GDS Associates, Inc.
ENGINEERS & CONSULTANTS

CONSUMERS ENERGY

Electric Energy Efficiency Potential Study

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1 EXECUTIVE SUMMARY

BACKGROUND

Consumers Energy staff and GDS Associates coordinated to complete this assessment of electric energy efficiency potential for Consumers Energy. This analysis provides a roadmap for policy makers and identifies the energy efficiency measures having the greatest potential savings and the measures that are the most cost-effective. In addition to technical and economic potential estimates, the development of achievable potential estimates for a range of feasible energy efficiency measures is useful for program planning and modification purposes. Unlike achievable potential estimates, technical and economic potential estimates do not include customer acceptance considerations for energy efficiency measures, which are often among the most important factors when estimating the likely customer response to new programs. For this study, GDS Associates, Inc. (GDS), the consulting firm retained to conduct this study, produced the following estimates of energy efficiency potential:

- Technical potential
- Economic potential
- Achievable potential – two scenarios
  - Scenario #1: Based on UCT cost-effectiveness screening, incentives for program participants set at 50% of incremental measure costs and no budget constraints
  - Scenario #2: Based on UCT cost-effectiveness screening, incentives for program participants set at 50% of incremental measure costs and energy efficiency program annual budgets constrained to 2% of projected annual Consumers Energy electric revenues

Definitions of the types of energy efficiency potential are provided below.

Technical Potential is the theoretical maximum amount of energy use that could be displaced by efficiency, disregarding all non-engineering constraints such as cost-effectiveness and the willingness of end-users to adopt the efficiency measures.

Economic Potential refers to the subset of the technical potential that is economically cost-effective as compared to conventional supply-side energy resources. Both technical and economic potential ignore market barriers to ensuring actual implementation of efficiency. Finally, they only consider the costs of efficiency measures themselves, ignoring any programmatic costs (e.g., marketing, analysis, administration) that would be necessary to capture them.

Achievable Potential is the amount of energy use that efficiency can realistically be expected to displace assuming different market penetration scenarios for cost-effective energy efficiency measures. An aggressive scenario, for example, could provide program participants with payments for the entire incremental cost of more energy efficient equipment. This is often referred to as "maximum achievable potential". Achievable potential takes into account real-world barriers to convincing end-users to adopt cost-effective energy efficiency measures, the non-measure costs of delivering programs (for administration, marketing, tracking systems, monitoring and evaluation, etc.), and the capability of programs and administrators to ramp up program activity over time.[1] Achievable savings potential savings is a subset of economic potential.

This potential study evaluates two achievable potential scenarios:

[1] These definitions are from the November 2007 National Action Plan for Energy Efficiency "Guide for Conducting Energy Efficiency Potential Studies"

1) **Scenario #1** | For the first scenario, achievable potential represents the amount of energy use that energy efficiency can realistically be expected to displace assuming incentives equal to 50% of the incremental measure cost and no spending cap. Cost-effectiveness of measures was determined with the Utility Cost Test (UCT).
2) **Scenario #2** | The second scenario is a subset of Achievable Scenario #1 (based on UCT cost-effectiveness screening). While scenario #1 assumed no annual spending cap on efficiency measures, Achievable Scenario #2 assumed a spending cap of approximately 2% of projected annual Consumers Energy electric revenues. According to Michigan Public Act 295 of 2008, gas and electric utilities are not permitted (without specific approval from the Commission) to spend more than 2.0% of revenues from 2 years prior in attempting to comply with the energy optimization performance standard.

The current achievable scenario includes an incentive level of 50% of incentive cost. This selection of the incentive level is consistent with the 2013 Michigan Statewide Study. The 2013 Study states "an incentive level of 50% of measure costs assumed in this study for the three achievable potential scenarios is a reasonable target based on the current financial incentive levels for program participants used by DTE Energy and Consumers Energy for their existing energy efficiency programs." Additionally, the incentive levels used in several studies reviewed by GDS as well as actual experience with incentive levels in other states confirm that an incentive level assumption of 50% or below is commonly used.[2]

The purpose of this energy efficiency potential study is to provide a foundation for the continuation of utility-administered electric energy efficiency programs in the Consumers Energy service area and to determine the remaining opportunities for cost-effective electric energy efficiency savings for the Consumers Energy service area. This detailed report presents results of the technical, economic, and achievable potential for electric energy efficiency measures in the Consumers Energy service area for two time periods:

- The ten-year period from January 1, 2017 through December 31, 2026
- The twenty-year period from January 1, 2017 through December 31, 2036

All results were developed using customized residential, commercial and industrial sector-level potential assessment analytic models and Consumers Energy-specific cost-effectiveness criteria including the most recent Consumers Energy specific avoided cost projections for electricity. To help inform these energy efficiency potential models, up-to-date energy efficiency measure data were primarily obtained from the following recent studies and reports:

1) 2016 Michigan Energy Measures Database (MEMD)

2) Energy efficiency baseline studies conducted by Consumers Energy

3) 2009 EIA Residential Energy Consumption Survey (RECS)

4) 2012 EIA Commercial Building Energy Consumption Survey (CBECS)[3]

5) 2010 EIA Manufacturing Energy Consumption Survey (MECS)

The above data sources provided valuable information regarding the current saturation, costs, savings and useful lives of electric energy efficiency measures considered in this study.

[2] GDS Associates October 25, 2013 survey of financial incentives used in energy efficiency programs implemented by Consumers Energy, DTE Energy, Ameren-Illinois, Efficiency Maine, Wisconsin Focus on Energy, and Xcel Energy (Minnesota).
[3] This is the latest publicly available CBECS data released by the Energy Information Administration (EIA).

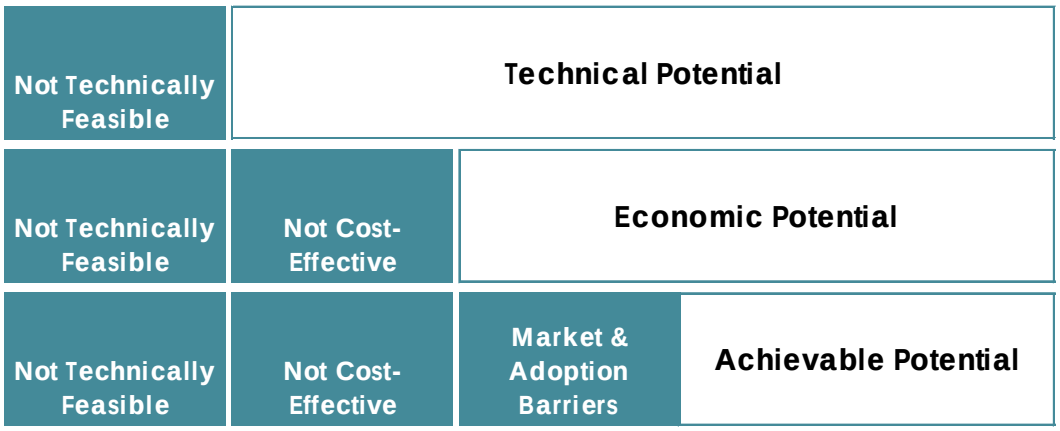
The results of this study provide detailed information on energy efficiency measures that are the most cost-effective and have the greatest potential electric savings for the Consumers Energy service area. The data used for this report were the best available at the time this analysis was developed. As building and appliance codes and energy efficiency standards change, and as energy prices fluctuate, additional opportunities for energy efficiency may occur while current practices may become outdated.

Study Scope

The study examines the potential to reduce electric consumption and peak demand through the implementation of energy efficiency technologies and practices in residential, commercial, and industrial facilities in the Consumers Energy service area. This study assesses electric energy efficiency potential in the Consumers Energy service area over twenty years, from 2017 through 2036.

The main objective of this study was to evaluate the electric energy efficiency technical, economic and achievable potential savings for the Consumers Energy service area, based upon cost-effectiveness screening with the UCT benefit/cost test. As noted above, the scope of this study distinguishes among three types of energy efficiency potential; (1) technical, (2) economic, and (3) achievable potential. Figure 1-1 below provides a graphical representation of the relationship of the various definitions of energy efficiency potential.

Figure 1-1: Types of Energy Efficiency Potential[4]



Limitations to the scope of study: As with any assessment of energy efficiency potential, this study necessarily builds on a large number of assumptions and data sources, including the following:

- Energy efficiency measure lives, measure savings and measure costs
- The discount rate for determining the net present value of future savings
- Projected penetration rates for energy efficiency measures
- Projections of Consumers Energy specific electric avoided costs
- Future changes to current energy efficiency codes and standards for buildings and equipment

While the GDS Team has sought to use the best and most current available data, there are many assumptions where there may be reasonable alternative assumptions that would yield somewhat different results. Furthermore, while the lists of energy efficiency measures examined in this study represent most commercially available measures, these measure lists are not exhaustive.

[4] Reproduced from "Guide to Resource Planning with Energy Efficiency" November 2007. US EPA. Figure 2-1.

With respect to non-energy benefits of energy efficiency programs, GDS did not place a value on reductions in power plant emissions of CO2 or other emissions.

Finally, there was no attempt to place a dollar value on some difficult to quantify benefits arising from installation of some measures, such as increased comfort or increased safety, which may in turn support some personal choices to implement particular measures that may otherwise not be cost-effective or only marginally so.

Summary of Results

This study examined several hundred electric energy efficiency measures in the residential, commercial and industrial sectors combined.

The data in Figure 1-2 below shows that cost-effective electric energy efficiency resources can play a significantly expanded role in Consumers Energy's energy resource mix over the next twenty years. For the Consumers Energy service area overall, the achievable potential for electricity savings based on the UCT cost-effectiveness test screening is 20.5% of forecast kWh sales for 2026, and 20.5% of forecast kWh sales in 2036.

Figure 1-2: Electric Energy Efficiency Potential Savings Summary

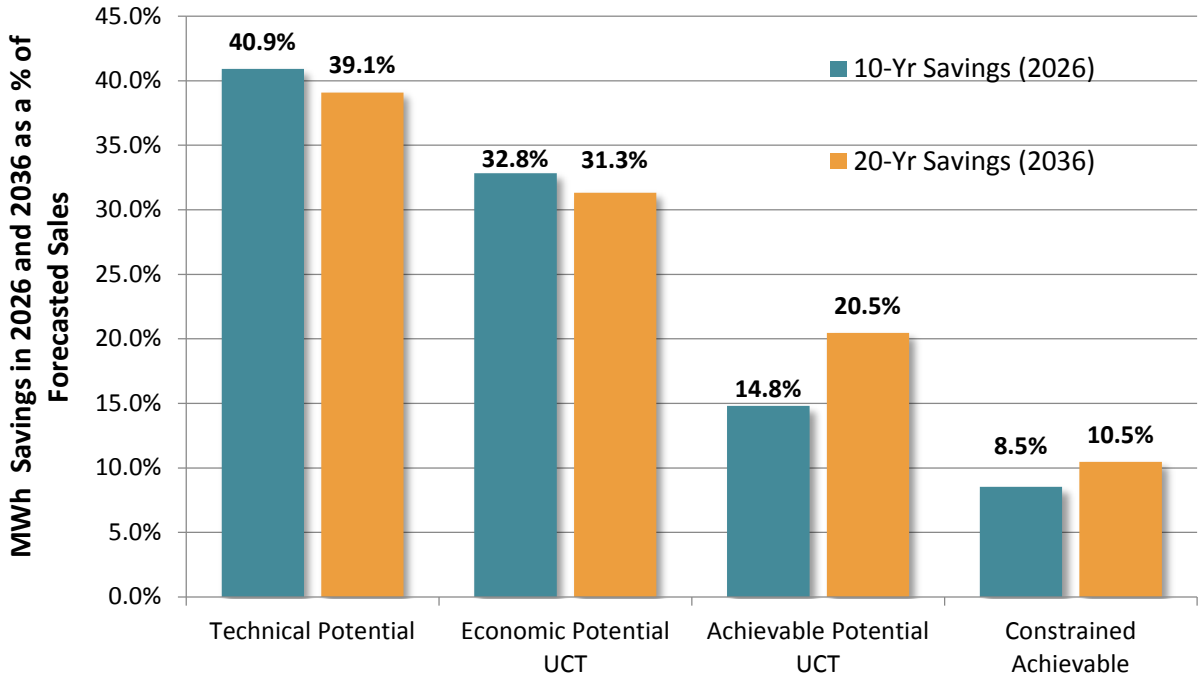


Table 1-1 and Table 1-2 present additional detail, providing the energy efficiency savings potential for all scenarios over a period of and 10 and 20 years, respectively.

Table 1-1: Summary of Technical, Economic and Achievable Electric Energy and Demand Savings for 2026

End Use	Technical Potential	Economic Potential (UCT)	Achievable Potential (UCT)	Constrained Achievable (UCT)
Electric Savings as % of Sales Forecast				
Savings % - Residential	39.8%	34.3%	15.1%	9.3%
Savings % - Commercial	49.2%	42.5%	18.7%	9.8%
Savings % - Industrial	34.2%	22.0%	10.7%	6.5%
Savings % - Total	**40.9%**	**32.8%**	**14.8%**	**8.5%**
Electric MWh Savings				
Savings MWh - Residential	4,950,836	4,261,741	1,880,488	1,152,058
Savings MWh - Commercial	5,435,783	4,699,113	2,070,073	1,087,146
Savings MWh - Industrial	3,966,855	2,553,725	1,240,571	756,346
Savings MWh - Total	**14,353,475**	**11,514,579**	**5,191,133**	**2,995,551**
Electric Summer Peak Savings as % of Summer Peak Demand Forecast				
Savings % - Residential	24.3%	17.8%	7.4%	4.5%
Savings % - Commercial	49.4%	43.5%	17.2%	9.2%
Savings % - Industrial	43.7%	28.1%	13.2%	8.0%
Savings % - Total	**36.1%**	**27.5%**	**11.5%**	**6.7%**
Electric Summer Peak Savings				
Savings MW - Residential	882	649	269	164
Savings MW - Commercial	1,045	919	363	194
Savings MW - Industrial	877	564	264	161
Savings MW - Total	**2,805**	**2,132**	**896**	**520**

Table 1-2: Summary of Technical, Economic and Achievable Electric Energy and Demand Savings for 2036

End Use	Technical Potential	Economic Potential (UCT)	Achievable Potential (UCT)	Constrained Achievable (UCT)
Electric Savings as % of Sales Forecast				
Savings % - Residential	39.6%	33.8%	19.2%	10.7%
Savings % - Commercial	47.2%	40.8%	25.0%	10.5%
Savings % - Industrial	31.2%	20.1%	17.6%	10.1%
Savings % - Total	**39.1%**	**31.3%**	**20.5%**	**10.5%**
Electric MWh Savings				
Savings MWh - Residential	5,274,476	4,510,440	2,561,361	1,431,777
Savings MWh - Commercial	5,444,470	4,706,760	2,886,566	1,216,159
Savings MWh - Industrial	3,966,855	2,553,725	2,236,815	1,286,743
Savings MWh - Total	**14,685,802**	**11,770,925**	**7,684,742**	**3,934,680**
Electric Summer Peak Savings as % of Summer Peak Demand Forecast				
Savings % - Residential	27.0%	19.4%	10.3%	5.8%
Savings % - Commercial	47.6%	41.9%	25.3%	11.0%
Savings % - Industrial	40.5%	26.1%	22.8%	11.6%

End Use	Technical Potential	Economic Potential (UCT)	Achievable Potential (UCT)	Constrained Achievable (UCT)
Savings % - Total	**36.0%**	**27.1%**	**17.6%**	**8.7%**
Electric Summer Peak Savings				
Savings MW - Residential	1,053	757	402	226
Savings MW - Commercial	1,047	921	555	242
Savings MW - Industrial	877	564	494	252
Savings MW - Total	**2,977**	**2,242**	**1,451**	**720**

Table 1.3 provides the projected levelized cost of conserved energy for the two periods of 2017-2026 and 2017-2036. Additionally, this chart contains the first-year and lifetime MWh saved for the two periods. This levelized cost per first-year kWh saved can be used to provide program planners and decision-makers with the expected cost to utilities to acquire the electric savings for the two achievable potential scenarios examined in this report. It is important for program planners and other decision-makers to have a good understanding of the cost to utilities to acquire these levels of energy efficiency savings.

Table 1-3: Levelized Cost of Energy ($/kWh)

	Achievable UCT		Constrained UCT	
Item	First 10-Years 2017-2026	Full 20-Year 2017-2036	First 10-Years 2017-2026	Full 20-Year 2017-2036
First-Year MWh Saved	7,036,385	16,125,842	4,163,035	8,721,716
Lifetime MWh Saved	70,205,272	148,112,654	42,030,470	80,873,318
Levelized Cost of Energy ($/kWh)	$0.0189	$0.0198	$0.0187	$0.0196
Achievable Potential (Cumulative Annual EE Savings) MWh	5,191,133	7,684,742	2,995,551	3,934,680
Average Achievable Potential as a % of Sales	14.8%	20.5%	8.5%	10.5%

Detailed workbooks containing the levelized cost assumptions and data inputs are found in Appendix F: ANNUAL SAVINGS, BUDGETS, & COST OF CONSERVED ENERGY.

The current achievable scenario includes an incentive level of 50% of incentive cost. This selection of the incentive level is consistent with the 2013 Michigan Statewide Study. The 2013 Study states "an incentive level of 50% of measure costs assumed in this study for the three achievable potential scenarios is a reasonable target based on the current financial incentive levels for program participants used by DTE Energy and Consumers Energy for their existing energy efficiency programs." Additionally, the incentive levels used in several studies reviewed by GDS as well as actual experience with incentive levels in other states confirm that an incentive level assumption of 50% or below is commonly used.

Table 1-4 and Table 1-5 present the annual utility budgets in total and by sector required to achieve the electric energy savings levels in each of the two achievable potential scenarios. These tables also present information on the percent of annual utility revenues needed to fund the energy savings levels for each achievable potential scenario.

A 2015 report by the American Council for an Energy Efficient Economy (ACEEE) offers information regarding the current savings and spending related to energy efficiency by state.[5] Based on self-reported data, twelve states annually **spent more than 2%** of electric sales revenue on electric energy efficiency programs in 2014. GDS also examined actual energy efficiency savings data for 2015 from the US Energy Information Administration (EIA) on the top twenty energy efficiency electric utilities. These top twenty utilities saved 5.3% of annual kWh sales in 2015. These percentage savings are attributable to energy efficiency measures installed in a one-year time frame and demonstrate what can be accomplished with full-scale and aggressive implementation of programs.

Table 1-4: Total Electric Energy Efficiency Program Budget Associated with the Achievable UCT Scenario (in millions)

	Residential	Commercial	Industrial	Total Budgets	% of Annual Revenue
2017-2036	$1,309.6	$1,154.5	$536.7	$3,001.1	3.66%

Table 1-5: Total Electric Energy Efficiency Program Budget Associated with the Constrained UCT Scenario (in millions)

	Residential	Commercial	Industrial	Total Budgets	% of Annual Revenue
2017-2036	$771.8	$563.2	$293.1	$1,628.2	2.00%

Energy Efficiency Potential Savings Detail By Sector

Note that Sections 6, 7, and 8 of this report include additional detail about the electric energy efficiency savings potential in the Consumers Energy service area by 2036.

Cost-Effectiveness Findings

This study examines the two achievable potential scenarios presented in this study. This potential study concludes that significant cost-effective electric energy efficiency potential remains in the Consumers Energy service area. Table 1-6 and Table 1-7 show the preliminary present value benefits, costs and benefit-cost ratios for these two scenarios.

Table 1-6: Benefit-Cost Ratios for Achievable Potential Scenarios For 2017 to 2026 Time Period

Benefit-Cost Ratios for 2017 to 2026 Time Period				
Achievable Potential Scenarios	NPV $ Benefits	NPV $ Costs	Benefit/Cost Ratio	Net Benefits
Achievable UCT - Scenario #1	$3,037,918,847	$963,835,628	3.15	$2,074,083,219
Constrained UCT - Scenario #2	$1,774,232,529	$580,096,787	3.06	$1,194,135,742

Table 1-7: Benefit-Cost Ratios for Achievable Potential Scenarios For 2017 to 2036 Time Period

Benefit-Cost Ratios for 2017 to 2036 Time Period				
Achievable Potential Scenarios	NPV $ Benefits	NPV $ Costs	Benefit/Cost Ratio	Net Benefits
Achievable UCT - Scenario #1	$5,505,918,939	$1,532,886,847	3.59	$3,973,032,092
Constrained UCT - Scenario #2	$3,001,303,183	$874,668,203	3.43	$2,126,634,980

[5] American Council for an Energy Efficient Economy, "The 2015 State Energy Efficiency Scorecard", Report #U1509, October 2015.

In addition, GDS did calculate UCT benefit/cost ratios for each individual energy efficiency measure considered in this study. Only measures that had a UCT benefit/cost ratio greater than or equal to 1.0 were retained in the economic and achievable potential savings estimates. Low income-specific measures with a UCT ratio of 0.50 or greater were retained in the residential analysis of economic and achievable potential.

Report Organization

The remainder of this report is organized as follows:

Section 2: Glossary of Terms defines key terminology used in the report.

Section 3: Introduction highlights the purpose of this study and the importance of energy efficiency.

Section 4: Characterization of Electric Energy Consumption provides an overview of Consumers Energy service area and a brief discussion of the historical and forecasted electric energy sales by sector as well as electric peak demand.

Section 5: Potential Study Methodology details the approach used to develop the estimates of technical, economic and achievable potential savings for electric energy efficiency savings.

Section 6: Residential Electric Energy Efficiency Potential Estimates *(2017-2036)* provides a breakdown of the technical, economic, and achievable electric energy efficiency savings potential in the residential sector.

Section 7: Commercial Sector Electric Energy Efficiency Potential Estimates *(2017-2036)* provides a breakdown of the technical, economic, and achievable electric energy efficiency savings potential in the commercial sector.

Section 8: Industrial Sector Electric Energy Efficiency Potential Estimates *(2017-2036)* provides a breakdown of the technical, economic, and achievable electric energy efficiency savings potential in the industrial sector.

2 GLOSSARY OF TERMS

The following list defines many of the key energy efficiency terms used throughout this energy efficiency potential study.

Achievable Potential: The November 2007 National Action Plan for Energy Efficiency "Guide for Conducting Energy Efficiency Potential Studies" defines achievable potential as the amount of energy use that energy efficiency can realistically be expected to displace assuming the most aggressive program scenario possible (*e.g.*, providing end-users with payments for the entire incremental cost of more efficient equipment). This is often referred to as maximum achievable potential. Achievable potential takes into account real-world barriers to convincing end-users to adopt efficiency measures, the non-measure costs of delivering programs (for administration, marketing, tracking systems, monitoring and evaluation, etc.), and the capability of programs and administrators to ramp up program activity over time.

Applicability Factor: The fraction of the applicable housing units or businesses that is technically feasible for conversion to the efficient technology from an engineering perspective (e.g., it may not be possible to install CFLs in all light sockets in a home because the CFLs may not fit in every socket in a home).

Avoided Costs: For purposes of this report, the electric avoided costs are defined as the generation, transmission and distribution costs that can be avoided in the future if the consumption of electricity can be reduced with energy efficiency or demand response programs.

Base Achievable Potential: For purposes of this study, an achievable potential scenario, which assumes incentives are set to 50% of the incremental or full measure cost.

Base Case Equipment End-Use Intensity: The electricity used per customer per year by each base-case technology in each market segment. This is the consumption of the electric energy using equipment that the efficient technology replaces or affects. For example, if the efficient measure is a high efficiency light bulb (CFL), the base end-use intensity would be the annual kWh use per bulb per household associated with a halogen incandescent light bulb that provides equivalent lumens to the CFL.

Base Case Factor: The fraction of the market that is applicable for the efficient technology in a given market segment. For example, for the residential electric clothes washer measure, this would be the fraction of all residential customers that have an electric clothes washer in their household.

Coincidence Factor: The fraction of connected load expected to be "on" and using electricity coincident with the electric system peak period.

Constrained Achievable: An achievable potential scenario that assumes a lower level of incentives or lower annual program budgets than in the base case achievable potential scenario.

Cost-Effectiveness: A measure of the relevant economic effects resulting from the implementation of an energy efficiency measure or program. If the benefits are greater than the costs, the measure is said to be cost-effective.

Cumulative Annual: Refers to the overall annual savings occurring in a given year from both new participants and annual savings continuing to result from past participation with energy efficiency measures that are still in place. Cumulative annual does not always equal the sum of all prior year incremental values as some energy efficiency measures have relatively short lives and, as a result, their savings drop off over time.

Commercial Sector: Comprised of non-manufacturing premises typically used to sell a product or provide a service, where electricity is consumed primarily for lighting, space cooling and heating, office equipment, refrigeration and other end uses. Business types are included in Section 5 – Methodology.

Demand Response: Refers to electric demand resources involving dynamic hourly load response to market conditions, such as curtailment or load control programs.

Early Replacement: Refers to an energy efficiency measure or efficiency program that seeks to encourage the replacement of functional equipment before the end of its operating life with higher-efficiency units.

Economic Potential: The November 2007 National Action Plan for Energy Efficiency "Guide for Conducting Energy Efficiency Potential Studies" refers to the subset of the technical potential that is economically cost-effective as compared to conventional supply-side energy resources as economic potential. Both technical and economic potential ignore market barriers to ensuring actual implementation of efficiency. Finally, they only consider the costs of efficiency measures themselves, ignoring any programmatic costs (e.g., marketing, analysis, administration, evaluation) that would be necessary to capture them.

End-Use: A category of equipment or service that consumes energy (*e.g.*, lighting, refrigeration, heating, process heat, cooling).

Energy Efficiency: Using less energy to provide the same or an improved level of service to the energy consumer in an economically efficient way. Sometimes "conservation" is used as a synonym, but that term is usually taken to mean using less of a resource even if this results in a lower service level (*e.g.*, setting a thermostat lower or reducing lighting levels).

Energy Use Intensity (EUI): A unit of measurement that describes a building's energy use. EUI represents the energy consumed by a building relative to its size.[6]

Free Driver: Individuals or businesses that adopt an energy efficient product or service because of an energy efficiency program, but are difficult to identify either because they do not receive an incentive or are not aware of the program.

Free Rider: Participants in an energy efficiency program who would have adopted an energy efficiency technology or improvement in the absence of a program or financial incentive.

Gross Savings: Gross energy (or demand) savings are the change in energy consumption or demand that results directly from program-promoted actions (e.g., installing energy efficient lighting) taken by program participants regardless of the extent or nature of program influence on their actions.

[6] See http://www.energystar.gov/index.cfm?fuseaction=buildingcontest.eui

Incentive Costs: A rebate or some form of payment used to encourage electricity consumers to implement a given demand-side management (DSM) technology.

Incremental: Savings or costs in a given year associated only with new installations of energy efficiency or demand response measures happening in that specific year.

Industrial Sector: Comprised of manufacturing premises typically used for producing and processing goods, where electricity is consumed primarily for operating motors, process cooling and heating, and space heating, ventilation, and air conditioning (HVAC). Business types are included in section 5 – Methodology.

Maximum (or Max) Achievable: An achievable potential scenario which assumes incentives for program participants are equal to 100% of measure incremental or full costs.

Measure: Any action taken to increase energy efficiency, whether through changes in equipment, changes to a building shell, implementation of control strategies, or changes in consumer behavior. Examples are higher-efficiency central air conditioners, occupancy sensor control of lighting, and retro-commissioning. In some cases, bundles of technologies or practices may be modeled as single measures. For example, an ENERGY STAR® ™ home package may be treated as a single measure.

MMBtu: A measure of power, used in this report to refer to consumption and savings associated with natural gas consuming equipment. One British thermal unit (symbol Btu or sometimes BTU) is a traditional unit of energy equal to about 1055 joules. It is the amount of energy needed to heat one pound of water by one degree Fahrenheit. MMBtu is defined as one million BTUs.

MW: A unit of electrical output, equal to one million watts or one thousand kilowatts. It is typically used to refer to the output of a power plant.

MWh: One thousand kilowatt-hours, or one million watt-hours. One MWh is equal to the use of 1,000,000 watts of power in one hour.

Net-to-Gross Ratio: A factor representing net program savings divided by gross program savings that is applied to gross program impacts to convert them into net program load impacts

Net Savings: Net energy or demand savings refer to the portion of gross savings that is attributable to the program. This involves separating out the impacts that are a result of other influences, such as consumer self-motivation. Given the range of influences on consumers' energy consumption, attributing changes to one cause (i.e., a particular program) or another can be quite complex.

Non Incentive Cost: Costs incurred by the utility that do not include incentives paid to the customer (i.e.: program administrative costs, program marketing costs, data tracking and reporting, program evaluation, etc.)

Nonparticipant Spillover: Savings from efficiency projects implemented by those who did not directly participate in a program, but which nonetheless occurred due to the influence of the program.

Participant Cost: The cost to the participant to participate in an energy efficiency program.

Participant Spillover: Additional energy efficiency actions taken by program participants as a result of program influence, but actions that go beyond those directly subsidized or required by the program.[7]

Portfolio: Either a collection of similar programs addressing the same market, technology, or mechanisms; or the set of all programs conducted by one energy efficiency organization or utility.

Program: A mechanism for encouraging energy efficiency that may be funded by a variety of sources and pursued by a wide range of approaches (typically includes multiple energy efficiency measures).

Program Potential: The November 2007 National Action Plan for Energy Efficiency 'Guide for Conducting Energy Efficiency Potential Studies" refers to the efficiency potential possible given specific program funding levels and designs as program potential. Often, program potential studies are referred to as "achievable" in contrast to "maximum achievable." In effect, they estimate the achievable potential from a given set of programs and funding. Program potential studies can consider scenarios ranging from a single program to a full portfolio of programs. A typical potential study may report a range of results based on different program funding levels.

Remaining Factor: The fraction of applicable units that have not yet been converted to the electric or natural gas energy efficiency measure; that is, one minus the fraction of units that already have the energy efficiency measure installed.

Replace-on-burnout: An energy efficiency measure is not implemented until the existing technology it is replacing fails or burns out. An example would be an energy efficient water heater being purchased after the failure of the existing water heater at the end of its useful life.

Resource Acquisition Costs: The cost of energy savings associated with energy efficiency programs, generally expressed in costs per first year or per lifetime MWH saved ($/MWh), kWh ($/kWh), or MMBtu saved ($/MMBtu) in this report.

Retrofit: Refers to an efficiency measure or efficiency program that seeks to encourage the replacement of functional equipment before the end of its operating life with higher-efficiency units (also called "early retirement") or the installation of additional controls, equipment, or materials in existing facilities for purposes of reducing energy consumption (e.g., increased insulation, low flow devices, lighting occupancy controls, economizer ventilation systems).

Savings Factor: The percentage reduction in electricity or natural gas consumption resulting from application of the efficient technology. The savings factor is used in the formulas to calculate energy efficiency potential.

Societal Cost Test: Measures the net benefits of the energy efficiency program for a region or service area as a whole. Costs included in the SCT are costs to purchase and install the energy efficiency measure and overhead costs of running the energy efficiency program. The SCT may also include non-energy costs, such as reduced customer comfort levels. The benefits included are the avoided costs of energy and capacity, plus environmental and other non-energy benefits that are not currently valued by the market.

[7] The definitions of participant and nonparticipant spillover were obtained from the National Action Plan for Energy Efficiency Report titled "Model Energy Efficiency Program Impact Evaluation Guide", November 2007, page ES-4.

Technical Potential: The theoretical maximum amount of energy use that could be displaced by energy efficiency, disregarding all non-engineering constraints such as cost-effectiveness and the willingness of end-users to adopt the energy efficiency measures

Total Resource Cost Test: The TRC measures the net benefits of the energy efficiency program for a region or service area as a whole from the combined perspective of the utility and program participants. Costs included in the TRC are costs to purchase and install the energy efficiency measure and overhead costs of running the energy efficiency program. Costs include all costs for the utility and the participants. The benefits included are the avoided costs of energy and capacity plus any quantifiable non-energy benefits (such as reduced emissions of carbon dioxide).

Utility Cost Test: The UCT measures the net benefits of the energy efficiency program for a region or service area as a whole from the utility's perspective. Costs included in the UCT are incentives and the utility's costs to design, implement and evaluate a program. The benefits included are the avoided utility costs of energy and capacity.

3 INTRODUCTION

This report assesses the potential for electric energy efficiency programs to assist Consumers Energy in meeting future electric energy service needs. This section of the report provides the following information:

- Defines the term "energy efficiency"
- Describes the general benefits of energy efficiency programs
- Provides results of similar electric energy efficiency potential studies conducted in Michigan and other states

The purpose of this electric energy efficiency potential study is to provide a detailed assessment of the technical, economic and achievable potential for electric energy efficiency measures for the Consumers Energy service area. This study has examined a full array of energy efficiency technologies and energy efficient building practices that are technically achievable. The results of this study can be used as a roadmap to develop energy efficiency goals and programs for Consumers Energy in the short and long-term. The strategies that will be developed based on this potential study can guide the direction and scope of Consumers Energy administered energy efficiency programs in reducing electricity consumption in the Consumers Energy service area.

3.1 INTRODUCTION TO ENERGY EFFICIENCY

Efficient energy use, often referred to as energy efficiency, is using less energy to provide the same level of energy service. An example would be insulating a home or business in order to use less heating and cooling energy to achieve the same inside temperature. Another example would be installing LED lighting in place of less efficient halogen lights to attain the same level of illumination. Energy efficiency can be achieved through more efficient technologies and/or processes as well as through changes in individual behavior.

3.1.1 General Benefits of Energy Efficiency

There are a number of benefits that can accrue to Consumers Energy electric customers due to electric energy efficiency programs. These benefits include avoided cost savings, non-electric benefits such as water and fossil fuel savings, environmental benefits, economic stimulus, job creation, risk reduction, and energy security.

Avoided electric energy and capacity costs are based upon the costs an electric utility would incur to either construct or operate new electric power plants, purchase power from another source or to operate existing power plants. These avoided costs of electricity include both fixed and variable costs that can be directly avoided through a reduction in electricity usage. The energy component includes the costs associated with the production of electricity, while the capacity component includes costs associated with the capability to deliver electric energy during peak load periods. Capacity costs consist primarily of the costs associated with building peaking generation facilities. The forecasts of electric energy and capacity avoided costs and natural gas avoided costs used in this study were provided to GDS by Consumers Energy.

At the consumer level, energy efficient products often cost more than their standard efficiency counterparts, but this additional cost is balanced by lower energy consumption and lower energy bills. Over time, the money saved from energy efficient products will pay consumers back for their initial investment as well as save them money on their electric bills. Although some energy efficient technologies are complex and expensive, such as installing new high efficiency windows or a high

efficiency boiler, many are simple and inexpensive. Installing LED lighting or low-flow water devices, for example, can be done by most individuals.

Although the reduction in electric costs is the primary benefit to electricity consumers to be gained from investments in energy efficiency, Consumers Energy and society as a whole can also benefit in other ways. Many electric efficiency measures also deliver non-energy benefits. For example, low-flow water devices and efficient clothes washers also reduce water consumption.[8] Similarly, weatherization measures that improve the building shell not only save on air conditioning costs in the summer, but also can save the customer money on space heating fuels, such as natural gas or propane. Reducing electricity consumption also reduces harmful emissions from power plants, such as SO_X, NO_X, CO_2 and particulates into the environment.[9]

Energy efficiency programs create both direct and indirect jobs. The manufacture and installation of energy efficiency products involves the manufacturing sector as well as research and development, service, and installation of jobs. These are skilled positions that are not easily outsourced to other states and countries. The creation of indirect jobs is more difficult to quantify, but result from households and businesses experiencing increased discretionary income from reduced energy bills. These savings produce multiplier effects, such as increased investment in other goods and services driving job creation in other markets.

Energy efficiency reduces risks associated with fuel price volatility, unanticipated capital cost increases, environmental regulations, supply shortages, and energy security. Aggressive energy efficiency programs can help eliminate or postpone the risk associated with committing to large investments for generation facilities a decade or more before they are needed. Energy efficiency is also not subject to the same supply and transportation constraints that impact fossil fuels. Finally, energy efficiency reduces competition between states and utilities for fuels, and reduces dependence on fuels imported from other states or countries to support electricity production. Energy efficiency can help meet future demand increases and reduce dependence on out-of-state or overseas resources.

3.2 THE CONSUMERS ENERGY CONTEXT

3.2.1 Slight Increase in MWh Sales for the 2017 to 2036 Time Period

The annual kWh sales and electric system peak load for the Consumers Energy are projected to stay fairly constant over the two decades. The total number of residential electric utility customers in the Consumers Energy service area increased slightly from 1,542,528 in 2004 to 1,577,087 in 2015 (an increase of 34,559 customers). The electric load forecast provided to GDS by Consumers Energy indicates that residential, commercial and industrial MWh sales will increase at an overall rate of 0.6% per year over the next two decades. This report assesses the potential for electric energy efficiency programs to assist Consumers Energy in meeting future electric energy service needs.

[8] As of February 16, 2016, the ENERGY STAR web site (www.energystar.gov) states that "The average American family washes about 300 loads of laundry each year. ENERGY STAR can help families cut their related energy and water costs. ENERGY STAR certified clothes washers use about 25% less energy and 40% less water than regular washers."

[9] The 2014 ENERGY STAR Annual Report states that "In 2014, millions of consumers and 16,000 partners tapped the value of ENERGY STAR and achieved impressive financial and environmental results. Their investments in energy-efficient technologies and practices reduced utility bills by $34 billion and will continue to provide cost savings for years to come. Americans, with the help of ENERGY STAR, prevented more than 300 million metric tons of GHG emissions in 2014 alone — providing over $12 billion in benefits to society due to reducing damages from climate change."

3.2.2 Energy Efficiency Activity

Making homes and buildings more energy efficient is seen as a key strategy for addressing energy security, reducing reliance on fossil fuels from other countries, assisting consumers to lower energy bills, and addressing concerns about climate change. Faced with rapidly increasing energy prices, constraints in energy supply and demand, and energy reliability concerns, states are continuing to turn to energy efficiency programs as a reliable, cost-effective, and quick resource to deploy. Between 1998 and 2010, U.S. spending for electric energy efficiency programs increased fivefold, from approximately $900 million to $4.6 billion. In 2014, total spending for electricity efficiency programs reached nearly $5.7 billion.[10]

3.2.3 Recent Energy Efficiency Potential Studies

Table 3-1 below provides the results from a GDS review of recent, publicly available energy efficiency potential studies conducted throughout the United States. It is useful to examine these results to understand if they are similar to this latest study for Consumers Energy.

Table 3-1: Results of Recent, Publicly Available Energy Efficiency Potential Studies in the US

State	Study Year	Author	Study Period	# of Years	Achievable Potential (Percent of MWh Sales Forecast)
ComEd	2013	ICF International	2013-2018	6	10.0%
New York	2014	Optimal Energy	2015-2030	16	18.0%
Ohio (AEP)-Base Case	2014	American Electric Power	2015-2034	20	24.0%
Pennsylvania	2015	Pennsylvania Statewide Evaluator	2016-2025	10	13.2%
USA	2014	Electric Power Research Institute	2015-2035	21	14.0%

The current achievable scenario includes an incentive level of 50% of incentive cost. This selection of the incentive level is consistent with the 2013 Michigan Statewide Study. The 2013 Study states "an incentive level of 50% of measure costs assumed in this study for the three achievable potential scenarios is a reasonable target based on the current financial incentive levels for program participants used by DTE Energy and Consumers Energy for their existing energy efficiency programs." Additionally, the incentive levels used in several studies reviewed by GDS as well as actual experience with incentive levels in other states confirm that an incentive level assumption of 50% or below is commonly used.[11]

The U.S. Department of Energy maintains an "Energy Efficiency Potential Studies Catalog"[12]. A copy of the catalog is provided in Appendix A. The catalog provides a summary of the energy efficiency potential studies compiled by the US DOE. This U.S. DOE web site reports that "States, utilities, and non-governmental organizations across the country have commissioned analyses over the years to identify potential energy savings (typically for electricity) available within their jurisdictions. These studies can be

[10] American Council for an Energy Efficient Economy, "The 2015 State Energy Efficiency Scorecard", Report #U1509, October 2015, page 22.
[11] GDS Associates October 25, 2013 survey of financial incentives used in energy efficiency programs implemented by Consumers Energy, DTE Energy, Ameren-Illinois, Efficiency Maine, Wisconsin Focus on Energy, and Xcel Energy (Minnesota).
[12] at http://energy.gov/eere/slsc/energy-efficiency-potential-studies-catalog#catalog

used to fulfill a variety of needs, including energy efficiency program planning, state goal setting, utility resource planning, and other priorities."

A 2015 report by the American Council for an Energy Efficient Economy (ACEEE) offers information regarding the current savings and spending related to energy efficiency by state.[13] Based on self-reported data, twelve states annually **spent more than 2%** of electric sales revenue on electric energy efficiency programs in 2014. GDS also examined actual energy efficiency savings data for 2015 from the US Energy Information Administration (EIA) on the top twenty energy efficiency electric utilities. These top twenty utilities saved 5.3% of annual kWh sales in 2015. These percentage savings are attributable to energy efficiency measures installed in a one-year time frame and demonstrate what can be accomplished with full-scale and aggressive implementation of programs.

3.3 COST-EFFECTIVENESS FINDINGS

The UCT calculations in this study follow the prescribed methodology detailed in the latest version of the California Standard Practice Manual (CA SPM). The California Standard Practice Manual establishes standard procedures for cost-effectiveness evaluations for utility-sponsored or public benefits programs and is generally considered to be an authoritative source for defining cost-effectiveness criteria and methodology. This manual is often referenced by many other states and utilities.

The GDS cost-effectiveness screening tool used for this study quantifies all of the benefits and costs included in the UCT test. For purposes of this study, quantified benefits of the UCT Test include electric energy and capacity avoided supply costs. GDS has not included any value for reduced carbon emissions. Costs include all utility costs, any increase in supply costs, as well as any additional operation and maintenance costs. In addition, the GDS screening tool is capable of evaluation of cost-effectiveness based on various market replacement approaches, including replace-on-burnout, retrofit, and early retirement.

The forecast of electric avoided costs of energy and generation capacity was obtained from Consumers Energy.

This energy efficiency potential study concludes that there remains significant achievable cost-effective potential for electric energy efficiency measures and programs in the Consumers Energy service area. Table 3-2 and Table 3-3 present the UCT benefit-cost ratios for the two scenarios examined in this study for the ten and twenty-year implementation periods starting in 2017.

Table 3-2: Scenario #1: Utility Cost Test Benefit-Cost Ratios for the Achievable Potential Scenario Based on UCT Screening (50% Incentives) For 10-Year and 20-Year Implementation Periods

Achievable Potential Scenarios	UCT $ Benefits	UCT $ Costs	UCT Benefit/Cost Ratio
10-yr period	$3,037,918,847	$963,835,628	3.15
20-yr period	$5,505,918,939	$1,532,886,847	3.59

[13] American Council for an Energy Efficient Economy, "The 2015 State Energy Efficiency Scorecard", Report #U1509, October 2015.

Table 3-3: Scenario #2: Utility Cost Test Benefit-Cost Ratios for the Achievable Potential Scenario Based on UCT Screening (50% Incentives) and Constrained Budget (2% of annual Consumers Energy Revenues) For 10-Year and 20-Year Implementation Periods

Achievable Potential Scenarios	UCT $ Benefits	UCT $ Costs	UCT Benefit/Cost Ratio
10-yr period	$1,774,232,529	$580,096,787	3.06
20-yr period	$3,001,303,183	$874,668,203	3.43

4 CHARACTERIZATION OF ELECTRICITY CONSUMPTION IN CONSUMERS ENERGY'S SERVICE TERRITORY

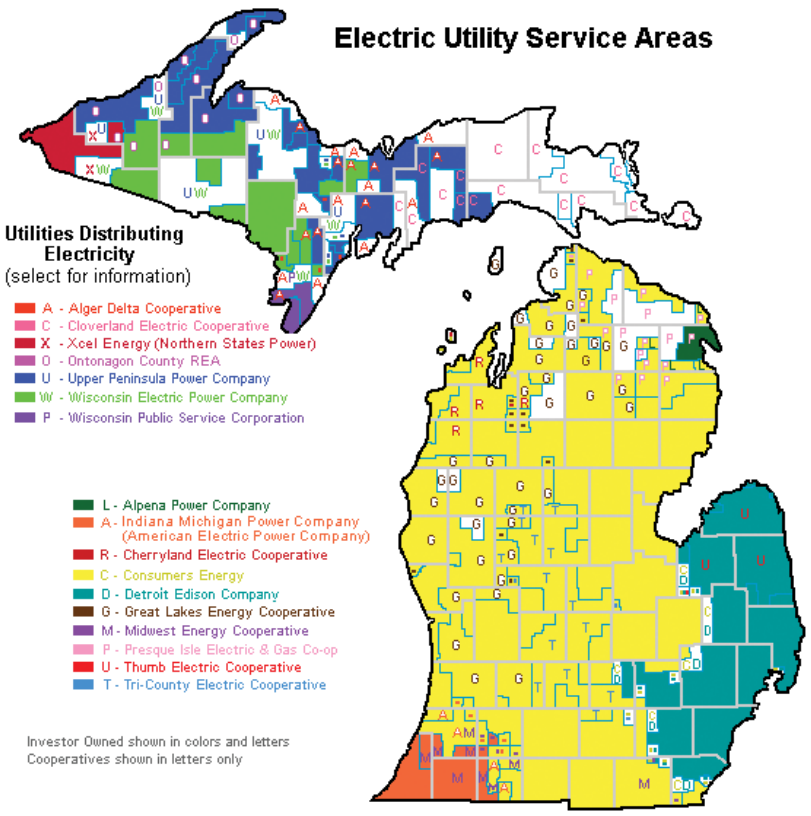
This chapter provides historical and forecast information on electricity consumption, consumption by market segment and by energy end use, and electric customers in Consumers Energy's service territory. This chapter also provides an overview of the number of households and housing units in the Consumers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

4.1 MICHIGAN ELECTRIC UTILITIES

There are multiple utilities that provide electricity to Michigan customers. According to data from the Michigan Public Service Commission, Michigan has 8 investor-owned electric utilities, 41 municipal electric utilities, and 9 rural electric distribution cooperatives. The two largest electric utilities are DTE Energy and Consumers Energy. These two utilities provide approximately 92% of electric energy sales in the state.

Figure 4-1 shows the service areas for electric distribution utilities in Michigan, with the largest two companies, DTE Energy and Consumers Energy taking up much of the geographic region of the state. Note that the size of utility service areas varies greatly.

Figure 4-1: Michigan Electric Utility Service Territories



4.2 RESIDENTIAL, COMMERCIAL AND INDUSTRIAL SECTOR BASELINE SEGMENTATION FINDINGS

This section provides detailed information on the breakdown of Consumers Energy residential, commercial and industrial sector electricity sales by market segment and end use.

4.2.1 Electricity Consumption by Market Segment

Figure 4-3 shows the breakdown of 2015 annual electricity consumption by building type for the Consumers Energy commercial sector. Figure 4-4 shows a similar breakdown of sales by industrial market segment for the industrial sector. The Office market sector (22%) contributed the largest share of commercial electricity consumption in 2015, followed by the Other (20%) category and Retail buildings (15%). In the industrial sector breakdown shown in Figure 4-5, Primary Metals (16% of 2015 annual industrial electricity sales) is the largest sector, followed by Automotive Manufacturing (14%) and Rubber and Plastics (13%). Reviewing and understanding information on Consumers Energy's sales of electricity by commercial and industrial market segment is an important step in the development of the estimates of future energy efficiency savings potential. Figure 4-3 and Figure 4-4 provide the actual 2015 MWh data market segment breakdown for Consumers Energy's commercial and industrial electricity sales.

Figure 4-2: Consumers Energy 2015 Commercial Electricity Consumption (MWH) by Business Type

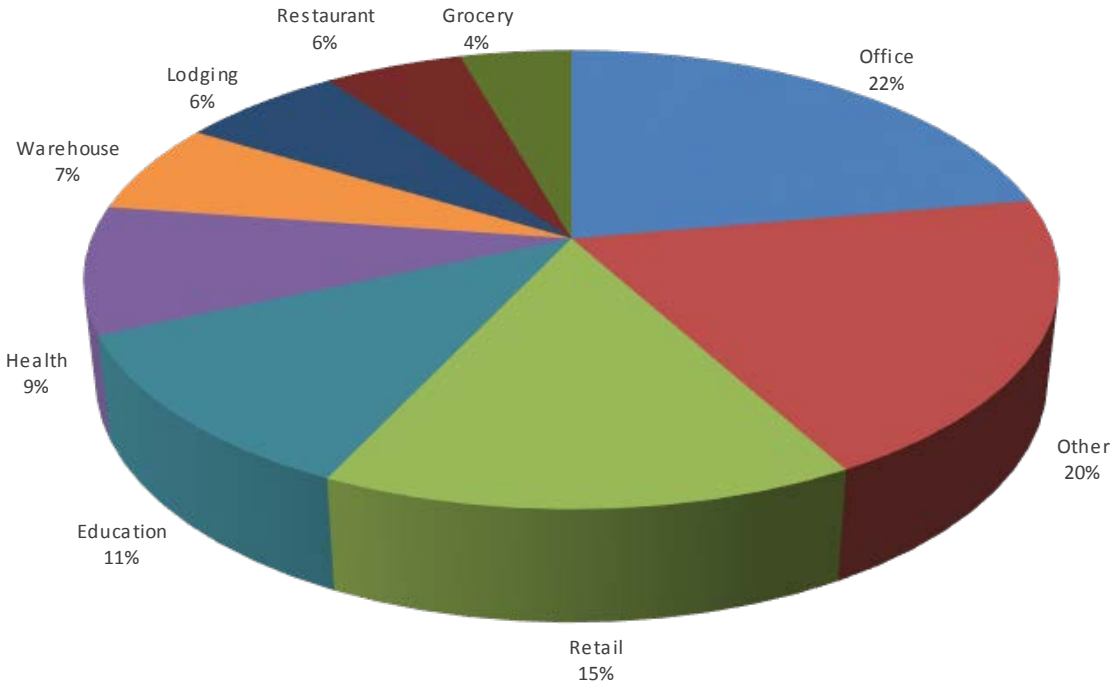


Figure 4-3: Consumers Energy 2015 Industrial Electricity Consumption (MWH) by Industry Type

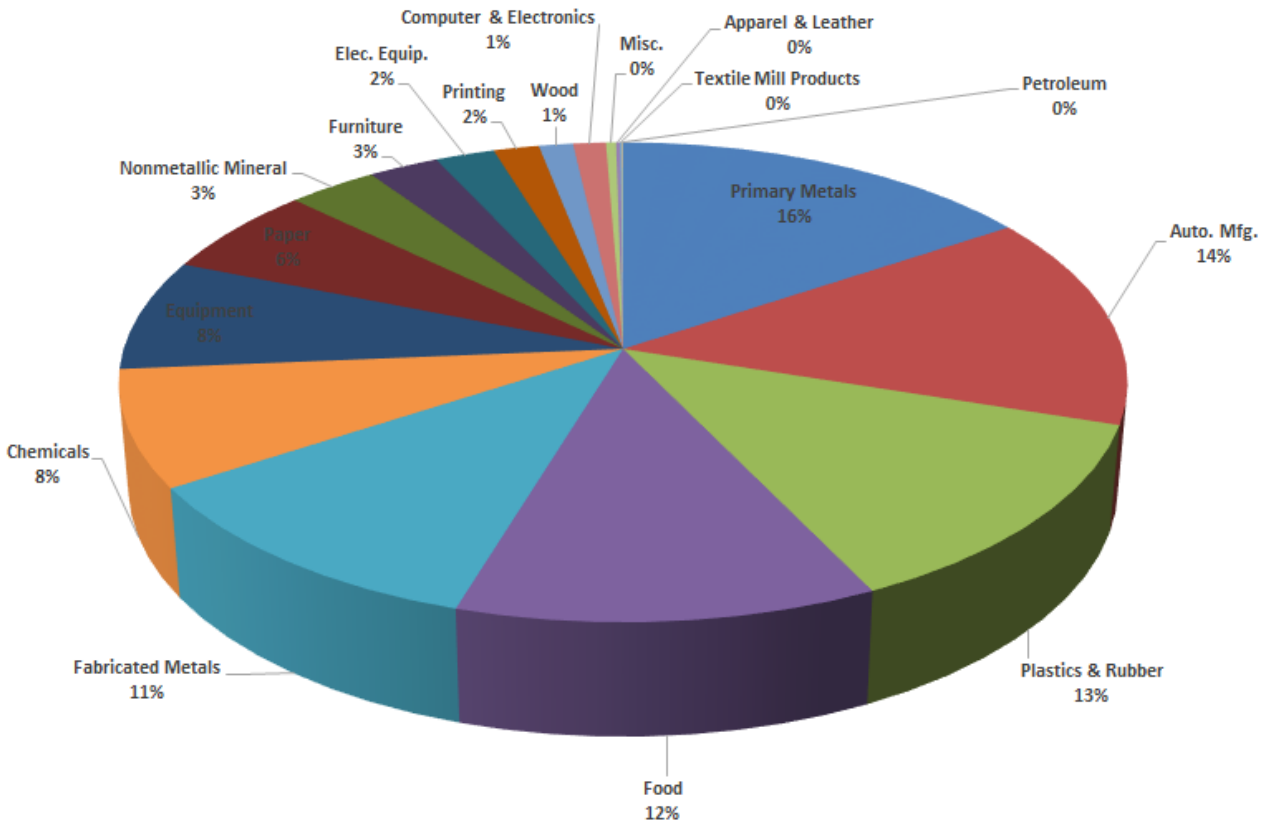


Table 4-1: 2015 Consumers Energy Commercial Sector Electric Energy Consumption by Business Type

Business Type	2015 Consumers Energy Commercial Sector Electricity Consumption (MWh)	Percent of Total Commercial Sector Sales
Office	2,595,355	22%
Other	2,318,216	20%
Retail	1,755,986	15%
Education	1,330,581	11%
Health	1,045,010	9%
Warehouse	751,729	6%
Lodging	751,729	6%
Restaurant	636,715	5%
Grocery	513,457	4%
Total	**11,698,777**	**100%**

Table 4-2: 2015 Consumers Energy Industrial Energy Consumption by Industry Type

Industry Type	2015 Industrial Electricity Consumption (MWh)	Electricity Share
Primary Metals	1,344,162	16%
Auto. Mfg.	1,239,176	14%
Plastics & Rubber	1,100,629	13%
Food	1,022,320	12%
Fabricated Metals	953,477	11%
Chemicals	678,105	8%
Equipment	646,265	8%
Paper	518,044	6%
Nonmetallic Mineral	283,978	3%
Furniture	222,880	3%
Elec. Equip.	187,598	2%
Printing	143,710	2%
Wood	107,567	1%
Computer & Electronics	103,265	1%
Misc.	31,840	0%
Apparel & Leather	13,769	0%
Textile Mill Products	6,024	0%
Petroleum	2,582	0%
Total	**8,605,390**	**100%**

4.2.2 Electric Consumption by End-Use

Table 4-4 shows the breakdown of Consumers Energy 2015 electric energy consumption by commercial building type and end use. The EIA Commercial Building Energy Consumption Survey 2012[14] results released in May 2016 (CBECS) were used to allocate energy consumption results to different end-uses. The 2012 CBECS data shows that energy consumption has shifted significantly since the last CBECS study in 2003. Specifically, lighting represented 40% of commercial energy used in 2003, and now represents only 19%. Refrigeration and Office Equipment/Plug Loads have increased by 5% and 7% respectively. This trend is driven by the installation of many high efficiency lighting products in commercial buildings since 2003.

Table 4-5 and Table 4-6 show the same end-use energy breakdown for the industrial sector by market segment. Lighting, ventilation, and miscellaneous end-uses are the largest end use for the commercial sector, 19%, 16% and 20% respectively. As for the industrial sector, machine drives represent the largest end use, followed by process heating and process cooling.

[14] http://www.eia.gov/consumption/commercial/

Table 4-3: Breakdown of Michigan Commercial Electricity Sales by Building Type and End-Use

	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other	Total
Lighting	30%	20%	8%	17%	13%	17%	6%	17%	18%	19%
Cooling	12%	13%	3%	13%	12%	19%	11%	19%	21%	15%
Ventilation	5%	17%	5%	25%	16%	23%	11%	15%	10%	16%
Water Heating	0%	1%	0%	0%	1%	0%	1%	1%	0%	0%
Refrigeration	17%	27%	69%	3%	11%	6%	41%	9%	6%	14%
Space Heating	1%	2%	2%	2%	2%	1%	1%	2%	3%	2%
Office Equipment	8%	6%	3%	24%	17%	14%	4%	22%	13%	14%
Miscellaneous	27%	14%	10%	16%	28%	21%	24%	15%	29%	20%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Table 4-4: Electric Industrial Energy Consumption by Industry Type and End Use (Table 1 of 2)

	Food	Textile Mill Products	Apparel & Leather	Paper	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral
Conventional Boiler Use	3%	1%	1%	1%	2%	1%	1%	1%	1%
Process Heating	5%	9%	6%	6%	3%	4%	0%	4%	18%
Process Cooling and Refrigeration	28%	6%	4%	1%	1%	5%	5%	8%	11%
Machine Drive	43%	47%	36%	72%	75%	46%	83%	59%	43%
Electro-Chemical Processes	0%	1%	1%	1%	1%	1%	0%	15%	0%
Other Process Use	1%	1%	2%	1%	4%	1%	2%	1%	3%
Facility HVAC (g)	8%	16%	26%	6%	4%	24%	4%	6%	10%
Facility Lighting	8%	15%	16%	8%	4%	9%	3%	4%	8%
Other Facility Support	2%	3%	4%	2%	1%	3%	1%	1%	2%
Onsite Transportation	0%	0%	0%	0%	0%	0%	0%	0%	0%
Other Non-Process Use	0%	0%	0%	1%	0%	1%	0%	0%	0%
End Use Not Reported	2%	1%	4%	2%	4%	4%	2%	1%	2%
Total Industrial	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Table 4-5: Electric Industrial Energy Consumption by Industry Type and End Use (Table 2 of 2)

	Primary Metals	Fabricated Metals	Equipment	Computers & Electronic	Electrical Equipment	Auto Mfg.	Furniture	Misc.
Conventional Boiler Use	0%	0%	1%	1%	1%	1%	1%	1%
Process Heating	32%	21%	11%	10%	15%	11%	5%	11%
Process Cooling and Refrigeration	1%	3%	3%	9%	4%	5%	1%	5%
Machine Drive	28%	41%	40%	23%	37%	36%	47%	30%
Electro-Chemical Processes	26%	3%	0%	2%	5%	2%	1%	5%
Other Process Use	3%	3%	3%	5%	4%	4%	2%	3%
Facility HVAC (g)	4%	9%	20%	30%	15%	19%	18%	25%
Facility Lighting	3%	11%	15%	12%	10%	15%	17%	14%
Other Facility Support	1%	2%	4%	5%	7%	3%	4%	4%
Onsite Transportation	0%	0%	0%	0%	0%	1%	1%	0%
Other Non-Process Use	0%	0%	1%	1%	0%	1%	1%	0%
End Use Not Reported	0%	6%	1%	4%	0%	3%	4%	1%
Total Industrial	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

5 POTENTIAL STUDY METHODOLOGY

This section describes the overall methodology GDS utilized to develop the electric energy efficiency potential study for Consumers Energy. The main objective of this energy efficiency potential study is to quantify the technical, economic and achievable potential for electric energy efficiency savings in the Consumers Energy electric service area. This report provides estimates of the potential kWh and kW electric savings for each level (technical, economic and achievable potential) of energy efficiency potential.

This document describes the general steps and methods that were used at each stage of the analytical process necessary to produce the various estimates of energy efficiency potential. GDS did not examine delivery approaches for energy efficiency programs as this task was not included in the scope of work for this study.

5.1 OVERVIEW OF APPROACH

GDS used a bottom-up approach to estimate energy efficiency potential in the residential sector. Bottom-up approaches begin with characterizing the eligible equipment stock, estimating savings and screening for cost-effectiveness first at the measure level, then summing savings at the end-use and service area levels. In the commercial and industrial sectors, the GDS team utilized a top-down modeling approach to first estimate measure-level savings and costs as well as cost-effectiveness, and then applied cost-effective measure savings to all applicable shares of electric energy load. Further details of the market research and modeling techniques utilized in this assessment are provided in the following sections.

5.2 FORECAST DISAGGREGATION FOR THE COMMERCIAL AND INDUSTRIAL SECTORS

For the commercial sector, the baseline electric energy forecasts for the Consumers Energy service area were disaggregated by combining sales breakdowns by business type provided by Consumers Energy with regional energy estimates by business type available from the U.S. Energy Information Administration (EIA)[15] The forecasts were then further disaggregated by end use based on end use consumption estimates from the Commercial Building Energy Consumption Survey (CBECS). The disaggregated forecast provided the foundation for the development of energy efficiency potential estimates for the commercial sector. The commercial sector, as defined in this analysis, is comprised of the following business segments:

[15] 2012 EIA Commercial Building Energy Consumption Survey (CBECS), East North Central and Midwest Regions.

- Warehouse
- Retail
- Grocery
- Office
- Lodging
- Healthcare
- Restaurant
- Education
- Other

For the industrial sector, the baseline electric forecast was disaggregated by industry type and then by end use. The industry type breakdowns are based on Consumers Energy electric sales by market segment data. Further disaggregation by end use is based on data from the EIA's 2010 Manufacturing Energy Consumption Survey (MECS). The disaggregated forecast data provides the foundation for the development of energy efficiency potential estimates for the industrial sector.

End use electric energy consumption estimates were calculated for the following end use categories for specific manufacturing segments:

- **Indirect Uses – Boilers**
  - Conventional boiler use
- **Direct Uses - Process**
  - Process heating (e.g., kilns, furnaces, ovens, strip heaters)
  - Process cooling & refrigeration
  - Machine drive
  - Electro-chemical processes
  - Other direct process use
- **Direct Uses – Non-process**
  - Facility heating, ventilation and air conditioning
  - Facility lighting
  - Other facility support (e.g., cooking, water heating, office equipment)
- **Other Non-Process Use**

Commercial and industrial baseline energy consumption data were advanced to 2017 and future years based upon the observed historical trend in Consumers Energy's nonresidential consumption and the forecast of electric sales for Consumers Energy's commercial and industrial sectors.

It was not necessary to develop a disaggregated residential sales forecast because a bottom-up approach was used for the residential sector.

5.3 MEASURE LIST ANALYSIS

5.3.1 Measure List Development

Energy efficiency measures considered in the study include measures in the 2016 Michigan Energy Measures Database (MEMD), as well as other energy efficiency measures based on GDS' knowledge and current databases of electric end-use technologies and energy efficiency measures in other jurisdictions. The study includes measures and practices that are currently commercially available as well as emerging technologies. Emerging technology research was focused on measures that are either commercially available but currently not widely accepted, or are not currently available but expected to be commercialized over the analysis timeframe.[16]

[16] For example, an ENERGY STAR criterion was recently established for clothes dryers. High efficiency clothes dryers were included as an emerging technology (these measures are also in the MEMD), even though the commercialization of high efficiency clothes dryers has not become widespread.

In total, GDS analyzed 568 energy efficiency measure types. Many measures required multiple permutations for different applications, such as different building types, efficiency levels, and replacement decision types. GDS developed a total of 4,918 measure permutations for this study, and tested all measures for cost-effectiveness using the Utility Cost Test (UCT). The parameters for cost-effectiveness calculations under the UCT are discussed in detail later in this section of the report. Approximately 79% of the measures had a measure UCT benefit-cost ratio of 1.0 or higher.[17]

Table 5-1: Number of Measures Evaluated

	# of Measures	Total # of Measure Permutations	# with UCT ≥ 1
By Sector			
Residential	131	546	319
Commercial	245	2205	1809
Industrial	192	3456	2790
Total	***568***	***6,207***	***4,918***

A complete listing of the energy efficiency measures included in this study is provided in the Appendices of this report.

5.3.2 Measure Characterization

A significant amount of data is needed to estimate the kWh and kW savings potential for individual energy efficiency measures or programs across the residential and non-residential sectors in the Consumers Energy service area. GDS used Consumers Energy or Michigan-specific data wherever it was available and reflective of recent updates. Considerable effort was expended to identify, review, and document all available data sources.[18] This review has allowed the development of reasonable and supportable assumptions regarding: measure lives; measure costs (incremental or full costs as appropriate); measure electric savings; and saturations for each energy efficiency measure included in the final list of measures examined in this study. This study addresses electric energy efficiency potential, but natural gas savings have been analyzed to the extent that some measures yield both electric and natural gas savings. Only the electric portion of the costs and savings of these measures are addressed in this assessment of electric energy efficiency potential.

Costs and savings for new construction and replace on burnout measures are calculated as the incremental difference between the code minimum equipment and the energy efficiency measure. This approach is utilized because the consumer must select an efficiency level that is at least the code minimum equipment when purchasing new equipment. The incremental cost is calculated as the difference between the cost of high efficiency and standard efficiency (code compliant) equipment. However, for retrofit or direct install measures, the measure cost was considered to be the "full" cost of the measure, as the baseline scenario assumes the consumer would not make energy efficiency improvements in the absence of a program. In general, the savings for retrofit measures are calculated as the difference between the energy use of the removed equipment and the energy use of the new high efficiency equipment (until the removed equipment would have reached the end of its useful life).

[17] The residential included some low income-specific measures with a UCT ratio less than 1.0 in the economic and achievable potential analysis. Low income-specific measures with a UCT ratio of 0.50 or greater were retained in the residential analysis of economic and achievable potential. This approach recognizes that low-income measures and programs may not always be cost-effective, but are offered by utilities to generate savings and address equity concerns.

[18] The appendices and supporting databases to this report provide the data sources used by GDS to obtain up-to-date data on energy efficiency measure costs, savings, useful lives and saturations.

Savings | Estimates of annual measure savings as a percentage of base equipment usage were developed from a variety of sources, including:

- 2016 Michigan Energy Measures Database
- Secondary sources such as the American Council for an Energy-Efficient Economy ("ACEEE"), Department of Energy ("DOE"), Energy Information Administration ("EIA"), ENERGY STAR savings calculators, Air Conditioning Contractors of America ("ACCA") and other technical potential studies and Technical Reference Manuals (TRMs)
- Program evaluations conducted by Consumers Energy

Measure Costs | Measure costs represent either incremental or full costs, and typically also include the incremental cost of measure installation. For purposes of this study, nominal measures costs were held constant over time. This general assumption is being made due to the fact that historically many measure costs (e.g., CFL bulbs, Energy Star appliances, etc.) have declined over time, while some measure costs have increased over time (e.g., fiberglass insulation). One exception to this assumption will be an assumed decrease in costs for light emitting diode (LED) bulbs, and to a lesser extent, compact fluorescent light (CFL) bulbs over the study horizon. LED bulb consumer costs have been declining rapidly over the last several years and future cost projections predict a continued decrease in bulb costs.[19] The GDS team's treatment of LED bulb costs and market penetration are discussed in greater detail in Section 5.3.4, "Review of LED Lighting Assumptions."

When available, GDS obtained measure cost estimates from the MEMD. For measures not in the database, GDS referenced the following data sources:

- Secondary sources such as ACEEE, ENERGY STAR, and other technical potential studies and TRMs
- Retail store pricing (such as web sites of Home Depot and Lowe's) and industry experts
- Consumers Energy program evaluation reports

Measure Life | Represents the number of years that energy-using equipment is expected to operate. Useful life estimates have been obtained from the following data sources:

- MEMD
- Manufacturer data
- Savings calculators and life-cycle cost analyses
- Secondary sources such as ACEEE, ENERGY STAR, and other technical potential studies
- The California Database for Energy Efficient Resources ("DEER") database
- Evaluation reports
- GDS and other consultant research or technical reports

Baseline and Efficient Technology Saturations | In order to assess the amount of electric energy efficiency savings still available, estimates of the current saturation of baseline equipment and energy efficiency measures, or for the non-residential sector the amount of energy use that is associated with a specific end use (such as HVAC) and percent of that energy use that is associated with energy efficient equipment are necessary. Up-to-date measure saturation data were primarily obtained from the following recent studies:

- 2014 Consumers Energy residential appliance saturation and home characteristics study
- 2011 Michigan Residential Baseline Study conducted by the MPSC

[19] 2014 DOE SSL Multi-Year Program Plan & NEEP Residential Lighting Strategy Report.

- Non-Residential Energy efficiency baseline study conducted for Consumers Energy in 2016[20]
- 2011 Michigan Commercial Baseline Study conducted by the MPSC
- 2009 EIA Residential Energy Consumption Survey
- 2007 American Housing Survey
- 2010 EIA Manufacturing Energy Consumption Survey (MECS)
- 2012 EIA Commercial Building Energy Consumption Survey (CBECS)

Further detail regarding the development of measure assumptions for energy efficiency in the residential and non-residential sectors are provided in this report in later sections. Additionally, as noted above, the appendices of the report provide a comprehensive listing of all energy efficiency measure assumptions and data sources.

5.3.3 Treatment of Codes and Standards

Although this analysis does not attempt to predict how energy codes and standards will change over time, the analysis does account for the impacts of several known improvements to federal codes and standards. Although not exhaustive, key adjustments include:

- General Service lighting baselines reflect the minimum efficiency standards and schedule established in the Energy Independence and Security Act of 2007 (EISA 2007). As a result, the baseline efficiency for most general lighting was assumed to be a halogen bulb through May 31, 2020. Beginning in 2021, the analysis reflects the adjustments included in the EISA 2007 backstop provision, and the general service lighting baseline shifts to the CFL bulb. This shift in baseline impacts all bulbs, including those installed prior to 2020.
- The baseline efficiency for air source heat pumps (ASHP) increased to 14 SEER/8.2 HSPF21 in 2015. As the existing stock of ASHPs was estimated to turn over, the baseline efficiency was assumed to be the new federal standard.
- In 2015, the DOE makes amended standards effective for residential water heaters that required updated energy factors (EF) depending on the type of water heater and the rated storage volume. For storage tank water heaters with a volume of 55 gallons or less, the new standard (EF=0.948) becomes essentially the equivalent of today's efficient storage tank water heaters.
- In March 2015, the DOE amended the standards for residential clothes washers. The new standards require the Integrated Modified Energy Factor (MEF) (ft3/kWh/cycle) to meet certain thresholds based on the machine configurations. Version 7.0 of the ENERGY STAR specification took effect in March 2015. These amended federal and ENERGY STAR standards have been factored into the MEMD and have thus been accounted for in the study.
- In January 2015, the DOE amended the standards for residential clothes dryers. The new standards will require the EF (pounds/kWh) to meet certain thresholds based on the machine configurations. Version 1.0 of the ENERGY STAR specification for residential clothes dryers took effect in January 2015. The DOE-amended standards and the ENERGY STAR specification for residential clothes dryers have been factored into the study.
- In line with the phase-in of 2005 EPAct regulations, the baseline efficiency for general service linear fluorescent lamps was moved from the T12 light bulb to a T8 light bulb.

[20] Consumer's Energy 2016 Non-Residential Baseline Study completed by EMI Consulting, January 2016.
[21] SEER: Seasonal Energy Efficiency Ratio; HSPF: Heating Seasonal Performance Factor.

5.3.4 Review of LED Lighting Assumptions

It is important to review the various assumptions that were made throughout this analysis given the emerging market for LEDs and the overall historical importance of lighting to energy efficiency portfolios.

Savings: Screw-in LED bulbs were assumed to replace the current federal code baseline according to the requirements of the EISA 2007 legislation. For the first four years of the analysis (2017 through 2020), LED bulb savings are calculated relative to a halogen incandescent bulb for standard screw-in sockets. For the remaining years of the analysis, the GDS team assumes the CFL bulb becomes the code baseline, and standard screw-in LED savings are calculated against the CFL bulb.[22]

Costs: LED bulb costs are widely projected to decrease significantly over the next two decades. Current estimates project standard LED screw-in bulbs at $4.00 by 2020 and $2.40 by 2030.[23] Similarly, LED reflector bulbs are assumed to decline to $7.00 in 2020 and $5.00 by 2030. Based on these declining projections, as well as the current price of LED bulbs and estimated interim price points, the GDS team developed annual cost projections for standard and reflector screw-in LED bulbs. Table 5-2 shows the annual projections for a standard 60-watt equivalent LED screw-in bulb, a specialty LED bulb, and a 65-watt equivalent LED reflector.

Table 5-2: Price Projections for Residential LED Lighting

Bulb Technology	2017	2018	2019	2020	2025	2030
Standard LED	$7.54	$6.36	$5.18	$4.00	$3.20	$2.40
Specialty LED	$9.60	$8.40	$7.20	$6.00	$5.00	$4.00
LED Reflector	$21.67	$16.78	11.89	$7.00	$6.00	$5.00

Market Acceptance: In an effort to recognize the increasing market adoption of LED bulbs and the increased focus on LED technologies in energy efficiency programs, the GDS' potential analysis also projected an increasing focus on LED screw-in bulb technologies over CFL bulbs. Table 5-3 shows the annual applicability of standard LED vs. CFL bulbs assumed in the residential sector. For example, in 2017, 70% of all assumed efficient screw-in bulb installations will be LED bulbs. As noted above, the screw-in lighting baseline effectively becomes the CFL bulb for standard bulbs in 2020, and all assumed efficient installations shift to LEDs in the following year (and all subsequent years).

Table 5-3: Assumed Annual Applicability of LED Bulbs

Bulb Technology	2017	2018	2019	2020	2021
CFL Bulb	30%	15%	10%	5%	0%
LED Bulb	70%	85%	90%	95%	100%

5.4 POTENTIAL SAVINGS OVERVIEW

Potential studies often distinguish between several types of energy efficiency potential: technical, economic, and achievable. However, because there are often important definitional issues between studies, it is important to understand the definition and scope of each potential estimate as it applies to

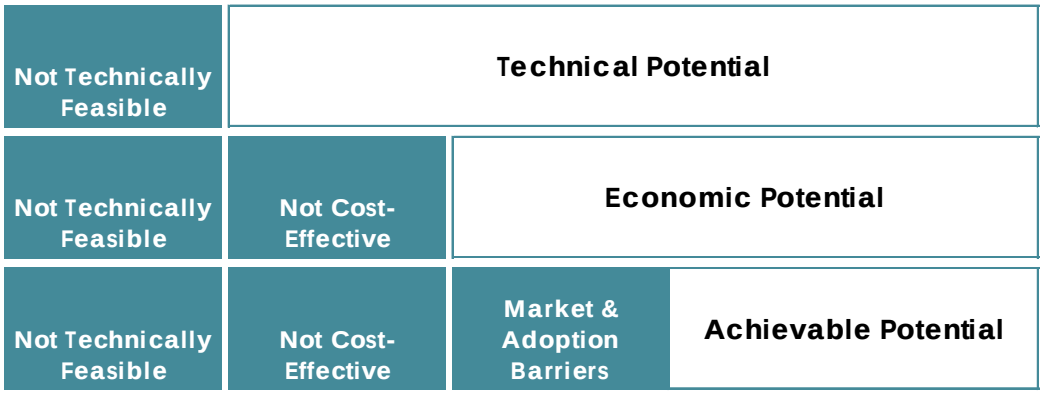
[22] Specialty and reflector LED bulbs are not impacted by the EISA backstop provision in the same manner; the federal baselines for these bulb types were not anticipated to change during the analysis timeframe.

[23] Energy Information Administration. Technology Forecast Updates – Residential and Commercial Building Technologies, Reference Case. The 2014 DOE SSL Multi-Year Program Plan, NEEP Residential Lighting Strategy, and IMS Research (Does LED Lighting Have a Tipping Point?) all estimate the $4.00 LED standard screw-in bulbs price point in 2020.

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

Figure 5-1 illustrates the three most common types of energy efficiency potential.

Figure 5-1: Types of Energy Efficiency Potential[24]



5.5 TECHNICAL POTENTIAL

Technical potential is the theoretical maximum amount of energy use that could be displaced by efficiency, disregarding all non-engineering constraints such as cost-effectiveness and the willingness of end users to adopt the efficiency measures. Technical potential is only constrained by factors such as technical feasibility and applicability of measures. Under technical potential, GDS assumed that 100% of new construction and burnout measures are adopted as those opportunities become available (e.g., as new buildings are constructed they immediately adopt efficiency measures), while retrofit opportunities are replaced incrementally (10% per year) until 100% of homes (residential) and stock (commercial and industrial) are converted to the efficient measures over a period of 10 years. [25]

In instances where technical reasons do not permit the installation of the efficient equipment in all eligible households or nonresidential facilities an applicability factor is used to limit the potential. The alternative technologies are then utilized to meet the remaining market potential. The applicability factor was also used to delineate between two (or more) competing technologies for the same electrical end use. In the technical potential estimate, priority was given to measures that produced the most savings.[26]

In developing the overall potential electricity savings, the analysis also accounts for the interactive effects of measures designed to impact the same end-use. For instance, if a home or business were to install energy efficient heating and cooling equipment, the overall space heating and cooling consumption in that home would decrease. As a result, the remaining potential for energy savings derived from duct sealing or other building shell equipment would be reduced.

[24] Reproduced from "Guide to Resource Planning with Energy Efficiency" November 2007. US EPA. Figure 2-1.
[25] Low-income direct install measures were assumed to occur at a rate of 5% annually over the entire 20-year study timeframe.
[26] For estimates of economic and achievable potential, priority was generally assigned to measures that were found to be most cost-effective, according to the UCT Test.

5.5.1 Core Equation for the Residential Sector

The core equation used in the residential sector energy efficiency technical potential analysis for each individual efficiency measure is shown below.

Equation 5-1: Core Equation for Residential Sector Technical Potential

Where:

- **Total Number of Households** = the number of households in the market segment (e.g. the number of households living in detached single-family buildings)
- **Base Case Equipment End-use Intensity** = the electricity used per customer per year by each base-case technology in each market segment. In other words, the base case equipment end-use intensity is the consumption of the electrical energy using equipment that the efficient technology replaces or affects.
- **Saturation Share** = this variable has two parts: the first is the fraction of the end-use electrical energy that is applicable for the efficient technology in a given market segment. For example, for residential water heating, the saturation share would be the fraction of all residential electric customers that have electric water heating in their household; the second is the share of market for a given end-use (i.e. Electric water heating) that is applicable for the efficient technology that has not yet been converted to an efficient technology.
- **Applicability Factor** = the fraction of the applicable units that is technically feasible for conversion to the most efficient available technology from an engineering perspective (e.g., it may not be possible to install CFLs in all light sockets in a home because the CFLs may not fit in every socket).[27]
- **Savings Factor** = the percentage reduction in electricity consumption resulting from the application of the efficient technology.

5.5.2 Core Equation for the Commercial Sector

The core equation utilized in the commercial sector technical potential analysis for each individual efficiency measure is shown below.

Equation 5-2: Core Equation for Commercial Sector Technical Potential

Where:

- **Total end-use kWh sales by commercial sector and by building type** = the forecasted electric sales level for a given end use (e.g., space heating) in a commercial market segment (e.g., office buildings, wholesale or retail facilities, etc.).

[27] In instances where there are two (or more) competing technologies for the same electrical end use, such as heat pump water heaters, water heater efficiency measures, high-efficiency electric storage water heaters and solar water heating systems, an applicability factor aids in determining the proportion of the available population assigned to each measure. In estimating the technical potential, measures with the most savings are given priority for installation. For all other types of potential, measures with the greatest UCT ratio are assigned installation priority.

- **Base Case factor** = the fraction of end-use energy applicable for the efficient technology in a given commercial sector type. For example, with fluorescent lighting, this would be the fraction of all lighting kWh in a given commercial building type that is associated with fluorescent fixtures.
- **Remaining factor** = the fraction of applicable kWh sales associated with equipment not yet converted to the electric energy efficiency measure; that is, one minus the fraction of the industry type with energy efficiency measures already installed.
- **Convertible factor** = the fraction of the equipment or practice that is technically feasible for conversion to the efficient technology from an engineering perspective (e.g., it may not be possible to install variable-frequency drives (VFDs) on all motors.
- **Savings factor** = the fraction of electric consumption reduced by application of the efficient technology.

5.5.3 Core Equation for the Industrial Sector

Estimating energy efficiency potential for the industrial sector can be more challenging than it is for the residential and commercial sectors because of the significant differences in the way energy is used across manufacturing industries (or market segments). The auto industry uses energy in a very different manner than does a plastics manufacturer. Further, even within a particular industrial segment, energy use is influenced by the particular processes utilized, past investments in energy efficiency, the age of the facility, and the corporate operating philosophy.

Recognizing the variability of energy use across industry types and the significance of process energy use in the industrial sector, GDS employed a top-down approach that constructed an energy profile based on local economic data, national energy consumption surveys and any available Michigan studies related to industrial energy consumption.

The core equation for estimating technical potential in the industrial sector analysis for each measure is provided below:

Equation 5-3: Core Equation for Industrial Sector Technical Potential

Where:

- **Total end-use sales by industry type** = the forecasted electric sales level for a given end use (e.g., space heating) by industrial industry type (e.g., fabricated metals, automobile manufacturing, paper and allied products, etc.).
- **Base Case factor** = the fraction of end-use energy applicable for the efficient technology in a given industry type. For example, with fluorescent lighting, this would be the fraction of all lighting kWh in a given industry type that is associated with fluorescent fixtures.
- **Remaining factor** = the fraction of applicable sales associated with equipment not yet converted to the electric energy-efficiency measure; that is, one minus the fraction of the industry type with energy-efficiency measures already installed.
- **Convertible factor** = the fraction of the equipment or practice that is technically feasible for conversion to the efficient technology from an engineering perspective (e.g., it may not be possible to install variable-frequency drives (VFDs) on all motors).
- **Savings factor** = the fraction of energy consumption reduced by application of the efficient technology.

5.6 ECONOMIC POTENTIAL

Economic potential refers to the subset of the technical potential that is economically cost-effective (based on screening with the UCT Test) as compared to conventional supply-side energy resources. GDS has calculated the benefit/cost ratios for this study according to the cost-effectiveness test definitions provided in the November 2008 National Action Plan for Energy Efficiency (NAPEE) guide titled "Understanding Cost-Effectiveness of Energy Efficiency Programs". Both technical and economic potential ignore market barriers to ensuring actual implementation of energy efficiency. *Finally, they typically only consider the costs of efficiency measures themselves, ignoring any programmatic costs (e.g., marketing, analysis, administration, program evaluation, etc.) that would be necessary to capture them*.

Furthermore, all measures that were not found to be cost-effective based on the results of the measure-level cost-effectiveness screening were excluded from the economic and achievable potential. Then allocation factors were re-adjusted and applied to the remaining measures that were cost-effective

5.6.1 Utility Cost Test

The UCT examines the costs and benefits of an energy efficiency program from the perspective of the entity implementing the program (utility, government agency, nonprofit, or other third party). GDS set incentives at 50% of measure costs when calculating the UCT. When conducting screening at the measure level, GDS only included utility incentive costs. For achievable potential, GDS included all costs incurred by the utility, including all other non-incentive costs. Overhead costs include the utility's administration, marketing, research and development, evaluation, and measurement and verification costs. Incentive costs are payments made to the utility's customers to offset purchase or installations costs. The benefits from the utility perspective are the savings derived from not delivering the energy to customers. Depending on the jurisdiction and type of utility, the "avoided costs" can include avoided or reduced wholesale electricity purchases, generation costs, power plant construction, transmission and distribution facilities, ancillary service and system operating costs, and other components.

Table 5-4 shows the key assumptions used by GDS in the development of the economic and achievable potential estimates based upon cost-effectiveness screening using the UCT:

Table 5-4: Key Assumptions Used by GDS in the Development of Measure-Level Screening

Key Assumption	Used in UCT Screening
Utility weighted average cost of capital for the discount rate	Yes
Forecasts of electric energy and capacity avoided costs provided to GDS by Consumers Energy	Yes
Forecast of avoided transmission and distribution costs	Yes
Average line losses provided by Consumers Energy	Yes
MISO planning reserve margin	Yes
Electricity and natural gas savings benefits both valued in the cost-effectiveness test for electric or natural gas energy efficiency programs	Yes
Value of avoided bulb purchases for high efficiency light bulbs	No
Water savings where applicable	No

Key Assumption	Used in UCT Screening
Tax credits	No
Non-energy benefits	No

Based on discussions with Consumers Energy, GDS has used average line losses to adjust kWh and kW savings at the customer meter to the generation level of the electric grid. Consumers Energy recognizes that in theory it would be appropriate to use marginal line losses instead of average line losses for this adjustment of savings. Because no studies or data exist at Consumers Energy relating to marginal line losses on the Consumers Energy electric grid, the study Team decided to use average line losses.

5.6.2 Financial Incentives for Program Participants

There are several reasons why an incentive level of 50% of measure costs (and not 100% of measure costs) was assumed for the two achievable potential scenarios examined for this study:

1) First, an incentive level of 50% of measure costs assumed in this study for the two achievable potential scenarios is a reasonable target based on the current financial incentive levels for program participants used by Consumers Energy for their existing energy efficiency programs.

2) Second, GDS has reviewed other energy efficiency potential studies conducted in the US. The incentive levels used in several studies reviewed by GDS as well as actual experience with incentive levels in other states confirm that an incentive level assumption of 50% or below is commonly used.[28] It is interesting to note that the majority of energy efficiency programs offered by NYSERDA offer no incentives to consumers.

3) Third, and most important, the highly recognized 2004 National Energy Efficiency Best Practices Study concluded that use of an incentive level of 100% of measure costs is not recommended as a program strategy.[29] This national best practices study concluded that it is very important to limit incentives to participants so that they do not exceed a pre-determined portion of average or customer-specific incremental cost estimates. The report states that this step is critical to avoid grossly overpaying for energy savings. This best practices report also notes that if incentives are set too high, free-ridership problems will increase significantly. Free riders dilute the market impact of program dollars.

4) Fourth, financial incentives are only one of many important programmatic marketing tools. Program designs and program logic models also need to make use of other education, training and marketing tools to maximize consumer awareness and understanding of energy efficient products. A program manager can ramp up or down expenditures for the mix of marketing tools to maximize program participation and savings. The February 2010 National Action Plan for Energy Efficiency Report titled "Customer Incentives for Energy Efficiency Through Program Offerings" states on page 1 that "Incentives can be used in conjunction with other program strategies to achieve market transformation, whereby there is a lasting change in the availability and demand for energy-efficient goods and services." On page 11 of this report it is stated that "Well-designed incentives address the key market barriers in the target market. Financial incentives are designed to be just high enough to gain the desired level of program participation. In some cases, financial incentives can be bundled

[28] GDS October 25, 2013 survey of financial incentives used in energy efficiency programs implemented by Consumers Energy, Consumers Energy, Ameren-Illinois, Efficiency Maine, Wisconsin Focus on Energy, and Xcel Energy (Minnesota).
[29] See "National Energy Efficiency Best Practices Study, Volume NR5, Non-Residential Large Comprehensive Incentive Programs Best Practices Report", prepared by Quantum Consulting for Pacific Gas and Electric Company, December 2004, page NR5-51.

with financing, information, or technical services to reach program participation and energy savings goals at lower total program cost than using financial incentives alone."

5.7 ACHIEVABLE POTENTIAL

Achievable potential was determined as the amount of energy and demand that can realistically be saved assuming an aggressive program marketing strategy and with three scenarios. Achievable potential takes into account barriers that hinder consumer adoption of energy efficiency measures such as financial, political and regulatory barriers, and the capability of programs and administrators to ramp up activity over time. This potential study evaluates three achievable potential scenarios:

1) **Scenario #1**: For the first scenario, achievable potential represents the amount of energy use that efficiency can realistically be expected to displace assuming incentives equal to 50% of the incremental measure cost and no spending cap. Cost-effectiveness of measures was determined with the UCT. The long-term market penetration for Scenario #1 was estimated based on the utilities paying incentives equal to 50% of measure costs. Year-by-year estimates of achievable potential for the period 2017 to 2036 were estimated by applying market penetration curves to this long-term penetration rate estimate. In general, these curves were developed based on willingness to pay data collected through survey research. Although this simplifies what an adoption curve would look like in practice, it succeeds in providing a concise method for estimating achievable savings potential over a specified period of time.

2) **Scenario #2**: The second scenario is a subset of Achievable Scenario #1 (based on UCT screening). While scenario #1 assumed no spending cap on efficiency measures, Achievable Scenario #2 assumed a spending cap of approximately 2% of utility revenues. Revenues are apportioned across each customer sector to prevent cross-subsidization of energy efficiency savings. GDS has not attempted to define specific program plans. Instead the market adoption assumptions from Achievable Scenario #1 have been scaled down to fit within the spending parameters.

While many different incentive scenarios could be modeled, the number of achievable potential scenarios that could be developed was limited to two scenarios due to the available budget for this potential study[30].

For new construction, energy efficiency measures can be implemented when each new home or building is constructed, thus the rate of availability will be a direct function of the rate of new construction. For existing buildings, energy efficiency potential in the existing stock of buildings will be captured over time through two principal processes:

1) As equipment replacements are made normally in the market when a piece of equipment is at the end of its effective useful life (referred to as "replace-on-burnout" or "turnover" vintage).
2) At any time in the life of the equipment or building (referred to as "retrofit" or "early replacement" vintage).

For the replace-on-burnout measures, the opportunity to replace existing equipment with high efficiency equipment is when equipment fails beyond repair or if the consumer is in the process of building or remodeling. Using this approach, only equipment that needs to be replaced in a given year will be eligible to be upgraded to energy efficient equipment.

[30] Neither of the two scenarios is considered a "maximum" achievable scenario. Maximum achievable scenarios assume 100% incentives. The two achievable potential scenarios included in the report assume 50% incentives. This approach approximates the level incentives currently offered by Consumers Energy.

For the retrofit measures, savings can theoretically be captured at any time; however, in practice, it takes many years to retrofit an entire stock of buildings, even with the most aggressive of energy efficiency programs.

5.7.1 Market Penetration Methodology

GDS assessed achievable potential on a measure-by-measure basis. In addition to accounting for the natural replacement cycle of equipment in the achievable potential scenario, GDS estimated measure specific maximum adoption rates that reflect the presence of possible market barriers and associated difficulties in achieving the 100% market adoption assumed in the technical and economic scenarios. The methodology utilized to forecast participation within each customer sector is described below.

5.7.1.1 Residential

The initial step in the market penetration methodology was to assess the long-term market adoption potential for residential energy efficiency technologies. As noted earlier in the report, there are approximately 550 residential measures included in this study. Due to the wide variety of measures across multiple end-uses, GDS employed varied measure and end-use-specific ultimate adoption rates versus a singular universal market adoption curve. These long-term market adoption estimates were based on publicly available DSM research including market adoption rate surveys and other utility program benchmarking.[31] GDS relied on one additional source for this study compared to the 2013 study.[32] This added reference point strengthened the market adoption estimates while also affirming that the estimates used in the 2013 study were reasonable. GDS also acknowledges that estimating future market adoption of energy efficient technologies is a difficult and uncertain practice, and that reliance on additional studies and alternate methods could produce different estimates of achievable potential.

Once the long-term market adoption rate was determined, GDS estimated initial year adoption rates by calibrating the estimates of 2017 annual potential to recent historical levels achieved by Consumers Energy's Energy Optimization portfolio. This calibration effort ensures that the forecasted achievable potential in 2017 is realistic and attainable. GDS then assumed a linear ramp rate over 10 years from the initial year market adoption rate to the various long-term market adoption rates for each specific end-use. Table 5-5 below provides the maximum market adoption rates used for the residential sector in the achievable potential scenarios.

Table 5-5: Market Adoption Rates (based on 50% incentives) by End Use – Residential Sector

End Use	Initial Year Adoption Rate	Ultimate Adoption Rate
Lighting	50%	50%
Appliances	14%	55%
Electronics	14%	70%
Water Heating	14%	50%
HVAC Shell	14%	40%
HVAC Equipment	14%	50%
Miscellaneous	14%	50%
Cross-Cutting	30%	50%

[31] Massachusetts Multifamily Market Characterization and Potential Study Volume I. May 2012. Cadmus Group. Appliance Recycling Program Process Evaluation and Market Characterization. Volume I. CALMAC Study ID# SCE0337.01. September 2012. Cadmus.
[32] 2014 Pennsylvania Statewide Act 129 Residential Baseline Study - April 2014. Submitted by GDS Associates Inc. in partnership with Nexant Inc., Research Into Action, and Apex Analytics.

End Use	Initial Year Adoption Rate	Ultimate Adoption Rate
Low Income	80%	80%

For the lighting end-use, the initial year adoption rate is set equal to the ultimate adoption rate. This recognizes the high penetration of efficient lighting in the Consumers Energy service territory. The lack of growth in the adoption rate for lighting recognizes that this is a mature market and not likely to increase market share over time, though significant savings can still be achieved by continuing to offer lighting programs. The low-income sector is assumed to have an initial year adoption rate of 80% which is equal to the ultimate adoption rate. The high starting point recognizes that participation should be expected to be high with 100% incentives being offered for low-income measures. The overall penetration of low-income measures is constrained to the extent that it is assumed that it will take 20 years to reach all of the customers in this sector.

One caveat to this approach is that the ultimate long-term adoption rate is generally a simple function of incentive levels and payback. There are many other possible elements that may influence a customer's willingness to purchase an energy efficiency measure. For example, increased marketing and education programs can have a critical impact on the success of energy efficiency programs. Additionally, other perceived measure benefits, such as increased comfort or safety as well as reduced maintenance costs could also factor into a customer's decision to purchase and install energy efficiency measures. Although these additional elements are not explicitly accounted for under this incentive/payback analysis, the estimated adoption rates and penetration curves provide a concise method for estimating achievable savings potential over a specified period of time.

5.7.1.2 Non-Residential

The non-residential approach for estimating market adoption rates is very similar to the residential sector approach. GDS employed varied, measures-specific maximum adoption rates versus a singular universal market adoption curve. These long-term market adoption estimates were based on the following survey results reported in the 2010 DTE Electric and Natural Gas Potential Study.[33] The study results were used for the 2013 Michigan Statewide study regarding adoption factors. The study reported the adoption factors by end-use shown in Table 5-6 below.

Table 5-6: Adoption Factors by Equipment and Incentive Level

Equipment Type	50%	75%	100%
Lighting	66%	70%	75%
AC / HVAC	63%	68%	74%
Motors	69%	73%	77%
Variable Speed	66%	67%	69%
Refrigeration	65%	71%	76%
Energy Mgmt. System	59%	67%	74%
Food Service	66%	69%	73%
Process Measures	65%	67%	69%
Water Heating	67%	74%	80%
Overall	**65%**	**69%**	**74%**

[33] Assessment of Nonresidential Electric and Natural Gas Energy Efficiency Potential (2010–2029), Prepared for Consumers Energy by The Cadmus Group, Inc.

GDS used the data shown above to estimate long term market penetration for commercial and industrial (process) measures based on the assumed incentive level stated as a percent of incremental cost.

GDS assumed two different paths to achieving long term market penetration, one for full cost measures such as insulation and another for incremental cost measures such as energy efficient fluorescent lighting. The participation for the maximum achievable cost-effective savings was allocated equally at 5% per year across the full twenty years for replace on burnout/new construction incremental cost measures. The retrofit measures, in keeping with the rate of participant achievement of the previous study, were allocated at 10% per year for the first ten years of the study.

As with the residential approach, the non-residential market penetration methodology uses the relationship between incentives and program participation as a concise quantitative method for estimating achievable savings potential over a specified period of time. While there are many other elements that may influence a business customer's willingness to install an energy efficiency measure, such as access to capital, corporate policy or reduced maintenance costs, these factors are difficult to quantify and fit into a forecasting approach.

6 RESIDENTIAL ELECTRIC ENERGY EFFICIENCY POTENTIAL ESTIMATES

This section provides electric energy efficiency potential estimates for the residential sector in Consumers Energy's service area. Estimates of technical, economic and achievable potential are provided.

According to 2015 historical sales data, the residential sector accounts for approximately 88% of total customers and 38% of total annual electric energy sales. The average Consumers Energy residential consumer uses approximately 7,900 kWh per year. From 2004-2014, the levels of residential sector sales and total customers have been stable. This analysis assumes residential MWh sales will continue to be fairly stable with some moderate growth across the 2017-2036 timeframe. The residential electric potential calculations are based upon these approximate consumption values and sales forecast figures over the time horizon covered by the study. The potential is calculated for the entire residential sector and includes breakdowns of the potential associated with each end use.

6.1 RESIDENTIAL ENERGY EFFICIENCY MEASURES EXAMINED

For the residential sector, there were 546 total electric savings measures included in the potential energy savings analysis[34]. Table 6-1 provides a brief description of the types of measures included for each end use in the residential model. The list of measures was developed based on a review of the MEMD and measures found in other residential potential studies and TRMs from the Midwest. Measure data includes incremental costs, electric energy and demand savings, natural gas savings, and measure life.

Table 6-1: Measures and Programs Included in the Electric Residential Sector Analysis

End Use Type	End Use Description	Measures Included
HVAC Envelope	Building envelope upgrades	– Air/duct sealing – Duct insulation and duct sealing – Improved insulation – Efficient windows – Window film – Cool roofs
HVAC Equipment	Heating/cooling/ventilation equipment	– Existing central AC tune-up – Efficient air-source heat pump – Dual fuel heat pumps – Geothermal heat pumps – Ductless mini-split systems – Efficient central AC systems – Programmable thermostats – Efficient room air conditioners – Room air conditioner recycling – Efficient chillers – Chiller controls – Efficient furnace fans

[34] This total represents the number of unique electric energy efficiency measures and all permutations of these unique measures. For example, there are 16 permutations of the ENERGY STAR Clothes Washer measure to account for the various housing types, water heating type and presence and fuel type of dryers.

End Use Type	End Use Description	Measures Included
Water Heating	Domestic hot water	– Heat pump water heater – Solar water heater – Low flow showerhead/faucet aerator – Gravity film heat exchangers – Pipe wrap – Restriction valves (ShowerStart / TubSpout)
Lighting	Interior/exterior lighting	– Specialty CFLs – Standard CFLs – Standard LED bulbs – Specialty LED bulbs – Efficient fluorescent tube lighting – LED night lights – Occupancy sensors
Appliances	High-efficiency appliances / retirement of inefficient appliances	– ENERGY STAR clothes washers – ENERGY STAR refrigerator – ENERGY STAR freezers – ENERGY STAR dishwashers – ENERGY STAR dehumidifiers – ENERGY STAR dryers – Secondary refrigerator/freezer recycling – Dehumidifier recycling
Electronics	High efficiency consumer electronics	– Controlled power strips – Efficient set-top boxes – ENERGY STAR desktops – Efficient laptops – Efficient televisions – LCD Monitors
Behavioral	Consumer response to feedback from utility and smartphone applications	– Home energy reports – Mobile applications
Other	Efficient pool equipment	– Efficient pool pump motors

6.2 RESIDENTIAL SECTOR RESULTS

This section presents estimates for electric technical, economic, and achievable potential for the residential sector. Each of the tables in the technical, economic and achievable sections present the respective potential for efficiency savings expressed as cumulative annual energy savings (MWh), percentage of savings by end use, and savings as a percentage of forecast sales. Data is provided on a 10-year and 20-year time horizon.

This energy efficiency potential study considers the impacts of the Energy and Independence and Security Act (EISA) as an improving code standard for the residential sector. The EISA improves the baseline efficiency of several types of lighting products, including CFL or LED bulbs. Other known increases to federal minimum efficiency standards over the time period studied have also been accounted for in the analysis. These included changes to the efficiency standards central air conditioners, electric water heaters, and appliances.

There are a variety of factors which contribute to uncertainty surrounding the savings estimates produced by this energy efficiency potential study. These factors can include the following:

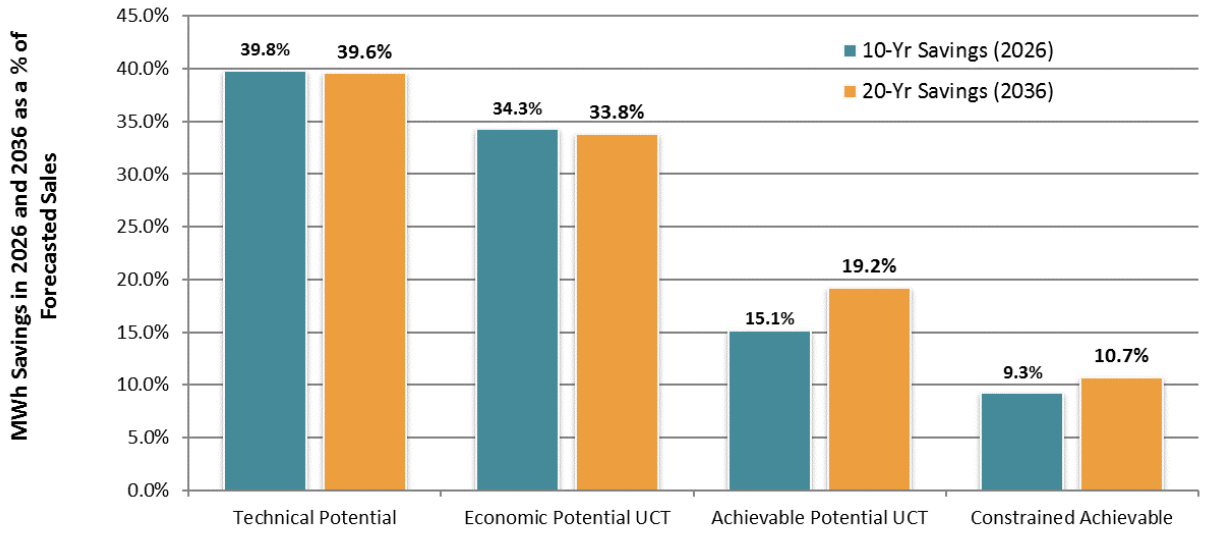
- Uncertainty about economic and fuel price forecasts used as inputs to the electric sales forecast
- The accuracy of results generated by building energy simulation modeling software
- Changes to codes and standards in the future which cannot be anticipated at the present time, and,
- Uncertainty regarding the future adoption of energy efficiency technologies which have minimal market share at the present time, such as LED lighting.

GDS has addressed the areas of uncertainty as robustly as possible given the time and budget constraints of this project. For example, GDS assumed an increasing market adoption of LEDs over the life of the study due to expected increases in program activity over the near term as well as expected decreased in LED bulb costs.[35] GDS also assimilated baseline study data into the estimates of weather sensitive measure savings where possible to adjust values acquired from the MEMD. These adjustments apply to measures such as insulation, for which savings are provided on a square footage basis in the MEMD.

6.2.1 Summary of Findings

Figure 6-1 illustrates the estimated savings potential for each of the scenarios included in this study.

Figure 6-1: Summary of Residential Electric Energy Efficiency Potential as a % of 2026 and 2036 Sales Forecasts



The potential estimates are expressed as cumulative 10-year and 20-year savings, as percentages of the respective 2026 and 2036 sector sales. The technical potential is 39.8% in 2026 and 39.6% in 2036. The 10-year and 20-year economic potential is 34.3% and 33.8% based on the UCT screen, assuming an incentive level equal to 50% of the measure cost. The slight drop from technical potential to economic potential indicates that most measures contributing to technical potential are cost-effective, particularly when screening based on the UCT.

The 10-year and 20-year achievable potential savings are: 15.1% and 19.2% for the Achievable UCT scenario and 9.3% and 10.7% for the Constrained Achievable scenario. The Achievable UCT scenario assumes 50% incentives and includes measures that passed the UCT Test. The Constrained

[35] Only LED bulbs are reflected in the estimate of technical and economic potential due to the greater savings opportunities. CFL and LED bulbs are included in the estimates of achievable potential to allow for the possibility of future CFL purchases. However, the assumed share of CFLs is increasingly minor relative to historical levels.

Achievable scenario is a subset of Achievable UCT scenario, assuming a spending cap on DSM approximately equal to 2% of future annual residential revenue from electric retail sales.

6.2.2 Technical Potential

Technical potential represents the quantification of savings that can be realized if all technologically available energy-efficiency measures are adopted in all feasible instances, regardless of cost. Table 6-2 shows that it is technically feasible to save nearly 4.95 million MWh in the residential sector between 2017 and 2026, as well as approximately 5.3 million MWh during the 20-year period from 2017 to 2036 statewide, representing 39.8% of 10-year residential sales, and 39.6% of 20-year residential sales. HVAC Equipment, lighting, and water heating measures are the greatest contributors to the technical potential. Table 6-3 shows the demand savings potential in 2026 and 2036. The ten and twenty-year summer peak demand savings potential is 882 MW and 1,053 MW, respectively, which is 24.3% and 27% of the peak forecast.

Table 6-2: Residential Sector Technical Potential Energy Savings by End Use

End Use	2026 Energy (MWh)	% of 2026 Savings	2036 Energy (MWh)	% of 2036 Savings
Lighting	894,275	18.1%	1,004,844	19.1%
Appliances	632,243	12.8%	320,541	6.1%
Electronics	618,250	12.5%	645,053	12.2%
Water Heating	812,196	16.4%	939,670	17.8%
HVAC Shell	695,752	14.1%	786,581	14.9%
HVAC Equipment	1,105,135	22.3%	1,379,063	26.1%
Miscellaneous	74,618	1.5%	76,896	1.5%
Cross-Cutting	118,369	2.4%	121,828	2.3%
Total	4,950,836	100.0%	5,274,476	100.0%
% of Annual Sales Forecast	*39.8%*		*39.6%*	

Table 6-3: Residential Sector Technical Potential Demand Savings

	2026 Demand Savings (MW)	% of 2026 Forecast Peak	2036 Demand Savings (MW)	% of 2036 Forecast Peak
Total System	882	24.3%	1,053	27.0%

6.2.3 Economic Potential

Economic potential is a subset of technical potential, which only accounts for measures that are cost-effective. The UCT was used for this study because it is mandated in Michigan to be the primary cost-effectiveness test used when considering energy efficiency programs. 56% of all measures that were included in the electric potential analysis passed the UCT.

Table 6-4 indicates that the economic potential based on the UCT screen is 4.3 million MWh during the 10-year period from 2017 to 2026, and the economic potential more than 4.5 million MWh during the 20-year period from 2017 to 2036. This represents 34.3% and 33.8% of residential sales across the respective 10-year and 20-year timeframes. HVAC Equipment, lighting, water heating, and appliance measures are the greatest contributors to the economic potential. Table 6-5 shows the demand savings potential in 2026 and 2036. The five and ten-year summer peak demand savings potential is 649 MW and 757 MW, respectively, which is 17.8% and 19.4% of the peak forecast.

Table 6-4: Residential Sector Economic Potential (UCT) Energy Savings by End Use

End Use	2026 Energy (MWh)	% of 2026 Savings	2036 Energy (MWh)	% of 2036 Savings
Lighting	789,056	18.5%	898,601	19.9%
Appliances	625,121	14.7%	309,146	6.9%
Electronics	585,849	13.7%	611,951	13.6%
Water Heating	705,457	16.6%	806,922	17.9%
HVAC Shell	514,943	12.1%	662,203	14.7%
HVAC Equipment	837,420	19.6%	1,011,339	22.4%
Miscellaneous	74,618	1.8%	76,896	1.7%
Cross-Cutting	129,278	3.0%	133,382	3.0%
Total	4,261,741	100.0%	4,510,440	100.0%
% of Annual Sales Forecast	*34.3%*		*33.8%*	

Table 6-5: Residential Sector Economic Potential (UCT) Demand Savings

	2026 Demand Savings (MW)	% of 2026 Forecast Peak	2036 Demand Savings (MW)	% of 2036 Forecast Peak
Total System	649	17.8%	757	19.4%

6.2.4 Achievable Potential

Achievable potential is a refinement of economic potential that takes into account the estimated market adoption of energy efficiency measures based on the incentive level and measure payback, the natural replacement cycle of equipment, and the capabilities of programs and administrators to ramp up program activity over time. Achievable potential also takes into account the non-measure costs of delivering programs (for administration, marketing, monitoring and evaluation, etc.). For purposes of this analysis, administrative costs were assumed to be equivalent to $0.0581 per first-year kWh saved, which was based on a review historical EIA data of typical program administrator costs of several utility energy efficiency programs in and around Michigan, including Consumers Energy.

The non-incentive acquisition cost of first-year kWh saved for each sector is based upon EIA Form 861 reported experience in 5 Mid-Western States in 2014. For purposes of this study GDS relied upon this regional data as the best data source for non-incentive costs that are likely to be experienced in the Consumers Energy Service area going forward. GDS escalated this acquisition cost by inflation for this study's planning horizon. Actual non-incentive cost for Consumers Energy may differ from the regional data based upon program design and other planning factors.[36]

This study estimated achievable potential for two scenarios. The Achievable UCT Scenario determines the achievable potential of all measures included in the UCT economic screening[37] assuming incentives equal to 50% of the measure cost.[38] The second scenario, Constrained UCT, assumes a spending cap

[36] Per Consumers Energy Staff, the best and most recent analysis they have for C&I rebates as a percentage of incremental costs is 22%. This number was calculated from prescriptive measures where there is good incremental cost data available, but they use it as their rough estimate for the overall % of incremental costs their rebates cover across their entire portfolio because calculating this percentage on custom projects is extremely difficult and subjective.

[37] Some LED measures which failed the 2017 UCT screen are included in the economic and achievable potential because of the ongoing decline in LED costs which is expected to continue in the next several years.

[38] Traditional low income measures associated with Michigan's Weatherization Assistance Program were evaluated using 100% incentives across all three achievable potential scenarios. All other measures were evaluated at the 50% incentive level.

equal to 2% of utility revenues, thereby limiting utilities from reaching the ultimate potential estimated in the Achievable UCT scenario.

6.2.4.1 Achievable UCT Scenario

Table 6-6 through Table 6-7 show the estimated savings for the Achievable UCT scenario over 10 and 20-year time horizons. As noted above, the scenario assumes an incentive level approximately equal to 50% of the incremental measure cost and includes an estimate 10-year market adoption rates based on incentive levels and equipment replacement cycles. The 10-year and 20-year Achievable UCT potential savings estimates are approximately 1.9 million MWh and 2.6 million MWh. This equates to 15.1% and 19.2% of sector sales in 2026 and 2036.

Table 6-6: Residential Achievable UCT Potential Electric Energy Savings by End Use

End Use	2026 Energy (MWh)	% of 2026 Savings	2036 Energy (MWh)	% of 2036 Savings
Lighting	451,432	24.0%	528,287	20.6%
Appliances	264,559	14.1%	231,536	9.0%
Electronics	289,185	15.4%	428,365	16.7%
Water Heating	303,927	16.2%	470,972	18.4%
HVAC Shell	190,036	10.1%	305,905	11.9%
HVAC Equipment	273,323	14.5%	477,030	18.6%
Miscellaneous	25,194	1.3%	38,448	1.5%
Cross-Cutting	82,832	4.4%	80,818	3.2%
Total	1,880,488	100.0%	2,561,361	100.0%
% of Annual Sales Forecast	*15.1%*		*19.2%*	

Table 6-7: Residential Achievable UCT Potential Demand Savings

	2026 Demand Savings (MW)	% of 2026 Forecast Peak	2036 Demand Savings (MW)	% of 2036 Forecast Peak
Total System	269	7.4%	402	10.3%

6.2.4.2 Achievable UCT vs. Constrained UCT

Although the Achievable UCT assumes incentives are set and capped at 50% of the incremental measure cost, the Achievable UCT scenario also assumes no annual DSM spending cap to reach all potential participants. In the constrained UCT scenario, the analysis assumes an annual spending cap for each sector roughly equal to 2% of Consumers Energy's annual revenue by sector. To model the impact of a spending cap the market penetration of all cost-effective measures was reduced by the ratio of capped sector spending to the uncapped annual sector budgets estimated in the Achievable UCT scenario savings potential.

Table 6-8 shows the estimated savings for the Constrained UCT scenario over 10 and 20-year time horizon. The 10-year and 20-year Achievable UCT potential savings estimates are approximately 1.2 million MWh and 1.4 million MWh. This equates to 9.3% and 10.7% of sector sales in 2026 and 2036. The ten and twenty-year demand savings estimates in the Constrained UCT scenario are depicted in Table 6-9.

Table 6-8: Residential Constrained Achievable Savings Potential Energy Savings by End Use

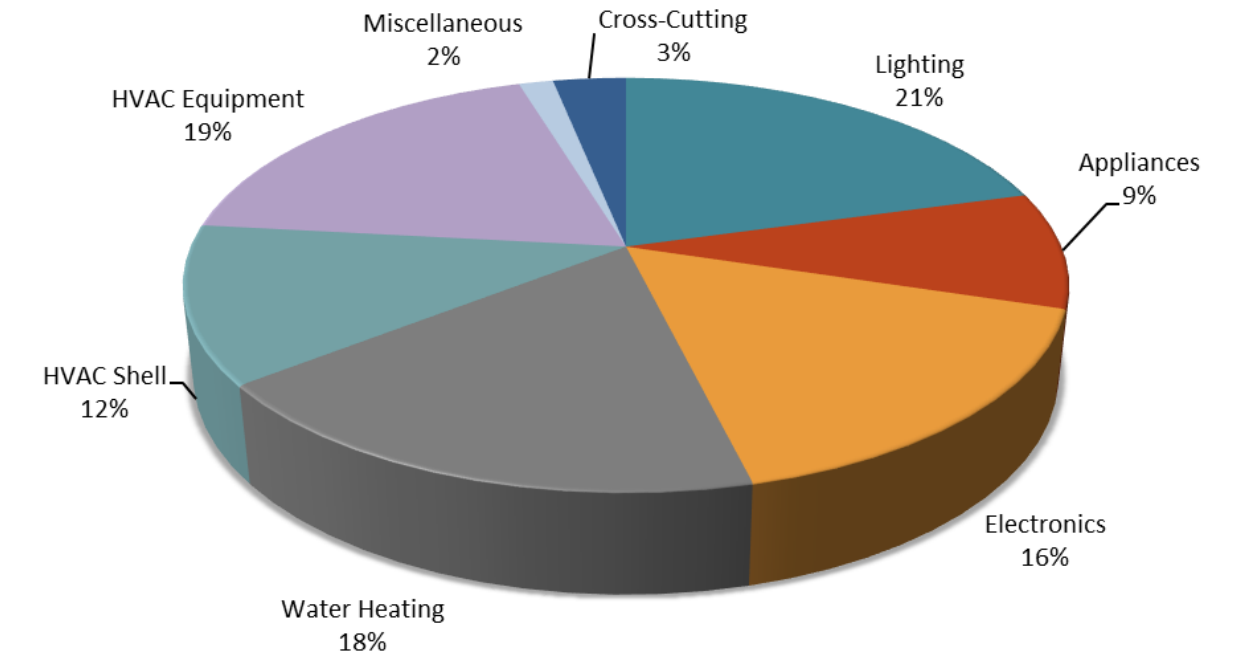
End Use	2026 Energy (MWh)	% of 2026 Savings	2036 Energy (MWh)	% of 2036 Savings
Lighting	291,179	25.3%	295,674	20.7%
Appliances	160,628	13.9%	130,667	9.1%
Electronics	166,973	14.5%	234,464	16.4%
Water Heating	188,664	16.4%	261,674	18.3%
HVAC Shell	118,876	10.3%	176,198	12.3%
HVAC Equipment	168,087	14.6%	266,091	18.6%
Miscellaneous	15,538	1.3%	21,459	1.5%
Cross-Cutting	42,113	3.7%	45,550	3.2%
Total	1,152,058	100.0%	1,431,777	100.0%
% of Annual Sales Forecast	*9.3%*		*10.7%*	

Table 6-9: Residential Constrained Achievable Potential Demand Savings

	2026 Demand Savings (MW)	% of 2026 Forecast Peak	2036 Demand Savings (MW)	% of 2036 Forecast Peak
Total System	164	4.5%	226	5.8%

Figure 6-2 shows the percentage of electric savings by each end use for the Constrained UCT scenario. Lighting, based on the remaining potential from specialty and reflect sockets, represents the largest share of remaining potential at 21% of total electric savings, followed closely by the HVAC Equipment, water heating, electronics, and HVAC shell end uses (each between 12% and 19%).

Figure 6-2: Residential Sector 2036 Constrained UCT Electric Potential Savings, by End Use



6.2.4.3 Annual Achievable Electric Savings Potential

Table 6-10 and Table 6-11 show cumulative annual energy savings (MWh) for both achievable potential scenarios for each year across the 20-year time horizon for the study, broken out by end use. The year by year associated incentive and administrative costs to achieve these savings are shown in Section 6.3. Table 6-12 and Table 6-13 show cumulative annual demand (MW) savings for both achievable potential scenarios for each year across the 20-year time horizon for the study, broken out by end use. The year by year associated incentive and administrative costs to achieve these savings are shown in Section 6.3.

Table 6-10: Cumulative Annual Residential Electric Energy MWh Savings in the Achievable UCT Potential Scenario, by End Use for Consumers Energy

	Lighting	Appliances	Electronics	Water Heating	HVAC Shell	HVAC Equipment	Misc.	Cross-Cutting	Total
2017	104,627	16,899	14,854	19,682	13,655	15,107	1,309	58,898	245,032
2018	204,774	36,571	34,019	42,062	28,590	32,585	2,890	61,828	443,319
2019	303,494	59,017	57,500	67,055	44,776	52,960	4,744	64,577	654,123
2020	400,699	84,228	85,275	94,544	62,181	76,219	6,870	67,155	877,172
2021	246,563	112,191	113,188	124,383	80,766	102,338	9,262	71,118	859,809
2022	295,415	142,905	143,797	156,454	100,501	130,860	11,921	73,754	1,055,608
2023	344,219	176,361	176,107	190,604	121,341	162,228	14,846	76,153	1,261,859
2024	392,962	212,550	210,815	226,669	143,240	196,428	18,033	78,389	1,479,085
2025	441,660	238,163	248,805	264,505	166,155	233,465	21,483	80,519	1,694,755
2026	451,432	264,559	289,185	303,927	190,036	273,323	25,194	82,832	1,880,488
2027	463,917	280,178	369,891	332,947	208,150	305,246	27,750	81,578	2,069,657
2028	477,394	290,976	398,761	360,318	225,242	335,146	30,028	80,840	2,198,705
2029	491,766	296,882	410,873	386,226	241,353	363,252	32,037	80,332	2,302,721
2030	505,920	298,424	416,279	405,610	253,040	389,652	33,777	80,122	2,382,825
2031	520,015	294,827	419,476	422,467	263,800	414,345	35,239	79,868	2,450,035
2032	523,968	286,635	421,513	436,854	273,836	432,541	36,423	79,912	2,491,683
2033	525,742	273,632	423,396	448,855	283,042	447,919	37,335	80,061	2,519,981
2034	526,791	255,975	425,088	458,517	291,438	460,475	37,976	80,383	2,536,643
2035	527,542	244,147	426,750	465,885	299,064	470,187	38,347	80,538	2,552,460
2036	528,287	231,536	428,365	470,972	305,905	477,030	38,448	80,818	2,561,361

Table 6-11: Cumulative Annual Electric Residential Energy MWh Savings in the Constrained UCT Potential Scenario, by End Use for Consumers Energy

	Lighting	Appliances	Electronics	Water Heating	HVAC Shell	HVAC Equipment	Misc.	Cross-Cutting	Total
2017	77,238	12,475	10,966	14,529	10,081	11,152	966	43,480	180,887
2018	150,404	26,848	24,967	30,880	20,991	23,917	2,122	45,171	325,299
2019	220,703	42,831	41,688	48,672	32,516	38,411	3,442	45,985	474,247
2020	289,279	60,617	61,283	68,056	44,792	54,814	4,941	47,377	631,159
2021	176,473	79,947	80,359	88,662	57,632	72,854	6,595	49,160	611,681
2022	207,800	99,643	99,417	109,155	70,265	91,026	8,300	47,295	732,901
2023	237,044	119,690	117,645	129,479	82,710	109,685	10,053	45,633	851,939
2024	264,646	140,183	135,632	149,689	95,045	128,909	11,857	44,389	970,349
2025	289,969	150,597	151,150	169,024	106,857	147,970	13,651	41,871	1,071,090
2026	291,179	160,628	166,973	188,664	118,876	168,087	15,538	42,113	1,152,058
2027	295,328	164,396	201,305	200,050	127,636	183,302	16,466	39,969	1,228,453
2028	302,182	167,651	215,251	213,760	137,291	200,170	17,499	45,849	1,299,652
2029	310,313	168,766	222,012	227,856	146,846	216,764	18,473	47,712	1,358,743
2030	318,457	168,378	226,419	237,189	152,942	232,506	19,292	48,042	1,403,224
2031	326,824	165,899	231,327	245,217	158,592	247,416	19,972	48,382	1,443,629
2032	323,191	160,645	233,094	250,824	163,208	255,482	20,452	45,421	1,452,317
2033	316,747	153,638	234,800	254,765	167,037	261,023	20,813	44,108	1,452,931
2034	310,354	144,581	236,210	257,775	170,446	264,886	21,111	44,150	1,449,512
2035	300,982	137,920	234,111	258,506	172,753	264,952	21,197	39,631	1,430,051
2036	295,674	130,667	234,464	261,674	176,198	266,091	21,459	45,550	1,431,777

Table 6-12: Cumulative Annual Electric Residential Demand Savings (MW) in the Achievable UCT Potential Scenario, by End Use for Consumers Energy

	Lighting	Appliances	Electronics	Water Heating	HVAC Shell	HVAC Equipment	Misc.	Cross-Cutting	Total
2017	10.8	3.1	1.7	1.6	2.7	2.8	1.0	6.7	30.4
2018	21.1	6.8	3.8	3.4	5.8	6.1	2.1	7.1	56.2
2019	31.3	11.0	6.5	5.4	9.2	9.8	3.5	7.4	84.0
2020	41.3	15.9	9.6	7.6	12.9	13.9	5.1	7.7	113.9
2021	25.2	21.3	12.8	10.0	16.9	18.5	6.8	8.1	119.6
2022	30.2	27.3	16.3	12.5	21.3	22.6	8.8	8.4	147.4
2023	35.2	33.8	19.9	15.2	25.9	27.2	10.9	8.7	176.9
2024	40.2	41.0	23.8	18.1	30.7	32.2	13.3	8.9	208.2
2025	45.1	47.0	28.0	21.1	35.9	37.6	15.8	9.2	239.7
2026	46.1	53.3	32.5	24.3	41.3	43.4	18.6	9.5	268.8
2027	47.4	57.6	41.0	26.6	45.5	50.2	20.4	9.3	298.1
2028	48.7	61.2	44.2	28.8	49.6	56.6	22.1	9.2	320.5
2029	50.2	63.8	45.6	30.9	53.5	62.8	23.6	9.2	339.5
2030	51.7	65.5	46.3	32.4	56.6	69.0	24.9	9.1	355.6
2031	53.2	66.4	46.7	33.8	59.5	75.3	25.9	9.1	369.9
2032	53.6	66.4	47.0	34.9	62.3	79.4	26.8	9.1	379.5
2033	53.7	65.5	47.2	35.9	65.0	83.1	27.5	9.1	387.0
2034	53.9	63.8	47.4	36.7	67.5	86.4	28.0	9.2	392.7
2035	53.9	62.7	47.6	37.3	69.8	89.3	28.2	9.2	398.0
2036	54.0	61.3	47.8	37.7	72.0	91.9	28.3	9.2	402.2

Table 6-13: Cumulative Annual Residential Demand Savings (MW) in the Constrained UCT Potential Scenario, by End Use for Consumers Energy

	Lighting	Appliances	Electronics	Water Heating	HVAC Shell	HVAC Equipment	Misc.	Cross-Cutting	Total
2017	8.0	2.3	1.2	1.2	2.0	2.1	0.7	5.0	22.4
2018	15.5	5.0	2.8	2.5	4.3	4.5	1.6	5.2	41.2
2019	22.7	8.0	4.7	3.9	6.7	7.1	2.5	5.2	60.9
2020	29.8	11.4	6.9	5.4	9.3	10.0	3.6	5.4	81.9
2021	18.0	15.2	9.1	7.1	12.1	13.2	4.9	5.6	85.1
2022	21.2	19.0	11.3	8.7	14.8	15.7	6.1	5.4	102.3
2023	24.2	22.9	13.3	10.4	17.6	18.3	7.4	5.2	119.4
2024	27.1	27.0	15.3	12.0	20.3	21.0	8.7	5.1	136.4
2025	29.6	29.7	17.0	13.5	23.0	23.6	10.1	4.8	151.3
2026	29.7	32.5	18.8	15.1	25.7	26.3	11.4	4.8	164.3
2027	30.1	34.0	22.3	16.0	27.8	29.4	12.1	4.6	176.3
2028	30.8	35.6	23.9	17.1	30.1	33.0	12.9	5.2	188.5
2029	31.7	36.6	24.7	18.2	32.4	36.7	13.6	5.4	199.3
2030	32.6	37.3	25.2	19.0	34.1	40.6	14.2	5.5	208.4
2031	33.4	37.6	25.8	19.6	35.7	44.6	14.7	5.5	217.0
2032	33.1	37.4	26.0	20.1	37.1	46.8	15.1	5.2	220.7
2033	32.4	36.8	26.3	20.4	38.4	48.4	15.3	5.0	223.0
2034	31.7	35.9	26.4	20.6	39.5	49.7	15.5	5.0	224.5
2035	30.8	35.1	26.2	20.7	40.4	50.3	15.6	4.5	223.6
2036	30.2	34.3	26.2	20.9	41.6	51.3	15.8	5.2	225.5

6.2.5 Residential Electric Savings Summary by Measure Group

Table 6-14 provides an end-use breakdown of the residential electric savings potential estimates for technical and economic potential, and each of the achievable potential scenarios. The table indicates how the savings potential decreases systematically from the technical potential scenario to the Constrained UCT potential scenario as additional limiting factors such as cost-effectiveness requirements and anticipated market adoption at given funding levels are introduced.

Table 6-14: Breakdown of Residential Cumulative Annual Electric Savings Potential for Technical, Economic and Achievable Potential, by End Use for Consumers Energy

Measure	Technical Potential (MWh)	Economic UCT (MWh)	Achievable UCT (MWh)	Constrained UCT (MWh)
Lighting				
Standard CFLs	0	0	0	0
Standard LEDs	112,111	112,111	64,599	36,150
Specialty CFLs	0	0	4,368	2,474
Specialty LEDs	466,583	466,583	263,731	147,564
Reflector CFLs	0	0	2,904	1,645
Reflector LEDs	306,823	306,823	185,248	103,722
Efficient Fluorescent Tube Lighting	73,065	0	0	0
LED night lights	13,084	13,084	7,437	4,119
Occupancy sensors	33,177	0	0	0
Appliances				
ENERGY STAR clothes washers	62,699	62,699	34,484	19,108
ENERGY STAR refrigerator	44,604	33,208	16,989	9,581
ENERGY STAR freezers	22,582	22,582	10,301	5,989
ENERGY STAR dishwashers	14,777	14,777	8,127	4,536
ENERGY STAR dehumidifiers	60,780	60,780	33,227	18,324
ENERGY STAR dryers	67,450	67,450	35,923	19,924
Secondary refrigerator/freezer recycling	47,650	47,650	89,941	51,724
Dehumidifier recycling	0	0	1,763	1,026
Room AC recycling	0	0	781	455
Electronics				
Controlled Power Strips	456,290	423,187	296,230	162,489
Efficient set-top boxes	51,496	51,496	36,047	19,427
ENERGY STAR desktops	47,533	47,533	33,273	17,933
Efficient laptops	13,298	13,298	9,309	5,017
Efficient televisions	66,158	66,158	46,311	25,677
LCD Monitors	10,279	10,279	7,195	3,920
Water Heating				
Heat pump water heaters	586,544	586,544	288,477	159,288
Solar water heater	92,590	0	0	0
Low flow showerhead/faucet aerator	176,894	179,129	149,259	83,303
Gravity film heat exchangers	42,920	0	0	0
Pipe wrap	14,564	14,744	13,144	7,870

Measure	Technical Potential (MWh)	Economic UCT (MWh)	Achievable UCT (MWh)	Constrained UCT (MWh)
Flow restriction valves (ShowerStart/TubSpout)	26,159	26,505	20,092	11,213
HVAC Envelope				
Air Sealing	215,786	218,762	117,294	64,624
Duct insulation/sealing	34,880	40,935	17,437	10,313
Improved Insulation	207,445	105,350	58,894	35,405
Efficient windows	328,470	297,156	112,280	65,856
Window film	0	0	0	0
Cool Roofs	0	0	0	0
HVAC Equipment				
Central AC tune-up*	0	10,289	6,006	3,283
Efficient air-source heat pump	5,158	7,091	3,375	1,887
Dual fuel heat pumps*	0	398	190	106
Geothermal heat pumps	7,192	0	0	0
Ductless mini-split systems	397,440	397,440	198,577	110,539
Efficient central AC systems	415,652	182,096	86,673	48,451
Programmable thermostats	61,809	59,803	29,902	16,687
Efficient room air conditioners	23,846	23,846	11,354	6,344
Efficient chillers	6,158	6,158	2,571	1,497
Chiller controls	0	0	0	0
Efficient furnace fans	422,126	286,626	136,502	76,239
Other				
Efficient pool pump motors	76,896	76,896	38,448	21,459
Cross-Cutting/Behavioral				
Home Energy Reports#	121,828	133,382	80,818	45,550
Mobile applications	39,681	37,592	1,880	1,059
Total				
Total	5,274,476	4,510,440	2,561,361	1,431,777
Percent of Annual Sector Sales Forecast	39.6%	33.8%	19.2%	10.7%

*No technical potential for select measures due to a competing measure with greater overall savings that were ultimately found to not to be cost-effective.
Economic potential is higher than technical potential due to reduced interactive effects as a result of the lower economic potential from non-behavior based measures.

6.3 ACHIEVABLE POTENTIAL BENEFITS & COSTS

The tables below provide the net present value (NPV) benefits and costs associated with the three achievable potential scenarios for the residential sector at the 10-year and 20-year periods. Table 6-15 and Table 6-16 compare the NPV benefits and costs associated with the Achievable UCT and Constrained UCT Scenarios. Both scenarios compared the benefits and costs based on the UCT. However, the constrained scenario's 2% of revenue spending cap on DSM results in reduced program participation and overall NPV benefits.

Table 6-15: 10-Year Benefit-Cost Ratios for Achievable UCT vs. Constrained UCT Scenarios – Residential Sector Only

10-year	NPV Benefits	NPV Costs	B/C Ratio	Net Benefits
Achievable UCT	$835,064,290	$429,731,251	1.94	$405,333,038
Constrained UCT	$529,797,176	$278,067,632	1.91	$251,729,543

Table 6-16: 20-Year Benefit-Cost Ratios for Achievable UCT vs. Constrained UCT Scenarios– Residential Sector Only

20-year	NPV Benefits	NPV Costs	B/C Ratio	Net Benefits
Achievable UCT	$1,449,797,359	$676,853,572	2.14	$772,943,787
Constrained UCT	$873,199,313	$415,348,824	2.10	$457,850,489

Year by year budgets for all three scenarios, broken out by incentive and administrative costs are depicted in Table 6-17 and Table 6-18. Table 6-19 shows the revenue requirements for each scenario as a percentage of forecasted sector sales.

Table 6-17: Annual Program Budgets Associated with the Achievable UCT Scenario (in millions)

Achievable UCT	Incentives	Admin.	Total Costs
2017	$35.3	$14.2	$49.6
2018	$37.2	$15.3	$52.5
2019	$37.1	$16.5	$53.6
2020	$36.3	$17.8	$54.1
2021	$38.6	$16.3	$54.9
2022	$41.3	$17.7	$59.1
2023	$44.0	$19.2	$63.2
2024	$46.7	$20.7	$67.3
2025	$50.4	$22.8	$73.1
2026	$52.0	$23.0	$75.0
2027	$53.5	$24.6	$78.1
2028	$46.9	$21.1	$68.0
2029	$44.6	$20.3	$64.8
2030	$44.0	$20.4	$64.4
2031	$43.6	$20.5	$64.2
2032	$45.9	$23.2	$69.2
2033	$46.8	$24.8	$71.6
2034	$47.0	$25.6	$72.6
2035	$52.1	$29.8	$81.8
2036	$46.3	$26.1	$72.5

Table 6-18: Annual Program Budgets Associated with the Constrained UCT Scenario (in millions)

Constrained UCT	Incentives	Admin.	Total Costs
2017	$26.1	$10.5	$36.6
2018	$27.2	$11.2	$38.3
2019	$26.4	$11.8	$38.2
2020	$25.6	$12.6	$38.2
2021	$26.6	$11.3	$37.9

Constrained UCT	Incentives	Admin.	Total Costs
2022	$26.5	$11.4	$37.9
2023	$26.4	$11.5	$37.9
2024	$26.4	$11.7	$38.1
2025	$26.2	$11.9	$38.0
2026	$26.5	$11.7	$38.1
2027	$26.2	$12.1	$38.2
2028	$26.6	$12.0	$38.6
2029	$26.5	$12.0	$38.5
2030	$26.4	$12.2	$38.6
2031	$26.4	$12.4	$38.9
2032	$26.1	$13.2	$39.3
2033	$25.8	$13.7	$39.5
2034	$25.8	$14.1	$39.9
2035	$25.6	$14.6	$40.3
2036	$26.1	$14.7	$40.8

7 COMMERCIAL ELECTRIC ENERGY EFFICIENCY POTENTIAL ESTIMATES

This section provides electric energy efficiency potential estimates for the commercial sector for Consumers Energy. Estimates of technical, economic and achievable electric energy efficiency potential are provided in separate sections of this chapter of the study.

According to 2015 historical sales data[39], the commercial sector accounts for approximately 36% of retail electric sales in the Consumers Energy service area, but only 12% of the total retail customers. The average commercial electric customer in the Consumers Energy service area consumes approximately 54,400 kWh annually. Comparatively, the average residential consumer in the Consumers Energy service area uses approximately 7,900 kWh per year. For this study, commercial electric sales are estimated to remain relatively stable throughout the 20-year study period of 2017 – 2036.[40]

7.1 ELECTRIC ENERGY EFFICIENCY MEASURES EXAMINED

For the commercial sector, there were 245 unique energy efficiency measures included in the electric energy savings potential analysis. Table 7-1 provides a brief description of the types of measures included for each end use in the commercial sector. The list of measures was developed based on a review of the latest MEMD, measures found in other TRMs and measures included in other commercial energy efficiency potential studies. For each measure, the analysis considered incremental costs, energy and demand savings, and measure useful lives.

Table 7-1: Types of Electric Energy Efficiency Measures Included in the Commercial Sector Analysis

End Use Type	End Use Description	Measures Included
Office Equipment	Office Equipment Improvements	– Appliances – High Efficiency Office Equipment – Smart Power Strips – Computer Energy Management Controls – Computer Room Upgrades
Compressed Air	Compressor Equipment	– Efficient Air Compressors – Automatic Drains – Cycling and High Efficiency Dryers – Low Pressure Drop-Filters – Air-Entraining Air Nozzles – Receiver Capacity Addition – Compressed Air Audits, Leak Repair, and Flow Control – Suction Line Insulation
Cooking	Cooking Equipment Improvements	– Efficient Cooking Equipment
Envelope	Space Heating and Space Cooling	– Building Envelope Improvements – Cool Roofing – Integrated Building Design
HVAC Controls	Space Cooling and Space Heating	– Programmable Thermostats – EMS Installation/Optimization – Hotel Guest Room Occupancy Control System – Retrocommissioning & Commissioning
Lighting	Lighting Improvements	– Efficient Lighting Equipment – Fixture Retrofits – Ballast Replacement

[39] Consumers Energy provided historical sales from 2015
[40] Based on kWh sales forecasts with DSM Impacts provided by Consumers Energy

End Use Type	End Use Description	Measures Included
		– Premium Efficiency T8 and T5 – High Bay Lighting Equipment – LED Bulbs and Fixtures – Light Tube – CFL Retrofits – Lighting Controls – Efficient Design for New Construction – LED Traffic Signals and Street Lighting
Other	Transformer Equipment Other	– Efficient Transformers – Optimized Snow and Ice Melt Controls – EC Plug Fans in Data Centers – Engine Block Heater Timer
Pools	Pool Equipment	– Efficient Equipment and Controls – Heat Pump Pool Heaters
Refrigeration	Refrigeration Improvements	– Vending Misers – Refrigerated Case Covers – Economizers – Efficient Refrigeration – Upgrades Motors and Controls – Door Heater Controls – Efficient Compressors and Controls – Door Gaskets and Door Retrofits – Refrigerant Charging Correction – Ice-Makers
Space Cooling	Cooling System Upgrades	– Efficient Chillers – Efficient Cooling Equipment – Ground/Water Source Heat Pump – Chiller Tune-up/Diagnostics – High Efficiency Pumps
Space Heating	Heating System Improvements	– Efficient Heating Equipment – Ground/Water Source Heat Pump – Efficient Heating Pumps, Motors, and Controls
Ventilation	Ventilation Equipment	– Enthalpy Economizer – Variable Speed Drive Controls – Improved Duct Sealing – Destratification Fans – Controlled Ventilation Optimization – Demand Controlled Ventilation
Water Heating	Water Heating Improvements	– Efficient Equipment – High Efficiency HW Appliances – Low Flow Equipment – Pipe and Tank Insulation – Heat Recovery Systems – Efficient HW Pump and Controls – Solar Water Heating System

7.2 COMMERCIAL SECTOR RESULTS

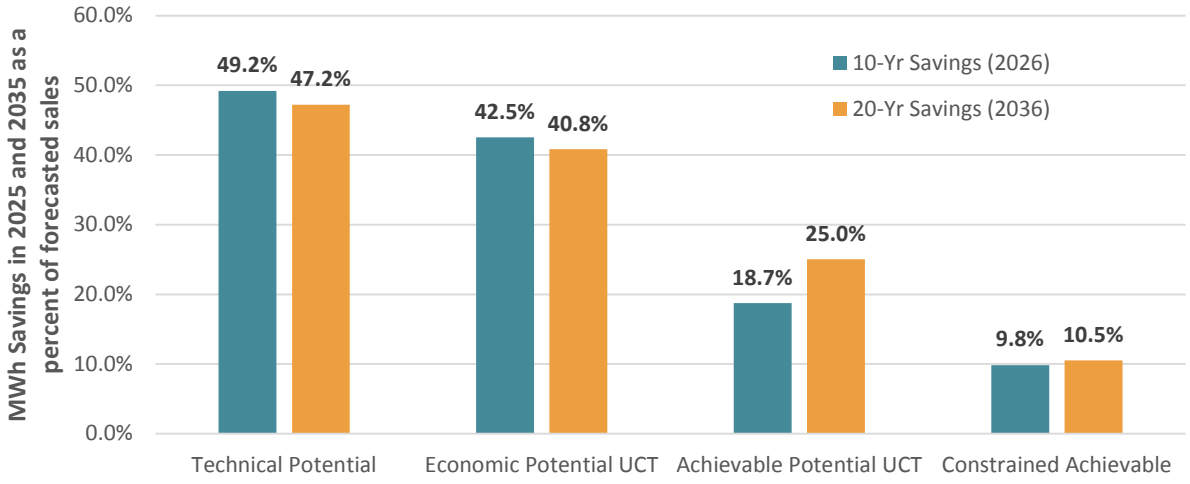
This section presents estimates for electric technical, economic, and achievable savings potential for the commercial sector. Each of the tables in the technical, economic and achievable sections presents the respective potential for efficiency savings expressed as cumulative annual savings (MWh) and percentage of commercial sector forecast annual MWh sales. Data is provided for 10 and 20-year horizons for Consumers Energy.

This energy efficiency potential study considers the impacts of the December 2007 Energy and Independence and Security Act (EISA) as an improving energy efficiency code standard for the commercial sector. EISA improves the baseline efficiency of compact fluorescent lamps (CFL), general service fluorescent lamps (GSFL), high intensity discharge (HID) lamps and ballasts and motors, all applicable in the commercial sector.

7.2.1 Summary of Findings

Figure 7-1 illustrates the estimated energy efficiency savings potential in the Consumers Energy service area for each of the scenarios included in this study.

Figure 7-1: Summary of Commercial Electric Energy Efficiency Potential as a % of Sales Forecasts



The potential savings estimates are expressed as cumulative annual 10-year and 20-year savings, as percentages of the respective 2026 and 2036 commercial sector electricity sales forecasts. The technical savings potential for the commercial sector is 49.2% in 2026 and 47.2% in 2036. The 10-year and 20-year economic potential is 42.5% and 40.8% (respectively) based on the UCT screen, assuming an incentive level set equal to 50% of the measure cost.

The 10-year and 20-year achievable potential savings are: 18.7% and 25.0% for the Achievable UCT scenario; and 9.8% and 10.5% for the Constrained Achievable scenario. The Achievable UCT scenario assumes 50% incentives and includes measures that passed the UCT Test. The Constrained Achievable scenario is a subset of the Achievable UCT scenario, assuming a spending cap on non-residential DSM equal to 2% of years' prior revenue, e.g., the 2017 spending cap is based on 2% of the 2015 retail revenue.

7.2.2 Technical Potential

Technical potential represents the quantification of savings that can be realized if energy-efficiency measures passing the qualitative screening are applied in all feasible instances, regardless of cost. Table 7-2 shows that it is technically feasible to save approximately 5.435 million MWh annually in the commercial sector by 2026, and approximately 5.444 million MWh annually by 2036 across Consumers Energy, representing 49.2% of the commercial sales forecast in 2026, and 47.2% of the commercial sales forecast in 2036. Table 7-3 shows the demand savings potential in 2026 and 2036. The ten and twenty-year summer peak demand savings technical potential is 1,045 MW and 1,047 MW, respectively, which is 49.4% and 47.6% of the peak forecasts for 2026 and 2036.

Refrigeration represents the majority of the technical energy efficiency savings potential at 23% of 20-yr savings followed by Lighting at 22%. In recent years, commercial lighting consistently had the majority of potential energy savings for commercial buildings. For this study, GDS used the 2012 CBECS energy consumption results to allocate energy to different end-uses. The 2012 CBECS data shows that energy consumption has shifted significantly since the last CBECS study in 2003. Specifically, lighting represented 40% of commercial energy used in 2003, and now represents only 19%. Refrigeration and Office Equipment/Plug Loads have increased by 5% and 7% respectively. This trend is driven by the installation of many high efficiency lighting products in commercial buildings since 2003. Going forward, utilities will need to increase usage of cost-effective non-lighting measures to continue achieving energy saving goals.

Table 7-2: Commercial Sector Technical Potential Electric Energy Savings by End Use

End Use	2026 Energy Savings (MWh)	% of 2026 Total	2036 Energy Savings (MWh)	% of 2036 Total
Lighting	1,179,172	22%	1,181,268	22%
Cooling	843,801	16%	845,313	16%
Ventilation	883,754	16%	884,615	16%
Water Heating	27,245	1%	27,294	1%
Refrigeration	1,230,334	23%	1,232,484	23%
Space Heating	88,682	2%	88,871	2%
Office Equipment	773,525	14%	774,910	14%
Miscellaneous	409,271	8%	409,715	8%
Total	**5,435,783**	**100%**	**5,444,470**	**100%**
% of Annual Sales Forecast	***49.2%***		***47.2%***	

Table 7-3: Commercial Sector Technical Potential Electric Demand Savings

End Use	2026 Demand Savings (MW)	% of 2026 Forecast Peak	2036 Demand Savings (MW)	% of 2036 Forecast Peak
Total System	1,045	49.4%	1,047	47.6%

7.2.3 Economic Potential

Economic potential is a subset of technical potential and only includes measures that are cost-effective. This analysis of cost-effectiveness screen is based on the Utility Cost Test (UCT). The utility incentive was assumed to be equal to 50% of the measure incremental cost. The UCT was used for cost-effectiveness screening for this study because it this is the mandatory test used in Michigan. Eighty-two percent of all measures that were included in the electric potential analysis for the commercial sector passed the UCT on a measure level basis.

Table 7-4 indicates that the economic potential based on the UCT screen is approximately 4.699 million MWh annually by 2026 and 4.706 million by 2036. This represents 42.5% and 40.8% of commercial sales in 2026 and 2036, respectively. Refrigeration, lighting, and ventilation energy efficiency measures make up a majority of the savings potential.

Table 7-4: Commercial Sector Economic Potential (UCT) Electric Energy Savings by End Use

End Use	2026 Energy Savings (MWh)	% of 2026 Total	2036 Energy Savings (MWh)	% of 2036 Total
Lighting	1,079,211	23%	1,081,230	23%
Cooling	582,961	12%	584,005	12%
Ventilation	775,026	16%	775,876	16%
Water Heating	26,962	1%	27,010	1%
Refrigeration	1,163,756	25%	1,165,785	25%
Space Heating	38,456	1%	38,550	1%
Office Equipment	662,777	14%	663,965	14%
Miscellaneous	369,964	8%	370,338	8%
Total	**4,699,113**	**100%**	**4,706,760**	**100%**
% of Annual Sales Forecast	***42.5%***		***40.8%***	

Table 7-5 shows the peak demand savings economic potential in 2026 and 2036. The ten and twenty-year summer peak demand savings economic potential is 919 MW and 921 MW, respectively, which is 43.5% and 41.9% of the peak forecasts in 2026 and 2036 respectively.

Table 7-5: Commercial Sector Economic Potential (UCT) Electric Demand Savings

End Use	2026 Demand Savings (MW)	% of 2026 Forecast Peak	2036 Demand Savings (MW)	% of 2036 Forecast Peak
Total System	919	43.5%	921	41.9%

7.2.4 Achievable Potential

Achievable potential is an estimate of energy savings that can feasibly be achieved given market barriers and equipment replacement cycles. This study estimated achievable potential for two scenarios. The Achievable UCT Scenario determines the achievable potential of all measures that passed the UCT economic screening assuming incentives equal to 50% of the measure cost. Unlike the economic potential, the commercial achievable potential takes into account the estimated market adoption of energy efficiency measures based on the incentive level and the natural replacement cycle of equipment. The second scenario, Constrained UCT, assumes a spending cap equal to 2% of two years' prior annual commercial utility revenues, thereby limiting utilities from reaching the ultimate potential estimated in the Achievable UCT scenario.

7.2.4.1 Achievable UCT Scenario

Table 7-6 shows the estimated cumulative annual savings for the Achievable UCT scenario over 10 and 20-year time horizons. As noted above, this scenario assumes an incentive level approximately equal to 50% of the incremental measure cost and includes estimated 20-year market adoption rates based on incentive levels and equipment replacement cycles. Table 7-7 shows the peak demand savings Achievable UCT potential in 2026 and 2036.

Table 7-6: Commercial Achievable UCT Potential Electric Energy Savings by End Use

End Use	2026 Energy Savings (MWh)	% of 2026 Total	2036 Energy Savings (MWh)	% of 2036 Total
Lighting	482,004	23%	679,104	24%
Cooling	192,982	9%	294,516	10%
Ventilation	409,975	20%	514,975	18%
Water Heating	12,787	1%	16,047	1%
Refrigeration	548,756	27%	739,889	26%
Space Heating	15,282	1%	22,548	1%
Office Equipment	250,118	12%	379,244	13%
Miscellaneous	158,168	8%	240,243	8%
Total	**2,070,073**	**100%**	**2,886,566**	**100%**
% of Annual Sales Forecast	***18.7%***		***25.0%***	

Table 7-7: Commercial Sector Achievable UCT Potential Electric Demand Savings

End Use	2026 Demand Savings (MW)	% of 2026 Forecast Peak	2036 Demand Savings (MW)	% of 2036 Forecast Peak
Total System	363	17.2%	555	25.3%

7.2.4.2 Constrained UCT Scenario

Although the Achievable UCT scenario assumes incentives are set and capped at 50% of the incremental measure cost, and that measures are typically replaced at the end of their useful life, the Achievable UCT scenario also assumes no annual DSM spending cap to reach all potential participants. In the Constrained UCT scenario, the analysis assumes a utility spending cap, as specified in Public Act 295, equal to 2% of the total retail commercial revenues from 2 years prior, e.g., the 2017 spending cap is based on 2% of the 2015 retail revenue. The percent of the non-residential spending cap allocated to the commercial sector is based on the percentage of total non-residential sales that the commercial sector represents. To model the impact of a spending cap the market penetration of all cost-effective measures was reduced by the ratio of capped spending to uncapped spending that would be required to achieve the Achievable UCT scenario savings potential.

Table 7-8 shows the estimated savings for the Constrained UCT scenario over 10 and 20-year time horizons. The 10-year and 20-year Constrained UCT potential cumulative annual savings estimates are 1.1 million MWh and 1.2 million MWh respectively. This equates to 9.8% and 10.5% of sector sales in 2026 and 2036. The ten and twenty-year demand savings estimates in the Constrained UCT scenario are presented in Table 7-9.

Table 7-8: Commercial Constrained Achievable Electric Energy Efficiency Savings by End Use

End Use	2026 Energy Savings (MWh)	% of 2026 Total	2036 Energy Savings (MWh)	% of 2036 Total
Lighting	261,972	24%	298,567	25%
Cooling	103,194	9%	133,830	11%
Ventilation	224,628	21%	225,051	19%
Water Heating	6,975	1%	6,955	1%
Refrigeration	278,582	26%	298,914	25%
Space Heating	8,098	1%	9,916	1%
Office Equipment	120,454	11%	137,907	11%

End Use	2026 Energy Savings (MWh)	% of 2026 Total	2036 Energy Savings (MWh)	% of 2036 Total
Miscellaneous	83,243	8%	105,019	9%
Total	**1,087,146**	**100%**	**1,216,159**	**100%**
% of Annual Sales Forecast	***9.8%***		***10.5%***	

Table 7-9: Commercial Constrained Achievable Electric Demand Savings

End Use	2026 Demand Savings (MW)	% of 2026 Forecast Peak	2036 Demand Savings (MW)	% of 2036 Forecast Peak
Total System	194	9.2%	242	11.0%

Figure 7-2 shows the estimated 20-year cumulative annual energy efficiency savings potential broken out by end use across the entire commercial sector for the Constrained UCT achievable potential scenario. Lighting and refrigeration end uses both represent 25% of the energy efficiency savings in this scenario, accounting for 50% of total savings with Ventilation end uses accounting for another 18%.

Figure 7-2: Commercial Sector 2036 Constrained UCT Potential Savings by End Use

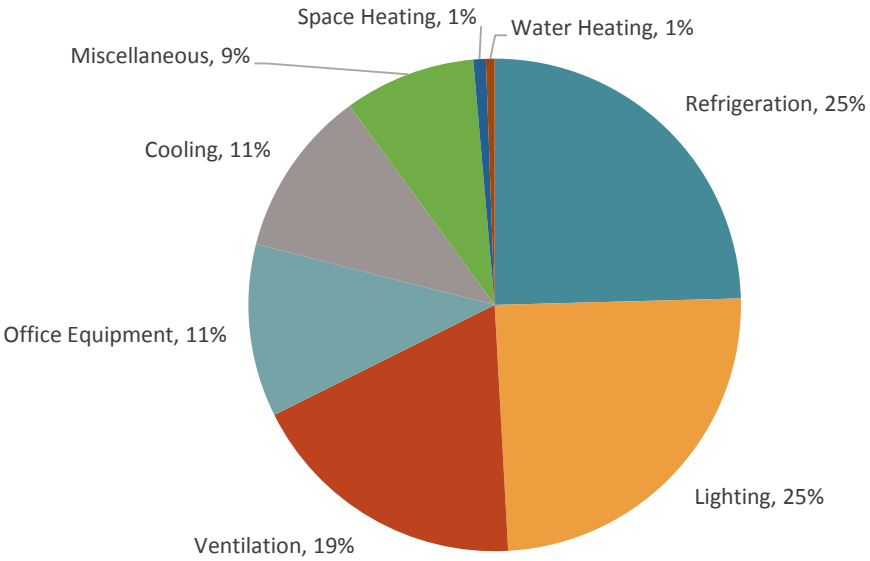
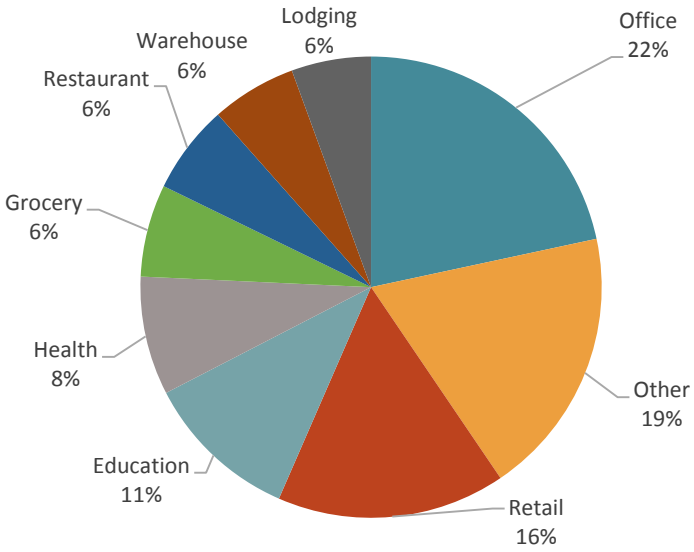


Figure 7-3 shows the breakdown of estimated savings in 2036 by building type for the Constrained UCT achievable potential scenario. The vast majority of savings come from existing/turnover measures, meaning energy efficient equipment is installed to replace existing equipment that has failed, with less than 1% of savings potential coming from new construction. Approximately 22% of the potential savings are found in Offices, followed by 19% in Other building types and 16% in Retail establishments.

Figure 7-3: Commercial Constrained UCT Savings in 2036 by Building Type



7.2.4.3 Annual Achievable Electric Savings Potential

Table 7-10 and Table 7-11 show cumulative annual electric energy savings for the Achievable UCT and Constrained Achievable scenarios for each year across the 20-year horizon for the study, broken out by end use. Table 7-12 and Table 7-13 show cumulative annual demand (MW) savings for these two potential scenarios for each year across the 20-year time horizon for the study, broken out by end use.

Table 7-10: Cumulative Annual Commercial Sector Electric Energy Savings (MWh) in the Unconstrained Achievable UCT Potential Scenario by End Use (MWh)

	Lighting	Office Equipment	Refrigeration	Space Cooling Chillers	Space Cooling Unitary and Split AC	Space Heating	Compressed Air	Water Heating	Ventilation	Cooking	Pools	Other	Total
2017	48,200	25,012	54,876	7,884	11,414	1,528	8,883	1,279	40,998	5,363	99	1,472	207,007
2018	96,401	50,024	109,751	15,769	22,828	3,056	17,767	2,557	81,995	10,725	197	2,945	414,015
2019	144,601	75,035	164,627	23,653	34,242	4,585	26,650	3,836	122,993	16,088	296	4,417	621,022
2020	192,802	100,047	219,502	31,537	45,655	6,113	35,534	5,115	163,990	21,451	394	5,889	828,029
2021	241,002	125,059	274,378	39,422	57,069	7,641	44,417	6,394	204,988	26,813	493	7,361	1,035,036
2022	289,202	150,071	329,254	47,306	68,483	9,169	53,300	7,672	245,985	32,176	591	8,834	1,242,044
2023	337,403	175,082	384,129	55,191	79,897	10,698	62,184	8,951	286,983	37,539	690	10,306	1,449,051
2024	385,603	200,094	439,005	63,075	91,311	12,226	71,067	10,230	327,980	42,901	788	11,778	1,656,058
2025	433,803	225,106	493,880	70,959	102,725	13,754	79,950	11,509	368,978	48,264	887	13,250	1,863,066
2026	482,004	250,118	548,756	78,844	114,138	15,282	88,834	12,787	409,975	53,626	985	14,723	2,070,073
2027	501,714	263,030	567,869	82,111	121,025	16,009	90,305	13,012	420,475	58,989	988	16,195	2,151,722
2028	521,424	275,943	586,982	85,378	127,911	16,736	91,776	13,236	430,975	64,352	991	17,667	2,233,371
2029	541,134	288,856	606,096	88,645	134,797	17,462	93,247	13,460	441,475	69,714	995	19,140	2,315,021
2030	560,844	301,768	625,209	91,913	141,683	18,189	94,718	13,685	451,975	75,077	998	20,612	2,396,670
2031	580,554	314,681	644,322	95,180	148,569	18,915	96,189	13,909	462,475	80,440	1,001	22,084	2,478,319
2032	600,264	327,594	663,435	98,447	155,455	19,642	97,660	14,133	472,975	85,802	1,004	23,556	2,559,969
2033	619,974	340,506	682,549	101,714	162,341	20,369	99,131	14,358	483,475	91,165	1,007	25,029	2,641,618
2034	639,684	353,419	701,662	104,981	169,228	21,095	100,602	14,582	493,975	96,528	1,010	26,501	2,723,267
2035	659,394	366,332	720,775	108,249	176,114	21,822	102,073	14,806	504,475	101,890	1,013	27,973	2,804,916
2036	679,104	379,244	739,889	111,516	183,000	22,548	103,544	15,031	514,975	107,253	1,016	29,446	2,886,566

Table 7-11: Cumulative Annual Commercial Sector Electric Energy Savings (MWh) in Constrained UCT Potential Scenario by End Use (MWh)

	Lighting	Office Equipment	Refrigeration	Space Cooling Chillers	Space Cooling Unitary and Split AC	Space Heating	Compressed Air	Water Heating	Ventilation	Cooking	Pools	Other	Total
2017	29,433	15,273	33,509	4,814	6,970	933	5,425	781	25,035	3,275	60	899	126,406
2018	60,812	31,556	69,234	9,947	14,400	1,928	11,328	1,613	51,725	6,766	124	1,858	261,291
2019	90,989	47,212	103,583	14,882	21,545	2,885	16,739	2,414	77,386	10,122	186	2,779	390,722
2020	120,233	62,397	136,897	19,669	28,474	3,813	21,965	3,190	102,277	13,378	246	3,673	516,212
2021	146,803	75,562	165,863	24,027	34,772	4,657	26,229	3,897	124,936	16,342	300	4,487	627,875
2022	172,204	86,353	191,991	28,190	40,778	5,462	30,558	4,569	146,604	19,176	352	5,223	731,460
2023	196,597	96,036	217,291	32,207	46,556	6,237	34,757	5,215	167,530	21,914	403	5,903	830,645
2024	220,263	105,576	241,451	36,069	51,970	6,936	38,872	5,843	187,893	24,577	452	6,569	926,471
2025	241,388	112,573	259,809	39,149	56,683	7,522	41,778	6,412	206,380	26,995	496	7,154	1,006,341
2026	261,972	120,454	278,582	41,891	61,303	8,098	45,566	6,975	224,628	29,382	540	7,755	1,087,146
2027	277,742	140,379	304,500	44,735	66,813	8,737	55,385	7,266	232,569	33,330	555	9,049	1,181,060
2028	293,418	160,604	330,784	47,623	72,386	9,389	56,319	7,516	240,352	37,258	564	10,343	1,266,555
2029	298,993	169,112	343,407	49,029	75,801	9,717	50,357	7,529	245,449	39,391	554	11,095	1,300,434
2030	303,008	178,486	355,822	50,519	79,131	10,054	50,771	7,553	250,495	41,245	545	11,876	1,339,506
2031	309,648	181,762	353,509	52,204	82,689	10,441	51,895	7,642	255,822	43,400	543	12,701	1,362,257
2032	308,044	165,068	335,575	52,507	83,080	10,405	47,099	7,487	250,479	44,226	529	12,631	1,317,131
2033	305,147	150,014	322,648	52,458	82,710	10,275	45,129	7,290	242,210	45,053	515	12,467	1,275,916
2034	304,044	144,115	310,708	52,404	82,374	10,109	44,357	7,140	235,218	46,065	502	12,670	1,249,706
2035	301,454	139,711	299,674	51,866	82,174	9,958	43,543	7,034	229,021	47,169	494	12,890	1,224,988
2036	298,567	137,907	298,914	51,256	82,574	9,916	43,054	6,955	225,051	48,367	487	13,112	1,216,159

Table 7-12: Cumulative Annual Commercial Sector Electric Demand Savings (MW) in the Unconstrained Achievable UCT Potential Scenario by End Use (MW)

	Lighting	Office Equipment	Refrigeration	Space Cooling Chillers	Space Cooling Unitary and Split AC	Space Heating	Compressed Air	Water Heating	Ventilation	Cooking	Pools	Other	Total
2017	8.6	1.5	4.3	1.0	4.1	0.0	2.7	0.2	11.1	1.7	1.0	0.0	36.3
2018	17.2	3.0	8.7	1.9	8.2	0.1	5.5	0.3	22.2	3.5	1.9	0.1	72.6
2019	25.9	4.5	13.0	2.9	12.3	0.1	8.2	0.5	33.3	5.2	2.9	0.1	108.9
2020	34.5	6.0	17.4	3.9	16.4	0.2	10.9	0.7	44.4	6.9	3.9	0.2	145.3
2021	43.1	7.5	21.7	4.9	20.5	0.2	13.7	0.9	55.5	8.7	4.8	0.2	181.6
2022	51.7	9.0	26.0	5.8	24.5	0.3	16.4	1.0	66.6	10.4	5.8	0.3	217.9
2023	60.4	10.5	30.4	6.8	28.6	0.3	19.1	1.2	77.7	12.1	6.8	0.3	254.2
2024	69.0	11.9	34.7	7.8	32.7	0.3	21.8	1.4	88.8	13.9	7.8	0.3	290.5
2025	77.6	13.4	39.0	8.8	36.8	0.4	24.6	1.6	100.0	15.6	8.7	0.4	326.8
2026	86.2	14.9	43.4	9.7	40.9	0.4	27.3	1.7	111.1	17.3	9.7	0.4	363.1
2027	89.5	15.8	45.6	10.4	43.8	0.5	27.5	1.8	117.3	19.1	10.7	0.4	382.3
2028	92.7	16.8	47.8	11.2	46.7	0.5	27.6	1.8	123.6	20.8	11.6	0.4	401.5
2029	95.9	17.7	50.1	11.9	49.5	0.5	27.8	1.9	129.8	22.5	12.6	0.4	420.7
2030	99.2	18.6	52.3	12.6	52.4	0.5	28.0	1.9	136.1	24.3	13.6	0.4	439.9
2031	102.4	19.5	54.5	13.3	55.3	0.6	28.1	2.0	142.4	26.0	14.5	0.4	459.0
2032	105.7	20.4	56.8	14.0	58.2	0.6	28.3	2.0	148.6	27.7	15.5	0.4	478.2
2033	108.9	21.3	59.0	14.7	61.0	0.6	28.5	2.1	154.9	29.5	16.5	0.4	497.4
2034	112.1	22.2	61.2	15.5	63.9	0.6	28.6	2.1	161.1	31.2	17.4	0.4	516.6
2035	115.4	23.2	63.5	16.2	66.8	0.7	28.8	2.1	167.4	32.9	18.4	0.4	535.8
2036	118.6	24.1	65.7	16.9	69.6	0.7	29.0	2.2	173.7	34.7	19.4	0.4	554.9

Table 7-13: Cumulative Annual Commercial Sector Electric Demand Savings (MW) in Constrained UCT Potential Scenario by End Use (MW)

	Lighting	Office Equipment	Refrigeration	Space Cooling Chillers	Space Cooling Unitary and Split AC	Space Heating	Compressed Air	Water Heating	Ventilation	Cooking	Pools	Other	Total
2017	5.3	0.9	2.6	0.6	2.5	0.0	1.7	0.1	6.8	1.1	0.0	0.6	22.2
2018	10.9	1.9	5.5	1.2	5.2	0.1	3.5	0.2	14.0	2.2	0.1	1.2	45.8
2019	16.3	2.8	8.2	1.8	7.7	0.1	5.2	0.3	21.0	3.3	0.1	1.8	68.5
2020	21.5	3.7	10.8	2.4	10.2	0.1	6.8	0.4	27.7	4.3	0.1	2.4	90.6
2021	26.3	4.5	13.1	3.0	12.5	0.1	8.2	0.5	33.8	5.3	0.1	3.0	110.3
2022	30.8	5.2	15.0	3.5	14.6	0.2	9.6	0.6	39.7	6.2	0.2	3.4	129.0
2023	35.1	5.8	17.0	4.0	16.7	0.2	10.9	0.7	45.4	7.1	0.2	3.8	146.8
2024	39.3	6.3	18.8	4.5	18.7	0.2	12.3	0.8	50.9	7.9	0.2	4.2	164.1
2025	43.1	6.8	20.2	4.9	20.5	0.2	13.3	0.9	55.9	8.7	0.2	4.5	179.2
2026	46.7	7.2	21.7	5.3	22.3	0.2	14.5	1.0	60.8	9.5	0.2	4.9	194.4
2027	49.4	8.5	24.6	5.9	24.5	0.3	15.9	1.0	65.5	10.8	0.2	5.9	212.3
2028	52.0	9.8	27.5	6.4	26.7	0.3	16.0	1.0	70.1	12.1	0.2	6.9	229.0
2029	52.9	10.4	28.8	6.7	28.2	0.3	15.1	1.1	73.2	12.8	0.2	7.4	237.1
2030	53.5	11.0	30.2	7.1	29.5	0.3	15.2	1.1	76.3	13.4	0.2	7.9	245.7
2031	54.6	11.3	30.0	7.5	30.9	0.3	15.3	1.1	79.5	14.1	0.2	8.5	253.5
2032	54.3	10.4	28.5	7.7	31.3	0.3	14.3	1.1	79.3	14.4	0.2	8.1	249.9
2033	53.5	9.4	27.5	7.9	31.4	0.3	13.5	1.0	78.3	14.7	0.2	7.7	245.5
2034	53.1	9.1	26.7	8.1	31.5	0.3	13.0	1.0	77.7	15.0	0.2	7.7	243.6
2035	52.4	8.9	26.1	8.4	31.8	0.3	12.5	1.0	77.2	15.4	0.2	7.8	242.0
2036	51.7	8.8	26.4	8.6	32.3	0.3	12.1	1.0	77.4	15.8	0.2	7.8	242.4

7.2.5 Commercial Electric Savings Summary by Measure Group

Table 7-14 on the following page provides an end-use breakdown of the commercial electric savings potential estimates for technical and economic potential, and each of the two achievable potential scenarios. The table indicates how the savings potential decreases systematically from the technical potential scenario to the Constrained UCT potential scenario as additional limiting factors such as cost-effectiveness requirements and anticipated market adoption at given funding levels are introduced.

Table 7-14: Commercial Sector Cumulative Electric Savings Potential by End-Use and Measure by 2036

Measure	Technical Potential (MWh)	Economic UCT (MWh)	Achievable UCT (MWh)	Constrained UCT (MWh)
Compressed Air				
Compressed Air Audits & Leak Repair	42,873	42,873	29,664	10,661
Efficient Air Compressors	43,002	43,002	24,673	**11,140**
Compressed Air Replacement with Air Blowers	32,691	32,691	22,619	**9,591**
Air-Entraining Air Nozzles	14,801	14,801	9,167	**3,887**
Variable Displacement Air Compressor	10,966	10,966	6,292	**2,651**
Compressed Air Pressure Flow Controller replacing no flow controller	6,350	6,350	3,933	**1,884**
High Efficiency Air Dryers	5,023	5,023	2,882	**1,301**
Automatic Drains	3,251	3,251	1,865	**675**
Compressed Air Storage Tank	1,715	1,715	1,187	**650**
Receiver Capacity Addition	1,793	1,793	1,029	**493**
Air Compressor Outdoor Air Intake	246	246	141	**77**
Low Pressure Drop-Filters	161	161	93	**44**
Cycling Dryers	448	0	0	**0**
Cooking				
HE Steamer	77,508	77,508	53,999	**24,329**
HE Holding Cabinet	59,139	59,139	39,655	**17,866**
HE Combination Oven	11,212	11,212	7,812	**3,519**
Induction Cooktops	4,691	4,691	3,268	**1,518**
HE Convection Ovens	3,615	3,615	2,518	**1,135**
HE Griddle	11,801	0	0	**0**
HE Fryer	6,089	0	0	**0**
Lighting - Exterior				
Exterior HID replacement with CFLs	51,899	51,899	33,312	**15,008**
LED Pedestrian Signals	42,892	42,892	29,794	**12,034**
LED Auto Traffic Signals	42,892	42,892	29,794	**11,446**
Lighting Power Density - Exterior	38,374	38,374	26,655	**12,009**
Garage HID replacement with LEDs	26,362	26,362	16,920	**7,623**
Lighting Power Density - Parking Garage	7,481	7,481	5,197	**2,341**
Exterior Linear Fluorescent	3,074	3,074	1,588	**715**
Garage BiLevel Controls	4,776	4,776	216	**102**
Exterior HID replacement with LEDs	26,362	0	0	**0**

Measure	Technical Potential (MWh)	Economic UCT (MWh)	Achievable UCT (MWh)	Constrained UCT (MWh)
Exterior BiLevel Controls	4,166	0	0	**0**
LED Fuel Pump Canopy Fixture	1,235	0	0	**0**
Sports Field Lighting HiLo Control	1,345	0	0	**0**
Lighting - Interior				
Central Lighting Control	273,594	273,594	174,312	**73,576**
Switching Controls for Multilevel Lighting (Non-HID)	145,054	145,054	92,028	**38,845**
LED Tube Lighting	69,396	69,396	47,819	**23,251**
LED low bay lighting	66,648	66,648	45,155	**21,956**
Interior Non Highbay/Lowbay LED Fixtures	62,564	62,564	42,389	**20,611**
Stairwell Bi-Level Control	36,772	36,772	25,028	**11,043**
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing T12)	39,974	39,974	23,914	**10,797**
Lamp & Ballast Retrofit (HPT8 Replacing T12)	30,572	30,572	18,290	**8,258**
Daylight Sensor Controls	28,700	28,700	18,256	**7,706**
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing Standard T8)	26,302	26,302	15,710	**7,093**
LED High bay lighting	16,093	16,093	11,150	**5,131**
CFL Screw-in	13,002	13,002	9,032	**3,239**
Occupancy Sensor & Daylight Sensor	8,763	8,763	5,574	**2,670**
Occupancy Sensors for LED Refrigerator Lighting	5,095	5,095	3,175	**1,461**
LED Specialty (replacing CFL)	7,692	7,692	1,708	**754**
Daylight Sensor Controls - New Construction	485	485	307	**130**
LED Specialty (replacing Incandescent)	6,023	6,023	228	**101**
LED Screw In (replacing Incandescent)	5,479	5,479	208	**92**
CFL Screw in Specialty	5,056	5,056	192	**69**
Lighting Power Density - Interior	293	293	191	**86**
CFL Reflector Flood	4,981	4,981	189	**68**
LED Downlight	4,625	4,625	175	**79**
CFL Fixture	4,496	4,496	170	**77**
LED Lighting in Refrigeration	256	256	164	**76**
LED Grow Light	153	153	92	**43**
Interior induction Lighting	123	123	85	**39**
Illuminated Signs to LED	116	116	81	**37**
LED Exit Sign	165	165	7	**3**
LED Troffer	33,094	0	0	**0**
Light Tube	2,306	0	0	**0**
Lamp & Ballast Retrofit (HPT8 Replacing Standard T8)	15,497	0	0	**0**
42W 8 lamp Hi Bay CFL	37	0	0	**0**

Measure	Technical Potential (MWh)	Economic UCT (MWh)	Achievable UCT (MWh)	Constrained UCT (MWh)
T5 HP Retrofits	10,858	0	0	**0**
HID Fixture Upgrade - Pulse Start Metal Halide	284	284	0	**0**
High Intensity Fluorescent Fixture (replacing HID) - New Construction	1	1	0	**0**
High Intensity Fluorescent Fixture (replacing HID)	720	720	0	**0**
LED Screw In (replacing CFL)	5,139	0	0	**0**
Office Equipment				
Energy Star office equipment including computers, monitors, copiers, multi-function machines.	433,517	433,517	251,793	**91,071**
PC Network Energy Management Controls replacing no central control	210,644	210,644	113,749	**40,596**
High Efficiency Hand Dryer	5,083	5,083	3,517	**1,684**
VFD for Process Fans -CRAC units	3,165	3,165	2,190	**929**
Computer Room Air Side Economizer	2,535	2,535	1,754	**840**
Computer Room Air Conditioner Economizer	2,529	2,529	1,750	**790**
Electrically Commutated Plug Fans in data centers	2,476	2,476	1,713	**773**
High Efficiency CRAC unit	2,218	2,218	1,535	**651**
Energy Star Compliant Refrigerator	1,798	1,798	1,244	**572**
Computer Room Hot Aisle Cold Aisle Configuration	566	0	0	**0**
Vendor Miser for Non-Refrig Equipment	3,641	0	0	**0**
Smart Strip plug outlet	106,264	0	0	**0**
Energy Star UPS	474	0	0	**0**
Other				
Engine Block Heater Timer	14,635	14,635	10,126	**3,663**
Parking Garage Exhaust Fan CO Control	10,976	10,976	7,595	**3,429**
NEMA Premium Transformer, three-phase	6,435	6,435	2,937	**1,508**
High Efficiency Transformer, three-phase	6,435	6,435	2,937	**1,508**
NEMA Premium Transformer, single-phase	6,409	6,409	2,925	**1,502**
High Efficiency Transformer, single-phase	6,409	6,409	2,925	**1,502**
Optimized Snow and Ice Melt Controls (electric)	21,038	0	0	**0**
Pools				
Heat Pump Pool Heater	1,380	1,380	955	**457**
High efficiency spas/hot tubs	99	99	62	**29**
Refrigeration				
Strip Curtains	239,500	239,500	168,221	**60,037**

Measure	Technical Potential (MWh)	Economic UCT (MWh)	Achievable UCT (MWh)	Constrained UCT (MWh)
ECM Case Motors	227,141	227,141	149,026	**67,285**
Door Gaskets - Cooler and Freezer	223,355	223,355	131,609	**47,009**
Vending Miser for Refrigerated Vending Machines	130,121	130,121	88,923	**35,729**
Anti-Sweat Heater Controls	120,447	120,447	82,073	**34,800**
Zero-Energy Doors	33,101	33,101	21,717	**10,402**
Walk-in Cooler Evaporator Motor Reduction	29,539	29,539	20,748	**9,367**
ENERGY STAR Commercial Glass Door Freezers	19,313	19,313	13,479	**6,073**
ENERGY STAR Commercial Solid Door Freezers	17,244	17,244	12,112	**5,457**
Floating Head Pressure Control	14,053	14,053	9,802	**4,156**
ENERGY STAR Commercial Solid Door Refrigerators	13,226	13,226	9,290	**4,185**
ENERGY STAR Commercial Glass Door Refrigerators	12,374	12,374	8,636	**3,891**
Refrigeration Suction Line Insulation	9,094	9,094	6,388	**2,708**
Discus and Scroll Compressors	7,165	7,165	4,166	**1,875**
Refrigeration Savings due to Lighting Savings	5,795	5,795	4,070	**1,834**
Efficient Refrigeration Condenser	3,818	3,818	2,220	**1,002**
Reach-in Refrigerated display case door retrofit	52,971	52,971	2,216	**935**
Automatic High Speed Doors	2,489	2,489	1,748	**788**
Automatic Door Closers for Refrigerated Walk-in Coolers/Freezers	2,485	2,485	1,745	**705**
Refrigerant charging correction	1,423	1,423	1,000	**359**
Efficient low-temp compressor	1,132	1,132	699	**315**
Night Covers	26,883	0	0	**0**
Evaporator Fan Motor Controls	15,447	0	0	**0**
Energy Star Ice Machines	24,369	0	0	**0**
Space Cooling - Chillers				
Chilled Hot Water Reset	51,216	51,216	34,303	**14,236**
EMS Pump Scheduling Controls	20,658	20,658	13,916	**6,283**
Air-Cooled Screw Chiller	15,053	15,053	10,140	**5,206**
Air-Cooled Recip Chiller	14,830	14,830	9,990	**5,129**
Water-Side Economizer	11,480	11,480	7,479	**3,377**
Retrocommissioning	6,204	6,204	4,179	**1,700**
Roof Insulation	6,008	6,008	3,042	**1,667**
HVAC Occupancy Sensors	4,195	4,195	2,826	**1,276**
Setback with Electric Heat	3,865	3,865	2,604	**1,149**
Water-Cooled Centrifugal Chiller < 150 ton	3,572	3,572	2,406	**1,236**
Water-Cooled Centrifugal Chiller > 300	3,569	3,569	2,404	**1,234**

Measure	Technical Potential (MWh)	Economic UCT (MWh)	Achievable UCT (MWh)	Constrained UCT (MWh)
ton				
Water-Cooled Centrifugal Chiller 150 - 300 ton	3,543	3,543	2,317	**1,189**
Water-Cooled Screw Chiller > 300 ton	3,358	3,358	2,262	**1,161**
Web enabled EMS	3,154	3,154	2,125	**959**
Water-Cooled Screw Chiller 150 - 300 ton	3,079	3,079	2,074	**1,065**
EMS install	3,953	3,953	2,038	**864**
Water-Cooled Screw Chiller < 150 ton	2,461	2,461	1,657	**851**
Air-Cooled Chiller Average Minimum Qualifying 1.04 kW/ton	1,507	1,507	1,015	**521**
Building Operator Certification	1,472	1,472	992	**359**
Efficient Chilled Water Pump	16,146	16,146	875	**371**
Water-Cooled Chiller Average 10% above IECC standard	1,205	1,205	812	**417**
Motor Belt Replacement	995	995	484	**204**
VAV System Conversion	7,800	7,800	422	**231**
Ceiling Insulation	4,612	4,612	250	**137**
High Efficiency Pumps	3,855	3,855	209	**89**
Window Improvements	3,913	3,913	198	**85**
Energy Efficient Windows	3,105	3,105	126	**64**
Wall Insulation	2,030	2,030	110	**60**
Water-Cooled Chiller Average 0.01 kW/ton IPLV Reduction	145	145	97	**50**
Air-Cooled Chiller Average 0.01 kW/ton IPLV Reduction	101	101	68	**35**
EMS Optimization	80	80	53	**29**
Integrated Building Design	89	89	35	**18**
Commissioning	14	14	9	**4**
Chiller Tune Up	0	0	0	**0**
Improved Duct Sealing - Cooling Chiller	5,157	0	0	**0**
Cool Roof	10,113	0	0	**0**
Zoning	19,766	0	0	**0**
Space Cooling - Unitary and Split AC				
EMS Pump Scheduling Controls	65,623	65,623	44,204	**19,958**
Retrocommissioning	28,329	28,329	19,083	**7,760**
AC <65k	25,932	25,932	17,468	**7,887**
Roof Insulation	28,182	28,182	14,270	**7,819**
HVAC Occupancy Sensors	19,678	19,678	13,255	**5,985**
AC 135k - 240k	18,728	18,728	12,616	**5,696**
AC 240k - 760k	13,760	13,760	9,269	**4,185**
AC >760k	12,420	12,420	8,366	**3,777**
Setback with Electric Heat	12,272	12,272	8,266	**3,647**

Measure	Technical Potential (MWh)	Economic UCT (MWh)	Achievable UCT (MWh)	Constrained UCT (MWh)
Web enabled EMS	12,149	12,149	8,184	**3,695**
EMS install	13,243	13,243	7,349	**3,116**
Packaged Terminal Air Conditioner (PTAC) - Cooling	10,351	10,351	6,166	**2,784**
Building Operator Certification	6,025	6,025	4,058	**1,468**
Air Source Heat Pump - Cooling	3,081	3,081	2,076	**937**
Window Improvements	36,199	36,199	1,961	**842**
Room A/C	11,320	11,320	1,603	**724**
Energy Efficient Windows	30,257	30,257	1,311	**673**
Ceiling Insulation	19,383	19,383	1,050	**575**
DX Condenser Coil Cleaning	1,492	1,492	1,005	**360**
Hotel Guest Room Occupancy Control System	726	726	475	**192**
Wall Insulation	6,447	6,447	349	**191**
Water Loop Heat Pump (WLHP) - Cooling	425	425	246	**111**
EMS Optimization	253	253	170	**93**
Integrated Building Design	401	401	159	**82**
Commissioning	63	63	41	**17**
Zoning	102,780	0	0	**0**
WLHP System (Cooling) New Construction	54	0	0	**0**
Improved Duct Sealing - Cooling AC	23,411	0	0	**0**
Ductless (mini split) - Cooling	12,348	0	0	**0**
Programmable Thermostats	6,491	0	0	**0**
AC 65k - 135k	30,647	0	0	**0**
Cool Roof	42,432	0	0	**0**
Ground Source Heat Pump - Cooling	8,109	0	0	**0**
Space Heating				
Web enabled EMS with Electric Heat	11,542	11,542	7,775	**3,510**
Retrocommissioning	7,157	7,157	4,821	**1,961**
HVAC Occupancy Sensors	3,778	3,778	2,545	**1,149**
VFD Pumps	2,728	2,728	1,625	**778**
Setback with Electric Heat	2,193	2,193	1,477	**652**
Web enabled EMS	2,171	2,171	1,463	**660**
EMS install	2,331	2,331	1,286	**545**
Building Operator Certification	1,077	1,077	725	**262**
Water Loop Heat Pump (WLHP) - Heating	718	718	396	**179**
Ceiling Insulation	4,539	4,539	246	**135**
Hotel Guest Room Occupancy Control System	187	187	122	**49**
EMS Optimization	45	45	30	**17**

Measure	Technical Potential (MWh)	Economic UCT (MWh)	Achievable UCT (MWh)	Constrained UCT (MWh)
Integrated Building Design	72	72	29	**15**
Commissioning	12	12	8	**3**
ECM motors on furnaces	1,196	0	0	**0**
Ground Source Heat Pump - Heating	14,199	0	0	**0**
Ductless (mini split) - Heating	13,793	0	0	**0**
WLHP System (Heating) New Construction	7	0	0	**0**
Cool Roof	8,468	0	0	**0**
Zoning	12,657	0	0	**0**
Ventilation				
Demand-Controlled Ventilation	300,515	300,515	207,176	**93,540**
Variable Speed Drive Control, 5 HP	148,496	148,496	96,240	**40,807**
Variable Speed Drive Control, 15 HP	148,217	148,217	96,059	**40,730**
Variable Speed Drive Control, 40 HP	147,938	147,938	95,878	**40,654**
High Volume Low Speed Fans	25,252	25,252	16,798	**8,046**
Engineered CKV hood	5,458	5,458	2,823	**1,275**
Economizer	102,680	0	0	**0**
High Speed Fans	6,059	0	0	**0**
Water Heating				
Tank Insulation (electric)	187	187	126	**53**
Low Flow Faucet Aerator	11,880	11,880	7,456	**3,571**
ECM Circulator Pump	2,758	2,758	1,966	**833**
Heat Pump Water Heater	1,824	1,824	1,303	**588**
HP Water Heater - Residential unit in Commercial Application	1,824	1,824	1,303	**588**
Heat Pump Storage Water Heater	1,824	1,824	1,303	**624**
Pre Rinse Sprayers (electric)	736	736	481	**174**
Low Flow Showerhead	536	536	279	**133**
Electric Tankless Water Heater	245	245	174	**89**
Tank Insulation (electric)	187	187	126	**53**
Hot Water (DHW) Pipe Insulation	177	177	123	**68**
Efficient Hot Water Pump	2,965	2,965	109	**46**
ES Dishwasher, Low Temp, Elec Heat	149	149	106	**49**
ES Dishwasher, High Temp, Elec Heat, Elec Booster	128	128	91	**42**
ES Dishwasher, High Temp, Gas Heat, Elec Booster	118	118	84	**39**
Clothes Washer ENERGY STAR, Electric Water heater, Electric Dryer	81	81	58	**23**
ES Dishwasher, High Temp, Gas Heat, Gas Booster	68	68	49	**23**
ES Dishwasher, Low Temp, Gas Heat	24	24	17	**8**
HVAC Condenser Heater Recovery Water Heating	3	3	2	**1**

Measure	Technical Potential (MWh)	Economic UCT (MWh)	Achievable UCT (MWh)	Constrained UCT (MWh)
Process Cooling Condenser Heater Recovery Water Heating	3	3	2	**1**
Drain water Heat Recovery Water Heater	1	1	1	**0**
Clothes Washer ENERGY STAR, Electric Water heater, Gas Dryer	97	0	0	**0**
Clothes Washer ENERGY STAR, Gas water heater, Electric dryer	74	0	0	**0**
Total				
Total	5,444,470	4,706,760	2,886,566	**1,216,159**
Percent of Annual Sales Forecast	47.2%	40.8%	25.0%	**10.6%**

7.3 ACHIEVABLE POTENTIAL BENEFITS & COSTS

Table 7-15 and Table 7-16 compare the NPV benefits and costs associated with the Achievable UCT and Constrained UCT Scenarios. Both scenarios compared the benefits and costs based on the UCT. However, the constrained scenario's 2% of revenue spending cap on DSM results in reduced program participation and overall NPV benefits.

Table 7-15: 10-Year Benefit-Cost Ratios for Achievable Potential Scenarios – Commercial Sector Only

10-year	NPV Benefits	NPV Costs	B/C Ratio	Net Benefits
Achievable UCT	$1,500,058,923	$377,834,965	3.97	$1,122,223,959
Constrained UCT	$815,236,773	$206,498,524	3.95	$608,738,248

Table 7-16: 20-Year Benefit-Cost Ratios for Achievable Potential Scenarios– Commercial Sector Only

20-year	NPV Benefits	NPV Costs	B/C Ratio	Net Benefits
Achievable UCT	$2,723,451,431	$587,408,986	4.64	$2,136,042,445
Constrained UCT	$1,383,022,031	$307,688,962	4.49	$1,075,333,069

Annual budgets for the two achievable potential scenarios, broken down by incentive and administrative costs are presented in Table 7-17 and Table 7-18.

Table 7-17: Annual Budgets for Unconstrained Achievable Potential UCT Scenarios– Commercial Sector Only
(Millions of Dollars)

	Admin	Incentive	Total
2017	$7.43	$39.43	$46.86
2018	$7.73	$39.48	$47.20
2019	$8.05	$39.57	$47.62
2020	$8.37	$39.65	$48.02
2021	$10.10	$41.44	$51.53
2022	$11.02	$41.72	$52.74
2023	$11.51	$41.98	$53.49
2024	$12.23	$42.98	$55.21
2025	$14.58	$46.10	$60.68

	Admin	Incentive	Total
2026	$15.22	$46.36	$61.57
2027	$10.85	$26.45	$37.30
2028	$11.13	$26.76	$37.89
2029	$15.15	$39.47	$54.62
2030	$15.57	$39.92	$55.48
2031	$14.81	$39.18	$53.99
2032	$20.06	$53.54	$73.61
2033	$22.78	$56.50	$79.28
2034	$23.03	$55.58	$78.62
2035	$22.27	$56.92	$79.19
2036	$22.76	$56.85	$79.61

Table 7-18: Annual Budgets for Cost Constrained UCT Scenarios– Commercial Sector Only (Millions of Dollars)

	Admin	Incentive	Total
2017	$4.54	$24.08	$28.62
2018	$5.03	$25.70	$30.73
2019	$5.04	$24.77	$29.81
2020	$5.08	$24.07	$29.16
2021	$5.58	$22.90	$28.48
2022	$5.82	$22.05	$27.87
2023	$5.87	$21.43	$27.30
2024	$6.07	$21.35	$27.42
2025	$6.57	$20.79	$27.36
2026	$6.77	$20.63	$27.41
2027	$7.99	$19.47	$27.46
2028	$8.11	$19.50	$27.62
2029	$7.65	$19.93	$27.57
2030	$7.75	$19.88	$27.63
2031	$7.61	$20.12	$27.73
2032	$7.62	$20.33	$27.95
2033	$8.04	$19.95	$27.99
2034	$8.25	$19.92	$28.17
2035	$7.97	$20.37	$28.34
2036	$8.18	$20.43	$28.61

8 INDUSTRIAL SECTOR ELECTRIC ENERGY EFFICIENCY POTENTIAL ESTIMATES

This section provides electric energy efficiency potential estimates for the industrial sector in the Consumers Energy service area. Estimates of technical, economic and achievable potential are provided in separate sections of this chapter.

According to 2015 historical sales data[41], the industrial sector accounts for approximately 26% of Consumers Energy annual retail electric sales, but less than 1% of total customers. Machine drives represent the largest end-use, followed by process heating and process heating and process cooling.

8.1 ELECTRIC ENERGY EFFICIENCY MEASURES EXAMINED

For the industrial sector, there were 192 energy efficiency measures included in the energy savings potential analysis. Table 8-1 provides a brief description of the types of measures included for each end use in the industrial sector. The list of measures was developed based on a review of the latest MEMD, and measures found in other TRMs and industrial potential studies. For each measure, the analysis considered incremental costs, energy and demand savings, and measure useful measure lives.

Table 8-1: Types of Electric Measures Included in the Industrial Sector Analysis

End Use Type	End Use Description	Measures Included
Computers & Office Equipment	Equipment Improvements	– Energy Star office equipment including computers, monitors, copiers, multi-function machines. – PC Network Energy Management Controls replacing no central control – Energy Efficient "Smart" Power Strip for PC/Monitor/Printer – Energy Star UPS – Energy Star office equipment including computers, monitors, copiers, multi-function machines. – PC Network Energy Management Controls replacing no central control
Water Heating	Water Heating Improvements	– Low Flow Faucet Aerator – Tank Insulation (electric) – Process Cooling Condenser Heat Recovery – HVAC Condenser Heater Recovery Water Heating – Heat Pump Water Heater – Efficient Hot Water Pump – Hot Water (DHW) Pipe Insulation – Drain Water Heat Recovery Water Heater – ECM Circulator Pump – Electric Tankless Water Heater

[41] U.S. Energy Information Administration

End Use Type	End Use Description	Measures Included
Ventilation	Ventilation Equipment	– Engineered CKV Hood – Variable Speed Drive Control, 15 HP – Variable Speed Drive Control, 5 HP – Variable Speed Drive Control, 40 HP – Destratification Fan (HVLS) – High Volume Low Speed Fans – Economizer – High Speed Fans
Space Cooling – Chillers	Cooling System Upgrades	– EMS Pump Scheduling – Wall Insulation – EMS install – Setback with Electric Heat – Web Enabled EMS – Efficient Chilled Water Pump – Chilled Hot Water Reset – EMS Optimization – Water Side Economizer – Chiller Tune Up – Water-Cooled Screw Chiller > 300 ton – Water-Cooled Centrifugal Chiller > 300 ton – Integrated Building Design – Retrocommissioning – Motor Belt Replacement – VAV System Conversion – Air-Cooled Recip Chiller – Air-Cooled Screw Chiller – High Efficiency Pumps – Ceiling Insulation – HVAC Occupancy Sensors – Programmable Thermostats – Economizer – Energy Efficient Windows – Roof Insulation – Zoning – Improved Duct Sealing – Window Improvements – Cool Roofing
Space Cooling – Unitary and Split AC	Cooling System Upgrades	– EMS Pump Scheduling – Wall Insulation – EMS install – Setback with Electric Heat – Web Enabled EMS – EMS Optimization – Integrated Building Design – Retrocommissioning – Room AC – Ground Source Heat Pump - Cooling

End Use Type	End Use Description	Measures Included
		– Water Loop Heat Pump (WLHP) - Cooling – Ceiling Insulation – DX Condenser Coil Cleaning – HVAC Occupancy Sensors – Economizer – Programmable Thermostats – Air Source Heat Pump - Cooling – Energy Efficient Windows – Packaged Terminal Air Conditioner (PTAC) - Cooling – AC 240K - 760 K – Roof Insulation – Zoning – Improved Duct Sealing – Window Improvements – Ductless (mini split) - Cooling – Cool Roofing
Lighting	Lighting Improvements	– Lighting Power Density - Parking Garage – CFL Screw-in – Lighting Power Density- Exterior – Lighting Power Density - Interior – CFL Screw in Specialty – LED Downlight – CFL Reflector Flood – LED Exit Sign – LED Screw In Replacing Incandescent – LED Specialty replacing incandescent – Stairwell Bi-Level Control – HID Fixture Upgrade - Pulse Start Metal Halide – CFL Fixture – Interior Induction Lighting – Long Day Lighting Dairy – High Intensity Fluorescent Fixture (replacing HID) – LED Grow Light – Daylight Sensor Controls – Central Lighting Control – Occupancy Sensor & Daylight Sensor – Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing T12) – Occupancy Sensor – LED Tube Lighting – Lamp & Ballast Retrofit (HPT8 Replacing T12) – LED High Bay Lighting – Lamp & Ballast Retrofit (Low Wattage HPT8

End Use Type	End Use Description	Measures Included
		Replacing Standard T8) – Switching Controls for Multilevel Lighting (Non-HID) – Exterior Linear Fluorescent – Exterior HID Replaced with CFL – Garage Bi-level Controls – LED Specialty replacing CFL – Garage HID replacement with LED – Illuminated Signs to LED – Interior Non-Highbay/Lowbay LED Fixtures – LED Low Bay Lighting – Exterior Bi-level Controls – T5 HP replacing T12 – Lamp & Ballast Retrofit (HPT8 Replacing Standard T8) – LED Screw In Replacing CFL – Light Tube – 42W 8 lamp Hi Bay CFL – Exterior HID replaced with LED – LED Troffer
Space Heating	Heating System Improvements	– EMS Pump Scheduling – Wall Insulation – EMS install – Setback with Electric Heat – Web Enabled EMS – EMS Optimization – VFD Pump – Integrated Building Design – Retrocommissioning – Ground Source Heat Pump - Heating – Ceiling Insulation – Water Loop Heat Pump (WLHP) - Heating – Destratification Fan (HVLS) – HVAC Occupancy Sensors – Programmable Thermostats – Economizer – ECM motors on furnaces – Air Source Heat Pump - Heating – Energy Efficient Windows – Roof Insulation – Zoning – Improved Duct Sealing – Window Improvements – Ductless (mini split) - Heating – Cool Roofing
Other		– Engine Block Heater Timer – Parking Garage Exhaust Fan CO Control

End Use Type	End Use Description	Measures Included
		– High Efficiency Transformer, three-phase – NEMA Premium Transformer, three-phase – High Efficiency Transformer, single-phase – NEMA Premium Transformer, single-phase – Optimized Snow and Ice Melt Controls
Machine Drive	Machine Drive Improvements	– Advanced Lubricants – Compressed Air System Management – Compressed Air - Advanced Compressor Controls – Elec motors replacing pneumatic (comp air) – Compressed Air Audits and Leak Repair – Storage Tank Addition (comp air) – VFD for Process Fans – Automatic Drains, High efficiency nozzles and other (comp air) – VFD for Process Pumps – Pump System Efficiency Improvements – Motor System Optimization (Including ASD) – Electric Supply System Improvements – Sensors & Controls – Industrial Motor Management – Fan System Improvements – High Efficiency Pumps – Advanced Efficient Motors – High Efficiency Dryers (comp air) – Energy Information System
Process Cooling & Refrigeration	Process Cooling and Refrigeration Improvements	– Improved Refrigeration – Electric Supply System Improvements – Sensors & Controls – Energy Information System
Process Heating	Heating Improvements	– Electric Supply System Improvements – Sensors & Controls – Energy Information System
Industrial Other		– Barrel Insulation - Inj. Molding (plastics) – High Efficiency Welders – Pellet Dryer Insulation (plastics) – 3 Phase High Eff Battery Charger – Injection Molding Machine - efficient (plastics) – Fiber Laser Replacing CO2 laser (auto industry)
Agriculture		– Fan Thermostat Controller – VFD for Process Fans - Agriculture – Milk Pre-Cooler Heat Exchanger – VFD for Process Pumps - Agriculture – Low Pressure Sprinkler Nozzles – VFD for Process Pumps - Irrigation

End Use Type	End Use Description	Measures Included
		– Variable Speed Drives for Dairy Vacuum Pumps – Other Industrial -Low-Energy Livestock Waterer – Other Industrial -Dairy Refrigerator Tune-Up – Grain Storage Temperature and Moisture Management Controller – Greenhouse Environmental Controls – Variable Speed Drive with Heat Exchanger, Milk – Scroll Compressor with Heat Exchanger for Dairy Refrigeration

8.2 INDUSTRIAL SECTOR RESULTS

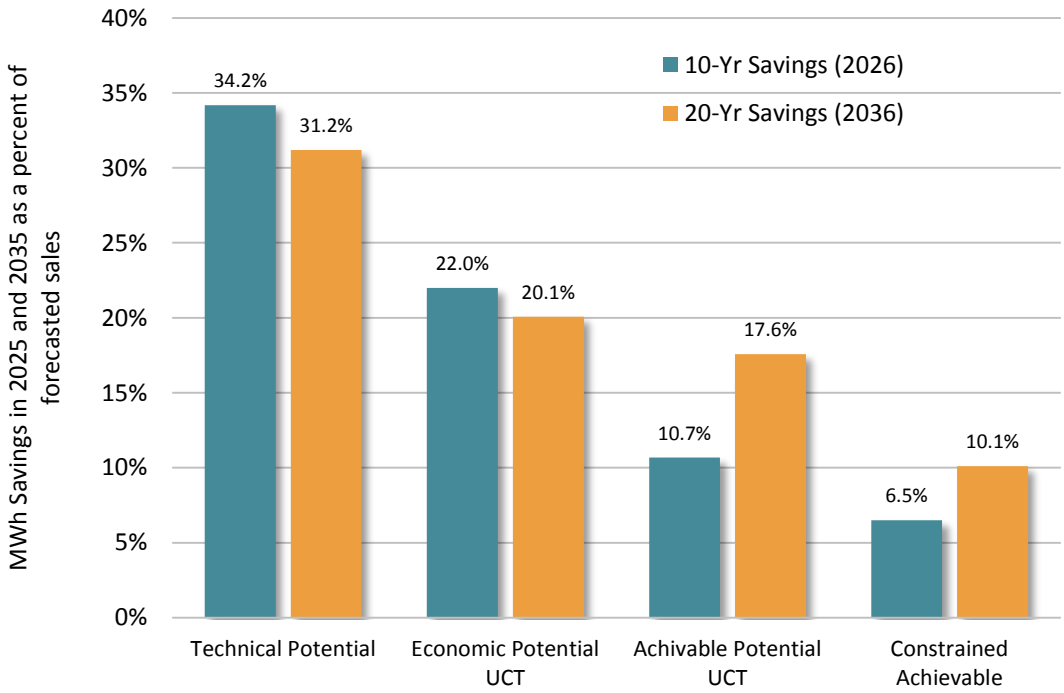
This section presents estimates for electric technical, economic, and achievable savings potential for the industrial sector. Each of the tables in the technical, economic and achievable sections present the respective potential for energy efficiency savings expressed as cumulative annual savings (MWh) and as a percentage of annual industrial kWh sales. Data is provided for 10 and 20-year horizons.

This energy efficiency potential study considers the impacts of the December 2007 Energy and Independence and Security Act (EISA) as an improving code standard for the industrial sector. EISA improves the baseline efficiency of compact fluorescent lamps (CFL), general service fluorescent lamps (GSFL), high intensity discharge (HID) lamps and ballasts and motors, all applicable in the industrial sector.

8.2.1 Summary of Findings

Figure 8-1 illustrates the estimated savings potential in the Consumers Energy service area for each of the scenarios included in this study.

Figure 8-1: Summary of Industrial Electric Energy Efficiency Potential as a % of Sales Forecasts



The potential estimates are expressed as cumulative annual 10-year and 20-year savings, as percentages of the respective 2026 and 2036 forecasts for industrial sector annual electricity sales. The technical potential is 34.2% in 2026 and 31.2% in 2036. The 10-year and 20-year economic potential is: 22.0% and 20.1% based on the UCT screen, assuming an incentive level equal to 50% of the measure cost.

The 10-year and 20-year achievable potential savings are: 10.7% and 17.6% for the Achievable UCT scenario and 6.5% and 10.1% for the Constrained Achievable scenario. The Achievable UCT scenario assumes 50% incentives and includes measures that passed the UCT Test. The Constrained Achievable scenario is a subset of Achievable UCT scenario, assuming a spending cap on non-residential DSM approximately equal to 2% of future annual industrial sector electric revenues. The percent of the non-residential spending cap allocated to the industrial sector is based on the percentage of total non-residential UCT savings that the industrial sector represents. This presumes that the total non-residential spending cap will be allocated at the sector level based on where the savings opportunities are found.

8.2.2 Technical Potential

Technical potential represents the quantification of savings that can be realized if energy-efficiency measures passing the qualitative screening are applied in all feasible instances, regardless of cost. Table 8-2 shows that the technical potential is almost 4.0 million MWh annually in the industrial sector during the 20-year period from 2017 to 2036 across Consumers Energy's service territory, representing 34.2% of 2026 forecast industrial sales and 31.2% of 2036 industrial sales. Machine Drive represents the majority of the potential at 39.6% of 20-yr savings, while other, agriculture, water heating, and computers and other office equipment represent the smallest shares, each with less than 2 percent of 20-yr savings. Table 8-3 shows the annual (summer) peak demand savings potential in 2026 and 2036. The twenty-year summer peak demand savings potential is 877 MW, which is 43.7% of the 10-year peak forecast and 40.5% of the 20-year peak forecast.

Table 8-2: Industrial Sector Technical Potential Savings By End Use

End Use	2026 Energy Savings (MWh)	% of 2026 Total	2036 Energy Savings (MWh)	% of 2036 Total
Machine Drive	1,570,910	39.6%	1,570,910	39.6%
Lighting	733,363	18.5%	733,363	18.5%
Space Cooling	794,851	20.0%	794,851	20.0%
Ventilation	201,137	5.1%	201,137	5.1%
Process Heating and Cooling	366,120	9.2%	366,120	9.2%
Space Heating	196,262	4.9%	196,262	4.9%
Other	4,986	0.1%	4,986	0.1%
Agriculture	73,359	1.8%	73,359	1.8%
Water Heating	19,622	0.5%	19,622	0.5%
Computers & Office Equipment	6,244	0.2%	6,244	0.2%
Total	**3,966,855**	**100%**	**3,966,855**	**100%**
% of Annual Sales Forecast	***34.2%***		***31.2%***	

Table 8-3: Industrial Sector Technical Potential Demand Savings

	2026 Demand Savings (MW)	% of 2026 Forecast Peak	2036 Demand Savings (MW)	% of 2036 Forecast Peak
Total System	877	43.7%	877	40.5%

8.2.3 Economic Potential

Economic potential is a subset of technical potential, which only accounts for measures that are cost-effective. Cost-effectiveness screening is based on the UCT Test. The UCT was used for this study because it is mandated in Michigan to be the primary cost-effectiveness test used when evaluating energy efficiency programs. 81% of all measures that were included in the industrial sector electric potential analysis passed the UCT Test.

Table 8-4 indicates that the economic potential based on the UCT screen is nearly 2.6 million MWh during the 20-year period from 2017 to 2036. This represents 22.0% and 20.1% of industrial sales across the respective 10-year and 20-year timeframes. Machine drive, lighting and process end uses make up a majority of the savings. Table 8-5 shows the economic demand savings potential in 2026 and 2036. The ten and twenty-year summer peak demand savings potential is 564 MW, which is 28.1% and 26.1% of the 10-year and 20-year peak forecasts.

Table 8-4: Industrial Sector Economic Potential (UCT) Savings By End Use

End Use	2026 Energy Savings (MWh)	% of 2026 Total	2036 Energy Savings (MWh)	% of 2036 Total
Machine Drive	1,064,702	41.7%	1,064,702	41.7%
Lighting	501,366	19.6%	501,366	19.6%
Space Cooling	408,021	16.0%	408,021	16.0%
Ventilation	137,273	5.4%	137,273	5.4%
Process Heating and Cooling	255,921	10.0%	255,921	10.0%
Space Heating	109,542	4.3%	109,542	4.3%
Other	3,202	0.1%	3,202	0.1%
Agriculture	55,914	2.2%	55,914	2.2%

End Use	2026 Energy Savings (MWh)	% of 2026 Total	2036 Energy Savings (MWh)	% of 2036 Total
Water Heating	13,977	0.5%	13,977	0.5%
Computers & Office Equipment	3,807	0.1%	3,807	0.1%
Total	**2,553,725**	**100%**	**2,553,725**	**100%**
% of Annual Sales Forecast	***22.0%***		***20.1%***	

Table 8-5: Industrial Sector Economic Potential (UCT) Demand Savings

	2026 Demand Savings (MW)	% of 2026 Forecast Peak	2036 Demand Savings (MW)	% of 2036 Forecast Peak
Total System	564	28.1%	564	26.1%

8.2.4 Achievable Potential

Achievable potential is an estimate of energy savings that can feasibly be achieved given market barriers and equipment replacement cycles. This study estimated achievable potential for two scenarios. The Unconstrained Achievable Potential Scenario with UCT Screening determines the achievable potential of all measures that passed the UCT economic screening assuming incentives equal to 50% of the measure cost. Unlike the economic potential, the industrial unconstrained achievable potential takes into account the estimated market adoption of energy efficiency measures based on the incentive level and the natural replacement cycle of equipment. The second achievable potential scenario, Constrained Achievable Potential Based with UCT Screening, assumes a spending cap equal to 2% of utility revenues, thereby limiting utilities from reaching the ultimate potential estimated in the Unconstrained Achievable UCT scenario.

8.2.4.1 UCT Achievable

Table 8-6 through Table 8-7 show the estimated savings for the Unconstrained Achievable UCT Potential Scenarios over 10 and 20-year time horizons. As noted above, the scenario assumes an incentive level approximately equal to 50% of the incremental measure cost and includes an estimated 20-year market adoption rates based on incentive levels and equipment replacement cycles. The 10-year and 20-year Achievable UCT potential savings estimates are approximately 1.24 million MWh and 2.2 million MWh. This equates to 10.7% and 17.6% of sector sales in 2026 and 2036. The ten and twenty-year summer demand savings estimates in the Unconstrained UCT scenario are 264 MW and 494 MW, respectively, which is 13.2% and 22.8% of the peak forecast in 2026 and 2036.

Table 8-6: Unconstrained Industrial Achievable UCT Potential Electric Energy Savings by End Use

End Use	2026 Energy Savings (MWh)	% of 2026 Total	2036 Energy Savings (MWh)	% of 2036 Total
Machine Drive	532,351	42.9%	1,064,702	47.6%
Lighting	250,328	20.2%	406,269	18.2%
Space Cooling	149,334	12.0%	264,546	11.8%
Ventilation	99,816	8.0%	108,989	4.9%
Process Heating and Cooling	127,744	10.3%	255,488	11.4%
Space Heating	37,967	3.1%	61,662	2.8%
Other	1,178	0.1%	2,357	0.1%
Agriculture	27,868	2.2%	55,736	2.5%
Water Heating	12,345	1.0%	13,977	0.6%
Computers & Office Equipment	1,640	0.1%	3,089	0.1%

End Use	2026 Energy Savings (MWh)	% of 2026 Total	2036 Energy Savings (MWh)	% of 2036 Total
total	**1,240,571**	**100%**	**2,236,815**	**100%**
% of Annual Sales Forecast	***10.7%***		***17.6%***	

Table 8-7: Industrial Achievable UCT Potential Demand Savings

	2025 Demand Savings (MW)	% of 2025 Forecast Peak	2035 Demand Savings (MW)	% of 2035 Forecast Peak
Total System	264	13.2%	494	22.8%

8.2.4.2 Achievable UCT vs. Constrained UCT

Although the Unconstrained Achievable UCT assumes incentives are set and capped at 50% of the incremental measure cost. The Achievable UCT scenario also assumes no DSM spending cap to reach all potential participants. In the Constrained UCT scenario, the analysis assumes a spending cap roughly equal to 2% of Consumers Energy annual utility revenues. The percent of the non-residential spending cap allocated to the industrial sector is based on the percentage of total non-residential UCT savings that the industrial sector represents. This presumes that the total non-residential spending cap will be allocated at the sector level based on where the savings opportunities are found. To model the impact of a spending cap the market penetration of all cost-effective measures was reduced by the ratio of capped spending to uncapped spending that would be required to achieve the Achievable UCT scenario savings potential.

Table 8-8 and Table 8-9 show the estimated savings for the Constrained UCT scenario over 10 and 20-year time horizons. The 10-year and 20-year Constrained UCT potential savings estimates are approximately 0.8 million MWh and 1.3 million MWh. This equates to 6.5% and 10.1% of sector sales in 2026 and 2036. The ten and twenty-year summer demand savings estimates in the Constrained UCT scenario are 161 MW and 252 MW, respectively, which is 8.0% and 11.6% of the peak forecast in 2026 and 2036.

Table 8-8: Industrial Constrained Achievable Energy Savings by End Use

End Use	2026 Energy Savings (MWh)	% of 2026 Total	2036 Energy Savings (MWh)	% of 2036 Total
Machine Drive	324,561	42.9%	607,993	47.3%
Lighting	152,619	20.2%	235,644	18.3%
Space Cooling	91,045	12.0%	152,368	11.8%
Ventilation	60,856	8.0%	65,740	5.1%
Process Heating and Cooling	77,882	10.3%	145,895	11.3%
Space Heating	23,148	3.1%	35,763	2.8%
Other	718	0.1%	1,346	0.1%
Agriculture	16,990	2.2%	31,828	2.5%
Water Heating	7,526	1.0%	8,396	0.7%
Computers & Office Equipment	1,000	0.1%	1,771	0.1%
total	**756,346**	**100%**	**1,286,743**	**100%**
% of Annual Sales Forecast	***6.5%***		***10.1%***	

Table 8-9: Industrial Constrained Achievable Demand Savings

	2026 Demand Savings (MW)	% of 2026 Forecast Peak	2036 Demand Savings (MW)	% of 2036 Forecast Peak
Total System	161	8.0%	252	11.6%

Figure 8-2 shows the estimated 20-year cumulative annual efficiency savings potential broken out by end use across the entire industrial sector for the Constrained UCT scenario. The Machine Drive end use shows the largest potential for savings at 47% of total savings, in the Constrained UCT scenario. Lighting is second at 18% of total savings.

Figure 8-2: Industrial Sector 2036 Constrained UCT Potential Savings by End Use

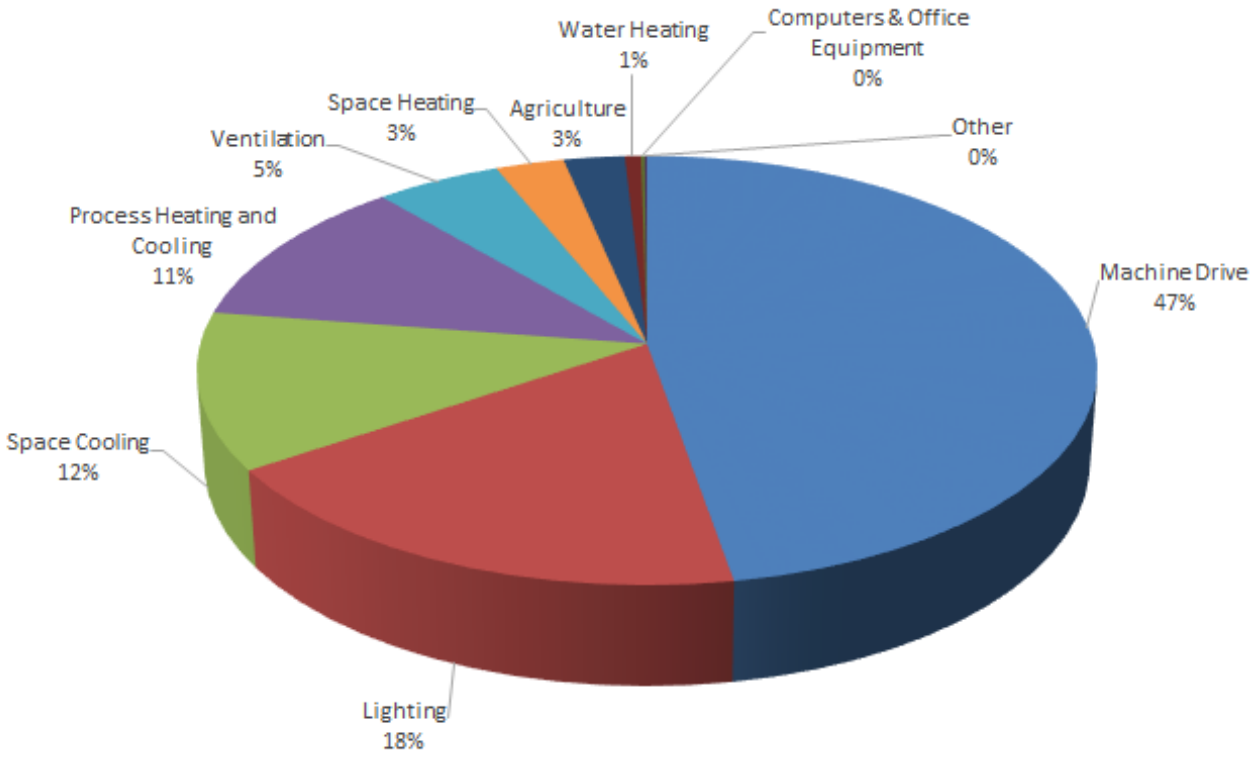
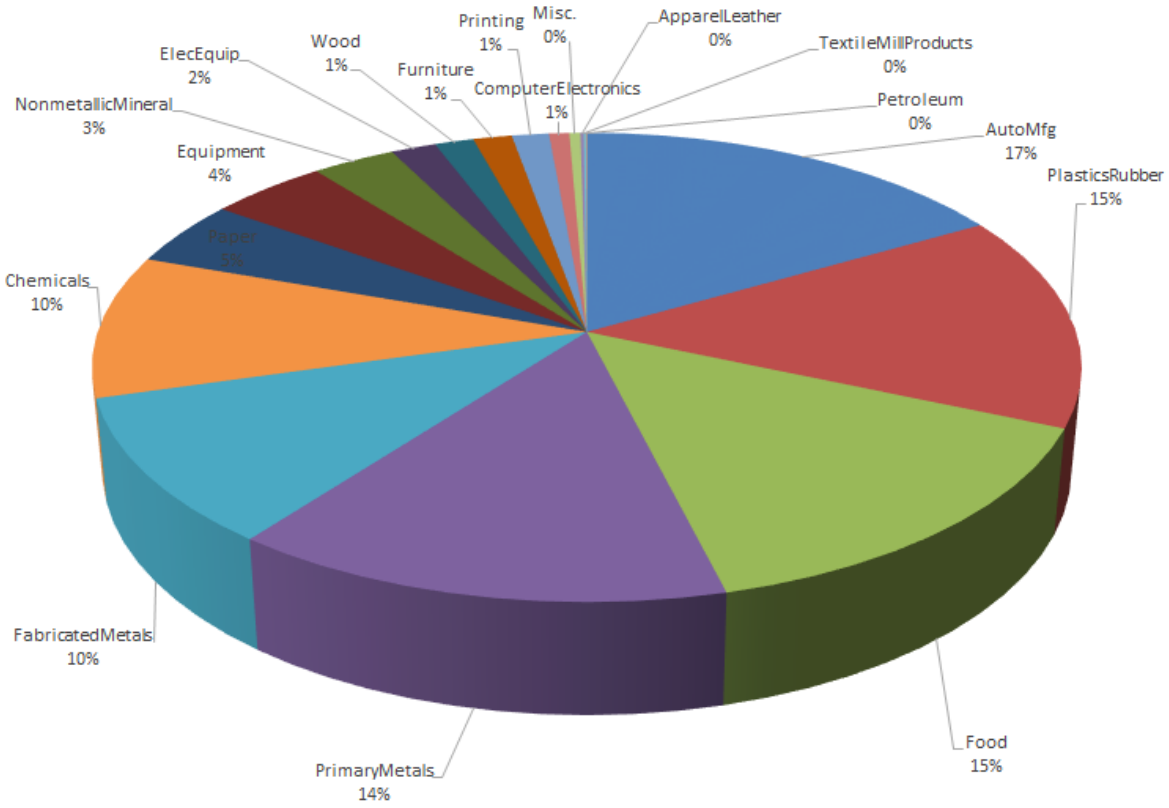


Figure 8-3 shows the breakdown of estimated savings in 2036 by industry type for the Constrained UCT scenario. The vast majority of savings come from the automobile manufacturing, plastics and rubber, food, primary metals, fabricated metals, and chemicals industries; with the other NAICS codes accounting for less than 20% of total savings.

Figure 8-3: Industrial Constrained UCT Savings in 2036 by Industry



8.2.4.3 Annual Achievable Electric Savings Potential

Tables 8-14, Table 8-15 and Table 8-16 show cumulative energy savings for both achievable potential scenarios for each year across the 20-year horizon for the study, broken out by end use.

Table 8-10: Cumulative Annual Industrial Energy Savings in the Unconstrained Achievable UCT Potential Scenario by End Use

	Machine Drive	Lighting	Space Cooling	Ventilation	Process Cooling & Heating	Space Heating	Other	Agriculture	Water Heat	Computers & Office Equipment	Total
2017	53,235	25,033	14,959	9,982	12,774	3,797	118	2,787	1,234	164	124,083
2018	106,470	50,066	29,918	19,963	25,549	7,593	236	5,574	2,469	328	248,166
2019	159,705	75,098	44,877	29,945	38,323	11,390	354	8,360	3,703	492	372,248
2020	212,940	100,131	59,830	39,927	51,098	15,187	471	11,147	4,938	656	496,325
2021	266,175	125,164	74,782	49,908	63,872	18,984	589	13,934	6,172	820	620,401
2022	319,411	150,197	89,735	59,890	76,646	22,780	707	16,721	7,407	984	744,477
2023	372,646	175,230	104,688	69,872	89,421	26,577	825	19,507	8,641	1,148	868,554
2024	425,881	200,262	119,570	79,853	102,195	30,374	943	22,294	9,876	1,312	992,560
2025	479,116	225,295	134,452	89,835	114,970	34,170	1,061	25,081	11,110	1,476	1,116,566
2026	532,351	250,328	149,334	99,816	127,744	37,967	1,178	27,868	12,345	1,640	1,240,571
2027	585,586	265,922	160,855	100,734	140,519	40,337	1,296	30,655	12,508	1,784	1,340,196
2028	638,821	281,516	172,377	101,651	153,293	42,706	1,414	33,441	12,671	1,929	1,439,820
2029	692,056	297,110	183,898	102,568	166,067	45,076	1,532	36,228	12,834	2,074	1,539,445
2030	745,291	312,704	195,419	103,486	178,842	47,445	1,650	39,015	12,998	2,219	1,639,069
2031	798,526	328,299	206,940	104,403	191,616	49,815	1,768	41,802	13,161	2,364	1,738,693
2032	851,762	343,893	218,461	105,320	204,391	52,184	1,885	44,589	13,324	2,509	1,838,318
2033	904,997	359,487	229,982	106,238	217,165	54,554	2,003	47,375	13,488	2,654	1,937,942
2034	958,232	375,081	241,503	107,155	229,939	56,923	2,121	50,162	13,651	2,799	2,037,566
2035	1,011,467	390,675	253,025	108,072	242,714	59,293	2,239	52,949	13,814	2,944	2,137,191
2036	1,064,702	406,269	264,546	108,989	255,488	61,662	2,357	55,736	13,977	3,089	2,236,815

Table 8-11: Cumulative Annual Industrial Energy Savings in Constrained UCT Potential Scenario by End Use

	Machine Drive	Lighting	Space Cooling	Ventilation	Process Cooling & Heating	Space Heating	Other	Agriculture	Water Heat	Computers & Office Equipment	Total
2017	37,739	17,746	10,605	7,076	9,056	2,692	84	1,976	875	116	87,963
2018	68,828	32,365	19,341	12,905	16,516	4,909	152	3,603	1,596	212	160,428
2019	100,261	47,146	28,174	18,799	24,059	7,151	222	5,249	2,325	309	233,694
2020	131,828	61,989	37,040	24,718	31,634	9,402	292	6,901	3,057	406	307,266
2021	163,169	76,727	45,843	30,594	39,154	11,637	361	8,542	3,784	503	380,314
2022	194,718	91,563	54,704	36,510	46,725	13,887	431	10,193	4,515	600	453,847
2023	226,645	106,576	63,672	42,496	54,386	16,164	502	11,865	5,256	698	528,259
2024	259,520	122,035	72,862	48,660	62,275	18,509	574	13,586	6,018	799	604,839
2025	292,200	137,401	81,998	54,788	70,117	20,840	647	15,296	6,776	900	680,963
2026	324,561	152,619	91,045	60,856	77,882	23,148	718	16,990	7,526	1,000	756,346
2027	362,539	163,744	99,262	61,510	86,996	24,838	803	18,978	7,643	1,103	827,415
2028	399,857	174,675	107,336	62,153	95,951	26,499	885	20,932	7,757	1,205	897,249
2029	431,734	184,013	114,233	62,702	103,600	27,918	956	22,601	7,855	1,291	956,902
2030	463,547	193,332	121,116	63,251	111,234	29,334	1,026	24,266	7,953	1,378	1,016,434
2031	495,193	202,602	127,962	63,796	118,828	30,742	1,096	25,923	8,050	1,464	1,075,656
2032	518,641	209,470	133,035	64,200	124,454	31,786	1,148	27,150	8,122	1,528	1,119,534
2033	541,446	216,151	137,970	64,593	129,927	32,801	1,199	28,344	8,191	1,590	1,162,210
2034	564,289	222,842	142,912	64,986	135,408	33,818	1,249	29,540	8,262	1,652	1,204,958
2035	586,082	229,226	147,627	65,362	140,638	34,788	1,297	30,681	8,328	1,711	1,245,740
2036	607,993	235,644	152,368	65,740	145,895	35,763	1,346	31,828	8,396	1,771	1,286,743

Table 8-12: Cumulative Annual Industrial Demand Savings in the Unconstrained Achievable UCT Potential Scenario by End Use

	Machine Drive	Lighting	Space Cooling	Ventilation	Process Cooling & Heating	Space Heating	Other	Agriculture	Water Heat	Computers & Office Equipment	Total
2017	11.83	4.62	3.98	2.36	2.21	0.61	0.06	0.48	0.23	0.01	26.4
2018	23.66	9.24	7.97	4.72	4.41	1.23	0.12	0.96	0.46	0.02	52.8
2019	35.48	13.86	11.95	7.08	6.62	1.84	0.18	1.45	0.69	0.04	79.2
2020	47.31	18.48	15.93	9.43	8.83	2.45	0.25	1.93	0.93	0.05	105.6
2021	59.14	23.10	19.92	11.79	11.04	3.06	0.31	2.41	1.16	0.06	132.0
2022	70.97	27.72	23.90	14.15	13.24	3.68	0.37	2.89	1.39	0.07	158.4
2023	82.80	32.34	27.88	16.51	15.45	4.29	0.43	3.38	1.62	0.09	184.8
2024	94.62	36.96	31.87	18.87	17.66	4.90	0.49	3.86	1.85	0.10	211.2
2025	106.45	41.58	35.85	21.23	19.86	5.52	0.55	4.35	2.08	0.11	237.6
2026	118.28	46.19	39.84	23.59	22.07	6.13	0.62	4.83	2.32	0.12	264.0
2027	130.11	49.01	43.44	23.81	24.28	6.71	0.68	6.67	2.35	0.13	287.2
2028	141.94	51.84	47.04	24.03	26.49	7.30	0.74	8.50	2.38	0.15	310.4
2029	153.77	54.67	50.64	24.25	28.69	7.88	0.80	10.34	2.41	0.16	333.6
2030	165.59	57.50	54.24	24.47	30.90	8.47	0.86	12.18	2.44	0.17	356.8
2031	177.42	60.34	57.84	24.69	33.11	9.05	0.92	14.01	2.47	0.18	380.0
2032	189.25	63.17	61.44	24.91	35.31	9.64	0.98	15.51	2.49	0.19	402.9
2033	201.08	66.00	65.05	25.13	37.52	10.22	1.05	17.00	2.52	0.20	425.8
2034	212.91	68.84	68.65	25.35	39.73	10.81	1.11	18.49	2.54	0.21	448.6
2035	224.73	71.67	72.25	25.57	41.94	11.40	1.17	19.98	2.57	0.23	471.5
2036	236.56	74.49	75.85	25.79	44.14	11.98	1.23	21.47	2.60	0.24	494.3

Table 8-13: Cumulative Annual Industrial Demand Savings in Constrained UCT Potential Scenario by End Use

	Machine Drive	Lighting	Space Cooling	Ventilation	Process Cooling & Heating	Space Heating	Other	Agriculture	Water Heat	Computers & Office Equipment	Total
2017	8.38	3.28	2.82	1.67	1.56	0.43	0.04	0.34	0.16	0.01	18.7
2018	15.15	5.97	5.15	3.05	2.85	0.79	0.08	0.62	0.30	0.02	34.0
2019	22.15	8.70	7.50	4.44	4.16	1.15	0.12	0.91	0.44	0.02	49.6
2020	29.17	11.44	9.83	5.84	5.47	1.52	0.15	1.19	0.57	0.03	65.2
2021	36.11	14.16	12.18	7.23	6.77	1.88	0.19	1.48	0.71	0.04	80.7
2022	43.11	16.89	14.54	8.63	8.07	2.24	0.22	1.76	0.85	0.04	96.4
2023	50.26	19.67	16.93	10.04	9.40	2.61	0.26	2.05	0.99	0.05	112.3
2024	57.72	22.52	19.41	11.50	10.76	2.99	0.30	2.35	1.13	0.06	128.7
2025	64.95	25.36	21.87	12.95	12.11	3.36	0.34	2.64	1.27	0.07	144.9
2026	72.08	28.15	24.29	14.38	13.46	3.74	0.37	2.94	1.41	0.07	160.9
2027	81.82	30.20	26.95	14.54	15.03	4.15	0.43	3.28	1.43	0.09	177.9
2028	90.34	32.22	29.55	14.85	16.58	4.57	0.48	3.63	1.47	0.10	193.8
2029	96.02	33.62	31.70	14.99	17.90	4.92	0.52	3.91	1.49	0.10	205.2
2030	103.08	35.32	33.75	15.13	19.22	5.27	0.55	4.20	1.51	0.11	218.1
2031	110.07	37.01	35.80	15.27	20.53	5.61	0.59	4.49	1.53	0.11	231.0
2032	110.02	37.66	36.68	14.89	20.95	5.80	0.58	4.58	1.49	0.11	232.7
2033	113.02	38.09	37.76	14.59	21.57	6.01	0.57	4.71	1.46	0.11	237.9
2034	116.26	38.65	38.84	14.27	22.19	6.21	0.57	4.84	1.43	0.11	243.4
2035	118.63	38.86	39.92	13.90	22.71	6.40	0.57	4.94	1.40	0.11	247.4
2036	121.55	39.09	41.02	13.55	23.25	6.59	0.57	5.06	1.37	0.10	252.2

8.2.5 Industrial Electric Savings Summary by Measure Group

Table 8-14 below provides an end-use breakdown of the industrial electric savings potential estimates for technical and economic potential, and each of the achievable potential scenarios. The table indicates how the savings potential decreases systematically from the technical potential scenario to the Constrained UCT potential scenario as additional limiting factors such as cost-effectiveness requirements and anticipated market adoption at given funding levels are introduced.

Table 8-14: Electric Potential by End-Use and Measure

End Use	Technical Potential (MWh)	Economic UCT (MWh)	Achievable UCT (MWh)	Constrained UCT (MWh)
Computers & Office Equipment				
Energy Star office equipment including computers, monitors, copiers, multi-function machines.	4,131	2,612	2,612	1,491
PC Network Energy Management Controls replacing no central control	363	225	225	135
High Efficiency CRAC Unit	250	33	33	19
Energy Star Compliant Single Door Refrigerator	307	219	219	125
Energy Efficient "Smart" Power Strip for PC/Monitor/Printer	1,154	713	0	0
Energy Star UPS	38	5	0	0
Water Heating				
Low Flow Faucet Aerator	14,032	10,467	10,467	6,316
Tank Insulation (electric)	315	13	13	8
Process Cooling Condenser Heat Recovery	241	169	169	97
Heat Pump Water Heater	1,417	1,001	1,001	571
HVAC Condenser Heater Recovery Water Heating	1,529	1,075	1,075	649
Efficient Hot Water Pump	323	28	28	17
Hot Water (DHW) Pipe Insulation	5	0	0	0
High Efficiency Electric Water Heater	286	214	214	129
Solar Storage Water Heating	1,097	814	814	491
ECM Circulator Pump	122	14	14	8
Electric Tankless Water Heater	43	29	29	17
Drain Water Heat Recovery Water Heater	212	153	153	92
Ventilation				
Variable Speed Drive Control, 15 HP	28,774	19,352	19,352	11,677
Variable Speed Drive Control, 5 HP	28,774	19,352	19,352	11,677
Variable Speed Drive Control, 40 HP	28,774	19,352	19,352	11,677
Destratification Fan (HVLS)	16,480	11,386	11,386	6,865
Economizer	35,179	24,195	0	0
High Volume Low Speed Fans	57,238	39,546	39,546	23,843
High Speed Fans	5,917	4,088	0	0
Space Cooling - Chillers				
EMS Pump Scheduling	443	313	313	179
Wall Insulation	910	94	94	55

End Use	Technical Potential (MWh)	Economic UCT (MWh)	Achievable UCT (MWh)	Constrained UCT (MWh)
EMS install	4,744	3,349	3,349	2,020
Setback with Electric Heat	993	743	743	425
Web Enabled EMS	4,917	3,477	3,477	1,995
EMS Optimization	261	194	194	117
Efficient Chilled Water Pump	320	29	29	17
Water Side Economizer	417	287	287	164
Chilled Hot Water Reset	1,033	769	769	464
Water-Cooled Centrifugal Chiller > 300 ton	1,301	893	893	510
Water-Cooled Screw Chiller > 300 ton	1,224	840	840	480
Integrated Building Design	27,907	11,408	11,408	6,515
Chiller Tune Up	237	133	133	80
VAV System Conversion	141	79	79	48
Motor Belt Replacement	78	44	44	27
Air-Cooled Recip Chiller	6,486	4,452	4,452	2,542
Air-Cooled Screw Chiller	6,584	4,519	4,519	2,581
Ceiling Insulation	670	27	27	17
High Efficiency Pumps	91	8	8	5
Energy Efficient Windows	2,578	150	150	86
Economizer	10,554	7,516	0	0
HVAC Occupancy Sensors	3,186	2,253	2,253	1,286
Programmable Thermostats	1,054	68	0	0
Roof Insulation	70	40	40	24
Improved Duct Sealing	90	7	0	0
Window Improvements	16	2	0	0
Cool Roofing	3,243	2,215	0	0
Space Cooling – Unitary and Split AC				
EMS Pump Scheduling	4,182	2,862	2,862	1,634
Wall Insulation	8,593	859	859	506
EMS install	44,806	30,367	30,367	18,323
Setback with Electric Heat	9,381	6,790	6,790	3,878
Web Enabled EMS	46,436	31,780	31,780	18,148
EMS Optimization	2,464	1,773	1,773	1,070
Integrated Building Design	276,310	107,795	107,795	61,556
Ceiling Insulation	8,531	415	415	253
Room AC	4,891	310	310	177
Water Loop Heat Pump (WLHP) - Cooling	2,533	1,486	1,486	849
Energy Efficient Windows	32,464	1,964	1,964	1,122
Economizer	99,673	68,552	0	0
HVAC Occupancy Sensors	43,266	29,610	29,610	16,909
Programmable Thermostats	9,957	577	0	0

End Use	Technical Potential (MWh)	Economic UCT (MWh)	Achievable UCT (MWh)	Constrained UCT (MWh)
Air Source Heat Pump - Cooling	7,423	5,080	5,080	2,901
Roof Insulation	937	504	504	304
AC 240K - 760 K	9,750	6,673	6,673	3,810
Improved Duct Sealing	1,179	89	0	0
Ground Source Heat Pump - Cooling	20,119	13,689	0	0
DX Condenser Coil Cleaning	2,960	2,143	2,143	1,293
Window Improvements	200	21	0	0
Cool Roofing	40,054	26,469	0	0
Ductless (mini split) - Cooling	39,190	24,303	0	0
Lighting				
Lighting Power Density - Parking Garage	824	560	560	320
Lighting Power Density- Exterior	8,791	6,377	6,377	3,642
Lighting Power Density - Interior	3,382	1,754	1,754	1,002
LED Downlight	277	179	179	102
CFL Screw-in	3,657	2,737	2,737	1,563
LED Exit Sign	4,005	363	363	207
LED Screw In Replacing Incandescent	2,785	1,920	1,920	1,096
CFL Screw in Specialty	3,343	2,304	2,304	1,316
LED Specialty replacing incandescent	3,604	2,484	2,484	1,419
Stairwell Bi-Level Control	4,019	2,820	2,820	1,610
Long Day Lighting Dairy	7,376	5,113	5,113	2,920
HID Fixture Upgrade - Pulse Start Metal Halide	12,266	1,083	1,083	619
CFL Reflector Flood	387	267	267	153
Interior Induction Lighting	34,353	23,814	23,814	13,599
CFL Fixture	525	351	351	200
High Intensity Fluorescent Fixture (replacing HID)	52,933	34,984	34,984	19,977
LED Grow Light	30,536	22,357	22,357	12,767
Daylight Sensor Controls	79,584	59,562	59,562	35,890
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing T12)	23,812	15,124	15,124	8,637
LED Tube Lighting	32,976	20,303	20,303	11,594
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing Standard T8)	15,872	10,081	10,081	5,757
Central Lighting Control	45,695	34,199	34,199	20,607
Lamp & Ballast Retrofit (HPT8 Replacing T12)	23,873	15,023	15,023	8,579
Occupancy Sensor & Daylight Sensor	24,209	17,637	0	0
LED High Bay Lighting	53,094	36,994	36,994	21,125
Occupancy Sensor	24,209	17,637	0	0
Exterior Linear Fluorescent	11,577	7,737	7,737	4,418
Exterior HID Replaced with CFL	3,619	2,626	2,626	1,499
Switching Controls for Multilevel Lighting (Non-HID)	29,430	21,913	21,913	13,204

End Use	Technical Potential (MWh)	Economic UCT (MWh)	Achievable UCT (MWh)	Constrained UCT (MWh)
Garage HID replacement with LED	0	0	0	0
Interior Non-Highbay/Lowbay LED Fixtures	44,107	30,310	30,310	17,309
LED Low Bay Lighting	23,493	16,144	16,144	9,219
Garage Bi-level Controls	3,880	2,878	2,878	1,644
LED Specialty replacing CFL	2,432	1,820	1,820	1,039
Illuminated Signs to LED	3,722	2,786	2,786	1,591
Exterior Bi-level Controls	9,937	7,397	0	0
T5 HP replacing T12	30,670	19,301	19,301	11,021
Lamp & Ballast Retrofit (HPT8 Replacing Standard T8)	9,353	5,941	0	0
Light Tube	19,280	13,579	0	0
42W 8 lamp Hi Bay CFL	20,875	15,067	0	0
Exterior HID replaced with LED	24,511	17,782	0	0
LED Troffer	92	58	0	0
Space Heating				
EMS Pump Scheduling	984	693	693	396
Wall Insulation	2,022	207	207	122
EMS install	10,543	7,404	7,404	4,467
Setback with Electric Heat	2,207	1,645	1,645	939
Web Enabled EMS	10,926	7,694	7,694	4,393
EMS Optimization	580	430	430	259
Integrated Building Design	65,014	26,421	26,421	15,087
VFD Pump	1,812	1,207	1,207	728
Ceiling Insulation	1,982	83	83	50
Water Loop Heat Pump (WLHP) - Heating	708	434	434	248
Destratification Fan (HVLS)	10,987	7,851	7,851	4,733
Energy Efficient Windows	6,990	409	409	234
ECM motors on furnaces	733	65	0	0
Economizer	23,452	16,629	0	0
HVAC Occupancy Sensors	9,057	6,382	6,382	3,644
Programmable Thermostats	2,343	149	0	0
Air Source Heat Pump - Heating	981	691	691	394
Roof Insulation	197	113	113	68
Improved Duct Sealing	254	0	0	0
Ground Source Heat Pump - Heating	17,800	12,468	0	0
Window Improvements	36	4	0	0
Cool Roofing	7,203	4,904	0	0
Ductless (mini split) - Heating	19,451	13,661	0	0
Other				
Engine Block Heater Timer	839	625	625	357
Parking Garage Exhaust Fan CO Control	1,554	1,084	1,084	619

End Use	Technical Potential (MWh)	Economic UCT (MWh)	Achievable UCT (MWh)	Constrained UCT (MWh)
NEMA Premium Transformer, three-phase	356	158	158	90
High Efficiency Transformer, three-phase	375	167	167	95
High Efficiency Transformer, single-phase	377	168	168	96
NEMA Premium Transformer, single-phase	349	155	155	89
Optimized Snow and Ice Melt Controls	1,136	845	0	0
Machine Drive				
Advanced Lubricants	27,392	20,773	20,773	11,863
Compressed Air System Management	56,455	42,271	42,271	24,138
Compressed Air - Advanced Compressor Controls	25,211	15,642	15,642	8,932
Storage Tank Addition (comp air)	22,569	11,461	11,461	6,545
VFD for Process Pumps	224,192	136,572	136,572	77,989
Pump System Efficiency Improvements	178,877	122,275	122,275	69,825
Motor System Optimization (Including ASD)	419,525	295,376	295,376	168,673
Automatic Drains, High efficiency nozzles and other (comp air)	25,447	19,557	19,557	11,168
Electric Supply System Improvements	131,579	91,478	91,478	52,238
High Efficiency Pumps	77,229	55,932	55,932	31,940
Compressed Air Audits and Leak Repair	90,824	69,800	69,800	39,859
High Efficiency Dryers (comp air)	23,641	18,081	18,081	10,325
Sensors & Controls	51,244	30,932	30,932	17,664
VFD for Process Fans	58,981	33,605	33,605	19,190
Industrial Motor Management	19,979	14,291	14,291	8,161
Elec motors replacing pneumatic (comp air)	49,506	31,555	31,555	18,019
Fan System Improvements	18,862	12,598	12,598	7,194
Advanced Efficient Motors	50,042	29,053	29,053	16,591
Energy Information System	19,356	13,450	13,450	7,680
Process Cooling & Refrigeration				
Improved Refrigeration	111,421	82,115	82,115	46,891
Electric Supply System Improvements	40,935	30,374	30,374	17,345
Sensors & Controls	41,012	27,331	27,331	15,607
Energy Information System	18,706	13,963	13,963	7,974
Process Heating				
Electric Supply System Improvements	56,115	40,620	40,620	23,196
Sensors & Controls	47,341	31,383	31,383	17,921
Energy Information System	17,774	12,866	12,866	7,347
Industrial Other				
Barrel Insulation - Inj. Molding (plastics)	4,660	186	186	106
High Efficiency Welders	129	91	91	52
3 Phase High Eff Battery Charger	8,369	6,041	6,041	3,449
Pellet Dryer Insulation (plastics)	3,717	148	148	85

End Use	Technical Potential (MWh)	Economic UCT (MWh)	Achievable UCT (MWh)	Constrained UCT (MWh)
Injection Molding Machine - efficient (plastics)	15,304	10,371	10,371	5,922
Fiber Laser Replacing CO2 laser (auto industry)	638	432	0	0
Agriculture				
Fan Thermostat Controller	40,169	31,974	31,974	18,258
Low Pressure Sprinkler Nozzles	5,258	4,185	4,185	2,390
Milk Pre-Cooler Heat Exchanger	4,916	3,913	3,913	2,235
VFD for Process Fans - Agriculture	4,063	2,645	2,645	1,510
Variable Speed Drives for Dairy Vacuum Pumps	5,136	3,344	3,344	1,909
Grain Storage Temperature and Moisture Management Controller	6,147	4,347	4,347	2,483
VFD for Process Pumps - Agriculture	2,911	1,895	1,895	1,082
Other Industrial -Low-Energy Livestock Waterer	3,159	2,515	2,515	1,436
Greenhouse Environmental Controls	346	276	276	157
VFD for Process Pumps - Irrigation	952	620	620	354
Other Industrial -Dairy Refrigerator Tune-Up	29	23	23	13
Variable Speed Drive with Heat Exchanger, Milk	228	148	0	0
Scroll Compressor with Heat Exchanger for Dairy Refrigeration	46	30	0	0
Total	**3,966,855**	**2,553,725**	**2,236,782**	**1,286,743**
% of Annual Sales Forecast	**31.2%**	**20.1%**	**17.6%**	**10.1%**

8.3 ACHIEVABLE POTENTIAL BENEFITS & COSTS

Table 8-15 and Table 8-16 compare the NPV benefits and costs associated with the Achievable UCT and Constrained UCT Scenarios. Both scenarios compared the benefits and costs based the UCT. However, the constrained scenario's 2% of revenue spending cap on DSM results in reduced program participation and overall NPV benefits.

Table 8-15 : 10-Year Benefit-Cost Ratios for Achievable Potential Scenarios – Industrial Sector Only

10-year	NPV Benefits	NPV Costs	B/C Ratio	Net Benefits
Achievable UCT	$702,795,634	$156,269,413	4.50	$546,526,221
Constrained UCT	$429,198,580	$95,530,631	4.49	$333,667,950

Table 8-16: 20-Year Benefit-Cost Ratios for Achievable Potential Scenarios– Industrial Sector Only

20-year	NPV Benefits	NPV Costs	B/C Ratio	Net Benefits
Achievable UCT	$1,332,670,150	$268,624,289	4.96	$1,064,045,860
Constrained UCT	$745,081,839	$151,630,417	4.91	$593,451,422

Year by year budgets for both achievable potential scenarios, broken out by incentive and administrative costs are depicted in Table 8-17 and Table 8-18.

Table 8-17: Annual Program Budgets Associated with the Achievable UCT Scenario (in millions)

ACHIEVABLE UCT	Incentives	Admin.	Total Costs
2017	$14.75	$4.79	$19.54
2018	$14.77	$5.15	$19.92
2019	$14.79	$5.53	$20.32
2020	$14.88	$5.92	$20.80
2021	$14.91	$6.33	$21.23
2022	$14.96	$6.81	$21.78
2023	$15.05	$7.26	$22.31
2024	$15.07	$7.70	$22.77
2025	$15.10	$8.16	$23.26
2026	$15.25	$8.69	$23.93
2027	$12.35	$8.45	$20.80
2028	$12.62	$9.00	$21.61
2029	$15.57	$10.17	$25.74
2030	$15.55	$10.70	$26.24
2031	$15.57	$11.26	$26.83
2032	$21.09	$15.83	$36.92
2033	$21.96	$16.68	$38.64
2034	$21.99	$17.37	$39.36
2035	$23.73	$18.35	$42.08
2036	$23.69	$19.07	$42.77

Table 8-18: Annual Program Budgets Associated with the Constrained UCT Scenario (in millions)

CONSTRAINED UCT	Incentives	Admin.	Total Costs
2017	$10.45	$3.40	$13.85
2018	$8.63	$3.01	$11.63
2019	$8.74	$3.26	$12.00
2020	$8.82	$3.51	$12.33
2021	$8.78	$3.72	$12.50
2022	$8.87	$4.04	$12.91
2023	$9.03	$4.35	$13.38
2024	$9.31	$4.75	$14.06
2025	$9.27	$5.01	$14.28
2026	$9.27	$5.28	$14.55
2027	$8.81	$6.03	$14.84
2028	$8.85	$6.31	$15.15
2029	$9.33	$6.09	$15.41
2030	$9.29	$6.39	$15.68
2031	$9.26	$6.69	$15.95
2032	$9.29	$6.97	$16.26
2033	$9.41	$7.15	$16.55
2034	$9.43	$7.45	$16.89
2035	$9.71	$7.51	$17.22

CONSTRAINED UCT	Incentives	Admin.	Total Costs
2036	$9.75	$7.85	$17.60

APPENDIX A | RESIDENTIAL MEASURE DETAIL

See separate Appendices file for the Residential Measure Assumption Detail.

APPENDIX B | COMMERCIAL MEASURE DETAIL

See separate Appendices file for the Commercial Measure Assumption Detail.

APPENDIX C | INDUSTRIAL MEASURE DETAIL

See separate Appendices file for the Industrial Measure Assumption Detail.

APPENDIX D | GLOBAL ASSUMPTIONS

See separate Appendices file for the Global Assumption Detail.

APPENDIX E | ENERGY EFFICIENCY POTENTIAL STUDY CATALOG

See separate Appendices file for the Energy Efficiency Potential Study Catalog.

APPENDIX F | COST OF CONSERVED ENERGY

See separate Appendices file for Cost of Conserved Energy Detail.

CONSUMERS ENERGY

ELECTRIC ENERGY EFFICIENCY POTENTIAL STUDY

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Electric Energy Efficiency Potential Study

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Appendices
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APPENDIX A | RESIDENTIAL MEASURE DETAIL

CE (Michigan) **Measure Assumption**

Measure #	End-Use	Measure Name	Home Type	Income Type	Replacement Type	Base Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer NCP kW	Per Unit Winter NCP kW	Base Fuel Use	% Fuel Savings	Per unit Fuel Saving	Useful Life	Measure Cost	O&M Benefits	O&M Costs	Tax Credits	Measure Description	UCT Ratio	Utility $ / LFT-kWh Saved (-Admin)	Utility $ / LFT-kWh Saved (+Admin)
1001	Lighting	Standard CFL (Replacing EISA Bulb)	SF	NLI	ROB	41.28	65%	26.82	0.035	0.035	0.000	0%	-0.047	9	$0.84	$1.29	$0.00	$0.00	Standard CFL Replacing Standard Halogen/Incandescent Bulb	21.29	$0.002	0.012
1002	Lighting	Specialty CFL (Replacing Specialty Incandescent)	SF	NLI	ROB	57.57	75%	43.12	0.056	0.056	0.000	0%	-0.076	9	$2.33	$4.21	$0.00	$0.00	Specialty CFL Replacing Specialty Halogen/Incandescent Bulb	12.32	$0.004	0.013
1003	Lighting	Standard LED (Replacing EISA Bulb)	SF	NLI	ROB	41.28	71%	29.11	0.038	0.038	0.000	0%	-0.051	15	$6.04	$3.89	$0.00	$0.00	Standard LED Replacing Standard Halogen/Incandescent Bulb	4.79	$0.012	0.019
1004	Lighting	Specialty LED (Replacing Specialty Incandescent)	SF	NLI	ROB	57.57	79%	45.40	0.059	0.059	0.000	0%	-0.080	15	$8.10	$5.54	$0.00	$0.00	Specialty LED Replacing Specialty Halogen/Incandescent Bulb	5.57	$0.010	0.017
1005	Lighting	Standard CFL (Replacing CFL)	SF	NLI	ROB	41.28	65%	26.82	0.035	0.035	0.000	0%	-0.047	9	$0.84	$1.29	$0.00	$0.00	Standard CFL Replacing CFL	21.29	$0.002	0.012
1006	Lighting	Specialty CFL (Replacing Specialty CFL)	SF	NLI	ROB	57.57	75%	43.12	0.056	0.056	0.000	0%	-0.076	9	$2.33	$4.21	$0.00	$0.00	Specialty CFL Replacing Specialty CFL Bulb	12.32	$0.004	0.013
1007	Lighting	Standard LED (Replacing CFL)	SF	NLI	ROB	14.45	16%	2.28	0.003	0.003	0.000	0%	-0.004	15	$5.20	$4.61	$0.00	$0.00	Standard LED Replacing Standard CFL Bulb	0.44	$0.130	0.137
1008	Lighting	Specialty LED (Replacing Specialty CFL)	SF	NLI	ROB	14.45	16%	2.28	0.003	0.003	0.000	0%	-0.004	15	$5.77	$13.97	$0.00	$0.00	Specialty LED Replacing Specialty CFL Bulb	0.39	$0.144	0.151
1009	Lighting	Reflector CFL (Replacing EISA Bulb)	SF	NLI	ROB	54.55	74%	40.28	0.052	0.052	0.000	0%	-0.071	9	$3.95	$7.91	$0.00	$0.00	Reflector CFL Replacing Standard Halogen/Incandescent Bulb	6.80	$0.008	0.017
1010	Lighting	Reflector LED (Replacing EISA Bulb)	SF	NLI	ROB	60.00	82%	49.09	0.064	0.064	0.000	0%	-0.087	15	$19.37	$10.80	$0.00	$0.00	Reflector LED Replacing Standard Halogen/Incandescent Bulb	2.52	$0.023	0.029
1011	Lighting	Reflector CFL (Replacing CFL)	SF	NLI	ROB	54.55	74%	40.28	0.052	0.052	0.000	0%	-0.071	9	$3.95	$7.91	$0.00	$0.00	Reflector CFL Replacing Reflector CFL Bulb	6.80	$0.008	0.017
1012	Lighting	Reflector LED (Replacing CFL Bulb)	SF	NLI	ROB	15.52	30%	4.62	0.006	0.006	0.000	0%	-0.008	15	$15.42	$20.82	$0.00	$0.00	Reflector LED Replacing Reflector CFL Bulb	0.30	$0.191	0.198
1013	Lighting	T8 Replacing T12 Linear Fluorescent Bulb	SF	NLI	RETRO	70.10	29%	20.57	0.025	0.025	0.000	0%	0.000	8	$106.76	$0.00	$0.00	$0.00	T8 Linear Tube Fluorescent Replacing T12 LTF	0.13	$0.446	0.456
1014	Lighting	Residential Occupancy Sensors	SF	NLI	RETRO	53.27	30%	15.98	0.044	0.044	0.000	0%	0.000	10	$30.00	$0.00	$0.00	$0.00	Residential Occupancy Sensors	0.55	$0.138	0.146
1015	Lighting	LED Nightlights	SF	NLI	RETRO	25.55	86%	21.90	0.006	0.006	0.000	0%	0.000	12	$5.00	$0.00	$0.00	$0.00	LED Nightlights Replacing Incandescent Nightlights	3.20	$0.015	0.022
1016	Lighting	DI Standard CFL (Replacing EISA Bulb)	SF	LI	DI	41.28	65%	26.82	0.035	0.035	0.000	0%	-0.047	9	$2.34	$1.29	$0.00	$0.00	Standard CFL Replacing Standard Halogen/Incandescent Bulb (DIRECT INSTALL)	3.82	$0.014	0.023
1017	Lighting	DI Specialty CFL (Replacing Specialty Incandescent)	SF	LI	DI	57.57	75%	43.12	0.056	0.056	0.000	0%	-0.076	9	$3.83	$4.21	$0.00	$0.00	Specialty CFL Replacing Specialty Halogen/Incandescent Bulb (DIRECT INSTALL)	3.75	$0.014	0.023
1018	Lighting	DI Standard LED (Replacing EISA Bulb)	SF	LI	DI	41.28	71%	29.11	0.038	0.038	0.000	0%	-0.051	15	$7.54	$3.89	$0.00	$0.00	Standard LED Replacing Standard Halogen/Incandescent Bulb (DIRECT INSTALL)	1.92	$0.030	0.036
1019	Lighting	DI Specialty LED (Replacing Specialty Incandescent)	SF	LI	DI	57.57	79%	45.40	0.059	0.059	0.000	0%	-0.080	15	$9.60	$5.54	$0.00	$0.00	Specialty LED Replacing Specialty Halogen/Incandescent Bulb (DIRECT INSTALL)	2.35	$0.024	0.031
1020	Lighting	DI Standard CFL (Replacing CFL)	SF	LI	DI	41.28	65%	26.82	0.035	0.035	0.000	0%	-0.047	9	$2.34	$1.29	$0.00	$0.00	Standard CFL Replacing Standard CFL Bulb (DIRECT INSTALL)	3.82	$0.014	0.023
1021	Lighting	DI Specialty CFL (Replacing Specialty CFL)	SF	LI	DI	57.57	75%	43.12	0.056	0.056	0.000	0%	-0.076	9	$3.83	$4.21	$0.00	$0.00	Specialty CFL Replacing Specialty CFL Bulb (DIRECT INSTALL)	3.75	$0.014	0.023
1022	Lighting	DI Standard LED (Replacing CFL)	SF	LI	DI	14.45	16%	2.28	0.003	0.003	0.000	0%	-0.004	15	$7.54	$4.61	$0.00	$0.00	Standard LED Replacing Standard CFL Bulb (DIRECT INSTALL)	0.15	$0.378	0.384
1023	Lighting	DI Specialty LED (Replacing Specialty CFL)	SF	LI	DI	14.45	16%	2.28	0.003	0.003	0.000	0%	-0.004	15	$9.60	$13.97	$0.00	$0.00	Specialty LED Replacing Specialty CFL Bulb (DIRECT INSTALL)	0.12	$0.481	0.488
1024	Lighting	DI Reflector CFL (Replacing EISA Bulb)	SF	LI	DI	54.55	74%	40.28	0.052	0.052	0.000	0%	-0.071	9	$6.25	$7.91	$0.00	$0.00	Reflector CFL Replacing Standard Halogen/Incandescent Bulb (DIRECT INSTALL)	2.15	$0.024	0.034
1025	Lighting	DI Reflector LED (Replacing EISA Bulb)	SF	LI	DI	60.00	82%	49.09	0.064	0.064	0.000	0%	-0.087	15	$21.67	$10.80	$0.00	$0.00	Reflector LED Replacing Standard Halogen/Incandescent Bulb (DIRECT INSTALL)	1.13	$0.050	0.057
1026	Lighting	DI Reflector CFL (Replacing CFL Bulb)	SF	LI	DI	54.55	74%	40.28	0.052	0.052	0.000	0%	-0.071	9	$6.25	$7.91	$0.00	$0.00	Reflector CFL Replacing Reflecor CFL Bulb (DIRECT INSTALL)	2.15	$0.024	0.034
1027	Lighting	DI Reflector LED (Replacing CFL Bulb)	SF	LI	DI	60.00	74%	44.48	0.058	0.058	0.000	0%	-0.079	15	$21.67	$20.82	$0.00	$0.00	Reflector LED Replacing Reflector CFL Bulb (DIRECT INSTALL)	1.02	$0.056	0.062
1028	Lighting	DI T8 Replacing T12 Linear Fluorescent Bulb	SF	LI	DI	70.10	29%	20.57	0.025	0.025	0.000	0%	0.000	8	$106.76	$0.00	$0.00	$0.00	T8 Linear Tube Fluorescent Replacing T12 LTF (DIRECT INSTALL)	0.06	$0.891	0.901
1029	Lighting	DI LED Nightlights	SF	LI	DI	25.55	86%	21.90	0.006	0.006	0.000	0%	0.000	12	$5.00	$0.00	$0.00	$0.00	LED Nightlights Replacing Incandescent Nightlights (DIRECT INSTALL)	1.60	$0.030	0.037
1030	Lighting	Standard CFL (Replacing EISA Bulb)	SF	ALL	NC	41.28	65%	26.82	0.035	0.035	0.000	0%	-0.047	9	$0.84	$1.29	$0.00	$0.00	Standard CFL Replacing Standard Halogen/Incandescent Bulb	21.29	$0.002	0.012
1031	Lighting	Specialty CFL (Replacing Specialty Incandescent)	SF	ALL	NC	57.57	75%	43.12	0.056	0.056	0.000	0%	-0.076	9	$2.33	$4.21	$0.00	$0.00	Specialty CFL Replacing Specialty Halogen/Incandescent Bulb	12.32	$0.004	0.013
1032	Lighting	Standard LED (Replacing EISA Bulb)	SF	ALL	NC	41.28	71%	29.11	0.038	0.038	0.000	0%	-0.051	15	$6.04	$3.89	$0.00	$0.00	Standard LED Replacing Standard Halogen/Incandescent Bulb	4.79	$0.012	0.019
1033	Lighting	Specialty LED (Replacing Specialty Incandescent)	SF	ALL	NC	57.57	79%	45.40	0.059	0.059	0.000	0%	-0.080	15	$8.10	$5.54	$0.00	$0.00	Specialty LED Replacing Specialty Halogen/Incandescent Bulb	5.57	$0.010	0.017
1034	Lighting	Standard CFL (Replacing CFL)	SF	ALL	NC	41.28	65%	26.82	0.035	0.035	0.000	0%	-0.047	9	$0.84	$1.29	$0.00	$0.00	Standard CFL Replacing CFL	21.29	$0.002	0.012
1035	Lighting	Specialty CFL (Replacing Specialty CFL)	SF	ALL	NC	57.57	75%	43.12	0.056	0.056	0.000	0%	-0.076	9	$2.33	$4.21	$0.00	$0.00	Specialty CFL Replacing Specialty CFL Bulb	12.32	$0.004	0.013
1036	Lighting	Standard LED (Replacing CFL)	SF	ALL	NC	14.45	16%	2.28	0.003	0.003	0.000	0%	-0.004	15	$5.20	$4.61	$0.00	$0.00	Standard LED Replacing Standard CFL Bulb	0.44	$0.130	0.137
1037	Lighting	Specialty LED (Replacing Specialty CFL)	SF	ALL	NC	14.45	16%	2.28	0.003	0.003	0.000	0%	-0.004	15	$5.77	$13.97	$0.00	$0.00	Specialty LED Replacing Specialty CFL Bulb	0.39	$0.144	0.151
1038	Lighting	Reflector CFL (Replacing EISA Bulb)	SF	ALL	NC	54.55	74%	40.28	0.052	0.052	0.000	0%	-0.071	9	$3.95	$7.91	$0.00	$0.00	Reflector CFL Replacing Standard Halogen/Incandescent Bulb	6.80	$0.008	0.017
1039	Lighting	Reflector LED (Replacing EISA Bulb)	SF	ALL	NC	60.00	82%	49.09	0.064	0.064	0.000	0%	-0.087	15	$19.37	$10.80	$0.00	$0.00	Reflector LED Replacing Standard Halogen/Incandescent Bulb	2.52	$0.023	0.029
1040	Lighting	Reflector CFL (Replacing CFL)	SF	ALL	NC	54.55	74%	40.28	0.052	0.052	0.000	0%	-0.071	9	$3.95	$7.91	$0.00	$0.00	Reflector CFL Replacing Reflector CFL Bulb	6.80	$0.008	0.017
1041	Lighting	Reflector LED (Replacing CFL Bulb)	SF	ALL	NC	15.52	30%	4.62	0.006	0.006	0.000	0%	-0.008	15	$15.42	$20.82	$0.00	$0.00	Reflector LED Replacing Reflector CFL Bulb	0.30	$0.191	0.198
1042	Lighting	Residential Occupancy Sensors	SF	ALL	NC	53.27	30%	15.98	0.044	0.044	0.000	0%	0.000	10	$30.00	$0.00	$0.00	$0.00	Residential Occupancy Sensors	0.55	$0.138	0.146
1043	Lighting	Standard CFL (Replacing EISA Bulb)	MF	NLI	ROB	41.28	65%	26.82	0.035	0.035	0.000	0%	-0.047	9	$0.84	$1.29	$0.00	$0.00	Standard CFL Replacing Standard Halogen/Incandescent Bulb	21.29	$0.002	0.012
1044	Lighting	Specialty CFL (Replacing Specialty Incandescent)	MF	NLI	ROB	57.57	75%	43.12	0.056	0.056	0.000	0%	-0.076	9	$2.33	$4.21	$0.00	$0.00	Specialty CFL Replacing Specialty Halogen/Incandescent Bulb	12.32	$0.004	0.013
1045	Lighting	Standard LED (Replacing EISA Bulb)	MF	NLI	ROB	41.28	71%	29.11	0.038	0.038	0.000	0%	-0.051	15	$6.04	$3.89	$0.00	$0.00	Standard LED Replacing Standard Halogen/Incandescent Bulb	4.79	$0.012	0.019
1046	Lighting	Specialty LED (Replacing Specialty Incandescent)	MF	NLI	ROB	57.57	79%	45.40	0.059	0.059	0.000	0%	-0.080	15	$8.10	$5.54	$0.00	$0.00	Specialty LED Replacing Specialty Halogen/Incandescent Bulb	5.57	$0.010	0.017
1047	Lighting	Standard CFL (Replacing CFL)	MF	NLI	ROB	41.28	65%	26.82	0.035	0.035	0.000	0%	-0.047	9	$0.84	$1.29	$0.00	$0.00	Standard CFL Replacing CFL	21.29	$0.002	0.012
1048	Lighting	Specialty CFL (Replacing Specialty CFL)	MF	NLI	ROB	57.57	75%	43.12	0.056	0.056	0.000	0%	-0.076	9	$2.33	$4.21	$0.00	$0.00	Specialty CFL Replacing Specialty CFL Bulb	12.32	$0.004	0.013
1049	Lighting	Standard LED (Replacing CFL)	MF	NLI	ROB	14.45	16%	2.28	0.003	0.003	0.000	0%	-0.004	15	$5.20	$4.61	$0.00	$0.00	Standard LED Replacing Standard CFL Bulb	0.44	$0.130	0.137
1050	Lighting	Specialty LED (Replacing Specialty CFL)	MF	NLI	ROB	14.45	16%	2.28	0.003	0.003	0.000	0%	-0.004	15	$5.77	$13.97	$0.00	$0.00	Specialty LED Replacing Specialty CFL Bulb	0.39	$0.144	0.151
1051	Lighting	Reflector CFL (Replacing EISA Bulb)	MF	NLI	ROB	54.55	74%	40.28	0.052	0.052	0.000	0%	-0.071	9	$3.95	$7.91	$0.00	$0.00	Reflector CFL Replacing Standard Halogen/Incandescent Bulb	6.80	$0.008	0.017
1052	Lighting	Reflector LED (Replacing EISA Bulb)	MF	NLI	ROB	60.00	82%	49.09	0.064	0.064	0.000	0%	-0.087	15	$19.37	$10.80	$0.00	$0.00	Reflector LED Replacing Standard Halogen/Incandescent Bulb	2.52	$0.023	0.029
1053	Lighting	Reflector CFL (Replacing CFL)	MF	NLI	ROB	54.55	74%	40.28	0.052	0.052	0.000	0%	-0.071	9	$3.95	$7.91	$0.00	$0.00	Reflector CFL Replacing Reflector CFL Bulb	6.80	$0.008	0.017
1054	Lighting	Reflector LED (Replacing CFL Bulb)	MF	NLI	ROB	15.52	30%	4.62	0.006	0.006	0.000	0%	-0.008	15	$15.42	$20.82	$0.00	$0.00	Reflector LED Replacing Reflector CFL Bulb	0.30	$0.191	0.198
1055	Lighting	T8 Replacing T12 Linear Fluorescent Bulb	MF	NLI	RETRO	70.10	29%	20.57	0.025	0.025	0.000	0%	0.000	8	$106.76	$0.00	$0.00	$0.00	T8 Linear Tube Fluorescent Replacing T12 LTF	0.13	$0.446	0.456
1056	Lighting	Residential Occupancy Sensors	MF	NLI	RETRO	53.27	30%	15.98	0.044	0.044	0.000	0%	0.000	10	$30.00	$0.00	$0.00	$0.00	Residential Occupancy Sensors	0.55	$0.138	0.146
1057	Lighting	LED Nightlights	MF	NLI	RETRO	25.55	86%	21.90	0.006	0.006	0.000	0%	0.000	12	$5.00	$0.00	$0.00	$0.00	LED Nightlights Replacing Incandescent Nightlights	3.20	$0.015	0.022
1058	Lighting	DI Standard CFL (Replacing EISA Bulb)	MF	LI	DI	41.28	65%	26.82	0.035	0.035	0.000	0%	-0.047	9	$2.34	$1.29	$0.00	$0.00	Standard CFL Replacing Standard Halogen/Incandescent Bulb (DIRECT INSTALL)	3.82	$0.014	0.023
1059	Lighting	DI Specialty CFL (Replacing Specialty Incandescent)	MF	LI	DI	57.57	75%	43.12	0.056	0.056	0.000	0%	-0.076	9	$3.83	$4.21	$0.00	$0.00	Specialty CFL Replacing Specialty Halogen/Incandescent Bulb (DIRECT INSTALL)	3.75	$0.014	0.023
1060	Lighting	DI Standard LED (Replacing EISA Bulb)	MF	LI	DI	41.28	71%	29.11	0.038	0.038	0.000	0%	-0.051	15	$7.54	$3.89	$0.00	$0.00	Standard LED Replacing Standard Halogen/Incandescent Bulb (DIRECT INSTALL)	1.92	$0.030	0.036
1061	Lighting	DI Specialty LED (Replacing Specialty Incandescent)	MF	LI	DI	57.57	79%	45.40	0.059	0.059	0.000	0%	-0.080	15	$9.60	$5.54	$0.00	$0.00	Specialty LED Replacing Specialty Halogen/Incandescent Bulb (DIRECT INSTALL)	2.35	$0.024	0.031
1062	Lighting	DI Standard CFL (Replacing CFL)	MF	LI	DI	41.28	65%	26.82	0.035	0.035	0.000	0%	-0.047	9	$2.34	$1.29	$0.00	$0.00	Standard CFL Replacing Standard CFL Bulb (DIRECT INSTALL)	3.82	$0.014	0.023
1063	Lighting	DI Specialty CFL (Replacing Specialty CFL)	MF	LI	DI	57.57	75%	43.12	0.056	0.056	0.000	0%	-0.076	9	$3.83	$4.21	$0.00	$0.00	Specialty CFL Replacing Specialty CFL Bulb (DIRECT INSTALL)	3.75	$0.014	0.023
1064	Lighting	DI Standard LED (Replacing CFL)	MF	LI	DI	14.45	16%	2.28	0.003	0.003	0.000	0%	-0.004	15	$7.54	$4.61	$0.00	$0.00	Standard LED Replacing Standard CFL Bulb (DIRECT INSTALL)	0.15	$0.378	0.384

CE (Michigan) **Measure Assumption**

Measure #	End-Use	Measure Name	Home Type	Income Type	Replacement Type	Base Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer NCP kW	Per Unit Winter NCP kW	Base Fuel Use	% Fuel Savings	Per unit Fuel Saving	Useful Life	Measure Cost	O&M Benefits	O&M Costs	Tax Credits	Measure Description	UCT Ratio	Utility $ / LFT-kWh Saved (-Admin)	Utility $ / LFT-kWh Saved (+Admin)
1065	Lighting	DI Specialty LED (Replacing Specialty CFL)	MF	LI	DI	14.45	16%	2.28	0.003	0.003	0.000	0%	-0.004	15	$9.60	$13.97	$0.00	$0.00	Specialty LED Replacing Specialty CFL Bulb (DIRECT INSTALL)	0.12	$0.481	0.488
1066	Lighting	DI Reflector CFL (Replacing EISA Bulb)	MF	LI	DI	54.55	74%	40.28	0.052	0.052	0.000	0%	-0.071	9	$6.25	$7.91	$0.00	$0.00	Reflector CFL Replacing Standard Halogen/Incandescent Bulb (DIRECT INSTALL)	2.15	$0.024	0.034
1067	Lighting	DI Reflector LED (Replacing EISA Bulb)	MF	LI	DI	60.00	82%	49.09	0.064	0.064	0.000	0%	-0.087	15	$21.67	$10.80	$0.00	$0.00	Reflector LED Replacing Standard Halogen/Incandescent Bulb (DIRECT INSTALL)	1.13	$0.050	0.057
1068	Lighting	DI Reflector CFL (Replacing CFL Bulb)	MF	LI	DI	54.55	74%	40.28	0.052	0.052	0.000	0%	-0.071	9	$6.25	$7.91	$0.00	$0.00	Reflector CFL Replacing Reflecor CFL Bulb (DIRECT INSTALL)	2.15	$0.024	0.034
1069	Lighting	DI Reflector LED (Replacing CFL Bulb)	MF	LI	DI	60.00	74%	44.48	0.058	0.058	0.000	0%	-0.079	15	$21.67	$20.82	$0.00	$0.00	Reflector LED Replacing Reflector CFL Bulb (DIRECT INSTALL)	1.02	$0.056	0.062
1070	Lighting	DI T8 Replacing T12 Linear Fluorescent Bulb	MF	LI	DI	70.10	29%	20.57	0.025	0.025	0.000	0%	0.000	8	$106.76	$0.00	$0.00	$0.00	T8 Linear Tube Fluorescent Replacing T12 LTF (DIRECT INSTALL)	0.06	$0.891	0.901
1071	Lighting	DI LED Nightlights	MF	LI	DI	25.55	86%	21.90	0.006	0.006	0.000	0%	0.000	12	$5.00	$0.00	$0.00	$0.00	LED Nightlights Replacing Incandescent Nightlights (DIRECT INSTALL)	1.60	$0.030	0.037
1072	Lighting	Standard CFL (Replacing EISA Bulb)	MF	ALL	NC	41.28	65%	26.82	0.035	0.035	0.000	0%	-0.047	9	$0.84	$1.29	$0.00	$0.00	Standard CFL Replacing Standard Halogen/Incandescent Bulb	21.29	$0.002	0.012
1073	Lighting	Specialty CFL (Replacing Specialty Incandescent)	MF	ALL	NC	57.57	75%	43.12	0.056	0.056	0.000	0%	-0.076	9	$2.33	$4.21	$0.00	$0.00	Specialty CFL Replacing Specialty Halogen/Incandescent Bulb	12.32	$0.004	0.013
1074	Lighting	Standard LED (Replacing EISA Bulb)	MF	ALL	NC	41.28	71%	29.11	0.038	0.038	0.000	0%	-0.051	15	$6.04	$3.89	$0.00	$0.00	Standard LED Replacing Standard Halogen/Incandescent Bulb	4.79	$0.012	0.019
1075	Lighting	Specialty LED (Replacing Specialty Incandescent)	MF	ALL	NC	57.57	79%	45.40	0.059	0.059	0.000	0%	-0.080	15	$8.10	$5.54	$0.00	$0.00	Specialty LED Replacing Specialty Halogen/Incandescent Bulb	5.57	$0.010	0.017
1076	Lighting	Standard CFL (Replacing CFL)	MF	ALL	NC	41.28	65%	26.82	0.035	0.035	0.000	0%	-0.047	9	$0.84	$1.29	$0.00	$0.00	Standard CFL Replacing CFL	21.29	$0.002	0.012
1077	Lighting	Specialty CFL (Replacing Specialty CFL)	MF	ALL	NC	57.57	75%	43.12	0.056	0.056	0.000	0%	-0.076	9	$2.33	$4.21	$0.00	$0.00	Specialty CFL Replacing Specialty CFL Bulb	12.32	$0.004	0.013
1078	Lighting	Standard LED (Replacing CFL)	MF	ALL	NC	14.45	16%	2.28	0.003	0.003	0.000	0%	-0.004	15	$5.20	$4.61	$0.00	$0.00	Standard LED Replacing Standard CFL Bulb	0.44	$0.130	0.137
1079	Lighting	Specialty LED (Replacing Specialty CFL)	MF	ALL	NC	14.45	16%	2.28	0.003	0.003	0.000	0%	-0.004	15	$5.77	$13.97	$0.00	$0.00	Specialty LED Replacing Specialty CFL Bulb	0.39	$0.144	0.151
1080	Lighting	Reflector CFL (Replacing EISA Bulb)	MF	ALL	NC	54.55	74%	40.28	0.052	0.052	0.000	0%	-0.071	9	$3.95	$7.91	$0.00	$0.00	Reflector CFL Replacing Standard Halogen/Incandescent Bulb	6.80	$0.008	0.017
1081	Lighting	Reflector LED (Replacing EISA Bulb)	MF	ALL	NC	60.00	82%	49.09	0.064	0.064	0.000	0%	-0.087	15	$19.37	$10.80	$0.00	$0.00	Reflector LED Replacing Standard Halogen/Incandescent Bulb	2.52	$0.023	0.029
1082	Lighting	Reflector CFL (Replacing CFL)	MF	ALL	NC	54.55	74%	40.28	0.052	0.052	0.000	0%	-0.071	9	$3.95	$7.91	$0.00	$0.00	Reflector CFL Replacing Reflector CFL Bulb	6.80	$0.008	0.017
1083	Lighting	Reflector LED (Replacing CFL Bulb)	MF	ALL	NC	15.52	30%	4.62	0.006	0.006	0.000	0%	-0.008	15	$15.42	$20.82	$0.00	$0.00	Reflector LED Replacing Reflector CFL Bulb	0.30	$0.191	0.198
1084	Lighting	Residential Occupancy Sensors	MF	ALL	NC	53.27	30%	15.98	0.044	0.044	0.000	0%	0.000	10	$30.00	$0.00	$0.00	$0.00	Residential Occupancy Sensors	0.55	$0.138	0.146
2001	Appliances	Refrigerators ENERGY STAR	SF	NLI	ROB	493.99	10%	47.69	0.008	0.008	0.000	-	0.000	16	$28.59	$0.00	$0.00	$0.00	Installation of high efficiency replacement refrigerators	2.19	$0.033	0.040
2002	Appliances	Refrigerator recycling	SF	NLI	RECYCLE	1135.00	100%	1135.00	0.131	0.131	0.000	0%	0.000	8	$78.00	$0.00	$0.00	$0.00	Removal and recylcing of non-primary refrigerators	9.92	$0.006	0.016
2003	Appliances	Refrigerators ENERGY STAR	SF	LI	DI	493.99	10%	47.69	0.008	0.008	0.000	0%	0.000	16	$451.00	$0.00	$0.00	$0.00	Installation of high efficiency replacement refrigerators	0.07	$1.045	1.051
2004	Appliances	Refrigerator recycling	SF	LI	DI	1135.00	100%	1135.00	0.131	0.131	0.000	0%	0.000	8	$78.00	$0.00	$0.00	$0.00	Removal and recylcing of non-primary refrigerators	4.96	$0.012	0.022
2005	Appliances	Freezers ENERGY STAR	SF	All	ROB	346.52	10%	34.66	0.006	0.006	0.000	0%	0.000	21	$9.90	$0.00	$0.00	$0.00	Installation of high efficiency replacement freezers	5.54	$0.014	0.020
2006	Appliances	Freezer recycling	SF	All	RECYCLE	944.00	100%	944.00	0.116	0.116	0.000	0%	0.000	8	$78.00	$0.00	$0.00	$0.00	Removal and recylcing of non-primary freezers	8.43	$0.007	0.017
2007	Appliances	Room AC recycling	SF	All	RECYCLE	113.00	100%	113.00	0.107	0.107	0.000	0%	0.000	8	$49.00	$0.00	$0.00	$0.00	Removal and recycling of room air conditioners (non-primary or secondary)	4.31	$0.037	0.047
2008	Appliances	ENERGY STAR Dishwasher - elec water heater	SF	All	ROB	307.00	12%	37.00	0.064	0.064	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of high efficiency dishwashers in homes with dishwashers and electric water heaters	13.32	$0.020	0.028
2009	Appliances	ENERGY STAR Dishwasher - gas water heater	SF	All	ROB	135.08	12%	16.28	0.050	0.050	0.782	12%	0.094	10	$10.00	$0.00	$0.00	$0.00	Installation of high efficiency dishwashers in homes with dishwashers and gas water heaters	10.09	$0.043	0.052
2010	Appliances	Clothes Washer ENERGY STAR, Electric Water heater, Gas Dryer	SF	All	ROB	241.66	35%	84.00	0.012	0.012	1.361	27%	0.369	11	$36.57	$0.00	$0.00	$0.00	Installation of ENERGY STAR replacement clothes washer in homes with electric water heating and gas dryers	2.16	$0.023	0.031
2011	Appliances	Clothes Washer ENERGY STAR, Electric Water heater, Electric Dryer	SF	All	ROB	598.10	29%	175.00	0.025	0.025	0.000	0%	0.000	11	$36.57	$0.00	$0.00	$0.00	Installation of ENERGY STAR replacement clothes washer in homes with electric water heating and electric dryers	3.38	$0.014	0.022
2012	Appliances	Clothes Washer ENERGY STAR, Gas water heater, Gas dryer	SF	All	ROB	42.29	39%	16.65	0.002	0.002	2.041	29%	0.598	11	$36.57	$0.00	$0.00	$0.00	Installation of ENERGY STAR replacement clothes washer in homes with gas water heating and gas dryers	1.19	$0.041	0.049
2013	Appliances	Clothes Washer ENERGY STAR, Gas water heater, Electric dryer	SF	All	ROB	398.73	27%	108.20	0.015	0.015	0.825	35%	0.285	11	$36.57	$0.00	$0.00	$0.00	Installation of ENERGY STAR replacement clothes washer in homes with gas water heating and electric dryers	2.50	$0.019	0.027
2014	Appliances	ENERGY STAR Electric Clothes Dryers	SF	All	ROB	768.92	21%	160.44	0.567	0.567	0.000	0%	0.000	14	$152.00	$0.00	$0.00	$0.00	Installation of high efficiency replacement electric clothes dryers	1.20	$0.056	0.063
2015	Appliances	ENERGY STAR Gas Clothes Dryers	SF	All	ROB	134.72	18%	24.78	0.088	0.088	2.414	18%	0.444	14	$152.00	$0.00	$0.00	$0.00	Installation of high efficiency replacement gas clothes dryers	0.37	$0.182	0.189
2016	Appliances	ENERGY STAR Dehumidifier	SF	All	ROB	624.22	27%	168.71	0.103	0.103	0.000	0%	0.000	12	$50.00	$0.00	$0.00	$0.00	Installation of high efficiency replacement dehumidifier	6.48	$0.019	0.027
2017	Appliances	Dehumidifier recycling	SF	All	RECYCLE	138.50	100%	138.50	0.035	0.035	0.000	0%	0.000	8	$49.00	$0.00	$0.00	$0.00	Retirement of secondary dehumidifiers	2.42	$0.030	0.040
2018	Appliances	Refrigerators ENERGY STAR	SF	All	NC	493.99	10%	47.69	0.008	0.008	0.000	0%	0.000	16	$28.59	$0.00	$0.00	$0.00	Installation of high efficiency replacement refrigerators	2.19	$0.033	0.040
2019	Appliances	Freezers ENERGY STAR	SF	All	NC	346.52	10%	34.66	0.006	0.006	0.000	0%	0.000	21	$9.90	$0.00	$0.00	$0.00	Installation of high efficiency replacement freezers	5.54	$0.014	0.020
2020	Appliances	ENERGY STAR Dishwasher - elec water heater	SF	All	NC	307.00	12%	37.00	0.064	0.064	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of high efficiency dishwashers in homes with dishwashers and electric water heaters	13.32	$0.020	0.028
2021	Appliances	ENERGY STAR Dishwasher - gas water heater	SF	All	NC	135.08	12%	16.28	0.050	0.050	0.782	12%	0.094	10	$10.00	$0.00	$0.00	$0.00	Installation of high efficiency dishwashers in homes with dishwashers and gas water heaters	10.09	$0.043	0.052
2022	Appliances	Clothes Washer ENERGY STAR, Electric Water heater, Gas Dryer	SF	All	NC	241.66	35%	84.00	0.012	0.012	1.361	27%	0.369	11	$36.57	$0.00	$0.00	$0.00	Installation of ENERGY STAR replacement clothes washer in homes with electric water heating and gas dryers	2.16	$0.023	0.031
2023	Appliances	Clothes Washer ENERGY STAR, Electric Water heater, Electric Dryer	SF	All	NC	598.10	29%	175.00	0.025	0.025	0.000	0%	0.000	11	$36.57	$0.00	$0.00	$0.00	Installation of ENERGY STAR replacement clothes washer in homes with electric water heating and electric dryers	3.38	$0.014	0.022
2024	Appliances	Clothes Washer ENERGY STAR, Gas water heater, Gas dryer	SF	All	NC	42.29	39%	16.65	0.002	0.002	2.041	29%	0.598	11	$36.57	$0.00	$0.00	$0.00	Installation of ENERGY STAR replacement clothes washer in homes with gas water heating and gas dryers	1.19	$0.041	0.049
2025	Appliances	Clothes Washer ENERGY STAR, Gas water heater, Electric dryer	SF	All	NC	398.73	27%	108.20	0.015	0.015	0.825	35%	0.285	11	$36.57	$0.00	$0.00	$0.00	Installation of ENERGY STAR replacement clothes washer in homes with gas water heating and electric dryers	2.50	$0.019	0.027
2026	Appliances	ENERGY STAR Electric Clothes Dryers	SF	All	NC	768.92	21%	160.44	0.567	0.567	0.000	0%	0.000	14	$152.00	$0.00	$0.00	$0.00	Installation of high efficiency replacement electric clothes dryers	1.20	$0.056	0.063
2027	Appliances	ENERGY STAR Gas Clothes Dryers	SF	All	NC	134.72	18%	24.78	0.088	0.088	2.414	18%	0.444	14	$152.00	$0.00	$0.00	$0.00	Installation of high efficiency replacement gas clothes dryers	0.37	$0.182	0.189
2028	Appliances	ENERGY STAR Dehumidifier	SF	All	NC	624.22	27%	168.71	0.103	0.103	0.000	0%	0.000	12	$50.00	$0.00	$0.00	$0.00	Installation of high efficiency replacement dehumidifier	6.48	$0.019	0.027
2029	Appliances	Refrigerators ENERGY STAR	MF	NLI	ROB	493.99	10%	47.69	0.008	0.008	0.000	0%	0.000	16	$451.00	$0.00	$0.00	$0.00	Installation of high efficiency replacement refrigerators	0.14	$0.522	0.529
2030	Appliances	Refrigerator recycling	MF	NLI	RECYCLE	1135.00	100%	1135.00	0.131	0.131	0.000	0%	0.000	8	$78.00	$0.00	$0.00	$0.00	Removal and recylcing of non-primary refrigerators	9.92	$0.006	0.016
2031	Appliances	Refrigerators ENERGY STAR	MF	LI	DI	493.99	10%	47.69	0.008	0.008	0.000	0%	0.000	16	$451.00	$0.00	$0.00	$0.00	Installation of high efficiency replacement refrigerators	0.07	$1.045	1.051
2032	Appliances	Refrigerator recycling	MF	LI	DI	1135.00	100%	1135.00	0.131	0.131	0.000	0%	0.000	8	$78.00	$0.00	$0.00	$0.00	Removal and recylcing of non-primary refrigerators	4.96	$0.012	0.022
2033	Appliances	Freezers ENERGY STAR	MF	All	ROB	346.52	10%	34.66	0.006	0.006	0.000	0%	0.000	21	$9.90	$0.00	$0.00	$0.00	Installation of high efficiency replacement freezers	5.54	$0.014	0.020
2034	Appliances	Freezer recycling	MF	All	RECYCLE	944.00	100%	944.00	0.116	0.116	0.000	0%	0.000	8	$78.00	$0.00	$0.00	$0.00	Removal and recylcing of non-primary freezers	8.43	$0.007	0.017
2035	Appliances	Room AC recycling	MF	All	RECYCLE	113.00	100%	113.00	0.107	0.107	0.000	0%	0.000	8	$49.00	$0.00	$0.00	$0.00	Removal and recycling of room air conditioners (non-primary or secondary)	4.31	$0.037	0.047
2036	Appliances	ENERGY STAR Dishwasher - elec water heater	MF	All	ROB	307.00	12%	37.00	0.064	0.064	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of high efficiency dishwashers in homes with dishwashers and electric water heaters	13.32	$0.020	0.028
2037	Appliances	ENERGY STAR Dishwasher - gas water heater	MF	All	ROB	135.08	12%	16.28	0.050	0.050	0.782	12%	0.094	10	$10.00	$0.00	$0.00	$0.00	Installation of high efficiency dishwashers in homes with dishwashers and gas water heaters	10.09	$0.043	0.052
2038	Appliances	Clothes Washer ENERGY STAR, Electric Water heater, Gas Dryer	MF	All	ROB	241.66	35%	84.00	0.012	0.012	1.361	27%	0.369	11	$36.57	$0.00	$0.00	$0.00	Installation of ENERGY STAR replacement clothes washer in homes with electric water heating and gas dryers	2.16	$0.023	0.031

CE (Michigan) **Measure Assumption**

Measure #	End-Use	Measure Name	Home Type	Income Type	Replacement Type	Base Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer NCP kW	Per Unit Winter NCP kW	Base Fuel Use	% Fuel Savings	Per unit Fuel Saving	Useful Life	Measure Cost	O&M Benefits	O&M Costs	Tax Credits	Measure Description	UCT Ratio	Utility $ / LFT-kWh Saved (-Admin)	Utility $ / LFT-kWh Saved (+Admin)
2039	Appliances	Clothes Washer ENERGY STAR, Electric Water heater, Electric Dryer	MF	All	ROB	598.10	29%	175.00	0.025	0.025	0.000	0%	0.000	11	$36.57	$0.00	$0.00	$0.00	Installation of ENERGY STAR replacement clothes washer in homes with electric water heating and electric dryers	3.38	$0.014	0.022
2040	Appliances	Clothes Washer ENERGY STAR, Gas water heater, Gas dryer	MF	All	ROB	42.29	39%	16.65	0.002	0.002	2.041	29%	0.598	11	$36.57	$0.00	$0.00	$0.00	Installation of ENERGY STAR replacement clothes washer in homes with gas water heating and gas dryers	1.19	$0.041	0.049
2041	Appliances	Clothes Washer ENERGY STAR, Gas water heater, Electric dryer	MF	All	ROB	398.73	27%	108.20	0.015	0.015	0.825	35%	0.285	11	$36.57	$0.00	$0.00	$0.00	Installation of ENERGY STAR replacement clothes washer in homes with gas water heating and electric dryers	2.50	$0.019	0.027
2042	Appliances	ENERGY STAR Electric Clothes Dryers	MF	All	ROB	768.92	21%	160.44	0.567	0.567	0.000	0%	0.000	14	$152.00	$0.00	$0.00	$0.00	Installation of high efficiency replacement electric clothes dryers	1.20	$0.056	0.063
2043	Appliances	ENERGY STAR Gas Clothes Dryers	MF	All	ROB	134.72	18%	24.78	0.088	0.088	2.414	18%	0.444	14	$152.00	$0.00	$0.00	$0.00	Installation of high efficiency replacement gas clothes dryers	0.37	$0.182	0.189
2044	Appliances	ENERGY STAR Dehumidifier	MF	All	ROB	624.22	27%	168.71	0.103	0.103	0.000	0%	0.000	12	$50.00	$0.00	$0.00	$0.00	Installation of high efficiency replacement dehumidifier	6.48	$0.019	0.027
2045	Appliances	Dehumidifier recycling	MF	All	RECYCLE	138.50	100%	138.50	0.035	0.035	0.000	0%	0.000	8	$49.00	$0.00	$0.00	$0.00	Retirement of secondary dehumidifiers	2.42	$0.030	0.040
2046	Appliances	Refrigerators ENERGY STAR	MF	All	NC	493.99	10%	47.69	0.008	0.008	0.000	0%	0.000	16	$28.59	$0.00	$0.00	$0.00	Installation of high efficiency replacement refrigerators	2.19	$0.033	0.040
2047	Appliances	Freezers ENERGY STAR	MF	All	NC	346.52	10%	34.66	0.006	0.006	0.000	0%	0.000	21	$9.90	$0.00	$0.00	$0.00	Installation of high efficiency replacement freezers	5.54	$0.014	0.020
2048	Appliances	ENERGY STAR Dishwasher - elec water heater	MF	All	NC	307.00	12%	37.00	0.064	0.064	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of high efficiency dishwashers in homes with dishwashers and electric water heaters	13.32	$0.020	0.028
2049	Appliances	ENERGY STAR Dishwasher - gas water heater	MF	All	NC	135.08	12%	16.28	0.050	0.050	0.782	12%	0.094	10	$10.00	$0.00	$0.00	$0.00	Installation of high efficiency dishwashers in homes with dishwashers and gas water heaters	10.09	$0.043	0.052
2050	Appliances	Clothes Washer ENERGY STAR, Electric Water heater, Gas Dryer	MF	All	NC	241.66	35%	84.00	0.012	0.012	1.361	27%	0.369	11	$36.57	$0.00	$0.00	$0.00	Installation of ENERGY STAR replacement clothes washer in homes with electric water heating and gas dryers	2.16	$0.023	0.031
2051	Appliances	Clothes Washer ENERGY STAR, Electric Water heater, Electric Dryer	MF	All	NC	598.10	29%	175.00	0.025	0.025	0.000	0%	0.000	11	$36.57	$0.00	$0.00	$0.00	Installation of ENERGY STAR replacement clothes washer in homes with electric water heating and electric dryers	3.38	$0.014	0.022
2052	Appliances	Clothes Washer ENERGY STAR, Gas water heater, Gas dryer	MF	All	NC	42.29	39%	16.65	0.002	0.002	2.041	29%	0.598	11	$36.57	$0.00	$0.00	$0.00	Installation of ENERGY STAR replacement clothes washer in homes with gas water heating and gas dryers	1.19	$0.041	0.049
2053	Appliances	Clothes Washer ENERGY STAR, Gas water heater, Electric dryer	MF	All	NC	398.73	27%	108.20	0.015	0.015	0.825	35%	0.285	11	$36.57	$0.00	$0.00	$0.00	Installation of ENERGY STAR replacement clothes washer in homes with gas water heating and electric dryers	2.50	$0.019	0.027
2054	Appliances	ENERGY STAR Electric Clothes Dryers	MF	All	NC	768.92	21%	160.44	0.567	0.567	0.000	0%	0.000	14	$152.00	$0.00	$0.00	$0.00	Installation of high efficiency replacement electric clothes dryers	1.20	$0.056	0.063
2055	Appliances	ENERGY STAR Gas Clothes Dryers	MF	All	NC	134.72	18%	24.78	0.088	0.088	2.414	18%	0.444	14	$152.00	$0.00	$0.00	$0.00	Installation of high efficiency replacement gas clothes dryers	0.37	$0.182	0.189
2056	Appliances	ENERGY STAR Dehumidifier	MF	All	NC	624.22	27%	168.71	0.103	0.103	0.000	0%	0.000	12	$50.00	$0.00	$0.00	$0.00	Installation of high efficiency replacement dehumidifier	6.48	$0.019	0.027
3001	Electronics	Smart Strip plug outlet	SF	All	RETRO	-	-	24.00	0.017	0.017	0.000	0%	0.000	5	$40.00	$0.00	$0.00	$0.00	Installation of Tier 1 smart strip power strips for home enertertainment and office centers to eliminate standby power use	0.39	$0.207	0.221
3002	Electronics	Advanced Power Strip Tier 2	SF	All	RETRO	602.08	51%	307.10	0.035	0.035	0.000	0%	0.000	8	$70.00	$0.00	$0.00	$0.00	Installation of Tier 2 smart strip power strips for home enertertainment and office centers to eliminate standby power use	2.77	$0.020	0.030
3003	Electronics	ENERGY STAR 6.0 TV (31-40")	SF	All	ROB	170.63	41%	70.30	0.039	0.039	0.000	0%	0.000	6	$10.00	$0.00	$0.00	$0.00	Installation of high efficiency replacement televisions (under 40" diameter category)	4.38	$0.015	0.028
3004	Electronics	ENERGY STAR 6.0 TV (over 60")	SF	All	ROB	452.64	57%	255.80	0.140	0.140	0.000	0%	0.000	6	$10.00	$0.00	$0.00	$0.00	Installation of high efficiency replacement televisions (over 40" diameter category)	15.92	$0.004	0.017
3005	Electronics	Efficient Set Top Box	SF	All	ROB	274.80	58%	160.60	0.018	0.018	0.000	0%	0.000	4	$5.00	$0.00	$0.00	$0.00	Installation of efficient set top box in place of standard efficiency unit	9.94	$0.005	0.022
3006	Electronics	ENERGY STAR Display	SF	All	ROB	66.20	61%	40.20	0.020	0.020	0.000	0%	0.000	5	$10.00	$0.00	$0.00	$0.00	Installation of high-efficiency displays (10% more efficient than ENERGY STAR minimum spec) for desktop computers in homes with deskptop computers	1.77	$0.031	0.045
3007	Electronics	ENERGY STAR PC	SF	All	ROB	238.50	32%	77.00	0.023	0.023	0.000	0%	0.000	4	$8.00	$0.00	$0.00	$0.00	Installation of high-efficiency desktop computers in homes with desktop computers	3.63	$0.016	0.033
3008	Electronics	ENERGY STAR Laptop	SF	All	ROB	50.30	72%	35.97	0.004	0.004	0.000	0%	0.000	4	$8.00	$0.00	$0.00	$0.00	Installation of high-efficiency laptop computers in homes with laptop computers	1.39	$0.033	0.051
3009	Electronics	Smart Strip plug outlet	SF	All	NC	-	-	24.00	0.017	0.017	0.000	0%	0.000	5	$40.00	$0.00	$0.00	$0.00	Installation of Tier 1 smart strip power strips for home enertertainment and office centers to eliminate standby power use	0.39	$0.207	0.221
3010	Electronics	Advanced Power Strip Tier 2	SF	All	NC	602.08	51%	307.10	0.035	0.035	0.000	0%	0.000	8	$70.00	$0.00	$0.00	$0.00	Installation of Tier 2 smart strip power strips for home enertertainment and office centers to eliminate standby power use	2.77	$0.020	0.030
3011	Electronics	ENERGY STAR 6.0 TV (31-40")	SF	All	NC	170.63	41%	70.30	0.039	0.039	0.000	0%	0.000	6	$10.00	$0.00	$0.00	$0.00	Installation of high efficiency replacement televisions (under 40" diameter category)	4.38	$0.015	0.028
3012	Electronics	ENERGY STAR 6.0 TV (over 60")	SF	All	NC	452.64	57%	255.80	0.140	0.140	0.000	0%	0.000	6	$10.00	$0.00	$0.00	$0.00	Installation of high efficiency replacement televisions (over 40" diameter category)	15.92	$0.004	0.017
3013	Electronics	Efficient Set Top Box	SF	All	NC	274.80	58%	160.60	0.018	0.018	0.000	0%	0.000	4	$5.00	$0.00	$0.00	$0.00	Installation of efficient set top box in place of standard efficiency unit	9.94	$0.005	0.022
3014	Electronics	ENERGY STAR Display	SF	All	NC	66.20	61%	40.20	0.020	0.020	0.000	0%	0.000	5	$10.00	$0.00	$0.00	$0.00	Installation of high-efficiency displays (10% more efficient than ENERGY STAR minimum spec) for desktop computers in homes with deskptop computers	1.77	$0.031	0.045
3015	Electronics	ENERGY STAR PC	SF	All	NC	238.50	32%	77.00	0.023	0.023	0.000	0%	0.000	4	$8.00	$0.00	$0.00	$0.00	Installation of high-efficiency desktop computers in homes with desktop computers	3.63	$0.016	0.033
3016	Electronics	ENERGY STAR Laptop	SF	All	NC	50.30	72%	35.97	0.004	0.004	0.000	0%	0.000	4	$8.00	$0.00	$0.00	$0.00	Installation of high-efficiency laptop computers in homes with laptop computers	1.39	$0.033	0.051
3017	Electronics	Smart Strip plug outlet	MF	All	RETRO	-	-	24.00	0.017	0.017	0.000	0%	0.000	5	$40.00	$0.00	$0.00	$0.00	Installation of Tier 1 smart strip power strips for home enertertainment and office centers to eliminate standby power use	0.39	$0.207	0.221
3018	Electronics	Advanced Power Strip Tier 2	MF	All	RETRO	602.08	51%	307.10	0.035	0.035	0.000	0%	0.000	8	$70.00	$0.00	$0.00	$0.00	Installation of Tier 2 smart strip power strips for home enertertainment and office centers to eliminate standby power use	2.77	$0.020	0.030
3019	Electronics	ENERGY STAR 6.0 TV (31-40")	MF	All	ROB	170.63	41%	70.30	0.039	0.039	0.000	0%	0.000	6	$10.00	$0.00	$0.00	$0.00	Installation of high efficiency replacement televisions (under 40" diameter category)	4.38	$0.015	0.028
3020	Electronics	ENERGY STAR 6.0 TV (over 60")	MF	All	ROB	452.64	57%	255.80	0.140	0.140	0.000	0%	0.000	6	$10.00	$0.00	$0.00	$0.00	Installation of high efficiency replacement televisions (over 40" diameter category)	15.92	$0.004	0.017
3021	Electronics	Efficient Set Top Box	MF	All	ROB	274.80	58%	160.60	0.018	0.018	0.000	0%	0.000	4	$5.00	$0.00	$0.00	$0.00	Installation of efficient set top box in place of standard efficiency unit	9.94	$0.005	0.022
3022	Electronics	ENERGY STAR Display	MF	All	ROB	66.20	61%	40.20	0.020	0.020	0.000	0%	0.000	5	$10.00	$0.00	$0.00	$0.00	Installation of high-efficiency displays (10% more efficient than ENERGY STAR minimum spec) for desktop computers in homes with deskptop computers	1.77	$0.031	0.045
3023	Electronics	ENERGY STAR PC	MF	All	ROB	238.50	32%	77.00	0.023	0.023	0.000	0%	0.000	4	$8.00	$0.00	$0.00	$0.00	Installation of high-efficiency desktop computers in homes with desktop computers	3.63	$0.016	0.033
3024	Electronics	ENERGY STAR Laptop	MF	All	ROB	50.30	72%	35.97	0.004	0.004	0.000	0%	0.000	4	$8.00	$0.00	$0.00	$0.00	Installation of high-efficiency laptop computers in homes with laptop computers	1.39	$0.033	0.051
3025	Electronics	Smart Strip plug outlet	MF	All	NC	-	-	24.00	0.017	0.017	0.000	0%	0.000	5	$40.00	$0.00	$0.00	$0.00	Installation of Tier 1 smart strip power strips for home enertertainment and office centers to eliminate standby power use	0.39	$0.207	0.221
3026	Electronics	Advanced Power Strip Tier 2	MF	All	NC	602.08	51%	307.10	0.035	0.035	0.000	0%	0.000	8	$70.00	$0.00	$0.00	$0.00	Installation of Tier 2 smart strip power strips for home enertertainment and office centers to eliminate standby power use	2.77	$0.020	0.030
3027	Electronics	ENERGY STAR 6.0 TV (31-40")	MF	All	NC	170.63	41%	70.30	0.039	0.039	0.000	0%	0.000	6	$10.00	$0.00	$0.00	$0.00	Installation of high efficiency replacement televisions (under 40" diameter category)	4.38	$0.015	0.028
3028	Electronics	ENERGY STAR 6.0 TV (over 60")	MF	All	NC	452.64	57%	255.80	0.140	0.140	0.000	0%	0.000	6	$10.00	$0.00	$0.00	$0.00	Installation of high efficiency replacement televisions (over 40" diameter category)	15.92	$0.004	0.017
3029	Electronics	Efficient Set Top Box	MF	All	NC	274.80	58%	160.60	0.018	0.018	0.000	0%	0.000	4	$5.00	$0.00	$0.00	$0.00	Installation of efficient set top box in place of standard efficiency unit	9.94	$0.005	0.022

CE (Michigan) **Measure Assumption**

Measure #	End-Use	Measure Name	Home Type	Income Type	Replacement Type	Base Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer NCP kW	Per Unit Winter NCP kW	Base Fuel Use	% Fuel Savings	Per unit Fuel Saving	Useful Life	Measure Cost	O&M Benefits	O&M Costs	Tax Credits	Measure Description	UCT Ratio	Utility $ / LFT-kWh Saved (-Admin)	Utility $ / LFT-kWh Saved (+Admin)
3030	Electronics	ENERGY STAR Display	MF	All	NC	66.20	61%	40.20	0.020	0.020	0.000	0%	0.000	5	$10.00	$0.00	$0.00	$0.00	Installation of high-efficiency displays (10% more efficient than ENERGY STAR minimum spec) for desktop computers in homes with deskptop computers	1.77	$0.031	0.045
3031	Electronics	ENERGY STAR PC	MF	All	NC	238.50	32%	77.00	0.023	0.023	0.000	0%	0.000	4	$8.00	$0.00	$0.00	$0.00	Installation of high-efficiency desktop computers in homes with desktop computers	3.63	$0.016	0.033
3032	Electronics	ENERGY STAR Laptop	MF	All	NC	50.30	72%	35.97	0.004	0.004	0.000	0%	0.000	4	$8.00	$0.00	$0.00	$0.00	Installation of high-efficiency laptop computers in homes with laptop computers	1.39	$0.033	0.051
4001	Water Heating	Pipe Wrap - gas water heater	SF	NLI	RETRO	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing pipe wrap on hot water lines in homes that have gas water heaters	0.00		
4002	Water Heating	Pipe Wrap - electric water heater	SF	NLI	RETRO	385.00	67%	257.00	0.029	0.029	0.000	0%	0.000	20	$65.00	$0.00	$0.00	$0.00	Installing pipe wrap on hot water lines in homes that have electric water heaters	5.33	$0.013	0.018
4003	Water Heating	Low Flow Showerheads 1.5 gpm gas water heater	SF	NLI	RETRO	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of low flow showerheads (1.5 gpm) in hoes with gas water heaters	0.00		
4004	Water Heating	Low Flow Showerheads 1.0 gpm gas water heater	SF	NLI	RETRO	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of low flow showerheads (1.0 gpm) in hoes with gas water heaters	0.00		
4005	Water Heating	Low Flow Showerheads 1.5 gpm electric water heater	SF	NLI	RETRO	834.39	40%	333.76	0.038	0.038	0.000	0%	0.000	10	$34.20	$0.00	$0.00	$0.00	Installation of low flow showerheads (1.5 gpm) in homes with electric water heating	7.39	$0.008	0.016
4006	Water Heating	Low Flow Showerheads 1.0 gpm electric water heater	SF	NLI	RETRO	834.39	60%	500.64	0.057	0.057	0.000	0%	0.000	10	$34.20	$0.00	$0.00	$0.00	Installation of low flow showerheads (1.0 gpm) in homes with electric water heating	11.08	$0.005	0.014
4007	Water Heating	Low Flow Kitchen Faucet Aerators - 1.0 gpm electric water heater	SF	NLI	RETRO	876.84	55%	478.28	0.055	0.055	0.000	0%	0.000	10	$9.50	$0.00	$0.00	$0.00	Installing 1.0 gpm low flow kitchen faucet aerators in homes with electric water heating	38.10	$0.001	0.010
4008	Water Heating	Low Flow Bathroom Faucet Aerators - 1.0 gpm electric water heater	SF	NLI	RETRO	125.04	55%	68.20	0.008	0.008	0.000	0%	0.000	10	$9.50	$0.00	$0.00	$0.00	Installing 1.0 gpm low flow bathroom faucet aerators in homes with electric water heating	5.43	$0.010	0.019
4009	Water Heating	Low Flow Kitchen Faucet Aerators - 1.0 gpm gas water heater	SF	NLI	RETRO	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing 1.0 gpm low flow kitchen faucet aerators in homes with gas water heating	0.00		
4010	Water Heating	Low Flow Bathroom Faucet Aerators - 1.0 gpm gas water heater	SF	NLI	RETRO	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing 1.0 gpm low flow bathroom faucet aerators in homes with gas water heating	0.00		
4011	Water Heating	Pipe Wrap - gas water heater	SF	LI	DI	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing pipe wrap on hot water lines in homes that have gas water heaters	0.00		
4012	Water Heating	Pipe Wrap - electric water heater	SF	LI	DI	385.00	67%	257.00	0.029	0.029	0.000	0%	0.000	20	$65.00	$0.00	$0.00	$0.00	Installing pipe wrap on hot water lines in homes that have electric water heaters	2.67	$0.025	0.031
4013	Water Heating	Low Flow Showerheads 1.5 gpm gas water heater	SF	LI	DI	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of low flow showerheads (1.5 gpm) in hoes with gas water heaters	0.00		
4014	Water Heating	Low Flow Showerheads 1.0 gpm gas water heater	SF	LI	DI	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of low flow showerheads (1.0 gpm) in hoes with gas water heaters	0.00		
4015	Water Heating	Low Flow Showerheads 1.5 gpm electric water heater	SF	LI	DI	834.39	40%	333.76	0.038	0.038	0.000	0%	0.000	10	$34.20	$0.00	$0.00	$0.00	Installation of low flow showerheads (1.5 gpm) in homes with electric water heating	3.69	$0.015	0.024
4016	Water Heating	Low Flow Showerheads 1.0 gpm electric water heater	SF	LI	DI	834.39	60%	500.64	0.057	0.057	0.000	0%	0.000	10	$34.20	$0.00	$0.00	$0.00	Installation of low flow showerheads (1.0 gpm) in homes with electric water heating	5.54	$0.010	0.019
4017	Water Heating	Low Flow Kitchen Faucet Aerators - 1.0 gpm electric water heater	SF	LI	DI	876.84	55%	478.28	0.055	0.055	0.000	0%	0.000	10	$9.50	$0.00	$0.00	$0.00	Installing 1.0 gpm low flow kitchen faucet aerators in homes with electric water heating	19.05	$0.003	0.011
4018	Water Heating	Low Flow Bathroom Faucet Aerators - 1.0 gpm electric water heater	SF	LI	DI	125.04	55%	68.20	0.008	0.008	0.000	0%	0.000	10	$9.50	$0.00	$0.00	$0.00	Installing 1.0 gpm low flow bathroom faucet aerators in homes with electric water heating	2.72	$0.020	0.029
4019	Water Heating	Low Flow Kitchen Faucet Aerators - 1.0 gpm gas water heater	SF	LI	DI	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing 1.0 gpm low flow kitchen faucet aerators in homes with gas water heating	0.00		
4020	Water Heating	Low Flow Bathroom Faucet Aerators - 1.0 gpm gas water heater	SF	LI	DI	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing 1.0 gpm low flow bathroom faucet aerators in homes with gas water heating	0.00		
4021	Water Heating	TubSpout with Showerhead 1.5 GPM, electric DHW	SF	All	RETRO	-	-	542.23	0.043	0.043	0.000	0%	0.000	10	$48.70	$0.00	$0.00	$0.00	Installation of TubSpout technology in homes with low flow shower heads and electric water heating	7.97	$0.007	0.015
4022	Water Heating	TubSpout with Showerhead 1.5 GPM, gas DHW	SF	All	RETRO	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of TubSpout technology in homes with low flow shower heads and gas water heating	0.00		
4023	Water Heating	Shower Start 2.0 gpm gas water heater	SF	All	RETRO	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of thermostatic restriction valve on a 2.0 gpm showerhead in homes with a gas water heater	0.00		
4024	Water Heating	Shower Start 2.0 gpm electric water heater	SF	All	RETRO	87.36	94%	82.12	0.009	0.009	0.000	0%	0.000	10	$38.20	$0.00	$0.00	$0.00	Installation of thermostatic restriction valve on a 2.0 gpm showerhead in homes with an electric water heater	1.63	$0.034	0.043
4025	Water Heating	Heat Pump Water Heaters, <= 55 gallons	SF	All	ROB	3696.00	52%	1913.00	0.218	0.218	0.000	0%	0.000	13	$1,100.00	$0.00	$0.00	$0.00	Installing an efficient heat pump water heater in place of a standard efficiency storage tank water heater	1.62	$0.036	0.043
4026	Water Heating	High Efficiency Gas Water Heater 0.67 EF, <= 55 gallons	SF	All	ROB	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing an efficient (0.67 EF) replacement gas storage tank water heater instead of a standard efficiency gas storage tank water heater	0.00		
4027	Water Heating	Super Efficiency Gas Water Heater 0.80 EF, <= 55 gallons	SF	All	ROB	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing an efficient (0.80 EF) replacement gas storage tank water heater instead of a standard efficiency gas storage tank water heater	0.00		
4028	Water Heating	Instant Gas Water Heater	SF	All	ROB	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing an efficient replacement instantaneous gas tankless water heater instead of a standard efficiency gas storage tank water heater	0.00		
4029	Water Heating	Solar Domestic Hot Water - electric water heater	SF	All	ROB	3696.00	56%	2059.00	0.600	0.600	0.000	0%	0.000	20	$4,500.00	$0.00	$0.00	$0.00	Installing a solar domestic water heater in homes with electric water heating	0.74	$0.108	0.114
4030	Water Heating	Solar Domestic Hot Water - gas water heater	SF	All	ROB	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing a solar domestic water heater in homes with gas water heating	0.00		
4031	Water Heating	Gravity Film Heat Exchanger GFX electric water heater	SF	All	RETRO	3696.00	6%	208.00	0.034	0.034	0.000	0%	0.000	20	$1,022.00	$0.00	$0.00	$0.00	Installing a gravity film heat exchanger in homes with electric water heating	0.27	$0.244	0.250
4032	Water Heating	Gravity Film Heat Exchanger GFX gas water heater	SF	All	RETRO	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing a gravity film heat exchanger in homes with gas water heating	0.00		
4033	Water Heating	Pipe Wrap - gas water heater	SF	All	NC	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing pipe wrap on hot water lines in homes that have gas water heaters	0.00		
4034	Water Heating	Pipe Wrap - electric water heater	SF	All	NC	385.00	67%	257.00	0.029	0.029	0.000	0%	0.000	20	$65.00	$0.00	$0.00	$0.00	Installing pipe wrap on hot water lines in homes that have electric water heaters	5.33	$0.013	0.018
4035	Water Heating	Low Flow Showerheads 1.5 gpm gas water heater	SF	All	NC	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of low flow showerheads (1.5 gpm) in hoes with gas water heaters	0.00		
4036	Water Heating	Low Flow Showerheads 1.0 gpm gas water heater	SF	All	NC	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of low flow showerheads (1.0 gpm) in hoes with gas water heaters	0.00		
4037	Water Heating	Low Flow Showerheads 1.5 gpm electric water heater	SF	All	NC	834.39	40%	333.76	0.038	0.038	0.000	0%	0.000	10	$34.20	$0.00	$0.00	$0.00	Installation of low flow showerheads (1.5 gpm) in homes with electric water heating	7.39	$0.008	0.016
4038	Water Heating	Low Flow Showerheads 1.0 gpm electric water heater	SF	All	NC	834.39	60%	500.64	0.057	0.057	0.000	0%	0.000	10	$34.20	$0.00	$0.00	$0.00	Installation of low flow showerheads (1.0 gpm) in homes with electric water heating	11.08	$0.005	0.014
4039	Water Heating	Low Flow Kitchen Faucet Aerators - 1.0 gpm electric water heater	SF	All	NC	876.84	55%	478.28	0.055	0.055	0.000	0%	0.000	10	$9.50	$0.00	$0.00	$0.00	Installing 1.0 gpm low flow kitchen faucet aerators in homes with electric water heating	38.10	$0.001	0.010

CE (Michigan) **Measure Assumption**

Measure #	End-Use	Measure Name	Home Type	Income Type	Replacement Type	Base Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer NCP kW	Per Unit Winter NCP kW	Base Fuel Use	% Fuel Savings	Per unit Fuel Saving	Useful Life	Measure Cost	O&M Benefits	O&M Costs	Tax Credits	Measure Description	UCT Ratio	Utility $ / LFT-kWh Saved (-Admin)	Utility $ / LFT-kWh Saved (+Admin)
4040	Water Heating	Low Flow Bathroom Faucet Aerators - 1.0 gpm electric water heater	SF	All	NC	125.04	55%	68.20	0.008	0.008	0.000	0%	0.000	10	$9.50	$0.00	$0.00	$0.00	Installing 1.0 gpm low flow bathroom faucet aerators in homes with electric water heating	5.43	$0.010	0.019
4041	Water Heating	Low Flow Kitchen Faucet Aerators - 1.0 gpm gas water heater	SF	All	NC	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing 1.0 gpm low flow kitchen faucet aerators in homes with gas water heating	0.00		
4042	Water Heating	Low Flow Bathroom Faucet Aerators - 1.0 gpm gas water heater	SF	All	NC	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing 1.0 gpm low flow bathroom faucet aerators in homes with gas water heating	0.00		
4043	Water Heating	TubSpout with Showerhead 1.5 GPM, electric DHW	SF	All	NC	-	-	542.23	0.043	0.043	0.000	0%	0.000	10	$48.70	$0.00	$0.00	$0.00	Installation of TubSpout technology in homes with low flow shower heads and electric water heating	7.97	$0.007	0.015
4044	Water Heating	TubSpout with Showerhead 1.5 GPM, gas DHW	SF	All	NC	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of TubSpout technology in homes with low flow shower heads and gas water heating	0.00		
4045	Water Heating	Shower Start 2.0 gpm gas water heater	SF	All	NC	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of thermostatic restriction valve on a 2.0 gpm showerhead in homes with a gas water heater	0.00		
4046	Water Heating	Shower Start 2.0 gpm electric water heater	SF	All	NC	87.36	94%	82.12	0.009	0.009	0.000	0%	0.000	10	$38.20	$0.00	$0.00	$0.00	Installation of thermostatic restriction valve on a 2.0 gpm showerhead in homes with an electric water heater	1.63	$0.034	0.043
4047	Water Heating	Heat Pump Water Heaters, <= 55 gallons	SF	All	NC	3696.00	52%	1913.00	0.218	0.218	0.000	0%	0.000	13	$1,100.00	$0.00	$0.00	$0.00	Installing an efficient heat pump water heater in place of a standard efficiency storage tank water heater	1.62	$0.036	0.043
4048	Water Heating	High Efficiency Gas Water Heater 0.67 EF, <= 55 gallons	SF	All	NC	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing an efficient (0.67 EF) replacement gas storage tank water heater instead of a standard efficiency gas storage tank water heater	0.00		
4049	Water Heating	Super Efficiency Gas Water Heater 0.80 EF, <= 55 gallons	SF	All	NC	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing an efficient (0.80 EF) replacement gas storage tank water heater instead of a standard efficiency gas storage tank water heater	0.00		
4050	Water Heating	Instant Gas Water Heater	SF	All	NC	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing an efficient replacement instantaneous gas tankless water heater instead of a standard efficiency gas storage tank water heater	0.00		
4051	Water Heating	Solar Domestic Hot Water - electric water heater	SF	All	NC	3696.00	56%	2059.00	0.600	0.600	0.000	0%	0.000	20	$4,500.00	$0.00	$0.00	$0.00	Installing a solar domestic water heater in homes with electric water heating	0.74	$0.108	0.114
4052	Water Heating	Solar Domestic Hot Water - gas water heater	SF	All	NC	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing a solar domestic water heater in homes with gas water heating	0.00		
4053	Water Heating	Gravity Film Heat Exchanger GFX electric water heater	SF	All	NC	3696.00	6%	208.00	0.034	0.034	0.000	0%	0.000	20	$1,022.00	$0.00	$0.00	$0.00	Installing a gravity film heat exchanger in homes with electric water heating	0.27	$0.244	0.250
4054	Water Heating	Gravity Film Heat Exchanger GFX gas water heater	SF	All	NC	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing a gravity film heat exchanger in homes with gas water heating	0.00		
4055	Water Heating	Pipe Wrap - gas water heater	MF	NLI	RETRO	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing pipe wrap on hot water lines in homes that have gas water heaters	0.00		
4056	Water Heating	Pipe Wrap - electric water heater	MF	NLI	RETRO	385.00	67%	257.00	0.029	0.029	0.000	0%	0.000	20	$65.00	$0.00	$0.00	$0.00	Installing pipe wrap on hot water lines in homes that have electric water heaters	5.33	$0.013	0.018
4057	Water Heating	Low Flow Showerheads 1.5 gpm gas water heater	MF	NLI	RETRO	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of low flow showerheads (1.5 gpm) in hoes with gas water heaters	0.00		
4058	Water Heating	Low Flow Showerheads 1.0 gpm gas water heater	MF	NLI	RETRO	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of low flow showerheads (1.0 gpm) in hoes with gas water heaters	0.00		
4059	Water Heating	Low Flow Showerheads 1.5 gpm electric water heater	MF	NLI	RETRO	815.59	40%	326.23	0.037	0.037	0.000	0%	0.000	10	$34.20	$0.00	$0.00	$0.00	Installation of low flow showerheads (1.5 gpm) in homes with electric water heating	7.22	$0.008	0.016
4060	Water Heating	Low Flow Showerheads 1.0 gpm electric water heater	MF	NLI	RETRO	815.59	60%	489.35	0.056	0.056	0.000	0%	0.000	10	$34.20	$0.00	$0.00	$0.00	Installation of low flow showerheads (1.0 gpm) in homes with electric water heating	10.83	$0.005	0.014
4061	Water Heating	Low Flow Kitchen Faucet Aerators - 1.0 gpm electric water heater	MF	NLI	RETRO	634.23	55%	345.95	0.039	0.039	0.000	0%	0.000	10	$9.50	$0.00	$0.00	$0.00	Installing 1.0 gpm low flow kitchen faucet aerators in homes with electric water heating	27.56	$0.002	0.011
4062	Water Heating	Low Flow Bathroom Faucet Aerators - 1.0 gpm electric water heater	MF	NLI	RETRO	129.02	55%	70.38	0.008	0.008	0.000	0%	0.000	10	$9.50	$0.00	$0.00	$0.00	Installing 1.0 gpm low flow bathroom faucet aerators in homes with electric water heating	5.61	$0.010	0.018
4063	Water Heating	Low Flow Kitchen Faucet Aerators - 1.0 gpm gas water heater	MF	NLI	RETRO	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing 1.0 gpm low flow kitchen faucet aerators in homes with gas water heating	0.00		
4064	Water Heating	Low Flow Bathroom Faucet Aerators - 1.0 gpm gas water heater	MF	NLI	RETRO	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing 1.0 gpm low flow bathroom faucet aerators in homes with gas water heating	0.00		
4065	Water Heating	Pipe Wrap - gas water heater	MF	LI	DI	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing pipe wrap on hot water lines in homes that have gas water heaters	0.00		
4066	Water Heating	Pipe Wrap - electric water heater	MF	LI	DI	385.00	67%	257.00	0.029	0.029	0.000	0%	0.000	20	$65.00	$0.00	$0.00	$0.00	Installing pipe wrap on hot water lines in homes that have electric water heaters	2.67	$0.025	0.031
4067	Water Heating	Low Flow Showerheads 1.5 gpm gas water heater	MF	LI	DI	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of low flow showerheads (1.5 gpm) in hoes with gas water heaters	0.00		
4068	Water Heating	Low Flow Showerheads 1.0 gpm gas water heater	MF	LI	DI	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of low flow showerheads (1.0 gpm) in hoes with gas water heaters	0.00		
4069	Water Heating	Low Flow Showerheads 1.5 gpm electric water heater	MF	LI	DI	815.59	40%	326.23	0.037	0.037	0.000	0%	0.000	10	$34.20	$0.00	$0.00	$0.00	Installation of low flow showerheads (1.5 gpm) in homes with electric water heating	3.61	$0.015	0.024
4070	Water Heating	Low Flow Showerheads 1.0 gpm electric water heater	MF	LI	DI	815.59	60%	489.35	0.056	0.056	0.000	0%	0.000	10	$34.20	$0.00	$0.00	$0.00	Installation of low flow showerheads (1.0 gpm) in homes with electric water heating	5.41	$0.010	0.019
4071	Water Heating	Low Flow Kitchen Faucet Aerators - 1.0 gpm electric water heater	MF	LI	DI	634.23	55%	345.95	0.039	0.039	0.000	0%	0.000	10	$9.50	$0.00	$0.00	$0.00	Installing 1.0 gpm low flow kitchen faucet aerators in homes with electric water heating	13.78	$0.004	0.013
4072	Water Heating	Low Flow Bathroom Faucet Aerators - 1.0 gpm electric water heater	MF	LI	DI	129.02	55%	70.38	0.008	0.008	0.000	0%	0.000	10	$9.50	$0.00	$0.00	$0.00	Installing 1.0 gpm low flow bathroom faucet aerators in homes with electric water heating	2.80	$0.020	0.028
4073	Water Heating	Low Flow Kitchen Faucet Aerators - 1.0 gpm gas water heater	MF	LI	DI	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing 1.0 gpm low flow kitchen faucet aerators in homes with gas water heating	0.00		
4074	Water Heating	Low Flow Bathroom Faucet Aerators - 1.0 gpm gas water heater	MF	LI	DI	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing 1.0 gpm low flow bathroom faucet aerators in homes with gas water heating	0.00		
4075	Water Heating	TubSpout with Showerhead 1.5 GPM, electric DHW	MF	All	RETRO	-	-	530.01	0.042	0.042	0.000	0%	0.000	10	$48.70	$0.00	$0.00	$0.00	Installation of TubSpout technology in homes with low flow shower heads and electric water heating	7.79	$0.007	0.015
4076	Water Heating	TubSpout with Showerhead 1.5 GPM, gas DHW	MF	All	RETRO	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of TubSpout technology in homes with low flow shower heads and gas water heating	0.00		
4077	Water Heating	Shower Start 2.0 gpm gas water heater	MF	All	RETRO	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of thermostatic restriction valve on a 2.0 gpm showerhead in homes with a gas water heater	0.00		
4078	Water Heating	Shower Start 2.0 gpm electric water heater	MF	All	RETRO	85.39	94%	80.27	0.009	0.009	0.000	0%	0.000	10	$38.20	$0.00	$0.00	$0.00	Installation of thermostatic restriction valve on a 2.0 gpm showerhead in homes with an electric water heater	1.59	$0.035	0.043
4079	Water Heating	Heat Pump Water Heaters, <= 55 gallons	MF	All	ROB	3111.00	52%	1610.00	0.184	0.184	0.000	0%	0.000	13	$1,100.00	$0.00	$0.00	$0.00	Installing an efficient heat pump water heater in place of a standard efficiency storage tank water heater	1.36	$0.042	0.050
4080	Water Heating	High Efficiency Gas Water Heater 0.67 EF, <= 55 gallons	MF	All	ROB	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing an efficient (0.67 EF) replacement gas storage tank water heater instead of a standard efficiency gas storage tank water heater	0.00		
4081	Water Heating	Super Efficiency Gas Water Heater 0.80 EF, <= 55 gallons	MF	All	ROB	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing an efficient (0.80 EF) replacement gas storage tank water heater instead of a standard efficiency gas storage tank water heater	0.00		
4082	Water Heating	Instant Gas Water Heater	MF	All	ROB	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing an efficient replacement instantaneous gas tankless water heater instead of a standard efficiency gas storage tank water heater	0.00		

CE (Michigan) **Measure Assumption**

Measure #	End-Use	Measure Name	Home Type	Income Type	Replacement Type	Base Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer NCP kW	Per Unit Winter NCP kW	Base Fuel Use	% Fuel Savings	Per unit Fuel Saving	Useful Life	Measure Cost	O&M Benefits	O&M Costs	Tax Credits	Measure Description	UCT Ratio	Utility $ / LFT-kWh Saved (-Admin)	Utility $ / LFT-kWh Saved (+Admin)
4083	Water Heating	Solar Domestic Hot Water - electric water heater	MF	All	ROB	3111.00	66%	2059.00	0.600	0.600	0.000	0%	0.000	20	$4,500.00	$0.00	$0.00	$0.00	Installing a solar domestic water heater in homes with electric water heating	0.74	$0.108	0.114
4084	Water Heating	Solar Domestic Hot Water - gas water heater	MF	All	ROB	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing a solar domestic water heater in homes with gas water heating	0.00		
4085	Water Heating	Gravity Film Heat Exchanger GFX electric water heater	MF	All	RETRO	3111.00	4%	134.93	0.022	0.022	0.000	0%	0.000	20	$1,022.00	$0.00	$0.00	$0.00	Installing a gravity film heat exchanger in homes with electric water heating	0.18	$0.376	0.382
4086	Water Heating	Gravity Film Heat Exchanger GFX gas water heater	MF	All	RETRO	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing a gravity film heat exchanger in homes with gas water heating	0.00		
4087	Water Heating	Pipe Wrap - gas water heater	MF	All	NC	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing pipe wrap on hot water lines in homes that have gas water heaters	0.00		
4088	Water Heating	Pipe Wrap - electric water heater	MF	All	NC	385.00	67%	257.00	0.029	0.029	0.000	0%	0.000	20	$65.00	$0.00	$0.00	$0.00	Installing pipe wrap on hot water lines in homes that have electric water heaters	5.33	$0.013	0.018
4089	Water Heating	Low Flow Showerheads 1.5 gpm gas water heater	MF	All	NC	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of low flow showerheads (1.5 gpm) in hoes with gas water heaters	0.00		
4090	Water Heating	Low Flow Showerheads 1.0 gpm gas water heater	MF	All	NC	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of low flow showerheads (1.0 gpm) in hoes with gas water heaters	0.00		
4091	Water Heating	Low Flow Showerheads 1.5 gpm electric water heater	MF	All	NC	815.59	40%	326.23	0.037	0.037	0.000	0%	0.000	10	$34.20	$0.00	$0.00	$0.00	Installation of low flow showerheads (1.5 gpm) in homes with electric water heating	7.22	$0.008	0.016
4092	Water Heating	Low Flow Showerheads 1.0 gpm electric water heater	MF	All	NC	815.59	60%	489.35	0.056	0.056	0.000	0%	0.000	10	$34.20	$0.00	$0.00	$0.00	Installation of low flow showerheads (1.0 gpm) in homes with electric water heating	10.83	$0.005	0.014
4093	Water Heating	Low Flow Kitchen Faucet Aerators - 1.0 gpm electric water heater	MF	All	NC	634.23	55%	345.95	0.039	0.039	0.000	0%	0.000	10	$9.50	$0.00	$0.00	$0.00	Installing 1.0 gpm low flow kitchen faucet aerators in homes with electric water heating	27.56	$0.002	0.011
4094	Water Heating	Low Flow Bathroom Faucet Aerators - 1.0 gpm electric water heater	MF	All	NC	129.02	55%	70.38	0.008	0.008	0.000	0%	0.000	10	$9.50	$0.00	$0.00	$0.00	Installing 1.0 gpm low flow bathroom faucet aerators in homes with electric water heating	5.61	$0.010	0.018
4095	Water Heating	Low Flow Kitchen Faucet Aerators - 1.0 gpm gas water heater	MF	All	NC	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing 1.0 gpm low flow kitchen faucet aerators in homes with gas water heating	0.00		
4096	Water Heating	Low Flow Bathroom Faucet Aerators - 1.0 gpm gas water heater	MF	All	NC	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing 1.0 gpm low flow bathroom faucet aerators in homes with gas water heating	0.00		
4097	Water Heating	TubSpout with Showerhead 1.5 GPM, electric DHW	MF	All	NC	-	-	530.01	0.042	0.042	0.000	0%	0.000	10	$48.70	$0.00	$0.00	$0.00	Installation of TubSpout technology in homes with low flow shower heads and electric water heating	7.79	$0.007	0.015
4098	Water Heating	TubSpout with Showerhead 1.5 GPM, gas DHW	MF	All	NC	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of TubSpout technology in homes with low flow shower heads and gas water heating	0.00		
4099	Water Heating	Shower Start 2.0 gpm gas water heater	MF	All	NC	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of thermostatic restriction valve on a 2.0 gpm showerhead in homes with a gas water heater	0.00		
4100	Water Heating	Shower Start 2.0 gpm electric water heater	MF	All	NC	85.39	94%	80.27	0.009	0.009	0.000	0%	0.000	10	$38.20	$0.00	$0.00	$0.00	Installation of thermostatic restriction valve on a 2.0 gpm showerhead in homes with an electric water heater	1.59	$0.035	0.043
4101	Water Heating	Heat Pump Water Heaters, <= 55 gallons	MF	All	NC	3111.00	52%	1610.00	0.184	0.184	0.000	0%	0.000	13	$1,100.00	$0.00	$0.00	$0.00	Installing an efficient heat pump water heater in place of a standard efficiency storage tank water heater	1.36	$0.042	0.050
4102	Water Heating	High Efficiency Gas Water Heater 0.67 EF, <= 55 gallons	MF	All	NC	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing an efficient (0.67 EF) replacement gas storage tank water heater instead of a standard efficiency gas storage tank water heater	0.00		
4103	Water Heating	Super Efficiency Gas Water Heater 0.80 EF, <= 55 gallons	MF	All	NC	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing an efficient (0.80 EF) replacement gas storage tank water heater instead of a standard efficiency gas storage tank water heater	0.00		
4104	Water Heating	Instant Gas Water Heater	MF	All	NC	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing an efficient replacement instantaneous gas tankless water heater instead of a standard efficiency gas storage tank water heater	0.00		
4105	Water Heating	Solar Domestic Hot Water - electric water heater	MF	All	NC	3111.00	66%	2059.00	0.600	0.600	0.000	0%	0.000	20	$4,500.00	$0.00	$0.00	$0.00	Installing a solar domestic water heater in homes with electric water heating	0.74	$0.108	0.114
4106	Water Heating	Solar Domestic Hot Water - gas water heater	MF	All	NC	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing a solar domestic water heater in homes with gas water heating	0.00		
4107	Water Heating	Gravity Film Heat Exchanger GFX electric water heater	MF	All	NC	3111.00	4%	134.93	0.022	0.022	0.000	0%	0.000	20	$1,022.00	$0.00	$0.00	$0.00	Installing a gravity film heat exchanger in homes with electric water heating	0.18	$0.376	0.382
4108	Water Heating	Gravity Film Heat Exchanger GFX gas water heater	MF	All	NC	0.00	0%	0.00	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing a gravity film heat exchanger in homes with gas water heating	0.00		
5001	HVAC Shell	Infiltration reduction - 30%	SF	NLI	RETRO	-	-	59.57	0.063	0.100	-	-	8.113	13	$202.68	$0.00	$0.00	$0.00	Air sealing (30% infiltration reduction) in homes with gas heating and central AC	3.30	$0.056	0.063
5002	HVAC Shell	Infiltration reduction - 50%	SF	NLI	RETRO	-	-	100.49	0.111	0.176	-	-	13.507	13	$202.68	$0.00	$0.00	$0.00	Air sealing (50% infiltration reduction) in homes with gas heating and central AC	5.56	$0.034	0.042
5003	HVAC Shell	Crawlspace Wall Insulation	SF	NLI	RETRO	-	-	-44.60	-0.027	-0.027	-	-	3.205	25	$552.11	$0.00	$0.00	$0.00	Installing crawlspace wall insulation in homes with unconditioned crawlspaces and gas heating and central AC	0.29	$0.000	0.005
5004	HVAC Shell	Basement Wall Insulation	SF	NLI	RETRO	-	-	-40.32	-0.059	-0.064	-	-	9.620	25	$1,104.21	$0.00	$0.00	$0.00	Installing basement wall insulation in homes with unconditioned basements and gas heating and central AC	0.60	$0.000	0.005
5005	HVAC Shell	Floor Insulation	SF	NLI	RETRO	-	-	-68.68	-0.030	-0.030	-	-	5.824	25	$874.23	$0.00	$0.00	$0.00	Installing floor wall insulation in homes with unconditioned basements or crawl spaces and gas heating and central AC	0.42	$0.000	0.005
5006	HVAC Shell	Wall Insulation	SF	NLI	RETRO	-	-	102.14	0.078	0.088	-	-	11.496	25	$3,041.11	$0.00	$0.00	$0.00	Installing wall insulation in homes with gas heating and central AC	0.48	$0.354	0.359
5007	HVAC Shell	R-38 Roof Insulation	SF	NLI	RETRO	-	-	41.70	0.045	0.053	-	-	4.651	20	$1,656.22	$0.00	$0.00	$0.00	Installing R-38 roof insulation in homes with poor attic insulation and gas heating and central AC	0.33	$0.617	0.623
5008	HVAC Shell	R-60 Roof Insulation	SF	NLI	RETRO	-	-	57.89	0.064	0.074	-	-	6.549	20	$3,573.96	$0.00	$0.00	$0.00	Installing R-60 roof insulation in homes with mediocre attic insulation and gas heating and central AC	0.22	$0.959	0.964
5009	HVAC Shell	Infiltration reduction - 30%	SF	NLI	RETRO	-	-	35.81	0.000	0.000	-	-	8.387	13	$202.68	$0.00	$0.00	$0.00	Air sealing (30% infiltration reduction) in homes with gas heating and no central AC	2.63	$0.017	0.024
5010	HVAC Shell	Infiltration reduction - 50%	SF	NLI	RETRO	-	-	59.62	0.000	0.000	-	-	13.983	13	$202.68	$0.00	$0.00	$0.00	Air sealing (50% infiltration reduction) in homes with gas heating and no central AC	4.38	$0.010	0.017
5011	HVAC Shell	Crawlspace Wall Insulation	SF	NLI	RETRO	-	-	12.33	0.000	0.000	-	-	4.246	25	$552.11	$0.00	$0.00	$0.00	Installing crawlspace wall insulation in homes with unconditioned crawlspaces and gas heating and no central AC	0.74	$0.068	0.074
5012	HVAC Shell	Basement Wall Insulation	SF	NLI	RETRO	-	-	36.24	0.000	0.000	-	-	10.171	25	$1,104.21	$0.00	$0.00	$0.00	Installing basement wall insulation in homes with unconditioned basements and gas heating and no central AC	0.90	$0.057	0.062
5013	HVAC Shell	Floor Insulation	SF	NLI	RETRO	-	-	23.14	0.000	0.000	-	-	4.863	25	$874.23	$0.00	$0.00	$0.00	Installing floor wall insulation in homes with unconditioned basements or crawl spaces and gas heating and no central AC	0.55	$0.092	0.098
5014	HVAC Shell	Wall Insulation	SF	NLI	RETRO	-	-	47.98	0.000	0.000	-	-	11.794	25	$3,041.11	$0.00	$0.00	$0.00	Installing wall insulation in homes with gas heating and no central AC	0.38	$0.134	0.139
5015	HVAC Shell	R-38 Roof Insulation	SF	NLI	RETRO	-	-	19.49	0.000	0.000	-	-	5.117	20	$1,656.22	$0.00	$0.00	$0.00	Installing R-38 roof insulation in homes with poor attic insulation and gas heating and no central AC	0.26	$0.183	0.189
5016	HVAC Shell	R-60 Roof Insulation	SF	NLI	RETRO	-	-	27.31	0.000	0.000	-	-	7.062	20	$3,573.96	$0.00	$0.00	$0.00	Installing R-60 roof insulation in homes with mediocre attic insulation and gas heating and no central AC	0.17	$0.286	0.291
5017	HVAC Shell	Infiltration reduction - 30%	SF	NLI	RETRO	-	-	1850.36	0.100	0.063	-	-	0.000	13	$202.68	$0.00	$0.00	$0.00	Air sealing (30% infiltration reduction) in homes with electric heating and central AC	8.05	$0.007	0.014
5018	HVAC Shell	Infiltration reduction - 50%	SF	NLI	RETRO	-	-	3072.98	0.111	0.176	-	-	0.000	13	$202.68	$0.00	$0.00	$0.00	Air sealing (50% infiltration reduction) in homes with electric heating and central AC	12.80	$0.004	0.011

CE (Michigan) **Measure Assumption**

Measure #	End-Use	Measure Name	Home Type	Income Type	Replacement Type	Base Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer NCP kW	Per Unit Winter NCP kW	Base Fuel Use	% Fuel Savings	Per unit Fuel Saving	Useful Life	Measure Cost	O&M Benefits	O&M Costs	Tax Credits	Measure Description	UCT Ratio	Utility $ / LFT-kWh Saved (-Admin)	Utility $ / LFT-kWh Saved (+Admin)
5019	HVAC Shell	Crawlspace Wall Insulation	SF	NLI	RETRO	-	-	652.89	-0.027	-0.027	-	-	0.000	25	$552.11	$0.00	$0.00	$0.00	Installing crawlspace wall insulation in homes with unconditioned crawlspaces and electric heating and central AC	1.24	$0.038	0.044
5020	HVAC Shell	Basement Wall Insulation	SF	NLI	RETRO	-	-	2065.31	-0.059	-0.064	-	-	0.000	25	$1,104.21	$0.00	$0.00	$0.00	Installing basement wall insulation in homes with unconditioned basements and electric heating and central AC	2.03	$0.024	0.030
5021	HVAC Shell	Floor Insulation	SF	NLI	RETRO	-	-	1222.96	-0.030	-0.030	-	-	0.000	25	$874.23	$0.00	$0.00	$0.00	Installing floor wall insulation in homes with unconditioned basements or crawl spaces and electric heating and central AC	1.54	$0.032	0.038
5022	HVAC Shell	Wall Insulation	SF	NLI	RETRO	-	-	2632.01	0.078	0.088	-	-	0.000	25	$3,041.11	$0.00	$0.00	$0.00	Installing wall insulation in homes with electric heating and central AC	1.11	$0.053	0.058
5023	HVAC Shell	R-38 Roof Insulation	SF	NLI	RETRO	-	-	1056.63	0.045	0.053	-	-	0.005	20	$1,656.22	$0.00	$0.00	$0.00	Installing R-38 roof insulation in homes with poor attic insulation and electric heating and central AC	0.74	$0.078	0.083
5024	HVAC Shell	R-60 Roof Insulation	SF	NLI	RETRO	-	-	1486.29	0.064	0.074	-	-	0.005	20	$3,573.96	$0.00	$0.00	$0.00	Installing R-60 roof insulation in homes with mediocre attic insulation and electric heating and central AC	0.48	$0.119	0.125
5025	HVAC Shell	Infiltration reduction - 50%	SF	LI	DI	-	-	100.49	0.111	0.176	-	-	13.507	13	$202.68	$0.00	$0.00	$0.00	Air sealing (50% infiltration reduction) in homes with gas heating and central AC	2.78	$0.069	0.076
5026	HVAC Shell	Crawlspace Wall Insulation	SF	LI	DI	-	-	-44.60	-0.027	-0.027	-	-	3.205	25	$552.11	$0.00	$0.00	$0.00	Installing crawlspace wall insulation in homes with unconditioned crawlspaces and gas heating and central AC	0.14	$0.000	0.005
5027	HVAC Shell	Basement Wall Insulation	SF	LI	DI	-	-	-40.32	-0.059	-0.064	-	-	9.620	25	$1,104.21	$0.00	$0.00	$0.00	Installing basement wall insulation in homes with unconditioned basements and gas heating and central AC	0.30	$0.000	0.005
5028	HVAC Shell	Floor Insulation	SF	LI	DI	-	-	-68.68	-0.030	-0.030	-	-	5.824	25	$874.23	$0.00	$0.00	$0.00	Installing floor wall insulation in homes with unconditioned basements or crawl spaces and gas heating and central AC	0.21	$0.000	0.005
5029	HVAC Shell	Wall Insulation	SF	LI	DI	-	-	102.14	0.078	0.088	-	-	11.496	25	$3,041.11	$0.00	$0.00	$0.00	Installing wall insulation in homes with gas heating and central AC	0.24	$0.708	0.713
5030	HVAC Shell	R-38 Roof Insulation	SF	LI	DI	-	-	41.70	0.045	0.053	-	-	4.651	20	$1,656.22	$0.00	$0.00	$0.00	Installing R-38 roof insulation in homes with poor attic insulation and gas heating and central AC	0.17	$1.234	1.239
5031	HVAC Shell	R-60 Roof Insulation	SF	LI	DI	-	-	57.89	0.064	0.074	-	-	6.549	20	$3,573.96	$0.00	$0.00	$0.00	Installing R-60 roof insulation in homes with mediocre attic insulation and gas heating and central AC	0.11	$1.917	1.923
5032	HVAC Shell	Infiltration reduction - 50%	SF	LI	DI	-	-	59.62	0.000	0.000	-	-	13.983	13	$202.68	$0.00	$0.00	$0.00	Air sealing (50% infiltration reduction) in homes with gas heating and no central AC	2.19	$0.021	0.028
5033	HVAC Shell	Crawlspace Wall Insulation	SF	LI	DI	-	-	12.33	0.000	0.000	-	-	4.246	25	$552.11	$0.00	$0.00	$0.00	Installing crawlspace wall insulation in homes with unconditioned crawlspaces and gas heating and no central AC	0.37	$0.137	0.142
5034	HVAC Shell	Basement Wall Insulation	SF	LI	DI	-	-	36.24	0.000	0.000	-	-	10.171	25	$1,104.21	$0.00	$0.00	$0.00	Installing basement wall insulation in homes with unconditioned basements and gas heating and no central AC	0.45	$0.113	0.118
5035	HVAC Shell	Floor Insulation	SF	LI	DI	-	-	23.14	0.000	0.000	-	-	4.863	25	$874.23	$0.00	$0.00	$0.00	Installing floor wall insulation in homes with unconditioned basements or crawl spaces and gas heating and no central AC	0.27	$0.185	0.190
5036	HVAC Shell	Wall Insulation	SF	LI	DI	-	-	47.98	0.000	0.000	-	-	11.794	25	$3,041.11	$0.00	$0.00	$0.00	Installing wall insulation in homes with gas heating and no central AC	0.19	$0.267	0.272
5037	HVAC Shell	R-38 Roof Insulation	SF	LI	DI	-	-	19.49	0.000	0.000	-	-	5.117	20	$1,656.22	$0.00	$0.00	$0.00	Installing R-38 roof insulation in homes with poor attic insulation and gas heating and no central AC	0.13	$0.366	0.371
5038	HVAC Shell	R-60 Roof Insulation	SF	LI	DI	-	-	27.31	0.000	0.000	-	-	7.062	20	$3,573.96	$0.00	$0.00	$0.00	Installing R-60 roof insulation in homes with mediocre attic insulation and gas heating and no central AC	0.08	$0.571	0.577
5039	HVAC Shell	Infiltration reduction - 50%	SF	LI	DI	-	-	3072.98	0.111	0.176	-	-	0.000	13	$202.68	$0.00	$0.00	$0.00	Air sealing (50% infiltration reduction) in homes with electric heating and central AC	6.40	$0.008	0.015
5040	HVAC Shell	Crawlspace Wall Insulation	SF	LI	DI	-	-	652.89	-0.027	-0.027	-	-	0.000	25	$552.11	$0.00	$0.00	$0.00	Installing crawlspace wall insulation in homes with unconditioned crawlspaces and electric heating and central AC	0.62	$0.077	0.082
5041	HVAC Shell	Basement Wall Insulation	SF	LI	DI	-	-	2065.31	-0.059	-0.064	-	-	0.000	25	$1,104.21	$0.00	$0.00	$0.00	Installing basement wall insulation in homes with unconditioned basements and electric heating and central AC	1.02	$0.049	0.054
5042	HVAC Shell	Floor Insulation	SF	LI	DI	-	-	1222.96	-0.030	-0.030	-	-	0.000	25	$874.23	$0.00	$0.00	$0.00	Installing floor wall insulation in homes with unconditioned basements or crawl spaces and electric heating and central AC	0.77	$0.065	0.070
5043	HVAC Shell	Wall Insulation	SF	LI	DI	-	-	2632.01	0.078	0.088	-	-	0.000	25	$3,041.11	$0.00	$0.00	$0.00	Installing wall insulation in homes with electric heating and central AC	0.55	$0.105	0.110
5044	HVAC Shell	R-38 Roof Insulation	SF	LI	DI	-	-	1056.63	0.045	0.053	-	-	0.005	20	$1,656.22	$0.00	$0.00	$0.00	Installing R-38 roof insulation in homes with poor attic insulation and electric heating and central AC	0.37	$0.155	0.161
5045	HVAC Shell	R-60 Roof Insulation	SF	LI	DI	-	-	1486.29	0.064	0.074	-	-	0.005	20	$3,573.96	$0.00	$0.00	$0.00	Installing R-60 roof insulation in homes with mediocre attic insulation and electric heating and central AC	0.24	$0.239	0.244
5046	HVAC Shell	Duct Insulation	SF	All	RETRO	-	-	-3.66	0.021	0.023	-	-	2.520	20	$405.36	$0.00	$0.00	$0.00	Adding duct insulation in homes with gas heating and central AC	0.65	-$1.182	-1.176
5047	HVAC Shell	Duct location	SF	All	RETRO	-	-	69.27	0.070	0.081	-	-	8.927	30	$1,266.75	$0.00	$0.00	$0.00	Moving ductwork from unconditioned space to conditioned space in homes with gas heating and central AC	1.00	$0.216	0.221
5048	HVAC Shell	Duct sealing 15% leakage base	SF	All	RETRO	-	-	18.88	0.025	0.033	-	-	1.025	18	$364.52	$0.00	$0.00	$0.00	Duct sealing (15% leakage reduction) in homes with gas heating and central AC	0.45	$0.524	0.530
5049	HVAC Shell	Duct sealing 30% leakage base	SF	All	RETRO	-	-	55.91	0.064	0.081	-	-	2.627	18	$364.52	$0.00	$0.00	$0.00	Duct sealing (30% leakage reduction) in homes with gas heating and central AC	1.17	$0.180	0.186
5050	HVAC Shell	Door weatherstripping	SF	All	RETRO	-	-	6.95	0.000	0.000	-	-	0.472	5	$86.00	$0.00	$0.00	$0.00	Installing door weatherstripping - savings estimate weighted across heating/cooling combinations	0.18	$0.237	0.252
5051	HVAC Shell	R0 to R19 kneewalls	SF	All	RETRO	-	-	72.29	0.077	0.086	-	-	7.516	20	$172.53	$0.00	$0.00	$0.00	Installing R19 kneewall insulation in homes with no kneewall insulation in homes with gas heating and central AC	5.28	$0.039	0.044
5052	HVAC Shell	R6 to R19 kneewalls	SF	All	RETRO	-	-	23.91	0.025	0.028	-	-	3.056	20	$162.53	$0.00	$0.00	$0.00	Installing R19 kneewall insulation in homes with R6 kneewall insulation in homes with gas heating and central AC	2.12	$0.093	0.099
5053	HVAC Shell	Rim Joist Insulation	SF	All	RETRO	-	-	35.01	0.024	0.028	-	-	3.805	25	$191.84	$0.00	$0.00	$0.00	Installing rim joist insulation in homes with gas heating and central AC	2.49	$0.064	0.069
5054	HVAC Shell	Window Film	SF	All	RETRO	-	-	372.22	0.335	0.390	-	-	-9.140	10	$389.69	$0.00	$0.00	$0.00	Installing window film on inefficient existing windows in homes with gas heating and central AC	0.91	$0.077	0.085
5055	HVAC Shell	Window Replacement	SF	All	ROB	-	-	317.96	0.332	0.374	-	-	13.421	25	$1,085.93	$0.00	$0.00	$0.00	Replacing inefficient windows at the end of useful life with efficient windows in homes with gas heating and central AC	2.52	$0.084	0.089
5056	HVAC Shell	Original double hung window with low U storm	SF	All	RETRO	-	-	738.72	0.742	0.863	-	-	28.169	25	$3,800.25	$0.00	$0.00	$0.00	Retrofitting inefficient windows with efficient alternatives in homes with gas heating and central AC	1.57	$0.131	0.136
5057	HVAC Shell	Duct Insulation	SF	All	RETRO	-	-	-15.74	0.000	0.000	-	-	2.524	20	$405.36	$0.00	$0.00	$0.00	Adding duct insulation in homes with gas heating and no central AC	0.47	$0.000	0.006
5058	HVAC Shell	Duct location	SF	All	RETRO	-	-	11.41	0.000	0.000	-	-	10.457	30	$1,266.75	$0.00	$0.00	$0.00	Moving ductwork from unconditioned space to conditioned space in homes with gas heating and no central AC	0.86	$0.062	0.067
5059	HVAC Shell	Duct sealing 15% leakage base	SF	All	RETRO	-	-	5.16	0.000	0.000	-	-	1.031	18	$364.52	$0.00	$0.00	$0.00	Duct sealing (15% leakage reduction) in homes with gas heating and no central AC	0.23	$0.207	0.213
5060	HVAC Shell	Duct sealing 30% leakage base	SF	All	RETRO	-	-	16.43	0.000	0.000	-	-	2.626	18	$364.52	$0.00	$0.00	$0.00	Duct sealing (30% leakage reduction) in homes with gas heating and no central AC	0.59	$0.080	0.086
5061	HVAC Shell	R0 to R19 kneewalls	SF	All	RETRO	-	-	31.41	0.000	0.000	-	-	7.761	20	$172.53	$0.00	$0.00	$0.00	Installing R19 kneewall insulation in homes with no kneewall insulation in homes with gas heating and no central AC	3.85	$0.013	0.018
5062	HVAC Shell	R6 to R19 kneewalls	SF	All	RETRO	-	-	11.52	0.000	0.000	-	-	3.104	20	$162.53	$0.00	$0.00	$0.00	Installing R19 kneewall insulation in homes with R6 kneewall insulation in homes with gas heating and no central AC	1.63	$0.030	0.035
5063	HVAC Shell	Rim Joist Insulation	SF	All	RETRO	-	-	0.00	0.000	0.000	-	-	3.881	25	$191.84	$0.00	$0.00	$0.00	Installing rim joist insulation in homes with gas heating and no central AC	1.89		
5064	HVAC Shell	Window Film	SF	All	RETRO	-	-	-42.27	0.000	0.000	-	-	-9.169	10	$389.69	$0.00	$0.00	$0.00	Installing window film on inefficient existing windows in homes with gas heating and no central AC	-1.22	-$0.676	-0.668

CE (Michigan) **Measure Assumption**

Measure #	End-Use	Measure Name	Home Type	Income Type	Replacement Type	Base Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer NCP kW	Per Unit Winter NCP kW	Base Fuel Use	% Fuel Savings	Per unit Fuel Saving	Useful Life	Measure Cost	O&M Benefits	O&M Costs	Tax Credits	Measure Description	UCT Ratio	Utility $ / LFT-kWh Saved (-Admin)	Utility $ / LFT-kWh Saved (+Admin)
5065	HVAC Shell	Window Replacement	SF	All	ROB	-	-	57.10	0.000	0.000	-	-	13.750	25	$1,085.93	$0.00	$0.00	$0.00	Replacing inefficient windows at the end of useful life with efficient windows in homes with gas heating and no central AC	1.24	$0.041	0.046
5066	HVAC Shell	Original double hung window with low U storm	SF	All	RETRO	-	-	160.41	0.000	0.000	-	-	28.158	25	$3,800.25	$0.00	$0.00	$0.00	Retrofitting inefficient windows with efficient alternatives in homes with gas heating and no central AC	0.74	$0.069	0.074
5067	HVAC Shell	HW pipe insulation	SF	All	RETRO	-	-	0.00	0.000	0.000	-	-	0.000	11	$1,404.58	$0.00	$0.00	$0.00	Installing hot water pipe insulation on boiler pipes in homes with boilers	0.00		
5068	HVAC Shell	Steam pipe insulation	SF	All	RETRO	-	-	0.00	0.000	0.000	-	-	0.000	11	$1,404.58	$0.00	$0.00	$0.00	Installing steam pipe insulation on boiler pipes in homes with boilers	0.00		
5069	HVAC Shell	Duct Insulation	SF	All	RETRO	-	-	598.17	0.021	0.023	-	-	0.000	20	$405.36	$0.00	$0.00	$0.00	Adding duct insulation in homes with electric heating and central AC	1.67	$0.034	0.039
5070	HVAC Shell	Duct location	SF	All	RETRO	-	-	2433.90	0.082	0.094	-	-	0.000	30	$1,266.75	$0.00	$0.00	$0.00	Moving ductwork from unconditioned space to conditioned space in homes with electric heating and central AC	2.76	$0.022	0.027
5071	HVAC Shell	Duct sealing 15% leakage base	SF	All	RETRO	-	-	265.53	0.025	0.033	-	-	0.000	18	$364.52	$0.00	$0.00	$0.00	Duct sealing (15% leakage reduction) in homes with electric heating and central AC	0.88	$0.071	0.078
5072	HVAC Shell	Duct sealing 30% leakage base	SF	All	RETRO	-	-	687.29	0.064	0.081	-	-	0.000	18	$364.52	$0.00	$0.00	$0.00	Duct sealing (30% leakage reduction) in homes with electric heating and central AC	2.28	$0.028	0.034
5073	HVAC Shell	R0 to R19 kneewalls	SF	All	RETRO	-	-	1756.71	0.078	0.087	-	-	0.002	20	$172.53	$0.00	$0.00	$0.00	Installing R19 kneewall insulation in homes with no kneewall insulation in homes with electric heating and central AC	11.79	$0.005	0.011
5074	HVAC Shell	R6 to R19 kneewalls	SF	All	RETRO	-	-	569.84	0.025	0.028	-	-	0.590	20	$162.53	$0.00	$0.00	$0.00	Installing R19 kneewall insulation in homes with R6 kneewall insulation in homes with electric heating and central AC	4.34	$0.013	0.019
5075	HVAC Shell	Rim Joist Insulation	SF	All	RETRO	-	-	878.21	0.024	0.028	-	-	0.000	25	$191.84	$0.00	$0.00	$0.00	Installing rim joist insulation in homes with electric heating and central AC	5.83	$0.010	0.015
5076	HVAC Shell	Window Film	SF	All	RETRO	-	-	-1568.09	0.335	0.390	-	-	-0.024	10	$389.69	$0.00	$0.00	$0.00	Installing window film on inefficient existing windows in homes with electric heating and central AC	-1.05	-$0.018	-0.010
5077	HVAC Shell	Window Replacement	SF	All	ROB	-	-	3297.79	0.332	0.374	-	-	0.000	25	$1,085.93	$0.00	$0.00	$0.00	Replacing inefficient windows at the end of useful life with efficient windows in homes with electric heating and central AC	4.60	$0.015	0.020
5078	HVAC Shell	Original double hung window with low U storm	SF	All	RETRO	-	-	7013.57	0.742	0.863	-	-	0.000	25	$3,800.25	$0.00	$0.00	$0.00	Retrofitting inefficient windows with efficient alternatives in homes with electric heating and central AC	2.83	$0.025	0.030
5079	HVAC Shell	Infiltration reduction - 30%	SF	All	NC	-	-	28.69	0.018	0.029	-	-	4.232	13	$33.78	$0.00	$0.00	$0.00	Air sealing (30% infiltration reduction) in homes with gas heating and central AC	9.34	$0.014	0.021
5080	HVAC Shell	Infiltration reduction - 50%	SF	All	NC	-	-	47.46	0.030	0.048	-	-	7.055	13	$33.78	$0.00	$0.00	$0.00	Air sealing (50% infiltration reduction) in homes with gas heating and central AC	15.57	$0.008	0.016
5081	HVAC Shell	Duct Insulation	SF	All	NC	-	-	2.76	0.024	0.026	-	-	1.870	20	$168.90	$0.00	$0.00	$0.00	Adding duct insulation in homes with gas heating and central AC	1.33	$0.976	0.981
5082	HVAC Shell	Duct location	SF	All	NC	-	-	53.72	0.047	0.054	-	-	7.423	30	$1,266.75	$0.00	$0.00	$0.00	Moving ductwork from unconditioned space to conditioned space in homes with gas heating and central AC	0.79	$0.244	0.249
5083	HVAC Shell	Duct sealing 15% leakage base	SF	All	NC	-	-	9.519	0.014	0.019	-	-	0.380	18	$56.30	$0.00	$0.00	$0.00	Duct sealing (15% leakage reduction) in homes with gas heating and central AC	1.36	$0.192	0.198
5084	HVAC Shell	Duct sealing 30% leakage base	SF	All	NC	-	-	26.729	0.034	0.041	-	-	1.015	18	$56.30	$0.00	$0.00	$0.00	Duct sealing (30% leakage reduction) in homes with gas heating and central AC	3.46	$0.066	0.072
5085	HVAC Shell	Door weatherstripping	SF	All	NC	-	-	0.000	0.000	0.000	-	-	0.000	5	$26.00	$0.00	$0.00	$0.00	Installing door weatherstripping - savings estimate weighted across heating/cooling combinations	0.00		
5086	HVAC Shell	Basement Wall Insulation	SF	All	NC	-	-	-2.885	-0.014	-0.025	-	-	4.006	25	$437.37	$0.00	$0.00	$0.00	Installing basement wall insulation in homes with unconditioned basements and gas heating and central AC	0.74	$0.000	0.005
5087	HVAC Shell	Floor Insulation	SF	All	NC	-	-	-6.530	-0.002	-0.002	-	-	0.721	25	$346.27	$0.00	$0.00	$0.00	Installing floor wall insulation in homes with unconditioned basements or crawl spaces and gas heating and central AC	0.16	$0.000	0.005
5088	HVAC Shell	Crawlspace Wall Insulation	SF	All	NC	-	-	-2.334	0.000	0.000	-	-	0.073	25	$218.68	$0.00	$0.00	$0.00	Installing crawlspace wall insulation in homes with unconditioned crawlspaces and gas heating and central AC	0.02	$0.000	0.005
5089	HVAC Shell	Wall Insulation	SF	All	NC	-	-	33.810	0.014	0.027	-	-	3.370	25	$349.57	$0.00	$0.00	$0.00	Installing wall insulation in homes with gas heating and central AC	1.15	$0.102	0.107
5090	HVAC Shell	Window Film	SF	All	NC	-	-	99.380	0.057	0.066	-	-	-2.151	10	$227.74	$0.00	$0.00	$0.00	Installing window film on windows in homes with gas heating and central AC	0.23	$0.168	0.177
5091	HVAC Shell	Window Replacement	SF	All	NC	-	-	75.528	0.002	0.103	-	-	1.429	25	$1,085.93	$0.00	$0.00	$0.00	Installing efficient windows in homes with gas heating and central AC	0.21	$0.274	0.279
5092	HVAC Shell	Infiltration reduction - 30%	MF	NLI	RETRO	-	-	33.415	0.049	0.072	-	-	4.383	13	$111.36	$0.00	$0.00	$0.00	Air sealing (30% infiltration reduction) in homes with gas heating and central AC	3.53	$0.067	0.075
5093	HVAC Shell	Infiltration reduction - 50%	MF	NLI	RETRO	-	-	56.672	0.082	0.123	-	-	7.330	13	$111.36	$0.00	$0.00	$0.00	Air sealing (50% infiltration reduction) in homes with gas heating and central AC	5.92	$0.040	0.047
5094	HVAC Shell	Basement Wall Insulation	MF	NLI	RETRO	-	-	-22.788	-0.025	-0.033	-	-	5.093	25	$640.44	$0.00	$0.00	$0.00	Installing basement wall insulation in homes with unconditioned basements and gas heating and central AC	0.57	$0.000	0.005
5095	HVAC Shell	Wall Insulation	MF	NLI	RETRO	-	-	43.987	0.034	0.043	-	-	6.726	25	$1,670.90	$0.00	$0.00	$0.00	Installing wall insulation in homes with gas heating and central AC	0.48	$0.359	0.364
5096	HVAC Shell	Roof Insulation	MF	NLI	RETRO	-	-	52.178	0.042	0.043	-	-	4.599	25	$702.45	$0.00	$0.00	$0.00	Installing roof insulation in homes with gas heating and central AC	0.90	$0.196	0.201
5097	HVAC Shell	Infiltration reduction - 30%	MF	NLI	RETRO	-	-	17.742	0.000	0.000	-	-	4.244	13	$111.36	$0.00	$0.00	$0.00	Air sealing (30% infiltration reduction) in homes with gas heating and no central AC	2.42	$0.019	0.026
5098	HVAC Shell	Infiltration reduction - 50%	MF	NLI	RETRO	-	-	29.200	0.000	0.000	-	-	7.098	13	$111.36	$0.00	$0.00	$0.00	Air sealing (50% infiltration reduction) in homes with gas heating and no central AC	4.04	$0.011	0.018
5099	HVAC Shell	Basement Wall Insulation	MF	NLI	RETRO	-	-	19.210	0.000	0.000	-	-	5.389	25	$640.44	$0.00	$0.00	$0.00	Installing basement wall insulation in homes with unconditioned basements and gas heating and no central AC	0.82	$0.062	0.067
5100	HVAC Shell	Wall Insulation	MF	NLI	RETRO	-	-	25.927	0.000	0.000	-	-	6.157	25	$1,670.90	$0.00	$0.00	$0.00	Installing wall insulation in homes with gas heating and no central AC	0.36	$0.140	0.146
5101	HVAC Shell	Roof Insulation	MF	NLI	RETRO	-	-	17.731	0.000	0.000	-	-	4.638	25	$702.45	$0.00	$0.00	$0.00	Installing roof insulation in homes with gas heating and no central AC	0.65	$0.079	0.084
5102	HVAC Shell	Infiltration reduction - 30%	MF	NLI	RETRO	-	-	928.818	0.049	0.074	-	-	0.000	13	$111.36	$0.00	$0.00	$0.00	Air sealing (30% infiltration reduction) in homes with electric heating and central AC	7.34	$0.007	0.015
5103	HVAC Shell	Infiltration reduction - 50%	MF	NLI	RETRO	-	-	1547.467	0.083	0.124	-	-	0.000	13	$111.36	$0.00	$0.00	$0.00	Air sealing (50% infiltration reduction) in homes with electric heating and central AC	12.25	$0.004	0.012
5104	HVAC Shell	Basement Wall Insulation	MF	NLI	RETRO	-	-	1044.730	-0.025	-0.033	-	-	0.000	25	$640.44	$0.00	$0.00	$0.00	Installing basement wall insulation in homes with unconditioned basements and electric heating and central AC	1.80	$0.028	0.033
5105	HVAC Shell	Wall Insulation	MF	NLI	RETRO	-	-	1407.665	0.035	0.044	-	-	0.000	25	$1,670.90	$0.00	$0.00	$0.00	Installing wall insulation in homes with electric heating and central AC	1.06	$0.054	0.059
5106	HVAC Shell	Roof Insulation	MF	NLI	RETRO	-	-	1006.409	0.038	0.048	-	-	0.000	25	$702.45	$0.00	$0.00	$0.00	Installing roof insulation in homes with electric heating and central AC	1.87	$0.032	0.037
5107	HVAC Shell	Infiltration reduction - 50%	MF	LI	DI	-	-	56.672	0.082	0.123	-	-	7.330	13	$111.36	$0.00	$0.00	$0.00	Air sealing (50% infiltration reduction) in homes with gas heating and central AC	2.96	$0.080	0.087
5108	HVAC Shell	Basement Wall Insulation	MF	LI	DI	-	-	-22.788	-0.025	-0.033	-	-	5.093	25	$640.44	$0.00	$0.00	$0.00	Installing basement wall insulation in homes with unconditioned basements and gas heating and central AC	0.29	$0.000	0.005
5109	HVAC Shell	Wall Insulation	MF	LI	DI	-	-	43.987	0.034	0.043	-	-	6.726	25	$1,670.90	$0.00	$0.00	$0.00	Installing wall insulation in homes with gas heating and central AC	0.24	$0.718	0.723
5110	HVAC Shell	Roof Insulation	MF	LI	DI	-	-	52.178	0.042	0.043	-	-	4.599	25	$702.45	$0.00	$0.00	$0.00	Installing roof insulation in homes with gas heating and central AC	0.45	$0.391	0.397
5111	HVAC Shell	Infiltration reduction - 50%	MF	LI	DI	-	-	29.200	0.000	0.000	-	-	7.098	13	$111.36	$0.00	$0.00	$0.00	Air sealing (50% infiltration reduction) in homes with gas heating and no central AC	2.02	$0.022	0.030
5112	HVAC Shell	Basement Wall Insulation	MF	LI	DI	-	-	19.210	0.000	0.000	-	-	5.389	25	$640.44	$0.00	$0.00	$0.00	Installing basement wall insulation in homes with unconditioned basements and gas heating and no central AC	0.41	$0.124	0.129

CE (Michigan) **Measure Assumption**

Measure #	End-Use	Measure Name	Home Type	Income Type	Replacement Type	Base Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer NCP kW	Per Unit Winter NCP kW	Base Fuel Use	% Fuel Savings	Per unit Fuel Saving	Useful Life	Measure Cost	O&M Benefits	O&M Costs	Tax Credits	Measure Description	UCT Ratio	Utility $ / LFT-kWh Saved (-Admin)	Utility $ / LFT-kWh Saved (+Admin)
5113	HVAC Shell	Wall Insulation	MF	LI	DI	-	-	25.927	0.000	0.000	-	-	6.157	25	$1,670.90	$0.00	$0.00	$0.00	Installing wall insulation in homes with gas heating and no central AC	0.18	$0.281	0.286
5114	HVAC Shell	Roof Insulation	MF	LI	DI	-	-	17.731	0.000	0.000	-	-	4.638	25	$702.45	$0.00	$0.00	$0.00	Installing roof insulation in homes with gas heating and no central AC	0.32	$0.157	0.163
5115	HVAC Shell	Infiltration reduction - 50%	MF	LI	DI	-	-	1547.467	0.083	0.124	-	-	0.000	13	$111.36	$0.00	$0.00	$0.00	Air sealing (50% infiltration reduction) in homes with electric heating and central AC	6.13	$0.009	0.016
5116	HVAC Shell	Basement Wall Insulation	MF	LI	DI	-	-	1044.730	-0.025	-0.033	-	-	0.000	25	$640.44	$0.00	$0.00	$0.00	Installing basement wall insulation in homes with unconditioned basements and electric heating and central AC	0.90	$0.056	0.061
5117	HVAC Shell	Wall Insulation	MF	LI	DI	-	-	1407.665	0.035	0.044	-	-	0.000	25	$1,670.90	$0.00	$0.00	$0.00	Installing wall insulation in homes with electric heating and central AC	0.53	$0.108	0.113
5118	HVAC Shell	Roof Insulation	MF	LI	DI	-	-	1006.409	0.038	0.048	-	-	0.000	25	$702.45	$0.00	$0.00	$0.00	Installing roof insulation in homes with electric heating and central AC	0.94	$0.063	0.069
5119	HVAC Shell	Duct Insulation	MF	All	RETRO	-	-	40.741	0.069	0.076	-	-	2.855	20	$222.72	$0.00	$0.00	$0.00	Adding duct insulation in homes with gas heating and central AC	2.13	$0.138	0.144
5120	HVAC Shell	Duct location	MF	All	RETRO	-	-	81.515	0.136	0.162	-	-	5.754	30	$696.00	$0.00	$0.00	$0.00	Moving ductwork from unconditioned space to conditioned space in homes with gas heating and central AC	1.73	$0.186	0.191
5121	HVAC Shell	Duct sealing 15% leakage base	MF	All	RETRO	-	-	15.232	0.016	0.018	-	-	0.897	18	$200.28	$0.00	$0.00	$0.00	Duct sealing (15% leakage reduction) in homes with gas heating and central AC	0.63	$0.313	0.319
5122	HVAC Shell	Duct sealing 30% leakage base	MF	All	RETRO	-	-	41.101	0.044	0.050	-	-	2.391	18	$200.28	$0.00	$0.00	$0.00	Duct sealing (30% leakage reduction) in homes with gas heating and central AC	1.70	$0.118	0.124
5123	HVAC Shell	Door weatherstripping	MF	All	RETRO	-	-	4.497	0.002	0.003	-	-	0.268	5	$43.00	$0.00	$0.00	$0.00	Installing door weatherstripping - savings estimate weighted across heating/cooling combinations	0.26	$0.408	0.422
5124	HVAC Shell	Window Film	MF	All	RETRO	-	-	453.925	0.460	0.475	-	-	-9.957	10	$214.11	$0.00	$0.00	$0.00	Installing window film on inefficient existing windows in homes with gas heating and central AC	2.69	$0.035	0.043
5125	HVAC Shell	Window Replacement	MF	All	ROB	-	-	159.225	0.157	0.175	-	-	6.847	25	$596.65	$0.00	$0.00	$0.00	Replacing inefficient windows at the end of useful life with efficient windows in homes with gas heating and central AC	2.26	$0.090	0.095
5126	HVAC Shell	Original double hung window with low U storm	MF	All	RETRO	-	-	721.366	0.698	0.776	-	-	53.349	25	$2,088.00	$0.00	$0.00	$0.00	Retrofitting inefficient windows with efficient alternatives in homes with gas heating and central AC	3.91	$0.051	0.056
5127	HVAC Shell	Duct Insulation	MF	All	RETRO	-	-	0.168	0.000	0.000	-	-	2.855	20	$222.72	$0.00	$0.00	$0.00	Adding duct insulation in homes with gas heating and no central AC	1.05	$0.046	0.052
5128	HVAC Shell	Duct location	MF	All	RETRO	-	-	6.266	0.000	0.000	-	-	5.755	30	$696.00	$0.00	$0.00	$0.00	Moving ductwork from unconditioned space to conditioned space in homes with gas heating and no central AC	0.86	$0.062	0.067
5129	HVAC Shell	Duct sealing 15% leakage base	MF	All	RETRO	-	-	4.273	0.000	0.000	-	-	0.897	18	$200.28	$0.00	$0.00	$0.00	Duct sealing (15% leakage reduction) in homes with gas heating and no central AC	0.36	$0.131	0.137
5130	HVAC Shell	Duct sealing 30% leakage base	MF	All	RETRO	-	-	11.800	0.000	0.000	-	-	2.391	18	$200.28	$0.00	$0.00	$0.00	Duct sealing (30% leakage reduction) in homes with gas heating and no central AC	0.96	$0.049	0.055
5131	HVAC Shell	Window Film	MF	All	RETRO	-	-	-42.322	0.000	0.000	-	-	-9.957	10	$214.11	$0.00	$0.00	$0.00	Installing window film on inefficient existing windows in homes with gas heating and no central AC	-2.40	-$0.371	-0.363
5132	HVAC Shell	Window Replacement	MF	All	ROB	-	-	27.397	0.000	0.000	-	-	6.605	25	$596.65	$0.00	$0.00	$0.00	Replacing inefficient windows at the end of useful life with efficient windows in homes with gas heating and no central AC	1.09	$0.047	0.052
5133	HVAC Shell	Original double hung window with low U storm	MF	All	RETRO	-	-	301.267	0.016	0.018	-	-	53.346	25	$2,088.00	$0.00	$0.00	$0.00	Retrofitting inefficient windows with efficient alternatives in homes with gas heating and no central AC	2.58	$0.023	0.028
5134	HVAC Shell	Duct Insulation	MF	All	RETRO	-	-	687.864	0.069	0.076	-	-	0.000	20	$222.72	$0.00	$0.00	$0.00	Adding duct insulation in homes with electric heating and central AC	4.07	$0.016	0.022
5135	HVAC Shell	Duct location	MF	All	RETRO	-	-	1380.144	0.136	0.162	-	-	0.000	30	$696.00	$0.00	$0.00	$0.00	Moving ductwork from unconditioned space to conditioned space in homes with electric heating and central AC	3.32	$0.022	0.027
5136	HVAC Shell	Duct sealing 15% leakage base	MF	All	RETRO	-	-	218.837	0.016	0.018	-	-	0.000	18	$200.28	$0.00	$0.00	$0.00	Duct sealing (15% leakage reduction) in homes with electric heating and central AC	1.27	$0.048	0.054
5137	HVAC Shell	Duct sealing 30% leakage base	MF	All	RETRO	-	-	585.103	0.044	0.050	-	-	0.000	18	$200.28	$0.00	$0.00	$0.00	Duct sealing (30% leakage reduction) in homes with electric heating and central AC	3.40	$0.018	0.024
5138	HVAC Shell	Window Film	MF	All	RETRO	-	-	-1459.184	0.457	0.478	-	-	0.000	10	$214.11	$0.00	$0.00	$0.00	Installing window film on inefficient existing windows in homes with electric heating and central AC	-0.63	-$0.011	-0.002
5139	HVAC Shell	Window Replacement	MF	All	ROB	-	-	1867.908	0.203	0.229	-	-	0.000	25	$596.65	$0.00	$0.00	$0.00	Replacing inefficient windows at the end of useful life with efficient windows in homes with electric heating and central AC	4.82	$0.015	0.020
5140	HVAC Shell	Original double hung window with low U storm	MF	All	RETRO	-	-	9753.798	0.698	0.776	-	-	0.000	25	$2,088.00	$0.00	$0.00	$0.00	Retrofitting inefficient windows with efficient alternatives in homes with electric heating and central AC	6.63	$0.010	0.015
5141	HVAC Shell	Infiltration reduction - 30%	MF	All	NC	-	-	20.020	0.030	0.039	-	-	2.769	13	$18.56	$0.00	$0.00	$0.00	Air sealing (30% infiltration reduction) in homes with gas heating and central AC	13.20	$0.018	0.025
5142	HVAC Shell	Infiltration reduction - 50%	MF	All	NC	-	-	33.871	0.051	0.066	-	-	4.647	13	$18.56	$0.00	$0.00	$0.00	Air sealing (50% infiltration reduction) in homes with gas heating and central AC	22.28	$0.011	0.018
5143	HVAC Shell	Airtight Can Lights	MF	All	NC	-	-	14.141	0.020	0.027	-	-	1.946	15	$150.00	$0.00	$0.00	$0.00	Installing air can lights to reduce infiltration in homes with gas heating and central AC	1.26	$0.188	0.195
5144	HVAC Shell	Duct Insulation	MF	All	NC	-	-	52.013	0.082	0.092	-	-	2.537	20	$92.80	$0.00	$0.00	$0.00	Adding duct insulation in homes with gas heating and central AC	5.34	$0.051	0.057
5145	HVAC Shell	Duct location	MF	All	NC	-	-	83.456	0.135	0.164	-	-	4.251	30	$696.00	$0.00	$0.00	$0.00	Moving ductwork from unconditioned space to conditioned space in homes with gas heating and central AC	1.50	$0.208	0.213
5146	HVAC Shell	Duct sealing 15% leakage base	MF	All	NC	-	-	10.916	0.012	0.014	-	-	0.549	18	$30.93	$0.00	$0.00	$0.00	Duct sealing (15% leakage reduction) in homes with gas heating and central AC	2.77	$0.075	0.081
5147	HVAC Shell	Duct sealing 30% leakage base	MF	All	NC	-	-	29.999	0.034	0.037	-	-	1.463	18	$30.93	$0.00	$0.00	$0.00	Duct sealing (30% leakage reduction) in homes with gas heating and central AC	7.46	$0.028	0.034
5148	HVAC Shell	Door weatherstripping	MF	All	NC	-	-	5.997	0.002	0.003	-	-	0.273	5	$13.00	$0.00	$0.00	$0.00	Installing door weatherstripping - savings estimate weighted across heating/cooling combinations	0.88	$0.096	0.111
5149	HVAC Shell	Basement Wall Insulation	MF	All	NC	-	-	-1.673	-0.011	-0.015	-	-	2.324	25	$253.67	$0.00	$0.00	$0.00	Installing basement wall insulation in homes with unconditioned basements and gas heating and central AC	0.71	$0.000	0.005
5150	HVAC Shell	Wall Insulation	MF	All	NC	-	-	13.688	0.010	0.014	-	-	2.200	25	$192.06	$0.00	$0.00	$0.00	Installing wall insulation in homes with gas heating and central AC	1.33	$0.125	0.130
5151	HVAC Shell	Roof Insulation	MF	All	NC	-	-	17.858	0.012	0.012	-	-	1.771	25	$524.16	$0.00	$0.00	$0.00	Installing roof insulation in homes with gas heating and central AC	0.43	$0.352	0.358
5152	HVAC Shell	Cool roof	MF	All	NC	-	-	69.871	0.078	0.078	-	-	-0.516	20	$92.80	$0.00	$0.00	$0.00	Installing a cool roof in homes with gas heating and central AC	2.75	$0.066	0.072
5153	HVAC Shell	Window Film	MF	All	NC	-	-	113.672	0.104	0.106	-	-	-2.496	10	$125.13	$0.00	$0.00	$0.00	Installing window film on windows in homes with gas heating and central AC	1.00	$0.081	0.089
5154	HVAC Shell	Window Replacement	MF	All	NC	-	-	35.716	0.033	0.034	-	-	0.902	25	$596.65	$0.00	$0.00	$0.00	Installing efficient windows in homes with gas heating and central AC	0.40	$0.488	0.494
5155	HVAC Shell	Infiltration reduction - 30%	MF	All	NC	-	-	364.551	0.021	0.023	-	-	0.000	13	$18.56	$0.00	$0.00	$0.00	Air sealing (30% infiltration reduction) in homes with electric heating and central AC	17.51	$0.003	0.010
5156	HVAC Shell	Infiltration reduction - 50%	MF	All	NC	-	-	608.134	0.034	0.037	-	-	0.000	13	$18.56	$0.00	$0.00	$0.00	Air sealing (50% infiltration reduction) in homes with electric heating and central AC	29.00	$0.002	0.009
5157	HVAC Shell	Airtight Can Lights	MF	All	NC	-	-	256.684	0.015	0.018	-	-	0.000	15	$150.00	$0.00	$0.00	$0.00	Installing air can lights to reduce infiltration in homes with electric heating and central AC	1.69	$0.033	0.040
5158	HVAC Shell	Duct Insulation	MF	All	NC	-	-	641.263	0.092	0.108	-	-	0.000	20	$92.80	$0.00	$0.00	$0.00	Adding duct insulation in homes with electric heating and central AC	9.98	$0.007	0.013
5159	HVAC Shell	Duct location	MF	All	NC	-	-	1002.488	0.136	0.160	-	-	0.000	30	$696.00	$0.00	$0.00	$0.00	Moving ductwork from unconditioned space to conditioned space in homes with electric heating and central AC	2.60	$0.030	0.035
5160	HVAC Shell	Duct sealing 15% leakage base	MF	All	NC	-	-	97.221	0.009	0.011	-	-	0.000	18	$30.93	$0.00	$0.00	$0.00	Duct sealing (15% leakage reduction) in homes with electric heating and central AC	3.84	$0.017	0.023

CE (Michigan) **Measure Assumption**

Measure #	End-Use	Measure Name	Home Type	Income Type	Replacement Type	Base Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer NCP kW	Per Unit Winter NCP kW	Base Fuel Use	% Fuel Savings	Per unit Fuel Saving	Useful Life	Measure Cost	O&M Benefits	O&M Costs	Tax Credits	Measure Description	UCT Ratio	Utility $ / LFT-kWh Saved (-Admin)	Utility $ / LFT-kWh Saved (+Admin)
5161	HVAC Shell	Duct sealing 30% leakage base	MF	All	NC	-	-	259.324	0.027	0.030	-	-	0.000	18	$30.93	$0.00	$0.00	$0.00	Duct sealing (30% leakage reduction) in homes with electric heating and central AC	10.41	$0.006	0.012
5162	HVAC Shell	Basement Wall Insulation	MF	All	NC	-	-	273.272	-0.001	-0.001	-	-	0.000	25	$253.67	$0.00	$0.00	$0.00	Installing basement wall insulation in homes with unconditioned basements and electric heating and central AC	1.26	$0.042	0.047
5163	HVAC Shell	Wall Insulation	MF	All	NC	-	-	298.740	0.012	0.015	-	-	0.000	25	$192.06	$0.00	$0.00	$0.00	Installing wall insulation in homes with electric heating and central AC	2.04	$0.029	0.034
5164	HVAC Shell	Roof Insulation	MF	All	NC	-	-	232.327	0.014	0.016	-	-	0.000	25	$524.16	$0.00	$0.00	$0.00	Installing roof insulation in homes with electric heating and central AC	0.61	$0.103	0.108
5165	HVAC Shell	Cool roof	MF	All	NC	-	-	-13.642	0.066	0.066	-	-	0.000	20	$92.80	$0.00	$0.00	$0.00	Installing a cool roof in homes with electric heating and central AC	1.88	-$0.337	-0.332
5166	HVAC Shell	Window Film	MF	All	NC	-	-	-133.124	0.115	0.119	-	-	0.000	10	$125.13	$0.00	$0.00	$0.00	Installing window film on windows in homes with electric heating and central AC	0.90	-$0.069	-0.060
5167	HVAC Shell	Window Replacement	MF	All	NC	-	-	169.767	0.037	0.039	-	-	0.000	25	$596.65	$0.00	$0.00	$0.00	Installing efficient windows in homes with electric heating and central AC	0.54	$0.160	0.165
6001	HVAC Equipment	Furnace/AC - SEER 16	SF	NLI	ROB	2271.376	0.231	524.164	0.456	0.456	87.300	-2%	-2.114	15	$1,381.90	$0.00	$0.00	$0.00	Installation of 16 SEER air conditioner - baseline is 13 SEER AC	1.01	$0.151	0.157
6002	HVAC Equipment	Furnace/AC - SEER 21	SF	NLI	ROB	2271.376	0.298	677.825	0.648	0.648	87.300	-3%	-2.289	15	$2,211.04	$0.00	$0.00	$0.00	Installation of 21 SEER air conditioner - baseline is 13 SEER AC	0.89	$0.186	0.193
6003	HVAC Equipment	RCA 10% improvement	SF	NLI	RETRO	2952.789	0.029	86.282	0.150	0.150	0.000	0%	0.000	5	$139.00	$0.00	$0.00	$0.00	Refrigerant charge and air flow adjustment - 10% improvement - in homes with gas furnace and central AC	1.21	$0.200	0.214
6004	HVAC Equipment	High efficiency 94 AFUE furnace with ECM	SF	NLI	ROB	1216.000	0.454	552.521	0.000	0.000	87.300	27%	23.135	15	$1,427.65	$0.00	$0.00	$0.00	Installation of 94 AFUE furnace with electronically commutated motor - baseline is 80 AFUE furnace	1.42	$0.034	0.041
6005	HVAC Equipment	High efficiency 98 AFUE furnace with ECM	SF	NLI	ROB	1216.000	0.454	552.521	0.000	0.000	87.300	35%	30.835	15	$1,608.58	$0.00	$0.00	$0.00	Installation of 98 AFUE furnace with electronically commutated motor - baseline is 80 AFUE furnace	1.58	$0.031	0.037
6006	HVAC Equipment	O&M Tune-up - furnace only	SF	NLI	RETRO	0.000	0.000	0.000	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	5% increase in furnace efficiency - in homes with gas furnaces	0.00		
6007	HVAC Equipment	Boiler 95% plus AFUE	SF	NLI	ROB	0.000	0.000	0.000	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing 95 AFUE boilers to replace standard boilers - in homes with gas boilers	0.00		
6008	HVAC Equipment	Boiler 92% plus AFUE	SF	NLI	ROB	0.000	0.000	0.000	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing 92 AFUE boilers to replace standard boilers - in homes with gas boilers	0.00		
6009	HVAC Equipment	Boiler Tune-up	SF	NLI	RETRO	0.000	0.000	0.000	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Increasing boiler efficiency by 5% - in homes with gas boilers	0.00		
6010	HVAC Equipment	Furnace/AC - SEER 16	SF	LI	DI	2271.376	0.231	524.164	0.456	0.456	87.300	-2%	-2.114	15	$3,997.96	$0.00	$0.00	$0.00	Installation of 16 SEER air conditioner - baseline is 13 SEER AC	0.17	$0.872	0.879
6011	HVAC Equipment	RCA 10% improvement	SF	LI	DI	2952.789	0.029	86.282	0.150	0.150	0.000	0%	0.000	5	$139.00	$0.00	$0.00	$0.00	Refrigerant charge and air flow adjustment - 10% improvement - in homes with gas furnace and central AC	0.60	$0.400	0.414
6012	HVAC Equipment	High efficiency 94 AFUE furnace with ECM	SF	LI	DI	1216.000	0.454	552.521	0.000	0.000	87.300	27%	23.135	15	$2,705.46	$0.00	$0.00	$0.00	Installation of 94 AFUE furnace with electronically commutated motor - baseline is 80 AFUE furnace	0.37	$0.130	0.137
6013	HVAC Equipment	O&M Tune-up - furnace only	SF	LI	DI	0.000	0.000	0.000	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	5% increase in furnace efficiency - in homes with gas furnaces	0.00		
6014	HVAC Equipment	Boiler 92% plus AFUE	SF	LI	DI	0.000	0.000	0.000	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing 92 AFUE boilers to replace standard boilers - in homes with gas boilers	0.00		
6015	HVAC Equipment	Boiler Tune-up	SF	LI	DI	0.000	0.000	0.000	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Increasing boiler efficiency by 5% - in homes with gas boilers	0.00		
6016	HVAC Equipment	ASHP - SEER 18 - SEER 14 base	SF	All	ROB	6695.450	0.217	1451.405	0.508	0.508	0.000	0%	0.000	15	$1,827.63	$0.00	$0.00	$0.00	Installation of SEER 18 ASHP in homes with electric heating/cooling - baseline is 14 SEER ASHP	1.33	$0.072	0.079
6017	HVAC Equipment	ASHP - SEER 21 - SEER 14 base	SF	All	ROB	6695.450	0.325	2177.107	0.762	0.762	0.000	0%	0.000	15	$3,198.36	$0.00	$0.00	$0.00	Installation of SEER 21 ASHP in homes with electric heating/cooling - baseline is 14 SEER ASHP	1.14	$0.084	0.091
6018	HVAC Equipment	GSHP - EER 19 ASHP SEER 14 Base	SF	All	ROB	6695.450	0.986	6600.822	0.311	0.311	0.000	0%	0.000	15	$20,313.66	$0.00	$0.00	$0.00	Installation of EER 19 GSHP in homes with electric heating/cooling - baseline is 14 SEER ASHP	0.31	$0.176	0.183
6019	HVAC Equipment	SEER21 Minisplit Heat pump	SF	All	ROB	6695.450	0.730	4889.236	0.541	0.541	0.000	0%	0.000	15	$2,111.74	$0.00	$0.00	$0.00	Installation of SEER 21 minisplit heat pump in homes with electric heating/cooling - baseline is 14 SEER ASHP	2.57	$0.025	0.031
6020	HVAC Equipment	SEER21 Minisplit Heat pump	SF	All	RETRO	28324.706	0.400	11329.882	-0.948	-0.948	0.000	0%	0.000	15	$4,334.05	$0.00	$0.00	$0.00	Installation of SEER 21 minisplit heat pump in homes with electric heating/cooling - baseline is electic furnace / central air conditioning	1.71	$0.022	0.029
6021	HVAC Equipment	DFHP - SEER 18 with 95 AFUE furnace - SEER 14 base	SF	All	ROB	6695.450	0.219	1468.769	0.508	0.508	87.300	4%	3.311	15	$1,189.14	$0.00	$0.00	$0.00	Installation of SEER 18/95 AFUE dual fuel heat pump in homes with electric heating/cooling - baseline is 14 SEER/80 AFUE DFHP	2.24	$0.042	0.049
6022	HVAC Equipment	DFHP - SEER 21 with 95 AFUE furnace - SEER 14 base	SF	All	ROB	6695.450	0.329	2203.153	0.762	0.762	87.300	6%	4.967	15	$2,125.65	$0.00	$0.00	$0.00	Installation of SEER 21/95 AFUE dual fuel heat pump in homes with electric heating/cooling - baseline is 14 SEER/80 AFUE DFHP	1.88	$0.051	0.057
6023	HVAC Equipment	Programmable Thermostats Tier 1	SF	All	RETRO	0.000	0.000	0.000	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of Tier 1 programmable thermostat in homes with gas heating and central AC	0.00		
6024	HVAC Equipment	Programmable Thermostats Tier 2	SF	All	RETRO	0.000	0.000	0.000	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of Tier 2 programmable thermostat in homes with gas heating and central AC	0.00		
6025	HVAC Equipment	Programmable Thermostats Tier 3	SF	All	RETRO	1165.045	0.090	104.854	0.000	0.000	87.300	10%	8.475	10	$400.00	$0.00	$0.00	$0.00	Installation of Tier 3 programmable thermostat in homes with gas heating and central AC	1.20	$0.036	0.045
6026	HVAC Equipment	Programmable Thermostats Tier 1	SF	All	RETRO	0.000	0.000	0.000	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of Tier 1 programmable thermostat in homes with gas heating and no AC	0.00		
6027	HVAC Equipment	Programmable Thermostats Tier 2	SF	All	RETRO	0.000	0.000	0.000	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of Tier 2 programmable thermostat in homes with gas heating and no AC	0.00		
6028	HVAC Equipment	Programmable Thermostats Tier 3	SF	All	RETRO	0.000	0.000	0.000	0.000	0.000	87.300	10%	8.618	10	$400.00	$0.00	$0.00	$0.00	Installation of Tier 3 programmable thermostat in homes with gas heating and no AC	1.06		
6029	HVAC Equipment	Programmable Thermostats Tier 1	SF	All	RETRO	0.000	0.000	0.000	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of Tier 1 programmable thermostat in homes with electric heating and central AC	0.00		
6030	HVAC Equipment	Programmable Thermostats Tier 2	SF	All	RETRO	0.000	0.000	0.000	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of Tier 2 programmable thermostat in homes with electric heating and central AC	0.00		
6031	HVAC Equipment	Programmable Thermostats Tier 3	SF	All	RETRO	18359.145	0.070	1285.140	0.000	0.000	0.000	0%	0.000	10	$400.00	$0.00	$0.00	$0.00	Installation of Tier 3 programmable thermostat in homes with electric heating and central AC	2.01	$0.023	0.031
6032	HVAC Equipment	Smartphone Behavior Application	SF	All	RETRO	2514.050	0.011	26.398	0.000	0.000	83.002	1%	0.872	1	$5.00	$0.00	$0.00	$0.00	Use of smartphone application to deliver behavioral savings	1.45	$0.027	0.089
6033	HVAC Equipment	Smartphone Behavior Application	SF	All	RETRO			0.000	0.000	0.000	0.000	0%	0.000	1	$5.00	$0.00	$0.00	$0.00	Use of smartphone application to deliver behavioral savings	0.00		
6034	HVAC Equipment	Smartphone Behavior Application	SF	All	RETRO			0.000	0.000	0.000	0.000	0%	0.000	1	$5.00	$0.00	$0.00	$0.00	Use of smartphone application to deliver behavioral savings	0.00		
6035	HVAC Equipment	ENERGY STAR Room AC	SF	All	ROB	471.193	0.092	43.193	0.067	0.067	0.000	0%	0.000	15	$75.00	$0.00	$0.00	$0.00	Installation of ENERGY STAR replacement room AC instead of a standard units	2.60	$0.099	0.106
6036	HVAC Equipment	ECM Furnace Fan	SF	All	RETRO	1216.000	0.603	733.000	0.073	0.073	0.000	0%	0.000	10	$788.00	$0.00	$0.00	$0.00	Installation of efficient fan motor in homes with furnaces	0.72	$0.079	0.087
6037	HVAC Equipment	Hot water temperature reset	SF	All	RETRO	0.000	0.000	-3.653	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Retrofitting of existing boiler with temperature reset controls	-0.22	-$0.201	-0.192
6038	HVAC Equipment	ASHP - SEER 18 - SEER 14 base	SF	All	NC	5311.246	0.205	1087.267	0.348	0.348	0.000	-	0.000	15	$1,827.63	$0.00	$0.00	$0.00	Installation of SEER 18 ASHP in homes with electric heating/cooling - baseline is 14 SEER ASHP	0.95	$0.096	0.103
6039	HVAC Equipment	ASHP - SEER 21 - SEER 14 base	SF	All	NC	5311.246	0.307	1630.901	0.523	0.523	0.000	-	0.000	15	$3,198.36	$0.00	$0.00	$0.00	Installation of SEER 21 ASHP in homes with electric heating/cooling - baseline is 14 SEER ASHP	0.82	$0.112	0.119
6040	HVAC Equipment	GSHP - EER 19 ASHP SEER 14 Base	SF	All	NC	5311.246	1.238	6575.407	0.400	0.400	0.000	-	0.000	15	$20,313.66	$0.00	$0.00	$0.00	Installation of EER 19 GSHP in homes with electric heating/cooling - baseline is 14 SEER ASHP	0.32	$0.177	0.183
6041	HVAC Equipment	SEER21 Minisplit Heat pump	SF	All	NC	5311.246	0.377	2003.311	0.449	0.449	0.000	-	0.000	15	$2,111.74	$0.00	$0.00	$0.00	Installation of SEER 21 minisplit heat pump in homes with electric heating/cooling - baseline is 14 SEER ASHP	1.31	$0.060	0.067
6042	HVAC Equipment	DFHP - SEER 18 with 95 AFUE furnace - SEER 14 base	SF	All	NC	5311.246	0.206	1092.821	0.348	0.348	87.300	-	1.801	15	$1,189.14	$0.00	$0.00	$0.00	Installation of SEER 18/95 AFUE dual fuel heat pump in homes with electric heating/cooling - baseline is 14 SEER/80 AFUE DFHP	1.57	$0.058	0.065

CE (Michigan) **Measure Assumption**

Measure #	End-Use	Measure Name	Home Type	Income Type	Replacement Type	Base Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer NCP kW	Per Unit Winter NCP kW	Base Fuel Use	% Fuel Savings	Per unit Fuel Saving	Useful Life	Measure Cost	O&M Benefits	O&M Costs	Tax Credits	Measure Description	UCT Ratio	Utility $ / LFT-kWh Saved (-Admin)	Utility $ / LFT-kWh Saved (+Admin)
6043	HVAC Equipment	DFHP - SEER 21 with 95 AFUE furnace - SEER 14 base	SF	All	NC	5311.246	0.309	1639.231	0.523	0.523	87.300	-	2.701	15	$2,125.65	$0.00	$0.00	$0.00	Installation of SEER 21/95 AFUE dual fuel heat pump in homes with electric heating/cooling - baseline is 14 SEER/80 AFUE DFHP	1.32	$0.069	0.076
6044	HVAC Equipment	Furnace/AC - SEER 16	SF	All	NC	1159.585	0.231	267.597	0.189	0.189	87.300	-	-1.591	15	$829.14	$0.00	$0.00	$0.00	Installation of 16 SEER air conditioner - baseline is 13 SEER AC	0.70	$0.177	0.184
6045	HVAC Equipment	Furnace/AC - SEER 21	SF	All	NC	1159.585	0.361	418.219	0.431	0.431	87.300	-	-1.705	15	$2,211.04	$0.00	$0.00	$0.00	Installation of 21 SEER air conditioner - baseline is 13 SEER AC	0.57	$0.302	0.309
6046	HVAC Equipment	ENERGY STAR Room AC	SF	All	NC	471.193	0.092	43.193	0.067	0.067	0.000	0%	0.000	15	$75.00	$0.00	$0.00	$0.00	Installation of ENERGY STAR replacement room AC instead of a standard units	2.60	$0.099	0.106
6047	HVAC Equipment	High efficiency 94 AFUE furnace with ECM	SF	All	NC	1216.000	0.458	557.410	0.000	0.000	87.300	-	15.391	15	$1,427.65	$0.00	$0.00	$0.00	Installation of 94 AFUE furnace with electronically commutated motor - baseline is 80 AFUE furnace	1.06	$0.046	0.053
6048	HVAC Equipment	High efficiency 98 AFUE furnace with ECM	SF	All	NC	1216.000	0.458	557.410	0.000	0.000	87.300	-	20.057	15	$1,608.58	$0.00	$0.00	$0.00	Installation of 98 AFUE furnace with electronically commutated motor - baseline is 80 AFUE furnace	1.13	$0.043	0.050
6049	HVAC Equipment	ECM Furnace Fan	SF	All	NC	1216.000	0.603	733.000	0.073	0.073	0.000	0%	0.000	10	$788.00	$0.00	$0.00	$0.00	Installation of efficient fan motor in homes with furnaces	0.72	$0.079	0.087
6050	HVAC Equipment	Boiler 92% plus AFUE	SF	All	NC	0.000	0.000	0.000	0.000	0.000	0.000	-	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing 92 AFUE boilers to replace standard boilers - in homes with gas boilers	0.00		
6051	HVAC Equipment	Boiler 95% plus AFUE	SF	All	NC	0.000	0.000	0.000	0.000	0.000	0.000	-	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing 95 AFUE boilers to replace standard boilers - in homes with gas boilers	0.00		
6052	HVAC Equipment	Furnace/AC - SEER 16	MF	NLI	ROB	1114.690	-	257.236	0.176	0.176	56.745	-	-6.674	15	$829.14	$0.00	$0.00	$0.00	Installation of 16 SEER air conditioner - baseline is 13 SEER AC	0.24	$0.184	0.191
6053	HVAC Equipment	Furnace/AC - SEER 21	MF	NLI	ROB	1114.690	-	501.895	0.541	0.541	56.745	-	-7.160	15	$2,211.04	$0.00	$0.00	$0.00	Installation of 21 SEER air conditioner - baseline is 13 SEER AC	0.56	$0.252	0.259
6054	HVAC Equipment	RCA 10% improvement	MF	NLI	RETRO	1449.097	-	76.892	0.129	0.129	0.000	-	0.000	5	$139.00	$0.00	$0.00	$0.00	Refrigerant charge and air flow adjustment - 10% improvement - in homes with gas furnace and central AC	1.05	$0.224	0.239
6055	HVAC Equipment	High efficiency 94 AFUE furnace with ECM	MF	NLI	ROB	1216.000	-	332.153	0.102	0.102	56.745	-	16.471	15	$1,427.65	$0.00	$0.00	$0.00	Installation of 94 AFUE furnace with electronically commutated motor - baseline is 80 AFUE furnace	1.14	$0.079	0.085
6056	HVAC Equipment	High efficiency 98 AFUE furnace with ECM	MF	NLI	ROB	1216.000	-	332.153	0.102	0.102	56.745	-	21.465	15	$1,608.58	$0.00	$0.00	$0.00	Installation of 98 AFUE furnace with electronically commutated motor - baseline is 80 AFUE furnace	1.22	$0.073	0.080
6057	HVAC Equipment	O&M Tune-up - furnace only	MF	NLI	RETRO	0.000	-	0.000	0.000	0.000	0.000	-	0.000	10	$10.00	$0.00	$0.00	$0.00	5% increase in furnace efficiency - in homes with gas furnaces	0.00		
6058	HVAC Equipment	Boiler 92% plus AFUE	MF	NLI	ROB	0.000	-	0.000	0.000	0.000	0.000	-	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing 92 AFUE boilers to replace standard boilers - in homes with gas boilers	0.00		
6059	HVAC Equipment	Boiler 95% plus AFUE	MF	NLI	ROB	0.000	-	0.000	0.000	0.000	0.000	-	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing 95 AFUE boilers to replace standard boilers - in homes with gas boilers	0.00		
6060	HVAC Equipment	Boiler Tune-up	MF	NLI	RETRO	0.000	-	0.000	0.000	0.000	0.000	-	0.000	10	$10.00	$0.00	$0.00	$0.00	Increasing boiler efficiency by 5% - in homes with gas boilers	0.00		
6061	HVAC Equipment	Furnace/AC - SEER 16	MF	LI	DI	1114.690	-	257.236	0.176	0.176	56.745	-	-6.674	15	$3,445.20	$0.00	$0.00	$0.00	Installation of 16 SEER air conditioner - baseline is 13 SEER AC	0.03	$1.531	1.538
6062	HVAC Equipment	RCA 10% improvement	MF	LI	DI	1449.097	-	76.892	0.129	0.129	0.000	-	0.000	5	$139.00	$0.00	$0.00	$0.00	Refrigerant charge and air flow adjustment - 10% improvement - in homes with gas furnace and central AC	0.52	$0.449	0.463
6063	HVAC Equipment	High efficiency 94 AFUE furnace with ECM	MF	LI	DI	1216.000	-	332.153	0.102	0.102	56.745	-	16.471	15	$2,705.46	$0.00	$0.00	$0.00	Installation of 94 AFUE furnace with electronically commutated motor - baseline is 80 AFUE furnace	0.30	$0.298	0.304
6064	HVAC Equipment	O&M Tune-up - furnace only	MF	LI	DI	0.000	-	0.000	0.000	0.000	0.000	-	0.000	10	$10.00	$0.00	$0.00	$0.00	5% increase in furnace efficiency - in homes with gas furnaces	0.00		
6065	HVAC Equipment	Boiler 92% plus AFUE	MF	LI	DI	0.000	-	0.000	0.000	0.000	0.000	-	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing 92 AFUE boilers to replace standard boilers - in homes with gas boilers	0.00		
6066	HVAC Equipment	Boiler Tune-up	MF	LI	DI	0.000	-	0.000	0.000	0.000	0.000	-	0.000	10	$10.00	$0.00	$0.00	$0.00	Increasing boiler efficiency by 5% - in homes with gas boilers	0.00		
6067	HVAC Equipment	ASHP - SEER 18 - SEER 14 base	MF	All	ROB	6796.262	-	1351.244	0.494	0.494	0.000	-	0.000	15	$1,827.63	$0.00	$0.00	$0.00	Installation of SEER 18 ASHP in homes with electric heating/cooling - baseline is 14 SEER ASHP	1.26	$0.077	0.084
6068	HVAC Equipment	ASHP - SEER 21 - SEER 14 base	MF	All	ROB	6796.262	-	2026.866	0.740	0.740	0.000	-	0.000	15	$3,198.36	$0.00	$0.00	$0.00	Installation of SEER 21 ASHP in homes with electric heating/cooling - baseline is 14 SEER ASHP	1.08	$0.090	0.097
6069	HVAC Equipment	SEER21 Minisplit Heat pump	MF	All	ROB	6796.262	-	1338.402	0.148	0.148	0.000	-	0.000	15	$1,052.13	$0.00	$0.00	$0.00	Installation of SEER 21 minisplit heat pump in homes with electric heating/cooling - baseline is 14 SEER ASHP	1.41	$0.045	0.052
6070	HVAC Equipment	SEER21 Minisplit Heat pump	MF	All	RETRO	14112.132	-	5644.853	-0.472	-0.472	0.000	-	0.000	15	$2,159.34	$0.00	$0.00	$0.00	Installation of SEER 21 minisplit heat pump in homes with electric heating/cooling - baseline is electic furnace / central air conditioning	1.71	$0.022	0.029
6071	HVAC Equipment	PTHP 9.1 EER	MF	All	ROB	6796.262	-	286.328	0.123	0.123	0.000	-	0.000	15	$169.21	$0.00	$0.00	$0.00	Installation of 9.3 EER packaged terminal heat pump (PTHP) - in homes with PTHPs	3.15	$0.034	0.040
6072	HVAC Equipment	DFHP - SEER 18 with 95 AFUE furnace - SEER 14 base	MF	All	ROB	6796.262	-	1336.400	0.494	0.494	56.745	-	2.650	15	$1,189.14	$0.00	$0.00	$0.00	Installation of SEER 18/95 AFUE dual fuel heat pump in homes with electric heating/cooling - baseline is 14 SEER/80 AFUE DFHP	2.08	$0.047	0.054
6073	HVAC Equipment	DFHP - SEER 21 with 95 AFUE furnace - SEER 14 base	MF	All	ROB	6796.262	-	2004.599	0.740	0.740	56.745	-	3.976	15	$2,125.65	$0.00	$0.00	$0.00	Installation of SEER 21/95 AFUE dual fuel heat pump in homes with electric heating/cooling - baseline is 14 SEER/80 AFUE DFHP	1.74	$0.056	0.063
6074	HVAC Equipment	Programmable Thermostats Tier 1	MF	All	RETRO	0.000	0.000	0.000	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of Tier 1 programmable thermostat in homes with gas heating and central AC	0.00		
6075	HVAC Equipment	Programmable Thermostats Tier 2	MF	All	RETRO	0.000	0.000	0.000	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of Tier 2 programmable thermostat in homes with gas heating and central AC	0.00		
6076	HVAC Equipment	Programmable Thermostats Tier 3	MF	All	RETRO	472.440	0.067	31.654	0.000	0.000	56.745	-	2.558	10	$400.00	$0.00	$0.00	$0.00	Installation of Tier 3 programmable thermostat in homes with gas heating and central AC	0.36	$0.120	0.128
6077	HVAC Equipment	Programmable Thermostats Tier 1	MF	All	RETRO	0.000	0.000	0.000	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of Tier 1 programmable thermostat in homes with gas heating and no AC	0.00		
6078	HVAC Equipment	Programmable Thermostats Tier 2	MF	All	RETRO	0.000	0.000	0.000	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of Tier 2 programmable thermostat in homes with gas heating and no AC	0.00		
6079	HVAC Equipment	Programmable Thermostats Tier 3	MF	All	RETRO	0.000	-	0.000	0.000	0.000	56.745	-	2.602	10	$400.00	$0.00	$0.00	$0.00	Installation of Tier 3 programmable thermostat in homes with gas heating and no AC	0.32		
6080	HVAC Equipment	Programmable Thermostats Tier 1	MF	All	RETRO	0.000	0.000	0.000	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of Tier 1 programmable thermostat in homes with electric heating and central AC	0.00		
6081	HVAC Equipment	Programmable Thermostats Tier 2	MF	All	RETRO	0.000	0.000	0.000	0.000	0.000	0.000	0%	0.000	10	$10.00	$0.00	$0.00	$0.00	Installation of Tier 2 programmable thermostat in homes with electric heating and central AC	0.00		
6082	HVAC Equipment	Programmable Thermostats Tier 3	MF	All	RETRO	5542.288	0.070	387.960	0.000	0.000	0.000	-	0.000	10	$400.00	$0.00	$0.00	$0.00	Installation of Tier 3 programmable thermostat in homes with electric heating and central AC	0.61	$0.076	0.084
6083	HVAC Equipment	Smartphone Behavior Application	MF	All	RETRO	1257.025	0.011	13.199	0.000	0.000	41.501	1%	0.436	1	$5.00	$0.00	$0.00	$0.00	Use of smartphone application to deliver behavioral savings	0.72	$0.053	0.116
6084	HVAC Equipment	Smartphone Behavior Application	MF	All	RETRO			0.000	0.000	0.000	0.000	0%	0.000	1	$5.00	$0.00	$0.00	$0.00	Use of smartphone application to deliver behavioral savings	0.00		
6085	HVAC Equipment	Smartphone Behavior Application	MF	All	RETRO			0.000	0.000	0.000	0.000	0%	0.000	1	$5.00	$0.00	$0.00	$0.00	Use of smartphone application to deliver behavioral savings	0.00		
6086	HVAC Equipment	PTAC 9.3 EER	MF	All	ROB	1114.690	-	126.795	0.123	0.123	0.000	-	0.000	15	$135.59	$0.00	$0.00	$0.00	Installation of 9.3 EER packaged terminal air conditioner (PTAC) - in homes with PTACs	2.96	$0.061	0.068
6087	HVAC Equipment	ENERGY STAR Room AC	MF	All	ROB	471.193	0.092	43.193	0.067	0.067	0.000	0%	0.000	15	$75.00	$0.00	$0.00	$0.00	Installation of ENERGY STAR replacement room AC instead of a standard units	2.60	$0.099	0.106
6088	HVAC Equipment	Air-Cooled Recip Chiller COP = 2.8, IPLV = 3.41	MF	All	ROB	144433.455	-	36108.364	7.206	7.206	0.000	-	0.000	20	$8,481.25	$0.00	$0.00	$0.00	Installation of efficient reciprocating chiller in apartment buildings with chillers	7.07	$0.012	0.017
6089	HVAC Equipment	CHW reset 10 deg	MF	All	RETRO	144433.455	-	15155.695	0.000	0.000	0.000	-	0.000	5	$158.98	$0.00	$0.00	$0.00	Chilled water reset control strategy (10 degrees) - in apartment buildings with chillers	34.20	$0.001	0.016
6090	HVAC Equipment	ECM Furnace Fan	MF	All	RETRO	1216.000	0.603	733.000	0.073	0.073	56.745	0%	0.000	10	$788.00	$0.00	$0.00	$0.00	Installation of efficient fan motor in homes with furnaces	0.72	$0.079	0.087

CE (Michigan) **Measure Assumption**

Measure #	End-Use	Measure Name	Home Type	Income Type	Replacement Type	Base Annual Electric	% Elec Savings	Per Unit Elec Savings	Per Unit Summer NCP kW	Per Unit Winter NCP kW	Base Fuel Use	% Fuel Savings	Per unit Fuel Saving	Useful Life	Measure Cost	O&M Benefits	O&M Costs	Tax Credits	Measure Description	UCT Ratio	Utility $ / LFT-kWh Saved (-Admin)	Utility $ / LFT-kWh Saved (+Admin)
6091	HVAC Equipment	O2 Trim Control	MF	All	RETRO	0.000	-	0.000	0.000	0.000	0.000	-	0.000	10	$10.00	$0.00	$0.00	$0.00	1.1% improvement in boiler efficiency resulting from the addition of oxygen trim controls - apartment buildings with boilers	0.00		
6092	HVAC Equipment	Boiler 85% Ec	MF	All	RETRO	0.000	-	0.000	0.000	0.000	0.000	-	0.000	10	$10.00	$0.00	$0.00	$0.00	5% increase in boiler efficiency - in apartments with gas boilers and no central AC	0.00		
6093	HVAC Equipment	Boiler turndown control	MF	All	RETRO	0.000	-	0.000	0.000	0.000	0.000	-	0.000	10	$10.00	$0.00	$0.00	$0.00	Installing boiler turndown controls - in apartment buildings with boilers	0.00		
6094	HVAC Equipment	ASHP - SEER 18 - SEER 14 base	MF	All	NC	7248.271	0.201	1459.956	0.545	0.545	0.000	0%	0.000	15	$1,827.63	$0.00	$0.00	$0.00	Installation of SEER 18 ASHP in homes with electric heating/cooling - baseline is 14 SEER ASHP	1.38	$0.072	0.078
6095	HVAC Equipment	ASHP - SEER 21 - SEER 14 base	MF	All	NC	7248.271	0.302	2189.934	0.818	0.818	0.000	0%	0.000	15	$3,198.36	$0.00	$0.00	$0.00	Installation of SEER 21 ASHP in homes with electric heating/cooling - baseline is 14 SEER ASHP	1.18	$0.083	0.090
6096	HVAC Equipment	SEER21 Minisplit Heat pump	MF	All	NC	7248.271	0.204	1475.970	0.163	0.163	0.000	0%	0.000	15	$1,160.27	$0.00	$0.00	$0.00	Installation of SEER 21 minisplit heat pump in homes with electric heating/cooling - baseline is 14 SEER ASHP	1.41	$0.045	0.052
6097	HVAC Equipment	PTHP 9.1 EER	MF	All	NC	7248.271	0.036	264.072	0.130	0.130	0.000	0%	0.000	15	$169.21	$0.00	$0.00	$0.00	Installation of 9.3 EER packaged terminal heat pump (PTHP) - in homes with PTHPs	3.13	$0.037	0.043
6098	HVAC Equipment	DFHP - SEER 18 with 95 AFUE furnace - SEER 14 base	MF	All	NC	7248.271	0.196	1423.773	0.545	0.545	56.745	7%	4.140	15	$1,189.14	$0.00	$0.00	$0.00	Installation of SEER 18/95 AFUE dual fuel heat pump in homes with electric heating/cooling - baseline is 14 SEER/80 AFUE DFHP	2.33	$0.043	0.050
6099	HVAC Equipment	DFHP - SEER 21 with 95 AFUE furnace - SEER 14 base	MF	All	NC	7248.271	0.295	2135.659	0.818	0.818	56.745	11%	6.210	15	$2,125.65	$0.00	$0.00	$0.00	Installation of SEER 21/95 AFUE dual fuel heat pump in homes with electric heating/cooling - baseline is 14 SEER/80 AFUE DFHP	1.95	$0.051	0.058
6100	HVAC Equipment	Furnace/AC - SEER 16	MF	All	NC	1343.544	0.231	310.049	0.361	0.361	56.745	-28%	-15.897	15	$1,381.90	$0.00	$0.00	$0.00	Installation of 16 SEER air conditioner - baseline is 13 SEER AC	0.04	$0.255	0.261
6101	HVAC Equipment	Furnace/AC - SEER 21	MF	All	NC	1343.544	0.355	476.390	0.582	0.582	56.745	-28%	-16.052	15	$2,211.04	$0.00	$0.00	$0.00	Installation of 21 SEER air conditioner - baseline is 13 SEER AC	0.32	$0.265	0.272
6102	HVAC Equipment	PTAC 9.3 EER	MF	All	NC	1343.544	0.115	154.115	0.129	0.129	0.000	0%	0.000	15	$135.59	$0.00	$0.00	$0.00	Installation of 9.3 EER packaged terminal air conditioner (PTAC) - in homes with PTACs	3.25	$0.050	0.057
6103	HVAC Equipment	ENERGY STAR Room AC	MF	All	NC	471.193	0.092	43.193	0.067	0.067	0.000	0%	0.000	15	$75.00	$0.00	$0.00	$0.00	Installation of ENERGY STAR replacement room AC instead of a standard units	2.60	$0.099	0.106
6104	HVAC Equipment	Air-Cooled Recip Chiller COP = 2.8, IPLV = 3.41	MF	All	NC	156565.172	0.250	39141.293	3.051	3.051	0.000	0%	0.000	20	$8,481.25	$0.00	$0.00	$0.00	Installation of efficient reciprocating chiller in apartment buildings with chillers	6.06	$0.011	0.017
6105	HVAC Equipment	CHW reset 10 deg	MF	All	NC	156565.172	0.103	16150.874	0.000	0.000	0.000	0%	0.000	5	$158.98	$0.00	$0.00	$0.00	Chilled water reset control strategy (10 degrees) - in apartment buildings with chillers	36.44	$0.001	0.016
6106	HVAC Equipment	High efficiency 94 AFUE furnace with ECM	MF	All	NC	1216.000	0.236	286.996	0.140	0.140	56.745	22%	12.361	15	$1,427.65	$0.00	$0.00	$0.00	Installation of 94 AFUE furnace with electronically commutated motor - baseline is 80 AFUE furnace	0.98	$0.116	0.122
6107	HVAC Equipment	High efficiency 98 AFUE furnace with ECM	MF	All	NC	1216.000	0.236	286.996	0.140	0.140	56.745	28%	16.109	15	$1,608.58	$0.00	$0.00	$0.00	Installation of 98 AFUE furnace with electronically commutated motor - baseline is 80 AFUE furnace	1.03	$0.110	0.117
6108	HVAC Equipment	ECM Furnace Fan	MF	All	NC	1216.000	0.603	733.000	0.073	0.073	56.745	0%	0.000	10	$788.00	$0.00	$0.00	$0.00	Installation of efficient fan motor in homes with furnaces	0.72	$0.079	0.087
6109	HVAC Equipment	Boiler 92% plus AFUE	MF	All	NC	0.000	0.000	0.000	0.000	0.000	82.875	0%	0.000	20	$1,954.00	$0.00	$0.00	$0.00	Installing 92 AFUE boilers to replace standard boilers - in homes with gas boilers	0.00		
6110	HVAC Equipment	Boiler 95% plus AFUE	MF	All	NC	0.000	0.000	0.000	0.000	0.000	82.875	0%	0.000	20	$2,436.00	$0.00	$0.00	$0.00	Installing 95 AFUE boilers to replace standard boilers - in homes with gas boilers	0.00		
6111	HVAC Equipment	O2 Trim Control	MF	All	NC	0.000	0.000	0.000	0.000	0.000	82.875	0%	0.000	15	$255.00	$0.00	$0.00	$0.00	1.1% improvement in boiler efficiency resulting from the addition of oxygen trim controls - apartment buildings with boilers	0.00		
6112	HVAC Equipment	Boiler 85% Ec	MF	All	NC	0.000	0.000	0.000	0.000	0.000	82.875	0%	0.000	20	$7,232.27	$0.00	$0.00	$0.00	5% increase in boiler efficiency - in apartments with gas boilers and no central AC	0.00		
6113	HVAC Equipment	Boiler turndown control	MF	All	NC	0.000	0.000	0.000	0.000	0.000	82.875	0%	0.000	15	$195.00	$0.00	$0.00	$0.00	Installing boiler turndown controls - in apartment buildings with boilers	0.00		
7001	Miscellaneous	Pump and Motor Single Speed	SF	All	ROB	2120.860	0.327	694.000	0.715	0.000	0.000	0%	0.000	10	$85.00	$0.00	$0.00	$0.00	Installing high efficiency single-speed pool pumps and motors in homes that have inefficient pool pumps and motors	12.35	$0.009	0.018
7002	Miscellaneous	Pump and motor w auto controls - multi speed	SF	All	ROB	2120.860	0.510	1081.000	1.592	0.000	0.000	0%	0.000	10	$579.00	$0.00	$0.00	$0.00	Installing high efficiency multi-speed pool pumps and motors in homes that have inefficient pool pumps and motors	3.52	$0.039	0.048
7003	Miscellaneous	Pump and Motor Single Speed	SF	All	NC	2120.860	0.327	694.000	0.715	0.000	0.000	0%	0.000	10	$85.00	$0.00	$0.00	$0.00	Installing high efficiency single-speed pool pumps and motors in homes that have inefficient pool pumps and motors	12.35	$0.009	0.018
7004	Miscellaneous	Pump and motor w auto controls - multi speed	SF	All	NC	2120.860	0.510	1081.000	1.592	0.000	0.000	0%	0.000	10	$579.00	$0.00	$0.00	$0.00	Installing high efficiency multi-speed pool pumps and motors in homes that have inefficient pool pumps and motors	3.52	$0.039	0.048
8001	Cross-Cutting	Behavior Modification: Home Energy Reports	SF	All	RETRO	8093.600	0.020	161.872	0.018	0.018	93.520	1%	0.935	1	$6.77	$0.00	$0.00	$0.00	Delivery of home energy reports	3.12	$0.016	0.079
8002	Cross-Cutting	Behavior Modification: Home Energy Reports	SF	All	NC	8093.600	0.020	161.872	0.018	0.018	93.520	1%	0.935	1	$6.77	$0.00	$0.00	$0.00	Delivery of home energy reports	3.12	$0.016	0.079
8003	Cross-Cutting	Behavior Modification: Home Energy Reports	MF	All	RETRO	4046.800	0.020	80.936	0.009	0.009	46.760	1%	0.468	1	$6.77	$0.00	$0.00	$0.00	Delivery of home energy reports	1.56	$0.033	0.095
8004	Cross-Cutting	Behavior Modification: Home Energy Reports	MF	All	NC	4046.800	0.020	80.936	0.009	0.009	46.760	1%	0.468	1	$6.77	$0.00	$0.00	$0.00	Delivery of home energy reports	1.56	$0.033	0.095

The list of sources provided below indicates where key assumptions, algorithms, parameters, etc. were obtained to calculate measure level estimates of energy and demand savings, useful lives, measure cost, and baseline/efficient saturations. The key data sources are provided by residential end-use. Data sources are recorded by measure and can be produced if needed. A list

End Use	Energy Savings	Demand Savings	EUL	Measure Cost	Base Saturation	EE Saturation
Lighting	MEMD Illinois TRM GDS calculations	MEMD Illinois TRM GDS calculations	MEMD	MEMD Energy Information Adminstration / GDS calcuation	2014 RAS	2014 RAS
Appliances	MEMD Illinois TRM ENERGY STAR calculators GDS calculations	MEMD Illinois TRM ENERGY STAR calculators GDS calculations	MEMD Illinois TRM ENERGY STAR calculators	MEMD Illinois TRM ENERGY STAR calculators	2013 RAS 2014 PA Baseline	2013 RAS 2014 PA Baseline GDS
Electronics	MEMD Hawaii TRM ENERGY STAR calculators	MEMD Hawaii TRM Vermont TRM ENERGY STAR calculators	MEMD Hawaii TRM	MEMD Vermont TRM GDS research / estimate	2014 RAS 2014 PA Baseline	ENERGY STAR 2014 PA Baseline GDS
Water Heating	MEMD GDS calculations	MEMD Vermont TRM	MEMD Illinois TRM	MEMD Illinois TRM	2013 RAS 2014 PA Baseline	2014 RAS 2014 PA Baseline GDS
HVAC Equipment	MEMD	MEMD	MEMD	MEMD	2014 RAS GDS	2014 RAS GDS
HVAC Shell	MEMD	MEMD	MEMD	MEMD	2014 RAS GDS	2014 RAS GDS
Other	MEMD	MEMD	MEMD	MEMD	2014 RAS	ENERGY STAR GDS
Cross-Cutting	MEMD GDS calculations	MEMD GDS calculations	MEMD	MEMD	GDS	GDS

List of Abbreviations

2014 RAS: 2014 Residential Appliance Saturation & Home Characteristics Study, March 2014

2014 PA Baseline: 2014 Pennsylvania Statewide Act 129 Residential Baseline Study

APPENDIX B | COMMERCIAL MEASURE DETAIL

Consumers Energy Commercial Measure Database - Electric

Measure Savings, Cost and Useful Life

Consumers Energy	Measure Assumption					
Measure Name	Annual kWh Savings	Cost Type: 1=Full 2=Inc.	Cost/Unit Descriptor	Cost/Unit	Effective Measure Life	UCT
Computers & Office Equipment						
Energy Star Compliant Refrigerator	47.8	2	Per Unit	$30.75	16	2.0
Energy Star office equipment including computers, monitors, copiers, multi-function machines.	631.0	2	per set	$20.00	5	12.7
Smart Strip plug outlet	17.0	1	per unit	$40.00	5	0.2
PC Network Energy Management Controls replacing no central control	135.0	1	per PC	$17.00	4	2.4
Energy Star UPS	104.8	2	per kW	$1,303.35	10	0.1
Vendor Miser for Non-Refrig Equipment	342.5	1	per unit	$116.00	5	1.0
High Efficiency Hand Dryer	965.0	1	per unit	$450.00	10	1.6
Electrically Commutated Plug Fans in data centers	1,444.5	2	per fan	$718.00	15	2.2
High Efficiency CRAC unit	162.3	1	MBH	$82.50	15	2.3
Computer Room Air Conditioner Economizer	358.0	2	MBH	$82.00	15	3.7
Computer Room Hot Aisle Cold Aisle Configuration	124.8	2	MBH	$156.00	15	0.9
Computer Room Air Side Economizer	440.3	2	MBH	$25.00	10	10.9
VFD for Process Fans -CRAC units	2,279.0	1	per HP	$200.00	15	12.7
Water Heating						
Heat Pump Water Heater	184,058.0	2	per heater	$10,600.00	15	22.9
HP Water Heater - Residential unit in Commercial Application	5,375.0	2	per heater	$1,000.00	15	8.0
Heat Pump Storage Water Heater	2,504.5	2	per heater	$433.00	10	5.0
Electric Tankless Water Heater	621.0	2	per heater	$466.00	20	1.9
Low Flow Faucet Aerator	903.0	1	per unit	$2.50	10	296.0
Low Flow Showerhead	615.0	1	per unit	$25.00	10	19.5
Hot Water (DHW) Pipe Insulation	44.7	1	Linear Ft	$10.00	20	7.1
Clothes Washer ENERGY STAR, Gas water heater, Gas dryer	126.0	2	per unit	$147.25	7	0.4
Clothes Washer ENERGY STAR, Gas water heater, Electric dryer	793.0	2	per unit	$448.06	7	0.9
Clothes Washer ENERGY STAR, Electric Water heater, Gas Dryer	627.0	2	per unit	$423.84	7	0.7
Clothes Washer ENERGY STAR, Electric Water heater, Electric Dryer	1,293.0	2	per unit	$540.00	7	1.2
ES Dishwasher, High Temp, Elec Heat, Elec Booster	12,913.5	2	per unit	$977.50	16	16.9
ES Dishwasher, High Temp, Gas Heat, Elec Booster	5,776.8	2	per unit	$759.46	16	9.7
ES Dishwasher, High Temp, Gas Heat, Gas Booster	1,698.8	2	per unit	$385.34	16	5.6
ES Dishwasher, Low Temp, Elec Heat	12,782.5	2	per unit	$255.00	16	64.2
ES Dishwasher, Low Temp, Gas Heat	584.0	2	per unit	$42.43	16	17.7
Tank Insulation (electric)	468.0	1	per square foot	$6.22	15	84.3
Pre Rinse Sprayers (electric)	1,396.0	1	each	$35.00	5	16.7
ECM Circulator Pump	4,949.4	1	per Motor	$2,266.67	15	2.7
Drain water Heat Recovery Water Heater	546.0	1	Per Unit	$631.00	25	1.4
Efficient Hot Water Pump	534.1	1	hp	$78.20	15	6.7
HVAC Condenser Heater Recovery Water Heating	3,536.5	1	ton	$254.00	15	42.2
Process Cooling Condenser Heater Recovery Water Heating	5,720.0	1	ton	$254.00	15	29.2
Pools						
Heat Pump Pool Heater	5,731.9	1	Per Unit	$4,000.00	10	1.9
High efficiency spas/hot tubs	375.0	2	Per Unit	$300.00	10	1.4
Ventilation						
Economizer	143.1	2	ton	$122.55	13	0.8
Demand-Controlled Ventilation	181.0	2	1000 sq ft cond floor area	$75.00	15	35.3
Variable Speed Drive Control, 15 HP	19,590.0	1	per Unit	$3,690.00	15	6.4
Variable Speed Drive Control, 5 HP	6,530.0	1	Per Unit	$1,230.00	15	6.4

Consumers Energy Commercial Measure Database - Electric

Measure Savings, Cost and Useful Life

Consumers Energy	Measure Assumption					
Measure Name	Annual kWh Savings	Cost Type: 1=Full 2=Inc.	Cost/Unit Descriptor	Cost/Unit	Effective Measure Life	UCT
Variable Speed Drive Control, 40 HP	52,240.0	1	Per Unit	$9,840.00	15	6.4
High Speed Fans	706.6	1	per fan	$675.00	7	0.9
High Volume Low Speed Fans	5,859.9	1	per fan	$5,767.40	10	1.3
Engineered CKV hood	729.7	2	100 cfm red	$139.02	15	7.5
Fan Thermostat Controller	1,586.0	1	per fan	$100.00	15	13.5
Space Cooling - Chillers						
Air-Cooled Recip Chiller	335.4	2	ton	$141.03	20	5.1
Air-Cooled Screw Chiller	332.0	2	ton	$143.92	20	4.9
Water-Cooled Centrifugal Chiller < 150 ton	251.2	2	ton	$411.03	20	1.2
Water-Cooled Centrifugal Chiller 150 - 300 ton	221.3	2	ton	$125.80	20	3.5
Water-Cooled Centrifugal Chiller > 300 ton	205.6	2	ton	$27.30	20	15.0
Water-Cooled Screw Chiller < 150 ton	248.4	2	ton	$387.99	20	1.3
Water-Cooled Screw Chiller 150 - 300 ton	225.0	2	ton	$129.11	20	3.7
Water-Cooled Screw Chiller > 300 ton	200.7	2	ton	$27.15	20	15.5
Chiller Tune Up	135.8	1	ton	$5.66	5	17.9
High Efficiency Pumps	201.4	1	per HP	$96.79	15	2.9
Efficient Chilled Water Pump	751.1	1	per HP	$33.20	15	28.1
Chilled Hot Water Reset	111.5	1	ton	$5.53	8	25.6
Air-Cooled Chiller Average Minimum Qualifying 1.04 kW/ton	157.8	2	ton	$66.63	20	5.7
Air-Cooled Chiller Average 0.01 kW/ton IPLV Reduction	9.9	2	ton	$4.36	20	4.3
Water-Cooled Chiller Average 10% above IECC standard	127.0	2	ton	$101.49	20	3.1
Water-Cooled Chiller Average 0.01 kW/ton IPLV Reduction	8.3	2	ton	$5.49	20	2.1
VAV System Conversion	4,723.4	1	1000 sq ft cond floor area	$1,400.12	20	3.7
Motor Belt Replacement	94.7	1	per HP	$21.33	14	5.9
Water-Side Economizer	1,047.5	2	ton	$50.00	15	18.9
Improved Duct Sealing - Cooling Chiller	31.2	2	ton	$107.91	18	0.8
Integrated Building Design	161,387.7	2	per Building	$74,099.27	30	4.8
Building Operator Certification	11,767.3	2	per participant of 194,500 SF	$429.67	5	12.4
Energy Efficient Windows	172.8	2	100SF	$322.25	25	1.2
Cool Roof	44.2	2	1000 sq ft roof area	$332.44	20	0.2
Ceiling Insulation	75.3	1	1000 sq ft roof area	$50.35	30	4.5
Wall Insulation	331.9	1	1000 sq ft wall area	$4.73	30	143.3
Roof Insulation	20.2	1	1000 sq ft	$67.58	30	1.1
Window Improvements	74.5	1	100 sq ft glazing	$160.28	15	1.0
EMS install	269.1	1	1000 sq ft cond floor area	$2.97	15	80.8
EMS Optimization	363.1	1	1000 sq ft cond floor area	$19.20	20	23.2
HVAC Occupancy Sensors	90.5	2	1000 sq ft cond floor area	$97.78	15	1.1
Setback with Electric Heat	3,796.2	2	each	$71.00	9	31.3
EMS Pump Scheduling Controls	1,524.4	2	pump Hp	$1.36	15	1218.1
Web enabled EMS	601.4	2	1000 sq ft cond floor area	$19.40	15	23.5
Zoning	187.4	2	1000 sq ft cond floor area	$500.00	15	0.6
Retrocommissioning	2.6	1	sq ft	$0.30	7	4.0
Commissioning	4.5	1	sq ft	$1.16	7	1.8
Space Cooling - Unitary & Split AC						
AC <65k	289.5	2	ton	$108.53	15	3.7
AC 65k - 135k	50.5	2	ton	$323.71	15	0.6
AC 135k - 240k	46.0	2	ton	$166.48	15	1.1
AC 240k - 760k	42.5	2	ton	$118.39	15	1.4
AC >760k	36.4	2	ton	$123.39	15	1.2
Air Source Heat Pump - Cooling	74.3	2	ton	$131.25	15	1.0

Consumers Energy Commercial Measure Database - Electric

Measure Savings, Cost and Useful Life

Consumers Energy	Measure Assumption					
Measure Name	**Annual kWh Savings**	**Cost Type: 1=Full 2=Inc.**	**Cost/Unit Descriptor**	**Cost/Unit**	**Effective Measure Life**	**UCT**
Ductless (mini split) - Cooling	126.1	1	ton	$952.30	15	0.3
Water Loop Heat Pump (WLHP) - Cooling	7.2	2	ton	$5.02	15	2.4
Ground Source Heat Pump - Cooling	302.2	2	ton	$927.66	15	0.4
Packaged Terminal Air Conditioner (PTAC) - Cooling	101.7	2	ton	$179.42	15	1.1
WLHP System (Cooling) New Construction	293.7	2	1000 sq ft cond floor area	$1,000.00	20	0.3
DX Condenser Coil Cleaning	51.2	1	ton	$32.40	3	1.3
Room A/C	158.0	2	per unit	$74.75	15	8.6
Improved Duct Sealing - Cooling AC	31.2	2	ton	$107.91	18	0.8
Integrated Building Design	161,387.7	2	per Building	$74,099.27	30	4.8
Building Operator Certification	11,767.3	2	per participant of 194,500 SF	$429.67	5	12.4
Energy Efficient Windows	172.8	2	100SF	$322.25	25	1.2
Cool Roof	44.2	2	1000 sq ft roof area	$332.44	20	0.2
Ceiling Insulation	75.3	1	1000 sq ft roof area	$50.35	30	4.5
Wall Insulation	331.9	1	1000 sq ft wall area	$4.73	30	143.3
Roof Insulation	20.2	1	1000 sq ft	$67.58	30	1.1
Window Improvements	74.5	1	100 sq ft glazing	$160.28	15	1.0
Programmable Thermostats	66.2	1	1000 sq ft cond floor area	$55.54	9	0.7
EMS install	269.1	1	1000 sq ft cond floor area	$2.97	15	80.8
EMS Optimization	363.1	1	1000 sq ft cond floor area	$19.20	20	23.2
Hotel Guest Room Occupancy Control System	557.0	2	per unit	$125.00	8	3.3
HVAC Occupancy Sensors	90.5	2	1000 sq ft cond floor area	$97.78	15	1.1
Setback with Electric Heat	3,796.2	2	each	$71.00	9	31.3
EMS Pump Scheduling Controls	1,524.4	2	pump Hp	$1.36	15	1218.1
Web enabled EMS	601.4	2	1000 sq ft cond floor area	$19.40	15	23.5
Zoning	187.4	2	1000 sq ft cond floor area	$500.00	15	0.6
Retrocommissioning	2.6	1	sq ft	$0.30	7	4.0
Commissioning	4.5	1	sq ft	$1.16	7	1.8
Cooking						
HE Steamer	12,914.0	2	each	$4,150.00	12	3.7
HE Combination Oven	18,432.0	2	each	$16,884.00	12	1.3
HE Convection Ovens	1,879.0	2	each	$471.00	12	4.7
HE Holding Cabinet	3,299.3	2	each	$1,783.00	12	2.0
HE Fryer	1,166.0	2	each	$1,706.00	12	0.7
HE Griddle	2,594.0	2	each	$3,604.00	12	0.8
Induction Cooktops	784.0	2	Per Unit	$3,000.00	11	2.0
Interior Lighting						
Lamp & Ballast Retrofit (HPT8 Replacing T12)	54.2	2	per fixture	$34.15	15	2.0
Lamp & Ballast Retrofit (HPT8 Replacing Standard T8)	24.7	2	ɛr fixture, Replacing standard T8	$34.00	15	0.9
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing T12)	73.4	2	r fixture, Replacing standard T12	$37.09	15	2.5
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing Standard T8)	42.0	2	ĸture, Replacing standard T8 4ft l	$37.09	15	1.5
T5 HP Retrofits	80.7	2	per fixture	$107.00	15	1.0
Light Tube	344.3	2	per fixture	$500.00	14	0.8
High Intensity Fluorescent Fixture (replacing HID)	4,160.0	2	kW saved	$1,491.00	12	3.3
High Intensity Fluorescent Fixture (replacing HID) - New Construction	4,160.0	2	kW saved	$941.46	12	5.2
42W 8 lamp Hi Bay CFL	345.0	2	per fixture, Replacing 400W HID	$496.40	12	0.8
HID Fixture Upgrade - Pulse Start Metal Halide	768.5	2	per fixture	$223.63	13	4.3
Interior induction Lighting	4.2	2	per watt reduced	$1.53	16	4.0
CFL Fixture	157.5	2	per fixture	$45.00	12	3.8
CFL Screw-in	84.7	2	per lamp	$1.36	2	13.4
CFL Screw in Specialty	132.8	2	per lamp	$4.58	2	6.2

Consumers Energy Commercial Measure Database - Electric

Measure Savings, Cost and Useful Life

Consumers Energy	Measure Assumption					
Measure Name	Annual kWh Savings	Cost Type: 1=Full 2=Inc.	Cost/Unit Descriptor	Cost/Unit	Effective Measure Life	UCT
CFL Reflector Flood	133.5	2	per lamp	$6.00	2	4.8
LED Screw In (replacing Incandescent)	134.8	2	per lamp	$12.69	9	9.1
LED Screw In (replacing CFL)	12.0	2	per lamp	$11.61	9	0.9
LED High bay lighting	4,160.0	2	kW saved	$2,900.00	16	2.1
LED low bay lighting	2,669.0	2	kW saved	$2,900.00	18	1.3
LED Downlight	141.5	2	per fixture	$12.74	15	14.2
LED Specialty (replacing Incandescent)	80.6	2	per lamp	$12.79	9	5.4
LED Specialty (replacing CFL)	16.1	2	per lamp	$10.17	9	1.4
LED Troffer	32.3	2	per fixture	$125.00	18	0.5
LED Tube Lighting	53.9	2	per lamp	$35.00	18	2.2
LED Grow Light	4.4	2	per watt reduced	$1.53	11	3.1
Interior Non Highbay/Lowbay LED Fixtures	2.7	2	per watt reduced	$2.90	18	1.3
Illuminated Signs to LED	5.7	2	per watt reduced	$4.00	10	1.3
LED Lighting in Refrigeration	460.0	2	per door	$356.00	16	1.4
LED Exit Sign	201.0	2	per fixture	$25.00	15	9.0
Long Day Lighting Dairy	6.2	2	per watt controlled	$1.79	16	4.5
Central Lighting Control	8,340.6	1	10,000 SF	$2,700.00	12	3.4
Daylight Sensor Controls	10,409.1	1	10,000 SF	$4,000.00	12	2.9
Daylight Sensor Controls - New Construction	8,810.0	1	10,000 SF	$4,000.00	12	2.4
Occupancy Sensor	504.4	2	per sensor	$226.47	10	1.5
Occupancy Sensor & Daylight Sensor	639.0	2	per sensor	$277.50	10	2.2
Switching Controls for Multilevel Lighting (Non-HID)	6,000.0	1	10,000 SF	$4,000.00	12	1.7
Lighting Power Density - Interior	2,669.0	2	per kW reduced	$220.00	15	15.6
Stairwell Bi-Level Control	4,809.0	2	per kW controlled	$825.00	9	4.3
Occupancy Sensors for LED Refrigerator Lighting	195.0	2	per door	$20.00	16	10.6
Exterior Lighting						
LED Fuel Pump Canopy Fixture	135.7	2	Per unit	$343.00	21	0.4
LED Auto Traffic Signals	275.0	2	per lamp	$50.00	6	4.1
LED Pedestrian Signals	150.0	2	per lamp	$100.00	8	1.4
Exterior HID replacement with CFLs	1,021.4	2	per fixture	$596.67	12	1.2
Exterior HID replacement with LEDs	519.5	2	per fixture	$753.67	12	0.5
Garage HID replacement with LEDs	1,053.7	2	per fixture	$753.67	12	1.3
Exterior Linear Fluorescent	4,319.0	2	per kW reduced	$2,500.00	12	1.2
Lighting Power Density - Exterior	4,319.0	2	per kW reduced	$220.00	12	14.2
Lighting Power Density - Parking Garage	8,760.0	2	per kW reduced	$220.00	12	36.9
Exterior BiLevel Controls	530.5	2	per fixture	$444.33	10	0.8
Garage BiLevel Controls	927.5	2	per fixture	$632.00	11	1.6
Sports Field Lighting HiLo Control	149.0	2	per fixture	$532.00	10	0.2
Refrigeration						
Vending Miser for Refrigerated Vending Machines	702.5	1	per unit	$238.75	8	1.5
Evaporator Fan Motor Controls	760.3	1	per controller	$621.00	5	0.5
Zero-Energy Doors	1,360.0	2	per door	$290.00	10	3.7
Discus and Scroll Compressors	1,500.0	2	per Unit	$825.00	13	1.9
Floating Head Pressure Control	1,264.0	1	per ton	$120.00	15	8.9
ENERGY STAR Commercial Solid Door Refrigerators	665.8	2	per unit	$600.00	12	1.0
ENERGY STAR Commercial Solid Door Freezers	1,737.3	2	per unit	$450.00	12	3.6
ENERGY STAR Commercial Glass Door Refrigerators	754.0	2	per unit	$600.00	12	1.2
ENERGY STAR Commercial Glass Door Freezers	3,671.0	2	per unit	$450.00	12	7.7
Energy Star Ice Machines	1,314.1	2	per unit	$1,426.00	9	0.6
Strip Curtains	269.5	1	per square foot	$12.42	4	7.6
Anti Sweat Heater Controls	1,489.0	1	per door	$340.00	15	3.7
Efficient Refrigeration Condenser	120.0	2	per ton	$35.00	15	10.8
Door Gaskets - Cooler and Freezer	98.0	2	per linear foot	$9.61	4	3.7

Consumers Energy Commercial Measure Database - Electric

Measure Savings, Cost and Useful Life

Consumers Energy	Measure Assumption					
Measure Name	Annual kWh Savings	Cost Type: 1=Full 2=Inc.	Cost/Unit Descriptor	Cost/Unit	Effective Measure Life	UCT
Reach-in Refrigerated display case door retrofit	1,014.0	1	Linear Ft	$1,010.00	12	1.4
Refrigeration Savings due to Lighting Savings	1.2	2	per lighting Watt reduced	$1.00	12	1.5
ECM Case Motors	1,131.8	2	per Motor	$200.00	15	6.1
Efficient low-temp compressor	875.0	2	per Unit	$552.00	13	1.6
Automatic High Speed Doors	968.3	2	SF	$150.00	12	6.1
Automatic Door Closers for Refrigerated Walk-in Coolers/Freezers	1,625.0	2	per door	$156.00	8	7.4
Refrigerant charging correction	75.3	2	ton	$38.36	2	1.1
Walk-in Cooler Evaporator Motor Reduction	1,462.1	2	per motor removed	$1,000.00	15	1.6
Night Covers	16.7	1	LF of case - hr	$37.54	5	0.3
Refrigeration Suction Line Insulation	10.8	1	LF	$4.32	15	2.8
Compressed Air						
Efficient Air Compressors	780.5	2	per HP	$150.00	15	5.5
Automatic Drains	2,097.0	2	per drain	$355.00	5	2.5
Cycling Dryers	12.8	2	per SCFM	$30.00	10	0.4
Low Pressure Drop-Filters	64.7	1	per HP	$22.00	10	2.4
Air-Entraining Air Nozzles	21,142.6	1	per nozzle	$95.25	15	293.7
Receiver Capacity Addition	9,158.8	1	per Unit	$2,000.00	10	4.3
Compressed Air Audits & Leak Repair	624.0	1	per SCFM	$16.00	1	3.5
Compressed Air Pressure Flow Controller replacing no flow controller	73.9	1	per HP	$37.00	10	1.6
High Efficiency Air Dryers	48.6	2	per SCFM	$32.33	15	1.6
Air Compressor Outdoor Air Intake	109.8	1	per HP	$5.00	20	28.5
Variable Displacement Air Compressor	442.0	1	per HP	$340.00	13	1.3
Compressed Air Storage Tank	422.8	1	per HP	$36.00	25	17.0
Compressed Air Replacement with Air Blowers	5,587.7	1	per HP	$930.00	15	11.8
Space Heating						
Air Source Heat Pump - Heating	74.3	2	ton	$131.25	15	1.0
Ground Source Heat Pump - Heating	1,208.7	2	ton	$3,710.66	15	0.3
Ductless (mini split) - Heating	126.1	1	ton	$952.30	15	0.2
VFD Pumps	1,732.2	1	per CHW pump hp	$212.29	10	5.3
ECM motors on furnaces	720.0	1	per Furnace	$1,250.00	20	0.7
Water Loop Heat Pump (WLHP) - Heating	28.9	2	ton	$20.09	15	2.3
WLHP System (Heating) New Construction	1,174.9	2	1000 sq ft cond floor area	$4,000.00	20	0.3
Integrated Building Design	161,387.7	2	per Building	$74,099.27	30	4.8
Building Operator Certification	11,767.3	2	per participant of 194,500 SF	$429.67	5	12.4
Energy Efficient Windows	172.8	2	100SF	$322.25	25	1.2
Cool Roof	44.2	2	1000 sq ft roof area	$332.44	20	0.2
Ceiling Insulation	75.3	1	1000 sq ft roof area	$50.35	30	4.5
Wall Insulation	331.9	1	1000 sq ft wall area	$4.73	30	143.3
Roof Insulation	20.2	1	1000 sq ft	$67.58	30	1.1
Window Improvements	74.5	1	100 sq ft glazing	$160.28	15	1.0
EMS install	269.1	1	1000 sq ft cond floor area	$2.97	15	80.8
EMS Optimization	363.1	1	1000 sq ft cond floor area	$19.20	20	23.2
Hotel Guest Room Occupancy Control System	557.0	2	per unit	$125.00	8	3.3
HVAC Occupancy Sensors	90.5	2	1000 sq ft cond floor area	$97.78	15	1.1
Setback with Electric Heat	3,796.2	2	each	$71.00	9	31.3
EMS Pump Scheduling Controls	1,524.4	2	pump Hp	$1.36	15	1218.1
Web enabled EMS	601.4	2	1000 sq ft cond floor area	$19.40	15	23.5
Web enabled EMS with Electric Heat	10,511.5	2	1000 sq ft cond floor area	$141.99	15	63.7
Zoning	187.4	2	1000 sq ft cond floor area	$500.00	15	0.6
Retrocommissioning	2.6	1	sq ft	$0.30	7	4.0
Commissioning	4.5	1	sq ft	$1.16	7	1.8

Consumers Energy Commercial Measure Database - Electric

Measure Savings, Cost and Useful Life

Consumers Energy	Measure Assumption					
Measure Name	Annual kWh Savings	Cost Type: 1=Full 2=Inc.	Cost/Unit Descriptor	Cost/Unit	Effective Measure Life	UCT
Infrared Heater	25.9	2	kBtu/hr input capacity	$2.70	15	19.2
Other						
NEMA Premium Transformer, single-phase	0.2	2	1% of NEMA Premium efficiency p	$0.24	30	2.3
NEMA Premium Transformer, three-phase	0.2	2	1% of NEMA Premium efficiency p	$0.18	30	1.6
High Efficiency Transformer, single-phase	0.4	2	).01% of additional efficiency per	$0.46	30	1.8
High Efficiency Transformer, three-phase	0.4	2	).01% of additional efficiency per	$0.44	30	3.7
Optimized Snow and Ice Melt Controls (electric)	0.1	1	SF	$15.15	15	0.0
Engine Block Heater Timer	576.0	2	per engine block	$50.00	5	18.4
Parking Garage Exhaust Fan CO Control	2,413.0	2	per HP	$900.00	15	4.9

Consumers Energy Commercial Measure Database - Electric

Base Case Factor:

Is the fraction of the end use energy that is applicable for the efficient technology in a given market segment. For example, for fluorescent lighting, this would be the fraction of all lighting kWh in a given market segment that is associated with fluorescent fixtures.

Measure Name	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other
Computers & Office Equipment									
Energy Star Compliant Refrigerator	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Energy Star office equipment including computers, monitors, copiers, multi-function machines.	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Smart Strip plug outlet	26.0%	26.0%	26.0%	26.0%	26.0%	26.0%	26.0%	26.0%	26.0%
PC Network Energy Management Controls replacing no central control	69.0%	69.0%	69.0%	69.0%	69.0%	69.0%	69.0%	69.0%	69.0%
Energy Star UPS	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Vendor Miser for Non-Refrig Equipment	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
High Efficiency Hand Dryer	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Electrically Commutated Plug Fans in data centers	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
High Efficiency CRAC unit	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Computer Room Air Conditioner Economizer	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Computer Room Hot Aisle Cold Aisle Configuration	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Computer Room Air Side Economizer	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
VFD for Process Fans -CRAC units	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Water Heating									
Heat Pump Water Heater	24.9%	24.9%	24.9%	24.7%	24.9%	24.9%	24.9%	24.9%	24.9%
HP Water Heater - Residential unit in Commercial Application	24.9%	24.9%	24.9%	24.7%	24.9%	24.9%	24.9%	24.9%	24.9%
Heat Pump Storage Water Heater	24.9%	24.9%	24.9%	24.7%	24.9%	24.9%	24.9%	24.9%	24.9%
Electric Tankless Water Heater	24.9%	24.9%	24.9%	24.7%	24.9%	24.9%	24.9%	24.9%	24.9%
Low Flow Faucet Aerator	100.0%	96.0%	79.0%	98.0%	50.0%	60.5%	22.5%	42.0%	77.0%
Low Flow Showerhead	0.0%	0.0%	0.0%	0.0%	20.0%	2.0%	0.0%	33.0%	13.0%
Hot Water (DHW) Pipe Insulation	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Clothes Washer ENERGY STAR, Gas water heater, Gas dryer	0.0%	0.0%	0.3%	0.0%	3.8%	4.4%	0.0%	1.3%	0.0%
Clothes Washer ENERGY STAR, Gas water heater, Electric dryer	0.0%	0.0%	0.3%	0.0%	3.8%	4.4%	0.0%	1.3%	0.0%
Clothes Washer ENERGY STAR, Electric Water heater, Gas Dryer	0.0%	0.0%	0.3%	0.0%	3.8%	4.4%	0.0%	1.3%	0.0%
Clothes Washer ENERGY STAR, Electric Water heater, Electric Dryer	0.0%	0.0%	0.3%	0.0%	3.8%	4.4%	0.0%	1.3%	0.0%
ES Dishwasher, High Temp, Elec Heat, Elec Booster	0.0%	0.8%	2.0%	0.4%	1.0%	2.0%	3.0%	2.0%	2.0%
ES Dishwasher, High Temp, Gas Heat, Elec Booster	0.0%	0.8%	2.0%	0.4%	1.0%	2.0%	3.0%	2.0%	2.0%
ES Dishwasher, High Temp, Gas Heat, Gas Booster	0.0%	0.8%	2.0%	0.4%	1.0%	2.0%	3.0%	2.0%	2.0%
ES Dishwasher, Low Temp, Elec Heat	0.0%	0.8%	2.0%	0.4%	1.0%	2.0%	3.0%	2.0%	2.0%
ES Dishwasher, Low Temp, Gas Heat	0.0%	0.8%	2.0%	0.4%	1.0%	2.0%	3.0%	2.0%	2.0%
Tank Insulation (electric)	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%
Pre Rinse Sprayers (electric)	0.0%	0.0%	10.0%	0.0%	10.0%	10.0%	62.5%	10.0%	0.0%
ECM Circulator Pump	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Drain water Heat Recovery Water Heater	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Efficient Hot Water Pump	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
HVAC Condenser Heater Recovery Water Heating	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Process Cooling Condenser Heater Recovery Water Heating	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Pools									
Heat Pump Pool Heater	0.0%	0.0%	0.0%	0.0%	42.5%	42.5%	0.0%	42.5%	42.5%
High efficiency spas/hot tubs	0.0%	0.0%	0.0%	0.0%	15.0%	15.0%	0.0%	15.0%	15.0%
Ventilation									
Economizer	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Demand-Controlled Ventilation	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Consumers Energy Commercial Measure Database - Electric

Base Case Factor:

Is the fraction of the end use energy that is applicable for the efficient technology in a given market segment. For example, for fluorescent lighting, this would be the fraction of all lighting kWh in a given market segment that is associated with fluorescent fixtures.

Measure Name	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other
Variable Speed Drive Control, 15 HP	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%
Variable Speed Drive Control, 5 HP	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%
Variable Speed Drive Control, 40 HP	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%
High Speed Fans	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%
High Volume Low Speed Fans	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%
Engineered CKV hood	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Fan Thermostat Controller	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Space Cooling - Chillers									
Air-Cooled Recip Chiller	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Air-Cooled Screw Chiller	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Water-Cooled Centrifugal Chiller < 150 ton	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Water-Cooled Centrifugal Chiller 150 - 300 ton	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Water-Cooled Centrifugal Chiller > 300 ton	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Water-Cooled Screw Chiller < 150 ton	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Water-Cooled Screw Chiller 150 - 300 ton	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Water-Cooled Screw Chiller > 300 ton	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Chiller Tune Up	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
High Efficiency Pumps	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Efficient Chilled Water Pump	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Chilled Hot Water Reset	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Air-Cooled Chiller Average Minimum Qualifying 1.04 kW/ton	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Air-Cooled Chiller Average 0.01 kW/ton IPLV Reduction	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Water-Cooled Chiller Average 10% above IECC standard	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Water-Cooled Chiller Average 0.01 kW/ton IPLV Reduction	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
VAV System Conversion	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	100.0%	0.0%
Motor Belt Replacement	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%
Water-Side Economizer	50.4%	50.4%	50.4%	50.4%	50.4%	50.4%	50.4%	50.4%	50.4%
Improved Duct Sealing - Cooling Chiller	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Integrated Building Design	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Building Operator Certification	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Energy Efficient Windows	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Cool Roof	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Ceiling Insulation	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Wall Insulation	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Roof Insulation	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Window Improvements	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
EMS install	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%
EMS Optimization	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%
HVAC Occupancy Sensors	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Setback with Electric Heat	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
EMS Pump Scheduling Controls	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Web enabled EMS	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Zoning	50.0%	50.0%	50.0%	50.0%	0.0%	50.0%	50.0%	50.0%	50.0%
Retrocommissioning	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Commissioning	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Space Cooling - Unitary and Split AC									
AC <65k	13.1%	15.7%	15.3%	15.5%	-0.3%	13.1%	15.7%	12.4%	10.9%
AC 65k - 135k	13.1%	15.7%	15.3%	15.5%	-0.3%	13.1%	15.7%	12.4%	10.9%
AC 135k - 240k	13.1%	15.7%	15.3%	15.5%	-0.3%	13.1%	15.7%	12.4%	10.9%
AC 240k - 760k	13.1%	15.7%	15.3%	15.5%	-0.3%	13.1%	15.7%	12.4%	10.9%
AC >760k	13.1%	15.7%	15.3%	15.5%	-0.3%	13.1%	15.7%	12.4%	10.9%
Air Source Heat Pump - Cooling	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%

Consumers Energy Commercial Measure Database - Electric

Base Case Factor:

Is the fraction of the end use energy that is applicable for the efficient technology in a given market segment. For example, for fluorescent lighting, this would be the fraction of all lighting kWh in a given market segment that is associated with fluorescent fixtures.

Measure Name	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other
Ductless (mini split) - Cooling	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
Water Loop Heat Pump (WLHP) - Cooling	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
Ground Source Heat Pump - Cooling	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
Packaged Terminal Air Conditioner (PTAC) - Cooling	13.0%	0.0%	2.0%	1.0%	80.0%	13.0%	0.0%	16.5%	24.0%
WLHP System (Cooling) New Construction	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
DX Condenser Coil Cleaning	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Room A/C	11.6%	11.6%	11.6%	11.6%	11.6%	11.6%	11.6%	11.6%	11.6%
Improved Duct Sealing - Cooling AC	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Integrated Building Design	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Building Operator Certification	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Energy Efficient Windows	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Cool Roof	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Ceiling Insulation	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Wall Insulation	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Roof Insulation	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Window Improvements	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Programmable Thermostats	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%
EMS install	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%
EMS Optimization	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%
Hotel Guest Room Occupancy Control System	0.0%	0.0%	0.0%	0.0%	5.0%	0.0%	0.0%	0.0%	0.0%
HVAC Occupancy Sensors	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Setback with Electric Heat	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
EMS Pump Scheduling Controls	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Web enabled EMS	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Zoning	50.0%	50.0%	50.0%	50.0%	0.0%	50.0%	50.0%	50.0%	50.0%
Retrocommissioning	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Commissioning	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Cooking									
HE Steamer	0.0%	0.0%	23.0%	34.0%	23.0%	23.0%	23.0%	23.0%	23.0%
HE Combination Oven	0.0%	0.0%	4.7%	6.7%	4.7%	4.7%	4.7%	4.7%	4.7%
HE Convection Ovens	0.0%	0.0%	4.7%	6.7%	4.7%	4.7%	4.7%	4.7%	4.7%
HE Holding Cabinet	0.0%	0.0%	18.0%	36.4%	18.0%	18.0%	18.0%	18.0%	18.0%
HE Fryer	0.0%	0.0%	26.0%	1.0%	26.0%	26.0%	26.0%	26.0%	26.0%
HE Griddle	0.0%	0.0%	19.0%	9.0%	19.0%	19.0%	19.0%	19.0%	19.0%
Induction Cooktops	0.0%	0.0%	4.7%	6.7%	4.7%	4.7%	4.7%	4.7%	4.7%
Interior Lighting									
Lamp & Ballast Retrofit (HPT8 Replacing T12)	9.5%	16.2%	17.6%	3.7%	2.9%	3.8%	6.2%	10.1%	9.6%
Lamp & Ballast Retrofit (HPT8 Replacing Standard T8)	6.3%	6.1%	9.7%	11.1%	3.4%	12.6%	11.0%	11.3%	7.6%
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing T12)	9.5%	16.2%	17.6%	3.7%	2.9%	3.8%	6.2%	10.1%	9.6%
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing Standard T8)	6.3%	6.1%	9.7%	11.1%	3.4%	12.6%	11.0%	11.3%	7.6%
T5 HP Retrofits	2.4%	8.6%	0.0%	0.0%	4.3%	5.1%	1.1%	0.0%	0.0%
Light Tube	0.5%	0.5%	0.1%	1.3%	6.2%	0.3%	1.2%	0.4%	1.4%
High Intensity Fluorescent Fixture (replacing HID)	7.2%	0.3%	0.0%	0.9%	0.0%	0.3%	0.0%	1.5%	3.9%
High Intensity Fluorescent Fixture (replacing HID) - New Construction	7.2%	0.3%	0.0%	0.9%	0.0%	0.3%	0.0%	1.5%	3.9%
42W 8 lamp Hi Bay CFL	7.2%	0.3%	0.0%	0.9%	0.0%	0.3%	0.0%	1.5%	3.9%
HID Fixture Upgrade - Pulse Start Metal Halide	7.2%	0.3%	0.0%	0.9%	0.0%	0.3%	0.0%	1.5%	3.9%
Interior induction Lighting	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
CFL Fixture	0.5%	0.5%	0.1%	1.3%	6.2%	0.3%	1.2%	0.4%	1.4%
CFL Screw-in	0.5%	0.5%	0.1%	1.3%	6.2%	0.3%	1.2%	0.4%	1.4%

Consumers Energy Commercial Measure Database - Electric

Base Case Factor:

Is the fraction of the end use energy that is applicable for the efficient technology in a given market segment. For example, for fluorescent lighting, this would be the fraction of all lighting kWh in a given market segment that is associated with fluorescent fixtures.

Measure Name	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other
CFL Screw in Specialty	0.5%	0.5%	0.1%	1.3%	6.2%	0.3%	1.2%	0.4%	1.4%
CFL Reflector Flood	0.5%	0.5%	0.1%	1.3%	6.2%	0.3%	1.2%	0.4%	1.4%
LED Screw In (replacing Incandescent)	0.5%	0.5%	0.1%	1.3%	6.2%	0.3%	1.2%	0.4%	1.4%
LED Screw In (replacing CFL)	0.3%	2.4%	0.5%	1.9%	8.7%	3.7%	3.1%	0.5%	1.1%
LED High bay lighting	7.2%	0.3%	0.0%	0.9%	0.0%	0.3%	0.0%	1.5%	3.9%
LED low bay lighting	6.3%	6.1%	9.7%	11.1%	3.4%	12.6%	11.0%	11.3%	7.6%
LED Downlight	0.5%	0.5%	0.1%	1.3%	6.2%	0.3%	1.2%	0.4%	1.4%
LED Specialty (replacing Incandescent)	0.5%	0.5%	0.1%	1.3%	6.2%	0.3%	1.2%	0.4%	1.4%
LED Specialty (replacing CFL)	0.3%	2.4%	0.5%	1.9%	8.7%	3.7%	3.1%	0.5%	1.1%
LED Troffer	6.3%	6.1%	9.7%	11.1%	3.4%	12.6%	11.0%	11.3%	7.6%
LED Tube Lighting	6.3%	6.1%	9.7%	11.1%	3.4%	12.6%	11.0%	11.3%	7.6%
LED Grow Light	0.0%	0.1%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%
Interior Non Highbay/Lowbay LED Fixtures	6.3%	6.1%	9.7%	11.1%	3.4%	12.6%	11.0%	11.3%	7.6%
Illuminated Signs to LED	0.0%	0.1%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%
LED Lighting in Refrigeration	0.0%	0.1%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%
LED Exit Sign	0.0%	0.1%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%
Long Day Lighting Dairy	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.0%
Central Lighting Control	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
Daylight Sensor Controls	22.9%	22.9%	22.9%	22.9%	22.9%	22.9%	22.9%	22.9%	22.9%
Daylight Sensor Controls - New Construction	32.9%	86.4%	100.0%	95.8%	100.0%	99.2%	100.0%	84.4%	83.0%
Occupancy Sensor	45.7%	74.8%	84.5%	67.1%	19.6%	74.1%	70.6%	74.3%	53.2%
Occupancy Sensor & Daylight Sensor	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Switching Controls for Multilevel Lighting (Non-HID)	63.9%	98.4%	100.0%	95.6%	100.0%	98.6%	99.9%	92.4%	80.5%
Lighting Power Density - Interior	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Stairwell Bi-Level Control	3.9%	4.2%	4.0%	4.1%	3.8%	4.2%	3.5%	4.1%	4.1%
Occupancy Sensors for LED Refrigerator Lighting	0.9%	1.0%	0.9%	0.9%	0.9%	1.0%	0.8%	0.9%	0.9%
Exterior Lighting									
LED Fuel Pump Canopy Fixture	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.0%
LED Auto Traffic Signals	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	22.5%
LED Pedestrian Signals	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	22.5%
Exterior HID replacement with CFLs	29.8%	12.8%	12.2%	28.4%	21.9%	24.0%	24.3%	30.5%	15.5%
Exterior HID replacement with LEDs	29.8%	12.8%	12.2%	28.4%	21.9%	24.0%	24.3%	30.5%	15.5%
Garage HID replacement with LEDs	29.8%	12.8%	12.2%	28.4%	21.9%	24.0%	24.3%	30.5%	15.5%
Exterior Linear Fluorescent	0.0%	9.8%	39.6%	2.5%	5.6%	0.2%	14.8%	0.4%	0.3%
Lighting Power Density - Exterior	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Lighting Power Density - Parking Garage	29.8%	12.8%	12.2%	28.4%	21.9%	24.0%	24.3%	30.5%	15.5%
Exterior BiLevel Controls	22.2%	22.2%	22.2%	22.2%	22.2%	22.2%	22.2%	22.2%	22.2%
Garage BiLevel Controls	22.2%	22.2%	22.2%	22.2%	22.2%	22.2%	22.2%	22.2%	22.2%
Sports Field Lighting HiLo Control	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
Refrigeration									
Vending Miser for Refrigerated Vending Machines	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%
Evaporator Fan Motor Controls	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%
Zero-Energy Doors	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%
Discus and Scroll Compressors	17.3%	17.3%	17.3%	17.3%	17.3%	17.3%	17.3%	17.3%	17.3%
Floating Head Pressure Control	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%
ENERGY STAR Commercial Solid Door Refrigerators	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
ENERGY STAR Commercial Solid Door Freezers	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
ENERGY STAR Commercial Glass Door Refrigerators	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
ENERGY STAR Commercial Glass Door Freezers	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
Energy Star Ice Machines	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%

Consumers Energy Commercial Measure Database - Electric

Base Case Factor:

Is the fraction of the end use energy that is applicable for the efficient technology in a given market segment. For example, for fluorescent lighting, this would be the fraction of all lighting kWh in a given market segment that is associated with fluorescent fixtures.

Measure Name	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other
Strip Curtains	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%
Anti Sweat Heater Controls	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%
Efficient Refrigeration Condenser	17.3%	17.3%	17.3%	17.3%	17.3%	17.3%	17.3%	17.3%	17.3%
Door Gaskets - Cooler and Freezer	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%
Reach-in Refrigerated display case door retrofit	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%
Refrigeration Savings due to Lighting Savings	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
ECM Case Motors	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%
Efficient low-temp compressor	17.3%	17.3%	17.3%	17.3%	17.3%	17.3%	17.3%	17.3%	17.3%
Automatic High Speed Doors	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Automatic Door Closers for Refrigerated Walk-in Coolers/Freezers	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Refrigerant charging correction	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Walk-in Cooler Evaporator Motor Reduction	7.7%	7.7%	7.7%	7.7%	7.7%	7.7%	7.7%	7.7%	7.7%
Compressed Air									
Efficient Air Compressors	36.0%	36.0%	36.0%	36.0%	36.0%	36.0%	36.0%	36.0%	36.0%
Automatic Drains	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Cycling Dryers	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Low Pressure Drop-Filters	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Air-Entraining Air Nozzles	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%
Receiver Capacity Addition	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Compressed Air Audits & Leak Repair	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%
Compressed Air Pressure Flow Controller replacing no flow controller	72.0%	72.0%	72.0%	72.0%	72.0%	72.0%	72.0%	72.0%	72.0%
High Efficiency Air Dryers	7.2%	7.2%	7.2%	7.2%	7.2%	7.2%	7.2%	7.2%	7.2%
Air Compressor Outdoor Air Intake	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Variable Displacement Air Compressor	36.0%	36.0%	36.0%	36.0%	36.0%	36.0%	36.0%	36.0%	36.0%
Compressed Air Storage Tank	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Compressed Air Replacement with Air Blowers	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%
Space Heating									
Air Source Heat Pump - Heating	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Ground Source Heat Pump - Heating	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Ductless (mini split) - Heating	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
VFD Pumps	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
ECM motors on furnaces	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Water Loop Heat Pump (WLHP) - Heating	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
WLHP System (Heating) New Construction	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Integrated Building Design	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Building Operator Certification	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Energy Efficient Windows	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Cool Roof	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Ceiling Insulation	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Wall Insulation	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Roof Insulation	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Window Improvements	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
EMS install	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%
EMS Optimization	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%
Hotel Guest Room Occupancy Control System	0.0%	0.0%	0.0%	0.0%	5.0%	0.0%	0.0%	0.0%	0.0%
HVAC Occupancy Sensors	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Setback with Electric Heat	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
EMS Pump Scheduling Controls	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Web enabled EMS	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Web enabled EMS with Electric Heat	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Zoning	50.0%	50.0%	50.0%	50.0%	0.0%	50.0%	50.0%	50.0%	50.0%

Consumers Energy Commercial Measure Database - Electric

Base Case Factor:

Is the fraction of the end use energy that is applicable for the efficient technology in a given market segment. For example, for fluorescent lighting, this would be the fraction of all lighting kWh in a given market segment that is associated with fluorescent fixtures.

Measure Name	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other
Retrocommissioning	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Commissioning	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Infrared Heater	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Other									
NEMA Premium Transformer, single-phase	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
NEMA Premium Transformer, three-phase	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
High Efficiency Transformer, single-phase	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
High Efficiency Transformer, three-phase	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Optimized Snow and Ice Melt Controls (electric)	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Engine Block Heater Timer	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Parking Garage Exhaust Fan CO Control	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%

Consumers Energy Commercial Measure Database - Electric

Savings Factor:
Is the percentage reduction in electricity or gas consumption resulting from application of the efficient technology.

Measure Name	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other
Computers & Office Equipment									
Energy Star Compliant Refrigerator	24.3%	24.3%	24.3%	24.3%	24.3%	24.3%	24.3%	24.3%	24.3%
Energy Star office equipment including computers, monitors, copiers, multi-function machines.	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%
Smart Strip plug outlet	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%
PC Network Energy Management Controls replacing no central control	46.0%	46.0%	46.0%	46.0%	46.0%	46.0%	46.0%	46.0%	46.0%
Energy Star UPS	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%
Vendor Miser for Non-Refrig Equipment	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%
High Efficiency Hand Dryer	68.7%	68.7%	68.7%	68.7%	68.7%	68.7%	68.7%	68.7%	68.7%
Electrically Commutated Plug Fans in data centers	33.5%	33.5%	33.5%	33.5%	33.5%	33.5%	33.5%	33.5%	33.5%
High Efficiency CRAC unit	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Computer Room Air Conditioner Economizer	46.9%	46.9%	46.9%	46.9%	46.9%	46.9%	46.9%	46.9%	46.9%
Computer Room Hot Aisle Cold Aisle Configuration	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%
Computer Room Air Side Economizer	46.9%	46.9%	46.9%	46.9%	46.9%	46.9%	46.9%	46.9%	46.9%
VFD for Process Fans -CRAC units	42.8%	42.8%	42.8%	42.8%	42.8%	42.8%	42.8%	42.8%	42.8%
Water Heating									
Heat Pump Water Heater	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%
HP Water Heater - Residential unit in Commercial Application	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%
Heat Pump Storage Water Heater	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%
Electric Tankless Water Heater	8.1%	8.1%	8.1%	8.1%	8.1%	8.1%	8.1%	8.1%	8.1%
Low Flow Faucet Aerator	65.9%	65.9%	65.9%	65.9%	65.9%	65.9%	65.9%	65.9%	65.9%
Low Flow Showerhead	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Hot Water (DHW) Pipe Insulation	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Clothes Washer ENERGY STAR, Gas water heater, Gas dryer	37.6%	37.6%	37.6%	37.6%	37.6%	37.6%	37.6%	37.6%	37.6%
Clothes Washer ENERGY STAR, Gas water heater, Electric dryer	25.1%	25.1%	25.1%	25.1%	25.1%	25.1%	25.1%	25.1%	25.1%
Clothes Washer ENERGY STAR, Electric Water heater, Gas Dryer	32.7%	32.7%	32.7%	32.7%	32.7%	32.7%	32.7%	32.7%	32.7%
Clothes Washer ENERGY STAR, Electric Water heater, Electric Dryer	27.3%	27.3%	27.3%	27.3%	27.3%	27.3%	27.3%	27.3%	27.3%
ES Dishwasher, High Temp, Elec Heat, Elec Booster	28.4%	28.4%	28.4%	28.4%	28.4%	28.4%	28.4%	28.4%	28.4%
ES Dishwasher, High Temp, Gas Heat, Elec Booster	26.2%	26.2%	26.2%	26.2%	26.2%	26.2%	26.2%	26.2%	26.2%
ES Dishwasher, High Temp, Gas Heat, Gas Booster	15.2%	15.2%	15.2%	15.2%	15.2%	15.2%	15.2%	15.2%	15.2%
ES Dishwasher, Low Temp, Elec Heat	33.2%	33.2%	33.2%	33.2%	33.2%	33.2%	33.2%	33.2%	33.2%
ES Dishwasher, Low Temp, Gas Heat	5.5%	5.5%	5.5%	5.5%	5.5%	5.5%	5.5%	5.5%	5.5%
Tank Insulation (electric)	91.0%	91.0%	91.0%	91.0%	91.0%	91.0%	91.0%	91.0%	91.0%
Pre Rinse Sprayers (electric)	27.3%	27.3%	27.3%	27.3%	27.3%	27.3%	27.3%	27.3%	27.3%
ECM Circulator Pump	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%
Drain water Heat Recovery Water Heater	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Efficient Hot Water Pump	20.5%	20.5%	20.5%	20.5%	20.5%	20.5%	20.5%	20.5%	20.5%
HVAC Condenser Heater Recovery Water Heating	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%
Process Cooling Condenser Heater Recovery Water Heating	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%
Pools									
Heat Pump Pool Heater	61.0%	61.0%	61.0%	61.0%	61.0%	61.0%	61.0%	61.0%	61.0%
High efficiency spas/hot tubs	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
Ventilation									
Economizer	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%
Demand-Controlled Ventilation	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Variable Speed Drive Control, 15 HP	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Variable Speed Drive Control, 5 HP	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%

Consumers Energy Commercial Measure Database - Electric

Savings Factor:
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Measure Name	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other
Variable Speed Drive Control, 40 HP	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
High Speed Fans	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%
High Volume Low Speed Fans	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Engineered CKV hood	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Fan Thermostat Controller	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%
Space Cooling - Chillers									
Air-Cooled Recip Chiller	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%
Air-Cooled Screw Chiller	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Water-Cooled Centrifugal Chiller < 150 ton	29.6%	29.6%	29.6%	29.6%	29.6%	29.6%	29.6%	29.6%	29.6%
Water-Cooled Centrifugal Chiller 150 - 300 ton	29.4%	29.4%	29.4%	29.4%	29.4%	29.4%	29.4%	29.4%	29.4%
Water-Cooled Centrifugal Chiller > 300 ton	29.6%	29.6%	29.6%	29.6%	29.6%	29.6%	29.6%	29.6%	29.6%
Water-Cooled Screw Chiller < 150 ton	25.5%	25.5%	25.5%	25.5%	25.5%	25.5%	25.5%	25.5%	25.5%
Water-Cooled Screw Chiller 150 - 300 ton	26.9%	26.9%	26.9%	26.9%	26.9%	26.9%	26.9%	26.9%	26.9%
Water-Cooled Screw Chiller > 300 ton	27.9%	27.9%	27.9%	27.9%	27.9%	27.9%	27.9%	27.9%	27.9%
Chiller Tune Up	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
High Efficiency Pumps	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%
Efficient Chilled Water Pump	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%
Chilled Hot Water Reset	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Air-Cooled Chiller Average Minimum Qualifying 1.04 kW/ton	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%
Air-Cooled Chiller Average 0.01 kW/ton IPLV Reduction	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%
Water-Cooled Chiller Average 10% above IECC standard	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Water-Cooled Chiller Average 0.01 kW/ton IPLV Reduction	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%
VAV System Conversion	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Motor Belt Replacement	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%
Water-Side Economizer	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Improved Duct Sealing - Cooling Chiller	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Integrated Building Design	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
Building Operator Certification	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Energy Efficient Windows	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%
Cool Roof	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
Ceiling Insulation	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Wall Insulation	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Roof Insulation	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Window Improvements	14.0%	14.0%	14.0%	14.0%	14.0%	14.0%	14.0%	14.0%	14.0%
EMS install	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
EMS Optimization	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
HVAC Occupancy Sensors	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%
Setback with Electric Heat	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
EMS Pump Scheduling Controls	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Web enabled EMS	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Zoning	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Retrocommissioning	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%
Commissioning	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%
Space Cooling - Unitary and Split AC									
AC <65k	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%
AC 65k - 135k	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%
AC 135k - 240k	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%
AC 240k - 760k	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%
AC >760k	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%
Air Source Heat Pump - Cooling	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%
Ductless (mini split) - Cooling	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%
Water Loop Heat Pump (WLHP) - Cooling	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%
Ground Source Heat Pump - Cooling	40.8%	40.8%	40.8%	40.8%	40.8%	40.8%	40.8%	40.8%	40.8%

Consumers Energy Commercial Measure Database - Electric

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Measure Name	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other
Packaged Terminal Air Conditioner (PTAC) - Cooling	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%
WLHP System (Cooling) New Construction	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%
DX Condenser Coil Cleaning	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%
Room A/C	15.9%	15.9%	15.9%	15.9%	15.9%	15.9%	15.9%	15.9%	15.9%
Improved Duct Sealing - Cooling AC	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Integrated Building Design	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
Building Operator Certification	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Energy Efficient Windows	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%
Cool Roof	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
Ceiling Insulation	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Wall Insulation	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Roof Insulation	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Window Improvements	14.0%	14.0%	14.0%	14.0%	14.0%	14.0%	14.0%	14.0%	14.0%
Programmable Thermostats	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
EMS install	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
EMS Optimization	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Hotel Guest Room Occupancy Control System	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
HVAC Occupancy Sensors	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%
Setback with Electric Heat	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
EMS Pump Scheduling Controls	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Web enabled EMS	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Zoning	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Retrocommissioning	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%
Commissioning	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%
Cooking									
HE Steamer	66.4%	66.4%	66.4%	66.4%	66.4%	66.4%	66.4%	66.4%	66.4%
HE Combination Oven	47.8%	47.8%	47.8%	47.8%	47.8%	47.8%	47.8%	47.8%	47.8%
HE Convection Ovens	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%
HE Holding Cabinet	62.9%	62.9%	62.9%	62.9%	62.9%	62.9%	62.9%	62.9%	62.9%
HE Fryer	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%
HE Griddle	15.2%	15.2%	15.2%	15.2%	15.2%	15.2%	15.2%	15.2%	15.2%
Induction Cooktops	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Interior Lighting									
Lamp & Ballast Retrofit (HPT8 Replacing T12)	25.3%	25.3%	25.3%	25.3%	25.3%	25.3%	25.3%	25.3%	25.3%
Lamp & Ballast Retrofit (HPT8 Replacing Standard T8)	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing T12)	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing Standard T8)	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%
T5 HP Retrofits	32.4%	32.4%	32.4%	32.4%	32.4%	32.4%	32.4%	32.4%	32.4%
Light Tube	44.6%	44.6%	44.6%	44.6%	44.6%	44.6%	44.6%	44.6%	44.6%
High Intensity Fluorescent Fixture (replacing HID)	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%
High Intensity Fluorescent Fixture (replacing HID) - New Construction	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%
42W 8 lamp Hi Bay CFL	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%
HID Fixture Upgrade - Pulse Start Metal Halide	21.2%	21.2%	21.2%	21.2%	21.2%	21.2%	21.2%	21.2%	21.2%
Interior induction Lighting	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
CFL Fixture	64.5%	64.5%	64.5%	64.5%	64.5%	64.5%	64.5%	64.5%	64.5%
CFL Screw-in	68.6%	68.6%	68.6%	68.6%	68.6%	68.6%	68.6%	68.6%	68.6%
CFL Screw in Specialty	72.5%	72.5%	72.5%	72.5%	72.5%	72.5%	72.5%	72.5%	72.5%
CFL Reflector Flood	71.4%	71.4%	71.4%	71.4%	71.4%	71.4%	71.4%	71.4%	71.4%
LED Screw In (replacing Incandescent)	78.4%	78.4%	78.4%	78.4%	78.4%	78.4%	78.4%	78.4%	78.4%
LED Screw In (replacing CFL)	31.6%	31.6%	31.6%	31.6%	31.6%	31.6%	31.6%	31.6%	31.6%
LED High bay lighting	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%

Consumers Energy Commercial Measure Database - Electric

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Measure Name	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other
LED low bay lighting	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%
LED Downlight	66.2%	66.2%	66.2%	66.2%	66.2%	66.2%	66.2%	66.2%	66.2%
LED Specialty (replacing Incandescent)	86.2%	86.2%	86.2%	86.2%	86.2%	86.2%	86.2%	86.2%	86.2%
LED Specialty (replacing CFL)	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%
LED Troffer	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%
LED Tube Lighting	46.1%	46.1%	46.1%	46.1%	46.1%	46.1%	46.1%	46.1%	46.1%
LED Grow Light	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Interior Non Highbay/Lowbay LED Fixtures	42.9%	42.9%	42.9%	42.9%	42.9%	42.9%	42.9%	42.9%	42.9%
Illuminated Signs to LED	18.1%	18.1%	18.1%	18.1%	18.1%	18.1%	18.1%	18.1%	18.1%
LED Lighting in Refrigeration	51.2%	51.2%	51.2%	51.2%	51.2%	51.2%	51.2%	51.2%	51.2%
LED Exit Sign	83.3%	83.3%	83.3%	83.3%	83.3%	83.3%	83.3%	83.3%	83.3%
Long Day Lighting Dairy	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%
Central Lighting Control	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Daylight Sensor Controls	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Daylight Sensor Controls - New Construction	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Occupancy Sensor	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Occupancy Sensor & Daylight Sensor	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Switching Controls for Multilevel Lighting (Non-HID)	17.5%	17.5%	17.5%	17.5%	17.5%	17.5%	17.5%	17.5%	17.5%
Lighting Power Density - Interior	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Stairwell Bi-Level Control	54.9%	54.9%	54.9%	54.9%	54.9%	54.9%	54.9%	54.9%	54.9%
Occupancy Sensors for LED Refrigerator Lighting	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%
Exterior Lighting									
LED Fuel Pump Canopy Fixture	73.5%	73.5%	73.5%	73.5%	73.5%	73.5%	73.5%	73.5%	73.5%
LED Auto Traffic Signals	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
LED Pedestrian Signals	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
Exterior HID replacement with CFLs	78.7%	78.7%	78.7%	78.7%	78.7%	78.7%	78.7%	78.7%	78.7%
Exterior HID replacement with LEDs	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
Garage HID replacement with LEDs	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
Exterior Linear Fluorescent	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%
Lighting Power Density - Exterior	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Lighting Power Density - Parking Garage	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Exterior BiLevel Controls	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
Garage BiLevel Controls	28.5%	28.5%	28.5%	28.5%	28.5%	28.5%	28.5%	28.5%	28.5%
Sports Field Lighting HiLo Control	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%
Refrigeration									
Vending Miser for Refrigerated Vending Machines	46.0%	46.0%	46.0%	46.0%	46.0%	46.0%	46.0%	46.0%	46.0%
Evaporator Fan Motor Controls	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Zero-Energy Doors	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Discus and Scroll Compressors	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%
Floating Head Pressure Control	9.2%	9.2%	9.2%	9.2%	9.2%	9.2%	9.2%	9.2%	9.2%
ENERGY STAR Commercial Solid Door Refrigerators	31.9%	31.9%	31.9%	31.9%	31.9%	31.9%	31.9%	31.9%	31.9%
ENERGY STAR Commercial Solid Door Freezers	29.7%	29.7%	29.7%	29.7%	29.7%	29.7%	29.7%	29.7%	29.7%
ENERGY STAR Commercial Glass Door Refrigerators	30.2%	30.2%	30.2%	30.2%	30.2%	30.2%	30.2%	30.2%	30.2%
ENERGY STAR Commercial Glass Door Freezers	33.7%	33.7%	33.7%	33.7%	33.7%	33.7%	33.7%	33.7%	33.7%
Energy Star Ice Machines	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
Strip Curtains	80.2%	80.2%	80.2%	80.2%	80.2%	80.2%	80.2%	80.2%	80.2%
Anti Sweat Heater Controls	68.0%	68.0%	68.0%	68.0%	68.0%	68.0%	68.0%	68.0%	68.0%
Efficient Refrigeration Condenser	1.8%	1.8%	1.8%	1.8%	1.8%	1.8%	1.8%	1.8%	1.8%
Door Gaskets - Cooler and Freezer	99.7%	99.7%	99.7%	99.7%	99.7%	99.7%	99.7%	99.7%	99.7%
Reach-in Refrigerated display case door retrofit	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%
Refrigeration Savings due to Lighting Savings	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Consumers Energy Commercial Measure Database - Electric

Savings Factor:
Is the percentage reduction in electricity or gas consumption resulting from application of the efficient technology.

Measure Name	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other
ECM Case Motors	55.0%	55.0%	55.0%	55.0%	55.0%	55.0%	55.0%	55.0%	55.0%
Efficient low-temp compressor	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%
Automatic High Speed Doors	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
Automatic Door Closers for Refrigerated Walk-in Coolers/Freezers	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
Refrigerant charging correction	14.0%	14.0%	14.0%	14.0%	14.0%	14.0%	14.0%	14.0%	14.0%
Walk-in Cooler Evaporator Motor Reduction	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%
Compressed Air									
Efficient Air Compressors	30.6%	30.6%	30.6%	30.6%	30.6%	30.6%	30.6%	30.6%	30.6%
Automatic Drains	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Cycling Dryers	29.3%	29.3%	29.3%	29.3%	29.3%	29.3%	29.3%	29.3%	29.3%
Low Pressure Drop-Filters	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
Air-Entraining Air Nozzles	41.7%	41.7%	41.7%	41.7%	41.7%	41.7%	41.7%	41.7%	41.7%
Receiver Capacity Addition	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Compressed Air Audits & Leak Repair	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Compressed Air Pressure Flow Controller replacing no flow controller	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
High Efficiency Air Dryers	21.6%	21.6%	21.6%	21.6%	21.6%	21.6%	21.6%	21.6%	21.6%
Air Compressor Outdoor Air Intake	5.9%	5.9%	5.9%	5.9%	5.9%	5.9%	5.9%	5.9%	5.9%
Variable Displacement Air Compressor	9.7%	9.7%	9.7%	9.7%	9.7%	9.7%	9.7%	9.7%	9.7%
Compressed Air Storage Tank	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Compressed Air Replacement with Air Blowers	78.7%	78.7%	78.7%	78.7%	78.7%	78.7%	78.7%	78.7%	78.7%
Space Heating									
Air Source Heat Pump - Heating	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
Ground Source Heat Pump - Heating	40.9%	40.9%	40.9%	40.9%	40.9%	40.9%	40.9%	40.9%	40.9%
Ductless (mini split) - Heating	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%
VFD Pumps	38.4%	38.4%	38.4%	38.4%	38.4%	38.4%	38.4%	38.4%	38.4%
ECM motors on furnaces	26.1%	26.1%	26.1%	26.1%	26.1%	26.1%	26.1%	26.1%	26.1%
Water Loop Heat Pump (WLHP) - Heating	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%
WLHP System (Heating) New Construction	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%
Integrated Building Design	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
Building Operator Certification	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Energy Efficient Windows	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%
Cool Roof	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
Ceiling Insulation	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Wall Insulation	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Roof Insulation	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Window Improvements	14.0%	14.0%	14.0%	14.0%	14.0%	14.0%	14.0%	14.0%	14.0%
EMS install	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
EMS Optimization	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Hotel Guest Room Occupancy Control System	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
HVAC Occupancy Sensors	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%
Setback with Electric Heat	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
EMS Pump Scheduling Controls	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Web enabled EMS	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Web enabled EMS with Electric Heat	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Zoning	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Retrocommissioning	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%
Commissioning	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%
Infrared Heater	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Other									
NEMA Premium Transformer, single-phase	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
NEMA Premium Transformer, three-phase	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
High Efficiency Transformer, single-phase	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%

Consumers Energy Commercial Measure Database - Electric

Savings Factor:
Is the percentage reduction in electricity or gas consumption resulting from application of the efficient technology.

Measure Name	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other
High Efficiency Transformer, three-phase	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
Optimized Snow and Ice Melt Controls (electric)	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%
Engine Block Heater Timer	64.0%	64.0%	64.0%	64.0%	64.0%	64.0%	64.0%	64.0%	64.0%
Parking Garage Exhaust Fan CO Control	48.0%	48.0%	48.0%	48.0%	48.0%	48.0%	48.0%	48.0%	48.0%

Consumers Energy Commercial Measure Database - Electric

Remaining Factor:

Is the fraction of applicable kWh or therm sales that are associated with equipment that has not yet been converted to the energy efficiency measure; that is, one minus the fraction of the market segment that already have the energy-efficiency measure installed.

Measure Name	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other
Computers & Office Equipment									
Energy Star Compliant Refrigerator	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Energy Star office equipment including computers, monitors, copiers, multi-function machines.	76.1%	76.1%	76.1%	76.1%	76.1%	76.1%	76.1%	76.1%	76.1%
Smart Strip plug outlet	83.6%	83.6%	83.6%	83.6%	83.6%	83.6%	83.6%	83.6%	83.6%
PC Network Energy Management Controls replacing no central control	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%
Energy Star UPS	61.0%	61.0%	61.0%	61.0%	61.0%	61.0%	61.0%	61.0%	61.0%
Vendor Miser for Non-Refrig Equipment	94.7%	94.7%	94.7%	94.7%	94.7%	94.7%	94.7%	94.7%	94.7%
High Efficiency Hand Dryer	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Electrically Commutated Plug Fans in data centers	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
High Efficiency CRAC unit	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Computer Room Air Conditioner Economizer	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Computer Room Hot Aisle Cold Aisle Configuration	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Computer Room Air Side Economizer	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
VFD for Process Fans -CRAC units	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Water Heating									
Heat Pump Water Heater	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
HP Water Heater - Residential unit in Commercial Application	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Heat Pump Storage Water Heater	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Electric Tankless Water Heater	98.9%	98.9%	98.9%	98.9%	98.9%	98.9%	98.9%	98.9%	98.9%
Low Flow Faucet Aerator	95.1%	86.4%	24.4%	85.2%	40.6%	72.6%	80.6%	92.1%	87.6%
Low Flow Showerhead	75.0%	100.0%	100.0%	20.0%	58.1%	77.9%	100.0%	94.4%	81.3%
Hot Water (DHW) Pipe Insulation	77.8%	93.8%	100.0%	71.4%	100.0%	83.3%	100.0%	100.0%	87.5%
Clothes Washer ENERGY STAR, Gas water heater, Gas dryer	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Clothes Washer ENERGY STAR, Gas water heater, Electric dryer	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Clothes Washer ENERGY STAR, Electric Water heater, Gas Dryer	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Clothes Washer ENERGY STAR, Electric Water heater, Electric Dryer	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
ES Dishwasher, High Temp, Elec Heat, Elec Booster	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
ES Dishwasher, High Temp, Gas Heat, Elec Booster	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
ES Dishwasher, High Temp, Gas Heat, Gas Booster	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
ES Dishwasher, Low Temp, Elec Heat	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
ES Dishwasher, Low Temp, Gas Heat	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Tank Insulation (electric)	88.0%	88.0%	88.0%	88.0%	88.0%	88.0%	88.0%	88.0%	88.0%
Pre Rinse Sprayers (electric)	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%
ECM Circulator Pump	85.7%	100.0%	100.0%	88.9%	100.0%	66.7%	100.0%	100.0%	100.0%
Drain water Heat Recovery Water Heater	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Efficient Hot Water Pump	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%
HVAC Condenser Heater Recovery Water Heating	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Process Cooling Condenser Heater Recovery Water Heating	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Pools									
Heat Pump Pool Heater	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
High efficiency spas/hot tubs	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%
Ventilation									
Economizer	97.0%	97.0%	97.0%	97.0%	97.0%	97.0%	97.0%	97.0%	97.0%

Consumers Energy Commercial Measure Database - Electric

Remaining Factor:

Is the fraction of applicable kWh or therm sales that are associated with equipment that has not yet been converted to the energy efficiency measure; that is, one minus the fraction of the market segment that already have the energy-efficiency measure installed.

Measure Name	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other
Demand-Controlled Ventilation	99.3%	99.3%	99.3%	99.3%	99.3%	99.3%	99.3%	99.3%	99.3%
Variable Speed Drive Control, 15 HP	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%
Variable Speed Drive Control, 5 HP	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%
Variable Speed Drive Control, 40 HP	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%
High Speed Fans	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%
High Volume Low Speed Fans	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%
Engineered CKV hood	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%
Fan Thermostat Controller	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Space Cooling - Chillers									
Air-Cooled Recip Chiller	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Air-Cooled Screw Chiller	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Water-Cooled Centrifugal Chiller < 150 ton	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Water-Cooled Centrifugal Chiller 150 - 300 ton	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Water-Cooled Centrifugal Chiller > 300 ton	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Water-Cooled Screw Chiller < 150 ton	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Water-Cooled Screw Chiller 150 - 300 ton	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Water-Cooled Screw Chiller > 300 ton	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Chiller Tune Up	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
High Efficiency Pumps	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%
Efficient Chilled Water Pump	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%
Chilled Hot Water Reset	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%
Air-Cooled Chiller Average Minimum Qualifying 1.04 kW/ton	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Air-Cooled Chiller Average 0.01 kW/ton IPLV Reduction	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Water-Cooled Chiller Average 10% above IECC standard	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Water-Cooled Chiller Average 0.01 kW/ton IPLV Reduction	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
VAV System Conversion	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%
Motor Belt Replacement	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%
Water-Side Economizer	94.5%	94.5%	94.5%	94.5%	94.5%	94.5%	94.5%	94.5%	94.5%
Improved Duct Sealing - Cooling Chiller	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Integrated Building Design	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%
Building Operator Certification	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Energy Efficient Windows	53.0%	40.0%	38.0%	24.0%	48.0%	12.0%	32.0%	7.0%	29.0%
Cool Roof	100.0%	100.0%	93.0%	99.0%	97.0%	100.0%	97.0%	100.0%	99.0%
Ceiling Insulation	53.8%	28.0%	54.0%	47.0%	23.0%	33.0%	31.0%	39.0%	51.0%
Wall Insulation	51.7%	51.7%	51.7%	51.7%	51.7%	51.7%	51.7%	51.7%	51.7%
Roof Insulation	69.5%	69.5%	69.5%	69.5%	69.5%	69.5%	69.5%	69.5%	69.5%
Window Improvements	53.0%	40.0%	38.0%	24.0%	48.0%	12.0%	32.0%	7.0%	29.0%
EMS install	100.0%	82.8%	100.0%	95.5%	75.6%	98.9%	100.0%	54.5%	65.3%
EMS Optimization	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%
HVAC Occupancy Sensors	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Setback with Electric Heat	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
EMS Pump Scheduling Controls	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Web enabled EMS	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Zoning	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%
Retrocommissioning	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Commissioning	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Space Cooling - Unitary and Split AC									
AC <65k	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
AC 65k - 135k	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
AC 135k - 240k	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
AC 240k - 760k	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Consumers Energy Commercial Measure Database - Electric

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Measure Name	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other
AC >760k	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Air Source Heat Pump - Cooling	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Ductless (mini split) - Cooling	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Water Loop Heat Pump (WLHP) - Cooling	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Ground Source Heat Pump - Cooling	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%
Packaged Terminal Air Conditioner (PTAC) - Cooling	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%
WLHP System (Cooling) New Construction	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%
DX Condenser Coil Cleaning	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Room A/C	100.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%
Improved Duct Sealing - Cooling AC	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Integrated Building Design	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%
Building Operator Certification	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Energy Efficient Windows	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%
Cool Roof	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Ceiling Insulation	53.8%	28.0%	54.0%	47.0%	23.0%	33.0%	31.0%	39.0%	51.0%
Wall Insulation	51.7%	51.7%	51.7%	51.7%	51.7%	51.7%	51.7%	51.7%	51.7%
Roof Insulation	69.5%	69.5%	69.5%	69.5%	69.5%	69.5%	69.5%	69.5%	69.5%
Window Improvements	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%
Programmable Thermostats	39.5%	39.5%	39.5%	39.5%	39.5%	39.5%	39.5%	39.5%	39.5%
EMS install	100.0%	82.8%	100.0%	95.5%	75.6%	98.9%	100.0%	54.5%	65.3%
EMS Optimization	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%
Hotel Guest Room Occupancy Control System	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
HVAC Occupancy Sensors	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Setback with Electric Heat	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
EMS Pump Scheduling Controls	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Web enabled EMS	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Zoning	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%
Retrocommissioning	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Commissioning	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Cooking									
HE Steamer	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
HE Combination Oven	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
HE Convection Ovens	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
HE Holding Cabinet	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%
HE Fryer	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
HE Griddle	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Induction Cooktops	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Interior Lighting									
Lamp & Ballast Retrofit (HPT8 Replacing T12)	74.3%	79.2%	71.5%	77.8%	70.0%	76.6%	72.3%	84.3%	78.7%
Lamp & Ballast Retrofit (HPT8 Replacing Standard T8)	74.3%	79.2%	71.5%	77.8%	70.0%	76.6%	72.3%	84.3%	78.7%
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing T12)	74.3%	79.2%	71.5%	77.8%	70.0%	76.6%	72.3%	84.3%	78.7%
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing Standard T8)	74.3%	79.2%	71.5%	77.8%	70.0%	76.6%	72.3%	84.3%	78.7%
T5 HP Retrofits	74.3%	79.2%	71.5%	77.8%	70.0%	76.6%	72.3%	84.3%	78.7%
Light Tube	22.0%	49.0%	16.0%	43.0%	2.0%	33.0%	46.0%	59.5%	24.0%
High Intensity Fluorescent Fixture (replacing HID)	4.5%	3.1%	5.0%	3.1%	5.1%	1.3%	4.3%	1.9%	3.8%
High Intensity Fluorescent Fixture (replacing HID) - New Construction	4.5%	3.1%	5.0%	3.1%	5.1%	1.3%	4.3%	1.9%	3.8%
42W 8 lamp Hi Bay CFL	4.5%	3.1%	5.0%	3.1%	5.1%	1.3%	4.3%	1.9%	3.8%
HID Fixture Upgrade - Pulse Start Metal Halide	4.5%	3.1%	5.0%	3.1%	5.1%	1.3%	4.3%	1.9%	3.8%
Interior induction Lighting	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
CFL Fixture	48.4%	6.4%	5.3%	50.1%	19.3%	11.7%	22.7%	28.9%	53.3%

Consumers Energy Commercial Measure Database - Electric

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Measure Name	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other
CFL Screw-in	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
CFL Screw in Specialty	48.4%	6.4%	5.3%	50.1%	19.3%	11.7%	22.7%	28.9%	53.3%
CFL Reflector Flood	48.4%	6.4%	5.3%	50.1%	19.3%	11.7%	22.7%	28.9%	53.3%
LED Screw In (replacing Incandescent)	48.4%	6.4%	5.3%	50.1%	19.3%	11.7%	22.7%	28.9%	53.3%
LED Screw In (replacing CFL)	43.6%	19.6%	43.1%	40.8%	77.0%	53.5%	38.3%	58.3%	46.7%
LED High bay lighting	100.0%	91.1%	100.0%	100.0%	100.0%	100.0%	100.0%	97.0%	100.0%
LED low bay lighting	99.6%	88.2%	95.2%	91.7%	97.4%	99.8%	95.5%	100.0%	96.9%
LED Downlight	48.4%	6.4%	5.3%	50.1%	19.3%	11.7%	22.7%	28.9%	53.3%
LED Specialty (replacing Incandescent)	48.4%	6.4%	5.3%	50.1%	19.3%	11.7%	22.7%	28.9%	53.3%
LED Specialty (replacing CFL)	43.6%	19.6%	43.1%	40.8%	77.0%	53.5%	38.3%	58.3%	46.7%
LED Troffer	100.0%	91.1%	100.0%	100.0%	100.0%	100.0%	100.0%	97.0%	100.0%
LED Tube Lighting	100.0%	91.1%	100.0%	100.0%	100.0%	100.0%	100.0%	97.0%	100.0%
LED Grow Light	91.0%	81.0%	84.0%	79.0%	48.0%	70.0%	92.0%	40.0%	43.0%
Interior Non Highbay/Lowbay LED Fixtures	99.6%	88.2%	95.2%	91.7%	97.4%	99.8%	95.5%	100.0%	96.9%
Illuminated Signs to LED	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
LED Lighting in Refrigeration	82.8%	88.0%	75.0%	86.5%	85.1%	80.0%	83.5%	72.7%	82.8%
LED Exit Sign	42.1%	27.9%	19.2%	48.3%	13.1%	16.7%	2.6%	55.3%	38.9%
Long Day Lighting Dairy	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Central Lighting Control	96.2%	90.4%	99.2%	88.4%	99.5%	73.4%	82.0%	65.2%	87.6%
Daylight Sensor Controls	96.2%	90.4%	99.2%	88.4%	99.5%	73.4%	82.0%	65.2%	87.6%
Daylight Sensor Controls - New Construction	96.2%	90.4%	99.2%	88.4%	99.5%	73.4%	82.0%	65.2%	87.6%
Occupancy Sensor	96.2%	90.4%	99.2%	88.4%	99.5%	73.4%	82.0%	65.2%	87.6%
Occupancy Sensor & Daylight Sensor	96.2%	90.4%	99.2%	88.4%	99.5%	73.4%	82.0%	65.2%	87.6%
Switching Controls for Multilevel Lighting (Non-HID)	96.2%	90.4%	99.2%	88.4%	99.5%	73.4%	82.0%	65.2%	87.6%
Lighting Power Density - Interior	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%
Stairwell Bi-Level Control	96.2%	96.2%	96.2%	96.2%	96.2%	96.2%	96.2%	96.2%	96.2%
Occupancy Sensors for LED Refrigerator Lighting	82.8%	88.0%	75.0%	86.5%	85.1%	80.0%	83.5%	72.7%	82.8%
Exterior Lighting									
LED Fuel Pump Canopy Fixture	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
LED Auto Traffic Signals	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
LED Pedestrian Signals	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Exterior HID replacement with CFLs	89.3%	48.3%	76.0%	87.8%	71.2%	72.2%	87.8%	91.9%	93.9%
Exterior HID replacement with LEDs	89.3%	48.3%	76.0%	87.8%	71.2%	72.2%	87.8%	91.9%	93.9%
Garage HID replacement with LEDs	89.3%	48.3%	76.0%	87.8%	71.2%	72.2%	87.8%	91.9%	93.9%
Exterior Linear Fluorescent	89.3%	48.3%	76.0%	87.8%	71.2%	72.2%	87.8%	91.9%	93.9%
Lighting Power Density - Exterior	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Lighting Power Density - Parking Garage	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Exterior BiLevel Controls	22.2%	22.2%	22.2%	22.2%	22.2%	22.2%	22.2%	22.2%	22.2%
Garage BiLevel Controls	22.2%	22.2%	22.2%	22.2%	22.2%	22.2%	22.2%	22.2%	22.2%
Sports Field Lighting HiLo Control	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
Refrigeration									
Vending Miser for Refrigerated Vending Machines	94.7%	94.7%	94.7%	94.7%	94.7%	94.7%	94.7%	94.7%	94.7%
Evaporator Fan Motor Controls	73.0%	73.0%	73.0%	73.0%	73.0%	73.0%	73.0%	73.0%	73.0%
Zero-Energy Doors	88.0%	88.0%	88.0%	88.0%	88.0%	88.0%	88.0%	88.0%	88.0%
Discus and Scroll Compressors	73.7%	73.7%	73.7%	73.7%	73.7%	73.7%	73.7%	73.7%	73.7%
Floating Head Pressure Control	98.6%	98.6%	98.6%	98.6%	98.6%	98.6%	98.6%	98.6%	98.6%
ENERGY STAR Commercial Solid Door Refrigerators	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
ENERGY STAR Commercial Solid Door Freezers	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
ENERGY STAR Commercial Glass Door Refrigerators	98.7%	98.7%	98.7%	98.7%	98.7%	98.7%	98.7%	98.7%	98.7%
ENERGY STAR Commercial Glass Door Freezers	98.7%	98.7%	98.7%	98.7%	98.7%	98.7%	98.7%	98.7%	98.7%

Consumers Energy Commercial Measure Database - Electric

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Is the fraction of applicable kWh or therm sales that are associated with equipment that has not yet been converted to the energy efficiency measure; that is, one minus the fraction of the market segment that already have the energy-efficiency measure installed.

Measure Name	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other
Energy Star Ice Machines	97.9%	97.9%	97.9%	97.9%	97.9%	97.9%	97.9%	97.9%	97.9%
Strip Curtains	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Anti Sweat Heater Controls	94.2%	94.2%	94.2%	94.2%	94.2%	94.2%	94.2%	94.2%	94.2%
Efficient Refrigeration Condenser	73.7%	73.7%	73.7%	73.7%	73.7%	73.7%	73.7%	73.7%	73.7%
Door Gaskets - Cooler and Freezer	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%
Reach-in Refrigerated display case door retrofit	65.5%	65.5%	65.5%	65.5%	65.5%	65.5%	65.5%	65.5%	65.5%
Refrigeration Savings due to Lighting Savings	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
ECM Case Motors	88.0%	88.0%	88.0%	88.0%	88.0%	88.0%	88.0%	88.0%	88.0%
Efficient low-temp compressor	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Automatic High Speed Doors	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Automatic Door Closers for Refrigerated Walk-in Coolers/Freezers	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Refrigerant charging correction	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Walk-in Cooler Evaporator Motor Reduction	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Compressed Air									
Efficient Air Compressors	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%
Automatic Drains	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%
Cycling Dryers	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%
Low Pressure Drop-Filters	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%
Air-Entraining Air Nozzles	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%
Receiver Capacity Addition	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%
Compressed Air Audits & Leak Repair	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Compressed Air Pressure Flow Controller replacing no flow controller	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%
High Efficiency Air Dryers	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%
Air Compressor Outdoor Air Intake	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%
Variable Displacement Air Compressor	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%
Compressed Air Storage Tank	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Compressed Air Replacement with Air Blowers	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Space Heating									
Air Source Heat Pump - Heating	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Ground Source Heat Pump - Heating	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%
Ductless (mini split) - Heating	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
VFD Pumps	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%
ECM motors on furnaces	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%
Water Loop Heat Pump (WLHP) - Heating	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
WLHP System (Heating) New Construction	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%
Integrated Building Design	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%
Building Operator Certification	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Energy Efficient Windows	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%
Cool Roof	98.3%	98.3%	98.3%	98.3%	98.3%	98.3%	98.3%	98.3%	98.3%
Ceiling Insulation	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%
Wall Insulation	51.7%	51.7%	51.7%	51.7%	51.7%	51.7%	51.7%	51.7%	51.7%
Roof Insulation	69.5%	69.5%	69.5%	69.5%	69.5%	69.5%	69.5%	69.5%	69.5%
Window Improvements	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%
EMS install	100.0%	82.8%	100.0%	95.5%	75.6%	98.9%	100.0%	54.5%	65.3%
EMS Optimization	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%
Hotel Guest Room Occupancy Control System	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
HVAC Occupancy Sensors	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Setback with Electric Heat	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
EMS Pump Scheduling Controls	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Web enabled EMS	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Web enabled EMS with Electric Heat	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Consumers Energy Commercial Measure Database - Electric

Remaining Factor:

Is the fraction of applicable kWh or therm sales that are associated with equipment that has not yet been converted to the energy efficiency measure; that is, one minus the fraction of the market segment that already have the energy-efficiency measure installed.

Measure Name	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other
Zoning	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%
Retrocommissioning	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Commissioning	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Infrared Heater	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Other									
NEMA Premium Transformer, single-phase	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%
NEMA Premium Transformer, three-phase	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%
High Efficiency Transformer, single-phase	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%
High Efficiency Transformer, three-phase	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%
Optimized Snow and Ice Melt Controls (electric)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Engine Block Heater Timer	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Parking Garage Exhaust Fan CO Control	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Consumers Energy Commercial Measure Database - Electric

Convertible Factor:
Is the fraction of the equipment or practice that is technically feasible for conversion to the efficient technology from an engineering perspective (e.g., it may not be possible to install VFDs on all motors in a given market segment).

Measure Name	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other
Computers & Office Equipment									
Energy Star Compliant Refrigerator	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Energy Star office equipment including computers, monitors, copiers, multi-function machines.	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Smart Strip plug outlet	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
PC Network Energy Management Controls replacing no central control	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Energy Star UPS	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Vendor Miser for Non-Refrig Equipment	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
High Efficiency Hand Dryer	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Electrically Commutated Plug Fans in data centers	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
High Efficiency CRAC unit	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Computer Room Air Conditioner Economizer	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Computer Room Hot Aisle Cold Aisle Configuration	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Computer Room Air Side Economizer	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
VFD for Process Fans -CRAC units	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Water Heating									
Heat Pump Water Heater	25.0%	25.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
HP Water Heater - Residential unit in Commercial Application	25.0%	25.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
Heat Pump Storage Water Heater	25.0%	25.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
Electric Tankless Water Heater	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%
Low Flow Faucet Aerator	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Low Flow Showerhead	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Hot Water (DHW) Pipe Insulation	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Clothes Washer ENERGY STAR, Gas water heater, Gas dryer	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Clothes Washer ENERGY STAR, Gas water heater, Electric dryer	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Clothes Washer ENERGY STAR, Electric Water heater, Gas Dryer	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Clothes Washer ENERGY STAR, Electric Water heater, Electric Dryer	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
ES Dishwasher, High Temp, Elec Heat, Elec Booster	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%
ES Dishwasher, High Temp, Gas Heat, Elec Booster	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%
ES Dishwasher, High Temp, Gas Heat, Gas Booster	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%
ES Dishwasher, Low Temp, Elec Heat	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%
ES Dishwasher, Low Temp, Gas Heat	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%
Tank Insulation (electric)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Pre Rinse Sprayers (electric)	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
ECM Circulator Pump	10.0%	5.0%	80.0%	10.0%	20.0%	80.0%	80.0%	15.0%	5.0%
Drain water Heat Recovery Water Heater	39.0%	39.0%	39.0%	39.0%	39.0%	39.0%	39.0%	39.0%	39.0%
Efficient Hot Water Pump	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
HVAC Condenser Heater Recovery Water Heating	39.0%	39.0%	39.0%	39.0%	39.0%	39.0%	39.0%	39.0%	39.0%
Process Cooling Condenser Heater Recovery Water Heating	39.0%	39.0%	39.0%	39.0%	39.0%	39.0%	39.0%	39.0%	39.0%
Pools									
Heat Pump Pool Heater	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
High efficiency spas/hot tubs	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Ventilation									
Economizer	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%
Demand-Controlled Ventilation	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%

Consumers Energy Commercial Measure Database - Electric

Convertible Factor:
Is the fraction of the equipment or practice that is technically feasible for conversion to the efficient technology from an engineering perspective (e.g., it may not be possible to install VFDs on all motors in a given market segment).

Measure Name	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other
Variable Speed Drive Control, 15 HP	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%
Variable Speed Drive Control, 5 HP	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%
Variable Speed Drive Control, 40 HP	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%
High Speed Fans	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
High Volume Low Speed Fans	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Engineered CKV hood	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Fan Thermostat Controller	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%
Space Cooling - Chillers									
Air-Cooled Recip Chiller	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%
Air-Cooled Screw Chiller	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%
Water-Cooled Centrifugal Chiller < 150 ton	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%
Water-Cooled Centrifugal Chiller 150 - 300 ton	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%
Water-Cooled Centrifugal Chiller > 300 ton	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%
Water-Cooled Screw Chiller < 150 ton	0.0%	0.0%	0.0%	80.0%	0.0%	80.0%	0.0%	80.0%	0.0%
Water-Cooled Screw Chiller 150 - 300 ton	0.0%	0.0%	0.0%	95.0%	0.0%	95.0%	0.0%	95.0%	0.0%
Water-Cooled Screw Chiller > 300 ton	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%
Chiller Tune Up	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%
High Efficiency Pumps	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%
Efficient Chilled Water Pump	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%
Chilled Hot Water Reset	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%
Air-Cooled Chiller Average Minimum Qualifying 1.04 kW/ton	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%
Air-Cooled Chiller Average 0.01 kW/ton IPLV Reduction	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%
Water-Cooled Chiller Average 10% above IECC standard	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%
Water-Cooled Chiller Average 0.01 kW/ton IPLV Reduction	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%
VAV System Conversion	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%
Motor Belt Replacement	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%
Water-Side Economizer	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%
Improved Duct Sealing - Cooling Chiller	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Integrated Building Design	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Building Operator Certification	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Energy Efficient Windows	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%
Cool Roof	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%
Ceiling Insulation	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Wall Insulation	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Roof Insulation	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Window Improvements	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
EMS install	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
EMS Optimization	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
HVAC Occupancy Sensors	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Setback with Electric Heat	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
EMS Pump Scheduling Controls	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Web enabled EMS	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Zoning	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%
Retrocommissioning	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%
Commissioning	71.0%	71.0%	71.0%	71.0%	71.0%	71.0%	71.0%	71.0%	71.0%
Space Cooling - Unitary and Split AC									
AC <65k	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
AC 65k - 135k	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
AC 135k - 240k	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
AC 240k - 760k	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
AC >760k	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Air Source Heat Pump - Cooling	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%

Consumers Energy Commercial Measure Database - Electric

Convertible Factor:
Is the fraction of the equipment or practice that is technically feasible for conversion to the efficient technology from an engineering perspective (e.g., it may not be possible to install VFDs on all motors in a given market segment).

Measure Name	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other
Ductless (mini split) - Cooling	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
Water Loop Heat Pump (WLHP) - Cooling	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
Ground Source Heat Pump - Cooling	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
Packaged Terminal Air Conditioner (PTAC) - Cooling	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
WLHP System (Cooling) New Construction	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
DX Condenser Coil Cleaning	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Room A/C	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Improved Duct Sealing - Cooling AC	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Integrated Building Design	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Building Operator Certification	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Energy Efficient Windows	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%
Cool Roof	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%
Ceiling Insulation	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Wall Insulation	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Roof Insulation	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Window Improvements	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Programmable Thermostats	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
EMS install	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
EMS Optimization	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Hotel Guest Room Occupancy Control System	0.0%	0.0%	0.0%	0.0%	90.0%	0.0%	0.0%	0.0%	0.0%
HVAC Occupancy Sensors	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Setback with Electric Heat	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
EMS Pump Scheduling Controls	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Web enabled EMS	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Zoning	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Retrocommissioning	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%
Commissioning	71.0%	71.0%	71.0%	71.0%	71.0%	71.0%	71.0%	71.0%	71.0%
Cooking									
HE Steamer	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
HE Combination Oven	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
HE Convection Ovens	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
HE Holding Cabinet	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
HE Fryer	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
HE Griddle	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Induction Cooktops	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Interior Lighting									
Lamp & Ballast Retrofit (HPT8 Replacing T12)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Lamp & Ballast Retrofit (HPT8 Replacing Standard T8)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing T12)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing Standard T8)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
T5 HP Retrofits	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Light Tube	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
High Intensity Fluorescent Fixture (replacing HID)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
High Intensity Fluorescent Fixture (replacing HID) - New Construction	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
42W 8 lamp Hi Bay CFL	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
HID Fixture Upgrade - Pulse Start Metal Halide	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Interior induction Lighting	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%
CFL Fixture	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
CFL Screw-in	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
CFL Screw in Specialty	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Consumers Energy Commercial Measure Database - Electric

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Measure Name	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other
CFL Reflector Flood	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
LED Screw In (replacing Incandescent)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
LED Screw In (replacing CFL)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
LED High bay lighting	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
LED low bay lighting	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
LED Downlight	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
LED Specialty (replacing Incandescent)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
LED Specialty (replacing CFL)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
LED Troffer	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
LED Tube Lighting	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
LED Grow Light	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Interior Non Highbay/Lowbay LED Fixtures	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Illuminated Signs to LED	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
LED Lighting in Refrigeration	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
LED Exit Sign	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Long Day Lighting Dairy	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Central Lighting Control	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Daylight Sensor Controls	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%
Daylight Sensor Controls - New Construction	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%
Occupancy Sensor	90.0%	10.0%	10.0%	20.0%	10.0%	10.0%	0.0%	50.0%	20.0%
Occupancy Sensor & Daylight Sensor	90.0%	10.0%	10.0%	20.0%	10.0%	10.0%	0.0%	50.0%	20.0%
Switching Controls for Multilevel Lighting (Non-HID)	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Lighting Power Density - Interior	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Stairwell Bi-Level Control	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Occupancy Sensors for LED Refrigerator Lighting	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Exterior Lighting									
LED Fuel Pump Canopy Fixture	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
LED Auto Traffic Signals	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
LED Pedestrian Signals	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Exterior HID replacement with CFLs	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Exterior HID replacement with LEDs	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Garage HID replacement with LEDs	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Exterior Linear Fluorescent	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Lighting Power Density - Exterior	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Lighting Power Density - Parking Garage	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Exterior BiLevel Controls	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Garage BiLevel Controls	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Sports Field Lighting HiLo Control	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Refrigeration									
Vending Miser for Refrigerated Vending Machines	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Evaporator Fan Motor Controls	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Zero-Energy Doors	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Discus and Scroll Compressors	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Floating Head Pressure Control	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%
ENERGY STAR Commercial Solid Door Refrigerators	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
ENERGY STAR Commercial Solid Door Freezers	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
ENERGY STAR Commercial Glass Door Refrigerators	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
ENERGY STAR Commercial Glass Door Freezers	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Energy Star Ice Machines	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Strip Curtains	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

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Is the fraction of the equipment or practice that is technically feasible for conversion to the efficient technology from an engineering perspective (e.g., it may not be possible to install VFDs on all motors in a given market segment).

Measure Name	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other
Anti Sweat Heater Controls	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Efficient Refrigeration Condenser	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Door Gaskets - Cooler and Freezer	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Reach-in Refrigerated display case door retrofit	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Refrigeration Savings due to Lighting Savings	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
ECM Case Motors	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Efficient low-temp compressor	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Automatic High Speed Doors	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Automatic Door Closers for Refrigerated Walk-in Coolers/Freezers	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Refrigerant charging correction	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Walk-in Cooler Evaporator Motor Reduction	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Compressed Air									
Efficient Air Compressors	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Automatic Drains	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Cycling Dryers	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Low Pressure Drop-Filters	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Air-Entraining Air Nozzles	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Receiver Capacity Addition	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Compressed Air Audits & Leak Repair	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Compressed Air Pressure Flow Controller replacing no flow controller	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
High Efficiency Air Dryers	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Air Compressor Outdoor Air Intake	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Variable Displacement Air Compressor	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Compressed Air Storage Tank	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Compressed Air Replacement with Air Blowers	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Space Heating									
Air Source Heat Pump - Heating	77.0%	77.0%	77.0%	67.0%	77.0%	60.0%	77.0%	60.0%	77.0%
Ground Source Heat Pump - Heating	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%
Ductless (mini split) - Heating	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
VFD Pumps	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
ECM motors on furnaces	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Water Loop Heat Pump (WLHP) - Heating	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%
WLHP System (Heating) New Construction	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%
Integrated Building Design	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Building Operator Certification	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Energy Efficient Windows	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%
Cool Roof	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%
Ceiling Insulation	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Wall Insulation	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Roof Insulation	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Window Improvements	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
EMS install	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
EMS Optimization	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Hotel Guest Room Occupancy Control System	0.0%	0.0%	0.0%	0.0%	90.0%	90.0%	90.0%	90.0%	90.0%
HVAC Occupancy Sensors	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Setback with Electric Heat	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
EMS Pump Scheduling Controls	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Web enabled EMS	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Web enabled EMS with Electric Heat	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Zoning	71.0%	71.0%	71.0%	71.0%	71.0%	71.0%	71.0%	71.0%	71.0%
Retrocommissioning	77.0%	77.0%	77.0%	77.0%	77.0%	77.0%	77.0%	77.0%	77.0%

Consumers Energy Commercial Measure Database - Electric

Convertible Factor:
Is the fraction of the equipment or practice that is technically feasible for conversion to the efficient technology from an engineering perspective (e.g., it may not be possible to install VFDs on all motors in a given market segment).

Measure Name	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other
Commissioning	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%
Infrared Heater	77.0%	77.0%	77.0%	67.0%	77.0%	60.0%	77.0%	60.0%	77.0%

Consumers Energy Commercial Measure Database - Electric

Convertible Factor:
Is the fraction of the equipment or practice that is technically feasible for conversion to the efficient technology from an engineering perspective (e.g., it may not be possible to install VFDs on all motors in a given market segment).

Measure Name	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other
Other									
NEMA Premium Transformer, single-phase	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%
NEMA Premium Transformer, three-phase	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%
High Efficiency Transformer, single-phase	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%
High Efficiency Transformer, three-phase	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%
Optimized Snow and Ice Melt Controls (electric)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Engine Block Heater Timer	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Parking Garage Exhaust Fan CO Control	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Consumers Energy Commercial Measure Database - Electric

Electric Measure Sources

Source Number	Source
1	Michigan Master Database of Deemed Savings - 2016 - Non-Weather Sensitive Commercial
2	Michigan Master Database of Deemed Savings - 2016 - Weather Sensitive
3	Michigan Master Database of Deemed Savings - 2016 Work Papers
4	ENERGY STAR Qualified Office Equipment Calculator
5	Vermont TRM - Manual No. 2014-87
6	Drain Water Heat Recovery Characterization and Modeling - Final Report, C. Zaloum, M. Lafrance, J Gusdorf, 2007
7	California Energy Commission Codes and Standards Enhancement (CASE) Initative: Analysis of Standards Options for Residential Swimming Pool & Portable Spa Equipment, July 2013
8	Mid-Atlantic TRM Version 4.0 June 2014
9	DC DDOE Natural Gas Efficiency Potential, Dec 2012 Completed by GDS Associates, Inc.
10	GDS Previous Study or GDS Engineering Estimate based upon past project experience
11	Big Ass Fan Company Calculations, http://www.todaysfacilitymanager.com/articles/the-hvac-factor-high-volume-low-speed-fans.php
12	Pacific NW Natitional Labs - HVAC Occupancy Sensor Study
13	https://kindledgrowlights.com/led-technology/led-cost-savings/
14	Energy Star Website. http://www.energystar.gov/products/commercial_food_service_equipment/commercial_ice_makers
15	2011 Michigan Statewide Commercial Baseline Study
16	2013 DTE Energy Commercial Baseline Study
17	2011 DTE Commercial Baseline Study
18	2011 Delaware Commercial Baseline Study
19	DTE Non-Residential Potential Study 2010
20	;2010 Maryland Commercial Baseline Study
21	US DOE, EERE Consumer's Guide to Energy Efficiency and Renewable Energy, "Solar Swimming Pool Heaters" http://apps1.eere.energy.gov/consumer/your_home/water_heating/index.cfm/mytopic=13230
22	Building Commissioning - A Golden Opportunity for Reducing Energy Costs and Greenhouse Gas Emissions. Lawrence Berkeley National Laboratory. Report Prepared for: California Energy Commission Public Interest Energy Research (PIER) - July 21, 2009

Consumers Energy Commercial Measure Database - Electric

Measure Savings, Cost and Useful Life, Savings Factor, Remaining Factor Sources
Reference numbers designate source for information from Electric Measure Source List

Measure Name	Annual kWh Savings	Cost/ Unit	Effective Measure Life	Savings Factor	Remaining Factor
Computers & Office Equipment					
Energy Star Compliant Refrigerator	3	3	1	3	16
Energy Star office equipment including computers, monitors, copiers, multi-function machines.	4	10	4	3	15
Smart Strip plug outlet	1	1	1	3	10
PC Network Energy Management Controls replacing no central control	1	1	1	3	16
Energy Star UPS	1	1	1	3	10
Vendor Miser for Non-Refrig Equipment	1	1	1	3	17
High Efficiency Hand Dryer	1	1	1	3	10
Electrically Commutated Plug Fans in data centers	1	1	1	3	10
High Efficiency CRAC unit	1	1	1	3	10
Computer Room Air Conditioner Economizer	1	1	1	3	10
Computer Room Hot Aisle Cold Aisle Configuration	1	1	1	3	10
Computer Room Air Side Economizer	1	1	1	3	10
VFD for Process Fans -CRAC units	1	1	1	3	10
Water Heating					
Heat Pump Water Heater	1	1	1	3	15
HP Water Heater - Residential unit in Commercial Application	1	1	1	3	15
Heat Pump Storage Water Heater	1	1	1	3	10
Electric Tankless Water Heater	1	1	1	3	15
Low Flow Faucet Aerator	1	1	1	3	16
Low Flow Showerhead	1	1	1	3	16
Hot Water (DHW) Pipe Insulation	1	1	1	3	15
Clothes Washer ENERGY STAR, Gas water heater, Gas dryer	1	1	1	3	19
Clothes Washer ENERGY STAR, Gas water heater, Electric dryer	1	1	1	3	19
Clothes Washer ENERGY STAR, Electric Water heater, Gas Dryer	1	1	1	3	19
Clothes Washer ENERGY STAR, Electric Water heater, Electric Dryer	1	1	1	3	19
ES Dishwasher, High Temp, Elec Heat, Elec Booster	1	1	1	3	19
ES Dishwasher, High Temp, Gas Heat, Elec Booster	1	1	1	3	19
ES Dishwasher, High Temp, Gas Heat, Gas Booster	1	1	1	3	19
ES Dishwasher, Low Temp, Elec Heat	1	1	1	3	19
ES Dishwasher, Low Temp, Gas Heat	1	1	1	3	19
Tank Insulation (electric)	1	1	1	3	16

Consumers Energy Commercial Measure Database - Electric

Measure Savings, Cost and Useful Life, Savings Factor, Remaining Factor Sources
Reference numbers designate source for information from Electric Measure Source List

Measure Name	Annual kWh Savings	Cost/ Unit	Effective Measure Life	Savings Factor	Remaining Factor
Pre Rinse Sprayers (electric)	1	1	1	3	10
ECM Circulator Pump	1	1	1	3	10
Drain water Heat Recovery Water Heater	6	5	5	3	15
Efficient Hot Water Pump	2	2	2	3	20
HVAC Condenser Heater Recovery Water Heating	1	1	1	3	15
Process Cooling Condenser Heater Recovery Water Heating	1	1	1	3	15
Pools					
Heat Pump Pool Heater	7	7	7	3	16
High efficiency spas/hot tubs	7	7	7	3	16
Ventilation					
Economizer	2	2	2	10	15
Demand-Controlled Ventilation	2	2	2	3	15
Variable Speed Drive Control, 15 HP	1	1	1	3	10
Variable Speed Drive Control, 5 HP	1	1	1	3	10
Variable Speed Drive Control, 40 HP	1	1	1	3	10
High Speed Fans	1	1	1	3	10
High Volume Low Speed Fans	1	1	1	3	10
Engineered CKV hood	2	2	2	3	10
Fan Thermostat Controller	2	2	2	3	10
Space Cooling - Chillers					
Air-Cooled Recip Chiller	2	2	2	3	10
Air-Cooled Screw Chiller	2	2	2	3	10
Water-Cooled Centrifugal Chiller < 150 ton	2	2	2	3	10
Water-Cooled Centrifugal Chiller 150 - 300 ton	2	2	2	3	10
Water-Cooled Centrifugal Chiller > 300 ton	2	2	2	3	10
Water-Cooled Screw Chiller < 150 ton	2	2	2	3	10
Water-Cooled Screw Chiller 150 - 300 ton	2	2	2	3	10
Water-Cooled Screw Chiller > 300 ton	2	2	2	3	10
Chiller Tune Up	2	2	2	10	15
High Efficiency Pumps	1	1	1	3	20
Efficient Chilled Water Pump	2	2	2	3	20
Chilled Hot Water Reset	2	2	2	3	20
Air-Cooled Chiller Average Minimum Qualifying 1.04 kW/ton	2	2	2	3	10
Air-Cooled Chiller Average 0.01 kW/ton IPLV Reduction	2	2	2	3	10
Water-Cooled Chiller Average 10% above IECC standard	2	2	2	3	10
Water-Cooled Chiller Average 0.01 kW/ton IPLV Reduction	2	2	2	3	10
VAV System Conversion	2	2	2	3	10
Motor Belt Replacement	1	1	1	3	16
Water-Side Economizer	1	1	1	3	10

Consumers Energy Commercial Measure Database - Electric

Measure Savings, Cost and Useful Life, Savings Factor, Remaining Factor Sources
Reference numbers designate source for information from Electric Measure Source List

Measure Name	Annual kWh Savings	Cost/ Unit	Effective Measure Life	Savings Factor	Remaining Factor
Improved Duct Sealing - Cooling Chiller	2	2	2	3	16
Integrated Building Design	10	10	10	3	16
Building Operator Certification	1	1	1	3	10
Energy Efficient Windows	2	2	2	3	15
Cool Roof	2	2	2	3	15
Ceiling Insulation	2	2	2	3	15
Wall Insulation	2	2	2	3	15
Roof Insulation	2	2	2	3	16
Window Improvements	2	2	2	3	15
EMS install	2	2	2	3	16
EMS Optimization	2	2	2	3	16
HVAC Occupancy Sensors	2	2	2	13	10
Setback with Electric Heat	2	2	2	3	10
EMS Pump Scheduling Controls	2	2	2	3	10
Web enabled EMS	2	2	2	3	10
Zoning	10	10	10	3	10
Retrocommissioning	10	10	10	3	10
Commissioning	22	22	22	3	10
Space Cooling - Unitary & Split AC					
AC <65k	2	2	2	3	10
AC 65k - 135k	2	2	2	3	10
AC 135k - 240k	2	2	2	3	10
AC 240k - 760k	2	2	2	3	10
AC >760k	2	2	2	3	10
Air Source Heat Pump - Cooling	2	2	2	3	10
Ductless (mini split) - Cooling	2	2	2	3	15
Water Loop Heat Pump (WLHP) - Cooling	2	2	2	3	10
Ground Source Heat Pump - Cooling	2	2	2	3	10
Packaged Terminal Air Conditioner (PTAC) - Cooling	2	2	2	3	10
WLHP System (Cooling) New Construction	2	2	2	3	10
DX Condenser Coil Cleaning	2	2	2	3	10
Room A/C	1	1	1	3	10
Improved Duct Sealing - Cooling AC	2	2	2	3	16
Integrated Building Design	10	10	10	3	16
Building Operator Certification	1	1	1	3	10
Energy Efficient Windows	2	2	2	3	15
Cool Roof	2	2	2	3	15
Ceiling Insulation	2	2	2	3	15
Wall Insulation	2	2	2	3	15
Roof Insulation	2	2	2	3	16
Window Improvements	2	2	2	3	15
Programmable Thermostats	2	2	2	3	16

Consumers Energy Commercial Measure Database - Electric

Measure Savings, Cost and Useful Life, Savings Factor, Remaining Factor Sources
Reference numbers designate source for information from Electric Measure Source List

Measure Name	Annual kWh Savings	Cost/ Unit	Effective Measure Life	Savings Factor	Remaining Factor
EMS install	2	2	2	3	16
EMS Optimization	2	2	2	3	16
Hotel Guest Room Occupancy Control System	1	1	1	3	15
HVAC Occupancy Sensors	2	2	2	13	10
Setback with Electric Heat	2	2	2	3	10
EMS Pump Scheduling Controls	2	2	2	3	10
Web enabled EMS	2	2	2	3	10
Zoning	10	10	10	3	10
Retrocommissioning	10	10	10	3	10
Commissioning	22	22	22	3	10
Cooking					
HE Steamer	1	1	1	3	15
HE Combination Oven	1	1	1	3	15
HE Convection Ovens	1	1	1	3	15
HE Holding Cabinet	1	1	1	3	15
HE Fryer	1	1	1	3	15
HE Griddle	1	1	1	3	15
Induction Cooktops	10	10	10	3	15
Interior Lighting					
Lamp & Ballast Retrofit (HPT8 Replacing T12)	1	1	1	3	16
Lamp & Ballast Retrofit (HPT8 Replacing Standard T8)	1	1	1	3	16
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing T12)	1	1	1	3	16
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing Standard T8)	1	1	1	3	16
T5 HP Retrofits	1	1	1	3	16
Light Tube	1	1	1	10	16
High Intensity Fluorescent Fixture (replacing HID)	1	1	1	3	16
High Intensity Fluorescent Fixture (replacing HID) - New Construction	1	1	1	3	16
42W 8 lamp Hi Bay CFL	1	1	1	3	16
HID Fixture Upgrade - Pulse Start Metal Halide	1	1	1	3	16
Interior induction Lighting	1	1	1	3	16
CFL Fixture	1	1	1	3	16
CFL Screw-in	1	1	1	3	16
CFL Screw in Specialty	1	1	1	3	16
CFL Reflector Flood	1	1	1	3	16
LED Screw In (replacing Incandescent)	1	1	1	3	16
LED Screw In (replacing CFL)	1	1	1	3	16
LED High bay lighting	1	1	1	3	16
LED low bay lighting	1	1	1	3	16
LED Downlight	1	1	1	3	16

Consumers Energy Commercial Measure Database - Electric

Measure Savings, Cost and Useful Life, Savings Factor, Remaining Factor Sources
Reference numbers designate source for information from Electric Measure Source List

Measure Name	Annual kWh Savings	Cost/ Unit	Effective Measure Life	Savings Factor	Remaining Factor
LED Specialty (replacing Incandescent)	1	1	1	3	16
LED Specialty (replacing CFL)	1	1	1	3	16
LED Troffer	1	1	1	3	16
LED Tube Lighting	1	1	1	3	16
LED Grow Light	1	1	1	15	16
Interior Non Highbay/Lowbay LED Fixtures	1	1	1	3	16
Illuminated Signs to LED	1	1	1	3	15
LED Lighting in Refrigeration	1	1	1	3	15
LED Exit Sign	1	1	1	3	16
Long Day Lighting Dairy	1	1	1	3	10
Central Lighting Control	1	1	1	3	16
Daylight Sensor Controls	1	1	1	3	16
Daylight Sensor Controls - New Construction	1	1	1	3	16
Occupancy Sensor	1	1	1	3	16
Occupancy Sensor & Daylight Sensor	1	1	1	3	16
Switching Controls for Multilevel Lighting (Non-HID)	1	1	1	3	16
Lighting Power Density - Interior	1	1	1	3	10
Stairwell Bi-Level Control	1	1	1	3	16
Occupancy Sensors for LED Refrigerator Lighting	1	1	1	3	15
Exterior Lighting					
LED Fuel Pump Canopy Fixture	8	8	8	3	10
LED Auto Traffic Signals	1	1	1	3	18
LED Pedestrian Signals	1	1	1	3	18
Exterior HID replacement with CFLs	1	1	1	3	15
Exterior HID replacement with LEDs	1	1	1	3	10
Garage HID replacement with LEDs	1	1	1	3	10
Exterior Linear Fluorescent	1	1	1	3	10
Lighting Power Density - Exterior	1	1	1	3	10
Lighting Power Density - Parking Garage	1	1	1	3	10
Exterior BiLevel Controls	1	1	1	3	16
Garage BiLevel Controls	1	1	1	3	16
Sports Field Lighting HiLo Control	1	1	1	3	16
Refrigeration					
Vending Miser for Refrigerated Vending Machines	1	1	1	3	16
Evaporator Fan Motor Controls	1	1	1	3	16
Zero-Energy Doors	5	5	5	3	16
Discus and Scroll Compressors	5	5	5	3	16
Floating Head Pressure Control	1	1	1	3	16
ENERGY STAR Commercial Solid Door Refrigerators	1	1	1	3	15
ENERGY STAR Commercial Solid Door Freezers	1	1	1	3	15

Consumers Energy Commercial Measure Database - Electric

Measure Savings, Cost and Useful Life, Savings Factor, Remaining Factor Sources
Reference numbers designate source for information from Electric Measure Source List

Measure Name	Annual kWh Savings	Cost/ Unit	Effective Measure Life	Savings Factor	Remaining Factor
ENERGY STAR Commercial Glass Door Refrigerators	1	1	1	3	15
ENERGY STAR Commercial Glass Door Freezers	1	1	1	3	15
Energy Star Ice Machines	1	1	1	14	15
Strip Curtains	1	1	1	3	10
Anti Sweat Heater Controls	1	1	1	3	16
Efficient Refrigeration Condenser	1	1	1	3	16
Door Gaskets - Cooler and Freezer	1	1	1	3	15
Reach-in Refrigerated display case door retrofit	1	1	1	3	15
Refrigeration Savings due to Lighting Savings	1	1	1	3	15
ECM Case Motors	1	1	1	3	16
Efficient low-temp compressor	5	5	5	3	10
Automatic High Speed Doors	1	1	1	3	10
Automatic Door Closers for Refrigerated Walk-in Coolers/Freezers	1	1	1	3	10
Refrigerant charging correction	2	2	2	3	10
Walk-in Cooler Evaporator Motor Reduction	1	1	1	3	10
Night Covers	1	1	1	3	10
Refrigeration Suction Line Insulation	1	1	1	3	10
Compressed Air					
Efficient Air Compressors	1	1	1	3	10
Automatic Drains	1	1	1	3	10
Cycling Dryers	1	1	1	3	10
Low Pressure Drop-Filters	1	1	1	3	10
Air-Entraining Air Nozzles	1	1	1	3	10
Receiver Capacity Addition	5	5	5	3	10
Compressed Air Audits & Leak Repair	1	1	1	3	10
Compressed Air Pressure Flow Controller replacing no flow controller	1	1	1	3	10
High Efficiency Air Dryers	1	1	1	3	10
Air Compressor Outdoor Air Intake	1	1	1	3	10
Variable Displacement Air Compressor	1	1	1	3	10
Compressed Air Storage Tank	1	1	1	3	10
Compressed Air Replacement with Air Blowers	1	1	1	3	10
Space Heating					
Air Source Heat Pump - Heating	2	2	2	3	10
Ground Source Heat Pump - Heating	2	2	2	3	10
Ductless (mini split) - Heating	2	2	2	3	10
VFD Pumps	1	1	1	3	20
ECM motors on furnaces	1	1	1	3	20
Water Loop Heat Pump (WLHP) - Heating	2	2	2	3	10
WLHP System (Heating) New Construction	2	2	2	3	10
Integrated Building Design	10	10	10	3	16

Consumers Energy Commercial Measure Database - Electric

Measure Savings, Cost and Useful Life, Savings Factor, Remaining Factor Sources
Reference numbers designate source for information from Electric Measure Source List

Measure Name	Annual kWh Savings	Cost/ Unit	Effective Measure Life	Savings Factor	Remaining Factor
Building Operator Certification	1	1	1	3	10
Energy Efficient Windows	2	2	2	3	15
Cool Roof	2	2	2	3	15
Ceiling Insulation	2	2	2	3	15
Wall Insulation	2	2	2	3	15
Roof Insulation	2	2	2	3	16
Window Improvements	2	2	2	3	15
EMS install	2	2	2	3	16
EMS Optimization	2	2	2	3	16
Hotel Guest Room Occupancy Control System	1	1	1	3	15
HVAC Occupancy Sensors	2	2	2	13	10
Setback with Electric Heat	2	2	2	3	10
EMS Pump Scheduling Controls	2	2	2	3	10
Web enabled EMS	2	2	2	3	10
Web enabled EMS with Electric Heat	2	2	2	3	10
Zoning	10	10	10	3	10
Retrocommissioning	10	10	10	3	10
Commissioning	22	22	22	3	10
Infrared Heater	2	2	2	3	10
Other					
NEMA Premium Transformer, single-phase	1	1	1	3	10
NEMA Premium Transformer, three-phase	1	1	1	3	10
High Efficiency Transformer, single-phase	1	1	1	3	10
High Efficiency Transformer, three-phase	1	1	1	3	10
Optimized Snow and Ice Melt Controls (electric)	1	1	1	3	10
Engine Block Heater Timer	1	1	1	3	10
Parking Garage Exhaust Fan CO Control	1	1	1	3	10

APPENDIX C | INDUSTRIAL MEASURE DETAIL

Consumers Energy Industrial Measure Database - Electric

Measure Savings, Cost and Useful Life

Consumers Energy	Measure Assumption					
Measure Name	**Annual kWh Savings**	**Cost Type: 1=Full 2=Inc.**	**Cost/Unit Descriptor**	**Cost/Unit**	**Effective Measure Life**	**UCT**
Computers & Office Equipment						
Energy Star Compliant Single Door Refrigerator	47.80	2	Per Unit	$30.75	16	1.8
Energy Star office equipment including computers, monitors, copiers, multi-function machines.	631.00	2	per set	$20.00	5	11.5
Energy Efficient "Smart" Power Strip for PC/Monitor/Printer	16.97	1	per unit	$40.00	5	0.2
PC Network Energy Management Controls replacing no central control	135.00	1	per PC	$17.00	4	2.3
Energy Star UPS	104.79	2	per kW	$1,303.35	10	0.1
High Efficiency CRAC Unit	162.33	1	MBH	$82.50	15	2.1
Water Heating						
Heat Pump Water Heater	184058.00	2	per heater	$10,600.00	15	29.5
Electric Tankless Water Heater	621.00	2	$/Unit	$466.00	20	2.5
Efficient Hot Water Pump	525.50	1	$/Unit	$78.00	15	9.2
Solar Storage Water Heating	2504.50	1	$/unit	$433.00	10	5.0
High Efficiency Electric Water Heater	5375.00	1	$/unit	$1,000.00	15	8.0
HVAC Condenser Heater Recovery Water Heating	3536.50	1	$/unit	$254.00	15	58.7
Low Flow Faucet Aerator	903.00	1	per unit	$2.50	10	389.1
Low Flow Showerhead	615.00	1	per unit	$25.00	10	19.5
Hot Water (DHW) Pipe Insulation	44.74	1	linear ft	$10.00	20	8.2
Tank Insulation (electric)	468.00	1	per square foot	$6.22	15	106.8
Drain Water Heat Recovery Water Heater	546.00	1	$/unit	$631.00	25	1.8
ECM Circulator Pump	4949.40	1	$/unit	$2,266.67	15	3.4
Process Cooling Condenser Heat Recovery	5720.00	2	$/unit	$254.00	15	39.9
Building Envelope						
Integrated Building Design	322775.43	2	per Building	$75,580.52	30	13.3
Energy Efficient Windows	172.80	2	100SF	$272.96	25	1.6
Cool Roofing	44.20	2	1000 sq ft roof area	$332.44	20	0.2
Ceiling Insulation	75.30	1	1000 sq ft roof area	$47.16	20	6.7
Window Improvements	85.30	1	100 sq ft glazing	$286.16	15	0.5
Wall Insulation	331.90	1	1000 sq ft wall area	$4.57	20	206.3
Roof Insulation	20.20	1	1000 sq ft	$54.88	20	2.0
Improved Duct Sealing	31.20	2	ton	$108.00	18	0.4
Ventilation						
Economizer	143.10	2	ton	$123.00	13	0.8
Variable Speed Drive Control, 15 HP	19590.00	1	per Unit	$3,690.00	15	8.1
Variable Speed Drive Control, 5 HP	6530.00	1	per Unit	$1,230.00	15	8.1
Variable Speed Drive Control, 40 HP	52240.00	1	per Unit	$9,840.00	15	8.1
High Speed Fans	706.60	1	ton	$675.00	7	0.9
High Volume Low Speed Fans	5859.90	1	per motor	$5,767.00	10	1.7
Destratification Fan (HVLS)	16.60	1	)00 sq ft cond floor are	$12.75	15	1.4
Engineered CKV Hood	727.20	2	per	$124.62	15	8.0
Space Cooling - Chillers						
Air-Cooled Recip Chiller	335.40	2	ton	$141.03	20	6.8
Air-Cooled Screw Chiller	332.00	2	ton	$143.92	20	6.6
Water Side Economizer	1047.50	2	ton	$50.00	15	25.5
VAV System Conversion	4723.40	1	ton	$1,396.00	20	4.7
Water-Cooled Centrifugal Chiller > 300 ton	205.60	2	ton	$27.30	20	20.2
Motor Belt Replacement	94.70	1	ton	$21.00	14	8.1
Chilled Hot Water Reset	111.50	1	ton	$6.00	8	35.5
Water-Cooled Screw Chiller > 300 ton	200.70	2	ton	$27.15	20	21.2

Consumers Energy Industrial Measure Database - Electric

Measure Savings, Cost and Useful Life

Consumers Energy	Measure Assumption					
Measure Name	**Annual kWh Savings**	**Cost Type: 1=Full 2=Inc.**	**Cost/Unit Descriptor**	**Cost/Unit**	**Effective Measure Life**	**UCT**
Chiller Tune Up	135.80	1	ton	$6.00	5	28.3
Efficient Chilled Water Pump	751.10	1	ton	$33.00	15	38.0
High Efficiency Pumps	201.40	1	per hp	$97.00	15	3.9
HVAC Controls						
Programmable Thermostats	77.10	1	)00 sq ft cond floor are	$58.99	9	0.4
EMS install	269.10	1	)00 sq ft cond floor are	$2.94	15	123.4
EMS Optimization	363.10	1	1000 sq ft	$18.62	20	36.1
HVAC Occupancy Sensors	99.30	2	per unit	$107.58	15	3.4
Zoning	187.35	2	)00 sq ft cond floor are	$500.00	15	0.6
Setback with Electric Heat	3792.20	2	)00 sq ft cond floor are	$71.00	9	51.7
EMS Pump Scheduling	1524.41	2	)00 sq ft cond floor are	$1.32	15	1712.9
Web Enabled EMS	601.38	2	)00 sq ft cond floor are	$19.10	15	32.0
Retrocommissioning	2.55	1	)00 sq ft cond floor are	$0.30	7	5.6
Space Cooling - Unitary and Split AC						
AC 240K - 760 K	42.50	2	ton	$118.39	15	2.4
Ductless (mini split) - Cooling	126.10	1	ton	$834.32	15	0.3
Ground Source Heat Pump - Cooling	302.20	2	ton	$927.66	15	0.5
Water Loop Heat Pump (WLHP) - Cooling	7.20	2	ton	$5.02	15	4.4
Air Source Heat Pump - Cooling	74.30	2	ton	$131.25	15	1.6
DX Condenser Coil Cleaning	51.20	1	ton	$32.00	3	1.6
Room AC	158.00	2	ton	$74.75	15	8.6
Lighting						
Lamp & Ballast Retrofit (HPT8 Replacing T12)	54.20	2	per fixture	$34.15	15	2.8
Lamp & Ballast Retrofit (HPT8 Replacing Standard T8)	24.70	2	Replacing standard T	$34.00	15	0.8
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing T12)	73.40	2	Replacing standard T1	$37.09	15	2.1
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing Standard T8)	42.00	2	$/unit	$22.98	15	1.2
T5 HP replacing T12	80.70	2	per fixture	$107.00	15	1.3
Exterior HID replaced with LED	519.47	2	per fixture	$754.00	12	0.5
Garage HID replacement with LED	1053.70	2	per fixture	$753.67	12	1.3
LED Exit Sign	201.00	2	per fixture	$25.00	15	12.3
LED High Bay Lighting	4160.00	2	per lamp	$2,900.00	16	2.8
LED Low Bay Lighting	2669.00	2	per lamp	$2,900.00	18	1.8
Light Tube	344.30	2	per fixture	$500.00	14	0.8
High Intensity Fluorescent Fixture (replacing HID)	4160.00	2	per fixture	$1,491.00	12	4.6
42W 8 lamp Hi Bay CFL	345.00	2	xture, Replacing 400V	$496.00	12	0.8
HID Fixture Upgrade - Pulse Start Metal Halide	768.50	2	per fixture	$223.63	13	6.0
Interior Induction Lighting	4.16	2	Watt Reduced	$1.53	16	5.5
CFL Fixture	157.50	2	per fixture	$45.00	12	5.3
CFL Screw-in	84.74	2	per lamp	$1.36	2	19.7
LED Screw In Replacing Incandescent	134.80	2	$/unit	$16.45	9	9.9
LED Screw In Replacing CFL	12.00	2	Not Found	$13.41	9	0.8
CFL Reflector Flood	133.50	2	per lamp	$6.00	2	7.0
LED Downlight	141.50	2	per fixture	$12.74	15	19.6
LED Troffer	32.30	2	per lamp	$125.00	18	0.5
LED Tube Lighting	53.90	2	$/unit	$35.00	18	3.0
LED Grow Light	4.40	2	$/unit	$1.53	11	4.4
Interior Non-Highbay/Lowbay LED Fixtures	2.67	2	$/unit	$2.90	18	1.8
Exterior HID Replaced with CFL	1021.40	2	$/unit	$597.00	12	1.7
Exterior Linear Fluorescent	4319.00	2	$/unit	$2,500.00	12	1.7

Consumers Energy Industrial Measure Database - Electric

Measure Savings, Cost and Useful Life

Consumers Energy	Measure Assumption					
Measure Name	**Annual kWh Savings**	**Cost Type: 1=Full 2=Inc.**	**Cost/Unit Descriptor**	**Cost/Unit**	**Effective Measure Life**	**UCT**
LED Specialty replacing CFL	16.10	2	$/unit	$10.00	9	1.9
CFL Screw in Specialty	132.80	2	per lamp	$4.58	2	9.2
LED Specialty replacing incandescent	80.60	2	per lamp	$13.00	9	7.6
Illuminated Signs to LED	5.71	2	per watt reduced	$4.00	10	1.8
Lighting Controls						
Exterior Bi-level Controls	530.50	2	per fixture	$444.00	10	0.8
Garage Bi-level Controls	927.50	2	$/unit	$632.00	11	2.1
Daylight Sensor Controls	10409.10	1	10,000 SF	$4,000.00	12	3.7
Lighting Power Density- Exterior	4319.00	2	10,000 SF	$220.00	12	19.4
Lighting Power Density - Parking Garage	8760.00	2	0.000	$220.00	12	50.6
Stairwell Bi-Level Control	4809.00	2	per kW controlled	$825.00	9	6.0
Occupancy Sensor	504.40	2	per sensor	$226.47	10	0.4
Occupancy Sensor & Daylight Sensor	639.00	2	per sensor	$278.00	10	0.7
Central Lighting Control	8340.63	1	10,000 SF	$3,700.00	12	3.4
Switching Controls for Multilevel Lighting (Non-HID)	6000.00	1	10,000 SF	$4,000.00	12	2.3
Lighting Power Density - Interior	2669.00	2	per kW reduced	$220.00	15	21.3
Long Day Lighting Dairy	6.21	2	per watt reduced	$2.00	16	3.8
Space Heating						
Air Source Heat Pump - Heating	74.30	2	ton	$131.25	15	1.5
Ground Source Heat Pump - Heating	1208.70	2	ton	$3,710.00	15	0.5
Ductless (mini split) - Heating	126.10	1	ton	$952.30	15	0.3
Water Loop Heat Pump (WLHP) - Heating	28.90	2	ton	$20.09	15	4.2
VFD Pump	1732.20	1	per CHW pump hp	$212.29	10	6.9
ECM motors on furnaces	1034.00	1	per Furnace	$1,359.00	20	0.9
Other						
High Efficiency Transformer, single-phase	0.39	2	per fan	$0.46	30	2.3
NEMA Premium Transformer, single-phase	0.16	2	per kVA	$0.24	30	3.0
NEMA Premium Transformer, three-phase	0.24	2	per kVA	$0.18	30	2.0
High Efficiency Transformer, three-phase	0.44	2	$/unit	$0.44	30	4.7
Parking Garage Exhaust Fan CO Control	2413.00	2	per unit	$900.00	15	6.2
Optimized Snow and Ice Melt Controls	0.12	1	SF	$15.15	15	0.0
Engine Block Heater Timer	576.00	2	per engine block	$50.00	5	27.3
Machine Drive						
Sensors & Controls	1.00	1	$/kWh	$0.15	15	126.3
Energy Information System	1.00	1	$/kWh	$0.64	15	29.0
Electric Supply System Improvements	1.00	1	$/kWh	$0.10	15	176.8
Advanced Efficient Motors	1.00	1	$/kWh	$0.49	25	66.7
Industrial Motor Management	1.00	1	$/kWh	$0.08	5	41.0
Advanced Lubricants	1.00	1	$/kWh	$0.00	1	16303.7
Motor System Optimization (Including ASD)	1.00	1	$/kWh	$0.10	15	196.5
Pump System Efficiency Improvements	1.00	1	$/kWh	$0.08	15	221.0
Fan System Improvements	1.00	1	$/kWh	$0.25	15	73.7
Compressed Air System Management	1.00	1	$/kWh	$0.00	1	16303.7
Compressed Air - Advanced Compressor Controls	1.00	1	$/kWh	$0.00	15	176832.4
VFD for Process Fans	785.00	1	per hp	$46.00	15	7.7
VFD for Process Pumps	1082.00	1	per hp	$94.00	15	20.4
High Efficiency Pumps	201.00	1	per hp	$31.00	15	11.5
Compressed Air Audits and Leak Repair	624.00	1	per cfm	$8.00	1	12.7
Elec motors replacing pneumatic (comp air)	1426.00	1	per hp	$25.00	10	25.0
Automatic Drains, High efficiency nozzles and other (comp air)	2097.00	1	per drain	$100.00	5	15.5

Consumers Energy Industrial Measure Database - Electric

Measure Savings, Cost and Useful Life

Consumers Energy	Measure Assumption					
Measure Name	**Annual kWh Savings**	**Cost Type: 1=Full 2=Inc.**	**Cost/Unit Descriptor**	**Cost/Unit**	**Effective Measure Life**	**UCT**
Storage Tank Addition (comp air)	423.00	1	per hp	$24.00	25	41.2
High Efficiency Dryers (comp air)	48.00	1	per hp	$10.00	15	8.5
Process Cooling & Refrigeration						
Sensors & Controls	1.00	1	$/kWh	$0.15	15	126.3
Energy Information System	1.00	1	$/kWh	$0.64	15	29.0
Electric Supply System Improvements	1.00	1	$/kWh	$0.10	15	176.8
Improved Refrigeration	1.00	1	$/kWh	$0.03	15	589.4
Process Heating						
Sensors & Controls	1.00	1	$/kWh	$0.15	15	126.3
Energy Information System	1.00	1	$/kWh	$0.64	15	29.0
Electric Supply System Improvements	1.00	1	$/kWh	$0.10	15	176.8
Industrial Other						
High Efficiency Welders	761.00	1	per unit	$200.00	20	12.4
3 Phase High Eff Battery Charger	2595.00	1	per unit	$872.50	20	5.4
Barrel Insulation - Inj. Molding (plastics)	1210.00	1	per sq ft	$80.00	10	21.8
Pellet Dryer Insulation (plastics)	185.00	1	per ft	$40.00	10	9.9
Injection Molding Machine - efficient (plastics)	237.00	1	per ton capacity	$175.00	20	2.9
Fiber Laser Replacing CO2 laser (auto industry)	32562.00	1	per kw	$60,000.00	20	0.8
Agriculture						
Other Industrial -Low-Energy Livestock Waterer	1593.00	1	per waterer	$788.00	10	2.6
Other Industrial -Dairy Refrigerator Tune-Up	0.10	1	per lb of milk/day	$0.05	5	1.4
Greenhouse Environmental Controls	98.00	1	per 1000 SF	$125.00	15	1.5
Scroll Compressor with Heat Exchanger for Dairy Refrigeration	190.00	1	er 1000 lbs of milk/da	$1,500.00	15	0.2
Variable Speed Drive withHeat Exchanger, Milk	0.58	1	er 1000 lbs of milk/da	$2.20	15	0.6
Milk Pre-Cooler Heat Exchanger	1.21	1	per lb milk/day	$0.30	15	11.8
Variable Speed Drives for Dairy Vacuum Pumps	598.00	1	per hp	$250.00	10	3.1
VFD for Process Fans - Agriculture	520.00	1	per hp	$200.00	15	20.0
VFD for Process Pumps - Agriculture	290.00	1	per hp	$200.00	15	11.1
VFD for Process Pumps - Irrigation	195.00	1	per hp	$200.00	10	5.6
Grain Storage Temperature and Moisture Management Controller	349.00	1	per hp	$233.00	15	2.8
Low Pressure Sprinkler Nozzles	5.00	1	per nozzle	$1.00	15	8.8
Fan Thermostat Controller	1586.00	1	per unit	$50.00	15	56.1

Consumers Energy Industrial Measure Database - Electric

Base Case Factor:
Is the fraction of the end use energy that is applicable for the efficient technology in a given market segment. For example, for fluorescent lighting, this would be the fraction of all lighting kWh in a given market segment that is associated with fluorescent fixtures.

Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals
Computers and Office Equipment														
Energy Star Compliant Single Door Refrigerator	7.7%	7.7%	7.7%	7.7%	7.7%	7.7%	7.7%	7.7%	7.7%	7.7%	7.7%	7.7%	7.7%	7.7%
Energy Star office equipment including computers, monitors, copiers, multi-function machines.	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Energy Efficient "Smart" Power Strip for PC/Monitor/Printer	47.5%	47.5%	47.5%	47.5%	47.5%	47.5%	47.5%	47.5%	47.5%	47.5%	47.5%	47.5%	47.5%	47.5%
PC Network Energy Management Controls replacing no central control	11.5%	11.5%	11.5%	11.5%	11.5%	11.5%	11.5%	11.5%	11.5%	11.5%	11.5%	11.5%	11.5%	11.5%
Energy Star UPS	5.8%	5.8%	5.8%	5.8%	5.8%	5.8%	5.8%	5.8%	5.8%	5.8%	5.8%	5.8%	5.8%	5.8%
High Efficiency CRAC Unit	11.5%	11.5%	11.5%	11.5%	11.5%	11.5%	11.5%	11.5%	11.5%	11.5%	11.5%	11.5%	11.5%	11.5%
Water Heating														
Heat Pump Water Heater	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Electric Tankless Water Heater	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Efficient Hot Water Pump	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Solar Storage Water Heating	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
High Efficiency Electric Water Heater	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
HVAC Condenser Heater Recovery Water Heating	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Low Flow Faucet Aerator	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%
Low Flow Showerhead	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Hot Water (DHW) Pipe Insulation	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
Tank Insulation (electric)	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Drain Water Heat Recovery Water Heater	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
ECM Circulator Pump	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Process Cooling Condenser Heat Recovery	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Building Envelope														
Integrated Building Design	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Energy Efficient Windows	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Cool Roofing	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Ceiling Insulation	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Window Improvements	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Consumers Energy Industrial Measure Database - Electric

Base Case Factor:
Is the fraction of the end use energy that is applicable for the efficient technology in a given market segment. For example, for fluorescent lighting, this would be the fraction of all lighting kWh in a given market segment that is associated with fluorescent fixtures.

Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals
Wall Insulation	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Roof Insulation	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Improved Duct Sealing	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Ventilation														
Economizer	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Variable Speed Drive Control, 15 HP	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%
Variable Speed Drive Control, 5 HP	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%
Variable Speed Drive Control, 40 HP	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%
High Speed Fans	3.3%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
High Volume Low Speed Fans	3.3%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Destratification Fan (HVLS)	3.3%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Space Cooling - Chillers														
Air-Cooled Recip Chiller	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Air-Cooled Screw Chiller	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Water Side Economizer	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%
VAV System Conversion	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Water-Cooled Centrifugal Chiller > 300 ton	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%
Motor Belt Replacement	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%
Chilled Hot Water Reset	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%
Water-Cooled Screw Chiller > 300 ton	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%
Chiller Tune Up	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%
Efficient Chilled Water Pump	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%
High Efficiency Pumps	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%
HVAC Controls														
Programmable Thermostats	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
EMS install	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
EMS Optimization	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
HVAC Occupancy Sensors	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Zoning	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Setback with Electric Heat	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
EMS Pump Scheduling	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%
Web Enabled EMS	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%

Consumers Energy Industrial Measure Database - Electric

Base Case Factor:
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Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals
Retrocommissioning	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Space Cooling - Unitary and Split AC														
AC 240K - 760 K	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Ductless (mini split) - Cooling	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Ground Source Heat Pump - Cooling	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Water Loop Heat Pump (WLHP) - Cooling	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Air Source Heat Pump - Cooling	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
DX Condenser Coil Cleaning	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Room AC	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Lighting														
Lamp & Ballast Retrofit (HPT8 Replacing T12)	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%
Lamp & Ballast Retrofit (HPT8 Replacing Standard T8)	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing T12)	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing Standard T8)	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%
T5 HP replacing T12	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%
Exterior HID replaced with LED	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Garage HID replacement with LED	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
LED Exit Sign	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%
LED High Bay Lighting	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%
LED Low Bay Lighting	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Light Tube	4.3%	4.3%	4.3%	4.3%	4.3%	4.3%	4.3%	4.3%	4.3%	4.3%	4.3%	4.3%	4.3%	4.3%
High Intensity Fluorescent Fixture (replacing HID)	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%
42W 8 lamp Hi Bay CFL	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%
HID Fixture Upgrade - Pulse Start Metal Halide	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%
Interior Induction Lighting	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%
CFL Fixture	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%
CFL Screw-in	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%
LED Screw In Replacing Incandescent	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%

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Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals
LED Screw In Replacing CFL	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
CFL Reflector Flood	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%
LED Downlight	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
LED Troffer	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
LED Tube Lighting	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%
LED Grow Light	10.0%	0.0%	0.0%	16.8%	16.8%	16.8%	16.8%	16.8%	16.8%	16.8%	16.8%	16.8%	16.8%	16.8%
Interior Non-Highbay/Lowbay LED Fixtures	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Exterior HID Replaced with CFL	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Exterior Linear Fluorescent	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
LED Specialty replacing CFL	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
CFL Screw in Specialty	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%
LED Specialty replacing incandescent	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Illuminated Signs to LED	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Lighting Controls														
Exterior Bi-level Controls	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%
Garage Bi-level Controls	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%
Daylight Sensor Controls	73.7%	73.7%	73.7%	73.7%	73.7%	73.7%	73.7%	73.7%	73.7%	73.7%	73.7%	73.7%	73.7%	73.7%
Lighting Power Density- Exterior	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Lighting Power Density - Parking Garage	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Stairwell Bi-Level Control	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
Occupancy Sensor	41.3%	41.3%	41.3%	41.3%	41.3%	41.3%	41.3%	41.3%	41.3%	41.3%	41.3%	41.3%	41.3%	41.3%
Occupancy Sensor & Daylight Sensor	41.3%	41.3%	41.3%	41.3%	41.3%	41.3%	41.3%	41.3%	41.3%	41.3%	41.3%	41.3%	41.3%	41.3%
Central Lighting Control	88.9%	88.9%	88.9%	88.9%	88.9%	88.9%	88.9%	88.9%	88.9%	88.9%	88.9%	88.9%	88.9%	88.9%
Switching Controls for Multilevel Lighting (Non-HID)	82.6%	82.6%	82.6%	82.6%	82.6%	82.6%	82.6%	82.6%	82.6%	82.6%	82.6%	82.6%	82.6%	82.6%
Lighting Power Density - Interior	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Long Day Lighting Dairy	5.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Space Heating														
Air Source Heat Pump - Heating	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Ground Source Heat Pump - Heating	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Ductless (mini split) - Heating	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Water Loop Heat Pump (WLHP) - Heating	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%

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Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals
VFD Pump	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
ECM motors on furnaces	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Other														
High Efficiency Transformer, single-phase	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
NEMA Premium Transformer, single-phase	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
NEMA Premium Transformer, three-phase	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
High Efficiency Transformer, three-phase	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Parking Garage Exhaust Fan CO Control	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Optimized Snow and Ice Melt Controls	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Engine Block Heater Timer	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Machine Drive														
Sensors & Controls	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Energy Information System	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Electric Supply System Improvements	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Advanced Efficient Motors	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Industrial Motor Management	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Advanced Lubricants	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%
Motor System Optimization (Including ASD)	43.0%	43.0%	46.0%	46.0%	59.8%	54.0%	26.9%	62.0%	14.8%	37.9%	41.2%	58.8%	50.8%	54.9%
Pump System Efficiency Improvements	23.2%	23.2%	23.0%	23.0%	0.0%	12.0%	33.1%	3.0%	59.4%	28.1%	34.0%	9.0%	8.7%	15.9%
Fan System Improvements	10.6%	10.6%	7.0%	7.0%	12.7%	8.0%	20.8%	7.0%	9.6%	12.0%	2.0%	5.0%	15.3%	3.0%
Compressed Air System Management	3.3%	3.3%	4.4%	4.4%	7.3%	2.5%	1.5%	2.2%	4.7%	9.1%	4.0%	7.8%	4.4%	7.5%
Compressed Air - Advanced Compressor Controls	10.9%	10.9%	14.3%	14.3%	24.0%	8.3%	4.8%	7.3%	15.3%	29.9%	13.0%	25.4%	14.3%	24.4%
VFD for Process Fans	8.5%	8.5%	5.6%	5.6%	10.2%	6.4%	16.6%	5.6%	7.7%	9.6%	1.6%	4.0%	12.2%	2.4%
VFD for Process Pumps	18.6%	18.6%	18.4%	18.4%	0.0%	9.6%	26.5%	2.4%	47.5%	22.5%	27.2%	7.2%	7.0%	12.7%
High Efficiency Pumps	23.2%	23.2%	23.0%	23.0%	0.0%	12.0%	33.1%	3.0%	59.4%	28.1%	34.0%	9.0%	8.7%	15.9%
Compressed Air Audits and Leak Repair	2.7%	2.7%	3.6%	3.6%	6.0%	2.1%	1.2%	1.8%	3.8%	7.5%	3.3%	6.4%	3.6%	6.1%
Elec motors replacing pneumatic (comp air)	1.2%	1.2%	1.6%	1.6%	2.7%	0.9%	0.5%	0.8%	1.7%	3.3%	1.4%	2.8%	1.6%	2.7%

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Automatic Drains, High efficiency nozzles and other (comp air)	1.2%	1.2%	1.6%	1.6%	2.7%	0.9%	0.5%	0.8%	1.7%	3.3%	1.4%	2.8%	1.6%	2.7%
Storage Tank Addition (comp air)	1.2%	1.2%	1.6%	1.6%	2.7%	0.9%	0.5%	0.8%	1.7%	3.3%	1.4%	2.8%	1.6%	2.7%
High Efficiency Dryers (comp air)	1.2%	1.2%	1.6%	1.6%	2.7%	0.9%	0.5%	0.8%	1.7%	3.3%	1.4%	2.8%	1.6%	2.7%
Process Cooling & Refrigeration														
Sensors & Controls	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Energy Information System	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Electric Supply System Improvements	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Improved Refrigeration	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Process Heating														
Sensors & Controls	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Energy Information System	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Electric Supply System Improvements	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Industrial Other														
High Efficiency Welders	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.0%
3 Phase High Eff Battery Charger	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Barrel Insulation - Inj. Molding (plastics)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%
Pellet Dryer Insulation (plastics)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%
Injection Molding Machine - efficient (plastics)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%
Fiber Laser Replacing CO2 laser (auto industry)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Agriculture														
Other Industrial -Low-Energy Livestock Waterer	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Other Industrial -Dairy Refrigerator Tune-Up	33.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Greenhouse Environmental Controls	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Scroll Compressor with Heat Exchanger for Dairy Refrigeration	33.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Variable Speed Drive withHeat Exchanger, Milk	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Milk Pre-Cooler Heat Exchanger	33.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Consumers Energy Industrial Measure Database - Electric

Base Case Factor:
Is the fraction of the end use energy that is applicable for the efficient technology in a given market segment. For example, for fluorescent lighting, this would be the fraction of all lighting kWh in a given market segment that is associated with fluorescent fixtures.

Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals
Variable Speed Drives for Dairy Vacuum Pumps	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
VFD for Process Fans - Agriculture	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
VFD for Process Pumps - Agriculture	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
VFD for Process Pumps - Irrigation	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Grain Storage Temperature and Moisture Management Controller	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Low Pressure Sprinkler Nozzles	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Fan Thermostat Controller	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Consumers Energy Industrial Measure Datal

Base Case Factor:
Is the fraction of the end use energy that is
would be the fraction of all lighting kWh in a

Measure Name	Machinery	Compute r & Electroni cs	Elec. Equip.	Trans. Equip.	Furnitur e	Misc.
Computers and Office Equipment						
Energy Star Compliant Single Door Refrigerator	7.7%	7.7%	7.7%	7.7%	7.7%	7.7%
Energy Star office equipment including computers, monitors, copiers, multi-function machines.	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Energy Efficient "Smart" Power Strip for PC/Monitor/Printer	47.5%	47.5%	47.5%	47.5%	47.5%	47.5%
PC Network Energy Management Controls replacing no central control	11.5%	11.5%	11.5%	11.5%	11.5%	11.5%
Energy Star UPS	5.8%	5.8%	5.8%	5.8%	5.8%	5.8%
High Efficiency CRAC Unit	11.5%	11.5%	11.5%	11.5%	11.5%	11.5%
Water Heating						
Heat Pump Water Heater	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Electric Tankless Water Heater	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Efficient Hot Water Pump	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Solar Storage Water Heating	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
High Efficiency Electric Water Heater	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
HVAC Condenser Heater Recovery Water Heating	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Low Flow Faucet Aerator	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%
Low Flow Showerhead	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Hot Water (DHW) Pipe Insulation	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
Tank Insulation (electric)	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Drain Water Heat Recovery Water Heater	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
ECM Circulator Pump	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Process Cooling Condenser Heat Recovery	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Building Envelope						
Integrated Building Design	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Energy Efficient Windows	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Cool Roofing	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Ceiling Insulation	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Window Improvements	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Consumers Energy Industrial Measure Datal

Base Case Factor:
Is the fraction of the end use energy that is
would be the fraction of all lighting kWh in a

Measure Name	Machinery	Computer & Electronics	Elec. Equip.	Trans. Equip.	Furniture	Misc.
Wall Insulation	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Roof Insulation	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Improved Duct Sealing	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Ventilation						
Economizer	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Variable Speed Drive Control, 15 HP	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%
Variable Speed Drive Control, 5 HP	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%
Variable Speed Drive Control, 40 HP	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%
High Speed Fans	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
High Volume Low Speed Fans	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Destratification Fan (HVLS)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Space Cooling - Chillers						
Air-Cooled Recip Chiller	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Air-Cooled Screw Chiller	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Water Side Economizer	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%
VAV System Conversion	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Water-Cooled Centrifugal Chiller > 300 ton	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%
Motor Belt Replacement	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%
Chilled Hot Water Reset	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%
Water-Cooled Screw Chiller > 300 ton	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%
Chiller Tune Up	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%
Efficient Chilled Water Pump	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%
High Efficiency Pumps	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%
HVAC Controls						
Programmable Thermostats	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
EMS install	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
EMS Optimization	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
HVAC Occupancy Sensors	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Zoning	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Setback with Electric Heat	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
EMS Pump Scheduling	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%
Web Enabled EMS	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%

Consumers Energy Industrial Measure Datal

Base Case Factor:
Is the fraction of the end use energy that is
would be the fraction of all lighting kWh in a

Measure Name	Machinery	Compute r & Electroni cs	Elec. Equip.	Trans. Equip.	Furnitur e	Misc.
Retrocommissioning	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Space Cooling - Unitary and Split AC						
AC 240K - 760 K	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Ductless (mini split) - Cooling	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Ground Source Heat Pump - Cooling	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Water Loop Heat Pump (WLHP) - Cooling	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Air Source Heat Pump - Cooling	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
DX Condenser Coil Cleaning	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Room AC	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Lighting						
Lamp & Ballast Retrofit (HPT8 Replacing T12)	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%
Lamp & Ballast Retrofit (HPT8 Replacing Standard T8)	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing T12)	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing Standard T8)	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%
T5 HP replacing T12	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%
Exterior HID replaced with LED	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Garage HID replacement with LED	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
LED Exit Sign	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%
LED High Bay Lighting	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%
LED Low Bay Lighting	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Light Tube	4.3%	4.3%	4.3%	4.3%	4.3%	4.3%
High Intensity Fluorescent Fixture (replacing HID)	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%
42W 8 lamp Hi Bay CFL	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%
HID Fixture Upgrade - Pulse Start Metal Halide	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%
Interior Induction Lighting	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%
CFL Fixture	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%
CFL Screw-in	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%
LED Screw In Replacing Incandescent	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%

Consumers Energy Industrial Measure Datal

Base Case Factor:
Is the fraction of the end use energy that is
would be the fraction of all lighting kWh in a

Measure Name	Machinery	Compute r & Electroni cs	Elec. Equip.	Trans. Equip.	Furnitur e	Misc.
LED Screw In Replacing CFL	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
CFL Reflector Flood	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%
LED Downlight	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
LED Troffer	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
LED Tube Lighting	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%
LED Grow Light	16.8%	16.8%	16.8%	16.8%	16.8%	16.8%
Interior Non-Highbay/Lowbay LED Fixtures	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Exterior HID Replaced with CFL	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Exterior Linear Fluorescent	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
LED Specialty replacing CFL	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
CFL Screw in Specialty	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%
LED Specialty replacing incandescent	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Illuminated Signs to LED	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Lighting Controls						
Exterior Bi-level Controls	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%
Garage Bi-level Controls	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%
Daylight Sensor Controls	73.7%	73.7%	73.7%	73.7%	73.7%	73.7%
Lighting Power Density- Exterior	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Lighting Power Density - Parking Garage	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Stairwell Bi-Level Control	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
Occupancy Sensor	41.3%	41.3%	41.3%	41.3%	41.3%	41.3%
Occupancy Sensor & Daylight Sensor	41.3%	41.3%	41.3%	41.3%	41.3%	41.3%
Central Lighting Control	88.9%	88.9%	88.9%	88.9%	88.9%	88.9%
Switching Controls for Multilevel Lighting (Non-HID)	82.6%	82.6%	82.6%	82.6%	82.6%	82.6%
Lighting Power Density - Interior	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Long Day Lighting Dairy	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Space Heating						
Air Source Heat Pump - Heating	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Ground Source Heat Pump - Heating	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Ductless (mini split) - Heating	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Water Loop Heat Pump (WLHP) - Heating	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%

Consumers Energy Industrial Measure Datal

Base Case Factor:
Is the fraction of the end use energy that is
would be the fraction of all lighting kWh in a

Measure Name	Machinery	Computer & Electronics	Elec. Equip.	Trans. Equip.	Furniture	Misc.
VFD Pump	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
ECM motors on furnaces	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Other						
High Efficiency Transformer, single-phase	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
NEMA Premium Transformer, single-phase	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
NEMA Premium Transformer, three-phase	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
High Efficiency Transformer, three-phase	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Parking Garage Exhaust Fan CO Control	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Optimized Snow and Ice Melt Controls	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Engine Block Heater Timer	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Machine Drive						
Sensors & Controls	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Energy Information System	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Electric Supply System Improvements	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Advanced Efficient Motors	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Industrial Motor Management	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Advanced Lubricants	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%
Motor System Optimization (Including ASD)	55.8%	28.5%	28.5%	43.6%	54.8%	42.1%
Pump System Efficiency Improvements	15.5%	50.9%	50.9%	25.0%	1.0%	20.4%
Fan System Improvements	2.2%	1.0%	1.0%	8.0%	18.0%	14.5%
Compressed Air System Management	4.9%	22.7%	22.7%	5.7%	12.5%	4.9%
Compressed Air - Advanced Compressor Controls	15.9%	22.7%	22.7%	18.7%	12.5%	16.1%
VFD for Process Fans	1.8%	0.8%	0.8%	6.4%	14.4%	11.6%
VFD for Process Pumps	12.4%	40.7%	40.7%	20.0%	0.8%	16.3%
High Efficiency Pumps	15.5%	50.9%	50.9%	25.0%	1.0%	20.4%
Compressed Air Audits and Leak Repair	4.0%	0.0%	0.0%	4.7%	0.0%	4.0%
Elec motors replacing pneumatic (comp air)	1.8%	0.0%	0.0%	2.1%	0.0%	1.8%

Consumers Energy Industrial Measure Datal

Base Case Factor:
Is the fraction of the end use energy that is
would be the fraction of all lighting kWh in a

Measure Name	Machinery	Computer & Electronics	Elec. Equip.	Trans. Equip.	Furniture	Misc.
Automatic Drains, High efficiency nozzles and other (comp air)	1.8%	0.0%	0.0%	2.1%	0.0%	1.8%
Storage Tank Addition (comp air)	1.8%	0.0%	0.0%	2.1%	0.0%	1.8%
High Efficiency Dryers (comp air)	1.8%	0.0%	0.0%	2.1%	0.0%	1.8%
Process Cooling & Refrigeration						
Sensors & Controls	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Energy Information System	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Electric Supply System Improvements	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Improved Refrigeration	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Process Heating						
Sensors & Controls	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Energy Information System	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Electric Supply System Improvements	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Industrial Other						
High Efficiency Welders	5.0%	0.0%	0.0%	5.0%	0.0%	0.0%
3 Phase High Eff Battery Charger	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Barrel Insulation - Inj. Molding (plastics)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pellet Dryer Insulation (plastics)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Injection Molding Machine - efficient (plastics)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Fiber Laser Replacing CO_2 laser (auto industry)	5.0%	0.0%	0.0%	5.0%	0.0%	0.0%
Agriculture						
Other Industrial -Low-Energy Livestock Waterer	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Other Industrial -Dairy Refrigerator Tune-Up	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Greenhouse Environmental Controls	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Scroll Compressor with Heat Exchanger for Dairy Refrigeration	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Variable Speed Drive withHeat Exchanger, Milk	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Milk Pre-Cooler Heat Exchanger	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Consumers Energy Industrial Measure Datal

Base Case Factor:
Is the fraction of the end use energy that is
would be the fraction of all lighting kWh in a

Measure Name	Machinery	Computer & Electronics	Elec. Equip.	Trans. Equip.	Furniture	Misc.
Variable Speed Drives for Dairy Vacuum Pumps	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
VFD for Process Fans - Agriculture	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
VFD for Process Pumps - Agriculture	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
VFD for Process Pumps - Irrigation	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Grain Storage Temperature and Moisture Management Controller	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Low Pressure Sprinkler Nozzles	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Fan Thermostat Controller	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Consumers Energy Industrial Measure Database - Electric

Savings Factor:
Is the percentage reduction in electricity or gas consumption resulting from application of the efficient technology.

Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals
Computers and Office Equipment														
Energy Star Compliant Single Door Refrigerator	24.3%	24.3%	24.3%	24.3%	24.3%	24.3%	24.3%	24.3%	24.3%	24.3%	24.3%	24.3%	24.3%	24.3%
Energy Star office equipment including computers, monitors, copiers, multi-function machines.	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%
Energy Efficient "Smart" Power Strip for PC/Monitor/Printer	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%
PC Network Energy Management Controls replacing no central control	46.0%	46.0%	46.0%	46.0%	46.0%	46.0%	46.0%	46.0%	46.0%	46.0%	46.0%	46.0%	46.0%	46.0%
Energy Star UPS	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%
High Efficiency CRAC Unit	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Water Heating														
Heat Pump Water Heater	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%
Electric Tankless Water Heater	8.1%	8.1%	8.1%	8.1%	8.1%	8.1%	8.1%	8.1%	8.1%	8.1%	8.1%	8.1%	8.1%	8.1%
Efficient Hot Water Pump	20.5%	20.5%	20.5%	20.5%	20.5%	20.5%	20.5%	20.5%	20.5%	20.5%	20.5%	20.5%	20.5%	20.5%
Solar Storage Water Heating	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
High Efficiency Electric Water Heater	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%
HVAC Condenser Heater Recovery Water Heating	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%
Low Flow Faucet Aerator	65.9%	65.9%	65.9%	65.9%	65.9%	65.9%	65.9%	65.9%	65.9%	65.9%	65.9%	65.9%	65.9%	65.9%
Low Flow Showerhead	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Hot Water (DHW) Pipe Insulation	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Tank Insulation (electric)	91.0%	91.0%	91.0%	91.0%	91.0%	91.0%	91.0%	91.0%	91.0%	91.0%	91.0%	91.0%	91.0%	91.0%
Drain Water Heat Recovery Water Heater	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
ECM Circulator Pump	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%
Process Cooling Condenser Heat Recovery	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%
Building Envelope														
Integrated Building Design	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
Energy Efficient Windows	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%
Cool Roofing	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
Ceiling Insulation	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Window Improvements	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%
Wall Insulation	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%
Roof Insulation	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%

Consumers Energy Industrial Measure Database - Electric

Savings Factor:
Is the percentage reduction in electricity or gas consumption resulting from application of the efficient technology.

Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals
Improved Duct Sealing	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%
Ventilation														
Economizer	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%
Variable Speed Drive Control, 15 HP	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Variable Speed Drive Control, 5 HP	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Variable Speed Drive Control, 40 HP	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
High Speed Fans	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%
High Volume Low Speed Fans	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Destratification Fan (HVLS)	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%
Space Cooling - Chillers														
Air-Cooled Recip Chiller	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%
Air-Cooled Screw Chiller	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Water Side Economizer	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
VAV System Conversion	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Water-Cooled Centrifugal Chiller > 300 ton	29.6%	29.6%	29.6%	29.6%	29.6%	29.6%	29.6%	29.6%	29.6%	29.6%	29.6%	29.6%	29.6%	29.6%
Motor Belt Replacement	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%
Chilled Hot Water Reset	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Water-Cooled Screw Chiller > 300 ton	27.9%	27.9%	27.9%	27.9%	27.9%	27.9%	27.9%	27.9%	27.9%	27.9%	27.9%	27.9%	27.9%	27.9%
Chiller Tune Up	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Efficient Chilled Water Pump	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%
High Efficiency Pumps	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%
HVAC Controls														
Programmable Thermostats	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
EMS install	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
EMS Optimization	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
HVAC Occupancy Sensors	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%
Zoning	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Setback with Electric Heat	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
EMS Pump Scheduling	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Web Enabled EMS	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Retrocommissioning	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	9.0%	9.0%	9.0%	9.0%	9.0%
Space Cooling - Unitary and Split AC														
AC 240K - 760 K	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%
Ductless (mini split) - Cooling	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%

Consumers Energy Industrial Measure Database - Electric

Savings Factor:
Is the percentage reduction in electricity or gas consumption resulting from application of the efficient technology.

Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals
Ground Source Heat Pump - Cooling	40.8%	40.8%	40.8%	40.8%	40.8%	40.8%	40.8%	40.8%	40.8%	40.8%	40.8%	40.8%	40.8%	40.8%
Water Loop Heat Pump (WLHP) - Cooling	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%
Air Source Heat Pump - Cooling	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%
DX Condenser Coil Cleaning	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%
Room AC	15.9%	15.9%	15.9%	15.9%	15.9%	15.9%	15.9%	15.9%	15.9%	15.9%	15.9%	15.9%	15.9%	15.9%
Lighting														
Lamp & Ballast Retrofit (HPT8 Replacing T12)	25.3%	25.3%	25.3%	25.3%	25.3%	25.3%	25.3%	25.3%	25.3%	25.3%	25.3%	25.3%	25.3%	25.3%
Lamp & Ballast Retrofit (HPT8 Replacing Standard T8)	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing T12)	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing Standard T8)	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%
T5 HP replacing T12	32.4%	32.4%	32.4%	32.4%	32.4%	32.4%	32.4%	32.4%	32.4%	32.4%	32.4%	32.4%	32.4%	32.4%
Exterior HID replaced with LED	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
Garage HID replacement with LED	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
LED Exit Sign	83.3%	83.3%	83.3%	83.3%	83.3%	83.3%	83.3%	83.3%	83.3%	83.3%	83.3%	83.3%	83.3%	83.3%
LED High Bay Lighting	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%
LED Low Bay Lighting	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%
Light Tube	44.6%	44.6%	44.6%	44.6%	44.6%	44.6%	44.6%	44.6%	44.6%	44.6%	44.6%	44.6%	44.6%	44.6%
High Intensity Fluorescent Fixture (replacing HID)	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%
42W 8 lamp Hi Bay CFL	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%
HID Fixture Upgrade - Pulse Start Metal Halide	21.2%	21.2%	21.2%	21.2%	21.2%	21.2%	21.2%	21.2%	21.2%	21.2%	21.2%	21.2%	21.2%	21.2%
Interior Induction Lighting	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
CFL Fixture	64.5%	64.5%	64.5%	64.5%	64.5%	64.5%	64.5%	64.5%	64.5%	64.5%	64.5%	64.5%	64.5%	64.5%
CFL Screw-in	68.6%	68.6%	68.6%	68.6%	68.6%	68.6%	68.6%	68.6%	68.6%	68.6%	68.6%	68.6%	68.6%	68.6%
LED Screw In Replacing Incandescent	78.4%	78.4%	78.4%	78.4%	78.4%	78.4%	78.4%	78.4%	78.4%	78.4%	78.4%	78.4%	78.4%	78.4%
LED Screw In Replacing CFL	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%
CFL Reflector Flood	71.4%	71.4%	71.4%	71.4%	71.4%	71.4%	71.4%	71.4%	71.4%	71.4%	71.4%	71.4%	71.4%	71.4%
LED Downlight	66.2%	66.2%	66.2%	66.2%	66.2%	66.2%	66.2%	66.2%	66.2%	66.2%	66.2%	66.2%	66.2%	66.2%
LED Troffer	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%
LED Tube Lighting	46.1%	46.1%	46.1%	46.1%	46.1%	46.1%	46.1%	46.1%	46.1%	46.1%	46.1%	46.1%	46.1%	46.1%
LED Grow Light	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%

Consumers Energy Industrial Measure Database - Electric

Savings Factor:
Is the percentage reduction in electricity or gas consumption resulting from application of the efficient technology.

Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals
Interior Non-Highbay/Lowbay LED Fixtures	42.9%	42.9%	42.9%	42.9%	42.9%	42.9%	42.9%	42.9%	42.9%	42.9%	42.9%	42.9%	42.9%	42.9%
Exterior HID Replaced with CFL	78.8%	78.8%	78.8%	78.8%	78.8%	78.8%	78.8%	78.8%	78.8%	78.8%	78.8%	78.8%	78.8%	78.8%
Exterior Linear Fluorescent	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%
LED Specialty replacing CFL	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%
CFL Screw in Specialty	72.5%	72.5%	72.5%	72.5%	72.5%	72.5%	72.5%	72.5%	72.5%	72.5%	72.5%	72.5%	72.5%	72.5%
LED Specialty replacing incandescent	86.2%	86.2%	86.2%	86.2%	86.2%	86.2%	86.2%	86.2%	86.2%	86.2%	86.2%	86.2%	86.2%	86.2%
Illuminated Signs to LED	18.1%	18.1%	18.1%	18.1%	18.1%	18.1%	18.1%	18.1%	18.1%	18.1%	18.1%	18.1%	18.1%	18.1%
Lighting Controls														
Exterior Bi-level Controls	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
Garage Bi-level Controls	28.5%	28.5%	28.5%	28.5%	28.5%	28.5%	28.5%	28.5%	28.5%	28.5%	28.5%	28.5%	28.5%	28.5%
Daylight Sensor Controls	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Lighting Power Density- Exterior	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Lighting Power Density - Parking Garage	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
Stairwell Bi-Level Control	54.9%	54.9%	54.9%	54.9%	54.9%	54.9%	54.9%	54.9%	54.9%	54.9%	54.9%	54.9%	54.9%	54.9%
Occupancy Sensor	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Occupancy Sensor & Daylight Sensor	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Central Lighting Control	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Switching Controls for Multilevel Lighting (Non-HID)	17.5%	17.5%	17.5%	17.5%	17.5%	17.5%	17.5%	17.5%	17.5%	17.5%	17.5%	17.5%	17.5%	17.5%
Lighting Power Density - Interior	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Long Day Lighting Dairy	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Space Heating														
Air Source Heat Pump - Heating	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
Ground Source Heat Pump - Heating	40.9%	40.9%	40.9%	40.9%	40.9%	40.9%	40.9%	40.9%	40.9%	40.9%	40.9%	40.9%	40.9%	40.9%
Ductless (mini split) - Heating	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%
Water Loop Heat Pump (WLHP) - Heating	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%
VFD Pump	38.4%	38.4%	38.4%	38.4%	38.4%	38.4%	38.4%	38.4%	38.4%	38.4%	38.4%	38.4%	38.4%	38.4%
ECM motors on furnaces	26.1%	26.1%	26.1%	26.1%	26.1%	26.1%	26.1%	26.1%	26.1%	26.1%	26.1%	26.1%	26.1%	26.1%
Other														
High Efficiency Transformer, single-phase	2.5%	33.5%	33.5%	33.5%	33.5%	33.5%	33.5%	33.5%	33.5%	33.5%	33.5%	33.5%	33.5%	33.5%
NEMA Premium Transformer, single-phase	2.5%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%

Consumers Energy Industrial Measure Database - Electric

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Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals
NEMA Premium Transformer, three-phase	2.5%	36.5%	36.5%	36.5%	36.5%	36.5%	36.5%	36.5%	36.5%	36.5%	36.5%	36.5%	36.5%	36.5%
High Efficiency Transformer, three-phase	2.5%	31.4%	31.4%	31.4%	31.4%	31.4%	31.4%	31.4%	31.4%	31.4%	31.4%	31.4%	31.4%	31.4%
Parking Garage Exhaust Fan CO Control	48.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%
Optimized Snow and Ice Melt Controls	92.0%	91.8%	91.8%	91.8%	91.8%	91.8%	91.8%	91.8%	91.8%	91.8%	91.8%	91.8%	91.8%	91.8%
Engine Block Heater Timer	64.0%	64.0%	64.0%	64.0%	64.0%	64.0%	64.0%	64.0%	64.0%	64.0%	64.0%	64.0%	64.0%	64.0%
Machine Drive														
Sensors & Controls	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Energy Information System	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Electric Supply System Improvements	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Advanced Efficient Motors	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%
Industrial Motor Management	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Advanced Lubricants	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%
Motor System Optimization (Including ASD)	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%
Pump System Efficiency Improvements	16.4%	16.4%	16.4%	16.4%	16.4%	16.4%	16.4%	16.4%	16.4%	16.4%	16.4%	16.4%	16.4%	16.4%
Fan System Improvements	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Compressed Air System Management	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%
Compressed Air - Advanced Compressor Controls	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
VFD for Process Fans	28.0%	28.0%	28.0%	28.0%	28.0%	28.0%	28.0%	28.0%	28.0%	28.0%	28.0%	28.0%	28.0%	28.0%
VFD for Process Pumps	29.0%	29.0%	29.0%	29.0%	29.0%	29.0%	29.0%	29.0%	29.0%	29.0%	29.0%	29.0%	29.0%	29.0%
High Efficiency Pumps	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%
Compressed Air Audits and Leak Repair	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Elec motors replacing pneumatic (comp air)	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%
Automatic Drains, High efficiency nozzles and other (comp air)	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Storage Tank Addition (comp air)	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
High Efficiency Dryers (comp air)	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Process Cooling & Refrigeration														
Sensors & Controls	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Energy Information System	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Electric Supply System Improvements	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Improved Refrigeration	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%

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Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals
Process Heating														
Sensors & Controls	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Energy Information System	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Electric Supply System Improvements	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Industrial Other														
High Efficiency Welders	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%
3 Phase High Eff Battery Charger	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Barrel Insulation - Inj. Molding (plastics)	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%
Pellet Dryer Insulation (plastics)	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%
Injection Molding Machine - efficient (plastics)	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%
Fiber Laser Replacing CO2 laser (auto industry)	78.0%	78.0%	78.0%	78.0%	78.0%	78.0%	78.0%	78.0%	78.0%	78.0%	78.0%	78.0%	78.0%	78.0%
Agriculture														
Other Industrial -Low-Energy Livestock Waterer	47.7%	47.7%	47.7%	47.7%	47.7%	47.7%	47.7%	47.7%	47.7%	47.7%	47.7%	47.7%	47.7%	47.7%
Other Industrial -Dairy Refrigerator Tune-Up	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
Greenhouse Environmental Controls	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Scroll Compressor with Heat Exchanger for Dairy Refrigeration	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%
Variable Speed Drive withHeat Exchanger, Milk	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
Milk Pre-Cooler Heat Exchanger	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Variable Speed Drives for Dairy Vacuum Pumps	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%
VFD for Process Fans - Agriculture	23.0%	23.0%	23.0%	23.0%	23.0%	23.0%	23.0%	23.0%	23.0%	23.0%	23.0%	23.0%	23.0%	23.0%
VFD for Process Pumps - Agriculture	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%
VFD for Process Pumps - Irrigation	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%
Grain Storage Temperature and Moisture Management Controller	49.0%	49.0%	49.0%	49.0%	49.0%	49.0%	49.0%	49.0%	49.0%	49.0%	49.0%	49.0%	49.0%	49.0%
Low Pressure Sprinkler Nozzles	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
Fan Thermostat Controller	53.4%	53.4%	53.4%	53.4%	53.4%	53.4%	53.4%	53.4%	53.4%	53.4%	53.4%	53.4%	53.4%	53.4%

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Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Machinery	Computer & Electronics	Elec. Equip.	Trans. Equip.	Furniture
Computers and Office Equipment														
Energy Star Compliant Single Door Refrigerator	24.3%	24.3%	24.3%	24.3%	24.3%	24.3%	24.3%	24.3%	24.3%	24.3%	24.3%	24.3%	24.3%	24.3%
Energy Star office equipment including computers, monitors, copiers, multi-function machines.	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%
Energy Efficient "Smart" Power Strip for PC/Monitor/Printer	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%
PC Network Energy Management Controls replacing no central control	46.0%	46.0%	46.0%	46.0%	46.0%	46.0%	46.0%	46.0%	46.0%	46.0%	46.0%	46.0%	46.0%	46.0%
Energy Star UPS	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%
High Efficiency CRAC Unit	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Water Heating														
Heat Pump Water Heater	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%
Electric Tankless Water Heater	8.1%	8.1%	8.1%	8.1%	8.1%	8.1%	8.1%	8.1%	8.1%	8.1%	8.1%	8.1%	8.1%	8.1%
Efficient Hot Water Pump	20.5%	20.5%	20.5%	20.5%	20.5%	20.5%	20.5%	20.5%	20.5%	20.5%	20.5%	20.5%	20.5%	20.5%
Solar Storage Water Heating	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
High Efficiency Electric Water Heater	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%
HVAC Condenser Heater Recovery Water Heating	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%
Low Flow Faucet Aerator	65.9%	65.9%	65.9%	65.9%	65.9%	65.9%	65.9%	65.9%	65.9%	65.9%	65.9%	65.9%	65.9%	65.9%
Low Flow Showerhead	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Hot Water (DHW) Pipe Insulation	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Tank Insulation (electric)	91.0%	91.0%	91.0%	91.0%	91.0%	91.0%	91.0%	91.0%	91.0%	91.0%	91.0%	91.0%	91.0%	91.0%
Drain Water Heat Recovery Water Heater	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
ECM Circulator Pump	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%
Process Cooling Condenser Heat Recovery	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%
Building Envelope														
Integrated Building Design	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
Energy Efficient Windows	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%
Cool Roofing	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
Ceiling Insulation	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Window Improvements	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%
Wall Insulation	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%
Roof Insulation	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%

Consumers Energy Industrial Measure Database - Electric

Savings Factor:
Is the percentage reduction in electricity or gas consumption resulting from application of the efficient technology.

Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Machinery	Computer & Electronics	Elec. Equip.	Trans. Equip.	Furniture
Improved Duct Sealing	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%
Ventilation														
Economizer	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%
Variable Speed Drive Control, 15 HP	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Variable Speed Drive Control, 5 HP	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Variable Speed Drive Control, 40 HP	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
High Speed Fans	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%
High Volume Low Speed Fans	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Destratification Fan (HVLS)	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%
Space Cooling - Chillers														
Air-Cooled Recip Chiller	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%
Air-Cooled Screw Chiller	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Water Side Economizer	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
VAV System Conversion	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Water-Cooled Centrifugal Chiller > 300 ton	29.6%	29.6%	29.6%	29.6%	29.6%	29.6%	29.6%	29.6%	29.6%	29.6%	29.6%	29.6%	29.6%	29.6%
Motor Belt Replacement	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%
Chilled Hot Water Reset	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Water-Cooled Screw Chiller > 300 ton	27.9%	27.9%	27.9%	27.9%	27.9%	27.9%	27.9%	27.9%	27.9%	27.9%	27.9%	27.9%	27.9%	27.9%
Chiller Tune Up	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Efficient Chilled Water Pump	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%
High Efficiency Pumps	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%
HVAC Controls														
Programmable Thermostats	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
EMS install	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
EMS Optimization	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
HVAC Occupancy Sensors	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%
Zoning	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Setback with Electric Heat	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
EMS Pump Scheduling	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Web Enabled EMS	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Retrocommissioning	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	9.0%	9.0%	9.0%	9.0%	9.0%
Space Cooling - Unitary and Split AC														
AC 240K - 760 K	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%
Ductless (mini split) - Cooling	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%

Consumers Energy Industrial Measure Database - Electric

Savings Factor:
Is the percentage reduction in electricity or gas consumption resulting from application of the efficient technology.

Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Machinery	Computer & Electronics	Elec. Equip.	Trans. Equip.	Furniture
Ground Source Heat Pump - Cooling	40.8%	40.8%	40.8%	40.8%	40.8%	40.8%	40.8%	40.8%	40.8%	40.8%	40.8%	40.8%	40.8%	40.8%
Water Loop Heat Pump (WLHP) - Cooling	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%
Air Source Heat Pump - Cooling	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%
DX Condenser Coil Cleaning	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%
Room AC	15.9%	15.9%	15.9%	15.9%	15.9%	15.9%	15.9%	15.9%	15.9%	15.9%	15.9%	15.9%	15.9%	15.9%
Lighting														
Lamp & Ballast Retrofit (HPT8 Replacing T12)	25.3%	25.3%	25.3%	25.3%	25.3%	25.3%	25.3%	25.3%	25.3%	25.3%	25.3%	25.3%	25.3%	25.3%
Lamp & Ballast Retrofit (HPT8 Replacing Standard T8)	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing T12)	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing Standard T8)	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%
T5 HP replacing T12	32.4%	32.4%	32.4%	32.4%	32.4%	32.4%	32.4%	32.4%	32.4%	32.4%	32.4%	32.4%	32.4%	32.4%
Exterior HID replaced with LED	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
Garage HID replacement with LED	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
LED Exit Sign	83.3%	83.3%	83.3%	83.3%	83.3%	83.3%	83.3%	83.3%	83.3%	83.3%	83.3%	83.3%	83.3%	83.3%
LED High Bay Lighting	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%
LED Low Bay Lighting	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%
Light Tube	44.6%	44.6%	44.6%	44.6%	44.6%	44.6%	44.6%	44.6%	44.6%	44.6%	44.6%	44.6%	44.6%	44.6%
High Intensity Fluorescent Fixture (replacing HID)	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%
42W 8 lamp Hi Bay CFL	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%
HID Fixture Upgrade - Pulse Start Metal Halide	21.2%	21.2%	21.2%	21.2%	21.2%	21.2%	21.2%	21.2%	21.2%	21.2%	21.2%	21.2%	21.2%	21.2%
Interior Induction Lighting	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
CFL Fixture	64.5%	64.5%	64.5%	64.5%	64.5%	64.5%	64.5%	64.5%	64.5%	64.5%	64.5%	64.5%	64.5%	64.5%
CFL Screw-in	68.6%	68.6%	68.6%	68.6%	68.6%	68.6%	68.6%	68.6%	68.6%	68.6%	68.6%	68.6%	68.6%	68.6%
LED Screw In Replacing Incandescent	78.4%	78.4%	78.4%	78.4%	78.4%	78.4%	78.4%	78.4%	78.4%	78.4%	78.4%	78.4%	78.4%	78.4%
LED Screw In Replacing CFL	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%
CFL Reflector Flood	71.4%	71.4%	71.4%	71.4%	71.4%	71.4%	71.4%	71.4%	71.4%	71.4%	71.4%	71.4%	71.4%	71.4%
LED Downlight	66.2%	66.2%	66.2%	66.2%	66.2%	66.2%	66.2%	66.2%	66.2%	66.2%	66.2%	66.2%	66.2%	66.2%
LED Troffer	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%
LED Tube Lighting	46.1%	46.1%	46.1%	46.1%	46.1%	46.1%	46.1%	46.1%	46.1%	46.1%	46.1%	46.1%	46.1%	46.1%
LED Grow Light	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%

Consumers Energy Industrial Measure Database - Electric

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Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Machinery	Computer & Electronics	Elec. Equip.	Trans. Equip.	Furniture
Interior Non-Highbay/Lowbay LED Fixtures	42.9%	42.9%	42.9%	42.9%	42.9%	42.9%	42.9%	42.9%	42.9%	42.9%	42.9%	42.9%	42.9%	42.9%
Exterior HID Replaced with CFL	78.8%	78.8%	78.8%	78.8%	78.8%	78.8%	78.8%	78.8%	78.8%	78.8%	78.8%	78.8%	78.8%	78.8%
Exterior Linear Fluorescent	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%
LED Specialty replacing CFL	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%
CFL Screw in Specialty	72.5%	72.5%	72.5%	72.5%	72.5%	72.5%	72.5%	72.5%	72.5%	72.5%	72.5%	72.5%	72.5%	72.5%
LED Specialty replacing incandescent	86.2%	86.2%	86.2%	86.2%	86.2%	86.2%	86.2%	86.2%	86.2%	86.2%	86.2%	86.2%	86.2%	86.2%
Illuminated Signs to LED	18.1%	18.1%	18.1%	18.1%	18.1%	18.1%	18.1%	18.1%	18.1%	18.1%	18.1%	18.1%	18.1%	18.1%
Lighting Controls														
Exterior Bi-level Controls	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
Garage Bi-level Controls	28.5%	28.5%	28.5%	28.5%	28.5%	28.5%	28.5%	28.5%	28.5%	28.5%	28.5%	28.5%	28.5%	28.5%
Daylight Sensor Controls	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Lighting Power Density- Exterior	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Lighting Power Density - Parking Garage	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
Stairwell Bi-Level Control	54.9%	54.9%	54.9%	54.9%	54.9%	54.9%	54.9%	54.9%	54.9%	54.9%	54.9%	54.9%	54.9%	54.9%
Occupancy Sensor	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Occupancy Sensor & Daylight Sensor	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Central Lighting Control	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Switching Controls for Multilevel Lighting (Non-HID)	17.5%	17.5%	17.5%	17.5%	17.5%	17.5%	17.5%	17.5%	17.5%	17.5%	17.5%	17.5%	17.5%	17.5%
Lighting Power Density - Interior	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Long Day Lighting Dairy	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Space Heating														
Air Source Heat Pump - Heating	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
Ground Source Heat Pump - Heating	40.9%	40.9%	40.9%	40.9%	40.9%	40.9%	40.9%	40.9%	40.9%	40.9%	40.9%	40.9%	40.9%	40.9%
Ductless (mini split) - Heating	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%
Water Loop Heat Pump (WLHP) - Heating	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%
VFD Pump	38.4%	38.4%	38.4%	38.4%	38.4%	38.4%	38.4%	38.4%	38.4%	38.4%	38.4%	38.4%	38.4%	38.4%
ECM motors on furnaces	26.1%	26.1%	26.1%	26.1%	26.1%	26.1%	26.1%	26.1%	26.1%	26.1%	26.1%	26.1%	26.1%	26.1%
Other														
High Efficiency Transformer, single-phase	2.5%	33.5%	33.5%	33.5%	33.5%	33.5%	33.5%	33.5%	33.5%	33.5%	33.5%	33.5%	33.5%	33.5%
NEMA Premium Transformer, single-phase	2.5%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%

Consumers Energy Industrial Measure Database - Electric

Savings Factor:
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Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Machinery	Computer & Electronics	Elec. Equip.	Trans. Equip.	Furniture
NEMA Premium Transformer, three-phase	2.5%	36.5%	36.5%	36.5%	36.5%	36.5%	36.5%	36.5%	36.5%	36.5%	36.5%	36.5%	36.5%	36.5%
High Efficiency Transformer, three-phase	2.5%	31.4%	31.4%	31.4%	31.4%	31.4%	31.4%	31.4%	31.4%	31.4%	31.4%	31.4%	31.4%	31.4%
Parking Garage Exhaust Fan CO Control	48.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%
Optimized Snow and Ice Melt Controls	92.0%	91.8%	91.8%	91.8%	91.8%	91.8%	91.8%	91.8%	91.8%	91.8%	91.8%	91.8%	91.8%	91.8%
Engine Block Heater Timer	64.0%	64.0%	64.0%	64.0%	64.0%	64.0%	64.0%	64.0%	64.0%	64.0%	64.0%	64.0%	64.0%	64.0%
Machine Drive														
Sensors & Controls	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Energy Information System	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Electric Supply System Improvements	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Advanced Efficient Motors	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%
Industrial Motor Management	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Advanced Lubricants	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%
Motor System Optimization (Including ASD)	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%
Pump System Efficiency Improvements	16.4%	16.4%	16.4%	16.4%	16.4%	16.4%	16.4%	16.4%	16.4%	16.4%	16.4%	16.4%	16.4%	16.4%
Fan System Improvements	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Compressed Air System Management	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%
Compressed Air - Advanced Compressor Controls	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
VFD for Process Fans	28.0%	28.0%	28.0%	28.0%	28.0%	28.0%	28.0%	28.0%	28.0%	28.0%	28.0%	28.0%	28.0%	28.0%
VFD for Process Pumps	29.0%	29.0%	29.0%	29.0%	29.0%	29.0%	29.0%	29.0%	29.0%	29.0%	29.0%	29.0%	29.0%	29.0%
High Efficiency Pumps	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%
Compressed Air Audits and Leak Repair	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Elec motors replacing pneumatic (comp air)	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%
Automatic Drains, High efficiency nozzles and other (comp air)	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Storage Tank Addition (comp air)	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
High Efficiency Dryers (comp air)	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Process Cooling & Refrigeration														
Sensors & Controls	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Energy Information System	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Electric Supply System Improvements	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Improved Refrigeration	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%

Consumers Energy Industrial Measure Database - Electric

Savings Factor:
Is the percentage reduction in electricity or gas consumption resulting from application of the efficient technology.

Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Machinery	Computer & Electronics	Elec. Equip.	Trans. Equip.	Furniture
Process Heating														
Sensors & Controls	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Energy Information System	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Electric Supply System Improvements	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Industrial Other														
High Efficiency Welders	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%
3 Phase High Eff Battery Charger	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Barrel Insulation - Inj. Molding (plastics)	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%
Pellet Dryer Insulation (plastics)	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%
Injection Molding Machine - efficient (plastics)	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%
Fiber Laser Replacing CO2 laser (auto industry)	78.0%	78.0%	78.0%	78.0%	78.0%	78.0%	78.0%	78.0%	78.0%	78.0%	78.0%	78.0%	78.0%	78.0%
Agriculture														
Other Industrial -Low-Energy Livestock Waterer	47.7%	47.7%	47.7%	47.7%	47.7%	47.7%	47.7%	47.7%	47.7%	47.7%	47.7%	47.7%	47.7%	47.7%
Other Industrial -Dairy Refrigerator Tune-Up	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
Greenhouse Environmental Controls	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Scroll Compressor with Heat Exchanger for Dairy Refrigeration	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%
Variable Speed Drive withHeat Exchanger, Milk	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
Milk Pre-Cooler Heat Exchanger	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Variable Speed Drives for Dairy Vacuum Pumps	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%
VFD for Process Fans - Agriculture	23.0%	23.0%	23.0%	23.0%	23.0%	23.0%	23.0%	23.0%	23.0%	23.0%	23.0%	23.0%	23.0%	23.0%
VFD for Process Pumps - Agriculture	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%
VFD for Process Pumps - Irrigation	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%
Grain Storage Temperature and Moisture Management Controller	49.0%	49.0%	49.0%	49.0%	49.0%	49.0%	49.0%	49.0%	49.0%	49.0%	49.0%	49.0%	49.0%	49.0%
Low Pressure Sprinkler Nozzles	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
Fan Thermostat Controller	53.4%	53.4%	53.4%	53.4%	53.4%	53.4%	53.4%	53.4%	53.4%	53.4%	53.4%	53.4%	53.4%	53.4%

Consumers Energy Industrial Measure Database - Electric

Savings Factor:
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Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Misc.
Computers and Office Equipment										
Energy Star Compliant Single Door Refrigerator	24.3%	24.3%	24.3%	24.3%	24.3%	24.3%	24.3%	24.3%	24.3%	24.3%
Energy Star office equipment including computers, monitors, copiers, multi-function machines.	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%
Energy Efficient "Smart" Power Strip for PC/Monitor/Printer	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%
PC Network Energy Management Controls replacing no central control	46.0%	46.0%	46.0%	46.0%	46.0%	46.0%	46.0%	46.0%	46.0%	46.0%
Energy Star UPS	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%
High Efficiency CRAC Unit	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Water Heating										
Heat Pump Water Heater	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%	30.7%
Electric Tankless Water Heater	8.1%	8.1%	8.1%	8.1%	8.1%	8.1%	8.1%	8.1%	8.1%	8.1%
Efficient Hot Water Pump	20.5%	20.5%	20.5%	20.5%	20.5%	20.5%	20.5%	20.5%	20.5%	20.5%
Solar Storage Water Heating	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
High Efficiency Electric Water Heater	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%
HVAC Condenser Heater Recovery Water Heating	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%
Low Flow Faucet Aerator	65.9%	65.9%	65.9%	65.9%	65.9%	65.9%	65.9%	65.9%	65.9%	65.9%
Low Flow Showerhead	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Hot Water (DHW) Pipe Insulation	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Tank Insulation (electric)	91.0%	91.0%	91.0%	91.0%	91.0%	91.0%	91.0%	91.0%	91.0%	91.0%
Drain Water Heat Recovery Water Heater	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
ECM Circulator Pump	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%
Process Cooling Condenser Heat Recovery	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%
Building Envelope										
Integrated Building Design	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
Energy Efficient Windows	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%
Cool Roofing	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
Ceiling Insulation	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Window Improvements	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%
Wall Insulation	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%
Roof Insulation	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%

Consumers Energy Industrial Measure Database - Electric

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Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Misc.
Improved Duct Sealing	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%
Ventilation										
Economizer	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%
Variable Speed Drive Control, 15 HP	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Variable Speed Drive Control, 5 HP	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Variable Speed Drive Control, 40 HP	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
High Speed Fans	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%
High Volume Low Speed Fans	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Destratification Fan (HVLS)	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%
Space Cooling - Chillers										
Air-Cooled Recip Chiller	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%
Air-Cooled Screw Chiller	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Water Side Economizer	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
VAV System Conversion	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Water-Cooled Centrifugal Chiller > 300 ton	29.6%	29.6%	29.6%	29.6%	29.6%	29.6%	29.6%	29.6%	29.6%	29.6%
Motor Belt Replacement	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%
Chilled Hot Water Reset	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Water-Cooled Screw Chiller > 300 ton	27.9%	27.9%	27.9%	27.9%	27.9%	27.9%	27.9%	27.9%	27.9%	27.9%
Chiller Tune Up	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Efficient Chilled Water Pump	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%
High Efficiency Pumps	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%
HVAC Controls										
Programmable Thermostats	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
EMS install	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
EMS Optimization	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
HVAC Occupancy Sensors	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%
Zoning	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Setback with Electric Heat	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
EMS Pump Scheduling	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Web Enabled EMS	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Retrocommissioning	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	9.0%
Space Cooling - Unitary and Split AC										
AC 240K - 760 K	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%
Ductless (mini split) - Cooling	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%

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Savings Factor:
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Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Misc.
Ground Source Heat Pump - Cooling	40.8%	40.8%	40.8%	40.8%	40.8%	40.8%	40.8%	40.8%	40.8%	40.8%
Water Loop Heat Pump (WLHP) - Cooling	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%
Air Source Heat Pump - Cooling	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%	15.4%
DX Condenser Coil Cleaning	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%
Room AC	15.9%	15.9%	15.9%	15.9%	15.9%	15.9%	15.9%	15.9%	15.9%	15.9%
Lighting										
Lamp & Ballast Retrofit (HPT8 Replacing T12)	25.3%	25.3%	25.3%	25.3%	25.3%	25.3%	25.3%	25.3%	25.3%	25.3%
Lamp & Ballast Retrofit (HPT8 Replacing Standard T8)	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%	13.0%
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing T12)	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing Standard T8)	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%
T5 HP replacing T12	32.4%	32.4%	32.4%	32.4%	32.4%	32.4%	32.4%	32.4%	32.4%	32.4%
Exterior HID replaced with LED	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
Garage HID replacement with LED	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
LED Exit Sign	83.3%	83.3%	83.3%	83.3%	83.3%	83.3%	83.3%	83.3%	83.3%	83.3%
LED High Bay Lighting	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%
LED Low Bay Lighting	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%	45.7%
Light Tube	44.6%	44.6%	44.6%	44.6%	44.6%	44.6%	44.6%	44.6%	44.6%	44.6%
High Intensity Fluorescent Fixture (replacing HID)	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%
42W 8 lamp Hi Bay CFL	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%
HID Fixture Upgrade - Pulse Start Metal Halide	21.2%	21.2%	21.2%	21.2%	21.2%	21.2%	21.2%	21.2%	21.2%	21.2%
Interior Induction Lighting	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
CFL Fixture	64.5%	64.5%	64.5%	64.5%	64.5%	64.5%	64.5%	64.5%	64.5%	64.5%
CFL Screw-in	68.6%	68.6%	68.6%	68.6%	68.6%	68.6%	68.6%	68.6%	68.6%	68.6%
LED Screw In Replacing Incandescent	78.4%	78.4%	78.4%	78.4%	78.4%	78.4%	78.4%	78.4%	78.4%	78.4%
LED Screw In Replacing CFL	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%
CFL Reflector Flood	71.4%	71.4%	71.4%	71.4%	71.4%	71.4%	71.4%	71.4%	71.4%	71.4%
LED Downlight	66.2%	66.2%	66.2%	66.2%	66.2%	66.2%	66.2%	66.2%	66.2%	66.2%
LED Troffer	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%
LED Tube Lighting	46.1%	46.1%	46.1%	46.1%	46.1%	46.1%	46.1%	46.1%	46.1%	46.1%
LED Grow Light	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%

Consumers Energy Industrial Measure Database - Electric

Savings Factor:
Is the percentage reduction in electricity or gas consumption resulting from application of the efficient technology.

Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Misc.
Interior Non-Highbay/Lowbay LED Fixtures	42.9%	42.9%	42.9%	42.9%	42.9%	42.9%	42.9%	42.9%	42.9%	42.9%
Exterior HID Replaced with CFL	78.8%	78.8%	78.8%	78.8%	78.8%	78.8%	78.8%	78.8%	78.8%	78.8%
Exterior Linear Fluorescent	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%
LED Specialty replacing CFL	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%	47.3%
CFL Screw in Specialty	72.5%	72.5%	72.5%	72.5%	72.5%	72.5%	72.5%	72.5%	72.5%	72.5%
LED Specialty replacing incandescent	86.2%	86.2%	86.2%	86.2%	86.2%	86.2%	86.2%	86.2%	86.2%	86.2%
Illuminated Signs to LED	18.1%	18.1%	18.1%	18.1%	18.1%	18.1%	18.1%	18.1%	18.1%	18.1%
Lighting Controls										
Exterior Bi-level Controls	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
Garage Bi-level Controls	28.5%	28.5%	28.5%	28.5%	28.5%	28.5%	28.5%	28.5%	28.5%	28.5%
Daylight Sensor Controls	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Lighting Power Density- Exterior	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Lighting Power Density - Parking Garage	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
Stairwell Bi-Level Control	54.9%	54.9%	54.9%	54.9%	54.9%	54.9%	54.9%	54.9%	54.9%	54.9%
Occupancy Sensor	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Occupancy Sensor & Daylight Sensor	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Central Lighting Control	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Switching Controls for Multilevel Lighting (Non-HID)	17.5%	17.5%	17.5%	17.5%	17.5%	17.5%	17.5%	17.5%	17.5%	17.5%
Lighting Power Density - Interior	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Long Day Lighting Dairy	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Space Heating										
Air Source Heat Pump - Heating	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
Ground Source Heat Pump - Heating	40.9%	40.9%	40.9%	40.9%	40.9%	40.9%	40.9%	40.9%	40.9%	40.9%
Ductless (mini split) - Heating	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%	61.5%
Water Loop Heat Pump (WLHP) - Heating	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%
VFD Pump	38.4%	38.4%	38.4%	38.4%	38.4%	38.4%	38.4%	38.4%	38.4%	38.4%
ECM motors on furnaces	26.1%	26.1%	26.1%	26.1%	26.1%	26.1%	26.1%	26.1%	26.1%	26.1%
Other										
High Efficiency Transformer, single-phase	2.5%	33.5%	33.5%	33.5%	33.5%	33.5%	33.5%	33.5%	33.5%	33.5%
NEMA Premium Transformer, single-phase	2.5%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%

Consumers Energy Industrial Measure Database - Electric

Savings Factor:
Is the percentage reduction in electricity or gas consumption resulting from application of the efficient technology.

Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Misc.
NEMA Premium Transformer, three-phase	2.5%	36.5%	36.5%	36.5%	36.5%	36.5%	36.5%	36.5%	36.5%	36.5%
High Efficiency Transformer, three-phase	2.5%	31.4%	31.4%	31.4%	31.4%	31.4%	31.4%	31.4%	31.4%	31.4%
Parking Garage Exhaust Fan CO Control	48.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%
Optimized Snow and Ice Melt Controls	92.0%	91.8%	91.8%	91.8%	91.8%	91.8%	91.8%	91.8%	91.8%	91.8%
Engine Block Heater Timer	64.0%	64.0%	64.0%	64.0%	64.0%	64.0%	64.0%	64.0%	64.0%	64.0%
Machine Drive										
Sensors & Controls	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Energy Information System	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Electric Supply System Improvements	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Advanced Efficient Motors	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%
Industrial Motor Management	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Advanced Lubricants	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%
Motor System Optimization (Including ASD)	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%
Pump System Efficiency Improvements	16.4%	16.4%	16.4%	16.4%	16.4%	16.4%	16.4%	16.4%	16.4%	16.4%
Fan System Improvements	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Compressed Air System Management	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%
Compressed Air - Advanced Compressor Controls	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
VFD for Process Fans	28.0%	28.0%	28.0%	28.0%	28.0%	28.0%	28.0%	28.0%	28.0%	28.0%
VFD for Process Pumps	29.0%	29.0%	29.0%	29.0%	29.0%	29.0%	29.0%	29.0%	29.0%	29.0%
High Efficiency Pumps	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%
Compressed Air Audits and Leak Repair	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Elec motors replacing pneumatic (comp air)	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%
Automatic Drains, High efficiency nozzles and other (comp air)	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Storage Tank Addition (comp air)	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
High Efficiency Dryers (comp air)	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Process Cooling & Refrigeration										
Sensors & Controls	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Energy Information System	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Electric Supply System Improvements	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Improved Refrigeration	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%

Consumers Energy Industrial Measure Database - Electric

Savings Factor:
Is the percentage reduction in electricity or gas consumption resulting from application of the efficient technology.

Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Misc.
Process Heating										
Sensors & Controls	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Energy Information System	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Electric Supply System Improvements	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Industrial Other										
High Efficiency Welders	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%
3 Phase High Eff Battery Charger	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Barrel Insulation - Inj. Molding (plastics)	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%
Pellet Dryer Insulation (plastics)	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%
Injection Molding Machine - efficient (plastics)	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%
Fiber Laser Replacing CO2 laser (auto industry)	78.0%	78.0%	78.0%	78.0%	78.0%	78.0%	78.0%	78.0%	78.0%	78.0%
Agriculture										
Other Industrial -Low-Energy Livestock Waterer	47.7%	47.7%	47.7%	47.7%	47.7%	47.7%	47.7%	47.7%	47.7%	47.7%
Other Industrial -Dairy Refrigerator Tune-Up	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
Greenhouse Environmental Controls	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Scroll Compressor with Heat Exchanger for Dairy Refrigeration	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%
Variable Speed Drive withHeat Exchanger, Milk	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
Milk Pre-Cooler Heat Exchanger	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Variable Speed Drives for Dairy Vacuum Pumps	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%
VFD for Process Fans - Agriculture	23.0%	23.0%	23.0%	23.0%	23.0%	23.0%	23.0%	23.0%	23.0%	23.0%
VFD for Process Pumps - Agriculture	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%
VFD for Process Pumps - Irrigation	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%
Grain Storage Temperature and Moisture Management Controller	49.0%	49.0%	49.0%	49.0%	49.0%	49.0%	49.0%	49.0%	49.0%	49.0%
Low Pressure Sprinkler Nozzles	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
Fan Thermostat Controller	53.4%	53.4%	53.4%	53.4%	53.4%	53.4%	53.4%	53.4%	53.4%	53.4%

Consumers Energy Industrial Measure Database - Electric

Remaining Factor:
Is the fraction of applicable kWh or therm sales that are associated with equipment that has not yet been converted to the energy efficiency measure;
that is, one minus the fraction of the market segment that already have the energy-efficiency measure installed.

Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery	Computer & Electronics
Computers and Office Equipment																
Energy Star Compliant Single Door Refrigerator	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Energy Star office equipment including computers, monitors, copiers, multi-function machines.	72.0%	72.0%	72.0%	72.0%	72.0%	72.0%	72.0%	72.0%	72.0%	72.0%	72.0%	72.0%	72.0%	72.0%	72.0%	72.0%
Energy Efficient "Smart" Power Strip for PC/Monitor/Printer	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%
PC Network Energy Management Controls replacing no central control	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%
Energy Star UPS	61.0%	61.0%	61.0%	61.0%	61.0%	61.0%	61.0%	61.0%	61.0%	61.0%	61.0%	61.0%	61.0%	61.0%	61.0%	61.0%
High Efficiency CRAC Unit	61.0%	61.0%	61.0%	61.0%	61.0%	61.0%	61.0%	61.0%	61.0%	61.0%	61.0%	61.0%	61.0%	61.0%	61.0%	61.0%
Water Heating																
Heat Pump Water Heater	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Electric Tankless Water Heater	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Efficient Hot Water Pump	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%
Solar Storage Water Heating	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%
High Efficiency Electric Water Heater	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
HVAC Condenser Heater Recovery Water Heating	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Low Flow Faucet Aerator	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Low Flow Showerhead	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Hot Water (DHW) Pipe Insulation	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Tank Insulation (electric)	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Drain Water Heat Recovery Water Heater	94.1%	94.1%	94.1%	94.1%	94.1%	94.1%	94.1%	94.1%	94.1%	94.1%	94.1%	94.1%	94.1%	94.1%	94.1%	94.1%
ECM Circulator Pump	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
Process Cooling Condenser Heat Recovery	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%
Building Envelope																
Integrated Building Design	82.6%	82.6%	82.6%	82.6%	82.6%	82.6%	82.6%	82.6%	82.6%	82.6%	82.6%	82.6%	82.6%	82.6%	82.6%	82.6%
Energy Efficient Windows	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%
Cool Roofing	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%
Ceiling Insulation	31.0%	31.0%	31.0%	31.0%	31.0%	31.0%	31.0%	31.0%	31.0%	31.0%	31.0%	31.0%	31.0%	31.0%	31.0%	31.0%
Window Improvements	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%
Wall Insulation	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%
Roof Insulation	69.0%	69.0%	69.0%	69.0%	69.0%	69.0%	69.0%	69.0%	69.0%	69.0%	69.0%	69.0%	69.0%	69.0%	69.0%	69.0%
Improved Duct Sealing	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%
Ventilation																
Economizer	97.0%	97.0%	97.0%	97.0%	97.0%	97.0%	97.0%	97.0%	97.0%	97.0%	97.0%	97.0%	97.0%	97.0%	97.0%	97.0%

Consumers Energy Industrial Measure Database - Electric

Remaining Factor:
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that is, one minus the fraction of the market segment that already have the energy-efficiency measure installed.

Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery	Computer & Electronics
Variable Speed Drive Control, 15 HP	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%
Variable Speed Drive Control, 5 HP	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%
Variable Speed Drive Control, 40 HP	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%
High Speed Fans	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%
High Volume Low Speed Fans	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%
Destratification Fan (HVLS)	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%
Space Cooling - Chillers																
Air-Cooled Recip Chiller	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Air-Cooled Screw Chiller	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Water Side Economizer	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%
VAV System Conversion	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%
Water-Cooled Centrifugal Chiller > 300 ton	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Motor Belt Replacement	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%
Chilled Hot Water Reset	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%
Water-Cooled Screw Chiller > 300 ton	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Chiller Tune Up	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%
Efficient Chilled Water Pump	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%
High Efficiency Pumps	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%
HVAC Controls																
Programmable Thermostats	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
EMS install	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
EMS Optimization	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%
HVAC Occupancy Sensors	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Zoning	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%	82.0%
Setback with Electric Heat	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
EMS Pump Scheduling	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Web Enabled EMS	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Retrocommissioning	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Space Cooling - Unitary and Split AC																
AC 240K - 760 K	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Ductless (mini split) - Cooling	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Ground Source Heat Pump - Cooling	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%
Water Loop Heat Pump (WLHP) - Cooling	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Air Source Heat Pump - Cooling	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
DX Condenser Coil Cleaning	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Room AC	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%
Lighting																

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Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery	Computer & Electronics
Lamp & Ballast Retrofit (HPT8 Replacing T12)	82.8%	82.8%	82.8%	82.8%	82.8%	82.8%	82.8%	82.8%	82.8%	82.8%	82.8%	82.8%	82.8%	82.8%	82.8%	82.8%
Lamp & Ballast Retrofit (HPT8 Replacing Standard T8)	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing T12)	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing Standard T8)	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%	84.0%
T5 HP replacing T12	82.8%	82.8%	82.8%	82.8%	82.8%	82.8%	82.8%	82.8%	82.8%	82.8%	82.8%	82.8%	82.8%	82.8%	82.8%	82.8%
Exterior HID replaced with LED	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Garage HID replacement with LED	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
LED Exit Sign	55.0%	55.0%	55.0%	55.0%	55.0%	55.0%	55.0%	55.0%	55.0%	55.0%	55.0%	55.0%	55.0%	55.0%	55.0%	55.0%
LED High Bay Lighting	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
LED Low Bay Lighting	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Light Tube	98.7%	98.7%	98.7%	98.7%	98.7%	98.7%	98.7%	98.7%	98.7%	98.7%	98.7%	98.7%	98.7%	98.7%	98.7%	98.7%
High Intensity Fluorescent Fixture (replacing HID)	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
42W 8 lamp Hi Bay CFL	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%
HID Fixture Upgrade - Pulse Start Metal Halide	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Interior Induction Lighting	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%
CFL Fixture	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%
CFL Screw-in	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
LED Screw In Replacing Incandescent	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%
LED Screw In Replacing CFL	58.0%	58.0%	58.0%	58.0%	58.0%	58.0%	58.0%	58.0%	58.0%	58.0%	58.0%	58.0%	58.0%	58.0%	58.0%	58.0%
CFL Reflector Flood	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%
LED Downlight	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%
LED Troffer	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%
LED Tube Lighting	82.8%	82.8%	82.8%	82.8%	82.8%	82.8%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%
LED Grow Light	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%
Interior Non-Highbay/Lowbay LED Fixtures	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Exterior HID Replaced with CFL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Exterior Linear Fluorescent	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%
LED Specialty replacing CFL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
CFL Screw in Specialty	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%
LED Specialty replacing incandescent	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%	86.5%
Illuminated Signs to LED	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Lighting Controls																

Consumers Energy Industrial Measure Database - Electric

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Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery	Computer & Electronics
Exterior Bi-level Controls	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Garage Bi-level Controls	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Daylight Sensor Controls	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Lighting Power Density- Exterior	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Lighting Power Density - Parking Garage	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Stairwell Bi-Level Control	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%
Occupancy Sensor	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%
Occupancy Sensor & Daylight Sensor	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%
Central Lighting Control	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Switching Controls for Multilevel Lighting (Non-HID)	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%
Lighting Power Density - Interior	65.8%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Long Day Lighting Dairy	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%
Space Heating																
Air Source Heat Pump - Heating	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Ground Source Heat Pump - Heating	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%
Ductless (mini split) - Heating	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Water Loop Heat Pump (WLHP) - Heating	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
VFD Pump	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%
ECM motors on furnaces	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%	47.0%
Other																
High Efficiency Transformer, single-phase	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%
NEMA Premium Transformer, single-phase	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%
NEMA Premium Transformer, three-phase	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%
High Efficiency Transformer, three-phase	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%
Parking Garage Exhaust Fan CO Control	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Optimized Snow and Ice Melt Controls	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Engine Block Heater Timer	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Machine Drive																
Sensors & Controls	71.0%	71.0%	72.0%	72.0%	72.0%	76.0%	64.0%	64.0%	72.0%	72.0%	80.0%	83.0%	74.0%	74.0%	76.0%	77.0%
Energy Information System	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Electric Supply System Improvements	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Advanced Efficient Motors	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Industrial Motor Management	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Advanced Lubricants	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Consumers Energy Industrial Measure Database - Electric

Remaining Factor:
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that is, one minus the fraction of the market segment that already have the energy-efficiency measure installed.

Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery	Computer & Electronics
Motor System Optimization (Including ASD)	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Pump System Efficiency Improvements	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Fan System Improvements	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Compressed Air System Management	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Compressed Air - Advanced Compressor Controls	71.0%	71.0%	72.0%	72.0%	72.0%	76.0%	64.0%	64.0%	72.0%	72.0%	80.0%	83.0%	74.0%	74.0%	76.0%	77.0%
VFD for Process Fans	71.0%	71.0%	72.0%	72.0%	72.0%	76.0%	64.0%	64.0%	72.0%	72.0%	80.0%	83.0%	74.0%	74.0%	76.0%	77.0%
VFD for Process Pumps	71.0%	71.0%	72.0%	72.0%	72.0%	76.0%	64.0%	64.0%	72.0%	72.0%	80.0%	83.0%	74.0%	74.0%	76.0%	77.0%
High Efficiency Pumps	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Compressed Air Audits and Leak Repair	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Elec motors replacing pneumatic (comp air)	71.0%	71.0%	72.0%	72.0%	72.0%	76.0%	64.0%	64.0%	72.0%	72.0%	80.0%	83.0%	74.0%	74.0%	76.0%	77.0%
Automatic Drains, High efficiency nozzles and other (comp air)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Storage Tank Addition (comp air)	71.0%	71.0%	72.0%	72.0%	72.0%	76.0%	64.0%	64.0%	72.0%	72.0%	80.0%	83.0%	74.0%	74.0%	76.0%	77.0%
High Efficiency Dryers (comp air)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Process Cooling & Refrigeration																
Sensors & Controls	72.0%	72.0%	86.0%	86.0%	86.0%	78.0%	64.0%	64.0%	86.0%	86.0%	82.0%	83.0%	76.0%	76.0%	78.0%	80.0%
Energy Information System	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Electric Supply System Improvements	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Improved Refrigeration	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Process Heating																
Sensors & Controls	72.0%	72.0%	86.0%	86.0%	86.0%	78.0%	64.0%	64.0%	86.0%	86.0%	82.0%	83.0%	76.0%	76.0%	78.0%	80.0%
Energy Information System	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Electric Supply System Improvements	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Industrial Other																
High Efficiency Welders	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
3 Phase High Eff Battery Charger	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Barrel Insulation - Inj. Molding (plastics)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	50.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pellet Dryer Insulation (plastics)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	50.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Injection Molding Machine - efficient (plastics)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	75.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Fiber Laser Replacing CO2 laser (auto industry)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	75.0%	0.0%
Agriculture																
Other Industrial -Low-Energy Livestock Waterer	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Consumers Energy Industrial Measure Database - Electric

Remaining Factor:
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that is, one minus the fraction of the market segment that already have the energy-efficiency measure installed.

Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery	Computer & Electronics
Other Industrial -Dairy Refrigerator Tune-Up	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Greenhouse Environmental Controls	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Scroll Compressor with Heat Exchanger for Dairy Refrigeration	70.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Variable Speed Drive withHeat Exchanger, Milk	71.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Milk Pre-Cooler Heat Exchanger	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Variable Speed Drives for Dairy Vacuum Pumps	71.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
VFD for Process Fans - Agriculture	71.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
VFD for Process Pumps - Agriculture	71.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
VFD for Process Pumps - Irrigation	71.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Grain Storage Temperature and Moisture Management Controller	80.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Low Pressure Sprinkler Nozzles	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Fan Thermostat Controller	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Consumers Energy Industrial Measure Data

Remaining Factor:
Is the fraction of applicable kWh or therm s
that is, one minus the fraction of the marke

Measure Name	Elec. Equip.	Trans. Equip.	Furniture	Misc.
Computers and Office Equipment				
Energy Star Compliant Single Door Refrigerator	100.0%	100.0%	100.0%	100.0%
Energy Star office equipment including computers, monitors, copiers, multi-function machines.	72.0%	72.0%	72.0%	72.0%
Energy Efficient "Smart" Power Strip for PC/Monitor/Printer	70.0%	70.0%	70.0%	70.0%
PC Network Energy Management Controls replacing no central control	70.0%	70.0%	70.0%	70.0%
Energy Star UPS	61.0%	61.0%	61.0%	61.0%
High Efficiency CRAC Unit	61.0%	61.0%	61.0%	61.0%
Water Heating				
Heat Pump Water Heater	100.0%	100.0%	100.0%	100.0%
Electric Tankless Water Heater	100.0%	100.0%	100.0%	100.0%
Efficient Hot Water Pump	47.0%	47.0%	47.0%	47.0%
Solar Storage Water Heating	99.0%	99.0%	99.0%	99.0%
High Efficiency Electric Water Heater	100.0%	100.0%	100.0%	100.0%
HVAC Condenser Heater Recovery Water Heating	90.0%	90.0%	90.0%	90.0%
Low Flow Faucet Aerator	100.0%	100.0%	100.0%	100.0%
Low Flow Showerhead	100.0%	100.0%	100.0%	100.0%
Hot Water (DHW) Pipe Insulation	30.0%	30.0%	30.0%	30.0%
Tank Insulation (electric)	30.0%	30.0%	30.0%	30.0%
Drain Water Heat Recovery Water Heater	94.1%	94.1%	94.1%	94.1%
ECM Circulator Pump	60.0%	60.0%	60.0%	60.0%
Process Cooling Condenser Heat Recovery	99.0%	99.0%	99.0%	99.0%
Building Envelope				
Integrated Building Design	82.6%	82.6%	82.6%	82.6%
Energy Efficient Windows	53.0%	53.0%	53.0%	53.0%
Cool Roofing	99.0%	99.0%	99.0%	99.0%
Ceiling Insulation	31.0%	31.0%	31.0%	31.0%
Window Improvements	54.0%	54.0%	54.0%	54.0%
Wall Insulation	52.0%	52.0%	52.0%	52.0%
Roof Insulation	69.0%	69.0%	69.0%	69.0%
Improved Duct Sealing	51.0%	51.0%	51.0%	51.0%
Ventilation				
Economizer	97.0%	97.0%	97.0%	97.0%

Consumers Energy Industrial Measure Data

Remaining Factor:
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Measure Name	Elec. Equip.	Trans. Equip.	Furniture	Misc.
Variable Speed Drive Control, 15 HP	89.0%	89.0%	89.0%	89.0%
Variable Speed Drive Control, 5 HP	89.0%	89.0%	89.0%	89.0%
Variable Speed Drive Control, 40 HP	89.0%	89.0%	89.0%	89.0%
High Speed Fans	93.0%	93.0%	93.0%	93.0%
High Volume Low Speed Fans	93.0%	93.0%	93.0%	93.0%
Destratification Fan (HVLS)	93.0%	93.0%	93.0%	93.0%
Space Cooling - Chillers				
Air-Cooled Recip Chiller	100.0%	100.0%	100.0%	100.0%
Air-Cooled Screw Chiller	100.0%	100.0%	100.0%	100.0%
Water Side Economizer	95.0%	95.0%	95.0%	95.0%
VAV System Conversion	67.0%	67.0%	67.0%	67.0%
Water-Cooled Centrifugal Chiller > 300 ton	100.0%	100.0%	100.0%	100.0%
Motor Belt Replacement	67.0%	67.0%	67.0%	67.0%
Chilled Hot Water Reset	99.0%	99.0%	99.0%	99.0%
Water-Cooled Screw Chiller > 300 ton	100.0%	100.0%	100.0%	100.0%
Chiller Tune Up	67.0%	67.0%	67.0%	67.0%
Efficient Chilled Water Pump	47.0%	47.0%	47.0%	47.0%
High Efficiency Pumps	47.0%	47.0%	47.0%	47.0%
HVAC Controls				
Programmable Thermostats	40.0%	40.0%	40.0%	40.0%
EMS install	90.0%	90.0%	90.0%	90.0%
EMS Optimization	99.0%	99.0%	99.0%	99.0%
HVAC Occupancy Sensors	100.0%	100.0%	100.0%	100.0%
Zoning	82.0%	82.0%	82.0%	82.0%
Setback with Electric Heat	100.0%	100.0%	100.0%	100.0%
EMS Pump Scheduling	100.0%	100.0%	100.0%	100.0%
Web Enabled EMS	100.0%	100.0%	100.0%	100.0%
Retrocommissioning	100.0%	100.0%	100.0%	100.0%
Space Cooling - Unitary and Split AC				
AC 240K - 760 K	100.0%	100.0%	100.0%	100.0%
Ductless (mini split) - Cooling	80.0%	80.0%	80.0%	80.0%
Ground Source Heat Pump - Cooling	99.0%	99.0%	99.0%	99.0%
Water Loop Heat Pump (WLHP) - Cooling	80.0%	80.0%	80.0%	80.0%
Air Source Heat Pump - Cooling	100.0%	100.0%	100.0%	100.0%
DX Condenser Coil Cleaning	100.0%	100.0%	100.0%	100.0%
Room AC	43.0%	43.0%	43.0%	43.0%
Lighting				

Consumers Energy Industrial Measure Data

Remaining Factor:
Is the fraction of applicable kWh or therm s
that is, one minus the fraction of the marke

Measure Name	Elec. Equip.	Trans. Equip.	Furnitur e	Misc.
Lamp & Ballast Retrofit (HPT8 Replacing T12)	82.8%	82.8%	82.8%	82.8%
Lamp & Ballast Retrofit (HPT8 Replacing Standard T8)	84.0%	84.0%	84.0%	84.0%
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing T12)	84.0%	84.0%	84.0%	84.0%
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing Standard T8)	84.0%	84.0%	84.0%	84.0%
T5 HP replacing T12	82.8%	82.8%	82.8%	82.8%
Exterior HID replaced with LED	100.0%	100.0%	100.0%	100.0%
Garage HID replacement with LED	100.0%	100.0%	100.0%	100.0%
LED Exit Sign	55.0%	55.0%	55.0%	55.0%
LED High Bay Lighting	100.0%	100.0%	100.0%	100.0%
LED Low Bay Lighting	100.0%	100.0%	100.0%	100.0%
Light Tube	98.7%	98.7%	98.7%	98.7%
High Intensity Fluorescent Fixture (replacing HID)	85.0%	85.0%	85.0%	85.0%
42W 8 lamp Hi Bay CFL	99.0%	99.0%	99.0%	99.0%
HID Fixture Upgrade - Pulse Start Metal Halide	50.0%	50.0%	50.0%	50.0%
Interior Induction Lighting	99.0%	99.0%	99.0%	99.0%
CFL Fixture	86.5%	86.5%	86.5%	86.5%
CFL Screw-in	100.0%	100.0%	100.0%	100.0%
LED Screw In Replacing Incandescent	86.5%	86.5%	86.5%	86.5%
LED Screw In Replacing CFL	58.0%	58.0%	58.0%	58.0%
CFL Reflector Flood	86.5%	86.5%	86.5%	86.5%
LED Downlight	99.0%	99.0%	99.0%	99.0%
LED Troffer	99.0%	99.0%	99.0%	99.0%
LED Tube Lighting	99.0%	99.0%	99.0%	99.0%
LED Grow Light	99.0%	99.0%	99.0%	99.0%
Interior Non-Highbay/Lowbay LED Fixtures	100.0%	100.0%	100.0%	100.0%
Exterior HID Replaced with CFL	100.0%	100.0%	100.0%	100.0%
Exterior Linear Fluorescent	86.5%	86.5%	86.5%	86.5%
LED Specialty replacing CFL	100.0%	100.0%	100.0%	100.0%
CFL Screw in Specialty	86.5%	86.5%	86.5%	86.5%
LED Specialty replacing incandescent	86.5%	86.5%	86.5%	86.5%
Illuminated Signs to LED	100.0%	100.0%	100.0%	100.0%
Lighting Controls				

Consumers Energy Industrial Measure Data

Remaining Factor:
Is the fraction of applicable kWh or therm s
that is, one minus the fraction of the marke

Measure Name	Elec. Equip.	Trans. Equip.	Furnitur e	Misc.
Exterior Bi-level Controls	100.0%	100.0%	100.0%	100.0%
Garage Bi-level Controls	100.0%	100.0%	100.0%	100.0%
Daylight Sensor Controls	100.0%	100.0%	100.0%	100.0%
Lighting Power Density- Exterior	100.0%	100.0%	100.0%	100.0%
Lighting Power Density - Parking Garage	100.0%	100.0%	100.0%	100.0%
Stairwell Bi-Level Control	89.0%	89.0%	89.0%	89.0%
Occupancy Sensor	95.0%	95.0%	95.0%	95.0%
Occupancy Sensor & Daylight Sensor	95.0%	95.0%	95.0%	95.0%
Central Lighting Control	100.0%	100.0%	100.0%	100.0%
Switching Controls for Multilevel Lighting (Non-HID)	99.0%	99.0%	99.0%	99.0%
Lighting Power Density - Interior	100.0%	100.0%	100.0%	100.0%
Long Day Lighting Dairy	99.0%	99.0%	99.0%	99.0%
Space Heating				
Air Source Heat Pump - Heating	100.0%	100.0%	100.0%	100.0%
Ground Source Heat Pump - Heating	99.0%	99.0%	99.0%	99.0%
Ductless (mini split) - Heating	90.0%	90.0%	90.0%	90.0%
Water Loop Heat Pump (WLHP) - Heating	80.0%	80.0%	80.0%	80.0%
VFD Pump	83.0%	83.0%	83.0%	83.0%
ECM motors on furnaces	47.0%	47.0%	47.0%	47.0%
Other				
High Efficiency Transformer, single-phase	98.0%	98.0%	98.0%	98.0%
NEMA Premium Transformer, single-phase	98.0%	98.0%	98.0%	98.0%
NEMA Premium Transformer, three-phase	98.0%	98.0%	98.0%	98.0%
High Efficiency Transformer, three-phase	98.0%	98.0%	98.0%	98.0%
Parking Garage Exhaust Fan CO Control	100.0%	100.0%	100.0%	100.0%
Optimized Snow and Ice Melt Controls	100.0%	100.0%	100.0%	100.0%
Engine Block Heater Timer	100.0%	100.0%	100.0%	100.0%
Machine Drive				
Sensors & Controls	77.0%	81.0%	72.0%	72.0%
Energy Information System	90.0%	90.0%	90.0%	90.0%
Electric Supply System Improvements	90.0%	90.0%	90.0%	90.0%
Advanced Efficient Motors	100.0%	100.0%	100.0%	100.0%
Industrial Motor Management	90.0%	90.0%	90.0%	90.0%
Advanced Lubricants	100.0%	100.0%	100.0%	100.0%

Consumers Energy Industrial Measure Data

Remaining Factor:
Is the fraction of applicable kWh or therm s
that is, one minus the fraction of the marke

Measure Name	Elec. Equip.	Trans. Equip.	Furnitur e	Misc.
Motor System Optimization (Including ASD)	90.0%	90.0%	90.0%	90.0%
Pump System Efficiency Improvements	90.0%	90.0%	90.0%	90.0%
Fan System Improvements	90.0%	90.0%	90.0%	90.0%
Compressed Air System Management	100.0%	100.0%	100.0%	100.0%
Compressed Air - Advanced Compressor Controls	77.0%	81.0%	72.0%	72.0%
VFD for Process Fans	77.0%	81.0%	72.0%	72.0%
VFD for Process Pumps	77.0%	81.0%	72.0%	72.0%
High Efficiency Pumps	100.0%	100.0%	100.0%	100.0%
Compressed Air Audits and Leak Repair	100.0%	100.0%	100.0%	100.0%
Elec motors replacing pneumatic (comp air)	77.0%	81.0%	72.0%	72.0%
Automatic Drains, High efficiency nozzles and other (comp air)	100.0%	100.0%	100.0%	100.0%
Storage Tank Addition (comp air)	77.0%	81.0%	72.0%	72.0%
High Efficiency Dryers (comp air)	100.0%	100.0%	100.0%	100.0%
Process Cooling & Refrigeration				
Sensors & Controls	80.0%	84.0%	86.0%	86.0%
Energy Information System	90.0%	90.0%	90.0%	90.0%
Electric Supply System Improvements	90.0%	90.0%	90.0%	90.0%
Improved Refrigeration	90.0%	90.0%	90.0%	90.0%
Process Heating				
Sensors & Controls	80.0%	84.0%	86.0%	86.0%
Energy Information System	90.0%	90.0%	90.0%	90.0%
Electric Supply System Improvements	90.0%	90.0%	90.0%	90.0%
Industrial Other				
High Efficiency Welders	80.0%	80.0%	80.0%	80.0%
3 Phase High Eff Battery Charger	90.0%	90.0%	90.0%	90.0%
Barrel Insulation - Inj. Molding (plastics)	0.0%	0.0%	0.0%	0.0%
Pellet Dryer Insulation (plastics)	0.0%	0.0%	0.0%	0.0%
Injection Molding Machine - efficient (plastics)	0.0%	0.0%	0.0%	0.0%
Fiber Laser Replacing CO2 laser (auto industry)	0.0%	75.0%	0.0%	0.0%
Agriculture				
Other Industrial -Low-Energy Livestock Waterer	0.0%	0.0%	0.0%	0.0%

Consumers Energy Industrial Measure Data

Remaining Factor:
Is the fraction of applicable kWh or therm s
that is, one minus the fraction of the marke

Measure Name	Elec. Equip.	Trans. Equip.	Furniture	Misc.
Other Industrial -Dairy Refrigerator Tune-Up	0.0%	0.0%	0.0%	0.0%
Greenhouse Environmental Controls	0.0%	0.0%	0.0%	0.0%
Scroll Compressor with Heat Exchanger for Dairy Refrigeration	0.0%	0.0%	0.0%	0.0%
Variable Speed Drive withHeat Exchanger, Milk	0.0%	0.0%	0.0%	0.0%
Milk Pre-Cooler Heat Exchanger	0.0%	0.0%	0.0%	0.0%
Variable Speed Drives for Dairy Vacuum Pumps	0.0%	0.0%	0.0%	0.0%
VFD for Process Fans - Agriculture	0.0%	0.0%	0.0%	0.0%
VFD for Process Pumps - Agriculture	0.0%	0.0%	0.0%	0.0%
VFD for Process Pumps - Irrigation	0.0%	0.0%	0.0%	0.0%
Grain Storage Temperature and Moisture Management Controller	0.0%	0.0%	0.0%	0.0%
Low Pressure Sprinkler Nozzles	0.0%	0.0%	0.0%	0.0%
Fan Thermostat Controller	0.0%	0.0%	0.0%	0.0%

Consumers Energy Industrial Measure Database - Electric

Convertible Factor:
Is the fraction of the equipment or practice that is technically feasible for conversion to the efficient technology from an engineering perspective (e.g., it may not be possible to install VFDs on all motors in a given market segment).

Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery
Computers and Office Equipment															
Energy Star Compliant Single Door Refrigerator	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Energy Star office equipment including computers, monitors, copiers, multi-function machines.	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Energy Efficient "Smart" Power Strip for PC/Monitor/Printer	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
PC Network Energy Management Controls replacing no central control	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Energy Star UPS	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
High Efficiency CRAC Unit	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Water Heating															
Heat Pump Water Heater	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
Electric Tankless Water Heater	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Efficient Hot Water Pump	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Solar Storage Water Heating	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%
High Efficiency Electric Water Heater	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
HVAC Condenser Heater Recovery Water Heating	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Low Flow Faucet Aerator	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Low Flow Showerhead	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Hot Water (DHW) Pipe Insulation	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Tank Insulation (electric)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Drain Water Heat Recovery Water Heater	39.0%	39.0%	39.0%	39.0%	39.0%	39.0%	39.0%	39.0%	39.0%	39.0%	39.0%	39.0%	39.0%	39.0%	39.0%
ECM Circulator Pump	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Process Cooling Condenser Heat Recovery	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Building Envelope															
Integrated Building Design	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%
Energy Efficient Windows	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%
Cool Roofing	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%
Ceiling Insulation	57.0%	57.0%	57.0%	57.0%	57.0%	57.0%	57.0%	57.0%	57.0%	57.0%	57.0%	57.0%	57.0%	57.0%	57.0%
Window Improvements	14.0%	14.0%	14.0%	14.0%	14.0%	14.0%	14.0%	14.0%	14.0%	14.0%	14.0%	14.0%	14.0%	14.0%	14.0%
Wall Insulation	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Roof Insulation	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%
Improved Duct Sealing	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%
Ventilation															
Economizer	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%	86.0%

Consumers Energy Industrial Measure Database - Electric

Convertible Factor:

Is the fraction of the equipment or practice that is technically feasible for conversion to the efficient technology from an engineering perspective (e.g., it may not be possible to install VFDs on all motors in a given market segment).

Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery
Variable Speed Drive Control, 15 HP	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%
Variable Speed Drive Control, 5 HP	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%
Variable Speed Drive Control, 40 HP	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%
High Speed Fans	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%
High Volume Low Speed Fans	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%
Destratification Fan (HVLS)	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Space Cooling - Chillers															
Air-Cooled Recip Chiller	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Air-Cooled Screw Chiller	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Water Side Economizer	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
VAV System Conversion	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Water-Cooled Centrifugal Chiller > 300 ton	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Motor Belt Replacement	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Chilled Hot Water Reset	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%
Water-Cooled Screw Chiller > 300 ton	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Chiller Tune Up	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Efficient Chilled Water Pump	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
High Efficiency Pumps	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
HVAC Controls															
Programmable Thermostats	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
EMS install	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
EMS Optimization	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
HVAC Occupancy Sensors	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Zoning	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Setback with Electric Heat	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
EMS Pump Scheduling	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Web Enabled EMS	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Retrocommissioning	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Space Cooling - Unitary and Split AC															
AC 240K - 760 K	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
Ductless (mini split) - Cooling	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
Ground Source Heat Pump - Cooling	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Water Loop Heat Pump (WLHP) - Cooling	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
Air Source Heat Pump - Cooling	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
DX Condenser Coil Cleaning	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
Room AC	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
Lighting															

Consumers Energy Industrial Measure Database - Electric

Convertible Factor:
Is the fraction of the equipment or practice that is technically feasible for conversion to the efficient technology from an engineering perspective (e.g., it may not be possible to install VFDs on all motors in a given market segment).

Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery
Lamp & Ballast Retrofit (HPT8 Replacing T12)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Lamp & Ballast Retrofit (HPT8 Replacing Standard T8)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing T12)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing Standard T8)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
T5 HP replacing T12	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Exterior HID replaced with LED	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Garage HID replacement with LED	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
LED Exit Sign	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
LED High Bay Lighting	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
LED Low Bay Lighting	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Light Tube	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
High Intensity Fluorescent Fixture (replacing HID)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
42W 8 lamp Hi Bay CFL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
HID Fixture Upgrade - Pulse Start Metal Halide	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Interior Induction Lighting	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%
CFL Fixture	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
CFL Screw-in	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
LED Screw In Replacing Incandescent	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
LED Screw In Replacing CFL	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
CFL Reflector Flood	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
LED Downlight	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
LED Troffer	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
LED Tube Lighting	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
LED Grow Light	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Interior Non-Highbay/Lowbay LED Fixtures	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Exterior HID Replaced with CFL	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
Exterior Linear Fluorescent	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
LED Specialty replacing CFL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
CFL Screw in Specialty	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
LED Specialty replacing incandescent	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Illuminated Signs to LED	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Lighting Controls															

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Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery
Exterior Bi-level Controls	73.0%	73.0%	73.0%	73.0%	73.0%	73.0%	73.0%	73.0%	73.0%	73.0%	73.0%	73.0%	73.0%	73.0%	73.0%
Garage Bi-level Controls	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
Daylight Sensor Controls	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%
Lighting Power Density- Exterior	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%
Lighting Power Density - Parking Garage	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Stairwell Bi-Level Control	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Occupancy Sensor	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Occupancy Sensor & Daylight Sensor	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Central Lighting Control	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Switching Controls for Multilevel Lighting (Non-HID)	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Lighting Power Density - Interior	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Long Day Lighting Dairy	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Space Heating															
Air Source Heat Pump - Heating	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%
Ground Source Heat Pump - Heating	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%
Ductless (mini split) - Heating	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
Water Loop Heat Pump (WLHP) - Heating	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
VFD Pump	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
ECM motors on furnaces	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Other															
High Efficiency Transformer, single-phase	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
NEMA Premium Transformer, single-phase	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%
NEMA Premium Transformer, three-phase	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%
High Efficiency Transformer, three-phase	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%
Parking Garage Exhaust Fan CO Control	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Optimized Snow and Ice Melt Controls	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Engine Block Heater Timer	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Machine Drive															
Sensors & Controls	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Energy Information System	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Electric Supply System Improvements	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Advanced Efficient Motors	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Industrial Motor Management	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Advanced Lubricants	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

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Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery
Motor System Optimization (Including ASD)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Pump System Efficiency Improvements	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Fan System Improvements	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Compressed Air System Management	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Compressed Air - Advanced Compressor Controls	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
VFD for Process Fans	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
VFD for Process Pumps	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
High Efficiency Pumps	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Compressed Air Audits and Leak Repair	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Elec motors replacing pneumatic (comp air)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Automatic Drains, High efficiency nozzles and other (comp air)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Storage Tank Addition (comp air)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
High Efficiency Dryers (comp air)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Process Cooling & Refrigeration															
Sensors & Controls	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Energy Information System	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Electric Supply System Improvements	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Improved Refrigeration	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Process Heating															
Sensors & Controls	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Energy Information System	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Electric Supply System Improvements	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Industrial Other															
High Efficiency Welders	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
3 Phase High Eff Battery Charger	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Barrel Insulation - Inj. Molding (plastics)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Pellet Dryer Insulation (plastics)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Injection Molding Machine - efficient (plastics)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Fiber Laser Replacing CO2 laser (auto industry)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Agriculture															
Other Industrial -Low-Energy Livestock Waterer	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

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Is the fraction of the equipment or practice that is technically feasible for conversion to the efficient technology from an engineering perspective (e.g., it may not be possible to install VFDs on all motors in a given market segment).

Measure Name	Food	Beverage	Textile Mills	Textile Mill Products	Apparel & Leather	Wood	Paper	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery
Other Industrial -Dairy Refrigerator Tune-Up	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Greenhouse Environmental Controls	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Scroll Compressor with Heat Exchanger for Dairy Refrigeration	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Variable Speed Drive withHeat Exchanger, Milk	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Milk Pre-Cooler Heat Exchanger	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Variable Speed Drives for Dairy Vacuum Pumps	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
VFD for Process Fans - Agriculture	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
VFD for Process Pumps - Agriculture	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
VFD for Process Pumps - Irrigation	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Grain Storage Temperature and Moisture Management Controller	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Low Pressure Sprinkler Nozzles	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Fan Thermostat Controller	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Consumers Energy Industrial Measure Datal

Convertible Factor:
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Measure Name	Computer & Electronics	Elec. Equip.	Trans. Equip.	Furniture	Misc.
Computers and Office Equipment					
Energy Star Compliant Single Door Refrigerator	100.0%	100.0%	100.0%	100.0%	100.0%
Energy Star office equipment including computers, monitors, copiers, multi-function machines.	100.0%	100.0%	100.0%	100.0%	100.0%
Energy Efficient "Smart" Power Strip for PC/Monitor/Printer	60.0%	60.0%	60.0%	60.0%	60.0%
PC Network Energy Management Controls replacing no central control	80.0%	80.0%	80.0%	80.0%	80.0%
Energy Star UPS	100.0%	100.0%	100.0%	100.0%	100.0%
High Efficiency CRAC Unit	100.0%	100.0%	100.0%	100.0%	100.0%
Water Heating					
Heat Pump Water Heater	85.0%	85.0%	85.0%	85.0%	85.0%
Electric Tankless Water Heater	90.0%	90.0%	90.0%	90.0%	90.0%
Efficient Hot Water Pump	80.0%	80.0%	80.0%	80.0%	80.0%
Solar Storage Water Heating	34.0%	34.0%	34.0%	34.0%	34.0%
High Efficiency Electric Water Heater	100.0%	100.0%	100.0%	100.0%	100.0%
HVAC Condenser Heater Recovery Water Heating	90.0%	90.0%	90.0%	90.0%	90.0%
Low Flow Faucet Aerator	100.0%	100.0%	100.0%	100.0%	100.0%
Low Flow Showerhead	90.0%	90.0%	90.0%	90.0%	90.0%
Hot Water (DHW) Pipe Insulation	50.0%	50.0%	50.0%	50.0%	50.0%
Tank Insulation (electric)	50.0%	50.0%	50.0%	50.0%	50.0%
Drain Water Heat Recovery Water Heater	39.0%	39.0%	39.0%	39.0%	39.0%
ECM Circulator Pump	10.0%	10.0%	10.0%	10.0%	10.0%
Process Cooling Condenser Heat Recovery	10.0%	10.0%	10.0%	10.0%	10.0%
Building Envelope					
Integrated Building Design	95.0%	95.0%	95.0%	95.0%	95.0%
Energy Efficient Windows	75.0%	75.0%	75.0%	75.0%	75.0%
Cool Roofing	75.0%	75.0%	75.0%	75.0%	75.0%
Ceiling Insulation	57.0%	57.0%	57.0%	57.0%	57.0%
Window Improvements	14.0%	14.0%	14.0%	14.0%	14.0%
Wall Insulation	100.0%	100.0%	100.0%	100.0%	100.0%
Roof Insulation	43.0%	43.0%	43.0%	43.0%	43.0%
Improved Duct Sealing	43.0%	43.0%	43.0%	43.0%	43.0%
Ventilation					
Economizer	86.0%	86.0%	86.0%	86.0%	86.0%

Consumers Energy Industrial Measure Datal

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Measure Name	Computer & Electronics	Elec. Equip.	Trans. Equip.	Furniture	Misc.
Variable Speed Drive Control, 15 HP	92.0%	92.0%	92.0%	92.0%	92.0%
Variable Speed Drive Control, 5 HP	92.0%	92.0%	92.0%	92.0%	92.0%
Variable Speed Drive Control, 40 HP	92.0%	92.0%	92.0%	92.0%	92.0%
High Speed Fans	75.0%	75.0%	75.0%	75.0%	75.0%
High Volume Low Speed Fans	75.0%	75.0%	75.0%	75.0%	75.0%
Destratification Fan (HVLS)	90.0%	90.0%	90.0%	90.0%	90.0%
Space Cooling - Chillers					
Air-Cooled Recip Chiller	100.0%	100.0%	100.0%	100.0%	100.0%
Air-Cooled Screw Chiller	100.0%	100.0%	100.0%	100.0%	100.0%
Water Side Economizer	100.0%	100.0%	100.0%	100.0%	100.0%
VAV System Conversion	100.0%	100.0%	100.0%	100.0%	100.0%
Water-Cooled Centrifugal Chiller > 300 ton	100.0%	100.0%	100.0%	100.0%	100.0%
Motor Belt Replacement	80.0%	80.0%	80.0%	80.0%	80.0%
Chilled Hot Water Reset	95.0%	95.0%	95.0%	95.0%	95.0%
Water-Cooled Screw Chiller > 300 ton	100.0%	100.0%	100.0%	100.0%	100.0%
Chiller Tune Up	100.0%	100.0%	100.0%	100.0%	100.0%
Efficient Chilled Water Pump	100.0%	100.0%	100.0%	100.0%	100.0%
High Efficiency Pumps	100.0%	100.0%	100.0%	100.0%	100.0%
HVAC Controls					
Programmable Thermostats	100.0%	100.0%	100.0%	100.0%	100.0%
EMS install	100.0%	100.0%	100.0%	100.0%	100.0%
EMS Optimization	100.0%	100.0%	100.0%	100.0%	100.0%
HVAC Occupancy Sensors	100.0%	100.0%	100.0%	100.0%	100.0%
Zoning	100.0%	100.0%	100.0%	100.0%	100.0%
Setback with Electric Heat	100.0%	100.0%	100.0%	100.0%	100.0%
EMS Pump Scheduling	100.0%	100.0%	100.0%	100.0%	100.0%
Web Enabled EMS	100.0%	100.0%	100.0%	100.0%	100.0%
Retrocommissioning	100.0%	100.0%	100.0%	100.0%	100.0%
Space Cooling - Unitary and Split AC					
AC 240K - 760 K	60.0%	60.0%	60.0%	60.0%	60.0%
Ductless (mini split) - Cooling	40.0%	40.0%	40.0%	40.0%	40.0%
Ground Source Heat Pump - Cooling	25.0%	25.0%	25.0%	25.0%	25.0%
Water Loop Heat Pump (WLHP) - Cooling	60.0%	60.0%	60.0%	60.0%	60.0%
Air Source Heat Pump - Cooling	60.0%	60.0%	60.0%	60.0%	60.0%
DX Condenser Coil Cleaning	60.0%	60.0%	60.0%	60.0%	60.0%
Room AC	60.0%	60.0%	60.0%	60.0%	60.0%
Lighting					

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Measure Name	Computer & Electronics	Elec. Equip.	Trans. Equip.	Furniture	Misc.
Lamp & Ballast Retrofit (HPT8 Replacing T12)	100.0%	100.0%	100.0%	100.0%	100.0%
Lamp & Ballast Retrofit (HPT8 Replacing Standard T8)	100.0%	100.0%	100.0%	100.0%	100.0%
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing T12)	100.0%	100.0%	100.0%	100.0%	100.0%
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing Standard T8)	100.0%	100.0%	100.0%	100.0%	100.0%
T5 HP replacing T12	100.0%	100.0%	100.0%	100.0%	100.0%
Exterior HID replaced with LED	100.0%	100.0%	100.0%	100.0%	100.0%
Garage HID replacement with LED	100.0%	100.0%	100.0%	100.0%	100.0%
LED Exit Sign	100.0%	100.0%	100.0%	100.0%	100.0%
LED High Bay Lighting	100.0%	100.0%	100.0%	100.0%	100.0%
LED Low Bay Lighting	100.0%	100.0%	100.0%	100.0%	100.0%
Light Tube	100.0%	100.0%	100.0%	100.0%	100.0%
High Intensity Fluorescent Fixture (replacing HID)	100.0%	100.0%	100.0%	100.0%	100.0%
42W 8 lamp Hi Bay CFL	100.0%	100.0%	100.0%	100.0%	100.0%
HID Fixture Upgrade - Pulse Start Metal Halide	100.0%	100.0%	100.0%	100.0%	100.0%
Interior Induction Lighting	75.0%	75.0%	75.0%	75.0%	75.0%
CFL Fixture	15.0%	15.0%	15.0%	15.0%	15.0%
CFL Screw-in	85.0%	85.0%	85.0%	85.0%	85.0%
LED Screw In Replacing Incandescent	85.0%	85.0%	85.0%	85.0%	85.0%
LED Screw In Replacing CFL	15.0%	15.0%	15.0%	15.0%	15.0%
CFL Reflector Flood	10.0%	10.0%	10.0%	10.0%	10.0%
LED Downlight	10.0%	10.0%	10.0%	10.0%	10.0%
LED Troffer	10.0%	10.0%	10.0%	10.0%	10.0%
LED Tube Lighting	100.0%	100.0%	100.0%	100.0%	100.0%
LED Grow Light	100.0%	100.0%	100.0%	100.0%	100.0%
Interior Non-Highbay/Lowbay LED Fixtures	100.0%	100.0%	100.0%	100.0%	100.0%
Exterior HID Replaced with CFL	15.0%	15.0%	15.0%	15.0%	15.0%
Exterior Linear Fluorescent	85.0%	85.0%	85.0%	85.0%	85.0%
LED Specialty replacing CFL	100.0%	100.0%	100.0%	100.0%	100.0%
CFL Screw in Specialty	85.0%	85.0%	85.0%	85.0%	85.0%
LED Specialty replacing incandescent	100.0%	100.0%	100.0%	100.0%	100.0%
Illuminated Signs to LED	100.0%	100.0%	100.0%	100.0%	100.0%
Lighting Controls					

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Measure Name	Compute r & Electroni cs	Elec. Equip.	Trans. Equip.	Furnitur e	Misc.
Exterior Bi-level Controls	73.0%	73.0%	73.0%	73.0%	73.0%
Garage Bi-level Controls	40.0%	40.0%	40.0%	40.0%	40.0%
Daylight Sensor Controls	35.0%	35.0%	35.0%	35.0%	35.0%
Lighting Power Density- Exterior	95.0%	95.0%	95.0%	95.0%	95.0%
Lighting Power Density - Parking Garage	20.0%	20.0%	20.0%	20.0%	20.0%
Stairwell Bi-Level Control	20.0%	20.0%	20.0%	20.0%	20.0%
Occupancy Sensor	20.0%	20.0%	20.0%	20.0%	20.0%
Occupancy Sensor & Daylight Sensor	20.0%	20.0%	20.0%	20.0%	20.0%
Central Lighting Control	20.0%	20.0%	20.0%	20.0%	20.0%
Switching Controls for Multilevel Lighting (Non-HID)	20.0%	20.0%	20.0%	20.0%	20.0%
Lighting Power Density - Interior	100.0%	100.0%	100.0%	100.0%	100.0%
Long Day Lighting Dairy	50.0%	50.0%	50.0%	50.0%	50.0%
Space Heating					
Air Source Heat Pump - Heating	67.0%	67.0%	67.0%	67.0%	67.0%
Ground Source Heat Pump - Heating	75.0%	75.0%	75.0%	75.0%	75.0%
Ductless (mini split) - Heating	60.0%	60.0%	60.0%	60.0%	60.0%
Water Loop Heat Pump (WLHP) - Heating	100.0%	100.0%	100.0%	100.0%	100.0%
VFD Pump	80.0%	80.0%	80.0%	80.0%	80.0%
ECM motors on furnaces	100.0%	100.0%	100.0%	100.0%	100.0%
Other					
High Efficiency Transformer, single-phase	100.0%	100.0%	100.0%	100.0%	100.0%
NEMA Premium Transformer, single-phase	93.0%	93.0%	93.0%	93.0%	93.0%
NEMA Premium Transformer, three-phase	93.0%	93.0%	93.0%	93.0%	93.0%
High Efficiency Transformer, three-phase	99.0%	99.0%	99.0%	99.0%	99.0%
Parking Garage Exhaust Fan CO Control	100.0%	100.0%	100.0%	100.0%	100.0%
Optimized Snow and Ice Melt Controls	100.0%	100.0%	100.0%	100.0%	100.0%
Engine Block Heater Timer	100.0%	100.0%	100.0%	100.0%	100.0%
Machine Drive					
Sensors & Controls	100.0%	100.0%	100.0%	100.0%	100.0%
Energy Information System	100.0%	100.0%	100.0%	100.0%	100.0%
Electric Supply System Improvements	100.0%	100.0%	100.0%	100.0%	100.0%
Advanced Efficient Motors	100.0%	100.0%	100.0%	100.0%	100.0%
Industrial Motor Management	100.0%	100.0%	100.0%	100.0%	100.0%
Advanced Lubricants	100.0%	100.0%	100.0%	100.0%	100.0%

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Measure Name	Computer & Electronics	Elec. Equip.	Trans. Equip.	Furniture	Misc.
Motor System Optimization (Including ASD)	100.0%	100.0%	100.0%	100.0%	100.0%
Pump System Efficiency Improvements	100.0%	100.0%	100.0%	100.0%	100.0%
Fan System Improvements	100.0%	100.0%	100.0%	100.0%	100.0%
Compressed Air System Management	100.0%	100.0%	100.0%	100.0%	100.0%
Compressed Air - Advanced Compressor Controls	100.0%	100.0%	100.0%	100.0%	100.0%
VFD for Process Fans	100.0%	100.0%	100.0%	100.0%	100.0%
VFD for Process Pumps	100.0%	100.0%	100.0%	100.0%	100.0%
High Efficiency Pumps	100.0%	100.0%	100.0%	100.0%	100.0%
Compressed Air Audits and Leak Repair	100.0%	100.0%	100.0%	100.0%	100.0%
Elec motors replacing pneumatic (comp air)	100.0%	100.0%	100.0%	100.0%	100.0%
Automatic Drains, High efficiency nozzles and other (comp air)	100.0%	100.0%	100.0%	100.0%	100.0%
Storage Tank Addition (comp air)	100.0%	100.0%	100.0%	100.0%	100.0%
High Efficiency Dryers (comp air)	100.0%	100.0%	100.0%	100.0%	100.0%
Process Cooling & Refrigeration					
Sensors & Controls	100.0%	100.0%	100.0%	100.0%	100.0%
Energy Information System	100.0%	100.0%	100.0%	100.0%	100.0%
Electric Supply System Improvements	100.0%	100.0%	100.0%	100.0%	100.0%
Improved Refrigeration	100.0%	100.0%	100.0%	100.0%	100.0%
Process Heating					
Sensors & Controls	100.0%	100.0%	100.0%	100.0%	100.0%
Energy Information System	100.0%	100.0%	100.0%	100.0%	100.0%
Electric Supply System Improvements	100.0%	100.0%	100.0%	100.0%	100.0%
Industrial Other					
High Efficiency Welders	100.0%	100.0%	100.0%	100.0%	100.0%
3 Phase High Eff Battery Charger	100.0%	100.0%	100.0%	100.0%	100.0%
Barrel Insulation - Inj. Molding (plastics)	100.0%	100.0%	100.0%	100.0%	100.0%
Pellet Dryer Insulation (plastics)	100.0%	100.0%	100.0%	100.0%	100.0%
Injection Molding Machine - efficient (plastics)	100.0%	100.0%	100.0%	100.0%	100.0%
Fiber Laser Replacing CO2 laser (auto industry)	100.0%	100.0%	100.0%	100.0%	100.0%
Agriculture					
Other Industrial -Low-Energy Livestock Waterer	0.0%	0.0%	0.0%	0.0%	0.0%

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Measure Name	Computer & Electronics	Elec. Equip.	Trans. Equip.	Furniture	Misc.
Other Industrial -Dairy Refrigerator Tune-Up	0.0%	0.0%	0.0%	0.0%	0.0%
Greenhouse Environmental Controls	0.0%	0.0%	0.0%	0.0%	0.0%
Scroll Compressor with Heat Exchanger for Dairy Refrigeration	0.0%	0.0%	0.0%	0.0%	0.0%
Variable Speed Drive withHeat Exchanger, Milk	0.0%	0.0%	0.0%	0.0%	0.0%
Milk Pre-Cooler Heat Exchanger	0.0%	0.0%	0.0%	0.0%	0.0%
Variable Speed Drives for Dairy Vacuum Pumps	0.0%	0.0%	0.0%	0.0%	0.0%
VFD for Process Fans - Agriculture	0.0%	0.0%	0.0%	0.0%	0.0%
VFD for Process Pumps - Agriculture	0.0%	0.0%	0.0%	0.0%	0.0%
VFD for Process Pumps - Irrigation	0.0%	0.0%	0.0%	0.0%	0.0%
Grain Storage Temperature and Moisture Management Controller	0.0%	0.0%	0.0%	0.0%	0.0%
Low Pressure Sprinkler Nozzles	0.0%	0.0%	0.0%	0.0%	0.0%
Fan Thermostat Controller	0.0%	0.0%	0.0%	0.0%	0.0%

Consumers Energy Industrial Measure Database - Electric

Electric Measure Sources

Source Number	Source
1	Michigan Master Database of Deemed Savings - 2013 - Non-Weather Sensitive Commercial
2	Michigan Master Database of Deemed Savings - 2013 - Weather Sensitive
3	Michigan Baseline 2011: Commercial Baseline Report
4	http://www.energystar.gov/ia/business/bulk_purchasing/bpsavings_calc/appliance_calculator.xlsx
5	Big Ass Fan Company Calculations, http://www.todaysfacilitymanager.com/articles/the-hvac-factor-high-volume-low-speed-fans.php
6	2009 MPRP EE Potential Study - June 2009
7	Vermont TRM - Manual No. 2011-73b
8	Vermont Energy Efficiency Potential Study - January 2007
9	Natural Gas Energy Efficiency Potential in Massachusetts, Prepared for GasNetworks by GDS Associates, April 22, 2009
10	Energy Efficiency and Renewable Energy Resource Development Potential in New York State - Final Report, Volume 5 Energy Efficiency Technical Appendices, August 2003.
11	GDS Benefit Cost Model
12	Federal Energy Management Program (FEMP), Energy Cost Calculator for Electric and Gas Water Heaters
13	http://www.aceee.org/consumer/water-heating
14	GDS Associates estimate based upon review of various customer and vendor surveys, baseline studies and potential studies conducted by GDS in other states
15	GDS New Hampshire Potential Study
16	Efficiency Vermont Technical Reference User Manual (TRM) No. 2006-41
17	Efficiency Vermont Technical Reference User Manual (TRM) No. 2010-64
18	Efficiency Maine Commercial Technical Reference Manual No. 2007-01
19	Efficiency Maine Commercial Technical Reference Manual No. 2010-01
20	Refrigerant Heat Recovery System Learning Center Dining Facility, PG&E Food Services Technology Center, April 1993
21	http://apps1.eere.energy.gov/consumer/your_home/space_heating_cooling/index.cfm/mytopic=12430
22	http://www.energysavers.gov/your_home/water_heating/index.cfm/mytopic=13200
23	US DOE, EERE Consumer's Guide to Energy Efficiency and Renewable Energy, "Solar Swimming Pool Heaters" http://apps1.eere.energy.gov/consumer/your_home/water_heating/index.cfm/mytopic=13230
24	ES Analysis-ResDWH: ENERGY STAR® Residential Water Heaters: Final Criteria Analysis (www.energystar.gov). April 2008.
25	http://web.archive.org/web/20061006153904/http://www.energy.ca.gov/appliances/2003rulemaking/documents/case_studies/CASE_Portable_Spa.pdf
26	City of Keene NH, Cities for Climate Protection Campaign, Local Action Plan, February 19, 2004
27	EPA Energy Star Program
28	DC SEU Technical Reference Manual 2012-1.2
29	Maryland Baseline Study – Commercial and Industrial Sectors, ITRON, December 3, 2010
30	Delaware Statewide Commercial & Industrial End Use & Saturation Study - July 26, 2012
31	Independent Assessment of Conservation and Energy Efficiency Potential for Connecticut and the Southwest Connecticut Region, GDS Associates, June 2004
32	Building Commissioning - A Golden Opportunity for Reducing Energy Costs and Greenhouse Gas Emissions. Lawrence Berkeley National Laboratory. Report Prepared for: California Energy Commission Public Interest Energy Research (PIER) - July 21, 2009
33	DTE Non-Residential Potential Study - 2010. Cadmus
34	Efficiency Maine Commercial Technical Reference Manual - Version 2013.1, January 1, 2013, Efficiency Maine Trust
35	Mid-Atlantic Technical Reference Manual - Version 3.0, March, 2013, NEEP
36	MEMD Support Documentation - 2014 - Workbooks and Algorithms
37	ENERGY STAR Qualified Office Equipment Calculator
38	Energy Consumption by Commercial Office and Telecommunication Equipment, ACEEE August 18, 2002
39	epartment of Energy, Office of Industrial Technologies, United States Industrial Electric Motor Systems Market Opportunities, December
40	U.S. Department of Energy, Office of Industrial Technologies, Assessment of the Market for Compressed Air Efficiency Services, 2002.
41	Advancing Energy Efficeincy In Arkansas, ACEEE, March 2011, p. 173
42	GDS Maine Potential Study (GDS Engineering Estimates)
43	ergy Information Administration, Model Documentation Report: Industrial Demand Module of the National Energy Modeling System, Ma

Consumers Energy Industrial Measure Database - Electric
Measure Savings, Cost and Useful Life, Savings Factor, Remaining Factor Sources
Reference numbers designate source for information from Electric Measure Source List

Measure Name	Annual kWh Savings	Cost/Unit	Effective Measure Life	Savings Factor	Remaining Factor
Computers & Office Equipment					
Energy Star Compliant Single Door Refrigerator	36	36	36	36	3
Energy Star office equipment including computers, monitors, copiers, multi-function machines.	27	7	27	7	14
Energy Efficient "Smart" Power Strip for PC/Monitor/Printer	36	36	36	36	3
PC Network Energy Management Controls replacing no central control	36	36	36	36	3
Energy Star UPS	36	36	36	36	3
High Efficiency CRAC Unit	36	36	36	36	3
Ventilation					
Economizer	36	36	36	36	3
Variable Speed Drive Control, 15 HP	36	36	36	36	3
Variable Speed Drive Control, 5 HP	36	36	36	36	14
Variable Speed Drive Control, 40 HP	36	36	36	36	14
High Speed Fans	36	36	36	36	14
High Volume Low Speed Fans	36	36	36	36	3
Destratification Fan (HVLS)	36	36	36	36	14
Engineered CKV Hood	36	36	36	36	3
Building Envelope					
Integrated Building Design	14	14	14	14	14
Energy Efficient Windows	36	36	36	36	3
Cool Roofing	36	36	36	36	3
Ceiling Insulation	36	36	36	36	3
Window Improvements	36	36	36	36	3
Wall Insulation	36	36	36	36	3
Roof Insulation	36	36	36	36	3
Improved Duct Sealing	36	36	36	36	3
Water Heating					
Heat Pump Water Heater	36	36	36	36	36
Electric Tankless Water Heater	36	36	36	36	36
Efficient Hot Water Pump	36	36	36	36	36
Solar Storage Water Heating	36	36	36	36	36
High Efficiency Electric Water Heater	36	36	36	36	36
HVAC Condenser Heater Recovery Water Heating	36	36	36	36	36
Low Flow Faucet Aerator	36	36	36	36	36
Low Flow Showerhead	36	36	36	36	36
Hot Water (DHW) Pipe Insulation	36	36	36	36	36
Tank Insulation (electric)	36	36	36	36	36
Drain Water Heat Recovery Water Heater	7	7	7	7	14
ECM Circulator Pump	36	36	36	36	36
Process Cooling Condenser Heat Recovery	36	36	36	36	36
Space Cooling - Chillers					
Air-Cooled Recip Chiller	36	36	36	36	14

Consumers Energy Industrial Measure Database - Electric
Measure Savings, Cost and Useful Life, Savings Factor, Remaining Factor Sources
Reference numbers designate source for information from Electric Measure Source List

Measure Name	Annual kWh Savings	Cost/Unit	Effective Measure Life	Savings Factor	Remaining Factor
Air-Cooled Screw Chiller	36	36	36	36	14
Water Side Economizer	36	36	36	36	14
VAV System Conversion	36	36	36	36	14
Water-Cooled Centrifugal Chiller > 300 ton	36	36	36	36	14
Motor Belt Replacement	36	36	36	36	14
Chilled Hot Water Reset	36	36	36	36	14
Water-Cooled Screw Chiller > 300 ton	36	36	36	36	14
Chiller Tune Up	36	36	36	36	14
Efficient Chilled Water Pump	36	36	36	36	14
High Efficiency Pumps	36	36	36	36	14
HVAC Controls					
Programmable Thermostats	2	2	2	8	3
EMS install	36	36	36	36	14
EMS Optimization	36	36	36	36	14
HVAC Occupancy Sensors	36	36	36	36	14
Zoning	2	2	2	14	3
Setback with Electric Heat	36	36	36	36	14
EMS Pump Scheduling	36	36	36	36	14
Web Enabled EMS	36	36	36	36	14
Retrocommissioning	2	2	2	14	3
Space Cooling - Unitary & Split AC					
AC 240K - 760 K	36	36	36	36	14
Ductless (mini split) - Cooling	36	36	36	36	3
Ground Source Heat Pump - Cooling	36	36	36	36	14
Water Loop Heat Pump (WLHP) - Cooling	36	36	36	36	14
Air Source Heat Pump - Cooling	36	36	36	36	14
DX Condenser Coil Cleaning	36	36	36	36	14
Room AC	36	36	36	36	14
Lighting					
Lamp & Ballast Retrofit (HPT8 Replacing T12)	36	36	36	36	3
Lamp & Ballast Retrofit (HPT8 Replacing Standard T8)	36	36	36	36	3
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing T12)	36	36	36	36	3
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing Standard T8)	36	36	36	36	3
T5 HP replacing T12	36	36	36	36	3
Exterior HID replaced with LED	36	36	36	36	3
Garage HID replacement with LED	36	36	36	36	14
LED Exit Sign	36	36	36	36	3
LED High Bay Lighting	36	36	36	36	14
LED Low Bay Lighting	36	36	36	36	14
Light Tube	36	36	36	36	3
High Intensity Fluorescent Fixture (replacing HID)	36	36	36	36	3
42W 8 lamp Hi Bay CFL	36	36	36	36	3

Consumers Energy Industrial Measure Database - Electric
Measure Savings, Cost and Useful Life, Savings Factor, Remaining Factor Sources
Reference numbers designate source for information from Electric Measure Source List

Measure Name	Annual kWh Savings	Cost/Unit	Effective Measure Life	Savings Factor	Remaining Factor
HID Fixture Upgrade - Pulse Start Metal Halide	36	36	36	36	3
Interior Induction Lighting	36	36	36	36	3
CFL Fixture	36	36	36	36	3
CFL Screw-in	36	36	36	36	3
LED Screw In Replacing Incandescent	36	36	36	36	3
LED Screw In Replacing CFL	36	36	36	36	14
CFL Reflector Flood	36	36	36	36	3
LED Downlight	36	36	36	36	3
LED Troffer	36	36	36	36	3
LED Tube Lighting	36	36	36	36	3
LED Grow Light	36	36	36	36	3
Interior Non-Highbay/Lowbay LED Fixtures	36	36	36	36	14
Exterior HID Replaced with CFL	36	36	36	36	14
Exterior Linear Fluorescent	36	36	36	36	3
LED Specialty replacing CFL	36	36	36	36	3
CFL Screw in Specialty	36	36	36	36	3
LED Specialty replacing incandescent	36	36	36	36	3
Illuminated Signs to LED	36	36	36	36	3
Lighting Controls					
Exterior Bi-level Controls	36	36	36	36	3
Garage Bi-level Controls	36	36	36	36	3
Daylight Sensor Controls	36	36	36	36	3
Lighting Power Density- Exterior	36	36	36	36	3
Lighting Power Density - Parking Garage	36	36	36	36	3
Stairwell Bi-Level Control	36	36	36	36	3
Occupancy Sensor	36	36	36	36	3
Occupancy Sensor & Daylight Sensor	36	36	36	36	3
Central Lighting Control	36	36	36	36	3
Switching Controls for Multilevel Lighting (Non-HID)	36	36	36	36	3
Lighting Power Density - Interior	36	36	36	36	3
Long Day Lighting Dairy	36	36	36	36	3
Space Heating					
Air Source Heat Pump - Heating	36	36	36	36	3
Ground Source Heat Pump - Heating	36	36	36	36	3
Ductless (mini split) - Heating	36	36	36	36	3
Water Loop Heat Pump (WLHP) - Heating	36	36	36	36	14
VFD Pump	36	36	36	36	3
ECM motors on furnaces	36	36	36	36	14
Other					
High Efficiency Transformer, single-phase	36	36	36	36	14
NEMA Premium Transformer, single-phase	36	36	36	36	3
NEMA Premium Transformer, three-phase	36	36	36	36	14
High Efficiency Transformer, three-phase	36	36	36	36	3
Parking Garage Exhaust Fan CO Control	36	36	36	36	14

Consumers Energy Industrial Measure Database - Electric
Measure Savings, Cost and Useful Life, Savings Factor, Remaining Factor Sources
Reference numbers designate source for information from Electric Measure Source List

Measure Name	Annual kWh Savings	Cost/Unit	Effective Measure Life	Savings Factor	Remaining Factor
Optimized Snow and Ice Melt Controls	36	36	36	36	14
Engine Block Heater Timer	36	36	36	36	14
Machine Drive					
Sensors & Controls	41	41	41	41	43
Energy Information System	41	41	41	41	43
Electric Supply System Improvements	41	41	41	41	43
Advanced Efficient Motors	41	41	41	41	43
Industrial Motor Management	41	41	41	41	43
Advanced Lubricants	41	41	41	41	43
Motor System Optimization (Including ASD)	41	41	41	41	43
Pump System Efficiency Improvements	41	41	41	41	43
Fan System Improvements	41	41	41	41	43
Compressed Air System Management	41	41	41	41	43
Compressed Air - Advanced Compressor Controls	41	41	41	41	43
VFD for Process Fans	36	36	36	36,14	14
VFD for Process Pumps	36	36	36	36,14	14
High Efficiency Pumps	36	36	36	36,14	14
Compressed Air Audits and Leak Repair	36	36	36	36,14	14
Elec motors replacing pneumatic (comp air)	36	36	36	36,14	14
Automatic Drains, High efficiency nozzles and other (comp air)	36	36	36	36,14	14
Storage Tank Addition (comp air)	36	36	36	36,14	14
High Efficiency Dryers (comp air)	36	36	36	36,14	14
Process Cooling & Refrigeration					
Sensors & Controls	41	41	41	41	43
Energy Information System	41	41	41	41	43
Electric Supply System Improvements	41	41	41	41	43
Improved Refrigeration	41	41	41	41	43
Process Heating					
Sensors & Controls	41	41	41	41	43
Energy Information System	41	41	41	41	43
Electric Supply System Improvements	41	41	41	41	43
Industrial Other Process					
High Efficiency Welders	36	36	36	36,14	14
3 Phase High Eff Battery Charger	36	36	36	36,14	14
Barrel Insulation - Inj. Molding (plastics)	36	36	36	36,14	14
Pellet Dryer Insulation (plastics)	36	36	36	36,14	14
Injection Molding Machine - efficient (plastics)	36	36	36	36,14	14
Fiber Laser Replacing CO_2 laser (auto industry)	36	36	36	36,14	14
Agriculture					
Other Industrial -Low-Energy Livestock Waterer	36	36	36	36,14	14
Other Industrial -Dairy Refrigerator Tune-Up	36	36	36	36,14	14
Greenhouse Environmental Controls	36	36	36	36,14	14

Consumers Energy Industrial Measure Database - Electric
Measure Savings, Cost and Useful Life, Savings Factor, Remaining Factor Sources
Reference numbers designate source for information from Electric Measure Source List

Measure Name	Annual kWh Savings	Cost/Unit	Effective Measure Life	Savings Factor	Remaining Factor
Scroll Compressor with Heat Exchanger for Dairy Refrigeration	36	36	36	36,14	14
Variable Speed Drive withHeat Exchanger, Milk	36	36	36	36,14	14
Milk Pre-Cooler Heat Exchanger	36	36	36	36,14	14
Variable Speed Drives for Dairy Vacuum Pumps	36	36	36	36,14	14
VFD for Process Fans - Agriculture	36	36	36	36,14	14
VFD for Process Pumps - Agriculture	36	36	36	36,14	14
VFD for Process Pumps - Irrigation	36	36	36	36,14	14
Grain Storage Temperature and Moisture Management Controller	36	36	36	36,14	14
Low Pressure Sprinkler Nozzles	36	36	36	36,14	14
Fan Thermostat Controller	36	36	36	36,14	14

APPENDIX D | GLOBAL ASSUMPTIONS

Consumers Energy | **UCT GLOBAL ASSUMPTIONS**

Analysis Start Year	2017
Length of Analysis (Years)	20

Nominal Discount Rate	7.650%
Inflation Rate	2.50%
Reserve Margin Multiplier	7.24%
Carbon Tax Adder ($/kWh)	$0.00
Carbon Tax Adder ($/MMBtu)	$0.00

Avoided Costs (Nominal Dollars)

Data Year	Natural Gas Wholesale Forecast $/MMBTU
2016	2.34
2017	3.06
2018	3.03
2019	3.05
2020	3.14
2021	3.30
2022	3.49
2023	3.60
2024	3.72
2025	3.83
2026	3.96
2027	4.08
2028	4.21
2029	4.35
2030	4.49
2031	4.63
2032	4.78
2033	4.93
2034	5.09
2035	5.25
2036	5.41
2037	5.59
2038	5.77
2039	5.95
2040	6.14
2041	6.33
2042	6.54
2043	6.74
2044	6.96

Data Year	Winter Peak Energy $/kWh	Winter Off-Peak Energy $/kWh	Summer Peak Energy $/kWh	Summer Off-Peak Energy $/kWh	Summer Capacity $/kW-yr	Winter Capacity $/kW-yr	Avoided T&D $/kW-yr
2016	0.029	0.025	0.034	0.025	22.25	0.000	2.405
2017	0.036	0.029	0.040	0.028	74.38	0.000	2.465
2018	0.036	0.029	0.040	0.029	86.59	0.000	2.527
2019	0.037	0.030	0.041	0.030	89.70	0.000	2.590
2020	0.036	0.031	0.043	0.031	92.92	0.000	2.655
2021	0.039	0.032	0.045	0.032	96.27	0.000	2.721
2022	0.040	0.033	0.046	0.033	99.75	0.000	2.789
2023	0.043	0.035	0.049	0.035	103.35	0.000	2.859
2024	0.044	0.037	0.052	0.037	107.09	0.000	2.930
2025	0.046	0.038	0.053	0.038	110.96	0.000	3.004
2026	0.047	0.039	0.055	0.039	114.98	0.000	3.079
2027	0.049	0.040	0.056	0.040	119.14	0.000	3.156
2028	0.050	0.041	0.057	0.041	123.45	0.000	3.234
2029	0.051	0.042	0.058	0.042	127.92	0.000	3.315
2030	0.051	0.043	0.060	0.043	132.56	0.000	3.398
2031	0.051	0.044	0.059	0.044	137.37	0.000	3.483
2032	0.053	0.045	0.061	0.045	142.36	0.000	3.570
2033	0.056	0.047	0.064	0.047	147.52	0.000	3.660
2034	0.058	0.048	0.066	0.048	152.88	0.000	3.751
2035	0.060	0.050	0.068	0.050	158.44	0.000	3.845
2036	0.062	0.052	0.071	0.052	164.19	0.000	3.941
2037	0.065	0.053	0.073	0.053	170.16	0.000	4.039
2038	0.070	0.056	0.077	0.056	176.35	0.000	4.140
2039	0.075	0.058	0.080	0.059	182.77	0.000	4.244
2040	0.077	0.060	0.084	0.062	189.42	0.000	4.350
2041	0.081	0.062	0.088	0.064	196.28	0.000	4.459
2042	0.085	0.065	0.091	0.067	203.39	0.000	4.570
2043	0.088	0.067	0.095	0.069	210.75	0.000	4.684
2044	0.093	0.069	0.099	0.072	218.39	0.000	4.802

Electric Line Losses

	Winter On Peak	Winter Off Peak	Summer On Peak	Summer Off Peak
Residential	1.094	1.090	1.096	1.091
C&I	1.094	1.090	1.096	1.091

Demand Line Losses

Winter Gen.	Summer Gen.	T&D Capacity
1.107	1.121	1.121
1.107	1.121	1.121

APPENDIX E | ENERGY EFFICIENCY POTENTIAL STUDY CATALOG

Energy Efficiency Potential Studies Catalog of the U.S. Department of Energy

The U.S. Department of Energy maintains an "Energy Efficiency Potential Studies Catalog". This report appendix provides a summary of the energy efficiency potential studies compiled by the US DOE. More information can be located on the US DOE web site for this catalog at http://energy.gov/eere/slsc/energy-efficiency-potential-studies-catalog#catalog. This U.S. DOE web site reports that "States, utilities, and non-governmental organizations across the country have commissioned analyses over the years to identify potential energy savings (typically for electricity) available within their jurisdictions. These studies can be used to fulfill a variety of needs, including energy efficiency program planning, state goal setting, utility resource planning, and other priorities.

Below is a compilation of state and local energy efficiency potential studies published since 2007, to serve as a resource for energy planners and as a baseline for future analyses. Although these studies have been completed by a variety of authors to meet numerous purposes and have important differences among them, the majority (60%) show an average annual energy efficiency potential savings rate[1] in the range of 1 to 2.5% per year (Figure 1). This convergence across such a wide range of studies suggests a high level of energy efficiency potential available throughout the U.S." GDS finds that the achievable electric energy efficiency potential for the Consumers Energy service area determined in this study are comparable to the majority of studies included in DOE's Catalog of studies.

Catalog Summary

The table below is re-produced from the U.S. DOE web site referenced above and "provides a summary of energy efficiency potential studies conducted by state, local, and non-governmental organizations (unaffiliated with DOE) between 2007 and 2015."

State	Author/Sponsor, Year	Type [42]	Study Time Range	Cumulative Energy Savings (GWh)[43]	Avg. Annual Potential Savings Rate[44]	Sectors Included [45]
AZ	SWEEP, 20B Bonanza 2012	Achievable Potential	2010-2010	16,713	2.1%	R,C,I
AR	ACEEE 2011	Achievable Potential	2009-2025	12,077	1.3%	R, C, I
AR	AR IOUs/Navigant 2015	Economic Potential	2016-2025	4,317	1.6%	R, C, I
CA	PUC/Navigant	Economic	2014-	51,000		R, C, I

[42] Economic and achievable potential are defined relative to the theoretical maximum, known as the technical potential. Technical energy efficiency potential is the total energy that could be saved by any efficiency measures, without consideration of cost or willingness of users to adopt the measures. Economic potential is the subset of technical potential that is considered cost-effective compared to a supply-side energy resource alternative (i.e., energy generation). Achievable potential is the energy savings that could be realistically achieved given real-world constraints, including market and programmatic barriers.

[43] GWh – Gigawatt-hours. Where savings were not reported directly, savings were calculated either using applicable reported percentages.

[44] Average annual savings rate was calculated by dividing the total cumulative savings percentage over the period of study by the number of years in the study; the initial year of study was assumed to be the baseline.

[45] Sectors include: residential (R), commercial (C), industrial (I) as indicated.

State	Author/Sponsor, Year	Type [42]	Study Time Range	Cumulative Energy Savings (GWh)[43]	Avg. Annual Potential Savings Rate[44]	Sectors Included [45]
	2013	Potential	2024			
CA	PUC/Navigant 2015	Economic Potential	2015-2024	30,374	1.6%	R, C, I
CA	PacificCorp Pacific Power/Cadmus 2013	Achievable Potential	2013-2032	123	0.7%	R, C, I
CO	SWEEP, 20B Bonanza 2012	Achievable Potential	2010-2020	11,495	1.1%	R, C, I
CO	Xcel/KEMA 2013	Economic Potential	2013-2020	6,470	2.9%	R, C, I
CO	CO Springs Utility/Summit Blue 2009	Achievable Potential	2009-2028	497	0.5%	R, C, I
CT	CT CES 2013	Economic Potential	2009-2018	9,748	3.3%	R, C, I
DE	Optimal Energy 2014	Economic Potential	2014-2025	4,360	2.5%	R, C, I
DC	DC 2013	Economic Potential	2013-2022	5,538	4.3%	R, C, I
FL	ACEEE 2007	Economic Potential	2013-2023	84,472	2.0%	R, C, I
GA	Georgia Power/Nexant, Cadmus 2015	Economic Potential	2015-2026	Redacted	1.7%	R, C, I
ID	PacificCorp Rocky Mountain Power/Cadmus 2013	Achievable Potential	2013-2032	298	0.6%	R, C, I
ID	Avista ID/ EnerNOC 2013	Economic Potential	2014-2033	860		R, C, I
ID	Idaho Power/ EnerNOC 2013	Economic Potential	2012-2032	3,839	1.1%	R, C, I
IL	ComEd / ICF 2013	Economic Potential	2013-2018	30,009	5.3%	R, C, I

State	Author/Sponsor, Year	Type [42]	Study Time Range	Cumulative Energy Savings (GWh)[43]	Avg. Annual Potential Savings Rate[44]	Sectors Included [45]
IN	IPL/AEG 2014	Economic Potential	2015-2034	3,911	1.2%	R, C, I
IN	Duke 2013	Achievable Potential	2013-2032	4,557		R, C, I
IA	Iowa Utility Association/Nexant 2008	Economic Potential	2008-2018	6,777	1.7%	R, C, I
IA	Iowa IOUs/Cadmus 2012	Economic Potential	2014-2023	6,865	1.9%	R, C, I
KS	Kansas Energy Council/Summit Blue 2008	Economic Potential	2008-2028	16,787	1.7%	R, C, I
KY	ACEEE 2012	Economic Potential	2013-2030	21,098	1.1%	R, C, I
KY	LG&E, KU / Cadmus 2013	Economic Potential	2013-2033	2,527	0.5%	R, C
KY	Duke/Forefront Economics, Gil Peach 2009	Economic Potential	2009-2013		0.7%	R, C, I
LA	ACEEE 2013	Economic Potential	2011-2030	24,507	1.4%	R, C, I
LA	ICF 2014	Achievable Potential	2014-2034	5,923	0.5%	R, C, I
ME	Efficiency Maine Trust/Cadmus 2012	Economic Potential	2012-2021	3,408	2.6%	R, C, I
MD	ACEEE 2008	Economic Potential	2008-2025	22,164	1.7%	R, C, I
MA	MA Energy Efficiency Advisory Council 2015	Achievable Potential	2016-2018	4,259	3.0%	R, C, I
MI	Michigan Public Service Commission/GDS 2013	Economic Potential	2013-2023	32,556	3.0%	R, C, I
MN	XCEL/KEMA	Economic	2011-	7,339	2.0%	R, C, I

State	Author/Sponsor, Year	Type [42]	Study Time Range	Cumulative Energy Savings (GWh)[43]	Avg. Annual Potential Savings Rate[44]	Sectors Included [45]
	2012	Potential	2020			
MS	ACEEE 2013	Achievable Potential	2014-2025	6,815	1.3%	R, C, I
MO	ACEEE 2011	Achievable Potential	2012-2020	9,164	1.0%	R, C, I
MO	KEMA 2010	Economic Potential	2011-2030	23,359	1.3%	R, C, I
MO	Ameren / EnerNOC 2013	Economic Potential	2016-2030	7,718	1.5%	R, C, I
MO	Kansas City Power and Light 2013	Achievable Potential	2013-2032		1.5%	R, C, I
MT	Power of Efficiency 2009	Achievable Potential	2009-2020	2,190		R, C, I
NV	SWEEP, 20B Bonanza 2012	Achievable Potential	2010-2020	7,040	1.1%	R, C, I
NV	NPC/SPCC/PA Consulting 2009	Economic Potential	2009-2028		0.8%	R, C, I
NH	NHPUC / GDS 2009	Achievable Potential	2009-2018	2,958	2.3%	R, C, I
NJ	NJ BPU/EnerNOC 2012	Economic Potential	2013-2016	9,369	3.2%	R, C, I
NM	SWEEP, 20B Bonanza 2012	Achievable Potential	2010-2020	5,110	2.4%	R, C, I
NM	GEP 2011	Economic Potential	2012-2025	3,510	1.1%	R, C, I
NY	NYSERDA/Optimal Energy 2014	Economic Potential	2014-2030	91,856	3.0%	R, C, I
NY	ConEd/GEP 2010	Economic Potential	2010-2018	11,094	2.0%	R, C, I
NC	ACEEE 2010	Achievable Potential	2015-2025	51,843	3.2%	R, C, I

State	Author/Sponsor, Year	Type [42]	Study Time Range	Cumulative Energy Savings (GWh)[43]	Avg. Annual Potential Savings Rate[44]	Sectors Included [45]
NC	Dominion NC/VA / DNV-GL 2015	Economic Potential	2014-2023	16,599	2.2%	R, C, I
NC	Dominion NC / DNV-GL 2015	Economic Potential	2014-2023	640	2.2%	R, C, I
OH	ACEEE 2009	Economic Potential	2015-2025	64,000	3.3%	R, C, I
OH	AEP / Navigant 2014	Economic Potential	2015-2034	22,283	2.6%	R, C, I
OH	Duke/Forefront Economics, Gil Peach 2013	Economic Potential	2013-2032		0.7%	R, C, I
OH	FirstEnergy 2012	Economic Potential	2012-2026	14,154	1.8%	R, C, I
OH	DP&L 2013	Economic Potential	2013-2022	1,518	1.2%	R, C, I
OK	Cadmus (Sum of OG&E and PSO) 2015	Economic Potential	2015-2024	5,130	1.4%	R, C, I
OK	OG&E / Cadmus 2015	Economic Potential	2015-2024	3,168	1.3%	R, C, I
OK	PSO / Cadmus 2015	Economic Potential	2015-2024	1,962	1.5%	R, C, I
OR	Energy Trust Oregon / Navigant 2014	Achievable potential	2014-2033	6,795	0.8%	R, C, I
PA	ACEEE 2009	Economic Potential	2008-2025	61,000	2.1%	R, C, I
PA	PA PUC 2015	Economic Potential	2016-2025	26,945	1.8%	R, C, I
RI	KEMA 2008	Economic Potential	2009-2018	2,050	2.4%	R, C, I
SC	ACEEE 2009	Achievable Potential	2015-2025	23,119	2.4%	R, C, I

State	Author/Sponsor, Year	Type [42]	Study Time Range	Cumulative Energy Savings (GWh)[43]	Avg. Annual Potential Savings Rate[44]	Sectors Included [45]
SD	Synapse 2009	Achievable Potential	2010-2020	9,604		R, C
TN	TVA / EnerNOC 2012	Economic Potential	2012-2030	40,365	1.2%	R, C, I
TX	Itron 2008	Economic Potential	2009-2018	56,913	1.8%	R, C, I
TX	Austin Energy 2012	Economic Potential	2011-2020	2,784	2.6%	R, C, I
UT	SWEEP, 20B Bonanza 2012	Achievable Potential	2010-2020	6,234	2.0%	R, C, I
UT	PacificCorp Rocky Mountain Power / Cadmus 2013	Achievable Potential	2013-2032	3,408	1.3%	R, C, I
VT	VEIC 2011	Achievable Potential	2011-2031	2,317	0.9%	R, C, I
VT	VDPS / GDS, Cadmus 2011	Economic Potential	2012-2031	1,652	1.5%	R, C, I
VA	ACEEE 2008	Economic Potential	2008-2025	44,371	1.7%	R, C, I
VA	Dominion VA / DNV-GL 2015	Economic Potential	2014-2023	13,736	1.1%	R, C, I
WA	PSE WA/ Cadmus 2013	Achievable Potential	2014-2033	4,564	0.8%	R, C, I
WA	Avista WA/ EnerNOC 2013	Economic Potential	2014-2033	1,808		R, C, I
WA	PacificCorp Pacific Power / Cadmus 2013	Achievable Potential	2013-2032	657	1.5%	R, C, I
WI	Energy Center Wisconsin 2009	Economic Potential	2012-2018	15,231	1.8%	R, C, I
WY	SWEEP, 20B Bonanza 2012	Achievable Potential	2010-2020	3,238	1.6%	R, C, I

State	Author/Sponsor, Year	Type [42]	Study Time Range	Cumulative Energy Savings (GWh)[43]	Avg. Annual Potential Savings Rate[44]	Sectors Included [45]
WY	PacificCorp Rocky Mountain Power / Cadmus 2013	Achievable Potential	2013-2032	1,191	0.5%	R, C, I

APPENDIX F | COST OF CONSERVED ENERGY

Achievable UCT - Cost of Conserved Energy

Levelized Cost of Energy (2017-2026)	$0.0189
Levelized Cost of Energy (2017-2036)	$0.0198

Constrained UCT - Cost of Conserved Energy

Levelized Cost of Energy (2017-2026)	$0.0187
Levelized Cost of Energy (2017-2036)	$0.0196

CONSUMERS ENERGY

ELECTRIC ENERGY EFFICIENCY POTENTIAL STUDY

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