	20	$31.50	$126.00	$0.00
Air Cooled Chiller COP = 3.2 - Direct Exp / Gas Heat	ASHRAE 90.1-2007 2.8 COP	Retail Non-Food	HVAC/Shell	Custom	Tons Cooling	0.0	0.0	20	$31.50	$126.00	$0.00
Air Cooled Chiller COP = 3.2 - Heat Pump	ASHRAE 90.1-2007 2.8 COP	Retail Non-Food	HVAC/Shell	Custom	Tons Cooling	0.0	0.0	20	$31.50	$126.00	$0.00
Code minimum R-20ci or R-38 batt - Chiller / Elec Resist	Existing R-value	Retail Non-Food	HVAC/Shell	Custom	1000 sqft roof	2446.8	102.0	20	$292.50	$1,170.00	$64.84
Code minimum R-20ci or R-38 batt - Chiller / Gas Heat	Existing R-value	Retail Non-Food	HVAC/Shell	Custom	1000 sqft roof	527.9	29.7	20	$292.50	$1,170.00	$13.79
Code minimum R-20ci or R-38 batt - Direct Exp / Elec Resist	Existing R-value	Retail Non-Food	HVAC/Shell	Custom	1000 sqft roof	905.2	70.6	20	$292.50	$1,170.00	$23.82
Code minimum R-20ci or R-38 batt - Direct Exp / Gas Heat	Existing R-value	Retail Non-Food	HVAC/Shell	Custom	1000 sqft roof	43.5	88.1	20	$292.50	$1,170.00	$0.87
Code minimum R-20ci or R-38 batt - Heat Pump	Existing R-value	Retail Non-Food	HVAC/Shell	Custom	1000 sqft roof	550.0	83.2	20	$292.50	$1,170.00	$14.11
Cool Roof - Chiller / Elec Resist	black membrane or built-up	Retail Non-Food	HVAC/Shell	Custom	1000 sqft roof	0.0	0.0	15	$166.25	$665.00	$0.00
Cool Roof - Chiller / Gas Heat	black membrane or built-up	Retail Non-Food	HVAC/Shell	Custom	1000 sqft roof	273.1	-0.3	15	$166.25	$665.00	$5.46
Cool Roof - Direct Exp / Elec Resist	black membrane or built-up	Retail Non-Food	HVAC/Shell	Custom	1000 sqft roof	0.0	53.1	15	$166.25	$665.00	$0.00
Cool Roof - Direct Exp / Gas Heat	black membrane or built-up	Retail Non-Food	HVAC/Shell	Custom	1000 sqft roof	194.6	51.1	15	$166.25	$665.00	$3.89
Cool Roof - Heat Pump	black membrane or built-up	Retail Non-Food	HVAC/Shell	Custom	1000 sqft roof	64.5	54.0	15	$166.25	$665.00	$1.29
EMS System	No EMS	Retail Non-Food	HVAC/Shell	Custom	1,000 SF	0.0	0.0	15	$126.90	$507.58	$0.00
High Performance Glazing - Chiller / Elec Resist	U=0.45 SHGC=0.40	Retail Non-Food	HVAC/Shell	Custom	100 sqft glazed	12863.8	1284.0	20	$349.00	$1,396.00	$340.90
High Performance Glazing - Chiller / Gas Heat	U=0.45 SHGC=0.40	Retail Non-Food	HVAC/Shell	Custom	100 sqft glazed	3899.2	276.2	20	$349.00	$1,396.00	$101.88
High Performance Glazing - Direct Exp / Elec Resist	U=0.45 SHGC=0.40	Retail Non-Food	HVAC/Shell	Custom	100 sqft glazed	2877.5	485.1	20	$349.00	$1,396.00	$75.73
High Performance Glazing - Direct Exp / Gas Heat	U=0.45 SHGC=0.40	Retail Non-Food	HVAC/Shell	Custom	100 sqft glazed	1491.8	481.9	20	$349.00	$1,396.00	$38.84
High Performance Glazing - Heat Pump	U=0.45 SHGC=0.40	Retail Non-Food	HVAC/Shell	Custom	100 sqft glazed	2610.5	599.5	20	$349.00	$1,396.00	$66.95
Improved Ceiling Insulation R24ci or R44 batt - Chiller / Elec Resist	R20 above deck R-38 attic	Retail Non-Food	HVAC/Shell	Custom	1000 sqft roof	178.9	9.4	20	$187.65	$750.61	$3.58
Improved Ceiling Insulation R24ci or R44 batt - Chiller / Gas Heat	R20 above deck R-38 attic	Retail Non-Food	HVAC/Shell	Custom	1000 sqft roof	31.0	2.2	20	$187.65	$750.61	$0.62
Improved Ceiling Insulation R24ci or R44 batt - Direct Exp / Elec Resist	R20 above deck R-38 attic	Retail Non-Food	HVAC/Shell	Custom	1000 sqft roof	77.8	5.8	20	$187.65	$750.61	$1.56
Improved Ceiling Insulation R24ci or R44 batt - Direct Exp / Gas Heat	R20 above deck R-38 attic	Retail Non-Food	HVAC/Shell	Custom	1000 sqft roof	0.8	5.6	20	$187.65	$750.61	$0.02
Improved Ceiling Insulation R24ci or R44 batt - Heat Pump	R20 above deck R-38 attic	Retail Non-Food	HVAC/Shell	Custom	1000 sqft roof	36.0	-1.7	20	$187.65	$750.61	$0.72
Refrigerant Charge	poor refrigerant charge	Retail Non-Food	HVAC/Shell	Custom	Tons Cooling	56.0	3.8	15	$4.98	$19.93	$1.20
Screw Chillers, Water-Cooled COP = 5.7 - Chiller / Elec Resist	ASHRAE 90.1-2007 4.90 COP	Retail Non-Food	HVAC/Shell	Custom	Tons Cooling	107.6	0.0	20	$22.50	$90.00	$2.85
Screw Chillers, Water-Cooled COP = 5.7 - Chiller / Gas Heat	ASHRAE 90.1-2007 4.90 COP	Retail Non-Food	HVAC/Shell	Custom	Tons Cooling	84.1	0.0	20	$22.50	$90.00	$2.20
Screw Chillers, Water-Cooled COP = 5.7 - Direct Exp / Elec Resist	ASHRAE 90.1-2007 4.90 COP	Retail Non-Food	HVAC/Shell	Custom	Tons Cooling	0.0	0.0	20	$22.50	$90.00	$0.00
Screw Chillers, Water-Cooled COP = 5.7 - Direct Exp / Gas Heat	ASHRAE 90.1-2007 4.90 COP	Retail Non-Food	HVAC/Shell	Custom	Tons Cooling	0.0	0.0	20	$22.50	$90.00	$0.00
Screw Chillers, Water-Cooled COP = 5.7 - Heat Pump	ASHRAE 90.1-2007 4.90 COP	Retail Non-Food	HVAC/Shell	Custom	Tons Cooling	0.0	0.0	20	$22.50	$90.00	$0.00

Table 52. Commercial Measure Characteristics (at meter savings), Retail Non-Food (Continued)

Efficiency Measure	Base Measure	Building Type	Category	Program	Units	Energy Impact (kWh/Unit)	Coincident Summer Peak Impact (W/Unit)	Measure Life	Base Incentive ($/unit)	Technology Cost ($/unit)	Administrative Cost ($/unit)
Window Films on Double Pane - Chiller / Elec Resist	Double-Pane Clear	Retail Non-Food	HVAC/Shell	Custom	100 sqft glazed	0.0	0.0	10	$38.50	$154.00	$0.00
Window Films on Double Pane - Chiller / Gas Heat	Double-Pane Clear	Retail Non-Food	HVAC/Shell	Custom	100 sqft glazed	417.8	-13.2	10	$38.50	$154.00	$10.92
Window Films on Double Pane - Direct Exp / Elec Resist	Double-Pane Clear	Retail Non-Food	HVAC/Shell	Custom	100 sqft glazed	1010.0	846.7	10	$38.50	$154.00	$26.58
Window Films on Double Pane - Direct Exp / Gas Heat	Double-Pane Clear	Retail Non-Food	HVAC/Shell	Custom	100 sqft glazed	3268.8	925.8	10	$38.50	$154.00	$85.11
Window Films on Double Pane - Heat Pump	Double-Pane Clear	Retail Non-Food	HVAC/Shell	Custom	100 sqft glazed	1717.1	866.7	10	$38.50	$154.00	$44.04
Window Films on Single Pane - Chiller / Elec Resist	Single-Pane Clear	Retail Non-Food	HVAC/Shell	Custom	100 sqft glazed	0.0	0.0	10	$38.50	$154.00	$0.00
Window Films on Single Pane - Chiller / Gas Heat	Single-Pane Clear	Retail Non-Food	HVAC/Shell	Custom	100 sqft glazed	0.0	0.0	10	$38.50	$154.00	$0.00
Window Films on Single Pane - Direct Exp / Elec Resist	Single-Pane Clear	Retail Non-Food	HVAC/Shell	Custom	100 sqft glazed	1254.7	1485.5	10	$38.50	$154.00	$33.02
Window Films on Single Pane - Direct Exp / Gas Heat	Single-Pane Clear	Retail Non-Food	HVAC/Shell	Custom	100 sqft glazed	3305.5	1621.2	10	$38.50	$154.00	$86.06
Window Films on Single Pane - Heat Pump	Single-Pane Clear	Retail Non-Food	HVAC/Shell	Custom	100 sqft glazed	2028.8	1431.0	10	$38.50	$154.00	$52.03
Economizer - Chiller / Elec Resist	No Economizer	Retail Non-Food	HVAC/Shell	Direct Install	Tons Cooling	144.9	-0.3	10	$136.00	$170.00	$32.60
Economizer - Chiller / Gas Heat	No Economizer	Retail Non-Food	HVAC/Shell	Direct Install	Tons Cooling	30.4	0.0	10	$136.00	$170.00	$6.83
Economizer - Direct Exp / Elec Resist	No Economizer	Retail Non-Food	HVAC/Shell	Direct Install	Tons Cooling	134.0	0.0	10	$136.00	$170.00	$30.16
Economizer - Direct Exp / Gas Heat	No Economizer	Retail Non-Food	HVAC/Shell	Direct Install	Tons Cooling	110.8	0.0	10	$136.00	$170.00	$24.94
Economizer - Heat Pump	No Economizer	Retail Non-Food	HVAC/Shell	Direct Install	Tons Cooling	135.8	0.0	10	$136.00	$170.00	$30.56
Programmable Thermostat - Chiller / Elec Resist	Manual Thermostat	Retail Non-Food	HVAC/Shell	Direct Install	Thermostat	3299.9	2.2	15	$116.00	$145.00	$983.82
Programmable Thermostat - Chiller / Gas Heat	Manual Thermostat	Retail Non-Food	HVAC/Shell	Direct Install	Thermostat	1475.1	0.0	15	$116.00	$145.00	$433.57
Programmable Thermostat - Direct Exp / Elec Resist	Manual Thermostat	Retail Non-Food	HVAC/Shell	Direct Install	Thermostat	336.8	-3.1	15	$116.00	$145.00	$99.71
Programmable Thermostat - Direct Exp / Gas Heat	Manual Thermostat	Retail Non-Food	HVAC/Shell	Direct Install	Thermostat	981.3	-39.7	15	$116.00	$145.00	$287.43
Programmable Thermostat - Heat Pump	Manual Thermostat	Retail Non-Food	HVAC/Shell	Direct Install	Thermostat	54.0	-4.5	15	$116.00	$145.00	$12.15
Economizer - Chiller / Elec Resist	No Economizer	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	144.9	-0.3	10	$42.50	$170.00	$3.62
Economizer - Chiller / Gas Heat	No Economizer	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	30.4	0.0	10	$42.50	$170.00	$0.76
Economizer - Direct Exp / Elec Resist	No Economizer	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	134.0	0.0	10	$42.50	$170.00	$3.35
Economizer - Direct Exp / Gas Heat	No Economizer	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	110.8	0.0	10	$42.50	$170.00	$2.77
Economizer - Heat Pump	No Economizer	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	135.8	0.0	10	$42.50	$170.00	$3.40
Ground Source Heat Pump (<65 kBtu/h) EER 16 - Chiller / Elec Resist	ASHRAE 90.1-2007 EER 13.4	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$328.25	$1,312.98	$0.00
Ground Source Heat Pump (<65 kBtu/h) EER 16 - Chiller / Gas Heat	ASHRAE 90.1-2007 EER 13.4	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$328.25	$1,312.98	$0.00
Ground Source Heat Pump (<65 kBtu/h) EER 16 - Direct Exp / Elec Resist	ASHRAE 90.1-2007 EER 13.4	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$328.25	$1,312.98	$0.00
Ground Source Heat Pump (<65 kBtu/h) EER 16 - Direct Exp / Gas Heat	ASHRAE 90.1-2007 EER 13.4	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$328.25	$1,312.98	$0.00
Ground Source Heat Pump (<65 kBtu/h) EER 16 - Heat Pump	ASHRAE 90.1-2007 EER 13.4	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$328.25	$1,312.98	$0.00
Package system A/C (>=63.3 tons, 10.2 EER) - Chiller / Elec Resist	ASHRAE 90.1-2007 9.5 EER	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$27.62	$110.48	$0.00
Package system A/C (>=63.3 tons, 10.2 EER) - Chiller / Gas Heat	ASHRAE 90.1-2007 9.5 EER	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$27.62	$110.48	$0.00
Package system A/C (>=63.3 tons, 10.2 EER) - Direct Exp / Elec Resist	ASHRAE 90.1-2007 9.5 EER	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	43.0	35.2	15	$27.62	$110.48	$1.42
Package system A/C (>=63.3 tons, 10.2 EER) - Direct Exp / Gas Heat	ASHRAE 90.1-2007 9.5 EER	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	47.3	35.5	15	$27.62	$110.48	$1.54
Package system A/C (>=63.3 tons, 10.2 EER) - Heat Pump	ASHRAE 90.1-2007 9.5 EER	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$27.62	$110.48	$0.00
Packaged terminal air-conditioner (< 7kbtuh)	ASHRAE 90.1-2007 EER 9.5	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	294.7	92.0	15	$27.62	$110.48	$7.87
Programmable Thermostat - Chiller / Elec Resist	Manual Thermostat	Retail Non-Food	HVAC/Shell	Prescriptive	Thermostat	3299.9	2.2	15	$36.25	$145.00	$109.31
Programmable Thermostat - Chiller / Gas Heat	Manual Thermostat	Retail Non-Food	HVAC/Shell	Prescriptive	Thermostat	1475.1	0.0	15	$36.25	$145.00	$48.17
Programmable Thermostat - Direct Exp / Elec Resist	Manual Thermostat	Retail Non-Food	HVAC/Shell	Prescriptive	Thermostat	336.8	-3.1	15	$36.25	$145.00	$11.08
Programmable Thermostat - Direct Exp / Gas Heat	Manual Thermostat	Retail Non-Food	HVAC/Shell	Prescriptive	Thermostat	981.3	-39.7	15	$36.25	$145.00	$31.94
Programmable Thermostat - Heat Pump	Manual Thermostat	Retail Non-Food	HVAC/Shell	Prescriptive	Thermostat	54.0	-4.5	15	$36.25	$145.00	$1.35
Split/Package system A/C (< 5.4 tons, 14 SEER) - Chiller / Elec Resist	Split/Package A/C (< 5.4 tons, 13.0 SEER)	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$13.89	$55.57	$0.00
Split/Package system A/C (< 5.4 tons, 14 SEER) - Chiller / Gas Heat	Split/Package A/C (< 5.4 tons, 13.0 SEER)	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$13.89	$55.57	$0.00
Split/Package system A/C (< 5.4 tons, 14 SEER) - Direct Exp / Elec Resist	Split/Package A/C (< 5.4 tons, 13.0 SEER)	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	23.1	19.0	15	$13.89	$55.57	$0.76
Split/Package system A/C (< 5.4 tons, 14 SEER) - Direct Exp / Gas Heat	Split/Package A/C (< 5.4 tons, 13.0 SEER)	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	26.1	19.6	15	$13.89	$55.57	$0.85
Split/Package system A/C (< 5.4 tons, 14 SEER) - Heat Pump	Split/Package A/C (< 5.4 tons, 13.0 SEER)	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$13.89	$55.57	$0.00
Split/Packaged Air Conditioner (135 - 240 kBtu/h) 11.5 EER - Chiller / Elec Resist	ASHRAE 90.1-2007 10.8 EER	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$27.72	$110.89	$0.00
Split/Packaged Air Conditioner (135 - 240 kBtu/h) 11.5 EER - Chiller / Gas Heat	ASHRAE 90.1-2007 10.8 EER	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$27.72	$110.89	$0.00
Split/Packaged Air Conditioner (135 - 240 kBtu/h) 11.5 EER - Direct Exp / Elec Resist	ASHRAE 90.1-2007 10.8 EER	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	33.6	27.5	15	$27.72	$110.89	$1.10

Table 52. Commercial Measure Characteristics (at meter savings), Retail Non-Food (Continued)

Efficiency Measure	Base Measure	Building Type	Category	Program	Units	Energy Impact (kWh/Unit)	Coincident Summer Peak Impact (W/Unit)	Measure Life	Base Incentive ($/unit)	Technology Cost ($/unit)	Administrative Cost ($/unit)
Split/Packaged Air Conditioner (135 - 240 kBtu/h) 11.5 EER - Direct Exp / Gas Heat	ASHRAE 90.1-2007 10.8 EER	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	36.9	27.7	15	$27.72	$110.89	$1.20
Split/Packaged Air Conditioner (135 - 240 kBtu/h) 11.5 EER - Heat Pump	ASHRAE 90.1-2007 10.8 EER	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$27.72	$110.89	$0.00
Split/Packaged Air Conditioner (240 - 760 kBtu/h) 11 EER - Chiller / Elec Resist	ASHRAE 90.1-2007 9.8 EER	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$28.78	$115.13	$0.00
Split/Packaged Air Conditioner (240 - 760 kBtu/h) 11 EER - Chiller / Gas Heat	ASHRAE 90.1-2007 9.8 EER	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$28.78	$115.13	$0.00
Split/Packaged Air Conditioner (240 - 760 kBtu/h) 11 EER - Direct Exp / Elec Resist	ASHRAE 90.1-2007 9.8 EER	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	66.3	54.2	15	$28.78	$115.13	$2.18
Split/Packaged Air Conditioner (240 - 760 kBtu/h) 11 EER - Direct Exp / Gas Heat	ASHRAE 90.1-2007 9.8 EER	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	72.9	60.5	15	$28.78	$115.13	$2.37
Split/Packaged Air Conditioner (240 - 760 kBtu/h) 11 EER - Heat Pump	ASHRAE 90.1-2007 9.8 EER	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$28.78	$115.13	$0.00
Split/Packaged Air Conditioner (65 - 135 kBtu/h) 12 EER - Chiller / Elec Resist	ASHRAE 90.1-2007 11.0 EER	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$37.28	$149.13	$0.00
Split/Packaged Air Conditioner (65 - 135 kBtu/h) 12 EER - Chiller / Gas Heat	ASHRAE 90.1-2007 11.0 EER	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$37.28	$149.13	$0.00
Split/Packaged Air Conditioner (65 - 135 kBtu/h) 12 EER - Direct Exp / Elec Resist	ASHRAE 90.1-2007 11.0 EER	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	45.1	36.9	15	$37.28	$149.13	$1.48
Split/Packaged Air Conditioner (65 - 135 kBtu/h) 12 EER - Direct Exp / Gas Heat	ASHRAE 90.1-2007 11.0 EER	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	49.6	37.2	15	$37.28	$149.13	$1.61
Split/Packaged Air Conditioner (65 - 135 kBtu/h) 12 EER - Heat Pump	ASHRAE 90.1-2007 11.0 EER	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$37.28	$149.13	$0.00
Split/Packaged Heat Pump (<65 kBtu/h) SEER 14 - Chiller / Elec Resist	ASHRAE 90.1-2007 SEER 13.0	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$18.38	$73.52	$0.00
Split/Packaged Heat Pump (<65 kBtu/h) SEER 14 - Chiller / Gas Heat	ASHRAE 90.1-2007 SEER 13.0	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$18.38	$73.52	$0.00
Split/Packaged Heat Pump (<65 kBtu/h) SEER 14 - Direct Exp / Elec Resist	ASHRAE 90.1-2007 SEER 13.0	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$18.38	$73.52	$0.00
Split/Packaged Heat Pump (<65 kBtu/h) SEER 14 - Direct Exp / Gas Heat	ASHRAE 90.1-2007 SEER 13.0	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$18.38	$73.52	$0.00
Split/Packaged Heat Pump (<65 kBtu/h) SEER 14 - Heat Pump	ASHRAE 90.1-2007 SEER 13.0	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	63.7	33.1	15	$18.38	$73.52	$2.04
Split/Packaged Heat Pump (135 - 240 kBtu/h) EER 11.5 - Chiller / Elec Resist	ASHRAE 90.1-2007 EER 10.6	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$31.36	$125.44	$0.00
Split/Packaged Heat Pump (135 - 240 kBtu/h) EER 11.5 - Chiller / Gas Heat	ASHRAE 90.1-2007 EER 10.6	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$31.36	$125.44	$0.00
Split/Packaged Heat Pump (135 - 240 kBtu/h) EER 11.5 - Direct Exp / Elec Resist	ASHRAE 90.1-2007 EER 10.6	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$31.36	$125.44	$0.00
Split/Packaged Heat Pump (135 - 240 kBtu/h) EER 11.5 - Direct Exp / Gas Heat	ASHRAE 90.1-2007 EER 10.6	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$31.36	$125.44	$0.00
Split/Packaged Heat Pump (135 - 240 kBtu/h) EER 11.5 - Heat Pump	ASHRAE 90.1-2007 EER 10.6	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	76.1	69.4	15	$31.36	$125.44	$2.44
Split/Packaged Heat Pump (240 - 760 kBtu/h) EER 10.8 - Chiller / Elec Resist	ASHRAE 90.1-2007 EER 9.5	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$32.46	$129.83	$0.00
Split/Packaged Heat Pump (240 - 760 kBtu/h) EER 10.8 - Chiller / Gas Heat	ASHRAE 90.1-2007 EER 9.5	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$32.46	$129.83	$0.00
Split/Packaged Heat Pump (240 - 760 kBtu/h) EER 10.8 - Direct Exp / Elec Resist	ASHRAE 90.1-2007 EER 9.5	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$32.46	$129.83	$0.00
Split/Packaged Heat Pump (240 - 760 kBtu/h) EER 10.8 - Direct Exp / Gas Heat	ASHRAE 90.1-2007 EER 9.5	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$32.46	$129.83	$0.00
Split/Packaged Heat Pump (240 - 760 kBtu/h) EER 10.8 - Heat Pump	ASHRAE 90.1-2007 EER 9.5	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	130.8	66.2	15	$32.46	$129.83	$4.19
Split/Packaged Heat Pump (65 - 135 kBtu/h) EER 12 - Chiller / Elec Resist	ASHRAE 90.1-2007 EER 11.0	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$45.61	$182.43	$0.00
Split/Packaged Heat Pump (65 - 135 kBtu/h) EER 12 - Chiller / Gas Heat	ASHRAE 90.1-2007 EER 11.0	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$45.61	$182.43	$0.00
Split/Packaged Heat Pump (65 - 135 kBtu/h) EER 12 - Direct Exp / Elec Resist	ASHRAE 90.1-2007 EER 11.0	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$45.61	$182.43	$0.00
Split/Packaged Heat Pump (65 - 135 kBtu/h) EER 12 - Direct Exp / Gas Heat	ASHRAE 90.1-2007 EER 11.0	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$45.61	$182.43	$0.00
Split/Packaged Heat Pump (65 - 135 kBtu/h) EER 12 - Heat Pump	ASHRAE 90.1-2007 EER 11.0	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	78.2	39.6	15	$45.61	$182.43	$2.51
Water Source Heat Pump (<65 kBtu/h) EER 15 - Chiller / Elec Resist	ASHRAE 90.1-2007 EER 12.0	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$6.57	$26.29	$0.00
Water Source Heat Pump (<65 kBtu/h) EER 15 - Chiller / Gas Heat	ASHRAE 90.1-2007 EER 12.0	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$6.57	$26.29	$0.00
Water Source Heat Pump (<65 kBtu/h) EER 15 - Direct Exp / Elec Resist	ASHRAE 90.1-2007 EER 12.0	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$6.57	$26.29	$0.00
Water Source Heat Pump (<65 kBtu/h) EER 15 - Direct Exp / Gas Heat	ASHRAE 90.1-2007 EER 12.0	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$6.57	$26.29	$0.00
Water Source Heat Pump (<65 kBtu/h) EER 15 - Heat Pump	ASHRAE 90.1-2007 EER 12.0	Retail Non-Food	HVAC/Shell	Prescriptive	Tons Cooling	88.7	34.4	15	$6.57	$26.29	$2.84
Daylighting Controls	No controls	Retail Non-Food	Lighting	Custom	Fixture	793.6	192.2	8	$195.61	$592.77	$15.87
Induction Lighting	Outdoor HIDs	Retail Non-Food	Lighting	Custom	Fixture	306.6	38.4	18	$158.97	$481.74	$6.13
CFL: Screw-In (<10W) Indoor	40W Incandescent	Retail Non-Food	Lighting	Direct Install	Lamp	92.0	15.6	3	$4.37	$5.46	$20.71
LED Lighting <10W - Indoor	40W Incandescent	Retail Non-Food	Lighting	Direct Install	Lamp	135.0	22.9	10	$21.34	$26.68	$30.37
CFL: Screw-In (10-15W) Indoor	60W Incandescent	Retail Non-Food	Lighting	Direct Install	Lamp	131.9	22.4	3	$4.37	$5.46	$29.68
LED Lighting >=10W - Indoor	60W Incandescent	Retail Non-Food	Lighting	Direct Install	Lamp	135.0	6.6	6	$21.34	$26.68	$30.38
CFL: Pin-Based (<25W) Indoor	<=100W Incandescent Fixture	Retail Non-Food	Lighting	Direct Install	Lamp	214.8	36.4	12	$8.00	$10.00	$48.32
CFL: Pin-Based (>=25W) Indoor	>100W Incandescent Fixture	Retail Non-Food	Lighting	Direct Install	Lamp	214.8	36.4	12	$8.00	$10.00	$48.32
CFL: Screw-In (<10W) Outdoor	40W Incandescent	Retail Non-Food	Lighting	Direct Install	Lamp	118.8	7.1	3	$1.15	$1.44	$26.74
CFL: Screw-In (>26W) Indoor	>100W Incandescent	Retail Non-Food	Lighting	Direct Install	Lamp	282.3	47.8	3	$4.37	$5.46	$63.51
CFL: Screw-In (>26W) Outdoor	>100W Incandescent	Retail Non-Food	Lighting	Direct Install	Lamp	437.0	26.2	3	$1.15	$1.44	$98.32
CFL: Screw-In (10-15W) Outdoor	60W Incandescent	Retail Non-Food	Lighting	Direct Install	Lamp	180.2	10.8	3	$1.15	$1.44	$40.53

Table 52. Commercial Measure Characteristics (at meter savings), Retail Non-Food (Continued)

Efficiency Measure	Base Measure	Building Type	Category	Program	Units	Energy Impact (kWh/Unit)	Coincident Summer Peak Impact (W/Unit)	Measure Life	Base Incentive ($/unit)	Technology Cost ($/unit)	Administrative Cost ($/unit)
CFL: Screw-In (16-21W) Indoor	75W Incandescent	Retail Non-Food	Lighting	Direct Install	Lamp	168.7	28.6	3	$4.37	$5.46	$37.97
CFL: Screw-In (16-21W) Outdoor	75W Incandescent	Retail Non-Food	Lighting	Direct Install	Lamp	218.5	13.1	3	$1.15	$1.44	$49.16
CFL: Screw-In (22-26W) Indoor	100W Incandescent	Retail Non-Food	Lighting	Direct Install	Lamp	208.6	35.4	3	$4.37	$5.46	$46.94
CFL: Screw-In (22-26W) Outdoor	100W Incandescent	Retail Non-Food	Lighting	Direct Install	Lamp	287.5	17.3	3	$1.15	$1.44	$64.68
Delamping	Avg. T8 Lamp	Retail Non-Food	Lighting	Direct Install	Fixture	98.2	16.6	10	$10.66	$13.33	$22.09
Dimmable Electronic Ballasts	T8 Fixtures	Retail Non-Food	Lighting	Direct Install	Fixture	836.4	274.0	8	$124.40	$155.50	$188.19
High Performance T8 Lighting	Indoor Metal Halides	Retail Non-Food	Lighting	Direct Install	Fixture	711.8	120.6	6	$21.82	$27.27	$160.15
High Performance T8 Lighting	T12 Lamps	Retail Non-Food	Lighting	Direct Install	Fixture	61.4	10.4	6	$21.82	$27.27	$13.81
LED Exit Signs - from CFL	CFL Exit Sign	Retail Non-Food	Lighting	Direct Install	Fixture	112.7	5.7	16	$44.08	$55.10	$25.37
LED Exit Signs - from Incand.	Incandescent Exit Signs	Retail Non-Food	Lighting	Direct Install	Fixture	317.7	16.1	16	$44.08	$55.10	$71.49
Occupancy Sensor	No sensor	Retail Non-Food	Lighting	Direct Install	Sensor	121.4	18.1	8	$96.75	$120.94	$27.32
Photocell	No Photocell (Outdoor Lighting)	Retail Non-Food	Lighting	Direct Install	380 W	106.0	0.0	8	$47.85	$59.81	$23.85
Screw in cold cathode CFL	Avg. Incandescent Wattage	Retail Non-Food	Lighting	Direct Install	Fixture	122.7	20.8	10	$5.09	$6.36	$27.61
T5 Lighting	Indoor Metal Halides	Retail Non-Food	Lighting	Direct Install	Fixture	687.2	116.5	18	$144.80	$181.00	$154.63
T8 to High Performance T8	Standard T8 Lamps	Retail Non-Food	Lighting	Direct Install	Fixture	30.7	5.2	6	$21.82	$27.27	$6.90
Time clock	Time clock (Outdoor Lighting)	Retail Non-Food	Lighting	Direct Install	380 W	474.0	0.0	8	$193.68	$242.10	$106.65
CFL: Screw-In (<10W) Indoor	40W Incandescent	Retail Non-Food	Lighting	Prescriptive	Lamp	92.0	15.6	3	$1.80	$5.46	$2.30
CFL: Screw-In (<10W) Outdoor	40W Incandescent	Retail Non-Food	Lighting	Prescriptive	Lamp	118.8	7.1	3	$0.48	$1.44	$2.97
LED Lighting <10W - Indoor	40W Incandescent	Retail Non-Food	Lighting	Prescriptive	Lamp	135.0	22.9	10	$8.80	$26.68	$3.37
CFL: Screw-In (10-15W) Indoor	60W Incandescent	Retail Non-Food	Lighting	Prescriptive	Lamp	131.9	22.4	3	$1.80	$5.46	$3.30
CFL: Screw-In (10-15W) Outdoor	60W Incandescent	Retail Non-Food	Lighting	Prescriptive	Lamp	180.2	10.8	3	$0.48	$1.44	$4.50
LED Lighting >=10W - Indoor	60W Incandescent	Retail Non-Food	Lighting	Prescriptive	Lamp	135.0	6.6	6	$8.80	$26.68	$3.38
CFL: Pin-Based (<25W) Indoor	<=100W Incandescent Fixture	Retail Non-Food	Lighting	Prescriptive	Lamp	214.8	36.4	12	$3.30	$10.00	$5.37
CFL: Pin-Based (>=25W) Indoor	>100W Incandescent Fixture	Retail Non-Food	Lighting	Prescriptive	Lamp	214.8	36.4	12	$3.30	$10.00	$5.37
CFL: Screw-In (>26W) Indoor	>100W Incandescent	Retail Non-Food	Lighting	Prescriptive	Lamp	282.3	47.8	3	$1.80	$5.46	$7.06
CFL: Screw-In (>26W) Outdoor	>100W Incandescent	Retail Non-Food	Lighting	Prescriptive	Lamp	437.0	26.2	3	$0.48	$1.44	$10.92
CFL: Screw-In (16-21W) Indoor	75W Incandescent	Retail Non-Food	Lighting	Prescriptive	Lamp	168.7	28.6	3	$1.80	$5.46	$4.22
CFL: Screw-In (16-21W) Outdoor	75W Incandescent	Retail Non-Food	Lighting	Prescriptive	Lamp	218.5	13.1	3	$0.48	$1.44	$5.46
CFL: Screw-In (22-26W) Indoor	100W Incandescent	Retail Non-Food	Lighting	Prescriptive	Lamp	208.6	35.4	3	$1.80	$5.46	$5.22
CFL: Screw-In (22-26W) Outdoor	100W Incandescent	Retail Non-Food	Lighting	Prescriptive	Lamp	287.5	17.3	3	$0.48	$1.44	$7.19
Delamping	Avg. T8 Lamp	Retail Non-Food	Lighting	Prescriptive	Fixture	98.2	16.6	10	$4.40	$13.33	$2.45
Dimmable Electronic Ballasts	T8 Fixtures	Retail Non-Food	Lighting	Prescriptive	Fixture	836.4	274.0	8	$51.32	$155.50	$20.91
High Performance T8 Lighting	Indoor Metal Halides	Retail Non-Food	Lighting	Prescriptive	Fixture	711.8	120.6	6	$9.00	$27.27	$17.79
High Performance T8 Lighting	T12 Lamps	Retail Non-Food	Lighting	Prescriptive	Fixture	61.4	10.4	6	$9.00	$27.27	$1.53
LED Exit Signs - from CFL	CFL Exit Sign	Retail Non-Food	Lighting	Prescriptive	Fixture	112.7	5.7	16	$18.18	$55.10	$2.82
LED Exit Signs - from Incand.	Incandescent Exit Signs	Retail Non-Food	Lighting	Prescriptive	Fixture	317.7	16.1	16	$18.18	$55.10	$7.94
Occupancy Sensor	No sensor	Retail Non-Food	Lighting	Prescriptive	Sensor	121.4	18.1	8	$39.91	$120.94	$3.04
Photocell	No Photocell (Outdoor Lighting)	Retail Non-Food	Lighting	Prescriptive	380 W	106.0	0.0	8	$19.74	$59.81	$2.65
Screw in cold cathode CFL	Avg. Incandescent Wattage	Retail Non-Food	Lighting	Prescriptive	Fixture	122.7	20.8	10	$2.10	$6.36	$3.07
T5 Lighting	Indoor Metal Halides	Retail Non-Food	Lighting	Prescriptive	Fixture	687.2	116.5	18	$59.73	$181.00	$17.18
T8 to High Performance T8	Standard T8 Lamps	Retail Non-Food	Lighting	Prescriptive	Fixture	30.7	5.2	6	$9.00	$27.27	$0.77
Time clock	Time clock (Outdoor Lighting)	Retail Non-Food	Lighting	Prescriptive	380 W	474.0	0.0	8	$79.89	$242.10	$11.85
VFD on centrif load - Process or HVAC	Baseline Process or HVAC	Retail Non-Food	Motors	Prescriptive	HP	356.8	160.7	15	$42.26	$169.04	$8.92
Vending Machine Controller - Cold Drink	Existing Controls	Retail Non-Food	Plug Load	Direct Install	Unit	1646.9	0.0	15	$172.40	$215.50	$370.55
Advanced Power Strips - Occupancy Sensors	Power Strip - No controls	Retail Non-Food	Plug Load	Prescriptive	power strip	262.9	23.5	8	$22.50	$90.00	$6.57
Advanced Power Strips - Timer Plug Strip	Power Strip - No controls	Retail Non-Food	Plug Load	Prescriptive	power strip	283.2	23.5	8	$4.75	$19.00	$7.08
Advanced Power Strips - Load Sensor	Power Strip - No controls	Retail Non-Food	Plug Load	Prescriptive	power strip	164.5	9.4	8	$7.99	$31.96	$4.11
Vending Machine Controller - Cold Drink	Existing Controls	Retail Non-Food	Plug Load	Prescriptive	Unit	1646.9	0.0	15	$53.88	$215.50	$41.17

Table 52. Commercial Measure Characteristics (at meter savings), Retail Non-Food (Continued)

Efficiency Measure	Base Measure	Building Type	Category	Program	Units	Energy Impact (kWh/Unit)	Coincident Summer Peak Impact (W/Unit)	Measure Life	Base Incentive ($/unit)	Technology Cost ($/unit)	Administrative Cost ($/unit)
High efficiency, low temperature compressor	1.0 COP	Retail Non-Food	Refrigeration	Custom	Compressor	1100.1	41.6	12	$191.85	$767.41	$22.00
Multiplex Compressor	Single Line refrigeration	Retail Non-Food	Refrigeration	Custom	Compressor	560.4	33.7	12	$551.51	$2,206.03	$11.21
Multiplex system with oversized condenser	Multi-plex system standard Condenser	Retail Non-Food	Refrigeration	Custom	Compressor	67.8	9.9	12	$107.12	$428.49	$1.36
Anti-Sweat Heat (ASH) Controls (or Humidistat Controls)	No Controls- continuous operation	Retail Non-Food	Refrigeration	Direct Install	per 36 ln.ft. of case	1678.2	257.1	12	$471.88	$589.85	$377.59
EC Motor: Reach-In Enclosure	PSC Motor	Retail Non-Food	Refrigeration	Direct Install	Motor	859.0	33.1	15	$21.80	$27.25	$193.28
EC Motor: Walk-In Enclosure	PSC Motor	Retail Non-Food	Refrigeration	Direct Install	Motor	1333.0	51.4	15	$21.80	$27.25	$299.93
Evap Fan Controller for Med. Temp Walk-in	Existing Controls Continuous Operation	Retail Non-Food	Refrigeration	Direct Install	Fan	11782.2	538.0	15	$2,360.00	$2,950.00	$2,651.00
Glass Doors on Low and Med. Temperature Displays	single pane glass doors	Retail Non-Food	Refrigeration	Direct Install	Case Door	159.6	3.7	12	$140.00	$175.00	$35.92
Intelligent Defrost Control	fixed interval defrost	Retail Non-Food	Refrigeration	Direct Install	Control	842.7	286.6	10	$400.00	$500.00	$189.60
Night Covers	No Night Covers	Retail Non-Food	Refrigeration	Direct Install	ln. ft. of case	107.5	19.4	5	$22.63	$28.29	$24.19
Anti-Sweat Heat (ASH) Controls (or Humidistat Controls)	No Controls- continuous operation	Retail Non-Food	Refrigeration	Prescriptive	per 36 ln.ft. of case	1678.2	257.1	12	$147.46	$589.85	$41.95
EC Motor: Reach-In Enclosure	PSC Motor	Retail Non-Food	Refrigeration	Prescriptive	Motor	859.0	33.1	15	$6.81	$27.25	$21.48
EC Motor: Walk-In Enclosure	PSC Motor	Retail Non-Food	Refrigeration	Prescriptive	Motor	1333.0	51.4	15	$6.81	$27.25	$33.33
Evap Fan Controller for Med. Temp Walk-in	Existing Controls Continuous Operation	Retail Non-Food	Refrigeration	Prescriptive	Fan	11782.2	538.0	15	$737.50	$2,950.00	$294.56
Floating Head Pressure Controls	Fixed head pressure controls	Retail Non-Food	Refrigeration	Prescriptive	Tons	1804.6	53.6	12	$23.24	$92.95	$45.11
Glass Doors on Low and Med. Temperature Displays	single pane glass doors	Retail Non-Food	Refrigeration	Prescriptive	Case Door	159.6	3.7	12	$43.75	$175.00	$3.99
Intelligent Defrost Control	fixed interval defrost	Retail Non-Food	Refrigeration	Prescriptive	Control	842.7	286.6	10	$125.00	$500.00	$21.07
Night Covers	No Night Covers	Retail Non-Food	Refrigeration	Prescriptive	ln. ft. of case	107.5	19.4	5	$7.07	$28.29	$2.69
Outside Air Economizer for Coolers	No OA for coolers	Retail Non-Food	Refrigeration	Prescriptive	Unit	5840.4	467.1	10	$669.75	$2,679.00	$146.01
Refrigerated Display LED Lighting Strips	Fluorescent or Incandescent Lighting	Retail Non-Food	Refrigeration	Prescriptive	Case Door	577.4	78.8	8	$62.50	$250.00	$14.44
Zero Energy Door	Standard Case door	Retail Non-Food	Refrigeration	Prescriptive	Case Door	1885.0	74.3	10	$72.50	$290.00	$47.13
Hot Water Circulation Pump Time Clock	No Time Clock	Retail Non-Food	Water Heat	Direct Install	Unit	1148.1	0.0	15	$249.85	$312.31	$258.33
Heat Pump Water Heater	Baseline Electric Water Heater	Retail Non-Food	Water Heat	Prescriptive	Water Heater	7542.7	220.8	10	$540.00	$2,160.00	$188.57
High Efficiency, Electric Water Heater	Baseline Electric Water Heater	Retail Non-Food	Water Heat	Prescriptive	Water Heater	65.4	3.8	15	$70.31	$281.22	$1.63
Hot Water Circulation Pump Time Clock	No Time Clock	Retail Non-Food	Water Heat	Prescriptive	Unit	1148.1	0.0	15	$78.08	$312.31	$28.70

Table 53. Commercial Measure Characteristics (at meter savings), Schools

Efficiency Measure	Base Measure	Building Type	Category	Program	Units	Energy Impact (kWh/Unit)	Coincident Summer Peak Impact (W/Unit)	Measure Life	Base Incentive ($/unit)	Technology Cost ($/unit)	Administrative Cost ($/unit)
Compressed Air - Controls	business as usual	Schools	Cooking/Other	Custom	Compressor HP	696.0	151.4	15	$46.25	$185.00	$13.92
Variable speed HE compressor	constant speed rotary-screw compressor	Schools	Cooking/Other	Custom	Motor	902.3	65.9	15	$65.61	$262.44	$18.05
Advanced Pre-Rinse Spray Nozzle	Existing Rinse Spray Nozzle	Schools	Cooking/Other	Direct Install	Unit	3703.1	196.9	5	$124.45	$155.57	$833.20
Compressed Air - Air Entraining Air Nozzle	Standard high-volume nozzles	Schools	Cooking/Other	Prescriptive	Nozzle	759.0	165.1	10	$3.50	$14.00	$18.98
Compressed Air - Air Receiver for Load/No-Load Compressors (5 gal/CFM)	Current storage capacity	Schools	Cooking/Other	Prescriptive	Compressor HP	368.0	80.0	10	$20.00	$80.00	$9.20
Compressed Air - Cycling Air Dryer	Continuous Air Dryer	Schools	Cooking/Other	Prescriptive	Compressor HP	40.9	8.9	10	$7.50	$30.00	$1.02
Advanced Pre-Rinse Spray Nozzle	Existing Rinse Spray Nozzle	Schools	Cooking/Other	Prescriptive	Unit	3703.1	196.9	5	$38.89	$155.57	$92.58
ENERGY STAR Connectionless Steamer	Connected Steamer	Schools	Cooking/Other	Prescriptive	Unit	29692.0	3592.9	12	$500.00	$2,000.00	$742.30
ENERGY STAR Fryer	Baseline Fryer	Schools	Cooking/Other	Prescriptive	Unit	1166.0	105.5	12	$125.00	$500.00	$29.15
ENERGY STAR Griddle	Baseline Griddle	Schools	Cooking/Other	Prescriptive	Unit	8497.0	105.5	12	$522.50	$2,090.00	$212.43
ENERGY STAR Oven (Convection)	Baseline Oven	Schools	Cooking/Other	Prescriptive	Unit	5786.0	700.1	12	$278.25	$1,113.00	$144.65
Insulated Hot Food Holding Cabinet: Half Size <=0.3 kW	stand hot food holding cabinet	Schools	Cooking/Other	Prescriptive	Cabinet	1200.0	116.1	12	$277.50	$1,110.00	$30.00
PC Power Management Software	No Management Software	Schools	Cooking/Other	Prescriptive	Unit	113.3	13.2	4	$3.04	$12.14	$2.83
<150 tons Centrifugal Water Cooled Chiller COP = 6.0 - Direct Exp / Gas Boiler	ASHRAE 90.1-2007 5.0 COP	Schools	HVAC/Shell	Custom	Tons Cooling	0.0	0.0	20	$23.00	$92.00	$0.00
<150 tons Centrifugal Water Cooled Chiller COP = 6.0 - WLHP	ASHRAE 90.1-2007 5.0 COP	Schools	HVAC/Shell	Custom	Tons Cooling	0.0	0.0	20	$23.00	$92.00	$0.00
Air Cooled Chiller COP = 3.2 - Direct Exp / Gas Boiler	ASHRAE 90.1-2007 2.8 COP	Schools	HVAC/Shell	Custom	Tons Cooling	0.0	0.0	20	$31.50	$126.00	$0.00
Air Cooled Chiller COP = 3.2 - WLHP	ASHRAE 90.1-2007 2.8 COP	Schools	HVAC/Shell	Custom	Tons Cooling	0.0	0.0	20	$31.50	$126.00	$0.00
Code minimum R-20ci or R-38 batt - Direct Exp / Gas Boiler	Existing R-value	Schools	HVAC/Shell	Custom	1000 sqft roof	230.3	2.2	20	$292.50	$1,170.00	$4.61
Code minimum R-20ci or R-38 batt - WLHP	Existing R-value	Schools	HVAC/Shell	Custom	1000 sqft roof	79.0	2.2	20	$292.50	$1,170.00	$1.58
Cool Roof - Direct Exp / Gas Boiler	black membrane or built-up	Schools	HVAC/Shell	Custom	1000 sqft roof	121.8	5.1	15	$166.25	$665.00	$2.44
Cool Roof - WLHP	black membrane or built-up	Schools	HVAC/Shell	Custom	1000 sqft roof	294.2	30.7	15	$166.25	$665.00	$10.94
EMS System	No EMS	Schools	HVAC/Shell	Custom	1,000 SF	0.0	0.0	15	$126.90	$507.58	$0.00
High Performance Glazing - Direct Exp / Gas Boiler	U=0.45 SHGC=0.40	Schools	HVAC/Shell	Custom	100 sqft glazed	719.8	253.4	20	$349.00	$1,396.00	$25.23
High Performance Glazing - WLHP	U=0.45 SHGC=0.40	Schools	HVAC/Shell	Custom	100 sqft glazed	1129.2	197.3	20	$349.00	$1,396.00	$41.98
Improved Ceiling Insulation R24ci or R44 batt - Direct Exp / Gas Boiler	R20 above deck R-38 attic	Schools	HVAC/Shell	Custom	1000 sqft roof	1.7	0.2	20	$187.65	$750.61	$0.03
Improved Ceiling Insulation R24ci or R44 batt - WLHP	R20 above deck R-38 attic	Schools	HVAC/Shell	Custom	1000 sqft roof	1.5	0.8	20	$187.65	$750.61	$0.03
Refrigerant Charge	poor refrigerant charge	Schools	HVAC/Shell	Custom	Tons Cooling	46.4	2.5	15	$4.98	$19.93	$1.50
Screw Chillers, Water-Cooled COP = 5.7 - Direct Exp / Gas Boiler	ASHRAE 90.1-2007 4.90 COP	Schools	HVAC/Shell	Custom	Tons Cooling	0.0	0.0	20	$22.50	$90.00	$0.00
Screw Chillers, Water-Cooled COP = 5.7 - WLHP	ASHRAE 90.1-2007 4.90 COP	Schools	HVAC/Shell	Custom	Tons Cooling	0.0	0.0	20	$22.50	$90.00	$0.00
Window Films on Double Pane - Direct Exp / Gas Boiler	Double-Pane Clear	Schools	HVAC/Shell	Custom	100 sqft glazed	2702.0	906.6	10	$38.50	$154.00	$94.70
Window Films on Double Pane - WLHP	Double-Pane Clear	Schools	HVAC/Shell	Custom	100 sqft glazed	3223.9	664.0	10	$38.50	$154.00	$119.86
Window Films on Single Pane - Direct Exp / Gas Boiler	Single-Pane Clear	Schools	HVAC/Shell	Custom	100 sqft glazed	5126.8	4704.4	10	$38.50	$154.00	$179.68
Window Films on Single Pane - WLHP	Single-Pane Clear	Schools	HVAC/Shell	Custom	100 sqft glazed	6478.7	1763.9	10	$38.50	$154.00	$240.87
Economizer - Direct Exp / Gas Boiler	No Economizer	Schools	HVAC/Shell	Direct Install	Tons Cooling	97.2	0.0	10	$136.00	$170.00	$21.88
Economizer - WLHP	No Economizer	Schools	HVAC/Shell	Direct Install	Tons Cooling	174.1	0.0	10	$136.00	$170.00	$39.17
Programmable Thermostat - Direct Exp / Gas Boiler	Manual Thermostat	Schools	HVAC/Shell	Direct Install	Thermostat	2154.8	-7.0	15	$116.00	$145.00	$484.83
Programmable Thermostat - WLHP	Manual Thermostat	Schools	HVAC/Shell	Direct Install	Thermostat	1628.5	-234.4	15	$116.00	$145.00	$366.42
Code minimum R-20ci or R-38 batt - WLHP	Existing R-value	Schools	HVAC/Shell	Prescriptive	1000 sqft roof	79.0	2.2	20	$292.50	$1,170.00	$1.98
Economizer - Direct Exp / Gas Boiler	No Economizer	Schools	HVAC/Shell	Prescriptive	Tons Cooling	97.2	0.0	10	$42.50	$170.00	$2.43
Economizer - WLHP	No Economizer	Schools	HVAC/Shell	Prescriptive	Tons Cooling	93.6	0.0	10	$42.50	$170.00	$4.35
Ground Source Heat Pump (<65 kBtu/h) EER 16 - Direct Exp / Gas Boiler	ASHRAE 90.1-2007 EER 13.4	Schools	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$328.25	$1,312.98	$0.00
Ground Source Heat Pump (<65 kBtu/h) EER 16 - WLHP	ASHRAE 90.1-2007 EER 13.4	Schools	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$328.25	$1,312.98	$0.00
Package system A/C (>=63.3 tons, 10.2 EER) - Direct Exp / Gas Boiler	ASHRAE 90.1-2007 9.5 EER	Schools	HVAC/Shell	Prescriptive	Tons Cooling	39.3	24.8	15	$27.62	$110.48	$1.72
Package system A/C (>=63.3 tons, 10.2 EER) - WLHP	ASHRAE 90.1-2007 9.5 EER	Schools	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$27.62	$110.48	$0.00
Packaged terminal air-conditioner (< 7kbtuh)	ASHRAE 90.1-2007 EER 9.5	Schools	HVAC/Shell	Prescriptive	Tons Cooling	195.3	61.0	15	$27.62	$110.48	$7.87
Programmable Thermostat - Direct Exp / Gas Boiler	Manual Thermostat	Schools	HVAC/Shell	Prescriptive	Thermostat	1229.6	-4.0	15	$36.25	$145.00	$53.87
Programmable Thermostat - WLHP	Manual Thermostat	Schools	HVAC/Shell	Prescriptive	Thermostat	876.1	-126.1	15	$36.25	$145.00	$40.71
Split/Package system A/C (< 5.4 tons, 14 SEER) - Direct Exp / Gas Boiler	Split/Package A/C (< 5.4 tons, 13.0 SEER)	Schools	HVAC/Shell	Prescriptive	Tons Cooling	74.7	47.1	15	$13.89	$55.57	$3.27
Split/Package system A/C (< 5.4 tons, 14 SEER) - WLHP	Split/Package A/C (< 5.4 tons, 13.0 SEER)	Schools	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$13.89	$55.57	$0.00
Split/Packaged Air Conditioner (135 - 240 kBtu/h) 11.5 EER - Direct Exp / Gas Boiler	ASHRAE 90.1-2007 10.8 EER	Schools	HVAC/Shell	Prescriptive	Tons Cooling	30.7	19.3	15	$27.72	$110.89	$1.34

Table 53. Commercial Measure Characteristics (at meter savings), Schools (Continued)

Efficiency Measure	Base Measure	Building Type	Category	Program	Units	Energy Impact (kWh/Unit)	Coincident Summer Peak Impact (W/Unit)	Measure Life	Base Incentive ($/unit)	Technology Cost ($/unit)	Administrative Cost ($/unit)
Split/Packaged Air Conditioner (135 - 240 kBtu/h) 11.5 EER - WLHP	ASHRAE 90.1-2007 10.8 EER	Schools	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$27.72	$110.89	$0.00
Split/Packaged Air Conditioner (240 - 760 kBtu/h) 11 EER - Direct Exp / Gas Boiler	ASHRAE 90.1-2007 9.8 EER	Schools	HVAC/Shell	Prescriptive	Tons Cooling	60.6	38.2	15	$28.78	$115.13	$2.65
Split/Packaged Air Conditioner (240 - 760 kBtu/h) 11 EER - WLHP	ASHRAE 90.1-2007 9.8 EER	Schools	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$28.78	$115.13	$0.00
Split/Packaged Air Conditioner (65 - 135 kBtu/h) 12 EER - Direct Exp / Gas Boiler	ASHRAE 90.1-2007 11.0 EER	Schools	HVAC/Shell	Prescriptive	Tons Cooling	41.2	26.0	15	$37.28	$149.13	$1.81
Split/Packaged Air Conditioner (65 - 135 kBtu/h) 12 EER - WLHP	ASHRAE 90.1-2007 11.0 EER	Schools	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$37.28	$149.13	$0.00
Split/Packaged Heat Pump (<65 kBtu/h) SEER 14 - Direct Exp / Gas Boiler	ASHRAE 90.1-2007 SEER 13.0	Schools	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$18.38	$73.52	$0.00
Split/Packaged Heat Pump (<65 kBtu/h) SEER 14 - WLHP	ASHRAE 90.1-2007 SEER 13.0	Schools	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$18.38	$73.52	$0.00
Split/Packaged Heat Pump (135 - 240 kBtu/h) EER 11.5 - Direct Exp / Gas Boiler	ASHRAE 90.1-2007 EER 10.6	Schools	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$31.36	$125.44	$0.00
Split/Packaged Heat Pump (135 - 240 kBtu/h) EER 11.5 - WLHP	ASHRAE 90.1-2007 EER 10.6	Schools	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$31.36	$125.44	$0.00
Split/Packaged Heat Pump (240 - 760 kBtu/h) EER 10.8 - Direct Exp / Gas Boiler	ASHRAE 90.1-2007 EER 9.5	Schools	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$32.46	$129.83	$0.00
Split/Packaged Heat Pump (240 - 760 kBtu/h) EER 10.8 - WLHP	ASHRAE 90.1-2007 EER 9.5	Schools	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$32.46	$129.83	$0.00
Split/Packaged Heat Pump (65 - 135 kBtu/h) EER 12 - Direct Exp / Gas Boiler	ASHRAE 90.1-2007 EER 11.0	Schools	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$45.61	$182.43	$0.00
Split/Packaged Heat Pump (65 - 135 kBtu/h) EER 12 - WLHP	ASHRAE 90.1-2007 EER 11.0	Schools	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$45.61	$182.43	$0.00
Water Source Heat Pump (<65 kBtu/h) EER 15 - Direct Exp / Gas Boiler	ASHRAE 90.1-2007 EER 12.0	Schools	HVAC/Shell	Prescriptive	Tons Cooling	68.6	-32.8	15	$6.57	$26.29	$3.01
Water Source Heat Pump (<65 kBtu/h) EER 15 - WLHP	ASHRAE 90.1-2007 EER 12.0	Schools	HVAC/Shell	Prescriptive	Tons Cooling	71.8	56.8	15	$6.57	$26.29	$3.34
Daylighting Controls	No controls	Schools	Lighting	Custom	Fixture	616.3	182.6	8	$195.61	$592.77	$12.33
Induction Lighting	Outdoor HIDs	Schools	Lighting	Custom	Fixture	306.6	38.4	18	$158.97	$481.74	$6.13
CFL: Screw-In (<10W) Indoor	40W Incandescent	Schools	Lighting	Direct Install	Lamp	62.4	14.4	3	$4.37	$5.46	$14.04
LED Lighting <10W - Indoor	40W Incandescent	Schools	Lighting	Direct Install	Lamp	91.5	22.9	10	$21.34	$26.68	$20.59
CFL: Screw-In (10-15W) Indoor	60W Incandescent	Schools	Lighting	Direct Install	Lamp	89.4	20.6	3	$4.37	$5.46	$20.12
LED Lighting >=10W - Indoor	60W Incandescent	Schools	Lighting	Direct Install	Lamp	135.0	6.6	6	$21.34	$26.68	$30.38
CFL: Screw-In (16-21W) Indoor	75W Incandescent	Schools	Lighting	Direct Install	Lamp	114.4	26.4	3	$4.37	$5.46	$25.74
CFL: Screw-In (16-21W) Outdoor	75W Incandescent	Schools	Lighting	Direct Install	Lamp	218.5	13.1	3	$1.15	$1.44	$49.16
CFL: Screw-In (22-26W) Indoor	100W Incandescent	Schools	Lighting	Direct Install	Lamp	141.4	32.6	3	$4.37	$5.46	$31.82
CFL: Screw-In (22-26W) Outdoor	100W Incandescent	Schools	Lighting	Direct Install	Lamp	287.5	17.3	3	$1.15	$1.44	$64.68
Delamping	Avg. T8 Lamp	Schools	Lighting	Direct Install	Fixture	66.6	15.4	10	$10.66	$13.33	$14.98
Dimmable Electronic Ballasts	T8 Fixtures	Schools	Lighting	Direct Install	Fixture	587.6	150.7	8	$124.40	$155.50	$132.21
High Performance T8 Lighting	Indoor Metal Halides	Schools	Lighting	Direct Install	Fixture	482.6	111.4	6	$21.82	$27.27	$108.58
High Performance T8 Lighting	T12 Lamps	Schools	Lighting	Direct Install	Fixture	41.6	9.6	6	$21.82	$27.27	$9.36
LED Exit Signs - from CFL	CFL Exit Sign	Schools	Lighting	Direct Install	Fixture	112.7	5.3	16	$44.08	$55.10	$25.37
LED Exit Signs - from Incand.	Incandescent Exit Signs	Schools	Lighting	Direct Install	Fixture	317.7	14.9	16	$44.08	$55.10	$71.49
Occupancy Sensor	No sensor	Schools	Lighting	Direct Install	Sensor	82.3	18.1	8	$96.75	$120.94	$18.52
Photocell	No Photocell (Outdoor Lighting)	Schools	Lighting	Direct Install	380 W	106.0	0.0	8	$47.85	$59.81	$23.85
Screw in cold cathode CFL	Avg. Incandescent Wattage	Schools	Lighting	Direct Install	Fixture	83.2	19.2	10	$5.09	$6.36	$18.72
T5 Lighting	Indoor Metal Halides	Schools	Lighting	Direct Install	Fixture	465.9	107.5	18	$144.80	$181.00	$104.83
T8 to High Performance T8	Standard T8 Lamps	Schools	Lighting	Direct Install	Fixture	20.8	4.8	6	$21.82	$27.27	$4.68
Time clock	Time clock (Outdoor Lighting)	Schools	Lighting	Direct Install	380 W	474.0	0.0	8	$193.68	$242.10	$106.65
CFL: Pin-Based (<25W) Indoor	<=100W Incandescent Fixture	Schools	Lighting	Direct Install	Lamp	145.6	33.6	12	$8.00	$10.00	$32.76
CFL: Pin-Based (>=25W) Indoor	>100W Incandescent Fixture	Schools	Lighting	Direct Install	Lamp	145.6	33.6	12	$8.00	$10.00	$32.76
CFL: Screw-In (<10W) Outdoor	40W Incandescent	Schools	Lighting	Direct Install	Lamp	118.8	7.1	3	$1.15	$1.44	$26.74
CFL: Screw-In (>26W) Indoor	>100W Incandescent	Schools	Lighting	Direct Install	Lamp	191.4	44.2	3	$4.37	$5.46	$43.06
CFL: Screw-In (>26W) Outdoor	>100W Incandescent	Schools	Lighting	Direct Install	Lamp	437.0	26.2	3	$1.15	$1.44	$98.32
CFL: Screw-In (10-15W) Outdoor	60W Incandescent	Schools	Lighting	Direct Install	Lamp	180.2	10.8	3	$1.15	$1.44	$40.53
CFL: Screw-In (<10W) Indoor	40W Incandescent	Schools	Lighting	Prescriptive	Lamp	62.4	14.4	3	$1.80	$5.46	$1.56
CFL: Screw-In (<10W) Outdoor	40W Incandescent	Schools	Lighting	Prescriptive	Lamp	118.8	7.1	3	$0.48	$1.44	$2.97
LED Lighting <10W - Indoor	40W Incandescent	Schools	Lighting	Prescriptive	Lamp	91.5	22.9	10	$8.80	$26.68	$2.29
CFL: Screw-In (10-15W) Indoor	60W Incandescent	Schools	Lighting	Prescriptive	Lamp	89.4	20.6	3	$1.80	$5.46	$2.24
CFL: Screw-In (10-15W) Outdoor	60W Incandescent	Schools	Lighting	Prescriptive	Lamp	180.2	10.8	3	$0.48	$1.44	$4.50
LED Lighting >=10W - Indoor	60W Incandescent	Schools	Lighting	Prescriptive	Lamp	135.0	6.6	6	$8.80	$26.68	$3.38
CFL: Screw-In (16-21W) Indoor	75W Incandescent	Schools	Lighting	Prescriptive	Lamp	114.4	26.4	3	$1.80	$5.46	$2.86

Table 53. Commercial Measure Characteristics (at meter savings), Schools (Continued)

Efficiency Measure	Base Measure	Building Type	Category	Program	Units	Energy Impact (kWh/Unit)	Coincident Summer Peak Impact (W/Unit)	Measure Life	Base Incentive ($/unit)	Technology Cost ($/unit)	Administrative Cost ($/unit)
CFL: Screw-In (16-21W) Outdoor	75W Incandescent	Schools	Lighting	Prescriptive	Lamp	218.5	13.1	3	$0.48	$1.44	$5.46
CFL: Screw-In (22-26W) Indoor	100W Incandescent	Schools	Lighting	Prescriptive	Lamp	141.4	32.6	3	$1.80	$5.46	$3.54
CFL: Screw-In (22-26W) Outdoor	100W Incandescent	Schools	Lighting	Prescriptive	Lamp	287.5	17.3	3	$0.48	$1.44	$7.19
Delamping	Avg. T8 Lamp	Schools	Lighting	Prescriptive	Fixture	66.6	15.4	10	$4.40	$13.33	$1.66
Dimmable Electronic Ballasts	T8 Fixtures	Schools	Lighting	Prescriptive	Fixture	587.6	150.7	8	$51.32	$155.50	$14.69
High Performance T8 Lighting	Indoor Metal Halides	Schools	Lighting	Prescriptive	Fixture	482.6	111.4	6	$9.00	$27.27	$12.06
High Performance T8 Lighting	T12 Lamps	Schools	Lighting	Prescriptive	Fixture	41.6	9.6	6	$9.00	$27.27	$1.04
LED Exit Signs - from CFL	CFL Exit Sign	Schools	Lighting	Prescriptive	Fixture	112.7	5.3	16	$18.18	$55.10	$2.82
LED Exit Signs - from Incand.	Incandescent Exit Signs	Schools	Lighting	Prescriptive	Fixture	317.7	14.9	16	$18.18	$55.10	$7.94
Occupancy Sensor	No sensor	Schools	Lighting	Prescriptive	Sensor	82.3	18.1	8	$39.91	$120.94	$2.06
Photocell	No Photocell (Outdoor Lighting)	Schools	Lighting	Prescriptive	380 W	106.0	0.0	8	$19.74	$59.81	$2.65
Screw in cold cathode CFL	Avg. Incandescent Wattage	Schools	Lighting	Prescriptive	Fixture	83.2	19.2	10	$2.10	$6.36	$2.08
T5 Lighting	Indoor Metal Halides	Schools	Lighting	Prescriptive	Fixture	465.9	107.5	18	$59.73	$181.00	$11.65
T8 to High Performance T8	Standard T8 Lamps	Schools	Lighting	Prescriptive	Fixture	20.8	4.8	6	$9.00	$27.27	$0.52
Time clock	Time clock (Outdoor Lighting)	Schools	Lighting	Prescriptive	380 W	474.0	0.0	8	$79.89	$242.10	$11.85
CFL: Pin-Based (<25W) Indoor	<=100W Incandescent Fixture	Schools	Lighting	Prescriptive	Lamp	145.6	33.6	12	$3.30	$10.00	$3.64
CFL: Pin-Based (>=25W) Indoor	>100W Incandescent Fixture	Schools	Lighting	Prescriptive	Lamp	145.6	33.6	12	$3.30	$10.00	$3.64
CFL: Screw-In (>26W) Indoor	>100W Incandescent	Schools	Lighting	Prescriptive	Lamp	191.4	44.2	3	$1.80	$5.46	$4.78
CFL: Screw-In (>26W) Outdoor	>100W Incandescent	Schools	Lighting	Prescriptive	Lamp	437.0	26.2	3	$0.48	$1.44	$10.92
VFD on centrif load - Process or HVAC	Baseline Process or HVAC	Schools	Motors	Prescriptive	HP	356.8	160.7	15	$42.26	$169.04	$8.92
Vending Machine Controller - Cold Drink	Existing Controls	Schools	Plug Load	Direct Install	Unit	1646.9	0.0	15	$172.40	$215.50	$370.55
Advanced Power Strips - Occupancy Sensors	Power Strip - No controls	Schools	Plug Load	Prescriptive	power strip	262.9	23.5	8	$22.50	$90.00	$6.57
Advanced Power Strips - Timer Plug Strip	Power Strip - No controls	Schools	Plug Load	Prescriptive	power strip	283.2	23.5	8	$4.75	$19.00	$7.08
Advanced Power Strips - Load Sensor	Power Strip - No controls	Schools	Plug Load	Prescriptive	power strip	164.5	9.4	8	$7.99	$31.96	$4.11
Vending Machine Controller - Cold Drink	Existing Controls	Schools	Plug Load	Prescriptive	Unit	1646.9	0.0	15	$53.88	$215.50	$41.17
High efficiency, low temperature compressor	1.0 COP	Schools	Refrigeration	Custom	Compressor	1100.1	41.6	12	$191.85	$767.41	$22.00
Multiplex Compressor	Single Line refrigeration	Schools	Refrigeration	Custom	Compressor	560.4	33.7	12	$551.51	$2,206.03	$11.21
Multiplex system with oversized condenser	Multi-plex system standard Condenser	Schools	Refrigeration	Custom	Compressor	67.8	9.9	12	$107.12	$428.49	$1.36
Anti-Sweat Heat (ASH) Controls (or Humidistat Controls)	No Controls- continuous operation	Schools	Refrigeration	Direct Install	per 36 ln.ft. of case	1137.8	218.8	12	$471.88	$589.85	$256.00
EC Motor: Reach-In Enclosure	PSC Motor	Schools	Refrigeration	Direct Install	Motor	859.0	28.2	15	$21.80	$27.25	$193.28
EC Motor: Walk-In Enclosure	PSC Motor	Schools	Refrigeration	Direct Install	Motor	1333.0	43.7	15	$21.80	$27.25	$299.93
Evap Fan Controller for Med. Temp Walk-in	Existing Controls Continuous Operation	Schools	Refrigeration	Direct Install	Fan	11782.2	538.0	15	$2,360.00	$2,950.00	$2,651.00
Glass Doors on Low and Med. Temperature Displays	single pane glass doors	Schools	Refrigeration	Direct Install	Case Door	159.6	3.7	12	$140.00	$175.00	$35.92
Intelligent Defrost Control	fixed interval defrost	Schools	Refrigeration	Direct Install	Control	842.7	286.6	10	$400.00	$500.00	$189.60
Night Covers	No Night Covers	Schools	Refrigeration	Direct Install	ln. ft. of case	107.5	0.0	5	$22.63	$28.29	$24.19
Anti-Sweat Heat (ASH) Controls (or Humidistat Controls)	No Controls- continuous operation	Schools	Refrigeration	Prescriptive	per 36 ln.ft. of case	1137.8	218.8	12	$147.46	$589.85	$28.44
EC Motor: Reach-In Enclosure	PSC Motor	Schools	Refrigeration	Prescriptive	Motor	859.0	28.2	15	$6.81	$27.25	$21.48
EC Motor: Walk-In Enclosure	PSC Motor	Schools	Refrigeration	Prescriptive	Motor	1333.0	43.7	15	$6.81	$27.25	$33.33
Evap Fan Controller for Med. Temp Walk-in	Existing Controls Continuous Operation	Schools	Refrigeration	Prescriptive	Fan	11782.2	538.0	15	$737.50	$2,950.00	$294.56
Floating Head Pressure Controls	Fixed head pressure controls	Schools	Refrigeration	Prescriptive	Tons	1804.6	82.4	12	$23.24	$92.95	$45.11
Glass Doors on Low and Med. Temperature Displays	single pane glass doors	Schools	Refrigeration	Prescriptive	Case Door	159.6	3.7	12	$43.75	$175.00	$3.99
Intelligent Defrost Control	fixed interval defrost	Schools	Refrigeration	Prescriptive	Control	842.7	286.6	10	$125.00	$500.00	$21.07
Night Covers	No Night Covers	Schools	Refrigeration	Prescriptive	ln. ft. of case	107.5	0.0	5	$7.07	$28.29	$2.69
Outside Air Economizer for Coolers	No OA for coolers	Schools	Refrigeration	Prescriptive	Unit	5840.4	467.1	10	$669.75	$2,679.00	$146.01
Refrigerated Display LED Lighting Strips	Fluorescent or Incandescent Lighting	Schools	Refrigeration	Prescriptive	Case Door	577.4	78.8	8	$62.50	$250.00	$14.44
Zero Energy Door	Standard Case door	Schools	Refrigeration	Prescriptive	Case Door	1885.0	74.3	10	$72.50	$290.00	$47.13
Hot Water Circulation Pump Time Clock	No Time Clock	Schools	Water Heat	Direct Install	Unit	1080.9	0.0	15	$249.85	$312.31	$243.20
Heat Pump Water Heater	Baseline Electric Water Heater	Schools	Water Heat	Prescriptive	Water Heater	7542.7	220.8	10	$540.00	$2,160.00	$188.57
High Efficiency, Electric Water Heater	Baseline Electric Water Heater	Schools	Water Heat	Prescriptive	Water Heater	65.4	3.8	15	$70.31	$281.22	$1.63
Hot Water Circulation Pump Time Clock	No Time Clock	Schools	Water Heat	Prescriptive	Unit	1080.9	0.0	15	$78.08	$312.31	$27.02

Table 54. Commercial Measure Characteristics (at meter savings), Other Commercial

Efficiency Measure	Base Measure	Building Type	Category	Program	Units	Energy Impact (kWh/Unit)	Coincident Summer Peak Impact (W/Unit)	Measure Life	Base Incentive ($/unit)	Technology Cost ($/unit)	Administrative Cost ($/unit)
Compressed Air - Controls	business as usual	Other Commercial	Cooking/Other	Custom	Compressor HP	696.0	151.4	15	$46.25	$185.00	$13.92
Variable speed HE compressor	constant speed rotary-screw compressor	Other Commercial	Cooking/Other	Custom	Motor	902.3	65.9	15	$65.61	$262.44	$18.05
Advanced Pre-Rinse Spray Nozzle	Existing Rinse Spray Nozzle	Other Commercial	Cooking/Other	Direct Install	Unit	3703.1	196.9	5	$124.45	$155.57	$833.20
Compressed Air - Air Entraining Air Nozzle	Standard high-volume nozzles	Other Commercial	Cooking/Other	Prescriptive	Nozzle	759.0	165.1	10	$3.50	$14.00	$18.98
Compressed Air - Air Receiver for Load/No-Load Compressors (5 gal/CFM)	Current storage capacity	Other Commercial	Cooking/Other	Prescriptive	Compressor HP	368.0	80.0	10	$20.00	$80.00	$9.20
Compressed Air - Cycling Air Dryer	Continuous Air Dryer	Other Commercial	Cooking/Other	Prescriptive	Compressor HP	40.9	8.9	10	$7.50	$30.00	$1.02
Advanced Pre-Rinse Spray Nozzle	Existing Rinse Spray Nozzle	Other Commercial	Cooking/Other	Prescriptive	Unit	3703.1	196.9	5	$38.89	$155.57	$92.58
ENERGY STAR Connectionless Steamer	Connected Steamer	Other Commercial	Cooking/Other	Prescriptive	Unit	29692.0	3592.9	12	$500.00	$2,000.00	$742.30
ENERGY STAR Fryer	Baseline Fryer	Other Commercial	Cooking/Other	Prescriptive	Unit	1166.0	105.5	12	$125.00	$500.00	$29.15
ENERGY STAR Griddle	Baseline Griddle	Other Commercial	Cooking/Other	Prescriptive	Unit	8497.0	105.5	12	$522.50	$2,090.00	$212.43
ENERGY STAR Oven (Convection)	Baseline Oven	Other Commercial	Cooking/Other	Prescriptive	Unit	5786.0	700.1	12	$278.25	$1,113.00	$144.65
Insulated Hot Food Holding Cabinet: Half Size <=0.3 kW	stand hot food holding cabinet	Other Commercial	Cooking/Other	Prescriptive	Cabinet	1200.0	116.1	12	$277.50	$1,110.00	$30.00
PC Power Management Software	No Management Software	Other Commercial	Cooking/Other	Prescriptive	Unit	113.3	13.2	4	$3.04	$12.14	$2.83
<150 tons Centrifugal Water Cooled Chiller COP = 6.0 - Direct Exp / Elec Resist	ASHRAE 90.1-2007 5.0 COP	Other Commercial	HVAC/Shell	Custom	Tons Cooling	0.0	0.0	20	$23.00	$92.00	$0.00
<150 tons Centrifugal Water Cooled Chiller COP = 6.0 - Direct Exp / Gas Heat	ASHRAE 90.1-2007 5.0 COP	Other Commercial	HVAC/Shell	Custom	Tons Cooling	0.0	0.0	20	$23.00	$92.00	$0.00
<150 tons Centrifugal Water Cooled Chiller COP = 6.0 - Heat Pump	ASHRAE 90.1-2007 5.0 COP	Other Commercial	HVAC/Shell	Custom	Tons Cooling	0.0	0.0	20	$23.00	$92.00	$0.00
Air Cooled Chiller COP = 3.2 - Direct Exp / Elec Resist	ASHRAE 90.1-2007 2.8 COP	Other Commercial	HVAC/Shell	Custom	Tons Cooling	0.0	0.0	20	$31.50	$126.00	$0.00
Air Cooled Chiller COP = 3.2 - Direct Exp / Gas Heat	ASHRAE 90.1-2007 2.8 COP	Other Commercial	HVAC/Shell	Custom	Tons Cooling	0.0	0.0	20	$31.50	$126.00	$0.00
Air Cooled Chiller COP = 3.2 - Heat Pump	ASHRAE 90.1-2007 2.8 COP	Other Commercial	HVAC/Shell	Custom	Tons Cooling	0.0	0.0	20	$31.50	$126.00	$0.00
Code minimum R-20ci or R-38 batt - Direct Exp / Elec Resist	Existing R-value	Other Commercial	HVAC/Shell	Custom	1000 sqft roof	0.0	56.2	20	$292.50	$1,170.00	$0.00
Code minimum R-20ci or R-38 batt - Direct Exp / Gas Heat	Existing R-value	Other Commercial	HVAC/Shell	Custom	1000 sqft roof	0.0	0.0	20	$292.50	$1,170.00	$0.00
Code minimum R-20ci or R-38 batt - Heat Pump	Existing R-value	Other Commercial	HVAC/Shell	Custom	1000 sqft roof	446.8	51.3	20	$292.50	$1,170.00	$8.94
Cool Roof - Direct Exp / Elec Resist	black membrane or built-up	Other Commercial	HVAC/Shell	Custom	1000 sqft roof	55.0	86.5	15	$166.25	$665.00	$1.10
Cool Roof - Direct Exp / Gas Heat	black membrane or built-up	Other Commercial	HVAC/Shell	Custom	1000 sqft roof	278.3	92.2	15	$166.25	$665.00	$5.57
Cool Roof - Heat Pump	black membrane or built-up	Other Commercial	HVAC/Shell	Custom	1000 sqft roof	136.3	87.0	15	$166.25	$665.00	$2.73
EMS System	No EMS	Other Commercial	HVAC/Shell	Custom	1,000 SF	0.0	0.0	15	$126.90	$507.58	$0.00
High Performance Glazing - Direct Exp / Elec Resist	U=0.45 SHGC=0.40	Other Commercial	HVAC/Shell	Custom	100 sqft glazed	2816.5	309.3	20	$349.00	$1,396.00	$82.28
High Performance Glazing - Direct Exp / Gas Heat	U=0.45 SHGC=0.40	Other Commercial	HVAC/Shell	Custom	100 sqft glazed	805.3	298.9	20	$349.00	$1,396.00	$23.27
High Performance Glazing - Heat Pump	U=0.45 SHGC=0.40	Other Commercial	HVAC/Shell	Custom	100 sqft glazed	2085.4	309.9	20	$349.00	$1,396.00	$59.36
Improved Ceiling Insulation R24ci or R44 batt - Direct Exp / Elec Resist	R20 above deck R-38 attic	Other Commercial	HVAC/Shell	Custom	1000 sqft roof	523.7	-0.3	20	$187.65	$750.61	$15.30
Improved Ceiling Insulation R24ci or R44 batt - Direct Exp / Gas Heat	R20 above deck R-38 attic	Other Commercial	HVAC/Shell	Custom	1000 sqft roof	0.0	0.0	20	$187.65	$750.61	$0.00
Improved Ceiling Insulation R24ci or R44 batt - Heat Pump	R20 above deck R-38 attic	Other Commercial	HVAC/Shell	Custom	1000 sqft roof	25.5	2.5	20	$187.65	$750.61	$0.51
Refrigerant Charge	poor refrigerant charge	Other Commercial	HVAC/Shell	Custom	Tons Cooling	63.1	3.4	15	$4.98	$19.93	$1.50
Screw Chillers, Water-Cooled COP = 5.7 - Direct Exp / Elec Resist	ASHRAE 90.1-2007 4.90 COP	Other Commercial	HVAC/Shell	Custom	Tons Cooling	0.0	0.0	20	$22.50	$90.00	$0.00
Screw Chillers, Water-Cooled COP = 5.7 - Direct Exp / Gas Heat	ASHRAE 90.1-2007 4.90 COP	Other Commercial	HVAC/Shell	Custom	Tons Cooling	0.0	0.0	20	$22.50	$90.00	$0.00
Screw Chillers, Water-Cooled COP = 5.7 - Heat Pump	ASHRAE 90.1-2007 4.90 COP	Other Commercial	HVAC/Shell	Custom	Tons Cooling	0.0	0.0	20	$22.50	$90.00	$0.00
Window Films on Double Pane - Direct Exp / Elec Resist	Double-Pane Clear	Other Commercial	HVAC/Shell	Custom	100 sqft glazed	794.2	567.8	10	$38.50	$154.00	$23.20
Window Films on Double Pane - Direct Exp / Gas Heat	Double-Pane Clear	Other Commercial	HVAC/Shell	Custom	100 sqft glazed	2585.7	579.4	10	$38.50	$154.00	$74.72
Window Films on Double Pane - Heat Pump	Double-Pane Clear	Other Commercial	HVAC/Shell	Custom	100 sqft glazed	1455.2	574.3	10	$38.50	$154.00	$41.42
Window Films on Single Pane - Direct Exp / Elec Resist	Single-Pane Clear	Other Commercial	HVAC/Shell	Custom	100 sqft glazed	720.7	526.9	10	$38.50	$154.00	$21.05
Window Films on Single Pane - Direct Exp / Gas Heat	Single-Pane Clear	Other Commercial	HVAC/Shell	Custom	100 sqft glazed	2309.4	529.0	10	$38.50	$154.00	$66.74
Window Films on Single Pane - Heat Pump	Single-Pane Clear	Other Commercial	HVAC/Shell	Custom	100 sqft glazed	1327.0	534.3	10	$38.50	$154.00	$37.77
Economizer - Direct Exp / Elec Resist	No Economizer	Other Commercial	HVAC/Shell	Direct Install	Tons Cooling	0.0	0.0	10	$136.00	$170.00	$0.00
Economizer - Direct Exp / Gas Heat	No Economizer	Other Commercial	HVAC/Shell	Direct Install	Tons Cooling	216.4	0.0	10	$136.00	$170.00	$70.36
Economizer - Heat Pump	No Economizer	Other Commercial	HVAC/Shell	Direct Install	Tons Cooling	220.6	0.0	10	$136.00	$170.00	$70.65
Programmable Thermostat - Direct Exp / Elec Resist	Manual Thermostat	Other Commercial	HVAC/Shell	Direct Install	Thermostat	905.1	0.0	15	$116.00	$145.00	$297.45
Programmable Thermostat - Direct Exp / Gas Heat	Manual Thermostat	Other Commercial	HVAC/Shell	Direct Install	Thermostat	0.0	0.0	15	$116.00	$145.00	$0.00
Programmable Thermostat - Heat Pump	Manual Thermostat	Other Commercial	HVAC/Shell	Direct Install	Thermostat	0.0	0.0	15	$116.00	$145.00	$0.00
Economizer - Direct Exp / Elec Resist	No Economizer	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	10	$42.50	$170.00	$0.00
Economizer - Direct Exp / Gas Heat	No Economizer	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	216.4	0.0	10	$42.50	$170.00	$7.82
Economizer - Heat Pump	No Economizer	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	220.6	0.0	10	$42.50	$170.00	$7.85

Table 54. Commercial Measure Characteristics (at meter savings), Other Commercial (Continued)

Efficiency Measure	Base Measure	Building Type	Category	Program	Units	Energy Impact (kWh/Unit)	Coincident Summer Peak Impact (W/Unit)	Measure Life	Base Incentive ($/unit)	Technology Cost ($/unit)	Administrative Cost ($/unit)
Ground Source Heat Pump (<65 kBtu/h) EER 16 - Direct Exp / Elec Resist	ASHRAE 90.1-2007 EER 13.4	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$328.25	$1,312.98	$0.00
Ground Source Heat Pump (<65 kBtu/h) EER 16 - Direct Exp / Gas Heat	ASHRAE 90.1-2007 EER 13.4	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$328.25	$1,312.98	$0.00
Ground Source Heat Pump (<65 kBtu/h) EER 16 - Heat Pump	ASHRAE 90.1-2007 EER 13.4	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$328.25	$1,312.98	$0.00
Package system A/C (>=63.3 tons, 10.2 EER) - Direct Exp / Elec Resist	ASHRAE 90.1-2007 9.5 EER	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	62.3	29.0	15	$27.62	$110.48	$2.28
Package system A/C (>=63.3 tons, 10.2 EER) - Direct Exp / Gas Heat	ASHRAE 90.1-2007 9.5 EER	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	65.1	28.8	15	$27.62	$110.48	$2.35
Package system A/C (>=63.3 tons, 10.2 EER) - Heat Pump	ASHRAE 90.1-2007 9.5 EER	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$27.62	$110.48	$0.00
Packaged terminal air-conditioner (< 7kbtuh)	ASHRAE 90.1-2007 EER 9.5	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	265.5	82.9	15	$27.62	$110.48	$7.87
Programmable Thermostat - Direct Exp / Elec Resist	Manual Thermostat	Other Commercial	HVAC/Shell	Prescriptive	Thermostat	905.1	0.0	15	$36.25	$145.00	$33.05
Programmable Thermostat - Direct Exp / Gas Heat	Manual Thermostat	Other Commercial	HVAC/Shell	Prescriptive	Thermostat	0.0	0.0	15	$36.25	$145.00	$0.00
Programmable Thermostat - Heat Pump	Manual Thermostat	Other Commercial	HVAC/Shell	Prescriptive	Thermostat	0.0	0.0	15	$36.25	$145.00	$0.00
Split/Package system A/C (< 5.4 tons, 14 SEER) - Direct Exp / Elec Resist	Split/Package A/C (< 5.4 tons, 13.0 SEER)	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	225.9	105.2	15	$13.89	$55.57	$8.25
Split/Package system A/C (< 5.4 tons, 14 SEER) - Direct Exp / Gas Heat	Split/Package A/C (< 5.4 tons, 13.0 SEER)	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	236.3	104.4	15	$13.89	$55.57	$8.54
Split/Package system A/C (< 5.4 tons, 14 SEER) - Heat Pump	Split/Package A/C (< 5.4 tons, 13.0 SEER)	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$13.89	$55.57	$0.00
Split/Packaged Air Conditioner (135 - 240 kBtu/h) 11.5 EER - Direct Exp / Elec Resist	ASHRAE 90.1-2007 10.8 EER	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	48.6	22.6	15	$27.72	$110.89	$1.78
Split/Packaged Air Conditioner (135 - 240 kBtu/h) 11.5 EER - Direct Exp / Gas Heat	ASHRAE 90.1-2007 10.8 EER	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	50.8	22.4	15	$27.72	$110.89	$1.84
Split/Packaged Air Conditioner (135 - 240 kBtu/h) 11.5 EER - Heat Pump	ASHRAE 90.1-2007 10.8 EER	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$27.72	$110.89	$0.00
Split/Packaged Air Conditioner (240 - 760 kBtu/h) 11 EER - Direct Exp / Elec Resist	ASHRAE 90.1-2007 9.8 EER	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	96.0	44.7	15	$28.78	$115.13	$3.51
Split/Packaged Air Conditioner (240 - 760 kBtu/h) 11 EER - Direct Exp / Gas Heat	ASHRAE 90.1-2007 9.8 EER	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	100.3	44.4	15	$28.78	$115.13	$3.62
Split/Packaged Air Conditioner (240 - 760 kBtu/h) 11 EER - Heat Pump	ASHRAE 90.1-2007 9.8 EER	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$28.78	$115.13	$0.00
Split/Packaged Air Conditioner (65 - 135 kBtu/h) 12 EER - Direct Exp / Elec Resist	ASHRAE 90.1-2007 11.0 EER	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	65.3	30.4	15	$37.28	$149.13	$2.39
Split/Packaged Air Conditioner (65 - 135 kBtu/h) 12 EER - Direct Exp / Gas Heat	ASHRAE 90.1-2007 11.0 EER	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	68.3	30.2	15	$37.28	$149.13	$2.47
Split/Packaged Air Conditioner (65 - 135 kBtu/h) 12 EER - Heat Pump	ASHRAE 90.1-2007 11.0 EER	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$37.28	$149.13	$0.00
Split/Packaged Heat Pump (<65 kBtu/h) SEER 14 - Direct Exp / Elec Resist	ASHRAE 90.1-2007 SEER 13.0	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$18.38	$73.52	$0.00
Split/Packaged Heat Pump (<65 kBtu/h) SEER 14 - Direct Exp / Gas Heat	ASHRAE 90.1-2007 SEER 13.0	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$18.38	$73.52	$0.00
Split/Packaged Heat Pump (<65 kBtu/h) SEER 14 - Heat Pump	ASHRAE 90.1-2007 SEER 13.0	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	50.8	26.0	15	$18.38	$73.52	$1.81
Split/Packaged Heat Pump (135 - 240 kBtu/h) EER 11.5 - Direct Exp / Elec Resist	ASHRAE 90.1-2007 EER 10.6	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$31.36	$125.44	$0.00
Split/Packaged Heat Pump (135 - 240 kBtu/h) EER 11.5 - Direct Exp / Gas Heat	ASHRAE 90.1-2007 EER 10.6	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$31.36	$125.44	$0.00
Split/Packaged Heat Pump (135 - 240 kBtu/h) EER 11.5 - Heat Pump	ASHRAE 90.1-2007 EER 10.6	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	92.9	30.3	15	$31.36	$125.44	$3.30
Split/Packaged Heat Pump (240 - 760 kBtu/h) EER 10.8 - Direct Exp / Elec Resist	ASHRAE 90.1-2007 EER 9.5	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$32.46	$129.83	$0.00
Split/Packaged Heat Pump (240 - 760 kBtu/h) EER 10.8 - Direct Exp / Gas Heat	ASHRAE 90.1-2007 EER 9.5	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$32.46	$129.83	$0.00
Split/Packaged Heat Pump (240 - 760 kBtu/h) EER 10.8 - Heat Pump	ASHRAE 90.1-2007 EER 9.5	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	158.2	52.0	15	$32.46	$129.83	$5.63
Split/Packaged Heat Pump (65 - 135 kBtu/h) EER 12 - Direct Exp / Elec Resist	ASHRAE 90.1-2007 EER 11.0	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$45.61	$182.43	$0.00
Split/Packaged Heat Pump (65 - 135 kBtu/h) EER 12 - Direct Exp / Gas Heat	ASHRAE 90.1-2007 EER 11.0	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$45.61	$182.43	$0.00
Split/Packaged Heat Pump (65 - 135 kBtu/h) EER 12 - Heat Pump	ASHRAE 90.1-2007 EER 11.0	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	95.4	31.1	15	$45.61	$182.43	$3.39
Water Source Heat Pump (<65 kBtu/h) EER 15 - Direct Exp / Elec Resist	ASHRAE 90.1-2007 EER 12.0	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$6.57	$26.29	$0.00
Water Source Heat Pump (<65 kBtu/h) EER 15 - Direct Exp / Gas Heat	ASHRAE 90.1-2007 EER 12.0	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$6.57	$26.29	$0.00
Water Source Heat Pump (<65 kBtu/h) EER 15 - Heat Pump	ASHRAE 90.1-2007 EER 12.0	Other Commercial	HVAC/Shell	Prescriptive	Tons Cooling	0.0	0.0	15	$6.57	$26.29	$0.00
Daylighting Controls	No controls	Other Commercial	Lighting	Custom	Fixture	2677.5	492.5	8	$195.61	$592.77	$53.55
Induction Lighting	Outdoor HIDs	Other Commercial	Lighting	Custom	Fixture	306.6	39.2	18	$158.97	$481.74	$6.13
CFL: Screw-In (10-15W) Indoor	60W Incandescent	Other Commercial	Lighting	Direct Install	Lamp	147.7	21.1	3	$4.37	$5.46	$33.23
LED Lighting >=10W - Indoor	60W Incandescent	Other Commercial	Lighting	Direct Install	Lamp	135.0	6.6	6	$21.34	$26.68	$30.38
CFL: Screw-In (<10W) Indoor	40W Incandescent	Other Commercial	Lighting	Direct Install	Lamp	103.1	14.7	3	$4.37	$5.46	$23.19
LED Lighting <10W - Indoor	40W Incandescent	Other Commercial	Lighting	Direct Install	Lamp	151.1	22.9	10	$21.34	$26.68	$34.01
CFL: Pin-Based (<25W) Indoor	<=100W Incandescent Fixture	Other Commercial	Lighting	Direct Install	Lamp	240.5	34.3	12	$8.00	$10.00	$54.10
CFL: Pin-Based (>=25W) Indoor	>100W Incandescent Fixture	Other Commercial	Lighting	Direct Install	Lamp	240.5	34.3	12	$8.00	$10.00	$54.10
CFL: Screw-In (<10W) Outdoor	40W Incandescent	Other Commercial	Lighting	Direct Install	Lamp	118.8	7.1	3	$1.15	$1.44	$26.74
CFL: Screw-In (>26W) Indoor	>100W Incandescent	Other Commercial	Lighting	Direct Install	Lamp	316.0	45.1	3	$4.37	$5.46	$71.10
CFL: Screw-In (>26W) Outdoor	>100W Incandescent	Other Commercial	Lighting	Direct Install	Lamp	437.0	26.2	3	$1.15	$1.44	$98.32
CFL: Screw-In (10-15W) Outdoor	60W Incandescent	Other Commercial	Lighting	Direct Install	Lamp	180.2	10.8	3	$1.15	$1.44	$40.53

Table 54. Commercial Measure Characteristics (at meter savings), Other Commercial (Continued)

Efficiency Measure	Base Measure	Building Type	Category	Program	Units	Energy Impact (kWh/Unit)	Coincident Summer Peak Impact (W/Unit)	Measure Life	Base Incentive ($/unit)	Technology Cost ($/unit)	Administrative Cost ($/unit)
CFL: Screw-In (16-21W) Indoor	75W Incandescent	Other Commercial	Lighting	Direct Install	Lamp	188.9	27.0	3	$4.37	$5.46	$42.51
CFL: Screw-In (16-21W) Outdoor	75W Incandescent	Other Commercial	Lighting	Direct Install	Lamp	218.5	13.1	3	$1.15	$1.44	$49.16
CFL: Screw-In (22-26W) Indoor	100W Incandescent	Other Commercial	Lighting	Direct Install	Lamp	233.6	33.3	3	$4.37	$5.46	$52.56
CFL: Screw-In (22-26W) Outdoor	100W Incandescent	Other Commercial	Lighting	Direct Install	Lamp	287.5	17.3	3	$1.15	$1.44	$64.68
Delamping	Avg. T8 Lamp	Other Commercial	Lighting	Direct Install	Fixture	109.9	15.7	10	$10.66	$13.33	$24.73
Dimmable Electronic Ballasts	T8 Fixtures	Other Commercial	Lighting	Direct Install	Fixture	2690.3	407.0	8	$124.40	$155.50	$605.31
High Performance T8 Lighting	Indoor Metal Halides	Other Commercial	Lighting	Direct Install	Fixture	796.9	113.7	6	$21.82	$27.27	$179.31
High Performance T8 Lighting	T12 Lamps	Other Commercial	Lighting	Direct Install	Fixture	68.7	9.8	6	$21.82	$27.27	$15.46
LED Exit Signs - from CFL	CFL Exit Sign	Other Commercial	Lighting	Direct Install	Fixture	112.7	5.4	16	$44.08	$55.10	$25.37
LED Exit Signs - from Incand.	Incandescent Exit Signs	Other Commercial	Lighting	Direct Install	Fixture	317.7	15.2	16	$44.08	$55.10	$71.49
Occupancy Sensor	No sensor	Other Commercial	Lighting	Direct Install	Sensor	136.0	18.1	8	$96.75	$120.94	$30.60
Photocell	No Photocell (Outdoor Lighting)	Other Commercial	Lighting	Direct Install	380 W	106.0	0.0	8	$47.85	$59.81	$23.85
Screw in cold cathode CFL	Avg. Incandescent Wattage	Other Commercial	Lighting	Direct Install	Fixture	137.4	19.6	10	$5.09	$6.36	$30.92
T5 Lighting	Indoor Metal Halides	Other Commercial	Lighting	Direct Install	Fixture	769.4	109.8	18	$144.80	$181.00	$173.12
T8 to High Performance T8	Standard T8 Lamps	Other Commercial	Lighting	Direct Install	Fixture	34.4	4.9	6	$21.82	$27.27	$7.73
Time clock	Time clock (Outdoor Lighting)	Other Commercial	Lighting	Direct Install	380 W	474.0	0.0	8	$193.68	$242.10	$106.65
CFL: Screw-In (10-15W) Indoor	60W Incandescent	Other Commercial	Lighting	Prescriptive	Lamp	147.7	21.1	3	$1.80	$5.46	$3.69
CFL: Screw-In (10-15W) Outdoor	60W Incandescent	Other Commercial	Lighting	Prescriptive	Lamp	180.2	10.8	3	$0.48	$1.44	$4.50
LED Lighting >=10W - Indoor	60W Incandescent	Other Commercial	Lighting	Prescriptive	Lamp	135.0	6.6	6	$8.80	$26.68	$3.38
CFL: Screw-In (<10W) Indoor	40W Incandescent	Other Commercial	Lighting	Prescriptive	Lamp	103.1	14.7	3	$1.80	$5.46	$2.58
CFL: Screw-In (<10W) Outdoor	40W Incandescent	Other Commercial	Lighting	Prescriptive	Lamp	118.8	7.1	3	$0.48	$1.44	$2.97
LED Lighting <10W - Indoor	40W Incandescent	Other Commercial	Lighting	Prescriptive	Lamp	151.1	22.9	10	$8.80	$26.68	$3.78
CFL: Pin-Based (<25W) Indoor	<=100W Incandescent Fixture	Other Commercial	Lighting	Prescriptive	Lamp	240.5	34.3	12	$3.30	$10.00	$6.01
CFL: Pin-Based (>=25W) Indoor	>100W Incandescent Fixture	Other Commercial	Lighting	Prescriptive	Lamp	240.5	34.3	12	$3.30	$10.00	$6.01
CFL: Screw-In (>26W) Indoor	>100W Incandescent	Other Commercial	Lighting	Prescriptive	Lamp	316.0	45.1	3	$1.80	$5.46	$7.90
CFL: Screw-In (>26W) Outdoor	>100W Incandescent	Other Commercial	Lighting	Prescriptive	Lamp	437.0	26.2	3	$0.48	$1.44	$10.92
CFL: Screw-In (16-21W) Indoor	75W Incandescent	Other Commercial	Lighting	Prescriptive	Lamp	188.9	27.0	3	$1.80	$5.46	$4.72
CFL: Screw-In (16-21W) Outdoor	75W Incandescent	Other Commercial	Lighting	Prescriptive	Lamp	218.5	13.1	3	$0.48	$1.44	$5.46
CFL: Screw-In (22-26W) Indoor	100W Incandescent	Other Commercial	Lighting	Prescriptive	Lamp	233.6	33.3	3	$1.80	$5.46	$5.84
CFL: Screw-In (22-26W) Outdoor	100W Incandescent	Other Commercial	Lighting	Prescriptive	Lamp	287.5	17.3	3	$0.48	$1.44	$7.19
Delamping	Avg. T8 Lamp	Other Commercial	Lighting	Prescriptive	Fixture	109.9	15.7	10	$4.40	$13.33	$2.75
Dimmable Electronic Ballasts	T8 Fixtures	Other Commercial	Lighting	Prescriptive	Fixture	2690.3	407.0	8	$51.32	$155.50	$67.26
High Performance T8 Lighting	Indoor Metal Halides	Other Commercial	Lighting	Prescriptive	Fixture	796.9	113.7	6	$9.00	$27.27	$19.92
High Performance T8 Lighting	T12 Lamps	Other Commercial	Lighting	Prescriptive	Fixture	68.7	9.8	6	$9.00	$27.27	$1.72
LED Exit Signs - from CFL	CFL Exit Sign	Other Commercial	Lighting	Prescriptive	Fixture	112.7	5.4	16	$18.18	$55.10	$2.82
LED Exit Signs - from Incand.	Incandescent Exit Signs	Other Commercial	Lighting	Prescriptive	Fixture	317.7	15.2	16	$18.18	$55.10	$7.94
Occupancy Sensor	No sensor	Other Commercial	Lighting	Prescriptive	Sensor	136.0	18.1	8	$39.91	$120.94	$3.40
Photocell	No Photocell (Outdoor Lighting)	Other Commercial	Lighting	Prescriptive	380 W	106.0	0.0	8	$19.74	$59.81	$2.65
Screw in cold cathode CFL	Avg. Incandescent Wattage	Other Commercial	Lighting	Prescriptive	Fixture	137.4	19.6	10	$2.10	$6.36	$3.44
T5 Lighting	Indoor Metal Halides	Other Commercial	Lighting	Prescriptive	Fixture	769.4	109.8	18	$59.73	$181.00	$19.24
T8 to High Performance T8	Standard T8 Lamps	Other Commercial	Lighting	Prescriptive	Fixture	34.4	4.9	6	$9.00	$27.27	$0.86
Time clock	Time clock (Outdoor Lighting)	Other Commercial	Lighting	Prescriptive	380 W	474.0	0.0	8	$79.89	$242.10	$11.85
VFD on centrif load - Process or HVAC	Baseline Process or HVAC	Other Commercial	Motors	Prescriptive	HP	356.8	160.7	15	$42.26	$169.04	$8.92
Vending Machine Controller - Cold Drink	Existing Controls	Other Commercial	Plug Load	Direct Install	Unit	1646.9	0.0	15	$172.40	$215.50	$370.55
Advanced Power Strips - Occupancy Sensors	Power Strip - No controls	Other Commercial	Plug Load	Prescriptive	power strip	262.9	23.5	8	$22.50	$90.00	$6.57
Advanced Power Strips - Timer Plug Strip	Power Strip - No controls	Other Commercial	Plug Load	Prescriptive	power strip	283.2	23.5	8	$4.75	$19.00	$7.08
Advanced Power Strips - Load Sensor	Power Strip - No controls	Other Commercial	Plug Load	Prescriptive	power strip	164.5	9.4	8	$7.99	$31.96	$4.11
Vending Machine Controller - Cold Drink	Existing Controls	Other Commercial	Plug Load	Prescriptive	Unit	1646.9	0.0	15	$53.88	$215.50	$41.17

Table 54. Commercial Measure Characteristics (at meter savings), Other Commercial (Continued)

Efficiency Measure	Base Measure	Building Type	Category	Program	Units	Energy Impact (kWh/Unit)	Coincident Summer Peak Impact (W/Unit)	Measure Life	Base Incentive ($/unit)	Technology Cost ($/unit)	Administrative Cost ($/unit)
High efficiency, low temperature compressor	1.0 COP	Other Commercial	Refrigeration	Custom	Compressor	1100.1	41.6	12	$191.85	$767.41	$22.00
Multiplex Compressor	Single Line refrigeration	Other Commercial	Refrigeration	Custom	Compressor	560.4	33.7	12	$551.51	$2,206.03	$11.21
Multiplex system with oversized condenser	Multi-plex system standard Condenser	Other Commercial	Refrigeration	Custom	Compressor	67.8	9.9	12	$107.12	$428.49	$1.36
Anti-Sweat Heat (ASH) Controls (or Humidistat Controls)	No Controls- continuous operation	Other Commercial	Refrigeration	Direct Install	per 36 ln.ft. of case	1878.9	218.8	12	$471.88	$589.85	$422.76
EC Motor: Reach-In Enclosure	PSC Motor	Other Commercial	Refrigeration	Direct Install	Motor	859.0	28.2	15	$21.80	$27.25	$193.28
EC Motor: Walk-In Enclosure	PSC Motor	Other Commercial	Refrigeration	Direct Install	Motor	1333.0	43.7	15	$21.80	$27.25	$299.93
Evap Fan Controller for Med. Temp Walk-in	Existing Controls Continuous Operation	Other Commercial	Refrigeration	Direct Install	Fan	11782.2	538.0	15	$2,360.00	$2,950.00	$2,651.00
Glass Doors on Low and Med. Temperature Displays	single pane glass doors	Other Commercial	Refrigeration	Direct Install	ln. ft. of case	159.6	3.7	12	$140.00	$175.00	$35.92
Intelligent Defrost Control	fixed interval defrost	Other Commercial	Refrigeration	Direct Install	Control	842.7	286.6	10	$400.00	$500.00	$189.60
Night Covers	No Night Covers	Other Commercial	Refrigeration	Direct Install	ln. ft. of case	107.5	19.4	5	$22.63	$28.29	$24.19
Anti-Sweat Heat (ASH) Controls (or Humidistat Controls)	No Controls- continuous operation	Other Commercial	Refrigeration	Prescriptive	per 36 ln.ft. of case	1878.9	218.8	12	$147.46	$589.85	$46.97
EC Motor: Reach-In Enclosure	PSC Motor	Other Commercial	Refrigeration	Prescriptive	Motor	859.0	28.2	15	$6.81	$27.25	$21.48
EC Motor: Walk-In Enclosure	PSC Motor	Other Commercial	Refrigeration	Prescriptive	Motor	1333.0	43.7	15	$6.81	$27.25	$33.33
Evap Fan Controller for Med. Temp Walk-in	Existing Controls Continuous Operation	Other Commercial	Refrigeration	Prescriptive	Fan	11782.2	538.0	15	$737.50	$2,950.00	$294.56
Floating Head Pressure Controls	Fixed head pressure controls	Other Commercial	Refrigeration	Prescriptive	Tons	1804.6	53.6	12	$23.24	$92.95	$45.11
Glass Doors on Low and Med. Temperature Displays	single pane glass doors	Other Commercial	Refrigeration	Prescriptive	ln. ft. of case	159.6	3.7	12	$43.75	$175.00	$3.99
Intelligent Defrost Control	fixed interval defrost	Other Commercial	Refrigeration	Prescriptive	Control	842.7	286.6	10	$125.00	$500.00	$21.07
Night Covers	No Night Covers	Other Commercial	Refrigeration	Prescriptive	ln. ft. of case	107.5	19.4	5	$7.07	$28.29	$2.69
Outside Air Economizer for Coolers	No OA for coolers	Other Commercial	Refrigeration	Prescriptive	Unit	5840.4	467.1	10	$669.75	$2,679.00	$146.01
Refrigerated Display LED Lighting Strips	Fluorescent or Incandescent Lighting	Other Commercial	Refrigeration	Prescriptive	Case Door	577.4	78.8	8	$62.50	$250.00	$14.44
Zero Energy Door	Standard Case door	Other Commercial	Refrigeration	Prescriptive	Case Door	1885.0	74.3	10	$72.50	$290.00	$47.13
Hot Water Circulation Pump Time Clock	No Time Clock	Other Commercial	Water Heat	Direct Install	Unit	1080.9	0.0	15	$249.85	$312.31	$243.20
Heat Pump Water Heater	Baseline Electric Water Heater	Other Commercial	Water Heat	Prescriptive	Water Heater	7542.7	220.8	10	$540.00	$2,160.00	$188.57
High Efficiency, Electric Water Heater	Baseline Electric Water Heater	Other Commercial	Water Heat	Prescriptive	Water Heater	65.4	3.8	15	$70.31	$281.22	$1.63
Hot Water Circulation Pump Time Clock	No Time Clock	Other Commercial	Water Heat	Prescriptive	Unit	1080.9	0.0	15	$78.08	$312.31	$27.02

C.6. Industrial Measure Characteristics by Program

Table 55. Industrial Measure Characteristics (at meter savings)

Efficiency Measure	Base Measure	Building Type	Category	Program	Units	Energy Impact (kWh/Unit)	Coincident Summer Peak Impact (W/Unit)	Measure Life	Base Incentive ($/unit)	Technology Cost ($/unit)	Administrative Cost ($/unit)
Compressed Air - Air Entraining Air Nozzle	Standard high-volume nozzles	Industrial	Cooking/Other	Prescriptive	Nozzle	1634.0	165.1	10	$3.50	$14.00	$40.85
Compressed Air - Air Receiver for Load/No-Load Compressors (5 gal/CFM)	Current storage capacity	Industrial	Cooking/Other	Prescriptive	Compressor HP	368.0	80.0	10	$20.00	$80.00	$9.20
Compressed Air - Cycling Air Dryer	Continuous Air Dryer	Industrial	Cooking/Other	Prescriptive	Compressor HP	40.9	8.9	10	$7.50	$30.00	$1.02
PC Power Management Software	No Management Software	Industrial	Cooking/Other	Prescriptive	Unit	113.3	13.2	4	$3.04	$12.14	$2.83
<150 tons Centrifugal Water Cooled Chiller COP = 6.0	ASHRAE 90.1-2007 5.0 COP	Industrial	HVAC/Shell	Custom	Tons Cooling	369.2	90.7	20	$23.00	$92.00	$7.38
Air Cooled Chiller COP = 3.2	ASHRAE 90.1-2007 2.8 COP	Industrial	HVAC/Shell	Custom	Tons Cooling	548.3	134.7	20	$31.50	$126.00	$10.97
Code minimum R-20ci or R-38 batt	Existing R-value	Industrial	HVAC/Shell	Custom	1000 sqft roof	1242.1	540.4	20	$150.00	$600.00	$24.84
Cool Roof	black membrane or built-up	Industrial	HVAC/Shell	Custom	1000 sqft roof	166.1	17.0	15	$166.25	$665.00	$3.32
Improved Ceiling Insulation R24ci or R44 batt	R20 above deck R-38 attic	Industrial	HVAC/Shell	Custom	1000 sqft roof	103.8	37.5	20	$187.50	$750.00	$2.08
Refrigerant Charge	poor refrigerant charge	Industrial	HVAC/Shell	Custom	Tons Cooling	74.8	4.1	15	$4.98	$19.93	$1.50
Screw Chillers, Water-Cooled COP = 5.7	ASHRAE 90.1-2007 4.90 COP	Industrial	HVAC/Shell	Custom	Tons Cooling	321.6	69.8	20	$22.50	$90.00	$6.43
Economizer	No Economizer	Industrial	HVAC/Shell	Direct Install	Tons Cooling	162.1	0.1	10	$136.00	$170.00	$36.47
Economizer	No Economizer	Industrial	HVAC/Shell	Prescriptive	Tons Cooling	162.1	0.1	10	$42.50	$170.00	$4.05
Package system A/C (>=63.3 tons, 10.2 EER)	ASHRAE 90.1-2007 9.5 EER	Industrial	HVAC/Shell	Prescriptive	Tons Cooling	288.7	91.4	15	$27.62	$110.48	$7.22
Split/Package system A/C (< 5.4 tons, 14 SEER)	Split/Package A/C (< 5.4 tons, 13.0 SEER)	Industrial	HVAC/Shell	Prescriptive	Site	158.2	50.1	15	$22.50	$90.00	$3.96
Split/Packaged Air Conditioner (135 - 240 kBtu/h) 11.5 EER	ASHRAE 90.1-2007 10.8 EER	Industrial	HVAC/Shell	Prescriptive	Tons Cooling	48.5	15.4	15	$27.72	$110.89	$1.21
Split/Packaged Air Conditioner (240 - 760 kBtu/h) 11 EER	ASHRAE 90.1-2007 9.8 EER	Industrial	HVAC/Shell	Prescriptive	Tons Cooling	320.6	101.5	15	$28.78	$115.13	$8.01
Split/Packaged Air Conditioner (65 - 135 kBtu/h) 12 EER	ASHRAE 90.1-2007 11.0 EER	Industrial	HVAC/Shell	Prescriptive	Tons Cooling	218.2	69.1	15	$45.61	$182.43	$5.45
Daylighting Controls	No controls	Industrial	Lighting	Custom	Fixture	92.0	5.5	8	$195.61	$592.77	$1.84
Induction Lighting	Outdoor HIDs	Industrial	Lighting	Custom	Fixture	306.6	38.4	18	$139.19	$421.79	$6.13
CFL: Pin-Based (<25W) Indoor	<=100W Incandescent Fixture	Industrial	Lighting	Direct Install	Lamp	240.5	33.6	12	$8.00	$10.00	$54.10
CFL: Pin-Based (>=25W) Indoor	>100W Incandescent Fixture	Industrial	Lighting	Direct Install	Lamp	240.5	33.6	12	$8.00	$10.00	$54.10
CFL: Screw-In (>26W) Indoor	>100W Incandescent	Industrial	Lighting	Direct Install	Lamp	316.0	44.2	3	$5.05	$6.31	$71.10
CFL: Screw-In (>26W) Outdoor	>100W Incandescent	Industrial	Lighting	Direct Install	Lamp	437.0	26.2	3	$1.79	$2.24	$98.32
CFL: Screw-In (10-15W) Indoor	60W Incandescent	Industrial	Lighting	Direct Install	Lamp	147.7	20.6	3	$5.05	$6.31	$33.23
CFL: Screw-In (16-21W) Indoor	75W Incandescent	Industrial	Lighting	Direct Install	Lamp	188.9	26.4	3	$5.05	$6.31	$42.51
CFL: Screw-In (22-26W) Indoor	100W Incandescent	Industrial	Lighting	Direct Install	Lamp	233.6	32.6	3	$5.05	$6.31	$52.56
CFL: Screw-In (22-26W) Outdoor	100W Incandescent	Industrial	Lighting	Direct Install	Lamp	287.5	17.3	3	$1.79	$2.24	$64.68
Delamping	Avg. T8 Lamp	Industrial	Lighting	Direct Install	Fixture	109.9	15.4	10	$10.64	$13.30	$24.73
Dimmable Electronic Ballasts	T8 Fixtures	Industrial	Lighting	Direct Install	Fixture	186.8	9.3	8	$124.40	$155.50	$42.03
High Performance T8 Lighting	Indoor Metal Halides	Industrial	Lighting	Direct Install	Fixture	68.7	9.6	6	$21.82	$27.27	$15.46
High Performance T8 Lighting	T12 Lamps	Industrial	Lighting	Direct Install	Fixture	68.7	9.6	6	$21.82	$27.27	$15.46
Induction Lighting	Outdoor HIDs	Industrial	Lighting	Direct Install	Fixture	306.6	38.4	18	$337.43	$421.79	$68.99
LED Exit Signs - from CFL	CFL Exit Sign	Industrial	Lighting	Direct Install	Fixture	112.7	5.3	16	$26.19	$32.74	$25.37
LED Exit Signs - from Incand.	Incandescent Exit Signs	Industrial	Lighting	Direct Install	Fixture	317.7	14.9	16	$26.19	$32.74	$71.49
LED Lighting >=10W - Indoor	60W Incandescent	Industrial	Lighting	Direct Install	Lamp	135.0	6.6	6	$21.34	$26.68	$30.38
Occupancy Sensor	No sensor	Industrial	Lighting	Direct Install	Sensor	136.0	18.2	8	$76.56	$95.70	$30.60
Photocell	No Photocell (Outdoor Lighting)	Industrial	Lighting	Direct Install	380 W	106.0	0.0	8	$47.85	$59.81	$23.85
Screw in cold cathode CFL	Avg. Incandescent Wattage	Industrial	Lighting	Direct Install	Fixture	137.4	19.2	10	$8.43	$10.54	$30.92
T5 Lighting	Indoor Metal Halides	Industrial	Lighting	Direct Install	Fixture	769.4	107.5	18	$144.80	$181.00	$173.12
T8 to High Performance T8	Standard T8 Lamps	Industrial	Lighting	Direct Install	Fixture	34.4	4.8	6	$21.82	$27.27	$7.73
Time clock	Time clock (Outdoor Lighting)	Industrial	Lighting	Direct Install	380 W	474.0	0.0	8	$193.68	$242.10	$106.65
CFL: Pin-Based (<25W) Indoor	<=100W Incandescent Fixture	Industrial	Lighting	Prescriptive	Lamp	240.5	33.6	12	$3.30	$10.00	$6.01
CFL: Pin-Based (>=25W) Indoor	>100W Incandescent Fixture	Industrial	Lighting	Prescriptive	Lamp	240.5	33.6	12	$3.30	$10.00	$6.01
CFL: Screw-In (>26W) Indoor	>100W Incandescent	Industrial	Lighting	Prescriptive	Lamp	316.0	44.2	3	$2.08	$6.31	$7.90
CFL: Screw-In (>26W) Outdoor	>100W Incandescent	Industrial	Lighting	Prescriptive	Lamp	437.0	26.2	3	$0.74	$2.24	$10.92
CFL: Screw-In (10-15W) Indoor	60W Incandescent	Industrial	Lighting	Prescriptive	Lamp	147.7	20.6	3	$2.08	$6.31	$3.69
CFL: Screw-In (16-21W) Indoor	75W Incandescent	Industrial	Lighting	Prescriptive	Lamp	188.9	26.4	3	$2.08	$6.31	$4.72
CFL: Screw-In (22-26W) Indoor	100W Incandescent	Industrial	Lighting	Prescriptive	Lamp	233.6	32.6	3	$2.08	$6.31	$5.84
CFL: Screw-In (22-26W) Outdoor	100W Incandescent	Industrial	Lighting	Prescriptive	Lamp	287.5	17.3	3	$0.74	$2.24	$7.19

Table 55. Industrial Measure Characteristics (at meter savings) (Continued)

Efficiency Measure	Base Measure	Building Type	Category	Program	Units	Energy Impact (kWh/Unit)	Coincident Summer Peak Impact (W/Unit)	Measure Life	Base Incentive ($/unit)	Technology Cost ($/unit)	Administrative Cost ($/unit)
Delamping	Avg. T8 Lamp	Industrial	Lighting	Prescriptive	Fixture	109.9	15.4	10	$4.39	$13.30	$2.75
Dimmable Electronic Ballasts	T8 Fixtures	Industrial	Lighting	Prescriptive	Fixture	186.8	9.3	8	$51.32	$155.50	$4.67
High Performance T8 Lighting	Indoor Metal Halides	Industrial	Lighting	Prescriptive	Fixture	68.7	9.6	6	$9.00	$27.27	$1.72
High Performance T8 Lighting	T12 Lamps	Industrial	Lighting	Prescriptive	Fixture	68.7	9.6	6	$9.00	$27.27	$1.72
Induction Lighting	Outdoor HIDs	Industrial	Lighting	Prescriptive	Fixture	306.6	38.4	18	$139.19	$421.79	$7.67
LED Exit Signs - from CFL	CFL Exit Sign	Industrial	Lighting	Prescriptive	Fixture	112.7	5.3	16	$10.80	$32.74	$2.82
LED Exit Signs - from Incand.	Incandescent Exit Signs	Industrial	Lighting	Prescriptive	Fixture	317.7	14.9	16	$10.80	$32.74	$7.94
LED Lighting >=10W - Indoor	60W Incandescent	Industrial	Lighting	Prescriptive	Lamp	135.0	6.6	6	$8.80	$26.68	$3.38
Occupancy Sensor	No sensor	Industrial	Lighting	Prescriptive	Sensor	136.0	18.2	8	$31.58	$95.70	$3.40
Photocell	No Photocell (Outdoor Lighting)	Industrial	Lighting	Prescriptive	380 W	106.0	0.0	8	$19.74	$59.81	$2.65
Screw in cold cathode CFL	Avg. Incandescent Wattage	Industrial	Lighting	Prescriptive	Fixture	137.4	19.2	10	$3.48	$10.54	$3.44
T5 Lighting	Indoor Metal Halides	Industrial	Lighting	Prescriptive	Fixture	769.4	107.5	18	$59.73	$181.00	$19.24
T8 to High Performance T8	Standard T8 Lamps	Industrial	Lighting	Prescriptive	Fixture	34.4	4.8	6	$9.00	$27.27	$0.86
Time clock	Time clock (Outdoor Lighting)	Industrial	Lighting	Prescriptive	380 W	474.0	0.0	8	$79.89	$242.10	$11.85
VFD on centrif load - Process or HVAC	Baseline Process or HVAC	Industrial	Motors	Prescriptive	HP	356.8	160.7	15	$42.26	$169.04	$8.92
Vending Machine Controller - Cold Drink	Existing Controls	Industrial	Plug Load	Direct Install	Unit	1646.9	0.0	15	$172.40	$215.50	$370.55
Advanced Power Strips - Occupancy Sensors	Power Strip - No controls	Industrial	Plug Load	Prescriptive	power strip	262.9	23.5	8	$22.50	$90.00	$6.57
Advanced Power Strips - Timer Plug Strip	Power Strip - No controls	Industrial	Plug Load	Prescriptive	power strip	283.2	23.5	8	$4.75	$19.00	$7.08
Advanced Power Strips - Load Sensor	Power Strip - No controls	Industrial	Plug Load	Prescriptive	power strip	164.5	9.4	8	$7.99	$31.96	$4.11
Vending Machine Controller - Cold Drink	Existing Controls	Industrial	Plug Load	Prescriptive	Unit	1646.9	0.0	15	$53.88	$215.50	$41.17
Hot Water Circulation Pump Time Clock	No Time Clock	Industrial	Water Heat	Direct Install	Unit	1080.9	0.0	15	$249.85	$312.31	$243.20
Hot Water Circulation Pump Time Clock	No Time Clock	Industrial	Water Heat	Prescriptive	Unit	1080.9	0.0	15	$78.08	$312.31	$27.02

Summary: Exhibit Exhibit B for Application and Request for Expedited Consideration (Part 3 of 3) electronically filed by Anne M Vogel on behalf of American Electric Power Company, Inc.