GDS Associates, Inc.
ENGINEERS & CONSULTANTS

DTE ENERGY

Electric Energy Efficiency Potential Study

Prepared for:

DTE Energy

Final Report

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1 EXECUTIVE SUMMARY

Background

DTE Energy staff and GDS Associates worked together to complete this 2016 study of electric energy efficiency potential for DTE Energy. This energy efficiency potential study 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
  - 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 DTE 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. It is often estimated as a "snapshot" in time assuming immediate implementation of all technologically feasible energy saving measures, with additional efficiency opportunities assumed as they arise from activities such as new construction.

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 are theoretical numbers that often assume immediate implementation of efficiency measures, with no regard for the gradual "ramping up" process of real-life programs. In addition, they 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.

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

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 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 spending cap on efficiency measures, Achievable Scenario #2 assumed a spending cap of approximately 2% of projected annual DTE 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 retail sales in attempting to comply with the energy optimization performance standard.

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 DTE Energy service area and to determine the remaining opportunities for cost effective electric energy efficiency savings for the DTE Energy service area. This detailed report presents results of the technical, economic, and achievable potential for electric energy efficiency measures in the DTE Energy service area for two time periods:

- The ten-year period from January 1, 2016 through December 31, 2025
- The twenty-year period from January 1, 2016 through December 31, 2035

All results were developed using customized residential, commercial and industrial sector-level potential assessment analytic models and DTE Energy-specific cost effectiveness criteria including the most recent DTE 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) October 2015 Michigan Energy Measures Database (MEMD)

2) Energy efficiency baseline studies conducted by DTE Energy

3) 2009 EIA Residential Energy Consumption Survey (RECS)

4) 2007 American Housing Survey (AHS)

5) 2003 EIA Commercial Building Energy Consumption Survey (CBECS)[2]

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.

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 DTE 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

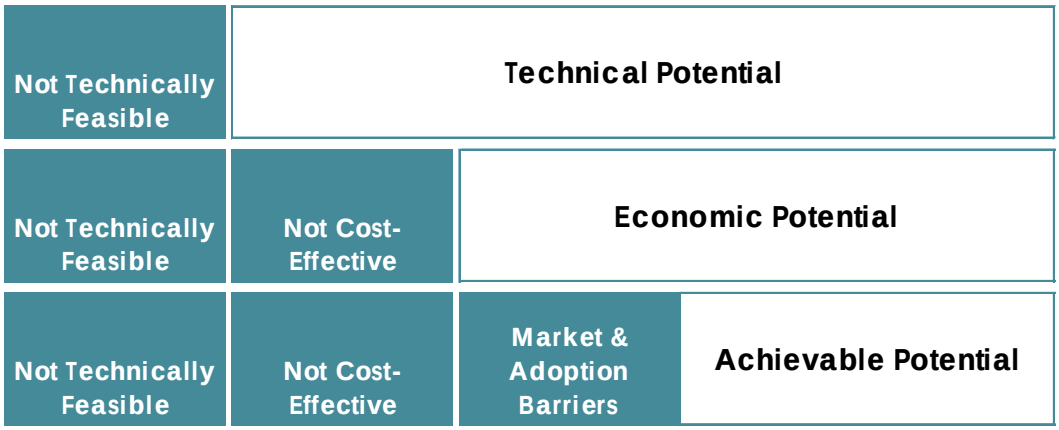
The study examines the potential to reduce electric consumption and peak demand through the implementation of energy efficiency technologies and practices in residential, commercial, and industrial

[2] This is the latest publicly available CBECS data released by the Energy Information Administration (EIA).

facilities in the DTE Energy service area. This study assesses electric energy efficiency potential in the DTE Energy service area over twenty years, from 2016 through 2035.

The main objective of this study was to evaluate the electric energy efficiency technical, economic and achievable potential savings for the DTE 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. The definitions used in this study for energy efficiency potential estimates were obtained directly from a 2007 National Action Plan for Energy Efficiency (NAPEE) report. 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[3]



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 DTE 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.

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.

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

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 DTE Energy's energy resource mix over the next twenty years. For the DTE Energy service area overall, the achievable potential for electricity savings based on the UCT cost effectiveness test screening is 12.5% of forecast kWh sales for 2025, and 18.8% of forecast kWh sales in 2035.

Figure 1-2: Electric Energy Efficiency Potential Savings Summary

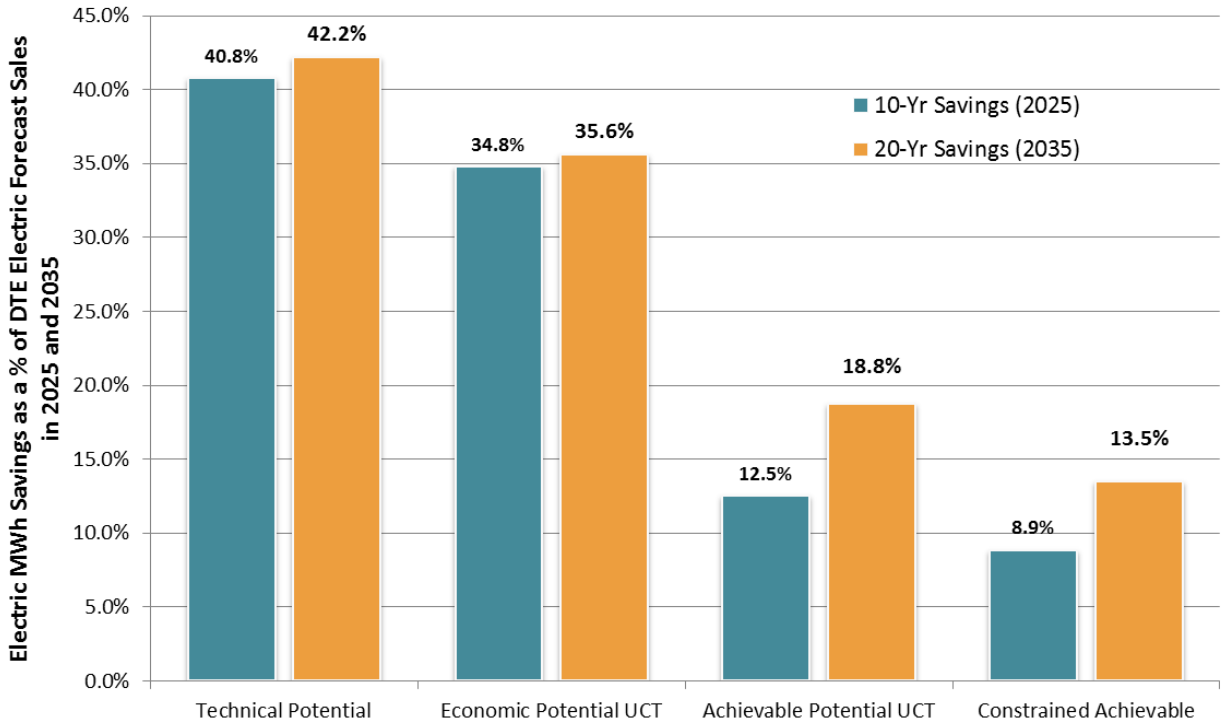


Table 1-1 and Table 1-2 present additional detail, providing the energy efficiency savings potential for all scenarios over a period of and 10 and 20 years, respectively.

Table 1-1: Summary of Technical, Economic and Achievable Electric Energy and Demand Savings for 2025

End Use	Technical Potential	Economic Potential (UCT)	Achievable Potential (UCT)	Constrained Achievable (UCT)
Electric Savings as % of Sales Forecast				
Savings % - Residential	47.2%	45.6%	15.6%	10.3%
Savings % - Commercial	41.9%	36.1%	12.1%	8.4%
Savings % - Industrial	30.3%	17.9%	9.3%	7.7%
Savings % - Total	40.8%	34.8%	12.5%	8.9%
Savings MWh - Residential	8,090,592	7,822,476	2,669,830	1,774,707
Savings MWh - Commercial	9,553,966	8,238,986	2,758,595	1,907,722
Savings MWh - Industrial	3,871,520	2,286,275	1,186,527	987,584
Savings MWh - Total	21,516,078	18,347,737	6,614,952	4,670,013
Savings % - Residential	29.1%	22.2%	6.9%	4.6%
Savings % - Commercial	32.9%	28.8%	8.9%	6.3%
Savings % - Industrial	33.7%	19.9%	10.4%	8.7%
Savings % - Total	31.5%	24.6%	8.4%	6.1%
Savings MW - Residential	1,469	1,121	350	233
Savings MW - Commercial	1,791	1,565	482	344
Savings MW - Industrial	756	447	234	195
Savings MW - Total	4,016	3,132	1,065	772

Table 1-2: Summary of Technical, Economic and Achievable Electric Energy and Demand Savings for 2035

End Use	Technical Potential	Economic Potential (UCT)	Achievable Potential (UCT)	Constrained Achievable (UCT)
Electric Savings as % of Sales Forecast				
Savings % - Residential	52.3%	49.0%	20.5%	17.6%
Savings % - Commercial	41.8%	36.0%	18.9%	10.6%
Savings % - Industrial	29.7%	17.6%	16.3%	13.2%
Savings % - Total	42.2%	35.6%	18.8%	13.5%
Savings MWh - Residential	8,903,407	8,339,118	3,499,557	2,989,765
Savings MWh - Commercial	9,557,694	8,242,372	4,313,889	2,425,069
Savings MWh - Industrial	3,871,520	2,286,275	2,118,727	1,721,110
Savings MWh - Total	22,332,621	18,867,765	9,932,173	7,135,944

Savings % - Residential	35.1%	24.1%	9.2%	7.9%
Savings % - Commercial	33.3%	29.1%	15.3%	9.1%
Savings % - Industrial	33.1%	19.5%	18.1%	14.0%
Savings % - Total	34.0%	25.4%	13.4%	9.5%
Savings MW - Residential	1,723	1,183	452	386
Savings MW - Commercial	1,791	1,565	823	491
Savings MW - Industrial	756	447	414	321
Savings MW - Total	4,270	3,195	1,690	1,198

The ten-year and twenty-year budgets and acquisition costs for the achievable potential scenarios for electric energy efficiency savings are shown in Table 1-3.

GDS is providing the information on the projected acquisition per first year unit of energy saved in order 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: Achievable Potential Scenarios; Budgets and Acquisition Costs Per Unit of Energy Saved – Electric Savings (Budgets Are Not in Present Value Dollars)

All Sectors Combined	10 - Year EE Budget	20-Year EE Budget	Acquisition Cost Per First Year kWh Saved - 10 years	Acquisition Cost Per First Year kWh Saved - 20 years
Achievable UCT – No budget constraint	$1,805,763,982	$4,003,284,983	$0.20	$0.20
Constrained UCT	$1,268,438,129	$2,872,986,840	$0.20	$0.19

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 annual information on the percent of annual utility revenues needed each year to fund acquiring the energy savings levels for each achievable potential scenario.

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

	Residential	Commercial	Industrial	Total Budgets	% of Annual Revenue
2016	$73.57	$61.36	$24.56	$159.49	2.88%
2017	$77.32	$61.84	$24.83	$163.98	2.88%
2018	$79.64	$62.34	$25.13	$167.10	2.83%
2019	$81.15	$62.84	$25.43	$169.43	2.78%
2020	$81.76	$68.24	$25.75	$175.75	2.80%
2021	$82.39	$69.64	$26.14	$178.17	2.77%
2022	$86.38	$70.73	$26.48	$183.59	2.78%

	Residential	Commercial	Industrial	Total Budgets	% of Annual Revenue
2023	$90.35	$73.33	$26.95	$190.63	2.81%
2024	$96.92	$82.23	$27.32	$206.47	2.97%
2025	$98.82	$84.57	$27.77	$211.16	2.96%
2026	$86.53	$71.82	$25.55	$183.90	2.52%
2027	$76.58	$72.87	$26.35	$175.80	2.36%
2028	$73.33	$88.86	$30.27	$192.46	2.52%
2029	$72.88	$89.77	$30.68	$193.33	2.48%
2030	$72.27	$87.21	$31.25	$190.73	2.40%
2031	$78.82	$114.32	$40.40	$233.54	2.88%
2032	$83.01	$123.26	$42.31	$248.58	3.01%
2033	$84.67	$122.03	$42.84	$249.54	2.96%
2034	$96.93	$125.60	$45.80	$268.33	3.13%
2035	$88.83	$126.11	$46.36	$261.30	2.99%

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

	Residential	Commercial	Industrial	Total Budgets	% of Annual Revenue
2016	$47.49	$44.06	$19.16	$110.71	2.00%
2017	$49.35	$45.30	$19.27	$113.92	2.00%
2018	$51.37	$46.43	$20.24	$118.04	2.00%
2019	$53.37	$47.46	$21.07	$121.90	2.00%
2020	$55.34	$48.47	$21.62	$125.43	2.00%
2021	$57.29	$49.51	$22.04	$128.85	2.00%
2022	$59.23	$50.48	$22.56	$132.26	2.00%
2023	$61.14	$51.45	$23.09	$135.69	2.00%
2024	$63.04	$52.39	$23.69	$139.12	2.00%
2025	$64.92	$53.32	$24.29	$142.53	2.00%
2026	$66.79	$54.22	$24.97	$145.97	2.00%
2027	$68.63	$55.10	$25.54	$149.27	2.00%
2028	$70.45	$55.97	$26.09	$152.52	2.00%
2029	$72.26	$56.82	$26.66	$155.74	2.00%
2030	$74.05	$57.65	$27.22	$158.92	2.00%
2031	$75.83	$58.46	$27.79	$162.08	2.00%
2032	$77.63	$59.26	$28.32	$165.21	2.00%
2033	$79.45	$60.05	$28.87	$168.37	2.00%

Energy Efficiency Potential Savings Detail By Sector

Note that Sections 6, 0 and 8 of this report include additional detail about the electric energy efficiency savings potential in the DTE Energy service area by 2035.

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 in the DTE 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 2016 to 2025 Time Period

Achievable Potential Scenarios	NPV $ Benefits	NPV $ Costs	Benefit/Cost Ratio	Net Benefits
Achievable UCT – Scenario #1	$3,684,419,836	$1,222,244,314	3.01	$2,462,175,522
Constrained UCT – Scenario #2	$2,624,013,101	$859,973,030	3.05	$1,764,040,071

Table 1-7: Benefit-Cost Ratios for Achievable Potential Scenarios For 2016 to 2035 Time Period

Achievable Potential Scenarios	NPV $ Benefits	NPV $ Costs	Benefit/Cost Ratio	Net Benefits
Achievable UCT – Scenario #1	$6,136,314,427	$1,823,960,258	3.36	$6,136,314,427
Constrained UCT – Scenario #2	$4,298,888,266	$1,309,310,721	3.28	$2,989,577,545

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. It is important to note that energy efficiency measures for low income households do not necessarily need to be cost effective in the DTE Energy service area. However, for consistency in this report, GDS has excluded all non-cost effective measures from estimates of economic and achievable potential energy efficiency savings.

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 the economic/demographic characteristics of DTE Energy 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 *(2016-2035)* provides a breakdown of the technical, economic, and achievable electric energy efficiency savings potential in the residential sector.

Section 0: Commercial Sector Electric Energy Efficiency Potential Estimates *(2016-2035)* 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 *(2016-2035)* provides a breakdown of the technical, economic, and achievable electric energy efficiency savings potential in the industrial sector.

2 GLOSSARY OF TERMS[4]

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.

Capital Recovery Rate (CRR): The return of invested capital expressed as an annual rate; often applied in a physical sense to wasting assets with a finite economic life.[5]

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 which assumes a lower level of incentives or lower annual program budgets than in the base case achievable potential scenario.

[4] Potential definitions taken from National Action Plan for Energy Efficiency (2007). "Guide for Conducting Energy Efficiency Potential Studies." Prepared by Philip Mosenthal and Jeffrey Loiter, Optimal Energy, Inc.
[5] Accuval. http://www.accuval.net/insights/glossary/

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 are theoretical numbers that assume immediate implementation of efficiency measures, with no regard for the gradual "ramping up" process of real-life programs. In addition, they 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.

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

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.

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-

[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.

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.

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. It is often estimated as a "snapshot" in time assuming immediate implementation of all technologically feasible energy saving measures, with additional efficiency opportunities assumed as they arise from activities such as new construction.

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 DTE 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
- Describes contents of the Sections of this report.

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 DTE 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 DTE 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 DTE Energy administered energy efficiency programs in reducing electricity consumption in the DTE 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 DTE 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 DTE 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, DTE 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 DTE Energy Context

3.2.1 Flat MWh Sales for the 2016 to 2035 Time Period

The annual kWh sales and electric system peak load for the DTE Energy are projected to stay fairly constant over the two decades. The total number of residential electric utility customers in the DTE service area declined from 1,966,973 in 2004 to 1,943,880 in 2014 (a decline of 23,093 customers). The electric load forecast provided to GDS by DTE Energy indicates that residential MWh sales will be relatively flat over the next two decades, while commercial and industrial annual MWh sales will increase slightly. This report assesses the potential for electric energy efficiency programs to assist DTE Energy in meeting future electric energy service needs, given that annual electric sales and peak load are not expected to change significantly over the next two decades.

[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 DTE 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%

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.[11] 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 2010 and 2011 from the US Energy Information Administration (EIA) on the top twenty energy efficiency electric utilities. These top twenty utilities saved over 2% of annual kWh sales in 2010 with their energy efficiency programs, and 3.8% of annual kWh sales in 2011.[12] 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.

[10] American Council for an Energy Efficient Economy, "The 2015 State Energy Efficiency Scorecard", Report #U1509, October 2015, page 22.
[11] American Council for an Energy Efficient Economy, "The 2015 State Energy Efficiency Scorecard", Report #U1509, October 2015.
[12] GDS will add data for 2012 to 2014 for the final version of this report.

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 were obtained from DTE Energy.

This energy efficiency potential study concludes that there remains significant achievable cost effective potential for electric energy efficiency measures and programs in the DTE 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 2016.

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	$3,684,419,836	$1,222,244,314	3.01
20-yr period	$6,136,314,427	$1,823,960,258	3.36

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 DTE Energy Revenues) For 10-Year and 20-Year Implementation Periods

Achievable Potential Scenarios	UCT $ Benefits	UCT $ Costs	UCT Benefit/Cost Ratio
10-yr period	$2,624,013,101	$859,973,030	3.05
20-yr period	$4,298,888,266	$1,309,310,721	3.28

4 Characterization of Electricity Consumption in DTE Energy's Service Territory

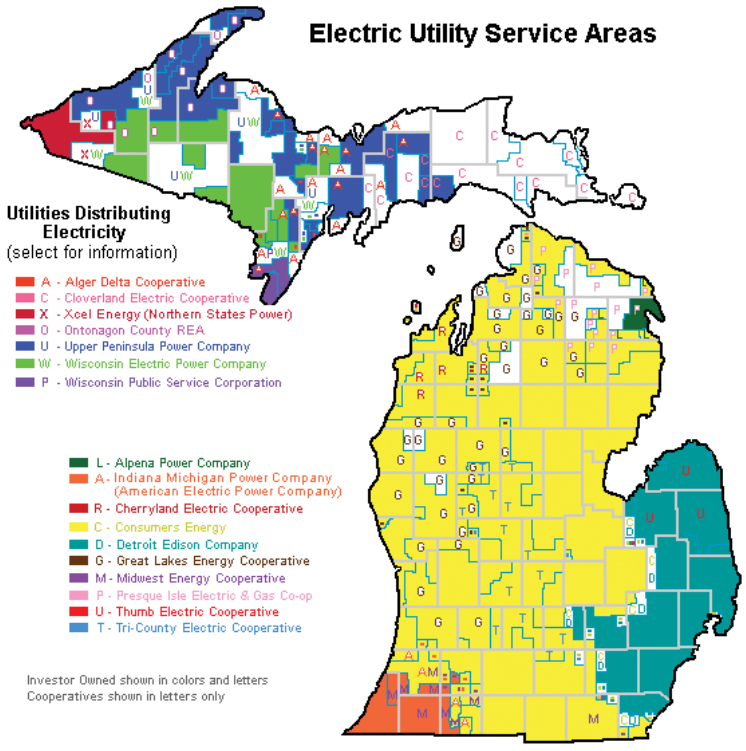
This chapter provides up-to-date historical and forecast information on electricity consumption, consumption by market segment and by energy end use, and electric customers in DTE Energy's service territory. This chapter also provides an overview of the number of households and housing units in DTE Energy's service area. Developing this information is a fundamental part of any energy efficiency potential study. It is necessary to understand how energy is consumed in a 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 electric 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 Company (DTE) 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 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 Economic/Demographic Characteristic

Michigan is located in the Great Lakes and the Midwestern region of the United States. It is the 11th largest state. It borders Wisconsin, Ohio, Indiana, Minnesota, and Canada. Michigan is 96,810 square miles, bordering four of the Great Lakes: Lake Michigan, Lake Superior, Lake Huron, and Lake Erie. Michigan's population in 2014 was 9,909,877 residents[13], ranking Michigan as the 10th most populated state in the country.

According to an estimate done by the Census Bureau, during the year 2012, there were about 103 people per square mile in the state of Michigan. The state's population distribution by age is as follows:

- Under 5 – 7.6%
- Ages 5-19 – 22.6%
- Ages 19-65 - 46.8%
- Above 65 – 23%

The estimated number of Michigan housing units in 2014 (data from the U.S. Bureau of the Census) was 4,539,871. Table 4-1 provides historical and forecast data for the number of electric customers by sector in the DTE Service area. It is interesting to note that DTE Energy had fewer electric customers in every sector but the commercial sector in 2014 than the Company had ten years earlier in 2004.

Table 4-1: Historical Number of DTE Electric Customers by Market Sector

Year	Residential Electric Customers	Commercial Electric Customers	Industrial Electric Customers	Other Electric Customers	Total Electric Customers
2004	1,966,973	176,896	786	1,981	2,146,636
2005	1,977,013	178,296	905	1,987	2,158,200
2006	1,976,982	188,408	1,088	1,977	2,168,454
2007	1,967,223	193,115	1,051	1,972	2,163,361
2008	1,950,805	196,685	1,030	1,902	2,150,422
2009	1,932,344	197,292	967	1,927	2,132,530
2010	1,922,753	194,286	839	1,869	2,119,747
2011	1,922,760	194,850	819	1,833	2,120,262
2012	1,925,908	196,579	810	946	2,124,244
2013	1,935,087	197,375	803	896	2,134,161
2014	1,943,880	198,297	778	898	2,143,853

4.3 Residential, Commercial and Industrial Sector Baseline Segmentation Findings

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

4.3.1 Electricity Sales Forecast by Sector for the DTE Energy Service Area

Figure 4-2 and Table 4-2 show historical and forecast electricity sales by sector (in millions of kWh) for the DTE service area for the period 2016 to 2035. DTE Energy does not have electric sales and peak load

[13] U.S. Department of Commerce, Bureau of the Census, at www.census.gov in 2014.

forecasts that exclude all impacts of their current energy efficiency programs. As a result, the forecast of annual electric sales for the DTE Energy service area shown below do reflect the impacts of current energy efficiency programs.

Figure 4-2: DTE Energy Forecast of Annual Electric Sales, 2016-2035 (GWh)

The DTE Energy Forecast of Electricity Sales shown in Figure 4-2 above highlights that the Company expects future GWh sales to remain at 2016 levels for the next two decades. The commercial sector is forecast to have the largest share of annual GWh sales, followed by the residential, industrial and other sectors. This flat outlook for future annual GWh sales means that the DTE Energy service area will have lower potential for energy efficiency savings as compared to other service areas that are forecast to have future growth in GWh sales.

Table 4-2: DTE Energy Projected Electric GWh Sales by Sector for 2016 to 2035

Year	Residential Electric Sales (GWh)	Commercial Electric Sales (GWh)	Industrial Electric Sales (GWh)	Other Electric Sales (GWh)	Total Electric Sales (GWh)
2016	16,586	21,439	12,551	278	50,854
2017	16,600	21,700	12,272	267	50,839
2018	16,716	21,889	12,565	257	51,427
2019	16,819	22,019	12,758	247	51,843
2020	16,901	22,140	12,772	237	52,050
2021	16,975	22,269	12,700	236	52,180
2022	17,037	22,349	12,687	235	52,308
2023	17,086	22,439	12,687	234	52,446
2024	17,124	22,504	12,729	233	52,590
2025	17,152	22,563	12,776	232	52,723
2026	17,170	22,605	12,876	232	52,882
2027	17,175	22,638	12,900	232	52,945

Year	Residential Electric Sales (GWh)	Commercial Electric Sales (GWh)	Industrial Electric Sales (GWh)	Other Electric Sales (GWh)	Total Electric Sales (GWh)
2028	17,167	22,662	12,913	232	52,974
2029	17,149	22,671	12,936	232	52,987
2030	17,119	22,669	12,952	232	52,972
2031	17,084	22,655	12,976	232	52,947
2032	17,060	22,638	12,975	232	52,904
2033	17,047	22,614	12,988	232	52,880
2034	17,041	22,633	13,005	232	52,911
2035	17,036	22,643	13,023	232	52,933

4.3.2 Electricity Consumption by Market Segment

Figure 4-3 shows the breakdown of 2014 annual electricity consumption by building type for the DTE Energy commercial sector. Figure 4-4 shows a similar breakdown of sales by industrial market segment for the industrial sector. The Office market sector (29%) contributed the largest share of commercial electricity consumption in 2014, followed by the Other (22%) category and Retail buildings (11%). In the industrial sector breakdown shown in Figure 4-5, Automobile Manufacturing (45% of 2014 annual industrial electricity sales) is the largest sector, followed by Primary Metals (24%) and Rubber and Plastics (7%). Reviewing and understanding information on DTE 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. Table 4-3 and Table 4-4 provide the actual 2014 GWh data market segment breakdown for DTE's commercial and industrial electricity sales.

Figure 4-3: DTE Energy 2014 Commercial Electricity Consumption by Market Segment

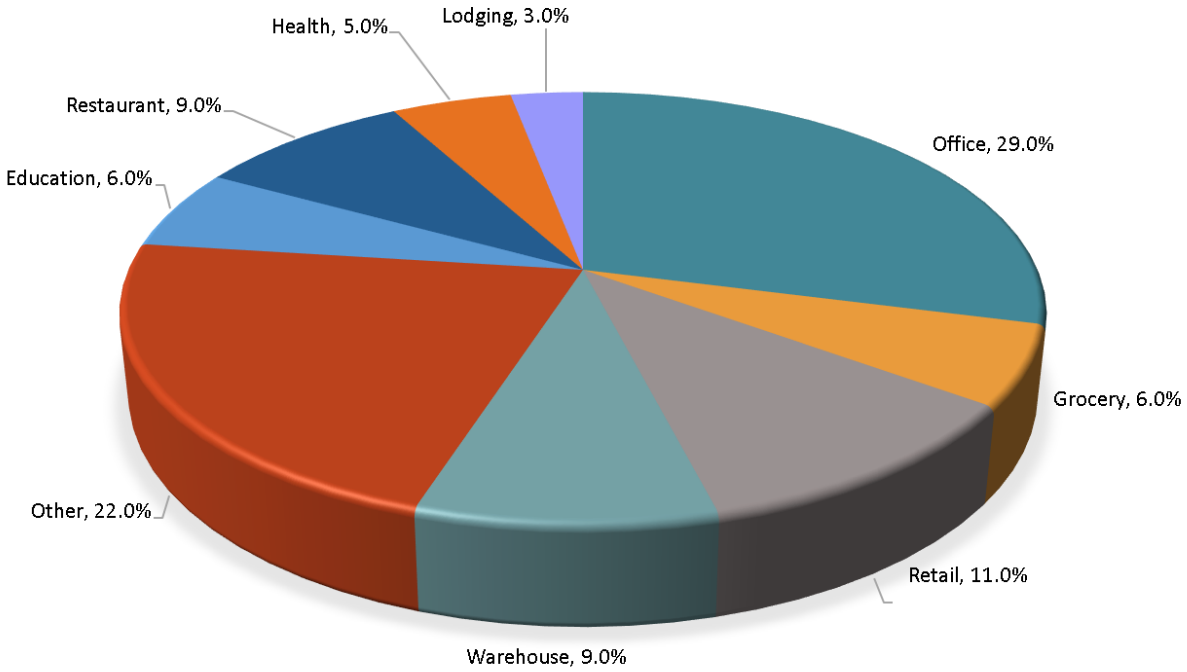


Table 4-3: 2014 DTE Energy Commercial Sector Electric Energy Consumption by Market Segment

Market Segment	2014 DTE Commercial Sector Electricity Consumption (MWh)	Percent of Total Commercial Sector Sales
Warehouse	1,786,684	9%
Retail	2,100,415	11%
Grocery	1,156,989	6%
Office	5,769,481	29%
Lodging	650,763	3%
Health	1,031,345	5%
Restaurant	1,702,356	9%
Education	1,301,525	7%
Other	4,433,900	22%
Total	**19,933,456**	**100%**

Figure 4-4: DTE Energy 2014 Electric Industrial Energy Consumption by Market Segment

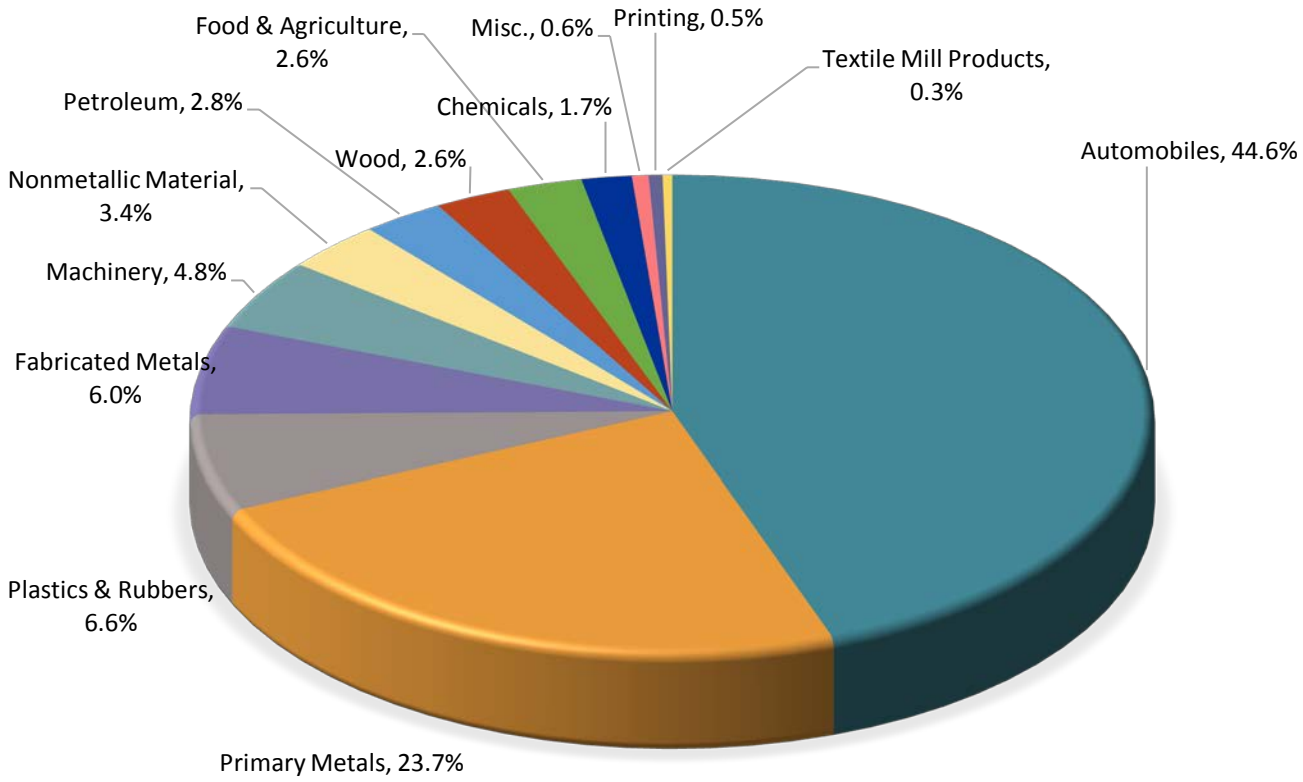


Table 4-4: 2014 DTE Energy Industrial Energy Consumption by Market Segment

Market Segment	2014 Industrial Electricity Consumption (MWh)	Electricity Share
Automobiles	4,545,561	44.6%
Primary Metals	2,414,032	23.7%
Plastics & Rubber	668,015	6.6%
Fabricated Metal	613,962	6.0%
Machinery	489,538	4.8%
Nonmetallic Mineral	341,656	3.4%
Petroleum	286,583	2.8%
Wood	265,166	2.6%
Food & Agriculture	260,067	2.5%
Chemicals	174,398	1.7%
Misc.	58,133	0.6%
Printing	47,934	0.5%
Textile Mill Products	33,656	0.3%
Total	10,198,700	100%

4.3.3 Electric Consumption by End-Use

Table 4-5 shows the breakdown of DTE 2014 electric energy consumption by commercial market segment by end use. Table 4-6 and Table 4-7 show the same end-use energy breakdown for the industrial sector by market segment. Lighting is the largest end use for the commercial sector (41% of commercial sector electricity consumption), followed by cooling (14%), and then by ventilation (13%). As for the industrial sector, machine drives represent the largest end use, followed by process heating and facility HVAC.

Table 4-5: Breakdown of Michigan Commercial Electricity Sales by Market Segment and End-Use

	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other	Total
Lighting	61%	47%	26%	44%	59%	48%	21%	34%	34%	41%
Cooling	3%	9%	4%	8%	6%	8%	8%	12%	8%	8%
Ventilation	9%	10%	4%	10%	7%	18%	12%	25%	21%	13%
Water Heating	1%	4%	1%	1%	3%	1%	3%	2%	0%	1%
Refrigeration	12%	6%	51%	4%	4%	2%	28%	4%	6%	10%
Space Heating	1%	7%	3%	4%	5%	2%	4%	3%	3%	4%
Office Equipment	3%	2%	3%	15%	3%	6%	2%	9%	2%	6%
Miscellaneous	9%	15%	8%	14%	14%	14%	21%	11%	26%	16%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Table 4-6: Electric Industrial Energy Consumption by End Use (Table 1 of 2)

	Food	Textile Mill Products	Wood	Printing	Petroleum	Chemicals	Plastics & Rubber
Conventional Boiler Use	2.9%	1.1%	0.4%	1.1%	1.8%	1.4%	0.9%
Process Heating	4.6%	9.4%	5.3%	5.9%	2.7%	4.1%	0.0%
Process Cooling and Refrigeration	28.1%	5.9%	2.1%	1.3%	1.5%	5.0%	4.6%
Machine Drive	43.4%	46.7%	51.4%	71.9%	75.0%	46.3%	82.6%
Electro-Chemical Processes	0.2%	0.9%	0.0%	0.5%	0.7%	0.5%	0.2%
Other Process Use	0.5%	0.9%	2.1%	0.6%	4.3%	1.3%	2.3%
Facility HVAC (g)	7.9%	16.4%	21.8%	6.2%	4.4%	24.2%	3.7%
Facility Lighting	7.7%	14.7%	13.2%	7.7%	4.2%	9.3%	2.7%
Other Facility Support	2.3%	2.9%	2.1%	1.7%	0.8%	3.5%	1.0%
Onsite Transportation	0.3%	0.2%	0.4%	0.1%	0.2%	0.2%	0.0%
Other Non-process Use	0.3%	0.0%	0.0%	0.9%	0.1%	0.6%	0.4%
End Use Not Reported	1.8%	0.9%	1.2%	1.9%	4.3%	3.7%	1.7%
Total Industrial	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Table 4-7: Electric Industrial Energy Consumption by End Use (Table 2 of 2)

	Nonmetallic Minerals	Primary Metals	Fabricated Metals	Machinery	Automobiles	Misc.
Conventional Boiler Use	1.1%	0.9%	0.3%	0.2%	0.7%	0.7%
Process Heating	4.1%	18.4%	26.5%	32.1%	9.7%	10.6%
Process Cooling and Refrigeration	7.6%	11.2%	2.9%	1.2%	8.7%	4.9%
Machine Drive	59.0%	43.3%	53.8%	27.7%	23.0%	35.9%
Electro-Chemical Processes	14.9%	0.4%	0.8%	26.5%	1.5%	2.1%
Other Process Use	0.9%	3.1%	1.8%	3.2%	5.0%	3.8%
Facility HVAC (g)	6.2%	9.9%	5.9%	3.7%	29.7%	18.7%
Facility Lighting	3.9%	8.4%	5.4%	3.4%	12.0%	14.6%
Other Facility Support	1.3%	2.0%	1.3%	0.9%	5.0%	3.5%
Onsite Transportation	0.1%	0.3%	0.1%	0.1%	0.1%	0.6%
Other Non-process Use	0.2%	0.2%	0.1%	0.5%	1.0%	1.1%
End Use Not Reported	0.7%	1.8%	1.1%	0.5%	3.6%	3.5%
Total Industrial	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

5 POTENTIAL STUDY METHODOLOGY

This section describes the overall methodology GDS utilized to develop the electric energy efficiency potential study for DTE 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 DTE 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 the bottom-up modeling approach to first estimate measure-level savings and costs as well as cost-effectiveness, and then applied cost-effective measure savings to all applicable shares of 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 were disaggregated by combining sales breakdowns by business type provided by DTE Energy with regional energy use estimates by business type available from the U.S. Energy Information Administration (EIA)[14] The forecasts were then further disaggregated by end use based on end use consumption estimates for the East North Central Region (Michigan, Wisconsin, Ohio, Indiana, Illinois). The disaggregated forecast provided the foundation for the development of energy efficiency potential estimates for the commercial sector. It was not necessary to develop a disaggregated residential sales forecast because a bottom-up approach was used for the residential sector.

For the industrial sector, the baseline electric demand forecasts were disaggregated by industry type and then by end use. The industry type breakdowns are based on DTE sales by market segment. 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.

For the commercial sector, the development of the energy efficiency technical potential estimate begins with a disaggregated energy sales forecast over the twenty year forecast horizon (2016 to 2035). The commercial sector energy sales forecast is broken down by building type, then by electric end use. Then a savings factor is applied to end use electricity sales to determine the potential electricity savings for each end use. The commercial sector, as defined in this analysis, is comprised of the following business segments:

- Warehouse

[14] 2003 EIA Commercial Building Energy Consumption Survey (CBECS), East North Central and Midwest Regions.

- Retail
- Grocery
- Office
- Lodging
- Healthcare
- Restaurant
- Institutional, including education
- Other

Estimates of industrial energy efficiency potential were developed employing a top-down approach using electricity sales data for key industrial segments (primarily reported for 3 digit NAICS codes) in the DTE Energy service area to develop industry-specific electric energy use estimates. This data was used in conjunction with energy use estimates from the 2010 Manufacturing Energy Consumption Survey[15] (produced by the Energy Information Administration (EIA)) to develop estimates of industrial electric energy use by industry type and end use.

Industrial baseline energy consumption data was advanced to 2016 and future years based upon the observed historical trend in DTE Energy's industrial consumption and the forecast of electricity sales for DTE's 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**

5.3 Measure List Analysis

5.3.1 Measure List Development

Energy efficiency measures considered in the study include measures in the 2015 Michigan Energy Measure 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

[15] http://www.eia.gov/emeu/mecs/contents.html

available but currently not widely accepted, or are not currently available but expected to be commercialized over the analysis timeframe.[16]

In total, GDS analyzed 538 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 4,859 measure permutations for this study, and tested all measures for cost-effectiveness using the Utility Cost Test (UCT). The parameters for cost-effectiveness under the UCT are discussed in detail later in this section of the report. Approximately 75% 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	568	330
Commercial	247	2,223	1,746
Industrial	161	2,093	1,633
Total	***538***	***4,884***	***3,709***

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 DTE Energy service area. GDS used DTE 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.

[16] For example, an ENERGY STAR criteria 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.

[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.

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).

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 DTE 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
- DTE 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

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

equipment are necessary. Up-to-date measure saturation data were primarily obtained from the following recent studies:

- 2013 DTE Energy Commercial Baseline Study
- 2011 Michigan Residential Baseline Study conducted by the MPSC
- Energy efficiency baseline studies conducted by DTE Energy
- 2011 Michigan Commercial Baseline Study conducted by the MPSC
- 2009 EIA Residential Energy Consumption Survey (RECS)
- 2007 American Housing Survey (AHS)
- 2010 EIA Manufacturing Energy Consumption Survey (MECS)
- 2003 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 HSPF[20] 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) (ft^3/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.

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

- 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 effective June 1, 2016, in PA Act 129.

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 five years of the analysis (2016 through 2020), LED bulb savings are calculated relative to a halogen incandescent bulb. For the remaining years of the analysis, the GDS team assumes the CFL bulb becomes the code baseline, and LED savings are calculated against the CFL bulb.

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.[21] 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. The costs of LEDs in the early years of the projections are also based on data provided by DTE associated with its ENERGY STAR products program.

Table 5-2: Price Projections for Residential LED Lighting

Bulb Technology	2016	2017	2018	2019	2020	2025	2030
Standard LED	$8.72	$7.54	$6.36	$5.18	$4.00	$3.20	$2.40
Specialty LED	$10.80	$9.60	$8.40	$7.20	$6.00	$5.00	$4.00
LED Reflector	$26.56	$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 LED vs. CFL bulbs assumed in the residential sector.[22] For example, in 2017, 83% of all assumed efficient screw-in bulb installations will be LED bulbs. As noted above, the screw-in lighting baseline shifts to the CFL bulb in 2020, and all assumed efficient installations shift to LEDs at that time.

Table 5-3: Assumed Annual Applicability of LED Bulbs

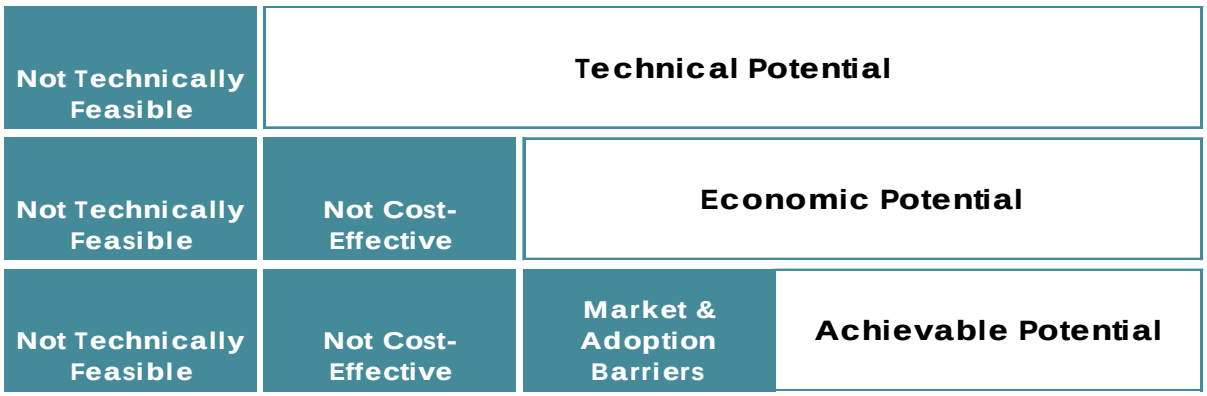
Bulb Technology	2016	2017	2018	2019	2020	2021
CFL Bulb	60%	50%	40%	25%	10%	0%
LED Bulb	40%	50%	60%	75%	90%	100%

5.4 Potential Savings Overview

[21] 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.
[22] Annual applicability factors based on the NEEP Residential Lighting Strategy. 2013-2014 Update. Table 6. Rate of In Program Bulbs.

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 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[23]



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. [24]

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.[25]

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.

[23] Reproduced from "Guide to Resource Planning with Energy Efficiency" November 2007. US EPA. Figure 2-1.
[24] Low-income direct install measures were assumed to occur at a rate of 5% annually over the entire 20-year study timeframe.
[25] 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).[26]
- **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 or industrial industry type (e.g., office buildings or fabricated metals).

[26] 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 industry 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). How the auto industry uses energy is very different from how a plastics manufacturer does. 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:

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 are theoretical numbers that assume immediate implementation of energy efficiency measures, with no regard for the gradual "ramping up" process of real-life programs. In addition, they 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 DTE	Yes
Average line losses provided by DTE 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
Tax credits	No
Non-energy benefits	No

Based on discussions with DTE Energy during the fall of 2015, GDS has used average line losses to adjust kWh and kW savings at the customer meter to the generation level of the electric grid. DTE 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 DTE Energy relating to marginal line losses on the DTE 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 three 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 DTE 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.[27] Also, the majority of energy efficiency programs offered by NYSERDA offer no incentives to consumers. In addition, the NYSERDA electric energy efficiency achievable potential study completed by Optimal Energy in 2006 assumed incentive levels in the range of 20% to 50%.

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.[28] 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 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:

[27] GDS 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).
[28] 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.

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 2016 to 2035 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[29].

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.

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.

[29] Neither 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 DTE.

5.7.1.1 Residential

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, measures and end-use-specific maximum 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.[30] GDS relied on one additional source for this study compared to the 2013 study.[31] This added reference point strengthened the market adoption estimates while also affirming that the estimates used in the 2013 study were reasonable. GDS acknowledges that reliance on additional studies and alternate methods could produce different estimates of achievable potential.

For the majority of residential measures, the analysis assumes that increased incentives and reduced participant costs will also reduce the simple payback period of energy efficiency measures. As incentives increase and payback periods decline, maximum market adoption rates will increase. Table 5-5 below provides the maximum market adoption rates used for the residential sector.

Table 5-5: Market Adoption Rates End Use – Residential Sector

End Use	Initial Year Adoption Rate	Ultimate Adoption Rate
Lighting	49%	49%
Appliances	21%	55%
Electronics	21%	69%
Water Heating	21%	49%
HVAC Shell	21%	38%
HVAC Equipment	21%	49%
Miscellaneous	21%	49%
Cross-Cutting	21%	49%
Low Income	80%	80%

Once the long-term market adoption rate was determined, GDS estimated the time interval required to reach the ultimate maximum adoption rate. For this study GDS assumed that each measure would reach the ultimate adoption rate after 10 years. 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 DTE 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

[30] 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.
[31] 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.

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.

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.[32] That 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%**

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, was 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,

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

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 DTE Energy's service area. Estimates of technical, economic and achievable potential are provided.

6.1 Residential Electric Potential

According to 2014 historical sales data, the residential sector accounts for approximately 90% of total customers and 35% of total energy sales. The average residential consumer uses approximately 7,700 kWh per year. From 2004-2014, residential sector sales and totals customers have been stable. This analysis assumes residential MWh sales will continue to be stable across the 2016-2035 timeframe, with some decrease in kWh sales. 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.

6.1.1 Energy Efficiency Measures Examined

For the residential sector, there were 568 total electric savings measures included in the potential energy savings analysis[33]. 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, electricity energy and demand savings, 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
Water Heating	Domestic hot water	• Heat pump water heater • Solar water heater

[33] 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
		• 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

6.1.2 Overview of Residential Electric Energy Efficiency Potential

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 and natural gas sales forecasts

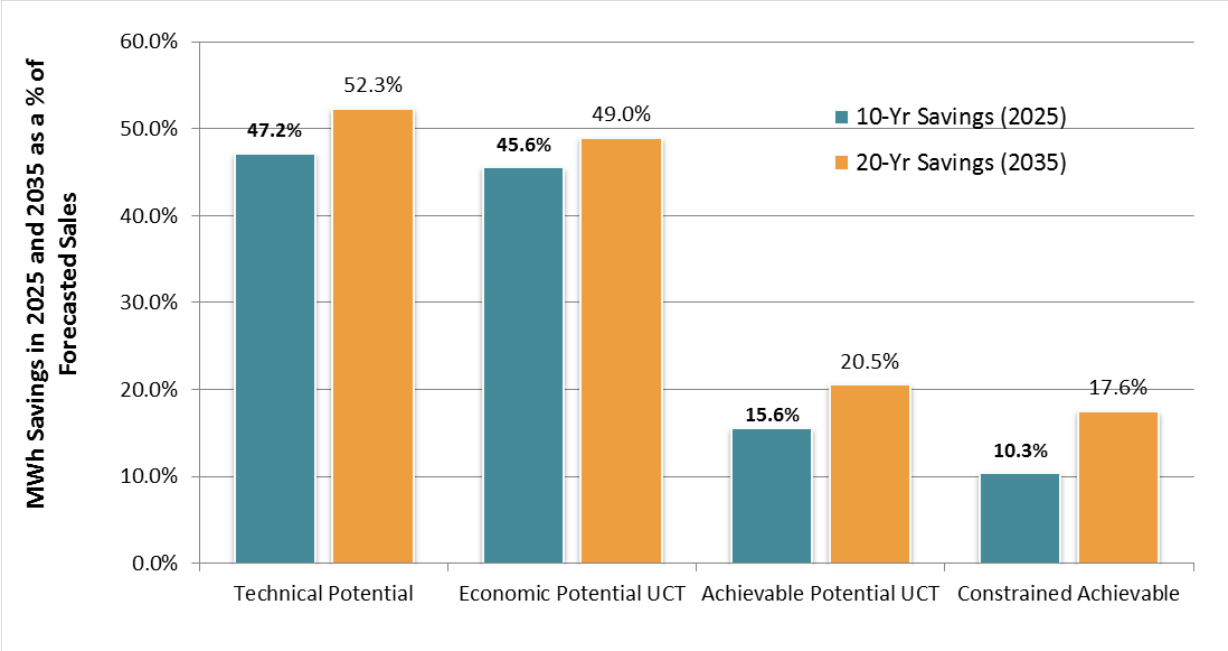
- The accuracy of results generated by building energy simulation modeling software
- Changes to codes and standards in the future which cannot be anticipated at the present time, and
- Uncertainty regarding the future adoption of energy efficiency technologies which have minimal market share at the 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 assumes increasing market adoption of LEDs over the life of the study because LED costs are expected to decrease over time. 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 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 2025 and 2035 Sales Forecasts



The potential estimates are expressed as cumulative 10-year and 20-year savings, as percentages of the respective 2025 and 2035 sector sales. The technical potential is 47.2% in 2025 and 52.3% in 2035. The 10-year and 20-year economic potential is 45.6% and 49.0% 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 are cost-effective, particularly when screening based on the UCT.

The 10-year and 20-year achievable potential savings are: 15.6% and 20.5% for the Achievable UCT scenario and 10.3% and 17.6% 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 DSM approximately equal to 2% of future annual residential revenue from electric and gas retail sales.

Technical Potential

Technical potential represents the quantification of savings that can be realized if all technologically available energy-efficiency measures are immediately adopted in all feasible instances, regardless of cost. Table 6-2 shows that it is technically feasible to save nearly 8.1 million MWh in the residential sector between 2016 and 2025, as well as approximately 8.9 million MWh during the 20 year period from 2016 to 2035 statewide, representing 47.2% of 10-year residential sales, and 52.3% of 20-year residential sales. HVAC Equipment, lighting, and cross-cutting behavioral measures are the greatest contributors to the technical potential. Table 6-3 shows the demand savings potential in 2025 and 2035. The ten and twenty year summer peak demand savings potential is 1,468 MW and 1,723 MW, respectively, which is 29.1% and 35.1% of the peak forecast.

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

End Use	2025 Energy (MWh)	% of 2025 Savings	2035 Energy (MWh)	% of 2035 Savings
Lighting	1,432,059	17.7%	1,592,468	17.9%
Appliances	743,392	9.2%	827,444	9.3%
Electronics	801,016	9.9%	853,480	9.6%
Water Heating	658,230	8.1%	772,726	8.7%
HVAC Shell	1,108,704	13.7%	1,255,000	14.1%
HVAC Equipment	1,858,925	23.0%	2,238,593	25.1%
Miscellaneous	96,812	1.2%	100,342	1.1%
Cross-Cutting	1,391,454	17.2%	1,263,354	14.2%
Total	**8,090,592**	**100.0%**	**8,903,407**	**100.0%**
% of Annual Sales Forecast	*47.2%*		*52.3%*	

Table 6-3: Residential Sector Technical Potential Demand Savings

	2025 Demand Savings (MW)	% of 2025 Forecast Peak	2035 Demand Savings (MW)	% of 2035 Forecast Peak
Total System	1,469	29.1%	1,723	35.1%

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. 58% 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 7.8 million MWh during the 10 year period from 2016 to 2025, and the economic potential more than 8.3 million MWh during the 20 year period from 2016 to 2035. This represents 45.6% and 49.0% of residential sales across the respective 10-year and 20-year timeframes. HVAC Equipment, HVAC Shell, lighting, and cross-cutting behavioral measures are the greatest contributors to the economic potential. Table 6-5 shows the

demand savings potential in 2025 and 2035. The five and ten year summer peak demand savings potential is 1,121 MW and 1,183 MW, respectively, which is 22.2% and 24.1% of the peak forecast.

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

End Use	2025 Energy (MWh)	% of 2025 Savings	2035 Energy (MWh)	% of 2035 Savings
Lighting	1,312,006	16.8%	1,470,879	17.6%
Appliances	743,392	9.5%	827,444	9.9%
Electronics	774,999	9.9%	826,746	9.9%
Water Heating	580,643	7.4%	678,902	8.1%
HVAC Shell	1,570,799	20.1%	1,606,197	19.3%
HVAC Equipment	1,311,201	16.8%	1,477,589	17.7%
Miscellaneous	96,812	1.2%	100,342	1.2%
Cross-Cutting	1,432,625	18.3%	1,351,019	16.2%
Total	**7,822,476**	**100.0%**	**8,339,118**	**100.0%**
% of Annual Sales Forecast	*45.6%*		*49.0%*	

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

	2025 Demand Savings (MW)	% of 2025 Forecast Peak	2035 Demand Savings (MW)	% of 2035 Forecast Peak
Total System	1,121	22.2%	1,183	24.1%

6.2.1 Achievable Electric Potential Savings in the Residential Sector

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, which is based on a review EIA data of typical program administrator costs of several utility energy efficiency programs in and around Michigan.

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[34] assuming incentives equal to 50% of the measure cost.[35] The second scenario, Constrained UCT, assumes a spending cap equal to 2% of utility revenues, thereby limiting utilities from reaching the ultimate potential estimated in the Achievable UCT scenario.

6.2.1.1 Achievable UCT Scenario

[34] Some LED measures which failed the 2016 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.

[35] 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.

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 assume an incentive level approximately equal to 50% of the incremental measure cost and include an estimate 10-year market adoption rates based on incentive levels and equipment replacement cycles. Table 6-6 and Table 6-7 show the estimated savings for the Achievable UCT scenario over 10 and 20 year time horizons. The 10-year and 20-year Achievable UCT potential savings estimates are approximately 2.7 million MWh and 3.5 million MWh. This equates to 15.6% and 20.5% of sector sales in 2025 and 2035.

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

End Use	2025 Energy (MWh)	% of 2025 Savings	2035 Energy (MWh)	% of 2035 Savings
Lighting	644,774	24.2%	663,387	19.0%
Appliances	321,607	12.0%	472,440	13.5%
Electronics	422,809	15.8%	578,721	16.5%
Water Heating	256,199	9.6%	394,860	11.3%
HVAC Shell	415,378	15.6%	514,058	14.7%
HVAC Equipment	473,528	17.7%	727,914	20.8%
Miscellaneous	34,586	1.3%	50,171	1.4%
Cross-Cutting	100,948	3.8%	98,005	2.8%
Total	**2,669,830**	**100.0%**	**3,499,557**	**100.0%**
% of Annual Sales Forecast	*15.6%*		*20.5%*	

Table 6-7: Residential Achievable UCT Potential Demand Savings

	2025 Demand Savings (MW)	% of 2025 Forecast Peak	2035 Demand Savings (MW)	% of 2035 Forecast Peak
Total System	350	6.9%	452	9.2%

6.2.1.2 Achievable UCT vs. Constrained UCT

Although the Achievable UCT 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 DSM spending cap to reach all potential participants. In the constrained UCT scenario, the analysis assumes a spending cap roughly equal to 2% of DTE Energy revenue. The percent of the non-residential spending cap allocated to the residential sector is based on the percentage of total non-residential UCT savings that the residential sector represents. This presumes that the total 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 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 1.8 million MWh and 3.0 million MWh. This equates to 10.3% and 17.6% of sector sales in 2025 and 2035. 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

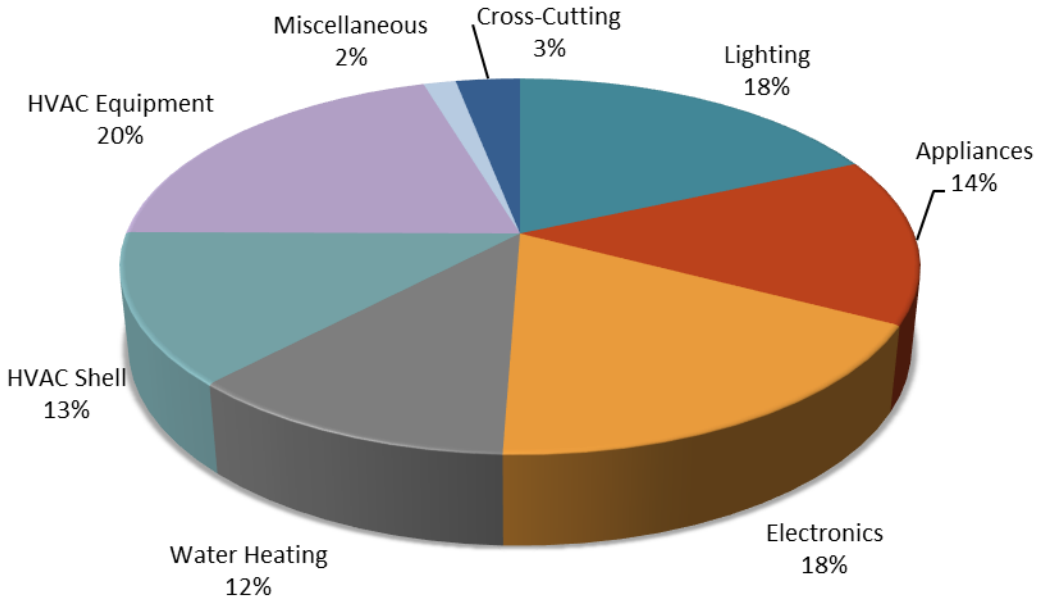
End Use	2025 Energy (MWh)	% of 2025 Savings	2035 Energy (MWh)	% of 2035 Savings
Lighting	428,293	24.1%	546,700	18.3%
Appliances	214,271	12.1%	430,351	14.4%
Electronics	282,365	15.9%	535,171	17.9%
Water Heating	170,258	9.6%	345,026	11.5%
HVAC Shell	275,487	15.5%	388,782	13.0%
HVAC Equipment	314,724	17.7%	605,626	20.3%
Miscellaneous	22,994	1.3%	46,428	1.6%
Cross-Cutting	66,317	3.7%	91,682	3.1%
Total	1,774,707	100.0%	2,989,765	100.0%
% of Annual Sales Forecast	*10.3%*		*17.6%*	

Table 6-9: Residential Constrained Achievable Potential Demand Savings

	2025 Demand Savings (MW)	% of 2025 Forecast Peak	2035 Demand Savings (MW)	% of 2035 Forecast Peak
Total System	233	4.6%	386	7.9%

Figure 6-2 shows the percentage of electric savings by each end use for the Constrained UCT scenario. The HVAC Equipment end use shows the largest potential for savings with 20% of total electric savings, followed by the electronics and lighting end uses each at 18%.

Figure 6-2: Residential Sector 2035 Constrained UCT Electric Potential Savings, by End Use



6.2.2 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 10-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 shows cumulative annual demand (MW) savings for all three achievable potential scenarios for each year across the 10-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 Savings in the Achievable UCT Potential Scenario, by End Use for DTE Energy

End Use	Lighting	Appliances	Electronics	Water Heating	HVAC Shell	HVAC Equipment	Misc.	Cross-Cutting	Total	% of Annual Forecast Sales
2016	115,440	22,672	28,093	17,969	40,456	30,879	2,061	71,876	329,447	2.0%
2017	233,724	47,903	63,068	38,092	81,320	64,828	4,468	75,475	608,878	3.7%
2018	352,813	75,546	104,289	60,024	122,519	102,607	7,180	78,893	903,872	5.4%
2019	472,163	105,551	151,526	83,604	163,996	144,150	10,186	82,084	1,213,260	7.2%
2020	591,725	137,899	193,306	108,721	205,693	189,431	13,480	85,086	1,525,342	9.0%
2021	413,686	172,642	238,078	135,382	247,553	238,523	17,077	89,602	1,552,543	9.1%
2022	484,836	209,827	280,505	163,575	289,516	291,488	20,988	92,608	1,833,344	10.8%
2023	556,123	249,463	325,365	193,219	331,519	348,339	25,215	95,441	2,124,685	12.4%
2024	627,439	284,345	373,054	224,157	373,495	409,039	29,752	98,119	2,419,401	14.1%
2025	644,774	321,607	422,809	256,199	415,378	473,528	34,586	100,948	2,669,830	15.6%
2026	661,669	373,744	496,551	280,311	428,390	517,610	37,544	99,781	2,895,601	16.9%
2027	679,079	402,347	529,258	303,284	441,308	558,626	40,221	99,039	3,053,161	17.8%
2028	696,190	420,725	546,646	325,098	454,148	596,596	42,573	98,463	3,180,439	18.5%
2029	713,266	434,246	555,702	340,286	462,295	631,533	44,596	98,043	3,279,966	19.1%
2030	730,751	444,630	561,547	353,786	470,429	663,446	46,293	97,665	3,368,546	19.7%
2031	718,876	453,490	565,161	365,462	479,002	683,871	47,679	97,595	3,411,136	20.0%
2032	700,549	459,513	568,583	375,326	487,632	700,677	48,757	97,637	3,438,673	20.2%
2033	675,816	464,631	571,850	383,451	496,343	713,616	49,529	97,786	3,453,023	20.3%
2034	668,979	468,925	575,216	389,946	505,151	722,688	50,000	97,873	3,478,777	20.4%
2035	663,387	472,440	578,721	394,860	514,058	727,914	50,171	98,005	3,499,557	20.5%

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

End Use	Lighting	Appliances	Electronics	Water Heating	HVAC Shell	HVAC Equipment	Misc.	Cross-Cutting	Total	% of Annual Forecast Sales
2016	74,526	14,637	18,136	11,601	26,118	19,935	1,331	46,402	212,686	1.3%
2017	150,027	30,742	40,461	24,444	52,200	41,597	2,867	48,175	390,512	2.4%
2018	226,851	48,574	67,053	38,593	78,779	65,977	4,616	50,893	581,336	3.5%
2019	305,345	68,308	98,120	54,108	106,065	93,317	6,593	53,985	785,842	4.7%
2020	386,275	90,204	126,787	71,127	134,312	123,999	8,823	57,593	999,120	5.9%
2021	273,112	114,365	158,839	89,704	163,467	158,173	11,325	62,312	1,031,296	6.1%
2022	321,900	139,862	189,007	109,063	192,276	194,471	14,006	63,501	1,224,086	7.2%
2023	370,141	166,685	220,150	129,140	220,722	232,924	16,867	64,586	1,421,215	8.3%
2024	416,525	189,453	250,607	149,228	247,990	272,342	19,817	63,817	1,609,780	9.4%
2025	428,293	214,271	282,365	170,258	275,487	314,724	22,994	66,317	1,774,707	10.3%
2026	445,091	257,088	344,772	189,975	285,742	349,334	25,536	77,014	1,974,551	11.5%
2027	466,392	288,511	387,978	212,996	297,752	387,084	28,557	88,762	2,158,033	12.6%
2028	489,250	313,820	426,121	237,074	310,605	424,646	31,673	94,595	2,327,785	13.6%
2029	512,013	335,899	460,996	257,961	322,359	460,443	34,681	97,212	2,481,565	14.5%
2030	535,147	357,319	492,808	278,698	334,818	494,467	37,566	100,075	2,630,898	15.4%
2031	538,046	375,439	512,426	295,833	346,346	523,682	39,859	93,891	2,725,521	16.0%
2032	536,462	394,283	526,878	310,731	357,302	549,636	41,842	91,306	2,808,441	16.5%
2033	530,935	413,335	537,872	324,328	368,217	573,145	43,673	91,758	2,883,262	16.9%
2034	536,302	422,576	533,562	333,655	377,375	588,294	44,921	82,066	2,918,752	17.1%
2035	546,700	430,351	535,171	345,026	388,782	605,626	46,428	91,682	2,989,765	17.6%

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

End Use	Lighting	Appliances	Electronics	Water Heating	HVAC Shell	HVAC Equipment	Misc.	Cross-Cutting	Total	% of Annual Forecast Sales
2016	11.8	4.3	3.3	1.5	12.0	-1.1	1.5	8.2	41.6	0.9%
2017	24.0	9.2	7.4	3.2	24.3	-2.3	3.3	8.6	77.6	1.6%
2018	36.2	14.7	12.2	5.0	36.7	-3.7	5.3	9.0	115.4	2.3%
2019	48.5	20.8	17.7	6.9	49.3	-5.3	7.5	9.4	154.8	3.1%
2020	60.7	27.3	23.0	9.0	62.0	-7.0	9.9	9.7	194.7	3.9%
2021	42.2	34.4	28.7	11.2	74.9	-8.9	12.6	10.2	205.3	4.1%
2022	49.4	42.1	33.7	13.5	87.9	-11.0	15.5	10.6	241.7	4.8%
2023	56.7	50.3	39.0	15.9	101.0	-13.2	18.6	10.9	279.2	5.5%
2024	64.0	58.3	44.6	18.5	114.1	-15.6	21.9	11.2	316.9	6.3%
2025	65.6	66.8	50.3	21.1	127.3	-18.1	25.5	11.5	350.0	6.9%
2026	67.4	76.1	58.1	23.1	130.9	-18.5	27.6	11.4	376.0	7.5%
2027	69.1	82.2	61.9	24.9	134.4	-18.7	29.6	11.3	394.8	7.8%
2028	70.9	86.6	64.2	26.7	137.8	-18.5	31.3	11.2	410.2	8.2%
2029	72.7	90.0	65.6	28.0	139.7	-18.1	32.8	11.2	421.9	8.4%
2030	74.5	92.9	66.4	29.1	141.5	-17.3	34.1	11.1	432.2	8.7%
2031	73.3	95.2	66.9	30.0	143.4	-17.1	35.1	11.1	437.9	8.8%
2032	71.4	96.9	67.3	30.9	145.2	-16.7	35.9	11.1	441.9	8.9%
2033	68.8	98.3	67.7	31.5	146.9	-16.1	36.5	11.2	444.7	9.0%
2034	68.1	99.4	68.1	32.1	148.6	-15.4	36.8	11.2	448.8	9.1%
2035	67.5	100.1	68.6	32.5	150.2	-14.5	36.9	11.2	452.5	9.2%

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

End Use	Lighting	Appliances	Electronics	Water Heating	HVAC Shell	HVAC Equipment	Misc.	Cross-Cutting	Total	% of Annual Forecast Sales
2016	8	3	2	1	8	-1	1	5	27	0.6%
2017	15	6	5	2	16	-1	2	5	50	1.0%
2018	23	9	8	3	24	-2	3	6	74	1.5%
2019	31	13	11	4	32	-3	5	6	100	2.0%
2020	40	18	15	6	41	-5	6	7	127	2.6%
2021	28	23	19	7	49	-6	8	7	136	2.7%
2022	33	28	23	9	58	-7	10	7	161	3.2%
2023	38	34	26	11	67	-9	12	7	187	3.7%
2024	42	39	30	12	76	-10	15	7	211	4.2%
2025	44	44	34	14	84	-12	17	8	233	4.6%
2026	45	52	40	16	87	-12	19	9	256	5.1%
2027	48	59	45	17	91	-13	21	10	278	5.5%
2028	50	65	50	19	94	-12	23	11	299	6.0%
2029	52	70	54	21	97	-12	26	11	319	6.4%
2030	55	75	58	23	100	-11	28	11	338	6.8%
2031	55	79	61	24	103	-11	29	11	351	7.1%
2032	55	83	63	25	106	-11	31	10	362	7.3%
2033	54	87	64	27	108	-11	32	10	371	7.5%
2034	55	89	64	27	110	-11	33	9	377	7.6%
2035	56	91	64	28	113	-10	34	10	386	7.9%

6.2.3 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 DTE Energy

Measure	Technical Potential (MWh)	Economic UCT (MWh)	Achievable UCT (MWh)	Constrained UCT (MWh)
Lighting				
Standard CFLs	0	0	0	0
Standard LEDs	115,618	115,618	56,151	44,461
Specialty CFLs	115,374	115,374	52,677	49,695
Specialty LEDs	733,173	733,173	308,967	249,575
Reflector CFLs	0	0	22,833	21,561
Reflector LEDs	484,164	484,164	210,411	170,453
Efficient Fluorescent Tube Lighting	81,661	0	0	0
LED night lights	22,550	22,550	12,349	10,956
Occupancy sensors	39,928	0	0	0
Appliances				
ENERGY STAR clothes washers	109,010	109,010	59,955	54,103
ENERGY STAR refrigerator	85,591	85,591	50,469	42,279
ENERGY STAR freezers	38,468	38,468	17,945	14,658
ENERGY STAR dishwashers	25,434	25,434	13,989	12,945
ENERGY STAR dehumidifiers	21,605	21,605	11,825	10,538
ENERGY STAR dryers	45,048	45,048	24,077	20,658
Secondary refrigerator/freezer recycling	472,990	472,990	278,067	260,149
Dehumidifier recycling	18,929	18,929	10,410	9,704
Room AC recycling	10,369	10,369	5,702	5,316
Electronics				
Controlled Power Strips	362,431	335,697	234,988	217,448
Efficient set-top boxes	142,935	142,935	100,055	91,231
ENERGY STAR desktops	77,679	77,679	54,376	49,582
Efficient laptops	27,264	27,264	19,085	17,402
Efficient televisions	222,997	222,997	156,098	146,490
LCD Monitors	20,173	20,173	14,121	13,018
Water Heating				
Heat pump water heaters	495,054	495,054	243,977	212,079
Solar water heater	60,976	0	0	0

Measure	Technical Potential (MWh)	Economic UCT (MWh)	Achievable UCT (MWh)	Constrained UCT (MWh)
Low flow showerhead/faucet aerator	106,940	108,080	87,342	80,825
Gravity film heat exchangers	34,856	0	0	0
Pipe wrap	45,573	46,114	41,154	31,404
Flow restriction valves (ShowerStart/TubSpout)	29,326	29,654	22,387	20,718
HVAC Envelope				
Air Sealing	280,459	285,249	133,152	115,224
Duct insulation/sealing	129,730	130,260	29,779	21,407
Improved Insulation	351,393	242,735	119,480	91,309
Efficient windows	493,418	947,954	231,648	160,842
Window film	0	0	0	0
Cool Roofs	0	0	0	0
HVAC Equipment				
Central AC tune-up	0	0	0	0
Efficient air-source heat pump	68,247	60,825	29,132	24,717
Dual fuel heat pumps	0	5,794	2,796	2,398
Geothermal heat pumps	65,321	0	0	0
Ductless mini-split systems	890,283	890,283	443,973	360,777
Efficient central AC systems	526,647	1,509	723	614
Programmable thermostats	103,922	103,922	51,961	48,087
Efficient room air conditioners	11,573	11,573	5,548	4,713
Efficient chillers	2,299	2,299	982	800
Chiller controls	0	0	0	0
Efficient furnace fans	511,293	348,283	190,143	161,035
Other				
Efficient pool pump motors	100,342	100,342	50,171	46,428
Cross-Cutting/Behavioral				
Home Energy Reports	1,263,354	1,351,019	98,005	91,682
Mobile applications	59,008	53,101	2,655	2,484
Total				
Total	**8,903,407**	**8,339,118**	**3,499,557**	**2,989,765**
Percent of Annual Sector Sales Forecast	52.3%	49.0%	20.5%	17.6%

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 compares 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	$1,063,036,271	$574,125,861	1.85	$488,910,410
Constrained UCT	$700,197,865	$379,546,437	1.84	$320,651,427

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	$1,583,266,651	$802,561,223	1.97	$780,705,428
Constrained UCT	$1,182,504,921	$588,778,596	2.01	$593,726,325

Year by year budgets for all three scenarios, broken out by incentive and administrative costs are depicted in Table 6-17 through

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
2016	$54.4	$19.1	$73.6
2017	$56.4	$20.9	$77.3
2018	$57.1	$22.5	$79.6
2019	$57.1	$24.1	$81.2
2020	$56.0	$25.8	$81.8
2021	$57.9	$24.5	$82.4
2022	$60.1	$26.3	$86.4
2023	$62.3	$28.1	$90.4
2024	$65.8	$31.1	$96.9
2025	$67.0	$31.8	$98.8
2026	$54.6	$31.9	$86.5
2027	$48.6	$28.0	$76.6
2028	$46.3	$27.0	$73.3
2029	$45.6	$27.3	$72.9
2030	$44.9	$27.4	$72.3
2031	$49.4	$29.5	$78.8
2032	$51.2	$31.8	$83.0
2033	$51.7	$33.0	$84.7
2034	$57.5	$39.4	$96.9
2035	$52.8	$36.0	$88.8

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

Constrained UCT	Incentives	Admin.	Total Costs
2016	$35.1	$12.4	$47.5
2017	$36.0	$13.3	$49.4
2018	$36.9	$14.5	$51.4
2019	$37.5	$15.8	$53.4
2020	$37.9	$17.4	$55.3
2021	$40.3	$17.0	$57.3
2022	$41.2	$18.0	$59.2
2023	$42.2	$19.0	$61.1
2024	$42.8	$20.2	$63.0
2025	$44.0	$20.9	$64.9
2026	$42.2	$24.6	$66.8
2027	$43.6	$25.1	$68.6
2028	$44.5	$26.0	$70.5
2029	$45.2	$27.0	$72.3
2030	$46.0	$28.1	$74.1
2031	$47.5	$28.4	$75.8
2032	$47.9	$29.8	$77.6
2033	$48.5	$31.0	$79.4
2034	$48.2	$33.1	$81.3
2035	$49.4	$33.7	$83.1

Table 6-19: Annual Achievable Scenario Budgets as a % of Annual Sector Revenue

	Achievable UCT	Constrained UCT
2016	3.1%	2.0%
2017	3.1%	2.0%
2018	3.1%	2.0%
2019	3.0%	2.0%
2020	3.0%	2.0%
2021	2.9%	2.0%
2022	2.9%	2.0%
2023	3.0%	2.0%
2024	3.1%	2.0%
2025	3.0%	2.0%
2026	2.6%	2.0%
2027	2.2%	2.0%
2028	2.1%	2.0%
2029	2.0%	2.0%
2030	2.0%	2.0%
2031	2.1%	2.0%
2032	2.1%	2.0%

2033	2.1%	2.0%
2034	2.4%	2.0%
2035	2.1%	2.0%

7 COMMERCIAL ELECTRIC ENERGY EFFICIENCY POTENTIAL ESTIMATES

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

7.1 Commercial Electric Energy Efficiency Potential

According to 2014 historical sales data[36], the commercial sector accounts for approximately 40% of retail electric sales in the DTE Energy service area, but only 9% of the total retail customers. The average commercial electric customer in the DTE Energy service area consumes approximately 85,700 kWh annually. Comparatively, the average residential consumer in the DTE Energy service area uses approximately 7,700 kWh per year. For this study, commercial electric sales are estimated to remain relatively stable throughout the 20 year study period of 2016 – 2035.[37]

7.1.1 Electric Energy Efficiency Measures Examined

For the commercial sector, there were 247 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

[36] DTE provided historical sales from 2014
[37] GDS forecast based on kWh sales forecasts provided by DTE Energy)

End Use Type	End Use Description	Measures Included
		• Retrocommissioning & Commissioning
Lighting	Lighting Improvements	• Efficient Lighting Equipment • Fixture Retrofits • Ballast Replacement • 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

7.1.2 Overview of Commercial Electric Energy Efficiency Potential

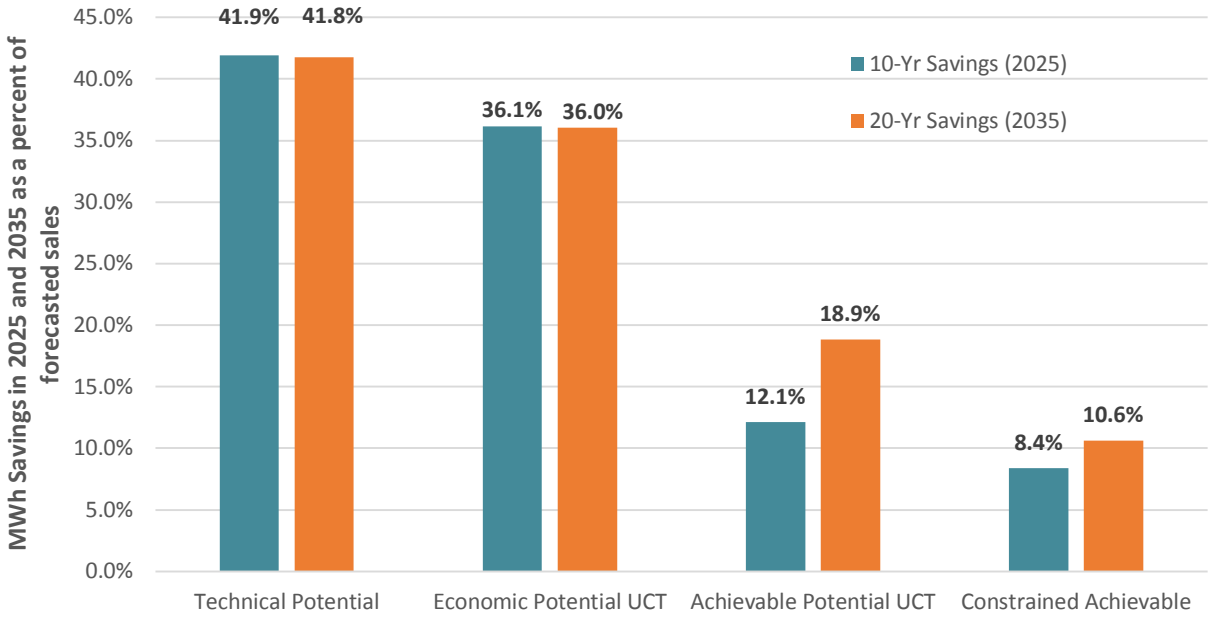
This section presents estimates for electric technical, economic, and achievable savings potential for the commercial sector. Each of the tables in the technical, economic and achievable sections presents the respective potential for efficiency savings expressed as cumulative annual savings (MWh) and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

Figure 7-1 illustrates the estimated energy efficiency savings potential in the DTE 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 2025 and 2035 commercial sector electricity sales forecasts. The technical savings potential for the commercial sector is 41.9% in 2025 and 41.8% in 2035. The 10-year and 20-year economic potential is 36.1% and 36.0% (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: 12.1% and 18.9% for the Achievable UCT scenario; and 8.4% and 10.6% 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 approximately equal to 2% of future annual commercial revenue.

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 9.6 million MWh annually in the commercial sector by 2025, and approximately 9.6 million MWh annually by 2035 across DTE Energy, representing 41.9% of the commercial sales forecast in 2025, and 41.8% of the commercial sales forecast in 2035. Lighting represents the majority of the energy efficiency savings potential at 40% of 20-yr savings, followed by Refrigeration and Ventilation at over 10% each. Table 7-3 shows the demand savings potential in 2025 and 2035. The ten and twenty-year summer peak demand savings technical potential is 1,791 MW and 1,791 MW, respectively, which is 32.9% and 33.3% of the peak forecasts for 2025 and 2035 respectively.

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

End Use	2025 Energy Savings (MWh)	% of 2025 Total	2035 Energy Savings (MWh)	% of 2035 Total
Lighting	3,813,640	40%	3,815,179	40%
Cooling	810,002	8%	810,358	8%
Ventilation	1,246,389	13%	1,246,788	13%
Water Heating	174,189	2%	174,263	2%
Refrigeration	1,725,050	18%	1,725,768	18%
Space Heating	356,781	4%	356,911	4%
Office Equipment	731,421	8%	731,731	8%
Miscellaneous	696,495	7%	696,696	7%
Total	**9,553,966**	**100%**	**9,557,694**	**100%**
% of Annual Sales Forecast	***41.9%***		***41.8%***	

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

End Use	2025 Demand Savings (MW)	% of 2025 Forecast Peak	2035 Demand Savings (MW)	% of 2035 Forecast Peak
Total System	1,791	32.9%	1,791	33.3%

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. Seventy-eight 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 8.2 million MWh annually by 2025 and 2035. This represents 36.1% and 36.0% of commercial sales in 2025 and 2035, respectively. Lighting, refrigeration, 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	2025 Energy Savings (MWh)	% of 2025 Total	2035 Energy Savings (MWh)	% of 2035 Total
Lighting	3,492,288	42%	3,493,743	42%
Cooling	505,268	6%	505,520	6%
Ventilation	927,855	11%	928,250	11%
Water Heating	173,061	2%	173,134	2%
Refrigeration	1,612,719	20%	1,613,389	20%
Space Heating	221,496	3%	221,578	3%
Office Equipment	651,234	8%	651,510	8%
Miscellaneous	655,064	8%	655,248	8%
Total	**8,238,986**	**100%**	**8,242,372**	**100%**
% of Annual Sales Forecast	***36.1%***		***36.0%***	

Table 7-5 shows the peak demand savings economic potential in 2025 and 2035. The ten and twenty-year summer peak demand savings economic potential is 1,565 MW and 1,565 MW, respectively, which is 28.8% and 29.4% of the peak forecasts in 2025 and 2035 respectively.

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

End Use	2025 Demand Savings (MW)	% of 2025 Forecast Peak	2035 Demand Savings (MW)	% of 2035 Forecast Peak
Total System	1,565	28.8%	1,565	29.1%

7.2.1 Achievable Potential Savings in the Commercial Sector

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 annual utility revenues, thereby limiting utilities from reaching the ultimate potential estimated in the Achievable UCT scenario.

7.2.1.1 Achievable UCT

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 2025 and 2035.

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

End Use	2025 Energy Savings (MWh)	% of 2025 Total	2035 Energy Savings (MWh)	% of 2035 Total
Lighting	683,288	25%	1,316,912	31%
Cooling	205,355	7%	295,175	7%
Ventilation	249,044	9%	447,508	10%

End Use	2025 Energy Savings (MWh)	% of 2025 Total	2035 Energy Savings (MWh)	% of 2035 Total
Water Heating	73,844	3%	104,706	2%
Refrigeration	842,675	31%	1,139,193	26%
Space Heating	87,956	3%	145,937	3%
Office Equipment	316,868	11%	434,756	10%
Miscellaneous	299,565	11%	429,701	10%
Total	**2,758,595**	**100%**	**4,313,889**	**100%**
% of Annual Sales Forecast	***12.1%***		***18.9%***	

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

End Use	2025 Demand Savings (MW)	% of 2025 Forecast Peak	2035 Demand Savings (MW)	% of 2035 Forecast Peak
Total System	482	8.9%	823	15.3%

7.2.1.2 Constrained UCT

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 approximately equal to 2% of annual DTE Energy commercial sector revenues. The percent of the non-residential spending cap allocated to the commercial sector is based on the percentage of total non-residential UCT savings that the commercial 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 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 1.9 million MWh and 2.4 million MWh respectively. This equates to 8.4% and 10.6% of sector sales in 2025 and 2035. 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	2025 Energy Savings (MWh)	% of 2025 Total	2035 Energy Savings (MWh)	% of 2035 Total
Lighting	479,905	25%	769,537	32%
Cooling	143,037	7%	170,423	7%
Ventilation	175,693	9%	262,864	11%
Water Heating	51,987	3%	49,837	2%
Refrigeration	576,155	30%	613,426	25%
Space Heating	61,567	3%	84,640	3%
Office Equipment	212,443	11%	214,176	9%

End Use	2025 Energy Savings (MWh)	% of 2025 Total	2035 Energy Savings (MWh)	% of 2035 Total
Miscellaneous	206,934	11%	260,166	11%
Total	**1,907,722**	**100%**	**2,425,069**	**100%**
% of Annual Sales Forecast	***8.4%***		***10.6%***	

Table 7-9: Commercial Constrained Achievable Electric Demand Savings

End Use	2025 Demand Savings (MW)	% of 2025 Forecast Peak	2035 Demand Savings (MW)	% of 2035 Forecast Peak
Total System	344	6.3%	491	9.1%

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. The lighting end use shows the largest potential for energy efficiency savings in this scenario, accounting for 32% of total savings with Refrigeration end uses accounting for 25%.

Figure 7-2: Commercial Sector 2035 Constrained UCT Potential Savings by End Use

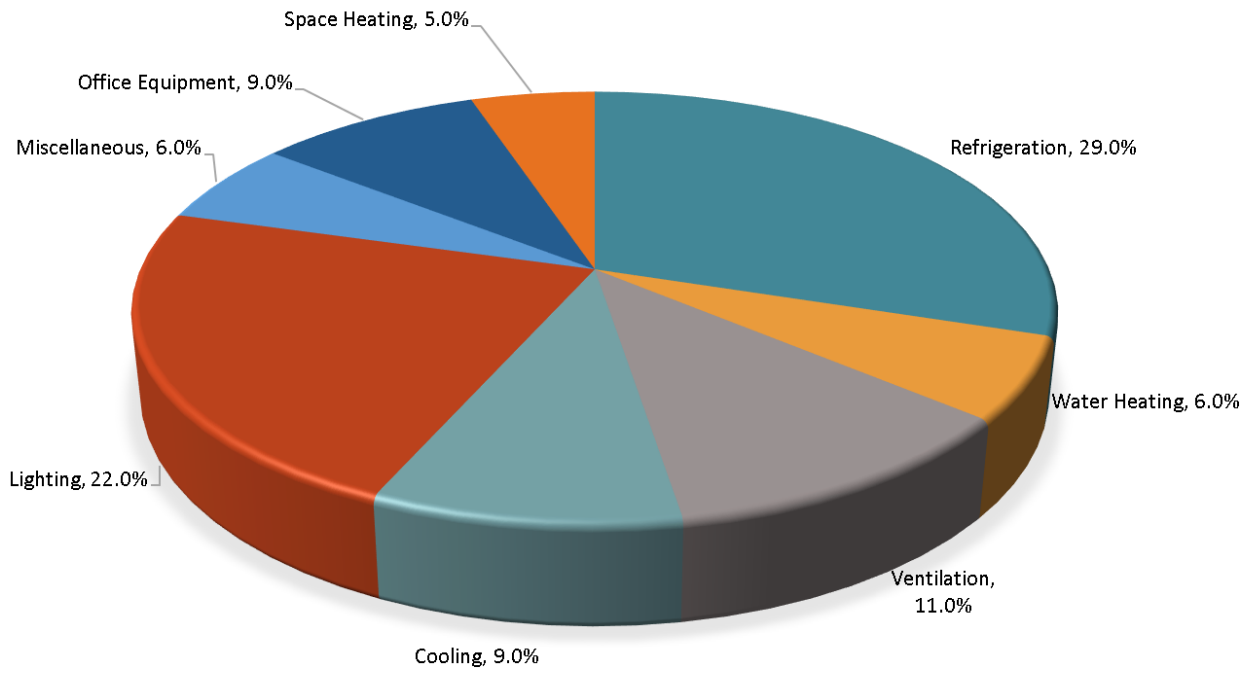
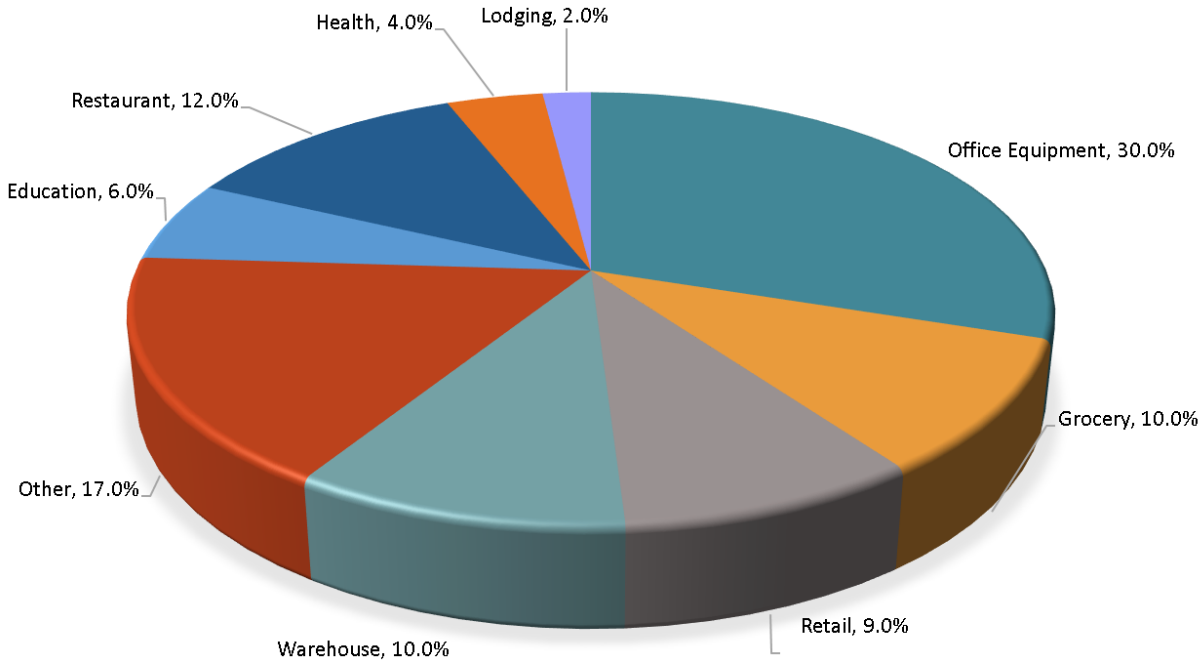


Figure 7-3 shows the breakdown of estimated savings in 2035 by building type for the Constrained UCT achievable potential scenario. The vast majority of savings come from existing/turnover measures, meaning energy efficient equipment is installed to replace existing equipment that has failed, with less

than 1% of savings potential coming from new construction. Approximately 30% of the potential savings are found in Offices, followed by 17% in Other building types and 12% in Restaurants.

Figure 7-3: Commercial Constrained UCT Savings in 2035 by Building Type



7.2.2 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 in the Unconstrained Achievable UCT Potential Scenario by End Use (MWh)

End Use	Lighting	Office Equipment	Refrigeration	Space Cooling Chillers	Space Cooling Unitary and Split AC	Space Heating	Compressed Air	Water Heating	Ventilation	Cooking	Pools	Other	Total	% of Annual Sales Forecast
2016	68,329	31,687	84,267	14,399	6,137	8,796	13,782	7,384	24,904	8,397	1,914	5,863	275,859	1.2%
2017	136,658	63,374	168,535	28,798	12,273	17,591	27,564	14,769	49,809	16,795	3,827	11,727	551,719	2.4%
2018	204,986	95,060	252,802	43,197	18,410	26,387	41,347	22,153	74,713	25,192	5,741	17,590	827,578	3.6%
2019	273,315	126,747	337,070	57,596	24,546	35,182	55,129	29,538	99,618	33,590	7,654	23,453	1,103,438	4.8%
2020	341,644	158,434	421,337	71,994	30,683	43,978	68,911	36,922	124,522	41,987	9,568	29,316	1,379,297	6.0%
2021	409,973	190,121	505,605	86,393	36,820	52,773	82,693	44,306	149,427	50,384	11,482	35,180	1,655,157	7.2%
2022	478,302	221,808	589,872	100,792	42,956	61,569	96,476	51,691	174,331	58,782	13,395	41,043	1,931,016	8.4%
2023	546,630	253,495	674,140	115,191	49,093	70,364	110,258	59,075	199,236	67,179	15,309	46,906	2,206,876	9.6%
2024	614,959	285,181	758,407	129,590	55,229	79,160	124,040	66,460	224,140	75,576	17,223	52,769	2,482,735	10.9%
2025	683,288	316,868	842,675	143,989	61,366	87,956	137,822	73,844	249,044	83,974	19,136	58,633	2,758,595	12.1%
2026	746,651	328,657	872,327	148,862	65,475	93,754	138,489	74,957	268,891	92,371	19,196	64,496	2,914,124	12.7%
2027	810,013	340,446	901,978	153,735	69,584	99,552	139,155	76,070	288,737	100,769	19,256	70,359	3,069,654	13.4%
2028	873,375	352,235	931,630	158,608	73,693	105,350	139,822	77,182	308,583	109,166	19,315	76,222	3,225,183	14.1%
2029	936,738	364,023	961,282	163,481	77,802	111,148	140,488	78,295	328,430	117,563	19,375	82,086	3,380,713	14.8%
2030	1,000,100	375,812	990,934	168,354	81,911	116,946	141,155	79,408	348,276	125,961	19,435	87,949	3,536,242	15.5%
2031	1,063,463	387,601	1,020,586	173,227	86,021	122,745	141,821	80,521	368,122	134,358	19,495	93,812	3,691,771	16.1%
2032	1,126,825	399,390	1,050,238	178,100	90,130	128,543	142,488	81,634	387,969	142,756	19,555	99,676	3,847,301	16.8%
2033	1,190,188	411,179	1,079,890	182,973	94,239	134,341	143,155	82,747	407,815	151,153	19,614	105,539	4,002,830	17.5%
2034	1,253,550	422,967	1,109,541	187,846	98,348	140,139	143,821	83,859	427,661	159,550	19,674	111,402	4,158,360	18.2%
2035	1,316,912	434,756	1,139,193	192,719	102,457	145,937	144,488	84,972	447,508	167,948	19,734	117,265	4,313,889	18.9%

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

End Use	Lighting	Office Equipment	Refrigeration	Space Cooling Chillers	Space Cooling Unitary and Split AC	Space Heating	Compressed Air	Water Heating	Ventilation	Cooking	Pools	Other	Total	% of Annual Sales Forecast
2016	49,061	22,752	60,505	10,339	4,406	6,315	9,896	5,302	17,882	6,029	1,374	4,210	198,070	0.9%
2017	99,118	45,965	122,238	20,887	8,902	12,759	20,073	10,712	36,126	12,181	2,776	8,505	400,242	1.7%
2018	150,011	69,564	184,998	31,611	13,472	19,309	30,471	16,211	54,674	18,435	4,201	12,872	605,830	2.6%
2019	201,614	93,493	248,633	42,484	18,106	25,951	41,050	21,788	73,481	24,777	5,646	17,300	814,323	3.6%
2020	250,134	115,853	308,202	52,711	22,465	32,199	49,852	27,033	91,170	30,741	7,005	21,464	1,008,830	4.4%
2021	298,698	137,889	367,320	62,948	26,827	38,451	59,669	32,280	108,876	36,711	8,366	25,626	1,203,662	5.3%
2022	347,447	159,692	426,317	73,221	31,203	44,725	69,591	37,542	126,649	42,704	9,732	29,793	1,398,617	6.1%
2023	395,274	180,409	483,370	83,300	35,478	50,861	78,796	42,707	144,124	48,596	11,074	33,868	1,587,856	6.9%
2024	438,065	196,445	530,451	91,941	39,229	56,271	84,724	47,364	159,991	53,946	12,293	37,495	1,748,216	7.6%
2025	479,905	212,443	576,155	100,148	42,889	61,567	93,076	51,987	175,693	59,241	13,500	41,118	1,907,722	8.3%
2026	528,151	223,948	601,693	103,942	46,011	65,984	100,459	53,085	190,791	65,580	13,616	45,625	2,038,884	8.9%
2027	576,443	235,930	628,477	107,725	49,202	70,483	101,064	54,104	205,873	71,938	13,706	50,136	2,165,082	9.5%
2028	612,998	241,212	644,729	109,971	51,610	73,859	94,428	54,050	218,009	76,485	13,524	53,698	2,244,572	9.8%
2029	649,835	248,661	662,096	112,379	54,066	77,281	94,843	54,007	230,183	80,960	13,328	57,401	2,335,039	10.2%
2030	689,855	253,603	672,671	115,120	56,655	80,927	96,735	54,466	243,145	85,806	13,273	61,333	2,423,591	10.6%
2031	710,819	241,659	656,541	114,965	57,382	81,961	87,108	53,488	248,170	88,063	12,922	63,518	2,416,596	10.6%
2032	726,950	228,989	640,212	113,993	57,710	82,429	83,653	52,203	251,500	90,173	12,505	65,404	2,405,721	10.5%
2033	744,738	221,742	625,781	113,081	58,222	83,118	82,614	51,171	255,111	92,467	12,133	67,736	2,407,912	10.5%
2034	756,875	215,403	611,066	111,951	58,570	83,636	80,488	50,458	258,383	94,622	11,871	69,985	2,403,309	10.5%
2035	769,537	214,176	613,426	111,180	59,243	84,640	79,333	49,837	262,864	96,970	11,631	72,233	2,425,069	10.6%

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

End Use	Lighting	Office Equipment	Refrigeration	Space Cooling Chillers	Space Cooling Unitary and Split AC	Space Heating	Compressed Air	Water Heating	Ventilation	Cooking	Pools	Other	Total	% of Annual Sales Forecast
2016	11	2	7	1	1	1	5	1	13	3	3	1	48	0.9%
2017	23	3	14	2	2	1	9	2	27	5	6	2	97	1.8%
2018	34	5	21	3	3	2	14	3	40	8	9	2	145	2.7%
2019	45	7	28	5	5	3	19	4	53	10	12	3	193	3.6%
2020	57	9	35	6	6	3	23	5	66	13	15	4	242	4.5%
2021	68	10	42	7	7	4	28	5	80	16	18	5	290	5.4%
2022	79	12	49	8	8	4	33	6	93	18	21	6	338	6.3%
2023	91	14	56	9	9	5	37	7	106	21	24	7	386	7.1%
2024	102	16	63	10	10	6	42	8	119	23	27	7	434	8.0%
2025	114	17	70	11	11	6	47	9	133	26	30	8	482	8.9%
2026	124	18	73	12	12	7	47	9	145	29	33	8	517	9.5%
2027	134	19	77	13	13	7	47	9	156	31	36	8	552	10.1%
2028	145	20	80	14	14	8	47	10	168	34	39	8	587	10.8%
2029	155	21	84	14	15	8	47	10	180	36	42	8	621	11.4%
2030	166	22	87	15	16	9	47	10	192	39	45	8	656	12.1%
2031	176	22	91	16	17	9	47	10	204	42	48	8	690	12.7%
2032	186	23	94	16	17	9	47	10	216	44	51	8	723	13.4%
2033	197	24	98	17	17	9	47	10	228	47	54	8	756	14.0%
2034	207	25	101	17	18	10	48	11	239	49	57	8	790	14.7%
2035	218	26	104	17	18	10	48	11	251	52	60	8	823	15.3%

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

End Use	Lighting	Office Equipment	Refrigeration	Space Cooling Chillers	Space Cooling Unitary and Split AC	Space Heating	Compressed Air	Water Heating	Ventilation	Cooking	Pools	Other	Total	% of Annual Sales Forecast
2016	8	1	5	1	1	1	3	1	10	2	1	2	35	0.7%
2017	16	3	10	2	2	1	7	1	19	4	1	4	72	1.4%
2018	25	4	15	3	3	2	10	2	29	6	2	7	108	2.0%
2019	33	5	21	5	5	3	14	3	39	8	2	9	146	2.7%
2020	42	6	26	6	6	3	17	3	49	10	3	11	181	3.4%
2021	50	8	30	7	7	4	20	4	58	11	4	13	216	4.0%
2022	58	9	35	8	8	4	24	5	68	13	4	15	251	4.6%
2023	66	10	40	9	9	5	27	5	77	15	5	17	285	5.3%
2024	73	11	44	10	10	6	30	6	85	17	5	19	315	5.8%
2025	80	12	48	11	11	6	32	6	94	18	6	21	344	6.3%
2026	87	13	50	12	12	7	33	7	103	20	6	23	373	6.9%
2027	95	13	54	13	13	7	34	7	112	22	6	26	401	7.4%
2028	101	14	56	14	14	8	33	7	119	24	6	27	421	7.7%
2029	108	14	58	14	15	8	33	7	126	25	6	29	443	8.1%
2030	114	15	59	15	16	9	33	7	134	27	6	31	465	8.6%
2031	118	14	58	16	17	9	31	7	137	27	5	32	471	8.7%
2032	120	13	57	16	17	9	30	7	140	28	5	32	474	8.8%
2033	123	13	56	17	17	9	29	7	142	29	5	33	480	8.9%
2034	125	13	55	17	18	10	28	6	145	29	5	34	484	9.0%
2035	126	13	56	17	18	10	27	6	148	30	5	35	491	9.1%

7.2.3 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 2035

Measure	Technical Potential (MWh)	Economic UCT (MWh)	Achievable UCT (MWh)	Constrained UCT (MWh)
Compressed Air				
Compressed Air Audits & Leak Repair	71503	71503	54970	26922
Compressed Air Replacement with Air Blowers	53,512	53,512	41,139	24,078
Air-Entraining Air Nozzles	23522	23522	16201	9482
Variable Displacement Air Compressor	17,021	17,021	7,822	4,476
Efficient Air Compressors	29877	29877	7430	4364
Compressed Air Pressure Flow Controller replacing no flow controller	10,619	10,619	7,314	4,311
High Efficiency Air Dryers	7792	7792	3583	2104
Automatic Drains	5,041	5,041	2,319	1,140
Compressed Air Storage Tank	2801	2801	2153	1519
Receiver Capacity Addition	2,779	2,779	1,279	754
Air Compressor Outdoor Air Intake	362	362	164	116
Low Pressure Drop-Filters	250	250	115	68
Cycling Dryers	697	0	0	0
Cooking				
HE Steamer	100,695	100,695	77,949	44,994
HE Holding Cabinet	95,091	95,091	70,847	40,894
HE Combination Oven	14,212	14,212	11,002	6,350

Measure	Technical Potential (MWh)	Economic UCT (MWh)	Achievable UCT (MWh)	Constrained UCT (MWh)
Induction Cooktops	5,947	5,947	4,603	2,684
HE Convection Ovens	4,582	4,582	3,547	2,047
HE Griddle	6,105	0	0	0
HE Fryer	286	0	0	0
Lighting - Exterior				
Exterior HID replacement with CFLs	205,678	205,678	148,658	85,808
Garage HID replacement with LEDs	117,620	117,620	90,779	52,399
LED Auto Traffic Signals	94,475	94,475	72,915	37,678
LED Pedestrian Signals	94,475	94,475	72,915	39,058
Exterior Linear Fluorescent	38,724	38,724	29,887	17,251
Garage BiLevel Controls	40,307	40,307	2,023	1,186
Lighting Power Density - Exterior	45	45	35	20
Lighting Power Density - Parking Garage	45	45	35	20
Sports Field Lighting HiLo Control	18,758	0	0	0
Exterior BiLevel Controls	32,903	0	0	0
Exterior HID replacement with LEDs	117,620	0	0	0
LED Fuel Pump Canopy Fixture	0	0	0	0
Lighting - Interior				
LED Tube Lighting	249,491	249,491	146,169	91,156
Interior Non Highbay/Lowbay LED Fixtures	232,226	232,226	136,054	84,848

Measure	Technical Potential (MWh)	Economic UCT (MWh)	Achievable UCT (MWh)	Constrained UCT (MWh)
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing T12)	178,660	178,660	104,671	61,477
T5 HP Retrofits	163,893	163,893	95,050	55,826
Lamp & Ballast Retrofit (HPT8 Replacing T12)	136,638	136,638	80,052	47,018
LED Specialty (replacing CFL)	212,652	212,652	73,918	41,589
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing Standard T8)	119,101	119,101	69,778	40,983
Lamp & Ballast Retrofit (HPT8 Replacing Standard T8)	70,174	70,174	41,113	24,147
Central Lighting Control	472,864	472,864	23,730	13,408
LED Grow Light	43,716	43,716	20,568	11,995
LED low bay lighting	31,094	31,094	18,017	11,236
Occupancy Sensors for LED Refrigerator Lighting	23,520	23,520	16,377	9,782
Switching Controls for Multilevel Lighting (Non-HID)	260,967	260,967	13,096	7,400
Daylight Sensor Controls	255,557	255,557	12,825	7,247
Interior induction Lighting	20,412	20,412	11,827	7,064
LED Lighting in Refrigeration	14,637	14,637	10,270	6,134
Illuminated Signs to LED	8,594	8,594	6,633	3,821
Occupancy Sensor	120,328	120,328	6,038	3,559
Stairwell Bi-Level Control	59,456	59,456	2,984	1,679
LED Specialty (replacing Incandescent)	28,965	28,965	1,425	802

Measure	Technical Potential (MWh)	Economic UCT (MWh)	Achievable UCT (MWh)	Constrained UCT (MWh)
LED Screw In (replacing Incandescent)	26,334	26,334	1,295	729
CFL Screw in Specialty	24,349	24,349	1,198	584
CFL Reflector Flood	23,988	23,988	1,180	575
CFL Screw-in	23,040	23,040	1,133	552
LED Downlight	22,239	22,239	1,094	643
CFL Fixture	21,650	21,650	1,065	615
LED High bay lighting	18,787	18,787	943	563
Occupancy Sensor & Daylight Sensor	18,277	18,277	917	541
Lighting Power Density - Interior	320	320	232	136
Daylight Sensor Controls - New Construction	260	260	13	7
High Intensity Fluorescent Fixture (replacing HID) - New Construction	4	4	0	0
High Intensity Fluorescent Fixture (replacing HID)	9,775	9,775	0	0
LED Troffer	118,977	0	0	0
HID Fixture Upgrade - Pulse Start Metal Halide	3,851	3,851	0	0
LED Screw In (replacing CFL)	17,700	0	0	0
LED Exit Sign	6,555	6,555	0	0
42W 8 lamp Hi Bay CFL	497	0	0	0
Light Tube	14,981	0	0	0
Long Day Lighting Dairy	0	0	0	0
Office Equipment				

Measure	Technical Potential (MWh)	Economic UCT (MWh)	Achievable UCT (MWh)	Constrained UCT (MWh)
Energy Star office equipment including computers, monitors, copiers, multi-function machines.	372,886	372,886	229,562	112,897
PC Network Energy Management Controls replacing no central control	257,370	257,370	189,008	92,012
High Efficiency Hand Dryer	4,632	4,632	3,561	2,099
Vendor Miser for Non-Refrig Equipment	3,458	3,458	2,640	1,298
VFD for Process Fans -CRAC units	2,883	2,883	2,217	1,297
Computer Room Air Side Economizer	2,357	2,357	1,812	1,068
Computer Room Air Conditioner Economizer	2,352	2,352	1,808	1,062
Electrically Commutated Plug Fans in data centers	2,256	2,256	1,735	1,019
High Efficiency CRAC unit	2,022	2,022	1,554	910
Energy Star Compliant Refrigerator	1,294	1,294	859	513
Smart Strip plug outlet	79,298	0	0	0
Energy Star UPS	432	0	0	0
Computer Room Hot Aisle Cold Aisle Configuration	491	0	0	0
Other				
NEMA Premium Transformer, three-phase	42,038	42,038	21,320	13,803
High Efficiency Transformer, three-phase	42,038	42,038	21,320	13,803

Measure	Technical Potential (MWh)	Economic UCT (MWh)	Achievable UCT (MWh)	Constrained UCT (MWh)
High Efficiency Transformer, single-phase	41,868	41,868	21,234	13,747
NEMA Premium Transformer, single-phase	41,868	41,868	21,234	13,747
Engine Block Heater Timer	23,903	23,903	18,376	9,037
Parking Garage Exhaust Fan CO Control	17,927	17,927	13,782	8,095
Optimized Snow and Ice Melt Controls (electric)	34,360	0	0	0
Pools				
Heat Pump Pool Heater	24,114	24,114	18,539	10,926
High efficiency spas/hot tubs	1,737	1,737	1,195	705
Refrigeration				
Strip Curtains	337,767	337,767	263,603	128,325
ECM Case Motors	338,426	338,426	254,510	149,483
Door Gaskets - Cooler and Freezer	314,998	314,998	206,231	100,415
Vending Miser for Refrigerated Vending Machines	183,510	183,510	139,342	74,458
Anti Sweat Heater Controls	158,719	158,719	115,705	67,721
Zero-Energy Doors	46,682	46,682	34,031	20,057
Walk-in Cooler Evaporator Motor Reduction	34,462	34,462	26,895	15,797
ENERGY STAR Commercial Glass Door Freezers	27,237	27,237	21,121	12,192
ENERGY STAR Commercial Solid Door Freezers	24,320	24,320	18,980	10,955
Floating Head Pressure Control	18,742	18,742	14,095	8,250

Measure	Technical Potential (MWh)	Economic UCT (MWh)	Achievable UCT (MWh)	Constrained UCT (MWh)
ENERGY STAR Commercial Glass Door Refrigerators	17,451	17,451	13,533	7,811
Refrigeration Suction Line Insulation	12,735	12,735	9,938	5,817
Refrigeration Savings due to Lighting Savings	7,519	7,519	5,868	3,387
Efficient Refrigeration Condenser	7,099	7,099	5,485	3,222
Reach-in Refrigerated display case door retrofit	74,704	74,704	3,473	1,962
Automatic High Speed Doors	3,511	3,511	2,740	1,581
Automatic Door Closers for Refrigerated Walk-in Coolers/Freezers	3,509	3,509	2,738	1,467
Efficient low-temp compressor	1,318	1,318	905	525
Night Covers	35,260	0	0	0
Discus and Scroll Compressors	680	680	0	0
Evaporator Fan Motor Controls	22,116	0	0	0
ENERGY STAR Commercial Solid Door Refrigerators	18,652	0	0	0
Energy Star Ice Machines	34,368	0	0	0
Refrigerant charging correction	1,983	0	0	0
Space Cooling - Chillers				
Chilled Hot Water Reset	95,968	95,968	71,419	38,842
EMS Pump Scheduling Controls	44,403	44,403	33,234	19,519
Water-Side Economizer	19,907	19,907	14,410	8,463

Measure	Technical Potential (MWh)	Economic UCT (MWh)	Achievable UCT (MWh)	Constrained UCT (MWh)
Retrocommissioning	15,850	15,850	11,863	6,413
HVAC Occupancy Sensors	11,011	11,011	8,242	4,841
Setback with Electric Heat	8,321	8,321	6,228	3,504
EMS install	8,214	8,214	5,827	3,411
Web enabled EMS	7,066	7,066	5,288	3,106
Water-Cooled Centrifugal Chiller > 300 ton	8,955	8,955	4,838	3,132
Water-Cooled Centrifugal Chiller 150 - 300 ton	8,892	8,892	4,470	2,894
Water-Cooled Chiller Average 10% above IECC standard	4,514	4,514	3,379	2,187
Air-Cooled Recip Chiller	5,513	5,513	2,978	1,928
Water-Cooled Screw Chiller > 300 ton	4,681	4,681	2,529	1,637
Building Operator Certification	3,331	3,331	2,493	1,226
Air-Cooled Chiller Average Minimum Qualifying 1.04 kW/ton	3,135	3,135	2,346	1,519
Water-Cooled Screw Chiller 150 - 300 ton	4,292	4,292	2,319	1,501
Air-Cooled Screw Chiller	4,197	4,197	2,267	1,468
Water-Cooled Screw Chiller < 150 ton	3,430	3,430	1,853	1,200
Roof Insulation	9,666	9,666	1,541	1,087
Efficient Chilled Water Pump	21,119	21,119	1,271	744
VAV System Conversion	15,891	15,891	956	675
Motor Belt Replacement	1,718	1,718	928	539
Ceiling Insulation	10,188	10,188	613	433

Measure	Technical Potential (MWh)	Economic UCT (MWh)	Achievable UCT (MWh)	Constrained UCT (MWh)
High Efficiency Pumps	8,416	8,416	506	296
Water-Cooled Chiller Average 0.01 kW/ton IPLV Reduction	542	542	405	262
Wall Insulation	3,359	3,359	200	141
Air-Cooled Chiller Average 0.01 kW/ton IPLV Reduction	211	211	158	102
EMS Optimization	171	171	128	90
Integrated Building Design	53	53	24	15
Commissioning	8	8	6	3
Zoning	34,273	0	0	0
Chiller Tune Up	0	0	0	0
Energy Efficient Windows	8,733	0	0	0
Window Improvements	10,909	0	0	0
Water-Cooled Centrifugal Chiller < 150 ton	8,964	0	0	0
Cool Roof	26,964	0	0	0
Improved Duct Sealing - Cooling Chiller	7,045	0	0	0
Space Cooling - Unitary and Split AC				
EMS Pump Scheduling Controls	44,403	44,403	33,234	19,519
Retrocommissioning	19,641	19,641	14,700	7,947
AC <65k	20,023	20,023	13,252	7,784
HVAC Occupancy Sensors	14,266	14,266	10,677	6,271
AC 240k - 760k	10,625	10,625	7,032	4,130
Setback with Electric Heat	8,339	8,339	6,241	3,512
Web enabled EMS	8,254	8,254	6,178	3,628

Measure	Technical Potential (MWh)	Economic UCT (MWh)	Achievable UCT (MWh)	Constrained UCT (MWh)
EMS install	6,397	6,397	3,736	2,187
Building Operator Certification	4,088	4,088	3,059	1,505
Air Source Heat Pump - Cooling	1,531	1,531	1,013	595
Ceiling Insulation	16,491	16,491	992	700
Ground Source Heat Pump - Cooling	1,334	1,334	883	518
Roof Insulation	8,448	8,448	508	359
Room A/C	4,663	4,663	318	187
Wall Insulation	3,375	3,375	203	143
Hotel Guest Room Occupancy Control System	269	269	196	105
EMS Optimization	171	171	128	90
Water Loop Heat Pump (WLHP) - Cooling	106	106	70	41
Integrated Building Design	65	65	29	19
Commissioning	10	10	7	4
Packaged Terminal Air Conditioner (PTAC) - Cooling	5,367	0	0	0
Window Improvements	20,755	0	0	0
DX Condenser Coil Cleaning	973	0	0	0
WLHP System (Cooling) New Construction	9	0	0	0
AC 65k - 135k	23,664	0	0	0
Energy Efficient Windows	18,932	0	0	0
Zoning	71,005	0	0	0
Improved Duct Sealing - Cooling AC	8,279	0	0	0

Measure	Technical Potential (MWh)	Economic UCT (MWh)	Achievable UCT (MWh)	Constrained UCT (MWh)
Programmable Thermostats	3,998	0	0	0
Cool Roof	30,278	0	0	0
AC >760k	9,590	0	0	0
Ductless (mini split) - Cooling	637	0	0	0
AC 135k - 240k	14,461	0	0	0
Space Heating				
Web enabled EMS with Electric Heat	78,341	78,341	58,636	34,439
EMS Pump Scheduling Controls	43,655	43,655	32,674	19,191
Retrocommissioning	24,730	24,730	18,510	10,007
HVAC Occupancy Sensors	12,779	12,779	9,564	5,618
VFD Pumps	9,224	9,224	6,105	3,598
Setback with Electric Heat	7,415	7,415	5,550	3,123
Web enabled EMS	7,339	7,339	5,493	3,226
EMS install	6,289	6,289	3,673	2,150
Building Operator Certification	3,635	3,635	2,721	1,338
Ceiling Insulation	14,803	14,803	891	629
Ground Source Heat Pump - Heating	1,384	1,384	808	475
Roof Insulation	7,692	7,692	463	327
Hotel Guest Room Occupancy Control System	457	457	332	178
Wall Insulation	3,318	3,318	200	141
EMS Optimization	169	169	125	88
Air Source Heat Pump - Heating	174	174	94	55

Measure	Technical Potential (MWh)	Economic UCT (MWh)	Achievable UCT (MWh)	Constrained UCT (MWh)
Water Loop Heat Pump (WLHP) - Heating	100	100	63	37
Integrated Building Design	64	64	28	18
Commissioning	11	11	8	4
Programmable Thermostats	1,965	0	0	0
Ductless (mini split) - Heating	571	0	0	0
Zoning	50,855	0	0	0
ECM motors on furnaces	3,998	0	0	0
Cool Roof	30,789	0	0	0
Energy Efficient Windows	17,891	0	0	0
Improved Duct Sealing - Heating	7,780	0	0	0
WLHP System (Heating) New Construction	6	0	0	0
Window Improvements	21,477	0	0	0
Ventilation				
Demand-Controlled Ventilation	512,363	512,363	392,473	230,514
High Volume Low Speed Fans	42,972	42,972	31,762	18,720
Variable Speed Drive Control, 5 HP	121,863	121,863	6,273	3,671
Variable Speed Drive Control, 40 HP	121,863	121,863	6,273	3,671
Variable Speed Drive Control, 15 HP	121,863	121,863	6,273	3,671
Engineered CKV hood	7,327	7,327	4,454	2,616
Economizer	308,227	0	0	0
High Speed Fans	10,311	0	0	0

Measure	Technical Potential (MWh)	Economic UCT (MWh)	Achievable UCT (MWh)	Constrained UCT (MWh)
Water Heating				
Low Flow Faucet Aerator	75,353	75,353	54,783	32,289
Solar Storage Water Heater	14,704	14,704	9,912	5,842
Heat Pump Water Heater	10,054	10,054	7,794	4,578
Pre Rinse Sprayers (electric)	5,401	5,401	3,918	1,927
High Efficiency Electric Water Heater	1,814	1,814	1,407	826
Electric Tankless Water Heater	1,399	1,399	1,082	701
Low Flow Showerhead	1,784	1,784	1,058	624
Hot Water (DHW) Pipe Insulation	1,081	1,081	818	577
Tank Insulation (electric)	1,091	1,091	812	476
Efficient Hot Water Pump	17,775	17,775	726	425
ECM Circulator Pump	13,891	13,891	567	332
ES Dishwasher, Low Temp, Elec Heat	786	786	554	333
ES Dishwasher, High Temp, Elec Heat, Elec Booster	674	674	474	285
ES Dishwasher, High Temp, Gas Heat, Elec Booster	621	621	437	263
ES Dishwasher, High Temp, Gas Heat, Gas Booster	360	360	253	152
Clothes Washer ENERGY STAR, Electric Water heater, Electric Dryer	323	323	251	133
ES Dishwasher, Low Temp, Gas Heat	129	129	91	55
HVAC Condenser Heater Recovery Water Heating	18	18	14	8

Measure	Technical Potential (MWh)	Economic UCT (MWh)	Achievable UCT (MWh)	Constrained UCT (MWh)
Process Cooling Condenser Heater Recovery Water Heating	18	18	14	8
Drain water Heat Recovery Water Heater	6	6	5	4
Clothes Washer ENERGY STAR, Gas water heater, Electric dryer	297	0	0	0
Clothes Washer ENERGY STAR, Electric Water heater, Gas Dryer	387	0	0	0
Clothes Washer ENERGY STAR, Gas water heater, Gas dryer	445	0	0	0
Total				
Total	**9,557,694**	**8,242,372**	**4,313,889**	**2,425,069**
Percent of Annual Sales Forecast	41.80%	36.00%	18.90%	10.60%

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	$2,060,595,059	$469,716,871	4.39	$1,590,878,189
Constrained UCT	$1,459,503,371	$333,175,840	4.38	$1,126,327,531

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	$3,619,559,327	$745,560,579	4.85	$2,873,998,747
Constrained UCT	$2,361,623,911	$496,323,514	4.76	$1,865,300,397

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 7-19 shows the revenue requirements for each scenario as a percentage of forecasted sector sales.

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

	Admin	Incentive	Total
2016	$9.90	$51.45	$61.36
2017	$10.30	$51.53	$61.84
2018	$10.72	$51.62	$62.34
2019	$11.14	$51.70	$62.84
2020	$13.75	$54.50	$68.24
2021	$14.78	$54.86	$69.64
2022	$15.45	$55.28	$70.73
2023	$16.46	$56.87	$73.33
2024	$20.03	$62.20	$82.23
2025	$20.97	$63.59	$84.57
2026	$17.64	$54.18	$71.82
2027	$18.05	$54.82	$72.87
2028	$22.49	$66.37	$88.86
2029	$22.98	$66.79	$89.77
2030	$21.69	$65.52	$87.21
2031	$27.50	$86.82	$114.32
2032	$31.43	$91.83	$123.26
2033	$31.63	$90.40	$122.03
2034	$30.58	$95.01	$125.60
2035	$31.09	$95.02	$126.11

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

	Admin	Incentive	Total
2016	$7.11	$36.94	$44.06
2017	$7.55	$37.75	$45.30
2018	$7.98	$38.44	$46.43
2019	$8.42	$39.04	$47.46
2020	$9.76	$38.71	$48.47
2021	$10.51	$39.01	$49.51
2022	$11.03	$39.45	$50.48
2023	$11.55	$39.90	$51.45
2024	$12.76	$39.63	$52.39
2025	$13.22	$40.09	$53.32
2026	$13.32	$40.90	$54.22
2027	$13.65	$41.45	$55.10
2028	$14.17	$41.81	$55.97
2029	$14.54	$42.28	$56.82
2030	$14.34	$43.31	$57.65
2031	$14.06	$44.40	$58.46
2032	$15.11	$44.15	$59.26
2033	$15.57	$44.48	$60.05
2034	$14.83	$46.08	$60.91
2035	$15.23	$46.53	$61.76

Table 7-19: Utility Energy Efficiency Budgets per Scenario as a % of Sector Revenues

	Achievable UCT	Constrained UCT
2016	2.79%	2.00%
2017	2.73%	2.00%
2018	2.69%	2.00%
2019	2.65%	2.00%
2020	2.82%	2.00%
2021	2.81%	2.00%
2022	2.80%	2.00%
2023	2.85%	2.00%
2024	3.14%	2.00%
2025	3.17%	2.00%
2026	2.65%	2.00%
2027	2.64%	2.00%
2028	3.18%	2.00%
2029	3.16%	2.00%
2030	3.03%	2.00%

	Achievable UCT	Constrained UCT
2031	3.91%	2.00%
2032	4.16%	2.00%
2033	4.06%	2.00%
2034	4.12%	2.00%
2035	4.08%	2.00%

8 Industrial Sector Electric Energy Efficiency Potential Estimates

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

8.1 Industrial Electric Energy Efficiency Potential

According to 2015 historical sales data[38], the industrial sector accounts for approximately 25% of retail electric sales in DTE Energy. This sector is dominated by the automobile industry which represents almost 45% of industrial electric retail sales. Other key industrial sectors are primary metals, plastics & rubber, and fabricated metal. Industrial kWh sales over the period 2004 to 2014 reached their highest level in 2007 of almost 40,000 GWh and their lowest level in 2009 of about 13,300 GWh. Since a low of 9,739 GWh in 2011 Industrial sales have rebounded, increasing by 4.7% to 10,199 GWh in 2012. For this study, industrial electric sales are forecast to continue to increase gradually, reaching a level of over 13,023 GWh in 2035.

8.1.1 Electric Energy Efficiency Measures Examined

For the industrial sector, there were 161 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

[38] U.S. Energy Information Administration

End Use Type	End Use Description	Measures Included
		• Efficient Hot Water Pump • Hot Water (DHW) Pipe Insulation • Drain Water Heat Recovery Water Heater • ECM Circulator Pump • Electric Tankless Water Heater
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

End Use Type	End Use Description	Measures Included
		• EMS Optimization • Integrated Building Design • Retrocommissioning • Room AC • Ground Source Heat Pump - Cooling • 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

End Use Type	End Use Description	Measures Included
		• LED Tube Lighting • Lamp & Ballast Retrofit (HPT8 Replacing T12) • LED High Bay Lighting • Lamp & Ballast Retrofit (Low Wattage HPT8 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

End Use Type	End Use Description	Measures Included
		• Window Improvements • Ductless (mini split) - Heating • Cool Roofing
Other		• Engine Block Heater Timer • Parking Garage Exhaust Fan CO Control • 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)

End Use Type	End Use Description	Measures Included
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 • 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

8.1.2 Overview of Industrial Electric Energy Efficiency Potential

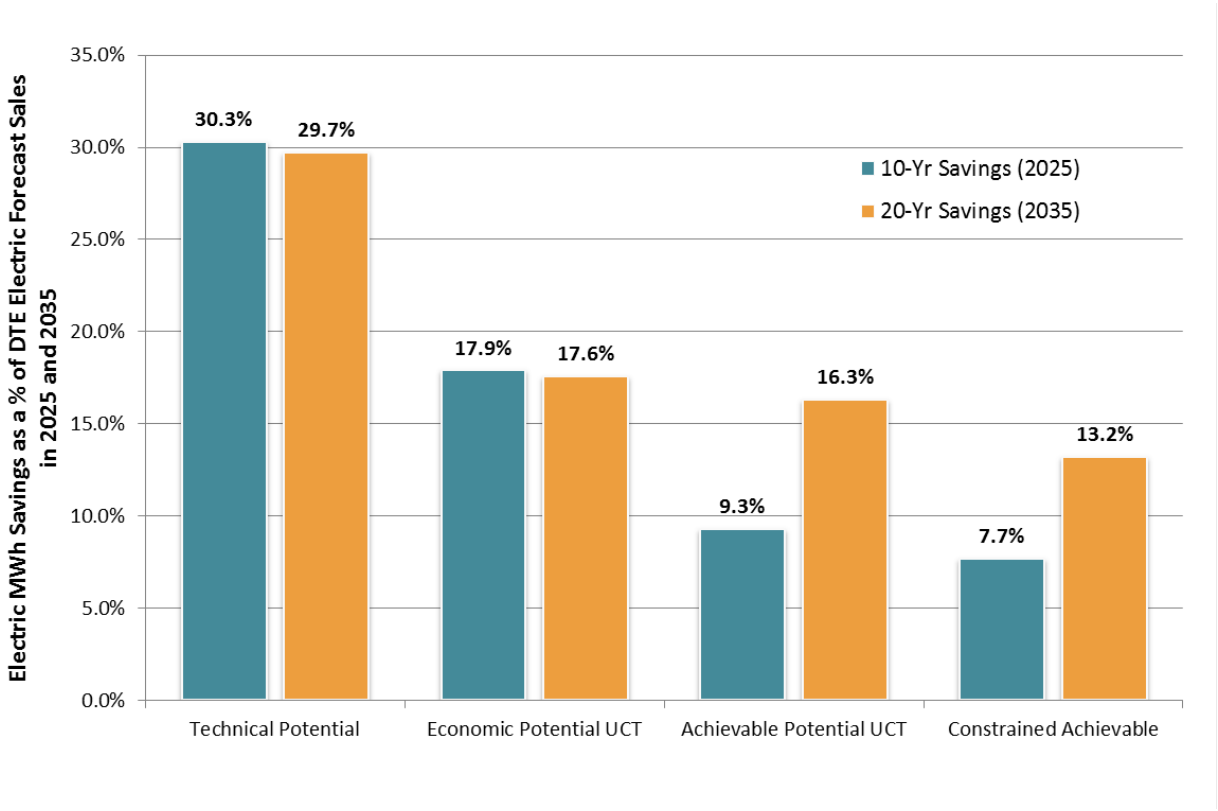
This section presents estimates for electric technical, economic, and achievable savings potential for the industrial sector. Each of the tables in the technical, economic and achievable sections present the respective potential for energy efficiency savings expressed as cumulative annual savings (MWh) 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 Summary of Findings

Figure 8-1 illustrates the estimated savings potential in the DTE 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 2025 and 2035 forecasts for industrial sector annual electricity sales. The technical potential is 30.3% in 2025 and 29.7% in 2035. The 10-year and 20-year economic potential is: 17.9% and 17.6% 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: 9.3% and 16.3% for the Achievable UCT scenario and 7.7% and 13.2% 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 allocated at the sector level based on where the savings opportunities are found.

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 3.9 million MWh annually in the industrial sector during the 20 year period from 2016 to 2035 across DTE's service territory, representing 30.3% of 2025 forecast industrial sales and 29.7% of 2035 industrial sales. Machine Drive represents the majority of the potential at 31.1% of 20-yr savings, while water heating, agriculture, space heating and other represent the smallest shares, each with less than 1 percent of 20-yr savings. Table 8-3 shows the annual (summer) peak demand savings potential in 2025 and 2035. The twenty year summer peak demand savings

potential is 756 MW, which is 33.7% of the 10-year peak forecast and 33.1% of the 20-year peak forecast.

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

End Use	2025 Energy Savings (MWh)	% of 2025 Total	2035 Energy Savings (MWh)	% of 2035 Total
Machine Drive	1,204,757	31.1%	1,204,757	31.1%
Lighting	799,885	20.7%	799,885	20.7%
Space Cooling	984,912	25.4%	984,912	25.4%
Ventilation	244,777	6.3%	244,777	6.3%
Process Heating and Cooling	322,830	8.3%	322,830	8.3%
Space Heating	247,047	6.4%	247,047	6.4%
Other	26,362	0.7%	26,362	0.7%
Agriculture	15,794	0.4%	15,794	0.4%
Water Heating	17,491	0.5%	17,491	0.5%
Computers & Office Equipment	7,666	0.2%	7,666	0.2%
Total	**3,871,520**	**100%**	**3,871,520**	**100%**
% of Annual Sales Forecast	***30.3%***		***29.7%***	

Table 8-3: Industrial Sector Technical Potential Demand Savings

	2025 Demand Savings (MW)	% of 2025 Forecast Peak	2035 Demand Savings (MW)	% of 2035 Forecast Peak
Total System	756	33.7%	756	33.1%

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. 78% 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 2.3 million MWh during the 20 year period from 2016 to 2035. This represents 17.9% and 17.6% 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 2025 and 2035. The ten and twenty year summer peak demand savings potential is 446.5 MW, respectively, which is 19.9% and 19.5% of the 10-year and 20-year peak forecasts.

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

End Use	2025 Energy Savings (MWh)	% of 2025 Total	2035 Energy Savings (MWh)	% of 2033 Total
Machine Drive	777,248	34.0%	777,248	34.0%

End Use	2025 Energy Savings (MWh)	% of 2025 Total	2035 Energy Savings (MWh)	% of 2033 Total
Lighting	580,685	25.4%	580,685	25.4%
Space Cooling	403,649	17.7%	403,649	17.7%
Ventilation	141,445	6.2%	141,445	6.2%
Process Heating and Cooling	225,032	9.8%	225,032	9.8%
Space Heating	122,111	5.3%	122,111	5.3%
Other	14,475	0.6%	14,475	0.6%
Agriculture	10,408	0.5%	10,408	0.5%
Water Heating	6,559	0.3%	6,559	0.3%
Computers & Office Equipment	4,663	0.2%	4,663	0.2%
Total	2,286,275	100%	2,286,275	100%
% of Annual Sales Forecast	17.9%		17.6%	

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

	2025 Demand Savings (MW)	% of 2025 Forecast Peak	2035 Demand Savings (MW)	% of 2035 Forecast Peak
Total System	446.5	19.9%	446.5	19.5%

8.2.1 Achievable Potential Savings in the Industrial Sector

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.

8.2.1.1 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 include an estimate 20-year market adoption rates based on incentive levels and equipment replacement cycles. Table 8-8 and Table 8-9 show the estimated savings for the Achievable UCT scenario over 10 and 20 year time horizons. The 10-year and 20-year Achievable UCT potential savings estimates are approximately 121 million MWh and 2.1 million MWh. This equates to 9.3% and 16.3% of sector sales in 2025 and 2035. The ten and twenty year summer demand savings estimates in the Constrained UCT scenario are 233.6 MW and 413.9 MW, respectively, which is 10.4% and 18.1% of the peak forecast in 2025 and 2035.

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

End Use	2025	% of 2025	2035	% of 2035
Machine Drive	388,624	32.8%	777,248	36.7%
Lighting	304,913	25.7%	514,097	24.3%
Space Cooling	174,283	14.7%	342,044	16.1%
Ventilation	133,812	11.3%	133,812	6.3%
Process Heating and Cooling	111,944	9.4%	223,888	10.6%
Space Heating	54,642	4.6%	93,366	4.4%
Other	7,648	0.6%	13,665	0.6%
Agriculture	5,167	0.4%	10,335	0.5%
Water Heating	3,484	0.3%	6,559	0.3%
Computers & Office Equipment	2,011	0.2%	3,716	0.2%
Total	**1,186,527**	**100%**	**2,118,730**	**100%**
% of Annual Sales Forecast	*9.3%*		*16.3%*	

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	233.6	10.4%	413.9	18.1%

8.2.1.2 Achievable UCT vs. Constrained UCT

Although the Unconstrained Achievable UCT 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 DSM spending cap to reach all potential participants. In the Constrained UCT scenario, the analysis assumes a spending cap roughly equal to 2% of DTE 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 1.0 million MWh and 1.7 million MWh. This equates to 7.7% and 13.2% of sector sales in 2025 and 2035. The ten and twenty year summer demand savings estimates in the Constrained UCT scenario are 194.8 MW and 321.0 MW, respectively, which is 8.7% and 14.0% of the peak forecast in 2025 and 2035.

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

	2025	% of 2025	2035	% of 2035
End Use	**Energy (MWh)**	**Savings**	**Energy (MWh)**	**Savings**
Machine Drive	323,464	32.8%	629,263	36.6%
Lighting	253,789	25.7%	418,391	24.3%
Space Cooling	145,061	14.7%	277,066	16.1%
Ventilation	111,376	11.3%	111,376	6.4%
Process Heating and Cooling	93,175	9.4%	181,261	10.5%
Space Heating	45,480	4.6%	75,951	4.4%
Other	6,365	0.6%	11,100	0.6%
Agriculture	4,301	0.4%	8,367	0.5%
Water Heating	2,900	0.3%	5,320	0.3%
Computers & Office Equipment	1,674	0.2%	3,016	0.2%
Total	**987,584**	**100%**	**1,721,110**	**100%**
% of Annual Sales Forecast	*7.7%*		*13.2%*	

Table 8-9: Industrial Constrained Achievable Demand Savings

	2025 Demand Savings (MW)	% of 2025 Forecast Peak	2035 Demand Savings (MW)	% of 2035 Forecast Peak
Total System	194.8	8.7%	321.0	14.0%

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 just 36.7% of total savings, in the Constrained UCT scenario. Lighting is second at 24.3% of total savings.

Figure 8-2: Industrial Sector 2035 Constrained UCT Potential Savings by End Use

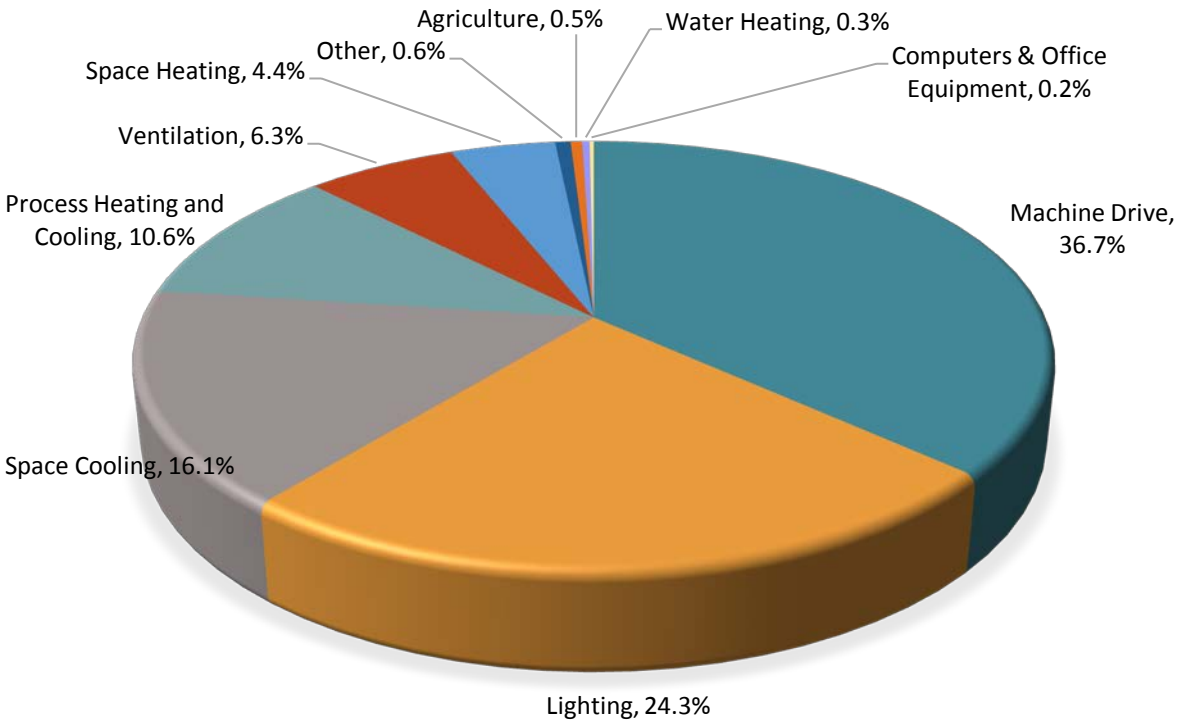
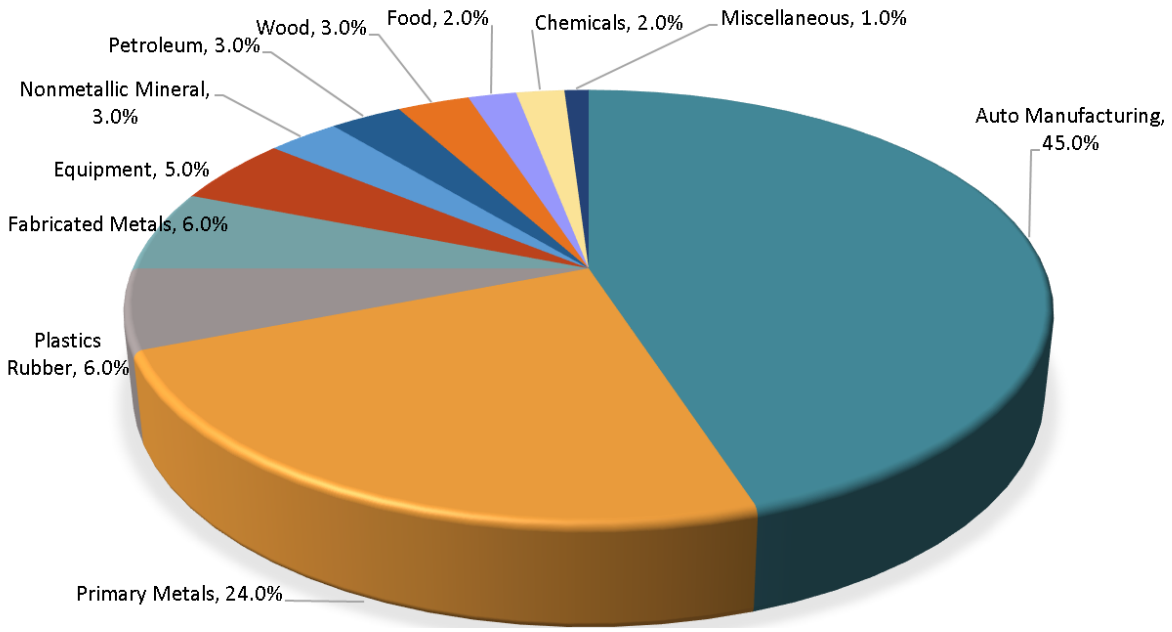


Figure 8-3 shows the breakdown of estimated savings in 2035 by industry type for the Constrained UCT scenario. The vast majority of savings come from the automobile manufacturing, primary metals,

plastics and rubber, and fabricated metals industries; with the other NAICS codes accounting for less than 20% of total savings.

Figure 8-3: Industrial Constrained UCT Savings in 2035 by Industry



8.2.2 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 10-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	% of Annual Sales Forecast
2016	38,862	30,491	17,431	13,381	11,194	5,464	765	517	348	201	118,655	0.9%
2017	77,725	60,983	34,862	26,762	22,389	10,928	1,530	1,033	697	402	237,311	1.9%
2018	116,587	91,474	52,293	40,144	33,583	16,393	2,294	1,550	1,045	603	355,966	2.8%
2019	155,450	121,965	69,723	53,525	44,778	21,857	3,059	2,067	1,393	804	474,620	3.7%
2020	194,312	152,456	87,153	66,906	55,972	27,321	3,824	2,584	1,742	1,005	593,275	4.6%
2021	233,174	182,948	104,583	80,287	67,167	32,785	4,589	3,100	2,090	1,207	711,929	5.6%
2022	272,037	213,439	122,013	93,668	78,361	38,249	5,353	3,617	2,439	1,408	830,584	6.5%
2023	310,899	243,930	139,436	107,049	89,555	43,713	6,118	4,134	2,787	1,609	949,232	7.5%
2024	349,762	274,422	156,860	120,431	100,750	49,178	6,883	4,651	3,135	1,810	1,067,880	8.4%
2025	388,624	304,913	174,283	133,812	111,944	54,642	7,648	5,167	3,484	2,011	1,186,527	9.3%
2026	427,486	325,831	191,059	133,812	123,139	58,514	8,249	5,684	3,791	2,181	1,279,748	9.9%
2027	466,349	346,750	207,835	133,812	134,333	62,387	8,851	6,201	4,099	2,352	1,372,968	10.6%
2028	505,211	367,668	224,612	133,812	145,527	66,259	9,453	6,717	4,406	2,522	1,466,188	11.4%
2029	544,074	388,587	241,388	133,812	156,722	70,131	10,054	7,234	4,714	2,693	1,559,409	12.1%
2030	582,936	409,505	258,164	133,812	167,916	74,004	10,656	7,751	5,022	2,863	1,652,629	12.8%
2031	621,798	430,423	274,940	133,812	179,111	77,876	11,258	8,268	5,329	3,034	1,745,849	13.5%
2032	660,661	451,342	291,716	133,812	190,305	81,749	11,859	8,784	5,637	3,205	1,839,069	14.2%
2033	699,523	472,260	308,492	133,812	201,500	85,621	12,461	9,301	5,944	3,375	1,932,290	14.9%
2034	738,386	493,179	325,268	133,812	212,694	89,493	13,063	9,818	6,252	3,546	2,025,510	15.6%
2035	777,248	514,097	342,044	133,812	223,888	93,366	13,665	10,335	6,559	3,716	2,118,730	16.3%

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	% of Annual Sales Forecast
2016	30,317	23,787	13,598	10,439	8,733	4,263	597	403	272	157	92,564	0.7%
2017	60,466	47,442	27,121	20,820	17,418	8,502	1,190	804	542	313	184,617	1.5%
2018	91,768	72,001	41,161	31,598	26,434	12,903	1,806	1,220	823	475	280,187	2.2%
2019	123,970	97,267	55,604	42,686	35,710	17,431	2,440	1,648	1,111	641	378,508	3.0%
2020	156,607	122,874	70,242	53,923	45,111	22,020	3,082	2,082	1,404	810	478,155	3.7%
2021	189,378	148,585	84,939	65,207	54,551	26,627	3,727	2,518	1,698	980	578,210	4.6%
2022	222,481	174,558	99,786	76,605	64,086	31,282	4,378	2,958	1,994	1,151	679,280	5.4%
2023	255,773	200,678	114,712	88,068	73,676	35,962	5,033	3,401	2,293	1,323	780,920	6.2%
2024	289,470	227,117	129,820	99,671	83,383	40,700	5,696	3,849	2,595	1,498	883,798	6.9%
2025	323,464	253,789	145,061	111,376	93,175	45,480	6,365	4,301	2,900	1,674	987,584	7.7%
2026	361,443	274,232	161,455	111,376	104,115	49,265	6,953	4,806	3,200	1,840	1,078,686	8.4%
2027	399,107	294,505	177,714	111,376	114,964	53,017	7,537	5,307	3,498	2,006	1,169,029	9.1%
2028	432,611	312,539	192,176	111,376	124,615	56,356	8,055	5,752	3,763	2,153	1,249,396	9.7%
2029	466,387	330,720	206,756	111,376	134,344	59,722	8,578	6,201	4,031	2,301	1,330,415	10.3%
2030	500,231	348,937	221,366	111,376	144,093	63,094	9,102	6,651	4,299	2,449	1,411,599	10.9%
2031	526,960	363,324	232,904	111,376	151,792	65,757	9,516	7,007	4,510	2,567	1,475,713	11.4%
2032	552,968	377,324	244,131	111,376	159,284	68,349	9,919	7,352	4,716	2,681	1,538,100	11.9%
2033	579,160	391,422	255,438	111,376	166,829	70,959	10,324	7,701	4,923	2,796	1,600,927	12.3%
2034	604,128	404,861	266,216	111,376	174,021	73,447	10,711	8,033	5,121	2,905	1,660,818	12.8%
2035	629,263	418,391	277,066	111,376	181,261	75,951	11,100	8,367	5,320	3,016	1,721,110	13.2%

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	% of Annual Sales Forecast
2016	6.7	5.8	4.3	3.2	1.8	0.8	0.4	0.2	0.1	0.0	23.4	1.1%
2017	13.4	11.7	8.6	6.3	3.7	1.6	0.8	0.4	0.2	0.0	46.7	2.2%
2018	20.2	17.5	12.9	9.5	5.5	2.4	1.2	0.6	0.3	0.0	70.1	3.2%
2019	26.9	23.4	17.2	12.7	7.3	3.2	1.5	0.8	0.3	0.1	93.4	4.2%
2020	33.6	29.2	21.5	15.8	9.2	4.0	1.9	1.0	0.4	0.1	116.8	5.2%
2021	40.3	35.1	25.8	19.0	11.0	4.9	2.3	1.2	0.5	0.1	140.2	6.3%
2022	47.0	40.9	30.1	22.2	12.8	5.7	2.7	1.4	0.6	0.1	163.5	7.3%
2023	53.8	46.8	34.4	25.3	14.7	6.5	3.1	1.6	0.7	0.1	186.9	8.4%
2024	60.5	52.6	38.7	28.5	16.5	7.3	3.5	1.8	0.8	0.1	210.3	9.4%
2025	67.2	58.5	43.0	31.6	18.3	8.1	3.8	2.0	0.9	0.1	233.6	10.4%
2026	73.9	62.2	47.3	31.6	20.2	8.9	4.2	2.2	0.9	0.1	251.6	11.1%
2027	80.6	66.0	51.5	31.6	22.0	9.7	4.6	2.4	1.0	0.2	269.6	11.9%
2028	87.4	69.8	55.7	31.6	23.8	10.5	5.0	2.6	1.1	0.2	287.7	12.7%
2029	94.1	73.7	59.9	31.6	25.6	11.2	5.3	2.8	1.2	0.2	305.7	13.5%
2030	100.8	77.5	64.2	31.6	27.5	12.0	5.7	3.0	1.3	0.2	323.7	14.2%
2031	107.5	81.3	68.4	31.6	29.3	12.8	6.1	3.2	1.4	0.2	341.8	15.0%
2032	114.2	85.1	72.6	31.6	31.1	13.6	6.4	3.4	1.5	0.2	359.8	15.8%
2033	120.9	88.9	76.8	31.6	33.0	14.4	6.8	3.6	1.5	0.2	377.8	16.6%
2034	127.7	92.7	81.1	31.6	34.8	15.2	7.2	3.8	1.6	0.2	395.9	17.3%
2035	134.4	96.5	85.3	31.6	36.6	16.0	7.5	4.0	1.7	0.3	413.9	18.1%

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	% of Annual Demand Forecast
2016	5.2	4.6	3.4	2.5	1.4	0.6	0.3	0.2	0.1	0.0	18.2	0.8%
2017	10.5	9.1	6.7	4.9	2.9	1.3	0.6	0.3	0.1	0.0	36.3	1.7%
2018	15.9	13.8	10.2	7.5	4.3	1.9	0.9	0.5	0.2	0.0	55.2	2.5%
2019	21.5	18.7	13.7	10.1	5.8	2.6	1.2	0.6	0.3	0.0	74.6	3.3%
2020	27.2	23.6	17.3	12.8	7.4	3.3	1.6	0.8	0.3	0.1	94.3	4.2%
2021	32.9	28.5	21.0	15.4	8.9	3.9	1.9	1.0	0.4	0.1	114.0	5.1%
2022	38.7	33.5	24.6	18.1	10.5	4.6	2.2	1.1	0.5	0.1	134.0	6.0%
2023	44.5	38.5	28.3	20.8	12.1	5.3	2.5	1.3	0.6	0.1	154.0	6.9%
2024	50.4	43.6	32.1	23.6	13.6	6.0	2.9	1.5	0.6	0.1	174.3	7.8%
2025	56.3	48.7	35.8	26.3	15.2	6.7	3.2	1.7	0.7	0.1	194.8	8.7%
2026	63.7	52.6	39.9	26.7	17.0	7.5	3.6	1.9	0.8	0.1	213.9	9.5%
2027	70.3	56.5	44.0	27.0	18.8	8.3	4.0	2.0	0.9	0.1	232.0	10.2%
2028	75.2	60.0	47.7	27.1	20.4	9.0	4.3	2.2	1.0	0.2	246.9	10.9%
2029	81.1	63.6	51.4	27.2	22.0	9.6	4.6	2.4	1.0	0.2	263.0	11.6%
2030	87.0	67.1	55.0	27.2	23.6	10.3	4.9	2.6	1.1	0.2	279.0	12.3%
2031	88.9	69.1	57.8	26.8	24.7	10.8	5.1	2.7	1.2	0.2	287.2	12.6%
2032	92.3	70.8	60.4	26.4	25.7	11.3	5.3	2.8	1.2	0.2	296.4	13.0%
2033	96.1	72.5	63.0	25.9	26.7	11.8	5.5	2.9	1.3	0.2	305.9	13.4%
2034	98.8	73.8	65.4	25.2	27.5	12.3	5.7	3.0	1.3	0.2	313.2	13.7%
2035	102.0	75.1	67.8	24.5	28.4	12.7	5.9	3.1	1.3	0.2	321.0	14.0%

8.2.3 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 Potential -UCT- (MWh)	Achievable Potential -UCT- (MWh)	Constrained Achievable -UCT- (MWh)
Computers & Office Equipment				
Energy Star office equipment including computers, monitors, copiers, multi-function machines.	5,203	3,404	3,404	2,756
PC Network Energy Management Controls replacing no central control	457	293	293	244
Energy Efficient "Smart" Power Strip for PC/Monitor/Printer	315	13	13	11
Energy Star UPS	166	7	7	5
Energy Star office equipment including computers, monitors, copiers, multi-function machines.	1,476	944	0	0
PC Network Energy Management Controls replacing no central control	48	2	0	0
Water Heating				
Low Flow Faucet Aerator	6,536	336	336	280
Tank Insulation (electric)	853	44	44	37
Process Cooling Condenser Heat Recovery	652	499	499	404
HVAC Condenser Heater Recovery Water Heating	5,163	3,743	3,743	3,030
Heat Pump Water Heater	1,561	1,113	1,113	901
Efficient Hot Water Pump	970	50	50	40
Hot Water (DHW) Pipe Insulation	14	1	1	1
Drain Water Heat Recovery Water Heater	1,065	634	634	513
ECM Circulator Pump	519	27	27	22
Electric Tankless Water Heater	159	114	114	92
Ventilation				
Engineered CKV Hood	0	0	0	0
Variable Speed Drive Control, 15 HP	36,084	23,193	23,193	19,304
Variable Speed Drive Control, 5 HP	36,084	23,193	23,193	19,304
Variable Speed Drive Control, 40 HP	36,084	23,193	23,193	19,304

End Use	Technical Potential (MWh)	Economic Potential -UCT- (MWh)	Achievable Potential -UCT- (MWh)	Constrained Achievable -UCT- (MWh)
Destratification Fan (HVLS)	24,359	17,456	17,456	14,530
High Volume Low Speed Fans	72,776	46,777	46,777	38,934
Economizer	30,357	1,827	0	0
High Speed Fans	9,034	5,806	0	0
Space Cooling - Chillers				
EMS Pump Scheduling	432	262	262	212
Wall Insulation	978	49	49	41
EMS install	3,677	185	185	154
Setback with Electric Heat	710	36	36	29
Web Enabled EMS	6,005	4,222	4,222	3,418
Efficient Chilled Water Pump	447	22	22	18
Chilled Hot Water Reset	975	566	566	458
EMS Optimization	364	280	280	233
Water Side Economizer	411	238	238	193
Chiller Tune Up	331	192	192	155
Water-Cooled Screw Chiller > 300 ton	1,144	663	663	537
Water-Cooled Centrifugal Chiller > 300 ton	1,216	705	705	571
Integrated Building Design	40,949	18,837	18,837	15,250
Retrocommissioning	3,122	2,143	2,143	1,735
Motor Belt Replacement	109	63	63	51
VAV System Conversion	197	114	114	93
Air-Cooled Recip Chiller	6,063	3,516	3,516	2,847
Air-Cooled Screw Chiller	6,154	3,569	3,569	2,890
High Efficiency Pumps	144	7	7	6
Ceiling Insulation	1,008	51	51	42

End Use	Technical Potential (MWh)	Economic Potential -UCT- (MWh)	Achievable Potential -UCT- (MWh)	Constrained Achievable -UCT- (MWh)
HVAC Occupancy Sensors	5,659	3,884	3,884	3,144
Programmable Thermostats	1,471	74	0	0
Economizer	9,107	457	0	0
Energy Efficient Windows	1,705	68	0	0
Roof Insulation	56	3	3	2
Zoning	0	0	0	0
Improved Duct Sealing	168	8	0	0
Window Improvements	30	2	0	0
Cool Roofing	6,064	4,656	0	0
Space Cooling – Unitary and Split AC				
EMS Pump Scheduling	4,084	2,317	2,317	1,876
Wall Insulation	9,233	556	556	463
EMS install	34,727	2,090	2,090	1,740
Setback with Electric Heat	6,705	404	404	327
Web Enabled EMS	56,709	38,213	38,213	30,938
EMS Optimization	3,438	2,559	2,559	2,130
Integrated Building Design	400,159	175,981	175,981	142,475
Retrocommissioning	30,512	20,005	20,005	16,196
Room AC	3,225	0	0	0
Ground Source Heat Pump - Cooling	24,099	16,239	16,239	13,147
Water Loop Heat Pump (WLHP) - Cooling	3,092	1,754	1,754	1,420
Ceiling Insulation	11,123	669	669	557
DX Condenser Coil Cleaning	1,963	118	0	0
HVAC Occupancy Sensors	62,321	40,861	40,861	33,081
Economizer	86,012	5,177	0	0

End Use	Technical Potential (MWh)	Economic Potential -UCT- (MWh)	Achievable Potential -UCT- (MWh)	Constrained Achievable -UCT- (MWh)
Programmable Thermostats	13,891	836	0	0
Air Source Heat Pump - Cooling	7,063	425	425	344
Energy Efficient Windows	19,069	918	0	0
Packaged Terminal Air Conditioner (PTAC) - Cooling	0	0	0	0
AC 240K - 760 K	5,441	327	327	265
Roof Insulation	626	38	38	31
Zoning	0	0	0	0
Improved Duct Sealing	1,859	112	0	0
Window Improvements	336	20	0	0
Ductless (mini split) - Cooling	37,500	2,257	0	0
Cool Roofing	63,027	46,904	0	0
Lighting				
Lighting Power Density - Parking Garage	951	691	691	560
CFL Screw-in	3,654	2,608	2,608	2,112
Lighting Power Density- Exterior	10,156	7,862	7,862	6,365
Lighting Power Density - Interior	3,907	2,240	2,240	1,814
CFL Screw in Specialty	3,862	2,756	2,756	2,232
LED Downlight	320	228	228	185
CFL Reflector Flood	448	320	320	259
LED Exit Sign	3,281	161	161	131
LED Screw In Replacing Incandescent	3,218	2,297	2,297	1,860
LED Specialty replacing incandescent	4,164	2,972	2,972	2,406
Stairwell Bi-Level Control	4,643	3,373	3,373	2,731
HID Fixture Upgrade - Pulse Start Metal Halide	14,172	697	697	564
CFL Fixture	606	433	433	350

End Use	Technical Potential (MWh)	Economic Potential -UCT- (MWh)	Achievable Potential -UCT- (MWh)	Constrained Achievable -UCT- (MWh)
Interior Induction Lighting	39,689	30,569	30,569	24,748
Long Day Lighting Dairy	8,129	6,261	6,261	5,069
High Intensity Fluorescent Fixture (replacing HID)	61,155	43,173	43,173	34,953
LED Grow Light	35,279	27,172	27,172	21,999
Daylight Sensor Controls	91,946	71,176	71,176	59,242
Central Lighting Control	52,794	40,868	40,868	33,087
Occupancy Sensor & Daylight Sensor	27,970	21,083	21,083	17,548
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing T12)	5,618	0	0	0
Occupancy Sensor	27,970	21,083	21,083	17,069
LED Tube Lighting	38,099	26,446	26,446	21,411
Lamp & Ballast Retrofit (HPT8 Replacing T12)	27,581	19,145	19,145	15,500
LED High Bay Lighting	61,341	47,485	47,485	38,444
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing Standard T8)	3,745	0	0	0
Switching Controls for Multilevel Lighting (Non-HID)	34,001	26,188	26,188	21,202
Exterior Linear Fluorescent	13,375	9,547	9,547	7,729
Exterior HID Replaced with CFL	4,181	3,237	3,237	2,621
Garage Bi-level Controls	4,482	3,470	3,470	2,888
LED Specialty replacing CFL	2,809	2,175	2,175	1,761
Garage HID replacement with LED	0	0	0	0
Illuminated Signs to LED	4,300	3,329	3,329	2,695
Interior Non-Highbay/Lowbay LED Fixtures	50,958	39,447	39,447	31,937
LED Low Bay Lighting	27,142	21,011	21,011	17,011
Exterior Bi-level Controls	11,481	8,887	0	0
T5 HP replacing T12	35,435	24,596	24,596	19,913
Lamp & Ballast Retrofit (HPT8 Replacing Standard T8)	2,207	0	0	0

End Use	Technical Potential (MWh)	Economic Potential -UCT- (MWh)	Achievable Potential -UCT- (MWh)	Constrained Achievable -UCT- (MWh)
LED Screw In Replacing CFL	0	0	0	0
Light Tube	22,275	17,128	0	0
42W 8 lamp Hi Bay CFL	24,118	18,575	0	0
Exterior HID replaced with LED	28,318	21,921	0	0
LED Troffer	106	76	0	0
Space Heating				
EMS Pump Scheduling	961	577	577	467
Wall Insulation	2,173	112	112	93
EMS install	8,171	421	421	350
Setback with Electric Heat	1,578	81	81	66
Web Enabled EMS	13,343	9,331	9,331	7,554
EMS Optimization	809	619	619	515
VFD Pump	3,825	2,632	2,632	2,191
Integrated Building Design	92,954	42,516	42,516	34,421
Retrocommissioning	7,088	4,836	4,836	3,915
Ground Source Heat Pump - Heating	18,060	11,118	11,118	9,001
Ceiling Insulation	2,433	125	125	104
Water Loop Heat Pump (WLHP) - Heating	528	27	27	22
Destratification Fan (HVLS)	16,239	12,003	12,003	9,991
HVAC Occupancy Sensors	12,361	8,435	8,435	6,829
Programmable Thermostats	3,268	168	0	0
Economizer	20,238	1,042	0	0
ECM motors on furnaces	753	39	0	0
Air Source Heat Pump - Heating	917	527	527	427
Energy Efficient Windows	3,662	151	0	0

End Use	Technical Potential (MWh)	Economic Potential -UCT- (MWh)	Achievable Potential -UCT- (MWh)	Constrained Achievable -UCT- (MWh)
Roof Insulation	121	6	6	5
Zoning	0	0	0	0
Improved Duct Sealing	360	19	0	0
Window Improvements	65	3	0	0
Ductless (mini split) - Heating	27,136	19,674	0	0
Cool Roofing	10,001	7,649	0	0
Other				
Engine Block Heater Timer	1,057	815	815	659
Parking Garage Exhaust Fan CO Control	2,116	1,631	1,631	1,357
High Efficiency Transformer, three-phase	5,887	2,957	2,957	2,394
NEMA Premium Transformer, three-phase	5,997	3,049	3,049	2,468
High Efficiency Transformer, single-phase	5,433	2,763	2,763	2,237
NEMA Premium Transformer, single-phase	4,820	2,451	2,451	1,984
Optimized Snow and Ice Melt Controls	1,052	810	0	0
Machine Drive				
Advanced Lubricants	18,045	11,726	11,726	9,493
Compressed Air System Management	33,608	21,970	21,970	17,787
Compressed Air - Advanced Compressor Controls	22,480	14,695	14,695	11,897
Elec motors replacing pneumatic (comp air)	61,072	39,921	39,921	32,320
Compressed Air Audits and Leak Repair	78,820	51,519	51,519	41,710
Storage Tank Addition (comp air)	20,651	10,797	10,797	8,741
VFD for Process Fans	69,882	44,938	44,938	36,382
Automatic Drains, High efficiency nozzles and other (comp air)	20,266	13,246	13,246	10,724
VFD for Process Pumps	178,859	117,224	117,224	94,905
Pump System Efficiency Improvements	119,896	78,591	78,591	63,627

End Use	Technical Potential (MWh)	Economic Potential -UCT- (MWh)	Achievable Potential -UCT- (MWh)	Constrained Achievable -UCT- (MWh)
Motor System Optimization (Including ASD)	297,778	192,878	192,878	156,155
Electric Supply System Improvements	94,322	61,219	61,219	49,563
Sensors & Controls	46,070	29,899	29,899	24,206
Industrial Motor Management	15,179	9,851	9,851	7,975
Fan System Improvements	15,520	9,972	9,972	8,074
High Efficiency Pumps	46,904	30,734	30,734	24,883
Advanced Efficient Motors	34,224	17,766	17,766	14,383
High Efficiency Dryers (comp air)	16,497	10,774	10,774	8,723
Energy Information System	14,684	9,528	9,528	7,714
Process Cooling & Refrigeration				
Improved Refrigeration	105,747	74,972	74,972	60,698
Electric Supply System Improvements	31,053	21,916	21,916	17,743
Sensors & Controls	32,031	22,523	22,523	18,234
Energy Information System	10,907	7,647	7,647	6,191
Process Heating				
Electric Supply System Improvements	52,509	37,005	37,005	29,959
Sensors & Controls	51,250	36,117	36,117	29,240
Energy Information System	16,674	11,750	11,750	9,513
Industrial Other				
Barrel Insulation - Inj. Molding (plastics)	2,445	97	97	79
High Efficiency Welders	309	218	218	177
Pellet Dryer Insulation (plastics)	2,101	84	84	68
3 Phase High Eff Battery Charger	8,090	6,120	6,120	4,955
Injection Molding Machine - efficient (plastics)	8,028	5,440	5,440	4,404
Fiber Laser Replacing CO_2 laser (auto industry)	1,687	1,143	0	0

End Use	Technical Potential (MWh)	Economic Potential -UCT- (MWh)	Achievable Potential -UCT- (MWh)	Constrained Achievable -UCT- (MWh)
Agriculture				
Fan Thermostat Controller	6,182	3,980	3,980	3,223
VFD for Process Fans - Agriculture	1,691	1,101	1,101	891
Milk Pre-Cooler Heat Exchanger	1,144	809	809	655
VFD for Process Pumps - Agriculture	2,296	1,495	1,495	1,210
Low Pressure Sprinkler Nozzles	627	443	443	359
VFD for Process Pumps - Irrigation	1,404	914	914	740
Variable Speed Drives for Dairy Vacuum Pumps	1,219	862	862	698
Other Industrial -Low-Energy Livestock Waterer	487	317	317	257
Other Industrial -Dairy Refrigerator Tune-Up	583	413	413	334
Grain Storage Temperature and Moisture Management Controller	6	0	0	0
Greenhouse Environmental Controls	45	2	0	0
Variable Speed Drive with Heat Exchanger, Milk	91	59	0	0
Scroll Compressor with Heat Exchanger for Dairy Refrigeration	19	12	0	0
Total	**3,871,520**	**2,286,275**	**2,118,727**	**1,721,110**
% of Annual Sales Forecast	**29.7%**	**17.6%**	**16.3%**	**13.2%**

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	$560,788,505	$178,401,582	3.14	$382,386,923
Constrained UCT	$464,311,865	$147,250,753	3.15	$317,061,112

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	$933,488,449	$275,838,455	3.38	$657,649,994
Constrained UCT	$754,759,434	$224,208,611	3.37	$530,550,823

Year by year budgets for both achievable potential scenarios, broken out by incentive and administrative costs are depicted in Table 8-17Table 8-17 and Table 8-18Table 8-18. Table 8-19Table 8-19 shows the revenue requirements for each scenario as a percentage of forecasted sector sales.

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

ACHIEVABLE UCT	Incentives	Admin.	Total Costs
2016	$19.98	$4.58	$24.56
2017	$19.99	$4.84	$24.83
2018	$20.01	$5.12	$25.13
2019	$20.03	$5.39	$25.43
2020	$20.05	$5.69	$25.75
2021	$20.09	$6.05	$26.14
2022	$20.11	$6.37	$26.48
2023	$20.21	$6.74	$26.95
2024	$20.23	$7.08	$27.32
2025	$20.32	$7.45	$27.77
2026	$18.38	$7.17	$25.55
2027	$18.75	$7.60	$26.35
2028	$21.62	$8.65	$30.27
2029	$21.64	$9.03	$30.68
2030	$21.74	$9.51	$31.25
2031	$27.24	$13.16	$40.40
2032	$28.42	$13.89	$42.31
2033	$28.44	$14.40	$42.84
2034	$30.60	$15.21	$45.80

ACHIEVABLE UCT	Incentives	Admin.	Total Costs
2035	$30.61	$15.75	$46.36

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

CONSTRAINED UCT	Incentives	Admin.	Total Costs
2016	$15.58	$3.57	$19.16
2017	$15.51	$3.75	$19.27
2018	$16.12	$4.12	$20.24
2019	$16.60	$4.47	$21.07
2020	$16.84	$4.78	$21.62
2021	$16.94	$5.10	$22.04
2022	$17.13	$5.42	$22.56
2023	$17.31	$5.78	$23.09
2024	$17.54	$6.14	$23.69
2025	$17.77	$6.52	$24.29
2026	$17.97	$7.01	$24.97
2027	$18.18	$7.37	$25.54
2028	$18.64	$7.46	$26.09
2029	$18.81	$7.85	$26.66
2030	$18.93	$8.29	$27.22
2031	$18.73	$9.05	$27.79
2032	$19.02	$9.30	$28.32
2033	$19.17	$9.70	$28.87
2034	$19.66	$9.77	$29.43
2035	$19.80	$10.19	$29.99

Table 8-19: Revenue Requirements per Scenario as a % of sector sales

	Achievable UCT	Constrained UCT
2016	2.6%	2.00%
2017	2.6%	2.00%
2018	2.5%	2.00%
2019	2.4%	2.00%
2020	2.4%	2.00%
2021	2.4%	2.00%
2022	2.3%	2.00%
2023	2.3%	2.00%
2024	2.3%	2.00%
2025	2.3%	2.00%
2026	2.0%	2.00%
2027	2.1%	2.00%
2028	2.3%	2.00%
2029	2.3%	2.00%

	Achievable UCT	Constrained UCT
2030	2.3%	2.00%
2031	2.9%	2.00%
2032	3.0%	2.00%
2033	3.0%	2.00%
2034	3.1%	2.00%
2035	3.1%	2.00%

APPENDIX A | RESIDENTIAL MEASURE DETAIL

APPENDIX B | COMMERCIAL MEASURE DETAIL

APPENDIX C | INDUSTRIAL MEASURE DETAIL

APPENDIX D | GLOBAL ASSUMPTIONS

DTE ENERGY

ELECTRIC ENERGY EFFICIENCY POTENTIAL STUDY

Prepared by:

GDS Associates, Inc
ENGINEERS & CONSULTANTS

1850 Parkway Place
Suite 800
Marietta, GA 30067
770.425.8100 | office
770.426.0303 | fax

www.gdsassociates.com

APPENDIX A – GLOBAL ASSUMPTIONS

General Modeling Assumptions Avoided Costs

DTE (Michigan) **UCT GLOBAL ASSUMPTIONS**

Analysis Start Year	2016
Length of Analysis (Years)	10

Nominal Discount Rate	9.310%
Inflation Rate	2.00%
Reserve Margin Multiplier	14.80%
Carbon Tax Adder ($/kWh)	$0.00
Carbon Tax Adder ($/MMBtu)	$0.00

Avoided Costs (Nominal Dollars)

Data Year	Natural Gas Wholesale Forecast $/MMBTU
2015	
2016	3.83
2017	3.48
2018	3.30
2019	3.55
2020	3.77
2021	3.89
2022	4.01
2023	4.14
2024	4.27
2025	4.41
2026	4.55
2027	4.69
2028	4.84
2029	5.00
2030	5.16
2031	5.32
2032	5.49
2033	5.67
2034	5.85
2035	6.03
2036	6.23
2037	6.42
2038	6.63
2039	6.84
2040	7.06
2041	7.28
2042	7.52
2043	7.75

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
2015	0.034	0.026	0.034	0.026	3.288	0.000	0.000
2016	0.039	0.029	0.039	0.029	32.273	0.000	0.000
2017	0.039	0.028	0.039	0.028	61.519	0.000	0.000
2018	0.040	0.029	0.040	0.029	67.761	0.000	0.000
2019	0.039	0.028	0.039	0.028	63.444	0.000	0.000
2020	0.040	0.028	0.040	0.028	75.921	0.000	0.000
2021	0.054	0.044	0.054	0.044	77.402	0.000	0.000
2022	0.055	0.045	0.055	0.045	77.825	0.000	0.000
2023	0.057	0.047	0.057	0.047	73.439	0.000	0.000
2024	0.061	0.048	0.061	0.048	62.410	0.000	0.000
2025	0.064	0.050	0.064	0.050	66.084	0.000	0.000
2026	0.066	0.051	0.066	0.051	67.996	0.000	0.000
2027	0.066	0.051	0.066	0.051	76.567	0.000	0.000
2028	0.067	0.052	0.067	0.052	82.391	0.000	0.000
2029	0.068	0.054	0.068	0.054	79.780	0.000	0.000
2030	0.070	0.054	0.070	0.054	85.036	0.000	0.000
2031	0.071	0.056	0.071	0.056	90.786	0.000	0.000
2032	0.072	0.057	0.072	0.057	95.647	0.000	0.000
2033	0.073	0.058	0.073	0.058	98.844	0.000	0.000
2034	0.075	0.059	0.075	0.059	104.188	0.000	0.000
2035	0.076	0.060	0.076	0.060	103.676	0.000	0.000
2036	0.078	0.061	0.078	0.061	105.750	0.000	0.000
2037	0.079	0.063	0.079	0.063	107.865	0.000	0.000
2038	0.081	0.064	0.081	0.064	110.022	0.000	0.000
2039	0.083	0.065	0.083	0.065	112.222	0.000	0.000
2040	0.084	0.066	0.084	0.066	114.467	0.000	0.000
2041	0.086	0.068	0.086	0.068	116.756	0.000	0.000
2042	0.088	0.069	0.088	0.069	119.091	0.000	0.000
2043	0.089	0.070	0.089	0.070	121.473	0.000	0.000

Electric Line Losses

	Winter On Peak	Winter Off Peak	Summer On Peak	Summer Off Peak
Residential	1.068	1.068	1.068	1.068
C&I	1.068	1.068	1.068	1.068

Demand Line Losses

Winter Gen.	Summer Gen.	T&D Capacity
1.068	1.068	1.068
1.068	1.068	1.068

APPENDIX B – RESIDENTIAL ASSUMPTIONS

DTE (Michigan) **Measure Assumption Tab**

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	Per unit Fuel Saving	Useful Life	Measure Cost	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	-0.047	9	$0.85	Standard CFL Replacing Standard Halogen/Incandescent Bulb	19.20	$0.003	0.012
1002	Lighting	Specialty CFL (Replacing Specialty Incandescent)	SF	NLI	ROB	57.57	75%	43.12	0.056	0.056	-0.076	9	$2.35	Specialty CFL Replacing Specialty Halogen/Incandescent Bulb	11.16	$0.005	0.014
1003	Lighting	Standard LED (Replacing EISA Bulb)	SF	NLI	ROB	41.28	71%	29.11	0.038	0.038	-0.051	15	$7.22	Standard LED Replacing Standard Halogen/Incandescent Bulb	3.65	$0.016	0.023
1004	Lighting	Specialty LED (Replacing Specialty Incandescent)	SF	NLI	ROB	57.57	79%	45.40	0.059	0.059	-0.080	15	$9.30	Specialty LED Replacing Specialty Halogen/Incandescent Bulb	4.42	$0.013	0.020
1005	Lighting	Standard CFL (Replacing CFL)	SF	NLI	ROB	41.28	65%	26.82	0.035	0.035	-0.047	9	$0.85	Standard CFL Replacing CFL	19.20	$0.003	0.012
1006	Lighting	Specialty CFL (Replacing Specialty CFL)	SF	NLI	ROB	57.57	75%	43.12	0.056	0.056	-0.076	9	$2.35	Specialty CFL Replacing Specialty CFL Bulb	11.16	$0.005	0.014
1007	Lighting	Standard LED (Replacing CFL)	SF	NLI	ROB	14.45	16%	2.28	0.003	0.003	-0.004	15	$6.37	Standard LED Replacing Standard CFL Bulb	0.32	$0.176	0.184
1008	Lighting	Specialty LED (Replacing Specialty CFL)	SF	NLI	ROB	14.45	16%	2.28	0.003	0.003	-0.004	15	$6.95	Specialty LED Replacing Specialty CFL Bulb	0.30	$0.192	0.200
1009	Lighting	Reflector CFL (Replacing EISA Bulb)	SF	NLI	ROB	54.55	74%	40.28	0.052	0.052	-0.071	9	$2.93	Reflector CFL Replacing Standard Halogen/Incandescent Bulb	8.36	$0.006	0.016
1010	Lighting	Reflector LED (Replacing EISA Bulb)	SF	NLI	ROB	60.00	82%	49.09	0.064	0.064	-0.087	15	$23.22	Reflector LED Replacing Standard Halogen/Incandescent Bulb	1.91	$0.030	0.037
1011	Lighting	Reflector CFL (Replacing CFL)	SF	NLI	ROB	54.55	74%	40.28	0.052	0.052	-0.071	9	$2.93	Reflector CFL Replacing Reflector CFL Bulb	8.36	$0.006	0.016
1012	Lighting	Reflector LED (Replacing CFL Bulb)	SF	NLI	ROB	15.52	30%	4.62	0.006	0.006	-0.008	15	$20.29	Reflector LED Replacing Reflector CFL Bulb	0.21	$0.278	0.285
1013	Lighting	T8 Replacing T12 Linear Fluorescent Bulb	SF	NLI	RETRO	70.10	29%	20.57	0.025	0.025	0.000	8	$106.76	T8 Linear Tube Fluorescent Replacing T12 LTF	0.12	$0.474	0.485
1014	Lighting	Residential Occupancy Sensors	SF	NLI	RETRO	53.27	30%	15.98	0.044	0.044	0.000	10	$30.00	Residential Occupancy Sensors	0.47	$0.148	0.157
1015	Lighting	LED Nightlights	SF	NLI	RETRO	25.55	86%	21.90	0.006	0.006	0.000	12	$5.00	LED Nightlights Replacing Incandescent Nightlights	3.29	$0.016	0.024
1016	Lighting	DI Standard CFL (Replacing EISA Bulb)	SF	LI	DI	41.28	65%	26.82	0.035	0.035	-0.047	9	$2.35	Standard CFL Replacing Standard Halogen/Incandescent Bulb (DIRECT INSTALL)	3.47	$0.015	0.025
1017	Lighting	DI Specialty CFL (Replacing Specialty Incandescent)	SF	LI	DI	57.57	75%	43.12	0.056	0.056	-0.076	9	$3.85	Specialty CFL Replacing Specialty Halogen/Incandescent Bulb (DIRECT INSTALL)	3.41	$0.015	0.025
1018	Lighting	DI Standard LED (Replacing EISA Bulb)	SF	LI	DI	41.28	71%	29.11	0.038	0.038	-0.051	15	$8.72	Standard LED Replacing Standard Halogen/Incandescent Bulb (DIRECT INSTALL)	1.51	$0.038	0.045
1019	Lighting	DI Specialty LED (Replacing Specialty Incandescent)	SF	LI	DI	57.57	79%	45.40	0.059	0.059	-0.080	15	$10.80	Specialty LED Replacing Specialty Halogen/Incandescent Bulb (DIRECT INSTALL)	1.90	$0.030	0.037
1020	Lighting	DI Standard CFL (Replacing CFL)	SF	LI	DI	41.28	65%	26.82	0.035	0.035	-0.047	9	$2.35	Standard CFL Replacing Standard CFL Bulb (DIRECT INSTALL)	3.47	$0.015	0.025
1021	Lighting	DI Specialty CFL (Replacing Specialty CFL)	SF	LI	DI	57.57	75%	43.12	0.056	0.056	-0.076	9	$3.85	Specialty CFL Replacing Specialty CFL Bulb (DIRECT INSTALL)	3.41	$0.015	0.025
1022	Lighting	DI Standard LED (Replacing CFL)	SF	LI	DI	14.45	16%	2.28	0.003	0.003	-0.004	15	$8.72	Standard LED Replacing Standard CFL Bulb (DIRECT INSTALL)	0.12	$0.483	0.490
1023	Lighting	DI Specialty LED (Replacing Specialty CFL)	SF	LI	DI	14.45	16%	2.28	0.003	0.003	-0.004	15	$10.80	Specialty LED Replacing Specialty CFL Bulb (DIRECT INSTALL)	0.10	$0.598	0.605
1024	Lighting	DI Reflector CFL (Replacing EISA Bulb)	SF	LI	DI	54.55	74%	40.28	0.052	0.052	-0.071	9	$6.27	Reflector CFL Replacing Standard Halogen/Incandescent Bulb (DIRECT INSTALL)	1.95	$0.026	0.036
1025	Lighting	DI Reflector LED (Replacing EISA Bulb)	SF	LI	DI	60.00	82%	49.09	0.064	0.064	-0.087	15	$26.56	Reflector LED Replacing Standard Halogen/Incandescent Bulb (DIRECT INSTALL)	0.84	$0.068	0.076
1026	Lighting	DI Reflector CFL (Replacing CFL Bulb)	SF	LI	DI	54.55	74%	40.28	0.052	0.052	-0.071	9	$6.27	Reflector CFL Replacing Reflecor CFL Bulb (DIRECT INSTALL)	1.95	$0.026	0.036
1027	Lighting	DI Reflector LED (Replacing CFL Bulb)	SF	LI	DI	60.00	74%	44.48	0.058	0.058	-0.079	15	$26.56	Reflector LED Replacing Reflector CFL Bulb (DIRECT INSTALL)	0.76	$0.075	0.083
1028	Lighting	DI T8 Replacing T12 Linear Fluorescent Bulb	SF	LI	DI	70.10	29%	20.57	0.025	0.025	0.000	8	$106.76	T8 Linear Tube Fluorescent Replacing T12 LTF (DIRECT INSTALL)	0.06	$0.949	0.959
1029	Lighting	DI LED Nightlights	SF	LI	DI	25.55	86%	21.90	0.006	0.006	0.000	12	$5.00	LED Nightlights Replacing Incandescent Nightlights (DIRECT INSTALL)	1.65	$0.032	0.041
1030	Lighting	Standard CFL (Replacing EISA Bulb)	SF	ALL	NC	41.28	65%	26.82	0.035	0.035	-0.047	9	$0.85	Standard CFL Replacing Standard Halogen/Incandescent Bulb	19.20	$0.003	0.012
1031	Lighting	Specialty CFL (Replacing Specialty Incandescent)	SF	ALL	NC	57.57	75%	43.12	0.056	0.056	-0.076	9	$2.35	Specialty CFL Replacing Specialty Halogen/Incandescent Bulb	11.16	$0.005	0.014
1032	Lighting	Standard LED (Replacing EISA Bulb)	SF	ALL	NC	41.28	71%	29.11	0.038	0.038	-0.051	15	$7.22	Standard LED Replacing Standard Halogen/Incandescent Bulb	3.65	$0.016	0.023
1033	Lighting	Specialty LED (Replacing Specialty Incandescent)	SF	ALL	NC	57.57	79%	45.40	0.059	0.059	-0.080	15	$9.30	Specialty LED Replacing Specialty Halogen/Incandescent Bulb	4.42	$0.013	0.020
1034	Lighting	Standard CFL (Replacing CFL)	SF	ALL	NC	41.28	65%	26.82	0.035	0.035	-0.047	9	$0.85	Standard CFL Replacing CFL	19.20	$0.003	0.012
1035	Lighting	Specialty CFL (Replacing Specialty CFL)	SF	ALL	NC	57.57	75%	43.12	0.056	0.056	-0.076	9	$2.35	Specialty CFL Replacing Specialty CFL Bulb	11.16	$0.005	0.014
1036	Lighting	Standard LED (Replacing CFL)	SF	ALL	NC	14.45	16%	2.28	0.003	0.003	-0.004	15	$6.37	Standard LED Replacing Standard CFL Bulb	0.32	$0.176	0.184
1037	Lighting	Specialty LED (Replacing Specialty CFL)	SF	ALL	NC	14.45	16%	2.28	0.003	0.003	-0.004	15	$6.95	Specialty LED Replacing Specialty CFL Bulb	0.30	$0.192	0.200
1038	Lighting	Reflector CFL (Replacing EISA Bulb)	SF	ALL	NC	54.55	74%	40.28	0.052	0.052	-0.071	9	$2.93	Reflector CFL Replacing Standard Halogen/Incandescent Bulb	8.36	$0.006	0.016
1039	Lighting	Reflector LED (Replacing EISA Bulb)	SF	ALL	NC	60.00	82%	49.09	0.064	0.064	-0.087	15	$23.22	Reflector LED Replacing Standard Halogen/Incandescent Bulb	1.91	$0.030	0.037
1040	Lighting	Reflector CFL (Replacing CFL)	SF	ALL	NC	54.55	74%	40.28	0.052	0.052	-0.071	9	$2.93	Reflector CFL Replacing Reflector CFL Bulb	8.36	$0.006	0.016
1041	Lighting	Reflector LED (Replacing CFL Bulb)	SF	ALL	NC	15.52	30%	4.62	0.006	0.006	-0.008	15	$20.29	Reflector LED Replacing Reflector CFL Bulb	0.21	$0.278	0.285
1042	Lighting	Residential Occupancy Sensors	SF	ALL	NC	53.27	30%	15.98	0.044	0.044	0.000	10	$30.00	Residential Occupancy Sensors	0.47	$0.148	0.157
1043	Lighting	Standard CFL (Replacing EISA Bulb)	MF	NLI	ROB	41.28	65%	26.82	0.035	0.035	-0.047	9	$0.85	Standard CFL Replacing Standard Halogen/Incandescent Bulb	19.20	$0.003	0.012
1044	Lighting	Specialty CFL (Replacing Specialty Incandescent)	MF	NLI	ROB	57.57	75%	43.12	0.056	0.056	-0.076	9	$2.35	Specialty CFL Replacing Specialty Halogen/Incandescent Bulb	11.16	$0.005	0.014
1045	Lighting	Standard LED (Replacing EISA Bulb)	MF	NLI	ROB	41.28	71%	29.11	0.038	0.038	-0.051	15	$7.22	Standard LED Replacing Standard Halogen/Incandescent Bulb	3.65	$0.016	0.023
1046	Lighting	Specialty LED (Replacing Specialty Incandescent)	MF	NLI	ROB	57.57	79%	45.40	0.059	0.059	-0.080	15	$9.30	Specialty LED Replacing Specialty Halogen/Incandescent Bulb	4.42	$0.013	0.020
1047	Lighting	Standard CFL (Replacing CFL)	MF	NLI	ROB	41.28	65%	26.82	0.035	0.035	-0.047	9	$0.85	Standard CFL Replacing CFL	19.20	$0.003	0.012
1048	Lighting	Specialty CFL (Replacing Specialty CFL)	MF	NLI	ROB	57.57	75%	43.12	0.056	0.056	-0.076	9	$2.35	Specialty CFL Replacing Specialty CFL Bulb	11.16	$0.005	0.014
1049	Lighting	Standard LED (Replacing CFL)	MF	NLI	ROB	14.45	16%	2.28	0.003	0.003	-0.004	15	$6.37	Standard LED Replacing Standard CFL Bulb	0.32	$0.176	0.184
1050	Lighting	Specialty LED (Replacing Specialty CFL)	MF	NLI	ROB	14.45	16%	2.28	0.003	0.003	-0.004	15	$6.95	Specialty LED Replacing Specialty CFL Bulb	0.30	$0.192	0.200
1051	Lighting	Reflector CFL (Replacing EISA Bulb)	MF	NLI	ROB	54.55	74%	40.28	0.052	0.052	-0.071	9	$2.93	Reflector CFL Replacing Standard Halogen/Incandescent Bulb	8.36	$0.006	0.016
1052	Lighting	Reflector LED (Replacing EISA Bulb)	MF	NLI	ROB	60.00	82%	49.09	0.064	0.064	-0.087	15	$23.22	Reflector LED Replacing Standard Halogen/Incandescent Bulb	1.91	$0.030	0.037
1053	Lighting	Reflector CFL (Replacing CFL)	MF	NLI	ROB	54.55	74%	40.28	0.052	0.052	-0.071	9	$2.93	Reflector CFL Replacing Reflector CFL Bulb	8.36	$0.006	0.016
1054	Lighting	Reflector LED (Replacing CFL Bulb)	MF	NLI	ROB	15.52	30%	4.62	0.006	0.006	-0.008	15	$20.29	Reflector LED Replacing Reflector CFL Bulb	0.21	$0.278	0.285
1055	Lighting	T8 Replacing T12 Linear Fluorescent Bulb	MF	NLI	RETRO	70.10	29%	20.57	0.025	0.025	0.000	8	$106.76	T8 Linear Tube Fluorescent Replacing T12 LTF	0.12	$0.474	0.485
1056	Lighting	Residential Occupancy Sensors	MF	NLI	RETRO	53.27	30%	15.98	0.044	0.044	0.000	10	$30.00	Residential Occupancy Sensors	0.47	$0.148	0.157
1057	Lighting	LED Nightlights	MF	NLI	RETRO	25.55	86%	21.90	0.006	0.006	0.000	12	$5.00	LED Nightlights Replacing Incandescent Nightlights	3.29	$0.016	0.024
1058	Lighting	DI Standard CFL (Replacing EISA Bulb)	MF	LI	DI	41.28	65%	26.82	0.035	0.035	-0.047	9	$2.35	Standard CFL Replacing Standard Halogen/Incandescent Bulb (DIRECT INSTALL)	3.47	$0.015	0.025
1059	Lighting	DI Specialty CFL (Replacing Specialty Incandescent)	MF	LI	DI	57.57	75%	43.12	0.056	0.056	-0.076	9	$3.85	Specialty CFL Replacing Specialty Halogen/Incandescent Bulb (DIRECT INSTALL)	3.41	$0.015	0.025

DTE (Michigan) **Measure Assumption Tab**

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	Per unit Fuel Saving	Useful Life	Measure Cost	Measure Description	UCT Ratio	Utility $ / LFT- kWh Saved (-Admin)	Utility $ / LFT- kWh Saved (+Admin)
1060	Lighting	DI Standard LED (Replacing EISA Bulb)	MF	LI	DI	41.28	71%	29.11	0.038	0.038	-0.051	15	$8.72	Standard LED Replacing Standard Halogen/Incandescent Bulb (DIRECT INSTALL)	1.51	$0.038	0.045
1061	Lighting	DI Specialty LED (Replacing Specialty Incandescent)	MF	LI	DI	57.57	79%	45.40	0.059	0.059	-0.080	15	$10.80	Specialty LED Replacing Specialty Halogen/Incandescent Bulb (DIRECT INSTALL)	1.90	$0.030	0.037
1062	Lighting	DI Standard CFL (Replacing CFL)	MF	LI	DI	41.28	65%	26.82	0.035	0.035	-0.047	9	$2.35	Standard CFL Replacing Standard CFL Bulb (DIRECT INSTALL)	3.47	$0.015	0.025
1063	Lighting	DI Specialty CFL (Replacing Specialty CFL)	MF	LI	DI	57.57	75%	43.12	0.056	0.056	-0.076	9	$3.85	Specialty CFL Replacing Specialty CFL Bulb (DIRECT INSTALL)	3.41	$0.015	0.025
1064	Lighting	DI Standard LED (Replacing CFL)	MF	LI	DI	14.45	16%	2.28	0.003	0.003	-0.004	15	$8.72	Standard LED Replacing Standard CFL Bulb (DIRECT INSTALL)	0.12	$0.483	0.490
1065	Lighting	DI Specialty LED (Replacing Specialty CFL)	MF	LI	DI	14.45	16%	2.28	0.003	0.003	-0.004	15	$10.80	Specialty LED Replacing Specialty CFL Bulb (DIRECT INSTALL)	0.10	$0.598	0.605
1066	Lighting	DI Reflector CFL (Replacing EISA Bulb)	MF	LI	DI	54.55	74%	40.28	0.052	0.052	-0.071	9	$6.27	Reflector CFL Replacing Standard Halogen/Incandescent Bulb (DIRECT INSTALL)	1.95	$0.026	0.036
1067	Lighting	DI Reflector LED (Replacing EISA Bulb)	MF	LI	DI	60.00	82%	49.09	0.064	0.064	-0.087	15	$26.56	Reflector LED Replacing Standard Halogen/Incandescent Bulb (DIRECT INSTALL)	0.84	$0.068	0.076
1068	Lighting	DI Reflector CFL (Replacing CFL Bulb)	MF	LI	DI	54.55	74%	40.28	0.052	0.052	-0.071	9	$6.27	Reflector CFL Replacing Reflecor CFL Bulb (DIRECT INSTALL)	1.95	$0.026	0.036
1069	Lighting	DI Reflector LED (Replacing CFL Bulb)	MF	LI	DI	60.00	74%	44.48	0.058	0.058	-0.079	15	$26.56	Reflector LED Replacing Reflector CFL Bulb (DIRECT INSTALL)	0.76	$0.075	0.083
1070	Lighting	DI T8 Replacing T12 Linear Fluorescent Bulb	MF	LI	DI	70.10	29%	20.57	0.025	0.025	0.000	8	$106.76	T8 Linear Tube Fluorescent Replacing T12 LTF (DIRECT INSTALL)	0.06	$0.949	0.959
1071	Lighting	DI LED Nightlights	MF	LI	DI	25.55	86%	21.90	0.006	0.006	0.000	12	$5.00	LED Nightlights Replacing Incandescent Nightlights (DIRECT INSTALL)	1.65	$0.032	0.041
1072	Lighting	Standard CFL (Replacing EISA Bulb)	MF	ALL	NC	41.28	65%	26.82	0.035	0.035	-0.047	9	$0.85	Standard CFL Replacing Standard Halogen/Incandescent Bulb	19.20	$0.003	0.012
1073	Lighting	Specialty CFL (Replacing Specialty Incandescent)	MF	ALL	NC	57.57	75%	43.12	0.056	0.056	-0.076	9	$2.35	Specialty CFL Replacing Specialty Halogen/Incandescent Bulb	11.16	$0.005	0.014
1074	Lighting	Standard LED (Replacing EISA Bulb)	MF	ALL	NC	41.28	71%	29.11	0.038	0.038	-0.051	15	$7.22	Standard LED Replacing Standard Halogen/Incandescent Bulb	3.65	$0.016	0.023
1075	Lighting	Specialty LED (Replacing Specialty Incandescent)	MF	ALL	NC	57.57	79%	45.40	0.059	0.059	-0.080	15	$9.30	Specialty LED Replacing Specialty Halogen/Incandescent Bulb	4.42	$0.013	0.020
1076	Lighting	Standard CFL (Replacing CFL)	MF	ALL	NC	41.28	65%	26.82	0.035	0.035	-0.047	9	$0.85	Standard CFL Replacing CFL	19.20	$0.003	0.012
1077	Lighting	Specialty CFL (Replacing Specialty CFL)	MF	ALL	NC	57.57	75%	43.12	0.056	0.056	-0.076	9	$2.35	Specialty CFL Replacing Specialty CFL Bulb	11.16	$0.005	0.014
1078	Lighting	Standard LED (Replacing CFL)	MF	ALL	NC	14.45	16%	2.28	0.003	0.003	-0.004	15	$6.37	Standard LED Replacing Standard CFL Bulb	0.32	$0.176	0.184
1079	Lighting	Specialty LED (Replacing Specialty CFL)	MF	ALL	NC	14.45	16%	2.28	0.003	0.003	-0.004	15	$6.95	Specialty LED Replacing Specialty CFL Bulb	0.30	$0.192	0.200
1080	Lighting	Reflector CFL (Replacing EISA Bulb)	MF	ALL	NC	54.55	74%	40.28	0.052	0.052	-0.071	9	$2.93	Reflector CFL Replacing Standard Halogen/Incandescent Bulb	8.36	$0.006	0.016
1081	Lighting	Reflector LED (Replacing EISA Bulb)	MF	ALL	NC	60.00	82%	49.09	0.064	0.064	-0.087	15	$23.22	Reflector LED Replacing Standard Halogen/Incandescent Bulb	1.91	$0.030	0.037
1082	Lighting	Reflector CFL (Replacing CFL)	MF	ALL	NC	54.55	74%	40.28	0.052	0.052	-0.071	9	$2.93	Reflector CFL Replacing Reflector CFL Bulb	8.36	$0.006	0.016
1083	Lighting	Reflector LED (Replacing CFL Bulb)	MF	ALL	NC	15.52	30%	4.62	0.006	0.006	-0.008	15	$20.29	Reflector LED Replacing Reflector CFL Bulb	0.21	$0.278	0.285
1084	Lighting	Residential Occupancy Sensors	MF	ALL	NC	53.27	30%	15.98	0.044	0.044	0.000	10	$30.00	Residential Occupancy Sensors	0.47	$0.148	0.157
2001	Appliances	Refrigerators ENERGY STAR	SF	NLI	ROB	503.09	10%	48.37	0.008	0.008	0.000	16	$29.24	Installation of high efficiency replacement refrigerators	1.91	$0.037	0.044
2002	Appliances	Refrigerator recycling	SF	NLI	RETRO	1135.00	100%	1135.00	0.131	0.131	0.000	8	$78.00	Removal and recylcing of non-primary refrigerators	9.13	$0.006	0.017
2003	Appliances	Refrigerators ENERGY STAR	SF	LI	DI	503.09	10%	48.37	0.008	0.008	0.000	16	$29.24	Installation of high efficiency replacement refrigerators	0.95	$0.074	0.081
2004	Appliances	Refrigerator recycling	SF	LI	DI	1135.00	100%	1135.00	0.131	0.131	0.000	8	$78.00	Removal and recylcing of non-primary refrigerators	4.56	$0.013	0.023
2005	Appliances	Freezers ENERGY STAR	SF	All	ROB	334.59	10%	33.49	0.006	0.006	0.000	21	$10.00	Installation of high efficiency replacement freezers	4.54	$0.016	0.023
2006	Appliances	Freezer recycling	SF	All	RETRO	944.00	100%	944.00	0.116	0.116	0.000	8	$78.00	Removal and recylcing of non-primary freezers	7.73	$0.008	0.018
2007	Appliances	Room AC recycling	SF	All	RETRO	113.00	100%	113.00	0.107	0.107	0.000	8	$49.00	Removal and recycling of room air conditioners (non-primary or secondary)	3.27	$0.040	0.050
2008	Appliances	ENERGY STAR Dishwasher - elec water heater	SF	All	ROB	307.00	12%	37.00	0.064	0.064	0.000	10	$10.00	Installation of high efficiency dishwashers in homes with dishwashers and electric water heaters	9.42	$0.021	0.031
2009	Appliances	ENERGY STAR Dishwasher - gas water heater	SF	All	ROB	135.08	12%	16.28	0.050	0.050	0.094	10	$10.00	Installation of high efficiency dishwashers in homes with dishwashers and gas water heaters	7.05	$0.045	0.054
2010	Appliances	Clothes Washer ENERGY STAR, Electric Water heater, Gas Dryer	SF	All	ROB	241.66	35%	84.00	0.012	0.012	0.369	11	$36.57	Installation of ENERGY STAR replacement clothes washer in homes with electric water heating and gas dryers	2.22	$0.024	0.033
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	11	$36.57	Installation of ENERGY STAR replacement clothes washer in homes with electric water heating and electric dryers	3.45	$0.016	0.024
2012	Appliances	Clothes Washer ENERGY STAR, Gas water heater, Gas dryer	SF	All	ROB	42.29	39%	16.65	0.002	0.002	0.598	11	$36.57	Installation of ENERGY STAR replacement clothes washer in homes with gas water heating and gas dryers	1.25	$0.043	0.052
2013	Appliances	Clothes Washer ENERGY STAR, Gas water heater, Electric dryer	SF	All	ROB	398.73	27%	108.20	0.015	0.015	0.285	11	$36.57	Installation of ENERGY STAR replacement clothes washer in homes with gas water heating and electric dryers	2.57	$0.021	0.030
2014	Appliances	ENERGY STAR Electric Clothes Dryers	SF	All	ROB	768.92	21%	160.44	0.567	0.567	0.000	14	$152.00	Installation of high efficiency replacement electric clothes dryers	1.10	$0.062	0.069
2015	Appliances	ENERGY STAR Gas Clothes Dryers	SF	All	ROB	134.72	18%	24.78	0.088	0.088	0.444	14	$152.00	Installation of high efficiency replacement gas clothes dryers	0.36	$0.187	0.195
2016	Appliances	ENERGY STAR Dehumidifier	SF	All	ROB	624.22	27%	168.71	0.103	0.103	0.000	12	$50.00	Installation of high efficiency replacement dehumidifier	4.87	$0.021	0.029
2017	Appliances	Dehumidifier recycling	SF	All	RETRO	138.50	100%	138.50	0.035	0.035	0.000	8	$49.00	Retirement of secondary dehumidifiers	2.05	$0.032	0.043
2018	Appliances	Refrigerators ENERGY STAR	SF	All	NC	503.09	10%	48.37	0.008	0.008	0.000	16	$29.24	Installation of high efficiency replacement refrigerators	1.91	$0.037	0.044
2019	Appliances	Freezers ENERGY STAR	SF	All	NC	334.59	10%	33.49	0.006	0.006	0.000	21	$10.00	Installation of high efficiency replacement freezers	4.54	$0.016	0.023
2020	Appliances	ENERGY STAR Dishwasher - elec water heater	SF	All	NC	307.00	12%	37.00	0.064	0.064	0.000	10	$10.00	Installation of high efficiency dishwashers in homes with dishwashers and electric water heaters	9.42	$0.021	0.031
2021	Appliances	ENERGY STAR Dishwasher - gas water heater	SF	All	NC	135.08	12%	16.28	0.050	0.050	0.094	10	$10.00	Installation of high efficiency dishwashers in homes with dishwashers and gas water heaters	7.05	$0.045	0.054
2022	Appliances	Clothes Washer ENERGY STAR, Electric Water heater, Gas Dryer	SF	All	NC	241.66	35%	84.00	0.012	0.012	0.369	11	$36.57	Installation of ENERGY STAR replacement clothes washer in homes with electric water heating and gas dryers	2.22	$0.024	0.033
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	11	$36.57	Installation of ENERGY STAR replacement clothes washer in homes with electric water heating and electric dryers	3.45	$0.016	0.024
2024	Appliances	Clothes Washer ENERGY STAR, Gas water heater, Gas dryer	SF	All	NC	42.29	39%	16.65	0.002	0.002	0.598	11	$36.57	Installation of ENERGY STAR replacement clothes washer in homes with gas water heating and gas dryers	1.25	$0.043	0.052
2025	Appliances	Clothes Washer ENERGY STAR, Gas water heater, Electric dryer	SF	All	NC	398.73	27%	108.20	0.015	0.015	0.285	11	$36.57	Installation of ENERGY STAR replacement clothes washer in homes with gas water heating and electric dryers	2.57	$0.021	0.030
2026	Appliances	ENERGY STAR Electric Clothes Dryers	SF	All	NC	768.92	21%	160.44	0.567	0.567	0.000	14	$152.00	Installation of high efficiency replacement electric clothes dryers	1.10	$0.062	0.069
2027	Appliances	ENERGY STAR Gas Clothes Dryers	SF	All	NC	134.72	18%	24.78	0.088	0.088	0.444	14	$152.00	Installation of high efficiency replacement gas clothes dryers	0.36	$0.187	0.195

DTE (Michigan) **Measure Assumption Tab**

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	Per unit Fuel Saving	Useful Life	Measure Cost	Measure Description	UCT Ratio	Utility $ / LFT kWh Saved (-Admin)	Utility $ / LFT kWh Saved (+Admin)
2028	Appliances	ENERGY STAR Dehumidifier	SF	All	NC	624.22	27%	168.71	0.103	0.103	0.000	12	$50.00	Installation of high efficiency replacement dehumidifier	4.87	$0.021	0.029
2029	Appliances	Refrigerators ENERGY STAR	MF	NLI	ROB	503.09	10%	48.37	0.008	0.008	0.000	16	$29.24	Installation of high efficiency replacement refrigerators	1.91	$0.037	0.044
2030	Appliances	Refrigerator recycling	MF	NLI	RETRO	1135.00	100%	1135.00	0.131	0.131	0.000	8	$78.00	Removal and recylcing of non-primary refrigerators	9.13	$0.006	0.017
2031	Appliances	Refrigerators ENERGY STAR	MF	LI	DI	503.09	10%	48.37	0.008	0.008	0.000	16	$29.24	Installation of high efficiency replacement refrigerators	0.95	$0.074	0.081
2032	Appliances	Refrigerator recycling	MF	LI	DI	1135.00	100%	1135.00	0.131	0.131	0.000	8	$78.00	Removal and recylcing of non-primary refrigerators	4.56	$0.013	0.023
2033	Appliances	Freezers ENERGY STAR	MF	All	ROB	334.59	10%	33.49	0.006	0.006	0.000	21	$10.00	Installation of high efficiency replacement freezers	4.54	$0.016	0.023
2034	Appliances	Freezer recycling	MF	All	RETRO	944.00	100%	944.00	0.116	0.116	0.000	8	$78.00	Removal and recylcing of non-primary freezers	7.73	$0.008	0.018
2035	Appliances	Room AC recycling	MF	All	RETRO	113.00	100%	113.00	0.107	0.107	0.000	8	$49.00	Removal and recycling of room air conditioners (non-primary or secondary)	3.27	$0.040	0.050
2036	Appliances	ENERGY STAR Dishwasher - elec water heater	MF	All	ROB	307.00	12%	37.00	0.064	0.064	0.000	10	$10.00	Installation of high efficiency dishwashers in homes with dishwashers and electric water heaters	9.42	$0.021	0.031
2037	Appliances	ENERGY STAR Dishwasher - gas water heater	MF	All	ROB	135.08	12%	16.28	0.050	0.050	0.094	10	$10.00	Installation of high efficiency dishwashers in homes with dishwashers and gas water heaters	7.05	$0.045	0.054
2038	Appliances	Clothes Washer ENERGY STAR, Electric Water heater, Gas Dryer	MF	All	ROB	241.66	35%	84.00	0.012	0.012	0.369	11	$36.57	Installation of ENERGY STAR replacement clothes washer in homes with electric water heating and gas dryers	2.22	$0.024	0.033
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	11	$36.57	Installation of ENERGY STAR replacement clothes washer in homes with electric water heating and electric dryers	3.45	$0.016	0.024
2040	Appliances	Clothes Washer ENERGY STAR, Gas water heater, Gas dryer	MF	All	ROB	42.29	39%	16.65	0.002	0.002	0.598	11	$36.57	Installation of ENERGY STAR replacement clothes washer in homes with gas water heating and gas dryers	1.25	$0.043	0.052
2041	Appliances	Clothes Washer ENERGY STAR, Gas water heater, Electric dryer	MF	All	ROB	398.73	27%	108.20	0.015	0.015	0.285	11	$36.57	Installation of ENERGY STAR replacement clothes washer in homes with gas water heating and electric dryers	2.57	$0.021	0.030
2042	Appliances	ENERGY STAR Electric Clothes Dryers	MF	All	ROB	768.92	21%	160.44	0.567	0.567	0.000	14	$152.00	Installation of high efficiency replacement electric clothes dryers	1.10	$0.062	0.069
2043	Appliances	ENERGY STAR Gas Clothes Dryers	MF	All	ROB	134.72	18%	24.78	0.088	0.088	0.444	14	$152.00	Installation of high efficiency replacement gas clothes dryers	0.36	$0.187	0.195
2044	Appliances	ENERGY STAR Dehumidifier	MF	All	ROB	624.22	27%	168.71	0.103	0.103	0.000	12	$50.00	Installation of high efficiency replacement dehumidifier	4.87	$0.021	0.029
2045	Appliances	Dehumidifier recycling	MF	All	RETRO	138.50	100%	138.50	0.035	0.035	0.000	8	$49.00	Retirement of secondary dehumidifiers	2.05	$0.032	0.043
2046	Appliances	Refrigerators ENERGY STAR	MF	All	NC	503.09	10%	48.37	0.008	0.008	0.000	16	$29.24	Installation of high efficiency replacement refrigerators	1.91	$0.037	0.044
2047	Appliances	Freezers ENERGY STAR	MF	All	NC	334.59	10%	33.49	0.006	0.006	0.000	21	$10.00	Installation of high efficiency replacement freezers	4.54	$0.016	0.023
2048	Appliances	ENERGY STAR Dishwasher - elec water heater	MF	All	NC	307.00	12%	37.00	0.064	0.064	0.000	10	$10.00	Installation of high efficiency dishwashers in homes with dishwashers and electric water heaters	9.42	$0.021	0.031
2049	Appliances	ENERGY STAR Dishwasher - gas water heater	MF	All	NC	135.08	12%	16.28	0.050	0.050	0.094	10	$10.00	Installation of high efficiency dishwashers in homes with dishwashers and gas water heaters	7.05	$0.045	0.054
2050	Appliances	Clothes Washer ENERGY STAR, Electric Water heater, Gas Dryer	MF	All	NC	241.66	35%	84.00	0.012	0.012	0.369	11	$36.57	Installation of ENERGY STAR replacement clothes washer in homes with electric water heating and gas dryers	2.22	$0.024	0.033
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	11	$36.57	Installation of ENERGY STAR replacement clothes washer in homes with electric water heating and electric dryers	3.45	$0.016	0.024
2052	Appliances	Clothes Washer ENERGY STAR, Gas water heater, Gas dryer	MF	All	NC	42.29	39%	16.65	0.002	0.002	0.598	11	$36.57	Installation of ENERGY STAR replacement clothes washer in homes with gas water heating and gas dryers	1.25	$0.043	0.052
2053	Appliances	Clothes Washer ENERGY STAR, Gas water heater, Electric dryer	MF	All	NC	398.73	27%	108.20	0.015	0.015	0.285	11	$36.57	Installation of ENERGY STAR replacement clothes washer in homes with gas water heating and electric dryers	2.57	$0.021	0.030
2054	Appliances	ENERGY STAR Electric Clothes Dryers	MF	All	NC	768.92	21%	160.44	0.567	0.567	0.000	14	$152.00	Installation of high efficiency replacement electric clothes dryers	1.10	$0.062	0.069
2055	Appliances	ENERGY STAR Gas Clothes Dryers	MF	All	NC	134.72	18%	24.78	0.088	0.088	0.444	14	$152.00	Installation of high efficiency replacement gas clothes dryers	0.36	$0.187	0.195
2056	Appliances	ENERGY STAR Dehumidifier	MF	All	NC	624.22	27%	168.71	0.103	0.103	0.000	12	$50.00	Installation of high efficiency replacement dehumidifier	4.87	$0.021	0.029
3001	Electronics	Smart Strip plug outlet	SF	All	RETRO	-	-	24.00	0.017	0.017	0.000	5	$40.00	Installation of Tier 1 smart strip power strips for home enertertainment and office centers to eliminate standby power use	0.31	$0.216	0.231
3002	Electronics	Advanced Power Strip Tier 2	SF	All	RETRO	-	-	307.10	0.032	0.032	0.000	8	$70.00	Installation of Tier 2 smart strip power strips for home enertertainment and office centers to eliminate standby power use	2.51	$0.021	0.031
3003	Electronics	ENERGY STAR 6.0 TV (31-40")	SF	All	ROB	170.63	41%	70.30	0.039	0.039	0.000	6	$10.00	Installation of high efficiency replacement televisions (under 40" diameter category)	3.84	$0.016	0.029
3004	Electronics	ENERGY STAR 6.0 TV (over 60")	SF	All	ROB	452.64	57%	255.80	0.140	0.140	0.000	6	$10.00	Installation of high efficiency replacement televisions (over 40" diameter category)	13.96	$0.004	0.017
3005	Electronics	Efficient Set Top Box	SF	All	ROB	274.80	58%	160.60	0.018	0.018	0.000	4	$5.00	Installation of efficient set top box in place of standard efficiency unit	9.42	$0.005	0.023
3006	Electronics	ENERGY STAR Display	SF	All	ROB	66.20	61%	40.20	0.020	0.020	0.000	5	$10.00	Installation of high-efficiency displays (10% more efficient than ENERGY STAR minimum spec) for desktop computers in homes with deskptop computers	1.53	$0.032	0.047
3007	Electronics	ENERGY STAR PC	SF	All	ROB	238.50	32%	77.00	0.023	0.023	0.000	4	$8.00	Installation of high-efficiency desktop computers in homes with desktop computers	3.15	$0.016	0.034
3008	Electronics	ENERGY STAR Laptop	SF	All	ROB	50.30	72%	35.97	0.004	0.004	0.000	4	$8.00	Installation of high-efficiency laptop computers in homes with laptop computers	1.27	$0.035	0.053
3009	Electronics	Smart Strip plug outlet	SF	All	NC	-	-	24.00	0.017	0.017	0.000	5	$40.00	Installation of Tier 1 smart strip power strips for home enertertainment and office centers to eliminate standby power use	0.31	$0.216	0.231
3010	Electronics	Advanced Power Strip Tier 2	SF	All	NC	-	-	307.10	0.032	0.032	0.000	8	$70.00	Installation of Tier 2 smart strip power strips for home enertertainment and office centers to eliminate standby power use	2.51	$0.021	0.031
3011	Electronics	ENERGY STAR 6.0 TV (31-40")	SF	All	NC	170.63	41%	70.30	0.039	0.039	0.000	6	$10.00	Installation of high efficiency replacement televisions (under 40" diameter category)	3.84	$0.016	0.029
3012	Electronics	ENERGY STAR 6.0 TV (over 60")	SF	All	NC	452.64	57%	255.80	0.140	0.140	0.000	6	$10.00	Installation of high efficiency replacement televisions (over 40" diameter category)	13.96	$0.004	0.017
3013	Electronics	Efficient Set Top Box	SF	All	NC	274.80	58%	160.60	0.018	0.018	0.000	4	$5.00	Installation of efficient set top box in place of standard efficiency unit	9.42	$0.005	0.023
3014	Electronics	ENERGY STAR Display	SF	All	NC	66.20	61%	40.20	0.020	0.020	0.000	5	$10.00	Installation of high-efficiency displays (10% more efficient than ENERGY STAR minimum spec) for desktop computers in homes with deskptop computers	1.53	$0.032	0.047
3015	Electronics	ENERGY STAR PC	SF	All	NC	238.50	32%	77.00	0.023	0.023	0.000	4	$8.00	Installation of high-efficiency desktop computers in homes with desktop computers	3.15	$0.016	0.034
3016	Electronics	ENERGY STAR Laptop	SF	All	NC	50.30	72%	35.97	0.004	0.004	0.000	4	$8.00	Installation of high-efficiency laptop computers in homes with laptop computers	1.27	$0.035	0.053
3017	Electronics	Smart Strip plug outlet	MF	All	RETRO	-	-	24.00	0.017	0.017	0.000	5	$40.00	Installation of Tier 1 smart strip power strips for home enertertainment and office centers to eliminate standby power use	0.31	$0.216	0.231

DTE (Michigan) **Measure Assumption Tab**

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	Per unit Fuel Saving	Useful Life	Measure Cost	Measure Description	UCT Ratio	Utility $ / LFT- kWh Saved (-Admin)	Utility $ / LFT- kWh Saved (+Admin)
3018	Electronics	Advanced Power Strip Tier 2	MF	All	RETRO	-	-	307.10	0.032	0.032	0.000	8	$70.00	Installation of Tier 2 smart strip power strips for home enertertainment and office centers to eliminate standby power use	2.51	$0.021	0.031
3019	Electronics	ENERGY STAR 6.0 TV (31-40")	MF	All	ROB	170.63	41%	70.30	0.039	0.039	0.000	6	$10.00	Installation of high efficiency replacement televisions (under 40" diameter category)	3.84	$0.016	0.029
3020	Electronics	ENERGY STAR 6.0 TV (over 60")	MF	All	ROB	452.64	57%	255.80	0.140	0.140	0.000	6	$10.00	Installation of high efficiency replacement televisions (over 40" diameter category)	13.96	$0.004	0.017
3021	Electronics	Efficient Set Top Box	MF	All	ROB	274.80	58%	160.60	0.018	0.018	0.000	4	$5.00	Installation of efficient set top box in place of standard efficiency unit	9.42	$0.005	0.023
3022	Electronics	ENERGY STAR Display	MF	All	ROB	66.20	61%	40.20	0.020	0.020	0.000	5	$10.00	Installation of high-efficiency displays (10% more efficient than ENERGY STAR minimum spec) for desktop computers in homes with deskptop computers	1.53	$0.032	0.047
3023	Electronics	ENERGY STAR PC	MF	All	ROB	238.50	32%	77.00	0.023	0.023	0.000	4	$8.00	Installation of high-efficiency desktop computers in homes with desktop computers	3.15	$0.016	0.034
3024	Electronics	ENERGY STAR Laptop	MF	All	ROB	50.30	72%	35.97	0.004	0.004	0.000	4	$8.00	Installation of high-efficiency laptop computers in homes with laptop computers	1.27	$0.035	0.053
3025	Electronics	Smart Strip plug outlet	MF	All	NC	-	-	24.00	0.017	0.017	0.000	5	$40.00	Installation of Tier 1 smart strip power strips for home enertertainment and office centers to eliminate standby power use	0.31	$0.216	0.231
3026	Electronics	Advanced Power Strip Tier 2	MF	All	NC	-	-	307.10	0.032	0.032	0.000	8	$70.00	Installation of Tier 2 smart strip power strips for home enertertainment and office centers to eliminate standby power use	2.51	$0.021	0.031
3027	Electronics	ENERGY STAR 6.0 TV (31-40")	MF	All	NC	170.63	41%	70.30	0.039	0.039	0.000	6	$10.00	Installation of high efficiency replacement televisions (under 40" diameter category)	3.84	$0.016	0.029
3028	Electronics	ENERGY STAR 6.0 TV (over 60")	MF	All	NC	452.64	57%	255.80	0.140	0.140	0.000	6	$10.00	Installation of high efficiency replacement televisions (over 40" diameter category)	13.96	$0.004	0.017
3029	Electronics	Efficient Set Top Box	MF	All	NC	274.80	58%	160.60	0.018	0.018	0.000	4	$5.00	Installation of efficient set top box in place of standard efficiency unit	9.42	$0.005	0.023
3030	Electronics	ENERGY STAR Display	MF	All	NC	66.20	61%	40.20	0.020	0.020	0.000	5	$10.00	Installation of high-efficiency displays (10% more efficient than ENERGY STAR minimum spec) for desktop computers in homes with deskptop computers	1.53	$0.032	0.047
3031	Electronics	ENERGY STAR PC	MF	All	NC	238.50	32%	77.00	0.023	0.023	0.000	4	$8.00	Installation of high-efficiency desktop computers in homes with desktop computers	3.15	$0.016	0.034
3032	Electronics	ENERGY STAR Laptop	MF	All	NC	50.30	72%	35.97	0.004	0.004	0.000	4	$8.00	Installation of high-efficiency laptop computers in homes with laptop computers	1.27	$0.035	0.053
4001	Water Heating	Pipe Wrap - gas water heater	SF	NLI	RETRO	-	-	0.00	0.000	0.000	1.300	20	$65.00	Installing pipe wrap on hot water lines in homes that have gas water heaters	1.64		
4002	Water Heating	Pipe Wrap - electric water heater	SF	NLI	RETRO	385.00	67%	257.00	0.029	0.029	0.000	20	$65.00	Installing pipe wrap on hot water lines in homes that have electric water heaters	4.78	$0.014	0.021
4003	Water Heating	Low Flow Showerheads 1.5 gpm gas water heater	SF	NLI	RETRO	-	-	0.00	0.000	0.000	2.200	10	$34.20	Installation of low flow showerheads (1.5 gpm) in hoes with gas water heaters	3.38		
4004	Water Heating	Low Flow Showerheads 1.0 gpm gas water heater	SF	NLI	RETRO	-	-	0.00	0.000	0.000	1.470	10	$34.20	Installation of low flow showerheads (1.0 gpm) in hoes with gas water heaters	2.26		
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	10	$34.20	Installation of low flow showerheads (1.5 gpm) in homes with electric water heating	7.06	$0.008	0.017
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	10	$34.20	Installation of low flow showerheads (1.0 gpm) in homes with electric water heating	10.59	$0.005	0.015
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	10	$9.50	Installing 1.0 gpm low flow kitchen faucet aerators in homes with electric water heating	36.43	$0.002	0.011
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	10	$9.50	Installing 1.0 gpm low flow bathroom faucet aerators in homes with electric water heating	5.19	$0.011	0.020
4009	Water Heating	Low Flow Kitchen Faucet Aerators - 1.0 gpm gas water heater	SF	NLI	RETRO	-	-	0.00	0.000	0.000	2.104	10	$9.50	Installing 1.0 gpm low flow kitchen faucet aerators in homes with gas water heating	11.64		
4010	Water Heating	Low Flow Bathroom Faucet Aerators - 1.0 gpm gas water heater	SF	NLI	RETRO	-	-	0.00	0.000	0.000	0.300	10	$9.50	Installing 1.0 gpm low flow bathroom faucet aerators in homes with gas water heating	1.66		
4011	Water Heating	Pipe Wrap - gas water heater	SF	LI	DI	-	-	0.00	0.000	0.000	1.300	20	$65.00	Installing pipe wrap on hot water lines in homes that have gas water heaters	0.82		
4012	Water Heating	Pipe Wrap - electric water heater	SF	LI	DI	385.00	67%	257.00	0.029	0.029	0.000	20	$65.00	Installing pipe wrap on hot water lines in homes that have electric water heaters	2.39	$0.028	0.035
4013	Water Heating	Low Flow Showerheads 1.5 gpm gas water heater	SF	LI	DI	-	-	0.00	0.000	0.000	2.200	10	$34.20	Installation of low flow showerheads (1.5 gpm) in hoes with gas water heaters	1.69		
4014	Water Heating	Low Flow Showerheads 1.0 gpm gas water heater	SF	LI	DI	-	-	0.00	0.000	0.000	1.470	10	$34.20	Installation of low flow showerheads (1.0 gpm) in hoes with gas water heaters	1.13		
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	10	$34.20	Installation of low flow showerheads (1.5 gpm) in homes with electric water heating	3.53	$0.016	0.025
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	10	$34.20	Installation of low flow showerheads (1.0 gpm) in homes with electric water heating	5.30	$0.011	0.020
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	10	$9.50	Installing 1.0 gpm low flow kitchen faucet aerators in homes with electric water heating	18.21	$0.003	0.012
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	10	$9.50	Installing 1.0 gpm low flow bathroom faucet aerators in homes with electric water heating	2.60	$0.022	0.031
4019	Water Heating	Low Flow Kitchen Faucet Aerators - 1.0 gpm gas water heater	SF	LI	DI	-	-	0.00	0.000	0.000	2.104	10	$9.50	Installing 1.0 gpm low flow kitchen faucet aerators in homes with gas water heating	5.82		
4020	Water Heating	Low Flow Bathroom Faucet Aerators - 1.0 gpm gas water heater	SF	LI	DI	-	-	0.00	0.000	0.000	0.300	10	$9.50	Installing 1.0 gpm low flow bathroom faucet aerators in homes with gas water heating	0.83		
4021	Water Heating	TubSpout with Showerhead 1.5 GPM, electric DHW	SF	All	RETRO	-	-	542.23	0.043	0.043	0.000	10	$48.70	Installation of TubSpout technology in homes with low flow shower heads and electric water heating	7.77	$0.007	0.016
4022	Water Heating	TubSpout with Showerhead 1.5 GPM, gas DHW	SF	All	RETRO	-	-	0.00	0.000	0.000	0.000	10	$48.70	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	0.000	0.000	0.361	10	$38.20	Installation of thermostatic restriction valve on a 2.0 gpm showerhead in homes with a gas water heater	0.50		
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	10	$38.20	Installation of thermostatic restriction valve on a 2.0 gpm showerhead in homes with an electric water heater	1.56	$0.037	0.046
4025	Water Heating	Heat Pump Water Heaters, <= 55 gallons	SF	All	ROB	3696.00	52%	1913.00	0.218	0.218	0.000	13	$1,100.00	Installing an efficient heat pump water heater in place of a standard efficiency storage tank water heater	1.55	$0.039	0.047
4026	Water Heating	High Efficiency Gas Water Heater 0.67 EF, <= 55 gallons	SF	All	ROB	-	-	0.00	0.000	0.000	2.100	13	$440.00	Installing an efficient (0.67 EF) replacement gas storage tank water heater instead of a standard efficiency gas storage tank water heater	0.30		
4027	Water Heating	Super Efficiency Gas Water Heater 0.80 EF, <= 55 gallons	SF	All	ROB	-	-	0.00	0.000	0.000	5.000	13	$520.00	Installing an efficient (0.80 EF) replacement gas storage tank water heater instead of a standard efficiency gas storage tank water heater	0.61		

DTE (Michigan) **Measure Assumption Tab**

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	Per unit Fuel Saving	Useful Life	Measure Cost	Measure Description	UCT Ratio	Utility $ / LFT- kWh Saved (-Admin)	Utility $ / LFT- kWh Saved (+Admin)
4028	Water Heating	Instant Gas Water Heater	SF	All	ROB	-	-	0.00	0.000	0.000	5.400	20	$602.00	Installing an efficient replacement instantaneous gas tankless water heater instead of a standard efficiency gas storage tank water heater	0.73		
4029	Water Heating	Solar Domestic Hot Water - electric water heater	SF	All	ROB	3696.00	56%	2059.00	0.600	0.600	0.000	20	$4,500.00	Installing a solar domestic water heater in homes with electric water heating	0.63	$0.122	0.129
4030	Water Heating	Solar Domestic Hot Water - gas water heater	SF	All	ROB	-	-	0.00	0.000	0.000	9.500	20	$4,500.00	Installing a solar domestic water heater in homes with gas water heating	0.17		
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	20	$1,022.00	Installing a gravity film heat exchanger in homes with electric water heating	0.25	$0.275	0.282
4032	Water Heating	Gravity Film Heat Exchanger GFX gas water heater	SF	All	RETRO	-	-	0.00	0.000	0.000	1.015	20	$1,022.00	Installing a gravity film heat exchanger in homes with gas water heating	0.08		
4033	Water Heating	Pipe Wrap - gas water heater	SF	All	NC	-	-	0.00	0.000	0.000	1.300	20	$65.00	Installing pipe wrap on hot water lines in homes that have gas water heaters	1.64		
4034	Water Heating	Pipe Wrap - electric water heater	SF	All	NC	385.00	67%	257.00	0.029	0.029	0.000	20	$65.00	Installing pipe wrap on hot water lines in homes that have electric water heaters	4.78	$0.014	0.021
4035	Water Heating	Low Flow Showerheads 1.5 gpm gas water heater	SF	All	NC	-	-	0.00	0.000	0.000	2.200	10	$34.20	Installation of low flow showerheads (1.5 gpm) in hoes with gas water heaters	3.38		
4036	Water Heating	Low Flow Showerheads 1.0 gpm gas water heater	SF	All	NC	-	-	0.00	0.000	0.000	1.470	10	$34.20	Installation of low flow showerheads (1.0 gpm) in hoes with gas water heaters	2.26		
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	10	$34.20	Installation of low flow showerheads (1.5 gpm) in homes with electric water heating	7.06	$0.008	0.017
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	10	$34.20	Installation of low flow showerheads (1.0 gpm) in homes with electric water heating	10.59	$0.005	0.015
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	10	$9.50	Installing 1.0 gpm low flow kitchen faucet aerators in homes with electric water heating	36.43	$0.002	0.011
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	10	$9.50	Installing 1.0 gpm low flow bathroom faucet aerators in homes with electric water heating	5.19	$0.011	0.020
4041	Water Heating	Low Flow Kitchen Faucet Aerators - 1.0 gpm gas water heater	SF	All	NC	-	-	0.00	0.000	0.000	2.104	10	$9.50	Installing 1.0 gpm low flow kitchen faucet aerators in homes with gas water heating	11.64		
4042	Water Heating	Low Flow Bathroom Faucet Aerators - 1.0 gpm gas water heater	SF	All	NC	-	-	0.00	0.000	0.000	0.300	10	$9.50	Installing 1.0 gpm low flow bathroom faucet aerators in homes with gas water heating	1.66		
4043	Water Heating	TubSpout with Showerhead 1.5 GPM, electric DHW	SF	All	NC	-	-	542.23	0.043	0.043	0.000	10	$48.70	Installation of TubSpout technology in homes with low flow shower heads and electric water heating	7.77	$0.007	0.016
4044	Water Heating	TubSpout with Showerhead 1.5 GPM, gas DHW	SF	All	NC	-	-	0.00	0.000	0.000	0.000	10	$48.70	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	0.000	0.000	0.361	10	$38.20	Installation of thermostatic restriction valve on a 2.0 gpm showerhead in homes with a gas water heater	0.50		
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	10	$38.20	Installation of thermostatic restriction valve on a 2.0 gpm showerhead in homes with an electric water heater	1.56	$0.037	0.046
4047	Water Heating	Heat Pump Water Heaters, <= 55 gallons	SF	All	NC	3696.00	52%	1913.00	0.218	0.218	0.000	13	$1,100.00	Installing an efficient heat pump water heater in place of a standard efficiency storage tank water heater	1.55	$0.039	0.047
4048	Water Heating	High Efficiency Gas Water Heater 0.67 EF, <= 55 gallons	SF	All	NC	-	-	0.00	0.000	0.000	2.100	13	$440.00	Installing an efficient (0.67 EF) replacement gas storage tank water heater instead of a standard efficiency gas storage tank water heater	0.30		
4049	Water Heating	Super Efficiency Gas Water Heater 0.80 EF, <= 55 gallons	SF	All	NC	-	-	0.00	0.000	0.000	5.000	13	$520.00	Installing an efficient (0.80 EF) replacement gas storage tank water heater instead of a standard efficiency gas storage tank water heater	0.61		
4050	Water Heating	Instant Gas Water Heater	SF	All	NC	-	-	0.00	0.000	0.000	5.400	20	$602.00	Installing an efficient replacement instantaneous gas tankless water heater instead of a standard efficiency gas storage tank water heater	0.73		
4051	Water Heating	Solar Domestic Hot Water - electric water heater	SF	All	NC	3696.00	56%	2059.00	0.600	0.600	0.000	20	$4,500.00	Installing a solar domestic water heater in homes with electric water heating	0.63	$0.122	0.129
4052	Water Heating	Solar Domestic Hot Water - gas water heater	SF	All	NC	-	-	0.00	0.000	0.000	9.500	20	$4,500.00	Installing a solar domestic water heater in homes with gas water heating	0.17		
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	20	$1,022.00	Installing a gravity film heat exchanger in homes with electric water heating	0.25	$0.275	0.282
4054	Water Heating	Gravity Film Heat Exchanger GFX gas water heater	SF	All	NC	-	-	0.00	0.000	0.000	1.015	20	$1,022.00	Installing a gravity film heat exchanger in homes with gas water heating	0.08		
4055	Water Heating	Pipe Wrap - gas water heater	MF	NLI	RETRO	-	-	0.00	0.000	0.000	1.300	20	$65.00	Installing pipe wrap on hot water lines in homes that have gas water heaters	1.64		
4056	Water Heating	Pipe Wrap - electric water heater	MF	NLI	RETRO	385.00	67%	257.00	0.029	0.029	0.000	20	$65.00	Installing pipe wrap on hot water lines in homes that have electric water heaters	4.78	$0.014	0.021
4057	Water Heating	Low Flow Showerheads 1.5 gpm gas water heater	MF	NLI	RETRO	-	-	0.00	0.000	0.000	2.150	10	$34.20	Installation of low flow showerheads (1.5 gpm) in hoes with gas water heaters	3.30		
4058	Water Heating	Low Flow Showerheads 1.0 gpm gas water heater	MF	NLI	RETRO	-	-	0.00	0.000	0.000	1.470	10	$34.20	Installation of low flow showerheads (1.0 gpm) in hoes with gas water heaters	2.26		
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	10	$34.20	Installation of low flow showerheads (1.5 gpm) in homes with electric water heating	6.90	$0.008	0.017
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	10	$34.20	Installation of low flow showerheads (1.0 gpm) in homes with electric water heating	10.35	$0.006	0.015
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	10	$9.50	Installing 1.0 gpm low flow kitchen faucet aerators in homes with electric water heating	26.35	$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	10	$9.50	Installing 1.0 gpm low flow bathroom faucet aerators in homes with electric water heating	5.36	$0.011	0.020
4063	Water Heating	Low Flow Kitchen Faucet Aerators - 1.0 gpm gas water heater	MF	NLI	RETRO	-	-	0.00	0.000	0.000	1.522	10	$9.50	Installing 1.0 gpm low flow kitchen faucet aerators in homes with gas water heating	8.42		
4064	Water Heating	Low Flow Bathroom Faucet Aerators - 1.0 gpm gas water heater	MF	NLI	RETRO	-	-	0.00	0.000	0.000	0.310	10	$9.50	Installing 1.0 gpm low flow bathroom faucet aerators in homes with gas water heating	1.72		
4065	Water Heating	Pipe Wrap - gas water heater	MF	LI	DI	-	-	0.00	0.000	0.000	1.300	20	$65.00	Installing pipe wrap on hot water lines in homes that have gas water heaters	0.82		
4066	Water Heating	Pipe Wrap - electric water heater	MF	LI	DI	385.00	67%	257.00	0.029	0.029	0.000	20	$65.00	Installing pipe wrap on hot water lines in homes that have electric water heaters	2.39	$0.028	0.035
4067	Water Heating	Low Flow Showerheads 1.5 gpm gas water heater	MF	LI	DI	-	-	0.00	0.000	0.000	2.150	10	$34.20	Installation of low flow showerheads (1.5 gpm) in hoes with gas water heaters	1.65		
4068	Water Heating	Low Flow Showerheads 1.0 gpm gas water heater	MF	LI	DI	-	-	0.00	0.000	0.000	1.470	10	$34.20	Installation of low flow showerheads (1.0 gpm) in hoes with gas water heaters	1.13		
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	10	$34.20	Installation of low flow showerheads (1.5 gpm) in homes with electric water heating	3.45	$0.017	0.026
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	10	$34.20	Installation of low flow showerheads (1.0 gpm) in homes with electric water heating	5.18	$0.011	0.020
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	10	$9.50	Installing 1.0 gpm low flow kitchen faucet aerators in homes with electric water heating	13.17	$0.004	0.014

DTE (Michigan) **Measure Assumption Tab**

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	Per unit Fuel Saving	Useful Life	Measure Cost	Measure Description	UCT Ratio	Utility $ / LFT- kWh Saved (-Admin)	Utility $ / LFT- kWh Saved (+Admin)
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	10	$9.50	Installing 1.0 gpm low flow bathroom faucet aerators in homes with electric water heating	2.68	$0.021	0.030
4073	Water Heating	Low Flow Kitchen Faucet Aerators - 1.0 gpm gas water heater	MF	LI	DI	-	-	0.00	0.000	0.000	1.522	10	$9.50	Installing 1.0 gpm low flow kitchen faucet aerators in homes with gas water heating	4.21		
4074	Water Heating	Low Flow Bathroom Faucet Aerators - 1.0 gpm gas water heater	MF	LI	DI	-	-	0.00	0.000	0.000	0.310	10	$9.50	Installing 1.0 gpm low flow bathroom faucet aerators in homes with gas water heating	0.86		
4075	Water Heating	TubSpout with Showerhead 1.5 GPM, electric DHW	MF	All	RETRO	-	-	530.01	0.042	0.042	0.000	10	$48.70	Installation of TubSpout technology in homes with low flow shower heads and electric water heating	7.59	$0.007	0.016
4076	Water Heating	TubSpout with Showerhead 1.5 GPM, gas DHW	MF	All	RETRO	-	-	0.00	0.000	0.000	0.000	10	$48.70	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	0.000	0.000	0.353	10	$38.20	Installation of thermostatic restriction valve on a 2.0 gpm showerhead in homes with a gas water heater	0.49		
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	10	$38.20	Installation of thermostatic restriction valve on a 2.0 gpm showerhead in homes with an electric water heater	1.52	$0.038	0.047
4079	Water Heating	Heat Pump Water Heaters, <= 55 gallons	MF	All	ROB	3111.00	52%	1610.00	0.184	0.184	0.000	13	$1,100.00	Installing an efficient heat pump water heater in place of a standard efficiency storage tank water heater	1.30	$0.046	0.054
4080	Water Heating	High Efficiency Gas Water Heater 0.67 EF, <= 55 gallons	MF	All	ROB	-	-	0.00	0.000	0.000	1.700	13	$440.00	Installing an efficient (0.67 EF) replacement gas storage tank water heater instead of a standard efficiency gas storage tank water heater	0.24		
4081	Water Heating	Super Efficiency Gas Water Heater 0.80 EF, <= 55 gallons	MF	All	ROB	-	-	0.00	0.000	0.000	4.200	13	$520.00	Installing an efficient (0.80 EF) replacement gas storage tank water heater instead of a standard efficiency gas storage tank water heater	0.51		
4082	Water Heating	Instant Gas Water Heater	MF	All	ROB	-	-	0.00	0.000	0.000	4.500	20	$602.00	Installing an efficient replacement instantaneous gas tankless water heater instead of a standard efficiency gas storage tank water heater	0.61		
4083	Water Heating	Solar Domestic Hot Water - electric water heater	MF	All	ROB	3111.00	66%	2059.00	0.600	0.600	0.000	20	$4,500.00	Installing a solar domestic water heater in homes with electric water heating	0.63	$0.122	0.129
4084	Water Heating	Solar Domestic Hot Water - gas water heater	MF	All	ROB	-	-	0.00	0.000	0.000	9.500	20	$4,500.00	Installing a solar domestic water heater in homes with gas water heating	0.17		
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	20	$1,022.00	Installing a gravity film heat exchanger in homes with electric water heating	0.16	$0.424	0.431
4086	Water Heating	Gravity Film Heat Exchanger GFX gas water heater	MF	All	RETRO	-	-	0.00	0.000	0.000	0.658	20	$1,022.00	Installing a gravity film heat exchanger in homes with gas water heating	0.05		
4087	Water Heating	Pipe Wrap - gas water heater	MF	All	NC	-	-	0.00	0.000	0.000	1.300	20	$65.00	Installing pipe wrap on hot water lines in homes that have gas water heaters	1.64		
4088	Water Heating	Pipe Wrap - electric water heater	MF	All	NC	385.00	67%	257.00	0.029	0.029	0.000	20	$65.00	Installing pipe wrap on hot water lines in homes that have electric water heaters	4.78	$0.014	0.021
4089	Water Heating	Low Flow Showerheads 1.5 gpm gas water heater	MF	All	NC	-	-	0.00	0.000	0.000	2.150	10	$34.20	Installation of low flow showerheads (1.5 gpm) in hoes with gas water heaters	3.30		
4090	Water Heating	Low Flow Showerheads 1.0 gpm gas water heater	MF	All	NC	-	-	0.00	0.000	0.000	1.470	10	$34.20	Installation of low flow showerheads (1.0 gpm) in hoes with gas water heaters	2.26		
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	10	$34.20	Installation of low flow showerheads (1.5 gpm) in homes with electric water heating	6.90	$0.008	0.017
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	10	$34.20	Installation of low flow showerheads (1.0 gpm) in homes with electric water heating	10.35	$0.006	0.015
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	10	$9.50	Installing 1.0 gpm low flow kitchen faucet aerators in homes with electric water heating	26.35	$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	10	$9.50	Installing 1.0 gpm low flow bathroom faucet aerators in homes with electric water heating	5.36	$0.011	0.020
4095	Water Heating	Low Flow Kitchen Faucet Aerators - 1.0 gpm gas water heater	MF	All	NC	-	-	0.00	0.000	0.000	1.522	10	$9.50	Installing 1.0 gpm low flow kitchen faucet aerators in homes with gas water heating	8.42		
4096	Water Heating	Low Flow Bathroom Faucet Aerators - 1.0 gpm gas water heater	MF	All	NC	-	-	0.00	0.000	0.000	0.310	10	$9.50	Installing 1.0 gpm low flow bathroom faucet aerators in homes with gas water heating	1.72		
4097	Water Heating	TubSpout with Showerhead 1.5 GPM, electric DHW	MF	All	NC	-	-	530.01	0.042	0.042	0.000	10	$48.70	Installation of TubSpout technology in homes with low flow shower heads and electric water heating	7.59	$0.007	0.016
4098	Water Heating	TubSpout with Showerhead 1.5 GPM, gas DHW	MF	All	NC	-	-	0.00	0.000	0.000	0.000	10	$48.70	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	0.000	0.000	0.353	10	$38.20	Installation of thermostatic restriction valve on a 2.0 gpm showerhead in homes with a gas water heater	0.49		
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	10	$38.20	Installation of thermostatic restriction valve on a 2.0 gpm showerhead in homes with an electric water heater	1.52	$0.038	0.047
4101	Water Heating	Heat Pump Water Heaters, <= 55 gallons	MF	All	NC	3111.00	52%	1610.00	0.184	0.184	0.000	13	$1,100.00	Installing an efficient heat pump water heater in place of a standard efficiency storage tank water heater	1.30	$0.046	0.054
4102	Water Heating	High Efficiency Gas Water Heater 0.67 EF, <= 55 gallons	MF	All	NC	-	-	0.00	0.000	0.000	1.700	13	$440.00	Installing an efficient (0.67 EF) replacement gas storage tank water heater instead of a standard efficiency gas storage tank water heater	0.24		
4103	Water Heating	Super Efficiency Gas Water Heater 0.80 EF, <= 55 gallons	MF	All	NC	-	-	0.00	0.000	0.000	4.200	13	$520.00	Installing an efficient (0.80 EF) replacement gas storage tank water heater instead of a standard efficiency gas storage tank water heater	0.51		
4104	Water Heating	Instant Gas Water Heater	MF	All	NC	-	-	0.00	0.000	0.000	4.500	20	$602.00	Installing an efficient replacement instantaneous gas tankless water heater instead of a standard efficiency gas storage tank water heater	0.61		
4105	Water Heating	Solar Domestic Hot Water - electric water heater	MF	All	NC	3111.00	66%	2059.00	0.600	0.600	0.000	20	$4,500.00	Installing a solar domestic water heater in homes with electric water heating	0.63	$0.122	0.129
4106	Water Heating	Solar Domestic Hot Water - gas water heater	MF	All	NC	-	-	0.00	0.000	0.000	9.500	20	$4,500.00	Installing a solar domestic water heater in homes with gas water heating	0.17		
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	20	$1,022.00	Installing a gravity film heat exchanger in homes with electric water heating	0.16	$0.424	0.431
4108	Water Heating	Gravity Film Heat Exchanger GFX gas water heater	MF	All	NC	-	-	0.00	0.000	0.000	0.658	20	$1,022.00	Installing a gravity film heat exchanger in homes with gas water heating	0.05		
5001	HVAC Shell	Infiltration reduction - 30%	SF	NLI	RETRO	-	-	56.41	0.071	0.112	6.884	13	$190.08	Air sealing (30% infiltration reduction) in homes with gas heating and central AC	3.00	$0.054	0.062
5002	HVAC Shell	Infiltration reduction - 50%	SF	NLI	RETRO	-	-	96.70	0.119	0.189	11.435	13	$190.08	Air sealing (50% infiltration reduction) in homes with gas heating and central AC	5.01	$0.032	0.040
5003	HVAC Shell	Crawlspace Wall Insulation	SF	NLI	RETRO	-	-	-46.66	-0.026	-0.027	3.151	25	$552.11	Installing crawlspace wall insulation in homes with unconditioned crawlspaces and gas heating and central AC	0.33	$0.000	0.006
5004	HVAC Shell	Basement Wall Insulation	SF	NLI	RETRO	-	-	-39.11	-0.048	-0.052	9.214	25	$1,104.21	Installing basement wall insulation in homes with unconditioned basements and gas heating and central AC	0.64	$0.000	0.006
5005	HVAC Shell	Floor Insulation	SF	NLI	RETRO	-	-	-61.73	-0.025	-0.026	5.233	25	$819.88	Installing floor wall insulation in homes with unconditioned basements or crawl spaces and gas heating and central AC	0.44	$0.000	0.006

DTE (Michigan) **Measure Assumption Tab**

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	Per unit Fuel Saving	Useful Life	Measure Cost	Measure Description	UCT Ratio	Utility $ / LFT- kWh Saved (-Admin)	Utility $ / LFT- kWh Saved (+Admin)
5006	HVAC Shell	Wall Insulation	SF	NLI	RETRO	-	-	110.44	0.096	0.113	11.168	25	$3,041.11	Installing wall insulation in homes with gas heating and central AC	0.44	$0.332	0.338
5007	HVAC Shell	R-38 Roof Insulation	SF	NLI	RETRO	-	-	42.77	0.046	0.043	4.233	20	$1,553.26	Installing R-38 roof insulation in homes with poor attic insulation and gas heating and central AC	0.30	$0.529	0.535
5008	HVAC Shell	R-60 Roof Insulation	SF	NLI	RETRO	-	-	60.38	0.065	0.068	5.967	20	$3,351.78	Installing R-60 roof insulation in homes with mediocre attic insulation and gas heating and central AC	0.20	$0.810	0.816
5009	HVAC Shell	Infiltration reduction - 30%	SF	NLI	RETRO	-	-	29.92	0.000	0.000	7.155	13	$190.08	Air sealing (30% infiltration reduction) in homes with gas heating and no central AC	2.50	$0.021	0.029
5010	HVAC Shell	Infiltration reduction - 50%	SF	NLI	RETRO	-	-	49.90	0.000	0.000	11.922	13	$190.08	Air sealing (50% infiltration reduction) in homes with gas heating and no central AC	4.16	$0.013	0.020
5011	HVAC Shell	Crawlspace Wall Insulation	SF	NLI	RETRO	-	-	11.81	0.000	0.000	4.356	25	$552.11	Installing crawlspace wall insulation in homes with unconditioned crawlspaces and gas heating and no central AC	0.74	$0.079	0.085
5012	HVAC Shell	Basement Wall Insulation	SF	NLI	RETRO	-	-	33.90	0.000	0.000	9.859	25	$1,104.21	Installing basement wall insulation in homes with unconditioned basements and gas heating and no central AC	0.85	$0.069	0.075
5013	HVAC Shell	Floor Insulation	SF	NLI	RETRO	-	-	20.15	0.000	0.000	4.215	25	$819.88	Installing floor wall insulation in homes with unconditioned basements or crawl spaces and gas heating and no central AC	0.50	$0.118	0.124
5014	HVAC Shell	Wall Insulation	SF	NLI	RETRO	-	-	46.23	0.000	0.000	11.498	25	$3,041.11	Installing wall insulation in homes with gas heating and no central AC	0.36	$0.162	0.168
5015	HVAC Shell	R-38 Roof Insulation	SF	NLI	RETRO	-	-	17.58	0.000	0.000	4.737	20	$1,553.26	Installing R-38 roof insulation in homes with poor attic insulation and gas heating and no central AC	0.26	$0.216	0.223
5016	HVAC Shell	R-60 Roof Insulation	SF	NLI	RETRO	-	-	24.59	0.000	0.000	6.519	20	$3,351.78	Installing R-60 roof insulation in homes with mediocre attic insulation and gas heating and no central AC	0.17	$0.339	0.346
5017	HVAC Shell	Infiltration reduction - 30%	SF	NLI	RETRO	-	-	1568.82	0.112	0.071	0.000	13	$190.08	Air sealing (30% infiltration reduction) in homes with electric heating and central AC	7.22	$0.008	0.016
5018	HVAC Shell	Infiltration reduction - 50%	SF	NLI	RETRO	-	-	2602.15	0.189	0.119	0.000	13	$190.08	Air sealing (50% infiltration reduction) in homes with electric heating and central AC	12.00	$0.005	0.013
5019	HVAC Shell	Crawlspace Wall Insulation	SF	NLI	RETRO	-	-	637.33	-0.027	-0.026	0.000	25	$552.11	Installing crawlspace wall insulation in homes with unconditioned crawlspaces and electric heating and central AC	1.22	$0.045	0.051
5020	HVAC Shell	Basement Wall Insulation	SF	NLI	RETRO	-	-	1969.24	-0.052	-0.048	0.000	25	$1,104.21	Installing basement wall insulation in homes with unconditioned basements and electric heating and central AC	1.94	$0.029	0.035
5021	HVAC Shell	Floor Insulation	SF	NLI	RETRO	-	-	1094.57	-0.026	-0.025	0.000	25	$819.88	Installing floor wall insulation in homes with unconditioned basements or crawl spaces and electric heating and central AC	1.46	$0.039	0.045
5022	HVAC Shell	Wall Insulation	SF	NLI	RETRO	-	-	2559.49	0.113	0.096	0.000	25	$3,041.11	Installing wall insulation in homes with electric heating and central AC	1.03	$0.062	0.068
5023	HVAC Shell	R-38 Roof Insulation	SF	NLI	RETRO	-	-	964.87	0.043	0.046	0.013	20	$1,553.26	Installing R-38 roof insulation in homes with poor attic insulation and electric heating and central AC	0.68	$0.090	0.097
5024	HVAC Shell	R-60 Roof Insulation	SF	NLI	RETRO	-	-	1358.43	0.068	0.065	0.013	20	$3,351.78	Installing R-60 roof insulation in homes with mediocre attic insulation and electric heating and central AC	0.45	$0.138	0.145
5025	HVAC Shell	Infiltration reduction - 50%	SF	LI	DI	-	-	96.70	0.119	0.189	11.435	13	$190.08	Air sealing (50% infiltration reduction) in homes with gas heating and central AC	2.50	$0.064	0.072
5026	HVAC Shell	Crawlspace Wall Insulation	SF	LI	DI	-	-	-46.66	-0.026	-0.027	3.151	25	$552.11	Installing crawlspace wall insulation in homes with unconditioned crawlspaces and gas heating and central AC	0.17	$0.000	0.006
5027	HVAC Shell	Basement Wall Insulation	SF	LI	DI	-	-	-39.11	-0.048	-0.052	9.214	25	$1,104.21	Installing basement wall insulation in homes with unconditioned basements and gas heating and central AC	0.32	$0.000	0.006
5028	HVAC Shell	Floor Insulation	SF	LI	DI	-	-	-61.73	-0.025	-0.026	5.233	25	$819.88	Installing floor wall insulation in homes with unconditioned basements or crawl spaces and gas heating and central AC	0.22	$0.000	0.006
5029	HVAC Shell	Wall Insulation	SF	LI	DI	-	-	110.44	0.096	0.113	11.168	25	$3,041.11	Installing wall insulation in homes with gas heating and central AC	0.22	$0.664	0.671
5030	HVAC Shell	R-38 Roof Insulation	SF	LI	DI	-	-	42.77	0.046	0.043	4.233	20	$1,553.26	Installing R-38 roof insulation in homes with poor attic insulation and gas heating and central AC	0.15	$1.057	1.064
5031	HVAC Shell	R-60 Roof Insulation	SF	LI	DI	-	-	60.38	0.065	0.068	5.967	20	$3,351.78	Installing R-60 roof insulation in homes with mediocre attic insulation and gas heating and central AC	0.10	$1.619	1.626
5032	HVAC Shell	Infiltration reduction - 50%	SF	LI	DI	-	-	49.90	0.000	0.000	11.922	13	$190.08	Air sealing (50% infiltration reduction) in homes with gas heating and no central AC	2.08	$0.025	0.033
5033	HVAC Shell	Crawlspace Wall Insulation	SF	LI	DI	-	-	11.81	0.000	0.000	4.356	25	$552.11	Installing crawlspace wall insulation in homes with unconditioned crawlspaces and gas heating and no central AC	0.37	$0.157	0.163
5034	HVAC Shell	Basement Wall Insulation	SF	LI	DI	-	-	33.90	0.000	0.000	9.859	25	$1,104.21	Installing basement wall insulation in homes with unconditioned basements and gas heating and no central AC	0.42	$0.138	0.144
5035	HVAC Shell	Floor Insulation	SF	LI	DI	-	-	20.15	0.000	0.000	4.215	25	$819.88	Installing floor wall insulation in homes with unconditioned basements or crawl spaces and gas heating and no central AC	0.25	$0.236	0.242
5036	HVAC Shell	Wall Insulation	SF	LI	DI	-	-	46.23	0.000	0.000	11.498	25	$3,041.11	Installing wall insulation in homes with gas heating and no central AC	0.18	$0.323	0.329
5037	HVAC Shell	R-38 Roof Insulation	SF	LI	DI	-	-	17.58	0.000	0.000	4.737	20	$1,553.26	Installing R-38 roof insulation in homes with poor attic insulation and gas heating and no central AC	0.13	$0.433	0.440
5038	HVAC Shell	R-60 Roof Insulation	SF	LI	DI	-	-	24.59	0.000	0.000	6.519	20	$3,351.78	Installing R-60 roof insulation in homes with mediocre attic insulation and gas heating and no central AC	0.08	$0.678	0.685
5039	HVAC Shell	Infiltration reduction - 50%	SF	LI	DI	-	-	2602.15	0.189	0.119	0.000	13	$190.08	Air sealing (50% infiltration reduction) in homes with electric heating and central AC	6.00	$0.010	0.018
5040	HVAC Shell	Crawlspace Wall Insulation	SF	LI	DI	-	-	637.33	-0.027	-0.026	0.000	25	$552.11	Installing crawlspace wall insulation in homes with unconditioned crawlspaces and electric heating and central AC	0.61	$0.090	0.096
5041	HVAC Shell	Basement Wall Insulation	SF	LI	DI	-	-	1969.24	-0.052	-0.048	0.000	25	$1,104.21	Installing basement wall insulation in homes with unconditioned basements and electric heating and central AC	0.97	$0.059	0.065
5042	HVAC Shell	Floor Insulation	SF	LI	DI	-	-	1094.57	-0.026	-0.025	0.000	25	$819.88	Installing floor wall insulation in homes with unconditioned basements or crawl spaces and electric heating and central AC	0.73	$0.078	0.084
5043	HVAC Shell	Wall Insulation	SF	LI	DI	-	-	2559.49	0.113	0.096	0.000	25	$3,041.11	Installing wall insulation in homes with electric heating and central AC	0.51	$0.124	0.130
5044	HVAC Shell	R-38 Roof Insulation	SF	LI	DI	-	-	964.87	0.043	0.046	0.013	20	$1,553.26	Installing R-38 roof insulation in homes with poor attic insulation and electric heating and central AC	0.34	$0.180	0.187
5045	HVAC Shell	R-60 Roof Insulation	SF	LI	DI	-	-	1358.43	0.068	0.065	0.013	20	$3,351.78	Installing R-60 roof insulation in homes with mediocre attic insulation and electric heating and central AC	0.23	$0.276	0.283

DTE (Michigan) **Measure Assumption Tab**

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5046	HVAC Shell	Duct Insulation	SF	All	RETRO	-	-	0.05	0.023	0.025	2.236	20	$380.16	Adding duct insulation in homes with gas heating and central AC	0.58	$78.635	78.641
5047	HVAC Shell	Duct location	SF	All	RETRO	-	-	75.19	0.070	0.081	7.871	30	$1,188.00	Moving ductwork from unconditioned space to conditioned space in homes with gas heating and central AC	0.85	$0.183	0.189
5048	HVAC Shell	Duct sealing 15% leakage base	SF	All	RETRO	-	-	18.72	0.028	0.035	0.923	18	$341.86	Duct sealing (15% leakage reduction) in homes with gas heating and central AC	0.39	$0.500	0.507
5049	HVAC Shell	Duct sealing 30% leakage base	SF	All	RETRO	-	-	57.15	0.074	0.085	2.368	18	$341.86	Duct sealing (30% leakage reduction) in homes with gas heating and central AC	1.04	$0.169	0.176
5050	HVAC Shell	Door weatherstripping	SF	All	RETRO	-	-	12.80	0.000	0.000	0.394	5	$86.00	Installing door weatherstripping - savings estimate weighted across heating/cooling combinations	0.19	$0.221	0.237
5051	HVAC Shell	R0 to R19 kneewalls	SF	All	RETRO	-	-	75.95	0.084	0.092	7.284	20	$172.53	Installing R19 kneewall insulation in homes with no kneewall insulation in homes with gas heating and central AC	4.73	$0.034	0.041
5052	HVAC Shell	R6 to R19 kneewalls	SF	All	RETRO	-	-	25.05	0.027	0.028	2.995	20	$162.53	Installing R19 kneewall insulation in homes with R6 kneewall insulation in homes with gas heating and central AC	1.94	$0.082	0.088
5053	HVAC Shell	Rim Joist Insulation	SF	All	RETRO	-	-	34.89	0.026	0.030	3.456	25	$179.92	Installing rim joist insulation in homes with gas heating and central AC	2.24	$0.059	0.065
5054	HVAC Shell	Window Film	SF	All	RETRO	-	-	371.23	0.317	0.369	-8.109	10	$365.46	Installing window film on inefficient existing windows in homes with gas heating and central AC	0.42	$0.078	0.087
5055	HVAC Shell	Window Replacement	SF	All	RETRO	-	-	313.16	0.315	0.360	12.126	25	$1,018.42	Replacing inefficient windows at the end of useful life with efficient windows in homes with gas heating and central AC	2.02	$0.078	0.084
5056	HVAC Shell	Original double hung window with low U storm	SF	All	RETRO	-	-	734.09	0.694	0.807	25.504	25	$3,564.00	Retrofitting inefficient windows with efficient alternatives in homes with gas heating and central AC	1.25	$0.121	0.127
5057	HVAC Shell	Duct Insulation	SF	All	RETRO	-	-	-13.81	0.000	0.000	2.239	20	$380.16	Adding duct insulation in homes with gas heating and no central AC	0.44	$0.000	0.007
5058	HVAC Shell	Duct location	SF	All	RETRO	-	-	10.36	0.000	0.000	9.200	30	$1,188.00	Moving ductwork from unconditioned space to conditioned space in homes with gas heating and no central AC	0.77	$0.078	0.084
5059	HVAC Shell	Duct sealing 15% leakage base	SF	All	RETRO	-	-	4.56	0.000	0.000	0.927	18	$341.86	Duct sealing (15% leakage reduction) in homes with gas heating and no central AC	0.22	$0.250	0.257
5060	HVAC Shell	Duct sealing 30% leakage base	SF	All	RETRO	-	-	14.43	0.000	0.000	2.367	18	$341.86	Duct sealing (30% leakage reduction) in homes with gas heating and no central AC	0.57	$0.097	0.103
5061	HVAC Shell	R0 to R19 kneewalls	SF	All	RETRO	-	-	29.82	0.000	0.000	7.559	20	$172.53	Installing R19 kneewall insulation in homes with no kneewall insulation in homes with gas heating and no central AC	3.76	$0.015	0.022
5062	HVAC Shell	R6 to R19 kneewalls	SF	All	RETRO	-	-	11.13	0.000	0.000	3.049	20	$162.53	Installing R19 kneewall insulation in homes with R6 kneewall insulation in homes with gas heating and no central AC	1.60	$0.035	0.042
5063	HVAC Shell	Rim Joist Insulation	SF	All	RETRO	-	-	0.00	0.000	0.000	3.536	25	$179.92	Installing rim joist insulation in homes with gas heating and no central AC	1.79		
5064	HVAC Shell	Window Film	SF	All	RETRO	-	-	-36.96	0.000	0.000	-8.143	10	$365.46	Installing window film on inefficient existing windows in homes with gas heating and no central AC	-1.23	-$0.781	-0.772
5065	HVAC Shell	Window Replacement	SF	All	RETRO	-	-	51.04	0.000	0.000	12.479	25	$1,018.42	Replacing inefficient windows at the end of useful life with efficient windows in homes with gas heating and no central AC	1.17	$0.050	0.056
5066	HVAC Shell	Original double hung window with low U storm	SF	All	RETRO	-	-	146.67	0.000	0.000	25.489	25	$3,564.00	Retrofitting inefficient windows with efficient alternatives in homes with gas heating and no central AC	0.70	$0.084	0.090
5067	HVAC Shell	HW pipe insulation	SF	All	RETRO	-	-	-8.94	0.000	0.000	29.119	11	$1,404.58	Installing hot water pipe insulation on boiler pipes in homes with boilers	1.16	$0.000	0.009
5068	HVAC Shell	Steam pipe insulation	SF	All	RETRO	-	-	-14.95	0.000	0.000	49.230	11	$1,404.58	Installing steam pipe insulation on boiler pipes in homes with boilers	1.97	$0.000	0.009
5069	HVAC Shell	Duct Insulation	SF	All	RETRO	-	-	534.20	0.025	0.023	0.000	20	$380.16	Adding duct insulation in homes with electric heating and central AC	1.55	$0.040	0.046
5070	HVAC Shell	Duct location	SF	All	RETRO	-	-	2151.72	0.095	0.083	0.000	30	$1,188.00	Moving ductwork from unconditioned space to conditioned space in homes with electric heating and central AC	2.37	$0.028	0.033
5071	HVAC Shell	Duct sealing 15% leakage base	SF	All	RETRO	-	-	240.31	0.035	0.028	0.000	18	$341.86	Duct sealing (15% leakage reduction) in homes with electric heating and central AC	0.84	$0.083	0.090
5072	HVAC Shell	Duct sealing 30% leakage base	SF	All	RETRO	-	-	625.84	0.085	0.074	0.000	18	$341.86	Duct sealing (30% leakage reduction) in homes with electric heating and central AC	2.17	$0.032	0.039
5073	HVAC Shell	R0 to R19 kneewalls	SF	All	RETRO	-	-	1706.72	0.094	0.085	0.000	20	$172.53	Installing R19 kneewall insulation in homes with no kneewall insulation in homes with electric heating and central AC	11.06	$0.006	0.012
5074	HVAC Shell	R6 to R19 kneewalls	SF	All	RETRO	-	-	555.27	0.028	0.027	0.590	20	$162.53	Installing R19 kneewall insulation in homes with R6 kneewall insulation in homes with electric heating and central AC	4.09	$0.015	0.022
5075	HVAC Shell	Rim Joist Insulation	SF	All	RETRO	-	-	798.25	0.030	0.026	0.000	25	$179.92	Installing rim joist insulation in homes with electric heating and central AC	5.37	$0.012	0.018
5076	HVAC Shell	Window Film	SF	All	RETRO	-	-	-1337.08	0.369	0.317	-0.020	10	$365.46	Installing window film on inefficient existing windows in homes with electric heating and central AC	-1.23	-$0.022	-0.012
5077	HVAC Shell	Window Replacement	SF	All	ROB	-	-	2997.22	0.360	0.315	0.000	25	$5,409.13	Replacing inefficient windows at the end of useful life with efficient windows in homes with electric heating and central AC	0.76	$0.094	0.100
5078	HVAC Shell	Original double hung window with low U storm	SF	All	RETRO	-	-	6404.40	0.807	0.694	0.000	25	$3,564.00	Retrofitting inefficient windows with efficient alternatives in homes with electric heating and central AC	2.47	$0.029	0.035
5079	HVAC Shell	Infiltration reduction - 30%	SF	All	NC	-	-	28.31	0.018	0.028	3.611	13	$190.08	Air sealing (30% infiltration reduction) in homes with gas heating and central AC	1.44	$0.076	0.083
5080	HVAC Shell	Infiltration reduction - 50%	SF	All	NC	-	-	46.02	0.029	0.046	6.012	13	$190.08	Air sealing (50% infiltration reduction) in homes with gas heating and central AC	2.39	$0.046	0.054
5081	HVAC Shell	Duct Insulation	SF	All	NC	-	-	7.11	0.029	0.030	1.663	20	$380.16	Adding duct insulation in homes with gas heating and central AC	0.51	$0.881	0.888
5082	HVAC Shell	Duct location	SF	All	NC	-	-	58.05	0.039	0.044	6.598	30	$1,188.00	Moving ductwork from unconditioned space to conditioned space in homes with gas heating and central AC	0.67	$0.191	0.197
5083	HVAC Shell	Duct sealing 15% leakage base	SF	All	NC	-	-	11.218	0.015	0.018	0.340	18	$341.86	Duct sealing (15% leakage reduction) in homes with gas heating and central AC	0.18	$1.003	1.010
5084	HVAC Shell	Duct sealing 30% leakage base	SF	All	NC	-	-	29.423	0.041	0.046	0.920	18	$341.86	Duct sealing (30% leakage reduction) in homes with gas heating and central AC	0.48	$0.386	0.393
5085	HVAC Shell	Door weatherstripping	SF	All	NC	-	-	0.000	0.000	0.000	0.000	5	$86.00	Installing door weatherstripping - savings estimate weighted across heating/cooling combinations	0.00		
5086	HVAC Shell	Basement Wall Insulation	SF	All	NC	-	-	-1.652	-0.017	-0.028	3.651	25	$1,104.21	Installing basement wall insulation in homes with unconditioned basements and gas heating and central AC	0.27	$0.000	0.006
5087	HVAC Shell	Floor Insulation	SF	All	NC	-	-	-6.083	0.000	0.000	0.642	25	$819.88	Installing floor wall insulation in homes with unconditioned basements or crawl spaces and gas heating and central AC	0.06	$0.000	0.006
5088	HVAC Shell	Crawlspace Wall Insulation	SF	All	NC	-	-	-1.863	0.000	0.000	0.074	25	$552.11	Installing crawlspace wall insulation in homes with unconditioned crawlspaces and gas heating and central AC	0.01	$0.000	0.006
5089	HVAC Shell	Wall Insulation	SF	All	NC	-	-	34.966	0.000	0.028	3.249	25	$3,041.11	Installing wall insulation in homes with gas heating and central AC	0.11	$0.549	0.555

DTE (Michigan) **Measure Assumption Tab**

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	Per unit Fuel Saving	Useful Life	Measure Cost	Measure Description	UCT Ratio	Utility $ / LFT- kWh Saved (-Admin)	Utility $ / LFT- kWh Saved (+Admin)
5090	HVAC Shell	Window Film	SF	All	NC	-	-	97.641	0.044	0.052	-1.943	10	$365.46	Installing window film on windows in homes with gas heating and central AC	0.02	$0.296	0.305
5091	HVAC Shell	Window Replacement	SF	All	NC	-	-	75.944	0.007	0.099	1.305	25	$1,018.42	Installing efficient windows in homes with gas heating and central AC	0.21	$0.318	0.324
5092	HVAC Shell	Infiltration reduction - 30%	MF	NLI	RETRO	-	-	29.948	0.040	0.073	3.576	13	$101.16	Air sealing (30% infiltration reduction) in homes with gas heating and central AC	2.98	$0.058	0.065
5093	HVAC Shell	Infiltration reduction - 50%	MF	NLI	RETRO	-	-	50.891	0.071	0.130	5.984	13	$101.16	Air sealing (50% infiltration reduction) in homes with gas heating and central AC	5.04	$0.035	0.043
5094	HVAC Shell	Basement Wall Insulation	MF	NLI	RETRO	-	-	-20.080	-0.019	-0.026	4.435	25	$581.78	Installing basement wall insulation in homes with unconditioned basements and gas heating and central AC	0.59	$0.000	0.006
5095	HVAC Shell	Wall Insulation	MF	NLI	RETRO	-	-	46.189	0.032	0.039	6.507	25	$1,670.90	Installing wall insulation in homes with gas heating and central AC	0.42	$0.302	0.308
5096	HVAC Shell	Roof Insulation	MF	NLI	RETRO	-	-	48.543	0.032	0.033	4.148	25	$638.11	Installing roof insulation in homes with gas heating and central AC	0.77	$0.160	0.166
5097	HVAC Shell	Infiltration reduction - 30%	MF	NLI	RETRO	-	-	14.135	0.000	0.000	3.445	13	$101.16	Air sealing (30% infiltration reduction) in homes with gas heating and no central AC	2.26	$0.023	0.031
5098	HVAC Shell	Infiltration reduction - 50%	MF	NLI	RETRO	-	-	23.375	0.000	0.000	5.766	13	$101.16	Air sealing (50% infiltration reduction) in homes with gas heating and no central AC	3.78	$0.014	0.022
5099	HVAC Shell	Basement Wall Insulation	MF	NLI	RETRO	-	-	16.342	0.000	0.000	4.748	25	$581.78	Installing basement wall insulation in homes with unconditioned basements and gas heating and no central AC	0.78	$0.075	0.081
5100	HVAC Shell	Wall Insulation	MF	NLI	RETRO	-	-	24.402	0.000	0.000	5.868	25	$1,670.90	Installing wall insulation in homes with gas heating and no central AC	0.34	$0.174	0.180
5101	HVAC Shell	Roof Insulation	MF	NLI	RETRO	-	-	15.625	0.000	0.000	4.176	25	$638.11	Installing roof insulation in homes with gas heating and no central AC	0.62	$0.094	0.100
5102	HVAC Shell	Infiltration reduction - 30%	MF	NLI	RETRO	-	-	714.758	0.042	0.075	0.000	13	$101.16	Air sealing (30% infiltration reduction) in homes with electric heating and central AC	6.06	$0.010	0.017
5103	HVAC Shell	Infiltration reduction - 50%	MF	NLI	RETRO	-	-	1191.506	0.071	0.129	0.000	13	$101.16	Air sealing (50% infiltration reduction) in homes with electric heating and central AC	10.12	$0.006	0.014
5104	HVAC Shell	Basement Wall Insulation	MF	NLI	RETRO	-	-	854.119	-0.019	-0.026	0.000	25	$581.78	Installing basement wall insulation in homes with unconditioned basements and electric heating and central AC	1.61	$0.036	0.042
5105	HVAC Shell	Wall Insulation	MF	NLI	RETRO	-	-	1283.273	0.035	0.042	0.000	25	$1,670.90	Installing wall insulation in homes with electric heating and central AC	0.91	$0.068	0.074
5106	HVAC Shell	Roof Insulation	MF	NLI	RETRO	-	-	849.257	0.028	0.039	0.000	25	$638.11	Installing roof insulation in homes with electric heating and central AC	1.60	$0.039	0.045
5107	HVAC Shell	Infiltration reduction - 50%	MF	LI	DI	-	-	50.891	0.071	0.130	5.984	13	$101.16	Air sealing (50% infiltration reduction) in homes with gas heating and central AC	2.52	$0.070	0.078
5108	HVAC Shell	Basement Wall Insulation	MF	LI	DI	-	-	-20.080	-0.019	-0.026	4.435	25	$581.78	Installing basement wall insulation in homes with unconditioned basements and gas heating and central AC	0.30	$0.000	0.006
5109	HVAC Shell	Wall Insulation	MF	LI	DI	-	-	46.189	0.032	0.039	6.507	25	$1,670.90	Installing wall insulation in homes with gas heating and central AC	0.21	$0.604	0.610
5110	HVAC Shell	Roof Insulation	MF	LI	DI	-	-	48.543	0.032	0.033	4.148	25	$638.11	Installing roof insulation in homes with gas heating and central AC	0.39	$0.320	0.326
5111	HVAC Shell	Infiltration reduction - 50%	MF	LI	DI	-	-	23.375	0.000	0.000	5.766	13	$101.16	Air sealing (50% infiltration reduction) in homes with gas heating and no central AC	1.89	$0.028	0.036
5112	HVAC Shell	Basement Wall Insulation	MF	LI	DI	-	-	16.342	0.000	0.000	4.748	25	$581.78	Installing basement wall insulation in homes with unconditioned basements and gas heating and no central AC	0.39	$0.151	0.157
5113	HVAC Shell	Wall Insulation	MF	LI	DI	-	-	24.402	0.000	0.000	5.868	25	$1,670.90	Installing wall insulation in homes with gas heating and no central AC	0.17	$0.348	0.354
5114	HVAC Shell	Roof Insulation	MF	LI	DI	-	-	15.625	0.000	0.000	4.176	25	$638.11	Installing roof insulation in homes with gas heating and no central AC	0.31	$0.187	0.193
5115	HVAC Shell	Infiltration reduction - 50%	MF	LI	DI	-	-	1191.506	0.071	0.129	0.000	13	$101.16	Air sealing (50% infiltration reduction) in homes with electric heating and central AC	5.06	$0.012	0.019
5116	HVAC Shell	Basement Wall Insulation	MF	LI	DI	-	-	854.119	-0.019	-0.026	0.000	25	$581.78	Installing basement wall insulation in homes with unconditioned basements and electric heating and central AC	0.81	$0.071	0.077
5117	HVAC Shell	Wall Insulation	MF	LI	DI	-	-	1283.273	0.035	0.042	0.000	25	$1,670.90	Installing wall insulation in homes with electric heating and central AC	0.46	$0.136	0.142
5118	HVAC Shell	Roof Insulation	MF	LI	DI	-	-	849.257	0.028	0.039	0.000	25	$638.11	Installing roof insulation in homes with electric heating and central AC	0.80	$0.078	0.084
5119	HVAC Shell	Duct Insulation	MF	All	RETRO	-	-	40.888	0.064	0.069	2.426	20	$202.32	Adding duct insulation in homes with gas heating and central AC	1.72	$0.119	0.125
5120	HVAC Shell	Duct location	MF	All	RETRO	-	-	81.138	0.127	0.153	4.888	30	$632.25	Moving ductwork from unconditioned space to conditioned space in homes with gas heating and central AC	1.32	$0.166	0.171
5121	HVAC Shell	Duct sealing 15% leakage base	MF	All	RETRO	-	-	14.388	0.015	0.016	0.767	18	$181.94	Duct sealing (15% leakage reduction) in homes with gas heating and central AC	0.53	$0.286	0.292
5122	HVAC Shell	Duct sealing 30% leakage base	MF	All	RETRO	-	-	39.214	0.040	0.044	2.048	18	$181.94	Duct sealing (30% leakage reduction) in homes with gas heating and central AC	1.43	$0.106	0.113
5123	HVAC Shell	Door weatherstripping	MF	All	RETRO	-	-	9.188	0.003	0.004	0.213	5	$43.00	Installing door weatherstripping - savings estimate weighted across heating/cooling combinations	0.26	$0.250	0.265
5124	HVAC Shell	Window Film	MF	All	RETRO	-	-	429.355	0.391	0.411	-8.685	10	$194.50	Installing window film on inefficient existing windows in homes with gas heating and central AC	1.23	$0.036	0.045
5125	HVAC Shell	Window Replacement	MF	All	RETRO	-	-	150.894	0.143	0.162	5.972	25	$542.00	Replacing inefficient windows at the end of useful life with efficient windows in homes with gas heating and central AC	1.81	$0.084	0.090
5126	HVAC Shell	Original double hung window with low U storm	MF	All	RETRO	-	-	671.964	0.660	0.734	46.728	25	$1,896.75	Retrofitting inefficient windows with efficient alternatives in homes with gas heating and central AC	3.30	$0.047	0.053
5127	HVAC Shell	Duct Insulation	MF	All	RETRO	-	-	0.352	0.000	0.000	2.426	20	$202.32	Adding duct insulation in homes with gas heating and no central AC	0.98	$0.057	0.064
5128	HVAC Shell	Duct location	MF	All	RETRO	-	-	5.559	0.000	0.000	4.890	30	$632.25	Moving ductwork from unconditioned space to conditioned space in homes with gas heating and no central AC	0.77	$0.078	0.084
5129	HVAC Shell	Duct sealing 15% leakage base	MF	All	RETRO	-	-	3.651	0.000	0.000	0.766	18	$181.94	Duct sealing (15% leakage reduction) in homes with gas heating and no central AC	0.34	$0.161	0.168
5130	HVAC Shell	Duct sealing 30% leakage base	MF	All	RETRO	-	-	10.076	0.000	0.000	2.046	18	$181.94	Duct sealing (30% leakage reduction) in homes with gas heating and no central AC	0.92	$0.060	0.067
5131	HVAC Shell	Window Film	MF	All	RETRO	-	-	-36.710	0.000	0.000	-8.685	10	$194.50	Installing window film on inefficient existing windows in homes with gas heating and no central AC	-2.46	-$0.418	-0.409
5132	HVAC Shell	Window Replacement	MF	All	RETRO	-	-	23.313	0.000	0.000	5.725	25	$542.00	Replacing inefficient windows at the end of useful life with efficient windows in homes with gas heating and no central AC	1.01	$0.058	0.064
5133	HVAC Shell	Original double hung window with low U storm	MF	All	RETRO	-	-	240.943	-0.011	-0.012	46.521	25	$1,896.75	Retrofitting inefficient windows with efficient alternatives in homes with gas heating and no central AC	2.37	$0.023	0.029
5134	HVAC Shell	Duct Insulation	MF	All	RETRO	-	-	585.128	0.065	0.071	0.000	20	$202.32	Adding duct insulation in homes with electric heating and central AC	3.51	$0.019	0.026
5135	HVAC Shell	Duct location	MF	All	RETRO	-	-	1160.832	0.126	0.152	0.000	30	$632.25	Moving ductwork from unconditioned space to conditioned space in homes with electric heating and central AC	2.64	$0.027	0.033

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5136	HVAC Shell	Duct sealing 15% leakage base	MF	All	RETRO	-	-	179.645	0.015	0.016	0.000	18	$181.94	Duct sealing (15% leakage reduction) in homes with electric heating and central AC	1.08	$0.059	0.066
5137	HVAC Shell	Duct sealing 30% leakage base	MF	All	RETRO	-	-	480.532	0.040	0.044	0.000	18	$181.94	Duct sealing (30% leakage reduction) in homes with electric heating and central AC	2.90	$0.022	0.029
5138	HVAC Shell	Window Film	MF	All	RETRO	-	-	-1098.453	0.399	0.419	0.000	10	$194.50	Installing window film on inefficient existing windows in homes with electric heating and central AC	-1.36	-$0.014	-0.005
5139	HVAC Shell	Window Replacement	MF	All	RETRO	-	-	1592.264	0.192	0.220	0.000	25	$542.00	Replacing inefficient windows at the end of useful life with efficient windows in homes with electric heating and central AC	4.01	$0.018	0.024
5140	HVAC Shell	Original double hung window with low U storm	MF	All	RETRO	-	-	7984.311	0.648	0.720	0.000	25	$1,896.75	Retrofitting inefficient windows with efficient alternatives in homes with electric heating and central AC	5.44	$0.012	0.018
5141	HVAC Shell	Infiltration reduction - 30%	MF	All	NC	-	-	18.306	0.028	0.043	2.272	13	$101.16	Air sealing (30% infiltration reduction) in homes with gas heating and central AC	1.91	$0.097	0.105
5142	HVAC Shell	Infiltration reduction - 50%	MF	All	NC	-	-	31.138	0.044	0.069	3.812	13	$101.16	Air sealing (50% infiltration reduction) in homes with gas heating and central AC	3.18	$0.056	0.063
5143	HVAC Shell	Airtight Can Lights	MF	All	NC	-	-	13.859	0.021	0.033	1.756	15	$459.90	Installing air can lights to reduce infiltration in homes with gas heating and central AC	0.36	$0.536	0.543
5144	HVAC Shell	Duct Insulation	MF	All	NC	-	-	51.471	0.074	0.081	2.140	20	$202.32	Adding duct insulation in homes with gas heating and central AC	1.74	$0.111	0.117
5145	HVAC Shell	Duct location	MF	All	NC	-	-	83.190	0.127	0.152	3.581	30	$632.25	Moving ductwork from unconditioned space to conditioned space in homes with gas heating and central AC	1.12	$0.191	0.197
5146	HVAC Shell	Duct sealing 15% leakage base	MF	All	NC	-	-	10.718	0.011	0.011	0.464	18	$181.94	Duct sealing (15% leakage reduction) in homes with gas heating and central AC	0.35	$0.431	0.438
5147	HVAC Shell	Duct sealing 30% leakage base	MF	All	NC	-	-	29.127	0.031	0.033	1.244	18	$181.94	Duct sealing (30% leakage reduction) in homes with gas heating and central AC	0.95	$0.163	0.170
5148	HVAC Shell	Door weatherstripping	MF	All	NC	-	-	5.380	0.003	0.003	0.244	5	$43.00	Installing door weatherstripping - savings estimate weighted across heating/cooling combinations	0.25	$0.325	0.340
5149	HVAC Shell	Basement Wall Insulation	MF	All	NC	-	-	-0.871	-0.011	-0.015	1.924	25	$581.78	Installing basement wall insulation in homes with unconditioned basements and gas heating and central AC	0.26	$0.000	0.006
5150	HVAC Shell	Wall Insulation	MF	All	NC	-	-	13.630	0.012	0.014	2.116	25	$1,670.90	Installing wall insulation in homes with gas heating and central AC	0.14	$1.065	1.071
5151	HVAC Shell	Roof Insulation	MF	All	NC	-	-	16.723	0.009	0.009	1.534	25	$638.11	Installing roof insulation in homes with gas heating and central AC	0.28	$0.408	0.414
5152	HVAC Shell	Cool roof	MF	All	NC	-	-	68.648	0.060	0.060	-0.455	20	$644.90	Installing a cool roof in homes with gas heating and central AC	0.21	$0.526	0.532
5153	HVAC Shell	Window Film	MF	All	NC	-	-	106.266	0.083	0.086	-2.174	10	$194.50	Installing window film on windows in homes with gas heating and central AC	0.22	$0.145	0.154
5154	HVAC Shell	Window Replacement	MF	All	NC	-	-	33.113	0.030	0.030	0.790	25	$2,878.72	Installing efficient windows in homes with gas heating and central AC	0.06	$2.561	2.567
5155	HVAC Shell	Infiltration reduction - 30%	MF	All	NC	-	-	265.185	0.028	0.030	0.000	13	$101.16	Air sealing (30% infiltration reduction) in homes with electric heating and central AC	2.41	$0.026	0.034
5156	HVAC Shell	Infiltration reduction - 50%	MF	All	NC	-	-	442.988	0.039	0.041	0.000	13	$101.16	Air sealing (50% infiltration reduction) in homes with electric heating and central AC	3.92	$0.016	0.023
5157	HVAC Shell	Airtight Can Lights	MF	All	NC	-	-	204.708	0.018	0.029	0.000	15	$459.90	Installing air can lights to reduce infiltration in homes with electric heating and central AC	0.44	$0.142	0.149
5158	HVAC Shell	Duct Insulation	MF	All	NC	-	-	492.048	0.089	0.089	0.000	20	$202.32	Adding duct insulation in homes with electric heating and central AC	3.23	$0.023	0.030
5159	HVAC Shell	Duct location	MF	All	NC	-	-	770.933	0.131	0.148	0.000	30	$632.25	Moving ductwork from unconditioned space to conditioned space in homes with electric heating and central AC	1.90	$0.041	0.047
5160	HVAC Shell	Duct sealing 15% leakage base	MF	All	NC	-	-	76.904	0.009	0.011	0.000	18	$181.94	Duct sealing (15% leakage reduction) in homes with electric heating and central AC	0.49	$0.138	0.145
5161	HVAC Shell	Duct sealing 30% leakage base	MF	All	NC	-	-	205.498	0.027	0.030	0.000	18	$181.94	Duct sealing (30% leakage reduction) in homes with electric heating and central AC	1.32	$0.052	0.058
5162	HVAC Shell	Basement Wall Insulation	MF	All	NC	-	-	215.779	0.000	0.000	0.000	25	$581.78	Installing basement wall insulation in homes with unconditioned basements and electric heating and central AC	0.42	$0.141	0.147
5163	HVAC Shell	Wall Insulation	MF	All	NC	-	-	261.392	0.014	0.014	0.000	25	$1,670.90	Installing wall insulation in homes with electric heating and central AC	0.19	$0.334	0.340
5164	HVAC Shell	Roof Insulation	MF	All	NC	-	-	208.608	0.007	0.007	0.000	25	$638.11	Installing roof insulation in homes with electric heating and central AC	0.39	$0.160	0.166
5165	HVAC Shell	Cool roof	MF	All	NC	-	-	10.590	0.037	0.037	0.000	20	$644.90	Installing a cool roof in homes with electric heating and central AC	0.11	$3.410	3.416
5166	HVAC Shell	Window Film	MF	All	NC	-	-	-69.739	0.087	0.087	0.000	10	$194.50	Installing window film on windows in homes with electric heating and central AC	0.26	-$0.220	-0.211
5167	HVAC Shell	Window Replacement	MF	All	NC	-	-	140.165	0.030	0.030	0.000	25	$2,878.72	Installing efficient windows in homes with electric heating and central AC	0.07	$1.072	1.078
6001	HVAC Equipment	Furnace/AC - SEER 18	SF	NLI	ROB	1925.834	-	444.423	0.329	0.329	-1.758	15	$829.14	Installation of 18 SEER air conditioner - baseline is 13 SEER AC	0.89	$0.118	0.125
6002	HVAC Equipment	Furnace/AC - SEER 21	SF	NLI	ROB	1925.834	-	762.677	0.761	0.761	-2.052	15	$2,211.04	Installation of 21 SEER air conditioner - baseline is 13 SEER AC	0.73	$0.183	0.190
6003	HVAC Equipment	RCA 10% improvement	SF	NLI	RETRO	2503.584	-	115.981	0.165	0.165	0.000	5	$139.00	Refrigerant charge and air flow adjustment - 10% improvement - in homes with gas furnace and central AC	0.99	$0.155	0.170
6004	HVAC Equipment	High efficiency 94 AFUE furnace with ECM	SF	NLI	ROB	1216.000	-	536.032	0.000	0.000	21.805	15	$1,427.65	Installation of 94 AFUE furnace with electronically commutated motor - baseline is 80 AFUE furnace	1.38	$0.040	0.047
6005	HVAC Equipment	High efficiency 98 AFUE furnace with ECM	SF	NLI	ROB	1216.000	-	536.032	0.000	0.000	29.062	15	$1,608.58	Installation of 98 AFUE furnace with electronically commutated motor - baseline is 80 AFUE furnace	1.54	$0.035	0.043
6006	HVAC Equipment	O&M Tune-up - furnace only	SF	NLI	RETRO	0.000	-	0.000	0.000	0.000	6.492	3	$139.00	5% increase in furnace efficiency - in homes with gas furnaces	0.91		
6007	HVAC Equipment	Boiler 95% plus AFUE	SF	NLI	ROB	0.000	-	-436.568	0.000	0.000	52.706	15	$2,436.00	Installing 95 AFUE boilers to replace standard boilers - in homes with gas boilers	1.35	$0.000	0.007
6008	HVAC Equipment	Boiler 92% plus AFUE	SF	NLI	ROB	0.000	-	-436.568	0.000	0.000	47.878	15	$1,954.00	Installing 92 AFUE boilers to replace standard boilers - in homes with gas boilers	1.51	$0.000	0.007
6009	HVAC Equipment	Boiler Tune-up	SF	NLI	RETRO	0.000	-	0.000	0.000	0.000	6.979	5	$139.00	Increasing boiler efficiency by 5% - in homes with gas boilers	1.52		
6010	HVAC Equipment	Furnace/AC - SEER 18	SF	LI	DI	1925.834	-	444.423	0.329	0.329	-1.758	15	$829.14	Installation of 18 SEER air conditioner - baseline is 13 SEER AC	0.44	$0.236	0.243
6011	HVAC Equipment	RCA 10% improvement	SF	LI	DI	2503.584	-	115.981	0.165	0.165	0.000	5	$139.00	Refrigerant charge and air flow adjustment - 10% improvement - in homes with gas furnace and central AC	0.49	$0.311	0.326
6012	HVAC Equipment	High efficiency 94 AFUE furnace with ECM	SF	LI	DI	1216.000	-	536.032	0.000	0.000	21.805	15	$1,427.65	Installation of 94 AFUE furnace with electronically commutated motor - baseline is 80 AFUE furnace	0.69	$0.079	0.086
6013	HVAC Equipment	O&M Tune-up - furnace only	SF	LI	DI	0.000	-	0.000	0.000	0.000	6.492	3	$139.00	5% increase in furnace efficiency - in homes with gas furnaces	0.46		
6014	HVAC Equipment	Boiler 92% plus AFUE	SF	LI	DI	0.000	-	-436.568	0.000	0.000	47.878	15	$1,954.00	Installing 92 AFUE boilers to replace standard boilers - in homes with gas boilers	0.75	$0.000	0.007

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6015	HVAC Equipment	Boiler Tune-up	SF	LI	DI	0.000	-	0.000	0.000	0.000	6.979	5	$139.00	Increasing boiler efficiency by 5% - in homes with gas boilers	0.76		
6016	HVAC Equipment	ASHP - SEER 18 - SEER 14 base	SF	All	ROB	6591.974	-	1398.000	0.617	0.617	0.000	15	$1,827.63	Installation of SEER 18 ASHP in homes with electric heating/cooling - baseline is 14 SEER ASHP	1.14	$0.083	0.090
6017	HVAC Equipment	ASHP - SEER 21 - SEER 14 base	SF	All	ROB	6591.974	-	2096.999	0.926	0.926	0.000	15	$3,198.36	Installation of SEER 21 ASHP in homes with electric heating/cooling - baseline is 14 SEER ASHP	0.98	$0.096	0.104
6018	HVAC Equipment	GSHP - EER 19 ASHP SEER 14 Base	SF	All	ROB	6591.974	-	4755.965	0.359	0.359	0.000	15	$20,313.66	Installation of EER 19 GSHP in homes with electric heating/cooling - baseline is 14 SEER ASHP	0.23	$0.270	0.277
6019	HVAC Equipment	SEER21 Minisplit Heat pump	SF	All	ROB	6591.974	-	3569.626	0.621	0.621	0.000	15	$2,111.74	Installation of SEER 21 minisplit heat pump in homes with electric heating/cooling - baseline is 14 SEER ASHP	1.88	$0.037	0.045
6020	HVAC Equipment	SEER21 Minisplit Heat pump	SF	All	RETRO	22188.534	-	8875.414	-1.040	-1.040	0.000	15	$4,334.05	Installation of SEER 21 minisplit heat pump in homes with electric heating/cooling - baseline is electic furnace / central air conditioning	1.43	$0.031	0.038
6021	HVAC Equipment	DFHP - SEER 18 with 95 AFUE furnace - SEER 14 base	SF	All	ROB	6591.974	-	1405.219	0.617	0.617	2.023	15	$1,189.14	Installation of SEER 18/95 AFUE dual fuel heat pump in homes with electric heating/cooling - baseline is 14 SEER/80 AFUE DFHP	1.87	$0.050	0.057
6022	HVAC Equipment	DFHP - SEER 21 with 95 AFUE furnace - SEER 14 base	SF	All	ROB	6591.974	-	2107.829	0.926	0.926	3.035	15	$2,125.65	Installation of SEER 21/95 AFUE dual fuel heat pump in homes with electric heating/cooling - baseline is 14 SEER/80 AFUE DFHP	1.57	$0.060	0.067
6023	HVAC Equipment	Programmable Thermostats Tier 1	SF	All	RETRO	0.000	-	62.811	0.000	0.000	7.516	10	$42.72	0.000	10.16	$0.005	0.014
6024	HVAC Equipment	Programmable Thermostats Tier 2	SF	All	RETRO	0.000	-	206.458	0.000	0.000	24.706	10	$161.72	0.000	8.83	$0.006	0.015
6025	HVAC Equipment	Programmable Thermostats Tier 3	SF	All	RETRO	1239.623	-	111.566	0.000	0.000	7.522	10	$237.99	Installation of Tier 3 programmable thermostat in homes with gas heating and central AC	1.95	$0.025	0.034
6026	HVAC Equipment	Programmable Thermostats Tier 1	SF	All	RETRO	0.000	-	0.000	0.000	0.000	6.857	10	$42.72	0.000	8.44		
6027	HVAC Equipment	Programmable Thermostats Tier 2	SF	All	RETRO	0.000	-	0.000	0.000	0.000	22.539	10	$161.72	0.000	7.33		
6028	HVAC Equipment	Programmable Thermostats Tier 3	SF	All	RETRO	0.000	-	0.000	0.000	0.000	7.653	10	$237.99	Installation of Tier 3 programmable thermostat in homes with gas heating and no AC	1.69		
6029	HVAC Equipment	Programmable Thermostats Tier 1	SF	All	RETRO	0.000	-	999.854	0.000	0.000	0.000	10	$42.72	0.000	14.85	$0.003	0.013
6030	HVAC Equipment	Programmable Thermostats Tier 2	SF	All	RETRO	0.000	-	3286.475	0.000	0.000	0.000	10	$161.72	0.000	12.89	$0.004	0.013
6031	HVAC Equipment	Programmable Thermostats Tier 3	SF	All	RETRO	16549.879	-	1158.492	0.000	0.000	0.000	10	$237.99	Installation of Tier 3 programmable thermostat in homes with electric heating and central AC	3.09	$0.016	0.025
6032	HVAC Equipment	Smartphone Behavior Application	SF	All	RETRO	3166.555	0.011	33.249	0.000	0.000	0.872	1	$5.00	Use of smartphone application to deliver behavioral savings	1.83	$0.022	0.086
6033	HVAC Equipment	Smartphone Behavior Application	SF	All	RETRO			0.000	0.000	0.000	0.000	1	$5.00		0.00		
6034	HVAC Equipment	Smartphone Behavior Application	SF	All	RETRO			0.000	0.000	0.000	0.000	1	$5.00		0.00		
6035	HVAC Equipment	ENERGY STAR Room AC	SF	All	ROB	471.193	0.092	43.193	0.067	0.067	0.000	15	$75.00	Installation of ENERGY STAR replacement room AC instead of a standard units	1.78	$0.110	0.117
6036	HVAC Equipment	ECM Furnace Fan	SF	All	RETRO	1216.000	0.603	733.000	0.073	0.073	0.000	10	$788.00	Installation of efficient fan motor in homes with furnaces	0.68	$0.085	0.094
6037	HVAC Equipment	Hot water temperature reset	SF	All	RETRO	0.000	-	-3.653	0.000	0.000	7.596	15	$600.00	Retrofitting of existing boiler with temperature reset controls	0.87	$0.000	0.007
6038	HVAC Equipment	ASHP - SEER 18 - SEER 14 base	SF	All	NC	4877.719	-	1012.492	0.447	0.447	0.000	15	$1,827.63	Installation of SEER 18 ASHP in homes with electric heating/cooling - baseline is 14 SEER ASHP	0.82	$0.114	0.121
6039	HVAC Equipment	ASHP - SEER 21 - SEER 14 base	SF	All	NC	4877.719	-	1518.738	0.670	0.670	0.000	15	$3,198.36	Installation of SEER 21 ASHP in homes with electric heating/cooling - baseline is 14 SEER ASHP	0.71	$0.133	0.140
6040	HVAC Equipment	GSHP - EER 19 ASHP SEER 14 Base	SF	All	NC	4877.719	-	4862.045	0.467	0.467	0.000	15	$20,313.66	Installation of EER 19 GSHP in homes with electric heating/cooling - baseline is 14 SEER ASHP	0.24	$0.264	0.271
6041	HVAC Equipment	SEER21 Minisplit Heat pump	SF	All	NC	4877.719	-	1604.489	0.513	0.513	0.000	15	$2,111.74	Installation of SEER 21 minisplit heat pump in homes with electric heating/cooling - baseline is 14 SEER ASHP	1.00	$0.083	0.090
6042	HVAC Equipment	DFHP - SEER 18 with 95 AFUE furnace - SEER 14 base	SF	All	NC	4877.719	-	1015.153	0.447	0.447	1.091	15	$1,189.14	Installation of SEER 18/95 AFUE dual fuel heat pump in homes with electric heating/cooling - baseline is 14 SEER/80 AFUE DFHP	1.33	$0.070	0.078
6043	HVAC Equipment	DFHP - SEER 21 with 95 AFUE furnace - SEER 14 base	SF	All	NC	4877.719	-	1522.729	0.670	0.670	1.636	15	$2,125.65	Installation of SEER 21/95 AFUE dual fuel heat pump in homes with electric heating/cooling - baseline is 14 SEER/80 AFUE DFHP	1.12	$0.084	0.091
6044	HVAC Equipment	Furnace/AC - SEER 18	SF	All	NC	1204.967	-	278.069	0.239	0.239	-1.165	15	$829.14	Installation of 18 SEER air conditioner - baseline is 13 SEER AC	0.61	$0.188	0.196
6045	HVAC Equipment	Furnace/AC - SEER 21	SF	All	NC	1204.967	-	482.696	0.539	0.539	-1.357	15	$2,211.04	Installation of 21 SEER air conditioner - baseline is 13 SEER AC	0.50	$0.289	0.297
6046	HVAC Equipment	ENERGY STAR Room AC	SF	All	NC	471.193	0.092	43.193	0.067	0.067	0.000	15	$75.00	Installation of ENERGY STAR replacement room AC instead of a standard units	1.78	$0.110	0.117
6047	HVAC Equipment	High efficiency 94 AFUE furnace with ECM	SF	All	NC	1216.000	-	499.049	0.000	0.000	12.931	15	$1,427.65	Installation of 94 AFUE furnace with electronically commutated motor - baseline is 80 AFUE furnace	0.93	$0.059	0.066
6048	HVAC Equipment	High efficiency 98 AFUE furnace with ECM	SF	All	NC	1216.000	-	499.049	0.000	0.000	17.235	15	$1,608.58	Installation of 98 AFUE furnace with electronically commutated motor - baseline is 80 AFUE furnace	1.01	$0.054	0.061
6049	HVAC Equipment	ECM Furnace Fan	SF	All	NC	1216.000	0.603	733.000	0.073	0.073	0.000	10	$788.00	Installation of efficient fan motor in homes with furnaces	0.68	$0.085	0.094
6050	HVAC Equipment	Boiler 92% plus AFUE	SF	All	NC	0.000	-	-260.007	0.000	0.000	29.774	15	$1,954.00	Installing 92 AFUE boilers to replace standard boilers - in homes with gas boilers	0.94	$0.000	0.007
6051	HVAC Equipment	Boiler 95% plus AFUE	SF	All	NC	0.000	-	-260.007	0.000	0.000	32.599	15	$2,436.00	Installing 95 AFUE boilers to replace standard boilers - in homes with gas boilers	0.84	$0.000	0.007
6052	HVAC Equipment	Furnace/AC - SEER 18	MF	NLI	ROB	1113.073	-	256.863	0.212	0.212	-5.702	15	$829.14	Installation of 18 SEER air conditioner - baseline is 13 SEER AC	0.16	$0.204	0.211
6053	HVAC Equipment	Furnace/AC - SEER 21	MF	NLI	ROB	1113.073	-	565.653	0.647	0.647	-6.231	15	$2,211.04	Installation of 21 SEER air conditioner - baseline is 13 SEER AC	0.44	$0.247	0.254
6054	HVAC Equipment	RCA 10% improvement	MF	NLI	RETRO	1446.995	-	101.969	0.149	0.149	0.000	5	$139.00	Refrigerant charge and air flow adjustment - 10% improvement - in homes with gas furnace and central AC	0.89	$0.177	0.192
6055	HVAC Equipment	High efficiency 94 AFUE furnace with ECM	MF	NLI	ROB	1216.000	-	344.238	0.139	0.139	13.534	15	$1,427.65	Installation of 94 AFUE furnace with electronically commutated motor - baseline is 80 AFUE furnace	1.00	$0.090	0.098
6056	HVAC Equipment	High efficiency 98 AFUE furnace with ECM	MF	NLI	ROB	1216.000	-	344.238	0.139	0.139	13.842	15	$1,608.58	Installation of 98 AFUE furnace with electronically commutated motor - baseline is 80 AFUE furnace	0.90	$0.100	0.108
6057	HVAC Equipment	O&M Tune-up - furnace only	MF	NLI	RETRO	0.000	-	0.000	0.000	0.000	4.133	3	$139.00	5% increase in furnace efficiency - in homes with gas furnaces	0.58		
6058	HVAC Equipment	Boiler 92% plus AFUE	MF	NLI	ROB	0.000	-	-672.477	0.000	0.000	32.502	15	$1,954.00	Installing 92 AFUE boilers to replace standard boilers - in homes with gas boilers	0.86	$0.000	0.007
6059	HVAC Equipment	Boiler 95% plus AFUE	MF	NLI	ROB	0.000	-	-672.477	0.000	0.000	39.662	15	$2,436.00	Installing 95 AFUE boilers to replace standard boilers - in homes with gas boilers	0.89	$0.000	0.007
6060	HVAC Equipment	Boiler Tune-up	MF	NLI	RETRO	0.000	-	0.000	0.000	0.000	8.556	5	$139.00	Increasing boiler efficiency by 5% - in homes with gas boilers	1.86		

DTE (Michigan) **Measure Assumption Tab**

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	Per unit Fuel Saving	Useful Life	Measure Cost	Measure Description	UCT Ratio	Utility $ / LFT- kWh Saved (-Admin)	Utility $ / LFT- kWh Saved (+Admin)
6061	HVAC Equipment	Furnace/AC - SEER 18	MF	LI	DI	1113.073	-	256.863	0.212	0.212	-5.702	15	$829.14	Installation of 18 SEER air conditioner - baseline is 13 SEER AC	0.08	$0.408	0.415
6062	HVAC Equipment	RCA 10% improvement	MF	LI	DI	1446.995	-	101.969	0.149	0.149	0.000	5	$139.00	Refrigerant charge and air flow adjustment - 10% improvement - in homes with gas furnace and central AC	0.45	$0.353	0.368
6063	HVAC Equipment	High efficiency 94 AFUE furnace with ECM	MF	LI	DI	1216.000	-	344.238	0.139	0.139	13.534	15	$1,427.65	Installation of 94 AFUE furnace with electronically commutated motor - baseline is 80 AFUE furnace	0.50	$0.181	0.188
6064	HVAC Equipment	O&M Tune-up - furnace only	MF	LI	DI	0.000	-	0.000	0.000	0.000	4.133	3	$139.00	5% increase in furnace efficiency - in homes with gas furnaces	0.29		
6065	HVAC Equipment	Boiler 92% plus AFUE	MF	LI	DI	0.000	-	-672.477	0.000	0.000	32.502	15	$1,954.00	Installing 92 AFUE boilers to replace standard boilers - in homes with gas boilers	0.43	$0.000	0.007
6066	HVAC Equipment	Boiler Tune-up	MF	LI	DI	0.000	-	0.000	0.000	0.000	8.556	5	$139.00	Increasing boiler efficiency by 5% - in homes with gas boilers	0.93		
6067	HVAC Equipment	ASHP - SEER 18 - SEER 14 base	MF	All	ROB	6466.164	-	1289.862	0.606	0.606	0.000	15	$1,827.63	Installation of SEER 18 ASHP in homes with electric heating/cooling - baseline is 14 SEER ASHP	1.08	$0.090	0.097
6068	HVAC Equipment	ASHP - SEER 21 - SEER 14 base	MF	All	ROB	6466.164	-	1934.793	0.908	0.908	0.000	15	$3,198.36	Installation of SEER 21 ASHP in homes with electric heating/cooling - baseline is 14 SEER ASHP	0.92	$0.104	0.112
6069	HVAC Equipment	SEER21 Minisplit Heat pump	MF	All	ROB	6466.164	-	1778.484	0.309	0.309	0.000	15	$1,052.13	Installation of SEER 21 minisplit heat pump in homes with electric heating/cooling - baseline is 14 SEER ASHP	1.88	$0.037	0.045
6070	HVAC Equipment	SEER21 Minisplit Heat pump	MF	All	RETRO	11054.926	-	4421.970	-0.518	-0.518	0.000	15	$2,159.34	Installation of SEER 21 minisplit heat pump in homes with electric heating/cooling - baseline is electic furnace / central air conditioning	1.43	$0.031	0.038
6071	HVAC Equipment	PTHP 9.1 EER	MF	All	ROB	6466.164	-	294.568	0.149	0.149	0.000	15	$169.21	Installation of 9.3 EER packaged terminal heat pump (PTHP) - in homes with PTHPs	2.75	$0.036	0.044
6072	HVAC Equipment	DFHP - SEER 18 with 95 AFUE furnace - SEER 14 base	MF	All	ROB	6466.164	-	1280.671	0.606	0.606	1.791	15	$1,189.14	Installation of SEER 18/95 AFUE dual fuel heat pump in homes with electric heating/cooling - baseline is 14 SEER/80 AFUE DFHP	1.76	$0.055	0.063
6073	HVAC Equipment	DFHP - SEER 21 with 95 AFUE furnace - SEER 14 base	MF	All	ROB	6466.164	-	1921.007	0.908	0.908	2.687	15	$2,125.65	Installation of SEER 21/95 AFUE dual fuel heat pump in homes with electric heating/cooling - baseline is 14 SEER/80 AFUE DFHP	1.47	$0.066	0.073
6074	HVAC Equipment	Programmable Thermostats Tier 1	MF	All	RETRO	0.000	0.000	0.000	0.000	0.000	0.000	10	$1.00	Installation of Tier 1 programmable thermostat	0.00		
6075	HVAC Equipment	Programmable Thermostats Tier 2	MF	All	RETRO	0.000	0.000	0.000	0.000	0.000	0.000	10	$1.00	Installation of Tier 2 programmable thermostat	0.00		
6076	HVAC Equipment	Programmable Thermostats Tier 3	MF	All	RETRO	471.631	-	31.599	0.000	0.000	2.130	10	$126.66	Installation of Tier 3 programmable thermostat	1.04	$0.047	0.057
6077	HVAC Equipment	Programmable Thermostats Tier 1	MF	All	RETRO	0.000	0.000	0.000	0.000	0.000	0.000	10	$1.00		0.00		
6078	HVAC Equipment	Programmable Thermostats Tier 2	MF	All	RETRO	0.000	0.000	0.000	0.000	0.000	0.000	10	$1.00		0.00		
6079	HVAC Equipment	Programmable Thermostats Tier 3	MF	All	RETRO	0.000	-	0.000	0.000	0.000	2.168	10	$126.66		0.90		
6080	HVAC Equipment	Programmable Thermostats Tier 1	MF	All	RETRO	0.000	0.000	0.000	0.000	0.000	0.000	10	$1.00		0.00		
6081	HVAC Equipment	Programmable Thermostats Tier 2	MF	All	RETRO	0.000	0.000	0.000	0.000	0.000	0.000	10	$1.00		0.00		
6082	HVAC Equipment	Programmable Thermostats Tier 3	MF	All	RETRO	4687.482	-	328.124	0.000	0.000	0.000	10	$126.66		1.64	$0.030	0.040
6083	HVAC Equipment	Smartphone Behavior Application	MF	All	RETRO	1583.278	0.011	16.624	0.000	0.000	0.436	1	$5.00	Use of smartphone application to deliver behavioral savings	0.92	$0.045	0.108
6084	HVAC Equipment	Smartphone Behavior Application	MF	All	RETRO			0.000	0.000	0.000	0.000	1	$5.00		0.00		
6085	HVAC Equipment	Smartphone Behavior Application	MF	All	RETRO			0.000	0.000	0.000	0.000	1	$5.00		0.00		
6086	HVAC Equipment	PTAC 9.3 EER	MF	All	ROB	1113.073	-	153.786	0.149	0.149	0.000	15	$135.59	Installation of 9.3 EER packaged terminal air conditioner (PTAC) - in homes with PTACs	2.55	$0.056	0.063
6087	HVAC Equipment	ENERGY STAR Room AC	MF	All	ROB	471.193	0.092	43.193	0.067	0.067	0.000	15	$75.00	Installation of ENERGY STAR replacement room AC instead of a standard units	1.78	$0.110	0.117
6088	HVAC Equipment	Air-Cooled Recip Chiller COP = 2.8, IPLV = 3.41	MF	All	ROB	158416.185	-	39604.046	5.501	5.501	0.000	20	$8,481.25	Installation of efficient reciprocating chiller in apartment buildings with chillers	5.94	$0.012	0.018
6089	HVAC Equipment	CHW reset 10 deg	MF	All	RETRO	158416.185	-	16203.608	0.000	0.000	0.000	5	$158.98	Chilled water reset control strategy (10 degrees) - in apartment buildings with chillers	33.32	$0.001	0.016
6090	HVAC Equipment	ECM Furnace Fan	MF	All	RETRO	1216.000	0.603	733.000	0.073	0.073	0.000	10	$788.00	Installation of efficient fan motor in homes with furnaces	0.68	$0.085	0.094
6091	HVAC Equipment	O2 Trim Control	MF	All	RETRO	0.000	-	0.000	0.000	0.000	2.185	15	$255.00	1.1% improvement in boiler efficiency resulting from the addition of oxygen trim controls - apartment buildings with boilers	0.59		
6092	HVAC Equipment	Boiler 85% Ec	MF	All	RETRO	0.000	-	0.000	0.000	0.000	11.311	20	$7,232.27	5% increase in boiler efficiency - in apartments with gas boilers and no central AC	0.13		
6093	HVAC Equipment	Boiler turndown control	MF	All	RETRO	0.000	-	-129.352	0.000	0.000	13.229	15	$195.00	Installing boiler turndown controls - in apartment buildings with boilers	4.12	$0.000	0.007
6094	HVAC Equipment	ASHP - SEER 18 - SEER 14 base	MF	All	NC	7236.621	-	1409.333	0.656	0.656	0.000	15	$1,827.63	Installation of SEER 18 ASHP in homes with electric heating/cooling - baseline is 14 SEER ASHP	1.17	$0.082	0.089
6095	HVAC Equipment	ASHP - SEER 21 - SEER 14 base	MF	All	NC	7236.621	-	2114.000	0.984	0.984	0.000	15	$3,198.36	Installation of SEER 21 ASHP in homes with electric heating/cooling - baseline is 14 SEER ASHP	1.01	$0.096	0.103
6096	HVAC Equipment	SEER21 Minisplit Heat pump	MF	All	NC	7236.621	-	799.400	0.255	0.255	0.000	15	$1,052.13	Installation of SEER 21 minisplit heat pump in homes with electric heating/cooling - baseline is 14 SEER ASHP	1.00	$0.083	0.090
6097	HVAC Equipment	PTHP 9.1 EER	MF	All	NC	7236.621	-	275.417	0.144	0.144	0.000	15	$169.21	Installation of 9.3 EER packaged terminal heat pump (PTHP) - in homes with PTHPs	2.61	$0.039	0.046
6098	HVAC Equipment	DFHP - SEER 18 with 95 AFUE furnace - SEER 14 base	MF	All	NC	7236.621	-	1381.658	0.656	0.656	2.895	15	$1,189.14	Installation of SEER 18/95 AFUE dual fuel heat pump in homes with electric heating/cooling - baseline is 14 SEER/80 AFUE DFHP	1.95	$0.050	0.057
6099	HVAC Equipment	DFHP - SEER 21 with 95 AFUE furnace - SEER 14 base	MF	All	NC	7236.621	-	2072.487	0.984	0.984	4.342	15	$2,125.65	Installation of SEER 21/95 AFUE dual fuel heat pump in homes with electric heating/cooling - baseline is 14 SEER/80 AFUE DFHP	1.64	$0.059	0.067
6100	HVAC Equipment	Furnace/AC - SEER 18	MF	All	NC	857.534	-	197.893	0.480	0.480	-14.046	15	$1,381.90	Installation of 18 SEER air conditioner - baseline is 13 SEER AC	-0.09	$0.441	0.448
6101	HVAC Equipment	Furnace/AC - SEER 21	MF	All	NC	857.534	-	556.739	0.741	0.741	-14.173	15	$2,211.04	Installation of 21 SEER air conditioner - baseline is 13 SEER AC	0.25	$0.251	0.258
6102	HVAC Equipment	PTAC 9.3 EER	MF	All	NC	857.534	-	181.102	0.144	0.144	0.000	15	$135.59	Installation of 9.3 EER packaged terminal air conditioner (PTAC) - in homes with PTACs	2.68	$0.047	0.055
6103	HVAC Equipment	ENERGY STAR Room AC	MF	All	NC	471.193	0.092	43.193	0.067	0.067	0.000	15	$75.00	Installation of ENERGY STAR replacement room AC instead of a standard units	1.78	$0.110	0.117
6104	HVAC Equipment	Air-Cooled Recip Chiller COP = 2.8, IPLV = 3.41	MF	All	NC	170996.965	-	42749.241	0.209	0.209	0.000	20	$8,481.25	Installation of efficient reciprocating chiller in apartment buildings with chillers	5.28	$0.011	0.018
6105	HVAC Equipment	CHW reset 10 deg	MF	All	NC	170996.965	-	17174.103	0.000	0.000	0.000	5	$158.98	Chilled water reset control strategy (10 degrees) - in apartment buildings with chillers	35.32	$0.001	0.016
6106	HVAC Equipment	High efficiency 94 AFUE furnace with ECM	MF	All	NC	1216.000	-	291.664	0.216	0.216	11.432	15	$1,427.65	Installation of 94 AFUE furnace with electronically commutated motor - baseline is 80 AFUE furnace	0.95	$0.128	0.135

DTE (Michigan) **Measure Assumption Tab**

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	Per unit Fuel Saving	Useful Life	Measure Cost	Measure Description	UCT Ratio	Utility $ / LFT- kWh Saved (-Admin)	Utility $ / LFT- kWh Saved (+Admin)
6107	HVAC Equipment	High efficiency 98 AFUE furnace with ECM	MF	All	NC	1216.000	-	298.293	0.216	0.216	14.898	15	$1,608.58	Installation of 98 AFUE furnace with electronically commutated motor - baseline is 80 AFUE furnace	0.99	$0.120	0.128
6108	HVAC Equipment	ECM Furnace Fan	MF	All	NC	1216.000	0.603	733.000	0.073	0.073	0.000	10	$788.00	Installation of efficient fan motor in homes with furnaces	0.68	$0.085	0.094
6109	HVAC Equipment	Boiler 92% plus AFUE	MF	All	NC	0.000	-	-560.533	0.000	0.000	27.138	15	$1,954.00	Installing 92 AFUE boilers to replace standard boilers - in homes with gas boilers	0.72	$0.000	0.007
6110	HVAC Equipment	Boiler 95% plus AFUE	MF	All	NC	0.000	-	-560.560	0.000	0.000	32.988	15	$2,436.00	Installing 95 AFUE boilers to replace standard boilers - in homes with gas boilers	0.74	$0.000	0.007
6111	HVAC Equipment	O2 Trim Control	MF	All	NC	0.000	-	0.000	0.000	0.000	1.629	15	$255.00	1.1% improvement in boiler efficiency resulting from the addition of oxygen trim controls - apartment buildings with boilers	0.44		
6112	HVAC Equipment	Boiler 85% Ec	MF	All	NC	0.000	-	0.000	0.000	0.000	8.407	20	$7,232.27	5% increase in boiler efficiency - in apartments with gas boilers and no central AC	0.10		
6113	HVAC Equipment	Boiler turndown control	MF	All	NC	0.000	-	-102.555	0.000	0.000	10.004	15	$195.00	Installing boiler turndown controls - in apartment buildings with boilers	3.09	$0.000	0.007
7001	Miscellaneous	Pump and Motor Single Speed	SF	All	ROB	2120.860	0.327	694.000	0.715	0.000	0.000	10	$85.00	Installing high efficiency single-speed pool pumps and motors in homes that have inefficient pool pumps and motors	9.68	$0.010	0.019
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	10	$579.00	Installing high efficiency multi-speed pool pumps and motors in homes that have inefficient pool pumps and motors	2.66	$0.042	0.051
7003	Miscellaneous	Pump and Motor Single Speed	SF	All	NC	2120.860	0.327	694.000	0.715	0.000	0.000	10	$85.00	Installing high efficiency single-speed pool pumps and motors in homes that have inefficient pool pumps and motors	9.68	$0.010	0.019
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	10	$579.00	Installing high efficiency multi-speed pool pumps and motors in homes that have inefficient pool pumps and motors	2.66	$0.042	0.051
8001	Cross-Cutting	Behavior Modification: Home Energy Reports	SF	All	RETRO	8226.000	0.020	164.520	0.019	0.019	1.075	1	$6.77	Delivery of home energy reports	3.27	$0.014	0.078
8002	Cross-Cutting	Behavior Modification: Home Energy Reports	SF	All	NC	8226.000	0.020	164.520	0.019	0.019	1.075	1	$6.77	Delivery of home energy reports	3.27	$0.014	0.078
8003	Cross-Cutting	Behavior Modification: Home Energy Reports	MF	All	RETRO	4113.000	0.020	82.260	0.009	0.009	0.537	1	$6.77	Delivery of home energy reports	1.64	$0.028	0.092
8004	Cross-Cutting	Behavior Modification: Home Energy Reports	MF	All	NC	4113.000	0.020	82.260	0.009	0.009	0.537	1	$6.77	Delivery of home energy reports	1.64	$0.028	0.092

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 of

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	**2013 RBS**	**2013 RBS**
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 RBS** **2013 RCASS** 2014 PA Baseline	**2013 RBS** 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	**2013 RCASS** 2014 PA Baseline	**ENERGY STAR** PA Baseline GDS
Water Heating	**MEMD** GDS calculations	**MEMD** Vermont TRM	**MEMD** Illinois TRM	**MEMD** Illinois TRM	**2013 RBS** 2014 PA Baseline	**2013 RBS** 2014 PA Baseline GDS
HVAC Equipment	**MEMD**	**MEMD**	**MEMD**	**MEMD**	**2015 RCAS** **2013 RBS** **2013 RCASS** GDS	**2015 RCAS** **2013 RBS** **2013 RCASS** GDS
HVAC Shell	**MEMD**	**MEMD**	**MEMD**	**MEMD**	**2015 RCAS** **2013 RBS** **2013 RCASS** GDS	**2015 RCAS** **2013 RBS** **2013 RCASS** GDS
Other	**MEMD**	**MEMD**	**MEMD**	**MEMD**	**2013 RCASS**	**ENERGY STAR** GDS
Cross-Cutting	**MEMD** GDS calculations	**MEMD** GDS calculations	**MEMD**	**MEMD**	**GDS**	**GDS**

List of Abbreviations

2013 RBS: DTE Energy Residential Baseline Study: First Quarter 2013

2013 RCASS: DTE Energy 2013 Residential Customer Appliance Saturation Survey

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

2015 RCAS: DTE Energy 2015 Residential Customer Appliance Survey

APPENDIX C – COMMERCIAL ASSUMPTIONS

Michigan Commercial Measure Database - Electric

Measure Savings, Cost and Useful Life

DTE (Michigan)	Measure Assumption					
Measure Name	**Annual kWh Savings**	**Cost Type: 1=Full 2=Inc.**	**Cost/Unit Descriptor**	**Cost/Unit**	**Effective Measure Life**	**Direct Utility Test**
Computers & Office Equipment						
Energy Star Compliant 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
Smart Strip plug outlet	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
Vendor Miser for Non-Refrig Equipment	342.50	1	per unit	$100.00	5	1.1
High Efficiency Hand Dryer	965.00	1	per unit	$450.00	10	1.5
Electrically Commutated Plug Fans in data centers	1444.50	2	per fan	$718.00	15	2.1
High Efficiency CRAC unit	162.33	1	MBH	$82.50	15	2.1
Computer Room Air Conditioner Economizer	358.00	2	MBH	$82.00	15	3.8
Computer Room Hot Aisle Cold Aisle Configuration	124.75	2	MBH	$156.00	15	0.8
Computer Room Air Side Economizer	440.33	2	MBH	$25.00	10	11.1
VFD for Process Fans -CRAC units	2279.00	1	per HP	$200.00	15	11.6
Water Heating						
Heat Pump Water Heater	184058.00	2	per heater	$10,600.00	15	20.0
HP Water Heater - Residential unit in Commercial Application	5375.00	2	per heater	$1,000.00	15	6.7
Heat Pump Storage Water Heater	2504.50	2	per heater	$433.00	10	4.5
Electric Tankless Water Heater	621.00	2	per heater	$466.00	20	1.7
Low Flow Faucet Aerator	903.00	1	per unit	$2.50	10	275.5
Low Flow Showerhead	615.00	1	per unit	$25.00	10	18.3
Hot Water (DHW) Pipe Insulation	44.74	1	Linear Ft	$10.00	20	6.1
Clothes Washer ENERGY STAR, Gas water heater, Gas dryer	126.00	2	per unit	$139.30	7	0.4
Clothes Washer ENERGY STAR, Gas water heater, Electric dryer	793.00	2	per unit	$442.03	7	0.9
Clothes Washer ENERGY STAR, Electric Water heater, Gas Dryer	627.00	2	per unit	$437.97	7	0.7
Clothes Washer ENERGY STAR, Electric Water heater, Electric Dryer	1293.00	2	per unit	$540.00	7	1.1
ES Dishwasher, High Temp, Elec Heat, Elec Booster	12913.50	2	per unit	$977.50	16	15.1
ES Dishwasher, High Temp, Gas Heat, Elec Booster	5776.75	2	per unit	$735.88	16	9.0
ES Dishwasher, High Temp, Gas Heat, Gas Booster	1698.75	2	per unit	$354.61	16	5.5
ES Dishwasher, Low Temp, Elec Heat	12782.50	2	per unit	$255.00	16	57.4
ES Dishwasher, Low Temp, Gas Heat	584.00	2	per unit	$83.61	16	54.0
Tank Insulation (electric)	468.00	1	per square foot	$6.22	15	77.7
Pre Rinse Sprayers (electric)	1396.00	1	each	$35.00	5	15.0
ECM Circulator Pump	4949.40	1	per Motor	$2,266.67	15	2.4
Drain water Heat Recovery Water Heater	546.00	1	Per Unit	$631.00	25	1.2
Efficient Hot Water Pump	525.50	1	hp	$78.20	15	5.8
HVAC Condenser Heater Recovery Water Heating	3536.50	1	ton	$254.00	15	30.4
Process Cooling Condenser Heater Recovery Water Heating	5720.00	1	ton	$254.00	15	25.6
Pools						
Heat Pump Pool Heater	5731.86	1	Per Unit	$4,000.00	10	1.6
High efficiency spas/hot tubs	375.00	2	Per Unit	$300.00	10	1.2
Ventilation						
Economizer	136.60	2	ton	$122.55	13	0.8
Demand-Controlled Ventilation	181.00	2	1000 sq ft cond floor area	$75.00	15	34.9
Variable Speed Drive Control, 15 HP	19590.00	1	per Unit	$3,690.00	15	5.7
Variable Speed Drive Control, 5 HP	6530.00	1	Per Unit	$1,230.00	15	5.7
Variable Speed Drive Control, 40 HP	52240.00	1	Per Unit	$9,840.00	15	5.7

Michigan Commercial Measure Database - Electric

Measure Savings, Cost and Useful Life

DTE (Michigan)	Measure Assumption					
Measure Name	Annual kWh Savings	Cost Type: 1=Full 2=Inc.	Cost/Unit Descriptor	Cost/Unit	Effective Measure Life	Direct Utility Test
High Speed Fans	706.60	1	per fan	$675.00	7	0.8
High Volume Low Speed Fans	5859.90	1	per fan	$5,767.40	10	1.0
Engineered CKV hood	727.20	2	100 cfm red	$124.62	15	6.9
Space Cooling - Chillers						
Air-Cooled Recip Chiller	343.80	2	ton	$141.03	20	4.0
Air-Cooled Screw Chiller	344.80	2	ton	$143.92	20	3.9
Water-Cooled Centrifugal Chiller < 150 ton	255.80	2	ton	$411.03	20	0.9
Water-Cooled Centrifugal Chiller 150 - 300 ton	225.80	2	ton	$125.80	20	2.8
Water-Cooled Centrifugal Chiller > 300 ton	209.70	2	ton	$27.30	20	11.7
Water-Cooled Screw Chiller < 150 ton	257.10	2	ton	$387.99	20	1.1
Water-Cooled Screw Chiller 150 - 300 ton	232.10	2	ton	$129.11	20	2.9
Water-Cooled Screw Chiller > 300 ton	207.60	2	ton	$27.15	20	12.2
Chiller Tune Up	141.70	1	ton	$5.66	5	14.5
High Efficiency Pumps	201.40	1	per HP	$96.79	15	2.4
Efficient Chilled Water Pump	772.20	1	per HP	$33.20	15	25.5
Chilled Hot Water Reset	116.90	1	ton	$5.53	8	26.8
Air-Cooled Chiller Average Minimum Qualifying 1.04 kW/ton	157.80	2	ton	$66.63	20	4.3
Air-Cooled Chiller Average 0.01 kW/ton IPLV Reduction	9.86	2	ton	$4.36	20	3.4
Water-Cooled Chiller Average 10% above IECC standard	127.00	2	ton	$101.49	20	2.3
Water-Cooled Chiller Average 0.01 kW/ton IPLV Reduction	8.31	2	ton	$5.49	20	1.8
VAV System Conversion	4945.40	1	1000 sq ft cond floor area	$1,395.76	20	3.7
Motor Belt Replacement	94.70	1	per HP	$21.33	14	5.0
Water-Side Economizer	1047.50	2	ton	$50.00	15	18.3
Improved Duct Sealing - Cooling Chiller	37.60	2	ton	$107.91	18	0.6
Integrated Building Design	322775.40	2	per Building	$75,580.52	30	8.3
Building Operator Certification	11767.25	2	per participant of 194,500 SF	$396.27	5	11.6
Energy Efficient Windows	170.35	2	100SF	$272.96	25	0.9
Cool Roof	51.25	2	1000 sq ft roof area	$332.44	20	0.1
Ceiling Insulation	65.50	1	1000 sq ft roof area	$47.16	30	2.7
Wall Insulation	364.80	1	1000 sq ft wall area	$4.57	30	130.5
Roof Insulation	22.10	1	1000 sq ft	$54.88	30	1.0
Window Improvements	85.30	1	100 sq ft glazing	$286.16	15	0.4
EMS install	269.45	1	1000 sq ft cond floor area	$2.94	15	80.9
EMS Optimization	358.90	1	1000 sq ft cond floor area	$18.62	20	23.5
HVAC Occupancy Sensors	99.25	2	1000 sq ft cond floor area	$107.59	15	1.8
Setback with Electric Heat	3451.55	2	each	$71.00	9	28.1
EMS Pump Scheduling Controls	1524.40	2	pump Hp	$1.32	15	1298.3
Web enabled EMS	670.75	2	1000 sq ft cond floor area	$19.10	15	23.1
Zoning	187.35	2	1000 sq ft cond floor area	$500.00	15	0.6
Retrocommissioning	2.55	1	sq ft	$0.30	7	3.9
Commissioning	4.50	1	sq ft	$1.16	7	1.8
Space Cooling - Unitary & Split AC						
AC <65k	290.80	2	ton	$108.53	15	3.0
AC 65k - 135k	58.50	2	ton	$323.71	15	0.4
AC 135k - 240k	56.10	2	ton	$166.48	15	0.9
AC 240k - 760k	51.60	2	ton	$118.39	15	1.1
AC >760k	44.10	2	ton	$123.39	15	0.9
Air Source Heat Pump - Cooling	75.70	2	ton	$131.25	15	1.2
Ductless (mini split) - Cooling	127.60	1	ton	$834.32	15	0.3
Water Loop Heat Pump (WLHP) - Cooling	7.12	2	ton	$5.02	15	3.9
Ground Source Heat Pump - Cooling	2740.20	2	ton	$927.66	15	2.9
Packaged Terminal Air Conditioner (PTAC) - Cooling	102.00	2	ton	$179.42	15	0.9

Michigan Commercial Measure Database - Electric

Measure Savings, Cost and Useful Life

DTE (Michigan)	Measure Assumption					
Measure Name	Annual kWh Savings	Cost Type: 1=Full 2=Inc.	Cost/Unit Descriptor	Cost/Unit	Effective Measure Life	Direct Utility Test
WLHP System (Cooling) New Construction	370.46	2	1000 sq ft cond floor area	$1,000.00	20	0.5
DX Condenser Coil Cleaning	58.60	1	ton	$32.40	3	1.0
Room A/C	158.00	2	per unit	$74.75	15	5.9
Improved Duct Sealing - Cooling AC	37.60	2	ton	$107.91	18	0.6
Integrated Building Design	322775.40	2	per Building	$75,580.52	30	8.3
Building Operator Certification	11767.25	2	per participant of 194,500 SF	$396.27	5	11.6
Energy Efficient Windows	170.35	2	100SF	$272.96	25	0.9
Cool Roof	51.25	2	1000 sq ft roof area	$332.44	20	0.1
Ceiling Insulation	65.50	1	1000 sq ft roof area	$47.16	30	2.7
Wall Insulation	364.80	1	1000 sq ft wall area	$4.57	30	130.5
Roof Insulation	22.10	1	1000 sq ft	$54.88	30	1.0
Window Improvements	85.30	1	100 sq ft glazing	$286.16	15	0.4
Programmable Thermostats	77.10	1	1000 sq ft cond floor area	$58.99	9	0.8
EMS install	269.45	1	1000 sq ft cond floor area	$2.94	15	80.9
EMS Optimization	358.90	1	1000 sq ft cond floor area	$18.62	20	23.5
Hotel Guest Room Occupancy Control System	557.00	2	per unit	$125.00	8	3.0
HVAC Occupancy Sensors	99.25	2	1000 sq ft cond floor area	$107.59	15	1.8
Setback with Electric Heat	3451.55	2	each	$71.00	9	28.1
EMS Pump Scheduling Controls	1524.40	2	pump Hp	$1.32	15	1298.3
Web enabled EMS	670.75	2	1000 sq ft cond floor area	$19.10	15	23.1
Zoning	187.35	2	1000 sq ft cond floor area	$500.00	15	0.6
Retrocommissioning	2.55	1	sq ft	$0.30	7	3.9
Commissioning	4.50	1	sq ft	$1.16	7	1.8
Cooking						
HE Steamer	12914.00	2	each	$4,150.00	12	3.2
HE Combination Oven	18432.00	2	each	$16,884.00	12	1.1
HE Convection Ovens	1879.00	2	each	$471.00	12	4.1
HE Holding Cabinet	3299.30	2	each	$1,783.00	12	1.8
HE Fryer	1166.00	2	each	$1,706.00	12	0.7
HE Griddle	2594.00	2	each	$3,604.00	12	0.7
Induction Cooktops	784.00	2	Per Unit	$3,000.00	11	1.3
Lighting						
Lamp & Ballast Retrofit (HPT8 Replacing T12)	54.20	2	per fixture	$34.15	15	1.8
Lamp & Ballast Retrofit (HPT8 Replacing Standard T8)	24.70	2	er fixture, Replacing standard T8	$34.00	15	1.1
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing T12)	73.40	2	r fixture, Replacing standard T12	$37.09	15	2.2
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing Standard T8)	42.00	2	xture, Replacing standard T8 4ft l	$37.09	15	1.3
T5 HP Retrofits	80.70	2	per fixture	$107.00	15	1.1
Light Tube	344.30	2	per fixture	$500.00	14	0.7
High Intensity Fluorescent Fixture (replacing HID)	4160.00	2	kW saved	$1,491.00	12	2.8
High Intensity Fluorescent Fixture (replacing HID) - New Construction	4160.00	2	kW saved	$941.46	12	4.5
42W 8 lamp Hi Bay CFL	345.00	2	per fixture, Replacing 400W HID	$496.40	12	0.7
HID Fixture Upgrade - Pulse Start Metal Halide	768.50	2	per fixture	$223.63	13	3.7
Interior induction Lighting	4.16	2	Watt Reduced	$1.53	16	3.4
CFL Fixture	157.50	2	per fixture	$45.00	12	3.4
CFL Screw-in	84.74	2	per lamp	$1.36	2	11.6
CFL Screw in Specialty	132.80	2	per lamp	$4.58	2	5.4
CFL Reflector Flood	133.50	2	per lamp	$6.00	2	4.1
LED Screw In (replacing Incandescent)	134.80	2	per lamp	$16.45	9	6.3
LED Screw In (replacing CFL)	12.00	2	per lamp	$13.41	9	0.7
LED High bay lighting	4160.00	2	kW saved	$2,900.00	16	1.8
LED low bay lighting	2669.00	2	kW saved	$2,900.00	18	1.2
LED Downlight	141.50	2	per fixture	$12.74	15	12.5

Michigan Commercial Measure Database - Electric

Measure Savings, Cost and Useful Life

DTE (Michigan)	Measure Assumption					
Measure Name	Annual kWh Savings	Cost Type: 1=Full 2=Inc.	Cost/Unit Descriptor	Cost/Unit	Effective Measure Life	Direct Utility Test
LED Specialty (replacing Incandescent)	80.55	2	per lamp	$12.79	9	4.8
LED Specialty (replacing CFL)	16.13	2	per lamp	$10.17	9	1.2
LED Troffer	32.33	2	per fixture	$125.00	18	0.4
LED Tube Lighting	53.86	2	per lamp	$35.00	18	2.0
LED Grow Light	4.38	2	per watt reduced	$1.53	11	2.7
Interior Non Highbay/Lowbay LED Fixtures	2.67	2	per watt reduced	$2.90	18	1.2
Illuminated Signs to LED	5.71	2	per watt reduced	$4.00	10	1.1
LED Lighting in Refrigeration	460.00	2	per door	$356.00	16	1.3
LED Exit Sign	201.00	2	per fixture	$25.00	15	8.3
LED Fuel Pump Canopy Fixture	135.67	2	Per unit	$343.00	21	0.4
LED Auto Traffic Signals	275.00	2	per lamp	$50.00	6	3.4
LED Pedestrian Signals	150.00	2	per lamp	$100.00	8	1.2
Exterior HID replacement with CFLs	1021.43	2	per fixture	$596.67	12	1.3
Exterior HID replacement with LEDs	519.47	2	per fixture	$753.67	12	0.5
Garage HID replacement with LEDs	1053.67	2	per fixture	$753.67	12	1.2
Exterior Linear Fluorescent	4319.00	2	per kW reduced	$2,500.00	12	1.3
Long Day Lighting Dairy	6.21	2	per watt controlled	$1.79	16	4.0
Lighting Controls						
Central Lighting Control	8340.63	1	10,000 SF	$3,700.00	12	2.2
Daylight Sensor Controls	10409.10	1	10,000 SF	$4,000.00	12	2.5
Daylight Sensor Controls - New Construction	8810.00	1	10,000 SF	$4,000.00	12	2.2
Occupancy Sensor	504.43	2	per sensor	$226.47	10	1.5
Occupancy Sensor & Daylight Sensor	639.00	2	per sensor	$277.50	10	1.9
Switching Controls for Multilevel Lighting (Non-HID)	6000.00	1	10,000 SF	$4,000.00	12	1.5
Lighting Power Density - Interior	2669.00	2	per kW reduced	$220.00	15	13.7
Lighting Power Density - Exterior	4319.00	2	per kW reduced	$220.00	12	14.6
Lighting Power Density - Parking Garage	8760.00	2	per kW reduced	$220.00	12	34.5
Stairwell Bi-Level Control	4809.00	2	per kW controlled	$825.00	9	4.0
Occupancy Sensors for LED Refrigerator Lighting	195.00	2	per door	$20.00	16	10.0
Exterior BiLevel Controls	530.53	2	per fixture	$444.33	10	0.8
Garage BiLevel Controls	927.49	2	per fixture	$632.00	11	1.4
Sports Field Lighting HiLo Control	149.00	2	per fixture	$532.00	10	0.2
Refrigeration						
Vending Miser for Refrigerated Vending Machines	702.50	1	per unit	$238.75	8	1.6
Evaporator Fan Motor Controls	760.30	1	per controller	$621.00	5	0.5
Zero-Energy Doors	1360.00	2	per door	$290.00	10	3.5
Discus and Scroll Compressors	1500.00	2	per Unit	$825.00	13	1.8
Floating Head Pressure Control	1264.00	1	per ton	$120.00	15	9.1
ENERGY STAR Commercial Solid Door Refrigerators	665.75	2	per unit	$600.00	12	1.0
ENERGY STAR Commercial Solid Door Freezers	1737.25	2	per unit	$450.00	12	3.4
ENERGY STAR Commercial Glass Door Refrigerators	754.00	2	per unit	$600.00	12	1.1
ENERGY STAR Commercial Glass Door Freezers	3671.00	2	per unit	$450.00	12	7.1
Energy Star Ice Machines	1314.10	2	per unit	$1,426.00	9	0.6
Strip Curtains	269.50	1	per square foot	$12.42	4	6.9
Anti Sweat Heater Controls	1489.00	1	per door	$340.00	15	3.8
Efficient Refrigeration Condenser	120.00	2	per ton	$35.00	15	7.7
Door Gaskets - Cooler and Freezer	98.00	2	per linear foot	$9.61	4	3.3
Reach-in Refrigerated display case door retrofit	1014.00	1	Linear Ft	$1,010.00	12	1.3
Refrigeration Savings due to Lighting Savings	1.24	2	per lighting Watt reduced	$1.00	12	1.3
ECM Case Motors	1131.75	2	per Motor	$200.00	15	5.7
Efficient low-temp compressor	875.00	2	per Unit	$552.00	13	1.5
Automatic High Speed Doors	968.30	2	SF	$150.00	12	5.6
Automatic Door Closers for Refrigerated Walk-in Coolers/Freezers	1625.00	2	per door	$156.00	8	6.7

Michigan Commercial Measure Database - Electric

Measure Savings, Cost and Useful Life

DTE (Michigan)	Measure Assumption					
Measure Name	**Annual kWh Savings**	**Cost Type: 1=Full 2=Inc.**	**Cost/Unit Descriptor**	**Cost/Unit**	**Effective Measure Life**	**Direct Utility Test**
Refrigerant charging correction	86.10	2	ton	$38.36	2	0.8
Walk-in Cooler Evaporator Motor Reduction	1462.10	2	per motor removed	$1,000.00	15	1.5
Night Covers	15.60	1	LF of case - hr	$37.54	5	0.3
Refrigeration Suction Line Insulation	10.82	1	LF	$4.32	15	2.6
Compressed Air						
Efficient Air Compressors	780.54	2	per HP	$150.00	15	5.5
Automatic Drains	2097.00	2	per drain	$355.00	5	2.5
Cycling Dryers	12.81	2	per SCFM	$30.00	10	0.4
Low Pressure Drop-Filters	64.70	1	per HP	$22.00	10	2.4
Air-Entraining Air Nozzles	21142.56	1	per nozzle	$95.25	15	293.7
Receiver Capacity Addition	9158.76	1	per Unit	$2,000.00	10	4.3
Compressed Air Audits & Leak Repair	624.00	1	per SCFM	$16.00	1	3.5
Compressed Air Pressure Flow Controller replacing no flow controller	73.94	1	per HP	$37.00	10	1.6
High Efficiency Air Dryers	48.63	2	per SCFM	$32.33	15	1.6
Air Compressor Outdoor Air Intake	109.80	1	per HP	$5.00	20	28.5
Variable Displacement Air Compressor	442.00	1	per HP	$340.00	13	1.3
Compressed Air Storage Tank	422.76	1	per HP	$36.00	25	17.0
Compressed Air Replacement with Air Blowers	5587.70	1	per HP	$930.00	15	11.8
Space Heating						
Air Source Heat Pump - Heating	75.70	2	ton	$131.25	15	1.1
Ground Source Heat Pump - Heating	10960.80	2	ton	$3,710.66	15	2.6
Ductless (mini split) - Heating	127.60	1	ton	$834.32	15	0.3
VFD Pumps	1708.90	1	per CHW pump hp	$212.29	10	5.4
ECM motors on furnaces	1034.00	1	per Furnace	$1,359.07	20	0.9
Water Loop Heat Pump (WLHP) - Heating	28.48	2	ton	$20.09	15	1.9
WLHP System (Heating) New Construction	1481.84	2	1000 sq ft cond floor area	$4,000.00	20	0.4
Integrated Building Design	322775.40	2	per Building	$75,580.52	30	8.3
Building Operator Certification	11767.25	2	per participant of 194,500 SF	$396.27	5	11.6
Energy Efficient Windows	170.35	2	100SF	$272.96	25	0.9
Cool Roof	51.25	2	1000 sq ft roof area	$332.44	20	0.1
Ceiling Insulation	65.50	1	1000 sq ft roof area	$47.16	30	2.7
Wall Insulation	364.80	1	1000 sq ft wall area	$4.57	30	130.5
Roof Insulation	22.10	1	1000 sq ft	$54.88	30	1.0
Window Improvements	85.30	1	100 sq ft glazing	$286.16	15	0.4
EMS install	269.45	1	1000 sq ft cond floor area	$2.94	15	80.9
EMS Optimization	358.90	1	1000 sq ft cond floor area	$18.62	20	23.5
Hotel Guest Room Occupancy Control System	557.00	2	per unit	$125.00	8	3.0
HVAC Occupancy Sensors	99.25	2	1000 sq ft cond floor area	$107.59	15	1.8
Setback with Electric Heat	3451.55	2	each	$71.00	9	28.1
EMS Pump Scheduling Controls	1524.40	2	pump Hp	$1.32	15	1298.3
Web enabled EMS	670.75	2	1000 sq ft cond floor area	$19.10	15	23.1
Web enabled EMS with Electric Heat	9571.00	2	1000 sq ft cond floor area	$141.99	15	57.7
Zoning	187.35	2	1000 sq ft cond floor area	$500.00	15	0.6
Retrocommissioning	2.55	1	sq ft	$0.30	7	3.9
Commissioning	4.50	1	sq ft	$1.16	7	1.8
Other						
NEMA Premium Transformer, single-phase	0.16	2	1% of NEMA Premium efficiency p	$0.24	30	1.6
NEMA Premium Transformer, three-phase	0.24	2	1% of NEMA Premium efficiency p	$0.18	30	1.5
High Efficiency Transformer, single-phase	0.39	2	).01% of additional efficiency per	$0.46	30	1.4
High Efficiency Transformer, three-phase	0.44	2	).01% of additional efficiency per	$0.44	30	2.5
Optimized Snow and Ice Melt Controls (electric)	0.12	1	SF	$15.15	15	0.0
Engine Block Heater Timer	576.00	2	per engine block	$50.00	5	13.1
Parking Garage Exhaust Fan CO Control	2413.00	2	per HP	$900.00	15	4.7

Michigan Commercial Measure Database - Electric

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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	24.8%	24.8%	24.8%	24.8%	24.8%	24.8%	24.8%	24.8%	24.8%
High Efficiency Electric Water Heater	24.8%	24.8%	24.8%	24.8%	24.8%	24.8%	24.8%	24.8%	24.8%
Solar Storage Water Heater	24.8%	24.8%	24.8%	24.8%	24.8%	24.8%	24.8%	24.8%	24.8%
Electric Tankless Water Heater	24.8%	24.8%	24.8%	24.8%	24.8%	24.8%	24.8%	24.8%	24.8%
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	42.5%	42.5%	42.5%	42.5%	42.5%	42.5%	42.5%	42.5%	42.5%
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	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%

Michigan Commercial Measure Database - Electric

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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%
Space Cooling - Chillers									
Air-Cooled Recip Chiller	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Air-Cooled Screw Chiller	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Water-Cooled Centrifugal Chiller < 150 ton	10.8%	10.8%	10.8%	10.8%	10.8%	10.8%	10.8%	10.8%	10.8%
Water-Cooled Centrifugal Chiller 150 - 300 ton	10.8%	10.8%	10.8%	10.8%	10.8%	10.8%	10.8%	10.8%	10.8%
Water-Cooled Centrifugal Chiller > 300 ton	10.8%	10.8%	10.8%	10.8%	10.8%	10.8%	10.8%	10.8%	10.8%
Water-Cooled Screw Chiller < 150 ton	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Water-Cooled Screw Chiller 150 - 300 ton	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Water-Cooled Screw Chiller > 300 ton	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
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	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Air-Cooled Chiller Average 0.01 kW/ton IPLV Reduction	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Water-Cooled Chiller Average 10% above IECC standard	10.8%	10.8%	10.8%	10.8%	10.8%	10.8%	10.8%	10.8%	10.8%
Water-Cooled Chiller Average 0.01 kW/ton IPLV Reduction	10.8%	10.8%	10.8%	10.8%	10.8%	10.8%	10.8%	10.8%	10.8%
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	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
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	9.8%	18.2%	14.2%	14.8%	0.6%	8.8%	15.6%	6.9%	32.2%
AC 65k - 135k	9.8%	18.2%	14.2%	14.8%	0.6%	8.8%	15.6%	6.9%	32.2%
AC 135k - 240k	9.8%	18.2%	14.2%	14.8%	0.6%	8.8%	15.6%	6.9%	32.2%
AC 240k - 760k	9.8%	18.2%	14.2%	14.8%	0.6%	8.8%	15.6%	6.9%	32.2%
AC >760k	9.8%	18.2%	14.2%	14.8%	0.6%	8.8%	15.6%	6.9%	32.2%
Air Source Heat Pump - Cooling	0.5%	0.0%	0.0%	3.0%	0.0%	7.0%	0.0%	5.5%	1.5%

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Measure Name	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other
Ductless (mini split) - Cooling	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.5%	0.0%
Water Loop Heat Pump (WLHP) - Cooling	0.2%	0.0%	0.0%	1.2%	0.0%	2.8%	0.0%	2.2%	0.6%
Ground Source Heat Pump - Cooling	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.0%	1.0%
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	1.0%	0.0%	0.0%	5.0%	11.0%	24.0%	10.0%	17.0%	8.0%
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	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	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%	34.0%	34.0%	0.0%	34.0%	34.0%	34.0%	0.0%
HE Combination Oven	0.0%	0.0%	6.7%	6.7%	0.0%	6.7%	6.7%	6.7%	0.0%
HE Convection Ovens	0.0%	0.0%	6.7%	6.7%	0.0%	6.7%	6.7%	6.7%	0.0%
HE Holding Cabinet	0.0%	0.0%	36.4%	36.4%	0.0%	36.4%	36.4%	36.4%	0.0%
HE Fryer	0.0%	0.0%	1.0%	1.0%	0.0%	1.0%	1.0%	1.0%	0.0%
HE Griddle	0.0%	0.0%	9.0%	9.0%	0.0%	9.0%	9.0%	9.0%	0.0%
Induction Cooktops	0.0%	0.0%	6.7%	6.7%	0.0%	6.7%	6.7%	6.7%	0.0%
Lighting									
Lamp & Ballast Retrofit (HPT8 Replacing T12)	9.7%	8.7%	8.7%	9.7%	9.7%	9.7%	9.7%	9.7%	8.7%
Lamp & Ballast Retrofit (HPT8 Replacing Standard T8)	9.7%	8.7%	8.7%	9.7%	9.7%	9.7%	9.7%	9.7%	8.7%
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing T12)	9.7%	8.7%	8.7%	9.7%	9.7%	9.7%	9.7%	9.7%	8.7%
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing Standard T8)	9.7%	8.7%	8.7%	9.7%	9.7%	9.7%	9.7%	9.7%	8.7%
T5 HP Retrofits	9.7%	8.7%	8.7%	9.7%	9.7%	9.7%	9.7%	9.7%	8.7%
Light Tube	1.3%	1.2%	1.2%	1.2%	1.3%	1.2%	0.8%	1.3%	1.2%
High Intensity Fluorescent Fixture (replacing HID)	1.3%	1.2%	1.2%	1.2%	1.3%	1.2%	0.8%	1.3%	1.2%
High Intensity Fluorescent Fixture (replacing HID) - New Construction	1.3%	1.2%	1.2%	1.2%	1.3%	1.2%	0.8%	1.3%	1.2%
42W 8 lamp Hi Bay CFL	1.3%	1.2%	1.2%	1.2%	1.3%	1.2%	0.8%	1.3%	1.2%
HID Fixture Upgrade - Pulse Start Metal Halide	1.3%	1.2%	1.2%	1.2%	1.3%	1.2%	0.8%	1.3%	1.2%
Interior induction Lighting	1.3%	1.2%	1.2%	1.2%	1.3%	1.2%	0.8%	1.3%	1.2%
CFL Fixture	1.3%	1.2%	1.2%	1.2%	1.3%	1.2%	0.8%	1.3%	1.2%

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	1.3%	1.2%	1.2%	1.2%	1.3%	1.2%	0.8%	1.3%	1.2%
CFL Screw in Specialty	1.3%	1.2%	1.2%	1.2%	1.3%	1.2%	0.8%	1.3%	1.2%
CFL Reflector Flood	1.3%	1.2%	1.2%	1.2%	1.3%	1.2%	0.8%	1.3%	1.2%
LED Screw In (replacing Incandescent)	1.3%	1.2%	1.2%	1.2%	1.3%	1.2%	0.8%	1.3%	1.2%
LED Screw In (replacing CFL)	1.3%	1.2%	1.2%	1.2%	1.3%	1.2%	0.8%	1.3%	1.2%
LED High bay lighting	1.3%	1.2%	1.2%	1.2%	1.3%	1.2%	0.8%	1.3%	1.2%
LED low bay lighting	1.3%	1.2%	1.2%	1.2%	1.3%	1.2%	0.8%	1.3%	1.2%
LED Downlight	1.3%	1.2%	1.2%	1.2%	1.3%	1.2%	0.8%	1.3%	1.2%
LED Specialty (replacing Incandescent)	1.3%	1.2%	1.2%	1.2%	1.3%	1.2%	0.8%	1.3%	1.2%
LED Specialty (replacing CFL)	9.7%	8.7%	8.7%	9.7%	9.7%	9.7%	9.7%	9.7%	9.7%
LED Troffer	9.7%	8.7%	8.7%	9.7%	9.7%	9.7%	9.7%	9.7%	8.7%
LED Tube Lighting	9.7%	8.7%	8.7%	9.7%	9.7%	9.7%	9.7%	9.7%	8.7%
LED Grow Light	0.0%	8.7%	8.7%	0.0%	0.0%	0.0%	0.0%	0.0%	8.7%
Interior Non Highbay/Lowbay LED Fixtures	9.7%	8.7%	8.7%	9.7%	9.7%	9.7%	9.7%	9.7%	8.7%
Illuminated Signs to LED	0.0%	0.7%	0.7%	0.7%	0.1%	0.1%	3.4%	0.0%	0.7%
LED Lighting in Refrigeration	0.0%	0.5%	0.2%	0.3%	2.6%	0.1%	1.3%	0.1%	0.6%
LED Exit Sign	0.9%	0.9%	0.9%	0.9%	0.8%	0.9%	0.8%	0.9%	0.9%
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%	28.7%
LED Pedestrian Signals	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	28.7%
Exterior HID replacement with CFLs	29.7%	29.7%	29.7%	29.7%	29.7%	29.7%	29.7%	29.7%	11.1%
Exterior HID replacement with LEDs	29.7%	29.7%	29.7%	29.7%	29.7%	29.7%	29.7%	29.7%	11.1%
Garage HID replacement with LEDs	29.7%	29.7%	29.7%	29.7%	29.7%	29.7%	29.7%	29.7%	11.1%
Exterior Linear Fluorescent	7.7%	7.7%	7.7%	7.7%	7.7%	7.7%	7.7%	7.7%	2.6%
Long Day Lighting Dairy	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.0%
Lighting Controls									
Central Lighting Control	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
Daylight Sensor Controls	92.9%	92.9%	92.9%	92.9%	92.9%	92.9%	92.9%	92.9%	92.9%
Daylight Sensor Controls - New Construction	92.9%	92.9%	92.9%	92.9%	92.9%	92.9%	92.9%	92.9%	92.9%
Occupancy Sensor	67.9%	67.9%	67.9%	67.9%	67.9%	67.9%	67.9%	67.9%	67.9%
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)	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%
Lighting Power Density - Interior	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%	38.0%
Lighting Power Density - Parking Garage	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	38.0%
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 BiLevel Controls	44.5%	44.5%	44.5%	44.5%	44.5%	44.5%	44.5%	44.5%	13.5%
Garage BiLevel Controls	44.5%	44.5%	44.5%	44.5%	44.5%	44.5%	44.5%	44.5%	13.5%
Sports Field Lighting HiLo Control	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%
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%

Michigan 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
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%
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%
Night Covers	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%
Refrigeration Suction Line Insulation	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
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	0.5%	0.0%	0.0%	3.0%	0.0%	7.0%	0.0%	5.5%	1.5%
Ground Source Heat Pump - Heating	0.2%	0.0%	0.0%	1.2%	0.0%	2.8%	0.0%	2.2%	0.6%
Ductless (mini split) - Heating	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.5%	0.0%
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	0.2%	0.0%	0.0%	1.2%	0.0%	2.8%	0.0%	2.2%	0.6%
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	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
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%

Michigan 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
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	100.0%	100.0%	100.0%	100.0%	0.0%	100.0%	100.0%	100.0%	100.0%
Zoning	50.0%	50.0%	50.0%	50.0%	50.0%	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%
Other									
NEMA Premium Transformer, single-phase	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
NEMA Premium Transformer, three-phase	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
High Efficiency Transformer, single-phase	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
High Efficiency Transformer, three-phase	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
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%

Michigan 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%
High Efficiency Electric Water Heater	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%
Solar Storage Water Heater	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
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%
Variable Speed Drive Control, 40 HP	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%

Michigan Commercial Measure Database - Electric

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Measure Name	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other
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%
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%
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%

Michigan Commercial Measure Database - Electric

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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%
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%
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%

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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%
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%
Long Day Lighting Dairy	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%	51.4%
Lighting Controls									
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%
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%
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 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%
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%

Michigan 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
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%
Night Covers	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%
Refrigeration Suction Line Insulation	60.1%	60.1%	60.1%	60.1%	60.1%	60.1%	60.1%	60.1%	60.1%
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%
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%
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%

Michigan 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	79.0%	79.0%	79.0%	79.0%	79.0%	79.0%	79.0%	79.0%	79.0%
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%
Smart Strip plug outlet	72.0%	72.0%	72.0%	72.0%	72.0%	72.0%	72.0%	72.0%	72.0%
PC Network Energy Management Controls replacing no central control	88.0%	88.0%	88.0%	94.0%	88.0%	88.0%	88.0%	88.0%	88.0%
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	98.7%	98.7%	98.7%	98.7%	98.7%	98.7%	98.7%	98.7%	98.7%
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%	92.3%	94.4%	87.5%	97.3%	100.0%	100.0%	90.9%	100.0%
High Efficiency Electric Water Heater	100.0%	92.3%	94.4%	87.5%	97.3%	100.0%	100.0%	90.9%	100.0%
Solar Storage Water Heater	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%
Electric Tankless Water Heater	100.0%	92.3%	94.4%	87.5%	97.3%	100.0%	100.0%	90.9%	100.0%
Low Flow Faucet Aerator	99.0%	87.0%	95.0%	74.0%	77.0%	69.0%	92.0%	84.5%	79.0%
Low Flow Showerhead	93.0%	100.0%	100.0%	69.0%	63.0%	85.0%	100.0%	86.0%	100.0%
Hot Water (DHW) Pipe Insulation	94.4%	95.1%	84.6%	92.6%	71.9%	88.2%	91.7%	86.7%	100.0%
Clothes Washer ENERGY STAR, Gas water heater, Gas dryer	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%
Clothes Washer ENERGY STAR, Gas water heater, Electric dryer	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%
Clothes Washer ENERGY STAR, Electric Water heater, Gas Dryer	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%
Clothes Washer ENERGY STAR, Electric Water heater, Electric Dryer	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%
ES Dishwasher, High Temp, Elec Heat, Elec Booster	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
ES Dishwasher, High Temp, Gas Heat, Elec Booster	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
ES Dishwasher, High Temp, Gas Heat, Gas Booster	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
ES Dishwasher, Low Temp, Elec Heat	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
ES Dishwasher, Low Temp, Gas Heat	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
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	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
Drain water Heat Recovery Water Heater	94.4%	90.2%	100.0%	94.1%	100.0%	88.2%	97.2%	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	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%
Process Cooling Condenser Heater Recovery Water Heating	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%
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%
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	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%

Michigan 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
Variable Speed Drive Control, 5 HP	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%
Variable Speed Drive Control, 40 HP	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%
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	71.0%	71.0%	71.0%	71.0%	71.0%	71.0%	71.0%	71.0%	71.0%
Space Cooling - Chillers									
Air-Cooled Recip Chiller	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%
Air-Cooled Screw Chiller	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%
Water-Cooled Centrifugal Chiller < 150 ton	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%
Water-Cooled Centrifugal Chiller 150 - 300 ton	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%
Water-Cooled Centrifugal Chiller > 300 ton	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%
Water-Cooled Screw Chiller < 150 ton	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%
Water-Cooled Screw Chiller 150 - 300 ton	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%
Water-Cooled Screw Chiller > 300 ton	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%
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	56.0%	56.0%	56.0%	56.0%	56.0%	56.0%	56.0%	56.0%	56.0%
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	40.0%	40.0%	47.0%	42.0%	16.0%	56.0%	44.0%	24.0%	40.0%
Roof Insulation	29.2%	62.5%	29.2%	16.7%	25.0%	20.8%	50.0%	41.7%	54.2%
Window Improvements	53.0%	40.0%	38.0%	24.0%	48.0%	12.0%	32.0%	7.0%	29.0%
EMS install	72.0%	92.0%	51.0%	90.0%	93.0%	87.0%	100.0%	99.5%	100.0%
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	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%
AC 65k - 135k	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%
AC 135k - 240k	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%
AC 240k - 760k	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%
AC >760k	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%
Air Source Heat Pump - Cooling	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%
Ductless (mini split) - Cooling	55.0%	55.0%	55.0%	55.0%	55.0%	55.0%	55.0%	55.0%	55.0%
Water Loop Heat Pump (WLHP) - Cooling	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%

Michigan Commercial Measure Database - Electric

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Measure Name	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other
Ground Source Heat Pump - Cooling	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%
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	56.0%	56.0%	56.0%	56.0%	56.0%	56.0%	56.0%	56.0%	56.0%
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%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%
Wall Insulation	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
Roof Insulation	29.2%	29.2%	29.2%	29.2%	29.2%	29.2%	29.2%	29.2%	29.2%
Window Improvements	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%
Programmable Thermostats	45.0%	45.0%	45.0%	45.0%	45.0%	45.0%	45.0%	45.0%	45.0%
EMS install	72.0%	72.0%	72.0%	72.0%	72.0%	72.0%	72.0%	72.0%	72.0%
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%
Lighting									
Lamp & Ballast Retrofit (HPT8 Replacing T12)	91.0%	81.0%	84.0%	79.0%	48.0%	70.0%	92.0%	40.0%	43.0%
Lamp & Ballast Retrofit (HPT8 Replacing Standard T8)	91.0%	81.0%	84.0%	79.0%	48.0%	70.0%	92.0%	40.0%	43.0%
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing T12)	91.0%	81.0%	84.0%	79.0%	48.0%	70.0%	92.0%	40.0%	43.0%
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing Standard T8)	91.0%	81.0%	84.0%	79.0%	48.0%	70.0%	92.0%	40.0%	43.0%
T5 HP Retrofits	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%
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)	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%
High Intensity Fluorescent Fixture (replacing HID) - New Construction	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%
42W 8 lamp Hi Bay CFL	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%
HID Fixture Upgrade - Pulse Start Metal Halide	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%
Interior induction Lighting	91.0%	81.0%	84.0%	79.0%	48.0%	70.0%	92.0%	40.0%	43.0%
CFL Fixture	22.0%	49.0%	16.0%	43.0%	2.0%	33.0%	46.0%	59.5%	24.0%
CFL Screw-in	22.0%	49.0%	16.0%	43.0%	2.0%	33.0%	46.0%	59.5%	24.0%
CFL Screw in Specialty	22.0%	49.0%	16.0%	43.0%	2.0%	33.0%	46.0%	59.5%	24.0%
CFL Reflector Flood	22.0%	49.0%	16.0%	43.0%	2.0%	33.0%	46.0%	59.5%	24.0%
LED Screw In (replacing Incandescent)	22.0%	49.0%	16.0%	43.0%	2.0%	33.0%	46.0%	59.5%	24.0%

Michigan Commercial Measure Database - Electric

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Measure Name	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other
LED Screw In (replacing CFL)	75.0%	48.0%	14.0%	48.0%	98.0%	63.0%	54.0%	75.5%	65.0%
LED High bay lighting	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%	43.0%
LED low bay lighting	91.0%	81.0%	84.0%	79.0%	48.0%	70.0%	92.0%	40.0%	43.0%
LED Downlight	22.0%	49.0%	16.0%	43.0%	2.0%	33.0%	46.0%	59.5%	24.0%
LED Specialty (replacing Incandescent)	22.0%	49.0%	16.0%	43.0%	2.0%	33.0%	46.0%	59.5%	24.0%
LED Specialty (replacing CFL)	75.0%	48.0%	14.0%	48.0%	98.0%	63.0%	54.0%	75.5%	65.0%
LED Troffer	91.0%	81.0%	84.0%	79.0%	48.0%	70.0%	92.0%	40.0%	43.0%
LED Tube Lighting	91.0%	81.0%	84.0%	79.0%	48.0%	70.0%	92.0%	40.0%	43.0%
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	91.0%	81.0%	84.0%	79.0%	48.0%	70.0%	92.0%	40.0%	43.0%
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	82.8%	88.0%	75.0%	86.5%	85.1%	80.0%	83.5%	72.7%	82.8%
LED Exit Sign	11.0%	11.0%	11.0%	11.0%	11.0%	11.0%	11.0%	11.0%	11.0%
LED Fuel Pump Canopy Fixture	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
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	99.0%	90.0%	93.0%	82.0%	66.0%	94.0%	94.0%	99.3%	91.0%
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%
Long Day Lighting Dairy	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Lighting Controls									
Central Lighting Control	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%
Daylight Sensor Controls	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%
Daylight Sensor Controls - New Construction	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%
Occupancy Sensor	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%
Occupancy Sensor & Daylight Sensor	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%
Switching Controls for Multilevel Lighting (Non-HID)	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%
Lighting Power Density - Interior	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%	89.0%
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%
Stairwell Bi-Level Control	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%
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 BiLevel Controls	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%
Garage BiLevel Controls	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%
Sports Field Lighting HiLo Control	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%
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	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Floating Head Pressure Control	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%
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	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%
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	88.0%	88.0%	88.0%	88.0%	88.0%	88.0%	88.0%	88.0%	88.0%
Efficient Refrigeration Condenser	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%	98.0%

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Measure Name	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other
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	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%
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%
Night Covers	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%
Refrigeration Suction Line Insulation	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%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	60.0%
Automatic Drains	75.0%	75.0%	0.0%	75.0%	75.0%	75.0%	75.0%	75.0%	60.0%
Cycling Dryers	75.0%	75.0%	0.0%	75.0%	75.0%	75.0%	75.0%	75.0%	60.0%
Low Pressure Drop-Filters	75.0%	75.0%	0.0%	75.0%	75.0%	75.0%	75.0%	75.0%	60.0%
Air-Entraining Air Nozzles	83.0%	83.0%	0.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.3%
Receiver Capacity Addition	75.0%	75.0%	0.0%	75.0%	75.0%	75.0%	75.0%	75.0%	60.0%
Compressed Air Audits & Leak Repair	100.0%	100.0%	0.0%	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%	0.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.3%
High Efficiency Air Dryers	75.0%	75.0%	0.0%	75.0%	75.0%	75.0%	75.0%	75.0%	60.0%
Air Compressor Outdoor Air Intake	75.0%	75.0%	0.0%	75.0%	75.0%	75.0%	75.0%	75.0%	60.0%
Variable Displacement Air Compressor	75.0%	75.0%	0.0%	75.0%	75.0%	75.0%	75.0%	75.0%	60.0%
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	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%
Ground Source Heat Pump - Heating	72.0%	72.0%	72.0%	72.0%	72.0%	72.0%	72.0%	72.0%	72.0%
Ductless (mini split) - Heating	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
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	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%	83.0%
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	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Ceiling Insulation	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%	53.8%
Wall Insulation	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
Roof Insulation	29.2%	29.2%	29.2%	29.2%	29.2%	29.2%	29.2%	29.2%	29.2%
Window Improvements	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%	53.0%
EMS install	72.0%	72.0%	72.0%	72.0%	72.0%	72.0%	72.0%	72.0%	72.0%
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%	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%
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	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%

Michigan 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
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%

Michigan 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%
High Efficiency Electric Water Heater	25.0%	25.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Solar Storage Water Heater	25.0%	25.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
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%
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%

Michigan 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, 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	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%	67.0%
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%
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%

Michigan 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
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%
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%
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%

Michigan Commercial Measure Database - Electric

Convertible Factor:
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Measure Name	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other
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%
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%
Long Day Lighting Dairy	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Lighting Controls									
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%
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%
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 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%
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%

Michigan Commercial Measure Database - Electric

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Measure Name	Warehouse	Retail	Grocery	Office	Lodging	Health	Restaurant	Education	Other
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%
Night Covers	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Refrigeration Suction Line Insulation	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%
Commissioning	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%

Michigan 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%

Michigan 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

Michigan 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
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

Michigan 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
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
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
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

Michigan 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
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
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	3	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

Michigan 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
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
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
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
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

Michigan 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
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
Long Day Lighting Dairy	1	1	1	3	10
Lighting Controls					
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
Lighting Power Density - Exterior	1	1	1	3	10
Lighting Power Density - Parking Garage	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 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
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

Michigan 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
Refrigerant charging correction	2	2	2	3	10
Walk-in Cooler Evaporator Motor Reduction	1	1	1	3	10
Night Covers	2	2	2	3	16
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
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	3	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

Michigan 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
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 D – INDUSTRIAL ASSUMPTIONS

DTE Industrial Measure Database - Electric

Measure Savings, Cost and Useful Life

DTE (Michigan)	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	20.0
Electric Tankless Water Heater	621.00	2	per heater	$466.00	20	1.7
Efficient Hot Water Pump	525.50	1	hp	$78.20	15	5.8
Pre-rinse sprayers (electric)	1396.00	1	each	$35.00	5	15.0
HVAC Condenser Heater Recovery Water Heating	3536.50	1	ton	$254.00	15	30.4
Low Flow Faucet Aerator	903.00	1	per unit	$2.50	10	275.5
Low Flow Showerhead	615.00	1	per unit	$25.00	10	18.3
Hot Water (DHW) Pipe Insulation	44.74	1	Linear Ft	$10.00	20	6.1
Tank Insulation (electric)	468.00	1	per square foot	$6.22	15	77.7
Drain Water Heat Recovery Water Heater	546.00	1	Per Unit	$631.00	25	1.2
ECM Circulator Pump	4949.40	1	per Motor	$2,266.67	15	2.4
Process Cooling Condenser Heat Recovery	5720.00	1	ton	$254.00	15	25.6
Building Envelope						
Integrated Building Design	322775.40	2	per Building	$75,580.52	30	8.3
Energy Efficient Windows	170.35	2	100SF	$272.96	25	0.9
Cool Roofing	51.25	2	1000 sq ft roof area	$332.44	20	0.1
Ceiling Insulation	65.50	1	1000 sq ft roof area	$47.16	30	2.7
Window Improvements	85.30	1	100 sq ft glazing	$286.16	15	0.4
Wall Insulation	364.80	1	1000 sq ft wall area	$4.57	30	130.5
Roof Insulation	22.10	1	1000 sq ft	$54.88	30	1.0
Improved Duct Sealing	37.60	2	ton	$107.91	18	0.6
Ventilation						
Economizer	136.60	2	ton	$122.55	13	0.8
Variable Speed Drive Control, 15 HP	19590.00	1	per Unit	$3,690.00	15	5.7
Variable Speed Drive Control, 5 HP	6530.00	1	Per Unit	$1,230.00	15	5.7
Variable Speed Drive Control, 40 HP	52240.00	1	Per Unit	$9,840.00	15	5.7
High Speed Fans	706.60	1	per fan	$675.00	7	0.8
High Volume Low Speed Fans	5859.90	1	per fan	$5,767.40	10	1.0
Destratification Fan (HVLS)	16.60	1	000 sq ft cond floor are	$12.75	15	1.6
Space Cooling - Chillers						
Air-Cooled Recip Chiller	343.80	2	ton	$141.03	20	4.0
Air-Cooled Screw Chiller	344.80	2	ton	$143.92	20	3.9
Water Side Economizer	1047.50	2	ton	$50.00	15	18.3
VAV System Conversion	4945.40	1	000 sq ft cond floor are	$1,395.76	20	3.7
Water-Cooled Centrifugal Chiller > 300 ton	209.70	2	ton	$27.30	20	11.7
Motor Belt Replacement	94.70	1	per HP	$21.33	14	5.0
Chilled Hot Water Reset	116.90	1	ton	$5.53	8	26.8
Water-Cooled Screw Chiller > 300 ton	207.60	2	ton	$27.15	20	12.2
Chiller Tune Up	141.70	1	ton	$5.66	5	14.5
Efficient Chilled Water Pump	772.20	1	per HP	$33.20	15	25.5
High Efficiency Pumps	201.40	1	per HP	$96.79	15	2.4

DTE Industrial Measure Database - Electric

Measure Savings, Cost and Useful Life

DTE (Michigan)	Measure Assumption					
Measure Name	**Annual kWh Savings**	**Cost Type: 1=Full 2=Inc.**	**Cost/Unit Descriptor**	**Cost/Unit**	**Effective Measure Life**	**UCT**
HVAC Controls						
Programmable Thermostats	77.00	1	000 sq ft cond floor are	$59.00	9	0.8
EMS install	269.45	1	000 sq ft cond floor are	$2.94	15	80.9
EMS Optimization	358.90	1	000 sq ft cond floor are	$18.62	20	23.5
HVAC Occupancy Sensors	99.25	2	000 sq ft cond floor are	$107.59	15	1.8
Zoning	187.35	2	000 sq ft cond floor are	$500.00	15	0.6
Setback with Electric Heat	3451.55	2	each	$71.00	9	28.1
EMS Pump Scheduling	1524.40	2	pump Hp	$1.32	15	1298.3
Web Enabled EMS	670.75	2	000 sq ft cond floor are	$19.10	15	23.1
Retrocommissioning	2.55	1	sq ft	$0.30	7	3.9
Space Cooling - Unitary and Split AC						
AC 240K - 760 K	51.60	2	ton	$118.39	15	1.1
Ductless (mini split) - Cooling	127.60	1	ton	$834.32	15	0.3
Ground Source Heat Pump - Cooling	2740.20	2	ton	$927.66	15	2.9
Water Loop Heat Pump (WLHP) - Cooling	7.12	2	ton	$5.02	15	3.9
Air Source Heat Pump - Cooling	75.70	2	ton	$131.25	15	1.2
DX Condenser Coil Cleaning	58.60	1	ton	$32.40	3	1.0
Room AC	158.00	2	per unit	$74.75	15	5.9
Lighting						
Lamp & Ballast Retrofit (HPT8 Replacing T12)	54.20	2	per fixture	$34.15	15	1.8
Lamp & Ballast Retrofit (HPT8 Replacing Standard T8)	24.70	2	ure, Replacing standar	$34.00	15	1.1
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing T12)	73.40	2	re, Replacing standar	$37.09	15	2.2
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing Standard T8)	42.00	2	Replacing standard T	$37.09	15	1.3
T5 HP replacing T12	80.70	2	per fixture	$107.00	15	1.1
Exterior HID replaced with LED	519.47	2	per fixture	$753.67	12	0.5
Garage HID replacement with LED	1053.67	2	per fixture	$753.67	12	1.2
LED Exit Sign	201.00	2	per fixture	$25.00	15	8.3
LED High Bay Lighting	4160.00	2	kW saved	$2,900.00	16	1.8
LED Low Bay Lighting	2669.00	2	kW saved	$2,900.00	18	1.2
Light Tube	344.30	2	per fixture	$500.00	14	0.7
High Intensity Fluorescent Fixture (replacing HID)	4160.00	2	kW saved	$1,491.00	12	2.8
42W 8 lamp Hi Bay CFL	345.00	2	ixture, Replacing 400W	$496.40	12	0.7
HID Fixture Upgrade - Pulse Start Metal Halide	768.50	2	per fixture	$223.63	13	3.7
Interior Induction Lighting	4.16	2	Watt Reduced	$1.53	16	3.4
CFL Fixture	157.50	2	per fixture	$45.00	12	3.4
CFL Screw-in	84.74	2	per lamp	$1.36	2	11.6
LED Screw In Replacing Incandescent	134.80	2	per lamp	$16.45	9	6.3
LED Screw In Replacing CFL	12.00	2	per lamp	$13.41	9	0.7
CFL Reflector Flood	133.50	2	per lamp	$6.00	2	4.1
LED Downlight	141.50	2	per fixture	$12.74	15	12.5
LED Troffer	32.33	2	per fixture	$125.00	18	0.4
LED Tube Lighting	53.86	2	per lamp	$35.00	18	2.0
LED Grow Light	4.38	2	per watt reduced	$1.53	11	2.7
Interior Non-Highbay/Lowbay LED Fixtures	2.67	2	per watt reduced	$2.90	18	1.2
Exterior HID Replaced with CFL	1021.43	2	per fixture	$596.67	12	1.3
Exterior Linear Fluorescent	4319.00	2	per kW reduced	$2,500.00	12	1.3
LED Specialty replacing CFL	16.13	2	per lamp	$10.17	9	1.2
CFL Screw in Specialty	132.80	2	per lamp	$4.58	2	5.4
LED Specialty replacing incandescent	80.55	2	per lamp	$12.79	9	4.8
Illuminated Signs to LED	5.71	2	per watt reduced	$4.00	10	1.1

DTE Industrial Measure Database - Electric

Measure Savings, Cost and Useful Life

DTE (Michigan)	Measure Assumption					
Measure Name	**Annual kWh Savings**	**Cost Type: 1=Full 2=Inc.**	**Cost/Unit Descriptor**	**Cost/Unit**	**Effective Measure Life**	**UCT**
Lighting Controls						
Exterior Bi-level Controls	530.53	2	per fixture	$444.33	10	0.8
Garage Bi-level Controls	927.49	2	per fixture	$632.00	11	1.4
Daylight Sensor Controls	10409.10	1	10,000 SF	$4,000.00	12	2.5
Lighting Power Density- Exterior	4319.00	2	per kW reduced	$220.00	12	14.6
Lighting Power Density - Parking Garage	8760.00	2	per kW reduced	$220.00	12	34.5
Stairwell Bi-Level Control	4809.00	2	per kW controlled	$825.00	9	4.0
Occupancy Sensor	504.43	2	per sensor	$226.47	10	1.5
Occupancy Sensor & Daylight Sensor	639.00	2	per sensor	$277.50	10	1.9
Central Lighting Control	8340.63	1	10,000 SF	$3,700.00	12	2.2
Switching Controls for Multilevel Lighting (Non-HID)	6000.00	1	10,000 SF	$4,000.00	12	1.5
Lighting Power Density - Interior	2669.00	2	per kW reduced	$220.00	15	13.7
Long Day Lighting Dairy	6.21	2	per watt controlled	$1.79	16	4.0
Space Heating						
Air Source Heat Pump - Heating	75.70	2	ton	$131.25	15	1.1
Ground Source Heat Pump - Heating	10960.80	2	ton	$3,710.66	15	2.6
Ductless (mini split) - Heating	127.60	1	ton	$834.32	15	0.3
Water Loop Heat Pump (WLHP) - Heating	28.48	2	ton	$20.09	15	1.9
VFD Pump	1708.90	1	per CHW pump hp	$212.29	10	5.4
ECM motors on furnaces	1034.00	1	per Furnace	$1,359.07	20	0.9
Other						
High Efficiency Transformer, single-phase	0.39	2	of additional efficienc	$0.46	30	1.4
NEMA Premium Transformer, single-phase	0.16	2	NEMA Premium effici	$0.24	30	1.6
NEMA Premium Transformer, three-phase	0.24	2	NEMA Premium effici	$0.18	30	1.5
High Efficiency Transformer, three-phase	0.44	2	of additional efficienc	$0.44	30	2.5
Parking Garage Exhaust Fan CO Control	2413.00	2	per HP	$900.00	15	4.7
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	13.1
Machine Drive						
Sensors & Controls	1.00	1	$/kWh	$0.15	15	6.5
Energy Information System	1.00	1	$/kWh	$0.64	15	1.5
Electric Supply System Improvements	1.00	1	$/kWh	$0.10	15	9.1
Advanced Efficient Motors	1.00	1	$/kWh	$0.49	25	2.7
Industrial Motor Management	1.00	1	$/kWh	$0.08	5	5.0
Advanced Lubricants	1.00	1	$/kWh	$0.00	1	8886.1
Motor System Optimization (Including ASD)	1.00	1	$/kWh	$0.10	15	9.8
Pump System Efficiency Improvements	1.00	1	$/kWh	$0.08	15	11.4
Fan System Improvements	1.00	1	$/kWh	$0.25	15	3.8
Compressed Air System Management	1.00	1	$/kWh	$0.00	1	8886.1
Compressed Air - Advanced Compressor Controls	1.00	1	$/kWh	$0.00	1	96413.7
VFD for Process Fans	707.00	1	per hp	$46.00	15	14.8
VFD for Process Pumps	1082.00	1	per hp	$94.00	15	11.1
High Efficiency Pumps	201.00	1	per hp	$31.00	15	6.3
Compressed Air Audits and Leak Repair	624.00	1	per cfm	$8.00	1	6.5
Elec motors replacing pneumatic (comp air)	1330.00	1	per hp	$25.00	10	38.2
Automatic Drains, High efficiency nozzles and other (comp air)	2097.00	1	per drain	$100.00	5	8.1
Storage Tank Addition (comp air)	423.00	1	per hp	$24.00	25	22.0
High Efficiency Dryers (comp air)	48.00	1	per hp	$10.00	15	4.6
Process Cooling & Refrigeration						
Sensors & Controls	1.00	1	$/kWh	$0.15	15	68.9
Energy Information System	1.00	1	$/kWh	$0.64	15	15.8

DTE Industrial Measure Database - Electric

Measure Savings, Cost and Useful Life

DTE (Michigan)	Measure Assumption					
Measure Name	**Annual kWh Savings**	**Cost Type: 1=Full 2=Inc.**	**Cost/Unit Descriptor**	**Cost/Unit**	**Effective Measure Life**	**UCT**
Electric Supply System Improvements	1.00	1	$/kWh	$0.10	15	96.4
Improved Refrigeration	1.00	1	$/kWh	$0.03	15	321.4
Process Heating						
Sensors & Controls	1.00	1	$/kWh	$0.15	15	68.9
Energy Information System	1.00	1	$/kWh	$0.64	15	15.8
Electric Supply System Improvements	1.00	1	$/kWh	$0.10	15	96.4
Industrial Other						
High Efficiency Welders	761.00	1	per unit	$200.00	20	10.9
3 Phase High Eff Battery Charger	2595.00	1	per unit	$872.50	20	4.5
Barrel Insulation - Inj. Molding (plastics)	1210.00	1	per sq ft	$80.00	10	18.8
Pellet Dryer Insulation (plastics)	185.00	1	per ft	$40.00	10	8.8
Injection Molding Machine - efficient (plastics)	223.00	1	per ton capacity	$125.00	20	3.4
Fiber Laser Replacing CO2 laser (auto industry)	32562.00	1	per unit	$60,000.00	20	0.9
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	0.6
Greenhouse Environmental Controls	98.00	1	per 1000 SF	$125.00	15	0.6
Scroll Compressor with Heat Exchanger for Dairy Refrigeration	190.00	1	ıer 1000 lbs of milk/da	$1,500.00	15	0.1
Variable Speed Drive withHeat Exchanger, Milk	878.00	1	ıer 1000 lbs of milk/da	$2,725.00	15	0.3
Milk Pre-Cooler Heat Exchanger	1.00	1	per lb milk/day	$0.15	15	5.4
Variable Speed Drives for Dairy Vacuum Pumps	598.00	1	per hp	$250.00	10	1.4
VFD for Process Fans - Agriculture	520.00	1	per hp	$46.00	15	9.1
VFD for Process Pumps - Agriculture	290.00	1	per hp	$46.00	15	5.1
VFD for Process Pumps - Irrigation	195.00	1	per hp	$46.00	10	2.5
Grain Storage Temperature and Moisture Management Controller	349.00	1	per hp	$233.00	15	1.2
Low Pressure Sprinkler Nozzles	5.00	1	per nozzle	$1.00	15	4.1
Fan Thermostat Controller	1586.00	1	per fan	$50.00	15	25.7

DTE 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	Textile Mill Products	Wood	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery	Auto. Mfg.	Misc.
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%
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%
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%
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%
Energy Star UPS	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%
High Efficiency CRAC Unit	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%
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%
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%
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%
Pre-rinse sprayers (electric)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
HVAC 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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
Roof Insulation													

DTE Industrial Measure Database - Electric

Base Case Factor:

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Measure Name	Food	Textile Mill Products	Wood	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery	Auto. Mfg.	Misc.
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%
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%
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%
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%
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%
High Speed Fans	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%
High Volume Low Speed Fans	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%
Destratification Fan (HVLS)	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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%

DTE 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	Textile Mill Products	Wood	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery	Auto. Mfg.	Misc.
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%

DTE Industrial Measure Database - Electric

Base Case Factor:

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Measure Name	Food	Textile Mill Products	Wood	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery	Auto. Mfg.	Misc.
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%

DTE Industrial Measure Database - Electric

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Measure Name	Food	Textile Mill Products	Wood	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery	Auto. Mfg.	Misc.
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
Motor System Optimization (Including ASD)	43.0%	46.0%	54.0%	62.0%	14.8%	37.9%	41.2%	58.8%	50.8%	54.9%	55.8%	43.6%	42.1%
Pump System Efficiency Improvements	23.2%	23.0%	12.0%	3.0%	59.4%	28.1%	34.0%	9.0%	8.7%	15.9%	15.5%	25.0%	20.4%
Fan System Improvements	10.6%	7.0%	8.0%	7.0%	9.6%	12.0%	2.0%	5.0%	15.3%	3.0%	2.2%	8.0%	14.5%
Compressed Air System Management	3.3%	4.4%	2.5%	2.2%	4.7%	9.1%	4.0%	7.8%	4.4%	7.5%	4.9%	5.7%	4.9%
Compressed Air - Advanced Compressor Controls	10.9%	14.3%	8.3%	7.3%	15.3%	29.9%	13.0%	25.4%	14.3%	24.4%	15.9%	18.7%	16.1%
VFD for Process Fans	8.5%	5.6%	6.4%	5.6%	7.7%	9.6%	1.6%	4.0%	12.2%	2.4%	1.8%	6.4%	11.6%
VFD for Process Pumps	18.6%	18.4%	9.6%	2.4%	47.5%	22.5%	27.2%	7.2%	7.0%	12.7%	12.4%	20.0%	16.3%
High Efficiency Pumps	23.2%	23.0%	12.0%	3.0%	59.4%	28.1%	34.0%	9.0%	8.7%	15.9%	15.5%	25.0%	20.4%
Compressed Air Audits and Leak Repair	2.7%	3.6%	2.1%	1.8%	3.8%	7.5%	3.3%	6.4%	3.6%	6.1%	4.0%	4.7%	4.0%
Elec motors replacing pneumatic (comp air)	1.2%	1.6%	0.9%	0.8%	1.7%	3.3%	1.4%	2.8%	1.6%	2.7%	1.8%	2.1%	1.8%
Automatic Drains, High efficiency nozzles and other (comp air)	1.2%	1.6%	0.9%	0.8%	1.7%	3.3%	1.4%	2.8%	1.6%	2.7%	1.8%	2.1%	1.8%
Storage Tank Addition (comp air)	1.2%	1.6%	0.9%	0.8%	1.7%	3.3%	1.4%	2.8%	1.6%	2.7%	1.8%	2.1%	1.8%
High Efficiency Dryers (comp air)	1.2%	1.6%	0.9%	0.8%	1.7%	3.3%	1.4%	2.8%	1.6%	2.7%	1.8%	2.1%	1.8%
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%
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%
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%
Improved Refrigeration	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%

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Measure Name	Food	Textile Mill Products	Wood	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery	Auto. Mfg.	Misc.
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%
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%
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%
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%
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%
Barrel Insulation - Inj. Molding (plastics)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	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%	100.0%	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%	100.0%	0.0%	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%	100.0%	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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%

DTE 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	Textile Mill Products	Wood	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery	Auto. Mfg.	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%	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%
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%
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%
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%
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%
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%
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%
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%
Pre-rinse sprayers (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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
Ventilation													

DTE 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	Textile Mill Products	Wood	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery	Auto. Mfg.	Misc.
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
Retrocommissioning	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%
Space Cooling - Unitary and Split AC											1		
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%
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%
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%
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%
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%

DTE 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	Textile Mill Products	Wood	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery	Auto. Mfg.	Misc.
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%

DTE Industrial Measure Database - Electric

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Measure Name	Food	Textile Mill Products	Wood	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery	Auto. Mfg.	Misc.
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
Machine Drive													

DTE 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	Textile Mill Products	Wood	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery	Auto. Mfg.	Misc.
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%

DTE 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	Textile Mill Products	Wood	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery	Auto. Mfg.	Misc.
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%

DTE 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	Textile Mill Products	Wood	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery	Auto. Mfg.	Misc.
Computers and Office Equipment													
Energy Star Compliant Single Door Refrigerator	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%
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%
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%
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%
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%
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%
Water Heating													
Heat Pump Water Heater	87.5%	87.5%	87.5%	87.5%	87.5%	87.5%	87.5%	87.5%	87.5%	87.5%	87.5%	87.5%	87.5%
Electric Tankless Water Heater	87.5%	87.5%	87.5%	87.5%	87.5%	87.5%	87.5%	87.5%	87.5%	87.5%	87.5%	87.5%	87.5%
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%
Pre-rinse sprayers (electric)	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%
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%
Low Flow Faucet Aerator	41.1%	41.1%	41.1%	41.1%	41.1%	41.1%	41.1%	41.1%	41.1%	41.1%	41.1%	41.1%	41.1%
Low Flow Showerhead	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%
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%
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%
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%
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%
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%
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%
Energy Efficient Windows	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%
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%
Ceiling 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%
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%
Wall 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%
Roof 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%
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%
Ventilation													
Economizer	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%
Variable Speed Drive Control, 15 HP	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%
Variable Speed Drive Control, 5 HP	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%

DTE 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	Textile Mill Products	Wood	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery	Auto. Mfg.	Misc.
Variable Speed Drive Control, 40 HP	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%
High Speed Fans	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%
High Volume Low Speed Fans	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%
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%
Space Cooling - Chillers													
Air-Cooled Recip Chiller	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%
Air-Cooled Screw Chiller	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 Side Economizer	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%
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%
Water-Cooled Centrifugal Chiller > 300 ton	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%
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%
Chilled Hot Water Reset	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 Screw Chiller > 300 ton	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%
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%
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%
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%
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%
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%
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%
HVAC Occupancy Sensors	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%
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%
Setback with Electric Heat	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 Pump Scheduling	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%
Web Enabled EMS	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%
Retrocommissioning	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%
Space Cooling - Unitary and Split AC											1		
AC 240K - 760 K	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%
Ductless (mini split) - Cooling	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%
Ground Source Heat Pump - Cooling	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%
Water Loop Heat Pump (WLHP) - Cooling	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%
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%
DX Condenser Coil Cleaning	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%
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%
Lighting													
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%

DTE Industrial Measure Database - Electric

Remaining Factor:

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Measure Name	Food	Textile Mill Products	Wood	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery	Auto. Mfg.	Misc.
Lamp & Ballast Retrofit (HPT8 Replacing Standard T8)	17.2%	17.2%	17.2%	17.2%	17.2%	17.2%	17.2%	17.2%	17.2%	17.2%	17.2%	17.2%	17.2%
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing T12)	17.2%	17.2%	17.2%	17.2%	17.2%	17.2%	17.2%	17.2%	17.2%	17.2%	17.2%	17.2%	17.2%
Lamp & Ballast Retrofit (Low Wattage HPT8 Replacing Standard T8)	17.2%	17.2%	17.2%	17.2%	17.2%	17.2%	17.2%	17.2%	17.2%	17.2%	17.2%	17.2%	17.2%
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%
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%
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%
LED Exit Sign	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%
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%
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%
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%
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%
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%
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%
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%
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%
CFL Screw-in	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 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%
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%
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%
LED Downlight	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 Troffer	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 Tube Lighting	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%
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%
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%
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%
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%
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%
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%
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%
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%
Lighting Controls													
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%
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%
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%

DTE Industrial Measure Database - Electric

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Measure Name	Food	Textile Mill Products	Wood	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery	Auto. Mfg.	Misc.
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%
Lighting Power Density - Parking Garage	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%
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%
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%
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%
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%
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%
Lighting Power Density - Interior	65.8%	65.8%	65.8%	65.8%	65.8%	65.8%	65.8%	65.8%	65.8%	65.8%	65.8%	65.8%	65.8%
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%
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%
Ground Source Heat Pump - Heating	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%
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%
Water Loop Heat Pump (WLHP) - Heating	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%
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%
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%
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%
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%
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%
High Efficiency Transformer, three-phase	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%
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%
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%
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%
Machine Drive													
Sensors & Controls	71.0%	72.0%	76.0%	64.0%	72.0%	72.0%	80.0%	83.0%	74.0%	74.0%	76.0%	81.0%	72.0%
Energy Information System	71.0%	72.0%	76.0%	64.0%	72.0%	72.0%	80.0%	83.0%	74.0%	74.0%	76.0%	81.0%	72.0%
Electric Supply System Improvements	71.0%	72.0%	76.0%	64.0%	72.0%	72.0%	80.0%	83.0%	74.0%	74.0%	76.0%	81.0%	72.0%
Advanced Efficient Motors	71.0%	72.0%	76.0%	64.0%	72.0%	72.0%	80.0%	83.0%	74.0%	74.0%	76.0%	81.0%	72.0%
Industrial Motor Management	71.0%	72.0%	76.0%	64.0%	72.0%	72.0%	80.0%	83.0%	74.0%	74.0%	76.0%	81.0%	72.0%
Advanced Lubricants	71.0%	72.0%	76.0%	64.0%	72.0%	72.0%	80.0%	83.0%	74.0%	74.0%	76.0%	81.0%	72.0%
Motor System Optimization (Including ASD)	71.0%	72.0%	76.0%	64.0%	72.0%	72.0%	80.0%	83.0%	74.0%	74.0%	76.0%	81.0%	72.0%
Pump System Efficiency Improvements	71.0%	72.0%	76.0%	64.0%	72.0%	72.0%	80.0%	83.0%	74.0%	74.0%	76.0%	81.0%	72.0%
Fan System Improvements	71.0%	72.0%	76.0%	64.0%	72.0%	72.0%	80.0%	83.0%	74.0%	74.0%	76.0%	81.0%	72.0%
Compressed Air System Management	71.0%	72.0%	76.0%	64.0%	72.0%	72.0%	80.0%	83.0%	74.0%	74.0%	76.0%	81.0%	72.0%

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Measure Name	Food	Textile Mill Products	Wood	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery	Auto. Mfg.	Misc.
Compressed Air - Advanced Compressor Controls	71.0%	72.0%	76.0%	64.0%	72.0%	72.0%	80.0%	83.0%	74.0%	74.0%	76.0%	81.0%	72.0%
VFD for Process Fans	71.0%	72.0%	76.0%	64.0%	72.0%	72.0%	80.0%	83.0%	74.0%	74.0%	76.0%	81.0%	72.0%
VFD for Process Pumps	71.0%	72.0%	76.0%	64.0%	72.0%	72.0%	80.0%	83.0%	74.0%	74.0%	76.0%	81.0%	72.0%
High Efficiency Pumps	71.0%	72.0%	76.0%	64.0%	72.0%	72.0%	80.0%	83.0%	74.0%	74.0%	76.0%	81.0%	72.0%
Compressed Air Audits and Leak Repair	71.0%	72.0%	76.0%	64.0%	72.0%	72.0%	80.0%	83.0%	74.0%	74.0%	76.0%	81.0%	72.0%
Elec motors replacing pneumatic (comp air)	71.0%	72.0%	76.0%	64.0%	72.0%	72.0%	80.0%	83.0%	74.0%	74.0%	76.0%	81.0%	72.0%
Automatic Drains, High efficiency nozzles and other (comp air)	71.0%	72.0%	76.0%	64.0%	72.0%	72.0%	80.0%	83.0%	74.0%	74.0%	76.0%	81.0%	72.0%
Storage Tank Addition (comp air)	71.0%	72.0%	76.0%	64.0%	72.0%	72.0%	80.0%	83.0%	74.0%	74.0%	76.0%	81.0%	72.0%
High Efficiency Dryers (comp air)	71.0%	72.0%	76.0%	64.0%	72.0%	72.0%	80.0%	83.0%	74.0%	74.0%	76.0%	81.0%	72.0%
Process Cooling & Refrigeration													
Sensors & Controls	72.0%	86.0%	78.0%	64.0%	86.0%	86.0%	82.0%	83.0%	76.0%	76.0%	78.0%	84.0%	86.0%
Energy Information System	72.0%	86.0%	78.0%	64.0%	86.0%	86.0%	82.0%	83.0%	76.0%	76.0%	78.0%	84.0%	86.0%
Electric Supply System Improvements	72.0%	86.0%	78.0%	64.0%	86.0%	86.0%	82.0%	83.0%	76.0%	76.0%	78.0%	84.0%	86.0%
Improved Refrigeration	72.0%	86.0%	78.0%	64.0%	86.0%	86.0%	82.0%	83.0%	76.0%	76.0%	78.0%	84.0%	86.0%
Process Heating													
Sensors & Controls	72.0%	86.0%	78.0%	64.0%	86.0%	86.0%	82.0%	83.0%	76.0%	76.0%	78.0%	84.0%	86.0%
Energy Information System	72.0%	86.0%	78.0%	64.0%	86.0%	86.0%	82.0%	83.0%	76.0%	76.0%	78.0%	84.0%	86.0%
Electric Supply System Improvements	72.0%	86.0%	78.0%	64.0%	86.0%	86.0%	82.0%	83.0%	76.0%	76.0%	78.0%	84.0%	86.0%
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%
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%
Barrel Insulation - Inj. Molding (plastics)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	50.0%	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%	50.0%	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%	75.0%	0.0%	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%	75.0%	0.0%
Agriculture													
Other Industrial -Low-Energy Livestock Waterer	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%
Other Industrial -Dairy Refrigerator Tune-Up	50.0%	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	50.0%	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%
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%

DTE 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	Textile Mill Products	Wood	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery	Auto. Mfg.	Misc.
Milk Pre-Cooler Heat Exchanger	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%
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%
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%
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%
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%
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%
Low Pressure Sprinkler Nozzles	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%
Fan Thermostat Controller	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%

DTE 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	Textile Mill Products	Wood	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery	Auto. Mfg.	Misc.
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%
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%
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%
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%
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%
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%
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%
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%
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%
Pre-rinse sprayers (electric)	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%
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%
Low Flow Faucet Aerator	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 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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%

DTE 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	Textile Mill Products	Wood	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery	Auto. Mfg.	Misc.
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%	100.0%	100.0%	100.0%	100.0%

DTE 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	Textile Mill Products	Wood	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery	Auto. Mfg.	Misc.
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
Lighting Controls													
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%
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%
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%

DTE 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	Textile Mill Products	Wood	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery	Auto. Mfg.	Misc.
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%

DTE Industrial Measure Database - Electric

Convertible Factor:
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Measure Name	Food	Textile Mill Products	Wood	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery	Auto. Mfg.	Misc.
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
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%
Agriculture													
Other Industrial -Low-Energy Livestock Waterer	100.0%	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 Industrial -Dairy Refrigerator 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%
Greenhouse Environmental 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%
Scroll Compressor with Heat Exchanger for Dairy 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%
Variable Speed Drive withHeat Exchanger, Milk	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

DTE Industrial Measure Database - Electric

Convertible Factor:
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Measure Name	Food	Textile Mill Products	Wood	Printing	Petroleum	Chemicals	Plastics & Rubber	Nonmetallic Mineral	Primary Metals	Fabricated Metals	Machinery	Auto. Mfg.	Misc.
Milk Pre-Cooler Heat Exchanger	100.0%	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 Drives for Dairy Vacuum 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%
VFD for Process Fans - Agriculture	100.0%	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 - Agriculture	100.0%	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 - Irrigation	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Grain Storage Temperature and Moisture Management Controller	100.0%	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 Pressure Sprinkler Nozzles	100.0%	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 Thermostat Controller	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Michigan 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	U.S. Department of Energy, Office of Industrial Technologies, United States Industrial Electric Motor Systems Market Opportunities, December 2002.
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	U.S. Energy Information Administration, Model Documentation Report: Industrial Demand Module of the National Energy Modeling System, May 2013.

DTE 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
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
Pre-rinse sprayers (electric)	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
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

DTE 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
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
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

DTE 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
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
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

DTE 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
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
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

DTE 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
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 E – SUPPLY CURVES

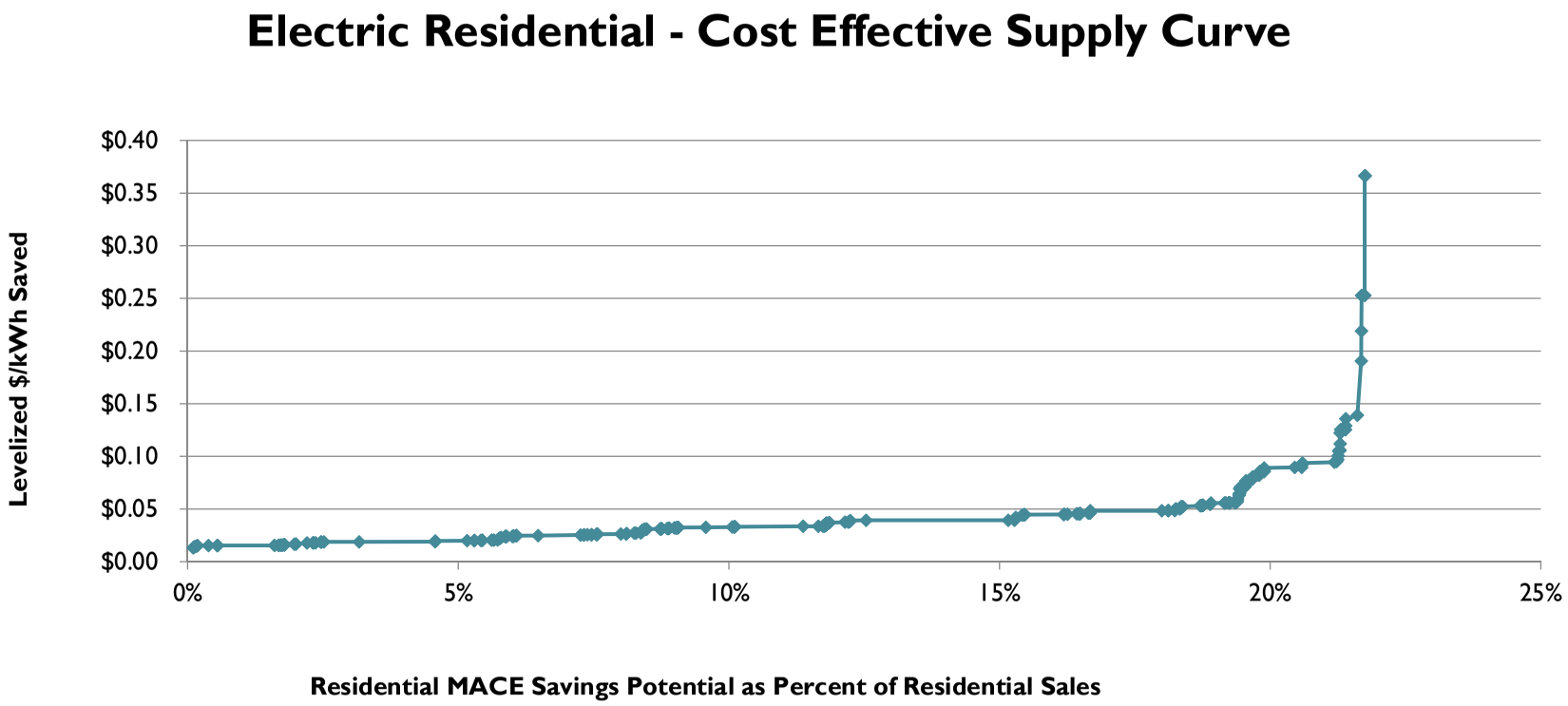
Supply Curve Models

A key element in the development of Potential Studies is the use of energy-efficiency supply curves. Supply curves are a common tool in economics. In the 1970s, conservation supply curves were developed by energy analysts as a means of ranking energy conservation investments alongside investments in energy supply in order to assess the least cost approach to meeting energy service needs. The advantage of using an energy-efficiency supply curve is that it provides a clear, easy-to-understand framework for summarizing a variety of complex information about energy efficiency technologies, their costs, and the potential for energy savings. Properly constructed, an energy-efficiency supply curve avoids the double counting of energy savings across measures by accounting for interactions between measures, is independent of prices, and also provides a simplified framework to compare the costs of efficiency with the costs of energy supply technologies.

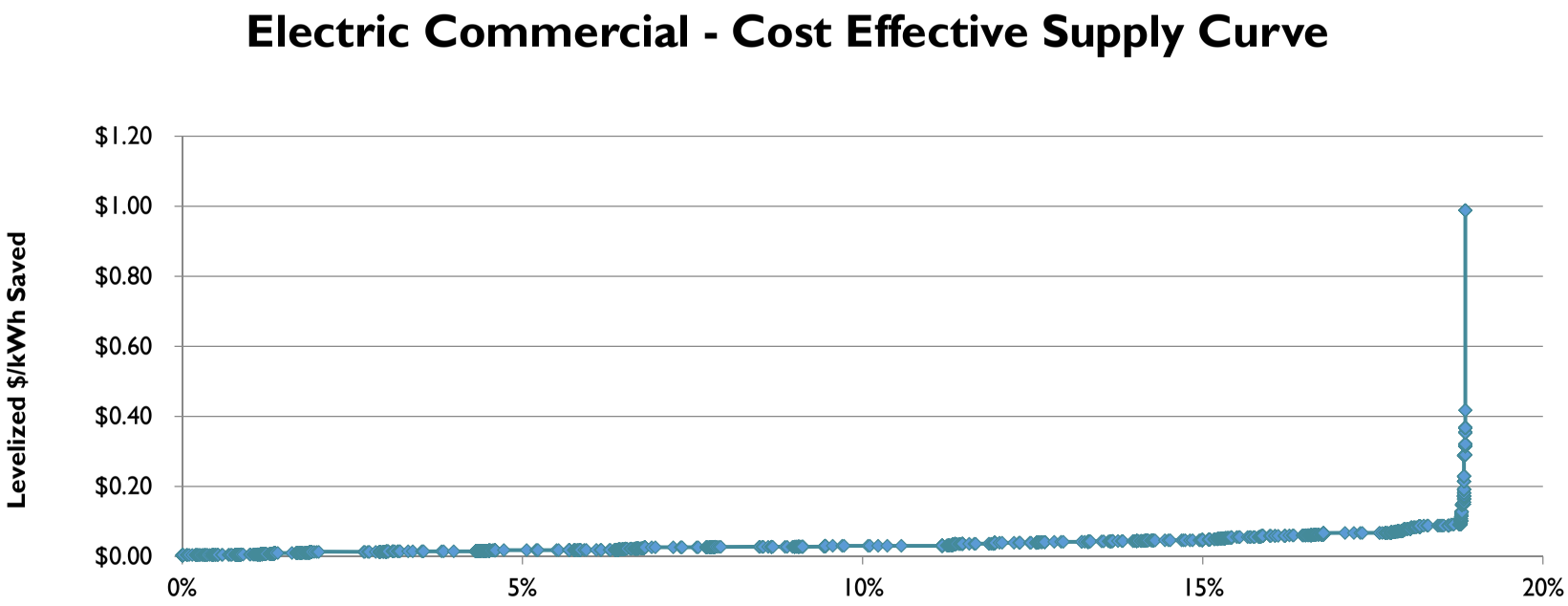
Following are Energy Efficiency Supply Curves for the Residential, Commercial and Industrial sectors reviewed in this study. These Supply Curves assume the following:

1) Levelized Cost is based upon Utility Cost, i.e. – Rebates + Administrative Expense
2) Rebates are 50% of incremental cost
3) Potential is based upon Maximum Achieve Cost Effective (MACE) potential
4) Percentage of Sales is based upon 2035 Forecast

RESIDENTIAL SUPPLY CURVE

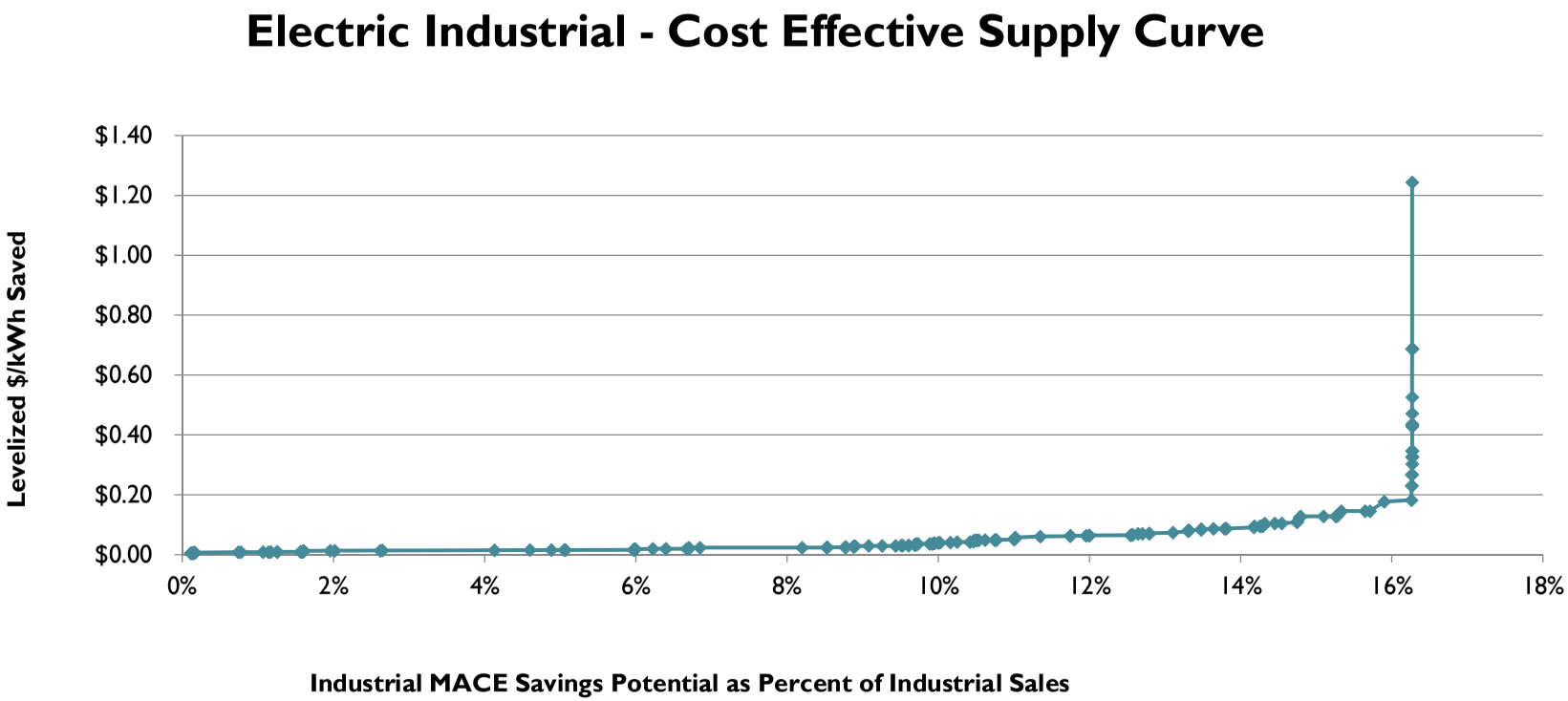


COMMERCIAL SUPPLY CURVE



- Chart does not include measures with Levelized cost greater than $1.00 per kWh Saved

Industrial Supply Curve



- Chart does not include measures with Levelized cost greater than $1.25 per kWh Saved

APPENDIX F –

INCREMENTAL ANNUAL ELECTRIC ENERGY SAVINGS

Incremental Annual Savings

It is important to note the distinction between incremental annual savings and cumulative annual savings. Incremental annual savings are those which occur in a given year due to participation in energy efficiency programs in that given year. Cumulative annual energy savings are those which accumulate in any given year due to participation in energy efficiency programs in that given year, as well as participation in prior years, to the extent that participation in prior years continues to yield savings. Cumulative annual energy savings account for the fact that measures installed in prior years may have useful lives longer than one year, and therefore produce savings that persist into the future for some time. However, cumulative annual energy savings also reflect savings decay – that is savings that can no longer be counted in a given year once a measure is no longer operational or has "burned out."

One particularly important distinction between incremental annual savings and cumulative annual savings is that the sum of the incremental annual savings may be greater than the cumulative annual savings over an extended time frame due to measure savings decay. Consider the example in the table below. In the example, an energy efficiency program is offering rebates for the purchase of high efficiency televisions. The program runs for five years and obtains one participant per year. Each participant yields 100 kWh in savings a year and it is assumed that the television measures have a useful life of four years. Each year, the new participants in the program provide 100 kWh in incremental annual savings in the year in which they participate and the savings from these participants persist in subsequent years for the life of the television. A participant in Year 1 will yield 100 kWh incremental annual savings in Year 1. This participant will also continue to yield 100 kWh of savings in Years 2 through Year 4. Then, in Year 5, the 100 kWh savings from the first year participant will disappear as it will be assumed that the efficient television will burn out after four years. However, because there is a participant in Year 5, the cumulative annual savings will stay at 400 kWh – what was lost to equipment decay is being replaced by a new participant. The sum of the incremental annual savings in Year 5 is 500 kWh because it is the sum of the savings introduced in each year by the five total participants. The year-by-year incremental annual data and cumulative annual data are provided in the table below.

Incremental Annual vs. Cumulative Annual Savings Example

Television Example	Year 1	Year 2	Year 3	Year 4	Year 5
Incremental Annual	100 kWh	100 kWh	100 kWh	100 kWh	100 kWh
Sum of Incremental Annual	100 kWh	200 kWh	300 kWh	400 kWh	500 kWh
Cumulative Annual	100 kWh	200 kWh	300 kWh	400 kWh	400 kWh

Incremental Annual Residential Electric Energy Savings in the Achievable UCT Potential Scenario, by End Use for DTE Energy

Year	Lighting	Appliances	Electronics	Water Heating	HVAC Shell	HVAC Equipment	Miscellaneous	Cross-Cutting	Total	% of Annual Sales
2016	115,440	22,672	28,093	17,969	40,456	30,879	2,061	71,876	329,447	2.0%
2017	118,284	25,232	34,975	20,220	41,003	35,089	2,406	75,475	352,683	2.1%
2018	119,089	27,643	41,222	22,161	41,514	39,087	2,712	78,893	372,321	2.2%
2019	119,349	30,005	47,236	23,980	42,000	43,019	3,006	82,084	390,679	2.3%
2020	119,563	32,348	54,133	25,727	42,463	46,926	3,295	85,086	409,540	2.4%
2021	71,033	34,743	60,935	27,528	42,907	50,906	3,597	89,602	381,250	2.2%
2022	71,151	37,184	68,829	29,364	43,329	54,946	3,911	92,608	401,323	2.4%
2023	71,287	39,637	75,999	31,171	43,726	59,001	4,227	95,441	420,489	2.5%
2024	71,316	51,517	91,858	32,875	44,096	63,018	4,536	98,119	457,335	2.7%
2025	50,823	55,476	100,705	34,447	44,438	66,976	4,835	100,948	458,649	2.7%
2026	45,033	72,468	131,047	33,288	14,968	48,968	5,019	99,781	450,571	2.6%
2027	40,103	52,712	96,290	32,846	14,804	46,231	5,084	99,039	387,109	2.3%
2028	38,246	44,880	89,992	32,264	14,647	43,515	5,064	98,463	367,072	2.1%
2029	35,464	42,141	89,487	32,762	18,966	40,811	5,028	98,043	362,703	2.1%
2030	33,150	41,759	89,829	32,728	19,051	38,117	4,992	97,665	357,290	2.1%
2031	35,265	42,412	90,697	32,374	19,143	54,443	4,983	97,595	376,911	2.2%
2032	36,103	53,166	101,170	31,978	19,238	54,859	4,989	97,637	399,140	2.3%
2033	36,025	56,214	104,905	31,626	19,341	54,819	5,000	97,786	405,718	2.4%
2034	54,690	73,175	137,256	31,426	20,870	54,712	5,007	97,873	475,009	2.8%
2035	59,270	53,228	103,448	31,307	21,012	54,602	5,006	98,005	425,877	2.5%

Incremental Annual Electric Residential Energy Savings in the Constrained UCT Potential Scenario, by End Use for DTE Energy

Year	Lighting	Appliances	Electronics	Water Heating	HVAC Shell	HVAC Equipment	Miscellaneous	Cross-Cutting	Total	% of Annual Sales
2016	74,526	14,637	18,136	11,601	26,118	19,935	1,331	46,402	212,686	1.3%
2017	75,501	16,105	22,325	12,906	26,172	22,397	1,536	48,175	225,118	1.4%
2018	76,824	17,832	26,592	14,296	26,781	25,215	1,750	50,893	240,183	1.4%
2019	78,494	19,734	31,067	15,771	27,623	28,293	1,977	53,985	256,944	1.5%
2020	80,930	21,896	36,642	17,414	28,742	31,763	2,230	57,593	277,211	1.6%
2021	49,399	24,162	42,376	19,144	29,839	35,401	2,501	62,312	265,132	1.6%
2022	48,788	25,497	47,196	20,135	29,710	37,676	2,682	63,501	275,185	1.6%
2023	48,241	26,823	51,430	21,094	29,590	39,927	2,861	64,586	284,552	1.7%
2024	46,384	33,507	59,745	21,382	28,680	40,987	2,950	63,817	297,452	1.7%
2025	33,387	36,444	66,157	22,630	29,193	43,999	3,176	66,317	301,303	1.8%
2026	34,757	55,933	101,145	25,693	11,553	37,795	3,874	77,014	347,763	2.0%
2027	35,941	47,243	86,299	29,438	13,268	41,433	4,557	88,762	346,940	2.0%
2028	36,744	43,117	86,458	30,997	14,072	41,806	4,865	94,595	352,654	2.1%
2029	35,164	41,784	88,729	32,484	18,805	40,465	4,985	97,212	359,629	2.1%
2030	33,968	42,789	92,046	33,535	19,521	39,058	5,115	100,075	366,108	2.1%
2031	33,926	40,803	87,254	31,145	18,416	52,376	4,794	93,891	362,605	2.1%
2032	33,762	49,719	94,610	29,905	17,991	51,302	4,665	91,306	373,261	2.2%
2033	33,804	52,748	98,438	29,676	18,149	51,439	4,691	91,758	380,704	2.2%
2034	45,858	61,357	115,089	26,351	17,500	45,876	4,199	82,066	398,295	2.3%
2035	55,446	49,793	96,773	29,287	19,656	51,079	4,683	91,682	398,398	2.3%

Incremental Annual Commercial Electric Energy Savings in the Achievable UCT Potential Scenario, by End Use for DTE Energy

END USE	Lighting	Office Equipment	Refrigeration	Space Cooling Chillers	Space Cooling Unitary and Split AC	Space Heating	Compressed Air	Water Heating	Ventilation	Cooking	Pools	Other	Total	% of Annual Sales
2016	68,329	31,687	84,267	14,399	6,137	8,796	13,782	7,384	24,904	8,397	1,914	5,863	275,859	1.3%
2017	68,329	31,687	84,267	14,399	6,137	8,796	19,279	7,384	24,904	8,397	1,914	5,863	281,357	1.3%
2018	68,504	31,687	84,267	14,399	6,137	8,796	24,776	7,384	24,904	8,397	1,914	5,863	287,029	1.3%
2019	68,504	31,687	84,267	14,399	6,137	8,796	30,273	7,384	24,904	8,397	1,914	5,863	292,526	1.3%
2020	68,680	50,588	120,939	14,399	6,137	8,796	35,770	7,384	24,904	8,397	1,914	5,863	353,771	1.6%
2021	68,680	62,330	120,939	14,524	6,290	8,932	41,383	7,776	24,904	8,397	1,914	6,782	372,851	1.7%
2022	72,501	62,330	120,939	14,524	6,290	8,932	46,880	7,776	24,904	8,397	1,914	6,782	382,169	1.7%
2023	72,501	62,330	127,906	15,710	7,760	10,783	52,377	7,789	24,904	8,397	1,914	6,782	399,155	1.8%
2024	76,323	81,231	171,682	20,710	7,770	10,800	57,874	7,789	24,904	8,397	1,914	6,782	476,176	2.1%
2025	80,469	81,231	171,682	23,164	8,082	11,077	63,371	7,789	24,904	8,397	1,914	6,782	488,863	2.1%
2026	76,243	73,521	118,768	13,762	6,208	8,827	56,739	7,989	23,023	8,397	1,973	7,701	403,151	1.8%
2027	77,322	73,521	118,768	13,762	6,208	8,827	56,739	7,989	23,023	8,628	1,973	7,701	404,460	1.8%
2028	99,632	92,422	158,899	13,762	6,208	8,827	56,739	7,989	23,023	16,795	1,973	7,701	493,970	2.2%
2029	99,632	92,422	158,945	13,762	6,208	8,827	57,521	7,989	23,023	16,795	1,973	7,701	494,798	2.2%
2030	99,808	73,521	136,068	15,042	7,678	10,678	57,521	8,001	23,023	16,795	1,973	7,701	457,810	2.0%
2031	119,407	85,554	171,353	18,986	11,838	16,548	63,922	8,675	44,751	16,795	1,973	9,309	569,111	2.5%
2032	125,200	104,497	211,646	22,486	11,848	16,565	63,922	8,738	44,751	16,795	1,973	9,309	637,728	2.8%
2033	125,200	104,497	204,679	24,298	10,377	14,713	63,922	8,765	44,751	16,795	1,973	9,309	629,279	2.8%
2034	148,097	85,597	171,351	20,253	10,689	14,991	63,922	8,765	44,751	16,795	1,973	9,309	596,492	2.6%
2035	148,263	85,597	171,351	18,110	10,689	14,991	63,922	8,765	44,751	16,795	1,973	9,309	594,515	2.6%

Incremental Annual Electric Commercial Energy Savings in the Constrained UCT Potential Scenario, by End Use for DTE Energy

END USE	Lighting	Office Equipment	Refrigeration	Space Cooling Chillers	Space Cooling Unitary and Split AC	Space Heating	Compressed Air	Water Heating	Ventilation	Cooking	Pools	Other	Total	% of Annual Sales
2016	49,061	22,752	60,505	10,339	4,406	6,315	9,896	5,302	17,882	6,029	1,374	4,210	198,070	0.9%
2017	50,057	23,213	61,733	10,548	4,496	6,444	14,124	5,410	18,245	6,152	1,402	4,295	206,118	0.9%
2018	51,020	23,599	62,759	10,724	4,570	6,551	18,452	5,500	18,548	6,254	1,425	4,367	213,769	1.0%
2019	51,732	23,929	63,635	10,873	4,634	6,642	22,861	5,576	18,807	6,341	1,445	4,428	220,903	1.0%
2020	48,782	35,931	85,900	10,227	4,359	6,247	25,407	5,245	17,689	5,964	1,359	4,165	251,275	1.1%
2021	48,829	44,314	85,983	10,326	4,472	6,350	29,422	5,529	17,706	5,970	1,361	4,822	265,083	1.2%
2022	51,740	44,482	86,308	10,365	4,489	6,374	33,456	5,549	17,773	5,993	1,366	4,840	272,735	1.2%
2023	50,872	43,735	89,748	11,024	5,445	7,566	36,752	5,465	17,475	5,892	1,343	4,759	280,076	1.2%
2024	48,626	51,753	109,381	13,194	4,950	6,881	36,872	4,962	15,867	5,350	1,219	4,321	303,377	1.3%
2025	50,734	51,214	108,241	14,604	5,096	6,984	39,954	4,911	15,702	5,294	1,206	4,276	308,215	1.4%
2026	57,553	55,498	89,654	10,389	4,686	6,663	42,830	6,030	17,379	6,339	1,490	5,813	304,324	1.3%
2027	58,467	55,594	89,807	10,407	4,694	6,674	42,904	6,041	17,409	6,524	1,492	5,823	305,835	1.3%
2028	62,760	58,219	100,094	8,669	3,910	5,560	35,741	5,032	14,502	10,579	1,243	4,851	311,162	1.4%
2029	63,062	58,498	100,603	8,711	3,929	5,587	36,408	5,056	14,572	10,630	1,249	4,874	313,180	1.4%
2030	65,976	48,600	89,945	9,943	5,076	7,059	38,023	5,289	15,219	11,102	1,304	5,090	302,626	1.3%
2031	61,059	43,748	87,622	9,708	6,053	8,462	32,687	4,436	22,883	8,588	1,009	4,760	291,015	1.3%
2032	60,194	50,241	101,755	10,811	5,696	7,964	30,733	4,201	21,515	8,075	949	4,475	306,608	1.3%
2033	61,611	51,423	100,722	11,957	5,106	7,240	31,456	4,313	22,022	8,265	971	4,581	309,668	1.4%
2034	71,826	41,514	83,104	9,823	5,184	7,270	31,002	4,251	21,704	8,145	957	4,515	289,295	1.3%
2035	72,612	41,921	83,919	8,870	5,235	7,342	31,306	4,293	21,917	8,225	966	4,559	291,165	1.3%

Incremental Annual Industrial Electric Energy Savings in the Achievable UCT Potential Scenario, by End Use for DTE Energy

END USE	Office Equipment	Water Heating	Ventilation	Lighting	Other	Machine Drive	Industrial Other	Process Cooling & Refrig	Process Heating	Agriculture	Space Cooling Chillers	Space Cooling Unitary & Split	Space Heating	Total	% of Annual Sales
2016	201	348	13,381	30,491	765	38,862	598	6,353	4,244	517	2,014	15,417	5,464	118,656	0.9%
2017	201	348	13,381	30,491	765	43,123	598	6,353	4,244	517	2,014	15,417	5,464	122,916	1.0%
2018	201	348	13,381	30,776	765	47,384	598	6,353	4,244	517	2,014	15,417	5,464	127,461	1.0%
2019	201	348	13,381	30,776	765	51,645	598	6,353	4,244	517	2,013	15,417	5,464	131,721	1.0%
2020	230	348	13,381	31,060	765	55,905	598	6,353	4,244	517	2,013	15,417	5,464	136,295	1.1%
2021	401	348	13,381	31,060	805	61,321	598	6,353	4,244	517	2,022	15,417	5,464	141,932	1.1%
2022	401	348	13,381	31,344	805	65,582	598	6,353	4,244	517	2,022	15,417	5,464	146,477	1.2%
2023	401	348	13,381	31,344	805	69,842	598	6,353	4,244	517	2,123	16,418	5,706	152,080	1.2%
2024	430	348	13,381	31,628	805	74,103	598	6,353	4,244	517	2,123	16,418	5,706	156,654	1.2%
2025	430	348	13,381	32,169	805	78,364	598	6,353	4,244	517	2,153	16,438	5,710	161,510	1.3%
2026	569	341	4,678	26,209	683	85,776	607	6,353	4,244	600	2,106	15,847	4,381	152,394	1.2%
2027	569	341	4,678	27,909	683	90,036	607	6,353	4,244	600	2,106	15,847	4,381	158,354	1.2%
2028	599	341	4,678	41,910	683	94,297	607	6,353	4,244	600	2,106	15,847	4,381	176,646	1.4%
2029	599	341	4,678	41,945	683	98,558	607	6,353	4,244	600	2,106	15,847	4,381	180,941	1.4%
2030	569	341	4,678	42,229	683	102,819	607	6,353	4,244	600	2,216	16,847	4,623	186,809	1.4%
2031	741	619	13,381	44,548	887	138,257	607	12,706	8,487	993	2,681	22,063	7,366	253,335	2.0%
2032	771	619	13,381	49,055	887	142,517	607	12,706	8,487	993	2,681	22,063	7,366	262,132	2.0%
2033	771	619	13,381	49,055	887	146,778	607	12,706	8,487	993	2,681	22,063	7,366	266,393	2.1%
2034	741	619	13,381	54,224	887	151,039	607	12,706	8,487	993	2,710	22,083	7,370	275,847	2.1%
2035	741	619	13,381	54,224	887	155,300	607	12,706	8,487	993	2,710	22,083	7,370	280,108	2.2%

Incremental Annual Electric Industrial Energy Savings in the Constrained UCT Potential Scenario, by End Use for DTE Energy

END USE	Office Equipment	Water Heating	Ventilation	Lighting	Other	Machine Drive	Industrial Other	Process Cooling & Refrig	Process Heating	Agriculture	Space Cooling Chillers	Space Cooling Unitary & Split	Space Heating	Total	% of Annual Sales
2016	157	272	10,439	23,787	597	30,317	466	4,956	3,310	387	1,571	12,027	4,263	92,548	0.7%
2017	156	270	10,381	23,655	593	33,455	464	4,929	3,292	384	1,562	11,961	4,239	95,341	0.8%
2018	162	281	10,778	24,788	616	38,165	482	5,117	3,418	399	1,622	12,418	4,401	102,646	0.8%
2019	167	289	11,088	25,501	634	42,794	495	5,264	3,516	411	1,668	12,775	4,528	109,130	0.9%
2020	193	293	11,238	26,084	642	46,950	502	5,335	3,564	416	1,690	12,948	4,589	114,444	0.9%
2021	338	294	11,284	26,191	679	51,709	504	5,357	3,578	418	1,705	13,001	4,608	119,666	0.9%
2022	341	297	11,398	26,699	686	55,863	509	5,411	3,615	422	1,723	13,133	4,654	124,750	1.0%
2023	343	298	11,463	26,851	690	59,830	512	5,442	3,635	425	1,818	14,064	4,888	130,261	1.0%
2024	373	302	11,603	27,424	698	64,254	519	5,509	3,680	430	1,841	14,236	4,948	135,815	1.1%
2025	376	305	11,705	28,140	705	68,548	523	5,557	3,712	434	1,883	14,379	4,995	141,261	1.1%
2026	557	333	4,571	25,614	668	83,826	593	6,208	4,147	586	2,058	15,487	4,282	148,930	1.2%
2027	552	331	4,533	27,048	662	87,258	588	6,157	4,113	581	2,041	15,358	4,246	153,468	1.2%
2028	516	294	4,033	36,132	589	81,295	523	5,477	3,658	517	1,816	13,662	3,777	152,290	1.2%
2029	520	297	4,065	36,455	594	85,658	528	5,521	3,688	521	1,830	13,773	3,808	157,258	1.2%
2030	496	297	4,074	36,777	595	89,543	529	5,533	3,696	522	1,930	14,672	4,026	162,689	1.3%
2031	510	425	9,203	30,639	610	95,089	417	8,739	5,837	683	1,844	15,174	5,066	174,237	1.3%
2032	516	414	8,955	32,830	594	95,380	406	8,503	5,680	664	1,794	14,765	4,930	175,431	1.4%
2033	519	417	9,018	33,061	598	98,922	409	8,563	5,720	669	1,807	14,869	4,965	179,537	1.4%
2034	476	397	8,597	34,838	570	97,038	390	8,163	5,453	638	1,741	14,188	4,735	177,224	1.4%
2035	479	400	8,655	35,071	574	100,444	393	8,218	5,489	642	1,753	14,283	4,767	181,166	1.4%