Michigan Energy Waste Reduction Statewide Potential Study (2021-2040)

Prepared for:

LARA MPSC

State of Michigan

Department of Licensing and Regulatory Affairs

Submitted by:

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Reference No.: 148595

September 13, 2021

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Common Acronyms

ACEEE	American Council for an Energy Efficient Economy
ACS	American Community Survey
Btu	British Thermal Unit
C&I	Commercial and Industrial
CBECS	Commercial Building End Use Consumption Survey
CBSA	Commercial Building Stock Assessment
CFL	Compact Fluorescent
Com	Commercial
Consumers	Consumers Energy
COVID-19	Coronavirus 2019
DOE	United States Department of Energy
DR	Demand Response
DSM	Demand-Side Management
DSMore	Demand Side Management Option Risk Evaluator
DSMSim™	Guidehouse's Proprietary Demand Side Management Simulator
DTE	DTE Energy
EWR	Energy Waste Reduction
EIA	US Energy Information Administration
EWR	Energy Waste Reduction
FERC	Federal Energy Regulatory Commission
GWh	Gigawatt-Hour
HVAC	Heating, Ventilation, and Air Conditioning
I&M	Indiana Michigan Power
kWh	Kilowatt-Hour
LED	Light-Emitting Diode
MECS	Manufacturing Energy Consumption Survey
MEMD	Michigan Energy Measures Database
MGU	Michigan Gas Utilities
MISO	Midcontinent Independent System Operator
MPSC	Michigan Public Service Commission
MW	Megawatt
MWh	Megawatt-Hour
NEW	New Construction

NSP	Northern States Power
NPV	Net Present Value
NTG	Net-to-Gross
PJM	PJM Interconnection
PV	Present Value
RECS	Residential Energy Consumption Survey
Res	Residential
RET	Retrofit
ROB	Replace-on-Burnout
SEER	Seasonal Energy Efficiency Ratio
SEMCO	SEMCO Energy Gas Company
TRC	Total Resource Cost
TRM	Technical Reference Manual
TSD	Technical Support Document
UMERC	Upper Michigan Energy Resources Corporation
UPPCO	Upper Peninsula Power Company
US	United States
UCT	Utility Cost Test

Executive Summary

The Michigan Public Service Commission (MPSC) engaged Guidehouse Inc. (Guidehouse) to prepare a statewide energy waste reduction (EWR) potential study for electricity and natural gas in the Michigan Lower and Upper Peninsulas over a 20-year forecast horizon from 2021 to 2040. The study was conducted simultaneously with a study (reported separately) of active demand response (DR) potential for the same time period.

This study's objective was to assess the potential in the residential, commercial, and industrial sectors, with the addition of small commercial, multifamily and low-income segments, by analyzing EWR measures and improvements to end-user behaviors to reduce energy consumption. Measure and market characterization data was input into Guidehouse's Demand Side Management Simulator (DSMSim™) model, which calculates technical, economic, and achievable potential across utility service areas in Michigan for more than 600 measure permutations. Results were developed and are presented separately for the Lower and Upper Peninsulas. These results will be used to inform EWR goal setting and associated program design for the MPSC.

Three scenarios were modeled:

1. **Reference Scenario:** Estimates of achievable potential calibrated to 2021 total program expectations and refined using relative savings percentages at the end use and high impact measure-level with 2019 actual achievements. Key assumptions include non-low income measure incentives of 40% of incremental cost (low income segments incentivized at 100% of incremental cost) and administrative costs representing 33% of total utility program spending.
2. **Aggressive Scenario:** Increased measure incentives and marketing factors and decreased program administrative costs.
    - Analyzed measure incentive levels to determine the 1.0 Utility Cost Test (UCT) ratio tipping point. Developed measure-level incentive estimates based on these results and adjusted where necessary to ensure program-level cost-effectiveness.
        - This adjustment models a more optimized incentive strategy that results in higher spending and reduced alignment with detailed Reference Scenario calibration while maintaining a cost-effective program UCT ratio.
    - Increased marketing factors above calibrated values for specific end use and sector combinations.
        - This adjustment estimates an increase in marketing effectiveness and implementation of program design enhancements, while not increasing the relative administrative cost burden of programs.
3. **Carbon Price Scenario:** Acknowledging the regulatory uncertainty around carbon price legislation, provides a high-level fuel cost adder, ramping up through time as the probability of regulatory action increases. This scenario provides insight into the sensitivity of EWR savings potential to avoided costs. Due to the uncertain nature of carbon pricing legislation, the scenario is not related to specific program or policy recommendations.

- Increased electricity ($/MWh) and natural gas ($/therm) avoided costs by 50% in 2021, escalating with a 2.5% multiplier growth until a 100% increase was met.

Estimation of Energy Waste Reduction Potential

Guidehouse employed its proprietary DSMSim model to estimate the technical, economic, and achievable potential for electricity and natural gas energy waste reduction and summer peak demand savings across Michigan. DSMSim is a bottom-up technology diffusion and stock tracking model implemented using a system dynamics[1] framework. The model explicitly accounts for different types of efficient measures, such as retrofit and early retirement (RET), replace-on-burnout (ROB), and new construction (NEW), and the impacts these measures have on savings potential. The model then reports the technical, economic, and achievable potential savings in aggregate by sector, customer segment, end-use category, and highest impact measures.

Guidehouse developed potential and cost estimates using a bottom-up analysis. The analysis involved five steps:

1. Characterize the market
2. Develop baseline projections
3. Define and characterize EWR options
4. Develop key assumptions for potential and costs
5. Estimate potential and costs

This study defines **technical potential** as the energy savings that can be achieved assuming that all installed measures can immediately be replaced with the efficient measure, wherever technically feasible, regardless of the cost, market acceptance, or whether a measure has failed (or burned out) and is in need of being replaced.

Economic potential is a subset of technical potential, using the same assumptions regarding the immediate replacement as in technical potential, but limiting the calculation only to those measures that have passed the benefit-cost test chosen for measure screening—in this case, the UCT test as used in Michigan.

Achievable potential further considers the likely rate of demand-side management (DSM) resource acquisition given factors like the rate of equipment turnover (a function of a measure's lifetime), simulated incentive levels, consumer willingness to adopt efficient technologies, and the likely rate at which marketing activities can facilitate technology adoption. The adoption of DSM measures can be broken down into the calculation of the equilibrium market share and the calculation of the dynamic approach to equilibrium market share, as discussed in more detail in Section 7.1.

[1] See Sterman, John D. *Business Dynamics: Systems Thinking and Modeling for a Complex World*. Irwin McGraw-Hill, 2000, for detail on system dynamics modeling. Also see http://en.wikipedia.org/wiki/System_dynamics for a high level overview.

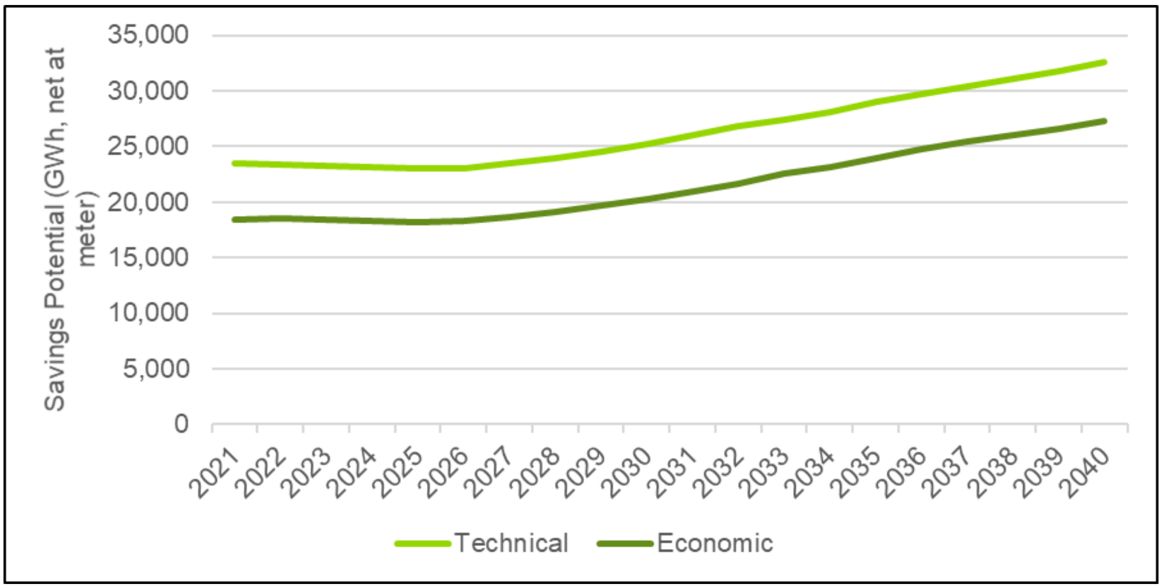
Achievable potential savings reported in this study are net rather than gross, meaning these values include the impacts of free ridership, spillover, and market effects attributable to DSM programs. Providing net potential is appropriate for MPSC's primary intended purposes for conducting this study—setting EWR goals and targets for Michigan utilities—because net savings is the definition used in Michigan.

Findings

EWR Potential Results

Figure ES-1 presents the net technical and economic electricity potential at the meter for utilities in Michigan's Lower Peninsula for the Reference Scenario. Technical and economic potential remain relatively flat or slightly declining through 2026 due to minor year-over-year decreases in stock and sales forecasts throughout the early study years, and then steadily increase over the remaining period. In 2026, unidentified future emerging technologies begin to phase in, causing the increase in technical potential in later years, in addition to increased customer stocks over the study period. Economic potential is close to technical, indicating the prevalence of established measures (i.e., ones that have already passed cost-effectiveness screening and are included in the Michigan Energy Measures Database, or MEMD) and that most might impact measures pass the economic UCT threshold ratio of 1.0.

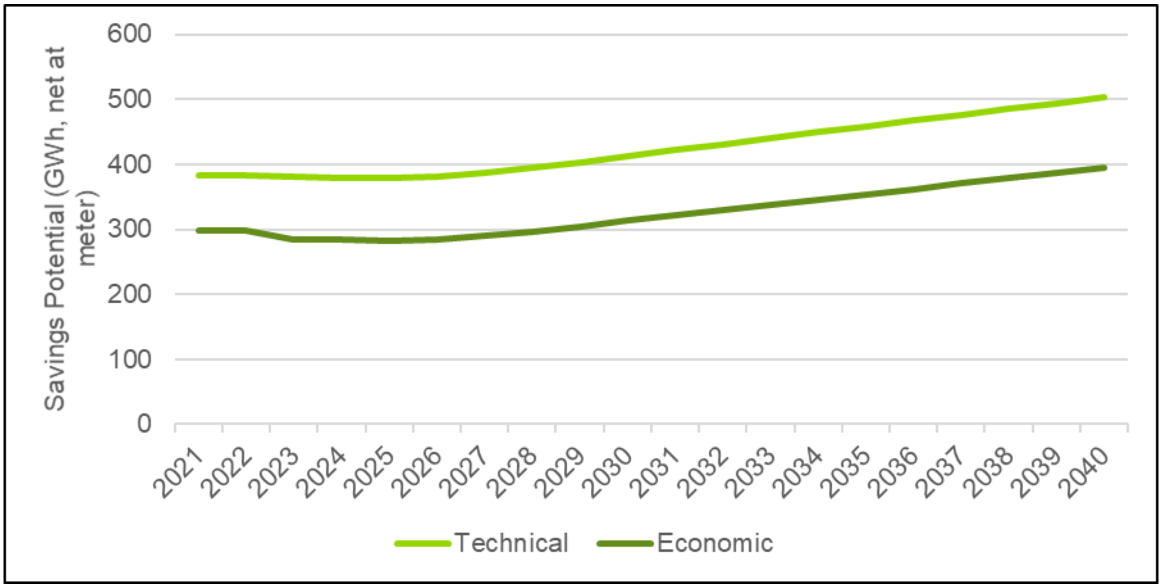
Figure ES-1. Lower Peninsula EWR Technical and Economic Potential Electricity Savings, Reference Scenario (GWh, Net at Meter)



Source: Guidehouse analysis

Figure ES-2 presents the net technical and economic electricity potential at the meter for utilities in Michigan's Upper Peninsula for the Reference Scenario. Technical and economic potential remain relatively flat or slightly declining through 2026 due to minor year-over-year decreases in stock and sales throughout the early study years, and then steadily increase over the remaining period. In 2026, unidentified future emerging technologies begin to phase in, causing the increase in technical potential in later years. Economic potential is close to technical, indicating the prevalence of established measures (i.e., ones that have already passed cost-effectiveness screening and are included in the MEMD) and that most high impact measures pass the economic UCT threshold ratio of 1.0.

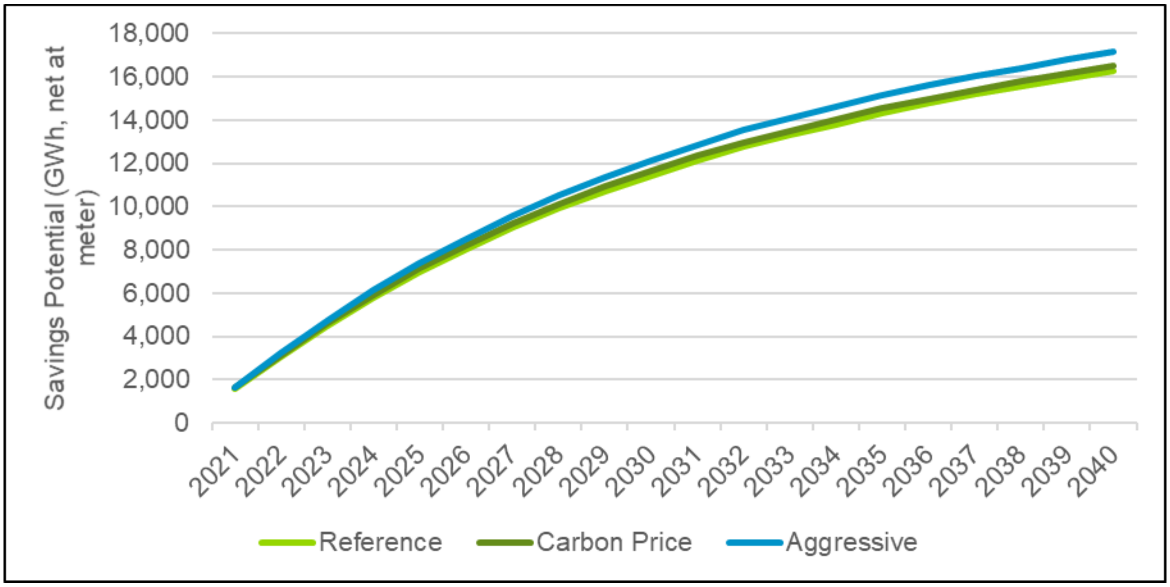
Figure ES-2. Upper Peninsula EWR Technical and Economic Potential Electricity Savings, Reference Scenario (GWh, Net at Meter)



Source: Guidehouse analysis

Figure ES-3 presents the cumulative annual net achievable electricity potential at the meter for utilities in Michigan's Lower Peninsula. The potential for all three scenarios (Reference, Aggressive, and Carbon Price) in 2021 is around 1,600 GWh net at meter and increases to more than 16,000 GWh net at meter over the 20-year study period, with all three scenarios resulting in similar overall savings potential. In 2040, the Aggressive Scenario achieves about 5% more total savings compared to the Reference Scenario, indicating that utilities' current calibrated achievements are capturing a majority of the achievable incremental annual savings.

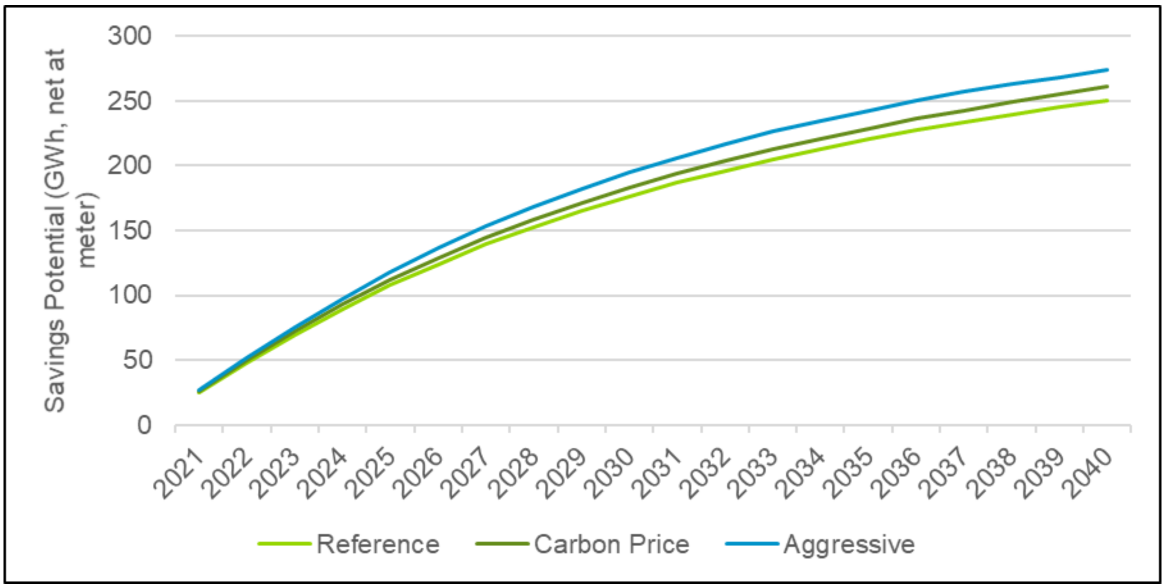
Figure ES-3. Lower Peninsula EWR Achievable Potential Electricity Cumulative Annual Savings by Scenario (GWh, Net at Meter)



Source: Guidehouse analysis

Figure ES-4 presents the cumulative annual net achievable electricity potential at the meter for utilities in Michigan's Upper Peninsula. The potential for all three scenarios (Reference, Aggressive, and Carbon Price) in 2021 is around 25 GWh net at meter and increases to at least 250 GWh net at meter over the 20-year study period, with all three scenarios resulting in similar overall savings potential. In 2040, the Aggressive Scenario achieves about 10% more total savings compared to the Reference Scenario, and twice the increase expected in the Lower Peninsula, indicating that the Upper Peninsula has generally lower efficient saturation of technologies in 2021. Differences in baseline and efficient saturation percentages, as well as fuel type multipliers, between the Upper and Lower Peninsula lead to differing changes based on scenario application. The Aggressive scenario impacts each measure by adjusting incentive levels. If the Upper Peninsula has lower efficient saturation in 2021 of a measure highly impacted by the incentive change then it will see a greater relative adoption increase over the study period.

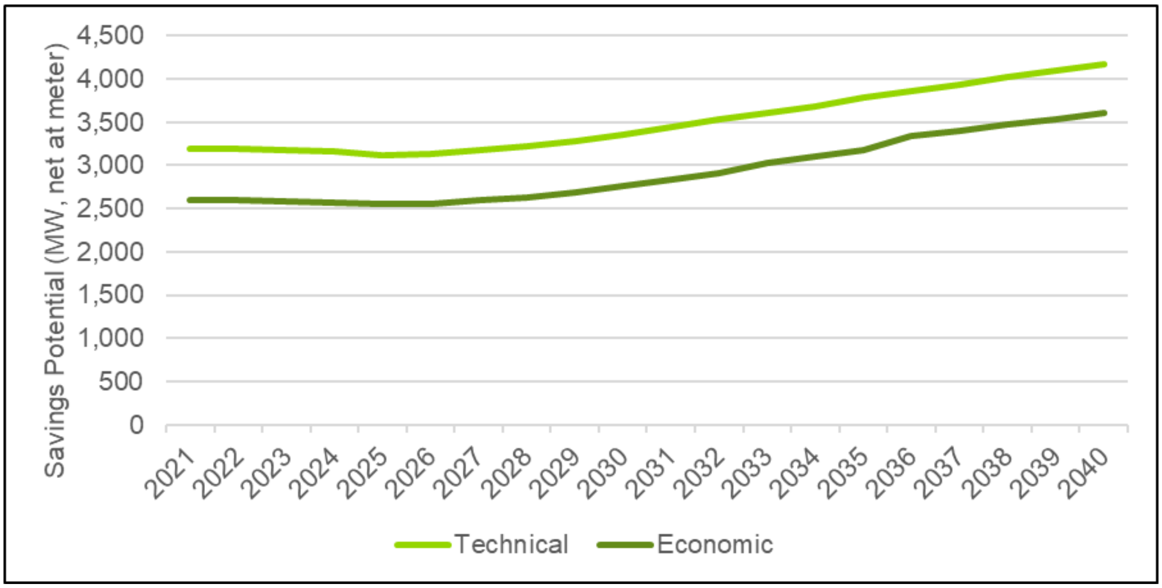
Figure ES-4. Upper Peninsula EWR Achievable Potential Electricity Cumulative Annual Savings by Scenario (GWh, Net at Meter)



Source: Guidehouse analysis

Figure ES-5 presents the net technical and economic summer peak demand potential at the meter for utilities in Michigan's Lower Peninsula for the Reference Scenario. Technical and economic potential remain relatively flat through 2026, and then steadily increase over the remaining period. Similar to the electricity technical potential, the peak demand savings remains relatively flat until 2026, when unidentified future emerging technologies begin to phase in. The economic potential is around 80% of technical, indicating the prevalence of established measures (i.e., measures that have already passed cost-effectiveness screening and are included in the MEMD) and that most high impact measures pass the economic UCT threshold ratio of 1.0.

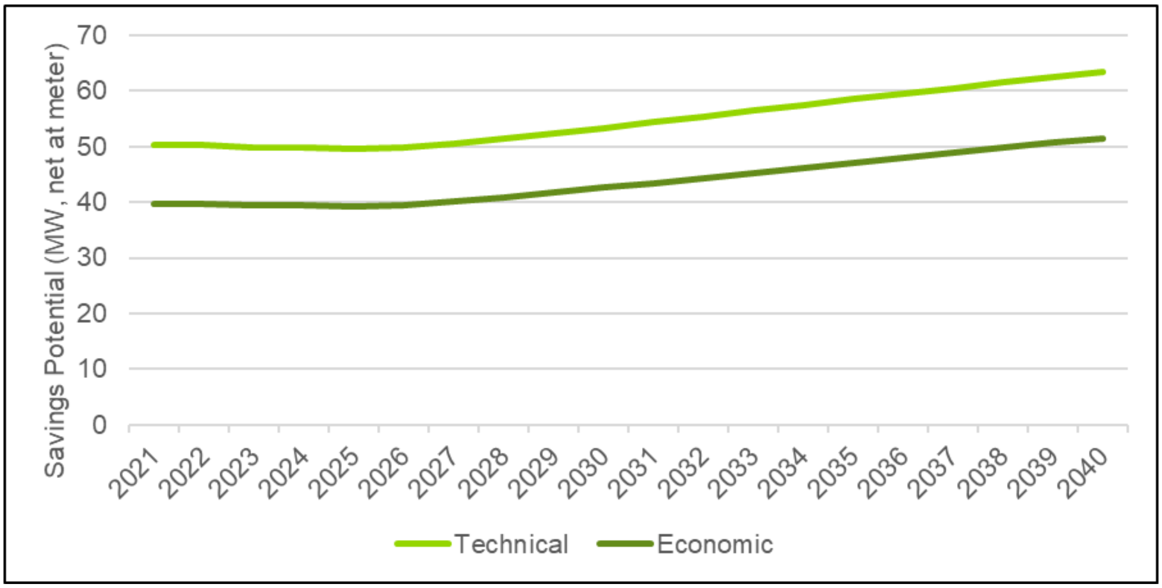
Figure ES-5. Lower Peninsula Technical and Economic Potential Summer Peak Demand Savings, Reference Scenario (MW, Net at Meter)



Source: Guidehouse analysis

Figure ES-6 presents the net technical and economic summer peak demand potential at the meter for utilities in Michigan's Upper Peninsula for the Reference Scenario. Technical and economic potential remain relatively flat through 2006, and then steadily increase through the remaining period. Similar to the electricity technical potential, the peak demand savings remains relatively flat until 2026, when unidentified future emerging technologies begin to phase in. Economic potential is around 80% of technical, indicating the prevalence of established measures (i.e., measures that have already passed cost-effectiveness screening and are included in the MEMD) and that most high impact measures pass the economic UCT threshold ratio of 1.0.

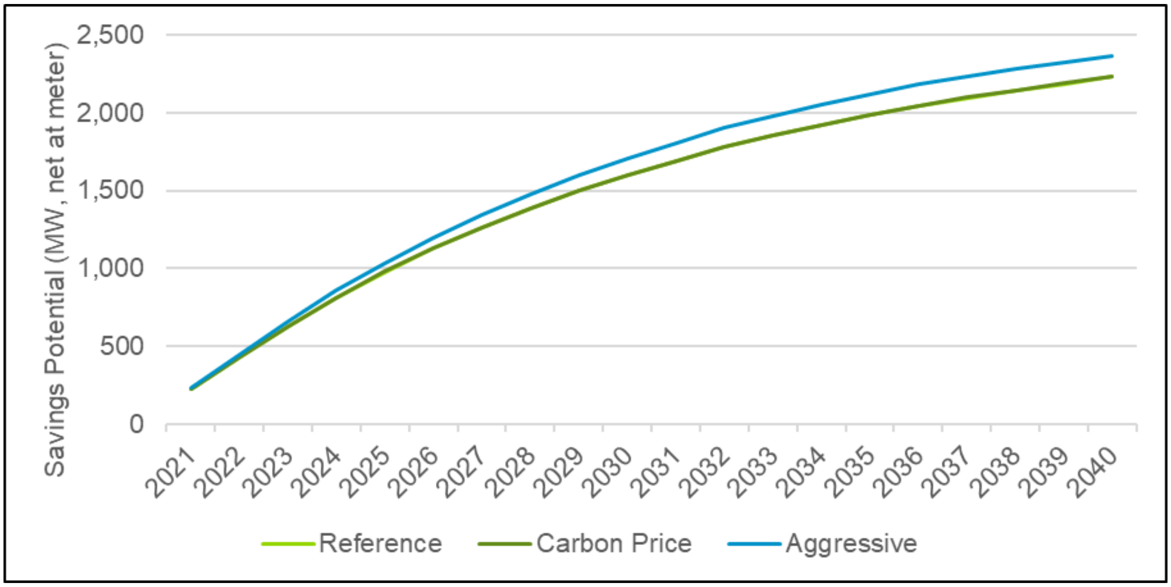
Figure ES-6. Upper Peninsula Technical and Economic Potential Summer Peak Demand, Reference Scenario Savings (MW, Net at Meter)



Source: Guidehouse analysis

Figure ES-7 presents the cumulative annual net achievable summer peak demand potential at the meter for utilities in Michigan's Lower Peninsula. The potential for all three scenarios (Reference, Aggressive, and Carbon Price) in 2021 is around 250 MW net at meter and increases overall to around 2,300 GW net at meter over the 20-year study period, with the Reference and Carbon Price Scenarios mirroring each other, indicating that achievable potential is not highly sensitive to increases in avoided costs. The Aggressive Scenario achieves about 6% greater cumulative savings in 2040 when compared to the Reference and Carbon Price Scenarios.

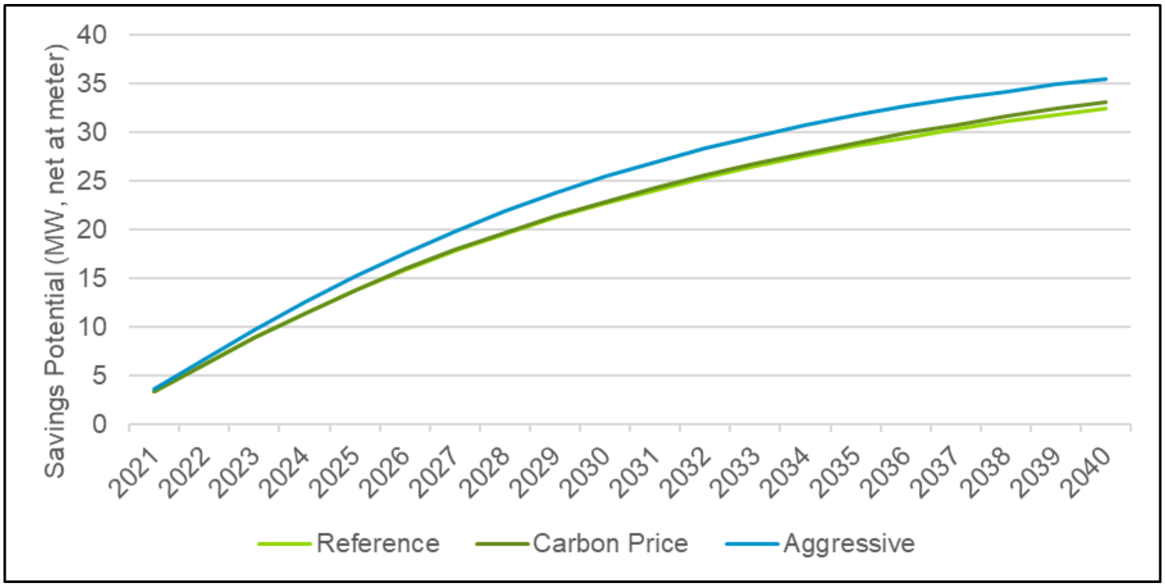
Figure ES-7. Lower Peninsula EWR Achievable Potential Summer Peak Demand Cumulative Annual Savings by Scenario (MW, Net at Meter)



Source: Guidehouse analysis

Figure ES-8 presents the cumulative annual net achievable summer peak demand potential at the meter for utilities in Michigan's Upper Peninsula. The potential for all three scenarios (Reference, Aggressive, and Carbon Price) in 2021 is around 4 MW net at meter and increases to around 34 MW net at meter over the 20-year study period, with the Reference and Carbon Price Scenarios mirroring each other, indicating that, similar to the Lower Peninsula, potential is not highly sensitive to increases in avoided costs. The Aggressive Scenario achieves about 10% greater cumulative savings in 2040 when compared to the Reference and Carbon Price Scenarios.

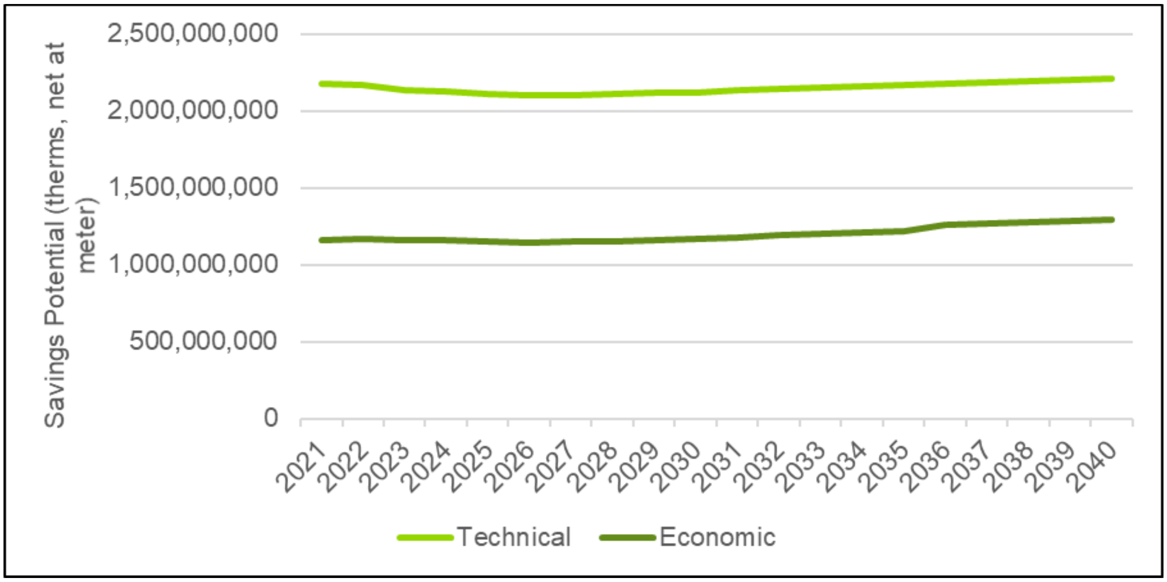
Figure ES-8. Upper Peninsula EWR Achievable Potential Summer Peak Demand Cumulative Annual Savings by Scenario (MW, Net at Meter)



Source: Guidehouse analysis

Figure ES-9 presents the net technical and economic natural gas potential at the meter for utilities in Michigan's Lower Peninsula for the Reference Scenario. Technical and economic potential remain relatively flat throughout the 20-year study period, with slight decreases in early years due to stock forecasts. Compared to electricity, natural gas savings are less impacted by the unidentified future technology assumptions, increasing slightly after a small decrease in the initial years. Economic potential is about 50% of technical, indicating that fewer natural gas measures pass the economic UCT threshold ratio of 1.0, as compared to electricity measures.

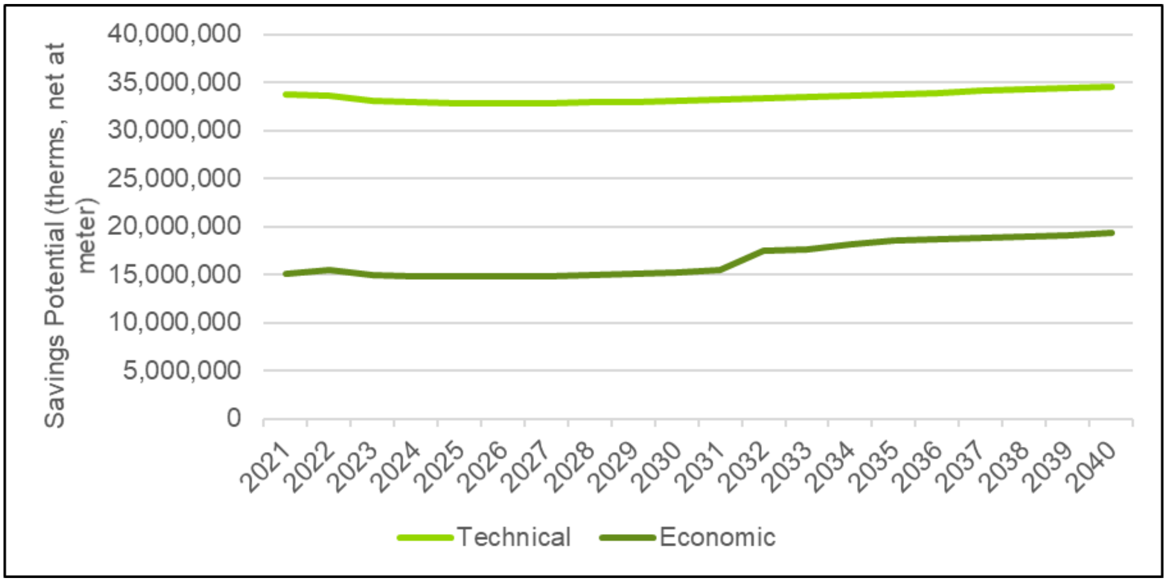
Figure ES-9. Lower Peninsula EWR Technical and Economic Potential Natural Gas Savings, Reference Scenario (therms, Net at Meter)



Source: Guidehouse analysis

Figure ES-10 presents the net technical and economic natural gas potential at the meter for utilities in Michigan's Lower Peninsula for the Reference Scenario. Technical and economic potential remain relatively flat throughout the 20-year study period. Compared to electricity, natural gas savings are less impacted by the unidentified future technology assumptions, increasing slightly after a small decrease in the initial years. Economic potential is about 50% of technical, indicating that fewer measures pass the economic UCT threshold ratio of 1.0, as compared to electricity measures. The increased in economic potential from 2031 to 2032 is attributable to residential thermostats becoming cost-effective.

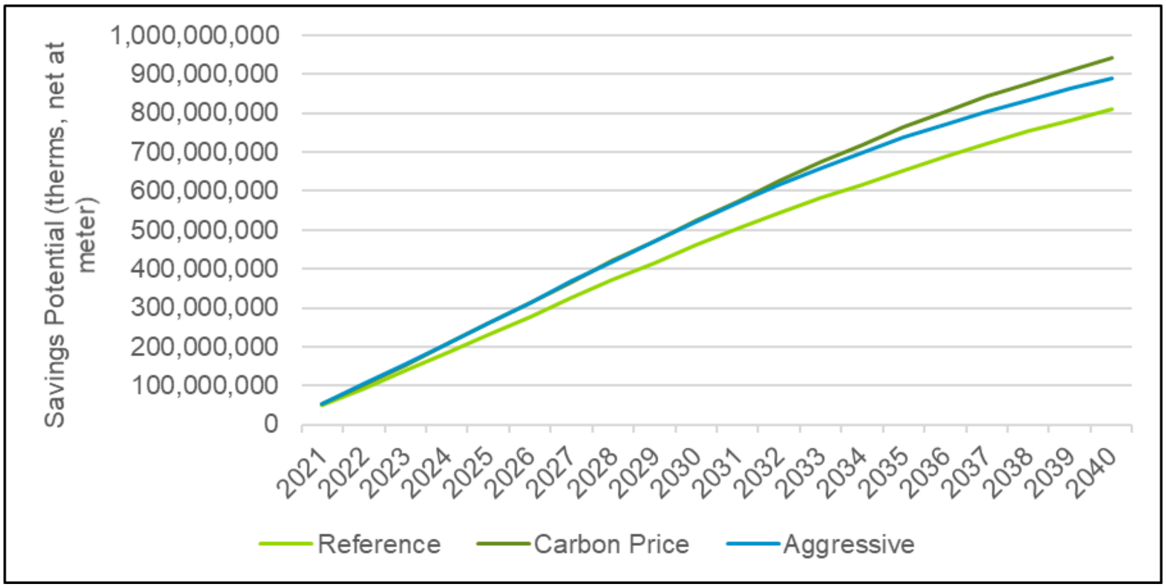
Figure ES-10. Upper Peninsula EWR Technical and Economic Potential Natural Gas Savings, Reference Scenario (therms, Net at Meter)



Source: Guidehouse analysis

Figure ES-11 presents the cumulative annual net achievable natural gas potential at the meter for utilities in Michigan's Lower Peninsula. The potential for all three scenarios (Reference, Aggressive, and Carbon Price) in 2021 is around 60 million therms net at meter and increases overall to between 800 million to around 950 million therms net at meter over the 20-year study period. The Carbon Price Scenario shows the greatest increase relative to the Reference Scenario, indicating that the natural gas potential is more sensitive to avoided costs than incentive refinements. The Carbon Price Scenario achieves about 16% greater cumulative potential in 2040 compared to the Reference Scenario.

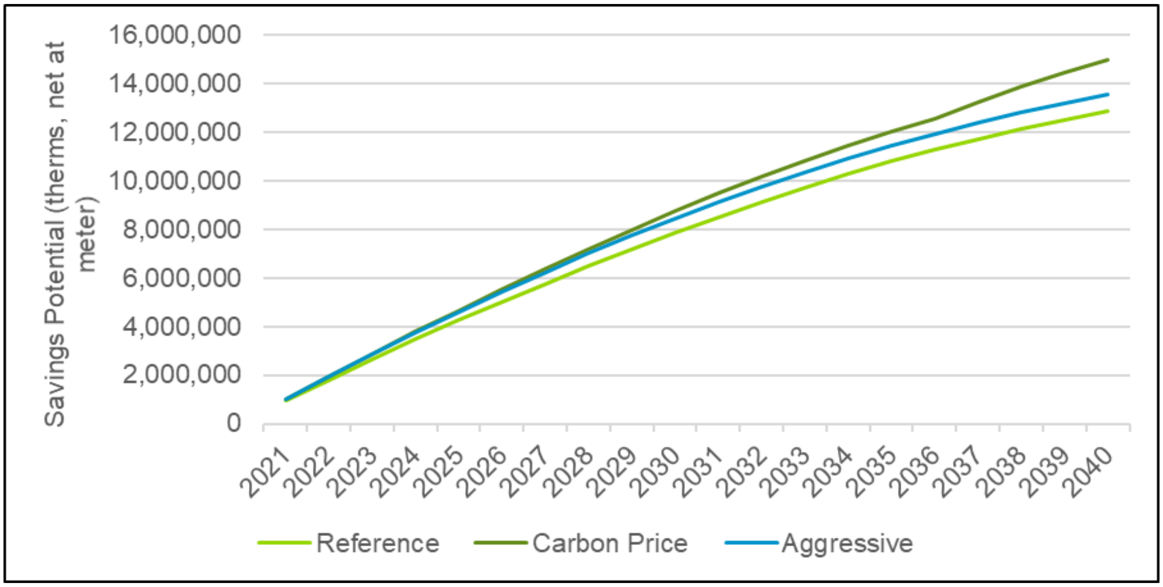
Figure ES-11. Lower Peninsula EWR Achievable Potential Natural Gas Cumulative Annual Savings by Scenario (therms, Net at Meter)



Source: Guidehouse analysis

Figure ES-12 presents the cumulative annual net achievable natural gas potential at the meter for utilities in Michigan's Upper Peninsula. The potential for all three scenarios (Reference, Aggressive, and Carbon Price) in 2021 is around 1 million therms net at meter and increases overall to between 12.5 million to around 15 million therms net at meter over the 20-year study period. The Carbon Price Scenario shows the greatest increase relative to the Reference Scenario, indicating that the natural gas potential is more sensitive to avoided costs than incentive refinements. The Carbon Price Scenario achieves about 16% greater cumulative potential by 2040 compared to the Reference Scenario.

Figure ES-12. Upper Peninsula EWR Achievable Potential Natural Gas Cumulative Savings (therms, Net at Meter)



Source: Guidehouse analysis

Table ES-1, Table ES-2, Table ES-3, and Table ES-4 summarize the EWR potential for each of the three achievable potential scenarios (Reference, Carbon Price, and Aggressive) for each year of the analysis, and in total over the 20-year study period, in terms of electricity savings and natural gas savings, and percent of sales, for the Lower Peninsula and Upper Peninsula.

Table ES-1 shows the EWR achievable electricity potential for the Lower Peninsula starts around 1,600 GWh in 2021 and increases to between 16,290 to 17,160 GWh across the three scenarios (Reference, Carbon Price, and Aggressive). The achievable potential reaches more than 18% of sales over the 20-year study period, with more than half the increase in sales in the first six years, through 2026.

Table ES-1. Lower Peninsula Energy Waste Reduction Cumulative Achievable Electricity Potential and Percent of Sales by Scenario

Year	Reference		Carbon Price		Aggressive	
	GWh Savings Net at Meter	% of Sales	GWh Savings Net at Meter	% of Sales	GWh Savings Net at Meter	% of Sales
2021	1,580	1.9%	1,618	2.0%	1,659	2.0%
2022	3,059	3.7%	3,132	3.8%	3,221	3.9%
2023	4,481	5.4%	4,582	5.5%	4,724	5.7%
2024	5,805	7.0%	5,926	7.2%	6,123	7.4%
2025	6,992	8.6%	7,132	8.7%	7,382	9.0%
2026	8,069	9.9%	8,226	10.1%	8,529	10.5%
2027	9,061	11.1%	9,235	11.3%	9,588	11.7%
2028	9,930	12.2%	10,119	12.4%	10,517	12.9%
2029	10,719	13.1%	10,920	13.4%	11,360	13.9%
2030	11,435	14.0%	11,648	14.2%	12,124	14.8%
2031	12,115	14.6%	12,339	14.9%	12,851	15.5%
2032	12,755	15.2%	12,976	15.4%	13,521	16.1%
2033	13,302	15.7%	13,520	16.0%	14,090	16.7%
2034	13,798	16.3%	14,013	16.5%	14,603	17.2%
2035	14,323	16.6%	14,541	16.8%	15,153	17.5%
2036	14,783	17.0%	15,003	17.2%	15,626	18.0%
2037	15,183	17.4%	15,406	17.6%	16,036	18.4%
2038	15,563	17.7%	15,789	18.0%	16,422	18.7%
2039	15,920	18.1%	16,150	18.3%	16,783	19.1%
2040	16,292	18.4%	16,526	18.6%	17,158	19.3%

Source: Guidehouse analysis

Table ES-2 shows the EWR achievable electricity potential for the Upper Peninsula starts around 25 GWh in 2021 and increases to between 250 to 275 GWh across the three scenarios (Reference, Carbon Price, and Aggressive). The achievable potential reaches 18.9% or more of sales over the 20-year study period, with more than half the increase in sales in the first seven years, through 2027.

Table ES-2. Upper Peninsula Energy Waste Reduction Cumulative Achievable Electricity Potential and Percent of Sales by Scenario

Year	Reference Scenario		Carbon Price Scenario		Aggressive Scenario	
	GWh Savings Net at Meter	% of Sales	GWh Savings Net at Meter	% of Sales	GWh Savings Net at Meter	% of Sales
2021	25	1.9%	26	2.0%	27	2.0%
2022	48	3.6%	50	3.7%	52	3.9%
2023	69	5.2%	72	5.4%	75	5.6%
2024	89	6.7%	93	6.9%	98	7.3%
2025	108	8.0%	112	8.4%	118	8.8%
2026	124	9.3%	129	9.6%	136	10.2%
2027	139	10.4%	145	10.8%	153	11.5%
2028	153	11.4%	159	11.9%	168	12.6%
2029	165	12.4%	171	12.8%	182	13.6%
2030	176	13.2%	183	13.7%	195	14.6%
2031	187	14.0%	194	14.5%	206	15.4%
2032	196	14.7%	203	15.3%	217	16.2%
2033	205	15.4%	213	15.9%	226	17.0%
2034	213	16.0%	221	16.6%	235	17.6%
2035	220	16.5%	229	17.2%	243	18.2%
2036	227	17.1%	236	17.7%	250	18.8%
2037	233	17.6%	243	18.3%	257	19.3%
2038	239	18.0%	249	18.7%	263	19.8%
2039	245	18.4%	255	19.2%	268	20.2%
2040	250	18.9%	261	19.6%	273	20.6%

Source: Guidehouse analysis

Table ES-3 shows the EWR achievable natural gas potential for the Lower Peninsula starts around 50 million therms in 2021 and increases to between 810 to 891 million therms across the three scenarios (Reference, Carbon Price, and Aggressive). The achievable potential reaches more than 18% of sales over the 20-year study period, with more than half the increase in sales in the first six years, through 2026.

Table ES-3. Lower Peninsula Energy Waste Reduction Cumulative Achievable Natural Gas Potential and Percent of Sales by Scenario

Year	Reference Scenario		Carbon Price Scenario		Aggressive Scenario	
	Therm Savings Net at Meter	% of Sales	Therm Savings Net at Meter	% of Sales	Therm Savings Net at Meter	% of Sales
2021	48,793,613	1.1%	53,113,808	1.2%	54,294,476	1.2%
2022	93,736,869	2.1%	102,762,455	2.3%	104,909,575	2.3%
2023	139,212,470	3.1%	153,597,221	3.4%	156,591,614	3.5%
2024	185,807,356	4.1%	206,747,249	4.6%	209,407,362	4.6%
2025	231,948,693	5.2%	259,755,434	5.8%	261,873,170	5.8%
2026	278,433,475	6.2%	313,349,468	7.0%	314,659,442	7.0%
2027	325,337,432	7.2%	367,511,999	8.2%	367,730,235	8.2%
2028	371,264,279	8.2%	420,713,395	9.3%	419,869,566	9.3%
2029	416,433,025	9.2%	473,071,012	10.5%	471,119,201	10.5%
2030	460,243,136	10.2%	524,663,350	11.6%	520,753,533	11.5%
2031	503,011,379	11.1%	574,944,392	12.7%	569,159,596	12.6%
2032	543,839,031	12.0%	626,469,029	13.8%	615,368,915	13.6%
2033	581,759,351	12.8%	674,620,024	14.9%	658,227,382	14.5%
2034	617,328,198	13.6%	719,837,243	15.9%	698,321,002	15.4%
2035	651,610,769	14.3%	763,092,844	16.8%	736,872,788	16.2%
2036	687,876,422	15.1%	803,585,377	17.6%	772,176,813	16.9%
2037	721,602,397	15.8%	842,164,403	18.4%	804,827,249	17.6%
2038	753,143,903	16.5%	877,751,070	19.2%	835,168,158	18.3%
2039	782,557,261	17.1%	910,471,230	19.9%	863,415,025	18.8%
2040	810,328,389	17.6%	940,901,460	20.5%	890,171,294	19.4%

Source: Guidehouse analysis

Table ES-4 shows the EWR achievable natural gas potential for the Upper Peninsula starts around 1 million in 2021 and increases to between 12.9 to 14.9 million therms across the three scenarios (Reference, Carbon Price, and Aggressive). The achievable potential varies between 14.7% to 17.0% of sales over the 20-year study period with the Carbon Price Scenario higher indicating gas measures are more sensitive to increases in avoided costs than incentives, with more than half the increase in sales in the first eight years, through 2028.

Table ES-4. Upper Peninsula Energy Waste Reduction Cumulative Achievable Natural Gas Potential and Percent of Sales by Scenario

Year	Reference Scenario		Carbon Price Scenario		Aggressive Scenario	
	Therm Savings Net at Meter	% of Sales	Therm Savings Net at Meter	% of Sales	Therm Savings Net at Meter	% of Sales
2021	952,861	1.2%	1,024,805	1.3%	1,028,348	1.3%
2022	1,803,188	2.2%	1,953,465	2.4%	1,952,009	2.4%
2023	2,642,031	3.2%	2,875,322	3.5%	2,860,444	3.5%
2024	3,466,185	4.2%	3,787,084	4.6%	3,750,534	4.5%
2025	4,255,711	5.2%	4,667,352	5.7%	4,601,799	5.6%
2026	5,021,800	6.1%	5,525,577	6.7%	5,425,292	6.6%
2027	5,768,281	7.0%	6,363,740	7.7%	6,224,177	7.5%
2028	6,491,371	7.8%	7,176,218	8.6%	6,994,324	8.4%
2029	7,191,767	8.6%	7,973,219	9.5%	7,735,449	9.3%
2030	7,867,635	9.4%	8,740,743	10.4%	8,445,100	10.1%
2031	8,516,519	10.1%	9,475,233	11.2%	9,120,537	10.8%
2032	9,135,586	10.8%	10,173,115	12.0%	9,759,176	11.5%
2033	9,722,408	11.4%	10,831,580	12.7%	10,359,383	12.2%
2034	10,275,035	12.0%	11,448,596	13.4%	10,920,458	12.8%
2035	10,792,342	12.6%	12,023,212	14.0%	11,442,783	13.3%
2036	11,274,087	13.1%	12,555,552	14.6%	11,927,637	13.8%
2037	11,720,984	13.5%	13,220,765	15.3%	12,377,059	14.3%
2038	12,134,413	13.9%	13,861,091	15.9%	12,793,453	14.7%
2039	12,516,471	14.3%	14,436,022	16.5%	13,179,547	15.1%
2040	12,869,751	14.7%	14,947,018	17.0%	13,538,197	15.4%

Source: Guidehouse analysis

Conclusions

This EWR potential study has resulted in updated, expanded, and improved information on the Michigan customer base, and the potential for energy and demand reductions possible through EWR programs and initiatives by building upon previous studies, with the addition of natural gas potential and analysis of the Upper Peninsula. While much EWR potential remains, there are unique challenges in Michigan in realizing this potential over the 20-year study period. The potential study incorporates these real factors into the analysis by using primary research findings, Michigan baseline study data, and historical and expected program achievements, to estimate efficient measure and fuel type saturations, as well as calibration targets. The following are the key findings and takeaways from the potential analysis.

- **Near-term electricity and summer peak demand savings:** The top five electricity measures—consisting of commercial and industrial custom and lighting, residential LED bulbs, and residential home energy reports—represent approximately 50% of achievable savings in 2021 for both the Lower and Upper Peninsulas. This situation presents challenges for program administrators interested in maintaining a high rate of incremental annual savings. LED bulbs and industrial custom stocks saturate quickly in the study period due to aggressive early year calibration. Home energy reports do not, by definition, saturate in year-over-year contributions to potential; however, their 1-year lifetime and contribution limits as a percentage of total residential potential presents uncertainty around the longevity of this measure.
- **Near-term natural gas savings:** The top five measures for each peninsula comprise nearly 60% of the natural gas savings. The Upper Peninsula's top five measures—residential furnaces, commercial custom, residential boilers, home energy reports, and residential showerheads—consist mostly of residential savings due to the large share of residential load to overall natural gas load in the Upper Peninsula. The Lower Peninsula contains many of the same top measures—commercial custom, residential furnaces, and residential home energy reports—but because of the larger share of commercial load in the Lower Peninsula, two other commercial measures round out the remaining top five measures in the Lower Peninsula (commercial demand controlled ventilation, and commercial HVAC).
- **Long-term electricity and summer peak demand savings trends:** Incremental annual electricity potential decreases year-over-year over the 20-year study period, as some end uses, such as lighting in all sectors, begin to saturate. The calibration resulted in high lighting savings in the first few years of the study, but little overall total lighting potential remains due to existing high LED saturations identified from the primary data collection, causing the projected lighting savings to saturate quickly. Custom savings potential also deteriorates over time, and the market also saturates. The HVAC end uses show strong and steady increases year-over-year, which is a product of relatively low current participation and stock turnover limits.
- **Long-term natural gas savings:** Natural gas savings are much steadier over the study period than electricity savings. The top two end-use categories for both peninsulas are residential HVAC and commercial HVAC, which are limited by stock turnover and relatively low historical accomplishments, resulting in these categories ramping up more over time. Other end-use categories, such as residential water heating, begin to saturate, resulting in lower incremental savings potential years. However, the variance from the incremental savings potential in the early years (about 1% per year) compared to later years (about 0.7% per year) is much lower than the variance of electricity savings over time.
- **Cost test results:** All sectors achieve a UCT ratio of above 1.0 at the start of the study. However, as time progresses, the residential sector UCT drops below 1.0 for both electricity and natural gas residential program bundles. For residential electricity, this result is largely due to low-cost lighting measures saturating in the market and being backfilled with more expensive technologies in later years. Additionally, low-income segments receive 100% incentives and are inherently less cost-effective at the UCT level. As the highly cost-effective lighting programs diminish, these less cost-effective segments have much more of an impact on overall residential program bundle cost-

effectiveness. This effect is true for residential natural gas programs as well, though it is a more muted effect because there is not a measure with an analogous impact to that of lighting. However, this result is observed in the natural gas programs when a low-income furnace measure passes the UCT threshold of 0.8 in 2036 in the Lower Peninsula.

- **Scenario savings comparison:** There are modest differences in cumulative annual achievable potential in 2040 across the three scenarios. The Aggressive Scenario yields the highest electricity potential in the Lower and Upper Peninsulas, with an increase of around 5% and about 10%, respectively, as compared to the Reference Scenario. The Carbon Price Scenario results in an increase of around 16% in natural gas potential, outpacing the Aggressive Scenario for this fuel type. These results indicate the electricity potential is more sensitive to changes in incentives and spending, while natural gas potential is more sensitive to increases in avoided costs.
- **Scenario dynamics:** The primary adjustment between the scenarios is the incentive alignment with measure level UCT screening. This adjustment has the effect of increasing potential by making more measures cost-effective and reducing customer payback for measures that were already cost-effective at the 40% incentive level in the Reference Scenario. The resulting magnitude of this impact is small for several reasons.
    - The low levels of incentives required to make additional measures in the Reference Scenario screen causes these measures to have long customer payback periods. While more measures are included, these new measures do not see much customer adoption.
    - The higher incentives for previously cost-effective measures increase the measure long-run market equilibrium but may not dramatically increase savings in the early study period as the increased incentives do not immediately manifest in greater technology awareness.
    - Many high impact measures are already achieving significant savings and therefore have reduced potential for increased savings between scenarios due to the high Reference Scenario calibration targets.
- **Sensitivity results:** Electricity potential exhibits a symmetrical and high sensitivity to net-to-gross (NTG) ratio and marketing effect variances, and a high negative impact from decreasing avoided costs, with a lower positive impact from increasing avoided costs. Natural gas potential shows a similar behavior to electricity, with the addition of a high positive impact from decreasing incremental costs. Changes to line loss factors, discount rates, and word of mouth effects have little impact on potential for each territory and fuel type.

1. Introduction

This section provides an overview of the potential study, including background and study goals, a discussion of the report's organization, and key caveats and limitations of the study. Guidehouse's modeling tools ensure the rigor, validity, and sensibility required of the demand-side management (DSM) potential study results. Our potential study models have been validated in numerous US states, and our DSM potential studies and models have been quoted by the American Council for an Energy Efficient Economy (ACEEE) as being "robust and transparent… [and] their methodology for forecasting participation is industry standard best-practice."[2]

As is typical in the development of such studies, Guidehouse worked collaboratively with the Michigan Public Service Commission (MPSC) and its stakeholders to ensure the study, to the fullest extent, reflects current Michigan market conditions. We received considerable guidance and feedback from MPSC staff, particularly in the development of global input assumptions, measure characterizations, and historical portfolio performance calibration. Guidehouse also carefully considered, and as appropriate, was responsive to stakeholders' input, incorporating their feedback into the analysis approach.

1.1 Context and Study Goals

MPSC retained Guidehouse to develop an estimate of the potential for electricity waste reduction (EWR) in Michigan during the 20-year timeframe covering the period 2021 to 2040. Concurrently, Guidehouse estimated the potential for active demand response (DR) for the same period; that potential is included in a separate report. We worked with MPSC to develop information on current levels and patterns of energy use in Michigan, characterize potential measures that could be implemented to increase EWR through DSM programs in the state, and develop estimates of EWR potential. The study data and analysis will be used to inform EWR program design for utilities in Michigan. Table 1-1 summarizes the various elements of the project scope.

Table 1-1. Summary of Project Scope

Element	Dimensions
Forms of Energy	Electricity, natural gas
Type of Potential	Energy waste reduction Technical, economic, achievable
Sectors	Residential, commercial, and industrial
Income	Residential: low income, non-low income
Characteristics	Multifamily, C&I small business
Climate	Single weather zone
Time Horizon	2021-2040 (20 years)

Source: Guidehouse analysis

[2] ACEEE, "Cracking the TEAPOT: Technical, Economic, and Achievable Energy Efficiency Potential Studies," August 2014.

1.2 Stakeholder Engagement and Interactive Review Process

The stakeholder engagement process and level of participation in Michigan was greater than what Guidehouse has seen in many other jurisdictions due to the number of affected utilities. We appreciate the thorough review and comments provided by stakeholders and thank them for their feedback and participation in the process. Modifications related to feedback from the reviews were incorporated into this final report.

Three virtual stakeholder meetings were conducted using the Microsoft Teams platform. Each meeting provided an update of study progress and provided stakeholders the opportunity to ask questions. Guidehouse used a project-specific email address to receive study-specific feedback from stakeholders.

- **December 2, 2020:** The initial stakeholder meeting provided an overview of the potential study approach and summarized the project's status. The meeting also solicited stakeholder feedback on the EWR measure and DR option lists.
- **February 4, 2021:** The second stakeholder meeting provided a general project update. Guidehouse presented on, and solicited feedback to, the market characterization results, and provided an overview of stakeholder feedback from the draft customer survey instruments.
- **June 17, 2021:** The final stakeholder meeting included a presentation of the EWR and DR achievable potential study draft results and provided stakeholders an opportunity to provide feedback and request clarifications on the analysis and results. Questions and clarifications from the meeting were incorporated into this final report.

Key reviews occurred and stakeholder feedback was incorporated into the Research Plan, measure list, customer survey, global inputs/market characterization, and draft technical, economic, and achievable potential.

This study began in September 2020 and encompassed five phases. Each phase involved interactive engagement and review.

1. **Research Plan.** The Research Plan details how Guidehouse planned to gather and analyze project data and model the estimated potentials. The Research Plan summarized planned stakeholder engagement, our process for drafting and finalizing the reports, and included the project's planned schedule and assumptions.
2. **Measure List.** Guidehouse compiled a comprehensive measure list based on historical Michigan program data and an assortment of recent potential studies in comparable jurisdictions. A high-level screen was applied based on savings potential (high, medium, low) and measure market maturity to develop a final list of 110 measures with the greatest savings potential or market opportunity. We developed savings assumptions, baseline measure characteristics, load shapes, and measure costs based on regionally appropriate program research. Measure savings not included in the top 110 were incorporated as uncharacterized potential (which was less than 10% of total potential).
3. **Customer Surveys.** Survey objectives included assessing customer program and measure awareness, willingness to pay, and effect of the COVID-19 pandemic to inform modeling. The surveys identified customer perspectives on EWR, barriers and recent energy use decisions, associated impacts on achievable potential, and customer

willingness to adopt joint EWR-DR technologies (e.g., smart thermostats, networked LEDs, smart water heaters).

4. **Market Characterization.** Several rounds of data requests and review were conducted from the applicable Michigan utilities to inform the market characterization. The information received through the data request was used as the preferred source for model inputs. However, secondary sources such as US Census Bureau (census) data and publicly available US Energy Information Administration (EIA) data were used to estimate statewide input values after utility data gaps were identified. Input values were adjusted throughout the study period as new data and resulting modifications to the modeling methodology became relevant.
5. **Draft Technical, Economic, and Achievable Results**. Guidehouse presented draft potential results to stakeholders on May 24, 2021 and incorporated their feedback to develop the final potential results.

1.3 Caveats and Limitations

Several caveats and limitations are associated with the results of this study, as detailed in the following sections.

1.3.1 Program Design

The results of this study provide the savings potential for the State of Michigan and provide insights into how this potential can be translated into program design in key areas. However, this potential study is not intended to provide, nor does it have information on, detailed program designs. Different program designs and delivery mechanisms would inevitably result in different levels of adoption of efficient technologies, which means the output of this study is an estimate of what can be achieved under the specific set of assumptions outlined in this study. Program design is typically a separate activity and is outside the scope of this study.

1.3.2 Measure Characterization

The scope of this study included primary data collection techniques and a variety of secondary data sources for estimates of measure savings, costs, and market presence (e.g., saturations and densities). Primary data specific to Michigan was used wherever possible. Where Michigan-specific data was not available, the best available data was used. This situation and approach did not limit Guidehouse's ability to achieve the study objectives and is consistent with the previous EWR potential study for Michigan and Guidehouse's experience in other jurisdictions.

Furthermore, we consider the measure list used in this study to appropriately focus on those technologies likely to have the highest impact on savings potential over the study horizon. However, unidentified emerging technologies may arise that could increase savings opportunities over the study period, and broader societal changes may affect levels of energy use in ways not anticipated in the study. Guidehouse included an estimate of unidentified future technology emergence for each sector and primary fuel type (electricity and natural gas) beginning in 2026 and accelerating through the study horizon. These estimates are high level and are meant to represent the directional probability of unknown technology contributions to potential toward the end of the study period. The addition of these assumptions adds some uncertainty to later year results. While the modeled unidentified future technology emergence may under or overstate the actual values in the future, it is reasonable to assume that such technologies will become available over the 20-year study period. This study does not make assumptions about future code and standard changes beyond those already planned for the study period.

Potential studies must make assumptions about the adoption of technologies and options that inevitably come with a degree of uncertainty. While techniques such as use of payback acceptance curves and technology diffusion models are considered to provide reasonable aggregate estimates of savings potential, such techniques (which must be applied to dozens or in some cases hundreds of measures) are limited in their ability to accurately predict the adoption for specific measures or in specific customer segments.

For EWR, model calibration steps (e.g., comparing projected results with past achieved results) seek to ground the analysis in the real world, but inaccuracies are bound to exist the further one drills into a technology or segment—even if the aggregate results are considered to be reasonable. One reason that aggregate results can, in many cases, be more reliable than individual technology or segment results is that the uncertainty of inputs at the measure level will exhibit a pooling effect when aggregated up to the portfolio (whereby positive or negative differences at a finer level of aggregation can help to offset each other in an aggregate result). While more in-depth technology adoption techniques do exist (e.g., discrete choice analysis) to improve the projection accuracy for any given technology, application of these techniques to the quantity of measures analyzed in studies such as this are not typically warranted, considering the dramatic increase in cost one would have to incur to calibrate a different adoption model for every single measure.

1.4 Interpreting Results

This report includes a high-level account of savings potential results for MPSC in Michigan and focuses largely on aggregated forms of savings potential. EWR potentials are estimated at the finest level of granularity, which is at the measure level within each customer segment. The measure-level data is mapped to the various customer segments and end-use categories to permit a reviewer to easily create custom aggregations. Top measure achievable potential results in 2021 are available in the study appendices and in the results section of this report for the Reference Scenario. Inputs were gathered from utilities in Michigan and aggregated to the service territory level, Lower and Upper Peninsulas. Results were not developed at the utility level as part of this study.

1.5 Utilities

Guidehouse engaged utilities within the State of Michigan as part of this process. The utilities provided information on their utility EWR and DR programs and provided Guidehouse with customer emails to allow us to collect information for modeling via surveys. We received data from the following utilities:

- Alpena Power Company (electric)
- Consumers Energy (gas and electric)
- DTE Energy (gas and electric)
- Indiana Michigan Power (I&M) (electric)
- Michigan Gas Utilities (MGU) (gas)

- Northern States Power (NSP) (gas and electric)
- SEMCO Energy Gas Company (gas and electric)
- Upper Michigan Energy Resources Corporation (UMERC) (gas and electric)
- Upper Peninsula Power Company (UPPCO) (electric)

Unless otherwise specified, all utilities will be referred to jointly in this report.

1.6 Report Organization

The report is organized as follows:

- Section 2 provides an overview of the **Global Data** developed and used in the study.
- Section 3 summarizes the **Primary Data Collection** conducted for the study, including the Michigan utility customer survey.
- Section 4 discusses the **Energy Waste Reduction Measure Characterization**, including key parameters.
- Section 5 presents the **Energy Waste Reduction Technical Potential Results** for energy waste reduction measures, including a summary of results by sector and end use. This is presented both for electricity and natural gas measures.
- Section 6 provides the **Energy Waste Reduction Economic Potential Results** for energy waste reduction measures, including a summary of results by sector and end use. This is presented for both electricity and natural gas measures.
- Section 7 presents the **Energy Waste Reduction Achievable Market Potential Approaches**, including discussion of equilibrium market share, behavioral measures, investment and incentive strategy, reparticipation, and model calibration.
- Section 8 discusses the **Energy Waste Reduction Scenario Configuration Approach** for the Carbon Price and Aggressive Scenarios.
- Section 9 presents the **Energy Waste Reduction Achievable Potential Results** for energy waste reduction measures for electricity and natural gas, including a summary of results by sector, end use, customer segment, and measure, as well as cost-effectiveness tests and investment insights.
- Section 10 presents the **Conclusions** of the study.

The report also includes four appendices:

- Appendix A. Residential Survey Instrument
- Appendix B. Commercial & Industrial Survey Instrument
- Appendix C. Michigan 2021-2040 Potential Study Modeling Methodology
- Appendix D. Energy Waste Reduction Results File

2. Global Data

Guidehouse aggregated multiple data sources to simulate many elements of the market conditions in Michigan that help to define the potential for energy-saving technologies modeled in this study. These inputs are separated into technical potential inputs and economic potential inputs, as Table 2-1 shows.

Table 2-1. Global Inputs Elements

Technical Potential Global Inputs	Economic Potential Global Inputs
Electricity, peak demand, and natural gas consumption forecasts	Electricity, demand, and natural gas avoided costs
Residential household stock forecasts	Electric and gas retail rates
Commercial and industrial building stock forecasts	Electric and gas load shapes
End-use allocations	Line losses
Space and water heating fuel type multipliers	Discount rate, inflation rate, reserve margins

Source: Guidehouse

Many of the global inputs rely on segmentation by sector or subsector. This study includes three sectors: residential, commercial, and industrial. Per discussions with the MPSC, the residential sector is further segmented into the following sub-sector segments: single-family, single-family – low income, multifamily, and multifamily – low income. Commercial is split into large and small commercial segments based on consumption thresholds outlined in Section 2.1.1. Industrial is not segmented any further than the sector level.

To develop the technical and economic global inputs, Guidehouse prioritized data provided by Michigan utilities or the MPSC and primary data collected from surveys fielded for this study. In many cases, the data provided by a utility or the MPSC required augmentation with secondary data, such as:

- EIA Form 861 – Annual Electric Power Industry Report[3]
- Federal Energy Regulatory Commission (FERC) Form 1 – Electric Utility Annual Report[4]
- US Census Bureau – American Community Survey (ACS)[5]
- EIA's Residential Energy Consumption Survey (RECS)[6]
- EIA's Commercial Building End Use Consumption Survey (CBECS)[7]
- EIA's Manufacturing Energy Consumption Survey (MECS)[8]

The following sections outline the data sources used to develop each of the global inputs.

[3] https://www.eia.gov/electricity/data/eia861/
[4] https://www.ferc.gov/industries-data/electric/general-information/electric-industry-forms/form-1-electric-utility-annual
[5] https://data.census.gov/cedsci/
[6] https://www.eia.gov/consumption/residential/
[7] https://www.eia.gov/consumption/commercial/
[8] https://www.eia.gov/consumption/manufacturing/data/2014/

2.1 Technical Potential Global Inputs

2.1.1 Electricity and Peak Load Forecasts

Guidehouse used energy sales forecasts data provided by utilities and supplemented with MPSC filings for those utilities that did not provide data. Data granularity provided by the utilities varied but allowed for disaggregation at the sector level. For utilities that did not provide sector-level data, the average proportion of sales by sector from other MI utilities was applied. In some cases, certain years of forecast or historical data were missing, and average compound annual growth rates (CAGRs) across years with submitted data were used to estimate sales for any missing years.

For the residential sector, census data and usage per home type from EIA's RECS[9] were used to determine the fraction of housing types (single-family vs. multifamily). Census data was also used to determine the percentage of income-eligible customers by segment (percentage of households below 200% of the federal poverty line).

To disaggregate commercial loads into small versus large commercial, Guidehouse leveraged DTE, Consumers, and UPPCO 2019 FERC Form 1 data, which reports customer counts and total annual energy sales by tariff for each of these utilities and classify it either as small commercial (<1,200 MWh/year) or large commercial (>1,200 MWh/year). Additionally, a statewide segment sales portion was calculated based on these three utilities. In the final application of shares, DTE, Consumers, and UPPCO sales forecasts all utilized their own respective shares based on FERC data and the statewide average was applied to all other utilities.

To determine peak load forecasts, Guidehouse applied peak factors to electricity sales forecasts based on the Michigan Energy Measures Database's (MEMD's) peak definition of 3 p.m. to 6 p.m. on the three consecutive hottest weekdays in July. Peak factors are developed based on 8,760 hourly data and 2019 sales from DTE (Lower Peninsula) and UMERC (Upper Peninsula). Data from these utilities provide the most comprehensive 8,760 hourly data in their region and comprise the largest share of the peak demand in their region. All residential segments use the same peak factor. Where additional granularity was available, different peak factors were developed for the commercial and industrial subsegments.

2.1.2 Natural Gas Forecasts

Gas sales were forecasted similarly to electricity sales using utility data, and data from MPSC filings, where needed. For utilities that did not distinguish between commercial and industrial sector sales, data from MPSC Annual Report Form P-522 was used for disaggregation. For SEMCO and DTE, which operate in both the Lower and Upper Peninsulas, Guidehouse allocated 97.5% of sales to the Lower Peninsula and 2.5% of the sales to the Upper Peninsula.

Like the electricity sales forecasts, census data and usage per home type from EIA's RECS were used to determine the fraction of housing types (single-family vs. multifamily) for the residential sector. Census data was also used to determine the percentage of income-eligible customers (percentage of households below 200% of the federal poverty line). For the commercial sector, Guidehouse used the same share of large versus small commercial as the

[9] https://www.eia.gov/consumption/residential/index.php

electricity load because there was not an analogous way to disaggregate gas sales in the data provided.

2.1.3 Residential Housing Stock Forecasts

The total number of residential households was primarily developed using utility customer count databases and supplemented by publicly available FERC and EIA form data. However, this customer tracking data lacked the granularity to develop customer segment level estimates. Therefore, census data was used to determine the fraction of housing types (single-family vs. multifamily) and percentage of income eligible customers (below 200% of federal poverty line). Residential demolition rates are set to a standard 0.5% per year, which indicates an expected 200-year full building stock turnover. Demolished stock is available for new construction installation in the next modeled year.

2.1.4 Commercial and Industrial Building Stock Forecasts

Commercial building stocks are expressed in thousands of square feet, and industrial stocks are expressed as annual load. Therefore, industrial stocks are already complete from the sales forecasts outlined previously. For commercial buildings, utility data received through the data request process lacked enough information to develop complete square footage stock forecasts. Therefore, average building energy use intensities (EUIs) were sourced from EIA's CBECS data and applied to the sales forecast to estimate total building square footage. As noted previously, commercial sales disaggregation to the segment level leveraged DTE, Consumers, and UPPCO 2019 FERC Form 1 data, which gives customer counts and total annual energy sales by tariff. Commercial demolition rates are set to a standard 0.5% per year, which indicates an expected 200-year full building stock turnover. Demolished stock is available for new construction installation in the next modeled year. Industrial demolition rates are set to a standard 0.00%.

2.1.5 End-Use Allocations

End-use allocations were used solely for quality control purposes in this model. End-use breakout data received by utilities was high level and limited. DTE provided detailed breakouts for the residential sector, and Consumers provided some distributions for the main end uses such as heating. Because of the sparsely received end-use allocation data, national survey data from EIA's RECS, CBECS, and MECS was used as the basis to derive the end-use allocations estimate for the residential, commercial, and industrial sectors, respectively. Whenever possible, regional numbers were used to approximate Michigan-specific values. End-use allocations from EIA were compared to utility-provided data and were deemed appropriate for use at the statewide level.

2.1.6 Space and Water Heating Fuel Type Multipliers

Space heating and water heating electricity and gas fuel splits are critical global inputs that parse out the total building stocks to applicable fuel types. This approach ensures that measures that are only applicable to one fuel type for space and water heating are applied only to the proper subset of building stocks. In this model, these inputs are essential for residential building stocks, but not for commercial and industrial, which weight measure-level density data to account for fuel shares.

Residential fuel type multipliers were developed from the primary data collection and census data. The primary data collection was initially used as the primary data source for each customer segment in the residential sector. However, upon stakeholder review, Guidehouse updated the primary data source to census data because multifamily electric heat saturation was skewed low compared to other sources. 2019 census data was used to develop average fuel type multipliers for single-family and multifamily, and primary data collected was used to estimate the fuel share difference between low income and non-low income stocks.

2.2 Economic Potential Global Inputs

Economic global inputs were either provided directly by the utilities during the data request or derived from utility-provided DSMore[10] benefit-cost calculators. These inputs are required in the model to estimate the Utility Cost Test (UCT) for each measure and subsequent inclusion into economic potential if the measure passes the UCT. Guidehouse received data from all utilities but Alpena and MGU. We analyzed the received data into separate economic inputs for the Lower and Upper Peninsulas, weighted based on each utility's load in that territory. Economic inputs between MISO and PJM territories were deemed to be similar in this study, thus adding this dimensionality would not materially impact study results.

2.2.1 Electricity Avoided Costs

DTE and I&M provided electricity avoided cost data through the data request. Guidehouse also received DSMore input data from NSP, UPPCO, and Consumers to supplement the electricity avoided costs already provided. We used the data from DTE, I&M, and the DSMore files to analyze this data for load shape periods common across available avoided cost information (on vs. off peak).

2.2.2 Electricity Peak Demand Avoided Costs

Electricity peak demand avoided costs include $/kW avoided for generation, transmission and distribution, and ancillary costs. DTE and I&M provided electricity demand avoided cost data during the data request. Guidehouse also received DSMore input data from NSP, UPPCO, and Consumers to supplement the electricity demand avoided costs already provided. DTE and I&M provided capacity avoided costs as a forecast, while the DSMore data files had predefined escalators to apply to the first-year avoided capacity and transmission and distribution values. We used the data from DTE, I&M, and the DSMore files to analyze this data for load shape periods common across available avoided cost information (on vs. off peak).

2.2.3 Natural Gas Avoided Costs

DTE provided gas avoided cost data during the data request. Guidehouse also received DSMore input data from NSP and Consumers to supplement the gas energy avoided costs already provided from DTE. This data was not provided for different load shape periods; therefore, Guidehouse summarized this data to create one gas avoided cost stream for both the Lower and Upper Peninsulas, weighted by gas sales in each region.

[10] Demand Side Management Option Risk Evaluator, Integral Analytics, https://iawpwebapp01.azurewebsites.net/index.php/dsmore-2/

2.2.4 Electricity and Gas Retail Rates

Electricity and gas retail rates were not provided by utilities during the data request, and the DSMore data provided limited detail on rates. Guidehouse used data on the MPSC website[11] [12] for residential, commercial, and industrial electricity and gas retail rates. These rates were weighted by sales within the Lower and Upper Peninsulas to create weighted rates specific to each region.

2.2.5 Electricity and Gas Load Shapes

DTE and I&M provided electricity load shapes during the data request. DTE provided a suite of 8,760 load shapes for all sectors and many end uses. I&M's load shapes are only for major end uses, such as heating, cooling, and lighting. Guidehouse also requested DSMore input data for each utility from its most recent DSM program evaluation to supplement currently obtained economic inputs. Load shapes are embedded into the DSMore model, which are identified in the input page, but are not extractable with the data provided. However, the load shapes identified in the utility input tabs of the DSMore files provided mostly identified DTE load shapes as the source for analysis.

Based on this information, Guidehouse used DTE load shapes as the base for this analysis, weighting in I&M load shapes where available. Load shapes were analyzed as the percentage of annual load that is during on-peak and off-peak market price hours for each end use. We used PJM and Midcontinent Independent System Operator's (MISO's) definition of on versus off peak market prices, defined as follows: on-peak is a period of time when consumers typically use more electricity - normally on weekdays, when many businesses are operating. PJM considers weekdays from 7 a.m. to 11 p.m. on peak, except for the following holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day.[13]

No gas load shapes were provided during the data request.

2.2.6 Line Losses

Alpena, Consumers, MGU, and DTE provided line loss assumptions or a line loss study. DTE and Consumers provided detailed line loss studies with average and marginal loss options. Guidehouse derived line loss assumptions for NSP, I&M, UPPCO, UMERC, and SEMCO from the DSMore data each of those utilities provided. The DSMore data is much less granular than the line loss studies provided, with only one line loss apparently applied to all sectors; the line losses appear to be averages and not marginal. To remain consistent between data sources, we used the average line losses from the DTE and Consumers line loss studies and weighted the losses by utility sales data for the Lower and Upper Peninsulas.

[11] Comparison of Average Electric Rates for MPSC-Regulated Electric Utilities in Michigan – February 1, 2021: https://www.michigan.gov/documents/mpsc/rates1_594951_7.pdf

[12] Gas Cost Recovery Factors - February 1, 2021: https://www.michigan.gov/documents/mpsc/gasrates_592543_7.pdf

[13] https://www.pjm.com/Glossary

2.2.7 Discount Rate, Inflation Rate, and Reserve Margins

2.2.7.1 Discount Rates

I&M, DTE, and MGU provided discount rates during the data request. Guidehouse was able to summarize discount rates from DSMore input files for Consumers, NSP, and SEMCO by different cost test types (UCT, Total Resource Cost [TRC], Societal, etc.). We summarized this data across the Lower and Upper Peninsulas, weight based on utility sales as a percentage of total in each region, which resulted in discount rates by cost test for the Lower and Upper Peninsulas.

2.2.7.2 Reserve Margin

I&M and DTE provided reserve margins during the data request. I&M's reserve margins are for PJM, and DTE's reserve margins are for MISO. Upon review of the PJM and MISO territory for Michigan, I&M is a part of PJM and the rest of the state is under MISO. Therefore, Guidehouse applied the MISO reserve margins to all the other utilities and created a weighted average statewide reserve margin.

2.2.7.3 Inflation

UMERC, Consumers, I&M, MGU, and DTE provided inflation rates data during the data request. We summarized this data across utilities and weighted the values based on utility sales as a percentage of total to approximate statewide inputs. Inflation rates were not available in the utility DSMore data.

3. Primary Data Collection

Guidehouse conducted online surveys of Michigan's electricity and gas utility end-use customers to collect primary data that supplemented secondary sources to develop market acceptance and adoption forecasts. Through the primary data collection process, we emphasized the collection of Michigan-specific data to improve the quality of the potential modeling and address data gaps that were not already available through recent studies.

As discussed in the following sections, primary data collection included two online surveys: a residential survey and a C&I survey. Each survey was used to collect data to inform both the EWR and DR potential analyses.

3.1 Approach to Primary Data Collection

The surveys' primary objective was to collect information on customer awareness of and willingness to pay for EWR measures, and awareness and willingness to participate in DR programs. Guidehouse also included a limited number of measure baseline and saturation questions to supplement data from other studies and further inform the potential study.

Guidehouse also collected customer feedback in the surveys to support achievable potential model calibration related to:

- Impacts of the COVID-19 pandemic on customer decision-making around energy efficiency upgrades.
- Motivating factors driving customer decision-making about energy-consuming equipment in their home or business.
- Major barriers to customers taking action on the ways they consume energy in their home or business, including installation of energy efficient equipment.

All survey respondents were recruited through email solicitations, sourced from utility tracking data. Customers were offered an incentive through Tango to encourage participation; Tango allows customers to select an e-gift card from a participating retailer or restaurant (including Amazon.com, CVS, Dunkin' Donuts, etc.) or an online debit card (Visa or MasterCard), as Table 3-1 shows.

Table 3-1. Customer Incentive Details

Survey/Customer Type	Customer Incentive
Residential	$15
C&I	$25

Source: Guidehouse 2021

The survey instruments and recruitment methodologies are detailed in the following sections: survey instruments are included in 0 (residential) and Appendix B (C&I).

3.2 Residential Survey Response Summary

Residential customer responses are tabulated by region (Lower Peninsula and Upper Peninsula), customer income level (low income and non-low income), and residence type (single-family and multifamily). Table 3-2 shows the stratification for residential customers and the number of completed surveys in each stratum.

Table 3-2. Stratification of Residential Customer Surveys

Segment (Region-Residence Type-Income Level)	Completed Surveys
Lower-Multifamily-Low Income	36
Lower-Multifamily-Non-Low Income	34
Lower-Multifamily-Unknown	11
Lower-Single-Family-Low Income	48
Lower-Single-Family-Non-Low Income	170
Lower-Single-Family-Unknown	70
Lower-Unknown-Unknown	1
Upper-Multifamily-Low Income	13
Upper-Multifamily-Non-Low Income	5
Upper-Multifamily-Unknown	2
Upper-Single-Family-Low Income	64
Upper-Single-Family-Non-Low Income	99
Total Residential Surveys	**591**

Source: Guidehouse 2021

3.3 C&I Survey Response Summary

C&I customer responses are tabulated by region (Lower Peninsula and Upper Peninsula), customer size[14] (small and large), and business type[15] (commercial or industrial). Table 3-3 shows the stratification for C&I customers and the number of completed surveys in each stratum.

[14] Large customers are defined as those customers who indicated their combined gas and electricity bills were more than $65,000 per year. Small customers are defined as those customers who indicated their combined gas and electricity bills were less than $65,000 per year.

[15] Customer business type was determined based on customer responses to a survey question.

Table 3-3. Stratification of Completed C&I Customer Surveys

Segment (Region-Customer Size-Business Type)	Completed Surveys
Lower-Large-Commercial	45
Lower-Large-Industrial	9
Lower-Large-Unknown	2
Lower-Small-Commercial	261
Lower-Small-Industrial	32
Lower-Small-Unknown	49
Upper-Large-Commercial	5
Upper-Large-Unknown	1
Upper-Small-Commercial	51
Upper-Small-Industrial	3
Upper-Small-Unknown	12
Total C&I Surveys	**470**

Source: Guidehouse 2021

To maximize online survey responses from large C&I customers and in the absence of a utility data flag to sample around customer size, Guidehouse implemented a small C&I customer quota of 400 in the online survey. This means that after receiving 400 small C&I completes, the survey remained open only for large customers. Upon closing the survey, Guidehouse received 408 small C&I completes and 62 large C&I completes.

3.4 Survey Methodology and Results

This section details the methodology for the primary research objectives of the survey for which responses were used as direct model inputs and briefly discusses the results.

3.4.1 EWR Awareness

To assess customer awareness of EWR measures, respondents were asked whether they are familiar with a sample of two measures. One was a higher cost measure (e.g., insulation, boiler) and one was a lower cost measure (e.g., a light bulb, thermostat). The two measures were randomly selected from a set of representative measures to provide context across an array of measure types. Table 3-4 and Table 3-5 show high cost and low cost measure awareness for the residential and C&I sectors.

Table 3-4. Residential EWR Awareness

Measure Type	% Customers Aware (n=591)
Low Cost EWR Measure	70%
High Cost EWR Measure	57%

Source: Guidehouse 2021

Table 3-5. C&I EWR Awareness

Measure Type	% Customers Aware (n=470)
Low Cost EWR Measure	51%
High Cost EWR Measure	57%

Source: Guidehouse 2021

An awareness index is calculated for each respondent at the high and low cost measure level. The combined awareness index was applied to measures with similar cost and decision-making influencers in the EWR potential model.

3.4.2 EWR Willingness to Pay

Respondents were asked two sets of questions to assess customer willingness to pay for EWR measures: one from a set of low cost measures (e.g., a light bulb, thermostat) and one from a set of high cost measures (e.g., insulation, boiler); low and high cost measures varied between the two surveys to ensure the measures included were relevant for the survey respondent population. These questions probe customers on alternative payback times required to adopt representative high and low cost energy efficient technologies. Each respondent started at a randomly assigned payback period. Results from these questions were used to develop acceptance curves (i.e., willingness to accept a simple payback period) that were calibrated for low cost and high cost measures. The results of interpolating the relevant willingness to pay curves derived from survey data were applied to forecasted measure simple paybacks to inform the long-run market equilibrium of each measure in the EWR potential model. Results from the EWR willingness to pay questions are included in the payback curves in Section 7.

3.4.3 Baseline and Saturation

Guidehouse included a limited number of baseline and saturation questions to supplement existing studies to inform the potential study models. Respondents were asked questions to assess the baseline number of bulbs in a variety of common interior and exterior fixture types and the saturation of given bulb types (e.g., LED, CFL, linear fluorescent). In addition, questions were asked to understand customer fuel and system type for domestic water and space heating. Details on these results and how they informed the model are included in Sections 2.1.6.

3.4.4 COVID-19 Pandemic Impacts

Respondents were asked to provide feedback on the impacts of the COVID-19 pandemic on their decision-making around energy efficiency upgrades. In aggregate, the pandemic has little-to-no impact on customer decision-making around energy efficiency.

More than half (60%) of residential customers say they are just as likely to pursue energy efficiency upgrades. Some customers say they are less likely to pursue upgrades (19%), and a similar proportion of customers say they are more likely to pursue upgrades (22%). Similarly, more than half (55%) of C&I customers say they are just as likely to pursue energy efficiency upgrades. Some customers say they are less likely to pursue upgrades (28%), and a similar proportion of customers say they are more likely to pursue upgrades (17%).

Based on the minimal, self-reported impact of the pandemic on customer decision-making around energy efficiency upgrades and a comparison of willingness to pay curves developed from this primary research to a range of previous studies, Guidehouse opted to not adjust the model scenarios.

4. Energy Waste Reduction Measure Characterization

Guidehouse fully characterized 110 detailed EWR measures and nine end use measure buckets across the utilities' residential, commercial, and industrial sectors. These sectors were further segmented (four residential segments and two commercial segments), with measures identified as eligible for either retrofit, new construction, or both. Measures also include electricity and gas end uses; however, impacts from fuel switching are not evaluated. Measures are mapped to either electric or gas program buckets, based on primary fuel, for the purposes of budget tracking but may provide multi-fuel benefits. The net combined impact of the dimensionality defined above produced 608 unique measure permutations that were incorporated into Guidehouse's Demand Side Management Simulator (DSMSim™) model.

4.1 Energy Waste Reduction Measure List

Guidehouse developed a comprehensive measure list of EWR measures likely to contribute to economic potential. To build this list of the most promising measures, we first compiled lists from current program offerings, MEMD, Michigan's 2017 Energy Waste Reduction Potential Study[16], and measure lists of top performing measures from other jurisdictions. The resulting list was ranked and prioritized to identify EWR measures with the greatest potential for achievable energy and economic impacts. EWR measures did not include fuel substitution, combined heat and power (CHP), conservation voltage reduction (CVR), or codes and standards attribution programs.

For the measure screening process, Guidehouse focused on EWR measures that would pass the UCT cost screen and, in aggregate, are projected to achieve 90% or more of the incremental achievable savings in 2021. We then worked with the MPSC and stakeholders to iterate and finalize the measure list, and ensure it contained technologies viable for future DSM program planning activities, to include current top performers and measures anticipated to offer the greatest future potential within the 20-year study period.

As one of the measure categories, Guidehouse included an estimate of unidentified future technology emergence for each sector and primary fuel type (electricity and gas) beginning in 2026 and accelerating through the study horizon. These estimates are high level and are meant to represent the directional probability of unknown technology contributions to potential toward the end of the study period. The addition of these assumptions adds some uncertainty to later year results. While the modeled unidentified future technology emergence may under or overstate the actual values in the future, it is reasonable to assume that such technologies will become available over the 20-year study period.

With the exception of the unidentified future technologies and custom measures, all remaining EWR measures included in the model are available in the market and economically viable. For measures not included in the primary list, Guidehouse benchmarked recent studies across North America compared to the primary list, removed measures that are no longer relevant[17], and modeled and aggregated results by end use with a high-level percentage of sales savings estimates and customer costs. Nine end use bucket characterizations were included through

[16] https://www.michigan.gov/mpsc/0,9535,7-395-93309_93439_93463_93723_93730-406251--,00.html

[17] Measures were removed if these have been superseded (e.g.,T8 lamps having been superseded by LEDs) or if the former energy conservation measure is now a standard market practice.

this process and represent less than 10% of achievable potential. In this way, the results provide a comprehensive assessment of potential.

4.2 Energy Waste Reduction Measure Characterization Key Parameters

The measure characterization effort consisted of defining more than 50 individual parameters for each measure included in this study. Table 4-1 defines 14 of the most critical parameters and how these items impact technical and economic potential savings estimates.

Table 4-1. Key Measure Characterization Parameters

Parameter Name	Definition	Example
Baseline Measure	Existing inefficient equipment or process to be replaced.	T5/T8 Fluorescent Lighting
Energy Waste Reduction Measure	Efficient equipment, process, or project to replace the baseline measure.	Indoor LED Linear Lamp
Measure Lifetime	The lifetime in years for the base and energy efficient technologies. The base and energy efficient lifetimes only differ in instances where the two cases represent inherently different technologies, such as solar water heaters compared to a baseline of regular storage water heaters.	T5/T8 Fluorescent Lighting: 10 years Indoor LED Linear Lamp: 12 years
Measure Costs	The incremental cost between the assumed baseline and efficient technology using the following variables: • Base Costs: The cost of the base equipment, including both material and labor costs. • Energy Efficient Costs: The cost of the energy efficient equipment, including both material and labor costs. Retrofit measure costs will include the full material cost of the efficiency measure and associated labor rates for removal of existing equipment and installation of the efficient technology. Dual baseline measures consider the initial retrofit measure cost and savings and that of the portion of measure life once a new code or standard is projected to become effective.	Baseline cost: $500 Efficient cost: $690
Replacement Type	Identifies when in the technology or building's life an efficiency measure is introduced. Replacement type affects when in the potential study period the savings are achieved and the duration of savings.	Retrofit and early retirement (RET), replace-on-burnout (ROB) and new construction (NEW)
Annual Energy Consumption	The annual energy consumption for electricity in kWh and demand in kW, for gas in therms, for propane and fuel oil in MMBtu, and for each baseline and EWR measure.	Baseline: 196 kWh/year Efficient: 163 kWh/year
Unit Basis	The normalizing unit for energy, demand, cost, and density estimates.	Per bulb, per hp, per kWh consumption, per therm consumption

Parameter Name	Definition	Example
Scaling Basis	The unit used to scale the energy, demand, cost, and density estimate for each measure according to the reference forecast.	Per home, per 1,000 square feet of commercial area, etc.
Sector and End-use Mapping	The team mapped each measure to the appropriate end uses, customer segments, and sectors. Where Michigan-specific information was not available, Guidehouse used secondary data, including internal Guidehouse data sources. Guidehouse's review of these resources was used to support the data sources provided by the utilities and to ensure consistency among the utilities' data, Guidehouse's estimates, and publicly available resources. Section 2.1 describes the breakdown of customer segments with each sector.	Commercial Chiller Tune-up is mapped to the commercial sector, HVAC end use, and has customized inputs for small and large market segments
Fuel Type Multiplier	Assigns the percentage of electric/gas fuel type to measures with electricity/gas fuel type, such as water heaters and space heating equipment.	The Electric space heating multiplier only assigns electric space heating measures to customers that have electric heating
Measure Density	Used to characterize the occurrence or count of a baseline or EWR measure, or stock, within a residential household or within 1,000 square feet of a commercial building. This parameter was not defined for industrial measures as they scaled by consumption.	35 bulbs per household
Energy Waste Reduction Saturation	The fraction of the residential housing stock or commercial building space that has the efficiency measure installed each year. For the industrial sector, saturations are based on energy consumption.	40% of all residential bulbs are LEDs so saturation of LEDs is 40%
Technical Suitability	The percentage of the base technology that can be reasonably and practically replaced with the specified efficient technology.	Occupancy sensors have a technical applicability <1.0 because they are not practical on fixtures that have constant use, require manual control, or have alternate controls (e.g., timer)
Competition Group	Identifies measures competing to replace the same baseline density to avoid double counting of savings.	Efficient storage tank water heater or a tankless water heater can replace an inefficient storage water heater, but not both.

Source: Guidehouse

4.3 Energy Waste Reduction Measure Characterization Approaches and Sources

This section provides approaches and sources for the main measure characterization variables. Table 4-2 lists sources of data accessed for measure characterization.

Table 4-2. Sources for Measure Characterization Inputs

Measure Input	Data Sources
Measure Costs, Measure Life, Energy Savings	• Michigan MEMD • MI Utilities' program data • US Department of Energy (DOE) Appliance Standards and Rulemakings supporting documents • Engineering analyses • Guidehouse measure database and previous potential studies
Fuel Type Applicability Splits, Density, Baseline Initial Saturation, Technical Suitability, End-Use Consumption Breakdown	• Primary research conducted by Guidehouse • 2016-2017 Michigan Baseline Study • Residential Building Stock Assessment (RBSA) • Commercial Building Stock Assessment (CBSA) • Guidehouse's other potential studies
Codes and Standards	• US DOE engineering analyses • Local building code

Source: Guidehouse

4.3.1 Energy and Demand Savings

Guidehouse took four general bottom-up approaches to analyzing measure energy and demand savings for all measures, except for proxy measures representing custom projects and emerging technologies. Inputs to these bottom-up analysis are based on the following:

- **MEMD:** This reference has two parts: one covers weather-dependent measures, and a separate document provides guidance around the remainder of measures with previously defined prescriptive savings applicable for utilities in Michigan. This document is the primary source for inputs on energy and demand savings, as well as effective useful life and incremental measure cost.
- **Utilities' Program Data**: For custom measures, Guidehouse used the custom program data to estimate consumption and savings for all custom measures included in this study. The savings assumptions for custom measures were derived from recently reported custom program data, which was provided by utilities through the data request. We also leveraged the characterization from the 2017 Energy Waste Reduction Potential Study[18].
- **Technical Reference Manual (TRM):** For measures or associated inputs not covered by the MEMD, Guidehouse cross-referenced various TRMs from the Midwest, New

[18] Michigan's 2017 Energy Waste Reduction Potential Study

England, and Mid-Atlantic states to determine standard algorithms and, when necessary, various inputs to the savings analysis.

- **Previous Potential Studies:** When applicable, Guidehouse leveraged research and analysis conducted for other recent potential studies. This data was calibrated to ensure applicability in Michigan and consistency in inputs from other sources, such as the MEMD.
- **Engineering Analysis:** Guidehouse used secondary research and custom engineering analysis to calculate any inputs not included in the sources listed previously.

4.3.2 Incremental Costs

For incremental cost data, Guidehouse relied primarily on the MEMD and utility-provided program data. To fill any remaining gaps in cost data, Guidehouse also leveraged market research our team has conducted as part of other, recent evaluation and potential studies. Incremental costs for custom measures were calculated based on utilities' actual program data. Incremental costs are held steady throughout the study period. This is a conservative assumption as some efficient measures may see a decline in costs through time as these gain market share.

4.3.3 Incentives, Administrative Costs, and Net-to-Gross

Net-to-gross (NTG) ratios were included from the utilities' 2019 tracking data for all electricity and natural gas measures. All low-income measures received a NTG ratio of 1.0. Generally, non-low income measure received a NTG ratio of 0.90, with the exception of screw-based lighting. The general service screw-based bulbs NTG ratio is 0.54, and specialty bulbs is 0.67. Guidehouse understands the variable nature of NTG ratios within Michigan. At the time of study completion, proposed screw-based lighting NTG adjustments have not been finalized, therefore the initial assumptions remain constant for the study period. Incentive levels and administrative costs are defined in the scenario characteristics, as discussed in Section 8.1.

4.3.4 Building Stock and Densities

Guidehouse relied heavily on the primary data for information on equipment densities and saturations for lighting, HVAC, and water heating measures in the residential and commercial sector. Density and saturation inputs for between 50% and 60% of savings (depending on impact and potential type) were sourced from this research. For lower impact measures and measures not included in the primary data collection, Guidehouse referred to previous baseline studies[19] conducted in Michigan secondary data from other baseline studies to estimate density and saturation values. To estimate density and saturation values for these measures, we also leveraged the historical data in the RBSA[20] and CBSA[21] databases, along with data from other potential and baseline studies.

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[19] Including: DTE Energy 2016 - 2017 Residential Baseline Study, DTE Energy 2016 - 2017 Commercial & Industrial Baseline Study, and 2011 Michigan Residential and Commercial Baseline Studies (https://www.michigan.gov/mpsc/0,9535,7-395-93309_94801_95000---,00.html)

[20] https://neea.org/data/residential-building-stock-assessment

[21] https://neea.org/data/commercial-building-stock-assessments

4.4 Codes and Standards Adjustments

Estimates of future adjustments in savings related to codes and standards are included as part of the measure characterization process.

DOE publishes federal energy waste reduction regulations for many types of residential appliances and commercial equipment. The DOE Technical Support Documents (TSDs)[22] contain information on energy and cost impacts of each appliance standard. In the TSD, Section 5 includes engineering analysis, Section 7 includes energy use analysis, and Section 8 includes cost impact. As these codes and standards take effect, the energy savings from existing measures impacted by these codes and standards decline and the reduction is transferred to the codes and standards savings potential.

Guidehouse accounts for the effect of codes and standards through baseline energy and cost multipliers (sourced from DOE's analysis), which reduce the baseline equipment consumption starting from the year a code or standard takes effect. The baseline cost of an efficient measure affected by codes and standards will often increase upon the code's implementation. As such, computed measure-level potential is net of these adjustments from codes and standards implemented after the study's first year.

[22] Appliance standards rulemaking notices and TSD can be found at: https://www.energy.gov/eere/buildings/appliance-and-equipment-standards-program

5. Energy Waste Reduction Technical Potential Results

This section briefly describes Guidehouse's approach to calculating technical potential and presents the results for the utilities pertaining to total technical savings potential at different levels of aggregation. Results are shown by sector and end-use category. For more detail and levels of aggregation of technical potential, see Appendix D.

5.1 Approach to Estimating Energy Waste Reduction Technical Potential

This study defines **technical potential** as the total energy savings available assuming that all applicable installed baseline measures can *immediately* be replaced with the efficient measure or technology—wherever technically feasible—regardless of the cost, market acceptance, or whether a measure has failed and must be replaced. Therefore, technical potential is neither cumulative nor incremental; instead, it shows the total potential if all savings were to be achieved in a single year.

The *Michigan 2021-2040 Potential Study Modeling Methodology* (see Appendix C) discusses the approach to estimating technical potential in more detail. Guidehouse used its DSMSim model to estimate the technical potential for demand-side resources considered for this study. DSMSim is a bottom-up, technology-diffusion and stock tracking model implemented using a system dynamics framework.[23]

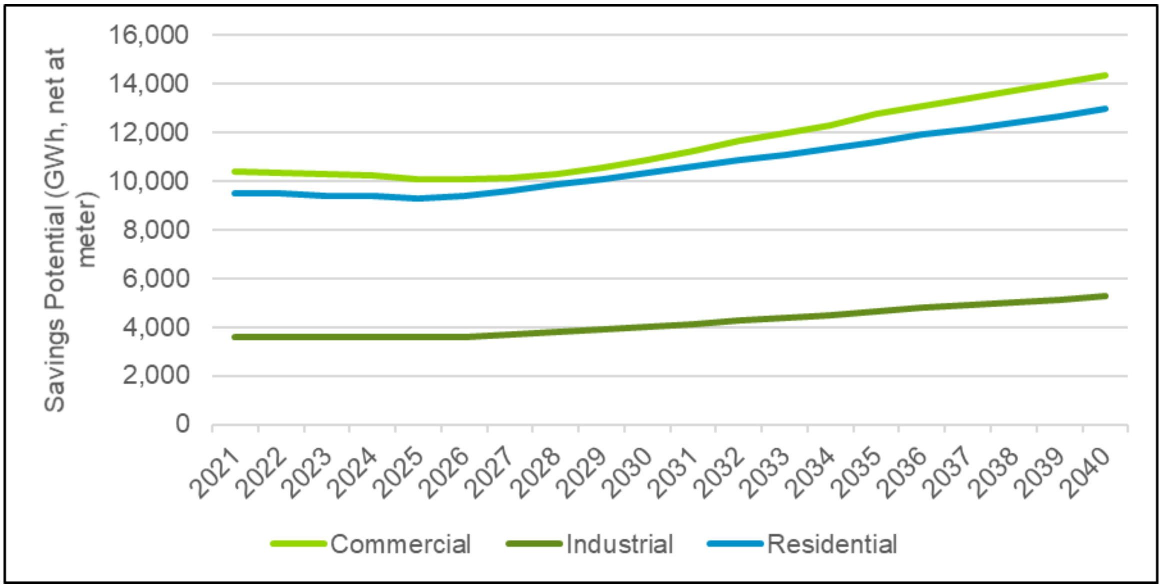
5.2 Energy Waste Reduction Technical Potential Results by Sector

Figure 5-1 shows the total electricity technical savings potential, net at meter, for each sector in the Lower Peninsula in GWh for the Reference Scenario. The technical potential remains relatively flat for all sectors for the first 5 years of the study period. In 2026, unidentified future emerging technologies begin to phase in, causing the increase in technical potential in later years, in addition to increased customer stocks over the study period.

Figure 5-2 shows the total electricity technical savings potential, net at meter, for each sector in the Upper Peninsula in GWh for the Reference Scenario. The technical potential remains relatively flat for all sectors for the first 5 years of the study period. In 2026, unidentified future emerging technologies begin to phase in, causing the increase in technical potential in later years.

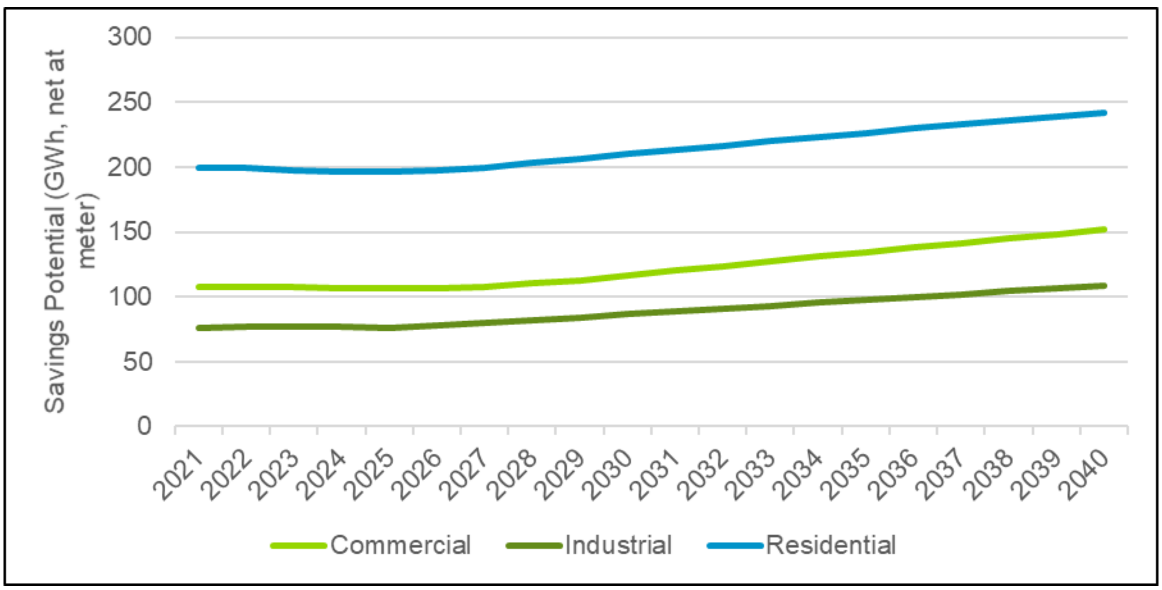
[23] See Sterman, John D. *Business Dynamics: Systems Thinking and Modeling for a Complex World*. Irwin McGraw-Hill. 2000 for detail on system dynamics modeling. Also see http://en.wikipedia.org/wiki/System_dynamics for a high level overview.

Figure 5-1. Lower Peninsula EWR Technical Potential, Electricity Savings by Sector, Reference Scenario (GWh, Net at Meter)



Source: Guidehouse analysis

Figure 5-2. Upper Peninsula EWR Technical Potential, Electricity Savings by Sector, Reference Scenario (GWh, Net at Meter)

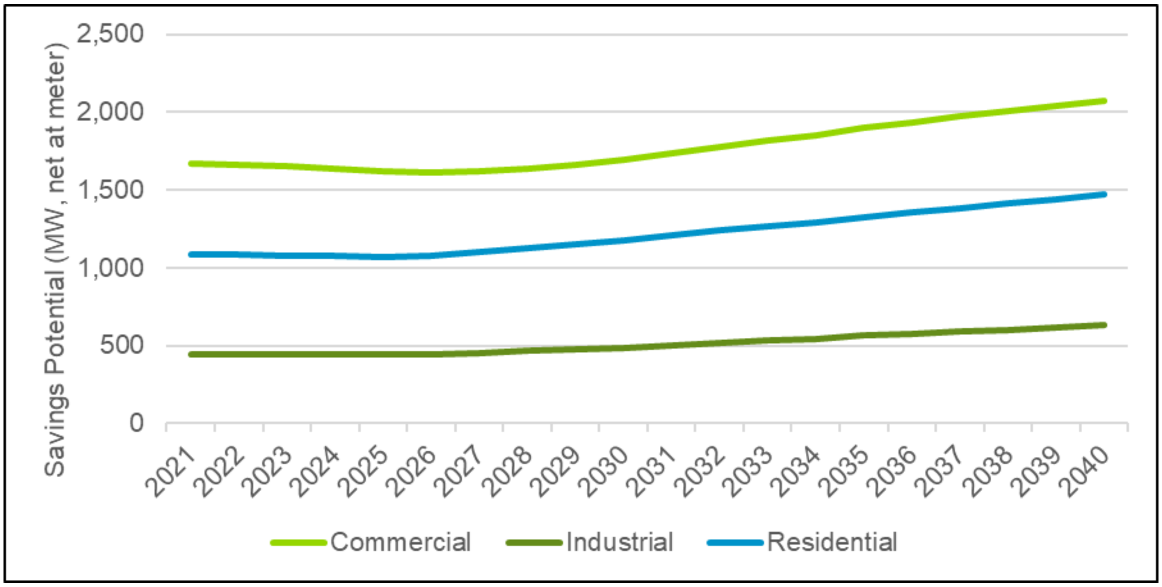


Source: Guidehouse analysis

Figure 5-3 shows the total summer peak demand technical savings potential, net at meter, for each sector in the Lower Peninsula in MW for the Reference Scenario. Like the electricity technical potential, the peak demand remains relatively flat until 2026, when unidentified future emerging technologies begin to phase in and increase the projected savings.

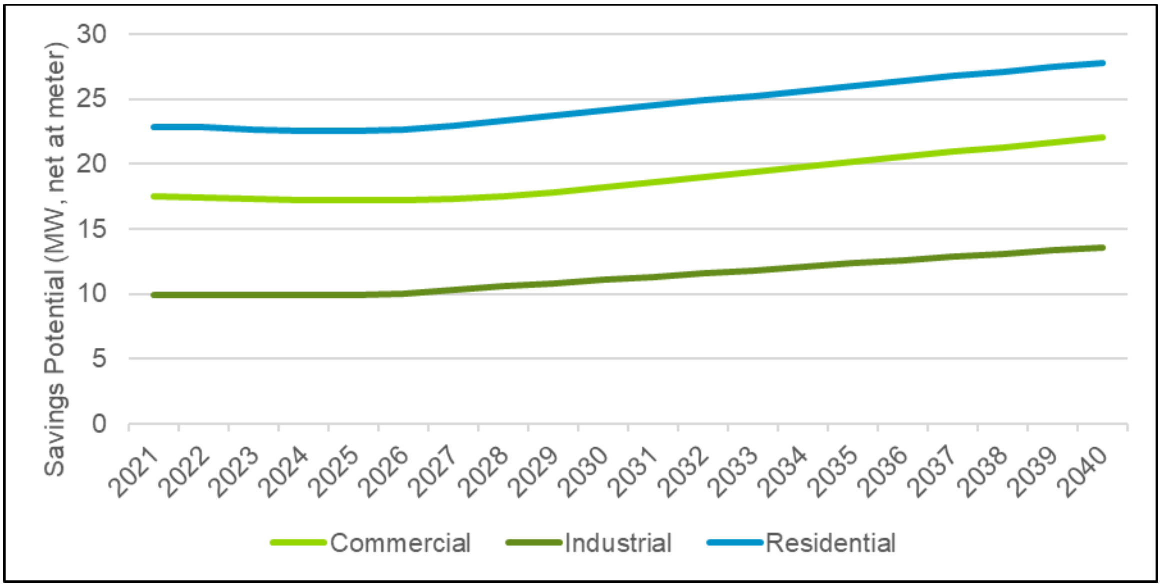
Figure 5-4 shows the total summer peak demand technical savings potential, net at meter, for each sector in the Upper Peninsula in MW for the Reference Scenario. Similar to the electricity technical potential, the peak demand remains relatively flat until 2026, when unidentified future emerging technologies begin to phase in.

Figure 5-3. Lower Peninsula EWR Technical Potential, Summer Peak Demand Savings by Sector, Reference Scenario (MW, Net at Meter)



Source: Guidehouse analysis

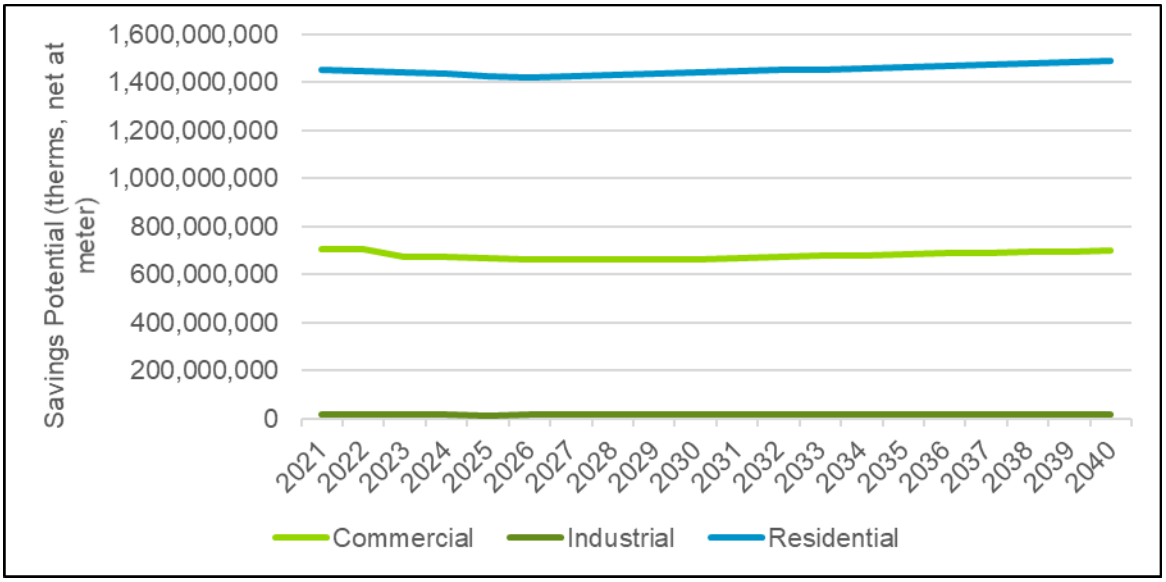
Figure 5-4. Upper Peninsula EWR Technical Potential, Summer Peak Demand Savings by Sector, Reference Scenario (MW, Net at Meter)



Source: Guidehouse analysis

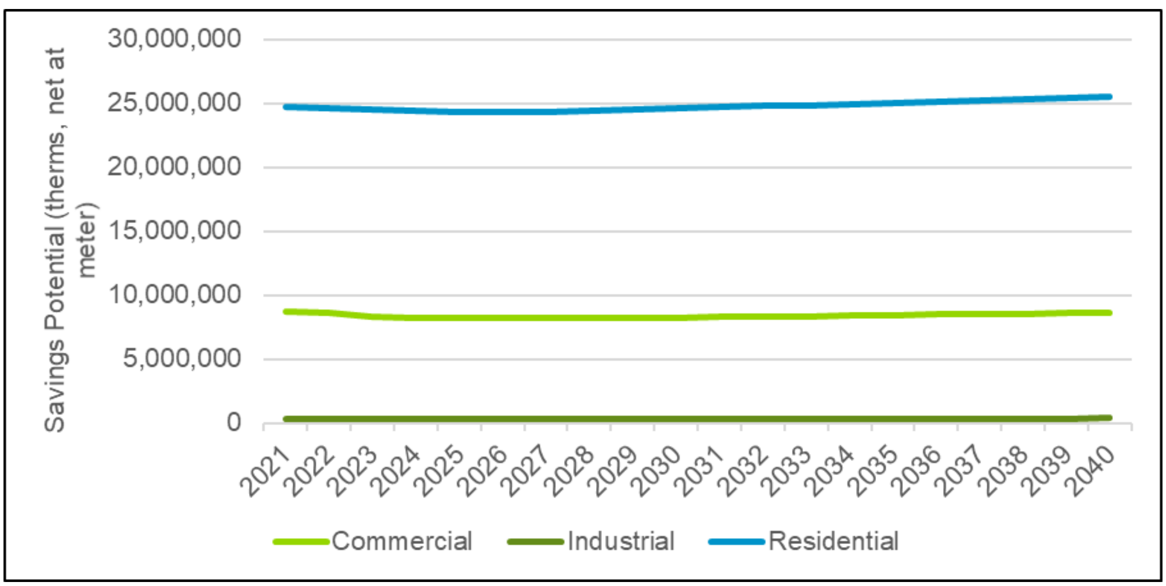
Figure 5-5 and Figure 5-6 show the total natural gas technical potential in therms for the Lower Peninsula and Upper Peninsula, respectively, for the Reference Scenario. Natural gas savings are less impacted by the unidentified future technology assumptions, increasing slightly after a small decrease in the initial years. Industrial natural gas technical potential is significantly smaller than commercial and residential sector potential due to the relatively small portion of gas sales from industrial (~3%). See Appendix D for details on the savings potential for each sector.

Figure 5-5. Lower Peninsula EWR Technical Potential, Natural Gas Savings by Sector, Reference Scenario (therms, Net at Meter)



Source: Guidehouse analysis

Figure 5-6. Upper Peninsula EWR Technical Potential, Natural Gas Savings by Sector, Reference Scenario (therms, Net at Meter)



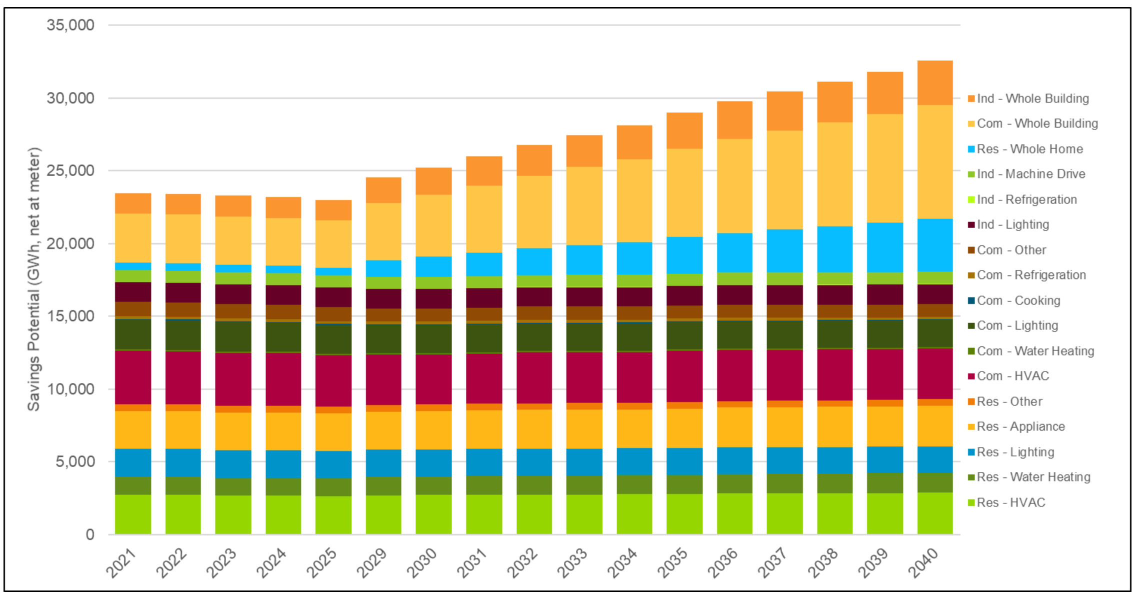
Source: Guidehouse analysis

5.3 Energy Waste Reduction Technical Potential Results by End Use

Figure 5-7 shows the electricity technical savings potential, net at meter, across all end uses and sectors in the Lower Peninsula for the Reference Scenario. The leading end uses in the Lower Peninsula are commercial whole building, residential whole building, commercial HVAC, and residential HVAC. This result reflects that there are still large opportunities in these end uses compared to lighting, which is relatively small in this study due to large increases in LED lighting saturations. The whole building and whole home end uses increase in savings over time because those end uses contain the unidentified future measure.

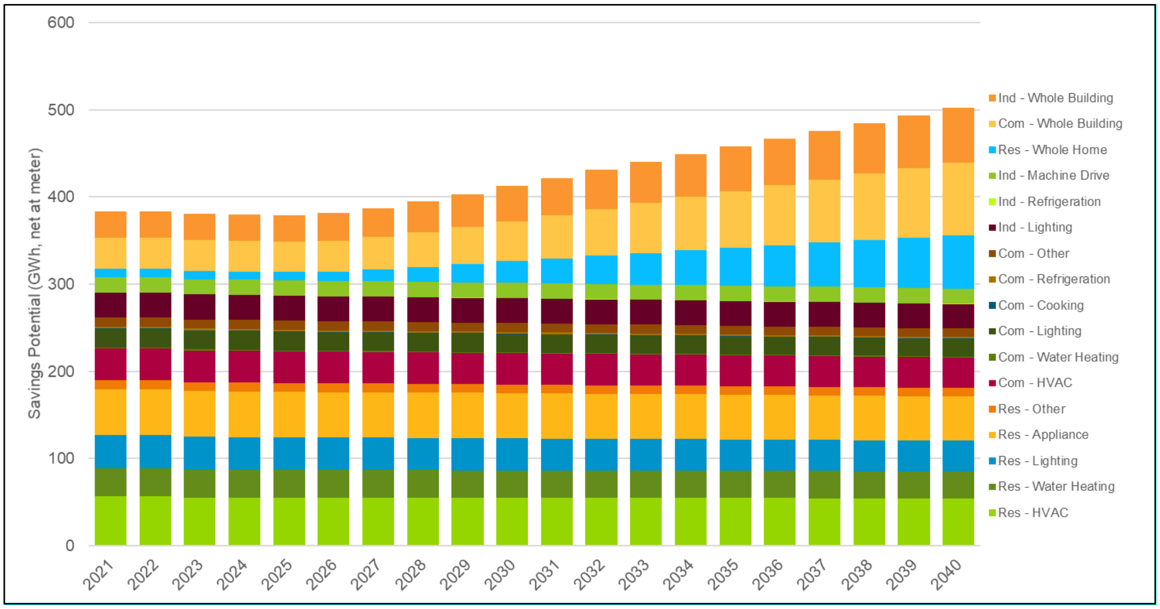
Figure 5-8 shows the electricity technical savings potential, net at meter, across all end uses and sectors in the Upper Peninsula for the Reference Scenario. The dominant end uses in the Upper Peninsula are residential HVAC, residential appliances, and commercial whole building. This difference from the Lower Peninsula is reflective of a larger share of residential customers and load in the Upper Peninsula compared to the Lower Peninsula. The whole building and whole home end uses increase in savings over time because those end uses contain the unidentified future measure.

Figure 5-7. Lower Peninsula EWR Technical Potential, Electricity Savings by End Use, Reference Scenario (GWh, Net at Meter)



Source: Guidehouse analysis

Figure 5-8. Upper Peninsula EWR Technical Potential, Electricity Savings by End Use, Reference Scenario (GWh, Net at Meter)

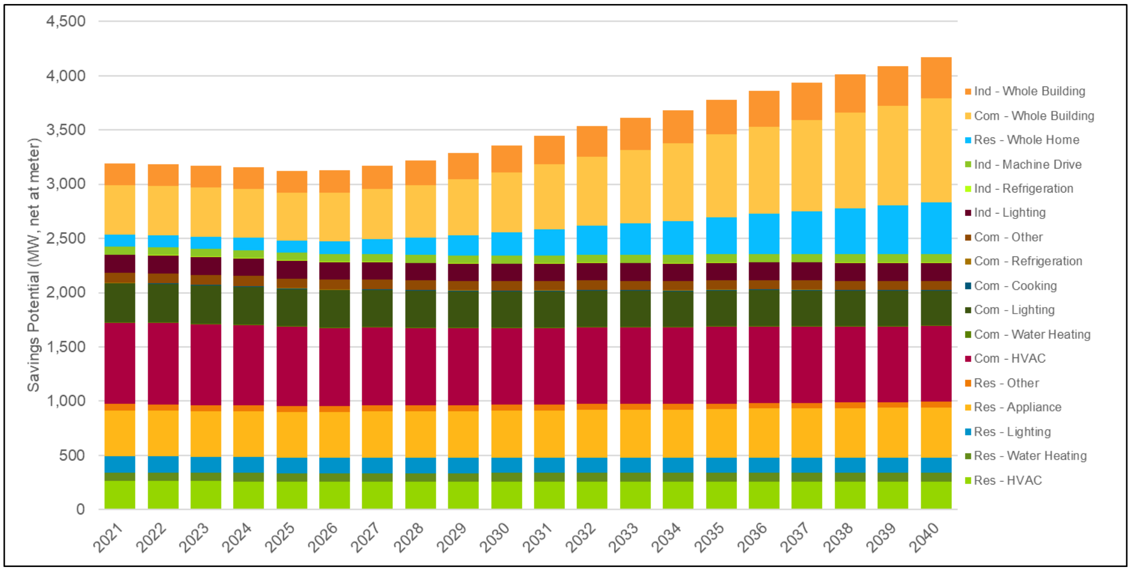


Source: Guidehouse analysis

Figure 5-9 shows the summer peak demand technical savings potential, net at meter, across all end uses and sectors in the Lower Peninsula for the Reference Scenario. The dominant end uses are commercial HVAC and commercial whole building, which coincide most with the MEMD peak hours definition.

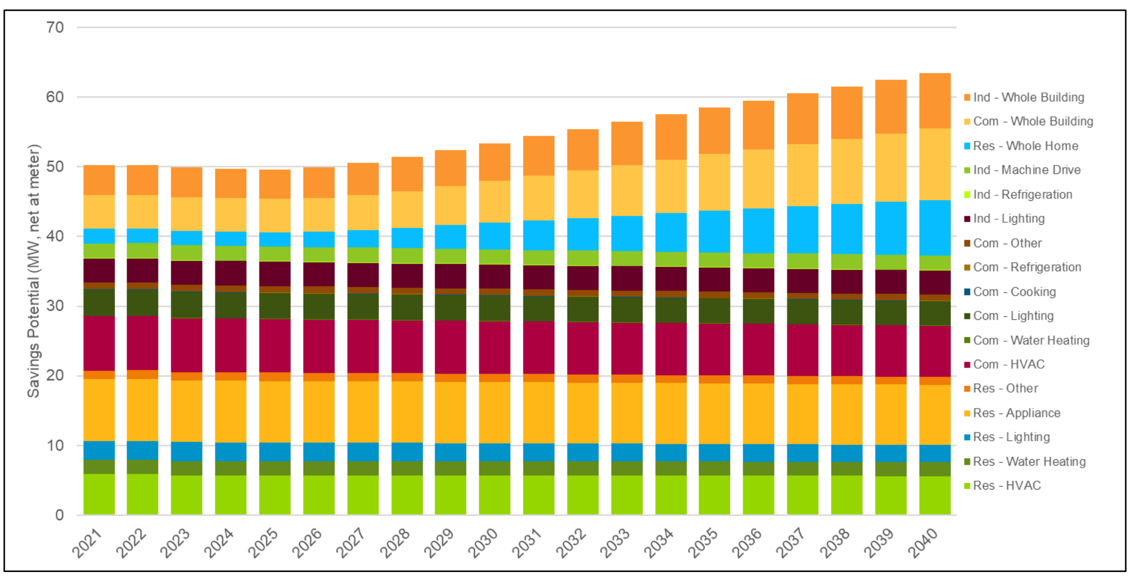
Figure 5-10 shows the summer peak demand technical savings potential, net at meter, across all end uses and sectors in the Upper Peninsula for the Reference Scenario. Residential end uses contribute more to the total peak savings in the Upper Peninsula than the Lower Peninsula due to the higher share of residential customers and load in the Upper Peninsula.

Figure 5-9. Lower Peninsula EWR Technical Potential, Summer Peak Demand Savings by End Use, Reference Scenario (MW, Net at Meter)



Source: Guidehouse analysis

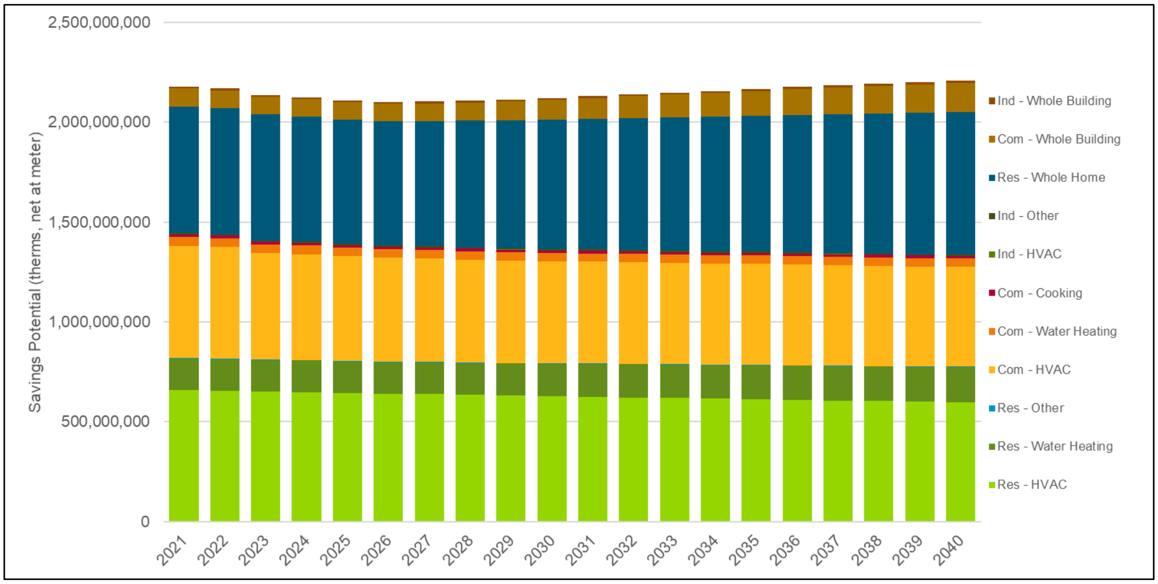
Figure 5-10. Upper Peninsula EWR Technical Potential, Summer Peak Demand Savings by End Use, Reference Scenario (MW, Net at Meter)



Source: Guidehouse analysis

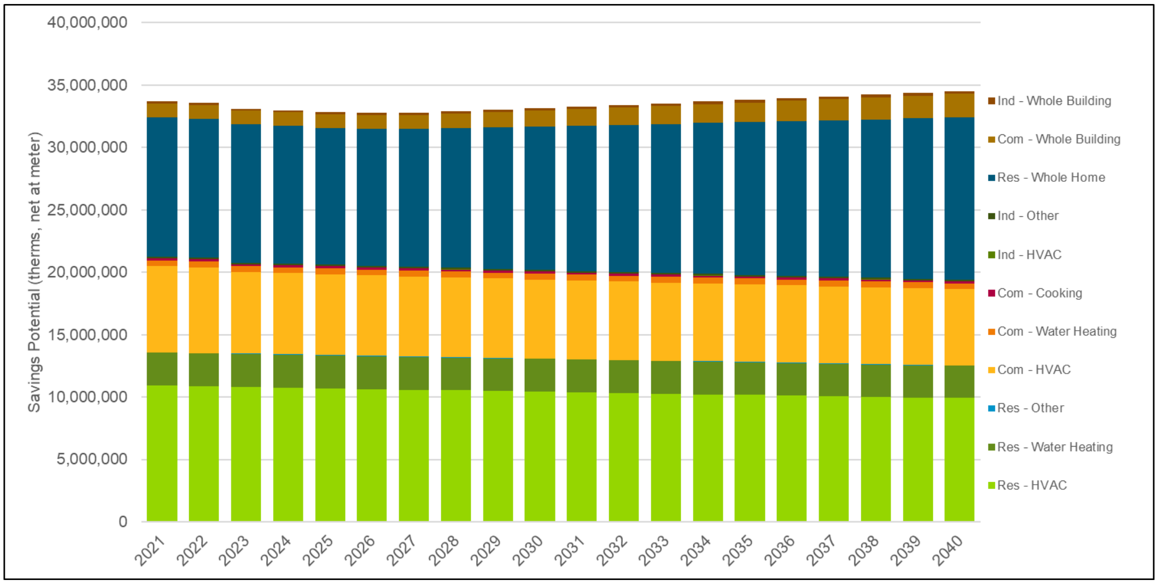
Figure 5-11 and Figure 5-12 show the natural gas technical savings potential across all end uses and sectors in the Lower Peninsula and Upper Peninsula, respectively, for the Reference Scenario. In both cases, weather-sensitive HVAC and whole building/home end uses make up the majority of the gas savings potential. Whole building/home measures contain envelope measures, which are also affected by seasonality.

Figure 5-11. Lower Peninsula EWR Technical Potential, Natural Gas Savings by End Use, Reference Scenario (therms, Net at Meter)



Source: Guidehouse analysis

Figure 5-12. Upper Peninsula EWR Technical Potential, Natural Gas Savings by End Use, Reference Scenario (therms, Net at Meter)



Source: Guidehouse analysis

6. Energy Waste Reduction Economic Potential Results

This section describes the economic savings potential, which is potential that meets a prescribed level of cost-effectiveness, available for the utilities in Michigan. The section begins by explaining Guidehouse's approach to calculating economic potential, and then presents the results for economic savings potential at different levels of aggregation. Results are shown by sector and end-use category. We developed economic potential using a UCT threshold ratio of 1.0 as the measure screen. For more detail and levels of aggregation of economic potential, see Appendix D.

6.1 Approach to Estimating Economic Potential

Economic potential is a subset of technical potential, using the same assumptions regarding immediate replacement as technical potential, but including only those measures that have passed the benefit-cost test chosen for measure screening—in this case, the UCT test per Michigan protocols. The UCT for each measure is calculated each year and compared against the measure-level UCT ratio screening threshold of 1.0. A measure with a UCT ratio greater than or equal to 1.0 is a measure that provides monetary benefits greater than or equal to its costs. If a measure's UCT meets or exceeds the threshold, it is included in the economic potential. Measures with UCT ratios less than 1.0 were non-cost-effective and do not appear in the economic potential. Measure level UCT screening does not include administrative costs. Administrative costs only are included at the program bundle and portfolio level.

The UCT test is a benefit-cost metric that measures the net benefits of EWR measures from a program administrator's viewpoint. The UCT benefit-cost ratio is calculated in the model using Equation 6-1.

Equation 6-1. Benefit-Cost Ratio for Utility Cost Test

$$UCT = \frac{PV(Avoided\ Costs)}{PV(Incentive\ Costs + Admin\ Costs)}$$

Where:

- *PV( )* is the present value calculation that discounts cost streams over time using the selected nominal discount rate (6.54% and 7.19% for the Lower Peninsula and Upper Peninsula, respectively).
- *Avoided Costs* are the monetary benefits resulting from electricity, natural gas, and capacity savings (e.g., avoided costs of infrastructure investments and fuel purchases due to the energy conserved and demand reduced by efficient measures).
- *Incentive Costs* are the utility incentive amounts paid at the measure level to help cover the incremental equipment cost to the customer. This is set to 40% of the technology incremental costs for non-low income customers in the Reference Scenario.
- *Admin Costs* are the administrative costs (including marketing and channel management) incurred by the program administrator(not included in measure level screening).

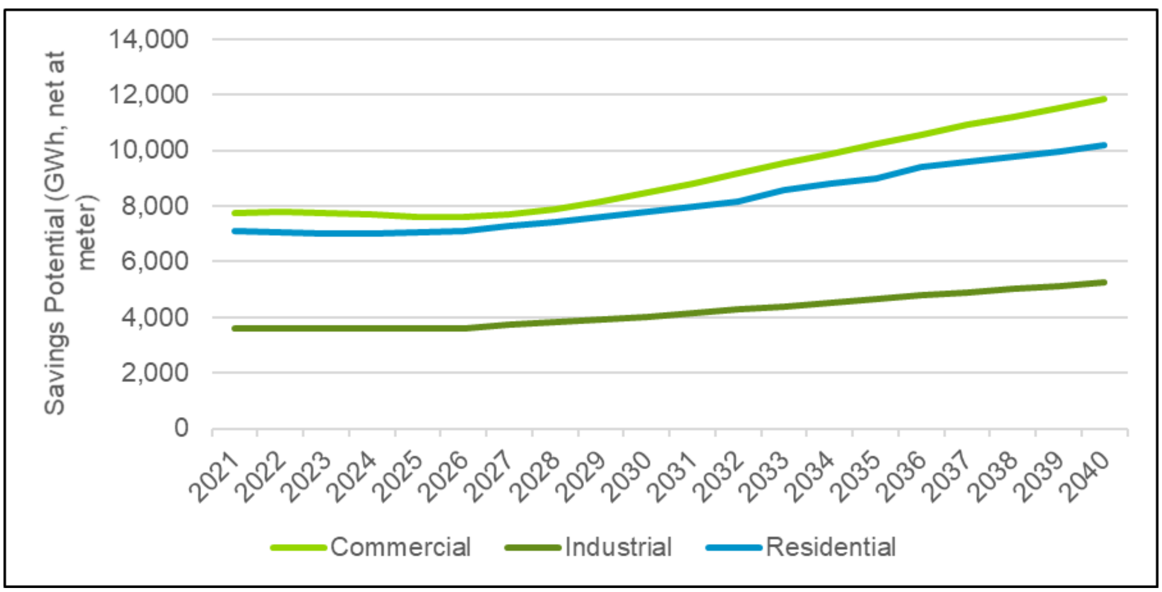
Guidehouse calculated UCT ratios for each measure based on the present value of benefits and costs (as defined previously) over each measure's life. Similar to technical potential, only one economic measure (meaning that its UCT ratio meets the threshold) from each competition group is included in the summation of economic potential across measures (e.g., at the end-use category, customer segment, sector, service territory, or total level). If a competition group is composed of more than one measure that passes the UCT test, then the economic measure that provides the greatest savings potential for its primary fuel type is included in the summation of economic potential. This approach ensures that double counting is not present in the reported economic potential.

Demand Response incentives and DR program awareness rates from the survey were integrated into the EWR adoption model to account for increased adoption of DR-enabled EWR technologies. The incorporation of these program design inputs results in reduced customer simple paybacks for specific measures with a DR incentive option weighted by the awareness of DR options as determined through Guidehouse primary research. To avoid double counting, only the EWR-specific incentive portion for these measures is included in budget and UCT calculations in the EWR study.

6.2 Energy Waste Reduction Economic Potential Results by Sector

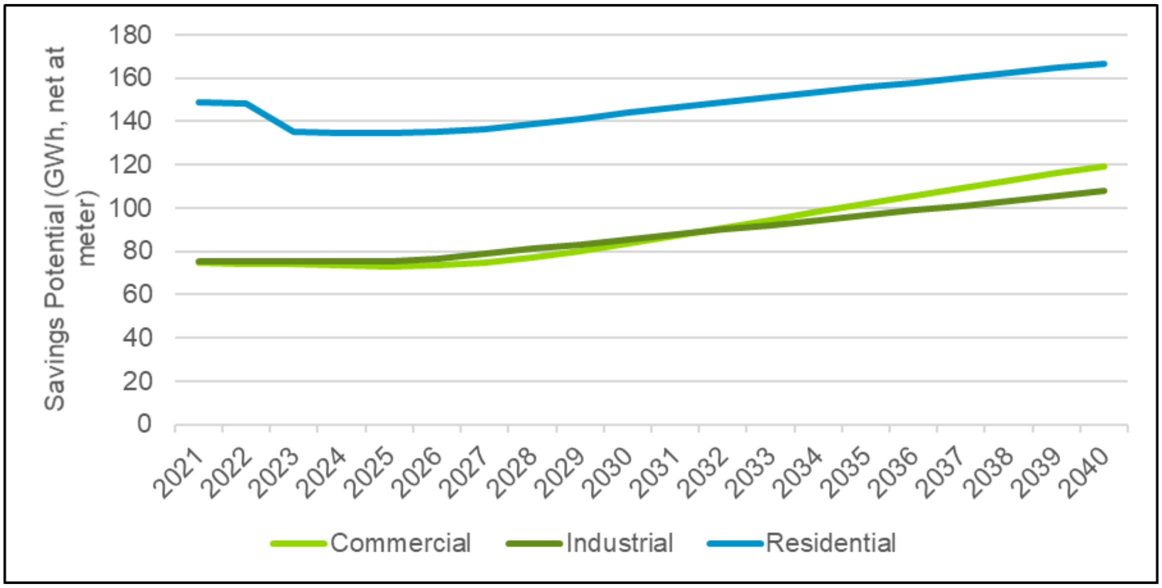
Figure 6-1 and Figure 6-2 show economic electricity savings potential, net at meter, across all sectors in the Lower Peninsula and Upper Peninsula, respectively, for the Reference Scenario. Avoided costs are different for the Lower and Upper Peninsulas. Additionally, these values change over time, and some measures fall in or out of cost-effectiveness over the study period. This is reflected most obviously in the residential sector. For the Lower Peninsula (Figure 6-1), some small stepwise increases can be seen in 2032 and 2035 as measures become cost-effective. Inversely, in the Upper Peninsula (Figure 6-2), some measures initially drop out of cost-effectiveness earlier on before rising back up.

Figure 6-1. Lower Peninsula EWR Economic Potential, Electricity Savings by Sector, Reference Scenario (GWh, Net at Meter)



Source: Guidehouse analysis

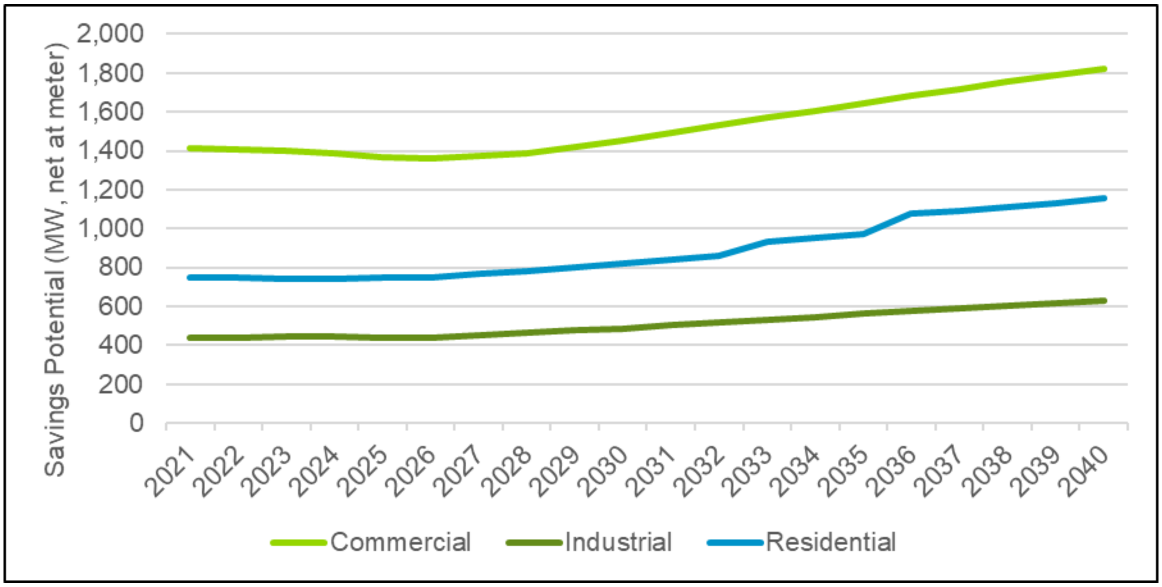
Figure 6-2. Upper Peninsula EWR Economic Potential, Electricity Savings by Sector, Reference Scenario (GWh, Net at Meter)



Source: Guidehouse analysis

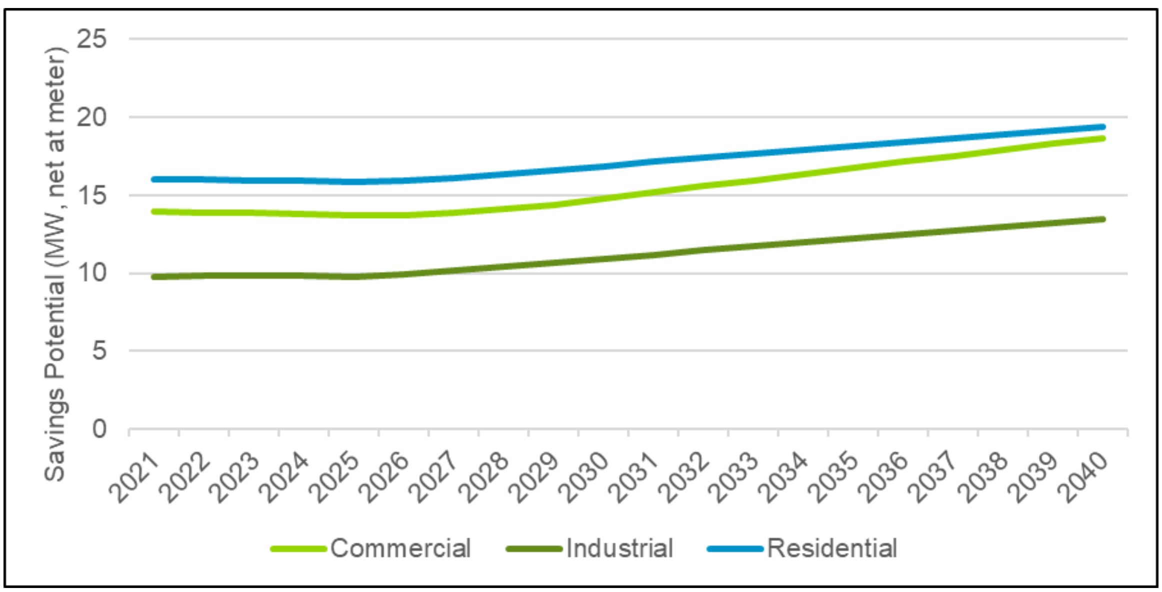
Figure 6-3 and Figure 6-4 show the economic summer peak demand potential, net at meter, in each of the sectors for the Reference Scenario. The Lower Peninsula (Figure 6-3) has the highest peak potential in the commercial sector, while the Upper Peninsula (Figure 6-4) has the most peak demand potential in the residential sector due to the makeup of the customers.

Figure 6-3. Lower Peninsula EWR Economic Potential, Summer Peak Demand Savings by Sector, Reference Scenario (MW, Net at Meter)



Source: Guidehouse analysis

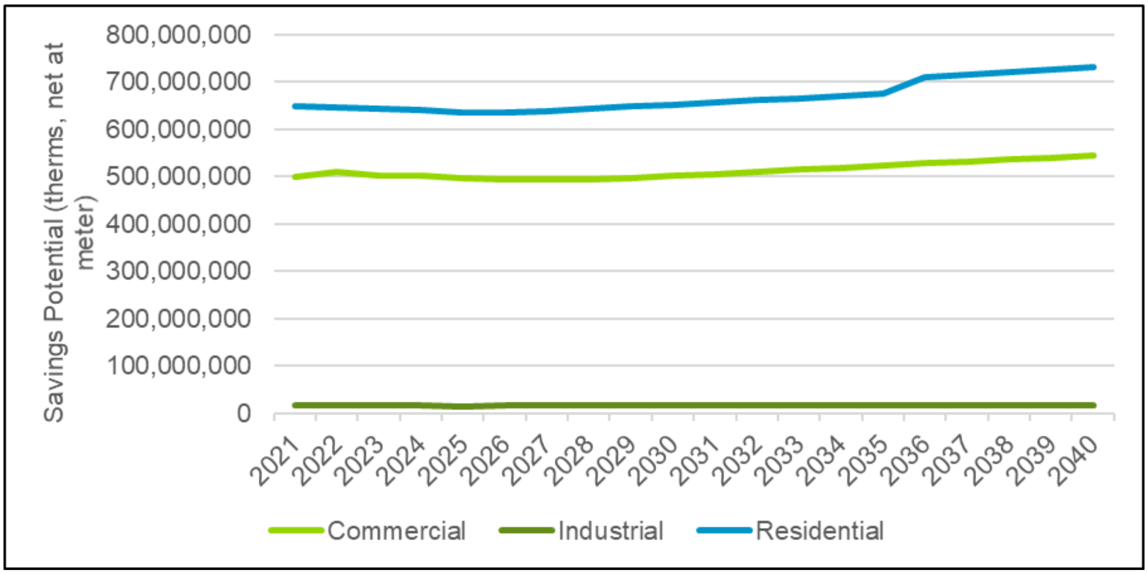
Figure 6-4. Upper Peninsula EWR Economic Potential, Summer Peak Demand Savings by Sector, Reference Scenario (MW, Net at Meter)



Source: Guidehouse analysis

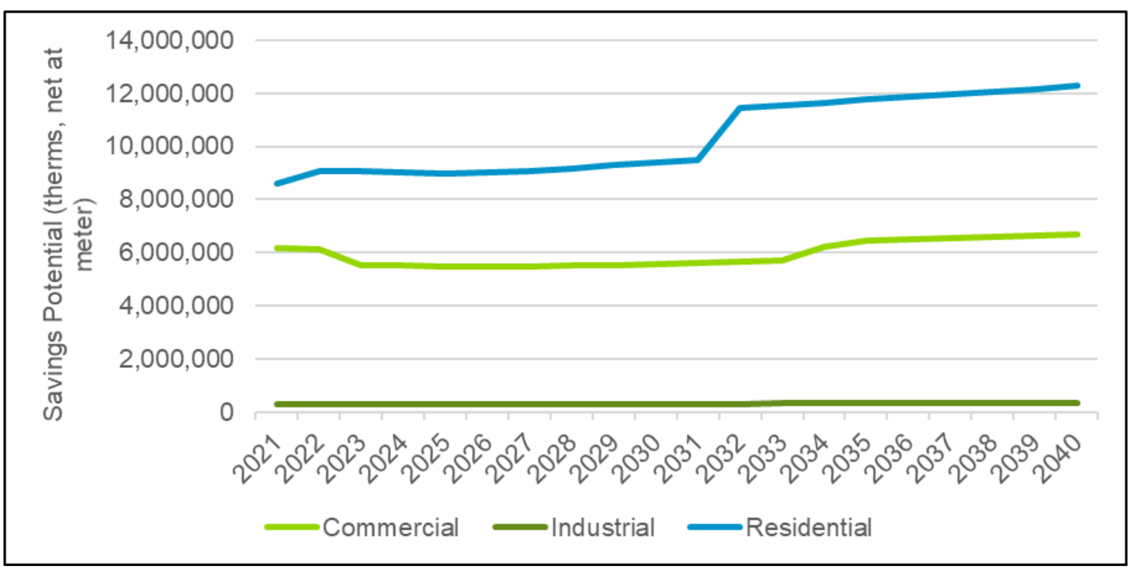
Figure 6-5 and Figure 6-6 show the economic net natural gas potential for the Reference Scenario. Avoided natural gas costs in the Upper Peninsula are lower than the Lower Peninsula. As Figure 6-5 shows, the Lower Peninsula has a residential water heating measure becoming cost-effective in 2026. Figure 6-6 shows the Upper Peninsula with residential thermostats coming into cost-effectiveness in 2032. By contrast, this thermostat measure is cost-effective the entire study period in the Lower Peninsula. Industrial natural gas technical potential is significantly smaller than commercial and residential sector potential due to the relatively small portion of industrial gas sales (~3%). See Appendix D for details on the savings potential for each sector.

Figure 6-5. Lower Peninsula EWR Economic Potential, Natural Gas Savings, Reference Scenario (therms, Net at Meter)



Source: Guidehouse analysis

Figure 6-6. Upper Peninsula EWR Economic Potential, Natural Gas Savings, Reference Scenario (therms, Net at Meter)



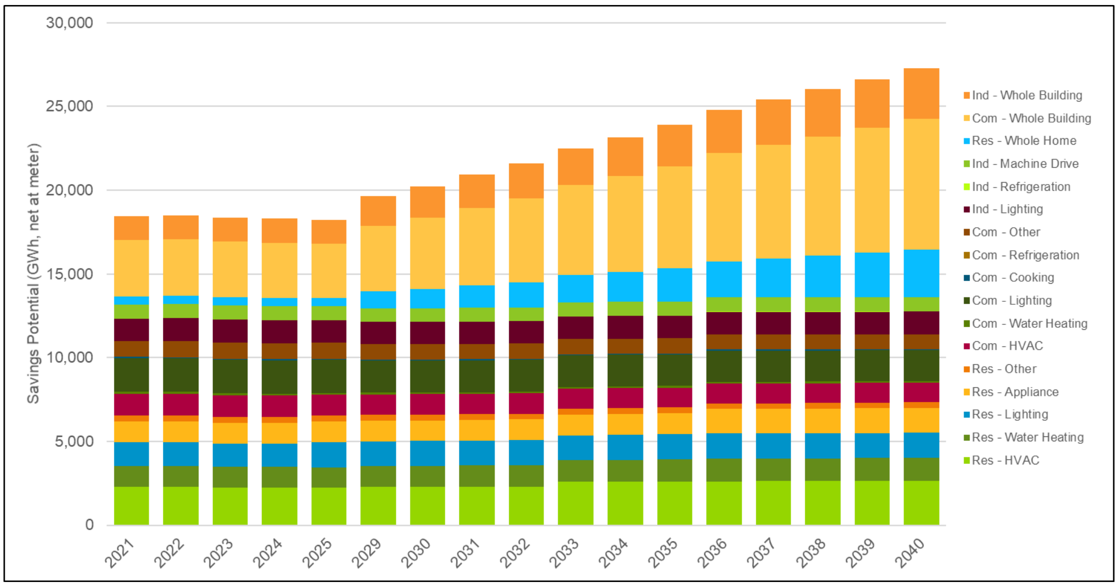
Source: Guidehouse analysis

6.3 Energy Waste Reduction Economic Potential Results by End Use

Figure 6-7 shows the economic electricity potential, net at meter, by end use for all sectors in the Lower Peninsula for the Reference Scenario. Overall, the breakdown of potential is similar to technical potential, except that commercial HVAC and residential appliances have a much lower share of economic potential than technical potential.

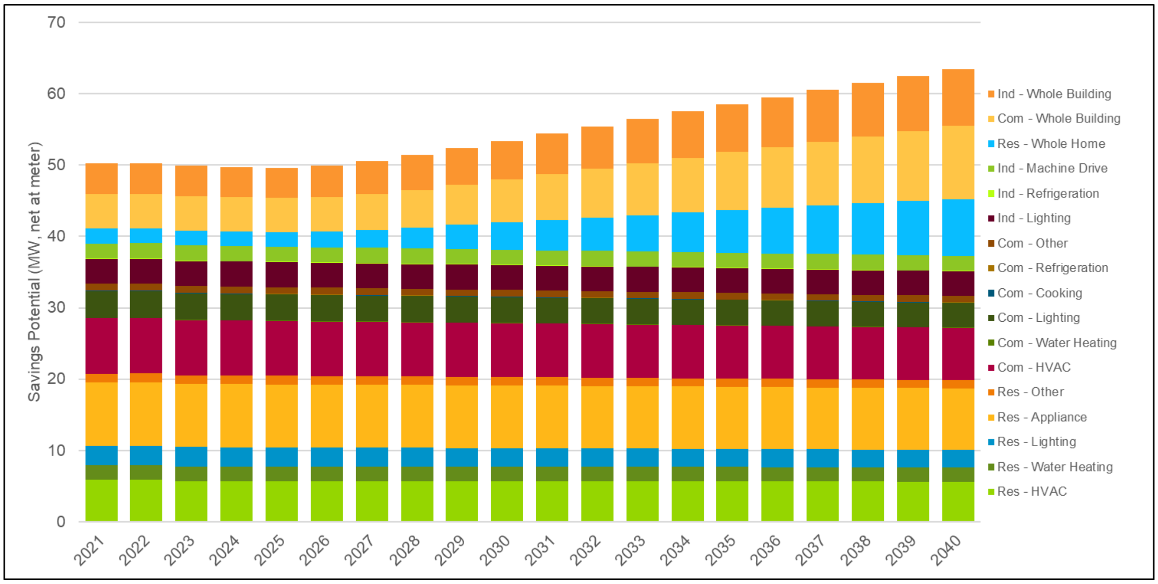
Figure 6-8 shows the economic electricity potential, net at meter, by end use for all sectors in the Upper Peninsula for the Reference Scenario. As with the Lower Peninsula, the breakdown of potential is similar to technical potential. The largest variances come from residential HVAC, commercial HVAC, and residential appliances, which all have lower shares of economic potential compared to technical potential.

Figure 6-7. Lower Peninsula EWR Economic Potential, Electricity Savings by End Use, Reference Scenario (GWh, Net at Meter)



Source: Guidehouse analysis

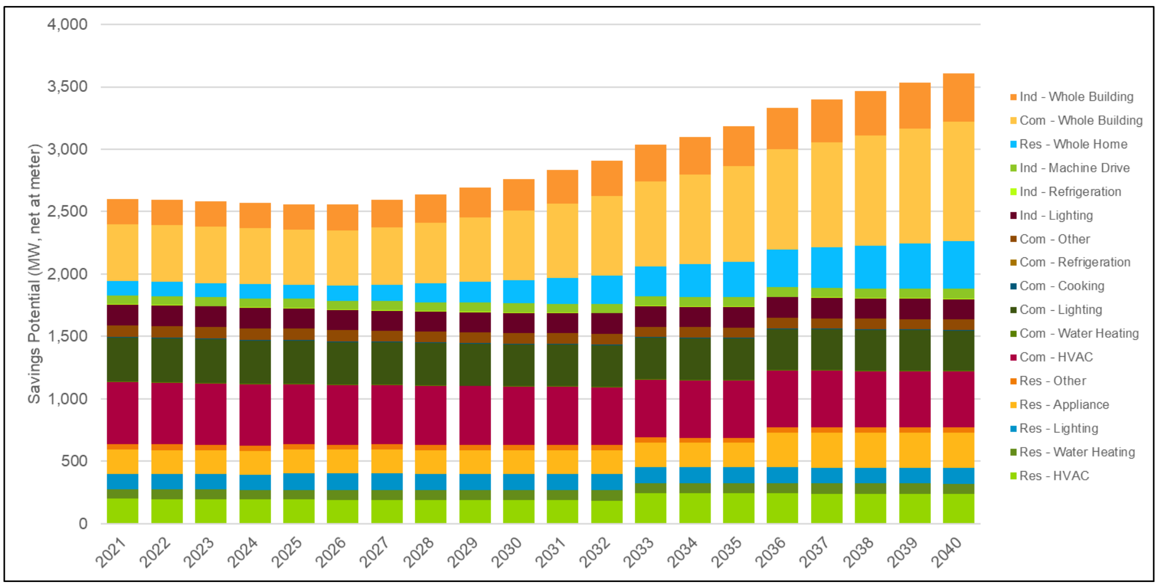
Figure 6-8. Upper Peninsula EWR Economic Potential, Electricity Savings by End Use, Reference Scenario (GWh, Net at Meter)



Source: Guidehouse analysis

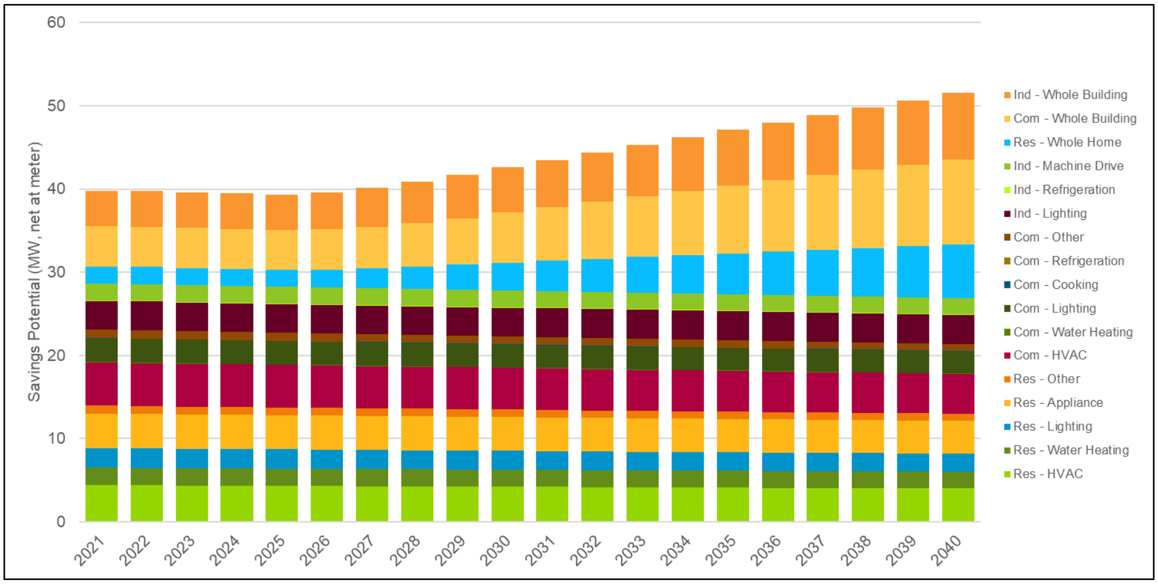
Figure 6-9 and Figure 6-10 show the summer peak demand savings for all sectors and end uses in the Lower Peninsula and Upper Peninsula, respectively, for the Reference Scenario. The demand savings trends compared to technical are the same as the electricity trends detailed previously.

Figure 6-9. Lower Peninsula EWR Economic Potential, Summer Peak Demand Savings by End Use, Reference Scenario (MW, Net at Meter)



Source: Guidehouse analysis

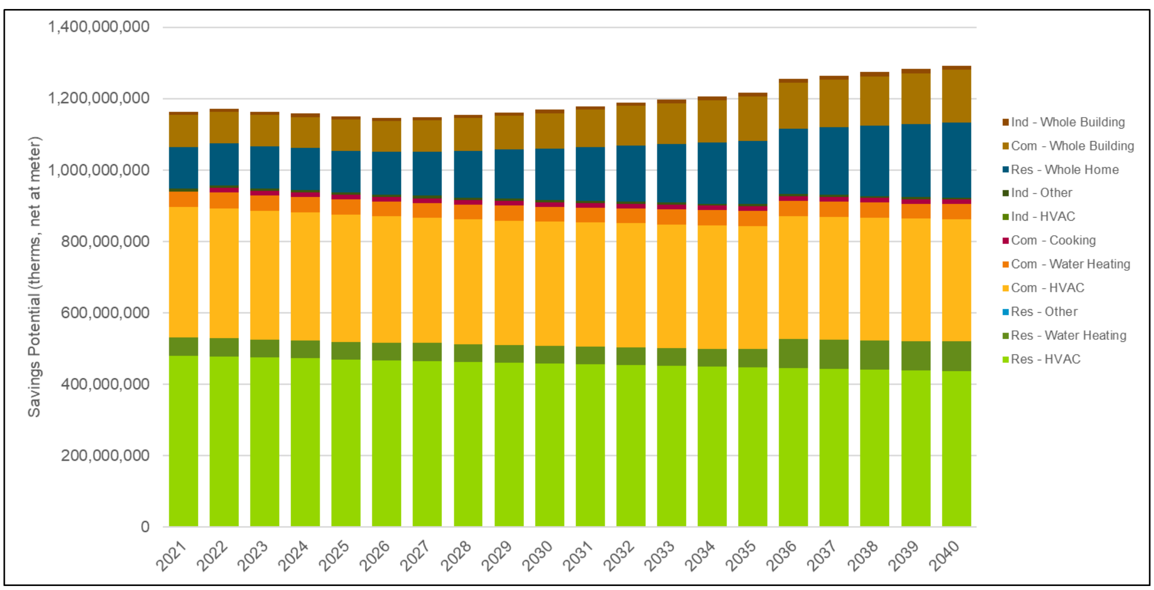
Figure 6-10. Upper Peninsula EWR Economic Potential, Summer Peak Demand Savings by End Use, Reference Scenario (MW, Net at Meter)



Source: Guidehouse analysis

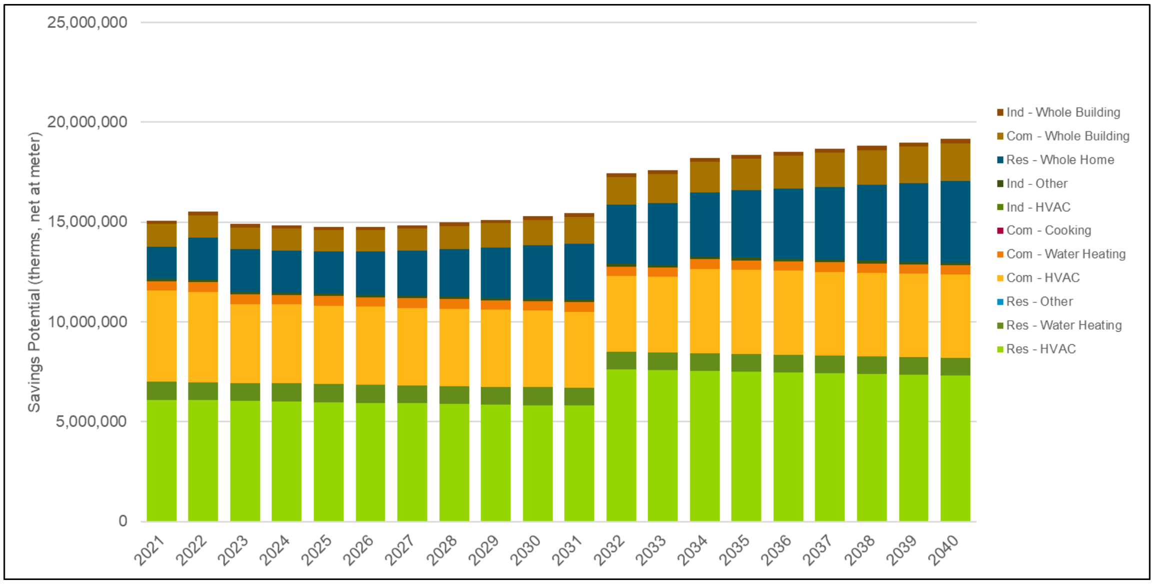
Figure 6-11 shows the economic natural gas potential by end use for all end uses and sectors in the Lower Peninsula for the Reference Scenario. Figure 6-12 shows the economic natural gas potential by end use for all end uses and sectors in the Upper Peninsula for the Reference Scenario. Similar to the natural gas technical potential, the residential sector, specifically HVAC, dominates the savings potential for natural gas in the Lower and Upper Peninsulas.

Figure 6-11. Lower Peninsula EWR Economic Potential, Natural Gas by End Use, Reference Scenario (therms, Net at Meter)



Source: Guidehouse analysis

Figure 6-12. Upper Peninsula EWR Economic Potential, Natural Gas by End Use, Reference Scenario (therms, Net at Meter)



Source: Guidehouse analysis

7. Energy Waste Reduction Achievable Market Potential Approaches

Achievable market potential further considers the likely rate of DSM resource acquisition given factors like the rate of equipment turnover (a function of a measure's lifetime), simulated incentive levels, consumer willingness to adopt efficient technologies, word-of-mouth effects that increase awareness in customers, and the likely rate at which marketing activities can facilitate technology adoption. The adoption of DSM measures can be broken down into the calculation of the equilibrium market share and the calculation of the dynamic approach to equilibrium market share, as discussed in more detail throughout this section.

Achievable potential differs from program potential in that achievable potential does not specifically consider the various delivery mechanisms that can be used by program managers to tailor their approach depending on the specific measure or market. Rather, achievable potential represents a high level assessment of savings that could be achieved over time, factoring in broader assumptions about customer acceptance and adoption rates that are not dependent on a specified program design. Additional effort is typically undertaken by program designers using the directional guidance from a market potential study to develop detailed plans for delivering EWR programs. Achievable potential in this report relies on a UCT measure screen for cost-effectiveness, with the threshold set at a UCT of 0.80 for the majority of measures, intended to reflect Michigan's regulatory practice of screening at the portfolio level. Some measures achieve a UCT ratio between the 0.8 and 1.0 achievable and economic thresholds and are included in achievable potential, but not the economic potential. The total potential attributed to these measures is minimal.

Table 7-1 summarizes the key methodology considerations and decision points informing the analysis in this report, with more detail provided in the report sections noted in the right-hand column of the table. Guidehouse decided on this methodology through discussions with MPSC, and in consideration of best practices and stakeholder feedback, about which approach best serves the objective of the study to understand achievable potential.

Table 7-1. EWR Achievable Potential Methodology Overview

Methodology Parameters	Approach
Benefit-cost test screen	Use the UCT as the primary screen for economic and achievable potential.
Diffusion parameters	Adjust diffusion parameters referencing ranges recommended by industry standard data sources to produce savings that are reasonably aligned with the utilities' DSM sector-level historical achievements.
Budget constraints	Do not apply budget constraints.
Incentive strategy	Set incentive levels at 40% of incremental costs for non-low income segments.
Treatment of administrative costs	Include program-level incentive to administrative cost ratios that scale administrative costs with calculated incentive budget.
NTG	Achievable potential estimates are developed using net savings based on historical program NTG inputs and TRM values.
Reparticipation	Assume 100% of measures reparticipate as an efficient measure at the end of their measure life.
Codes and standards	Use the same assumptions about codes and standards as in technical and economic potential.

7.1 Calculation of Equilibrium Market Share

The equilibrium market share can be thought of as the percentage of individuals choosing to purchase a technology provided those individuals are fully aware of the technology and its relative merits (e.g., the energy- and cost-saving features of the technology). For DSM measures, a key differentiating factor between the base technology and the efficient technology is the energy and cost savings associated with the efficient technology. That additional efficiency often comes at a premium in initial cost. This study calculates an equilibrium market share as a function of the payback time of the efficient technology relative to the baseline technology. In effect, measures with more favorable customer payback periods after incorporating incentives will have higher equilibrium market share, which reflects consumers' economically rational decision-making. While such approaches have limitations, these are directionally reasonable and simple enough to permit estimation of market share for the hundreds of technologies appearing in most potential studies.

To inform this study, Guidehouse fielded primary research to develop equilibrium payback acceptance curves. To develop these curves, we relied on surveys of 591 residential and 470 C&I customers. These surveys presented decision makers with two sets of questions to assess customer willingness to pay for EWR measures: one from a set of low cost measures (e.g., a light bulb, thermostat) and one from a set of high cost measures (e.g., insulation, boiler). Guidehouse fitted generalized logit models to customer willingness to pay survey results by technology cost bin and segment to develop the set of curves, which we used in this study. The resulting willingness to pay curves are used as starting points for achievable potential calibration described in Appendix C. The willingness to pay curves by territory, segment, and cost level used in the potential model are show in Appendix D.

Because the payback period of a technology can change over time (as technology or energy costs change over time), the equilibrium market share can also change over time. The equilibrium market share is recalculated for every year of the study period to ensure the dynamics of technology adoption take this effect into consideration. As such, equilibrium market share is a bit of an oversimplification and a misnomer, as it can itself change over time and is never truly in equilibrium, but it is used nonetheless to facilitate understanding of the approach.

7.2 Calculation of the Approach to Equilibrium Market Share

Two approaches are used for calculating the approach to equilibrium market share: one for technologies being modeled as retrofit (RET) measures, and one for technologies simulated as replace-on-burnout (ROB) or new construction (NEW) measures.[24] *Michigan 2021-2040 Potential Study Modeling Methodology* (see Appendix C) discusses the approach to equilibrium market share in more detail.

7.3 Behavioral Measures

Behavior measures typically impose little-to-no direct costs to the participant,[25] and their rate of adoption is highly dependent on the marketing and incentive efforts taken by program administrators. Given these unique characteristics of behavior measures, the payback acceptance curves and technology diffusion models have limited applicability to these types of measures. As such, this study models the adoption of behavior measures in terms of an equilibrium saturation level relative to economic potential and a given amount of time to reach that equilibrium state. Behavioral measure equilibrium saturation levels were derived from Guidehouse's discussions with the MPSC and calibrated to about 20%-25% of residential sector electricity and natural gas achievable potential.

7.4 Energy Waste Reduction Investment Strategy

Achievable potential is viewed without imposing any explicit budget constraints on the simulated results. The implication of this decision is that achievable potential is only constrained by stock turnover, customer willingness to adopt efficient measures, and calibration to historical savings levels. Without future budget constraints, the program administrator spending falls out naturally from the input assumptions for per-unit incentives and program administrative cost, without tying spending to a given budget level. In this study, the per-unit incentive and administrative spending levels are fixed at the same levels (in real dollars, compared with nominal dollars) over the study horizon. Therefore, changes in spending (in real dollars) only reflect a changing mix and magnitude of savings among measures.

7.5 Energy Waste Reduction Incentive Strategy

Per MPSC guidance, this study sets measure incentives at 40% of incremental cost for non-low income customer segments for the Reference Scenario. Incentive levels are varied for the Aggressive Scenario, as described in Section 8.1.

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[24] Each of these approaches can be better understood by visiting Guidehouse's technology diffusion simulator, available at: http://forio.com/simulate/navigantsimulations/technology-diffusion-simulation.

[25] Participants may incur indirect costs through implementation of adjustments to typical operations in response to energy information feedback (e.g., through upgrading a water heater). However, estimating these indirect costs requires additional data on the actions taken by the participant beyond participating in the behavioral program and is beyond the scope of this analysis.

7.6 Reparticipation

The model assumes that 100% of program participants re-adopt energy efficient measures after the end of the efficient measure's expected useful lifetimes. This implies that efficient measures generally do not revert to a minimum code or lower efficiency level. As such, the model's cost accounting incurs an incentive cost on the initial conversion of a minimum code or lower efficiency measure to an efficient measure, but it does not incur incentive costs when replacing incumbent equipment that was already updated to efficient equipment during the study horizon. Incremental savings are counted only for new program participants, and these savings are summed up year-over-year to represent cumulative potential.

Behavior measures, such as home energy reports, are an exception to this approach. When a behavior measure is re-adopted at the end of its expected useful lifetime, the incentives provided for those measures are added to total program administrator spending. The rationale is that similar savings opportunities provided by behavior measures are only available with ongoing support or administration from the program administrator. Because ongoing program administrator support is required to achieve behavior measure savings, the incentives provided to repeat adopters are incurred multiple times throughout the study horizon.

7.7 Energy Waste Reduction Model Calibration

Any model simulating future product adoption faces challenges with calibration because there is no future world against which one can compare simulated results to actual results. Engineering models can often be calibrated to a higher degree of accuracy because simulated performance can be compared directly with performance of actual hardware. DSM potential models do not have this luxury. Guidehouse had to rely on other techniques to provide recipient of the model results with a level of comfort that simulated results are reasonable. For this study, we took several steps to ensure that model results were reasonable, including:

- Identifying the subset of potential measures that were included in historical Michigan utilities' program offerings to have a basis for comparison with historical program achievements.
- Ensuring sector-level savings magnitudes in the early years align reasonably with current utility annual achievements and plans. Sector calibration targets were developed through consultation with the MPSC and stakeholder feedback to set an estimated percentage of sales reduction in 2021.
- Ensuring similar trends and magnitudes between the utilities' historical sector- and end use-level savings and simulated sector- and end use-level savings from the measure subset in the model's base year. 2019 historical achievements were used in the calibration refinement process because these results represent the most recent available data at this level of granularity. Separate estimates were developed for the Lower Peninsula and Upper Peninsula.
- Studying draft results with stakeholders to identify trends, high impact measure mixes, and savings trajectories for review at a more granular level than the sector and end-use calibration. This review resulted in significant assumption updates to high impact measures including residential screw-based lighting and C&I custom.

Before making comparisons of model results to historical achievements, it was first necessary to identify the potential measures included in the utilities' historical program offerings. The simulated savings from this subset of potential measures became the basis for comparing modeled savings to historical savings during the calibration process. Although the team calibrated to historical results for this subset of measures, the model's results for total achievable potential may differ from the utilities' historically achieved program savings. This situation is due to the iterative process for achievable potential review and addition of new measures and competition groups to the portfolio. The subset measure calibration step is an important starting point for calibration; this step is built to account for the differences in measure mix between the potential study and historical DSM programs. Guidehouse and the MPSC designed a detailed measure list of the top 110 measures, which account for the vast majority of cost-effective savings. To account for the other measures, Guidehouse created measure buckets by sector and end use based on our other previously completed studies as described in Section 4.1.

To align as close as possible with the utilities' historical savings, we adjusted technology diffusion coefficients and payback acceptance curves. Calibration required an iterative process of modifying the aforementioned parameters until all goals of calibration were reasonably satisfied. For example, the marketing effectiveness parameters are the key lever for calibrating the magnitude of historical savings for each sector and end-use combination, the word-of-mouth parameter strongly influences the rate of adoption and savings growth over time, and the measure-level payback acceptance curves allow for detailed calibration of high impact measures with significant historical data to support granular review. Guidehouse varied these diffusion parameters within commonly observed ranges until simulated savings were trending reasonably compared with historical sector-level savings.

To summarize, the calibration process ensures that the potential analysis is grounded against real-world data considering the many factors that determine likely adoption of DSM measures, including economic and non-economic factors.

8. Energy Waste Reduction Scenario Configuration Approach

The Reference Scenario was developed through the calibration process, as detailed in Section 7.7. Two alternative scenarios—the Aggressive Scenario and the Carbon Price Scenario—were developed through adjustments to incentive levels, administrative burdens, marketing effects, and avoided costs.

8.1 Scenario Configuration

Guidehouse developed two alternative achievable scenarios and seven sensitivity cases relative to the Reference Scenario.

Differences between the Reference Scenario and the two alternative scenarios are as follows. All other scenario assumptions are held constant.

- **Aggressive Scenario**
    - Analyzed measure incentive levels to determine the 1.0 UCT tipping point. Developed measure-level incentive estimates based on these results and tweaked where necessary to ensure program-level cost-effectiveness.
        - This adjustment models a more optimized incentive strategy that results in higher spending and reduced alignment with detailed calibration, while maintaining a cost-effective program UCT.
    - Increased marketing factors above calibrated values for specific end use and sector combinations.
        - This adjustment estimates an increase in marketing effectiveness and implementation of program design enhancements, while not increasing the relative administrative cost burden of programs.
- **Carbon Price Scenario**
    - Increased electricity ($/MWh) and natural gas ($/therm) avoided costs by 50% in 2021, escalating with a 2.5% multiplier growth until a 100% increase was met.
        - This adjustment acknowledges regulatory uncertainty around carbon price legislation with a high level adder, ramping up through time as probability of regulatory action increases.

9. Energy Waste Reduction Achievable Potential Results

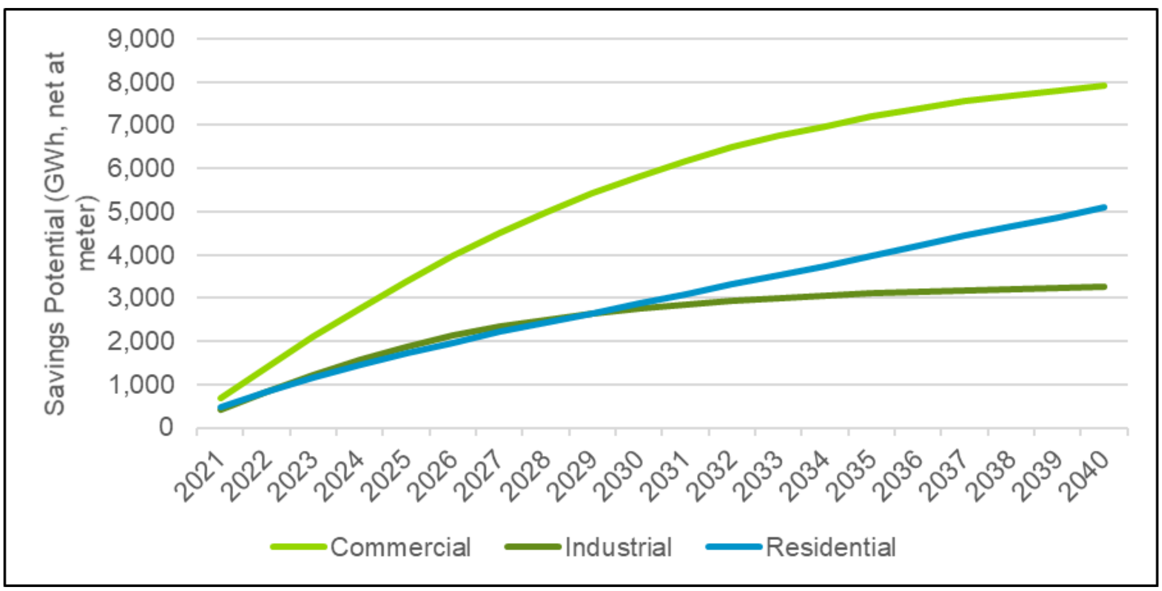
This section provides the achievable potential results calculated by the model at varying levels of aggregation, using the UCT benefit-cost test as a screen set to 0.80 for most measures, with the exception of the end use bucket measures and unidentified future technologies which bypass the UCT requirement, but are calibrated to account for technologies that may not produce economic savings. The UCT threshold of 0.80 is used to reflect Michigan's regulatory requirement to achieve at least a 1.0 benefit-cost ratio at the portfolio level. As a result, some measures achieve a UCT ratio between 0.8 and 1.0 (which is used as the minimum threshold for economic potential) and are included in the achievable potential but are not included in the economic potential. The total potential attributed to these measures is small. At the meter net savings results are shown by sector, end-use category, and by highest impact measures. For more detail and levels of aggregation of achievable potential, including summaries for the Aggressive and Carbon Price Scenarios, see Appendix D.

9.1 Reference Scenario Energy Waste Reduction Achievable Potential Results by Sector

Figure 9-1 shows the cumulative annual electricity achievable savings potential, net at meter, for all sectors in the Lower Peninsula for the Reference Scenario. The commercial sector makes up the largest portion of achievable savings of all the sectors, though it begins to flatten by the end of the study period. The residential potential remains steady throughout, while industrial savings flattens relatively quickly.

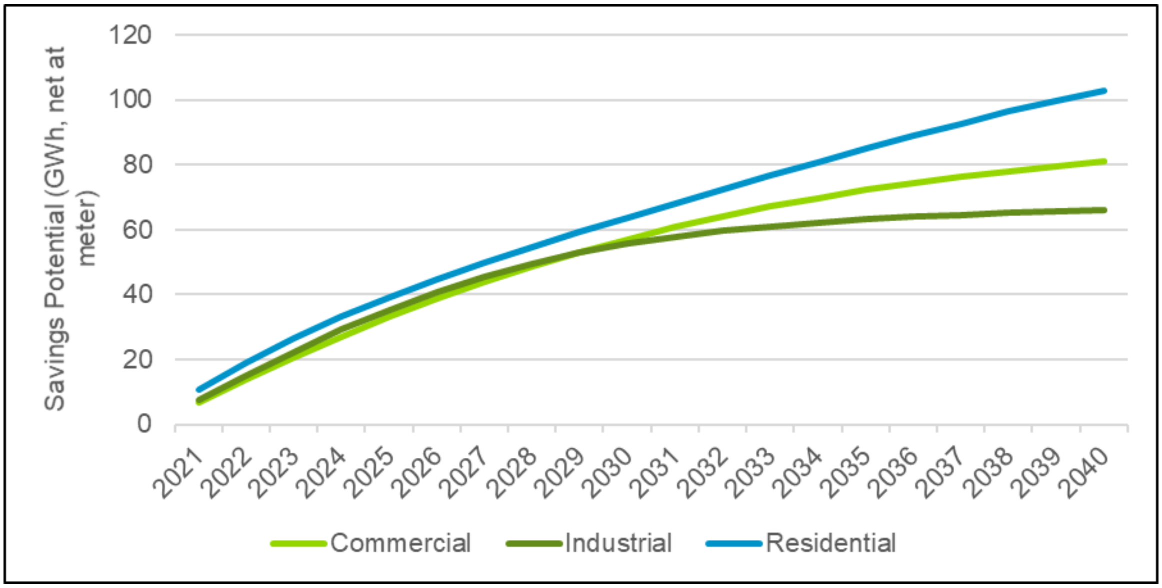
Figure 9-2 shows the cumulative annual electricity achievable savings potential, net at meter, for all sectors in the Upper Peninsula for the Reference Scenario. Due to the different make up of customer stocks in the Upper Peninsula, the residential sector makes up the largest percentage of the Upper Peninsula potential.

Figure 9-1. Lower Peninsula EWR Cumulative Achievable Potential, Incremental Annual Electricity Savings by Sector, Reference Scenario (GWh, Net at Meter)



Source: Guidehouse analysis

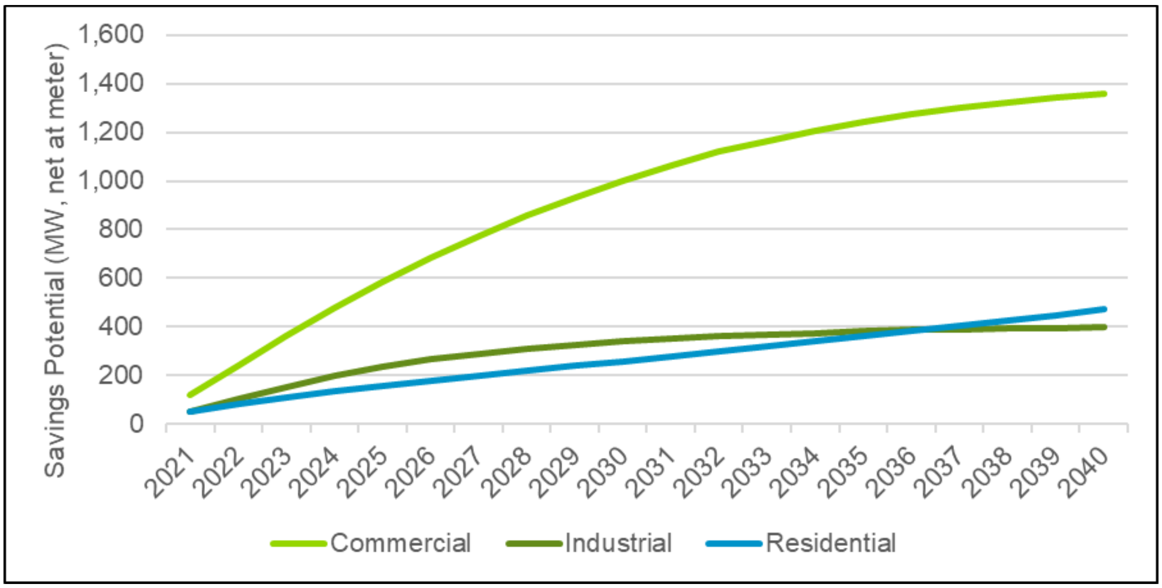
Figure 9-2. Upper Peninsula EWR Cumulative Achievable Potential, Incremental Annual Electricity Savings by Sector, Reference Scenario (GWh, Net at Meter)



Source: Guidehouse analysis

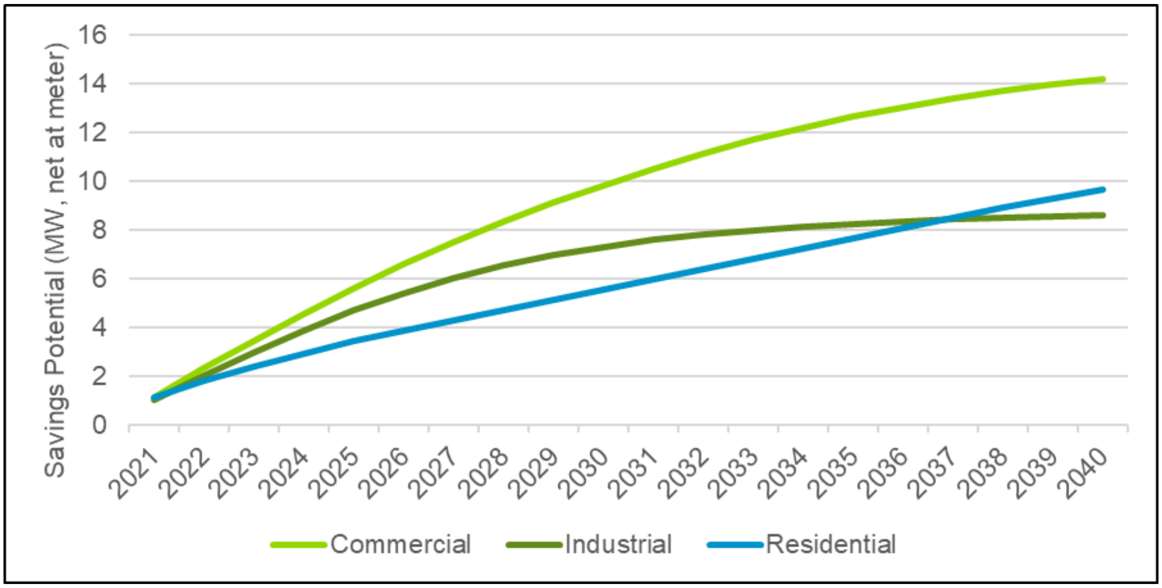
Figure 9-3 shows the cumulative summer peak demand achievable potential, net at meter, by scenario for all sectors in the Lower Peninsula for the Reference Scenario. Figure 9-4 shows the cumulative summer peak demand achievable potential, net at meter, by scenario for all sectors in the Upper Peninsula for the Reference Scenario. For peak demand, in both the Lower and Upper Peninsulas, commercial makes up the largest percentage of savings due to commercial's high coincidence with system peaks.

Figure 9-3. Lower Peninsula EWR Cumulative Achievable Potential, Incremental Annual Summer Peak Demand Savings by Sector, Reference Scenario (MW, Net at Meter)



Source: Guidehouse analysis

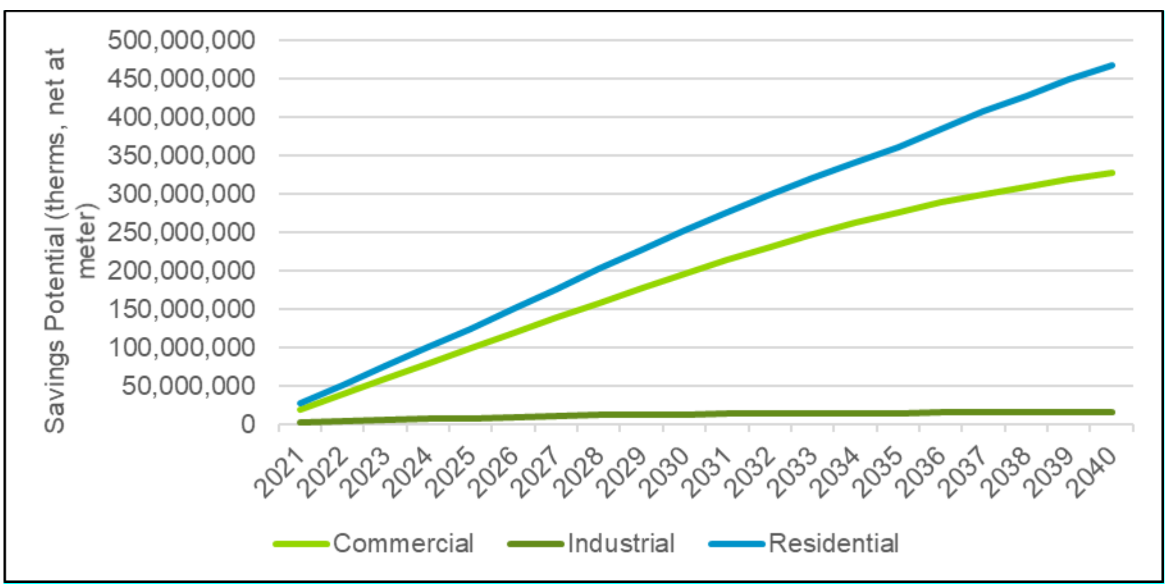
Figure 9-4. Upper Peninsula EWR Cumulative Achievable Potential, Incremental Annual Summer Peak Demand Savings by Sector, Reference Scenario (MW, Net at Meter)



Source: Guidehouse analysis

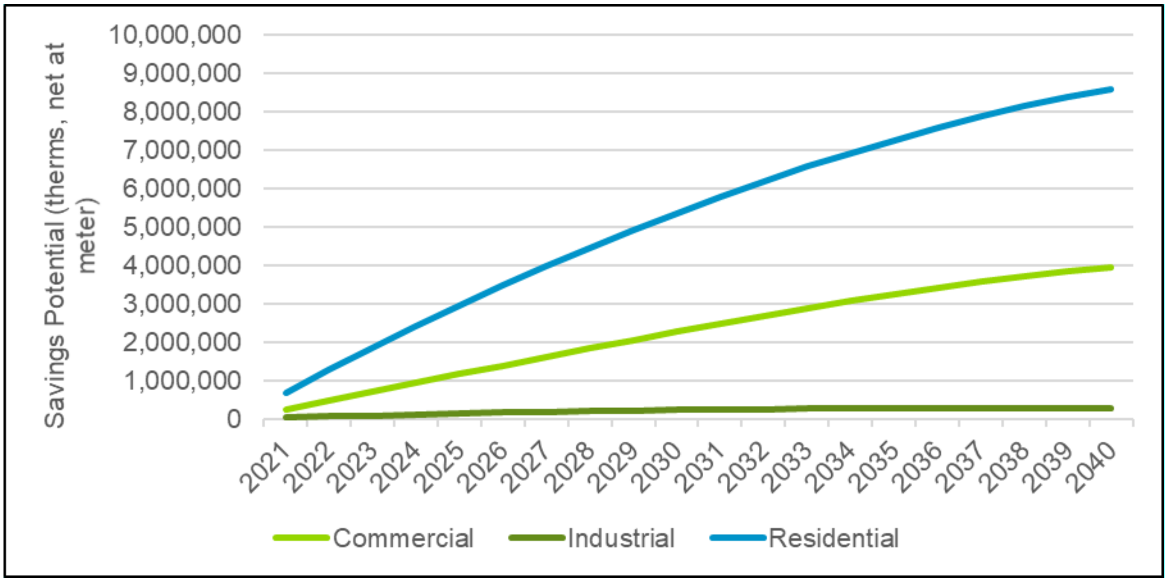
Figure 9-5 shows the reference case cumulative natural gas achievable potential, net at meter, by scenario for all sectors in the Lower Peninsula for the Reference Scenario. Figure 9-6 shows the cumulative natural gas achievable potential, net at meter, by scenario for all sectors in the Lower Peninsula for the Reference Scenario. Residential gas energy savings makes up the highest percentage of savings for both peninsulas due to the high saturation of natural gas in residential homes.

Figure 9-5. Lower Peninsula EWR Cumulative Achievable Potential, Incremental Annual Natural Gas Savings by Sector, Reference Scenario (therms, Net at Meter)



Source: Guidehouse analysis

Figure 9-6. Upper Peninsula EWR Cumulative Achievable Potential, Incremental Annual Natural Gas Demand Savings by Sector, Reference Scenario (therms, Net at Meter)

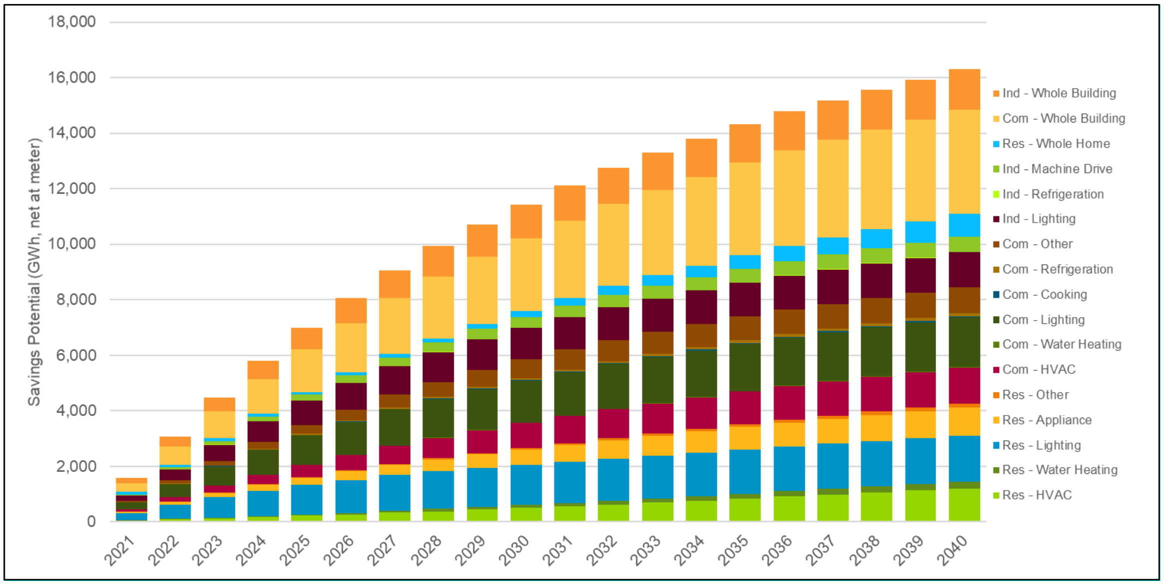


Source: Guidehouse analysis

9.2 Reference Scenario Energy Waste Reduction Achievable Potential Results by End Use

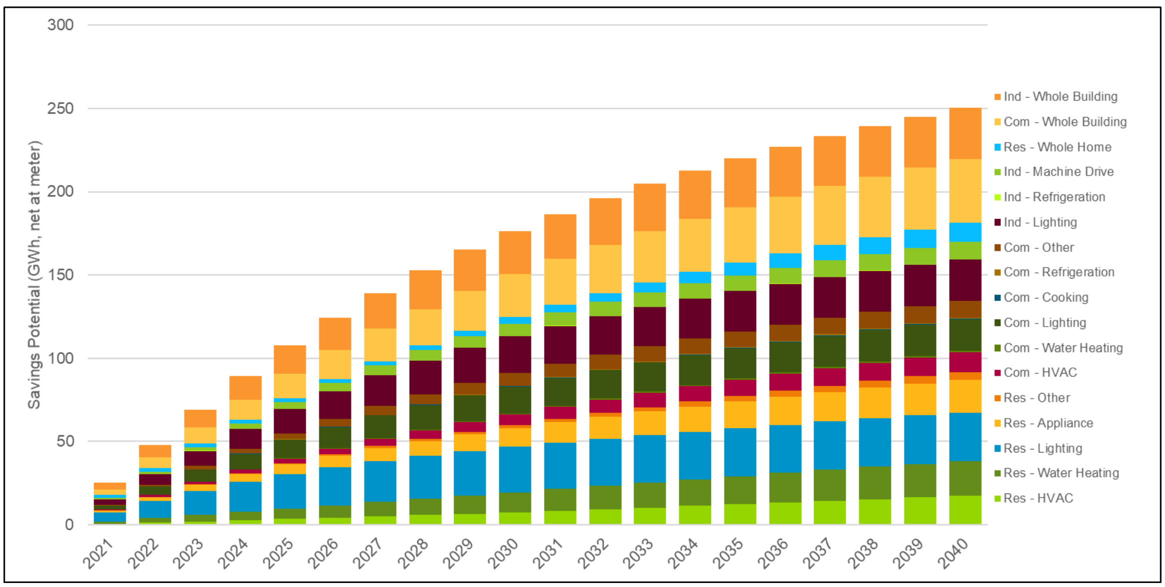
Figure 9-7 shows the incremental annual electricity achievable potential, net at meter, across end uses in the Lower Peninsula for the Reference Scenario. Figure 9-8 shows the incremental annual electricity achievable potential, net at meter, across end uses in the Upper Peninsula for the Reference Scenario. In the Lower and Upper Peninsulas, lighting and custom (within the whole building end uses) dominate the early years' potential. However, by the later years, lighting remains relatively flat, indicating it has saturated out and other end uses, such as HVAC and whole building/home, become much larger portions of the overall savings potential.

Figure 9-7. Lower Peninsula EWR Cumulative Achievable Potential, Incremental Annual Electricity Savings by End Use, Reference Scenario (GWh, Net at Meter)



Source: Guidehouse analysis

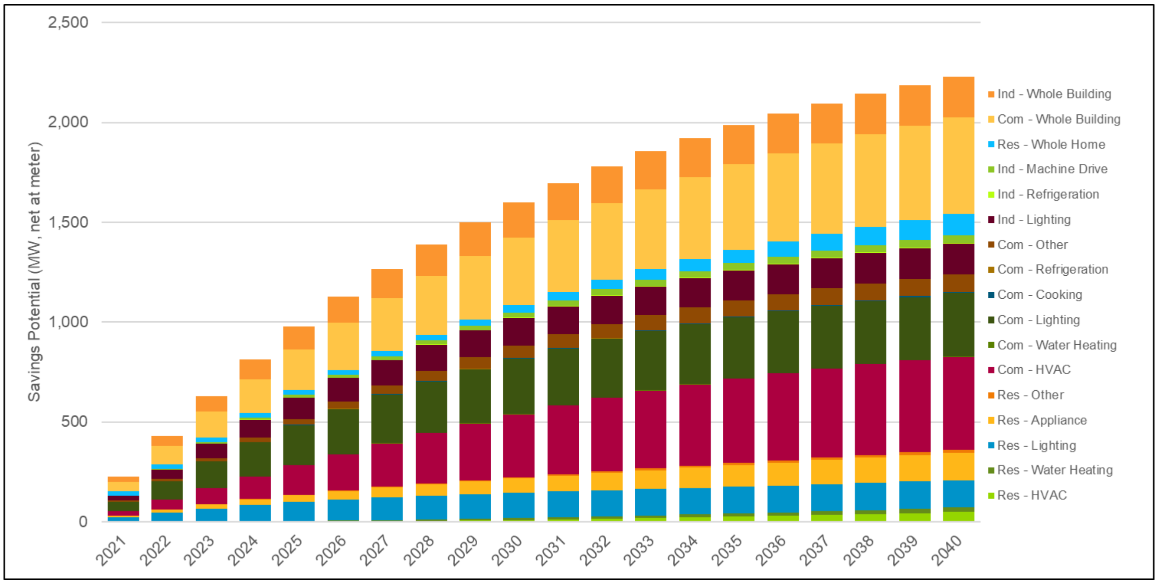
Figure 9-8. Upper Peninsula EWR Cumulative Achievable Potential, Incremental Annual Electricity Savings by End Use, Reference Scenario (GWh, Net at Meter)



Source: Guidehouse analysis

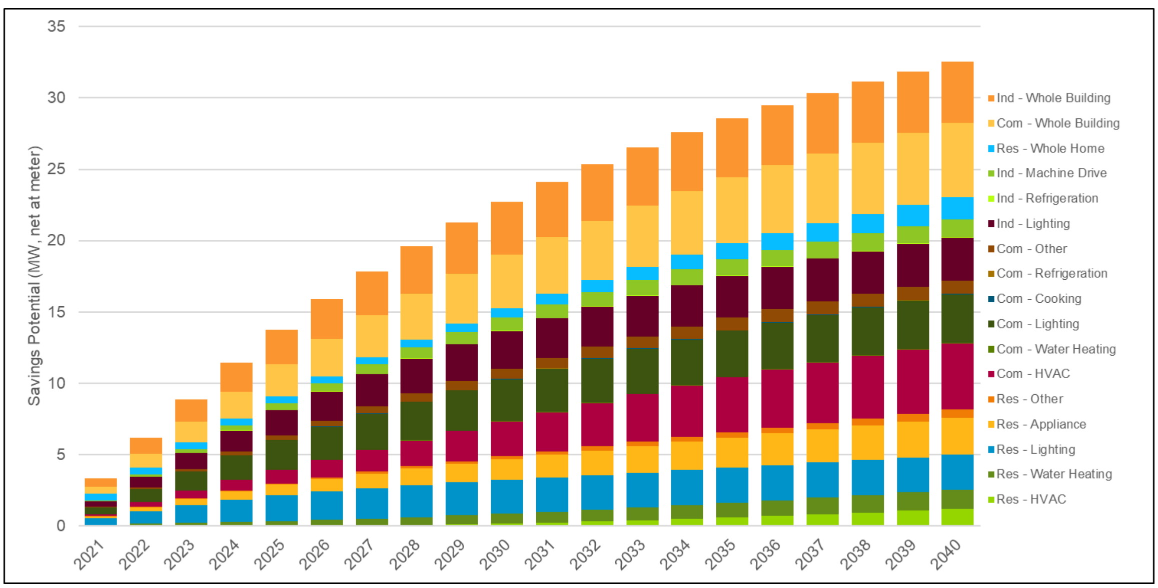
Figure 9-9 shows the cumulative summer peak demand achievable potential, net at meter, across end uses in the Lower Peninsula for the Reference Scenario. Figure 9-10 shows the cumulative summer peak demand achievable potential, net at meter, across end uses in the Upper Peninsula for the Reference Scenario. In both figures, the dominant end uses are commercial HVAC, commercial lighting, and commercial whole building, all of which have a high peak coincidence.

Figure 9-9. Lower Peninsula EWR Cumulative Achievable Potential, Incremental Annual Summer Peak Demand Savings by End Use, Reference Scenario (MW, Net at Meter)



Source: Guidehouse analysis

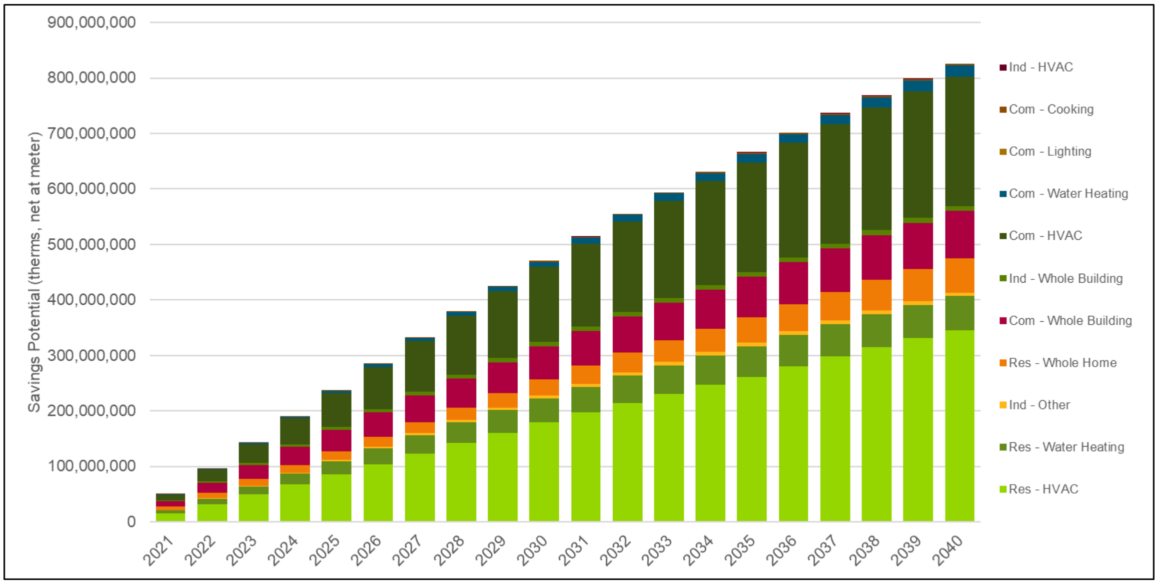
Figure 9-10. Upper Peninsula EWR Cumulative Achievable Potential, Incremental Annual Summer Peak Demand Savings by End Use, Reference Scenario (MW, Net at Meter)



Source: Guidehouse analysis

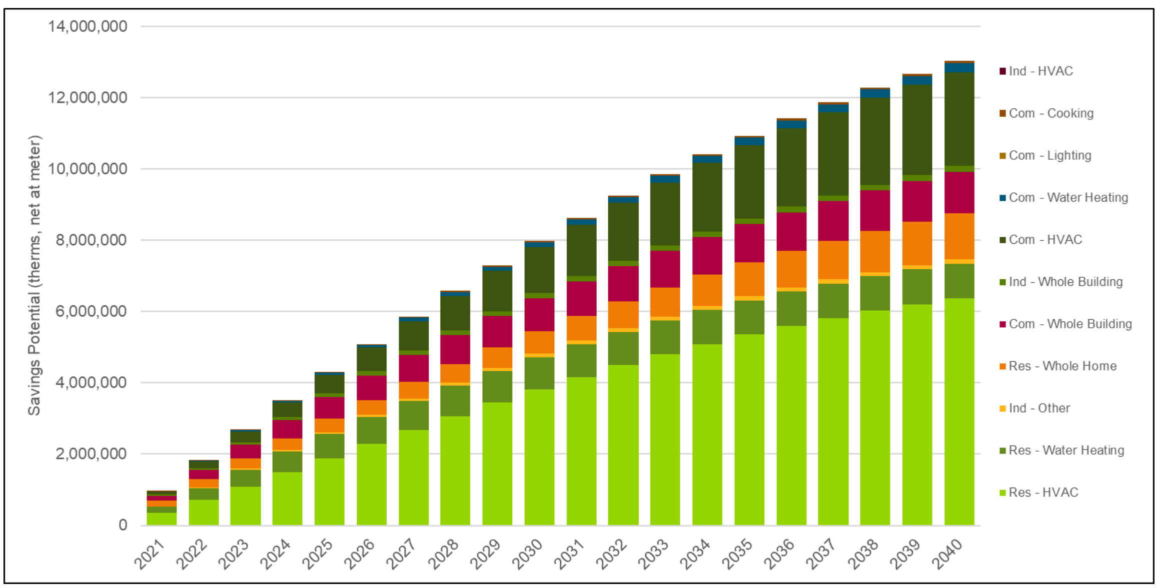
Figure 9-11 shows the incremental natural gas net achievable potential across end uses in the Lower Peninsula for the Reference Scenario. Figure 9-12 shows the incremental natural gas net achievable potential across end uses in the Upper Peninsula for the Reference Scenario. The dominant end uses are residential HVAC, commercial HVAC, and commercial whole building.

Figure 9-11. Lower Peninsula EWR Cumulative Achievable Potential, Incremental Annual Natural Gas Savings by End Use, Reference Scenario (therms, Net at Meter)



Source: Guidehouse analysis

Figure 9-12. Upper Peninsula EWR Cumulative Achievable Potential, Incremental Annual Natural Gas Savings by End Use, Reference Scenario (therms, Net at Meter)

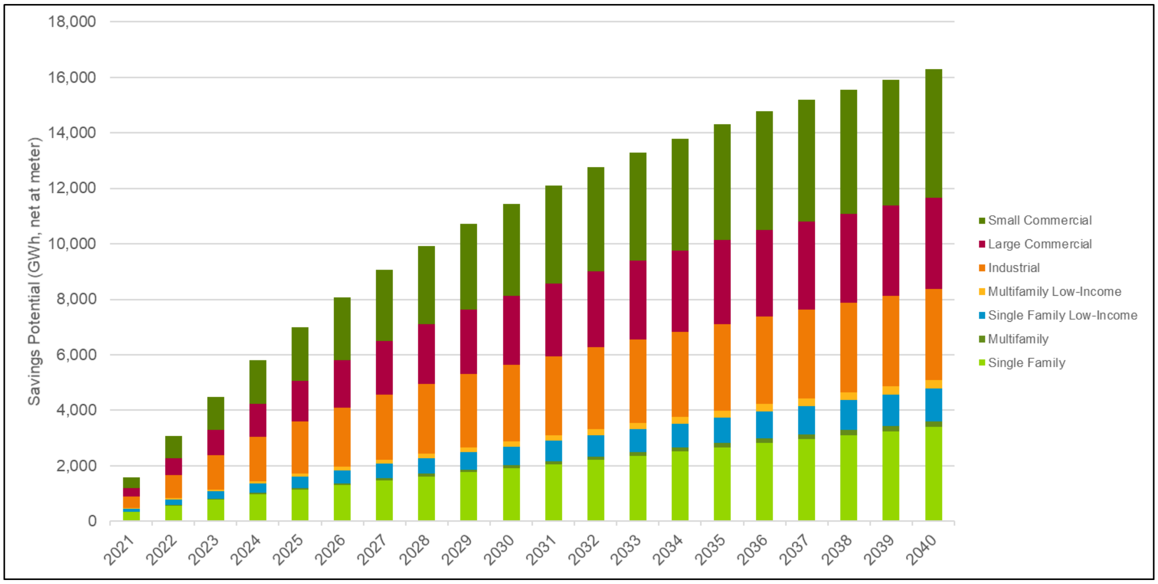


Source: Guidehouse analysis

9.3 Reference Scenario Energy Waste Reduction Potential Results by Customer Segment

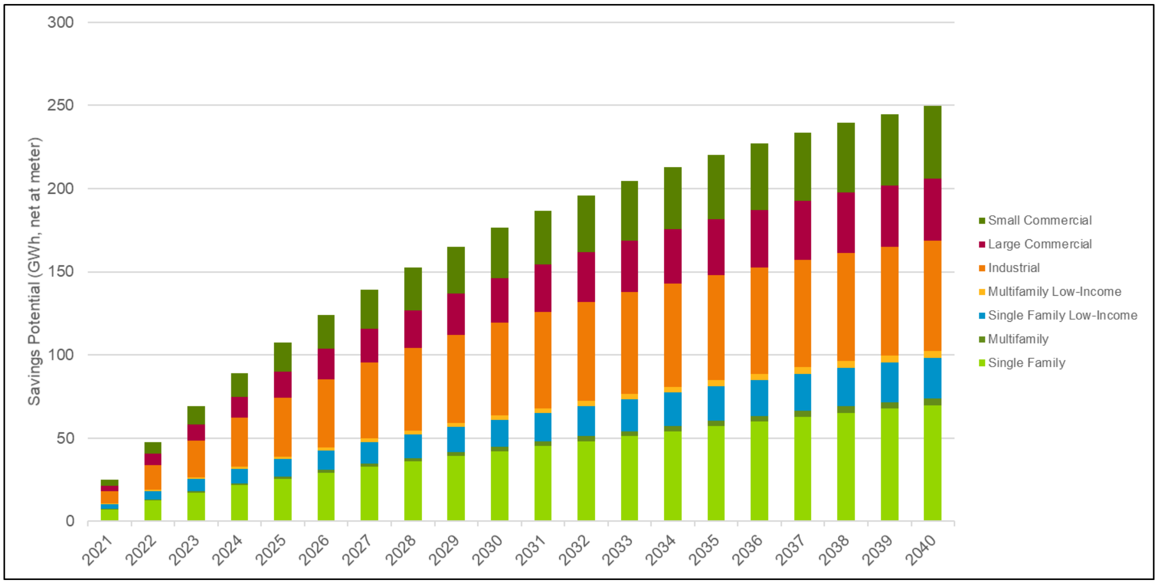
Figure 9-13 shows the cumulative electricity achievable potential, net at meter, across customer segments in the Lower Peninsula for the Reference Scenario. Figure 9-14 shows the cumulative electricity achievable potential, net at meter, across customer segments in the Upper Peninsula for the Reference Scenario. Small commercial represents the highest savings potential segment in the Lower Peninsula, while industrial represents the highest savings potential segment in the Upper Peninsula. In both peninsulas, multifamily and multifamily – low income represents the lowest portion of savings. Additional detail and tabular data for customer segment-level results are provided in Appendix D.

Figure 9-13. Lower Peninsula EWR Cumulative Achievable Potential, Incremental Annual Electricity Savings by Customer Segment, Reference Scenario (GWh, Net at Meter)



Source: Guidehouse analysis

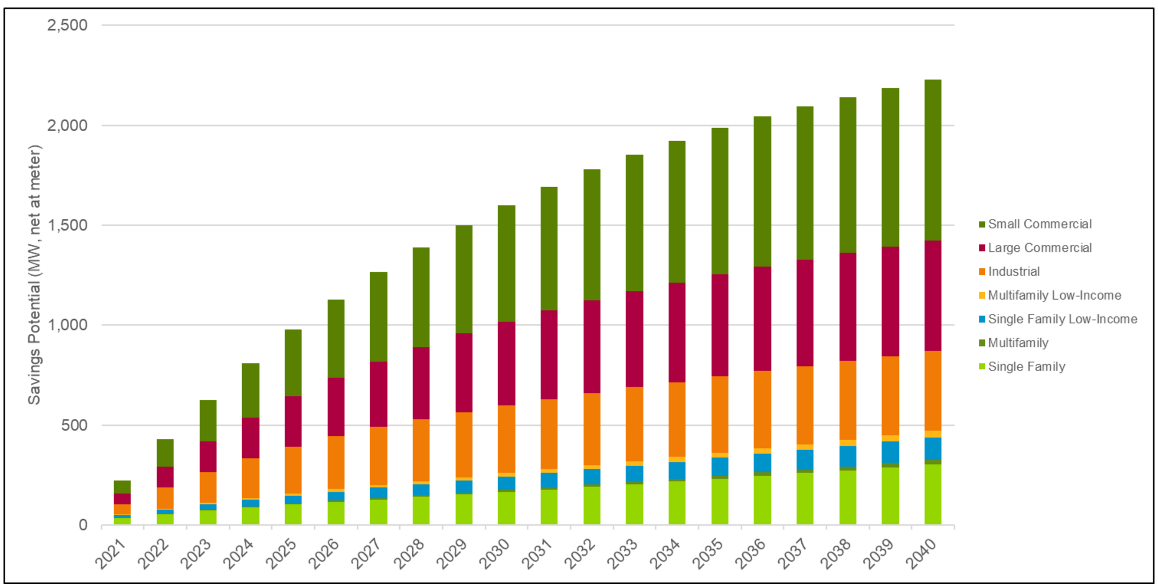
Figure 9-14. Upper Peninsula EWR Cumulative Achievable Potential, Incremental Annual Electricity Savings by Customer Segment, Reference Scenario (GWh, Net at Meter)



Source: Guidehouse analysis

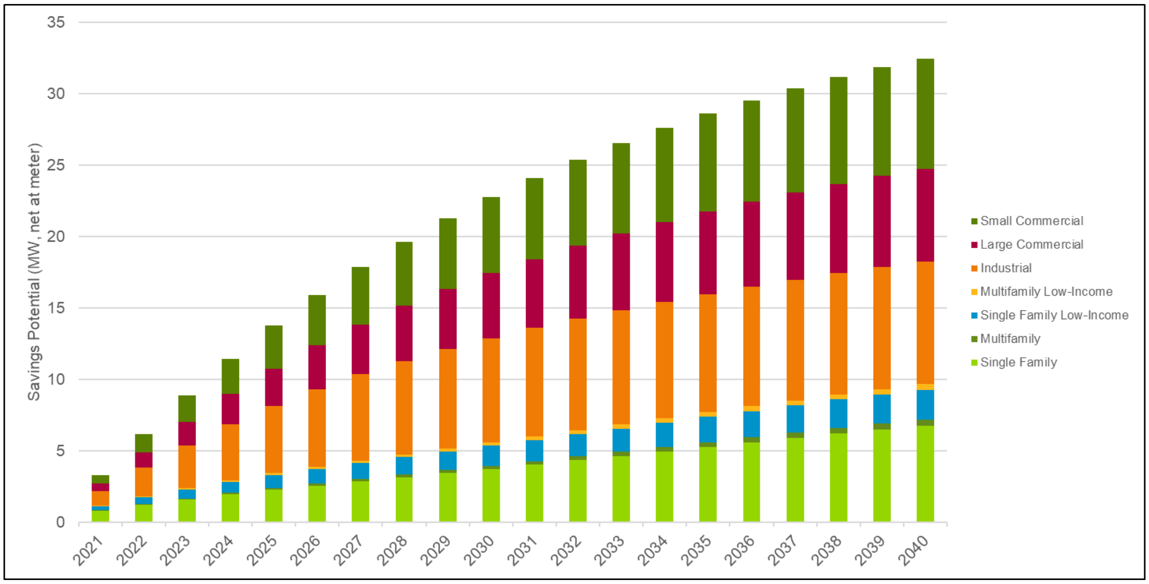
Figure 9-15 shows the cumulative summer peak demand achievable savings potential, net at meter, across customer segments in the Lower Peninsula for the Reference Scenario. Figure 9-16 shows the cumulative summer peak demand achievable savings potential, net at meter, across customer segments in the Upper Peninsula for the Reference Scenario. The segment-level patterns are generally the same for electricity savings for both peninsulas. Additional detail and tabular data for customer segment-level results are provided in Appendix D.

Figure 9-15. Lower Peninsula EWR Cumulative Achievable Potential, Incremental Annual Summer Peak Demand Savings by Customer Segment, Reference Scenario (MW, Net at Meter)



Source: Guidehouse analysis

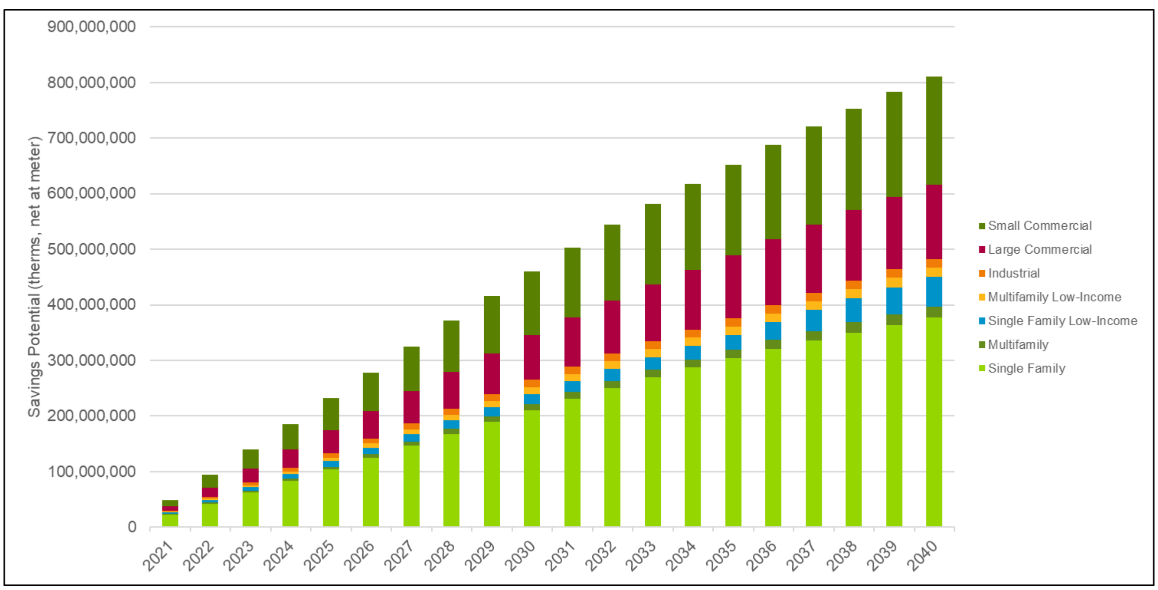
Figure 9-16. Upper Peninsula EWR Cumulative Achievable Potential, Incremental Annual Summer Peak Demand Savings by Customer Segment, Reference Scenario (MW, Net at Meter)



Source: Guidehouse analysis

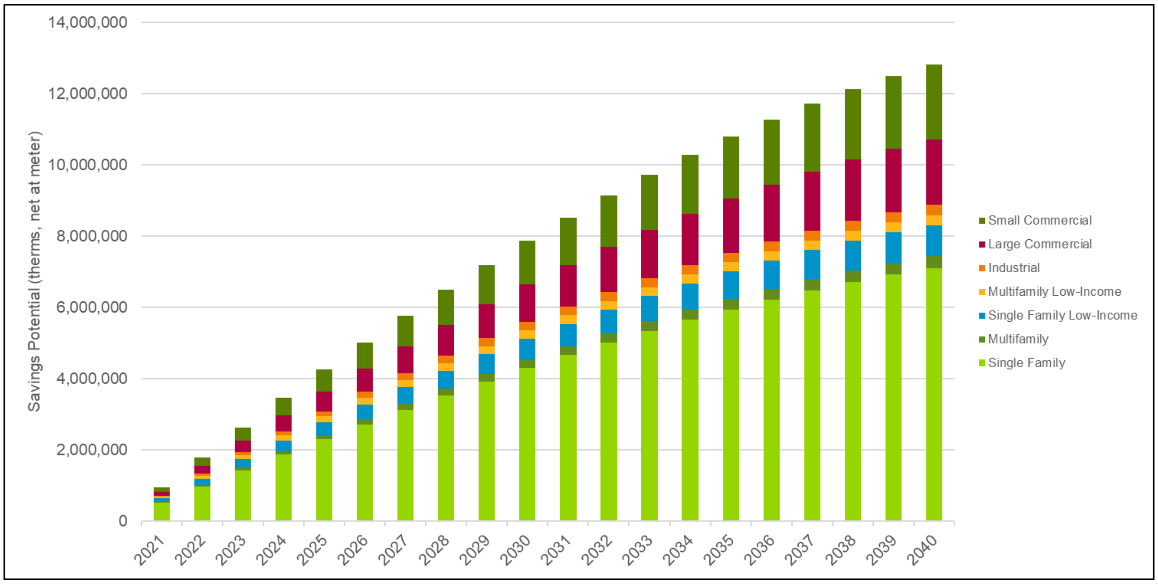
Figure 9-17 and Figure 9-18 show the cumulative net natural gas achievable potential across customer segments for the Lower Peninsula and Upper Peninsula, respectively, for the Reference Scenario. Unlike electricity savings, residential single-family dominates the savings potential for natural gas in both peninsulas. Additional detail and tabular data for customer segment-level results are provided in Appendix D.

Figure 9-17. Lower Peninsula EWR Cumulative Achievable Potential, Incremental Annual Natural Gas Savings by Customer Segment, Reference Scenario (therms, Net at Meter)



Source: Guidehouse analysis

Figure 9-18. Upper Peninsula EWR Cumulative Achievable Potential, Incremental Annual Natural Gas Savings by Customer Segment, Reference Scenario (therms, Net at Meter)

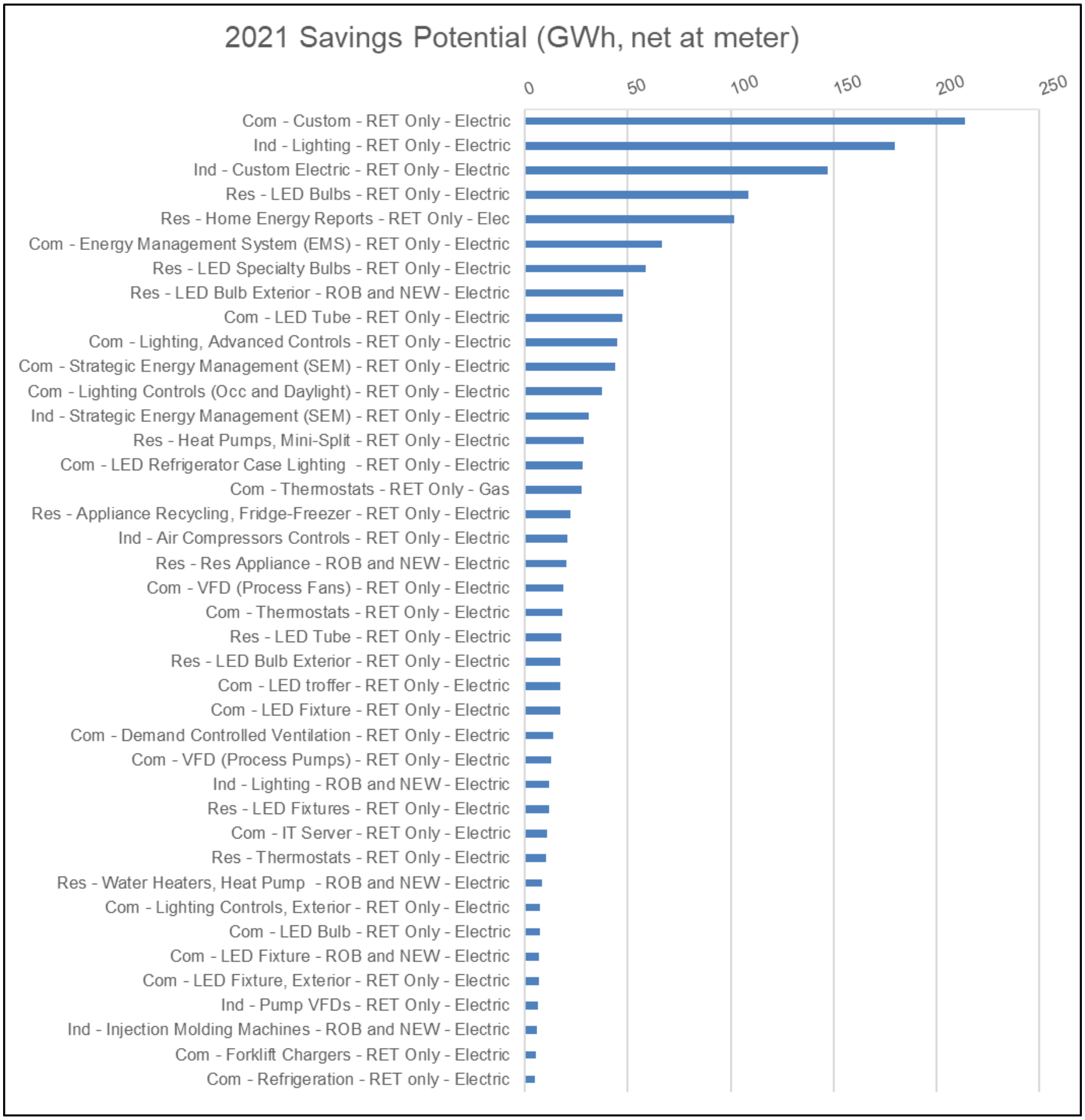


Source: Guidehouse analysis

9.4 Reference Scenario Energy Waste Reduction Potential Results by Measure

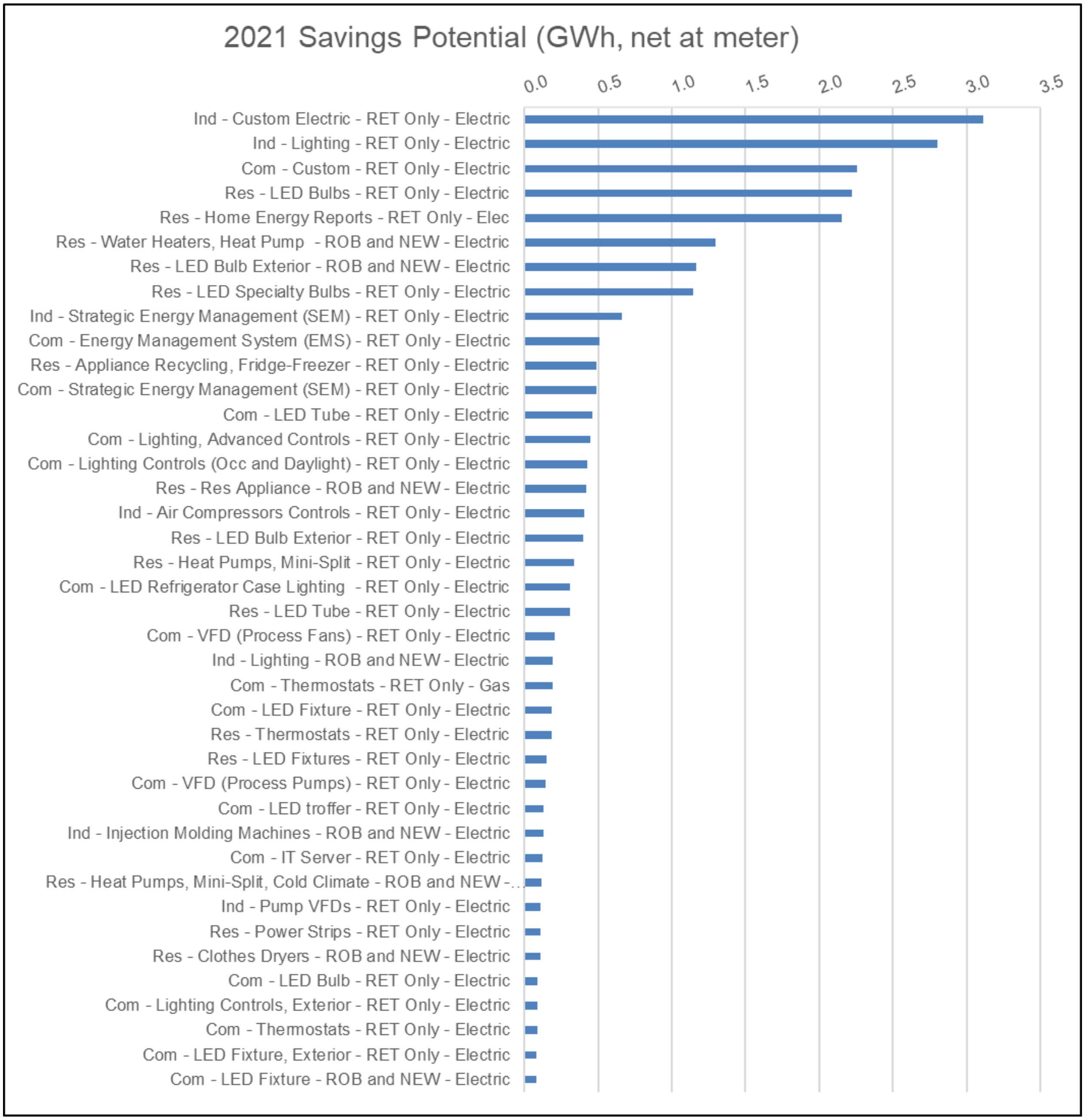
Figure 9-19 and Figure 9-20 show the top electricity-saving measures, net at meter, in 2021 for the Lower Peninsula and Upper Peninsula, respectively, for the Reference Scenario. In both cases, annual savings are dominated by custom, lighting, and home energy reports, making up approximately 50% of the savings in 2021. This trend does not continue throughout the study period, as both lighting and custom measures become saturated and measure mix changes.

Figure 9-19. Lower Peninsula EWR Achievable Potential, 2021 Top Measures for Electricity Savings, Reference Scenario (GWh, Net at Meter)



Source: Guidehouse analysis

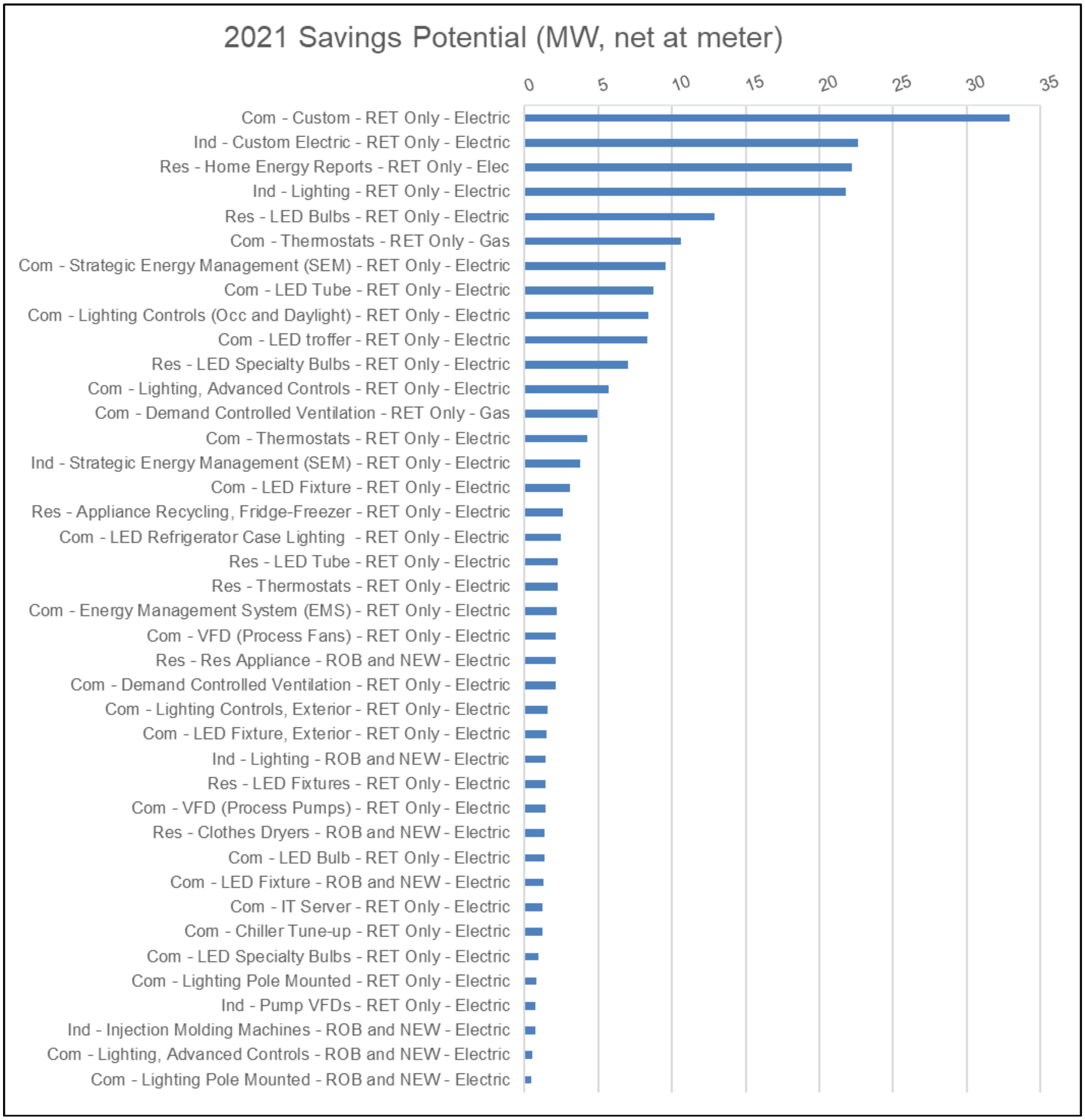
Figure 9-20. Upper Peninsula EWR Achievable Potential, 2021 Top Measures for Electricity Savings, Reference Scenario (GWh, Net at Meter)



Source: Guidehouse analysis

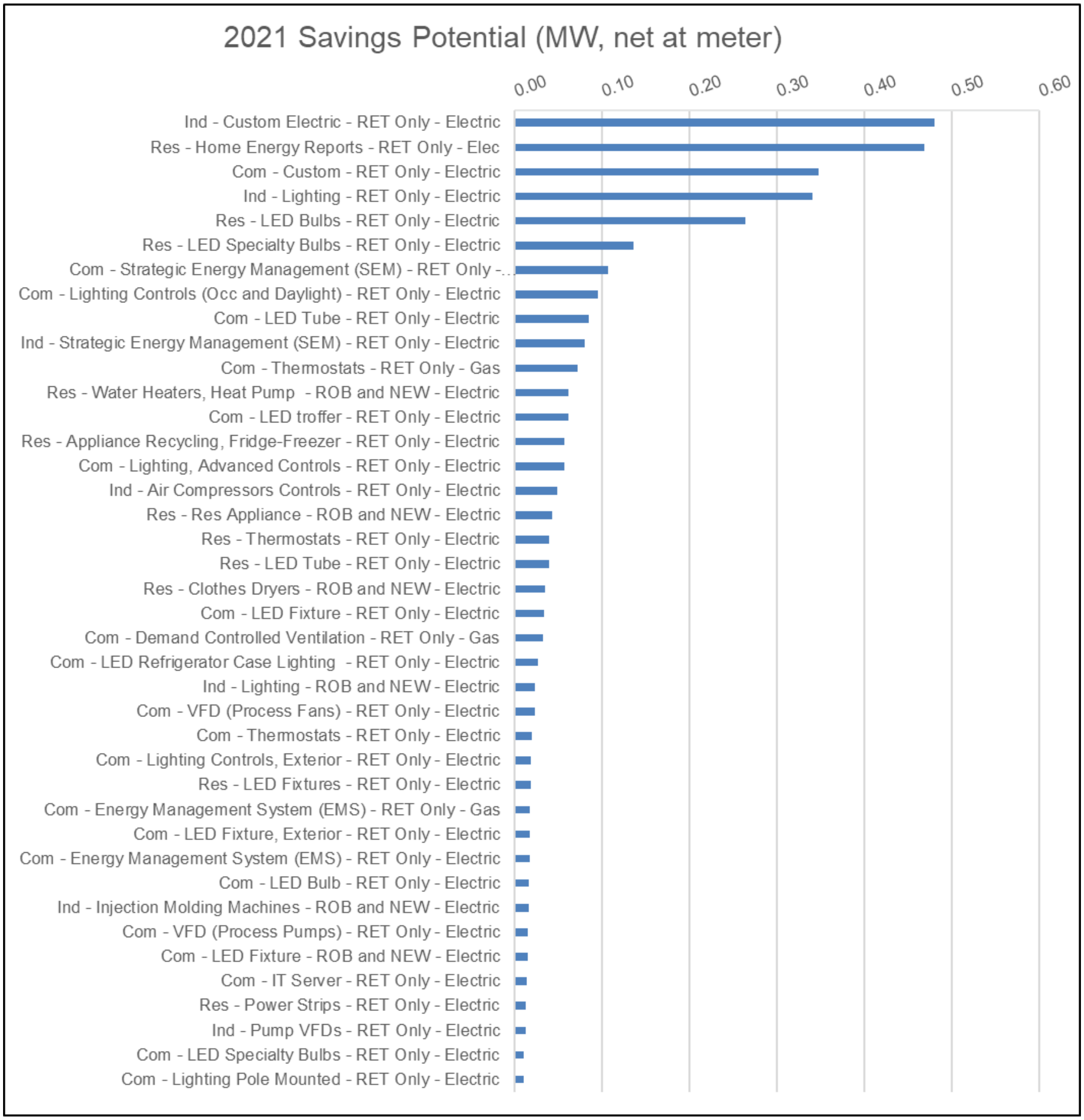
Figure 9-21 and Figure 9-22 show that the top summer peak demand savings measures, net at meter, in 2021 are dominated by the same measures as electricity savings for the Lower Peninsula and Upper Peninsula, respectively, for the Reference Scenario.

Figure 9-21. Lower Peninsula EWR Achievable Potential, 2021 Top Measures for Summer Peak Demand Savings, Reference Scenario (MW, Net at Meter)



Source: Guidehouse analysis

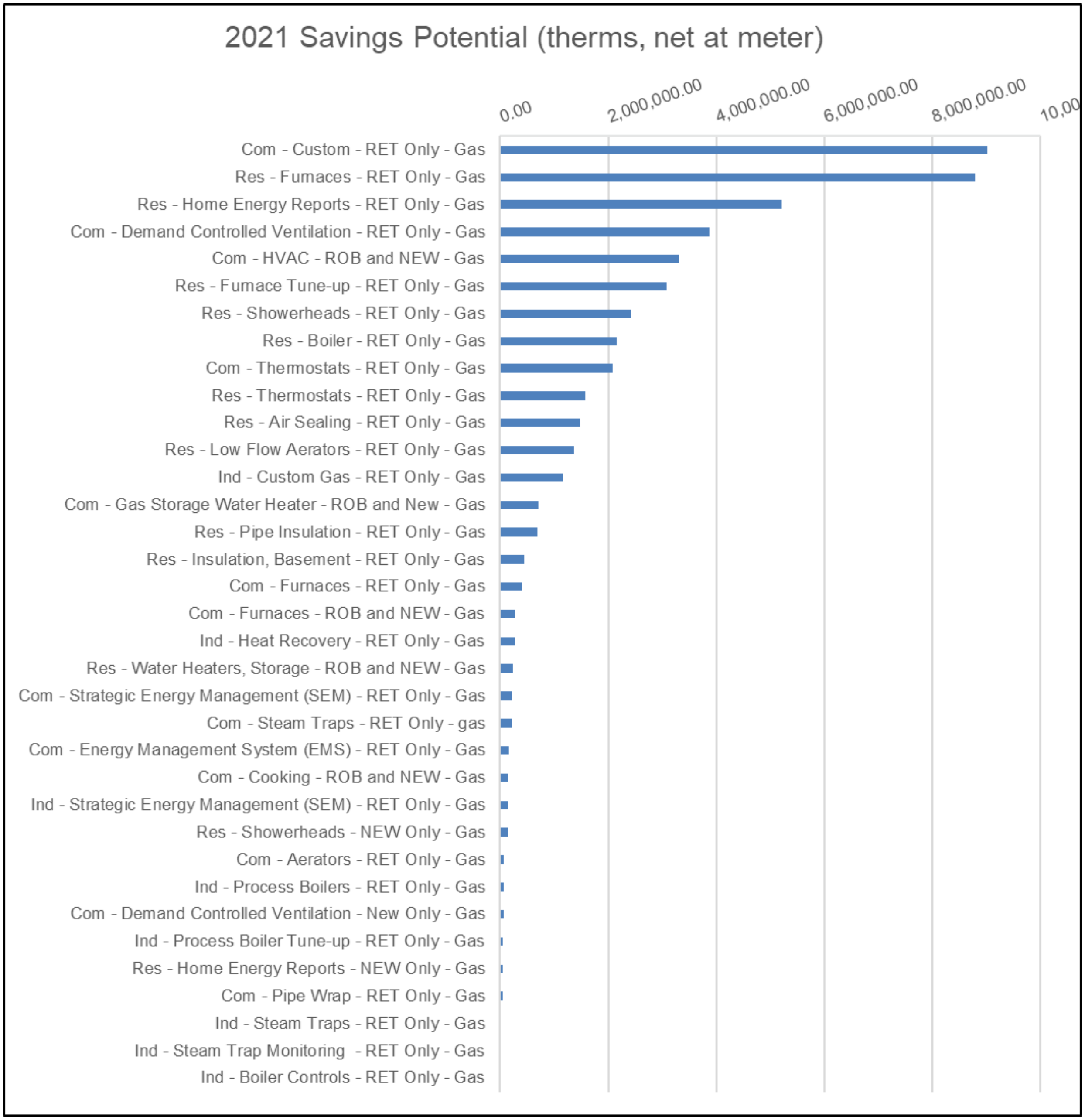
Figure 9-22. Upper Peninsula EWR Achievable Potential, 2021 Top Measures for Summer Peak Demand Savings, Reference Scenario (MW, Net at Meter)



Source: Guidehouse analysis

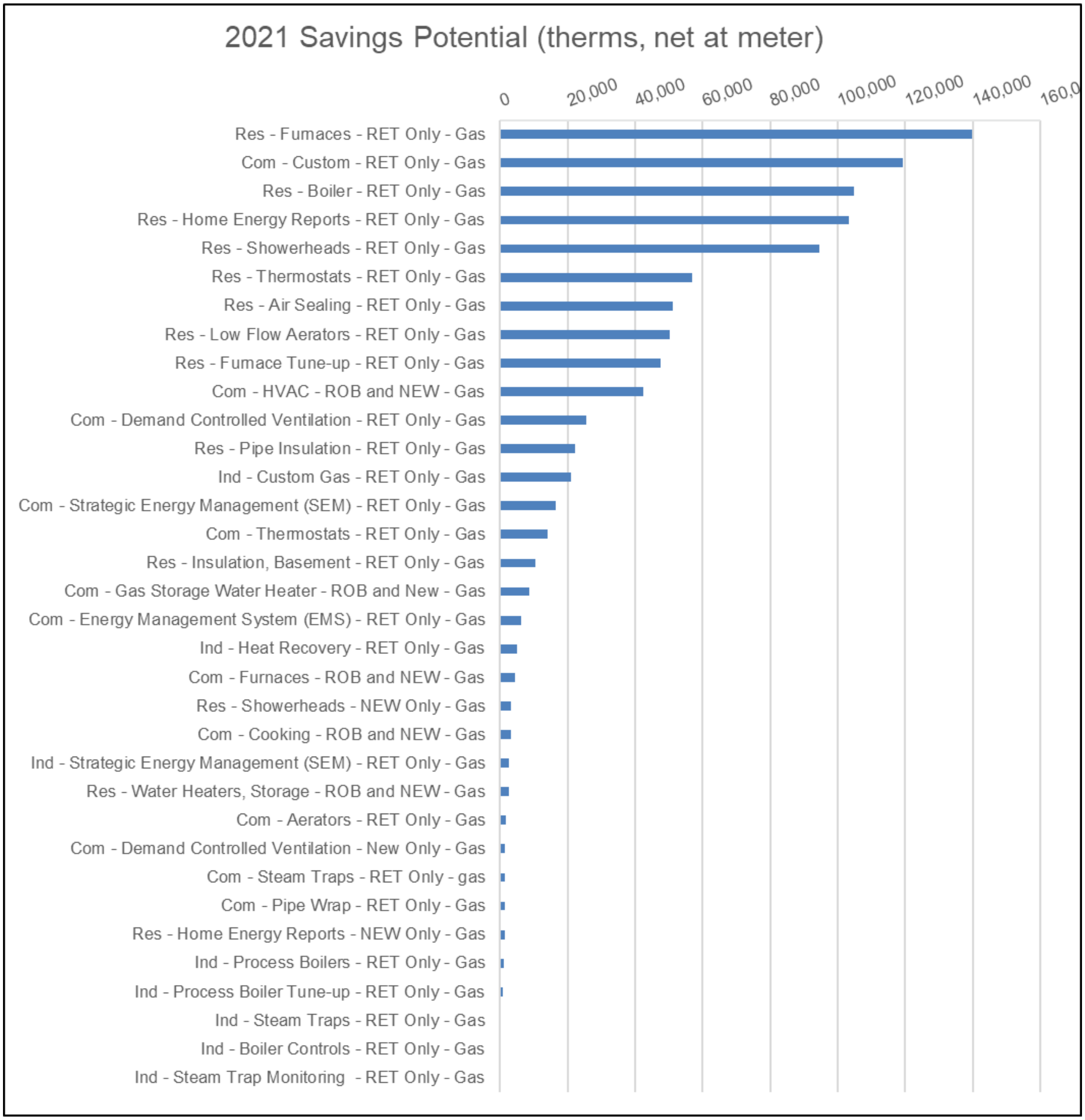
Figure 9-23 and Figure 9-24 show the top natural gas savings measures in 2021 for the Lower Peninsula and Upper Peninsula, respectively, for the Reference Scenario. The top two measures are the same for both peninsulas, just in different orders, with commercial custom as the top saving measure in the Lower Peninsula, and residential furnaces as the top saving measure in the Lower Peninsula.

Figure 9-23. Lower Peninsula EWR Achievable Potential, 2021 Top Measures for Natural Gas Savings, Reference Scenario (therms, Net at Meter)



Source: Guidehouse analysis

Figure 9-24. Upper Peninsula EWR Achievable Potential, 2021 Top Measures for Natural Gas Savings, Reference Scenario (therms, Net at Meter)



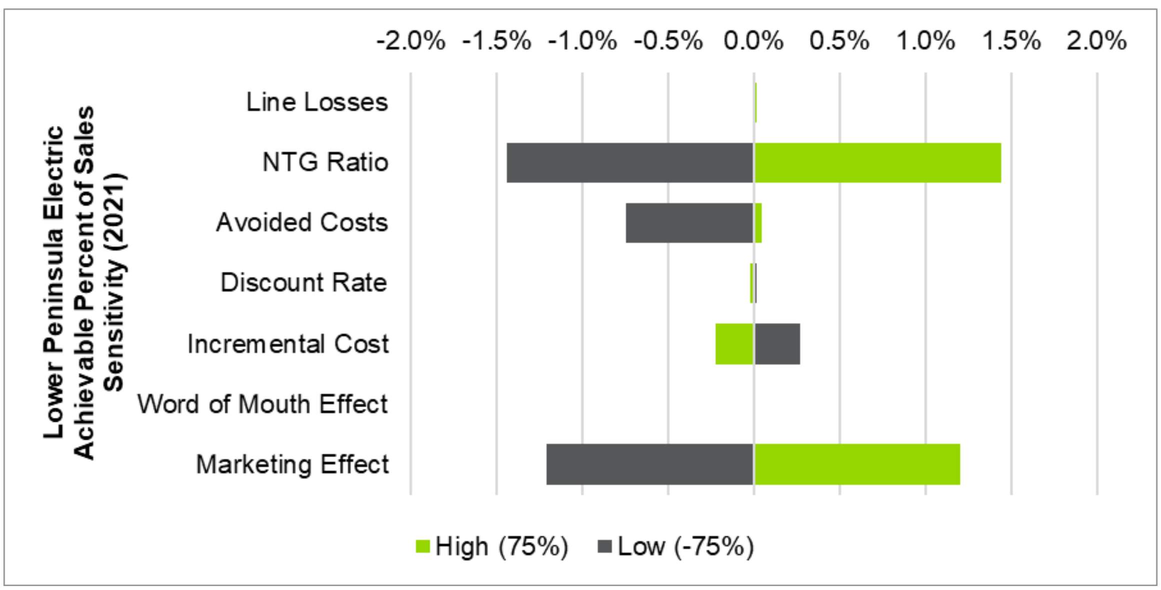
Source: Guidehouse analysis

9.5 Reference Scenario Sensitivity Analysis

Guidehouse conducted a parametric sensitivity analysis on the incremental achievable electricity and natural gas savings potential in the first year of the study period to evaluate the response of the Reference Scenario to changes in key potential model inputs. To determine the sensitivity of the results to seven input variables, we varied each parameter by +/-75% from base model values. Because the model has multiple non-linear components, the effects of varying a parameter is often asymmetrical. For each sensitivity, all other variables were held constant, allowing individual effects to be observed. In the interpretation of the following figures, it is important to note the directionality of the +75% and -75% bars. Some variables modeled show an increase in potential when the variable is increased (e.g., NTG ratio), and some variables show a decrease in potential when increased (e.g., incremental cost).

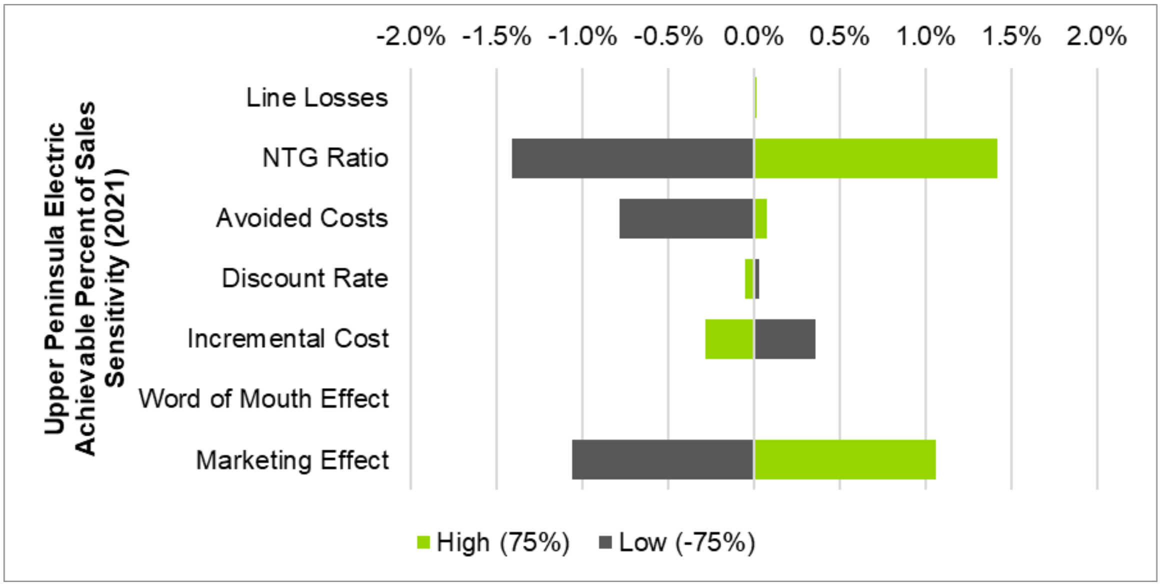
Figure 9-25 and Figure 9-26 show that of the seven parameters tested, for the Reference Scenario, the Lower Peninsula and Upper Peninsula electricity potential in 2021 is the most sensitive to NTG ratio and marketing effects. Marketing effects influence the growth of customer awareness and, along with incentives, are a primary pathway that program administrators use to influence the adoption of efficient measures. Avoided costs show a non-linear impact as increasing avoided costs do little to increase potential, while reducing avoided costs has a considerable negative effect. Customers do not respond to changes in avoided costs during purchase decision-making. Therefore, because most high impact measures pass the UCT screening threshold (0.8 for achievable) in the Reference Scenario, we do not see increased customer adoption with avoided costs. However, a decrease in avoided costs will reduce measure UCTs below the screening threshold, resulting in fewer programmatic offerings for customers and negatively impacting potential. Line losses, word-of-mouth effects, and discount rates show negligible impact, and the effect of incremental cost adjustments are moderate and symmetrical.

Figure 9-25. Lower Peninsula Electricity Achievable Percent of Sales Sensitivity, Reference Scenario (2021)



Source: Guidehouse analysis

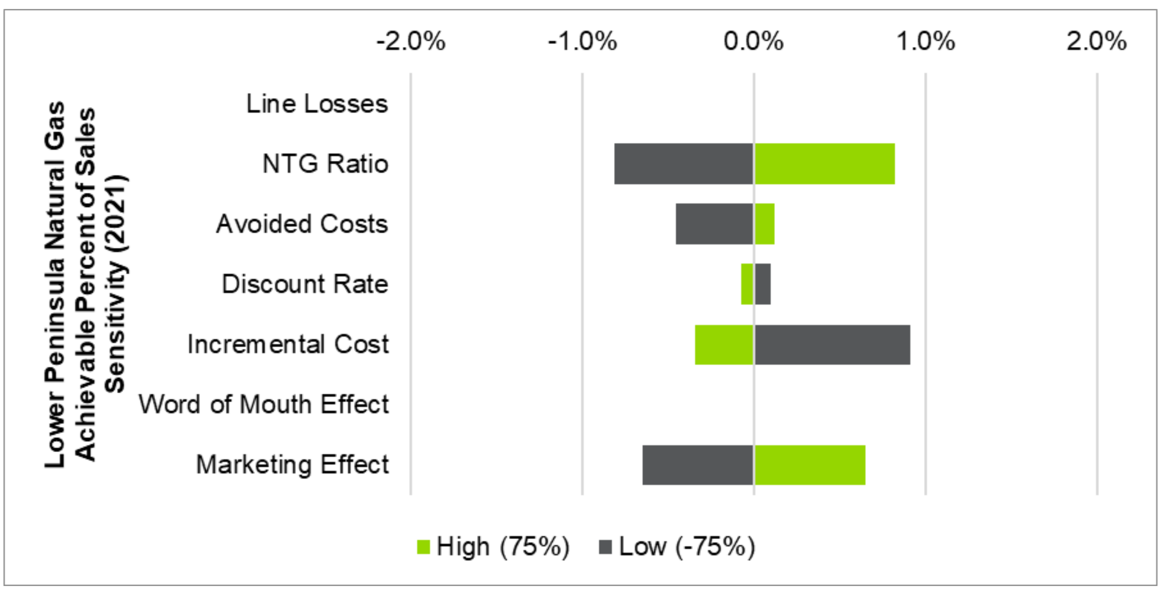
Figure 9-26. Upper Peninsula Electricity Achievable Percent of Sales Sensitivity, Reference Scenario (2021)



Source: Guidehouse analysis

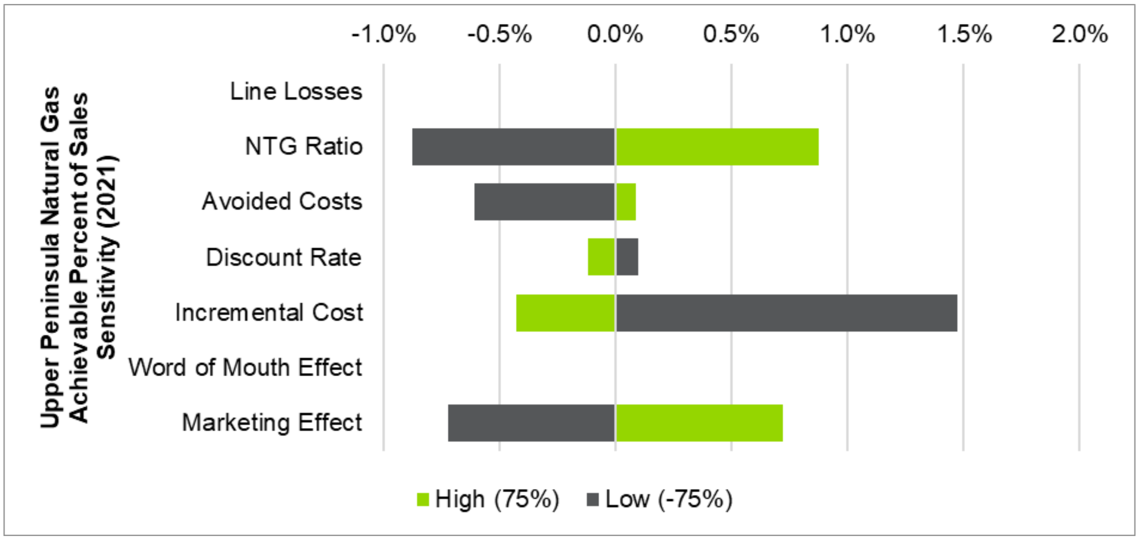
Figure 9-27 and Figure 9-28 show that of the seven parameters tested, for the Reference Scenario, the Lower Peninsula and Upper Peninsula natural gas potential in 2021 has a similar relative sensitivity to the electricity results with the exception of higher sensitivity to incremental costs. Increases in incremental costs result in a modest increase in potential; however, decreases in incremental costs lead to a large increase in potential. This indicates that natural gas measures have longer payback times than electricity measures and that decreasing the upfront cost to customers is a key leverage point to capturing savings. Overall, natural gas potential is less sensitive to changes in modeled inputs than electricity potential.

Figure 9-27. Lower Peninsula Natural Gas Achievable Percent of Sales Sensitivity, Reference Scenario (2021)



Source: Guidehouse analysis

Figure 9-28. Upper Peninsula Natural Gas Achievable Percent of Sales Sensitivity, Reference Scenario (2021)

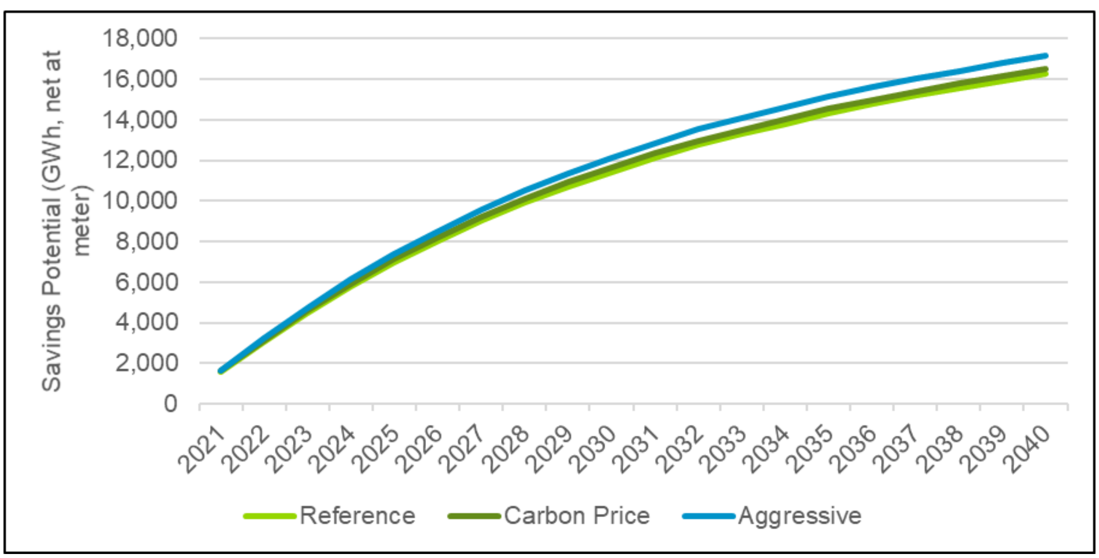


Source: Guidehouse analysis

9.6 Comparison of Energy Waste Reduction Achievable Potential Scenario

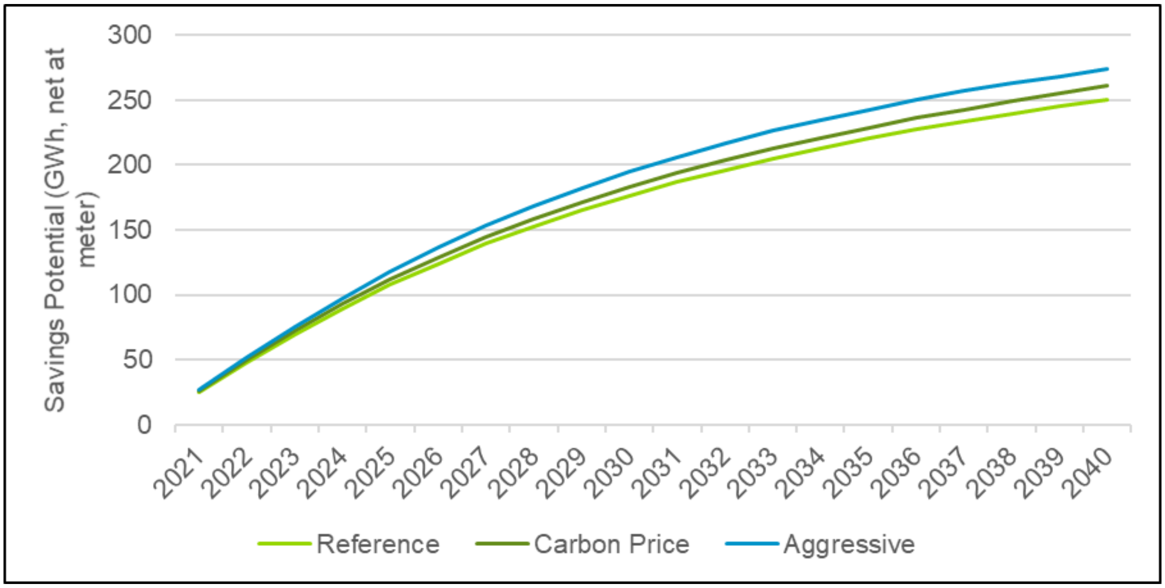
Figure 9-29 shows the scenario results for cumulative electricity achievable potential, net at meter, in the Lower Peninsula. The Aggressive Scenario results in about a 5% increase in cumulative savings compared to the Reference Scenario. Figure 9-30 shows the scenario results for cumulative electricity achievable potential, net at meter, in the Upper Peninsula. The Aggressive Scenario results in about a 10% increase in cumulative savings compared to the Reference Scenario.

Figure 9-29. Lower Peninsula EWR Achievable Potential, Cumulative Annual Electricity Savings, by Scenario (GWh, Net at Meter)



Source: Guidehouse analysis

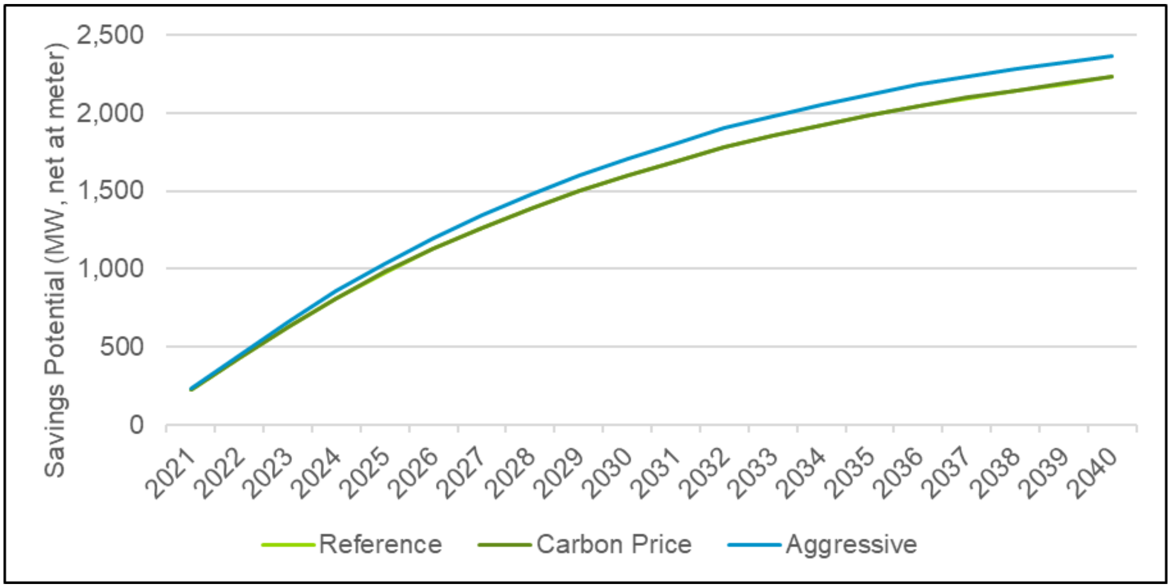
Figure 9-30. Upper Peninsula EWR Achievable Potential, Cumulative Annual Electricity Savings, by Scenario (GWh, Net at Meter)



Source: Guidehouse analysis

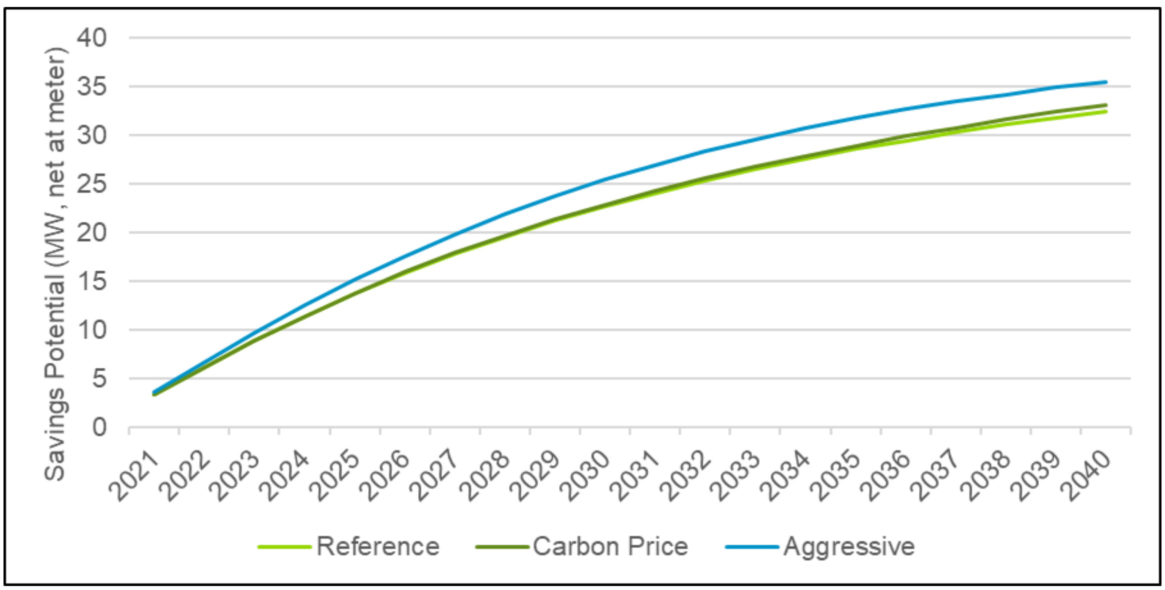
Figure 9-31 shows the cumulative annual summer peak demand potential, net at meter, by scenario for the Lower Peninsula. The peak demand increased slightly more than energy at about 6% cumulatively, indicating that more weather-sensitive measures were impacted by the Aggressive Scenario than non-weather-sensitive. The Carbon Price Scenario resulted in negligible change compared to the Reference Scenario. Figure 9-32 shows the cumulative annual summer peak demand potential, net at meter, by scenario for the Upper Peninsula. As with the electricity savings, the Upper Peninsula was affected more by the scenarios, resulting in about an 11% increase in peak demand savings in the Aggressive Scenario compared to the Reference Scenario.

Figure 9-31. Lower Peninsula EWR Achievable Potential, Cumulative Annual Summer Peak Demand Savings (MW, Net at Meter)



Source: Guidehouse analysis

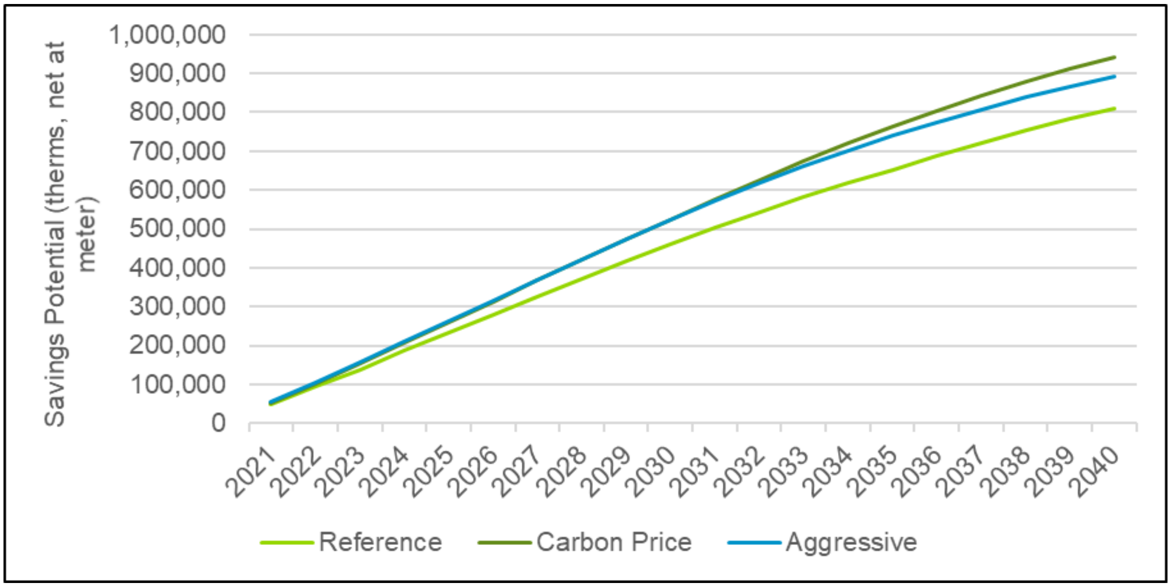
Figure 9-32. Upper Peninsula EWR Achievable Potential, Cumulative Annual Summer Peak Demand Savings, by Scenario (MW, Net at Meter)



Source: Guidehouse analysis

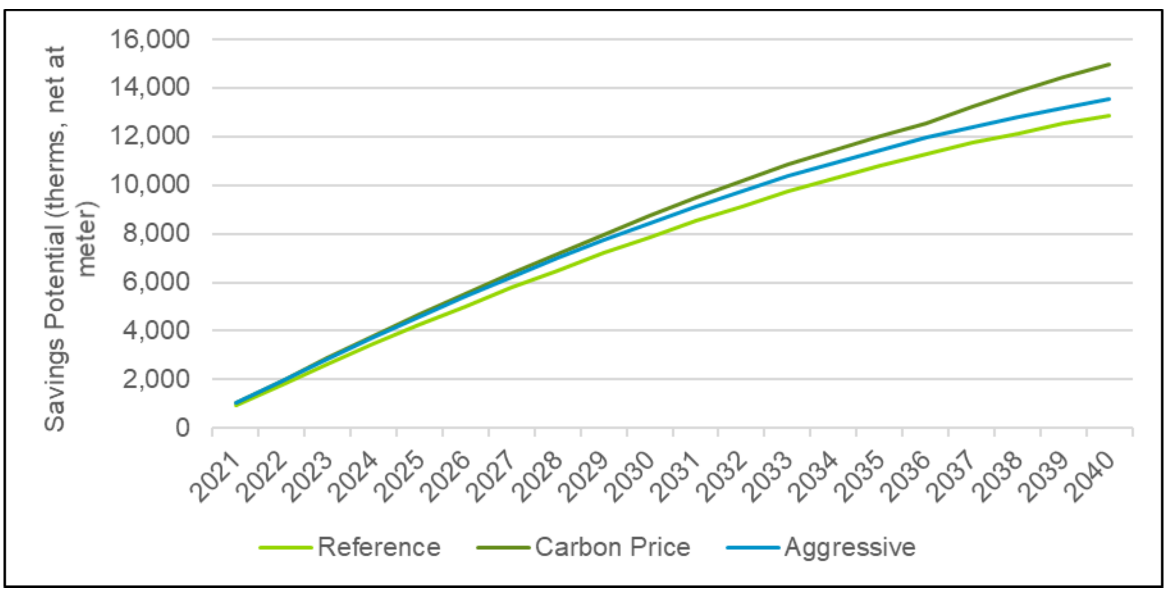
Figure 9-33 and Figure 9-34 show the cumulative natural gas savings achievable potential, in net therms, by scenario for the Lower Peninsula and Upper Peninsula, respectively. Unlike the electricity scenario results, the Carbon Price Scenario had more of an impact than the Aggressive Scenario on natural gas results, resulting in about a 16% increase in cumulative potential for both peninsulas. This indicates that gas measures are more sensitive to increases in avoided costs than changes in incentive levels.

Figure 9-33. Lower Peninsula EWR Achievable Potential, Cumulative Annual Natural Gas Savings, by Scenario (therms, Net at Meter)



Source: Guidehouse analysis

Figure 9-34. Upper Peninsula EWR Achievable Potential, Cumulative Annual Natural Gas Savings, by Scenario (therms, Net at Meter)



Source: Guidehouse analysis

9.7 Budgets and Cost-Effectiveness

This section presents UCT costs, benefits, net benefits, and test ratio results for the Reference Scenario. Results are grouped in primary fuel type and sector bundles to estimate program cost-effectiveness. Results are also presented as sector and portfolio total values for the Lower Peninsula and Upper Peninsula. Each table shows three snapshot years—2021, 2030, and 2040—to illustrate cost test and budget dynamics throughout the study period. Complete results for each scenario are presented in Appendix D.

Table 9-1 and Table 9-2 shows the UCT results for the Lower and Upper Peninsula program bundles. All program bundles are cost-effective in 2021; however, the residential program bundles decrease to a UCT below 1.0 throughout the study period. This decrease is largely due to the saturation of low-cost lighting measures in the early years of the study period for the residential electricity bundle. This is highlighted by the increase in budget projected to achieve savings as program administrators will need to incentivize higher cost measures to achieve savings. Additionally, the results bundle income eligible programs in with market rate residential customer programs, which have 100% incentive levels; as the more cost-effective lighting programs diminish, these higher incentives have an increased impact.

Residential gas UCT decreases as residential income eligible furnace measures pass the measure-level UCT of 0.8, which is a lower UCT ratio than single-family because the low-income segment receives 100% incentives. This measure is a major portion of the residential gas portfolio and has a significant impact on the overall sector UCT. Commercial and industrial bundles remain cost-effective throughout the study period with exception of the Upper Peninsula electricity bundle in later years; however, spending estimates decline. Saturation of currently projected custom measures occurs throughout the study period and outweighs the modeled emergence of unidentified future technologies. This effect results in an overall decline in savings potential and spending in later years. Overall, the Lower Peninsula portfolio is cost-effective throughout the study period and the Upper Peninsula portfolio remains cost-effective until late in the study period.

Table 9-1. Lower Peninsula, Benefits and Costs, Reference Scenario

Lower Peninsula	Net UCT Test Ratio = (a) / (b)	Net PV UCT Benefits NPV 2021 $ Million (a)	Net PV UCT Costs NPV 2021 $ Million (b) = (c) + (d)	Program Administrative Costs NPV 2021 $ Million (c)	Program Incentive Costs NPV 2021 $ Million (d)
Residential Electricity Program Bundle					
2021	1.1	$135,300,849	$118,294,428	$39,431,476	$78,862,952
2030	0.88	$157,461,751	$178,822,063	$59,607,354	$119,214,709
2040	0.85	$237,422,675	$279,856,964	$93,285,655	$186,571,310
Residential Natural Gas Program Bundle					
2021	1.3	$81,069,344	$64,728,771	$21,576,257	$43,152,514
2030	1.2	$111,853,792	$91,681,198	$30,560,399	$61,120,798
2040	0.93	$114,873,542	$124,108,175	$41,369,392	$82,738,783
C&I Electricity Program Bundle					
2021	1.4	$592,747,301	$428,260,444	$142,753,481	$285,506,963
2030	1.5	$327,343,257	$213,761,007	$71,253,669	$142,507,338
2040	1.3	$150,996,084	$117,716,905	$39,238,968	$78,477,936
C&I Natural Gas Program Bundle					
2021	2.5	$99,530,402	$40,554,645	$13,518,215	$27,036,430
2030	5.3	$145,717,267	$27,498,669	$9,166,223	$18,332,446
2040	3.7	$67,527,640	$18,045,654	$6,015,218	$12,030,436
Residential Programs Total					
2021	1.2	$216,370,193	$183,023,199	$61,007,733	$122,015,466
2030	1.0	$269,315,543	$270,503,261	$90,167,754	$180,335,507
2040	0.87	$352,296,217	$403,965,139	$134,655,046	$269,310,093
C&I Programs Total					
2021	1.5	$692,277,704	$468,815,090	$156,271,697	$312,543,393
2030	2.0	$473,060,523	$241,259,676	$80,419,892	$160,839,784
2040	1.6	$218,523,724	$135,762,559	$45,254,186	$90,508,372
Lower Peninsula Portfolio Total					
2021	**1.4**	**$908,647,897**	**$651,838,288**	**$217,279,429**	**$434,558,859**
2030	**1.5**	**$742,376,066**	**$511,762,937**	**$170,587,646**	**$341,175,291**
2040	**1.1**	**$570,819,941**	**$539,727,698**	**$179,909,233**	**$359,818,465**

Source: Guidehouse analysis

Table 9-2. Upper Peninsula, Benefits and Costs, Reference Scenario

Upper Peninsula	Net UCT Test Ratio = (a) / (b)	Net PV UCT Benefits NPV 2021 $ Million (a)	Net PV UCT Costs NPV 2021 $ Million (b) = (c) + (d)	Program Administrative Costs NPV 2021 $ Million (c)	Program Incentive Costs NPV 2021 $ Million (d)
Residential Electricity Program Bundle					
2021	1.3	$3,173,073	$2,446,999	$815,666	$1,631,333
2030	0.87	$2,477,571	$2,854,349	$951,450	$1,902,900
2040	0.66	$2,081,817	$3,164,112	$1,054,704	$2,109,408
Residential Natural Gas Program Bundle					
2021	1.2	$2,012,906	$1,697,472	$565,824	$1,131,648
2030	1.0	$1,976,958	$1,893,203	$631,068	$1,262,135
2040	1.0	$1,125,749	$1,085,114	$361,705	$723,409
C&I Electricity Program Bundle					
2021	1.2	$6,894,419	$5,567,214	$1,855,738	$3,711,476
2030	1.2	$3,367,418	$2,765,494	$921,831	$1,843,662
2040	0.91	$1,184,539	$1,301,513	$433,838	$867,675
C&I Natural Gas Program Bundle					
2021	2.0	$986,170	$500,672	$166,891	$333,781
2030	4.0	$1,448,365	$359,251	$119,750	$239,501
2040	4.5	$861,285	$192,033	$64,011	$128,022
Residential Programs Total					
2021	1.3	$5,185,979	$4,144,471	$1,381,490	$2,762,981
2030	0.94	$4,454,530	$4,747,552	$1,582,517	$3,165,035
2040	0.75	$3,207,565	$4,249,227	$1,416,409	$2,832,818
C&I Programs Total					
2021	1.3	$7,880,589	$6,067,886	$2,022,629	$4,045,257
2030	1.5	$4,815,784	$3,124,745	$1,041,582	$2,083,163
2040	1.4	$2,045,824	$1,493,546	$497,849	$995,697
Upper Peninsula Portfolio Total					
2021	**1.3**	**$13,066,568**	**$10,212,357**	**$3,404,119**	**$6,808,238**
2030	**1.2**	**$9,270,313**	**$7,872,297**	**$2,624,099**	**$5,248,198**
2040	**0.94**	**$5,869,021**	**$6,238,833**	**$2,079,611**	**$4,159,222**

Source: Guidehouse analysis

10. Conclusions

This EWR potential study has resulted in updated, expanded, and improved information on the Michigan customer base, and the potential for energy and demand reductions possible through EWR programs and initiatives by building upon previous studies, with the addition of natural gas potential and analysis of the Upper Peninsula. While much EWR potential remains, there are unique challenges in Michigan in realizing this potential over the 20-year study period. The potential study incorporates these real factors into the analysis by using primary research findings, Michigan baseline study data, and historical and expected program achievements, to estimate efficient measure and fuel type saturations, as well as calibration targets. The following are the key findings and takeaways from the potential analysis.

- **Near-term electricity and summer peak demand savings:** The top five electricity measures—consisting of commercial and industrial custom and lighting, residential LED bulbs, and residential home energy reports—represent approximately 50% of achievable savings in 2021 for both the Lower and Upper Peninsulas. This situation presents challenges for program administrators interested in maintaining a high rate of incremental annual savings. LED bulbs and industrial custom stocks saturate quickly in the study period due to aggressive early year calibration. Home energy reports do not, by definition, saturate in year-over-year contributions to potential; however, their 1-year lifetime and contribution limits as a percentage of total residential potential presents uncertainty around the longevity of this measure.
- **Near-term natural gas savings:** The top five measures for each peninsula comprise nearly 60% of the natural gas savings. The Upper Peninsula's top five measures—residential furnaces, commercial custom, residential boilers, home energy reports, and residential showerheads—consist mostly of residential savings due to the large share of residential load to overall natural gas load in the Upper Peninsula. The Lower Peninsula contains many of the same top measures—commercial custom, residential furnaces, and residential home energy reports—but because of the larger share of commercial load in the Lower Peninsula, two other commercial measures round out the remaining top five measures in the Lower Peninsula (commercial demand controlled ventilation, and commercial HVAC).
- **Long-term electricity and summer peak demand savings trends:** Incremental annual electricity potential decreases year-over-year over the 20-year study period, as some end uses, such as lighting in all sectors, begin to saturate. The calibration resulted in high lighting savings in the first few years of the study, but little overall total lighting potential remains due to existing high LED saturations identified from the primary data collection, causing the projected lighting savings to saturate quickly. Custom savings potential also deteriorates over time, and the market also saturates. The HVAC end uses show strong and steady increases year-over-year, which is a product of relatively low current participation and stock turnover limits.
- **Long-term natural gas savings:** Natural gas savings are much steadier over the study period than electricity savings. The top two end-use categories for both peninsulas are residential HVAC and commercial HVAC, which are limited by stock turnover and relatively low historical accomplishments, resulting in these categories ramping up more over time. Other end-use categories, such as residential water heating, begin to saturate, resulting in lower incremental savings potential years. However, the variance from the incremental savings potential in the early years (about 1% per year) compared

to later years (about 0.7% per year) is much lower than the variance of electricity savings over time.

- **Cost test results:** All sectors achieve a UCT ratio of above 1.0 at the start of the study. However, as time progresses, the residential sector UCT drops below 1.0 for both electricity and natural gas residential program bundles. For residential electricity, this result is largely due to low-cost lighting measures saturating in the market and being backfilled with more expensive technologies in later years. Additionally, low-income segments receive 100% incentives and are inherently less cost-effective at the UCT level. As the highly cost-effective lighting programs diminish, these less cost-effective segments have much more of an impact on overall residential program bundle cost-effectiveness. This effect is true for residential natural gas programs as well, though it is a more muted effect because there is not a measure with an analogous impact to that of lighting. However, this result is observed in the natural gas programs when a low-income furnace measure passes the UCT threshold of 0.8 in 2036 in the Lower Peninsula.
- **Scenario savings comparison:** There are modest differences in cumulative annual achievable potential in 2040 across the three scenarios. The Aggressive Scenario yields the highest electricity potential in the Lower and Upper Peninsulas, with an increase of around 5% and about 10%, respectively, as compared to the Reference Scenario. The Carbon Price Scenario results in an increase of around 16% in natural gas potential, outpacing the Aggressive Scenario for this fuel type. These results indicate the electricity potential is more sensitive to changes in incentives and spending, while natural gas potential is more sensitive to increases in avoided costs.
- **Scenario dynamics:** The primary adjustment between the scenarios is the incentive alignment with measure level UCT screening. This adjustment has the effect of increasing potential by making more measures cost-effective and reducing customer payback for measures that were already cost-effective at the 40% incentive level in the Reference Scenario. The resulting magnitude of this impact is small for several reasons.
    - The low levels of incentives required to make additional measures in the Reference Scenario screen causes these measures to have long customer payback periods. While more measures are included, these new measures do not see much customer adoption.
    - The higher incentives for previously cost-effective measures increase the measure long-run market equilibrium but may not dramatically increase savings in the early study period as the increased incentives do not immediately manifest in greater technology awareness.
    - Many high impact measures are already achieving significant savings and therefore have reduced potential for increased savings between scenarios due to the high Reference Scenario calibration targets.
- **Sensitivity results:** Electricity potential exhibits a symmetrical and high sensitivity to net-to-gross (NTG) ratio and marketing effect variances, and a high negative impact from decreasing avoided costs, with a lower positive impact from increasing avoided costs. Natural gas potential shows a similar behavior to electricity, with the addition of a high positive impact from decreasing incremental costs. Changes to line loss factors, discount rates, and word of mouth effects have little impact on potential for each territory and fuel type.

Appendix A. Residential Survey Instrument

MI Potential Study
Residential Survey_FII

Appendix B. Commercial & Industrial Survey Instrument

MI Potential Study
Commercial Survey_F

Appendix C. Michigan 2021-2040 Potential Study Modeling Methodology

Guidehouse MI EWR potential Study Appendix C Modeling Methodology.docx is provided as a separate attachment.

Guidehouse MI EWR
Potential Study Apper

Appendix D. Energy Waste Reduction Results File

Guidehouse MI EWR Potential Study Final Draft_08_18_2021.xlsx is provided as a separate attachment.

Guidehouse MI EWR
Potential Study Apper

Michigan Energy Waste Reduction and Demand Response 2021 to 2040 Potential Study – Residential Survey

Prepared for:

LARA
MPSC

State of Michigan Public Service Commission

Submitted by:

Guidehouse Inc.
South State Commons
2723 South State Street
Ann Arbor, MI 48104

guidehouse.com

March 28, 2021

Table of Contents

Residential Survey Overview

The primary objective of this survey is to collect information on customer awareness and willingness to pay for EWR and DR measures from MI residential utility customers. Guidehouse will use the survey results to inform the development of market acceptance and adoption forecasts. Additional secondary research objectives, included in the following table, have been incorporated into the survey to provide datapoints the research team will use to guide calibration of the EWR and DR potential models.

Topic	Survey Questions
Introduction	INTRO1
Lighting Baseline	LIGHTING1 – LIGHTING8
EWR Awareness	AWARE_EWR_LOW – AWARE_EWR_HIGH
EWR Willingness to Pay	EWR_WILLINGNESS_LOW – EWR_WILLINGNESS_HIGH
DR Awareness	AWARE_DR_TSTAT – AWARE_DR_EVBTM
DR Willingness to Participate	DR_WILLINGNESS_TSTAT1 – DR_WILLINGNESS_RES1
COVID-19 Impacts	COVID_EWR – COVID_DR
Recent Energy Use Actions	ACTIONS
Decision Factors	DECISIONS
Barriers	BARRIERS
Demographics	DEM1 – DEM9
Close	CLOSE1 – CLOSE2

Sample Variables

This table presents the sample file variables required for fielding.

Survey Variables	Description	Source
UTILITY	The customer's utility company	Utility tracking data

Sample

This table outlines Guidehouse's sampling techniques.

Topic	Description	Population
Sample size	What is the target number of completes?	500 completes
Stratification	Is the sample stratified?	The sample will be designed to achieve a proportionate mix of customers from each utility and will be stratified by Upper and Lower Peninsula.

Topic	Description	Population
Incentives	Any incentives or persuasion techniques?	$15; customers will be offered an incentive through Tango[1] which allows customers to select an e-gift card from a participating retailer or restaurant (including Amazon.com, CVS or Dunkin' Donuts and more) or an online debit card (Visa® or MasterCard®). Customer's may also choose to donate $15 to a charitable organization instead of receiving the gift card.

[1] https://www.tangocard.com/

Invitation Emails

Initial Invitation Email

Dear __________,

Guidehouse, on behalf of the Michigan Public Service Commission, is conducting a study to help understand energy decision-making in Michigan and invites you to complete a brief survey. Your responses will help improve energy-related programs offered by your utility provider that assist residential customers in saving energy and money. Respondents who complete the survey will be offered a **$15 e-gift or online debit card,** or can choose to donate $15 to a charitable organization.

Please take the survey using the link below; we recommend completing the survey on a laptop or computer if possible.

[Insert survey link]

Your participation in this survey is anonymous and voluntary. Your individual answers will remain confidential and reported only in the aggregate. The survey will take about 15 minutes.

If you have any questions about this survey or how your responses to this survey will be used, please contact us at Michigan.EnergyStudy@guidehouse.com.

Sincerely,

Guidehouse

First Reminder Email

Dear __________,

Guidehouse, on behalf of the Michigan Public Service Commission, recently invited you to complete a 15-minute survey to help us improve energy-related programs offered by your utility provider that assist residential customers in saving energy and money, and ultimately benefit the environment.

As a token of appreciation for completing this survey, respondents who complete the survey will be offered a **$15 e-gift or online debit card,** or choose to donate $15 to a charitable organization.

Please take the survey using the link below; we recommend completing the survey on a laptop or computer.

[Insert survey link]

Your participation in this survey is anonymous and voluntary. Your individual answers will remain confidential and reported only in the aggregate.

If you have any questions about this survey or how your responses to this survey will be used, please contact us at Michigan.EnergyStudy@guidehouse.com.

Sincerely,

Guidehouse

Second Reminder Email

Dear __________,

Guidehouse, on behalf of the Michigan Public Service Commission, recently invited you to complete a 15-minute survey to help us improve energy-related programs offered by your utility provider that assist residential customers in saving energy and money, and ultimately benefit the environment. This survey will be closing on **[Date]**; don't miss out on this opportunity to contribute!

As a token of appreciation for completing this survey, respondents who complete the survey will be offered a **$15 e-gift or online debit card,** or choose to donate $15 to a charitable organization.

Please take the survey using the link below; we recommend completing the survey on a laptop or computer.

[Insert survey link]

Your participation in this survey is anonymous and voluntary. Your individual answers will remain confidential and reported only in the aggregate.

If you have any questions about this survey or how your responses to this survey will be used, please contact us at Michigan.EnergyStudy@guidehouse.com.

Sincerely,

Guidehouse

Survey Body

Introduction

INTRO1 In this survey we will ask you about your awareness of different energy-related technologies and utility programs, and decision-making around energy use in your home. If you are not the best person to answer these questions, please ask another member of your household who makes decisions about your energy bills to complete this survey. Note that you will need to complete the entire survey to receive your **$15 e-gift or online debit card**, or to donate the $15 to a charitable organization.

Lighting Baseline

The first part of the survey will ask for additional information about the lighting in your home. If you need to finish the survey at a later time or switch to a different mobile device, you can return to this point in the survey by clicking the link in the email you received. All of your survey progress will have been saved.

LIGHTING1 How many **indoor light *bulbs*** of the following types do you have within each of the below fixture types in your home (***excluding*** any bulbs found in unconditioned exteriors structures such as a garage), if any? If possible, please walk through your home to count the light bulbs. Keep in mind that some light fixtures and lamps have more than one bulb, and we are looking for the total bulb count, *not* the total fixture count.

	None	**1-5**	**6-10**	**11-15**	**16-20**	**21-25**	**26-30**	**31-35**	**36-40**	**>40**
a. In a table or floor lamp										
b. In a wall-mounted light fixture (e.g., sconces, bathroom vanity)										
c. In a pin-based light fixture										
d. In a ceiling-mounted light fixture (non-linear)										
Error! Reference source not found.e. In a linear light fixture (long white tube)										

[If LIGHTING1_a DOES NOT = None]

LIGHTING2 Approximately what percentages of the light bulbs in **table or floor lamps** in your home fall into the following bulb type categories? **[CONSTANT SUM TABLE (see example), MUST SUM TO 100%]**

1. LED
2. CFL
3. Halogen
4. Incandescent

[If LIGHTING1_b DOES NOT = None]

LIGHTING3 Approximately what percentages of the light bulbs in **wall-mounted light fixtures (e.g., sconces, bathroom vanity)** in your home fall into the following bulb type categories? **[CONSTANT SUM TABLE (see example), MUST SUM TO 100%]**

1. LED
2. CFL
3. Halogen
4. Incandescent

LED	0	%
CFL	0	%
Halogen	0	%
Incandescent	0	%
Don't know	0	%
Total	0	%

[If LIGHTING1_c DOES NOT = None]

LIGHTING4 Approximately what percentages of the light bulbs in **pin-based light fixtures** in your home fall into the following bulb type categories? **[CONSTANT SUM TABLE (see example), MUST SUM TO 100%]**

1. LED
2. CFL
3. Halogen
4. Incandescent

[If LIGHTING1_d DOES NOT = None]

LIGHTING5 Approximately what percentages of the light bulbs in **ceiling-mounted light fixtures (non-linear)** in your home fall into the following bulb type categories? **[CONSTANT SUM TABLE (see example), MUST SUM TO 100%]**

1. LED
2. CFL
3. Halogen
4. Incandescent

[If LIGHTING1_e DOES NOT = None]

LIGHTING6 Approximately what percentages of the light bulbs in **linear light fixtures** in your home fall into the following bulb type categories? **[CONSTANT SUM TABLE (see example), MUST SUM TO 100%]**

1. Linear fluorescent
2. LED

LIGHTING7 Approximately how many **exterior light bulbs** are there at your home? Please think about any porch lights, flood lights, garage lighting, outhouse lights, etc.

1. None
2. 1
3. 2
4. 3
5. 4
6. 5
7. 6

8. 7
9. 8
10. 9
11. 10
12. More than 10 (please enter the number) **[Numeric entry]**

[Ask if LIGHTING7 DOES NOT = None]

LIGHTING8 What percentage of the exterior lighting falls into the following bulb type categories? **[CONSTANT SUM TABLE (see example), MUST SUM TO 100%]**

1. Linear fluorescent
2. LED
3. CFL
4. Incandescent
5. Halogen
6. Metal halide
7. High pressure sodium
8. Mercury vapor
9. Solar-powered lights

EWR Awareness

AWARE_EWR_LOW **[Low Cost Measure Reference Table. ROTATE, 1 MEASURE PER RESPONDENT]**

[low cost measure description_1]. Before today, were you familiar with **[low cost measure_2]?**

1. Yes
2. No

Low Cost Measure Table			
Measure	**Low Cost Measure Description_1**	**Low Cost Measure_2**	**Photo**
LED Screw-in General Service Lamp	LED screw-in general service lamps are intended to serve general lighting applications by providing an interior or exterior area with overall illumination. These bulbs have a standard (Edison) base.	LED screw-in general service lamps	
Advanced Smart (Tier 2) Power Strip	Advanced smart (Tier 2) power strips have a master and switched plug. When the master plug (a TV or PC) is on, the switched outlets are powered on. When the master plug (a TV or PC) is switched off, the switched outlets and peripherals are powered off. In addition, this power strip has a motion sensor, like those for lights, that turns the master switch off if	advanced smart (Tier 2) power strips	

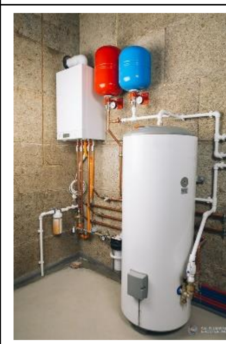
Low Cost Measure Table			
Measure	**Low Cost Measure Description_1**	**Low Cost Measure_2**	**Photo**
	someone leaves the room for an extended period.		
System with smart thermostat	A smart thermostat lets users remotely modify heating and cooling settings such as setpoints and schedule, or turn the unit on or off, from a mobile device or website. The system is defined as being the home heating and cooling system, comprising heating, ventilation and air conditioning.	smart thermostats	
Occupancy Sensor	An occupancy sensor is a motion detecting device used to detect the presence of a person (or animal) in a home to automatically control lights.	occupancy sensors	
Low-flow Showerhead	A low-flow showerhead uses two gallons or less of water per minute, saving both water and water heating costs with little to no impact on the user.	low-flow showerheads	
Low-flow Faucet Aerator	A low-flow faucet aerator can be added to an existing faucet, saving both water and water heating costs with little to no impact on the user.	low-flow faucet aerators	

Low Cost Measure Table			
Measure	**Low Cost Measure Description_1**	**Low Cost Measure_2**	**Photo**
Hot Water Pipe Insulation	Insulating hot water pipes reduces pipe heat loss by 2 to 4 degrees. Because the water is warmer, you'll use less of it, saving water and energy.	hot water pipe insulation	

AWARE_EWR_HIGH **[High Cost Measure Reference Table. ROTATE, 1 MEASURE PER RESPONDENT]**

[high cost measure description_1]. Before today, were you familiar with **[high cost measure_2]**?

1. Yes
2. No

High Cost Measure Table			
Measure	**High Cost Measure Description_1**	**High Cost Measure_2**	**Photo**
Heat Pump Water Heater	Heat pump water heaters use electricity to move heat from one place to another instead of generating heat directly. Heat pump water heaters pull heat from the surrounding air and transfer it -- at a higher temperature -- into a tank to heat water.	heat pump water heaters	
ENERGY STAR Mini-split Heat Pump	ENERGY STAR mini-split heat pumps provide both heating and cooling through a single device – a heat pump. Ductless mini-split heat pumps use an indoor unit connected to an outdoor unit via refrigerant lines. Up to 8 indoor units can be attached to one outdoor unit.	ENERGY STAR mini-split heat pumps	

High Cost Measure Table			
Measure	**High Cost Measure Description_1**	**High Cost Measure_2**	**Photo**
Heat Pump Clothes Dryer	A heat pump clothes dryer is a self-contained system that heats recirculating air to extract moisture. The liquid water is then pumped to the same drain as used by the clothes washer. Heat Pump clothes dryers don’t require ventilation, can reduce energy use by at least 28% compared to standard dryers, and dry laundry at low temperatures and therefore gentler on clothes.[2]	heat pump clothes dryers	
Air Sealing	A home that has air sealing performed has been sealed with caulking or spray foam to prevent the passage of air or water vapor into or out of the home.	home air sealing	
ENERGY STAR Front-Loading Clothes Washer	ENERGY STAR front-loading clothes washers use a horizontal or tumble-axis basket to lift and drop clothing into the water, instead of rubbing clothes around a central agitator. These also use faster spin speeds to extract more water from clothes, reducing dryer time and energy use.	ENERGY STAR front-loading clothes washers	
Insulation	Insulation in your home provides resistance to heat flow and lowers your heating and cooling costs. Properly insulating your home reduces heating and cooling costs, and also improves comfort.	insulation	

[2] Energy Star, https://www.energystar.gov/products/heat_pump_dryer#:~:text=WHAT%20IS%20A%20HEAT%20PUMP,once%20the%20moisture%20is%20removed.&text=Making%20use%20of%20a%20refrigerant,is%20used%20to%20generate%20heat.

High Cost Measure Table			
Measure	**High Cost Measure Description_1**	**High Cost Measure_2**	**Photo**
High Efficiency Storage Tank Water Heaters	High efficiency storage tank water heaters keep water hot and ready for use at all times in insulated storage tanks with capacities ranging from 20 to 80 gallons[3].	high efficiency storage hot water heaters	
High Efficiency Tankless Water Heater	High efficiency tankless water heaters, also known as demand water heaters or instantaneous hot water heaters, circulate water through a large coil that is heated only on demand; there is no storage tank continuously maintaining hot water[4].	high efficiency tankless hot water heaters	

EWR Willingness to Pay

EWR_WILLINGNESS_LOW Suppose an energy efficiency project does not have any adverse impacts on the QUALITY of lighting, heating, and cooling in your home, but reduces the amount of energy consumed. An example might be a smart thermostat.

Would you generally pursue an energy efficiency project where the cost to you after utility rebates is $75 if the project provided an annual energy bill savings of **[Annual Energy Bill Savings]**, and a **[Suggested payback period]** payback (that is, in about **[Suggested payback period]** the money you would save in energy costs would be greater than the extra cost for the energy efficiency technology?

Annual Energy Bill Savings [Randomized option choice, hide lettering from respondent:]	**Suggested payback period**	Yes (1) **[Radio button, only one response per row]**	No (2) **[Radio button, only one response per row]**	Don't Know / Not Sure (3) **[Radio button, only one response per row]**
a) $100 per year	9 months			

[3] https://www.energystar.gov/ia/new_homes/features/waterhtrs_062906.pdf
[4] https://www.energystar.gov/ia/new_homes/features/waterhtrs_062906.pdf

Annual Energy Bill Savings [Randomized option choice, hide lettering from respondent:]	Suggested payback period	Yes (1) **[Radio button, only one response per row]**	No (2) **[Radio button, only one response per row]**	Don't Know / Not Sure (3) **[Radio button, only one response per row]**
b) $75 per year	1 year			
c) $40 per year	18 months			
d) $25 per year	3 years			
f) $15 per year	5 years			
g) $10 per year	7 ½ years			

[The respondent is randomly shown an Annual Energy Bill Savings option. Depending on the response (Yes or No) the respondent is asked the next possible option. This process is continued until the respondent gets to the highest or lowest possible value or they provide an opposite response to their initial Yes or No response. Example: The respondent answers No to answer option f) $15 per year. Ask the next possible option starting with e) and proceeding through a) until the respondent answers yes or they reach the highest value.]

EWR_WILLINGNESS_HIGH Suppose an energy efficiency project does not have any adverse impacts on the QUALITY of lighting, heating, and cooling in your home, but reduces the amount of energy consumed and MAY result in some inconvenience (for example: obtaining project estimates, selecting and overseeing a contractor for the installation). An example might be a high efficiency storage tank water heater.

Would you generally pursue an energy efficiency project where the cost to you after utility rebates is $1,000 if the project provided and annual energy bill savings of **[Annual Energy Bill Savings]**, and a **[Suggested payback period]** payback (that is, in about **[Suggested payback period]** the money you would save in energy costs would be greater than the extra cost for the energy efficiency technology?

Annual Energy Bill Savings [Randomized option choice, hide lettering from respondent:]	Suggested payback period	Yes (1) **[Radio button, only one response per row]**	No (2) **[Radio button, only one response per row]**	Don't Know / Not Sure (3) **[Radio button, only one response per row]**
a) $1,250 per year	10 months			
b) $1,000 per year	1 year			
c) $500 per year	2 years			
d) $330 per year	3 years			
e) $250 per year	4 years			

Annual Energy Bill Savings [Randomized option choice, hide lettering from respondent:]	**Suggested payback period**	Yes (1) **[Radio button, only one response per row]**	No (2) **[Radio button, only one response per row]**	Don't Know / Not Sure (3) **[Radio button, only one response per row]**
f) $200 per year	5 years			
g) $125 per year	8 years			
h) $100 per year	10 years			

[The respondent is randomly shown an Annual Energy Bill Savings option. Depending on the response (Yes or No) the respondent is asked the next possible option. This process is continued until the respondent gets to the highest or lowest possible value or they provide an opposite response to their initial Yes or No response. Example: The respondent answers No to answer option f) $200 per year. Ask the next possible option starting with e) and proceeding through a) until the respondent answers yes or they reach the highest value.]

Demand Response Program Awareness

Next, we have a few questions about your awareness of <u>Demand Response programs</u> that electric utilities offer or could potentially offer to residential customers.

Demand Response programs reward electricity customers for voluntarily agreeing to reduce energy usage during periods of high electricity demand, which helps keep electricity costs down and allows your electric utility to supply reliable power at a more affordable rate to all customers.

If you sign up for a Demand Response program offered by your utility, the utility would control your air conditioning and/or heating system energy use during high (peak) demand periods (referred to as "demand response events") for a limited time (usually less than 4 hours), by automatically adjusting your thermostat during those periods. Your usage would be controlled only for a certain maximum number of days in a season (for example, 10 days maximum in the summer). However, you can always opt-out if you are unable to reduce your energy use during these periods.

An electric utility rewards Demand Response program participants by paying an incentive each summer. Additionally, the utility may offer a one-time incentive for enrolling in the program.

Alternatively, you could also be placed on an electricity rate that gives you a discount on your current rate during off-peak times (typically nights and weekends), but is more expensive during on-peak times (weekday afternoons). You may be eligible to get a free smart thermostat from your utility, which will be controlled by the utility to reduce your electricity demand during certain critical peak events periods when electricity is much more expensive.

AWARE_DR_TSTAT Utilities typically control space cooling/heating system energy use during Demand Response events using a smart thermostat. A smart thermostat learns your patterns and offers the ability to control it from anywhere. Does your household use a smart thermostat?

1. Yes

2. No
3. Don’t Know/Not Sure

[If UTILITY = DTE]

AWARE_DR_DTE1 Before today, have you heard of the following demand response programs offered by your utility?

<table>
<tr><th>[Radio buttons, only one response per row]</th><th>Yes, my household participates in the program
(1)</th><th>Yes, but my household does not participate
(2)</th><th>No
(3)</th><th>Don’t Know / Not Sure
(4)</th></tr>
<tr><td>a) Smart Savers Program that offers customers who own a smart thermostat a $20 incentive per thermostat at the end of each summer in exchange for allowing DTE to make minor, short-term adjustments to a participant’s thermostat to reduce energy use during periods of peak (high) demand for electricity. Participants can anticipate at least one adjustment, and a maximum of up to 10 adjustments, per summer. Peak demand periods for adjustments typically occur on especially hot days. Adjustments will occur on non-holiday weekdays.</td><td></td><td></td><td></td><td></td></tr>
<tr><td>b) Dynamic Peak Pricing Rate is an electricity rate which provides a discount on standard rates (typically 30%-50% discount on standard rates) during night and on weekends (called off-peak periods), with more expensive rates on weekday afternoons (called peak periods). Participants save money by shifting use to off-peak periods. Participants are notified to reduce electricity use during critical peak events, when electricity is much more expensive. The events only occur on weekdays from 3 p.m. to 7 p.m. and are limited to a maximum of 14 occurrences (56 hours) per calendar year.
Here is summary of the rates:
<table>
<tr><th>Rate</th><th>Time</th><th>Cost</th></tr>
<tr><td>Off-Peak</td><td>Monday to Friday
11 p.m. to 7 a.m.
and
All Day Weekends and Holidays</td><td>4.8 cents per kWh (kilowatt-hour)</td></tr>
<tr><td>Mid-Peak</td><td>Monday to Friday
7 a.m. to 3 p.m.
and
7 p.m. to 11 p.m.</td><td>9.2 cents per kWh</td></tr>
</table></td><td></td><td></td><td></td><td></td></tr>
</table>

[Radio buttons, only one response per row]	Yes, my household **participates** in the program (1)	Yes, but my household **does not** participate (2)	No (3)	Don't Know / Not Sure (4)
On-Peak — Monday to Friday 3 p.m. to 7 p.m. — 16.6 cents per kWh **Critical Peak Events** — Not more than 14 times per year on certain weekdays 3 p.m. to 7 p.m. — 95.0 cents per kWh				
c) **SmartCurrents Program** that offers customers a free smart thermostat for enrolling in the Dynamic Peak Pricing Rate and for agreeing to allow DTE to control your thermostat (for example, increase thermostat setpoint by 4 degrees) during critical peak event periods. You have an option to override the utility adjustment and make your own thermostat adjustments if you are uncomfortable. The Dynamic Peak Pricing rate is as follows: (see table below) The off-peak rate at 4.8 cents per kWh is a 45% discount from the standard residential electric rate of 8.7 cents per kWh.				

Rate	Time	Cost
On-Peak	Monday to Friday 3 p.m. to 7 p.m.	16.6 cents per kWh
Critical Peak Events	Not more than 14 times per year on certain weekdays 3 p.m. to 7 p.m.	95.0 cents per kWh

(Table for item c:)

Rate	Time	Cost
Off-Peak	Monday to Friday 11 p.m. to 7 a.m. and All Day Weekends and Holidays	4.8 cents per kWh (kilowatt-hour)
Mid-Peak	Monday to Friday 7 a.m. to 3 p.m. and 7 p.m. to 11 p.m.	9.2 cents per kWh
On-Peak	Monday to Friday 3 p.m. to 7 p.m.	16.6 cents per kWh
Critical Peak Events	Not more than 14 times per year on certain weekdays 3 p.m. to 7 p.m.	95.0 cents per kWh

[Radio buttons, only one response per row]	Yes, my household **participates** in the program (1)	Yes, but my household **does not** participate (2)	No (3)	Don't Know / Not Sure (4)
d) **Residential Smart Charger Support** is a part of the Charging Forward program on electric vehicles, where DTE would provide a rebate of up to $500 to electric vehicle (EV) owners who install a qualified "smart" Level 2 charger. To qualify for the rebate, a customer must enroll in a time of use (TOU) rate (for example, the whole-home TOU rate, dynamic peak pricing rate, or EV-only TOU rate), and agree to enroll in future demand response programs offered by DTE that allows DTE to control vehicle charging during peak periods. The customer will always have the option to override the signals if required/desired to do so.				

[IF UTILITY = CONSUMERS]

AWARE_DR_CONSUMERS1 Before today, have you heard of the following demand response programs offered by your utility?

[Radio buttons, only one response per row]	Yes, my household **participates** in the program (1)	Yes, but my household **does not** participate (2)	No (3)	Don't Know / Not Sure (4)
a) **Peak Power Savers Smart Thermostat Program** that offers customers an enrollment incentive ($75 for current smart thermostat owners and $175 for customers who purchase a new smart thermostat), plus a $25 incentive at the end of each season for each enrolled thermostat. Consumers syncs with a participant's smart thermostat to learn comfort preferences. On select summer and winter days when electricity demand is high, the thermostat will be adjusted to reduce energy usage. These events are limited to 14 times in summer and 10 times in winter, and rarely last more than four hours.				
b) **Peak Power Savers – Critical Peak Pricing Program** that gives a discount on standard electricity rates during nights and on weekends (called off-peak periods), with more expensive rates on weekday afternoons (called peak periods). Participants save money by shifting electricity use to off-peak periods.				

[Radio buttons, only one response per row]	Yes, my household **participates** in the program (1)	Yes, but my household **does not** participate (2)	No (3)	Don't Know / Not Sure (4)
Participants are notified to reduce electricity use during critical peak events, when electricity is much more expensive. Participants receive a 33% discount on the off-peak rate over standard rates with a critical peak rate of 95 cents per kWh. These events can occur up to 14 times per year on weekdays from June to September from 2 p.m. to 6 p.m.				
c) **Peak Power Savers – Peak Time Rewards Program** that offers customers the opportunity to earn bill credits by shifting energy use to off-peak times when costs are lower. These Energy Savings Days can occur up to 14 times per year on weekdays from June to September from 2 p.m. to 6 p.m. If you enroll in this program, you can earn 95 cents per kWh for the amount of energy reduced during Energy Savings Days.				

AWARE_DR_GENERAL Before today, have you heard of any of the following demand response program type(s) that utilities may offer to customers?

	Yes (1) **[Radio button, only one response per row]**	No (2) **[Radio button, only one response per row]**	Don't Know / Not Sure (3) **[Radio button, only one response per row]**
[If UTILITY IS NOT DTE OR CONSUMERS] a) **Bring Your Own Thermostat programs** (where customers already own the smart thermostat) offer a fixed payment per season (**typically $25 per thermostat**) for enrolling in the program and allowing the utility to remotely control the thermostat on hot summer and cold winter days, when demand for electricity is highest. The utility may also offer an upfront payment for enrolling in the program. The utility will typically control the thermostat for a limited number of hours per season (could be limited to 14 events in summer and 10 events in winter with a maximum 4-hour duration). The utility may automatically pre-cool or pre-heat the home before an event, and notify participant's in			

advance of events, with the option to opt-out of events at any time.			
[If UTILITY IS NOT DTE OR CONSUMERS] b) **Critical Peak Pricing** is an electricity rate which provides a discount on standard rates (typically 30% to 50% discount on standard rates) during nights and on weekends (called off-peak periods), with more expensive rates on weekday afternoons (called peak periods). Participants save money by shifting use to off-peak periods. Participants are notified to reduce electricity use during critical peak events, when electricity is much more expensive. The events only occur during peak periods on weekdays and are limited to a specified maximum number of occurrences and total duration per calendar year (e.g., could be 14 events in a year with maximum 56 hours of event calling). The utility may offer customers a free smart thermostat and control it to reduce energy use during critical peak events. **You could expect to save 10% on the electricity bill by enrolling in this rate in relation to your standard rate, which could translate to approximately $5 monthly bill savings per thermostat, or $25 total per thermostat for the summer season.**			
[If UTILITY IS NOT CONSUMERS] c) **Peak Time Rebates** offer customers the ability to receive a payment on reduced electricity usage during critical peak periods when electricity demand is high, and consequently electricity is more expensive. Participation is optional, and customers receive a rebate based on reduced electricity usage during the event. For example, you could **earn 95 cents per kWh for the energy reduced during the peak periods** when electricity demand is high.			

AWARE_DR_EVBTM Before today, have you heard of the below type of demand response program that other utilities may offer to customers?

Program type	Yes (1) **[Radio button, only one response per row]**	No (2) **[Radio button, only one response per row]**	Don't Know / Not Sure (3) **[Radio button, only one response per row]**
[If UTILITY IS NOT DTE] a) **Electric Vehicle Load Control programs** are offered			

Program type	Yes (1) **[Radio button, only one response per row]**	No (2) **[Radio button, only one response per row]**	Don't Know / Not Sure (3) **[Radio button, only one response per row]**
to customers who own a plug-in electric vehicle and charge at home. Participants agree to let the utility control charging from periods of high demand to periods of lower demand (nights or weekends) in exchange for an upfront payment (which could be a rebate on the smart charger), plus an ongoing participation payment from the utility.			
b) **Battery Control programs** are offered to customers with on-site battery storage systems (for example, a battery charged by an on-site solar system). Participants agree to let the utility control the charging and discharging of the battery during events when electricity demand is the highest, in exchange for an upfront payment and/or an ongoing participation payment from the utility.			

Demand Response Willingness to Participate

[If respondent doesn't already participate in a smart thermostat program (AWARE_DR_DTE1_a IS NOT = 1 and AWARE_DR_CONSUMERS1_a IS NOT = 1)]

DR_WILLINGNESS_TSTAT1 Next, consider your utility has a(n) **[Thermostat DR Option]** program that **[Thermostat Option Description]**.

How likely would your household be to participate in this type of program if you received a **[Incentive Detail]**?

1. Not at all likely
2. Slightly likely
3. Somewhat likely
4. Very likely
5. Extremely likely
6. Not sure/don't know

Thermostat Demand Response Option	Thermostat Option Description	Incentive Detail
a) **[If customer already has a smart thermostat (AWARE_DR_TSTAT = 1)]** Bring Your Own Smart Thermostat	offers customers who already own a smart thermostat a fixed payment per season for allowing the utility to remotely control the thermostat on hot summer and cold winter days when demand for electricity is highest. The utility	one-time **$75** sign-up bonus plus **$25** per season you participate for each enrolled thermostat

Thermostat Demand Response Option	Thermostat Option Description	Incentive Detail
	may also provide an upfront incentive for signing up for the program. The utility will typically control the participant's thermostat for a limited number of hours per season (limited to 14 in summer and 10 in winter with a maximum 4-hour duration). The utility may automatically pre-cool or pre-heat the home before an event and notify participants in advance of events, with the option to opt-out of events at any time.	
b) **[If customer DOES NOT already have a smart thermostat (AWARE_DR_TSTAT = 2 or 3)]** Energy Efficiency and Bring Your Own Smart Thermostat	offers customers who do not already have a smart thermostat an incentive payment to purchase one through an energy efficiency program. The utility then offers a smart thermostat demand response program in which customers receive a fixed payment per season for allowing the utility to remotely control the thermostat on hot summer and cold winter days when demand for electricity is highest. The utility will control the thermostat for a limited number of hours per season (limited to 14 events in summer and 10 events in winter with maximum 4-hour duration). The utility may automatically pre-cool or pre-heat the home before an event and notify participants in advance of events, with the option to opt-out of events at any time	a rebate of up to **$175** for the purchase of a smart thermostat (typical retail costs range from $80 to $250), and **$25 for each enrolled thermostat** per season you participate (paid at the end of each season) in the smart thermostat demand response program

[If customer already has a smart thermostat (AWARE_DR_TSTAT = 1) and DR_WILLINGNESS_TSTAT1 IS NOT = 6)]

DR_WILLINGNESS_TSTAT2 How likely would your household be to participate in a smart thermostat demand response program if you received…

	Not at all likely (1)	Slightly likely (2)	Some-what likely (3)	Very likely (4)	Extremely likely (5)	Not sure/ don't know (6)
[Lower incentive amount if DR_WILLINGNESS_ TSTAT1 = 4 or 5] a) a one-time **$50** sign-up bonus, plus **$25** per season you participate, for each enrolled thermostat?						
[Higher incentive amount if DR_WILLINGNESS_ TSTAT1 <4] b) a one-time **$100** sign-up bonus, plus **$25** per season you participate, for each enrolled thermostat?						

[If customer DOES NOT already have a smart thermostat (AWARE_DR_TSTAT DOES NOT = 1) and DR_WILLINGNESS_TSTAT1 IS NOT = 6)]

DR_WILLINGNESS_TSTAT3 How likely would your household be to participate in a smart thermostat demand response program if …

	Not at all likely (1)	Slightly likely (2)	Some-what likely (3)	Very likely (4)	Extremely likely (5)	Not sure/ don't know (6)
[Lower incentive amount if DR_WILLINGNESS_ TSTAT1 = 4 or 5] a) the utility were to offer up to a **$150 rebate** on a smart thermostat (typical retail costs range from $80 to $250) for signing up in the demand response program, plus **$25** for each enrolled thermostat per season you participate?						
[Higher incentive amount if DR_WILLINGNESS_ TSTAT1 <4] b) the utility were to offer up to a **$200 rebate** on a smart thermostat (typical retail costs range from $80 to $250) for signing up in the demand response program, plus **$25** for each enrolled thermostat per season you participate?						

[If customer does not already participate in this program type (AWARE_DR_DTE1_b IS NOT = 1 and AWARE_DR_CONSUMERS1_b IS NOT = 1)]

DR_WILLINGNESS_CPP1 Next, consider if your utility offered a Critical Peak Pricing Program which provides a discount on standard rates (typically a 30%-50% discount on standard rates) during nights and on weekends (called off-peak periods), with more expensive rates on weekday afternoons (called peak periods). Participants save money by shifting use to off-peak periods. Participants are notified to reduce electricity use during critical peak events, when electricity is much more expensive. The events only occur during peak periods on weekdays and are limited to a specified maximum number of occurrences and total duration per calendar year (e.g., could be 14 events in a year with maximum 56 hours of event calling). You could save around 10% on your electricity bill by enrolling in this rate in relation to your standard rate.

A residential customer enrolled in this rate can expect to save 10% on the electricity bill by enrolling in this rate in relation to your standard rate, which could translate to **approximately $5 monthly bill savings per thermostat or $25 total per thermostat for the summer season**.

How likely would your household be to participate in this type of Critical Peak Pricing program?

1. Not at all likely
2. Slightly likely
3. Somewhat likely
4. Very likely
5. Extremely likely
6. Not sure/don't know

[Ask if DR_WILLINGNESS_CPP1<4]
DR_WILLINGNESS_CPP_TSTAT How likely would your household be to participate in a critical peak pricing program if you received…

	Not at all likely (1)	Slightly likely (2)	Some-what likely (3)	Very likely (4)	Extremely likely (5)	Not sure/ don't know (6)
A **free smart thermostat from your utility** for agreeing to enroll in the critical peak pricing rate and **allowing the utility to control your thermostat (e.g., increase setpoint by 4 degrees) during critical peak events**. You will always have an option to override the utility adjustment and make your own adjustment if you are uncomfortable. A residential customer can **expect to save 10% on the electricity bill by enrolling in this rate in relation to your standard rate, which could translate to approximately $5 monthly bill**						

	Not at all likely (1)	Slightly likely (2)	Some-what likely (3)	Very likely (4)	Extremely likely (5)	Not sure/ don't know (6)
savings per thermostat or $25 total per thermostat for the summer season.						

[If customer does not already participate in this program type (AWARE_DR_CONSUMERS1_c IS NOT = 1)]

DR_WILLINGNESS_PTR Next, consider your utility offers a **Peak Time Rebate program** in which you earn a credit or rebate for reducing energy use during critical peak periods (up to 14 days per summer with a max. 4-hour event duration). You will be notified by text, phone, or email the day before events are called. For example, you could receive 95 cents/kWh for the energy reduced during peak periods.

By enrolling in this program, an average customer could earn around $25 per summer by reducing approximately 20% of your energy usage during peak demand periods. There is no penalty if you are unable to shift your energy usage.

How likely would your household be to participate in this type of **Peak Time Rebate** program?

1. Not at all likely
2. Slightly likely
3. Somewhat likely
4. Very likely
5. Extremely likely
6. Not sure/don't know

DR_WILLINGNESS_RES1 If your utility offered a(n) **[Residential DR Option]** program that **[Residential DR Option Description].**

How likely would your household be to participate in this type of program?

1. Not at all likely
2. Slightly likely
3. Somewhat likely
4. Very likely
5. Extremely likely
6. Not sure/don't know

Residential DR Option [Randomized option choice, hide lettering from respondent:]	Residential DR Option Description
If respondent doesn't already participate in DTE's EV program (AWARE_DR_DTE1_d IS NOT = 1) a) Electric Vehicle (EV) Load Control	offers customers who own and charge a plug-in electric vehicle at home an upfront payment (such as a rebate on a smart charger), plus an ongoing participation payment in exchange for allowing the utility to shift charging from periods of high demand (typically weekday afternoons) to nights or weekends
b) Battery Control	offers customers with on-site battery storage systems (e.g., a battery charged by an on-site solar system or a standalone battery) an upfront payment and/or an ongoing participation payment in exchange for allowing the utility to discharge the battery during peak demand periods.

COVID-19 Impacts

COVID_EWR How has the COVID-19 pandemic impacted your household's decision-making around <u>energy efficiency upgrades</u>? We are…

1. Much ***less*** likely to pursue energy efficiency upgrades
2. Slightly ***less*** likely to pursue energy efficiency upgrades
3. Just as likely to pursue energy efficiency upgrades (i.e., there has been little or no impact)
4. Slightly ***more*** likely to pursue energy efficiency upgrades
5. Much ***more*** likely to pursue energy efficiency upgrades

COVID_DR How has the COVID-19 pandemic impacted your household's decision-making around <u>demand response programs</u> that reward electricity customers for voluntarily agreeing to reduce energy usage during periods of high electricity demand? We are…

1. Much ***less*** likely to pursue demand response participation
2. Slightly ***less*** likely to pursue demand response participation
3. Just as likely to pursue demand response participation (i.e., there has been little or no impact)
4. Slightly ***more*** likely to pursue demand response participation
5. Much ***more*** likely to pursue demand response participation

Recent Energy Use Actions

ACTIONS Which of the following **energy-efficient** products have you installed in the last 12 months, if any? Please select all that you have installed. **[Randomize Response Options]**

1. LED lighting
2. Advanced Smart (Tier 2) Power Strip
3. Smart thermostat
4. Occupancy Sensor

5. Low-flow Showerhead
6. Low-flow Faucet Aerator
7. Heat Pump Water Heater
8. ENERGY STAR Mini-split Heat Pump
9. Heat Pump Clothes Dryer
10. Air Sealing
11. ENERGY STAR Front-Loading Clothes Washer
12. Home insulation
13. High Efficiency Storage Tank Water Heaters
14. High Efficiency Tankless Water Heater
15. Hot water pipe insulation
16. None

Decision Factors

DECISIONS How important are the following factors in **driving the decisions you make about energy-consuming equipment** in your home? Please rank each factor on a scale of 1 to 5 with 1 being “not at all important” and 5 being “very important”. **[Randomize response options.]**

1. Desire to test new technologies
2. Environmental issues such as climate change, pollution and waste
3. Reduce the need for additional power plants and support grid reliability
4. Financial considerations (ability to earn investment money back quickly though energy bill savings)
5. The amount of money the technology will save me
6. Support my community and/or state’s energy initiatives
7. Advanced features or settings like internet connectivity, remote control from a tablet or smartphone, etc.
8. The availability of incentives and rebates

Barriers

BARRIERS Which of the following factors are likely to **prevent** your household from taking action on the way you consume energy in your home, including installation of energy efficient equipment or participation in demand response programs? Please rank each factor on a scale of 1 to 5 with 1 being “not at all likely to prevent…” and 5 being “extremely likely to prevent”. **[Randomize response options.]**

1. Limited information about costs and benefits
2. Ability to find a skilled and/or trusted equipment installers
3. Potential for disruption during equipment installation
4. Lack of access to energy efficient products in local stores or from local contractors
5. I have limited time, attention or ability to seek out information about energy efficient technology or utility demand response programs
6. Lack of trust in the available information
7. The upfront cost of higher efficiency technologies or equipment
8. Limited or no access to financing options like a credit card, store credit account, or loan to purchase the new appliance/measure

Demographics

BASELINE1 What type of system(s) do you use to <u>heat</u> your home? Please select the **primary** system that you use.

1. Natural gas boiler
2. Natural gas furnace
3. Electric furnace
4. Air source heat pump
5. Dual-fuel heat pump (ASHP with natural gas furnace backup)
6. Ground source heat pump
7. Variable refrigerant flow heat pump
8. Packaged terminal heat pump
9. Ductless mini-split heat pumps
10. Other: please describe:_____________
11. Don't know
12. Prefer not to say

BASELINE2 What type of <u>water heater(s)</u> do you use at your home? Please select the **primary** water heater that you use.

1. Electric tankless water heater
2. Electric water heater with storage tank
3. Natural gas tankless water heater
4. Natural gas water heater with storage tank
5. Heat pump water heater
6. Other: please describe:_____________
7. Don't know
8. Prefer not to say

DEM1. Including yourself, how many people lived in your home during the past 12 months?

1. Number of people (1-12): ___________________________ **[Only allow whole numbers 1-12]**
2. 13 or more
3. Prefer not to answer

DEM2. In what year were you born?

1. Year born (1900 – 2003), specify year: ______ **[Only allow four-digit numbers between 1900-2003]**
2. Don't know
3. Prefer not to answer

DEM3. Which of the following best describes your home?

1. Single-family detached home
2. Single-family attached home such as townhouse or row house
3. Apartment or condominium
4. Mobile (manufactured) home
5. Other, please specify:

DEM4. Approximately how many square feet is your residence?

1. Less than 1,000 sq. ft.
2. Between 1,000 and 1,999 sq. ft.
3. Between 2,000 and 2,999 sq. ft.
4. Between 3,000 and 3,999 sq. ft.
5. Between 4,000 and 4,999 sq. ft.
6. Greater than 5,000 sq. ft.
7. Don't know

DEM5. What is the last grade of school you completed?

1. Grade school or less (1–8)
2. Some high school (9–11)
3. Graduated high school (12)
4. Vocational/technical school
5. Some college (1–3 years)
6. Graduated college (4 years)
7. Post graduate education
8. Prefer not to answer

DEM6. How would you describe your race or ethnicity?

1. Caucasian (or White)
2. African American (or Black)
3. Arab American
4. Latino (or Hispanic)
5. Asian descent
6. Native American/Indian
7. Other, please specify: ____
8. Prefer not to answer

DEM7. What was your <u>total family income</u> was in 2020 before taxes and including Social Security or other payments?

1. Less than $10,000
2. $10,000 to just under $20,000
3. $20,000 to just under $30,000
4. $30,000 to just under $40,000
5. $40,000 to just under $50,000
6. $50,000 to just under $60,000
7. $60,000 to just under $70,000
8. $70,000 to just under $80,000
9. $80,000 to just under $90,000
10. $90,000 to just under $100,000
11. $100,000 to just under $150,000
12. $150,000 or more
13. Don't know
14. Prefer not to answer

Close

CLOSE1 Those are all the questions we have, thank you for your help! Would you like to receive the $15 e-gift card or online debit card, or credit to donate to a charitable organization, at **[Email]** or at another email address? You will receive the gift card within 4 to 6 weeks of survey completion.

1. Yes, please send the gift card to **[Email]**
2. Please send the credit for the e-gift card, online debit card or charitable donation to another email address (please specify): **[OPEN ENDED, require valid email address]**
3. No thanks, I do not wish to either receive or donate the gift card

CLOSE2 This concludes the survey. The Michigan Public Service Commission thanks you for your participation in this survey. If you have any questions about the survey or how your responses will be used please reach out to us at Michigan.EnergyStudy@guidehouse.com.

Michigan Energy Waste Reduction and Demand Response 2021 to 2040 Potential Study – Commercial and Industrial Survey

Prepared for:

LARA
MPSC

State of Michigan Public Service Commission

Submitted by:

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March 5, 2021

Table of Contents

Commercial and Industrial Survey Overview

The primary objective of this survey is to collect information on customer awareness and willingness to pay for EWR and DR measures from MI commercial and industrial utility customers. Guidehouse will use the survey results to inform the development of market acceptance and adoption forecasts. Additional secondary research objectives, included in the table below, have been incorporated into the survey to provide datapoints the research team will use to guide calibration of the EWR and DR potential models.

Topic	Survey Questions
Introduction	INTRO1 – INTRO2
EWR Awareness	AWARE_EWR_LOW – AWARE_EWR_HIGH
EWR Willingness to Pay	EWR_WILLINGNESS_LOW – EWR_WILLINGNESS_HIGH
DR Awareness	AWARE_DR_TSTAT – AWARE_DR_BTM
DR Willingness to Participate	DR_WILLINGNESS_LARGE1 – WILLINGNESS_DR_BTM
COVID-19 Impacts	COVID_EWR – COVID_DR
Recent Energy Use Actions	ACTIONS1 – ACTIONS2
Decision Factors	DECISIONS
Barriers	BARRIERS
Firmographics	FIRM1 – FIRM4
Close	CLOSE1 – CLOSE2

Sample Variables

This table presents the sample file variables required for fielding.

Survey Variables	Description	Source
UTILITY	The customer's utility company	Utility tracking data
CUSTOMER SIZE	SMALL = annual energy use $\leq$ 1.2 GWh (approximately $65,000/year for gas and electric bills combined) LARGE = annual energy use > 1.2 GWh (approximately $65,000/year for gas and electric bills combined)	Survey screener question

Sample

This table outlines Guidehouse's sampling techniques.

Topic	Description	Population
Sample size	What is the target number of completes?	500 completes
Stratification	Is the sample stratified?	The sample will be designed to achieve a proportionate mix of customers from each utility and will be stratified by Upper and Lower Peninsula.

Topic	Description	Population
Incentives	Any incentives or persuasion techniques?	$25; customers will be offered an incentive through Tango[1] which allows customers to select an e-gift card from a participating retailer or restaurant (including Amazon.com, CVS or Dunkin' Donuts and more) or an online debit card (Visa® or MasterCard®). Customer's may also choose to donate $25 to a charitable organization instead of receiving the gift card.

[1] https://www.tangocard.com/

Invitation Emails

Initial Invitation Email

Dear __________,

Guidehouse, on behalf of the Michigan Public Service Commission, is conducting a study to help understand energy decision-making in Michigan and invites you to complete a brief survey. Your responses will help improve energy-related programs offered by your utility provider that assist business customers in saving energy and money. Respondents who complete the survey will be offered a **$25 e-gift or online debit card,** or can choose to donate $25 to a charitable organization.

Please take the survey using the link below; we recommend completing the survey on a laptop or computer if possible.

[Insert survey link]

Your participation in this survey is anonymous and voluntary. Your individual answers will remain confidential and reported only in the aggregate. The survey will take about 15 minutes.

If you have any questions about this survey or how your responses to this survey will be used, please contact us at Michigan.EnergyStudy@guidehouse.com.

Sincerely,

Guidehouse

First Reminder Email

Dear __________,

Guidehouse, on behalf of the Michigan Public Service Commission, recently invited you to complete a 15-minute survey to help improve energy-related programs offered by your utility provider that assist business customers in saving energy and money, and ultimately benefit the environment.

As a token of appreciation for completing this survey, respondents who complete the survey will be offered a **$25 e-gift or online debit card,** or can choose to donate $25 to a charitable organization.

Please take the survey using the link below; we recommend completing the survey on a laptop or computer if possible.

[Insert survey link]

Your participation in this survey is anonymous and voluntary. Your individual answers will remain confidential and reported only in the aggregate.

If you have any questions about this survey or how your responses to this survey will be used, please contact us at Michigan.EnergyStudy@guidehouse.com.

Sincerely,

Guidehouse

Second Reminder Email

Dear __________,

Guidehouse, on behalf of the Michigan Public Service Commission, recently invited you to complete a 15-minute survey to help improve energy-related programs offered by your utility provider that assist business customers in saving energy and money, and ultimately benefit the environment. This survey will be closing on **[Date]**; don't miss out on this opportunity to contribute!

As a token of appreciation for completing this survey, respondents who complete the survey will be offered a **$25 e-gift or online debit card,** or can choose to donate $25 to a charitable organization.

Please take the survey using the link below; we recommend completing the survey on a laptop or computer if possible.

[Insert survey link]

Your participation in this survey is anonymous and voluntary. Your individual answers will remain confidential and reported only in the aggregate.

If you have any questions about this survey or how your responses to this survey will be used, please contact us at Michigan.EnergyStudy@guidehouse.com.

Sincerely,

Guidehouse

Survey Body

Introduction

INTRO1 In this survey we will ask you about your awareness of different energy-related technologies and utility programs, and decision-making around energy use at your business. If you are not the best person to answer these questions, please ask a colleague who makes decisions about your business's energy usage and/or capital investments to complete this survey. Note that you will need to complete the entire survey to receive your **$25 e-gift or online debit card**, or to donate the $25 to a charitable organization.

INTRO2 Are your combined gas and electric utility bills more than $65,000 per year, approximately? If you are unsure, please respond with your best guess.

1. Yes
2. No

[If YES set respondent as CUSTOMER SIZE = LARGE; if NO set respondent as CUSTOMER SIZE = SMALL.]

Lighting Baseline

The first part of the survey will ask for additional information about the lighting in your building. If you need to finish the survey at a later time or switch to a different mobile device, you can return to this point in the survey by clicking the link in the email you received. All your survey progress will have been saved.

LIGHTING1 How many **total lamps** do you have installed within the light fixture types listed below in your building (***excluding*** any bulbs found in unconditioned exteriors structures such as a garage), if any? Please estimate the total number of lamps, *not* the total number of fixtures; the fixture is the device that houses individual lamps. **[Matrix-style question; answer categories will vary by overall building size; example images will be provided]**

[Answer categories if CUSTOMER SIZE = SMALL (INTRO2 =2)]	**None**	**1-25**	**26-100**	**101-200**	**201-300**	**301-400**	**401-500**	**501-600**	**601-700**	**>700**
[Answer categories if CUSTOMER SIZE = LARGE (INTRO2 =1)]	**None**	**1-50**	**51-250**	**251-500**	**501-750**	**751-1,000**	**1,001-1,250**	**1,251-1,500**	**1,501-1,750**	**>1,750**
a. In a high bay fixture										
b. In a troffer (a modular ceiling grid fixture)										
c. In a fixture or lamp that accepts regular screw-in bulbs (A-shape or reflectors)										

d. In a downlight fixture (recessed "can light")										
e. In other interior light fixture types										

[If LIGHTING1_a DOES NOT=None]

LIGHTING2 Approximately what percentages of the **high bay fixtures** in this building fall into the following bulb type categories? **[CONSTANT SUM SLIDER (see example), MUST SUM TO 100%]**

1. Linear fluorescent (e.g., T5, T8, T12)
2. Linear LED
3. Round LED
4. Round metal halide
5. Round Induction

[If LIGHTING1_b DOES NOT=None]
LIGHTING3 Approximately what percentages of the **troffers** at your business fall into the following bulb type categories? **[CONSTANT SUM SLIDER (see example above), MUST SUM TO 100%]**

1. Linear fluorescent (e.g., T5, T8, T12)
2. LED

[If LIGHTING1_c DOES NOT=None]
LIGHTING4 Approximately what percentages of the **interior screw-in lamps** (standard A-shape and reflectors) at your business fall into the following lamp type categories? **[CONSTANT SUM SLIDER (see example above), MUST SUM TO 100%]**

1. LED
2. CFL
3. Halogen
4. Incandescent

[If LIGHTING1_d DOES NOT=None]
LIGHTING5 Approximately what percentages of the **downlight lamps** at your business fall into the following

lamp type categories? **[CONSTANT SUM SLIDER (see example above), MUST SUM TO 100%]**

1. LED
2. CFL
3. Halogen
4. Incandescent

[If LIGHTING1_e DOES NOT=None]

LIGHTING6 Approximately what percentages of the **other interior lighting** at your business fall into the following lamp type categories? **[CONSTANT SUM SLIDER (see example above), MUST SUM TO 100%]**

1. LED
2. CFL
3. Halogen
4. Incandescent
5. High pressure sodium
6. Metal halide

LIGHTING7 Approximately how many **exterior light fixtures** of the following types are there at your business? **[Example images will be provided]**

	None	1-5	6-10	11-25	26-50	51-75	76-100	>100
Error! Reference source not found.a. Exterior wall packs								
Error! Reference source not found.b. Parking garage or parking lot fixtures/ wall packs								
Error! Reference source not found.c. Exterior canopy fixtures								

[Ask if LIGHTING7 DOES NOT = None]

LIGHTING8 What percentage of the **exterior lighting** at your business falls into the following lamp type categories? Please think about flood lights, garage lighting, parking lot lighting, etc. **[CONSTANT SUM SLIDER, MUST SUM TO 100%]**

1. LED
2. High pressure sodium
3. Mercury vapor
4. Metal halide
5. Halogen
6. CFL
7. Incandescent
8. Halogen
9. Linear fluorescent (e.g., T5, T8, T12)
10.

Energy Efficiency Awareness

AWARE_EWR_LOW **[Low Cost Measure Reference Table. ROTATE, 1 MEASURE PER RESPONDENT]**

[low cost measure description_1]. Before today, were you familiar with **[low cost measure_2]?**

1. Yes
2. No

Low Cost Measure Reference Table			
Measure	**Low Cost Measure Description_1**	**Low Cost Measure_2**	**Photo**
LED Lighting	LEDs use less energy, last longer, are more durable, and offer comparable or better light quality than other types of lighting. This includes LED A line, reflector lamps, general purpose LEDs, downlights, linear LEDs etc.	LED lighting	
Indoor Occupancy Sensor	An occupancy sensor is a motion detecting device used to detect the presence of a person to automatically control lights.	indoor occupancy sensors	
Advanced Smart (Tier 2) Power Strip	Advanced smart (Tier 2) power strips have a master and switched plugs. When the master plug (Personal Computer or a TV) is on, the switched outlets are powered on. When the master plug (Personal Computer or a TV) is switched off, the switched outlets and peripherals are powered off. In addition, this power strip has a motion sensor, like those for lights, that turns the master switch off if someone leaves the room for an extended period.	advanced smart (Tier 2) power strips	
LED Pole/Arm Mounted	Exterior LED parking lot lighting fixtures can be mounted on a pole or extension arm.	pole/arm mounted LEDs	

Low Cost Measure Reference Table			
Measure	**Low Cost Measure Description_1**	**Low Cost Measure_2**	**Photo**
Daylight Dimming Control	Daylighting control systems dim indoor lighting in response to interior daylight levels.	daylighting controls	
Low-flow Faucet Aerator	A low-flow faucet aerator can be added to an existing faucet, saving both water and water heating costs with little to no impact on the user.	low-flow faucet aerators	
System with Smart thermostat	A Smart thermostat lets users remotely modify heating and cooling settings such as setpoints and schedule, or turn the unit on or off, from a mobile device or website. The system is defined as being the heating and cooling system, comprising heating, ventilation and air conditioning.	smart thermostats	
Demand Controlled Ventilation	Demand controlled ventilation is an HVAC control method that automatically adjusts fan speeds and fresh air intake in response to changes in occupancy.	demand controlled ventilation	
Steam Trap	Steam traps minimize steam waste to reduce energy consumption and cut costs.	steam traps	

AWARE_EWR_HIGH **[High Cost Measure Reference Table. ROTATE, 1 MEASURE PER RESPONDENT]**

[high cost measure description_1]. Before today, were you familiar with **[high cost measure_2]**?

1. Yes
2. No

High Cost Measure Table			
Measure	**High Cost Measure Description_1**	**High Cost Measure_2**	**Photo**
Advanced Controls and Automation	Advanced Controls and Automation include smart thermostats, building automation systems, and demand control ventilation.	advanced controls and building automation	
Heat Pump Water Heater	Heat pumps use electricity to move heat from one place to another instead of generating heat directly. **Heat pump water heaters** pull heat from the surrounding air and transfer it -- at a higher temperature -- into a tank to heat water.	heat pump water heaters	
Variable Frequency Drive (VFD)	Variable Frequency Drives (VFDs) control the frequency and voltage of power supplied to a motor and save electricity by allowing the motor to run at partial speed to better match the load. Typical applications include fans, pumps, and dynamic process loads.	VFDs	
ENERGY STAR Servers and Storage Devices	Computer servers and storage equipment that are ENERGY STAR certified use less electricity from reducing energy waste in the power infrastructure (e.g., power distribution unit, uninterruptible power supply) and reducing 24/7 energy needed to cool the waste heat produced by data storage.	ENERGY STAR servers and storage devices	

High Cost Measure Table			
Measure	**High Cost Measure Description_1**	**High Cost Measure_2**	**Photo**
Equipment Optimization	Equipment optimization is the process of reducing energy consumption through fine-tuning equipment operation (including HVAC equipment, compressed air systems, motors, pumps, and advanced equipment controls).	equipment optimization	
Efficient Equipment Upgrades	Replacing existing equipment can reduce energy use when upgrading to efficient equipment such as higher efficiency furnaces, boilers, and chillers, and installing higher efficiency motors and pumps.	efficient equipment upgrades	

Energy Efficiency Willingness to Pay

EWR_WILLINGNESS_LOW Suppose an energy efficiency project does not have any adverse impacts on the QUALITY of lighting, heating, and cooling in your business, but reduces the amount of energy consumed. An example might be an LED lighting retrofit.

Would you generally pursue an energy efficiency project where the cost to you after utility rebates is $5,000 if the project provided an annual energy bill savings of **[Annual Energy Bill Savings]** , and a **[Suggested payback period]** payback (that is, in about **[Suggested payback period]** the money you would save in energy costs would be greater than the extra cost for the energy efficiency technology)?

Annual Energy Bill Savings [Randomized option choice, hide lettering from respondent:]	**Suggested payback period**	Yes (1) **[Radio button, only one response per row]**	No (2) **[Radio button, only one response per row]**	Don't Know / Not Sure (3) **[Radio button, only one response per row]**
a) $7,500 per year	less than a year			
b) $5,000 per year	1 year			
c) $3,750 per year	16 months			
d) $2,500 per year	2 years			
e) $1,250 per year	4 years			
f) $1,000 per year	5 years			
g) $500 per year	10 years			

[Depending on the response, eliminate answer options not possible and ask the next possible option. Example: The respondent answers No to answer option f) $1,000 per year. The No response means options f) through g) can be removed. Ask the next possible option starting with e) and proceeding through a) until the respondent answers yes.]

EWR_WILLINGNESS_HIGH Suppose an energy efficiency project does not have any adverse impacts on the QUALITY of lighting, heating, and cooling in your business, but reduces the amount of energy consumed and MAY result in some inconvenience (for example: obtaining project estimates, selecting and overseeing a contractor for the installation). An example might be installing a Variable Frequency Drive (VFD), building automation system or a high efficiency boiler.

Would you generally pursue an energy efficiency project where the cost to you after utility rebates is $25,000 if the project provided an annual energy bill savings of **[Annual Energy Bill Savings]**, and a **[Suggested payback period]** payback (that is, in about **[Suggested payback period]** the money you would save in energy costs would be greater than the extra cost for the energy efficiency technology)?

Annual Energy Bill Savings [Randomized option choice, hide lettering from respondent:]	**Suggested payback period**	Yes (1) **[Radio button, only one response per row]**	No (2) **[Radio button, only one response per row]**	Don't Know / Not Sure (3) **[Radio button, only one response per row]**
a) $37,500 per year	less than a year			
b) $25,000 per year	1 year			
c) $12,500 per year	2 years			
d) $8,333 per year	3 years			
e) $5,000 per year	5 years			
f) $2,500 per year	10 years			

[The respondent is randomly shown an Annual Energy Bill Savings option. Depending on the response (Yes or No) the respondent is asked the next possible option. This process is continued until the respondent gets to the highest or lowest possible value or they provide an opposite response to their initial Yes or No response. Example: The respondent answers No to answer option e) $5,000 per year. Ask the next possible option starting with d) and proceeding through a) until the respondent answers yes or they reach the highest value.]

DR Program Awareness

[IF CUSTOMER SIZE = SMALL (INTRO2=2)]

Next, we have a few questions about your awareness of Demand Response programs that electric utilities offer or could potentially offer to business customers.

Demand Response programs reward electricity customers for voluntarily agreeing to reduce energy usage during periods of high electricity demand, which helps keep electricity costs down and allows your utility to supply reliable power at a more affordable rate to all customers.

If you sign up for a Demand Response program offered by your utility, the utility would control your air conditioning and/or heating system energy use during high (peak) demand periods (referred to as “demand response events”) for a limited time (usually less than 4 hours), by automatically adjusting your thermostat during those periods. Your usage would be controlled only for a certain maximum number of days in a season (for example, 10 days maximum in the summer). You can opt-out if you are unable to reduce your energy use during these periods.

An electric utility rewards Demand Response program participants by paying a fixed and/or variable incentive each summer. Additionally, the utility may offer a one-time incentive for enrolling in the program.

Alternatively, you could also be placed on an electricity rate that gives you a discount on your current rate during off-peak times (typically nights and weekends) but is more expensive during on-peak times (weekday afternoons). You may be eligible to get a free smart thermostat from your utility, which will be controlled by the utility to reduce your electricity demand during certain critical peak events periods when electricity is much more expensive.

[IF CUSTOMER SIZE = LARGE (INTRO2=1)]

Next, we have a few questions about your awareness of Demand Response programs that electric utilities offer or could potentially offer to commercial and industrial customers.

Demand Response programs reward electricity customers for voluntarily agreeing to reduce energy usage during periods of high electricity demand, which helps keep electricity costs down and allows your utility to supply reliable power at a more affordable rate to all customers.

If you sign up for a Demand Response program offered by your utility, the utility will call events where you are asked to reduce your electricity usage. Usually there is a maximum number of days you’d be asked to reduce your energy usage in a season. Under some program designs, you can nominate a certain level of load reduction before the season begins. You select a load reduction amount that would not impact your business operations and get paid for being on standby, even if no event occurs. Additionally, you get paid for the actual energy reduction during an event. The utility may also offer you a choice to enroll in another type of Demand Response program where you are not required to nominate a fixed load reduction amount, but can instead voluntarily reduce your energy use when called and get paid for the actual energy reduced during an event.

Alternatively, you could also be placed on an electricity rate that gives a discount on your current rate during nights and on weekends (off-peak times), but is more expensive on weekday afternoons (peak times), therefore incentivizing you to shift your energy use to off-peak times.

[IF CUSTOMER SIZE = SMALL (INTRO2=2)]

AWARE_DR_TSTAT Utilities typically control space cooling/heating energy use during Demand Response events using a smart thermostat. A smart thermostat learns your patterns and offers the ability to control it from anywhere. Does your business use smart thermostats to control HVAC usage?

1. Yes
2. No
3. Don’t Know/Not Sure

[IF UTILITY = DTE AND CUSTOMER SIZE = SMALL (INTRO2=2)]

AWARE_DR_SMALL_DTE Before today, have you heard of the following demand response programs offered by your utility?

<table>
<tr><th>[Radio buttons, only one response per row]</th><th>Yes, my business participates in the program
(1)</th><th>Yes, but my business does not participate
(2)</th><th>No
(3)</th><th>Don't Know / Not Sure
(4)</th></tr>
<tr><td>a) Smart Savers Program that offers customers who own a smart thermostat a $20 incentive per thermostat at the end of each summer in exchange for allowing DTE to make minor, short-term adjustments to a participant's thermostat to reduce energy use during periods of peak (high) demand for electricity. Participants can anticipate at least one adjustment, and a maximum of up to 10 adjustments, per summer. Peak demand periods for adjustments typically occur on especially hot days. Adjustments will occur on non-holiday weekdays.</td><td></td><td></td><td></td><td></td></tr>
<tr><td>b) Dynamic Peak Pricing Rate is an electricity rate which provides a discount on standard rates (typically 30% to 50% discount on standard rates) during night and on weekends (called off-peak periods), with more expensive rates on weekday afternoons (called peak periods). Participants save money by shifting use to off-peak periods. Participants are notified to reduce electricity use during critical peak events, when electricity is much more expensive. The events only occur on weekdays from 3 p.m. to 7 p.m. and are limited to a maximum of 14 occurrences (56 hours) per calendar year.
Here is summary of the rates:
<table>
<tr><th>Rate</th><th>Time</th><th>Cost</th></tr>
<tr><td>Off-Peak</td><td>Monday-Friday
11 p.m. to 7 a.m.
All Day Weekends and Holidays</td><td>4.8 cents/kWh</td></tr>
<tr><td>Mid-Peak</td><td>Monday-Friday
7 a.m. to 3 p.m.
and
7 p.m. to 11 p.m.</td><td>9.2 cents/kWh</td></tr>
<tr><td>On-Peak</td><td>Monday-Friday
3 p.m. to 7 p.m.</td><td>16.6 cents/kWh</td></tr>
<tr><td>Critical Peak Events</td><td>Not more than 14 times per year on certain weekdays

3 p.m. to 7 p.m.</td><td>95.0 cents/kWh</td></tr>
</table></td><td></td><td></td><td></td><td></td></tr>
</table>

[IF UTILITY = CONSUMERS AND IF CUSTOMER SIZE = LARGE (INTRO2=1)]

AWARE_DR_LARGE_CONSUMERS Before today, have you heard of these demand response programs offered by your utility?

[Radio buttons, only one response per row]	Yes, my business **participates** in the program (1)	Yes, but my business **does not participate** (2)	No (3)	Don't Know / Not Sure (4)
a) **C&I Demand Response program (capacity plus energy payment)** that offers customers a capacity payment of $25/kW-yr., plus an energy payment of 5 cents/kWh. You nominate a certain fixed amount of load reduction and receive the $25/kW-yr. incentive on the nominated amount for being on call, regardless of whether events are called. In addition, you are compensated at 5 cents/kWh for every hour of each event dispatch, based on your actual reduction. Consumers Energy calls events **during grid emergencies**. You are **required to participate once you sign up for the program**. A 200-kW load reduction nomination could result in $5,500 annual compensation from your utility.				
b) **C&I Demand Response program (energy payment only)** that offers customers an incentive of 30 cents/kWh for every hour of each event dispatch, based on your actual load reduction during an event. Consumers Energy calls events **when electricity prices are high**. Participation in events is **optional.** A 200-kW average load reduction during DR events could result in $2,500 annual compensation from your utility.				

[IF CUSTOMER SIZE = SMALL (INTRO2=2)]

AWARE_DR_SMALL_GENERAL Before today, have you heard of any of the following demand response program type(s) that utilities may offer to customers?

	Yes (1) **[Radio button, only one response per row]**	No (2) **[Radio button, only one response per row]**	Don't Know / Not Sure (3) **[Radio button, only one response per row]**
[If UTILITY IS NOT DTE] a) **Bring Your Own Thermostat programs** (where customers already own the smart thermostat) offer a fixed payment per season (**typically $25 per thermostat**) for enrolling in the program and allowing the utility to remotely control the thermostat on hot summer and cold winter days, when demand for electricity is highest. The utility may also offer an upfront payment for enrolling in the program. The utility will typically control the thermostat for a limited number of hours per season (could be limited to 14 events in summer and 10 events in winter with a maximum 4-hour duration). The utility may automatically pre-cool or pre-heat the home before an event, and notify participants in advance of events, with the option to opt-out of events at any time.			
[If UTILITY IS NOT DTE] **b) Critical Peak Pricing** is an electricity rate which provides a discount on standard rates (typically 30%-50% discount on standard rates) during nights and on weekends (called off-peak periods), with more expensive rates on weekday afternoons (called peak periods). Participants save money by shifting use to off-peak periods. Participants are notified to reduce electricity use during critical peak events, when electricity is much more expensive. The events only occur during peak periods on weekdays and are limited to a specified maximum number of occurrences and total duration per calendar year (e.g., could be 14 events in a year with maximum 56 hours of event calling). The utility may offer customers a free smart thermostat and control it to reduce energy use during critical peak events. **You could save around 10% or more on your electricity bill by enrolling in a discounted rate of 4.8 cents/kWh in relation to your standard rate of 8.6 cents/kWh** with a **critical peak price 95 cents/kWh that is approximately 6 times.**			

[IF CUSTOMER SIZE = LARGE (INTRO2=1)]

AWARE1_DR_LARGE_GENERAL Before today, have you heard of any of the following demand response program type(s) that utilities may offer to customers?

	Yes (1) **[Radio button, only one response per row]**	No (2) **[Radio button, only one response per row]**	Don't Know / Not Sure (3) **[Radio button, only one response per row]**
[If UTILITY IS NOT CONSUMERS] a) **Capacity Bidding program** that offers customers a fixed capacity payment (e.g., $25/kW-year) for nominating to reduce a certain amount of load when demand response events are called. You receive this incentive on the nominated amount for being on call, regardless of whether events are called. In addition, you are compensated for every hour of each event dispatch, based on your actual load reduction during an event (e.g., 5 cents/kWh). You are **required to participate once you sign up for the program**. You may be called for a certain maximum number of hours (e.g., 40 hours) in total over summer with individual event duration not exceeding 4 hours. **A 200 kW load reduction nomination could result in almost $5,500 annual compensation from your utility.**			
[If UTILITY IS NOT CONSUMERS] b) **Demand Bidding program** that offers customers payment for reducing energy consumption during peak periods when demand response events are called. Participants may be called to reduce demand for a maximum of 40 hours throughout the summer. Participation is optional, and participants receive an energy payment ($/kWh) based on actual energy reduction during the event. For example, you could be paid at 30 cents/kWh for reducing energy during an event. Participation in events is **optional**. **A 200 kW average load reduction during DR events could result in almost $2,500 annual compensation from your utility.**			
[FOR ALL UTILITIES] **c) Critical Peak Pricing** is an electricity rate which provides a discount on standard rates (typically 30%-50% discount on standard rates) during nights and weekends (called off-peak periods), with more			

	Yes (1) **[Radio button, only one response per row]**	No (2) **[Radio button, only one response per row]**	Don't Know / Not Sure (3) **[Radio button, only one response per row]**
expensive rates on weekday afternoons (called peak periods). Participants save money by shifting use to off-peak periods. Participants are notified to reduce electricity use during critical peak events, when electricity is much more expensive. The events only occur on weekdays (typically from 3 p.m. to 7 p.m.) and are usually limited to a maximum of 14 occurrences (56 hours) per calendar year. **You could save around 10% or higher on your electricity bill by enrolling in this rate in relation to your standard rate.**			

[ALL UTILITIES AND ALL BUSINESS SIZES]

AWARE_DR_BTM Before today, have you heard of this type of demand response program that utilities may offer to customers?

Program category	Yes (1) **[Radio button, only one response per row]**	No (2) **[Radio button, only one response per row]**	Don't Know / Not Sure (3) **[Radio button, only one response per row]**
Battery programs are offered to customers with on-site battery storage systems (e.g., a battery charged by an on-site solar or standalone batteries). Participants agree to let the utility control the charging and discharging of the battery during events when electricity demand is the highest, in exchange for an upfront payment and/or an ongoing participation payment from the utility.			

Demand Response Willingness to Participate

[If respondent doesn't already participate in a capacity or demand bidding program (AWARE_DR_LARGE_CONSUMERS_a IS NOT = 1 and AWARE_DR_LARGE_CONSUMERS_b IS NOT = 1) and CUSTOMER SIZE = LARGE (INTRO2 = 1)]

DR_WILLINGNESS_LARGE1 Which program would your business be more likely to enroll in if offered by your utility? Please select one.

1. **Capacity bidding programs:** Participants receive a fixed capacity payment (e.g., $25/kW-yr.) for nominating to reduce a certain amount of load when demand response events are called. You receive this incentive on the nominated amount for being on call, regardless of whether events are called. In addition, you are compensated for every hour of each event dispatch, based on your actual load reduction during an event (e.g., 5 cents/kWh). You are **required to participate once you sign up for the program**. You may be called for a certain maximum number of hours (e.g., 40 hours) in total over summer with individual event duration not exceeding 4 hours.
2. **Demand bidding programs:** Participants receive a payment for reducing energy consumption during peak periods when demand response events are called. Participants may be called to reduce demand for a maximum of 40 hours throughout the summer. Participation is optional, and participants receive an energy payment ($/kWh) based on actual energy reduction during the event. For example, you could be paid at 30 cents/kWh for reducing energy during an event. Participation in events is **optional**.

[If respondent doesn't already participate in a capacity or demand bidding program (AWARE_DR_LARGE_CONSUMERS_a IS NOT = 1 and AWARE_DR_LARGE_CONSUMERS_b IS NOT = 1) and CUSTOMER SIZE = LARGE (INTRO2 = 1)]

DR_WILLINGNESS_LARGE2 How likely would your business be to participate in this type of **[Large CI DR Option]** program if you received a **[Incentive Detail]**?

1. Not at all likely
2. Slightly likely
3. Somewhat likely
4. Very likely
5. Extremely likely
6. Not sure/don't know

Large CI DR Option	Incentive Detail
[If more likely to participate in a Capacity Bidding Program (DR_WILLINGNESS_ LARGE1 = 1)] a) Capacity Bidding Program	$25/kW capacity payment for committed load reduction, plus an additional 5 cents/kWh for your actual reduction during the event **A 200 kW load reduction nomination could result in $5,500 annual compensation from your utility.**
[If more likely to participate in a Demand Bidding Program (DR_WILLINGNESS_ LARGE1 =2)] b) Demand Bidding Program	30 cents/kWh payment based on your actual reduction during the event **A 200 kW average load reduction during DR events could result in $2,500 annual compensation from your utility.**

[If respondent is more likely to participate in capacity bidding (DR_WILLINGNESS_LARGE1 = 1 and DR_WILLINGNESS_LARGE2 IS NOT = 6)]

DR_WILLINGNESS_LARGE3

How likely would your business be to participate in this type of a **Capacity Bidding** program if you received a…

	Not at all likely (1)	Slightly likely (2)	Some-what likely (3)	Very likely (4)	Extremely likely (5)	Not sure/ don't know (6)
[Lower incentive amount if DR_WILLINGNESS_LARGE_2 = 4 or 5] a) $20/kW capacity payment for committed load reduction, plus an additional 5 cents/kWh for your actual reduction during the event? **A 200 kW load reduction nomination could result in almost $4,500 annual compensation from your utility.**						
[Higher incentive amount if DR_WILLINGNESS_LARGE_2 <4] b) $30/kW capacity payment for committed load reduction, plus an additional 5 cents/kWh for your actual reduction during the event? **A 200 kW load reduction nomination could result in almost $6,500 annual compensation from your utility.**						

[If respondent is more likely to participate in demand bidding (DR_WILLINGNESS_LARGE_2 = 2 and DR_WILLINGNESS_LARGE2 IS NOT = 6)]

DR_WILLINGNESS_LARGE4 How likely would your business be to participate in this type of a Demand Bidding program if you received a…

	Not at all likely (1)	Slightly likely (2)	Some-what likely (3)	Very likely (4)	Extremely likely (5)	Not sure/ don't know (6)
[Lower incentive amount if DR_WILLINGNESS_LARGE_2 = 4 or 5] a) 25 cents/kWh payment based on your actual reduction during the event? **A 200 kW average load reduction during DR events could result in almost $2,000 annual compensation from your utility.**						

	Not at all likely (1)	Slightly likely (2)	Some-what likely (3)	Very likely (4)	Extremely likely (5)	Not sure/ don't know (6)
[Higher incentive amount if DR_WILLINGNESS_LARGE_2 <4] b) 35 cents/kWh payment based on your actual reduction during the event? **A 200 kW average load reduction during DR events could result in almost $3,000 annual compensation from your utility.**						

[If respondent doesn't already participate in a smart thermostat program (AWARE_DR_SMALL_DTE_a IS NOT = 1) and CUSTOMER SIZE = SMALL (INTRO2 = 2)]

DR_WILLINGNESS_SMALL1 If your utility offered a(n) **[Small CI Option]** program that **[Small CI Option Description]**.

How likely would your business be to participate in this type of program if you received a **[Incentive Detail]**?

1. Not at all likely
2. Slightly likely
3. Somewhat likely
4. Very likely
5. Extremely likely
6. Not sure/don't know

Small CI DR Option	Small CI Option Description	Incentive Detail
a) **[If customer already has a smart thermostat (AWARE_DR_TSTAT = 1)]** Bring Your Own Smart Thermostat	offers customers who already own a smart thermostat a fixed payment per season (**typically $25 per thermostat**) for enrolling in the program and allowing the utility to remotely control the thermostat on hot summer and cold winter days, when demand for electricity is highest. The utility may also offer an upfront payment for enrolling in the program. The utility will typically control the thermostat for a limited number of hours per season (could be limited to 14 in summer and 10 in winter with a maximum 4-hour duration). The utility may automatically pre-cool or pre-heat the home before an event, and notify participants in advance of events, with the option to opt-out of events at any time.	one-time **$75** sign-up bonus plus **$25** per season for each enrolled thermostat

Small CI DR Option	Small CI Option Description	Incentive Detail
b) **[If customer DOES NOT already have a smart thermostat (AWARE_DR_TSTAT = 2 or 3)]** Energy Efficiency and Bring Your Own Smart Thermostat	offers customers who do not already have a smart thermostat an incentive payment to purchase one through an energy efficiency program. The utility then offers a smart thermostat demand response program in which customers receive a fixed payment per season (**typically $25 per thermostat**) for allowing the utility to remotely control the thermostat on hot summer and cold winter days, when demand for electricity is highest. The utility will typically control the thermostat for a limited number of hours per season (could be limited to 14 in summer and 10 in winter with a maximum 4-hour duration). The utility may automatically pre-cool or pre-heat the home before an event, and notify participants in advance of events, with the option to opt-out of events at any time.	one-time discount of up to **$175** for the purchase of a smart thermostat (typical retail costs range from $80-$250), and **$25 per season** for each enrolled thermostat (paid at the end of each season) for participating in the smart thermostat demand response program

[If customer already has a smart thermostat (AWARE_DR_TSTAT = 1) and DR_WILLINGNESS_SMALL1a IS NOT = 6)]

DR_WILLINGNESS_SMALL2 How likely would your business be to participate in a smart thermostat demand response program if you received…

	Not at all likely (1)	Slightly likely (2)	Some-what likely (3)	Very likely (4)	Extremely likely (5)	Not sure/ don't know (6)
[Lower incentive amount if DR_WILLINGNESS_SMALL1 = 4 or 5] a) a one-time **$50** sign-up bonus, plus **$25** per season you participate, for each enrolled thermostat?						
[Higher incentive amount if DR_WILLINGNESS_SMALL1 <4] b) a one-time **$100** sign-up bonus, plus **$25** per season you participate, for each enrolled thermostat?						

[If customer DOES NOT already have a smart thermostat (AWARE_DR_TSTAT = 2 or 3 and DR_WILLINGNESS_SMALL1b IS NOT = 6)]

DR_WILLINGNESS_SMALL3 How likely would your business be to participate in a smart thermostat demand response program if …

	Not at all likely (1)	Slightly likely (2)	Some-what likely (3)	Very likely (4)	Extremely likely (5)	Not sure/ don't know (6)
[Lower incentive amount if DR_WILLINGNESS_SMALL1 = 4 or 5] a) the utility were to offer up to a **$150 rebate** on a smart thermostat (typical retail costs range from $80-$250) for signing up in the demand response program, plus **$25** per season you participate, for each enrolled thermostat?						
[Higher incentive amount if DR_WILLINGNESS_SMALL1 <4] b) the utility were to offer up to a **$200 rebate** on a smart thermostat (typical retail costs range from $80-$250) for signing up in the demand response program, plus **$25** per season you participate, for each enrolled thermostat?						

DR_WILLINGNESS_CPP1 Next, consider if your utility offered a Critical Peak Pricing Program in combination with your Time-of-Use (TOU) rate, with discounted electricity prices during night and on weekends (called off-peak periods) and higher rates on weekday afternoons (called peak periods). Participants save money by shifting energy use to off-peak periods. Participants are notified to reduce energy use during critical peak events, when electricity is much more expensive. Critical peak events are restricted and can only occur on weekdays, typically from 3 p.m. to 7 p.m. and would be limited to certain maximum occurrences and hours (e.g., 14 occurrences and 56 total hours) per calendar year.

How likely would your business be to participate in this type of program if you could save 10% or higher on your electricity bill by enrolling in this rate in relation to your standard rate?

1. Not at all likely
2. Slightly likely
3. Somewhat likely
4. Very likely
5. Extremely likely
6. Not sure/don't know

[If CUSTOMER SIZE = SMALL (INTRO2 = 2) and DR_WILLINGNESS_CPP1<4]

DR_WILLINGNESS_CPP_TSTAT How likely would your business be to participate in a critical peak pricing program if you received…

	Not at all likely (1)	Slightly likely (2)	Some-what likely (3)	Very likely (4)	Extremely likely (5)	Not sure/ don't know (6)
A **free smart thermostat from your utility** for agreeing to enroll in the critical peak pricing rate and **allowing the utility to control your thermostat (e.g., increase setpoint by 4 degrees) during critical peak events**. You will always have an option to override the utility adjustment and make your own adjustment if you are uncomfortable. You can expect to save **10% on electricity bill by enrolling in this rate in relation to your standard rate**, plus receive free smart thermostats.						

[If CUSTOMER SIZE = SMALL (INTRO2 = 2)]

DR_WILLINGNESS_PTR As an alternative to the Critical Peak Pricing rate, your utility could offer a **Peak Time Rebate program** in which you earn a credit or rebate for reducing energy use during the critical peak periods (up to 14 days per summer with a max. 4-hour event duration). You will be notified by text, phone, or email the day before events are called. For example, you could receive 95 cents/kWh for the energy reduced during peak periods.

By enrolling in this program, an average customer could earn around $50 per summer by reducing approximately 20% of your energy usage during the peak demand periods. The program is risk-free and there is no penalty if you are unable to shift.

How likely would your business be to participate in this type of **Peak Time Rebate** program?

1. Not at all likely
2. Slightly likely
3. Somewhat likely
4. Very likely
5. Extremely likely
6. Not sure/don't know

WILLINGNESS_DR_BTM Next, consider if your utility offers a Battery Control program that offers customers with on-site battery storage systems (e.g., on-site solar or standalone batteries) an upfront payment and/or an ongoing participation payment in exchange for allowing the utility to discharge your battery during peak demand periods. If you have demand charges in your electricity tariff, you could use your battery for demand charge reduction at other times.

How likely would you be to install a battery and enroll in this type of demand response program?

1. Not at all likely
2. Slightly likely
3. Somewhat likely
4. Very likely
5. Extremely likely
6. Not sure/don't know

COVID-19 Impacts

COVID_EWR How has the COVID-19 pandemic impacted your business' decision-making around energy efficiency upgrades? We are…

1. Much ***less*** likely to pursue energy efficiency upgrades
2. Slightly ***less*** likely to pursue energy efficiency upgrades
3. Just as likely to pursue energy efficiency upgrades (i.e., there has been ***little or no impact***)
4. Slightly ***more*** likely to pursue energy efficiency upgrades
5. Much ***more*** likely to pursue energy efficiency upgrades

COVID_DR How has the COVID-19 pandemic impacted your business' decision-making around demand response programs that reward electricity customers for voluntarily agreeing to reduce energy usage during periods of high electricity demand? We are…

1. Much ***less*** likely to pursue demand response participation
2. Slightly ***less*** likely to pursue demand response participation
3. Just as likely to pursue demand response participation (i.e., there has been ***little or no impact***)
4. Slightly ***more*** likely to pursue demand response participation
5. Much ***more*** likely to pursue demand response participation

Recent Energy Use Actions

ACTIONS1 Which of the following **energy-efficient** products have you installed **in the last 12 months**, if any? Please select all that you have installed. **[Randomize Response Options]**

1. LED Lighting
2. Indoor Occupancy Sensor
3. Advanced Smart (Tier 2) Power Strip
4. Pole/Arm Mounted LED
5. Daylight Dimming Control
6. Low-flow Faucet Aerator
7. Smart thermostat
8. Demand Controlled Ventilation
9. Steam Trap Advanced Controls and Automation
10. Replacing broken steam traps
11. Heat Pump Water Heater
12. Variable Frequency Drive (VFD)

13. ENERGY STAR Servers and Storage Devices
14. Equipment Optimization
15. Efficient Equipment Upgrades (e.g., boilers, chillers, etc.)
16. Other
17. None

ACTIONS2 Do you currently have an energy management system installed at your business?

1. Yes
2. No
3. Don't know/not sure

Decision Factors

DECISIONS How important are the following factors in driving the decisions you make about energy-consuming equipment at your business? Please rate each factor on a scale of 1 to 5 with 1 being "not at all important" and 5 being "very important". **[Randomize response options.]**

1. Reducing environmental impact
2. Financial considerations (e.g., payback period)
3. Limited disruption during installation
4. Price of the higher efficiency model
5. Savings on energy bill
6. Be the first to purchase the latest high-tech products and equipment
7. Reduce the need for additional power plants and support grid reliability
8. Support my community and/or state's energy initiatives
9. Concern about potential impacts on the products or services offered to my customers
10. The availability of incentives and rebates

Barriers

BARRIERS Which of the following factors are likely to **prevent** your business from pursuing additional energy management activities including installation of energy efficient equipment or participation in demand response programs? Please rank each factor on a scale of 1 to 5 with 1 being "not at all likely <u>to prevent</u>" and 5 being "extremely likely <u>to prevent</u>". **[Randomize response options.]**

1. Time and attention needed for energy management
2. The upfront cost of technologies or equipment
3. Awareness of available utility programs that offer payments for changing the way energy is managed at my business
4. Level of in-house technical expertise and data to make informed decisions about energy
5. Reluctance to allow your utility to control equipment in your business
6. Ownership or lease restrictions of the building
7. Corporate limitations or policy

Firmographics

FIRM1 Which of the following best describes your business?

1. Multifamily (Market Rate)
2. Multifamily (Low Income)
3. Industrial
4. Education
5. Grocery
6. Health
7. Lodging
8. Office
9. Restaurant
10. Retail
11. Warehouse
12. Other

FIRM2 Approximately, what percentage of your business expenses are spent on energy?

[A slide bar scale from 0 to 100% will be on the web version of the survey, and a "Don't Know" option will be provided.]

FIRM3 What type of system(s) do you use to <u>heat</u> your business? Please select the **primary** system that you use.

1. Gas boiler
2. Gas furnace
3. Electric furnace
4. Air source heat pump
5. Variable refrigerant flow heat pump
6. Packaged terminal heat pump
7. Other: please describe:_____________
8. Don't know
9. Prefer not to say

FIRM4 What type of <u>water heater</u> do you use at your business? Please select the **primary** water heater that you use.

1. Electric tankless water heater
2. Electric water heater with storage tank
3. Gas tankless water heater
4. Gas water heater with storage tank
5. Heat pump water heater
6. Other: please describe:_____________
7. Don't know
8. Prefer not to say

Close

CLOSE1 Those are all the questions we have, thank you for your help! Would you like to receive the $25 e-gift card or online debit card, or credit to donate to a charitable organization, at **[Email]** or at another email address? You will receive the gift card within 4 to 6 weeks of survey completion.

1. Yes, please send the gift card to **[Email]**

2. Please send the credit for the e-gift card, online debit card or charitable donation to another email address (please specify): **[OPEN ENDED, require valid email address]**
3. No thanks, I do not wish to either receive or donate the gift card

CLOSE2 This concludes the survey. The Michigan Public Service Commission thanks you for your participation in this survey. If you have any questions about the survey or how your responses will be used please reach out to us at Michigan.EnergyStudy@guidehouse.com.

Appendix C. Michigan 2021-2040 Statewide Potential Study Modeling Methodology

Prepared for:

LARA MPSC

State of Michigan

Department of Licensing and Regulatory Affairs

Submitted by:
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August 18, 2021

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Energy Waste Reduction

Guidehouse used a custom-designed version of its DSM Potential tool – DSMSim™ – to estimate technical, economic, and achievable energy waste reduction (EWR) potential using best practice methods that have been vetted with many other clients. DSMSim™ is a bottom-up technology diffusion and stock/flow tracking model implemented in a powerful, flexible, modeling platform that can readily deal with high degrees of dimensionality and the evolving needs of potential studies.

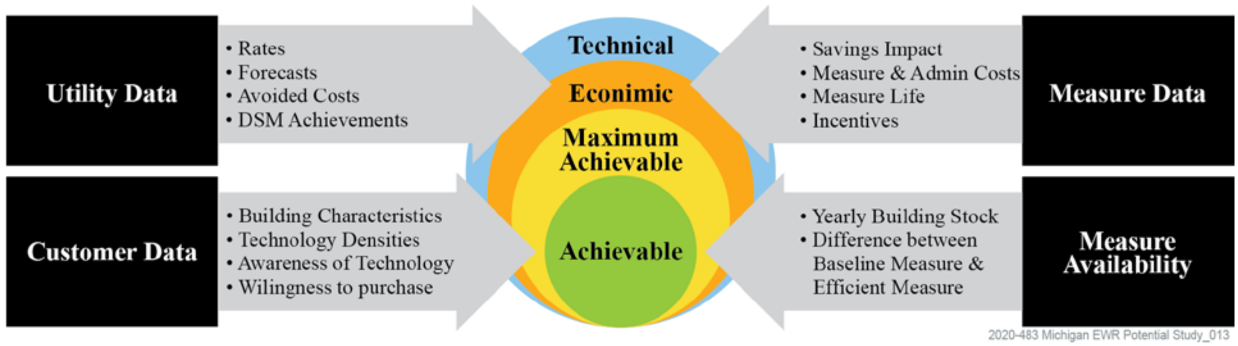
The DSMSim™ model has been widely used to forecast energy and demand potential across the United States and Canada, and adheres to all the current best practices in the evaluation industry. Key features include:

- Ability to accommodate standard or customized cost test protocols, such as those outlined in national standard practice manuals[1]
- Ability to seamlessly assess sensitivities on avoided costs, retail rates, and a variety of other key model input variables
- Handles any number of measures, programs, sectors, program periods and savings types (electric energy/demand, gas, water, emissions, etc.)
- Accounting for three measure replacement types (i.e., retrofit, ROB, and new construction measures) and the effects of similar technologies competing for market share
- Results based on planned input assumptions (incentives, administrative costs, non-energy benefits, participation, etc.) can be compared against those derived from actual values after program implementation is finalized
- Can easily switch between net and gross savings and cost-effectiveness results
- Provides cost-effectiveness metrics at the measure, program, sector, portfolio, end-use or building type level, including combinations of these levels of granularity
- Powerful sensitivity and scenario analysis capability to identify key assumptions and largest leverage points
- Input data is imported from an Excel spreadsheet for portability, version control, and scenario analysis
- All summary results and intermediate calculations are immediately available in tabular or graphical form, in specified units, and can be exported to Excel

Guidehouse developed EWR potential estimates starting with technical potential, followed by economic, and then finally achievable potential scenarios. 0 illustrates the key inputs and the layers of the potential modeling approach.

[1] E.g., the 2001 California Standard Practice Manual (CASPM); subsequent 2007 revision to the CASPM; 2017 National Standard Practice Manual by the National Efficiency Screening Project; etc.

Figure 1. *Approach to Achievable Potential Analysis*



Source: Guidehouse 2020

Developing Technical Potential

Technical potential is defined as the energy savings that can be achieved assuming that all installed measures can immediately be replaced with the efficient measure/technology, wherever technically feasible, regardless of the cost, market acceptance, or whether a measure has failed and must be replaced.

Guidehouse's modeling approach considers an energy-efficient measure to be any change made to a building, piece of equipment, process, or behavior that could save energy. The savings can be defined in numerous ways, depending on which method is most appropriate for a given measure.

The calculation of technical potential in this study differs depending on the assumed measure replacement type, since technical potential is calculated on a per-measure basis and includes estimates of savings per unit, measure density (e.g., quantity of measures per home), and total building stock.

The potential forecast estimates the incremental annual and cumulative technical potential of energy and peak demand savings capable through EWR, without consideration of any non-engineering constraints, and include all possible efficient measures, disregarding economic feasibility and market acceptance. Technical potential also considers how any anticipated future codes and standards will affect the baseline.

The DSMSim™ model accounts for three replacement types, where technical potential from **retrofit** and **replace-on-burnout** measures are calculated differently from technical potential for **new construction** measures. The formulae used to calculate technical potential by replacement type are discussed in the following two subsections.

Retrofit (RET) and Replace-On-Burnout (ROB) Measures

Retrofit (RET) measures, commonly referred to as advancement or early-retirement measures, are replacements of existing equipment before the equipment fails. RET measures can also be efficient processes that are not currently in place and that are not required for operational purposes. RET measures incur the full cost of implementation rather than incremental costs to some other baseline technology or process because the customer could choose not to replace the measure and would, therefore, incur no costs. In contrast, replace-on-burnout measures (ROB), sometimes referred to as lost-opportunity measures, are replacements of existing equipment that have failed and must be replaced, or existing processes that must be renewed. Because the failure of the existing measure requires a capital investment by the customer, the cost of implementing ROB measures is always incremental to the cost of a baseline (and less efficient) measure.

RET and ROB measures have a different meaning for technical potential compared with NEW measures. In any given year, the entire building stock is used for the calculation of technical potential. This method does not limit the calculated technical potential to any pre-assumed rate of adoption of retrofit measures. Existing building stock is reduced each year by the quantity of demolished building stock in that year and does not include new building stock that is added throughout the simulation.

For RET and ROB measures, annual potential is equal to total potential, thus offering an instantaneous view of technical potential. The equation used to calculate technical potential for retrofit measures is provided below.

Annual/Total Savings Potential *= Existing Building Stock* $_{YEAR}$ *(e.g., households) X Measure Density (e.g., widgets/building) X Savings* $_{YEAR}$ *(e.g., sq.ft.[3]/widget) X Technical Suitability (dimensionless)*

New Construction (NEW) Measures

Similar to replace-on-burnout measures, the cost of implementing new measures is incremental to the cost of a baseline (and less efficient) measure. However, new construction technical potential is driven by equipment installations in new building stock rather than by equipment in existing building stock. New building stock is added to keep up with forecasted growth in total building stock and to replace existing stock that is demolished each year. Demolished (sometimes called replacement) stock is calculated as a percentage of existing stock in each year and can be specified to market conditions. New building stock (the sum of growth in building stock and replacement of demolished stock) determines the incremental annual addition to technical potential, which is then added to totals from previous years to calculate the total potential in any given year.

The equation used to calculate technical potential for new construction measures is provided below.

Annual Incremental Technical Potential (AITP): *$AITP_{YEAR}$ = New $Buildings_{YEAR}$ (e.g., buildings/year[10]) X Measure Density (e.g., widgets/building) X $Savings_{YEAR}$ (e.g., sq.ft./widget) X Technical Suitability (dimensionless)*

Competition Groups

The study defines competition as efficient measures competing for the same installation as opposed to competing for the same savings (e.g., window A/C vs. split-system A/C) or for the same budget (e.g., lighting vs. water heating). For instance, a consumer may install a condensing water heater or a tankless water heater; both of which belong to the same competition group, as only one of these would be installed. General characteristics of competing technologies used to define the competition groups proposed for this study include:

- Competing efficient technologies share the same baseline technology characteristics, including baseline technology densities, costs, and consumption
- The total (baseline plus efficient) maximum densities of competing efficient technologies are the same
- Installation of competing technologies is mutually exclusive (i.e., installing one precludes installation of the others for that application)
- Competing technologies share the same replacement type (RET, ROB, or NEW)

To address the overlapping nature of measures within a competition group, Guidehouse's analysis only selects one measure per competition group to include in the summation of technical potential across measures (i.e., at the end use, customer segment, sector, service territory, or total level). The measure with the largest savings potential in a given competition group is used for calculating total technical potential of the competition group. This approach ensures that double counting is not present in the reported technical potential, though the technical potential for each individual measure is still calculated.

Technical Potential

For technical potential, the overall modelling framework is shown in 0. The chart identifies the data inputs, the resource potential module, and the specific output types provided from the various modules. 0 also summarizes the various dimensions of outputs produced from the potential model, including type of potential (technical) reported at various levels (sector, end use, etc.) and in certain units (GWh, MW, therms, etc.).

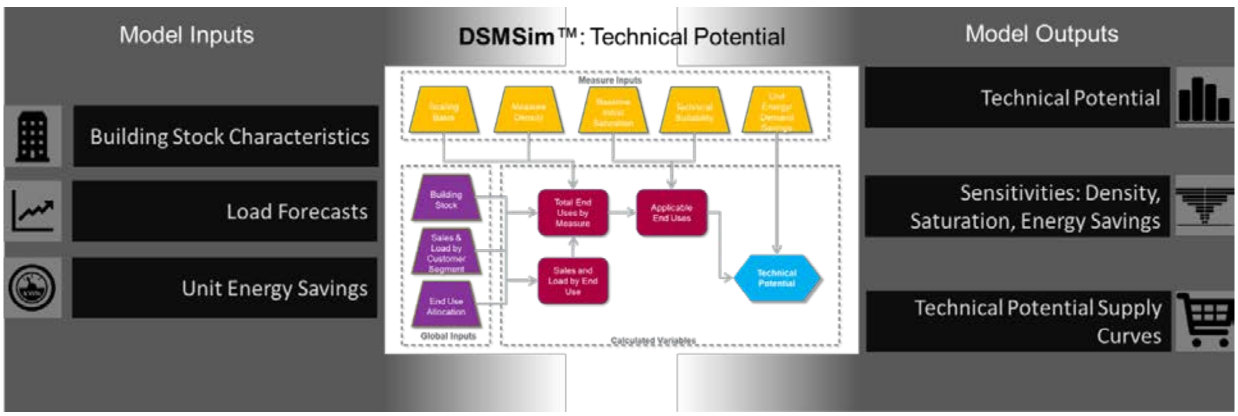


Figure 2. Guidehouse's Technical Potential Model Data Flow

Developing Economic Potential

Economic potential is a subset of technical potential and uses the same assumptions regarding immediate replacement as in technical potential. However, economic potential only includes those measures that have passed the benefit-cost (B/C) tests chosen for measure screening. A measure with a B/C ratio greater than or equal to 1.0 is a measure that provides present value monetary benefits greater than or equal to its present value costs. If a measure's B/C meets or exceeds the threshold, it is included in the economic potential.

DSMSim™ can calculate the five standard tests,[2] and use any of these tests for economic screening. It can also allow the economic potential threshold value to be adjusted (set at 1.0, or higher or lower). As with technical potential, Guidehouse recognizes codes and standards, replacement types, and competition groups in the development of economic potential.

Similar to technical potential, only one economic measure (meaning that its B/C ratio meets the threshold) from each competition group is included in the summation of economic potential across measures (e.g., at the end use, customer segment, sector, service territory or total level). If a competition group is composed of more than one measure that passes the chosen

2 The California Standard Practice Manual (CASPM) defines five standard cost tests for cost-benefit analysis: Participant Cost Test, Program Administrator Cost Test, Ratepayer Impact Measure Test, Total Resource Cost Test, and Societal Cost Test.

screening cost test, then the economic measure that provides the greatest savings potential is included in the summation of economic potential. This approach ensures that double counting is not present in the reported economic potential, though economic potential for each individual measure is still calculated.

Within DSMSim™, Guidehouse used Michigan specific avoided cost forecasts based on utility data, and other financial inputs to apply cost-benefit screens for all measures considered in the technical potential analysis. 0 illustrates the overall economic potential modelling framework, with the resulting economic potential outputs outlined on the right-hand side.

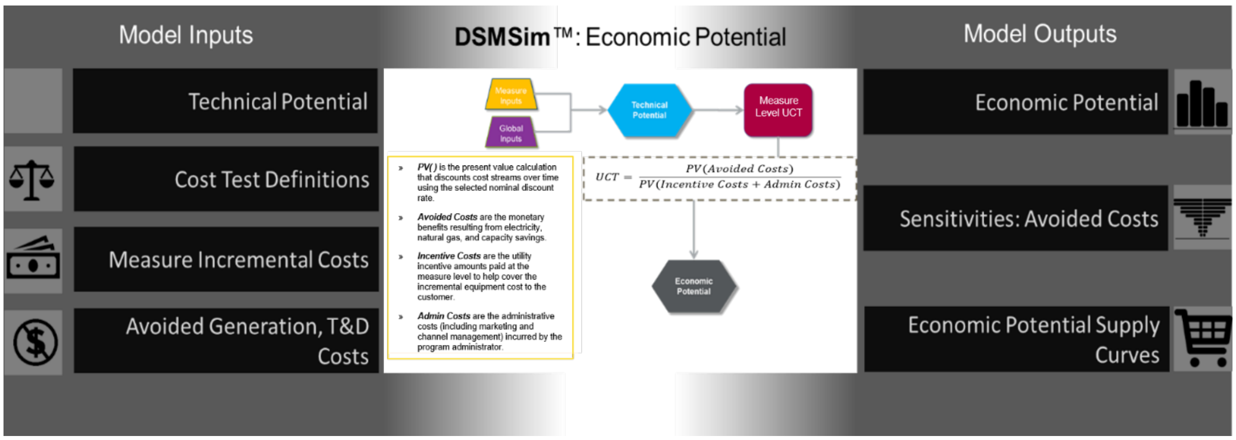


Figure 3. Guidehouse's Economic Potential Model Data Flow

Develop Achievable Potential

Achievable potential further considers the likely rate of efficient measure acquisition, which is driven by a number of factors including the rate of equipment turnover (a function of measure's lifetime), simulated incentive levels, budget constraints, consumer willingness to adopt efficient technologies, and the likely rate at which marketing activities can facilitate technology adoption. This section provides a high-level summary of the approach to calculating achievable potential, which is fundamentally more complex than calculation of technical or economic potential.

The critical first step in the process of accurately estimating achievable potential is to simulate market adoption of efficient measures. Annual program participation is modeled through technology adoption and diffusion algorithms. The long-run equilibrium market share[3] (i.e., how quickly a technology reaches final market saturation) is calculated by comparing a measure's payback period to a customer payback acceptance curve. Each measure's payback period is derived from subtracting the energy bill savings (retail rates multiplied by energy savings) and incentive from the measure's incremental participant cost. Guidehouse's model employs an enhanced Bass Diffusion model[4] to simulate the S-shaped growth toward equilibrium commonly seen for technology adoption. The Bass Diffusion model describes the process of the adoption of products as an interaction between users and potential users. In the model, achievable

3 This term, although something of a misnomer due to the fact that the long run market share is dynamic, changing with building stocks, technology prices, and avoided costs for example, is used to describe the percentage of the market that would participate in a program if perfect information was available to the customer. As awareness of each measure increases, the market will move toward this point.

4 Bass, Frank (1969). "A new product growth model for consumer durables". Management Science 15 (5): pgs. 215–227.

potential adopters "flow" to adopters by two primary mechanisms – adoption from external influences, such as marketing and advertising, and adoption from internal influences, such as word-of-mouth or peer-effects – with differences in stock turnover captured for replace-on-burnout measures relative to retrofit and new construction.

Guidehouse typically uses payback acceptance curves to estimate equilibrium market share. Payback acceptance curves have been developed in the past by presenting decision makers with numerous choices between technologies with low upfront costs but high annual energy costs, and measures with higher upfront costs but lower annual energy costs. Figure 4 shows payback acceptance curves for the Lower Peninsula low cost measures in the Michigan 2021-2040 EWR study at the customer segment. Each curve represents the percentage of customers willing to purchase a technology based on its payback time. Separate curves were developed for high upfront cost and low upfront cost measures for the Lower and Upper Peninsulas.

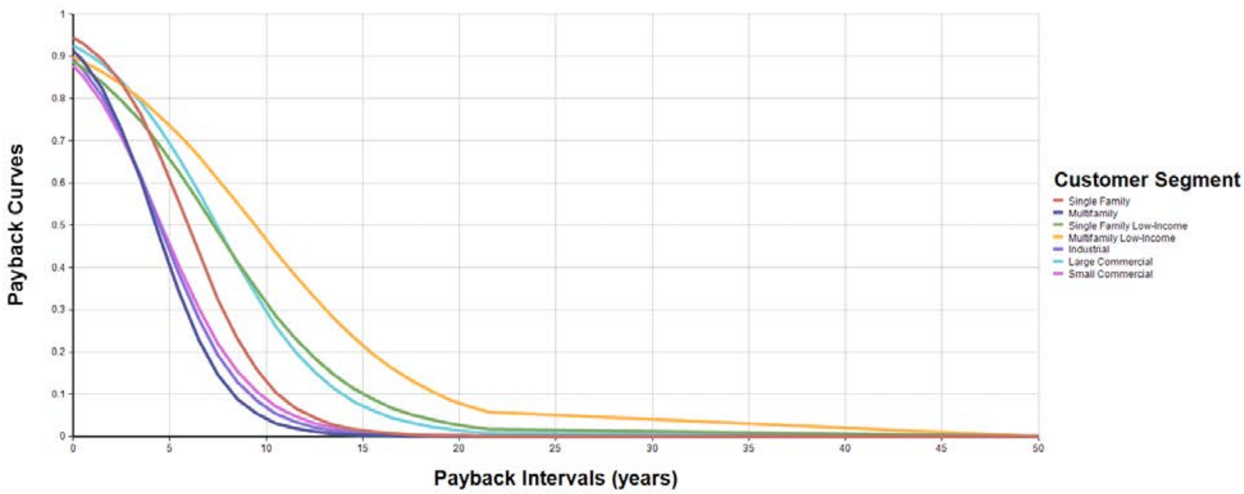


Figure 4. Lower Peninsula Low Cost Measure Payback Acceptance Curves

Since the payback time of a technology can change over time; as technology costs and/or energy costs change over time, the equilibrium market share can also change over time. The equilibrium market share is, therefore, recalculated for every time-step within the market simulation to make certain the dynamics of technology adoption considers this effect. As such, the term "equilibrium market share" is a bit of an oversimplification and a misnomer, as it can itself change over time and is, therefore, never truly in equilibrium; it is used nonetheless to facilitate understanding of the approach.

Calculation of the Approach to Equilibrium Market Share

Two approaches are used for calculating the approach to equilibrium market share (i.e., how quickly a technology reaches final market saturation): one for new technologies or those being modeled as a retrofit (a.k.a. discretionary) measures, and one for technologies simulated as ROB (a.k.a. lost opportunity) measures.

The retrofit and new technologies adoption approach uses an enhanced version of the classic Bass diffusion model to simulate the S-shaped approach to equilibrium that is commonly observed for technology adoption.

Figure 5 provides a stock/flow diagram illustrating the causal influences underlying the Bass model. In this model, achievable potential adopters flow to adopters by two primary mechanisms: adoption from external influences, such as program marketing/advertising, and adoption from internal influences, including word-of-mouth. The fraction of the population willing to adopt is estimated using the payback acceptance curves shown above.

The marketing effectiveness and external influence parameters for this diffusion model are typically estimated upon the results of case studies where these parameters were estimated for dozens of technologies. Recognition of the positive, or self-reinforcing, feedback generated by the word-of-mouth mechanism is evidenced by increasing discussion of the concepts such as social marketing as well as the term viral, which has been popularized and strengthened most recently by social networking sites such as Facebook and YouTube. However, the underlying positive feedback associated with this mechanism has been ever present and a part of the Bass diffusion model of product adoption since its inception in 1969.

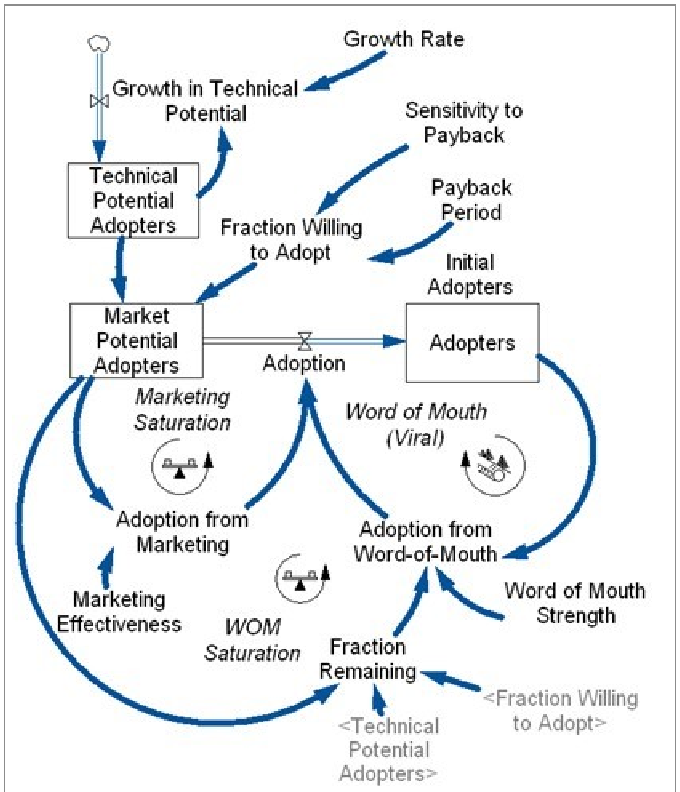


Figure 5. Stock/Flow Diagram of Diffusion Model for New Products and Retrofits

The dynamics of ROB technology adoption is somewhat more complicated than for new/retrofit technologies since it requires simulating the turnover of long-lived technology stocks. To account for this, the DSMSim™ model tracks the stock of all technologies and explicitly calculates technology retirements and additions consistent with the lifetime of the technologies. This approach considers the technology churn in the estimation of achievable potential, since only a fraction of the total stock of technologies are replaced each year, which affects how quickly technologies can be replaced. A model that endogenously generates growth in the familiarity of a technology, analogous to the Bass approach described above, is overlaid on the stock-tracking model to capture the dynamics associated with the diffusion of technology familiarity. A simplified version of the model employed in DSMSim™ is shown in Figure 6.

Model Calibration

Another critical step in the process is the model calibration. We begin calibrating the model's marketing effectiveness and word-of-mouth parameters at the sector and end use level using Michigan historical and forecasted program participation.

As noted, key inputs for the achievable potential assessment are payback acceptance curves that represent the percentage of customers from different sectors willing to purchase a technology based on the time it takes the technology to pay back the upfront cost after incentives through annual cost savings.

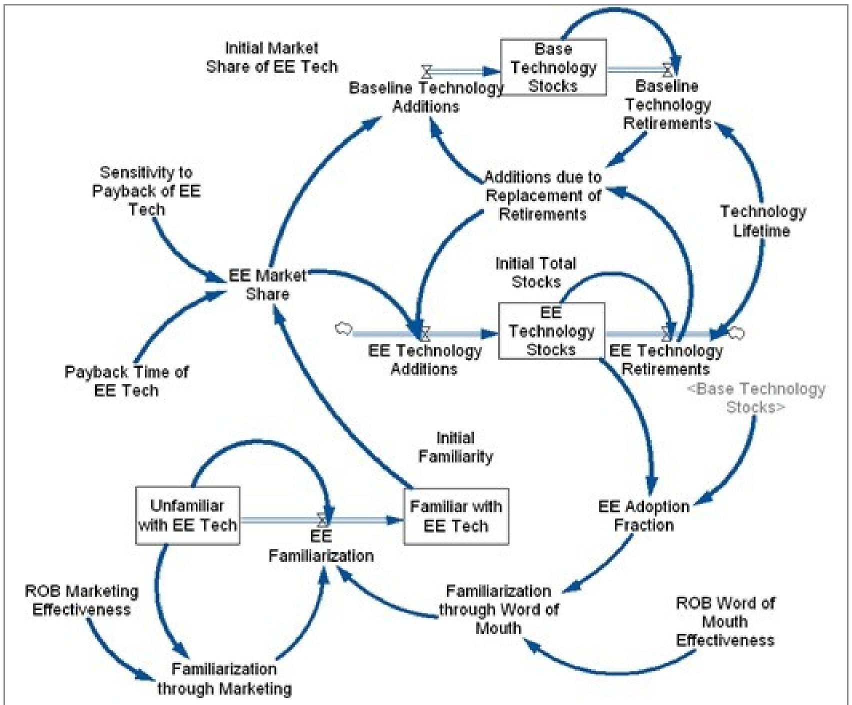


Figure 6. Stock/Flow Diagram of Diffusion Model for Replace-on-Burnout Measures

Calibration of a predictive model imposes unique challenges, as future data is not available to compare against model predictions. While engineering models, for example, can often be calibrated to a high degree of accuracy since simulated performance can be compared directly with performance of actual hardware, predictive models do not have this luxury. Demand-side management models, therefore, must rely on other techniques to provide the recipient of model results with a level of comfort that simulated results are reasonable. Guidehouse takes a number of steps to make sure that the initial, base year projected portfolio achievements used (2021) for the forecast model are reasonable and consider historic adoption, including:

- Comparing forecast values, by sector and end use, against historic achieved savings (e.g., from program savings for 2019 and projected achievements in 2020 and 2021). Although some studies indicate that demand-side management potential models are calibrated to check first-year simulated savings precisely equal to prior-year reported savings, we have found that forcing such precise agreement has the potential to introduce errors into the modeling process by effectively masking the explanation for differences—particularly when the measures included may vary significantly. Additionally, there may be sound reasons for first-year simulated savings to differ from prior-year reported savings (e.g., savings estimates have changed). Thus, while we will endeavor to achieve agreement to a degree that is reasonable between past results and forecast first-year results, our approach does not force the model to do so.
- Identifying and ensuring an explanation existed for significant discrepancies between forecast savings and prior-year savings, recognizing that some ramp-up is expected, especially for new measures or archetype programs.

The overall achievable potential modelling framework is shown in Figure 7. Guidehouse draws on the results of the economic potential analysis (and any sensitivity parameters identified) to develop the achievable potential outputs in the manner outlined on the right-hand bar of Figure 7.

Figure 7. Guidehouse's Achievable Potential Model Data Flow

LARA MPSC Guidehouse

Michigan Energy Waste Reduction Statewide Potential Study (2021-2040)
Appendix D. Energy Waste Reduction Results File

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Lower Peninsula Electricity Cumulative Annual Achievable Potential Net at Meter and Percent of Sales by Scenario						
Year	Reference		Carbon Price		Aggressive	
	GWh Savings	% of Sales	GWh Savings	% of Sales	GWh Savings	% of Sales
2021	1,580	1.9%	1,618	2.0%	1,659	2.0%
2022	3,059	3.7%	3,132	3.8%	3,221	3.9%
2023	4,481	5.4%	4,582	5.5%	4,724	5.7%
2024	5,805	7.0%	5,926	7.2%	6,123	7.4%
2025	6,992	8.6%	7,132	8.7%	7,382	9.0%
2026	8,069	9.9%	8,226	10.1%	8,529	10.5%
2027	9,061	11.1%	9,235	11.3%	9,588	11.7%
2028	9,930	12.2%	10,119	12.4%	10,517	12.9%
2029	10,719	13.1%	10,920	13.4%	11,360	13.9%
2030	11,435	14.0%	11,648	14.2%	12,124	14.8%
2031	12,115	14.6%	12,339	14.9%	12,851	15.5%
2032	12,755	15.2%	12,976	15.4%	13,521	16.1%
2033	13,302	15.7%	13,520	16.0%	14,090	16.7%
2034	13,798	16.3%	14,013	16.5%	14,603	17.2%
2035	14,323	16.6%	14,541	16.8%	15,153	17.5%
2036	14,783	17.0%	15,003	17.2%	15,626	18.0%
2037	15,183	17.4%	15,406	17.6%	16,036	18.4%
2038	15,563	17.7%	15,789	18.0%	16,422	18.7%
2039	15,920	18.1%	16,150	18.3%	16,783	19.1%
2040	16,292	18.4%	16,526	18.6%	17,158	19.3%

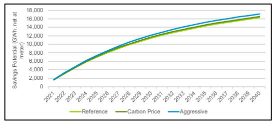
Upper Peninsula Electricity Cumulative Annual Achievable Potential Net at Meter and Percent of Sales by Scenario						
Year	Reference		Carbon Price		Aggressive	
	GWh Savings	% of Sales	GWh Savings	% of Sales	GWh Savings	% of Sales
2021	25	1.9%	26	2.0%	27	2.0%
2022	48	3.6%	50	3.7%	52	3.9%
2023	69	5.2%	72	5.4%	75	5.6%
2024	89	6.7%	93	6.9%	98	7.3%
2025	108	8.0%	112	8.4%	118	8.8%
2026	124	9.3%	129	9.6%	136	10.2%
2027	139	10.4%	145	10.8%	153	11.5%
2028	153	11.4%	159	11.9%	168	12.6%
2029	165	12.4%	171	12.8%	182	13.6%
2030	176	13.2%	183	13.7%	195	14.6%
2031	187	14.0%	194	14.5%	206	15.4%
2032	196	14.7%	203	15.3%	217	16.2%
2033	205	15.4%	213	15.9%	226	17.0%
2034	213	16.0%	221	16.6%	235	17.6%
2035	220	16.5%	229	17.2%	243	18.2%
2036	227	17.1%	236	17.7%	250	18.8%
2037	233	17.6%	243	18.3%	257	19.3%
2038	239	18.0%	249	18.7%	263	19.8%
2039	245	18.4%	255	19.2%	268	20.2%
2040	250	18.9%	261	19.6%	273	20.6%

Lower Peninsula Natural Gas Cumulative Annual Achievable Net at Meter Potential and Percent of Sales by Scenario						
Year	Reference		Carbon Price		Aggressive	
	Therm Savings	% of Sales	Therm Savings	% of Sales	Therm Savings	% of Sales
2021	48,793,613	1.1%	53,113,808	1.2%	54,294,476	1.2%
2022	93,736,869	2.1%	102,762,455	2.3%	104,909,575	2.3%
2023	139,212,470	3.1%	153,597,221	3.4%	156,591,614	3.5%
2024	185,807,356	4.1%	206,747,249	4.6%	209,407,362	4.6%
2025	231,948,693	5.2%	259,755,434	5.8%	261,873,170	5.8%
2026	278,433,475	6.2%	313,349,468	7.0%	314,659,442	7.0%
2027	325,337,432	7.2%	367,511,999	8.2%	367,730,235	8.2%
2028	371,264,279	8.2%	420,713,395	9.3%	419,869,566	9.3%
2029	416,433,025	9.2%	473,071,012	10.5%	471,119,201	10.5%
2030	460,243,136	10.2%	524,663,350	11.6%	520,753,533	11.5%
2031	503,011,379	11.1%	574,944,392	12.7%	569,159,596	12.6%
2032	543,839,031	12.0%	626,469,029	13.8%	615,368,915	13.6%
2033	581,759,351	12.8%	674,620,024	14.9%	658,227,382	14.5%
2034	617,328,198	13.6%	719,837,243	15.9%	698,321,002	15.4%
2035	651,610,769	14.3%	763,092,844	16.8%	736,872,788	16.2%
2036	687,876,422	15.1%	803,585,377	17.6%	772,176,813	16.9%
2037	721,602,397	15.8%	842,164,403	18.4%	804,827,249	17.6%
2038	753,143,903	16.5%	877,751,070	19.2%	835,168,158	18.3%
2039	782,557,261	17.1%	910,471,230	19.9%	863,415,025	18.8%
2040	810,328,389	17.6%	940,901,460	20.5%	890,171,294	19.4%

Upper Peninsula Natural Gas Cumulative Annual Achievable Potential Net at Meter and Percent of Sales by Scenario						
Year	Reference		Carbon Price		Aggressive	
	Therm Savings	% of Sales	Therm Savings	% of Sales	Therm Savings	% of Sales
2021	952,861	1.2%	1,024,805	1.3%	1,028,348	1.3%
2022	1,803,188	2.2%	1,953,465	2.4%	1,952,009	2.4%
2023	2,642,031	3.2%	2,875,322	3.5%	2,860,444	3.5%
2024	3,466,185	4.2%	3,787,084	4.6%	3,750,534	4.5%
2025	4,255,711	5.2%	4,667,352	5.7%	4,601,799	5.6%
2026	5,021,800	6.1%	5,525,577	6.7%	5,425,292	6.6%
2027	5,768,281	7.0%	6,363,740	7.7%	6,224,177	7.5%
2028	6,491,371	7.8%	7,176,218	8.6%	6,994,324	8.4%
2029	7,191,767	8.6%	7,973,219	9.5%	7,735,449	9.3%
2030	7,867,635	9.4%	8,740,743	10.4%	8,445,100	10.1%
2031	8,516,519	10.1%	9,475,233	11.2%	9,120,537	10.8%
2032	9,135,586	10.8%	10,173,115	12.0%	9,759,176	11.5%
2033	9,722,408	11.4%	10,831,580	12.7%	10,359,383	12.2%
2034	10,275,035	12.0%	11,448,596	13.4%	10,920,458	12.8%
2035	10,792,342	12.6%	12,023,212	14.0%	11,442,783	13.3%
2036	11,274,087	13.1%	12,555,552	14.6%	11,927,637	13.8%
2037	11,720,984	13.5%	13,220,765	15.3%	12,377,059	14.3%
2038	12,134,413	13.9%	13,861,091	15.9%	12,793,453	14.7%
2039	12,516,471	14.3%	14,436,022	16.5%	13,179,547	15.1%
2040	12,869,751	14.7%	14,947,018	17.0%	13,538,197	15.4%

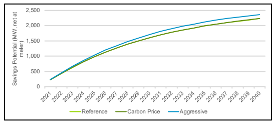
Lower Peninsula Electricity Cumulative Annual Achievable Potential, GWh, net at meter

Lower Pen	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Reference	1,580	3,059	4,481	5,805	6,992	8,069	9,061	9,930	10,719	11,435	12,115	12,755	13,302	13,798	14,323	14,783	15,183	15,563	15,920	16,292
Carbon Price	1,618	3,132	4,582	5,926	7,132	8,226	9,235	10,118	10,920	11,648	12,339	12,976	13,520	14,013	14,541	15,003	15,406	15,789	16,150	16,526
Aggressive	1,659	3,221	4,724	6,123	7,382	8,529	9,588	10,517	11,360	12,124	12,851	13,521	14,090	14,603	15,153	15,626	16,036	16,422	16,783	17,158
% Diff Agg/Ref	*5.0%*	*5.3%*	*5.4%*	*5.5%*	*5.6%*	*5.7%*	*5.8%*	*5.9%*	*6.0%*	*6.0%*	*6.1%*	*6.0%*	*5.9%*	*5.8%*	*5.8%*	*5.7%*	*5.6%*	*5.5%*	*5.4%*	*5.3%*



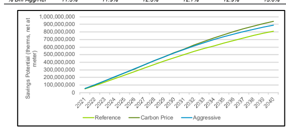
Lower Peninsula Electric Demand Cumulative Annual Achievable Potential, MW, net at meter

Lower Pen	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Reference	225	429	627	812	978	1,129	1,266	1,388	1,499	1,599	1,694	1,781	1,855	1,921	1,988	2,045	2,096	2,143	2,186	2,230
Carbon Price	226	430	629	813	979	1,130	1,267	1,389	1,500	1,600	1,694	1,781	1,855	1,921	1,990	2,048	2,099	2,147	2,191	2,236
Aggressive	235	451	661	857	1,035	1,197	1,344	1,476	1,596	1,705	1,807	1,900	1,979	2,049	2,121	2,181	2,232	2,279	2,321	2,364
% Diff Agg/Ref	*4.6%*	*5.1%*	*5.4%*	*5.6%*	*5.8%*	*6.0%*	*6.2%*	*6.3%*	*6.5%*	*6.6%*	*6.7%*	*6.7%*	*6.7%*	*6.7%*	*6.7%*	*6.6%*	*6.5%*	*6.4%*	*6.2%*	*6.0%*



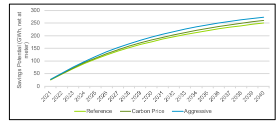
Lower Peninsula Natural Gas Cumulative Annual Achievable Potential, therms, net at meter

Lower Pen	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Reference	48,793,613	93,736,869	139,212,470	185,807,356	231,948,693	278,433,475	325,337,432	371,264,279	416,433,025	460,243,136	503,011,379	543,839,031	581,759,351	617,328,198	651,610,769	687,876,422	721,602,397	753,143,903	782,557,261	810,328,389
Carbon Price	53,113,808	102,762,455	153,597,221	206,747,249	259,755,434	313,349,468	367,511,999	420,713,395	473,071,012	524,663,350	574,944,392	626,469,029	674,620,024	719,837,243	763,092,844	803,585,377	842,164,403	877,751,070	910,471,230	940,901,460
Aggressive	54,294,476	104,909,575	156,591,614	209,407,362	261,873,170	314,659,442	367,730,235	419,869,566	471,119,201	520,753,533	569,159,596	615,368,915	658,227,382	698,321,002	736,872,788	772,176,813	804,827,249	835,168,158	863,415,025	890,171,294
% Diff Agg/Ref	*11.3%*	*11.9%*	*12.5%*	*12.7%*	*12.9%*	*13.0%*	*13.0%*	*13.1%*	*13.1%*	*13.1%*	*13.2%*	*13.2%*	*13.1%*	*13.1%*	*13.1%*	*12.3%*	*11.5%*	*10.9%*	*10.3%*	*9.9%*



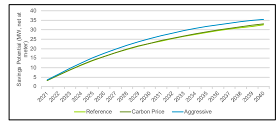
Upper Peninsula Electricity Cumulative Annual Achievable Potential, GWh, net at meter

Upper Pen	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Reference	25	48	69	89	108	124	139	153	165	176	187	196	205	213	220	227	233	239	245	250
Carbon Price	26	50	72	93	112	129	145	159	171	183	194	203	213	221	229	236	243	249	255	261
Aggressive	27	52	75	98	118	136	153	168	182	195	206	217	226	235	243	250	257	263	268	273
% Diff Agg/Ref	*7.8%*	*8.5%*	*8.9%*	*9.3%*	*9.6%*	*9.8%*	*10.0%*	*10.2%*	*10.3%*	*10.4%*	*10.4%*	*10.4%*	*10.4%*	*10.3%*	*10.2%*	*10.0%*	*9.9%*	*9.7%*	*9.5%*	*9.2%*



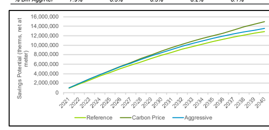
Upper Peninsula Electric Demand Cumulative Annual Achievable Potential, MW, net at meter

Upper Pen	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Reference	3	6	9	11	14	16	18	20	21	23	24	25	27	28	29	30	30	31	32	33
Carbon Price	3	6	9	11	14	16	18	20	21	23	24	26	27	28	29	30	31	32	32	33
Aggressive	4	7	10	13	15	18	20	22	24	25	27	28	30	31	32	33	33	34	35	36
% Diff Agg/Ref	*8.0%*	*9.0%*	*9.7%*	*10.2%*	*10.6%*	*11.0%*	*11.3%*	*11.5%*	*11.7%*	*11.7%*	*11.7%*	*11.6%*	*11.5%*	*11.2%*	*10.9%*	*10.6%*	*10.3%*	*9.9%*	*9.5%*	*9.1%*



Upper Peninsula Natural Gas Cumulative Annual Achievable Potential, therms, net at meter

Upper Pen	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Reference	952,861	1,803,188	2,642,031	3,466,185	4,255,711	5,021,800	5,768,281	6,491,371	7,191,767	7,867,635	8,516,519	9,135,586	9,722,408	10,275,035	10,792,342	11,274,087	11,720,984	12,134,413	12,516,471	12,869,751
Carbon Price	1,024,805	1,953,465	2,875,322	3,787,084	4,667,352	5,525,577	6,363,740	7,176,218	7,973,219	8,740,743	9,475,233	10,173,115	10,831,580	11,448,596	12,023,212	12,555,552	13,220,765	13,861,091	14,436,022	14,947,018
Aggressive	1,028,348	1,952,009	2,860,444	3,750,534	4,601,799	5,425,292	6,224,177	6,994,324	7,735,449	8,445,100	9,120,537	9,759,176	10,359,383	10,920,458	11,442,783	11,927,637	12,377,059	12,793,453	13,179,547	13,538,197
% Diff Agg/Ref	*7.9%*	*8.3%*	*8.3%*	*8.2%*	*8.1%*	*8.0%*	*7.9%*	*7.7%*	*7.6%*	*7.3%*	*7.1%*	*6.8%*	*6.6%*	*6.3%*	*6.0%*	*5.8%*	*5.6%*	*5.4%*	*5.3%*	*5.2%*

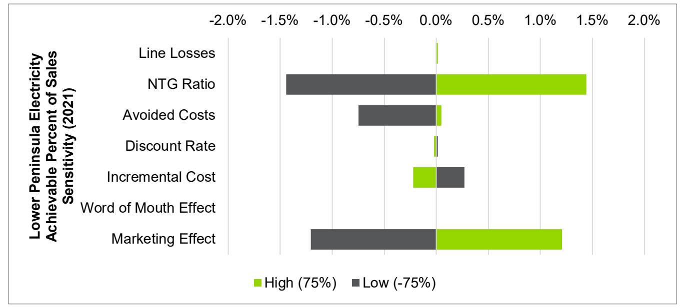


Lower Peninsula Electricity Cumulative Achievable Percent of Sales Sensitivity (2021)

	Marketing Effect	Word of Mouth Effect	Incremental Cost	Discount Rate	Avoided Costs	NTG Ratio	Line Losses
Low (-75%)	0.72%	1.92%	2.19%	1.94%	1.18%	0.48%	1.92%
High (75%)	3.13%	1.92%	1.70%	1.90%	1.97%	3.37%	1.94%
Default	1.92%	1.92%	1.92%	1.92%	1.92%	1.92%	1.92%

Lower Peninsula Electricity Cumulative Achievable Percent of Sales Sensitivity (2021)

	Marketing Effect	Word of Mouth Effect	Incremental Cost	Discount Rate	Avoided Costs	NTG Ratio	Line Losses
Low (-75%)	-1.21%	0.00%	0.27%	0.02%	-0.75%	-1.44%	0.00%
High (75%)	1.21%	0.00%	-0.22%	-0.02%	0.05%	1.44%	0.01%
Default	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

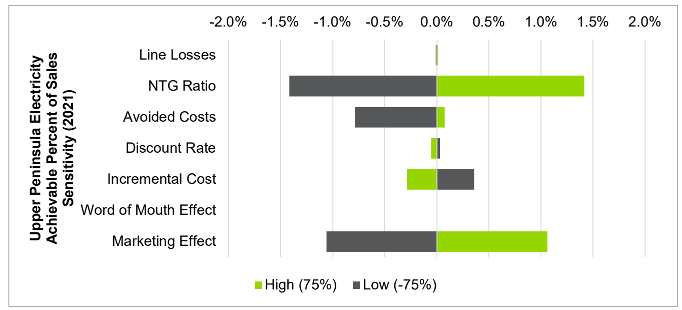


Upper Peninsula Electricity Cumulative Achievable Percent of Sales Sensitivity (2021)

	Marketing Effect	Word of Mouth Effect	Incremental Cost	Discount Rate	Avoided Costs	NTG Ratio	Line Losses
Low (-75%)	0.83%	1.89%	2.25%	1.92%	1.10%	0.47%	1.88%
High (75%)	2.95%	1.89%	1.60%	1.83%	1.96%	3.30%	1.90%
Default	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%

Upper Peninsula Electricity Cumulative Achievable Percent of Sales Sensitivity (2021)

	Marketing Effect	Word of Mouth Effect	Incremental Cost	Discount Rate	Avoided Costs	NTG Ratio	Line Losses
Low (-75%)	-1.06%	0.00%	0.36%	0.03%	-0.79%	-1.42%	-0.01%
High (75%)	1.06%	0.00%	-0.29%	-0.05%	0.08%	1.42%	0.01%
Default	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

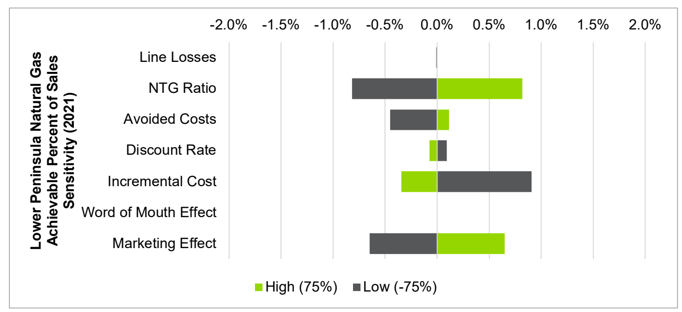


Lower Peninsula Natural Gas Cumulative Achievable Percent of Sales Sensitivity (2021)

	Marketing Effect	Word of Mouth Effect	Incremental Cost	Discount Rate	Avoided Costs	NTG Ratio	Line Losses
Low (-75%)	0.44%	1.09%	2.00%	1.18%	0.64%	0.27%	1.08%
High (75%)	1.74%	1.09%	0.75%	1.02%	1.21%	1.91%	1.09%
Default	1.09%	1.09%	1.09%	1.09%	1.09%	1.09%	1.09%

Lower Peninsula Natural Gas Cumulative Achievable Percent of Sales Sensitivity (2021)

	Marketing Effect	Word of Mouth Effect	Incremental Cost	Discount Rate	Avoided Costs	NTG Ratio	Line Losses
Low (-75%)	-0.65%	0.00%	0.91%	0.09%	-0.45%	-0.82%	-0.01%
High (75%)	0.65%	0.00%	-0.34%	-0.07%	0.12%	0.82%	0.00%
Default	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

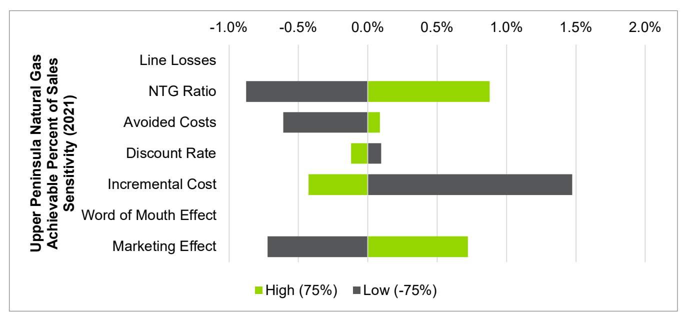


Upper Peninsula Natural Gas Cumulative Achievable Percent of Sales Sensitivity (2021)

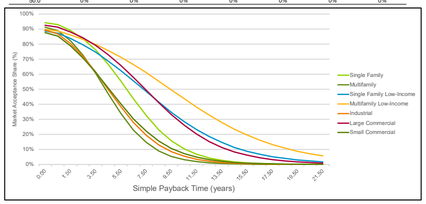
	Marketing Effect	Word of Mouth Effect	Incremental Cost	Discount Rate	Avoided Costs	NTG Ratio	Line Losses
Low (-75%)	0.45%	1.17%	2.64%	1.27%	0.56%	0.29%	1.17%
High (75%)	1.89%	1.17%	0.74%	1.05%	1.26%	2.05%	1.17%
Default	1.17%	1.17%	1.17%	1.17%	1.17%	1.17%	1.17%

Upper Peninsula Natural Gas Cumulative Achievable Percent of Sales Sensitivity (2021)

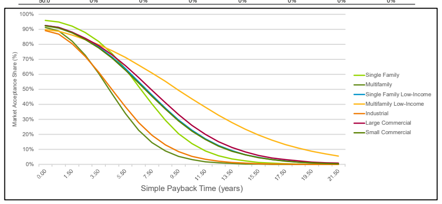
	Marketing Effect	Word of Mouth Effect	Incremental Cost	Discount Rate	Avoided Costs	NTG Ratio	Line Losses
Low (-75%)	-0.72%	0.00%	1.47%	0.10%	-0.61%	-0.88%	0.00%
High (75%)	0.72%	0.00%	-0.43%	-0.12%	0.09%	0.88%	0.00%
Default	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%



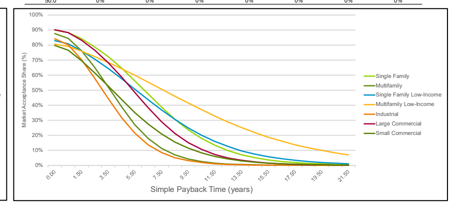
Lower Peninsula Low Cost Measure Willingness to Pay Curves by Customer Segment							
Simple Payback (Years)	Single Family	Multifamily	Single Family Low-Income	Multifamily Low-Income	Industrial	Large Commercial	Small Commercial
0.0	94%	91%	89%	90%	89%	93%	88%
0.5	93%	89%	87%	89%	87%	91%	85%
1.5	89%	82%	84%	86%	80%	88%	79%
2.5	84%	73%	80%	83%	72%	84%	71%
3.5	76%	61%	75%	80%	61%	79%	61%
4.5	67%	47%	69%	76%	50%	73%	51%
5.5	55%	34%	62%	71%	38%	66%	40%
6.5	44%	23%	56%	66%	28%	58%	30%
7.5	33%	15%	48%	61%	19%	49%	22%
8.5	23%	9%	41%	55%	13%	41%	16%
9.5	16%	5%	35%	50%	9%	33%	11%
10.5	10%	3%	29%	44%	6%	26%	7%
11.5	7%	2%	23%	38%	3%	20%	5%
12.5	4%	1%	19%	33%	2%	15%	3%
13.5	3%	1%	15%	28%	1%	11%	2%
14.5	2%	0%	11%	24%	1%	8%	1%
15.5	1%	0%	9%	20%	1%	6%	1%
16.5	1%	0%	7%	16%	0%	4%	1%
17.5	0%	0%	5%	13%	0%	3%	0%
18.5	0%	0%	4%	11%	0%	2%	0%
19.5	0%	0%	3%	9%	0%	2%	0%
20.5	0%	0%	2%	7%	0%	1%	0%
21.5	0%	0%	2%	6%	0%	1%	0%
50.0	0%	0%	0%	0%	0%	0%	0%



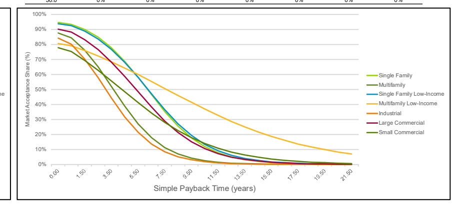
Upper Peninsula Low Cost Measure Willingness to Pay Curves by Customer Segment							
Simple Payback (Years)	Single Family	Multifamily	Single Family Low-Income	Multifamily Low-Income	Industrial	Large Commercial	Small Commercial
0.0	96%	91%	93%	90%	89%	93%	92%
0.5	95%	89%	91%	89%	87%	91%	91%
1.5	92%	82%	88%	86%	80%	88%	88%
2.5	88%	73%	84%	83%	72%	84%	83%
3.5	82%	61%	78%	80%	61%	79%	78%
4.5	74%	47%	72%	76%	50%	73%	71%
5.5	64%	34%	64%	71%	38%	66%	63%
6.5	52%	23%	55%	66%	28%	58%	54%
7.5	40%	15%	46%	61%	19%	49%	45%
8.5	29%	9%	38%	55%	13%	41%	37%
9.5	21%	5%	30%	50%	9%	33%	29%
10.5	14%	3%	23%	44%	6%	26%	22%
11.5	9%	2%	17%	38%	3%	20%	17%
12.5	6%	1%	13%	33%	2%	15%	12%
13.5	4%	1%	9%	28%	1%	11%	9%
14.5	2%	0%	7%	24%	1%	8%	6%
15.5	1%	0%	5%	20%	1%	6%	5%
16.5	1%	0%	3%	16%	0%	4%	3%
17.5	1%	0%	2%	13%	0%	3%	2%
18.5	0%	0%	2%	11%	0%	2%	2%
19.5	0%	0%	1%	9%	0%	2%	1%
20.5	0%	0%	1%	7%	0%	1%	1%
21.5	0%	0%	1%	6%	0%	1%	1%
50.0	0%	0%	0%	0%	0%	0%	0%



Lower Peninsula High Cost Measure Willingness to Pay Curves by Customer Segment							
Simple Payback (Years)	Single Family	Multifamily	Single Family Low-Income	Multifamily Low-Income	Industrial	Large Commercial	Small Commercial
0.0	90%	88%	83%	81%	84%	90%	80%
0.5	88%	84%	81%	79%	80%	88%	77%
1.5	84%	76%	76%	76%	70%	83%	70%
2.5	79%	65%	71%	72%	58%	76%	61%
3.5	72%	52%	64%	68%	44%	68%	53%
4.5	65%	39%	58%	64%	32%	59%	44%
5.5	56%	27%	51%	60%	21%	48%	35%
6.5	47%	18%	44%	55%	14%	38%	27%
7.5	39%	11%	37%	51%	8%	29%	21%
8.5	31%	7%	30%	46%	5%	21%	16%
9.5	24%	4%	25%	41%	3%	15%	11%
10.5	18%	2%	20%	37%	2%	11%	8%
11.5	13%	1%	16%	33%	1%	7%	6%
12.5	10%	1%	12%	29%	1%	5%	4%
13.5	7%	1%	10%	25%	0%	3%	3%
14.5	5%	0%	7%	22%	0%	2%	2%
15.5	4%	0%	6%	19%	0%	1%	1%
16.5	3%	0%	4%	16%	0%	1%	1%
17.5	2%	0%	3%	14%	0%	1%	1%
18.5	1%	0%	3%	12%	0%	0%	0%
19.5	1%	0%	2%	10%	0%	0%	0%
20.5	1%	0%	1%	8%	0%	0%	0%
21.5	0%	0%	1%	7%	0%	0%	0%
50.0	0%	0%	0%	0%	0%	0%	0%



Upper Peninsula High Cost Measure Willingness to Pay Curves by Customer Segment							
Simple Payback (Years)	Single Family	Multifamily	Single Family Low-Income	Multifamily Low-Income	Industrial	Large Commercial	Small Commercial
0.0	95%	88%	94%	81%	84%	90%	78%
0.5	93%	84%	92%	79%	80%	88%	75%
1.5	90%	76%	89%	76%	70%	83%	69%
2.5	85%	65%	84%	72%	58%	76%	63%
3.5	78%	52%	77%	68%	44%	68%	56%
4.5	69%	39%	68%	64%	32%	59%	48%
5.5	58%	27%	58%	60%	21%	48%	41%
6.5	46%	18%	47%	55%	14%	38%	34%
7.5	35%	11%	36%	51%	8%	29%	28%
8.5	25%	7%	27%	46%	5%	21%	22%
9.5	18%	4%	19%	41%	3%	15%	18%
10.5	12%	2%	13%	37%	2%	11%	14%
11.5	8%	1%	9%	33%	1%	7%	11%
12.5	5%	1%	6%	29%	1%	5%	8%
13.5	3%	1%	4%	25%	0%	3%	6%
14.5	2%	0%	3%	22%	0%	2%	5%
15.5	1%	0%	2%	19%	0%	1%	4%
16.5	1%	0%	1%	16%	0%	1%	3%
17.5	1%	0%	1%	14%	0%	1%	2%
18.5	0%	0%	0%	12%	0%	0%	2%
19.5	0%	0%	0%	10%	0%	0%	1%
20.5	0%	0%	0%	8%	0%	0%	1%
21.5	0%	0%	0%	7%	0%	0%	1%
50.0	0%	0%	0%	0%	0%	0%	0%



Note: Unique measure names are a combination of common measure name, replacement type, primary fuel type, and peninsula.

Key Measure Input Summary

Measure ID	Unique Measure Name	Common Measure Name	Service Territory	End Use Category	Customer Segment	Sector	Replacement Type	Market Share Mechanism	Scaling Basis	Unit Basis	Base Measure Lifetime (years)	Efficient Measure Lifetime (years)	Early Retirement RUL (Years)	Base Measure Cost ($)	Efficient Measure Cost ($)	Labor Cost ($) (for Direct Install only)	Electric Energy Savings Loadshape	Base Electric Energy Consumption (kWh)	Efficient Electric Energy Consumption (kWh)	Base Electric Coincident Peak Demand (kW)	Efficient Electric Coincident Peak Demand (kW)	Gas Savings Loadshape	Base Gas Consumption (therms)	Efficient Gas Consumption (therms)	Water Savings Loadshape	Base Water Consumption (Gallons)	Efficient Water Consumption (Gallons)	Total Measure Density (Base + EE) (Unit Basis per Scaling Basis)	Baseline Initial Saturation (%)	EE Measure Initial Saturation (%)	Competition Group	NTG Factor (1-FreeRiders) (%)
Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric.1	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric | Upper Peninsula	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	Upper Peninsula | Total	Res - Appliance	Single Family	[illegible]	RET Only	Incentive-Based	Residential Households	per home	7.47	7.47	2	$0.00	$78.00	$0.00	Residential Appliances	0.00	-921.82	0.00	-0.11	None	0.00	0.00	None	0.00	0.00	0.23	100%	0%	NA	90%
Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric.2	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric | Lower Peninsula	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	Lower Peninsula | Total	Res - Appliance	Single Family	[illegible]	RET Only	Incentive-Based	Residential Households	per home	7.47	7.47	2	$0.00	$78.00	$0.00	Residential Appliances	0.00	-921.82	0.00	-0.11	None	0.00	0.00	None	0.00	0.00	0.23	100%	0%	NA	90%
Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric.3	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric | Upper Peninsula	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	Upper Peninsula | Total	Res - Appliance	Single Family Low-Income	[illegible]	RET Only	Incentive-Based	Residential Households	per home	7.47	7.47	2	$0.00	$78.00	$0.00	Residential Appliances	0.00	-921.82	0.00	-0.11	None	0.00	0.00	None	0.00	0.00	0.21	100%	0%	NA	100%
Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric.4	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric | Lower Peninsula	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	Lower Peninsula | Total	Res - Appliance	Single Family Low-Income	[illegible]	RET Only	Incentive-Based	Residential Households	per home	7.47	7.47	2	$0.00	$78.00	$0.00	Residential Appliances	0.00	-921.82	0.00	-0.11	None	0.00	0.00	None	0.00	0.00	0.21	100%	0%	NA	100%
Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric.5	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric | Upper Peninsula	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	Upper Peninsula | Total	Res - Appliance	Multifamily Low-Income	[illegible]	RET Only	Incentive-Based	Residential Households	per home	7.47	7.47	2	$0.00	$78.00	$0.00	Residential Appliances	0.00	-921.82	0.00	-0.11	None	0.00	0.00	None	0.00	0.00	0.09	100%	0%	NA	100%
Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric.6	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric | Lower Peninsula	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	Lower Peninsula | Total	Res - Appliance	Multifamily Low-Income	[illegible]	RET Only	Incentive-Based	Residential Households	per home	7.47	7.47	2	$0.00	$78.00	$0.00	Residential Appliances	0.00	-921.82	0.00	-0.11	None	0.00	0.00	None	0.00	0.00	0.09	100%	0%	NA	100%
Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric.7	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric | Upper Peninsula	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	Upper Peninsula | Total	Res - Appliance	Multifamily	[illegible]	RET Only	Incentive-Based	Residential Households	per home	7.47	7.47	2	$0.00	$78.00	$0.00	Residential Appliances	0.00	-921.82	0.00	-0.11	None	0.00	0.00	None	0.00	0.00	0.09	100%	0%	NA	100%
Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric.8	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric | Upper Peninsula	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	Upper Peninsula | Total	Res - Appliance	Multifamily	[illegible]	RET Only	Incentive-Based	Residential Households	per home	7.47	7.47	2	$0.00	$78.00	$0.00	Residential Appliances	0.00	-921.82	0.00	-0.11	None	0.00	0.00	None	0.00	0.00	0.09	100%	0%	NA	90%
Res - Clothes Dryers, Heatpump - ROB and NEW - Electric.1	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric | Upper Peninsula	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric	Upper Peninsula | Total	Res - Appliance	Single Family	[illegible]	ROB and NEW	Payback-Based	Residential Households	Clothes Dryers	12.00	12.00	0	$560.11	$1,345.84	$100.00	Residential Appliances	768.92	390.52	0.34	0.11	None	0.00	0.00	None	0.00	0.00	0.94	44%	0%	Upper Peninsula Electric Clothes Dryers	90%
Res - Clothes Dryers, Heatpump - ROB and NEW - Electric.2	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric | Lower Peninsula	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric	Lower Peninsula | Total	Res - Appliance	Single Family	[illegible]	ROB and NEW	Payback-Based	Residential Households	Clothes Dryers	12.00	12.00	0	$560.11	$1,345.84	$100.00	Residential Appliances	768.92	390.52	0.34	0.11	None	0.00	0.00	None	0.00	0.00	0.94	44%	0%	Lower Peninsula Electric Clothes Dryers	90%
Res - Clothes Dryers, Heatpump - ROB and NEW - Electric.3	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric | Upper Peninsula	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric	Upper Peninsula | Total	Res - Appliance	Single Family Low-Income	[illegible]	ROB and NEW	Payback-Based	Residential Households	Clothes Dryers	12.00	12.00	0	$560.11	$1,345.84	$100.00	Residential Appliances	768.92	390.52	0.34	0.11	None	0.00	0.00	None	0.00	0.00	0.81	63%	0%	Upper Peninsula Electric Clothes Dryers	100%
Res - Clothes Dryers, Heatpump - ROB and NEW - Electric.4	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric | Lower Peninsula	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric	Lower Peninsula | Total	Res - Appliance	Single Family Low-Income	[illegible]	ROB and NEW	Payback-Based	Residential Households	Clothes Dryers	12.00	12.00	0	$560.11	$1,345.84	$100.00	Residential Appliances	768.92	390.52	0.34	0.11	None	0.00	0.00	None	0.00	0.00	0.81	63%	0%	Lower Peninsula Electric Clothes Dryers	100%
Res - Clothes Dryers, Heatpump - ROB and NEW - Electric.5	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric | Upper Peninsula	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric	Upper Peninsula | Total	Res - Appliance	Multifamily Low-Income	[illegible]	ROB and NEW	Payback-Based	Residential Households	Clothes Dryers	12.00	12.00	0	$560.11	$1,345.84	$100.00	Residential Appliances	768.92	390.52	0.34	0.11	None	0.00	0.00	None	0.00	0.00	0.34	70%	0%	Upper Peninsula Electric Clothes Dryers	100%
Res - Clothes Dryers, Heatpump - ROB and NEW - Electric.6	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric | Lower Peninsula	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric	Lower Peninsula | Total	Res - Appliance	Multifamily Low-Income	[illegible]	ROB and NEW	Payback-Based	Residential Households	Clothes Dryers	12.00	12.00	0	$560.11	$1,345.84	$100.00	Residential Appliances	768.92	390.52	0.34	0.11	None	0.00	0.00	None	0.00	0.00	0.34	70%	0%	Lower Peninsula Electric Clothes Dryers	100%
Res - Clothes Dryers, Heatpump - ROB and NEW - Electric.7	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric | Upper Peninsula	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric	Upper Peninsula | Total	Res - Appliance	Multifamily	[illegible]	ROB and NEW	Payback-Based	Residential Households	Clothes Dryers	12.00	12.00	0	$560.11	$1,345.84	$100.00	Residential Appliances	768.92	390.52	0.34	0.11	None	0.00	0.00	None	0.00	0.00	0.34	59%	0%	Upper Peninsula Electric Clothes Dryers	90%
Res - Clothes Dryers, Heatpump - ROB and NEW - Electric.8	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric | Lower Peninsula	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric	Lower Peninsula | Total	Res - Appliance	Multifamily	[illegible]	ROB and NEW	Payback-Based	Residential Households	Clothes Dryers	12.00	12.00	0	$560.11	$1,345.84	$100.00	Residential Appliances	768.92	390.52	0.34	0.11	None	0.00	0.00	None	0.00	0.00	0.34	59%	0%	Lower Peninsula Electric Clothes Dryers	90%
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Com - Power Strips - RET Only - Electric.2	Com - Power Strips - RET Only - Electric | Lower Peninsula	Com - Power Strips - RET Only - Electric	Lower Peninsula | Total	Com - Other	per power strip	5.00	5.00	2	$0.00	$30.00	$0.00	C&I Office Equipment	338.36	274.23	0.00	0.00	None	0.00	0.00
Com - Power Strips - RET Only - Electric.3	Com - Power Strips - RET Only - Electric | Upper Peninsula	Com - Power Strips - RET Only - Electric	Upper Peninsula | Total	Com - Other	per power strip	5.00	5.00	2	$0.00	$30.00	$0.00	C&I Office Equipment	338.36	274.23	0.00	0.00	None	0.00	0.00
Com - Power Strips - RET Only - Electric.4	Com - Power Strips - RET Only - Electric | Lower Peninsula	Com - Power Strips - RET Only - Electric	Lower Peninsula | Total	Com - Other	per power strip	5.00	5.00	2	$0.00	$30.00	$0.00	C&I Office Equipment	338.36	274.23	0.00	0.00	None	0.00	0.00
Com - Air Compressors - RET Only - Electric.1	Com - Air Compressors - RET Only - Electric | Upper Peninsula	Com - Air Compressors - RET Only - Electric	Upper Peninsula | Total	Com - Other	per hp	15.00	15.00	5	$336.50	$689.44	$0.00	C&I Compressed Air	2,620.80	1,834.56	0.74	0.52	None	0.00	0.00
Com - Air Compressors - RET Only - Electric.2	Com - Air Compressors - RET Only - Electric | Lower Peninsula	Com - Air Compressors - RET Only - Electric	Lower Peninsula | Total	Com - Other	per hp	15.00	15.00	5	$336.50	$689.44	$0.00	C&I Compressed Air	2,620.80	1,834.56	0.74	0.52	None	0.00	0.00
Com - Air Compressors - RET Only - Electric.3	Com - Air Compressors - RET Only - Electric | Upper Peninsula	Com - Air Compressors - RET Only - Electric	Upper Peninsula | Total	Com - Other	per hp	15.00	15.00	5	$336.50	$689.44	$0.00	C&I Compressed Air	2,620.80	1,834.56	0.74	0.52	None	0.00	0.00
Com - Air Compressors - RET Only - Electric.4	Com - Air Compressors - RET Only - Electric | Lower Peninsula	Com - Air Compressors - RET Only - Electric	Lower Peninsula | Total	Com - Other	per hp	15.00	15.00	5	$336.50	$689.44	$0.00	C&I Compressed Air	2,620.80	1,834.56	0.74	0.52	None	0.00	0.00
Com - Custom - RET Only - Electric.1	Com - Custom - RET Only - Electric | Upper Peninsula	Com - Custom - RET Only - Electric	Upper Peninsula | Total	Com - Whole Building	Customer Segment Consumption (kWh/year)	10.00	10.00	3	$0.00	$0.05	$0.00	C&I Other	1.00	0.93	0.00	0.00	None	0.00	0.00
Com - Custom - RET Only - Electric.2	Com - Custom - RET Only - Electric | Lower Peninsula	Com - Custom - RET Only - Electric	Lower Peninsula | Total	Com - Whole Building	Customer Segment Consumption (kWh/year)	10.00	10.00	3	$0.00	$0.05	$0.00	C&I Other	1.00	0.93	0.00	0.00	None	0.00	0.00
Com - Custom - RET Only - Electric.3	Com - Custom - RET Only - Electric | Upper Peninsula	Com - Custom - RET Only - Electric	Upper Peninsula | Total	Com - Whole Building	Customer Segment Consumption (kWh/year)	10.00	10.00	3	$0.00	$0.05	$0.00	C&I Other	1.00	0.93	0.00	0.00	None	0.00	0.00
Com - Custom - RET Only - Electric.4	Com - Custom - RET Only - Electric | Lower Peninsula	Com - Custom - RET Only - Electric	Lower Peninsula | Total	Com - Whole Building	Customer Segment Consumption (kWh/year)	10.00	10.00	3	$0.00	$0.05	$0.00	C&I Other	1.00	0.93	0.00	0.00	None	0.00	0.00
Com - Strategic Energy Management (SEM) - RET Only - Electric.1	Com - Strategic Energy Management (SEM) - RET Only - Electric | Upper Peninsula	Com - Strategic Energy Management (SEM) - RET Only - Electric	Upper Peninsula | Total	Com - Whole Building	Customer Segment Consumption (kWh/year)	5.00	5.00	2	$0.00	$0.01	$0.00	C&I Other	1.00	0.96	0.00	0.00	None	0.00	0.00
Com - Strategic Energy Management (SEM) - RET Only - Electric.2	Com - Strategic Energy Management (SEM) - RET Only - Electric | Lower Peninsula	Com - Strategic Energy Management (SEM) - RET Only - Electric	Lower Peninsula | Total	Com - Whole Building	Customer Segment Consumption (kWh/year)	5.00	5.00	2	$0.00	$0.01	$0.00	C&I Other	1.00	0.96	0.00	0.00	None	0.00	0.00
Com - Strategic Energy Management (SEM) - RET Only - Electric.3	Com - Strategic Energy Management (SEM) - RET Only - Electric | Upper Peninsula	Com - Strategic Energy Management (SEM) - RET Only - Electric	Upper Peninsula | Total	Com - Whole Building	Customer Segment Consumption (kWh/year)	5.00	5.00	2	$0.00	$0.01	$0.00	C&I Other	1.00	0.96	0.00	0.00	None	0.00	0.00
Com - Strategic Energy Management (SEM) - RET Only - Electric.4	Com - Strategic Energy Management (SEM) - RET Only - Electric | Lower Peninsula	Com - Strategic Energy Management (SEM) - RET Only - Electric	Lower Peninsula | Total	Com - Whole Building	Customer Segment Consumption (kWh/year)	5.00	5.00	2	$0.00	$0.01	$0.00	C&I Other	1.00	0.96	0.00	0.00	None	0.00	0.00
Com - Strategic Energy Management (SEM) - RET Only - Gas.5	Com - Strategic Energy Management (SEM) - RET Only - Gas | Upper Peninsula	Com - Strategic Energy Management (SEM) - RET Only - Gas	Upper Peninsula | Total	Com - Whole Building	Customer Segment Consumption (Therms/year)	5.00	5.00	2	$0.00	$0.01	$0.00	C&I Other	0.00	0.00	0.00	0.00	None	1.00	0.98
Com - Strategic Energy Management (SEM) - RET Only - Gas.6	Com - Strategic Energy Management (SEM) - RET Only - Gas | Lower Peninsula	Com - Strategic Energy Management (SEM) - RET Only - Gas	Lower Peninsula | Total	Com - Whole Building	Customer Segment Consumption (Therms/year)	5.00	5.00	2	$0.00	$0.01	$0.00	C&I Other	0.00	0.00	0.00	0.00	None	1.00	0.98
Com - Strategic Energy Management (SEM) - RET Only - Gas.7	Com - Strategic Energy Management (SEM) - RET Only - Gas | Upper Peninsula	Com - Strategic Energy Management (SEM) - RET Only - Gas	Upper Peninsula | Total	Com - Whole Building	Customer Segment Consumption (Therms/year)	5.00	5.00	2	$0.00	$0.01	$0.00	C&I Other	0.00	0.00	0.00	0.00	None	1.00	0.98
Com - Strategic Energy Management (SEM) - RET Only - Gas.8	Com - Strategic Energy Management (SEM) - RET Only - Gas | Lower Peninsula	Com - Strategic Energy Management (SEM) - RET Only - Gas	Lower Peninsula | Total	Com - Whole Building	Customer Segment Consumption (Therms/year)	5.00	5.00	2	$0.00	$0.01	$0.00	C&I Other	0.00	0.00	0.00	0.00	None	1.00	0.98
Com - Custom - RET Only - Gas.1	Com - Custom - RET Only - Gas | Upper Peninsula	Com - Custom - RET Only - Gas	Upper Peninsula | Total	Com - Whole Building	Customer Segment Consumption (Therms/year)	10.00	10.00	3	$0.00	$0.32	$0.00	C&I Other	0.00	0.00	0.00	0.00	None	1.00	0.91
Com - Custom - RET Only - Gas.2	Com - Custom - RET Only - Gas | Lower Peninsula	Com - Custom - RET Only - Gas	Lower Peninsula | Total	Com - Whole Building	Customer Segment Consumption (Therms/year)	10.00	10.00	3	$0.00	$0.32	$0.00	C&I Other	0.00	0.00	0.00	0.00	None	1.00	0.91
Com - Custom - RET Only - Gas.3	Com - Custom - RET Only - Gas | Upper Peninsula	Com - Custom - RET Only - Gas	Upper Peninsula | Total	Com - Whole Building	Customer Segment Consumption (Therms/year)	10.00	10.00	3	$0.00	$0.32	$0.00	C&I Other	0.00	0.00	0.00	0.00	None	1.00	0.91
Com - Custom - RET Only - Gas.4	Com - Custom - RET Only - Gas | Lower Peninsula	Com - Custom - RET Only - Gas	Lower Peninsula | Total	Com - Whole Building	Customer Segment Consumption (Therms/year)	10.00	10.00	3	$0.00	$0.32	$0.00	C&I Other	0.00	0.00	0.00	0.00	None	1.00	0.91
Com - Forklift Chargers - RET Only - Electric.1	Com - Forklift Chargers - RET Only - Electric | Upper Peninsula	Com - Forklift Chargers - RET Only - Electric	Upper Peninsula | Total	Com - Other	Forklift Chargers	20.00	20.00	7	$0.00	$872.50	$0.00	C&I Machine Drive	0.00	-2,595.33	0.00	0.00	None	0.00	0.00
Com - Forklift Chargers - RET Only - Electric.2	Com - Forklift Chargers - RET Only - Electric | Lower Peninsula	Com - Forklift Chargers - RET Only - Electric	Lower Peninsula | Total	Com - Other	Forklift Chargers	20.00	20.00	7	$0.00	$872.50	$0.00	C&I Machine Drive	0.00	-2,595.33	0.00	0.00	None	0.00	0.00
Com - Energy Management System (EMS) - RET Only - Electric.1	Com - Energy Management System (EMS) - RET Only - Electric | Upper Peninsula	Com - Energy Management System (EMS) - RET Only - Electric	Upper Peninsula | Total	Com - Whole Building	per 1000 ft2 of floor space	15.00	15.00	5	$0.00	$926.14	$1.27	C&I Other	0.00	-1,143.10	0.00	-0.04	None	0.00	0.00
Com - Energy Management System (EMS) - RET Only - Electric.2	Com - Energy Management System (EMS) - RET Only - Electric | Upper Peninsula	Com - Energy Management System (EMS) - RET Only - Electric	Upper Peninsula | Total	Com - Whole Building	per 1000 ft2 of floor space	15.00	15.00	5	$0.00	$926.14	$1.27	C&I Other	0.00	-1,143.10	0.00	-0.04	None	0.00	0.00
Com - Energy Management System (EMS) - RET Only - Electric.3	Com - Energy Management System (EMS) - RET Only - Electric | Lower Peninsula	Com - Energy Management System (EMS) - RET Only - Electric	Lower Peninsula | Total	Com - Whole Building	per 1000 ft2 of floor space	15.00	15.00	5	$0.00	$926.14	$1.27	C&I Other	0.00	-1,143.10	0.00	-0.04	None	0.00	0.00
Com - Energy Management System (EMS) - RET Only - Electric.4	Com - Energy Management System (EMS) - RET Only - Electric | Lower Peninsula	Com - Energy Management System (EMS) - RET Only - Electric	Lower Peninsula | Total	Com - Whole Building	per 1000 ft2 of floor space	15.00	15.00	5	$0.00	$926.14	$1.27	C&I Other	0.00	-1,143.10	0.00	-0.04	None	0.00	0.00
Com - Energy Management System (EMS) - RET Only - Gas.5	Com - Energy Management System (EMS) - RET Only - Gas | Upper Peninsula	Com - Energy Management System (EMS) - RET Only - Gas	Upper Peninsula | Total	Com - Whole Building	per 1000 ft2 of floor space	15.00	15.00	5	$0.00	$70.71	$1.27	C&I Other	0.00	0.00	0.04	0.00	None	0.00	-13.73
Com - Energy Management System (EMS) - RET Only - Gas.6	Com - Energy Management System (EMS) - RET Only - Gas | Upper Peninsula	Com - Energy Management System (EMS) - RET Only - Gas	Upper Peninsula | Total	Com - Whole Building	per 1000 ft2 of floor space	15.00	15.00	5	$0.00	$70.71	$1.27	C&I Other	0.00	0.00	0.04	0.00	None	0.00	-13.73
Com - Energy Management System (EMS) - RET Only - Gas.7	Com - Energy Management System (EMS) - RET Only - Gas | Lower Peninsula	Com - Energy Management System (EMS) - RET Only - Gas	Lower Peninsula | Total	Com - Whole Building	per 1000 ft2 of floor space	15.00	15.00	5	$0.00	$70.71	$1.27	C&I Other	0.00	0.00	0.04	0.00	None	0.00	-13.73
Com - Energy Management System (EMS) - RET Only - Gas.8	Com - Energy Management System (EMS) - RET Only - Gas | Lower Peninsula	Com - Energy Management System (EMS) - RET Only - Gas	Lower Peninsula | Total	Com - Whole Building	per 1000 ft2 of floor space	15.00	15.00	5	$0.00	$70.71	$1.27	C&I Other	0.00	0.00	0.04	0.00	None	0.00	-13.73

Lower Peninsula	Net UCT Test Ratio = (a) / (b)	Net PV UCT Benefits NPV 2021 $ Million (a)	Net PV UCT Costs NPV 2021 $ Million (b) = (c) + (d)	Program Administrative Costs NPV 2021 $ Million (c)	Program Incentive Costs NPV 2021 $ Million (d)
Residential Electric Program Bundle					
2021	1.1	$135,300,849	$118,294,428	$39,431,476	$78,862,952
2030	0.88	$157,461,751	$178,822,063	$59,607,354	$119,214,709
2040	0.85	$237,422,675	$279,856,964	$93,285,655	$186,571,310
Residential Natural Gas Program Bundle					
2021	1.3	$81,069,344	$64,728,771	$21,576,257	$43,152,514
2030	1.2	$111,853,792	$91,681,198	$30,560,399	$61,120,798
2040	0.93	$114,873,542	$124,108,175	$41,369,392	$82,738,783
Commercial & Industrial Electric Program Bundle					
2021	1.4	$592,747,301	$428,260,444	$142,753,481	$285,506,963
2030	1.5	$327,343,257	$213,761,007	$71,253,669	$142,507,338
2040	1.3	$150,996,084	$117,716,905	$39,238,968	$78,477,936
Commercial & Industrial Natural Gas Program Bundle					
2021	2.5	$99,530,402	$40,554,645	$13,518,215	$27,036,430
2030	5.3	$145,717,267	$27,498,669	$9,166,223	$18,332,446
2040	3.7	$67,527,640	$18,045,654	$6,015,218	$12,030,436
Residential Programs Total					
2021	1.2	$216,370,193	$183,023,199	$61,007,733	$122,015,466
2030	1.0	$269,315,543	$270,503,261	$90,167,754	$180,335,507
2040	0.87	$352,296,217	$403,965,139	$134,655,046	$269,310,093
Commercial & Industrial Programs Total					
2021	1.5	$692,277,704	$468,815,090	$156,271,697	$312,543,393
2030	2.0	$473,060,523	$241,259,676	$80,419,892	$160,839,784
2040	1.6	$218,523,724	$135,762,559	$45,254,186	$90,508,372
Lower Peninsula Portfolio Total					
2021	**1.4**	**$908,647,897**	**$651,838,288**	**$217,279,429**	**$434,558,859**
2030	**1.5**	**$742,376,066**	**$511,762,937**	**$170,587,646**	**$341,175,291**
2040	**1.1**	**$570,819,941**	**$539,727,698**	**$179,909,233**	**$359,818,465**

Upper Peninsula	Net UCT Test Ratio = (a) / (b)	Net PV UCT Benefits NPV 2021 $ Million (a)	Net PV UCT Costs NPV 2021 $ Million (b) = (c) + (d)	Program Administrativ e Costs NPV 2021 $ Million (c)	Program Incentive Costs NPV 2021 $ Million (d)
Residential Electric Program Bundle					
2021	1.3	$3,173,073	$2,446,999	$815,666	$1,631,333
2030	0.87	$2,477,571	$2,854,349	$951,450	$1,902,900
2040	0.72	$2,495,770	$3,468,162	$1,156,054	$2,312,108
Residential Natural Gas Program Bundle					
2021	1.2	$2,012,906	$1,697,472	$565,824	$1,131,648
2030	1.0	$1,976,958	$1,893,203	$631,068	$1,262,135
2040	1.0	$1,327,427	$1,277,125	$425,708	$851,417
Commercial & Industrial Electric Program Bundle					
2021	1.2	$6,894,419	$5,567,214	$1,855,738	$3,711,476
2030	1.2	$3,367,418	$2,765,494	$921,831	$1,843,662
2040	0.91	$1,184,539	$1,301,513	$433,838	$867,675
Commercial & Industrial Natural Gas Program Bundle					
2021	2.0	$986,170	$500,672	$166,891	$333,781
2030	4.0	$1,448,365	$359,251	$119,750	$239,501
2040	4.5	$861,285	$192,033	$64,011	$128,022
Residential Programs Total					
2021	1.3	$5,185,979	$4,144,471	$1,381,490	$2,762,981
2030	0.94	$4,454,530	$4,747,552	$1,582,517	$3,165,035
2040	0.81	$3,823,197	$4,745,288	$1,581,763	$3,163,525
Commercial & Industrial Programs Total					
2021	1.3	$7,880,589	$6,067,886	$2,022,629	$4,045,257
2030	1.5	$4,815,784	$3,124,745	$1,041,582	$2,083,163
2040	1.4	$2,045,824	$1,493,546	$497,849	$995,697
Lower Peninsula Portfolio Total					
2021	**1.3**	**$13,066,568**	**$10,212,357**	**$3,404,119**	**$6,808,238**
2030	**1.2**	**$9,270,313**	**$7,872,297**	**$2,624,099**	**$5,248,198**
2040	**0.94**	**$5,869,021**	**$6,238,833**	**$2,079,611**	**$4,159,222**

Program UCT Benefits ($)

Lower Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential Electric Programs	$135,300,849	$136,287,954	$132,076,388	$138,555,565	$129,092,208	$134,003,630	$152,385,591	$139,912,131	$146,992,726	$157,461,751	$166,351,767	$179,562,784	$175,573,217	$185,393,840	$203,976,297	$221,440,207	$199,609,180	$216,121,272	$222,148,009	$237,422,675
C&I Electric Programs	$592,747,301	$624,639,355	$630,397,993	$601,819,159	$558,198,647	$508,105,105	$455,881,035	$408,982,896	$369,206,002	$327,343,257	$318,487,757	$296,164,016	$244,703,355	$212,406,591	$244,271,479	$182,494,820	$169,516,743	$148,632,592	$135,154,705	$150,996,084
Residential Gas Programs	$81,069,344	$86,761,675	$91,291,232	$96,412,579	$99,225,760	$103,670,035	$109,036,325	$109,147,444	$110,783,226	$111,853,792	$111,860,760	$110,806,974	$108,421,873	$106,643,713	$105,141,114	$130,143,876	$125,475,545	$122,801,025	$118,835,616	$114,873,542
C&I Gas Programs	$99,530,402	$108,143,372	$115,421,780	$126,051,078	$131,886,271	$138,754,333	$144,104,462	$147,478,362	$148,829,800	$145,717,267	$145,037,296	$140,315,054	$127,643,942	$116,871,988	$112,572,633	$97,779,606	$88,848,785	$79,361,559	$71,743,199	$67,527,640

*Benefits based on savings net of free ridership

Program UCT Costs ($)

Lower Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential Electric Programs	$118,294,428	$119,848,790	$119,525,508	$132,035,408	$123,388,457	$133,705,238	$162,357,539	$150,452,808	$163,257,263	$178,822,063	$191,124,657	$212,791,960	$207,296,952	$219,708,615	$242,268,218	$264,038,876	$234,870,343	$255,408,563	$262,231,457	$279,856,964
C&I Electric Programs	$428,260,444	$434,669,350	$425,602,952	$395,794,205	$360,696,624	$326,024,931	$292,545,013	$262,992,415	$239,101,923	$213,761,007	$212,651,700	$202,019,985	$168,666,341	$149,616,219	$177,210,168	$134,888,850	$128,151,847	$113,488,260	$104,642,022	$117,716,905
Residential Gas Programs	$64,728,771	$68,922,534	$72,409,513	$76,196,687	$78,716,531	$82,467,358	$86,887,008	$88,283,147	$90,282,598	$91,681,198	$92,179,993	$91,795,465	$90,392,665	$89,146,353	$87,900,505	$137,028,806	$134,146,220	$131,842,274	$128,225,162	$124,108,175
C&I Gas Programs	$40,554,645	$40,506,050	$37,002,395	$35,722,732	$34,259,063	$32,942,102	$31,623,797	$30,311,651	$29,204,337	$27,498,669	$27,482,327	$29,009,253	$26,130,829	$24,275,463	$24,952,066	$21,855,600	$20,722,364	$19,210,027	$18,122,985	$18,045,654

Program UCT Ratio

Lower Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential Electric Programs	1.1	1.1	1.1	1.0	1.0	1.0	0.94	0.93	0.90	0.88	0.87	0.84	0.85	0.84	0.84	0.84	0.85	0.85	0.85	0.85
C&I Electric Programs	1.4	1.4	1.5	1.5	1.5	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.3	1.3	1.3	1.3
Residential Gas Programs	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	0.95	0.94	0.93	0.93	0.93
C&I Gas Programs	2.5	2.7	3.1	3.5	3.8	4.2	4.6	4.9	5.1	5.3	5.3	4.8	4.9	4.8	4.5	4.5	4.3	4.1	4.0	3.7

Sector and Portfolio UCT Benefits ($)

Lower Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential	216,370,193	223,049,629	223,367,620	234,968,145	228,317,967	237,673,665	261,421,916	249,059,574	257,775,953	269,315,543	278,212,526	290,369,758	283,995,090	292,037,552	309,117,410	351,584,083	325,084,725	338,922,298	340,983,624	352,296,217
Commercial & Industrial	692,277,704	732,782,728	745,819,773	727,870,237	690,084,918	646,859,438	599,985,498	556,461,257	518,035,803	473,060,523	463,525,053	436,479,070	372,347,296	329,278,579	356,844,112	280,274,427	258,365,529	227,994,151	206,897,904	218,523,724
Total Portfolio	908,647,897	955,832,357	969,187,393	962,838,382	918,402,886	884,533,102	861,407,413	805,520,832	775,811,755	742,376,066	741,737,580	726,848,828	656,342,386	621,316,132	665,961,523	631,858,509	583,450,254	566,916,449	547,881,528	570,819,941

Sector and Portfolio UCT Costs ($)

Lower Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential	183,023,199	188,771,324	191,935,020	208,232,095	202,104,988	216,172,596	249,244,547	238,735,955	253,539,860	270,503,261	283,304,650	304,587,425	297,689,617	308,854,967	330,168,722	401,067,682	369,016,563	387,250,837	390,456,619	403,965,139
Commercial & Industrial	468,815,090	475,175,400	462,605,347	431,516,937	394,955,687	358,967,034	324,168,810	293,304,066	268,306,260	241,259,676	240,134,027	231,029,239	194,797,171	173,891,682	202,162,234	156,744,450	148,874,211	132,698,287	122,765,008	135,762,559
Total Portfolio	651,838,288	663,946,724	654,540,367	639,749,032	597,060,675	575,139,630	573,413,357	532,040,020	521,846,120	511,762,937	523,438,676	535,616,663	492,486,788	482,746,649	532,330,956	557,812,132	517,890,774	519,949,124	513,221,627	539,727,698

Sector and Portfolio UCT Ratio

Lower Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential	1.2	1.2	1.2	1.1	1.1	1.1	1.0	1.0	1.0	1.0	0.98	0.95	0.95	0.95	0.94	0.88	0.88	0.88	0.87	0.87
Commercial & Industrial	1.5	1.5	1.6	1.7	1.7	1.8	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.8	1.8	1.7	1.7	1.7	1.6
Total Portfolio	1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.3	1.3	1.3	1.1	1.1	1.1	1.1	1.1

Program UCT Benefits ($)

Upper Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential Electric Programs	$3,173,073	$3,099,977	$2,897,335	$2,751,499	$2,605,716	$2,500,769	$2,522,820	$2,444,896	$2,457,019	$2,477,571	$2,505,571	$2,528,609	$2,550,794	$2,565,530	$2,574,729	$2,574,212	$2,568,656	$2,546,453	$2,519,560	$2,495,770
C&I Electric Programs	$6,894,419	$7,062,648	$6,926,619	$6,599,583	$6,099,386	$5,519,077	$4,931,249	$4,351,032	$3,828,558	$3,367,418	$2,960,339	$2,606,661	$2,303,578	$2,046,309	$1,829,439	$1,648,129	$1,497,019	$1,372,225	$1,269,309	$1,184,539
Residential Gas Programs	$2,012,906	$2,078,549	$2,104,972	$2,107,007	$2,088,586	$2,066,685	$2,054,883	$2,032,039	$2,008,828	$1,976,958	$1,936,648	$1,887,288	$1,830,151	$1,765,995	$1,696,604	$1,623,477	$1,548,625	$1,473,001	$1,398,656	$1,327,427
C&I Gas Programs	$986,170	$1,039,238	$1,090,564	$1,184,516	$1,203,940	$1,261,625	$1,324,442	$1,372,409	$1,416,153	$1,448,365	$1,462,867	$1,455,203	$1,424,330	$1,371,401	$1,300,228	$1,216,276	$1,125,392	$1,033,217	$944,140	$861,285

*Benefits based on savings net of free ridership

Program UCT Costs ($)

Upper Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential Electric Programs	$2,446,999	$2,458,720	$2,362,963	$2,330,307	$2,296,477	$2,328,326	$2,513,303	$2,578,299	$2,722,462	$2,854,349	$2,977,526	$3,081,256	$3,173,852	$3,250,709	$3,316,377	$3,367,554	$3,411,098	$3,431,241	$3,447,585	$3,468,162
C&I Electric Programs	$5,567,214	$5,599,095	$5,420,539	$5,115,596	$4,704,728	$4,262,392	$3,838,872	$3,427,236	$3,070,598	$2,765,494	$2,498,523	$2,267,454	$2,069,112	$1,899,231	$1,753,779	$1,630,041	$1,524,834	$1,436,651	$1,362,942	$1,301,513
Residential Gas Programs	$1,697,472	$1,772,247	$1,825,003	$1,861,234	$1,880,840	$1,898,114	$1,915,178	$1,921,798	$1,915,072	$1,893,203	$1,857,930	$1,810,991	$1,754,843	$1,691,716	$1,623,897	$1,553,392	$1,482,093	$1,411,285	$1,342,530	$1,277,125
C&I Gas Programs	$500,672	$490,713	$472,117	$457,058	$432,676	$413,671	$399,528	$382,974	$370,425	$359,251	$347,565	$334,351	$319,158	$301,936	$283,101	$263,449	$243,804	$225,011	$207,634	$192,033

Program UCT Ratio

Upper Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential Electric Programs	1.3	1.3	1.2	1.2	1.1	1.1	1.0	0.95	0.90	0.87	0.84	0.82	0.80	0.79	0.78	0.76	0.75	0.74	0.73	0.72
C&I Electric Programs	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.1	1.1	1.1	1.0	1.0	0.98	0.96	0.93	0.91
Residential Gas Programs	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
C&I Gas Programs	2.0	2.1	2.3	2.6	2.8	3.0	3.3	3.6	3.8	4.0	4.2	4.4	4.5	4.5	4.6	4.6	4.6	4.6	4.5	4.5

Sector and Portfolio UCT Benefits ($)

Upper Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential	5,185,979	5,178,526	5,002,307	4,858,507	4,694,301	4,567,454	4,577,703	4,476,935	4,465,847	4,454,530	4,442,219	4,415,897	4,380,946	4,331,525	4,271,333	4,197,689	4,117,281	4,019,454	3,918,215	3,823,197
Commercial & Industrial	7,880,589	8,101,886	8,017,183	7,784,099	7,303,326	6,780,702	6,255,690	5,723,441	5,244,711	4,815,784	4,423,206	4,061,865	3,727,907	3,417,710	3,129,667	2,864,405	2,622,411	2,405,442	2,213,449	2,045,824
Total Portfolio	13,066,568	13,280,412	13,019,490	12,642,606	11,997,628	11,348,156	10,833,394	10,200,376	9,710,558	9,270,313	8,865,425	8,477,762	8,108,853	7,749,235	7,400,999	7,062,094	6,739,692	6,424,896	6,131,664	5,869,021

Sector and Portfolio UCT Costs ($)

Upper Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential	4,144,471	4,230,967	4,187,966	4,191,541	4,177,317	4,226,439	4,428,480	4,500,097	4,637,534	4,747,552	4,835,456	4,892,246	4,928,695	4,942,425	4,940,275	4,920,946	4,893,192	4,842,525	4,790,115	4,745,288
Commercial & Industrial	6,067,886	6,089,808	5,892,656	5,572,654	5,137,404	4,676,063	4,238,400	3,810,211	3,441,023	3,124,745	2,846,087	2,601,805	2,388,270	2,201,167	2,036,880	1,893,491	1,768,638	1,661,662	1,570,575	1,493,546
Total Portfolio	10,212,357	10,320,776	10,080,622	9,764,195	9,314,720	8,902,502	8,666,880	8,310,308	8,078,558	7,872,297	7,681,543	7,494,051	7,316,965	7,143,592	6,977,155	6,814,437	6,661,829	6,504,187	6,360,690	6,238,833

Sector and Portfolio UCT Ratio

Upper Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential	1.3	1.2	1.2	1.2	1.1	1.1	1.0	0.99	0.96	0.94	0.92	0.90	0.89	0.88	0.86	0.85	0.84	0.83	0.82	0.81
Commercial & Industrial	1.3	1.3	1.4	1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.6	1.6	1.5	1.5	1.5	1.4	1.4	1.4
Total Portfolio	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.0	1.0	0.99	0.96	0.94

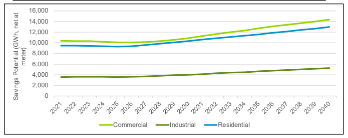
Lower Peninsula Program Budget by Budget Type ($)

Service Territory	Program Bundles	Budget Type	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Lower Peninsula | Total	Residential Electric Programs	Incentives	$78,862,952	$79,899,193	$79,683,672	$88,023,605	$82,258,971	$89,136,825	$108,238,359	$100,301,872	$108,838,175	$119,214,709	$127,416,438	$141,861,306	$138,197,968	$146,472,410	$161,512,145	$176,025,918	$156,580,229	$170,272,376	$174,820,971	$186,571,310
Lower Peninsula | Total	C&I Electric Programs	Incentives	$285,506,963	$289,779,567	$283,735,301	$263,862,804	$240,464,416	$217,349,954	$195,030,008	$175,328,277	$159,401,282	$142,507,338	$141,767,800	$134,679,990	$112,444,228	$99,744,146	$118,140,112	$89,925,900	$85,434,565	$75,658,840	$69,761,348	$78,477,936
Lower Peninsula | Total	Residential Gas Programs	Incentives	$43,152,514	$45,948,356	$48,273,009	$50,797,791	$52,477,688	$54,978,239	$57,924,672	$58,855,431	$60,188,398	$61,120,798	$61,453,328	$61,196,977	$60,261,777	$59,430,902	$58,600,336	$91,352,537	$89,430,813	$87,894,849	$85,483,441	$82,738,783
Lower Peninsula | Total	C&I Gas Programs	Incentives	$27,036,430	$27,004,033	$24,668,263	$23,815,154	$22,839,375	$21,961,402	$21,082,531	$20,207,767	$19,469,558	$18,332,446	$18,321,551	$19,339,502	$17,420,553	$16,183,642	$16,634,711	$14,570,400	$13,814,909	$12,806,684	$12,081,990	$12,030,436
Lower Peninsula | Total	Residential Electric Programs	Program Admin	$39,431,476	$39,949,597	$39,841,836	$44,011,803	$41,129,486	$44,568,413	$54,119,180	$50,150,936	$54,419,088	$59,607,354	$63,708,219	$70,930,653	$69,098,984	$73,236,205	$80,756,073	$88,012,959	$78,290,114	$85,136,188	$87,410,486	$93,285,655
Lower Peninsula | Total	C&I Electric Programs	Program Admin	$142,753,481	$144,889,783	$141,867,651	$131,931,402	$120,232,208	$108,674,977	$97,515,004	$87,664,138	$79,700,641	$71,253,669	$70,883,900	$67,339,995	$56,222,114	$49,872,073	$59,070,056	$44,962,950	$42,717,282	$37,829,420	$34,880,674	$39,238,968
Lower Peninsula | Total	Residential Gas Programs	Program Admin	$21,576,257	$22,974,178	$24,136,504	$25,398,896	$26,238,844	$27,489,119	$28,962,336	$29,427,716	$30,094,199	$30,560,399	$30,726,664	$30,598,488	$30,130,888	$29,715,451	$29,300,168	$45,676,269	$44,715,407	$43,947,425	$42,741,721	$41,369,392
Lower Peninsula | Total	C&I Gas Programs	Program Admin	$13,518,215	$13,502,017	$12,334,132	$11,907,577	$11,419,688	$10,980,701	$10,541,266	$10,103,884	$9,734,779	$9,166,223	$9,160,776	$9,669,751	$8,710,276	$8,091,821	$8,317,355	$7,285,200	$6,907,455	$6,403,342	$6,040,995	$6,015,218
Lower Peninsula | Total	Residential Electric Programs	Program Total	$118,294,428	$119,848,790	$119,525,508	$132,035,408	$123,388,457	$133,705,238	$162,357,539	$150,452,808	$163,257,263	$178,822,063	$191,124,657	$212,791,960	$207,296,952	$219,708,615	$242,268,218	$264,038,876	$234,870,343	$255,408,563	$262,231,457	$279,856,964
Lower Peninsula | Total	C&I Electric Programs	Program Total	$428,260,444	$434,669,350	$425,602,952	$395,794,205	$360,696,624	$326,024,931	$292,545,013	$262,992,415	$239,101,923	$213,761,007	$212,651,700	$202,019,985	$168,666,341	$149,616,219	$177,210,168	$134,888,850	$128,151,847	$113,488,260	$104,642,022	$117,716,905
Lower Peninsula | Total	Residential Gas Programs	Program Total	$64,728,771	$68,922,534	$72,409,513	$76,196,687	$78,716,531	$82,467,358	$86,887,008	$88,283,147	$90,282,598	$91,681,198	$92,179,993	$91,795,465	$90,392,665	$89,146,353	$87,900,505	$137,028,806	$134,146,220	$131,842,274	$128,225,162	$124,108,175
Lower Peninsula | Total	C&I Gas Programs	Program Total	$40,554,645	$40,506,050	$37,002,395	$35,722,732	$34,259,063	$32,942,102	$31,623,797	$30,311,651	$29,204,337	$27,498,669	$27,482,327	$29,009,253	$26,130,829	$24,275,463	$24,952,066	$21,855,600	$20,722,364	$19,210,027	$18,122,985	$18,045,654
Lower Peninsula | Total	Portfolio Total	Incentives	$434,558,859	$442,631,149	$436,360,245	$426,499,355	$398,040,450	$383,426,420	$382,275,571	$354,693,347	$347,897,413	$341,175,291	$348,959,118	$357,077,776	$328,324,525	$321,831,099	$354,887,304	$371,874,754	$345,260,516	$346,632,750	$342,147,751	$359,818,465
Lower Peninsula | Total	Portfolio Total	Program Admin	$217,279,429	$221,315,575	$218,180,122	$213,249,677	$199,020,225	$191,713,210	$191,137,786	$177,346,673	$173,948,707	$170,587,646	$174,479,559	$178,538,888	$164,162,263	$160,915,550	$177,443,652	$185,937,377	$172,630,258	$173,316,375	$171,073,876	$179,909,233
Lower Peninsula | Total	Portfolio Total	Program Total	$651,838,288	$663,946,724	$654,540,367	$639,749,032	$597,060,675	$575,139,630	$573,413,357	$532,040,020	$521,846,120	$511,762,937	$523,438,676	$535,616,663	$492,486,788	$482,746,649	$532,330,956	$557,812,132	$517,890,774	$519,949,124	$513,221,627	$539,727,698

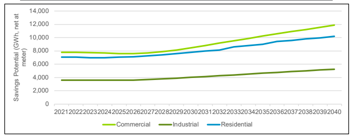
Upper Peninsula Program Budget by Budget Type ($)

Service Territory	Program Bundles	Budget Type	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Upper Peninsula | Total	Residential Electric Programs	Incentives	$1,631,333	$1,639,147	$1,575,309	$1,553,538	$1,530,984	$1,552,217	$1,675,535	$1,718,866	$1,814,975	$1,902,900	$1,985,017	$2,054,170	$2,115,901	$2,167,139	$2,210,918	$2,245,036	$2,274,066	$2,287,494	$2,298,390	$2,312,108
Upper Peninsula | Total	C&I Electric Programs	Incentives	$3,711,476	$3,732,730	$3,613,693	$3,410,397	$3,136,485	$2,841,595	$2,559,248	$2,284,824	$2,047,065	$1,843,662	$1,665,682	$1,511,636	$1,379,408	$1,266,154	$1,169,186	$1,086,694	$1,016,556	$957,767	$908,628	$867,675
Upper Peninsula | Total	Residential Gas Programs	Incentives	$1,131,648	$1,181,498	$1,216,669	$1,240,823	$1,253,893	$1,265,409	$1,276,785	$1,281,199	$1,276,715	$1,262,135	$1,238,620	$1,207,327	$1,169,895	$1,127,811	$1,082,598	$1,035,595	$988,062	$940,856	$895,020	$851,417
Upper Peninsula | Total	C&I Gas Programs	Incentives	$333,781	$327,142	$314,745	$304,706	$288,451	$275,780	$266,352	$255,316	$246,950	$239,501	$231,710	$222,900	$212,772	$201,290	$188,734	$175,633	$162,536	$150,007	$138,422	$128,022
Upper Peninsula | Total	Residential Electric Programs	Program Admin	$815,666	$819,573	$787,654	$776,769	$765,492	$776,109	$837,768	$859,433	$907,487	$951,450	$992,509	$1,027,085	$1,057,951	$1,083,570	$1,105,459	$1,122,518	$1,137,033	$1,143,747	$1,149,195	$1,156,054
Upper Peninsula | Total	C&I Electric Programs	Program Admin	$1,855,738	$1,866,365	$1,806,846	$1,705,199	$1,568,243	$1,420,797	$1,279,624	$1,142,412	$1,023,533	$921,831	$832,841	$755,818	$689,704	$633,077	$584,593	$543,347	$508,278	$478,884	$454,314	$433,838
Upper Peninsula | Total	Residential Gas Programs	Program Admin	$565,824	$590,749	$608,334	$620,411	$626,947	$632,705	$638,393	$640,599	$638,357	$631,068	$619,310	$603,664	$584,948	$563,905	$541,299	$517,797	$494,031	$470,428	$447,510	$425,708
Upper Peninsula | Total	C&I Gas Programs	Program Admin	$166,891	$163,571	$157,372	$152,353	$144,225	$137,890	$133,176	$127,658	$123,475	$119,750	$115,855	$111,450	$106,386	$100,645	$94,367	$87,816	$81,268	$75,004	$69,211	$64,011
Upper Peninsula | Total	Residential Electric Programs	Program Total	$2,446,999	$2,458,720	$2,362,963	$2,330,307	$2,296,477	$2,328,326	$2,513,303	$2,578,299	$2,722,462	$2,854,349	$2,977,526	$3,081,256	$3,173,852	$3,250,709	$3,316,377	$3,367,554	$3,411,098	$3,431,241	$3,447,585	$3,468,162
Upper Peninsula | Total	C&I Electric Programs	Program Total	$5,567,214	$5,599,095	$5,420,539	$5,115,596	$4,704,728	$4,262,392	$3,838,872	$3,427,236	$3,070,598	$2,765,494	$2,498,523	$2,267,454	$2,069,112	$1,899,231	$1,753,779	$1,630,041	$1,524,834	$1,436,651	$1,362,942	$1,301,513
Upper Peninsula | Total	Residential Gas Programs	Program Total	$1,697,472	$1,772,247	$1,825,003	$1,861,234	$1,880,840	$1,898,114	$1,915,178	$1,921,798	$1,915,072	$1,893,203	$1,857,930	$1,810,991	$1,754,843	$1,691,716	$1,623,897	$1,553,392	$1,482,093	$1,411,285	$1,342,530	$1,277,125
Upper Peninsula | Total	C&I Gas Programs	Program Total	$500,672	$490,713	$472,117	$457,058	$432,676	$413,671	$399,528	$382,974	$370,425	$359,251	$347,565	$334,351	$319,158	$301,936	$283,101	$263,449	$243,804	$225,011	$207,634	$192,033
Upper Peninsula | Total	Portfolio Total	Incentives	$6,808,238	$6,880,517	$6,720,415	$6,509,464	$6,209,813	$5,935,001	$5,777,920	$5,540,205	$5,385,705	$5,248,198	$5,121,029	$4,996,034	$4,877,977	$4,762,395	$4,651,437	$4,542,958	$4,441,220	$4,336,125	$4,240,460	$4,159,222
Upper Peninsula | Total	Portfolio Total	Program Admin	$3,404,119	$3,440,259	$3,360,207	$3,254,732	$3,104,907	$2,967,501	$2,888,960	$2,770,103	$2,692,853	$2,624,099	$2,560,514	$2,498,017	$2,438,988	$2,381,197	$2,325,718	$2,271,479	$2,220,610	$2,168,062	$2,120,230	$2,079,611
Upper Peninsula | Total	Portfolio Total	Program Total	$10,212,357	$10,320,776	$10,080,622	$9,764,195	$9,314,720	$8,902,502	$8,666,880	$8,310,308	$8,078,558	$7,872,297	$7,681,543	$7,494,051	$7,316,965	$7,143,592	$6,977,155	$6,814,437	$6,661,829	$6,504,187	$6,360,690	$6,238,833

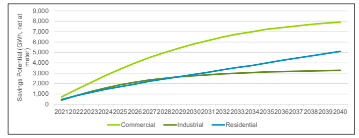
Lower Peninsula Electricity Technical Potential by Sector (GWh, net at meter)				
Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	10,384	3,601	9,480
Lower Peninsula | Total	2022	10.344	3.608	9.477
Lower Peninsula | Total	2023	10.295	3.618	9.384
Lower Peninsula | Total	2024	10.210	3.617	9.375
Lower Peninsula | Total	2025	10.089	3.592	9.307
Lower Peninsula | Total	2026	10.056	3.615	9.379
Lower Peninsula | Total	2027	10.147	3.719	9.618
Lower Peninsula | Total	2028	10.305	3.806	9.839
Lower Peninsula | Total	2029	10.562	3.914	10.073
Lower Peninsula | Total	2030	10.873	4.013	10.328
Lower Peninsula | Total	2031	11.253	4.143	10.593
Lower Peninsula | Total	2032	11.650	4.279	10.853
Lower Peninsula | Total	2033	11.987	4.398	11.083
Lower Peninsula | Total	2034	12.308	4.509	11.325
Lower Peninsula | Total	2035	12.733	4.667	11.601
Lower Peninsula | Total	2036	13.067	4.784	11.906
Lower Peninsula | Total	2037	13.403	4.899	12.142
Lower Peninsula | Total	2038	13.714	5.015	12.406
Lower Peninsula | Total	2039	14.015	5.129	12.671
Lower Peninsula | Total	2040	14,356	5,259	12,957



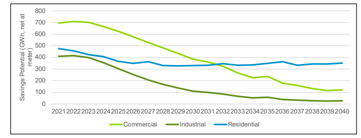
Lower Peninsula Electricity Economic Potential by Sector (GWh, net at meter)				
Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	7,767	3,601	7,079
Lower Peninsula | Total	2022	7.798	3.608	7.074
Lower Peninsula | Total	2023	7.758	3.618	6.999
Lower Peninsula | Total	2024	7.694	3.617	6.990
Lower Peninsula | Total	2025	7.603	3.592	7.048
Lower Peninsula | Total	2026	7.596	3.615	7.097
Lower Peninsula | Total	2027	7.701	3.719	7.264
Lower Peninsula | Total	2028	7.875	3.806	7.422
Lower Peninsula | Total	2029	8.138	3.914	7.589
Lower Peninsula | Total	2030	8.462	4.013	7.771
Lower Peninsula | Total	2031	8.820	4.143	7.959
Lower Peninsula | Total	2032	9.189	4.279	8.145
Lower Peninsula | Total	2033	9.524	4.398	8.590
Lower Peninsula | Total	2034	9.850	4.509	8.804
Lower Peninsula | Total	2035	10.240	4.667	9.000
Lower Peninsula | Total	2036	10.573	4.784	9.426
Lower Peninsula | Total	2037	10.907	4.899	9.595
Lower Peninsula | Total	2038	11.222	5.015	9.784
Lower Peninsula | Total	2039	11.530	5.129	9.975
Lower Peninsula | Total	2040	11,867	5,259	10,180



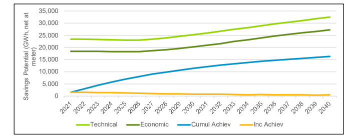
Lower Peninsula Electricity Cumulative Annual Achievable Potential by Sector (GWh, net at meter)				
Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	697	408	475
Lower Peninsula | Total	2022	1.408	823	828
Lower Peninsula | Total	2023	2.109	1.222	1.149
Lower Peninsula | Total	2024	2.776	1.578	1.452
Lower Peninsula | Total	2025	3.399	1.882	1.712
Lower Peninsula | Total	2026	3.976	2.135	1.958
Lower Peninsula | Total	2027	4.505	2.342	2.215
Lower Peninsula | Total	2028	4.986	2.510	2.435
Lower Peninsula | Total	2029	5.421	2.647	2.651
Lower Peninsula | Total	2030	5.806	2.758	2.871
Lower Peninsula | Total	2031	6.166	2.858	3.091
Lower Peninsula | Total	2032	6.491	2.943	3.321
Lower Peninsula | Total	2033	6.758	3.008	3.536
Lower Peninsula | Total	2034	6.984	3.059	3.754
Lower Peninsula | Total	2035	7.220	3.118	3.985
Lower Peninsula | Total	2036	7.398	3.156	4.228
Lower Peninsula | Total	2037	7.557	3.189	4.437
Lower Peninsula | Total	2038	7.690	3.217	4.656
Lower Peninsula | Total	2039	7.805	3.242	4.873
Lower Peninsula | Total	2040	7,927	3,269	5,097



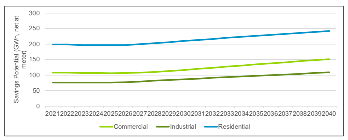
Lower Peninsula Electricity Incremental Annual Achievable Potential by Sector (GWh, net at meter)				
Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	697	408	475
Lower Peninsula | Total	2022	710	415	456
Lower Peninsula | Total	2023	701	399	425
Lower Peninsula | Total	2024	667	355	406
Lower Peninsula | Total	2025	623	304	364
Lower Peninsula | Total	2026	577	253	350
Lower Peninsula | Total	2027	529	207	362
Lower Peninsula | Total	2028	481	168	329
Lower Peninsula | Total	2029	435	137	326
Lower Peninsula | Total	2030	385	111	330
Lower Peninsula | Total	2031	360	100	333
Lower Peninsula | Total	2032	325	85	345
Lower Peninsula | Total	2033	266	65	331
Lower Peninsula | Total	2034	226	52	335
Lower Peninsula | Total	2035	236	58	351
Lower Peninsula | Total	2036	178	38	364
Lower Peninsula | Total	2037	159	33	331
Lower Peninsula | Total	2038	132	29	343
Lower Peninsula | Total	2039	115	25	343
Lower Peninsula | Total	2040	122	26	352



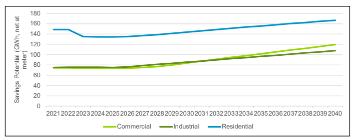
Lower Peninsula Electricity Potential (GWh, net at meter)					
Service Territory	Year	Technical	Economic	Cumul Achiev	Inc Achiev
Lower Peninsula | Total	2021	23,465	18,447	1,580	1,580
Lower Peninsula | Total	2022	23.429	18.479	3.059	1.581
Lower Peninsula | Total	2023	23.296	18.374	4.481	1.526
Lower Peninsula | Total	2024	23.202	18.301	5.805	1.428
Lower Peninsula | Total	2025	22.989	18.243	6.992	1.291
Lower Peninsula | Total	2026	23.050	18.308	8.069	1.181
Lower Peninsula | Total	2027	23.484	18.684	9.061	1.098
Lower Peninsula | Total	2028	23.951	19.104	9.930	977
Lower Peninsula | Total	2029	24.549	19.640	10.719	898
Lower Peninsula | Total	2030	25.215	20.246	11.435	826
Lower Peninsula | Total	2031	25.989	20.922	12.115	793
Lower Peninsula | Total	2032	26.782	21.613	12.755	755
Lower Peninsula | Total	2033	27.468	22.513	13.302	663
Lower Peninsula | Total	2034	28.142	23.163	13.798	613
Lower Peninsula | Total	2035	29.001	23.907	14.323	645
Lower Peninsula | Total	2036	29.757	24.782	14.783	580
Lower Peninsula | Total	2037	30.445	25.401	15.183	523
Lower Peninsula | Total	2038	31.135	26.021	15.563	504
Lower Peninsula | Total	2039	31.815	26.634	15.920	483
Lower Peninsula | Total	2040	32,571	27,305	16,292	500



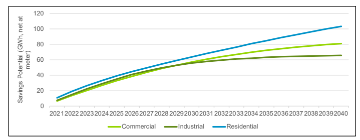
Upper Peninsula Electricity Technical Potential by Sector (GWh, net at meter)				
Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	108	76	199.10
Upper Peninsula | Total	2022	108	77	199.20
Upper Peninsula | Total	2023	107	77	197.21
Upper Peninsula | Total	2024	107	76	196.77
Upper Peninsula | Total	2025	106	76	196.33
Upper Peninsula | Total	2026	107	78	197.16
Upper Peninsula | Total	2027	108	80	199.64
Upper Peninsula | Total	2028	110	82	203.02
Upper Peninsula | Total	2029	113	84	206.41
Upper Peninsula | Total	2030	117	86	209.79
Upper Peninsula | Total	2031	120	89	213.18
Upper Peninsula | Total	2032	124	91	216.54
Upper Peninsula | Total	2033	127	93	219.87
Upper Peninsula | Total	2034	131	95	223.16
Upper Peninsula | Total	2035	134	98	226.42
Upper Peninsula | Total	2036	138	100	229.64
Upper Peninsula | Total	2037	141	102	232.82
Upper Peninsula | Total	2038	145	104	235.95
Upper Peninsula | Total	2039	148	107	239.03
Upper Peninsula | Total	2040	152	109	242.11



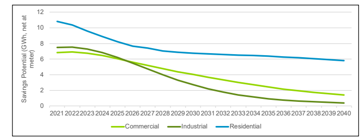
Upper Peninsula Electricity Economic Potential by Sector (GWh, net at meter)				
Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	75	75	149
Upper Peninsula | Total	2022	74	76	149
Upper Peninsula | Total	2023	74	75	135
Upper Peninsula | Total	2024	74	75	135
Upper Peninsula | Total	2025	73	75	134
Upper Peninsula | Total	2026	74	76	135
Upper Peninsula | Total	2027	75	79	137
Upper Peninsula | Total	2028	77	81	139
Upper Peninsula | Total	2029	80	83	141
Upper Peninsula | Total	2030	84	85	144
Upper Peninsula | Total	2031	87	88	146
Upper Peninsula | Total	2032	91	90	149
Upper Peninsula | Total	2033	95	92	151
Upper Peninsula | Total	2034	98	94	153
Upper Peninsula | Total	2035	102	97	156
Upper Peninsula | Total	2036	105	99	158
Upper Peninsula | Total	2037	109	101	160
Upper Peninsula | Total	2038	112	103	162
Upper Peninsula | Total	2039	116	105	165
Upper Peninsula | Total	2040	119	108	167



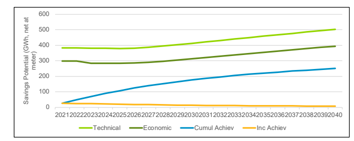
Upper Peninsula Electricity Cumulative Annual Achievable Potential by Sector (GWh, net at meter)				
Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	7	7	11
Upper Peninsula | Total	2022	14	15	19
Upper Peninsula | Total	2023	21	22	26
Upper Peninsula | Total	2024	27	29	33
Upper Peninsula | Total	2025	33	35	39
Upper Peninsula | Total	2026	39	41	45
Upper Peninsula | Total	2027	44	46	50
Upper Peninsula | Total	2028	49	50	55
Upper Peninsula | Total	2029	53	53	59
Upper Peninsula | Total	2030	57	56	64
Upper Peninsula | Total	2031	61	58	68
Upper Peninsula | Total	2032	64	60	72
Upper Peninsula | Total	2033	67	61	77
Upper Peninsula | Total	2034	70	62	81
Upper Peninsula | Total	2035	72	63	85
Upper Peninsula | Total	2036	74	64	89
Upper Peninsula | Total	2037	76	65	93
Upper Peninsula | Total	2038	78	65	96
Upper Peninsula | Total	2039	80	65	100
Upper Peninsula | Total	2040	81	66	103



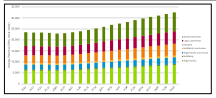
Upper Peninsula Electricity Incremental Annual Achievable Potential by Sector (GWh, net at meter)				
Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	7	7	11
Upper Peninsula | Total	2022	7	8	10
Upper Peninsula | Total	2023	7	7	10
Upper Peninsula | Total	2024	6	7	9
Upper Peninsula | Total	2025	6	6	8
Upper Peninsula | Total	2026	6	5	8
Upper Peninsula | Total	2027	5	5	7
Upper Peninsula | Total	2028	5	4	7
Upper Peninsula | Total	2029	4	3	7
Upper Peninsula | Total	2030	4	3	7
Upper Peninsula | Total	2031	4	2	7
Upper Peninsula | Total	2032	3	2	7
Upper Peninsula | Total	2033	3	1	7
Upper Peninsula | Total	2034	3	1	6
Upper Peninsula | Total	2035	2	1	6
Upper Peninsula | Total	2036	2	1	6
Upper Peninsula | Total	2037	2	1	6
Upper Peninsula | Total	2038	2	1	6
Upper Peninsula | Total	2039	2	0	6
Upper Peninsula | Total	2040	1	0	6



Upper Peninsula Electricity Potential (GWh, net at meter)					
Service Territory	Year	Technical	Economic	Cumul Achiev	Inc Achiev
Upper Peninsula | Total	2021	383	299	25	25
Upper Peninsula | Total	2022	383	298	48	25
Upper Peninsula | Total	2023	381	285	69	24
Upper Peninsula | Total	2024	380	284	89	22
Upper Peninsula | Total	2025	379	283	108	20
Upper Peninsula | Total	2026	381	285	124	19
Upper Peninsula | Total	2027	387	290	139	17
Upper Peninsula | Total	2028	395	297	153	16
Upper Peninsula | Total	2029	404	305	165	15
Upper Peninsula | Total	2030	413	313	176	14
Upper Peninsula | Total	2031	422	321	187	13
Upper Peninsula | Total	2032	431	330	196	12
Upper Peninsula | Total	2033	440	338	205	11
Upper Peninsula | Total	2034	449	346	213	10
Upper Peninsula | Total	2035	458	354	220	10
Upper Peninsula | Total	2036	467	362	227	9
Upper Peninsula | Total	2037	476	370	233	9
Upper Peninsula | Total	2038	485	378	239	8
Upper Peninsula | Total	2039	494	386	245	8
Upper Peninsula | Total	2040	503	394	250	8



Customer Segment	Service Territory	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Single Family	Lower Peninsula | Total	6,109	6,107	6,046	6,040	5,996	6,045	6,204	6,355	6,514	6,686	6,865	7,041	7,197	7,361	7,547	7,753	7,913	8,096	8,270	8,463
Multifamily	Lower Peninsula | Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Multifamily Low Income	Lower Peninsula | Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Small Commercial	Lower Peninsula | Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]



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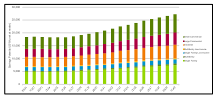

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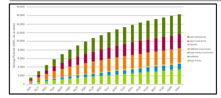

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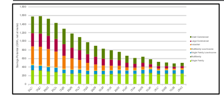

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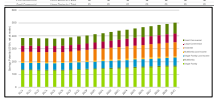

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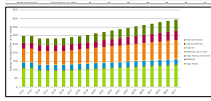

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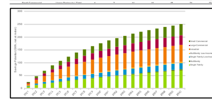

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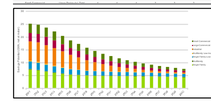
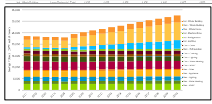
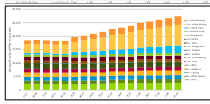
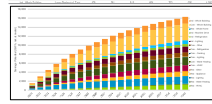
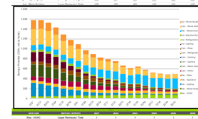
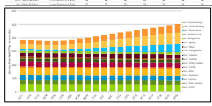


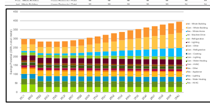


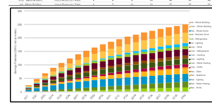


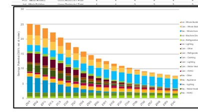






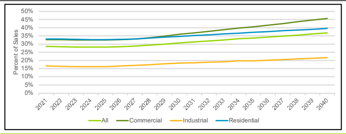






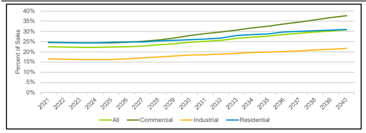
Michigan Total Electricity Technical Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	29%	33%	17%	33%
2022	MI Total	28%	33%	16%	33%
2023	MI Total	28%	32%	16%	33%
2024	MI Total	28%	32%	16%	33%
2025	MI Total	28%	32%	16%	33%
2026	MI Total	28%	33%	16%	33%
2027	MI Total	29%	33%	17%	33%
2028	MI Total	29%	34%	17%	34%
2029	MI Total	30%	35%	18%	34%
2030	MI Total	31%	36%	18%	35%
2031	MI Total	31%	37%	19%	35%
2032	MI Total	32%	38%	19%	36%
2033	MI Total	32%	39%	19%	36%
2034	MI Total	33%	40%	20%	37%
2035	MI Total	34%	41%	20%	37%
2036	MI Total	34%	42%	20%	38%
2037	MI Total	35%	43%	21%	38%
2038	MI Total	36%	44%	21%	39%
2039	MI Total	36%	45%	21%	39%
2040	MI Total	37%	46%	22%	39%



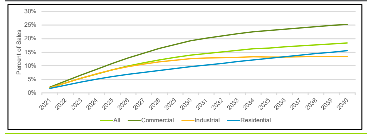
Michigan Total Electricity Economic Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	22%	24%	17%	25%
2022	MI Total	22%	25%	16%	25%
2023	MI Total	22%	24%	16%	24%
2024	MI Total	22%	24%	16%	24%
2025	MI Total	22%	24%	16%	25%
2026	MI Total	22%	25%	16%	25%
2027	MI Total	23%	25%	17%	25%
2028	MI Total	23%	26%	17%	25%
2029	MI Total	24%	27%	18%	26%
2030	MI Total	25%	28%	18%	26%
2031	MI Total	25%	29%	19%	26%
2032	MI Total	26%	30%	19%	27%
2033	MI Total	27%	31%	19%	28%
2034	MI Total	27%	32%	20%	28%
2035	MI Total	28%	33%	20%	29%
2036	MI Total	28%	34%	20%	30%
2037	MI Total	29%	35%	21%	30%
2038	MI Total	30%	36%	21%	30%
2039	MI Total	30%	37%	21%	31%
2040	MI Total	31%	38%	22%	31%



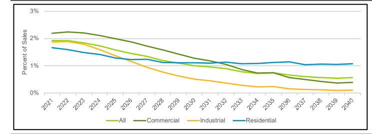
Michigan Total Electricity Cumulative Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	2%	2%	2%	2%
2022	MI Total	4%	4%	4%	3%
2023	MI Total	5%	7%	5%	4%
2024	MI Total	7%	9%	7%	5%
2025	MI Total	9%	11%	8%	6%
2026	MI Total	10%	13%	10%	7%
2027	MI Total	11%	15%	11%	8%
2028	MI Total	12%	16%	11%	8%
2029	MI Total	13%	18%	12%	9%
2030	MI Total	14%	19%	13%	10%
2031	MI Total	15%	20%	13%	10%
2032	MI Total	15%	21%	13%	11%
2033	MI Total	16%	22%	13%	12%
2034	MI Total	16%	23%	13%	12%
2035	MI Total	17%	23%	13%	13%
2036	MI Total	17%	24%	13%	13%
2037	MI Total	17%	24%	13%	14%
2038	MI Total	18%	24%	13%	14%
2039	MI Total	18%	25%	13%	15%
2040	MI Total	18%	25%	13%	16%



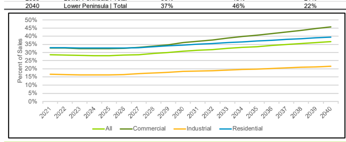
Michigan Total Electricity Incremental Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	2%	2%	2%	2%
2022	MI Total	2%	2%	2%	2%
2023	MI Total	2%	2%	2%	1%
2024	MI Total	2%	2%	2%	1%
2025	MI Total	2%	2%	1%	1%
2026	MI Total	1%	2%	1%	1%
2027	MI Total	1%	2%	1%	1%
2028	MI Total	1%	2%	1%	1%
2029	MI Total	1%	1%	1%	1%
2030	MI Total	1%	1%	1%	1%
2031	MI Total	1%	1%	0%	1%
2032	MI Total	1%	1%	0%	1%
2033	MI Total	1%	1%	0%	1%
2034	MI Total	1%	1%	0%	1%
2035	MI Total	1%	1%	0%	1%
2036	MI Total	1%	1%	0%	1%
2037	MI Total	1%	1%	0%	1%
2038	MI Total	1%	0%	0%	1%
2039	MI Total	1%	0%	0%	1%
2040	MI Total	1%	0%	0%	1%



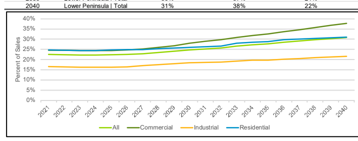
Lower Peninsula Electricity Technical Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula | Total	29%	33%	17%	33%
2022	Lower Peninsula | Total	28%	33%	16%	33%
2023	Lower Peninsula | Total	28%	32%	16%	33%
2024	Lower Peninsula | Total	28%	32%	16%	33%
2025	Lower Peninsula | Total	28%	32%	16%	33%
2026	Lower Peninsula | Total	28%	33%	16%	33%
2027	Lower Peninsula | Total	29%	33%	17%	33%
2028	Lower Peninsula | Total	29%	34%	17%	34%
2029	Lower Peninsula | Total	30%	35%	18%	34%
2030	Lower Peninsula | Total	31%	36%	18%	35%
2031	Lower Peninsula | Total	31%	37%	19%	35%
2032	Lower Peninsula | Total	32%	38%	19%	36%
2033	Lower Peninsula | Total	32%	39%	19%	36%
2034	Lower Peninsula | Total	33%	40%	20%	37%
2035	Lower Peninsula | Total	34%	41%	20%	37%
2036	Lower Peninsula | Total	34%	42%	20%	37%
2037	Lower Peninsula | Total	35%	43%	21%	38%
2038	Lower Peninsula | Total	35%	44%	21%	38%
2039	Lower Peninsula | Total	36%	45%	21%	39%
2040	Lower Peninsula | Total	37%	46%	22%	39%



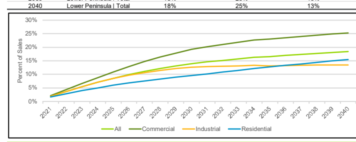
Lower Peninsula Electricity Economic Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula | Total	22%	25%	17%	25%
2022	Lower Peninsula | Total	22%	25%	16%	25%
2023	Lower Peninsula | Total	22%	24%	16%	24%
2024	Lower Peninsula | Total	22%	24%	16%	24%
2025	Lower Peninsula | Total	22%	24%	16%	25%
2026	Lower Peninsula | Total	23%	25%	16%	25%
2027	Lower Peninsula | Total	23%	25%	17%	25%
2028	Lower Peninsula | Total	23%	26%	17%	25%
2029	Lower Peninsula | Total	24%	27%	18%	26%
2030	Lower Peninsula | Total	25%	28%	18%	26%
2031	Lower Peninsula | Total	25%	29%	19%	26%
2032	Lower Peninsula | Total	26%	30%	19%	27%
2033	Lower Peninsula | Total	27%	31%	19%	28%
2034	Lower Peninsula | Total	27%	32%	20%	28%
2035	Lower Peninsula | Total	28%	33%	20%	29%
2036	Lower Peninsula | Total	28%	34%	20%	30%
2037	Lower Peninsula | Total	29%	35%	21%	30%
2038	Lower Peninsula | Total	30%	36%	21%	30%
2039	Lower Peninsula | Total	30%	37%	21%	31%
2040	Lower Peninsula | Total	31%	38%	22%	31%



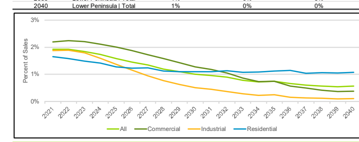
Lower Peninsula Electricity Cumulative Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula | Total	2%	2%	2%	2%
2022	Lower Peninsula | Total	4%	4%	4%	3%
2023	Lower Peninsula | Total	5%	7%	5%	4%
2024	Lower Peninsula | Total	7%	9%	7%	5%
2025	Lower Peninsula | Total	9%	11%	9%	6%
2026	Lower Peninsula | Total	10%	13%	10%	7%
2027	Lower Peninsula | Total	11%	15%	11%	8%
2028	Lower Peninsula | Total	12%	16%	12%	8%
2029	Lower Peninsula | Total	13%	18%	12%	9%
2030	Lower Peninsula | Total	14%	19%	13%	10%
2031	Lower Peninsula | Total	15%	20%	13%	10%
2032	Lower Peninsula | Total	15%	21%	13%	11%
2033	Lower Peninsula | Total	16%	22%	13%	12%
2034	Lower Peninsula | Total	16%	23%	13%	12%
2035	Lower Peninsula | Total	17%	23%	13%	13%
2036	Lower Peninsula | Total	17%	24%	13%	13%
2037	Lower Peninsula | Total	17%	24%	13%	14%
2038	Lower Peninsula | Total	18%	24%	13%	14%
2039	Lower Peninsula | Total	18%	25%	13%	15%
2040	Lower Peninsula | Total	18%	25%	13%	15%



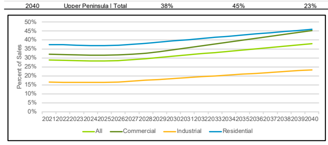
Lower Peninsula Electricity Incremental Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula | Total	2%	2%	2%	2%
2022	Lower Peninsula | Total	2%	2%	2%	2%
2023	Lower Peninsula | Total	2%	2%	2%	1%
2024	Lower Peninsula | Total	2%	2%	2%	1%
2025	Lower Peninsula | Total	2%	2%	1%	1%
2026	Lower Peninsula | Total	1%	2%	1%	1%
2027	Lower Peninsula | Total	1%	2%	1%	1%
2028	Lower Peninsula | Total	1%	2%	1%	1%
2029	Lower Peninsula | Total	1%	1%	1%	1%
2030	Lower Peninsula | Total	1%	1%	1%	1%
2031	Lower Peninsula | Total	1%	1%	0%	1%
2032	Lower Peninsula | Total	1%	1%	0%	1%
2033	Lower Peninsula | Total	1%	1%	0%	1%
2034	Lower Peninsula | Total	1%	1%	0%	1%
2035	Lower Peninsula | Total	1%	1%	0%	1%
2036	Lower Peninsula | Total	1%	1%	0%	1%
2037	Lower Peninsula | Total	1%	1%	0%	1%
2038	Lower Peninsula | Total	1%	0%	0%	1%
2039	Lower Peninsula | Total	1%	0%	0%	1%
2040	Lower Peninsula | Total	1%	0%	0%	1%



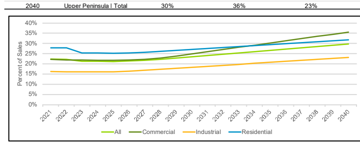
Upper Peninsula Electricity Technical Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula | Total	29%	32%	17%	37%
2022	Upper Peninsula | Total	29%	32%	16%	37%
2023	Upper Peninsula | Total	28%	32%	16%	37%
2024	Upper Peninsula | Total	28%	32%	16%	37%
2025	Upper Peninsula | Total	28%	32%	16%	37%
2026	Upper Peninsula | Total	29%	32%	17%	37%
2027	Upper Peninsula | Total	29%	32%	17%	37%
2028	Upper Peninsula | Total	30%	33%	18%	38%
2029	Upper Peninsula | Total	30%	33%	18%	39%
2030	Upper Peninsula | Total	31%	35%	19%	39%
2031	Upper Peninsula | Total	32%	36%	19%	40%
2032	Upper Peninsula | Total	32%	37%	20%	41%
2033	Upper Peninsula | Total	33%	38%	20%	41%
2034	Upper Peninsula | Total	34%	39%	20%	42%
2035	Upper Peninsula | Total	34%	40%	21%	43%
2036	Upper Peninsula | Total	35%	41%	21%	43%
2037	Upper Peninsula | Total	36%	42%	22%	44%
2038	Upper Peninsula | Total	36%	43%	22%	45%
2039	Upper Peninsula | Total	37%	44%	23%	45%
2040	Upper Peninsula | Total	38%	45%	23%	46%



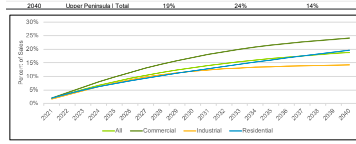
Upper Peninsula Electricity Economic Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula | Total	22%	22%	16%	28%
2022	Upper Peninsula | Total	22%	22%	16%	28%
2023	Upper Peninsula | Total	21%	22%	16%	25%
2024	Upper Peninsula | Total	21%	22%	16%	25%
2025	Upper Peninsula | Total	21%	22%	16%	25%
2026	Upper Peninsula | Total	21%	22%	16%	25%
2027	Upper Peninsula | Total	22%	22%	17%	26%
2028	Upper Peninsula | Total	22%	23%	17%	26%
2029	Upper Peninsula | Total	23%	24%	18%	27%
2030	Upper Peninsula | Total	23%	25%	18%	27%
2031	Upper Peninsula | Total	24%	26%	19%	28%
2032	Upper Peninsula | Total	25%	27%	19%	28%
2033	Upper Peninsula | Total	25%	28%	20%	28%
2034	Upper Peninsula | Total	26%	29%	20%	29%
2035	Upper Peninsula | Total	27%	30%	21%	29%
2036	Upper Peninsula | Total	27%	31%	21%	30%
2037	Upper Peninsula | Total	28%	32%	22%	30%
2038	Upper Peninsula | Total	28%	33%	22%	31%
2039	Upper Peninsula | Total	29%	34%	23%	31%
2040	Upper Peninsula | Total	30%	36%	23%	32%



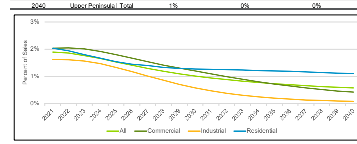
Upper Peninsula Electricity Cumulative Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula | Total	2%	2%	2%	2%
2022	Upper Peninsula | Total	4%	4%	3%	4%
2023	Upper Peninsula | Total	5%	6%	5%	5%
2024	Upper Peninsula | Total	7%	8%	6%	6%
2025	Upper Peninsula | Total	8%	10%	8%	7%
2026	Upper Peninsula | Total	9%	11%	9%	8%
2027	Upper Peninsula | Total	10%	13%	10%	9%
2028	Upper Peninsula | Total	11%	14%	11%	10%
2029	Upper Peninsula | Total	12%	16%	11%	11%
2030	Upper Peninsula | Total	13%	17%	12%	12%
2031	Upper Peninsula | Total	14%	18%	12%	13%
2032	Upper Peninsula | Total	15%	19%	13%	14%
2033	Upper Peninsula | Total	15%	20%	13%	14%
2034	Upper Peninsula | Total	16%	21%	13%	15%
2035	Upper Peninsula | Total	17%	21%	14%	16%
2036	Upper Peninsula | Total	17%	22%	14%	17%
2037	Upper Peninsula | Total	18%	23%	14%	18%
2038	Upper Peninsula | Total	18%	23%	14%	18%
2039	Upper Peninsula | Total	18%	24%	14%	19%
2040	Upper Peninsula | Total	19%	24%	14%	20%



Upper Peninsula Electricity Incremental Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula | Total	2%	2%	2%	2%
2022	Upper Peninsula | Total	2%	2%	2%	2%
2023	Upper Peninsula | Total	2%	2%	2%	2%
2024	Upper Peninsula | Total	2%	2%	1%	2%
2025	Upper Peninsula | Total	2%	2%	1%	2%
2026	Upper Peninsula | Total	1%	2%	1%	1%
2027	Upper Peninsula | Total	1%	2%	1%	1%
2028	Upper Peninsula | Total	1%	1%	1%	1%
2029	Upper Peninsula | Total	1%	1%	1%	1%
2030	Upper Peninsula | Total	1%	1%	1%	1%
2031	Upper Peninsula | Total	1%	1%	0%	1%
2032	Upper Peninsula | Total	1%	1%	0%	1%
2033	Upper Peninsula | Total	1%	1%	0%	1%
2034	Upper Peninsula | Total	1%	1%	0%	1%
2035	Upper Peninsula | Total	1%	1%	0%	1%
2036	Upper Peninsula | Total	1%	1%	0%	1%
2037	Upper Peninsula | Total	1%	1%	0%	1%
2038	Upper Peninsula | Total	1%	1%	0%	1%
2039	Upper Peninsula | Total	1%	0%	0%	1%
2040	Upper Peninsula | Total	1%	0%	0%	1%



Residential 2021 Electricity Technical Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Thermostats - RET Only - Electric	1,204.5
2	Res - Water Heaters, Heat Pump - ROB and NEW - Electric	1,125.3
3	Res - Heat Pumps, Mini-Split - RET Only - Electric	1,062.8
4	Res - Res HVAC - RET only - Electric	971.3
5	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	704.0
6	Res - LED Bulbs - RET Only - Electric	596.3
7	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric	576.4
8	Res - Home Energy Reports - RET Only - Elec	510.3
9	Res - Power Strips - RET Only - Electric	482.3
10	Res - LED Specialty Bulbs - RET Only - Electric	323.3
11	Res - Heat Pumps, VRF - ROB and NEW - Electric	289.0
12	Res - LED Bulb Exterior - ROB and NEW - Electric	288.7
13	Res - Res Appliance - ROB and NEW - Electric	253.2
14	Res - Lighting Controls - RET Only - Electric	252.1
15	e - Heat Pumps, Mini-Split, Cold Climate - ROB and NEW - Elec	183.7
16	Res - LED Fixtures - RET Only - Electric	167.1
17	Res - LED Tube - RET Only - Electric	151.5
18	Res - Low Flow Aerators - RET Only - Electric	97.2
19	Res - LED Bulb Exterior - RET Only - Electric	95.5
20	Res - Clothes Washers - ROB and NEW - Electric	70.9
21	Res - LED Fixtures Exterior - RET Only - Electric	59.9
22	Res - Res HVAC - NEW only - Electric	8.0
23	Res - Home Energy Reports - NEW Only - Elec	4.2
24	Res - Heat Pumps, Ground Source - NEW Only - Electric	2.5
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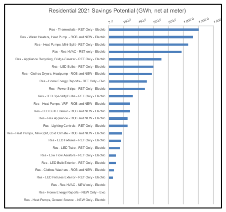
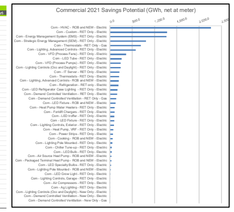


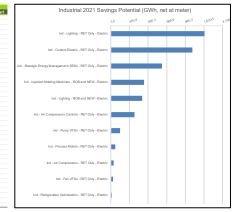
Commercial 2021 Electricity Technical Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1–24	[illegible]	[illegible]
25	Com - Power Strips - RET Only - Electric	66.9
26	Com - Cooking - ROB and NEW - Electric	63.1
27	Com - Lighting Pole Mounted - RET Only - Electric	54.5
28	Com - Chiller Tune-up - RET Only - Electric	43.1
29	Com - LED Bulb - RET Only - Electric	41.1
30	Com - Air Source Heat Pump - ROB and NEW - Electric	33.7
31	'om - Packaged Terminal Heat Pump - ROB and NEW - Elect	32.6
32	Com - LED Specialty Bulbs - RET Only - Electric	28.0
33	Com - Lighting Pole Mounted - ROB and NEW - Electric	18.2
34	Com - LED Grow Light - RET Only - Electric	10.1
35	Com - Lighting Controls, Garage - RET Only - Electric	3.9
36	Com - Air Compressors - RET Only - Electric	1.2
37	Com - Ag Lighting - RET Only - Electric	0.5
38	'om - Lighting Controls (Occ and Daylight) - New Only - Elect	0.3
39	Com - Demand Controlled Ventilation - New Only - Electric	0.3
40	Com - Demand Controlled Ventilation - New Only - Gas	0.2



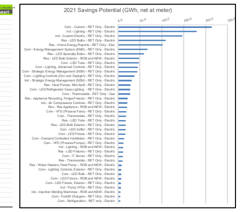
[illegible]

Rank	Measure Name	Potential (cumul. impact/year)
[illegible]	[illegible]	[illegible]



[illegible]

Rank	Measure Name	Potential (cumul. impact/year)
[illegible]	[illegible]	[illegible]



Residential 2021 Electricity Economic Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Water Heaters, Heat Pump - ROB and NEW - Electric	1,125.3
2	Res - Heat Pumps, Mini-Split - RET Only - Electric	1,062.8
3	Res - Thermostats - RET Only - Electric	905.6
4	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	704.0
5	Res - LED Bulbs - RET Only - Electric	596.3
6	Res - Home Energy Reports - RET Only - Elec	510.3
7	Res - Power Strips - RET Only - Electric	366.8
8	Res - LED Specialty Bulbs - RET Only - Electric	323.3
9	Res - LED Bulb Exterior - ROB and NEW - Electric	288.7
10	Res - Res Appliance - ROB and NEW - Electric	253.2
11	Res - Clothes Dryers - ROB and NEW - Electric	244.4
12	Res - Heat Pumps, VRF - ROB and NEW - Electric	207.5
13	e - Heat Pumps, Mini-Split, Cold Climate - ROB and NEW - Elec	131.9
14	Res - LED Tube - RET Only - Electric	114.5
15	Res - Low Flow Aerators - RET Only - Electric	97.2
16	Res - LED Bulb Exterior - RET Only - Electric	95.5
17	Res - Clothes Washers - ROB and NEW - Electric	47.6
18	Res - Home Energy Reports - NEW Only - Elec	4.2
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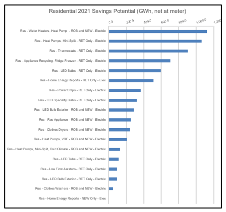

Commercial 2021 Electricity Economic Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - Custom - RET Only - Electric	1,282.1
2	'om - Energy Management System (EMS) - RET Only - Elect	1,267.4
3	om - Strategic Energy Management (SEM) - RET Only - Elec	808.0
4	Com - Thermostats - RET Only - Gas	694.3
5	Com - Lighting, Advanced Controls - RET Only - Electric	581.6
6	Com - VFD (Process Fans) - RET Only - Electric	361.8
7	Com - LED Tube - RET Only - Electric	265.3
8	Com - VFD (Process Pumps) - RET Only - Electric	243.9
9	'om - Lighting Controls (Occ and Daylight) - RET Only - Elect	239.9
10	Com - IT Server - RET Only - Electric	211.7
11	Com - Thermostats - RET Only - Electric	206.4
12	Com - Lighting, Advanced Controls - ROB and NEW - Electri	194.7
13	Com - LED Refrigerator Case Lighting - RET Only - Electric	170.1
14	Com - Demand Controlled Ventilation - RET Only - Electric	162.4
15	Com - Demand Controlled Ventilation - RET Only - Gas	139.2
16	Com - LED Fixture - ROB and NEW - Electric	128.7
17	Com - Heat Pump Water Heaters - RET Only - Electric	107.7
18	Com - Forklift Chargers - RET Only - Electric	100.3
19	Com - LED troffer - RET Only - Electric	97.8
20	Com - LED Fixture - RET Only - Electric	96.1
21	Com - Lighting Controls, Exterior - RET Only - Electric	92.2
22	Com - Cooking - ROB and NEW - Electric	63.1
23	Com - Lighting Pole Mounted - RET Only - Electric	54.5
24	Com - Chiller Tune-up - RET Only - Electric	43.1
25	Com - LED Bulb - RET Only - Electric	41.1
26	'om - Packaged Terminal Heat Pump - ROB and NEW - Elect	32.6
27	Com - LED Specialty Bulbs - RET Only - Electric	28.0
28	Com - Air Source Heat Pump - ROB and NEW - Electric	18.5
29	Com - Lighting Pole Mounted - ROB and NEW - Electric	18.2
30	Com - LED Grow Light - RET Only - Electric	10.1
31	Com - Lighting Controls, Garage - RET Only - Electric	3.9
32	Com - Air Compressors - RET Only - Electric	1.2
33	Com - Ag Lighting - RET Only - Electric	0.5
34	'om - Lighting Controls (Occ and Daylight) - New Only - Elect	0.3
35	Com - Demand Controlled Ventilation - New Only - Electric	0.3
36	Com - Demand Controlled Ventilation - New Only - Gas	0.2
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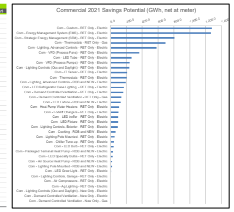

Industrial 2021 Electricity Economic Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Lighting - RET Only - Electric	1,005.1
2	Ind - Custom Electric - RET Only - Electric	875.0
3	nd - Strategic Energy Management (SEM) - RET Only - Elect	551.4
4	Ind - Injection Molding Machines - ROB and NEW - Electric	358.9
5	Ind - Lighting - ROB and NEW - Electric	338.3
6	Ind - Air Compressors Controls - RET Only - Electric	253.0
7	Ind - Pump VFDs - RET Only - Electric	101.0
8	Ind - Process Motors - RET Only - Electric	48.7
9	Ind - Air Compressors - RET Only - Electric	32.1
10	Ind - Fan VFDs - RET Only - Electric	25.6
11	Ind - Refrigeration Optimization - RET Only - Electric	11.0
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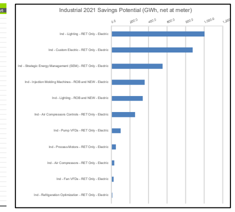

Residential 2021 Electricity Cumulative Annual Achievable Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - LED Bulbs - RET Only - Electric	108.7
2	Res - Home Energy Reports - RET Only - Elec	101.7
3	Res - LED Specialty Bulbs - RET Only - Electric	59.0
4	Res - LED Bulb Exterior - ROB and NEW - Electric	48.1
5	Res - Heat Pumps, Mini-Split - RET Only - Electric	28.6
6	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	22.1
7	Res - Res Appliance - ROB and NEW - Electric	20.5
8	Res - LED Tube - RET Only - Electric	17.7
9	Res - LED Bulb Exterior - RET Only - Electric	17.5
10	Res - LED Fixtures - RET Only - Electric	11.7
11	Res - Thermostats - RET Only - Electric	10.3
12	Res - Water Heaters, Heat Pump - ROB and NEW - Electric	8.4
13	Res - Clothes Dryers - ROB and NEW - Electric	4.3
14	e - Heat Pumps, Mini-Split, Cold Climate - ROB and NEW - Elec	3.9
15	Res - Power Strips - RET Only - Electric	3.5
16	Res - Res HVAC - RET only - Electric	2.7
17	Res - Clothes Washers - ROB and NEW - Electric	2.6
18	Res - Low Flow Aerators - RET Only - Electric	1.3
19	Res - Home Energy Reports - NEW Only - Elec	0.9
20	Res - Heat Pumps, VRF - ROB and NEW - Electric	0.7
21	Res - Res HVAC - NEW only - Electric	0.2
22	Res - ASHP - ROB and NEW - Electric	0.2
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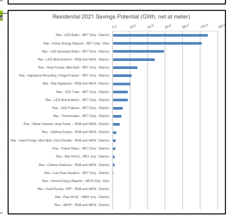
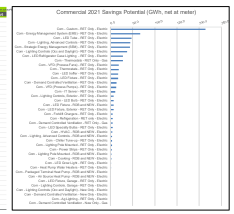


Commercial 2021 Electricity Cumulative Annual Achievable Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - Custom - RET Only - Electric	213.9
2	'om - Energy Management System (EMS) - RET Only - Elect	66.9
3	Com - LED Tube - RET Only - Electric	47.4
4	Com - Lighting, Advanced Controls - RET Only - Electric	45.0
5	om - Strategic Energy Management (SEM) - RET Only - Elec	43.9
6	'om - Lighting Controls (Occ and Daylight) - RET Only - Elect	37.4
7	Com - LED Refrigerator Case Lighting - RET Only - Electric	28.0
8	Com - Thermostats - RET Only - Gas	27.8
9	Com - VFD (Process Fans) - RET Only - Electric	19.0
10	Com - Thermostats - RET Only - Electric	18.5
11	Com - LED troffer - RET Only - Electric	17.5
12	Com - LED Fixture - RET Only - Electric	17.1
13	Com - Demand Controlled Ventilation - RET Only - Electric	13.7
14	Com - VFD (Process Pumps) - RET Only - Electric	12.7
15	Com - IT Server - RET Only - Electric	10.8
16	Com - Lighting Controls, Exterior - RET Only - Electric	7.4
17	Com - LED Bulb - RET Only - Electric	7.3
18	Com - LED Fixture - ROB and NEW - Electric	7.1
19	Com - LED Fixture, Exterior - RET Only - Electric	6.9
20	Com - Forklift Chargers - RET Only - Electric	5.3
21	Com - Refrigeration - RET only - Electric	5.2
22	Com - Demand Controlled Ventilation - RET Only - Gas	5.0
23	Com - LED Specialty Bulbs - RET Only - Electric	5.0
24	Com - HVAC - ROB and NEW - Electric	4.2
25	Com - Lighting, Advanced Controls - ROB and NEW - Electri	4.0
26	Com - Chiller Tune-up - RET Only - Electric	3.9
27	Com - Lighting Pole Mounted - RET Only - Electric	3.9
28	Com - Power Strips - RET Only - Electric	3.2
29	Com - Lighting Pole Mounted - ROB and NEW - Electric	2.1
30	Com - Cooking - ROB and NEW - Electric	2.0
31	Com - LED Grow Light - RET Only - Electric	1.5
32	Com - Heat Pump Water Heaters - RET Only - Electric	1.4
33	'om - Packaged Terminal Heat Pump - ROB and NEW - Elect	1.0
34	Com - Air Source Heat Pump - ROB and NEW - Electric	0.5
35	Com - LED Fixture, Garage - RET Only - Electric	0.3
36	Com - Lighting Controls, Garage - RET Only - Electric	0.2
37	'om - Lighting Controls (Occ and Daylight) - New Only - Elect	0.1
38	Com - Demand Controlled Ventilation - New Only - Electric	0.1
39	Com - Ag Lighting - RET Only - Electric	0.1
40	Com - Demand Controlled Ventilation - New Only - Gas	0.1



Industrial 2021 Electricity Cumulative Annual Achievable Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Lighting - RET Only - Electric	179.6
2	Ind - Custom Electric - RET Only - Electric	147.1
3	nd - Strategic Energy Management (SEM) - RET Only - Elect	31.3
4	Ind - Air Compressors Controls - RET Only - Electric	21.0
5	Ind - Lighting - ROB and NEW - Electric	11.7
6	Ind - Pump VFDs - RET Only - Electric	6.4
7	Ind - Injection Molding Machines - ROB and NEW - Electric	5.7
8	Ind - Fan VFDs - RET Only - Electric	2.0
9	Ind - Process Motors - RET Only - Electric	1.5
10	Ind - Air Compressors - RET Only - Electric	1.5
11	Ind - Refrigeration Optimization - RET Only - Electric	0.5
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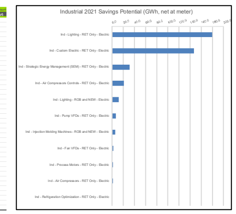

Residential 2021 Electricity Technical Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Water Heaters, Heat Pump - ROB and NEW - Electric	28.8
2	Res - Thermostats - RET Only - Electric	25.9
3	Res - Heat Pumps, VRF - ROB and NEW - Electric	18.4
4	Res - Res HVAC - RET only - Electric	18.0
5	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	15.6
6	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric	12.7
7	Res - LED Bulbs - RET Only - Electric	11.9
8	Res - Power Strips - RET Only - Electric	10.4
9	Res - Home Energy Reports - RET Only - Elec	9.5
10	Res - Heat Pumps, Mini-Split - RET Only - Electric	8.3
11	Res - LED Bulb Exterior - ROB and NEW - Electric	6.4
12	Res - LED Specialty Bulbs - RET Only - Electric	6.1
13	Res - Lighting Controls - RET Only - Electric	5.6
14	Res - Res Appliance - ROB and NEW - Electric	4.7
15	e - Heat Pumps, Mini-Split, Cold Climate - ROB and NEW - Ele	4.0
16	Res - Low Flow Aerators - RET Only - Electric	2.8
17	Res - LED Tube - RET Only - Electric	2.6
18	Res - LED Bulb Exterior - RET Only - Electric	2.1
19	Res - LED Fixtures - RET Only - Electric	2.1
20	Res - Clothes Washers - ROB and NEW - Electric	1.5
21	Res - LED Fixtures Exterior - RET Only - Electric	1.3
22	Res - Heat Pumps, Ground Source - NEW Only - Electric	0.2
23	Res - Res HVAC - NEW only - Electric	0.1
24	Res - Home Energy Reports - NEW Only - Elec	0.1
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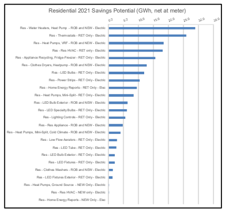

Commercial 2021 Electricity Technical Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	[illegible]	[illegible]
2	[illegible]	[illegible]
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20	[illegible]	[illegible]
21	[illegible]	[illegible]
22	[illegible]	[illegible]
23	[illegible]	[illegible]
24	[illegible]	[illegible]
25	Com - Cooking - ROB and NEW - Electric	0.7
26	Com - Lighting Pole Mounted - RET Only - Electric	0.6
27	Com - LED Bulb - RET Only - Electric	0.5
28	Com - Heat Pump, VRF - RET Only - Electric	0.3
29	Com - LED Specialty Bulbs - RET Only - Electric	0.3
30	Com - Lighting Pole Mounted - ROB and NEW - Electric	0.2
31	Com - Chiller Tune-up - RET Only - Electric	0.2
32	Com - Air Source Heat Pump - ROB and NEW - Electric	0.2
33	om - Packaged Terminal Heat Pump - ROB and NEW - Elect	0.2
34	Com - LED Grow Light - RET Only - Electric	0.1
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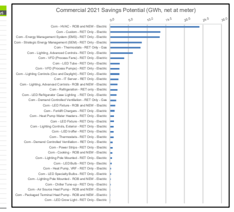

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Rank	Measure Name	Potential (cumul. impact/year)
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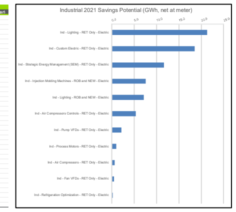

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Rank	Measure Name	Potential (cumul. impact/year)
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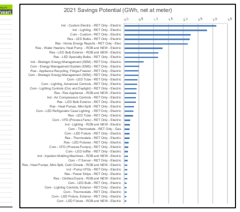

Residential 2021 Electricity Economic Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Water Heaters, Heat Pump - ROB and NEW - Electric	28.8
2	Res - Thermostats - RET Only - Electric	19.8
3	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	15.6
4	Res - Heat Pumps, VRF - ROB and NEW - Electric	13.3
5	Res - LED Bulbs - RET Only - Electric	11.9
6	Res - Home Energy Reports - RET Only - Elec	9.5
7	Res - Heat Pumps, Mini-Split - RET Only - Electric	8.3
8	Res - Power Strips - RET Only - Electric	8.0
9	Res - LED Bulb Exterior - ROB and NEW - Electric	6.4
10	Res - LED Specialty Bulbs - RET Only - Electric	6.1
11	Res - Clothes Dryers - ROB and NEW - Electric	5.4
12	Res - Res Appliance - ROB and NEW - Electric	4.7
13	e - Heat Pumps, Mini-Split, Cold Climate - ROB and NEW - Ele	3.9
14	Res - Low Flow Aerators - RET Only - Electric	2.8
15	Res - LED Bulb Exterior - RET Only - Electric	2.1
16	Res - LED Tube - RET Only - Electric	1.9
17	Res - Clothes Washers - ROB and NEW - Electric	1.0
18	Res - Home Energy Reports - NEW Only - Elec	0.1
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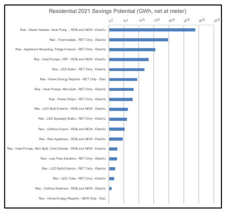

Commercial 2021 Electricity Economic Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - Custom - RET Only - Electric	13.6
2	om - Energy Management System (EMS) - RET Only - Elect	13.4
3	om - Strategic Energy Management (SEM) - RET Only - Elec	8.6
4	Com - Thermostats - RET Only - Gas	8.2
5	Com - VFD (Process Fans) - RET Only - Electric	3.8
6	Com - LED Tube - RET Only - Electric	2.6
7	Com - VFD (Process Pumps) - RET Only - Electric	2.6
8	om - Lighting Controls (Occ and Daylight) - RET Only - Elect	2.5
9	Com - IT Saver - RET Only - Electric	2.2
10	Com - Lighting, Advanced Controls - ROB and NEW - Electri	2.1
11	Com - LED Refrigerator Case Lighting - RET Only - Electric	1.8
12	Com - Demand Controlled Ventilation - RET Only - Gas	1.6
13	Com - LED Fixture - ROB and NEW - Electric	1.4
14	Com - Forklift Chargers - RET Only - Electric	1.2
15	Com - Heat Pump Water Heaters - RET Only - Electric	1.1
16	Com - LED Fixture - RET Only - Electric	1.1
17	Com - Lighting Controls, Exterior - RET Only - Electric	1.0
18	Com - LED troffer - RET Only - Electric	1.0
19	Com - Thermostats - RET Only - Electric	1.0
20	Com - Demand Controlled Ventilation - RET Only - Electric	0.8
21	Com - Power Strips - RET Only - Electric	0.7
22	Com - Cooking - ROB and NEW - Electric	0.7
23	Com - LED Bulb - RET Only - Electric	0.5
24	Com - LED Specialty Bulbs - RET Only - Electric	0.3
25	Com - Lighting Pole Mounted - ROB and NEW - Electric	0.2
26	Com - Chiller Tune-up - RET Only - Electric	0.2
27	om - Packaged Terminal Heat Pump - ROB and NEW - Elect	0.2
28	Com - LED Grow Light - RET Only - Electric	0.1
29	Com - Air Source Heat Pump - ROB and NEW - Electric	0.1
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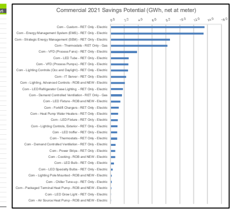

Industrial 2021 Electricity Economic Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Lighting - RET Only - Electric	21.3
2	Ind - Custom Electric - RET Only - Electric	18.5
3	nd - Strategic Energy Management (SEM) - RET Only - Elect	11.7
4	Ind - Injection Molding Machines - ROB and NEW - Electric	7.6
5	Ind - Lighting - ROB and NEW - Electric	7.2
6	Ind - Air Compressors Controls - RET Only - Electric	5.4
7	Ind - Pump VFDs - RET Only - Electric	2.1
8	Ind - Air Compressors - RET Only - Electric	0.7
9	Ind - Fan VFDs - RET Only - Electric	0.5
10	Ind - Refrigeration Optimization - RET Only - Electric	0.2
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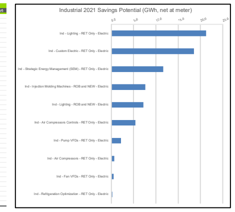

Residential 2021 Electricity Cumulative Annual Achievable Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - LED Bulbs - RET Only - Electric	2.2
2	Res - Home Energy Reports - RET Only - Elec	2.2
3	Res - Water Heaters, Heat Pump - ROB and NEW - Electric	1.3
4	Res - LED Bulb Exterior - ROB and NEW - Electric	1.2
5	Res - LED Specialty Bulbs - RET Only - Electric	1.1
6	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	0.5
7	Res - Res Appliance - ROB and NEW - Electric	0.4
8	Res - LED Bulb Exterior - RET Only - Electric	0.4
9	Res - Heat Pumps, Mini-Split - RET Only - Electric	0.3
10	Res - LED Tube - RET Only - Electric	0.3
11	Res - Thermostats - RET Only - Electric	0.2
12	Res - LED Fixtures - RET Only - Electric	0.1
13	e - Heat Pumps, Mini-Split, Cold Climate - ROB and NEW - Ele	0.1
14	Res - Power Strips - RET Only - Electric	0.1
15	Res - Clothes Dryers - ROB and NEW - Electric	0.1
16	Res - Clothes Washers - ROB and NEW - Electric	0.1
17	Res - Heat Pumps, VRF - ROB and NEW - Electric	0.1
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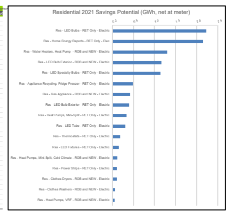

Commercial 2021 Electricity Cumulative Annual Achievable Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - Custom - RET Only - Electric	2.3
2	om - Energy Management System (EMS) - RET Only - Elect	0.5
3	om - Strategic Energy Management (SEM) - RET Only - Elec	0.5
4	Com - LED Tube - RET Only - Electric	0.5
5	Com - Lighting, Advanced Controls - RET Only - Electric	0.4
6	om - Lighting Controls (Occ and Daylight) - RET Only - Elect	0.4
7	Com - LED Refrigerator Case Lighting - RET Only - Electric	0.3
8	Com - VFD (Process Fans) - RET Only - Electric	0.2
9	Com - Thermostats - RET Only - Gas	0.2
10	Com - LED Fixture - RET Only - Electric	0.2
11	Com - VFD (Process Pumps) - RET Only - Electric	0.1
12	Com - LED troffer - RET Only - Electric	0.1
13	Com - IT Saver - RET Only - Electric	0.1
14	Com - LED Bulb - RET Only - Electric	0.1
15	Com - Lighting Controls, Exterior - RET Only - Electric	0.1
16	Com - Thermostats - RET Only - Electric	0.1
17	Com - LED Fixture, Exterior - RET Only - Electric	0.1
18	Com - LED Fixture - ROB and NEW - Electric	0.1
19	Com - Forklift Chargers - RET Only - Electric	0.1
20	Com - Demand Controlled Ventilation - RET Only - Electric	0.1
21	Com - LED Specialty Bulbs - RET Only - Electric	0.1
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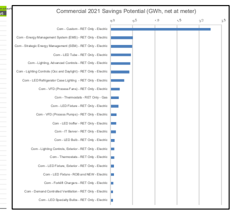

Industrial 2021 Electricity Cumulative Annual Achievable Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Custom Electric - RET Only - Electric	3.1
2	Ind - Lighting - RET Only - Electric	2.8
3	nd - Strategic Energy Management (SEM) - RET Only - Elect	0.7
4	Ind - Air Compressors Controls - RET Only - Electric	0.4
5	Ind - Lighting - ROB and NEW - Electric	0.2
6	Ind - Injection Molding Machines - ROB and NEW - Electric	0.1
7	Ind - Pump VFDs - RET Only - Electric	0.1
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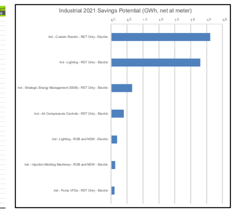
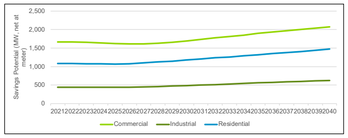
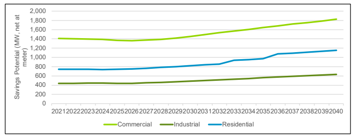


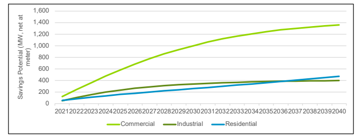
Lower Peninsula Electric Demand Technical Potential by Sector (MW, net at meter)				
Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	1,669	441	1,084
Lower Peninsula | Total	2022	1.663	441	1.083
Lower Peninsula | Total	2023	1.653	443	1.075
Lower Peninsula | Total	2024	1.639	443	1.074
Lower Peninsula | Total	2025	1.620	440	1.066
Lower Peninsula | Total	2026	1.611	442	1.074
Lower Peninsula | Total	2027	1.619	454	1.100
Lower Peninsula | Total	2028	1.634	464	1.125
Lower Peninsula | Total	2029	1.661	476	1.151
Lower Peninsula | Total	2030	1.694	487	1.179
Lower Peninsula | Total	2031	1.736	502	1.208
Lower Peninsula | Total	2032	1.780	518	1.237
Lower Peninsula | Total	2033	1.816	531	1.263
Lower Peninsula | Total	2034	1.851	544	1.290
Lower Peninsula | Total	2035	1.898	562	1.321
Lower Peninsula | Total	2036	1.934	576	1.354
Lower Peninsula | Total	2037	1.971	589	1.381
Lower Peninsula | Total	2038	2.004	602	1.410
Lower Peninsula | Total	2039	2.036	615	1.439
Lower Peninsula | Total	2040	2,073	630	1,471



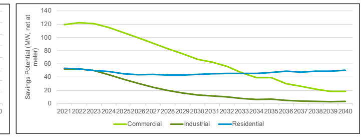
Lower Peninsula Electric Demand Economic Potential by Sector (MW, net at meter)				
Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	1,411	441	748
Lower Peninsula | Total	2022	1.405	441	746
Lower Peninsula | Total	2023	1.398	443	741
Lower Peninsula | Total	2024	1.387	443	739
Lower Peninsula | Total	2025	1.370	440	747
Lower Peninsula | Total	2026	1.364	442	751
Lower Peninsula | Total	2027	1.373	454	766
Lower Peninsula | Total	2028	1.390	464	783
Lower Peninsula | Total	2029	1.417	476	800
Lower Peninsula | Total	2030	1.452	487	819
Lower Peninsula | Total	2031	1.491	502	838
Lower Peninsula | Total	2032	1.532	518	857
Lower Peninsula | Total	2033	1.568	531	935
Lower Peninsula | Total	2034	1.603	544	953
Lower Peninsula | Total	2035	1.647	562	972
Lower Peninsula | Total	2036	1.683	576	1.075
Lower Peninsula | Total	2037	1.719	589	1.093
Lower Peninsula | Total	2038	1.753	602	1.113
Lower Peninsula | Total	2039	1.786	615	1.133
Lower Peninsula | Total	2040	1,822	630	1,154



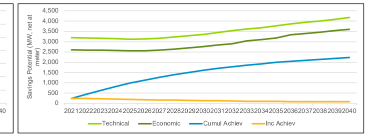
Lower Peninsula Electric Demand Cumulative Annual Achievable Potential by Sector (MW, net at meter)				
Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	120	52	53
Lower Peninsula | Total	2022	242	105	83
Lower Peninsula | Total	2023	363	154	110
Lower Peninsula | Total	2024	477	198	136
Lower Peninsula | Total	2025	585	235	158
Lower Peninsula | Total	2026	684	266	180
Lower Peninsula | Total	2027	775	290	201
Lower Peninsula | Total	2028	858	310	220
Lower Peninsula | Total	2029	933	326	240
Lower Peninsula | Total	2030	1.001	339	260
Lower Peninsula | Total	2031	1.063	351	280
Lower Peninsula | Total	2032	1.119	361	301
Lower Peninsula | Total	2033	1.166	369	321
Lower Peninsula | Total	2034	1.205	375	341
Lower Peninsula | Total	2035	1.244	382	362
Lower Peninsula | Total	2036	1.274	386	385
Lower Peninsula | Total	2037	1.300	390	405
Lower Peninsula | Total	2038	1.322	394	427
Lower Peninsula | Total	2039	1.341	397	449
Lower Peninsula | Total	2040	1,359	400	471



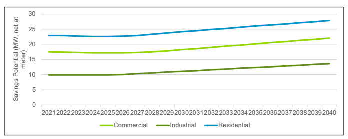
Lower Peninsula Electric Demand Incremental Annual Achievable Potential by Sector (MW, net at meter)				
Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | To	2021	120	52	53
Lower Peninsula | To	2022	122	52	52
Lower Peninsula | To	2023	121	50	50
Lower Peninsula | To	2024	115	44	48
Lower Peninsula | To	2025	107	37	45
Lower Peninsula | To	2026	99	30	44
Lower Peninsula | To	2027	91	25	44
Lower Peninsula | To	2028	83	20	43
Lower Peninsula | To	2029	75	16	43
Lower Peninsula | To	2030	67	13	44
Lower Peninsula | To	2031	62	12	45
Lower Peninsula | To	2032	56	10	46
Lower Peninsula | To	2033	46	8	45
Lower Peninsula | To	2034	39	6	46
Lower Peninsula | To	2035	39	7	47
Lower Peninsula | To	2036	30	5	49
Lower Peninsula | To	2037	26	4	47
Lower Peninsula | To	2038	22	3	49
Lower Peninsula | To	2039	19	3	49
Lower Peninsula | To	2040	19	3	50



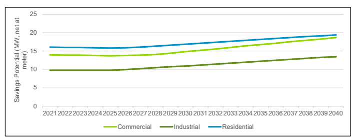
Lower Peninsula Electric Demand Potential (MW, net at meter)					
Service Territory	Year	Technical	Economic	Cumul Achiev	Inc Achiev
Lower Peninsula | Total	2021	3,194	2,600	225	225
Lower Peninsula | Total	2022	3.187	2.593	429	227
Lower Peninsula | Total	2023	3.171	2.581	627	220
Lower Peninsula | Total	2024	3.156	2.568	812	207
Lower Peninsula | Total	2025	3.125	2.556	978	189
Lower Peninsula | Total	2026	3.127	2.557	1.129	174
Lower Peninsula | Total	2027	3.172	2.593	1.266	160
Lower Peninsula | Total	2028	3.222	2.636	1.388	146
Lower Peninsula | Total	2029	3.288	2.694	1.499	135
Lower Peninsula | Total	2030	3.360	2.758	1.599	124
Lower Peninsula | Total	2031	3.446	2.831	1.694	119
Lower Peninsula | Total	2032	3.535	2.907	1.781	112
Lower Peninsula | Total	2033	3.610	3.035	1.855	99
Lower Peninsula | Total	2034	3.685	3.100	1.921	91
Lower Peninsula | Total	2035	3.781	3.181	1.988	93
Lower Peninsula | Total	2036	3.864	3.333	2.045	84
Lower Peninsula | Total	2037	3.940	3.401	2.096	78
Lower Peninsula | Total	2038	4.016	3.468	2.143	74
Lower Peninsula | Total	2039	4.091	3.534	2.186	71
Lower Peninsula | Total	2040	4,174	3,607	2,230	72



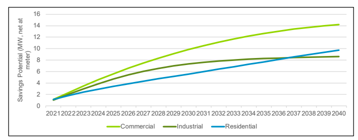
Upper Peninsula Electric Demand Technical Potential by Sector (MW, net at meter)				
Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	17	10	23
Upper Peninsula | Total	2022	17	10	23
Upper Peninsula | Total	2023	17	10	23
Upper Peninsula | Total	2024	17	10	23
Upper Peninsula | Total	2025	17	10	23
Upper Peninsula | Total	2026	17	10	23
Upper Peninsula | Total	2027	17	10	23
Upper Peninsula | Total	2028	18	11	23
Upper Peninsula | Total	2029	18	11	24
Upper Peninsula | Total	2030	18	11	24
Upper Peninsula | Total	2031	19	11	24
Upper Peninsula | Total	2032	19	12	25
Upper Peninsula | Total	2033	19	12	25
Upper Peninsula | Total	2034	20	12	26
Upper Peninsula | Total	2035	20	12	26
Upper Peninsula | Total	2036	21	13	26
Upper Peninsula | Total	2037	21	13	27
Upper Peninsula | Total	2038	21	13	27
Upper Peninsula | Total	2039	22	13	27
Upper Peninsula | Total	2040	22	14	28



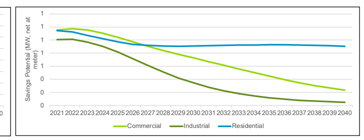
Upper Peninsula Electric Demand Economic Potential by Sector (MW, net at meter)				
Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	14	10	16
Upper Peninsula | Total	2022	14	10	16
Upper Peninsula | Total	2023	14	10	16
Upper Peninsula | Total	2024	14	10	16
Upper Peninsula | Total	2025	14	10	16
Upper Peninsula | Total	2026	14	10	16
Upper Peninsula | Total	2027	14	10	16
Upper Peninsula | Total	2028	14	10	16
Upper Peninsula | Total	2029	14	11	17
Upper Peninsula | Total	2030	15	11	17
Upper Peninsula | Total	2031	15	11	17
Upper Peninsula | Total	2032	16	11	17
Upper Peninsula | Total	2033	16	12	18
Upper Peninsula | Total	2034	16	12	18
Upper Peninsula | Total	2035	17	12	18
Upper Peninsula | Total	2036	17	12	18
Upper Peninsula | Total	2037	18	13	19
Upper Peninsula | Total	2038	18	13	19
Upper Peninsula | Total	2039	18	13	19
Upper Peninsula | Total	2040	19	13	19



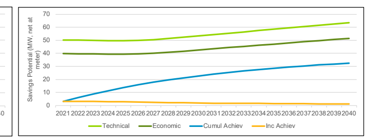
Upper Peninsula Electric Demand Cumulative Annual Achievable Potential by Sector (MW, net at meter)				
Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	1	1	1
Upper Peninsula | Total	2022	2	2	2
Upper Peninsula | Total	2023	3	3	2
Upper Peninsula | Total	2024	5	4	3
Upper Peninsula | Total	2025	6	5	3
Upper Peninsula | Total	2026	7	5	4
Upper Peninsula | Total	2027	7	6	4
Upper Peninsula | Total	2028	8	7	5
Upper Peninsula | Total	2029	9	7	5
Upper Peninsula | Total	2030	10	7	6
Upper Peninsula | Total	2031	11	8	6
Upper Peninsula | Total	2032	11	8	6
Upper Peninsula | Total	2033	12	8	7
Upper Peninsula | Total	2034	12	8	7
Upper Peninsula | Total	2035	13	8	8
Upper Peninsula | Total	2036	13	8	8
Upper Peninsula | Total	2037	13	8	9
Upper Peninsula | Total	2038	14	9	9
Upper Peninsula | Total	2039	14	9	9
Upper Peninsula | Total	2040	14	9	10



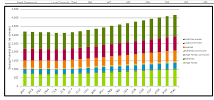
Lower Peninsula Electric Demand Incremental Annual Achievable Potential by Sector (MW, net at meter)				
Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | To	2021	1	1	1
Lower Peninsula | To	2022	1	1	1
Lower Peninsula | To	2023	1	1	1
Lower Peninsula | To	2024	1	1	1
Lower Peninsula | To	2025	1	1	1
Lower Peninsula | To	2026	1	1	1
Lower Peninsula | To	2027	1	1	1
Lower Peninsula | To	2028	1	1	1
Lower Peninsula | To	2029	1	0	1
Lower Peninsula | To	2030	1	0	1
Lower Peninsula | To	2031	1	0	1
Lower Peninsula | To	2032	1	0	1
Lower Peninsula | To	2033	1	0	1
Lower Peninsula | To	2034	1	0	1
Lower Peninsula | To	2035	0	0	1
Lower Peninsula | To	2036	0	0	1
Lower Peninsula | To	2037	0	0	1
Lower Peninsula | To	2038	0	0	1
Lower Peninsula | To	2039	0	0	1
Lower Peninsula | To	2040	0	0	1

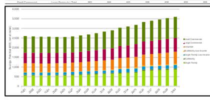


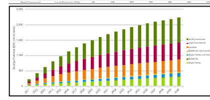
Upper Electric Demand Electricity Potential (MW, net at meter)					
Service Territory	Year	Technical	Economic	Cumul Achiev	Inc Achiev
Upper Peninsula | Total	2021	50	40	3	3
Upper Peninsula | Total	2022	50	40	6	3
Upper Peninsula | Total	2023	50	40	9	3
Upper Peninsula | Total	2024	50	39	11	3
Upper Peninsula | Total	2025	50	39	14	3
Upper Peninsula | Total	2026	50	40	16	3
Upper Peninsula | Total	2027	51	40	18	2
Upper Peninsula | Total	2028	51	41	20	2
Upper Peninsula | Total	2029	52	42	21	2
Upper Peninsula | Total	2030	53	43	23	2
Upper Peninsula | Total	2031	54	44	24	2
Upper Peninsula | Total	2032	55	44	25	2
Upper Peninsula | Total	2033	56	45	27	2
Upper Peninsula | Total	2034	58	46	28	2
Upper Peninsula | Total	2035	59	47	29	1
Upper Peninsula | Total	2036	60	48	30	1
Upper Peninsula | Total	2037	61	49	30	1
Upper Peninsula | Total	2038	62	50	31	1
Upper Peninsula | Total	2039	62	51	32	1
Upper Peninsula | Total	2040	63	52	33	1

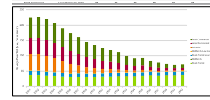


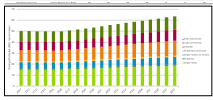
Customer Segment	Service Territory	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Single Family	Lower Peninsula | Total	710	709	704	703	698	703	721	738	756	775
Multifamily	Lower Peninsula | Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Lower Peninsula | Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Multifamily Low-Income	Lower Peninsula | Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Lower Peninsula | Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Lower Peninsula | Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Small Commercial	Lower Peninsula | Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

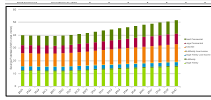


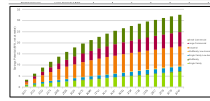


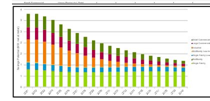


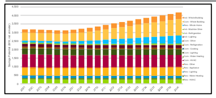


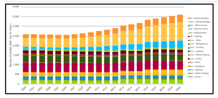


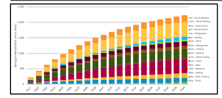


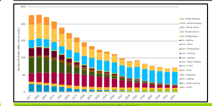


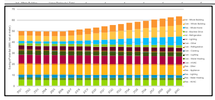


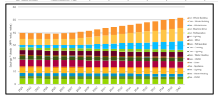


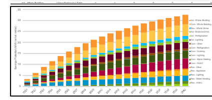


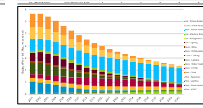






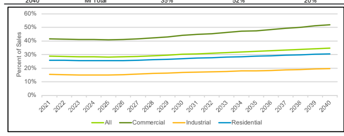






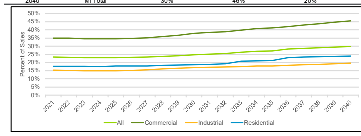
Michigan Total Electric Demand Technical Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	29%	41%	15%	26%
2022	MI Total	29%	41%	15%	26%
2023	MI Total	28%	41%	15%	26%
2024	MI Total	28%	41%	15%	26%
2025	MI Total	28%	41%	15%	26%
2026	MI Total	28%	41%	15%	26%
2027	MI Total	29%	42%	16%	26%
2028	MI Total	29%	42%	16%	26%
2029	MI Total	30%	43%	16%	27%
2030	MI Total	30%	44%	17%	27%
2031	MI Total	31%	45%	17%	27%
2032	MI Total	31%	45%	17%	28%
2033	MI Total	31%	46%	18%	28%
2034	MI Total	32%	47%	18%	28%
2035	MI Total	32%	48%	18%	29%
2036	MI Total	33%	48%	18%	29%
2037	MI Total	33%	49%	19%	30%
2038	MI Total	34%	50%	19%	30%
2039	MI Total	34%	51%	19%	30%
2040	MI Total	35%	52%	20%	31%



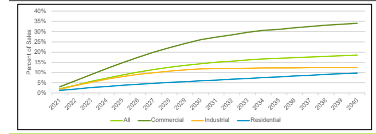
Michigan Total Electric Demand Economic Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	23%	35%	15%	18%
2022	MI Total	23%	35%	15%	18%
2023	MI Total	23%	35%	15%	18%
2024	MI Total	23%	35%	15%	18%
2025	MI Total	23%	35%	15%	18%
2026	MI Total	23%	35%	15%	18%
2027	MI Total	23%	35%	16%	18%
2028	MI Total	24%	36%	16%	18%
2029	MI Total	24%	37%	16%	19%
2030	MI Total	25%	38%	17%	19%
2031	MI Total	25%	38%	17%	19%
2032	MI Total	25%	39%	17%	19%
2033	MI Total	26%	40%	18%	21%
2034	MI Total	27%	41%	18%	21%
2035	MI Total	27%	41%	18%	21%
2036	MI Total	28%	42%	18%	23%
2037	MI Total	29%	43%	19%	23%
2038	MI Total	29%	44%	19%	24%
2039	MI Total	30%	45%	19%	24%
2040	MI Total	30%	46%	20%	24%



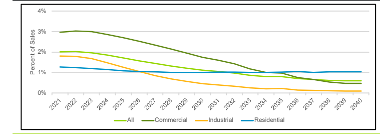
Michigan Total Electric Demand Cumulative Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	2%	3%	2%	1%
2022	MI Total	4%	6%	4%	2%
2023	MI Total	6%	9%	5%	3%
2024	MI Total	7%	12%	7%	3%
2025	MI Total	9%	15%	8%	4%
2026	MI Total	10%	17%	9%	4%
2027	MI Total	11%	20%	10%	5%
2028	MI Total	13%	22%	11%	5%
2029	MI Total	13%	24%	11%	6%
2030	MI Total	14%	26%	12%	6%
2031	MI Total	15%	27%	12%	6%
2032	MI Total	16%	28%	12%	7%
2033	MI Total	16%	30%	12%	7%
2034	MI Total	17%	31%	12%	8%
2035	MI Total	17%	31%	12%	8%
2036	MI Total	17%	32%	12%	8%
2037	MI Total	18%	32%	12%	9%
2038	MI Total	18%	33%	12%	9%
2039	MI Total	18%	34%	12%	9%
2040	MI Total	19%	34%	12%	10%



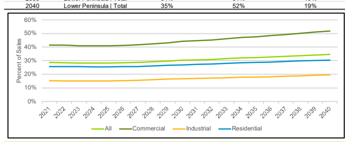
Michigan Total Electric Demand Incremental Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	2%	3%	2%	1%
2022	MI Total	2%	3%	2%	1%
2023	MI Total	2%	3%	2%	1%
2024	MI Total	2%	3%	1%	1%
2025	MI Total	2%	3%	1%	1%
2026	MI Total	2%	3%	1%	1%
2027	MI Total	1%	2%	1%	1%
2028	MI Total	1%	2%	1%	1%
2029	MI Total	1%	2%	1%	1%
2030	MI Total	1%	2%	0%	1%
2031	MI Total	1%	2%	0%	1%
2032	MI Total	1%	1%	0%	1%
2033	MI Total	1%	1%	0%	1%
2034	MI Total	1%	1%	0%	1%
2035	MI Total	1%	1%	0%	1%
2036	MI Total	1%	1%	0%	1%
2037	MI Total	1%	1%	0%	1%
2038	MI Total	1%	1%	0%	1%
2039	MI Total	1%	0%	0%	1%
2040	MI Total	1%	0%	0%	1%



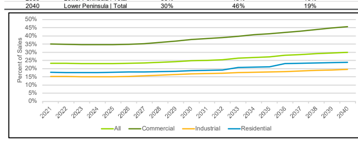
Lower Peninsula Electric Demand Technical Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula | Total	29%	41%	15%	26%
2022	Lower Peninsula | Total	29%	41%	15%	26%
2023	Lower Peninsula | Total	28%	41%	15%	26%
2024	Lower Peninsula | Total	28%	41%	15%	25%
2025	Lower Peninsula | Total	28%	41%	15%	25%
2026	Lower Peninsula | Total	28%	41%	15%	26%
2027	Lower Peninsula | Total	29%	42%	16%	26%
2028	Lower Peninsula | Total	29%	42%	16%	26%
2029	Lower Peninsula | Total	30%	43%	16%	26%
2030	Lower Peninsula | Total	30%	44%	17%	27%
2031	Lower Peninsula | Total	31%	45%	17%	27%
2032	Lower Peninsula | Total	31%	45%	17%	28%
2033	Lower Peninsula | Total	31%	46%	17%	28%
2034	Lower Peninsula | Total	32%	47%	18%	28%
2035	Lower Peninsula | Total	32%	48%	18%	29%
2036	Lower Peninsula | Total	33%	48%	18%	29%
2037	Lower Peninsula | Total	33%	49%	19%	29%
2038	Lower Peninsula | Total	34%	50%	19%	30%
2039	Lower Peninsula | Total	34%	51%	19%	30%
2040	Lower Peninsula | Total	35%	52%	19%	30%



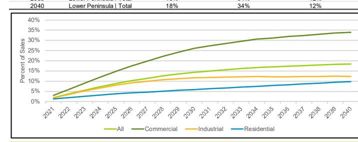
Lower Peninsula Electric Demand Economic Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula | Total	23%	35%	15%	18%
2022	Lower Peninsula | Total	23%	35%	15%	18%
2023	Lower Peninsula | Total	23%	35%	15%	18%
2024	Lower Peninsula | Total	23%	35%	15%	18%
2025	Lower Peninsula | Total	23%	35%	15%	18%
2026	Lower Peninsula | Total	23%	35%	15%	18%
2027	Lower Peninsula | Total	23%	35%	16%	18%
2028	Lower Peninsula | Total	24%	36%	16%	18%
2029	Lower Peninsula | Total	24%	37%	16%	18%
2030	Lower Peninsula | Total	25%	38%	17%	19%
2031	Lower Peninsula | Total	25%	38%	17%	19%
2032	Lower Peninsula | Total	25%	39%	17%	19%
2033	Lower Peninsula | Total	26%	40%	17%	21%
2034	Lower Peninsula | Total	27%	41%	18%	21%
2035	Lower Peninsula | Total	27%	41%	18%	21%
2036	Lower Peninsula | Total	28%	42%	18%	23%
2037	Lower Peninsula | Total	29%	43%	19%	23%
2038	Lower Peninsula | Total	29%	44%	19%	24%
2039	Lower Peninsula | Total	30%	45%	19%	24%
2040	Lower Peninsula | Total	30%	46%	19%	24%



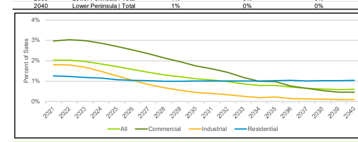
Lower Peninsula Electric Demand Cumulative Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula | Total	2%	3%	2%	1%
2022	Lower Peninsula | Total	4%	6%	4%	2%
2023	Lower Peninsula | Total	6%	9%	5%	3%
2024	Lower Peninsula | Total	7%	12%	7%	3%
2025	Lower Peninsula | Total	9%	15%	8%	4%
2026	Lower Peninsula | Total	10%	17%	9%	4%
2027	Lower Peninsula | Total	11%	20%	10%	5%
2028	Lower Peninsula | Total	13%	22%	11%	5%
2029	Lower Peninsula | Total	14%	24%	11%	6%
2030	Lower Peninsula | Total	14%	26%	12%	6%
2031	Lower Peninsula | Total	15%	27%	12%	6%
2032	Lower Peninsula | Total	16%	28%	12%	7%
2033	Lower Peninsula | Total	16%	30%	12%	7%
2034	Lower Peninsula | Total	17%	31%	12%	8%
2035	Lower Peninsula | Total	17%	31%	12%	8%
2036	Lower Peninsula | Total	17%	32%	12%	8%
2037	Lower Peninsula | Total	18%	32%	12%	9%
2038	Lower Peninsula | Total	18%	33%	12%	9%
2039	Lower Peninsula | Total	18%	34%	12%	9%
2040	Lower Peninsula | Total	18%	34%	12%	10%



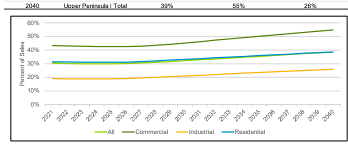
Lower Peninsula Electric Demand Incremental Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula | Total	2%	3%	2%	1%
2022	Lower Peninsula | Total	2%	3%	2%	1%
2023	Lower Peninsula | Total	2%	3%	2%	1%
2024	Lower Peninsula | Total	2%	3%	1%	1%
2025	Lower Peninsula | Total	2%	3%	1%	1%
2026	Lower Peninsula | Total	2%	3%	1%	1%
2027	Lower Peninsula | Total	1%	2%	1%	1%
2028	Lower Peninsula | Total	1%	2%	1%	1%
2029	Lower Peninsula | Total	1%	2%	1%	1%
2030	Lower Peninsula | Total	1%	2%	0%	1%
2031	Lower Peninsula | Total	1%	2%	0%	1%
2032	Lower Peninsula | Total	1%	1%	0%	1%
2033	Lower Peninsula | Total	1%	1%	0%	1%
2034	Lower Peninsula | Total	1%	1%	0%	1%
2035	Lower Peninsula | Total	1%	1%	0%	1%
2036	Lower Peninsula | Total	1%	1%	0%	1%
2037	Lower Peninsula | Total	1%	1%	0%	1%
2038	Lower Peninsula | Total	1%	1%	0%	1%
2039	Lower Peninsula | Total	1%	0%	0%	1%
2040	Lower Peninsula | Total	1%	0%	0%	1%



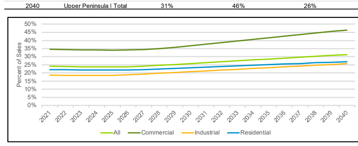
Upper Peninsula Electric Demand Technical Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula | Total	30%	43%	19%	31%
2022	Upper Peninsula | Total	30%	43%	19%	31%
2023	Upper Peninsula | Total	30%	43%	19%	31%
2024	Upper Peninsula | Total	30%	43%	19%	31%
2025	Upper Peninsula | Total	30%	43%	19%	31%
2026	Upper Peninsula | Total	30%	43%	19%	31%
2027	Upper Peninsula | Total	31%	43%	20%	32%
2028	Upper Peninsula | Total	31%	44%	20%	32%
2029	Upper Peninsula | Total	32%	44%	21%	33%
2030	Upper Peninsula | Total	32%	45%	21%	33%
2031	Upper Peninsula | Total	33%	46%	22%	34%
2032	Upper Peninsula | Total	34%	47%	22%	34%
2033	Upper Peninsula | Total	34%	48%	23%	35%
2034	Upper Peninsula | Total	35%	49%	23%	35%
2035	Upper Peninsula | Total	35%	50%	24%	36%
2036	Upper Peninsula | Total	36%	51%	24%	37%
2037	Upper Peninsula | Total	37%	52%	25%	37%
2038	Upper Peninsula | Total	37%	53%	25%	38%
2039	Upper Peninsula | Total	38%	54%	26%	38%
2040	Upper Peninsula | Total	39%	55%	26%	39%



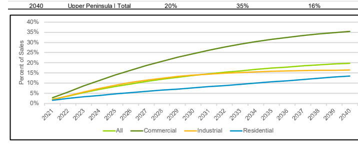
Upper Peninsula Electric Demand Economic Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula | Total	24%	35%	19%	22%
2022	Upper Peninsula | Total	24%	34%	19%	22%
2023	Upper Peninsula | Total	24%	34%	19%	22%
2024	Upper Peninsula | Total	24%	34%	19%	22%
2025	Upper Peninsula | Total	24%	34%	19%	22%
2026	Upper Peninsula | Total	24%	34%	19%	22%
2027	Upper Peninsula | Total	24%	34%	19%	22%
2028	Upper Peninsula | Total	25%	35%	20%	22%
2029	Upper Peninsula | Total	25%	36%	20%	23%
2030	Upper Peninsula | Total	26%	37%	21%	23%
2031	Upper Peninsula | Total	26%	38%	21%	24%
2032	Upper Peninsula | Total	27%	39%	22%	24%
2033	Upper Peninsula | Total	27%	40%	22%	24%
2034	Upper Peninsula | Total	28%	41%	23%	25%
2035	Upper Peninsula | Total	29%	42%	23%	25%
2036	Upper Peninsula | Total	29%	43%	24%	26%
2037	Upper Peninsula | Total	30%	44%	24%	26%
2038	Upper Peninsula | Total	30%	45%	25%	26%
2039	Upper Peninsula | Total	31%	45%	25%	27%
2040	Upper Peninsula | Total	31%	46%	26%	27%



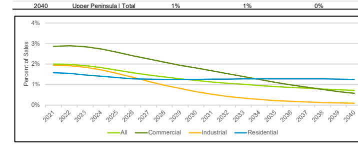
Upper Peninsula Electric Demand Cumulative Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula | Total	2%	3%	2%	2%
2022	Upper Peninsula | Total	4%	6%	4%	2%
2023	Upper Peninsula | Total	5%	9%	6%	3%
2024	Upper Peninsula | Total	7%	11%	7%	4%
2025	Upper Peninsula | Total	8%	14%	9%	5%
2026	Upper Peninsula | Total	10%	16%	10%	5%
2027	Upper Peninsula | Total	11%	19%	11%	6%
2028	Upper Peninsula | Total	12%	21%	12%	7%
2029	Upper Peninsula | Total	13%	23%	13%	7%
2030	Upper Peninsula | Total	14%	24%	14%	8%
2031	Upper Peninsula | Total	15%	26%	14%	8%
2032	Upper Peninsula | Total	15%	28%	15%	9%
2033	Upper Peninsula | Total	16%	29%	15%	9%
2034	Upper Peninsula | Total	17%	30%	16%	10%
2035	Upper Peninsula | Total	17%	31%	16%	11%
2036	Upper Peninsula | Total	18%	32%	16%	11%
2037	Upper Peninsula | Total	18%	33%	16%	12%
2038	Upper Peninsula | Total	19%	34%	16%	12%
2039	Upper Peninsula | Total	19%	35%	16%	13%
2040	Upper Peninsula | Total	20%	35%	16%	14%



Upper Peninsula Electric Demand Incremental Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula | Total	2%	3%	2%	2%
2022	Upper Peninsula | Total	2%	3%	2%	2%
2023	Upper Peninsula | Total	2%	3%	2%	1%
2024	Upper Peninsula | Total	2%	3%	2%	1%
2025	Upper Peninsula | Total	2%	3%	2%	1%
2026	Upper Peninsula | Total	2%	2%	1%	1%
2027	Upper Peninsula | Total	1%	2%	1%	1%
2028	Upper Peninsula | Total	1%	2%	1%	1%
2029	Upper Peninsula | Total	1%	2%	1%	1%
2030	Upper Peninsula | Total	1%	2%	1%	1%
2031	Upper Peninsula | Total	1%	2%	1%	1%
2032	Upper Peninsula | Total	1%	2%	0%	1%
2033	Upper Peninsula | Total	1%	1%	0%	1%
2034	Upper Peninsula | Total	1%	1%	0%	1%
2035	Upper Peninsula | Total	1%	1%	0%	1%
2036	Upper Peninsula | Total	1%	1%	0%	1%
2037	Upper Peninsula | Total	1%	1%	0%	1%
2038	Upper Peninsula | Total	1%	1%	0%	1%
2039	Upper Peninsula | Total	1%	1%	0%	1%
2040	Upper Peninsula | Total	1%	1%	0%	1%



Residential 2021 Electric Demand Technical Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Thermostats - RET Only - Electric	261.5
2	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric	205.8
3	Res - Home Energy Reports - RET Only - Elec	111.2
4	Res - Res HVAC - RET only - Electric	99.1
5	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	81.8
6	Res - LED Bulbs - RET Only - Electric	70.7
7	Res - Power Strips - RET Only - Electric	57.7
8	Res - Water Heaters, Heat Pump, - ROB and NEW - Electric	53.3
9	Res - LED Specialty Bulbs - RET Only - Electric	38.3
10	Res - Res Appliance - ROB and NEW - Electric	25.8
11	Res - Low Flow Aerators - RET Only - Electric	24.6
12	Res - LED Fixtures - RET Only - Electric	20.1
13	Res - LED Tube - RET Only - Electric	19.2
14	Res - Clothes Washers - ROB and NEW - Electric	9.4
15	Res - Heat Pumps, VRF - ROB and NEW - Electric	2.9
16	Res - Home Energy Reports - NEW Only - Elec	0.9
17	Res - Res HVAC - NEW only - Electric	0.8
18	Res - Heat Pumps, Ground Source, - NEW Only - Electric	0.7
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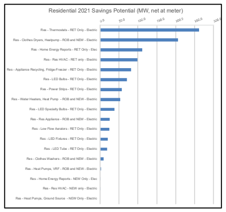
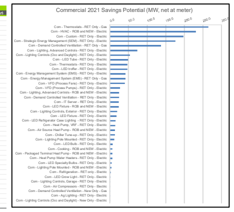
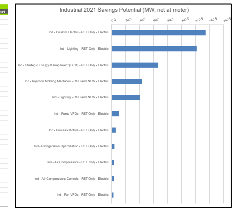


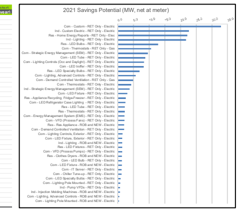
Rank	Measure Name	Potential (cumul. impact/year)
[illegible]	[illegible]	[illegible]
25	Com - Lighting Pole Mounted - RET Only - Electric	11.5
26	Com - LED Bulb - RET Only - Electric	7.6
27	Com - Cooking - ROB and NEW - Electric	6.4
28	Com - Packaged Terminal Heat Pump - ROB and NEW - Elect	6.2
29	Com - Heat Pump Water Heaters - RET Only - Electric	6.1
30	Com - LED Specialty Bulbs - RET Only - Electric	5.1
31	Com - Lighting Pole Mounted - ROB and NEW - Electric	3.8
32	Com - Refrigeration - RET only - Electric	2.5
33	Com - LED Grow Light - RET Only - Electric	1.5
34	Com - Lighting Controls, Garage - RET Only - Electric	0.8
35	Com - Air Compressors - RET Only - Electric	0.3
36	Com - Demand Controlled Ventilation - New Only - Gas	0.2
37	Com - Ag Lighting - RET Only - Electric	0.1
38	Com - Lighting Controls (Occ and Daylight) - New Only - Elect	0.1
39		
40		



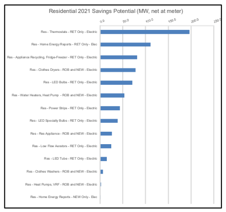
Rank	Measure Name	Potential (cumul. impact/year)
[illegible]	[illegible]	[illegible]



Rank	Measure Name	Potential (cumul. impact/year)
[illegible]	[illegible]	[illegible]



Rank	Measure Name	Potential (cumul. impact/year)
[illegible]	[illegible]	[illegible]



Commercial 2021 Electric Demand Economic Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - Thermostats - RET Only - Gas	264.8
2	Com - Custom - RET Only - Electric	197.4
3	Com - Strategic Energy Management (SEM) - RET Only - Elec	176.2
4	Com - Demand Controlled Ventilation - RET Only - Gas	137.0
5	Com - Lighting, Advanced Controls - RET Only - Electric	73.6
6	Com - Lighting Controls (Occ and Daylight) - RET Only - Elect	53.8
7	Com - LED Tube - RET Only - Electric	49.0
8	Com - Thermostats - RET Only - Electric	47.4
9	Com - LED troffer - RET Only - Electric	46.6
10	Com - Energy Management System (EMS) - RET Only - Elect	41.7
11	Com - Energy Management System (EMS) - RET Only - Gas	41.7
12	Com - VFD (Process Fans) - RET Only - Electric	40.2
13	Com - VFD (Process Pumps) - RET Only - Electric	27.1
14	Com - Lighting, Advanced Controls - ROB and NEW - Electri	24.6
15	Com - Demand Controlled Ventilation - RET Only - Electric	24.6
16	Com - IT Saver - RET Only - Electric	24.2
17	Com - LED Fixture - ROB and NEW - Electric	23.4
18	Com - Lighting Controls, Exterior - RET Only - Electric	19.6
19	Com - LED Fixture - RET Only - Electric	17.4
20	Com - LED Refrigerator Case Lighting - RET Only - Electric	14.8
21	Com - Chiller Tune-up - RET Only - Electric	13.2
22	Com - Lighting Pole Mounted - RET Only - Electric	11.5
23	Com - LED Bulb - RET Only - Electric	7.6
24	Com - Cooking - ROB and NEW - Electric	6.4
25	Com - Packaged Terminal Heat Pump - ROB and NEW - Elect	6.2
26	Com - Heat Pump Water Heaters - RET Only - Electric	6.1
27	Com - LED Specialty Bulbs - RET Only - Electric	5.1
28	Com - Lighting Pole Mounted - ROB and NEW - Electric	3.8
29	Com - Air Source Heat Pump - ROB and NEW - Electric	3.4
30	Com - LED Grow Light - RET Only - Electric	1.5
31	Com - Lighting Controls, Garage - RET Only - Electric	0.8
32	Com - Air Compressors - RET Only - Electric	0.3
33	Com - Demand Controlled Ventilation - New Only - Gas	0.2
34	Com - Ag Lighting - RET Only - Electric	0.1
35	Com - Lighting Controls (Occ and Daylight) - New Only - Elect	0.1
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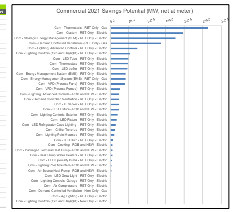

Industrial 2021 Electric Demand Economic Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Custom Electric - RET Only - Electric	134.7
2	Ind - Lighting - RET Only - Electric	122.0
3	Ind - Strategic Energy Management (SEM) - RET Only - Elect	66.9
4	Ind - Injection Molding Machines - ROB and NEW - Electric	43.6
5	Ind - Lighting - ROB and NEW - Electric	41.1
6	Ind - Pump VFDs - RET Only - Electric	11.3
7	Ind - Process Motors - RET Only - Electric	5.9
8	Ind - Refrigeration Optimization - RET Only - Electric	4.4
9	Ind - Air Compressors - RET Only - Electric	3.9
10	Ind - Air Compressors Controls - RET Only - Electric	3.9
11	Ind - Fan VFDs - RET Only - Electric	2.9
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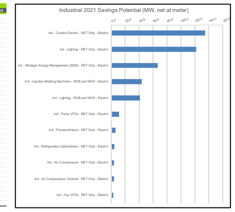

Residential 2021 Electric Demand Cumulative Annual Achievable Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Home Energy Reports - RET Only - Elec	22.2
2	Res - LED Bulbs - RET Only - Electric	12.9
3	Res - LED Specialty Bulbs - RET Only - Electric	7.0
4	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	2.6
5	Res - LED Tube - RET Only - Electric	2.2
6	Res - Thermostats - RET Only - Electric	2.2
7	Res - Res Appliance - ROB and NEW - Electric	2.1
8	Res - LED Fixtures - RET Only - Electric	1.4
9	Res - Clothes Dryers - ROB and NEW - Electric	1.4
10	Res - Power Strips - RET Only - Electric	0.4
11	Res - Water Heaters, Heat Pump, - ROB and NEW - Electric	0.4
12	Res - Clothes Washers - ROB and NEW - Electric	0.3
13	Res - Low Flow Aerators - RET Only - Electric	0.3
14	Res - Res HVAC - RET only - Electric	0.3
15	Res - Home Energy Reports - NEW Only - Elec	0.2
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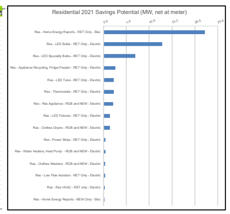

Commercial 2021 Electric Demand Cumulative Annual Achievable Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - Custom - RET Only - Electric	32.9
2	Com - Thermostats - RET Only - Gas	10.6
3	Com - Strategic Energy Management (SEM) - RET Only - Elec	9.6
4	Com - LED Tube - RET Only - Electric	8.8
5	Com - Lighting Controls (Occ and Daylight) - RET Only - Elect	8.4
6	Com - LED troffer - RET Only - Electric	8.3
7	Com - Lighting, Advanced Controls - RET Only - Electric	5.7
8	Com - Demand Controlled Ventilation - RET Only - Gas	4.9
9	Com - Thermostats - RET Only - Electric	4.3
10	Com - LED Fixture - RET Only - Electric	3.1
11	Com - LED Refrigerator Case Lighting - RET Only - Electric	2.4
12	Com - Energy Management System (EMS) - RET Only - Elect	2.2
13	Com - VFD (Process Fans) - RET Only - Electric	2.1
14	Com - Demand Controlled Ventilation - RET Only - Electric	2.1
15	Com - Lighting Controls, Exterior - RET Only - Electric	1.6
16	Com - LED Fixture, Exterior - RET Only - Electric	1.5
17	Com - VFD (Process Pumps) - RET Only - Electric	1.4
18	Com - LED Bulb - RET Only - Electric	1.3
19	Com - LED Fixture - ROB and NEW - Electric	1.3
20	Com - IT Saver - RET Only - Electric	1.2
21	Com - Chiller Tune-up - RET Only - Electric	1.2
22	Com - LED Specialty Bulbs - RET Only - Electric	0.9
23	Com - Lighting Pole Mounted - RET Only - Electric	0.8
24	Com - Lighting, Advanced Controls - ROB and NEW - Electri	0.5
25	Com - Lighting Pole Mounted - ROB and NEW - Electric	0.4
26	Com - HVAC - ROB and NEW - Electric	0.4
27	Com - Energy Management System (EMS) - RET Only - Gas	0.4
28	Com - LED Grow Light - RET Only - Electric	0.2
29	Com - Cooking - ROB and NEW - Electric	0.2
30	Com - Packaged Terminal Heat Pump - ROB and NEW - Elect	0.2
31	Com - Air Source Heat Pump - ROB and NEW - Electric	0.1
32	Com - Demand Controlled Ventilation - New Only - Gas	0.1
33	Com - Heat Pump Water Heaters - RET Only - Electric	0.1
34	Com - Refrigeration - RET only - Electric	0.1
35	Com - LED Fixture, Garage - RET Only - Electric	0.1
36	Com - Lighting Controls, Garage - RET Only - Electric	0.1
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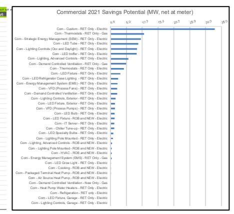
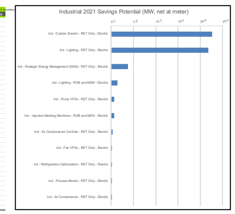


Rank	Measure Name	Potential (cumul. impact/year)
[illegible]	[illegible]	[illegible]



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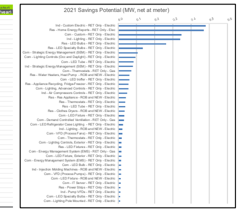
Rank	Measure Name	Potential (cumul. impact/year)
1	[illegible]	[illegible]



Residential 2021 Electric Demand Technical Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Thermostats - RET Only - Electric	5.6
2	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric	4.5
3	Res - Home Energy Reports - RET Only - Elec	2.1
4	Res - Res HVAC - RET only - Electric	1.8
5	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	1.8
6	Res - LED Bulbs - RET Only - Electric	1.4
7	Res - Water Heaters, Heat Pump - ROB and NEW - Electric	1.4
8	Res - Power Strips - RET Only - Electric	1.2
9	Res - LED Specialty Bulbs - RET Only - Electric	0.7
10	Res - Low Flow Aerators - RET Only - Electric	0.7
11	Res - Res Appliance - ROB and NEW - Electric	0.5
12	Res - LED Tube - RET Only - Electric	0.3
13	Res - LED Fixtures - RET Only - Electric	0.3
14	Res - Clothes Washers - ROB and NEW - Electric	0.2
15	Res - Heat Pumps, VRF - ROB and NEW - Electric	0.2
16	Res - Heat Pumps, Ground Source - NEW Only - Electric	0.0
17	Res - Home Energy Reports - NEW Only - Elec	0.0
18	Res - Res HVAC - NEW only - Electric	0.0
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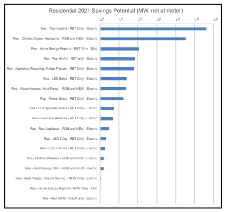

[illegible]

Rank	Measure Name	Potential (cumul. impact/year)
1–24	[illegible]	[illegible]
25	Com - Cooking - ROB and NEW - Electric	0.1
26	Com - Heat Pump, VRF - RET Only - Electric	0.1
27	Com - Heat Pump Water Heaters - RET Only - Electric	0.1
28	Com - Chiller Tune-up - RET Only - Electric	0.1
29	Com - LED Specialty Bulbs - RET Only - Electric	0.1
30	Com - Lighting Pole Mounted - ROB and NEW - Electric	0.0
31	om - Packaged Terminal Heat Pump - ROB and NEW - Elect	0.0
32	Com - Refrigeration - RET only - Electric	0.0
33	Com - LED Grow Light - RET Only - Electric	0.0
34	Com - Lighting Controls, Garage - RET Only - Electric	0.0
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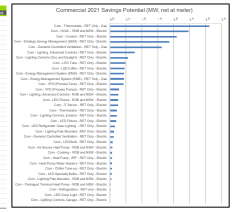

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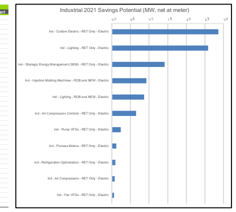
Rank	Measure Name	Potential (cumul. impact/year)
1	[illegible]	[illegible]



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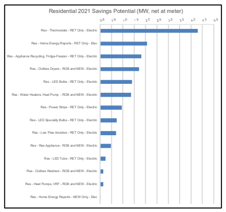
Rank	Measure Name	Potential (cumul. impact/year)
1	[illegible]	[illegible]



Commercial 2021 Electric Demand Economic Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - Thermostats - RET Only - Gas	3.1
2	Com - Custom - RET Only - Electric	2.1
3	om - Strategic Energy Management (SEM) - RET Only - Elec	1.9
4	Com - Demand Controlled Ventilation - RET Only - Gas	1.6
5	'om - Lighting Controls (Occ and Daylight) - RET Only - Elect	0.6
6	Com - LED Tube - RET Only - Electric	0.5
7	Com - LED troffer - RET Only - Electric	0.5
8	'om - Energy Management System (EMS) - RET Only - Elect	0.4
9	Com - Energy Management System (EMS) - RET Only - Gas	0.4
10	Com - VFD (Process Fans) - RET Only - Electric	0.4
11	Com - VFD (Process Pumps) - RET Only - Electric	0.3
12	Com - Lighting, Advanced Controls - ROB and NEW - Electri	0.3
13	Com - LED Fixture - ROB and NEW - Electric	0.3
14	Com - IT Server - RET Only - Electric	0.3
15	Com - Thermostats - RET Only - Electric	0.2
16	Com - Lighting Controls, Exterior - RET Only - Electric	0.2
17	Com - LED Fixture - RET Only - Electric	0.2
18	Com - LED Refrigerator Case Lighting - RET Only - Electric	0.2
19	Com - Demand Controlled Ventilation - RET Only - Electric	0.1
20	Com - LED Bulb - RET Only - Electric	0.1
21	Com - Cooking - ROB and NEW - Electric	0.1
22	Com - Heat Pump Water Heaters - RET Only - Electric	0.1
23	Com - Chiller Tune-up - RET Only - Electric	0.1
24	Com - LED Specialty Bulbs - RET Only - Electric	0.1
25	Com - Lighting Pole Mounted - ROB and NEW - Electric	0.0
26	'om - Packaged Terminal Heat Pump - ROB and NEW - Elect	0.0
27	Com - Air Source Heat Pump - ROB and NEW - Electric	0.0
28	Com - LED Grow Light - RET Only - Electric	0.0
29	Com - Lighting Controls, Garage - RET Only - Electric	0.0
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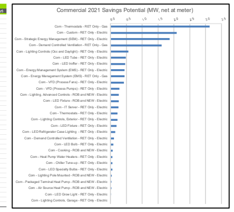

Industrial 2021 Electric Demand Economic Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Custom Electric - RET Only - Electric	3.0
2	Ind - Lighting - RET Only - Electric	2.6
3	nd - Strategic Energy Management (SEM) - RET Only - Elect	1.4
4	Ind - Injection Molding Machines - ROB and NEW - Electric	0.9
5	Ind - Lighting - ROB and NEW - Electric	0.9
6	Ind - Air Compressors Controls - RET Only - Electric	0.7
7	Ind - Pump VFDs - RET Only - Electric	0.2
8	Ind - Refrigeration Optimization - RET Only - Electric	0.1
9	Ind - Air Compressors - RET Only - Electric	0.1
10	Ind - Fan VFDs - RET Only - Electric	0.1
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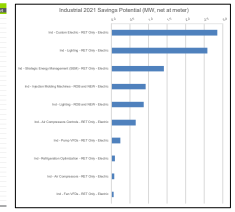

Residential 2021 Electric Demand Cumulative Annual Achievable Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Home Energy Reports - RET Only - Elec	0.5
2	Res - LED Bulbs - RET Only - Electric	0.3
3	Res - LED Specialty Bulbs - RET Only - Electric	0.1
4	Res - Water Heaters, Heat Pump - ROB and NEW - Electric	0.1
5	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	0.1
6	Res - Res Appliance - ROB and NEW - Electric	0.0
7	Res - Thermostats - RET Only - Electric	0.0
8	Res - LED Tube - RET Only - Electric	0.0
9	Res - Clothes Dryers - ROB and NEW - Electric	0.0
10	Res - LED Fixtures - RET Only - Electric	0.0
11	Res - Power Strips - RET Only - Electric	0.0
12	Res - Low Flow Aerators - RET Only - Electric	0.0
13	Res - Clothes Washers - ROB and NEW - Electric	0.0
14	Res - Res HVAC - RET only - Electric	0.0
15	Res - Home Energy Reports - NEW Only - Elec	0.0
16	Res - ASHP - ROB and NEW - Electric	0.0
17	Res - Heat Pumps, VRF - ROB and NEW - Electric	0.0
18	Res - Res HVAC - NEW only - Electric	0.0
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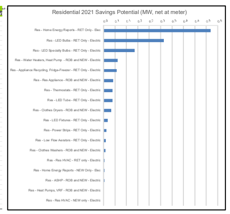
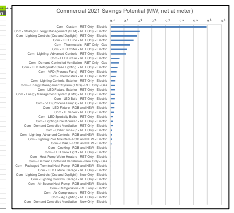


Commercial 2021 Electric Demand Cumulative Annual Achievable Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - Custom - RET Only - Electric	0.3
2	om - Strategic Energy Management (SEM) - RET Only - Elec	0.1
3	'om - Lighting Controls (Occ and Daylight) - RET Only - Elect	0.1
4	Com - LED Tube - RET Only - Electric	0.1
5	Com - Thermostats - RET Only - Gas	0.1
6	Com - LED troffer - RET Only - Electric	0.1
7	Com - Lighting, Advanced Controls - RET Only - Electric	0.1
8	Com - LED Fixture - RET Only - Electric	0.0
9	Com - Demand Controlled Ventilation - RET Only - Gas	0.0
10	Com - LED Refrigerator Case Lighting - RET Only - Electric	0.0
11	Com - VFD (Process Fans) - RET Only - Electric	0.0
12	Com - Thermostats - RET Only - Electric	0.0
13	Com - Lighting Controls, Exterior - RET Only - Electric	0.0
14	Com - Energy Management System (EMS) - RET Only - Gas	0.0
15	Com - LED Fixture, Exterior - RET Only - Electric	0.0
16	'om - Energy Management System (EMS) - RET Only - Elect	0.0
17	Com - LED Bulb - RET Only - Electric	0.0
18	Com - VFD (Process Pumps) - RET Only - Electric	0.0
19	Com - LED Fixture - ROB and NEW - Electric	0.0
20	Com - IT Server - RET Only - Electric	0.0
21	Com - LED Specialty Bulbs - RET Only - Electric	0.0
22	Com - Lighting Pole Mounted - RET Only - Electric	0.0
23	Com - Demand Controlled Ventilation - RET Only - Electric	0.0
24	Com - Chiller Tune-up - RET Only - Electric	0.0
25	Com - Lighting, Advanced Controls - ROB and NEW - Electri	0.0
26	Com - Lighting Pole Mounted - ROB and NEW - Electric	0.0
27	Com - HVAC - ROB and NEW - Electric	0.0
28	Com - Cooking - ROB and NEW - Electric	0.0
29	Com - LED Grow Light - RET Only - Electric	0.0
30	Com - Heat Pump Water Heaters - RET Only - Electric	0.0
31	Com - Demand Controlled Ventilation - New Only - Gas	0.0
32	'om - Packaged Terminal Heat Pump - ROB and NEW - Elect	0.0
33	Com - LED Fixture, Garage - RET Only - Electric	0.0
34	'om - Lighting Controls (Occ and Daylight) - New Only - Elect	0.0
35	Com - Lighting Controls, Garage - RET Only - Electric	0.0
36	Com - Air Source Heat Pump - ROB and NEW - Electric	0.0
37	Com - Refrigeration - RET only - Electric	0.0
38	Com - Air Compressors - RET Only - Electric	0.0
39	Com - Ag Lighting - RET Only - Electric	0.0
40	Com - Demand Controlled Ventilation - New Only - Electric	0.0



Industrial 2021 Electric Demand Cumulative Annual Achievable Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Custom Electric - RET Only - Electric	0.5
2	Ind - Lighting - RET Only - Electric	0.3
3	nd - Strategic Energy Management (SEM) - RET Only - Elect	0.1
4	Ind - Air Compressors Controls - RET Only - Electric	0.0
5	Ind - Lighting - ROB and NEW - Electric	0.0
6	Ind - Injection Molding Machines - ROB and NEW - Electric	0.0
7	Ind - Pump VFDs - RET Only - Electric	0.0
8	Ind - Fan VFDs - RET Only - Electric	0.0
9	Ind - Air Compressors - RET Only - Electric	0.0
10	Ind - Refrigeration Optimization - RET Only - Electric	0.0
11	Ind - Process Motors - RET Only - Electric	0.0
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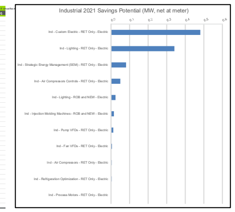
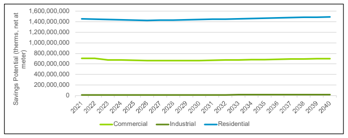


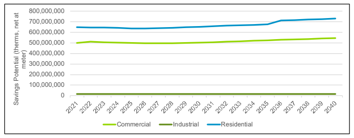
Lower Peninsula Natural Gas Technical Potential by Sector (therms, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	707,602,443	16,147,592	1,454,194,527
Lower Peninsula | Total	2022	704,709,296	16,078,157	1,448,481,133
Lower Peninsula | Total	2023	676,863,841	15,919,536	1,442,245,657
Lower Peninsula | Total	2024	673,393,299	15,815,904	1,436,326,420
Lower Peninsula | Total	2025	667,471,235	15,691,186	1,426,083,410
Lower Peninsula | Total	2026	663,019,410	15,703,208	1,423,703,492
Lower Peninsula | Total	2027	661,772,039	15,856,857	1,426,754,505
Lower Peninsula | Total	2028	661,374,766	16,009,724	1,430,979,017
Lower Peninsula | Total	2029	663,071,113	16,161,899	1,435,437,846
Lower Peninsula | Total	2030	665,249,490	16,313,471	1,440,356,743
Lower Peninsula | Total	2031	669,468,753	16,464,528	1,445,480,746
Lower Peninsula | Total	2032	674,096,460	16,615,156	1,450,521,195
Lower Peninsula | Total	2033	677,284,754	16,765,443	1,454,968,545
Lower Peninsula | Total	2034	680,193,846	16,915,474	1,459,630,479
Lower Peninsula | Total	2035	685,224,788	17,065,335	1,464,974,810
Lower Peninsula | Total	2036	688,505,784	17,215,112	1,470,776,942
Lower Peninsula | Total	2037	691,887,353	17,364,889	1,475,364,534
Lower Peninsula | Total	2038	694,882,701	17,514,751	1,480,428,163
Lower Peninsula | Total	2039	697,796,044	17,664,782	1,485,518,376
Lower Peninsula | Total	2040	701,388,535	17,815,066	1,490,927,780



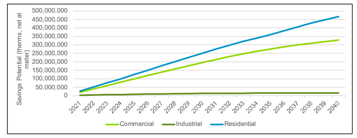
Lower Peninsula Natural Gas Economic Potential by Sector (therms, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	498,764,493	15,761,701	648,124,150
Lower Peninsula | Total	2022	510,079,046	15,693,926	645,597,741
Lower Peninsula | Total	2023	503,403,406	15,539,095	643,324,890
Lower Peninsula | Total	2024	501,358,576	15,437,940	640,646,032
Lower Peninsula | Total	2025	497,478,782	15,316,202	636,182,328
Lower Peninsula | Total	2026	494,866,754	15,331,003	635,970,011
Lower Peninsula | Total	2027	494,615,811	15,487,053	638,543,858
Lower Peninsula | Total	2028	495,310,022	15,642,264	643,021,061
Lower Peninsula | Total	2029	497,809,036	15,796,725	647,543,943
Lower Peninsula | Total	2030	500,911,317	15,950,527	652,157,789
Lower Peninsula | Total	2031	505,815,832	16,103,756	656,812,301
Lower Peninsula | Total	2032	511,095,329	16,256,503	661,450,488
Lower Peninsula | Total	2033	515,043,697	16,408,852	665,971,445
Lower Peninsula | Total	2034	518,732,329	16,560,892	670,536,178
Lower Peninsula | Total	2035	524,378,364	16,712,708	675,238,120
Lower Peninsula | Total	2036	528,407,011	16,864,387	710,267,772
Lower Peninsula | Total	2037	532,526,994	17,016,013	715,055,225
Lower Peninsula | Total	2038	536,289,083	17,167,671	720,046,908
Lower Peninsula | Total	2039	539,974,241	17,319,447	725,048,505
Lower Peninsula | Total	2040	544,285,404	17,471,425	730,186,982



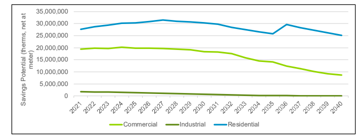
Lower Peninsula Natural Gas Cumulative Annual Achievable Potential by Sector (therms, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	19,425,313	1,716,951	27,651,349
Lower Peninsula | Total	2022	39,202,831	3,422,289	51,111,749
Lower Peninsula | Total	2023	58,898,249	5,078,760	75,235,460
Lower Peninsula | Total	2024	79,146,616	6,647,325	100,013,415
Lower Peninsula | Total	2025	99,004,958	8,098,993	124,844,742
Lower Peninsula | Total	2026	118,809,930	9,413,835	150,209,709
Lower Peninsula | Total	2027	138,509,324	10,576,538	176,251,570
Lower Peninsula | Total	2028	157,978,525	11,577,124	201,708,630
Lower Peninsula | Total	2029	177,133,941	12,414,503	226,884,581
Lower Peninsula | Total	2030	195,528,401	13,096,700	251,618,035
Lower Peninsula | Total	2031	213,712,866	13,639,256	275,659,258
Lower Peninsula | Total	2032	231,310,596	14,062,312	298,466,123
Lower Peninsula | Total	2033	247,209,771	14,387,452	320,162,127
Lower Peninsula | Total	2034	261,781,032	14,635,170	340,911,996
Lower Peninsula | Total	2035	275,974,667	14,823,363	360,812,739
Lower Peninsula | Total	2036	288,320,844	14,966,746	384,588,832
Lower Peninsula | Total	2037	299,615,029	15,076,899	406,910,469
Lower Peninsula | Total	2038	309,759,413	15,162,656	428,221,834
Lower Peninsula | Total	2039	318,972,244	15,230,604	448,354,413
Lower Peninsula | Total	2040	327,665,596	15,285,843	467,376,950



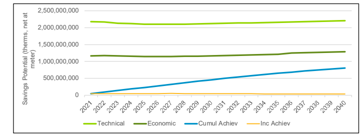
Lower Peninsula Natural Gas Incremental Annual Achievable Potential by Sector (therms, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	19,425,313	1,716,951	27,651,349
Lower Peninsula | Total	2022	19,777,518	1,705,338	28,727,977
Lower Peninsula | Total	2023	19,695,418	1,656,472	29,441,528
Lower Peninsula | Total	2024	20,248,366	1,568,564	30,189,498
Lower Peninsula | Total	2025	19,858,342	1,451,669	30,276,956
Lower Peninsula | Total	2026	19,804,972	1,314,842	30,815,979
Lower Peninsula | Total	2027	19,699,394	1,162,703	31,534,190
Lower Peninsula | Total	2028	19,469,201	1,000,586	30,993,696
Lower Peninsula | Total	2029	19,155,417	837,379	30,756,913
Lower Peninsula | Total	2030	18,394,460	682,198	30,358,760
Lower Peninsula | Total	2031	18,184,464	542,555	29,710,898
Lower Peninsula | Total	2032	17,597,730	423,057	28,520,934
Lower Peninsula | Total	2033	15,899,176	325,140	27,454,493
Lower Peninsula | Total	2034	14,571,260	247,718	26,552,808
Lower Peninsula | Total	2035	14,193,635	188,193	25,748,167
Lower Peninsula | Total	2036	12,346,177	143,383	29,668,036
Lower Peninsula | Total	2037	11,294,185	110,153	28,258,139
Lower Peninsula | Total	2038	10,144,384	85,757	27,292,465
Lower Peninsula | Total	2039	9,212,831	67,948	26,158,322
Lower Peninsula | Total	2040	8,693,352	55,239	25,092,969



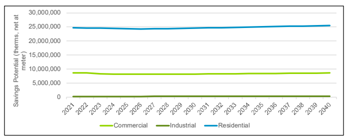
Lower Peninsula Natural Gas Potential (therms, net at meter)

Service Territory	Year	Technical	Economic	Cumul Achiev	Inc Achiev
Lower Peninsula | Total	2021	2,177,944,562	1,162,650,345	48,793,613	48,793,613
Lower Peninsula | Total	2022	2,169,268,586	1,171,370,713	93,736,869	50,210,833
Lower Peninsula | Total	2023	2,135,029,034	1,162,267,391	139,212,470	50,793,418
Lower Peninsula | Total	2024	2,125,535,623	1,157,442,548	185,807,356	52,006,428
Lower Peninsula | Total	2025	2,109,245,831	1,148,977,312	231,948,693	51,586,967
Lower Peninsula | Total	2026	2,102,426,111	1,146,167,768	278,433,475	51,935,792
Lower Peninsula | Total	2027	2,104,383,400	1,148,646,722	325,337,432	52,396,286
Lower Peninsula | Total	2028	2,108,363,507	1,153,973,346	371,264,279	51,463,483
Lower Peninsula | Total	2029	2,114,670,858	1,161,149,705	416,433,025	50,749,708
Lower Peninsula | Total	2030	2,121,919,704	1,169,019,632	460,243,136	49,435,418
Lower Peninsula | Total	2031	2,131,414,026	1,178,731,889	503,011,379	48,437,917
Lower Peninsula | Total	2032	2,141,232,812	1,188,802,319	543,839,031	46,541,720
Lower Peninsula | Total	2033	2,149,018,742	1,197,423,994	581,759,351	43,678,808
Lower Peninsula | Total	2034	2,156,739,799	1,205,829,399	617,328,198	41,371,787
Lower Peninsula | Total	2035	2,167,264,934	1,216,329,193	651,610,769	40,129,995
Lower Peninsula | Total	2036	2,176,497,838	1,255,539,170	687,876,422	42,157,596
Lower Peninsula | Total	2037	2,184,616,776	1,264,598,231	721,602,397	39,662,477
Lower Peninsula | Total	2038	2,192,825,614	1,273,503,661	753,143,903	37,522,606
Lower Peninsula | Total	2039	2,200,979,201	1,282,342,194	782,557,261	35,439,101
Lower Peninsula | Total	2040	2,210,131,382	1,291,943,812	810,328,389	33,841,560



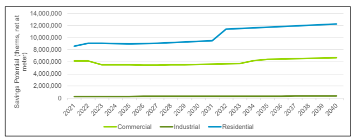
Upper Peninsula Natural Gas Technical Potential by Sector (therms, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	8,683,933	289,381	24,716,959
Upper Peninsula | Total	2022	8,645,733	289,381	24,624,973
Upper Peninsula | Total	2023	8,277,701	289,381	24,544,049
Upper Peninsula | Total	2024	8,258,304	289,381	24,437,952
Upper Peninsula | Total	2025	8,217,275	289,381	24,322,665
Upper Peninsula | Total	2026	8,188,589	291,773	24,284,854
Upper Peninsula | Total	2027	8,181,634	296,570	24,316,749
Upper Peninsula | Total	2028	8,186,791	301,389	24,405,176
Upper Peninsula | Total	2029	8,206,627	306,230	24,494,880
Upper Peninsula | Total	2030	8,240,902	311,096	24,585,707
Upper Peninsula | Total	2031	8,275,864	315,987	24,677,743
Upper Peninsula | Total	2032	8,311,545	320,905	24,770,539
Upper Peninsula | Total	2033	8,347,950	325,851	24,864,167
Upper Peninsula | Total	2034	8,385,022	330,827	24,958,454
Upper Peninsula | Total	2035	8,422,703	335,834	25,053,468
Upper Peninsula | Total	2036	8,461,009	340,873	25,149,118
Upper Peninsula | Total	2037	8,499,968	345,946	25,245,615
Upper Peninsula | Total	2038	8,539,678	351,054	25,342,705
Upper Peninsula | Total	2039	8,580,211	356,199	25,440,581
Upper Peninsula | Total	2040	8,621,622	361,381	25,539,823



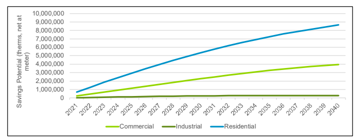
Upper Peninsula Natural Gas Economic Potential by Sector (therms, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	6,170,080	282,465	8,604,077
Upper Peninsula | Total	2022	6,143,569	282,465	9,083,449
Upper Peninsula | Total	2023	5,538,054	282,465	9,072,652
Upper Peninsula | Total	2024	5,528,738	282,465	9,036,580
Upper Peninsula | Total	2025	5,499,404	282,465	8,990,990
Upper Peninsula | Total	2026	5,482,277	284,857	9,006,255
Upper Peninsula | Total	2027	5,485,073	289,655	9,069,427
Upper Peninsula | Total	2028	5,501,094	294,473	9,177,050
Upper Peninsula | Total	2029	5,531,712	299,315	9,285,200
Upper Peninsula | Total	2030	5,576,613	304,180	9,393,854
Upper Peninsula | Total	2031	5,621,992	309,071	9,503,043
Upper Peninsula | Total	2032	5,667,885	313,989	11,451,036
Upper Peninsula | Total	2033	5,714,315	318,935	11,551,952
Upper Peninsula | Total	2034	6,230,291	323,911	11,653,361
Upper Peninsula | Total	2035	6,437,425	328,918	11,755,291
Upper Peninsula | Total	2036	6,484,981	333,958	11,857,733
Upper Peninsula | Total	2037	6,533,147	339,031	11,960,749
Upper Peninsula | Total	2038	6,582,018	344,139	12,064,292
Upper Peninsula | Total	2039	6,631,662	349,283	12,168,421
Upper Peninsula | Total	2040	6,682,133	354,466	12,273,279



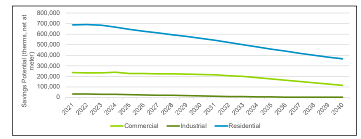
Upper Peninsula Natural Gas Cumulative Annual Achievable Potential by Sector (therms, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	234,324	30,652	687,885
Upper Peninsula | Total	2022	467,415	61,337	1,274,436
Upper Peninsula | Total	2023	698,430	91,275	1,852,326
Upper Peninsula | Total	2024	935,770	119,796	2,410,619
Upper Peninsula | Total	2025	1,163,042	146,353	2,946,316
Upper Peninsula | Total	2026	1,388,566	170,559	3,462,675
Upper Peninsula | Total	2027	1,613,605	192,133	3,962,543
Upper Peninsula | Total	2028	1,836,002	210,878	4,444,491
Upper Peninsula | Total	2029	2,056,172	226,746	4,908,849
Upper Peninsula | Total	2030	2,273,561	239,850	5,354,224
Upper Peninsula | Total	2031	2,486,678	250,435	5,779,406
Upper Peninsula | Total	2032	2,693,487	258,835	6,183,264
Upper Peninsula | Total	2033	2,891,862	265,420	6,565,127
Upper Peninsula | Total	2034	3,079,844	270,550	6,924,641
Upper Peninsula | Total	2035	3,255,899	274,548	7,261,895
Upper Peninsula | Total	2036	3,419,104	277,684	7,577,299
Upper Peninsula | Total	2037	3,569,161	280,176	7,871,647
Upper Peninsula | Total	2038	3,706,369	282,193	8,145,851
Upper Peninsula | Total	2039	3,831,461	283,866	8,401,144
Upper Peninsula | Total	2040	3,945,463	285,289	8,639,000



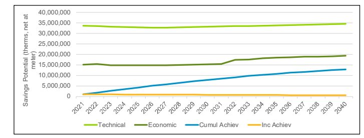
Upper Peninsula Natural Gas Incremental Annual Achievable Potential by Sector (therms, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	234,324	30,652	687,885
Upper Peninsula | Total	2022	233,091	30,685	691,244
Upper Peninsula | Total	2023	231,015	29,938	683,842
Upper Peninsula | Total	2024	237,340	28,521	667,473
Upper Peninsula | Total	2025	227,272	26,557	645,562
Upper Peninsula | Total	2026	225,524	24,206	626,224
Upper Peninsula | Total	2027	225,038	21,574	610,927
Upper Peninsula | Total	2028	222,397	18,745	594,246
Upper Peninsula | Total	2029	220,170	15,869	577,900
Upper Peninsula | Total	2030	217,389	13,104	560,163
Upper Peninsula | Total	2031	213,118	10,585	541,218
Upper Peninsula | Total	2032	206,808	8,400	521,145
Upper Peninsula | Total	2033	198,375	6,585	500,404
Upper Peninsula | Total	2034	187,982	5,130	479,313
Upper Peninsula | Total	2035	176,055	3,998	458,312
Upper Peninsula | Total	2036	163,205	3,136	437,726
Upper Peninsula | Total	2037	150,057	2,492	417,935
Upper Peninsula | Total	2038	137,208	2,018	399,061
Upper Peninsula | Total	2039	125,092	1,672	381,423
Upper Peninsula | Total	2040	114,002	1,423	365,262

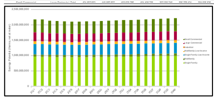


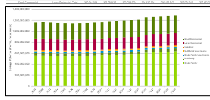
Upper Peninsula Natural Gas Potential (therms, net at meter)

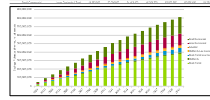
Service Territory	Year	Technical	Economic	Cumul Achiev	Inc Achiev
Upper Peninsula | Total	2021	33,690,274	15,056,622	952,861	952,861
Upper Peninsula | Total	2022	33,560,087	15,509,483	1,803,188	955,021
Upper Peninsula | Total	2023	33,111,132	14,893,172	2,642,031	944,795
Upper Peninsula | Total	2024	32,985,637	14,847,784	3,466,185	933,334
Upper Peninsula | Total	2025	32,829,321	14,772,859	4,255,711	899,391
Upper Peninsula | Total	2026	32,765,216	14,773,389	5,021,800	875,954
Upper Peninsula | Total	2027	32,794,953	14,844,154	5,768,281	857,539
Upper Peninsula | Total	2028	32,893,356	14,972,618	6,491,371	835,388
Upper Peninsula | Total	2029	33,007,737	15,116,227	7,191,767	813,939
Upper Peninsula | Total	2030	33,137,705	15,274,647	7,867,635	790,655
Upper Peninsula | Total	2031	33,269,594	15,434,106	8,516,519	764,921
Upper Peninsula | Total	2032	33,402,989	17,432,910	9,135,586	736,354
Upper Peninsula | Total	2033	33,537,968	17,585,202	9,722,408	705,364
Upper Peninsula | Total	2034	33,674,303	18,207,563	10,275,035	672,425
Upper Peninsula | Total	2035	33,812,004	18,521,634	10,792,342	638,365
Upper Peninsula | Total	2036	33,951,000	18,676,672	11,274,087	604,067
Upper Peninsula | Total	2037	34,091,529	18,832,927	11,720,984	570,484
Upper Peninsula | Total	2038	34,233,436	18,990,449	12,134,413	538,287
Upper Peninsula | Total	2039	34,376,991	19,149,366	12,516,471	508,187
Upper Peninsula | Total	2040	34,522,827	19,309,877	12,869,751	480,687

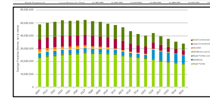


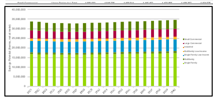
Customer Segment	Service Territory	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Single Family	Lower Peninsula | Total	963,258,756	959,541,491	955,505,570	951,834,004	944,887,666	943,415,056	945,682,350	948,717,996	951,931,964	955,457,525	959,121,658
Multifamily	Lower Peninsula | Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Single Family Low Income	Lower Peninsula | Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Multifamily Low Income	Lower Peninsula | Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Industrial	Lower Peninsula | Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Large Commercial	Lower Peninsula | Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Small Commercial	Lower Peninsula | Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

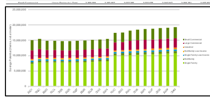


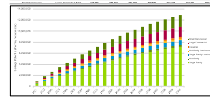


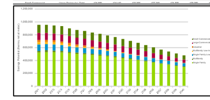




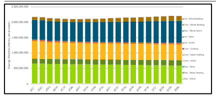


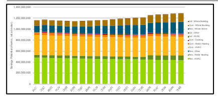


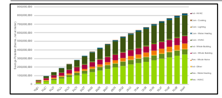


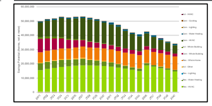


End Use	Service Territory	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Res - HVAC	Lower Peninsula | Total	658,945,142	655,650,417	652,372,165	649,110,304	644,380,852	641,158,948	637,953,153	634,763,387	631,589,570	628,431,622	625,289,464	622,163,017	619,052,202	615,956,941	612,877,156	609,812,770	606,763,706	603,739,888	600,711,238	597,707,682

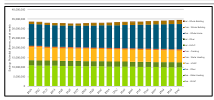


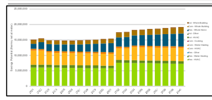


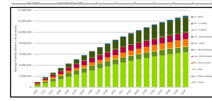


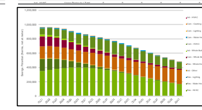


End Use	Service Territory	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Res - HVAC	Upper Peninsula | Total	10,915,825	10,861,246	10,806,940	10,752,905	10,699,141	10,645,645	10,592,417	10,539,455	10,486,758	10,434,324	10,382,152	10,330,241	10,278,590	10,227,197	10,176,061	10,125,181	10,074,555	10,024,182	9,974,061	9,924,191



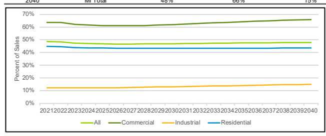






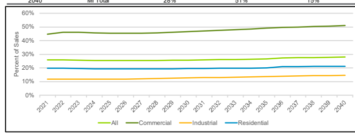
Michigan Total Natural Gas Technical Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	49%	64%	12%	45%
2022	MI Total	48%	64%	12%	45%
2023	MI Total	47%	62%	12%	44%
2024	MI Total	47%	62%	12%	44%
2025	MI Total	47%	61%	12%	43%
2026	MI Total	47%	61%	12%	43%
2027	MI Total	47%	61%	12%	43%
2028	MI Total	47%	61%	13%	43%
2029	MI Total	47%	62%	13%	43%
2030	MI Total	47%	62%	13%	43%
2031	MI Total	47%	62%	13%	43%
2032	MI Total	47%	63%	13%	43%
2033	MI Total	47%	63%	14%	43%
2034	MI Total	47%	64%	14%	43%
2035	MI Total	47%	64%	14%	43%
2036	MI Total	48%	65%	14%	43%
2037	MI Total	48%	65%	14%	43%
2038	MI Total	48%	65%	15%	43%
2039	MI Total	48%	66%	15%	43%
2040	MI Total	48%	66%	15%	44%



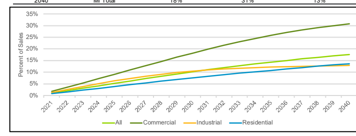
Michigan Total Natural Gas Economic Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	26%	45%	12%	20%
2022	MI Total	26%	46%	12%	20%
2023	MI Total	26%	46%	12%	20%
2024	MI Total	26%	46%	12%	19%
2025	MI Total	25%	46%	12%	19%
2026	MI Total	25%	46%	12%	19%
2027	MI Total	25%	46%	12%	19%
2028	MI Total	26%	46%	12%	19%
2029	MI Total	26%	46%	13%	19%
2030	MI Total	26%	47%	13%	20%
2031	MI Total	26%	47%	13%	20%
2032	MI Total	26%	48%	13%	20%
2033	MI Total	26%	48%	13%	20%
2034	MI Total	26%	49%	14%	20%
2035	MI Total	27%	49%	14%	20%
2036	MI Total	27%	50%	14%	21%
2037	MI Total	28%	50%	14%	21%
2038	MI Total	28%	50%	14%	21%
2039	MI Total	28%	51%	15%	21%
2040	MI Total	28%	51%	15%	21%



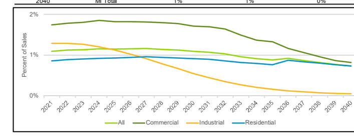
Michigan Total Natural Gas Cumulative Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	1%	2%	1%	1%
2022	MI Total	2%	4%	3%	2%
2023	MI Total	3%	5%	4%	2%
2024	MI Total	4%	7%	5%	3%
2025	MI Total	5%	9%	6%	4%
2026	MI Total	6%	11%	7%	5%
2027	MI Total	7%	13%	8%	5%
2028	MI Total	8%	15%	9%	6%
2029	MI Total	9%	16%	10%	7%
2030	MI Total	10%	18%	10%	8%
2031	MI Total	11%	20%	11%	8%
2032	MI Total	12%	22%	11%	9%
2033	MI Total	13%	23%	12%	10%
2034	MI Total	14%	25%	12%	10%
2035	MI Total	14%	26%	12%	11%
2036	MI Total	15%	27%	12%	11%
2037	MI Total	16%	28%	13%	12%
2038	MI Total	16%	29%	13%	13%
2039	MI Total	17%	30%	13%	13%
2040	MI Total	18%	31%	13%	14%



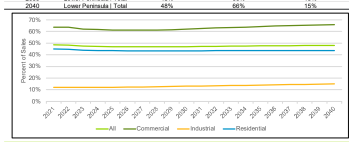
Michigan Total Natural Gas Incremental Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	1%	2%	1%	1%
2022	MI Total	1%	2%	1%	1%
2023	MI Total	1%	2%	1%	1%
2024	MI Total	1%	2%	1%	1%
2025	MI Total	1%	2%	1%	1%
2026	MI Total	1%	2%	1%	1%
2027	MI Total	1%	2%	1%	1%
2028	MI Total	1%	2%	1%	1%
2029	MI Total	1%	2%	1%	1%
2030	MI Total	1%	2%	1%	1%
2031	MI Total	1%	2%	0%	1%
2032	MI Total	1%	2%	0%	1%
2033	MI Total	1%	1%	0%	1%
2034	MI Total	1%	1%	0%	1%
2035	MI Total	1%	1%	0%	1%
2036	MI Total	1%	1%	0%	1%
2037	MI Total	1%	1%	0%	1%
2038	MI Total	1%	1%	0%	1%
2039	MI Total	1%	1%	0%	1%
2040	MI Total	1%	1%	0%	1%



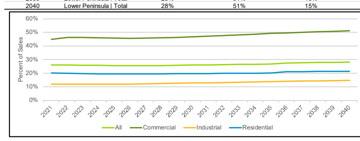
Lower Peninsula Natural Gas Technical Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula | Total	49%	64%	12%	45%
2022	Lower Peninsula | Total	48%	64%	12%	45%
2023	Lower Peninsula | Total	47%	62%	12%	44%
2024	Lower Peninsula | Total	47%	62%	12%	44%
2025	Lower Peninsula | Total	47%	61%	12%	44%
2026	Lower Peninsula | Total	47%	61%	12%	43%
2027	Lower Peninsula | Total	47%	61%	12%	43%
2028	Lower Peninsula | Total	47%	61%	13%	43%
2029	Lower Peninsula | Total	47%	62%	13%	43%
2030	Lower Peninsula | Total	47%	62%	13%	43%
2031	Lower Peninsula | Total	47%	62%	13%	43%
2032	Lower Peninsula | Total	47%	63%	13%	44%
2033	Lower Peninsula | Total	47%	63%	14%	44%
2034	Lower Peninsula | Total	47%	64%	14%	44%
2035	Lower Peninsula | Total	48%	64%	14%	44%
2036	Lower Peninsula | Total	48%	65%	14%	44%
2037	Lower Peninsula | Total	48%	65%	14%	44%
2038	Lower Peninsula | Total	48%	65%	15%	44%
2039	Lower Peninsula | Total	48%	66%	15%	44%
2040	Lower Peninsula | Total	48%	66%	15%	44%



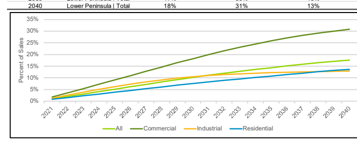
Lower Peninsula Natural Gas Economic Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula | Total	26%	45%	12%	20%
2022	Lower Peninsula | Total	26%	46%	12%	20%
2023	Lower Peninsula | Total	26%	46%	12%	20%
2024	Lower Peninsula | Total	26%	46%	12%	20%
2025	Lower Peninsula | Total	26%	46%	12%	19%
2026	Lower Peninsula | Total	26%	46%	12%	19%
2027	Lower Peninsula | Total	26%	46%	12%	19%
2028	Lower Peninsula | Total	26%	46%	12%	20%
2029	Lower Peninsula | Total	26%	46%	13%	20%
2030	Lower Peninsula | Total	26%	47%	13%	20%
2031	Lower Peninsula | Total	26%	47%	13%	20%
2032	Lower Peninsula | Total	26%	48%	13%	20%
2033	Lower Peninsula | Total	26%	48%	13%	20%
2034	Lower Peninsula | Total	27%	49%	14%	20%
2035	Lower Peninsula | Total	27%	49%	14%	20%
2036	Lower Peninsula | Total	28%	50%	14%	21%
2037	Lower Peninsula | Total	28%	50%	14%	21%
2038	Lower Peninsula | Total	28%	50%	14%	21%
2039	Lower Peninsula | Total	28%	51%	15%	21%
2040	Lower Peninsula | Total	28%	51%	15%	21%



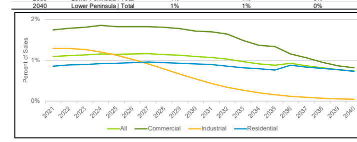
Lower Peninsula Natural Gas Cumulative Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula | Total	1%	2%	1%	1%
2022	Lower Peninsula | Total	2%	4%	3%	2%
2023	Lower Peninsula | Total	3%	5%	4%	2%
2024	Lower Peninsula | Total	4%	7%	5%	3%
2025	Lower Peninsula | Total	5%	9%	6%	4%
2026	Lower Peninsula | Total	6%	11%	7%	5%
2027	Lower Peninsula | Total	7%	13%	8%	5%
2028	Lower Peninsula | Total	8%	15%	9%	6%
2029	Lower Peninsula | Total	9%	16%	10%	7%
2030	Lower Peninsula | Total	10%	18%	10%	8%
2031	Lower Peninsula | Total	11%	20%	11%	8%
2032	Lower Peninsula | Total	12%	22%	11%	9%
2033	Lower Peninsula | Total	13%	23%	12%	10%
2034	Lower Peninsula | Total	14%	25%	12%	10%
2035	Lower Peninsula | Total	14%	26%	12%	11%
2036	Lower Peninsula | Total	15%	27%	12%	11%
2037	Lower Peninsula | Total	16%	28%	13%	12%
2038	Lower Peninsula | Total	16%	29%	13%	13%
2039	Lower Peninsula | Total	17%	30%	13%	13%
2040	Lower Peninsula | Total	18%	31%	13%	14%



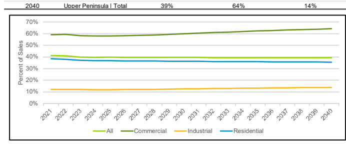
Lower Peninsula Natural Gas Incremental Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula | Total	1%	2%	1%	1%
2022	Lower Peninsula | Total	1%	2%	1%	1%
2023	Lower Peninsula | Total	1%	2%	1%	1%
2024	Lower Peninsula | Total	1%	2%	1%	1%
2025	Lower Peninsula | Total	1%	2%	1%	1%
2026	Lower Peninsula | Total	1%	2%	1%	1%
2027	Lower Peninsula | Total	1%	2%	1%	1%
2028	Lower Peninsula | Total	1%	2%	1%	1%
2029	Lower Peninsula | Total	1%	2%	1%	1%
2030	Lower Peninsula | Total	1%	2%	1%	1%
2031	Lower Peninsula | Total	1%	2%	0%	1%
2032	Lower Peninsula | Total	1%	2%	0%	1%
2033	Lower Peninsula | Total	1%	1%	0%	1%
2034	Lower Peninsula | Total	1%	1%	0%	1%
2035	Lower Peninsula | Total	1%	1%	0%	1%
2036	Lower Peninsula | Total	1%	1%	0%	1%
2037	Lower Peninsula | Total	1%	1%	0%	1%
2038	Lower Peninsula | Total	1%	1%	0%	1%
2039	Lower Peninsula | Total	1%	1%	0%	1%
2040	Lower Peninsula | Total	1%	1%	0%	1%



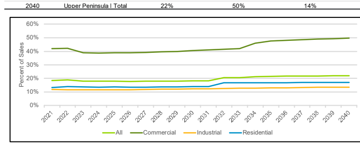
Upper Peninsula Natural Gas Technical Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula | Total	41%	59%	12%	38%
2022	Upper Peninsula | Total	41%	59%	12%	38%
2023	Upper Peninsula | Total	40%	58%	12%	37%
2024	Upper Peninsula | Total	40%	58%	12%	37%
2025	Upper Peninsula | Total	40%	58%	12%	37%
2026	Upper Peninsula | Total	40%	58%	12%	37%
2027	Upper Peninsula | Total	40%	59%	12%	37%
2028	Upper Peninsula | Total	39%	59%	12%	36%
2029	Upper Peninsula | Total	39%	59%	12%	36%
2030	Upper Peninsula | Total	39%	60%	13%	36%
2031	Upper Peninsula | Total	39%	60%	13%	36%
2032	Upper Peninsula | Total	39%	61%	13%	36%
2033	Upper Peninsula | Total	39%	61%	13%	36%
2034	Upper Peninsula | Total	39%	62%	13%	36%
2035	Upper Peninsula | Total	39%	62%	13%	36%
2036	Upper Peninsula | Total	39%	63%	13%	36%
2037	Upper Peninsula | Total	39%	63%	14%	36%
2038	Upper Peninsula | Total	39%	63%	14%	36%
2039	Upper Peninsula | Total	39%	64%	14%	36%
2040	Upper Peninsula | Total	39%	64%	14%	36%



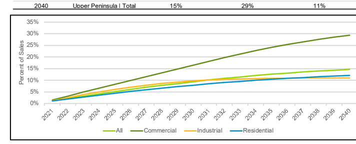
Upper Peninsula Natural Gas Economic Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula | Total	18%	42%	12%	13%
2022	Upper Peninsula | Total	19%	42%	12%	14%
2023	Upper Peninsula | Total	18%	39%	12%	14%
2024	Upper Peninsula | Total	18%	39%	12%	14%
2025	Upper Peninsula | Total	18%	39%	12%	14%
2026	Upper Peninsula | Total	18%	39%	12%	14%
2027	Upper Peninsula | Total	18%	39%	12%	14%
2028	Upper Peninsula | Total	18%	40%	12%	14%
2029	Upper Peninsula | Total	18%	40%	12%	14%
2030	Upper Peninsula | Total	18%	41%	12%	14%
2031	Upper Peninsula | Total	18%	41%	12%	14%
2032	Upper Peninsula | Total	21%	42%	13%	17%
2033	Upper Peninsula | Total	21%	42%	13%	17%
2034	Upper Peninsula | Total	21%	46%	13%	17%
2035	Upper Peninsula | Total	22%	48%	13%	17%
2036	Upper Peninsula | Total	22%	48%	13%	17%
2037	Upper Peninsula | Total	22%	48%	13%	17%
2038	Upper Peninsula | Total	22%	49%	13%	17%
2039	Upper Peninsula | Total	22%	49%	14%	17%
2040	Upper Peninsula | Total	22%	50%	14%	17%



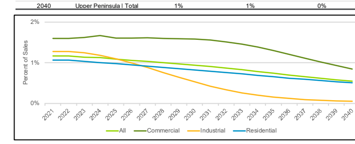
Upper Peninsula Natural Gas Cumulative Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula | Total	1%	2%	1%	1%
2022	Upper Peninsula | Total	2%	3%	3%	2%
2023	Upper Peninsula | Total	3%	5%	4%	3%
2024	Upper Peninsula | Total	4%	7%	5%	4%
2025	Upper Peninsula | Total	5%	8%	6%	4%
2026	Upper Peninsula | Total	6%	10%	7%	5%
2027	Upper Peninsula | Total	7%	12%	8%	6%
2028	Upper Peninsula | Total	8%	13%	9%	7%
2029	Upper Peninsula | Total	9%	15%	9%	7%
2030	Upper Peninsula | Total	9%	17%	10%	8%
2031	Upper Peninsula | Total	10%	18%	10%	8%
2032	Upper Peninsula | Total	11%	20%	10%	9%
2033	Upper Peninsula | Total	11%	21%	11%	10%
2034	Upper Peninsula | Total	12%	23%	11%	10%
2035	Upper Peninsula | Total	13%	24%	11%	10%
2036	Upper Peninsula | Total	13%	25%	11%	11%
2037	Upper Peninsula | Total	14%	26%	11%	11%
2038	Upper Peninsula | Total	14%	28%	11%	11%
2039	Upper Peninsula | Total	14%	29%	11%	12%
2040	Upper Peninsula | Total	15%	29%	11%	12%



Upper Peninsula Natural Gas Incremental Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula | Total	1%	2%	1%	1%
2022	Upper Peninsula | Total	1%	2%	1%	1%
2023	Upper Peninsula | Total	1%	2%	1%	1%
2024	Upper Peninsula | Total	1%	2%	1%	1%
2025	Upper Peninsula | Total	1%	2%	1%	1%
2026	Upper Peninsula | Total	1%	2%	1%	1%
2027	Upper Peninsula | Total	1%	2%	1%	1%
2028	Upper Peninsula | Total	1%	2%	1%	1%
2029	Upper Peninsula | Total	1%	2%	1%	1%
2030	Upper Peninsula | Total	1%	2%	1%	1%
2031	Upper Peninsula | Total	1%	2%	0%	1%
2032	Upper Peninsula | Total	1%	2%	0%	1%
2033	Upper Peninsula | Total	1%	1%	0%	1%
2034	Upper Peninsula | Total	1%	1%	0%	1%
2035	Upper Peninsula | Total	1%	1%	0%	1%
2036	Upper Peninsula | Total	1%	1%	0%	1%
2037	Upper Peninsula | Total	1%	1%	0%	1%
2038	Upper Peninsula | Total	1%	1%	0%	1%
2039	Upper Peninsula | Total	1%	1%	0%	1%
2040	Upper Peninsula | Total	1%	1%	0%	1%



Residential 2021 Natural Gas Technical Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Furnaces - RET Only - Gas	391,118,621
2	Res - Insulation, Ceiling/Attic - RET Only - Gas	195,824,114
3	Res - Insulation, Wall - RET Only - Gas	188,888,937
4	Res - Air Sealing - RET Only - Gas	144,562,900
5	Res - Thermostats - RET Only - Gas	118,302,249
6	Res - Water Heaters, Tankless - ROB and NEW - Gas	107,893,868
7	Res - Furnace Tune-up - RET Only - Gas	86,861,361
8	Res - Boiler - RET Only - Gas	62,662,911
9	Res - Home Energy Reports - RET Only - Gas	57,385,886
10	Res - Insulation, Basement - RET Only - Gas	47,641,918
11	Res - Showerheads - RET Only - Gas	27,131,855
12	Res - Low Flow Aerators - RET Only - Gas	15,390,962
13	Res - Pipe Insulation - RET Only - Gas	7,544,385
14	Res - Clothes Dryers - ROB and NEW - Gas	2,272,774
15	Res - Home Energy Reports - NEW Only - Gas	503,036
16	Res - Showerheads - NEW Only - Gas	208,748
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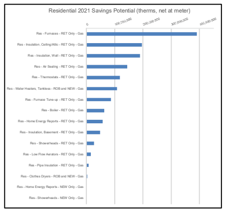
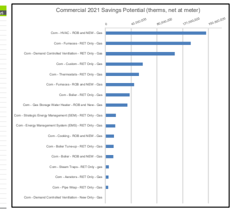


Commercial 2021 Natural Gas Technical Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - HVAC - ROB and NEW - Gas	156,193,927
2	Com - Furnaces - RET Only - Gas	132,626,786
3	Com - Demand Controlled Ventilation - RET Only - Gas	107,606,383
4	Com - Custom - RET Only - Gas	57,885,847
5	Com - Thermostats - RET Only - Gas	52,229,459
6	Com - Furnaces - ROB and NEW - Gas	44,404,199
7	Com - Boiler - RET Only - Gas	37,493,413
8	Com - Gas Storage Water Heater - ROB and New - Gas	34,255,564
9	Com - Strategic Energy Management (SEM) - RET Only - Ga	16,125,309
10	Com - Energy Management System (EMS) - RET Only - Ga	15,225,934
11	Com - Cooking - ROB and NEW - Gas	13,291,827
12	Com - Boiler Tune-up - RET Only - Gas	12,872,662
13	Com - Boiler - ROB and NEW - Gas	12,553,262
14	Com - Steam Traps - RET Only - gas	5,429,913
15	Com - Aerators - RET Only - Gas	4,992,070
16	Com - Pipe Wrap - RET Only - Gas	4,260,650
17	Com - Demand Controlled Ventilation - New Only - Gas	155,239



Rank	Measure Name	Potential (cumul. impact/year)
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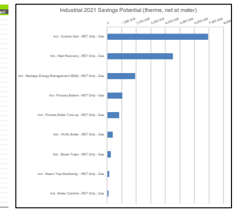
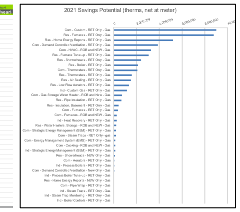


Rank	Measure Name	Potential (cumul. impact/year)
[illegible]	[illegible]	[illegible]



Residential 2021 Natural Gas Economic Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Furnaces - RET Only - Gas	283,220,544
2	Res - Thermostats - RET Only - Gas	88,952,064
3	Res - Furnace Tune-up - RET Only - Gas	62,852,054
4	Res - Home Energy Reports - RET Only - Gas	57,385,886
5	Res - Boiler - RET Only - Gas	45,432,811
6	Res - Insulation, Basement - RET Only - Gas	31,103,580
7	Res - Air Sealing - RET Only - Gas	28,299,217
8	Res - Showerheads - RET Only - Gas	27,131,855
9	Res - Low Flow Aerators - RET Only - Gas	15,390,962
10	Res - Pipe Insulation - RET Only - Gas	7,544,385
11	Res - Home Energy Reports - NEW Only - Gas	503,036
12	Res - Showerheads - NEW Only - Gas	208,748
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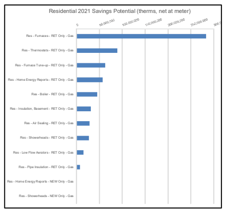

Commercial 2021 Natural Gas Economic Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
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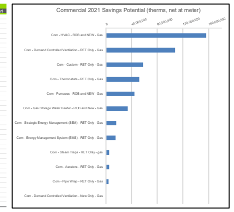
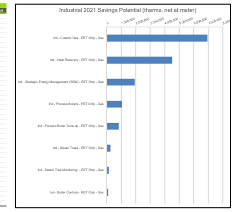


Rank	Measure Name	Potential (cumul. impact/year)
[illegible]	[illegible]	[illegible]



Residential 2021 Natural Gas Cumulative Annual Achievable Potential Top Measures (therms, net at m

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Furnaces - RET Only - Gas	8,795,156
2	Res - Home Energy Reports - RET Only - Gas	5,217,274
3	Res - Furnace Tune-up - RET Only - Gas	3,077,719
4	Res - Showerheads - RET Only - Gas	2,426,795
5	Res - Boiler - RET Only - Gas	2,152,665
6	Res - Thermostats - RET Only - Gas	1,573,131
7	Res - Air Sealing - RET Only - Gas	1,487,233
8	Res - Low Flow Aerators - RET Only - Gas	1,361,510
9	Res - Pipe Insulation - RET Only - Gas	681,270
10	Res - Insulation, Basement - RET Only - Gas	448,058
11	Res - Water Heaters, Storage - ROB and NEW - Gas	244,204
12	Res - Showerheads - NEW Only - Gas	136,030
13	Res - Home Energy Reports - NEW Only - Gas	50,304
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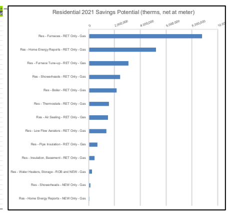
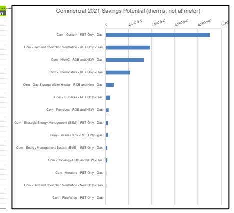
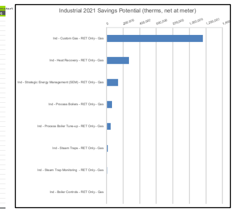


Commercial 2021 Natural Gas Cumulative Annual Achievable Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
[illegible]	[illegible]	[illegible]

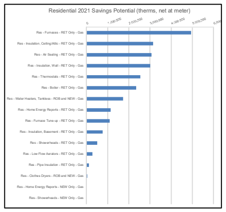


Rank	Measure Name	Potential (cumul. impact/year)
[illegible]	[illegible]	[illegible]



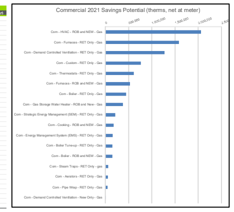
Residential 2021 Natural Gas Technical Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Furnaces - RET Only - Gas	4,930,809
2	Res - Insulation, Ceiling/Attic - RET Only - Gas	3,150,353
3	Res - Air Sealing - RET Only - Gas	3,067,025
4	Res - Insulation, Wall - RET Only - Gas	3,001,513
5	Res - Thermostats - RET Only - Gas	2,546,547
6	Res - Boiler - RET Only - Gas	2,343,893
7	Res - Water Heaters, Tankless - ROB and NEW - Gas	1,726,085
8	Res - Home Energy Reports - RET Only - Gas	1,140,646
9	Res - Furnace Tune-up - RET Only - Gas	1,094,576
10	Res - Insulation, Basement - RET Only - Gas	755,525
11	Res - Showerheads - RET Only - Gas	512,071
12	Res - Low Flow Aerators - RET Only - Gas	274,649
13	Res - Pipe Insulation - RET Only - Gas	120,020
14	Res - Clothes Dryers - ROB and NEW - Gas	36,394
15	Res - Home Energy Reports - NEW Only - Gas	12,573
16	Res - Showerheads - NEW Only - Gas	4,279



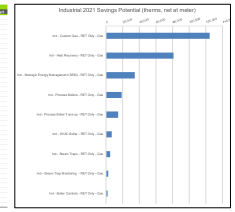
Commercial 2021 Natural Gas Technical Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - HVAC - ROB and NEW - Gas	[illegible]
2	Com - Furnaces - RET Only - Gas	[illegible]
3	Com - Demand Controlled Ventilation - RET Only - Gas	[illegible]
4	Com - Custom - RET Only - Gas	[illegible]
5	Com - Thermostats - RET Only - Gas	[illegible]
6	Com - Furnaces - ROB and NEW - Gas	[illegible]
7	Com - Boiler - RET Only - Gas	[illegible]
8	Com - Gas Storage Water Heater - ROB and New - Gas	[illegible]
9	Com - Strategic Energy Management (SEM) - RET Only - Gas	[illegible]
10	Com - Cooking - ROB and NEW - Gas	[illegible]
11	Com - Energy Management System (EMS) - RET Only - Gas	[illegible]
12	Com - Boiler Tune-up - RET Only - Gas	[illegible]
13	Com - Boiler - ROB and NEW - Gas	[illegible]
14	Com - Steam Traps - RET Only - gas	[illegible]
15	Com - Aerators - RET Only - Gas	[illegible]
16	Com - Pipe Wrap - RET Only - Gas	[illegible]
17	Com - Demand Controlled Ventilation - New Only - Gas	[illegible]



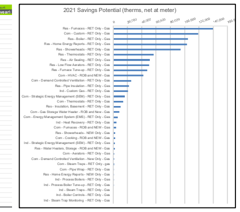
Industrial 2021 Natural Gas Technical Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Custom Gas - RET Only - Gas	[illegible]
2	Ind - Heat Recovery - RET Only - Gas	[illegible]
3	Ind - Strategic Energy Management (SEM) - RET Only - Gas	[illegible]
4	Ind - Process Boilers - RET Only - Gas	[illegible]
5	Ind - Process Boiler Tune-up - RET Only - Gas	[illegible]
6	Ind - HVAC Boiler - RET Only - Gas	[illegible]
7	Ind - Steam Traps - RET Only - Gas	[illegible]
8	Ind - Steam Trap Monitoring - RET Only - Gas	[illegible]
9	Ind - Boiler Controls - RET Only - Gas	[illegible]



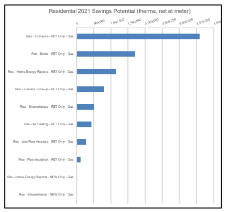
[illegible]

Rank	Measure Name	Potential (cumul. impact/year)
1	[illegible]	[illegible]
2	[illegible]	[illegible]
3	[illegible]	[illegible]
4	[illegible]	[illegible]
5	[illegible]	[illegible]
6	[illegible]	[illegible]
7	[illegible]	[illegible]
8	[illegible]	[illegible]
9	[illegible]	[illegible]
10	[illegible]	[illegible]
11	[illegible]	[illegible]
12	[illegible]	[illegible]
13	[illegible]	[illegible]
14	[illegible]	[illegible]
15	[illegible]	[illegible]
16	[illegible]	[illegible]
17	[illegible]	[illegible]
18	[illegible]	[illegible]
19	[illegible]	[illegible]
20	[illegible]	[illegible]
21	[illegible]	[illegible]
22	[illegible]	[illegible]
23	[illegible]	[illegible]
24	[illegible]	[illegible]
25	[illegible]	[illegible]
26	[illegible]	[illegible]
27	[illegible]	[illegible]
28	[illegible]	[illegible]
29	[illegible]	[illegible]
30	[illegible]	[illegible]
31	[illegible]	[illegible]
32	[illegible]	[illegible]



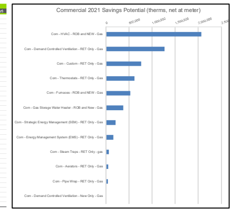
Residential 2021 Natural Gas Economic Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Furnaces - RET Only - Gas	[illegible]
2	Res - Boiler - RET Only - Gas	[illegible]
3	Res - Home Energy Reports - RET Only - Gas	[illegible]
4	Res - Furnace Tune-up - RET Only - Gas	[illegible]
5	Res - Showerheads - RET Only - Gas	[illegible]
6	Res - Air Sealing - RET Only - Gas	[illegible]
7	Res - Low Flow Aerators - RET Only - Gas	[illegible]
8	Res - Pipe Insulation - RET Only - Gas	[illegible]
9	Res - Home Energy Reports - NEW Only - Gas	[illegible]
10	Res - Showerheads - NEW Only - Gas	[illegible]



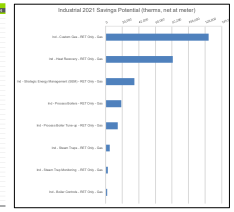
Commercial 2021 Natural Gas Economic Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - HVAC - ROB and NEW - Gas	2,063,181
2	Com - Demand Controlled Ventilation - RET Only - Gas	1,271,823
3	Com - Custom - RET Only - Gas	784,089
4	Com - Thermostats - RET Only - Gas	616,254
5	Com - Furnaces - ROB and NEW - Gas	532,577
6	Com - Gas Storage Water Heater - ROB and New - Gas	370,130
7	Com - Strategic Energy Management (SEM) - RET Only - Gas	213,104
8	Com - Energy Management System (EMS) - RET Only - Gas	161,333
9	Com - Steam Traps - RET Only - gas	64,728
10	Com - Aerators - RET Only - Gas	53,514
11	Com - Pipe Wrap - RET Only - Gas	45,808
12	Com - Demand Controlled Ventilation - New Only - Gas	3,630



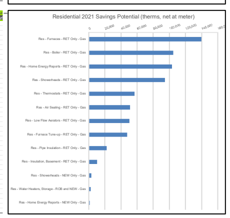
Industrial 2021 Natural Gas Economic Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Custom Gas - RET Only - Gas	124,325
2	Ind - Heat Recovery - RET Only - Gas	80,906
3	Ind - Strategic Energy Management (SEM) - RET Only - Gas	34,633
4	Ind - Process Boilers - RET Only - Gas	18,683
5	Ind - Process Boiler Tune-up - RET Only - Gas	14,682
6	Ind - Steam Traps - RET Only - Gas	4,770
7	Ind - Steam Trap Monitoring - RET Only - Gas	2,592
8	Ind - Boiler Controls - RET Only - Gas	1,865



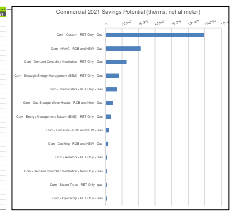
Residential 2021 Natural Gas Cumulative Annual Achievable Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Furnaces - RET Only - Gas	139,729
2	Res - Boiler - RET Only - Gas	104,785
3	Res - Home Energy Reports - RET Only - Gas	103,436
4	Res - Showerheads - RET Only - Gas	94,497
5	Res - Thermostats - RET Only - Gas	56,803
6	Res - Air Sealing - RET Only - Gas	51,214
7	Res - Low Flow Aerators - RET Only - Gas	50,312
8	Res - Furnace Tune-up - RET Only - Gas	47,588
9	Res - Pipe Insulation - RET Only - Gas	22,304
10	Res - Insulation, Basement - RET Only - Gas	10,380
11	Res - Showerheads - NEW Only - Gas	3,115
12	Res - Water Heaters, Storage - ROB and NEW - Gas	2,466
13	Res - Home Energy Reports - NEW Only - Gas	1,257



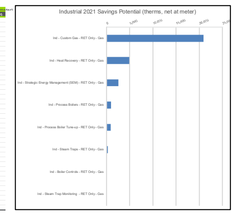
Commercial 2021 Natural Gas Cumulative Annual Achievable Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - Custom - RET Only - Gas	119,153
2	Com - HVAC - ROB and NEW - Gas	42,425
3	Com - Demand Controlled Ventilation - RET Only - Gas	25,413
4	Com - Strategic Energy Management (SEM) - RET Only - Gas	16,362
5	Com - Thermostats - RET Only - Gas	14,170
6	Com - Gas Storage Water Heater - ROB and New - Gas	8,580
7	Com - Energy Management System (EMS) - RET Only - Gas	6,267
8	Com - Furnaces - ROB and NEW - Gas	4,322
9	Com - Cooking - ROB and NEW - Gas	3,099
10	Com - Aerators - RET Only - Gas	1,717
11	Com - Demand Controlled Ventilation - New Only - Gas	1,474
12	Com - Steam Traps - RET Only - gas	1,462
13	Com - Pipe Wrap - RET Only - Gas	1,293



Industrial 2021 Natural Gas Cumulative Annual Achievable Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Custom Gas - RET Only - Gas	20,902
2	Ind - Heat Recovery - RET Only - Gas	4,890
3	Ind - Strategic Energy Management (SEM) - RET Only - Gas	2,532
4	Ind - Process Boilers - RET Only - Gas	990
5	Ind - Process Boiler Tune-up - RET Only - Gas	911
6	Ind - Steam Traps - RET Only - Gas	307
7	Ind - Boiler Controls - RET Only - Gas	71
8	Ind - Steam Trap Monitoring - RET Only - Gas	48



Lower Peninsula	Net UCT Test Ratio = (a) / (b)	Net PV UCT Benefits NPV 2021 $ Million (a)	Net PV UCT Costs NPV 2021 $ Million (b) = (c) + (d)	Program Administrative Costs NPV 2021 $ Million (c)	Program Incentive Costs NPV 2021 $ Million (d)
Residential Electric Program Bundle					
2021	1.5	$228,536,456	$155,585,129	$51,861,710	$103,723,419
2030	1.4	$270,152,824	$191,961,241	$63,987,080	$127,974,161
2040	1.5	$436,364,393	$288,112,977	$96,037,659	$192,075,318
Residential Natural Gas Program Bundle					
2021	1.6	$157,531,147	$100,523,458	$33,507,819	$67,015,639
2030	1.5	$256,460,314	$171,939,371	$57,313,124	$114,626,247
2040	1.3	$239,813,019	$180,306,339	$60,102,113	$120,204,226
Commercial & Industrial Electric Program Bundle					
2021	2.0	$877,781,297	$428,260,444	$142,753,481	$285,506,963
2030	2.5	$535,622,049	$213,761,007	$71,253,669	$142,507,338
2040	2.3	$274,113,263	$117,716,905	$39,238,968	$78,477,936
Commercial & Industrial Natural Gas Program Bundle					
2021	3.7	$151,328,854	$41,238,198	$13,746,066	$27,492,132
2030	7.6	$238,680,007	$31,577,182	$10,525,727	$21,051,455
2040	6.6	$124,087,193	$18,700,977	$6,233,659	$12,467,318
Residential Programs Total					
2021	1.5	$386,067,603	$256,108,587	$85,369,529	$170,739,058
2030	1.4	$526,613,138	$363,900,612	$121,300,204	$242,600,408
2040	1.4	$676,177,412	$468,419,316	$156,139,772	$312,279,544
Commercial & Industrial Programs Total					
2021	2.2	$1,029,110,151	$469,498,642	$156,499,547	$312,999,095
2030	3.2	$774,302,055	$245,338,189	$81,779,396	$163,558,793
2040	2.9	$398,200,456	$136,417,881	$45,472,627	$90,945,254
Lower Peninsula Portfolio Total					
2021	**2.0**	**$1,415,177,754**	**$725,607,228**	**$241,869,076**	**$483,738,152**
2030	**2.1**	**$1,300,915,193**	**$609,238,802**	**$203,079,601**	**$406,159,201**
2040	**1.8**	**$1,074,377,868**	**$604,837,197**	**$201,612,399**	**$403,224,798**

Upper Peninsula	Net UCT Test Ratio = (a) / (b)	Net PV UCT Benefits NPV 2021 $ Million (a)	Net PV UCT Costs NPV 2021 $ Million (b) = (c) + (d)	Program Administrative Costs NPV 2021 $ Million (c)	Program Incentive Costs NPV 2021 $ Million (d)
Residential Electric Program Bundle					
2021	1.6	$5,445,170	$3,360,701	$1,120,234	$2,240,468
2030	1.3	$4,449,992	$3,324,467	$1,108,156	$2,216,311
2040	1.2	$4,966,578	$4,011,426	$1,337,142	$2,674,284
Residential Natural Gas Program Bundle					
2021	1.6	$3,673,236	$2,340,923	$780,308	$1,560,615
2030	1.5	$4,119,525	$2,767,249	$922,416	$1,844,833
2040	1.0	$4,090,563	$3,966,734	$1,322,245	$2,644,489
Commercial & Industrial Electric Program Bundle					
2021	1.9	$10,400,749	$5,567,214	$1,855,738	$3,711,476
2030	2.0	$5,549,248	$2,765,494	$921,831	$1,843,662
2040	1.7	$2,174,954	$1,301,513	$433,838	$867,675
Commercial & Industrial Natural Gas Program Bundle					
2021	2.9	$1,550,452	$533,148	$177,716	$355,432
2030	6.0	$2,430,737	$403,079	$134,360	$268,720
2040	6.8	$1,634,741	$239,077	$79,692	$159,385
Residential Programs Total					
2021	1.6	$9,118,406	$5,701,624	$1,900,541	$3,801,083
2030	1.4	$8,569,517	$6,091,716	$2,030,572	$4,061,144
2040	1.1	$9,057,141	$7,978,160	$2,659,387	$5,318,773
Commercial & Industrial Programs Total					
2021	2.0	$11,951,201	$6,100,362	$2,033,454	$4,066,908
2030	2.5	$7,979,985	$3,168,573	$1,056,191	$2,112,382
2040	2.5	$3,809,695	$1,540,589	$513,530	$1,027,060
Lower Peninsula Portfolio Total					
2021	**1.8**	**$21,069,606**	**$11,801,986**	**$3,933,995**	**$7,867,991**
2030	**1.8**	**$16,549,502**	**$9,260,289**	**$3,086,763**	**$6,173,526**
2040	**1.4**	**$12,866,835**	**$9,518,749**	**$3,172,916**	**$6,345,833**

Program UCT Benefits ($)

Lower Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential Electric Programs	$228,536,456	$232,603,604	$223,499,050	$228,028,346	$214,648,618	$224,480,517	$257,638,088	$237,312,302	$250,577,940	$270,152,824	$287,256,460	$298,372,067	$294,792,522	$314,639,747	$357,542,770	$392,008,972	$355,393,198	$389,138,792	$404,324,668	$436,364,393
C&I Electric Programs	$877,781,297	$936,148,598	$956,325,520	$921,559,721	$863,076,265	$793,970,993	$720,549,692	$654,001,963	$597,214,710	$535,622,049	$527,031,180	$495,492,289	$413,969,618	$363,252,059	$422,017,371	$318,812,611	$299,198,995	$265,080,227	$243,346,637	$274,113,263
Residential Gas Programs	$157,531,147	$170,869,235	$182,449,570	$201,247,180	$210,505,148	$222,225,430	$235,198,184	$238,566,970	$244,007,021	$256,460,314	$258,282,654	$285,740,629	$282,807,346	$279,650,161	$275,751,610	$270,643,821	$270,934,219	$262,043,874	$250,763,870	$239,813,019
C&I Gas Programs	$151,328,854	$165,530,393	$179,717,423	$197,551,860	$207,519,710	$219,570,763	$229,668,093	$236,968,594	$241,301,208	$238,680,007	$240,223,761	$232,804,071	$214,274,715	$198,649,537	$193,918,240	$170,677,168	$157,189,271	$142,288,813	$130,286,664	$124,087,193

*Benefits based on savings net of free ridership

Program UCT Costs ($)

Lower Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential Electric Programs	$155,585,129	$155,925,485	$147,848,487	$149,923,600	$140,930,853	$150,384,888	$179,594,807	$165,043,960	$176,930,189	$191,961,241	$203,708,621	$210,021,454	$205,428,955	$218,137,970	$253,103,779	$273,985,019	$242,780,914	$263,168,740	$270,582,503	$288,112,977
C&I Electric Programs	$428,260,444	$434,669,350	$425,602,952	$395,794,205	$360,696,624	$326,024,931	$292,545,013	$262,992,415	$239,101,923	$213,761,007	$212,651,700	$202,019,985	$168,666,341	$149,616,219	$177,210,168	$134,888,850	$128,151,847	$113,488,260	$104,642,022	$117,716,905
Residential Gas Programs	$100,523,458	$107,838,664	$114,223,211	$132,285,794	$137,933,326	$144,368,517	$150,859,339	$153,084,168	$155,232,084	$171,939,371	$171,644,888	$222,195,447	$219,424,904	$215,001,654	$208,846,383	$202,791,662	$215,852,515	$204,971,368	$192,701,886	$180,306,339
C&I Gas Programs	$41,238,198	$41,298,911	$40,231,696	$39,089,734	$37,774,250	$36,613,019	$35,432,161	$34,240,014	$33,223,294	$31,577,182	$31,596,345	$30,432,346	$27,462,553	$25,504,518	$26,080,038	$22,868,143	$21,631,070	$20,021,536	$18,849,103	$18,700,977

Program UCT Ratio

Lower Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential Electric Programs	1.5	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.5	1.5
C&I Electric Programs	2.0	2.2	2.2	2.3	2.4	2.4	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.4	2.4	2.4	2.3	2.3	2.3	2.3
Residential Gas Programs	1.6	1.6	1.6	1.5	1.5	1.5	1.6	1.6	1.6	1.5	1.5	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
C&I Gas Programs	3.7	4.0	4.5	5.1	5.5	6.0	6.5	6.9	7.3	7.6	7.6	7.6	7.8	7.8	7.4	7.5	7.3	7.1	6.9	6.6

Sector and Portfolio UCT Benefits ($)

Lower Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential	386,067,603	403,472,839	405,948,620	429,275,526	425,153,766	446,705,947	492,836,272	475,879,271	494,584,961	526,613,138	545,539,114	584,112,696	577,599,867	594,289,908	633,294,380	662,652,793	626,327,417	651,182,666	655,088,539	676,177,412
Commercial & Industrial	1,029,110,151	1,101,678,991	1,136,042,943	1,119,111,581	1,070,595,975	1,013,541,757	950,217,785	890,970,557	838,515,918	774,302,055	767,254,941	728,296,361	628,244,333	561,901,596	615,935,611	489,489,779	456,388,266	407,369,040	373,633,301	398,200,456
Total Portfolio	1,415,177,754	1,505,151,830	1,541,991,563	1,548,387,106	1,495,749,741	1,460,247,704	1,443,054,057	1,366,849,828	1,333,100,879	1,300,915,193	1,312,794,054	1,312,409,056	1,205,844,201	1,156,191,504	1,249,229,991	1,152,142,572	1,082,715,683	1,058,551,706	1,028,721,840	1,074,377,868

Sector and Portfolio UCT Costs ($)

Lower Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential	256,108,587	263,764,148	262,071,698	282,209,395	278,864,179	294,753,405	330,454,146	318,128,128	332,162,274	363,900,612	375,353,509	432,216,901	424,853,858	433,139,624	461,950,162	476,776,681	458,633,429	468,140,108	463,284,389	468,419,316
Commercial & Industrial	469,498,642	475,968,261	465,834,648	434,883,939	398,470,874	362,637,951	327,977,173	297,232,429	272,325,217	245,338,189	244,248,045	232,452,332	196,128,895	175,120,737	203,290,206	157,756,993	149,782,917	133,509,796	123,491,126	136,417,881
Total Portfolio	725,607,228	739,732,409	727,906,346	717,093,334	677,335,053	657,391,355	658,431,320	615,360,557	604,487,490	609,238,802	619,601,554	664,669,232	620,982,753	608,260,361	665,240,368	634,533,674	608,416,346	601,649,904	586,775,515	604,837,197

Sector and Portfolio UCT Ratio

Lower Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.4	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Commercial & Industrial	2.2	2.3	2.4	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.1	3.1	3.2	3.2	3.0	3.1	3.0	3.1	3.0	2.9
Total Portfolio	2.0	2.0	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.0	1.9	1.9	1.9	1.8	1.8	1.8	1.8	1.8

Program UCT Benefits ($)

Upper Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential Electric Programs	$5,445,170	$5,385,343	$5,080,701	$4,862,762	$4,630,942	$4,458,616	$4,496,712	$4,367,615	$4,397,586	$4,449,962	$4,523,436	$4,633,161	$4,716,008	$4,786,978	$4,854,306	$4,906,773	$4,851,192	$4,963,440	$4,964,012	$4,986,578
C&I Electric Programs	$10,455,749	$10,749,437	$10,636,864	$10,228,831	$9,943,153	$8,719,649	$7,869,890	$7,016,099	$6,240,080	$5,549,249	$4,933,610	$4,394,099	$3,938,152	$3,529,926	$3,182,276	$2,908,153	$2,670,100	$2,472,605	$2,309,736	$2,178,554
Residential Gas Programs	$3,673,236	$3,857,619	$3,977,492	$4,052,490	$4,085,258	$4,100,052	$4,118,770	$4,105,526	$4,168,206	$4,119,525	$4,048,049	$3,952,933	$3,836,821	$3,703,792	$3,558,475	$3,404,867	$4,799,616	$4,675,740	$4,498,671	$4,080,563
C&I Gas Programs	$1,550,452	$1,645,505	$1,732,638	$1,897,630	$1,960,471	$2,048,491	$2,186,867	$2,263,386	$2,355,270	$2,430,737	$2,478,904	$2,491,490	$2,495,603	$2,402,031	$2,308,514	$2,185,182	$2,049,159	$1,907,302	$1,767,240	$1,634,741

*Benefits based on savings net of free ridership

Program UCT Costs ($)

Upper Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential Electric Programs	$3,360,701	$3,386,865	$3,244,363	$3,147,487	$3,040,917	$2,866,453	$3,121,436	$3,126,011	$3,226,500	$3,324,467	$3,425,544	$3,585,648	$3,677,517	$3,758,460	$3,831,527	$3,881,262	$3,943,433	$3,970,556	$3,990,277	$4,011,426
C&I Electric Programs	$5,567,214	$5,596,095	$5,420,539	$5,115,586	$4,704,738	$4,262,392	$3,838,872	$3,427,236	$3,070,566	$2,765,464	$2,498,523	$2,267,494	$2,069,112	$1,899,231	$1,753,779	$1,630,041	$1,524,834	$1,436,601	$1,362,942	$1,301,513
Residential Gas Programs	$2,340,923	$2,470,224	$2,570,363	$2,643,968	$2,688,013	$2,714,747	$2,725,066	$2,710,035	$2,829,203	$2,767,249	$2,681,805	$2,577,094	$2,459,237	$2,332,085	$2,202,620	$2,072,413	$4,832,000	$5,121,117	$4,568,959	$3,988,734
C&I Gas Programs	$523,148	$525,147	$502,005	$488,742	$466,365	$449,455	$437,464	$422,699	$412,447	$403,079	$392,927	$380,912	$366,550	$349,796	$331,114	$311,375	$291,498	$272,428	$254,812	$239,077

Program UCT Ratio

Upper Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential Electric Programs	1.6	1.6	1.6	1.5	1.5	1.6	1.4	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.3	1.2	1.2
C&I Electric Programs	1.9	1.9	2.0	2.0	2.1	2.0	2.1	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.8	1.8	1.8	1.7	1.7	1.7
Residential Gas Programs	1.6	1.6	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.6	1.6	1.0	0.9	1.0	1.0
C&I Gas Programs	3.0	3.1	3.5	3.9	4.2	4.6	5.0	5.4	5.7	6.0	6.3	6.5	6.8	6.9	7.0	7.0	7.0	7.0	6.9	6.8

Sector and Portfolio UCT Benefits ($)

Upper Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential	9,118,406	9,242,962	9,063,193	8,915,252	8,716,200	8,558,668	8,615,482	8,473,141	8,563,792	8,569,517	8,571,484	8,586,815	8,552,829	8,490,769	8,412,781	8,311,660	9,750,808	9,639,180	9,462,683	9,067,141
Commercial & Industrial	11,991,201	12,394,937	12,369,502	12,126,261	11,493,623	10,768,140	10,036,577	9,279,487	8,595,326	7,979,985	7,412,514	6,885,594	6,363,755	5,931,927	5,490,791	5,093,334	4,719,258	4,380,227	4,076,976	3,809,695
Total Portfolio	21,099,606	21,637,899	21,432,695	21,041,513	20,198,823	19,326,808	18,652,059	17,752,628	17,159,121	16,549,502	15,983,998	15,471,389	14,946,583	14,422,695	13,910,972	13,404,994	14,470,067	14,219,407	13,539,659	12,866,835

Sector and Portfolio UCT Costs ($)

Upper Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential	5,701,624	5,857,119	5,814,726	5,791,455	5,728,931	5,714,200	5,847,001	5,836,046	6,054,703	6,091,716	6,107,150	6,162,742	6,136,752	6,091,445	6,034,347	5,953,675	8,775,433	9,091,155	8,559,237	7,978,160
Commercial & Industrial	6,100,362	6,124,242	5,922,544	5,604,328	5,171,093	4,711,847	4,276,336	3,850,235	3,483,045	3,168,573	2,891,450	2,648,396	2,435,662	2,249,028	2,084,893	1,941,417	1,816,333	1,709,079	1,617,754	1,540,589
Total Portfolio	11,801,986	11,981,361	11,737,270	11,395,783	10,900,024	10,426,047	10,123,337	9,686,281	9,537,747	9,260,289	8,998,600	8,811,038	8,572,416	8,340,473	8,119,240	7,895,091	10,591,766	10,800,234	10,176,990	9,518,749

Sector and Portfolio UCT Ratio

Upper Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.1	1.1	1.1	1.1
Commercial & Industrial	2.0	2.0	2.1	2.2	2.2	2.3	2.3	2.4	2.5	2.5	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.5	2.5
Total Portfolio	1.8	1.8	1.8	1.8	1.9	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.7	1.7	1.7	1.7	1.4	1.3	1.3	1.4

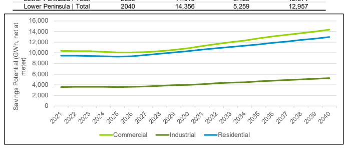
Lower Peninsula Program Budget by Budget Type ($)

Service Territory	Program Bundles	Budget Type	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Lower Peninsula | Total	Residential Electric Programs	Incentives	$103,723,419	$103,950,323	$98,565,658	$99,949,067	$93,953,902	$100,256,592	$119,729,871	$110,029,306	$117,953,459	$127,974,161	$135,805,747	$140,014,303	$136,952,636	$145,425,313	$168,735,853	$182,656,679	$161,853,943	$175,445,827	$180,388,335	$192,075,318
Lower Peninsula | Total	C&I Electric Programs	Incentives	$285,506,963	$289,779,567	$283,735,301	$263,862,804	$240,464,416	$217,349,954	$195,030,008	$175,328,277	$159,401,282	$142,507,338	$141,767,800	$134,679,990	$112,444,228	$99,744,146	$118,140,112	$89,925,900	$85,434,565	$75,658,840	$69,761,348	$78,477,936
Lower Peninsula | Total	Residential Gas Programs	Incentives	$67,015,639	$71,892,442	$76,148,808	$88,190,530	$91,955,551	$96,245,678	$100,572,893	$102,056,112	$103,488,056	$114,626,247	$114,429,925	$148,130,298	$146,283,269	$143,334,436	$139,230,922	$135,194,441	$143,901,677	$136,647,578	$128,467,924	$120,204,226
Lower Peninsula | Total	C&I Gas Programs	Incentives	$27,492,132	$27,532,607	$26,821,131	$26,059,822	$25,182,833	$24,408,679	$23,621,441	$22,826,676	$22,148,863	$21,051,455	$21,064,230	$20,288,231	$18,308,369	$17,003,012	$17,386,692	$15,245,428	$14,420,713	$13,347,691	$12,566,069	$12,467,318
Lower Peninsula | Total	Residential Electric Programs	Program Admin	$51,861,710	$51,975,162	$49,282,829	$49,974,533	$46,976,951	$50,128,296	$59,864,936	$55,014,653	$58,976,730	$63,987,080	$67,902,874	$70,007,151	$68,476,318	$72,712,657	$84,367,926	$91,328,340	$80,926,971	$87,722,913	$90,194,168	$96,037,659
Lower Peninsula | Total	C&I Electric Programs	Program Admin	$142,753,481	$144,889,783	$141,867,651	$131,931,402	$120,232,208	$108,674,977	$97,515,004	$87,664,138	$79,700,641	$71,253,669	$70,883,900	$67,339,995	$56,222,114	$49,872,073	$59,070,056	$44,962,950	$42,717,282	$37,829,420	$34,880,674	$39,238,968
Lower Peninsula | Total	Residential Gas Programs	Program Admin	$33,507,819	$35,946,221	$38,074,404	$44,095,265	$45,977,775	$48,122,839	$50,286,446	$51,028,056	$51,744,028	$57,313,124	$57,214,963	$74,065,149	$73,141,635	$71,667,218	$69,615,461	$67,597,221	$71,950,838	$68,323,789	$64,233,962	$60,102,113
Lower Peninsula | Total	C&I Gas Programs	Program Admin	$13,746,066	$13,766,304	$13,410,565	$13,029,911	$12,591,417	$12,204,340	$11,810,720	$11,413,338	$11,074,431	$10,525,727	$10,532,115	$10,144,115	$9,154,184	$8,501,506	$8,693,346	$7,622,714	$7,210,357	$6,673,845	$6,283,034	$6,233,659
Lower Peninsula | Total	Residential Electric Programs	Program Total	$155,585,129	$155,925,485	$147,848,487	$149,923,600	$140,930,853	$150,384,888	$179,594,807	$165,043,960	$176,930,189	$191,961,241	$203,708,621	$210,021,454	$205,428,955	$218,137,970	$253,103,779	$273,985,019	$242,780,914	$263,168,740	$270,582,503	$288,112,977
Lower Peninsula | Total	C&I Electric Programs	Program Total	$428,260,444	$434,669,350	$425,602,952	$395,794,205	$360,696,624	$326,024,931	$292,545,013	$262,992,415	$239,101,923	$213,761,007	$212,651,700	$202,019,985	$168,666,341	$149,616,219	$177,210,168	$134,888,850	$128,151,847	$113,488,260	$104,642,022	$117,716,905
Lower Peninsula | Total	Residential Gas Programs	Program Total	$100,523,458	$107,838,664	$114,223,211	$132,285,794	$137,933,326	$144,368,517	$150,859,339	$153,084,168	$155,232,084	$171,939,371	$171,644,888	$222,195,447	$219,424,904	$215,001,654	$208,846,383	$202,791,662	$215,852,515	$204,971,368	$192,701,886	$180,306,339
Lower Peninsula | Total	C&I Gas Programs	Program Total	$41,238,198	$41,298,911	$40,231,696	$39,089,734	$37,774,250	$36,613,019	$35,432,161	$34,240,014	$33,223,294	$31,577,182	$31,596,345	$30,432,346	$27,462,553	$25,504,518	$26,080,038	$22,868,143	$21,631,070	$20,021,536	$18,849,103	$18,700,977
Lower Peninsula | Total	Portfolio Total	Incentives	$483,738,152	$493,154,939	$485,270,898	$478,062,223	$451,556,702	$438,260,903	$438,954,213	$410,240,371	$402,991,660	$406,159,201	$413,067,703	$443,112,822	$413,988,502	$405,506,907	$443,493,579	$423,022,449	$405,610,898	$401,099,936	$391,183,676	$403,224,798
Lower Peninsula | Total	Portfolio Total	Program Admin	$241,869,076	$246,577,470	$242,635,449	$239,031,111	$225,778,351	$219,130,452	$219,477,107	$205,120,186	$201,495,830	$203,079,601	$206,533,851	$221,556,411	$206,994,251	$202,753,454	$221,746,789	$211,511,225	$202,805,449	$200,549,968	$195,591,838	$201,612,399
Lower Peninsula | Total	Portfolio Total	Program Total	$725,607,228	$739,732,409	$727,906,346	$717,093,334	$677,335,053	$657,391,355	$658,431,320	$615,360,557	$604,487,490	$609,238,802	$619,601,554	$664,669,232	$620,982,753	$608,260,361	$665,240,368	$634,533,674	$608,416,346	$601,649,904	$586,775,515	$604,837,197

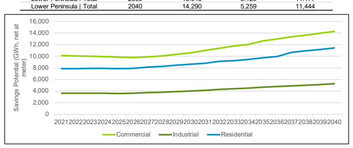
Upper Peninsula Program Budget by Budget Type ($)

Service Territory	Program Bundles	Budget Type	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Upper Peninsula | Total	Residential Electric Programs	Incentives	$2,240,468	$2,257,930	$2,162,909	$2,098,325	$2,027,278	$1,999,635	$2,080,957	$2,084,007	$2,150,333	$2,216,311	$2,283,696	$2,390,432	$2,451,678	$2,505,640	$2,554,352	$2,594,174	$2,628,956	$2,646,692	$2,660,185	$2,674,284
Upper Peninsula | Total	C&I Electric Programs	Incentives	$3,711,476	$3,732,730	$3,613,693	$3,410,397	$3,136,485	$2,841,595	$2,559,248	$2,284,824	$2,047,065	$1,843,662	$1,665,682	$1,511,636	$1,379,408	$1,266,154	$1,169,186	$1,086,694	$1,016,556	$957,767	$908,628	$867,675
Upper Peninsula | Total	Residential Gas Programs	Incentives	$1,560,615	$1,646,816	$1,713,575	$1,762,645	$1,792,009	$1,809,832	$1,817,044	$1,806,690	$1,886,135	$1,844,833	$1,787,737	$1,718,056	$1,639,491	$1,555,323	$1,468,546	$1,381,609	$3,221,333	$3,414,078	$3,045,973	$2,644,489
Upper Peninsula | Total	C&I Gas Programs	Incentives	$355,432	$350,098	$334,670	$325,828	$310,910	$299,637	$291,643	$281,999	$274,965	$268,720	$261,952	$253,941	$244,367	$233,198	$220,743	$207,583	$194,333	$181,619	$169,875	$159,385
Upper Peninsula | Total	Residential Electric Programs	Program Admin	$1,120,234	$1,128,965	$1,081,454	$1,049,162	$1,013,639	$999,818	$1,040,479	$1,042,004	$1,075,167	$1,108,156	$1,141,848	$1,195,216	$1,225,839	$1,252,820	$1,277,176	$1,297,087	$1,314,478	$1,323,346	$1,330,092	$1,337,142
Upper Peninsula | Total	C&I Electric Programs	Program Admin	$1,855,738	$1,866,365	$1,806,846	$1,705,199	$1,568,243	$1,420,797	$1,279,624	$1,142,412	$1,023,533	$921,831	$832,841	$755,818	$689,704	$633,077	$584,593	$543,347	$508,278	$478,884	$454,314	$433,838
Upper Peninsula | Total	Residential Gas Programs	Program Admin	$780,308	$823,408	$856,788	$881,323	$896,004	$904,916	$908,522	$903,345	$943,068	$922,416	$893,868	$859,028	$819,746	$777,662	$734,273	$690,804	$1,610,667	$1,707,039	$1,522,986	$1,322,245
Upper Peninsula | Total	C&I Gas Programs	Program Admin	$177,716	$175,049	$167,335	$162,914	$155,455	$149,818	$145,821	$141,000	$137,482	$134,360	$130,976	$126,971	$122,183	$116,599	$110,371	$103,792	$97,166	$90,809	$84,937	$79,692
Upper Peninsula | Total	Residential Electric Programs	Program Total	$3,360,701	$3,386,895	$3,244,363	$3,147,487	$3,040,917	$2,999,453	$3,121,436	$3,126,011	$3,225,500	$3,324,467	$3,425,544	$3,585,648	$3,677,517	$3,758,460	$3,831,527	$3,891,262	$3,943,433	$3,970,038	$3,990,277	$4,011,426
Upper Peninsula | Total	C&I Electric Programs	Program Total	$5,567,214	$5,599,095	$5,420,539	$5,115,596	$4,704,728	$4,262,392	$3,838,872	$3,427,236	$3,070,598	$2,765,494	$2,498,523	$2,267,454	$2,069,112	$1,899,231	$1,753,779	$1,630,041	$1,524,834	$1,436,651	$1,362,942	$1,301,513
Upper Peninsula | Total	Residential Gas Programs	Program Total	$2,340,923	$2,470,224	$2,570,363	$2,643,968	$2,688,013	$2,714,747	$2,725,566	$2,710,035	$2,829,203	$2,767,249	$2,681,605	$2,577,084	$2,459,237	$2,332,985	$2,202,820	$2,072,413	$4,832,000	$5,121,117	$4,568,959	$3,966,734
Upper Peninsula | Total	C&I Gas Programs	Program Total	$533,148	$525,147	$502,005	$488,742	$466,365	$449,455	$437,464	$422,999	$412,447	$403,079	$392,927	$380,912	$366,550	$349,796	$331,114	$311,375	$291,499	$272,428	$254,812	$239,077
Upper Peninsula | Total	Portfolio Total	Incentives	$7,867,991	$7,987,574	$7,824,847	$7,597,195	$7,266,682	$6,950,698	$6,748,891	$6,457,521	$6,358,498	$6,173,526	$5,999,067	$5,874,066	$5,714,944	$5,560,315	$5,412,827	$5,270,061	$7,061,177	$7,200,156	$6,784,660	$6,345,833
Upper Peninsula | Total	Portfolio Total	Program Admin	$3,933,995	$3,993,787	$3,912,423	$3,798,598	$3,633,341	$3,475,349	$3,374,446	$3,228,760	$3,179,249	$3,086,763	$2,999,533	$2,937,033	$2,857,472	$2,780,158	$2,706,413	$2,635,030	$3,530,589	$3,600,078	$3,392,330	$3,172,916
Upper Peninsula | Total	Portfolio Total	Program Total	$11,801,986	$11,981,361	$11,737,270	$11,395,793	$10,900,024	$10,426,047	$10,123,337	$9,686,281	$9,537,747	$9,260,289	$8,998,600	$8,811,099	$8,572,416	$8,340,473	$8,119,240	$7,905,091	$10,591,766	$10,800,234	$10,176,990	$9,518,749

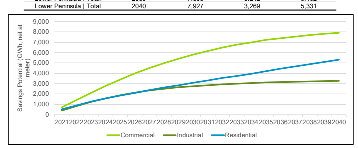
Lower Peninsula Electricity Technical Potential by Sector (GWh, net at meter)				
Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	10,384	3,601	9,480
Lower Peninsula | Total	2022	10.344	3.608	9.477
Lower Peninsula | Total	2023	10.295	3.618	9.384
Lower Peninsula | Total	2024	10.210	3.617	9.375
Lower Peninsula | Total	2025	10.089	3.592	9.307
Lower Peninsula | Total	2026	10.056	3.615	9.379
Lower Peninsula | Total	2027	10.147	3.719	9.618
Lower Peninsula | Total	2028	10.305	3.806	9.839
Lower Peninsula | Total	2029	10.562	3.914	10.073
Lower Peninsula | Total	2030	10.873	4.013	10.328
Lower Peninsula | Total	2031	11.253	4.143	10.593
Lower Peninsula | Total	2032	11.650	4.279	10.853
Lower Peninsula | Total	2033	11.987	4.398	11.083
Lower Peninsula | Total	2034	12.308	4.509	11.325
Lower Peninsula | Total	2035	12.733	4.667	11.601
Lower Peninsula | Total	2036	13.067	4.784	11.906
Lower Peninsula | Total	2037	13.403	4.899	12.142
Lower Peninsula | Total	2038	13.714	5.015	12.406
Lower Peninsula | Total	2039	14.015	5.129	12.671
Lower Peninsula | Total	2040	14,356	5,259	12,957



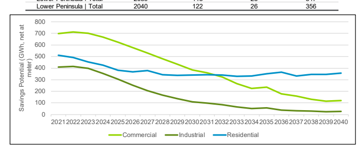
Lower Peninsula Electricity Economic Potential by Sector (GWh, net at meter)				
Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	10,101	3,601	7,848
Lower Peninsula | Total	2022	10.063	3.608	7.841
Lower Peninsula | Total	2023	10.030	3.618	7.943
Lower Peninsula | Total	2024	9.947	3.617	7.931
Lower Peninsula | Total	2025	9.830	3.592	7.873
Lower Peninsula | Total	2026	9.799	3.615	7.921
Lower Peninsula | Total	2027	9.892	3.719	8.113
Lower Peninsula | Total	2028	10.052	3.806	8.270
Lower Peninsula | Total	2029	10.310	3.914	8.437
Lower Peninsula | Total	2030	10.622	4.013	8.619
Lower Peninsula | Total	2031	11.003	4.143	8.808
Lower Peninsula | Total	2032	11.402	4.279	9.103
Lower Peninsula | Total	2033	11.740	4.398	9.267
Lower Peninsula | Total	2034	12.062	4.509	9.445
Lower Peninsula | Total	2035	12.665	4.667	9.708
Lower Peninsula | Total	2036	12.999	4.784	9.928
Lower Peninsula | Total	2037	13.336	4.899	10.679
Lower Peninsula | Total	2038	13.647	5.015	10.927
Lower Peninsula | Total	2039	13.948	5.129	11.177
Lower Peninsula | Total	2040	14,290	5,259	11,444



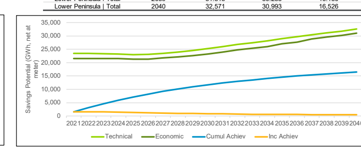
Lower Peninsula Electricity Cumulative Annual Achievable Potential by Sector (GWh, net at meter)				
Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	697	408	512
Lower Peninsula | Total	2022	1.408	823	902
Lower Peninsula | Total	2023	2.109	1.222	1.251
Lower Peninsula | Total	2024	2.776	1.578	1.573
Lower Peninsula | Total	2025	3.399	1.882	1.851
Lower Peninsula | Total	2026	3.976	2.135	2.115
Lower Peninsula | Total	2027	4.505	2.342	2.389
Lower Peninsula | Total	2028	4.986	2.510	2.623
Lower Peninsula | Total	2029	5.421	2.647	2.853
Lower Peninsula | Total	2030	5.806	2.758	3.084
Lower Peninsula | Total	2031	6.166	2.858	3.315
Lower Peninsula | Total	2032	6.481	2.943	3.542
Lower Peninsula | Total	2033	6.758	3.008	3.754
Lower Peninsula | Total	2034	6.984	3.059	3.970
Lower Peninsula | Total	2035	7.220	3.118	4.203
Lower Peninsula | Total	2036	7.398	3.156	4.449
Lower Peninsula | Total	2037	7.557	3.189	4.660
Lower Peninsula | Total	2038	7.690	3.217	4.882
Lower Peninsula | Total	2039	7.805	3.242	5.102
Lower Peninsula | Total	2040	7,927	3,269	5,331



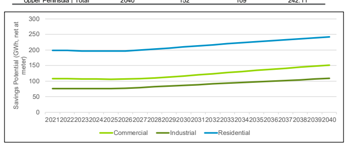
Lower Peninsula Electricity Incremental Annual Achievable Potential by Sector (GWh, net at meter)				
Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	697	408	512
Lower Peninsula | Total	2022	710	415	492
Lower Peninsula | Total	2023	701	399	452
Lower Peninsula | Total	2024	667	355	426
Lower Peninsula | Total	2025	623	304	383
Lower Peninsula | Total	2026	577	253	368
Lower Peninsula | Total	2027	529	207	379
Lower Peninsula | Total	2028	481	168	343
Lower Peninsula | Total	2029	435	137	339
Lower Peninsula | Total	2030	385	111	342
Lower Peninsula | Total	2031	360	100	344
Lower Peninsula | Total	2032	325	85	341
Lower Peninsula | Total	2033	266	65	329
Lower Peninsula | Total	2034	226	52	333
Lower Peninsula | Total	2035	236	58	353
Lower Peninsula | Total	2036	178	38	367
Lower Peninsula | Total	2037	159	33	334
Lower Peninsula | Total	2038	132	29	346
Lower Peninsula | Total	2039	115	25	347
Lower Peninsula | Total	2040	122	26	356



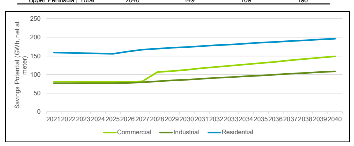
Lower Peninsula Electricity Potential (GWh, net at meter)					
Service Territory	Year	Technical	Economic	Cumul Achiev	Inc Achiev
Lower Peninsula | Total	2021	23,465	21,550	1,618	1,618
Lower Peninsula | Total	2022	23.429	21.512	3.132	1.617
Lower Peninsula | Total	2023	23.296	21.590	4.582	1.553
Lower Peninsula | Total	2024	23.202	21.495	5.926	1.448
Lower Peninsula | Total	2025	22.989	21.295	7.132	1.310
Lower Peninsula | Total	2026	23.050	21.335	8.226	1.198
Lower Peninsula | Total	2027	23.484	21.724	9.235	1.114
Lower Peninsula | Total	2028	23.951	22.128	10.118	991
Lower Peninsula | Total	2029	24.549	22.660	10.920	911
Lower Peninsula | Total	2030	25.215	23.254	11.648	838
Lower Peninsula | Total	2031	25.989	23.954	12.339	804
Lower Peninsula | Total	2032	26.782	24.784	12.976	752
Lower Peninsula | Total	2033	27.468	25.405	13.520	660
Lower Peninsula | Total	2034	28.142	26.016	14.013	611
Lower Peninsula | Total	2035	29.001	27.040	14.541	647
Lower Peninsula | Total	2036	29.757	27.711	15.003	583
Lower Peninsula | Total	2037	30.445	28.914	15.406	526
Lower Peninsula | Total	2038	31.135	29.589	15.789	507
Lower Peninsula | Total	2039	31.815	30.255	16.150	487
Lower Peninsula | Total	2040	32,571	30,993	16,526	504



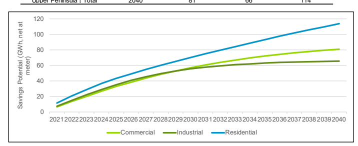
Upper Peninsula Electricity Technical Potential by Sector (GWh, net at meter)				
Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	108	76	199.10
Upper Peninsula | Total	2022	108	77	199.20
Upper Peninsula | Total	2023	107	77	197.21
Upper Peninsula | Total	2024	107	76	196.77
Upper Peninsula | Total	2025	106	76	196.33
Upper Peninsula | Total	2026	107	78	197.16
Upper Peninsula | Total	2027	108	80	199.64
Upper Peninsula | Total	2028	110	82	203.02
Upper Peninsula | Total	2029	113	84	206.41
Upper Peninsula | Total	2030	117	86	209.79
Upper Peninsula | Total	2031	120	89	213.18
Upper Peninsula | Total	2032	124	91	216.54
Upper Peninsula | Total	2033	127	93	219.87
Upper Peninsula | Total	2034	131	95	223.16
Upper Peninsula | Total	2035	134	98	226.42
Upper Peninsula | Total	2036	138	100	229.64
Upper Peninsula | Total	2037	141	102	232.82
Upper Peninsula | Total	2038	145	104	235.95
Upper Peninsula | Total	2039	148	107	239.03
Upper Peninsula | Total	2040	152	109	242.11



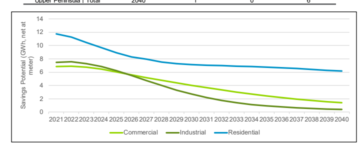
Upper Peninsula Electricity Economic Potential by Sector (GWh, net at meter)				
Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	81	76	159
Upper Peninsula | Total	2022	81	77	159
Upper Peninsula | Total	2023	81	77	157
Upper Peninsula | Total	2024	80	76	157
Upper Peninsula | Total	2025	80	76	156
Upper Peninsula | Total	2026	80	78	162
Upper Peninsula | Total	2027	82	80	167
Upper Peninsula | Total	2028	107	82	169
Upper Peninsula | Total	2029	110	84	172
Upper Peninsula | Total	2030	113	86	174
Upper Peninsula | Total	2031	117	89	176
Upper Peninsula | Total	2032	121	91	179
Upper Peninsula | Total	2033	124	93	181
Upper Peninsula | Total	2034	128	95	183
Upper Peninsula | Total	2035	131	98	186
Upper Peninsula | Total	2036	135	100	188
Upper Peninsula | Total	2037	138	102	190
Upper Peninsula | Total	2038	142	104	192
Upper Peninsula | Total	2039	145	107	194
Upper Peninsula | Total	2040	149	109	196



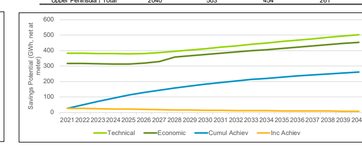
Upper Peninsula Electricity Cumulative Annual Achievable Potential by Sector (GWh, net at meter)				
Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	7	7	12
Upper Peninsula | Total	2022	14	15	21
Upper Peninsula | Total	2023	21	22	29
Upper Peninsula | Total	2024	27	29	37
Upper Peninsula | Total	2025	33	35	43
Upper Peninsula | Total	2026	39	41	49
Upper Peninsula | Total	2027	44	46	55
Upper Peninsula | Total	2028	49	50	60
Upper Peninsula | Total	2029	53	53	65
Upper Peninsula | Total	2030	57	56	70
Upper Peninsula | Total	2031	61	58	75
Upper Peninsula | Total	2032	64	60	80
Upper Peninsula | Total	2033	67	61	84
Upper Peninsula | Total	2034	70	62	89
Upper Peninsula | Total	2035	72	63	93
Upper Peninsula | Total	2036	74	64	98
Upper Peninsula | Total	2037	76	65	102
Upper Peninsula | Total	2038	78	65	106
Upper Peninsula | Total	2039	80	65	110
Upper Peninsula | Total	2040	81	66	114



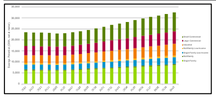
Upper Peninsula Electricity Incremental Annual Achievable Potential by Sector (GWh, net at meter)				
Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	7	7	12
Upper Peninsula | Total	2022	7	8	11
Upper Peninsula | Total	2023	7	7	10
Upper Peninsula | Total	2024	6	7	10
Upper Peninsula | Total	2025	6	6	9
Upper Peninsula | Total	2026	6	5	8
Upper Peninsula | Total	2027	5	5	8
Upper Peninsula | Total	2028	5	4	8
Upper Peninsula | Total	2029	4	3	7
Upper Peninsula | Total	2030	4	3	7
Upper Peninsula | Total	2031	4	2	7
Upper Peninsula | Total	2032	3	2	7
Upper Peninsula | Total	2033	3	1	7
Upper Peninsula | Total	2034	3	1	7
Upper Peninsula | Total	2035	2	1	7
Upper Peninsula | Total	2036	2	1	7
Upper Peninsula | Total	2037	2	1	7
Upper Peninsula | Total	2038	2	1	6
Upper Peninsula | Total	2039	2	0	6
Upper Peninsula | Total	2040	1	0	6

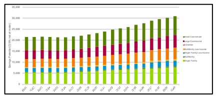


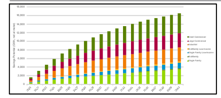
Upper Peninsula Electricity Potential (GWh, net at meter)					
Service Territory	Year	Technical	Economic	Cumul Achiev	Inc Achiev
Upper Peninsula | Total	2021	383	317	26	26
Upper Peninsula | Total	2022	383	316	50	26
Upper Peninsula | Total	2023	381	314	72	25
Upper Peninsula | Total	2024	380	313	93	23
Upper Peninsula | Total	2025	379	312	112	21
Upper Peninsula | Total	2026	381	319	129	19
Upper Peninsula | Total	2027	387	328	145	18
Upper Peninsula | Total	2028	395	358	159	16
Upper Peninsula | Total	2029	404	366	171	15
Upper Peninsula | Total	2030	413	374	183	14
Upper Peninsula | Total	2031	422	382	194	13
Upper Peninsula | Total	2032	431	390	203	12
Upper Peninsula | Total	2033	440	398	213	11
Upper Peninsula | Total	2034	449	406	221	11
Upper Peninsula | Total	2035	458	414	229	10
Upper Peninsula | Total	2036	467	422	236	10
Upper Peninsula | Total	2037	476	430	243	9
Upper Peninsula | Total	2038	485	438	249	9
Upper Peninsula | Total	2039	494	446	255	8
Upper Peninsula | Total	2040	503	454	261	8

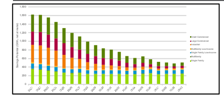


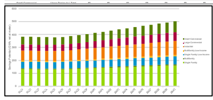
Customer Segment	Service Territory	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Single Family	Lower Peninsula | Total	6,109	6,107	6,046	6,040	5,996	6,045	6,204	6,355	6,514	6,686	6,865	7,041	7,197	7,361	7,547	7,753	7,913	8,096	8,270	8,463
Multifamily	Lower Peninsula | Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Lower Peninsula | Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Multifamily Low Income	Lower Peninsula | Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Lower Peninsula | Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Lower Peninsula | Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Small Commercial	Lower Peninsula | Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

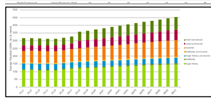


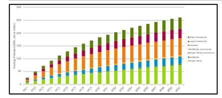


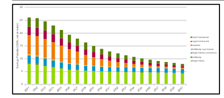


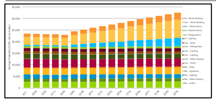


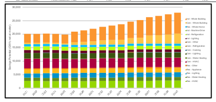


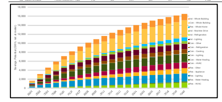


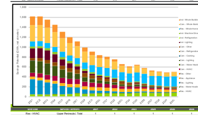


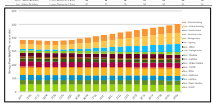


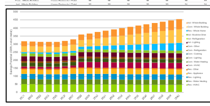


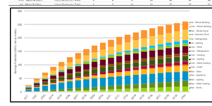


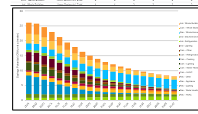






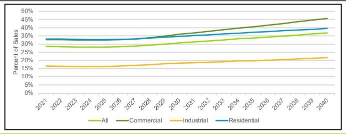






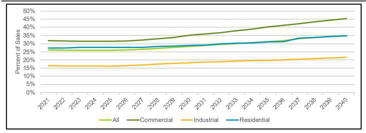
Michigan Total Electricity Technical Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	29%	33%	17%	33%
2022	MI Total	28%	33%	16%	33%
2023	MI Total	28%	32%	16%	33%
2024	MI Total	28%	32%	16%	33%
2025	MI Total	28%	32%	16%	33%
2026	MI Total	28%	33%	16%	33%
2027	MI Total	29%	33%	17%	33%
2028	MI Total	29%	34%	17%	34%
2029	MI Total	30%	35%	18%	34%
2030	MI Total	31%	36%	18%	35%
2031	MI Total	31%	37%	19%	35%
2032	MI Total	32%	38%	19%	36%
2033	MI Total	32%	39%	19%	36%
2034	MI Total	33%	40%	20%	37%
2035	MI Total	34%	41%	20%	37%
2036	MI Total	34%	42%	20%	38%
2037	MI Total	35%	43%	21%	38%
2038	MI Total	36%	44%	21%	39%
2039	MI Total	36%	45%	21%	39%
2040	MI Total	37%	46%	22%	39%



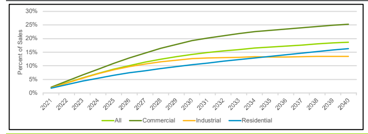
Michigan Total Electricity Economic Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	26%	32%	17%	27%
2022	MI Total	26%	32%	16%	27%
2023	MI Total	26%	32%	16%	28%
2024	MI Total	26%	32%	16%	28%
2025	MI Total	26%	31%	16%	28%
2026	MI Total	26%	32%	16%	28%
2027	MI Total	27%	32%	17%	28%
2028	MI Total	27%	33%	17%	28%
2029	MI Total	28%	34%	18%	29%
2030	MI Total	28%	35%	18%	29%
2031	MI Total	29%	36%	19%	29%
2032	MI Total	29%	37%	19%	30%
2033	MI Total	30%	38%	19%	30%
2034	MI Total	31%	39%	20%	31%
2035	MI Total	31%	40%	20%	31%
2036	MI Total	32%	41%	20%	31%
2037	MI Total	33%	42%	21%	33%
2038	MI Total	34%	43%	21%	34%
2039	MI Total	34%	44%	21%	34%
2040	MI Total	35%	45%	22%	35%



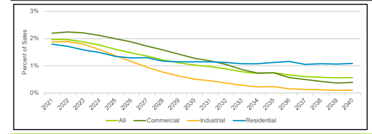
Michigan Total Electricity Cumulative Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	2%	2%	2%	2%
2022	MI Total	4%	4%	4%	3%
2023	MI Total	6%	7%	5%	4%
2024	MI Total	7%	9%	7%	6%
2025	MI Total	9%	11%	8%	7%
2026	MI Total	10%	13%	10%	7%
2027	MI Total	11%	15%	11%	8%
2028	MI Total	12%	16%	11%	9%
2029	MI Total	13%	18%	12%	10%
2030	MI Total	14%	19%	13%	10%
2031	MI Total	15%	20%	13%	11%
2032	MI Total	15%	21%	13%	12%
2033	MI Total	16%	22%	13%	12%
2034	MI Total	17%	23%	13%	13%
2035	MI Total	17%	23%	13%	13%
2036	MI Total	17%	24%	13%	14%
2037	MI Total	18%	24%	13%	15%
2038	MI Total	18%	24%	13%	15%
2039	MI Total	18%	25%	13%	16%
2040	MI Total	19%	25%	13%	16%



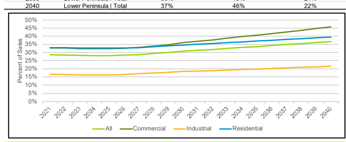
Michigan Total Electricity Incremental Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	2%	2%	2%	2%
2022	MI Total	2%	2%	2%	2%
2023	MI Total	2%	2%	2%	2%
2024	MI Total	2%	2%	2%	1%
2025	MI Total	2%	2%	1%	1%
2026	MI Total	1%	2%	1%	1%
2027	MI Total	1%	2%	1%	1%
2028	MI Total	1%	2%	1%	1%
2029	MI Total	1%	1%	1%	1%
2030	MI Total	1%	1%	1%	1%
2031	MI Total	1%	1%	0%	1%
2032	MI Total	1%	1%	0%	1%
2033	MI Total	1%	1%	0%	1%
2034	MI Total	1%	1%	0%	1%
2035	MI Total	1%	1%	0%	1%
2036	MI Total	1%	1%	0%	1%
2037	MI Total	1%	1%	0%	1%
2038	MI Total	1%	0%	0%	1%
2039	MI Total	1%	0%	0%	1%
2040	MI Total	1%	0%	0%	1%



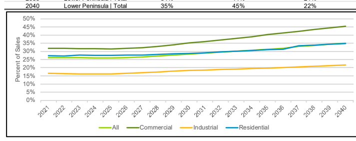
Lower Peninsula Electricity Technical Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula | Total	29%	33%	17%	33%
2022	Lower Peninsula | Total	28%	33%	16%	33%
2023	Lower Peninsula | Total	28%	32%	16%	33%
2024	Lower Peninsula | Total	28%	32%	16%	33%
2025	Lower Peninsula | Total	28%	32%	16%	33%
2026	Lower Peninsula | Total	28%	33%	16%	33%
2027	Lower Peninsula | Total	29%	33%	17%	33%
2028	Lower Peninsula | Total	29%	34%	17%	34%
2029	Lower Peninsula | Total	30%	35%	18%	34%
2030	Lower Peninsula | Total	31%	36%	18%	35%
2031	Lower Peninsula | Total	31%	37%	19%	35%
2032	Lower Peninsula | Total	32%	38%	19%	36%
2033	Lower Peninsula | Total	32%	39%	19%	36%
2034	Lower Peninsula | Total	33%	40%	20%	37%
2035	Lower Peninsula | Total	34%	41%	20%	37%
2036	Lower Peninsula | Total	34%	42%	20%	37%
2037	Lower Peninsula | Total	35%	43%	21%	38%
2038	Lower Peninsula | Total	35%	44%	21%	38%
2039	Lower Peninsula | Total	36%	45%	21%	39%
2040	Lower Peninsula | Total	37%	46%	22%	39%



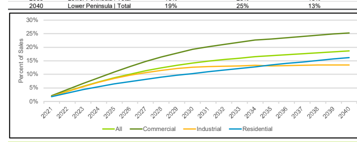
Lower Peninsula Electricity Economic Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula | Total	26%	32%	17%	27%
2022	Lower Peninsula | Total	26%	32%	16%	27%
2023	Lower Peninsula | Total	26%	32%	16%	28%
2024	Lower Peninsula | Total	26%	32%	16%	28%
2025	Lower Peninsula | Total	26%	32%	16%	28%
2026	Lower Peninsula | Total	26%	32%	16%	28%
2027	Lower Peninsula | Total	27%	32%	17%	28%
2028	Lower Peninsula | Total	27%	33%	17%	28%
2029	Lower Peninsula | Total	28%	34%	18%	29%
2030	Lower Peninsula | Total	28%	35%	18%	29%
2031	Lower Peninsula | Total	29%	36%	19%	29%
2032	Lower Peninsula | Total	29%	37%	19%	30%
2033	Lower Peninsula | Total	30%	38%	19%	30%
2034	Lower Peninsula | Total	31%	39%	20%	31%
2035	Lower Peninsula | Total	31%	40%	20%	31%
2036	Lower Peninsula | Total	32%	41%	20%	31%
2037	Lower Peninsula | Total	33%	42%	21%	33%
2038	Lower Peninsula | Total	34%	43%	21%	34%
2039	Lower Peninsula | Total	34%	44%	21%	34%
2040	Lower Peninsula | Total	35%	45%	22%	35%



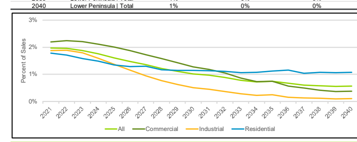
Lower Peninsula Electricity Cumulative Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula | Total	2%	2%	2%	2%
2022	Lower Peninsula | Total	4%	4%	4%	3%
2023	Lower Peninsula | Total	6%	7%	5%	4%
2024	Lower Peninsula | Total	7%	9%	7%	5%
2025	Lower Peninsula | Total	9%	11%	9%	7%
2026	Lower Peninsula | Total	10%	13%	10%	7%
2027	Lower Peninsula | Total	11%	15%	11%	8%
2028	Lower Peninsula | Total	12%	16%	12%	9%
2029	Lower Peninsula | Total	13%	18%	12%	10%
2030	Lower Peninsula | Total	14%	19%	13%	10%
2031	Lower Peninsula | Total	15%	20%	13%	11%
2032	Lower Peninsula | Total	15%	21%	13%	12%
2033	Lower Peninsula | Total	16%	22%	13%	12%
2034	Lower Peninsula | Total	17%	23%	13%	13%
2035	Lower Peninsula | Total	17%	23%	13%	13%
2036	Lower Peninsula | Total	17%	24%	13%	14%
2037	Lower Peninsula | Total	18%	24%	13%	15%
2038	Lower Peninsula | Total	18%	24%	13%	15%
2039	Lower Peninsula | Total	18%	25%	13%	16%
2040	Lower Peninsula | Total	19%	25%	13%	16%



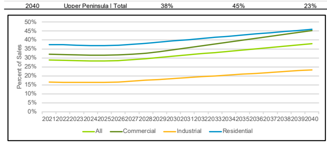
Lower Peninsula Electricity Incremental Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula | Total	2%	2%	2%	2%
2022	Lower Peninsula | Total	2%	2%	2%	2%
2023	Lower Peninsula | Total	2%	2%	2%	2%
2024	Lower Peninsula | Total	2%	2%	2%	1%
2025	Lower Peninsula | Total	2%	2%	1%	1%
2026	Lower Peninsula | Total	1%	2%	1%	1%
2027	Lower Peninsula | Total	1%	2%	1%	1%
2028	Lower Peninsula | Total	1%	2%	1%	1%
2029	Lower Peninsula | Total	1%	1%	1%	1%
2030	Lower Peninsula | Total	1%	1%	1%	1%
2031	Lower Peninsula | Total	1%	1%	0%	1%
2032	Lower Peninsula | Total	1%	1%	0%	1%
2033	Lower Peninsula | Total	1%	1%	0%	1%
2034	Lower Peninsula | Total	1%	1%	0%	1%
2035	Lower Peninsula | Total	1%	1%	0%	1%
2036	Lower Peninsula | Total	1%	1%	0%	1%
2037	Lower Peninsula | Total	1%	1%	0%	1%
2038	Lower Peninsula | Total	1%	0%	0%	1%
2039	Lower Peninsula | Total	1%	0%	0%	1%
2040	Lower Peninsula | Total	1%	0%	0%	1%



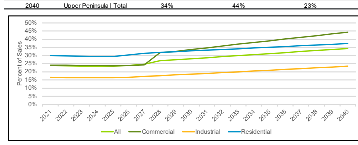
Upper Peninsula Electricity Technical Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula | Total	29%	32%	17%	37%
2022	Upper Peninsula | Total	29%	32%	16%	37%
2023	Upper Peninsula | Total	28%	32%	16%	37%
2024	Upper Peninsula | Total	28%	32%	16%	37%
2025	Upper Peninsula | Total	28%	32%	16%	37%
2026	Upper Peninsula | Total	29%	32%	17%	37%
2027	Upper Peninsula | Total	29%	32%	17%	37%
2028	Upper Peninsula | Total	30%	33%	18%	38%
2029	Upper Peninsula | Total	30%	33%	18%	39%
2030	Upper Peninsula | Total	31%	35%	19%	39%
2031	Upper Peninsula | Total	32%	36%	19%	40%
2032	Upper Peninsula | Total	32%	37%	20%	41%
2033	Upper Peninsula | Total	33%	38%	20%	41%
2034	Upper Peninsula | Total	34%	39%	20%	42%
2035	Upper Peninsula | Total	34%	40%	21%	43%
2036	Upper Peninsula | Total	35%	41%	21%	43%
2037	Upper Peninsula | Total	36%	42%	22%	44%
2038	Upper Peninsula | Total	36%	43%	22%	45%
2039	Upper Peninsula | Total	37%	44%	23%	45%
2040	Upper Peninsula | Total	38%	45%	23%	46%



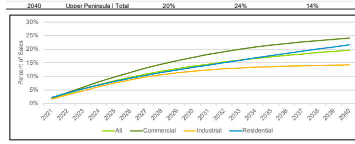
Upper Peninsula Electricity Economic Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula | Total	24%	24%	17%	30%
2022	Upper Peninsula | Total	24%	24%	16%	30%
2023	Upper Peninsula | Total	23%	24%	16%	29%
2024	Upper Peninsula | Total	23%	24%	16%	29%
2025	Upper Peninsula | Total	23%	24%	16%	29%
2026	Upper Peninsula | Total	24%	24%	17%	30%
2027	Upper Peninsula | Total	25%	24%	17%	31%
2028	Upper Peninsula | Total	27%	32%	18%	32%
2029	Upper Peninsula | Total	27%	33%	18%	32%
2030	Upper Peninsula | Total	28%	34%	19%	33%
2031	Upper Peninsula | Total	29%	35%	19%	33%
2032	Upper Peninsula | Total	29%	36%	20%	34%
2033	Upper Peninsula | Total	30%	37%	20%	34%
2034	Upper Peninsula | Total	31%	38%	20%	35%
2035	Upper Peninsula | Total	31%	39%	21%	35%
2036	Upper Peninsula | Total	32%	40%	21%	35%
2037	Upper Peninsula | Total	32%	41%	22%	36%
2038	Upper Peninsula | Total	33%	42%	22%	36%
2039	Upper Peninsula | Total	34%	43%	23%	37%
2040	Upper Peninsula | Total	34%	44%	23%	37%



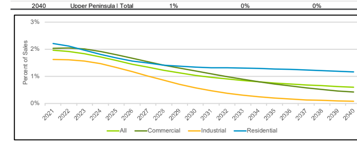
Upper Peninsula Electricity Cumulative Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula | Total	2%	2%	2%	2%
2022	Upper Peninsula | Total	4%	4%	3%	4%
2023	Upper Peninsula | Total	5%	6%	5%	5%
2024	Upper Peninsula | Total	7%	8%	6%	7%
2025	Upper Peninsula | Total	8%	10%	8%	8%
2026	Upper Peninsula | Total	10%	11%	9%	9%
2027	Upper Peninsula | Total	11%	13%	10%	10%
2028	Upper Peninsula | Total	12%	14%	11%	11%
2029	Upper Peninsula | Total	13%	16%	11%	12%
2030	Upper Peninsula | Total	14%	17%	12%	13%
2031	Upper Peninsula | Total	15%	18%	12%	14%
2032	Upper Peninsula | Total	15%	19%	13%	15%
2033	Upper Peninsula | Total	16%	20%	13%	16%
2034	Upper Peninsula | Total	17%	21%	13%	17%
2035	Upper Peninsula | Total	17%	21%	14%	18%
2036	Upper Peninsula | Total	18%	22%	14%	18%
2037	Upper Peninsula | Total	18%	23%	14%	19%
2038	Upper Peninsula | Total	19%	23%	14%	20%
2039	Upper Peninsula | Total	19%	24%	14%	21%
2040	Upper Peninsula | Total	20%	24%	14%	22%



Upper Peninsula Electricity Incremental Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula | Total	2%	2%	2%	2%
2022	Upper Peninsula | Total	2%	2%	2%	2%
2023	Upper Peninsula | Total	2%	2%	2%	2%
2024	Upper Peninsula | Total	2%	2%	1%	2%
2025	Upper Peninsula | Total	2%	2%	1%	2%
2026	Upper Peninsula | Total	1%	2%	1%	2%
2027	Upper Peninsula | Total	1%	2%	1%	1%
2028	Upper Peninsula | Total	1%	1%	1%	1%
2029	Upper Peninsula | Total	1%	1%	1%	1%
2030	Upper Peninsula | Total	1%	1%	1%	1%
2031	Upper Peninsula | Total	1%	1%	0%	1%
2032	Upper Peninsula | Total	1%	1%	0%	1%
2033	Upper Peninsula | Total	1%	1%	0%	1%
2034	Upper Peninsula | Total	1%	1%	0%	1%
2035	Upper Peninsula | Total	1%	1%	0%	1%
2036	Upper Peninsula | Total	1%	1%	0%	1%
2037	Upper Peninsula | Total	1%	1%	0%	1%
2038	Upper Peninsula | Total	1%	1%	0%	1%
2039	Upper Peninsula | Total	1%	0%	0%	1%
2040	Upper Peninsula | Total	1%	0%	0%	1%



Residential 2021 Electricity Technical Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Thermostats - RET Only - Electric	1,204.5
2	Res - Water Heaters, Heat Pump - ROB and NEW - Electric	1,125.3
3	Res - Heat Pumps, Mini-Split - RET Only - Electric	1,062.8
4	Res - Res HVAC - RET only - Electric	971.3
5	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	704.0
6	Res - LED Bulbs - RET Only - Electric	596.3
7	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric	576.4
8	Res - Home Energy Reports - RET Only - Elec	510.3
9	Res - Power Strips - RET Only - Electric	482.3
10	Res - LED Specialty Bulbs - RET Only - Electric	323.3
11	Res - Heat Pumps, VRF - ROB and NEW - Electric	289.0
12	Res - LED Bulb Exterior - ROB and NEW - Electric	288.7
13	Res - Res Appliance - ROB and NEW - Electric	253.2
14	Res - Lighting Controls - RET Only - Electric	252.1
15	e - Heat Pumps, Mini-Split, Cold Climate - ROB and NEW - Ele	183.7
16	Res - LED Fixtures - RET Only - Electric	167.1
17	Res - LED Tube - RET Only - Electric	151.5
18	Res - Low Flow Aerators - RET Only - Electric	97.2
19	Res - LED Bulb Exterior - RET Only - Electric	95.5
20	Res - Clothes Washers - ROB and NEW - Electric	70.9
21	Res - LED Fixtures Exterior - RET Only - Electric	59.9
22	Res - Res HVAC - NEW only - Electric	8.0
23	Res - Home Energy Reports - NEW Only - Elec	4.2
24	Res - Heat Pumps, Ground Source - NEW Only - Electric	2.5
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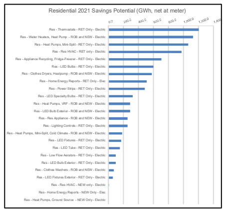
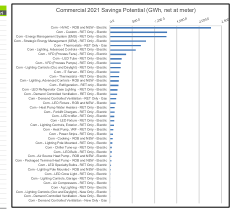


Commercial 2021 Electricity Technical Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
[illegible]	[illegible]	[illegible]



Industrial 2021 Electricity Technical Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Lighting - RET Only - Electric	1,005.1
2	Ind - Custom Electric - RET Only - Electric	875.0
3	nd - Strategic Energy Management (SEM) - RET Only - Elect	551.4
4	Ind - Injection Molding Machines - ROB and NEW - Electric	358.9
5	Ind - Lighting - ROB and NEW - Electric	338.3
6	Ind - Air Compressors Controls - RET Only - Electric	253.9
7	Ind - Pump VFDs - RET Only - Electric	101.0
8	Ind - Process Motors - RET Only - Electric	48.7
9	Ind - Air Compressors - RET Only - Electric	32.1
10	Ind - Fan VFDs - RET Only - Electric	25.6
11	Ind - Refrigeration Optimization - RET Only - Electric	11.0
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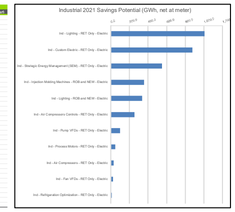
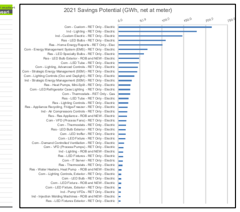


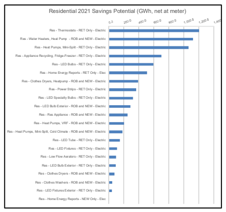
All Sectors 2021 Electricity Cumulative Annual Achievable Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - Custom - RET Only - Electric	213.9
2	Ind - Lighting - RET Only - Electric	179.6
3	Ind - Custom Electric - RET Only - Electric	147.1
4	Res - LED Bulbs - RET Only - Electric	108.7
5	Res - Home Energy Reports - RET Only - Elec	101.7
6	Com - Energy Management System (EMS) - RET Only - Elect	66.9
7	Res - LED Specialty Bulbs - RET Only - Electric	59.0
8	Res - LED Bulb Exterior - ROB and NEW - Electric	48.1
9	Com - LED Tube - RET Only - Electric	47.4
10	Com - Lighting, Advanced Controls - RET Only - Electric	45.0
11	Com - Strategic Energy Management (SEM) - RET Only - Elec	43.9
12	Com - Lighting Controls (Occ and Daylight) - RET Only - Elect	37.4
13	nd - Strategic Energy Management (SEM) - RET Only - Elect	31.3
14	Res - Heat Pumps, Mini-Split - RET Only - Electric	28.6
15	Com - LED Refrigerator Case Lighting - RET Only - Electric	28.0
16	Com - Thermostats - RET Only - Gas	27.8
17	Res - LED Tube - RET Only - Electric	24.3
18	Res - Lighting Controls - RET Only - Electric	23.1
19	Res - Appliance Recycling, Fridge-Freezer - RET Only - Elect	22.1
20	Ind - Air Compressors Controls - RET Only - Electric	21.0
21	Res - Res Appliance - ROB and NEW - Electric	20.5
22	Com - VFD (Process Fans) - RET Only - Electric	19.0
23	Com - Thermostats - RET Only - Electric	18.5
24	Res - LED Bulb Exterior - RET Only - Electric	17.5
25	Com - LED troffer - RET Only - Electric	17.5
26	Com - LED Fixture - RET Only - Electric	17.1
27	Com - Demand Controlled Ventilation - RET Only - Electric	13.7
28	Com - VFD (Process Pumps) - RET Only - Electric	12.7
29	Ind - Lighting - ROB and NEW - Electric	11.7
30	Res - LED Fixtures - RET Only - Electric	11.7
31	Com - IT Server - RET Only - Electric	10.8
32	Res - Thermostats - RET Only - Electric	10.3
33	Res - Water Heaters, Heat Pump - ROB and NEW - Electric	8.4
34	Com - Lighting Controls, Exterior - RET Only - Electric	7.4
35	Com - LED Bulb - RET Only - Electric	7.3
36	Com - LED Fixture - ROB and NEW - Electric	7.1
37	Com - LED Fixture, Exterior - RET Only - Electric	6.9
38	Ind - Pump VFDs - RET Only - Electric	6.4
39	Ind - Injection Molding Machines - ROB and NEW - Electric	5.7
40	Res - LED Fixtures Exterior - RET Only - Electric	5.7



Residential 2021 Electricity Economic Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
[illegible]	[illegible]	[illegible]



Commercial 2021 Electricity Economic Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
[illegible]	[illegible]	[illegible]
25	Com - Lighting Pole Mounted - RET Only - Electric	54.5
26	Com - Chiller Tune-up - RET Only - Electric	43.1
27	Com - LED Bulb - RET Only - Electric	41.1
28	Com - Packaged Terminal Heat Pump - ROB and NEW - Elect	32.6
29	Com - LED Specialty Bulbs - RET Only - Electric	28.0
30	Com - Air Source Heat Pump - ROB and NEW - Electric	18.5
31	Com - Lighting Pole Mounted - ROB and NEW - Electric	18.2
32	Com - LED Grow Light - RET Only - Electric	10.1
33	Com - Lighting Controls, Garage - RET Only - Electric	3.9
34	Com - Air Compressors - RET Only - Electric	1.2
35	Com - Ag Lighting - RET Only - Electric	0.5
36	Com - Lighting Controls (Occ and Daylight) - New Only - Elect	0.3
37	Com - Demand Controlled Ventilation - New Only - Electric	0.3
38	Com - Demand Controlled Ventilation - New Only - Gas	0.2
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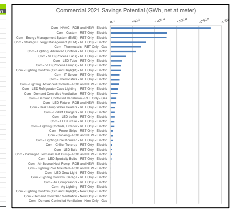

Industrial 2021 Electricity Economic Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Lighting - RET Only - Electric	1,005.1
2	Ind - Custom Electric - RET Only - Electric	875.0
3	nd - Strategic Energy Management (SEM) - RET Only - Elect	551.4
4	Ind - Injection Molding Machines - ROB and NEW - Electric	358.9
5	Ind - Lighting - ROB and NEW - Electric	338.3
6	Ind - Air Compressors Controls - RET Only - Electric	253.9
7	Ind - Pump VFDs - RET Only - Electric	101.0
8	Ind - Process Motors - RET Only - Electric	48.7
9	Ind - Air Compressors - RET Only - Electric	32.1
10	Ind - Fan VFDs - RET Only - Electric	25.6
11	Ind - Refrigeration Optimization - RET Only - Electric	11.0
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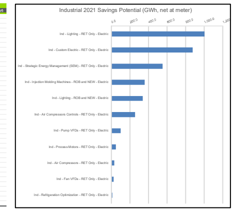
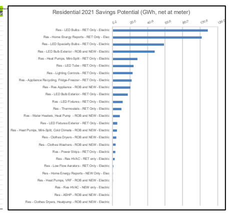


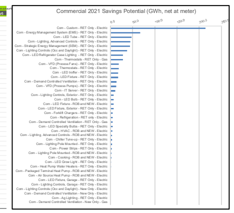
Residential 2021 Electricity Cumulative Annual Achievable Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
[illegible]	[illegible]	[illegible]



Commercial 2021 Electricity Cumulative Annual Achievable Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - Custom - RET Only - Electric	213.9
2	Com - Energy Management System (EMS) - RET Only - Elect	66.9
3	Com - LED Tube - RET Only - Electric	47.4
4	Com - Lighting, Advanced Controls - RET Only - Electric	45.0
5	Com - Strategic Energy Management (SEM) - RET Only - Elec	43.9
6	Com - Lighting Controls (Occ and Daylight) - RET Only - Elect	37.4
7	Com - LED Refrigerator Case Lighting - RET Only - Electric	28.0
8	Com - Thermostats - RET Only - Gas	27.8
9	Com - VFD (Process Fans) - RET Only - Electric	19.0
10	Com - Thermostats - RET Only - Electric	18.5
11	Com - LED troffer - RET Only - Electric	17.5
12	Com - LED Fixture - RET Only - Electric	17.1
13	Com - Demand Controlled Ventilation - RET Only - Electric	13.7
14	Com - VFD (Process Pumps) - RET Only - Electric	12.7
15	Com - IT Server - RET Only - Electric	10.8
16	Com - Lighting Controls, Exterior - RET Only - Electric	7.4
17	Com - LED Bulb - RET Only - Electric	7.3
18	Com - LED Fixture - ROB and NEW - Electric	7.1
19	Com - LED Fixture, Exterior - RET Only - Electric	6.9
20	Com - Forklift Chargers - RET Only - Electric	5.3
21	Com - Refrigeration - RET only - Electric	5.2
22	Com - Demand Controlled Ventilation - RET Only - Gas	5.0
23	Com - LED Specialty Bulbs - RET Only - Electric	5.0
24	Com - HVAC - ROB and NEW - Electric	4.2
25	Com - Lighting, Advanced Controls - ROB and NEW - Electri	4.0
26	Com - Chiller Tune-up - RET Only - Electric	3.9
27	Com - Lighting Pole Mounted - RET Only - Electric	3.9
28	Com - Power Strips - RET Only - Electric	3.2
29	Com - Lighting Pole Mounted - ROB and NEW - Electric	2.1
30	Com - Cooking - ROB and NEW - Electric	2.0
31	Com - LED Grow Light - RET Only - Electric	1.5
32	Com - Heat Pump Water Heaters - RET Only - Electric	1.4
33	Com - Packaged Terminal Heat Pump - ROB and NEW - Elect	1.0
34	Com - Air Source Heat Pump - ROB and NEW - Electric	0.5
35	Com - LED Fixture, Garage - RET Only - Electric	0.3
36	Com - Lighting Controls, Garage - RET Only - Electric	0.2
37	Com - Lighting Controls (Occ and Daylight) - New Only - Elect	0.1
38	Com - Demand Controlled Ventilation - New Only - Electric	0.1
39	Com - Ag Lighting - RET Only - Electric	0.1
40	Com - Demand Controlled Ventilation - New Only - Gas	0.1



Industrial 2021 Electricity Cumulative Annual Achievable Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Lighting - RET Only - Electric	179.6
2	Ind - Custom Electric - RET Only - Electric	147.1
3	nd - Strategic Energy Management (SEM) - RET Only - Elect	31.3
4	Ind - Air Compressors Controls - RET Only - Electric	21.0
5	Ind - Lighting - ROB and NEW - Electric	11.7
6	Ind - Pump VFDs - RET Only - Electric	6.4
7	Ind - Injection Molding Machines - ROB and NEW - Electric	5.7
8	Ind - Fan VFDs - RET Only - Electric	2.0
9	Ind - Process Motors - RET Only - Electric	1.5
10	Ind - Air Compressors - RET Only - Electric	1.5
11	Ind - Refrigeration Optimization - RET Only - Electric	0.5
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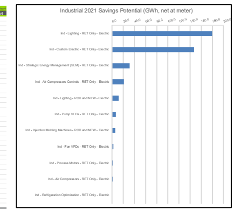

Residential 2021 Electricity Technical Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Water Heaters, Heat Pump - ROB and NEW - Electric	28.8
2	Res - Thermostats - RET Only - Electric	25.9
3	Res - Heat Pumps, VRF - ROB and NEW - Electric	18.4
4	Res - Res HVAC - RET only - Electric	18.0
5	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	15.6
6	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric	12.7
7	Res - LED Bulbs - RET Only - Electric	11.9
8	Res - Power Strips - RET Only - Electric	10.4
9	Res - Home Energy Reports - RET Only - Elec	9.5
10	Res - Heat Pumps, Mini-Split - RET Only - Electric	8.3
11	Res - LED Bulb Exterior - ROB and NEW - Electric	6.4
12	Res - LED Specialty Bulbs - RET Only - Electric	6.1
13	Res - Lighting Controls - RET Only - Electric	5.6
14	Res - Res Appliance - ROB and NEW - Electric	4.7
15	e - Heat Pumps, Mini-Split, Cold Climate - ROB and NEW - Ele	4.0
16	Res - Low Flow Aerators - RET Only - Electric	2.8
17	Res - LED Tube - RET Only - Electric	2.6
18	Res - LED Bulb Exterior - RET Only - Electric	2.1
19	Res - LED Fixtures - RET Only - Electric	2.1
20	Res - Clothes Washers - ROB and NEW - Electric	1.5
21	Res - LED Fixtures Exterior - RET Only - Electric	1.3
22	Res - Heat Pumps, Ground Source - NEW Only - Electric	0.2
23	Res - Res HVAC - NEW only - Electric	0.1
24	Res - Home Energy Reports - NEW Only - Elec	0.1
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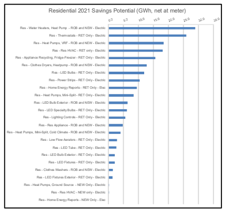
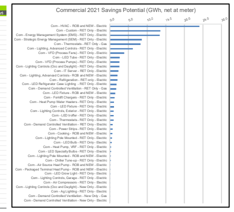


Commercial 2021 Electricity Technical Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
[illegible]	[illegible]	[illegible]



Industrial 2021 Electricity Technical Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Lighting - RET Only - Electric	21.3
2	Ind - Custom Electric - RET Only - Electric	18.5
3	nd - Strategic Energy Management (SEM) - RET Only - Elect	11.7
4	Ind - Injection Molding Machines - ROB and NEW - Electric	7.6
5	Ind - Lighting - ROB and NEW - Electric	7.2
6	Ind - Air Compressors Controls - RET Only - Electric	5.4
7	Ind - Pump VFDs - RET Only - Electric	2.1
8	Ind - Process Motors - RET Only - Electric	1.0
9	Ind - Air Compressors - RET Only - Electric	0.7
10	Ind - Fan VFDs - RET Only - Electric	0.5
11	Ind - Refrigeration Optimization - RET Only - Electric	0.2
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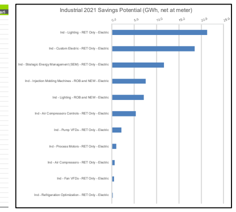
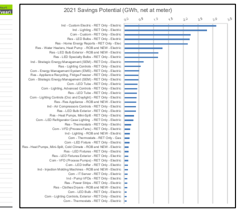


All Sectors 2021 Electricity Cumulative Annual Achievable Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Custom Electric - RET Only - Electric	3.1
2	Ind - Lighting - RET Only - Electric	2.8
3	Com - Custom - RET Only - Electric	2.3
4	Res - LED Bulbs - RET Only - Electric	2.2
5	Res - Home Energy Reports - RET Only - Elec	2.2
6	Res - Water Heaters, Heat Pump - ROB and NEW - Electric	1.3
7	Res - LED Bulb Exterior - ROB and NEW - Electric	1.2
8	Res - LED Specialty Bulbs - RET Only - Electric	1.1
9	Ind - Strategic Energy Management (SEM) - RET Only - Electric	0.7
10	Res - Lighting Controls - RET Only - Electric	0.6
11	Com - Energy Management System (EMS) - RET Only - Electric	0.5
12	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	0.5
13	Com - Strategic Energy Management (SEM) - RET Only - Electric	0.5
14	Com - LED Tube - RET Only - Electric	0.5
15	Com - Lighting, Advanced Controls - RET Only - Electric	0.4
16	Res - LED Tube - RET Only - Electric	0.4
17	Com - Lighting Controls (Occ and Daylight) - RET Only - Electric	0.4
18	Res - Res Appliance - ROB and NEW - Electric	0.4
19	Ind - Air Compressors Controls - RET Only - Electric	0.4
20	Res - LED Bulb Exterior - RET Only - Electric	0.4
21	Res - Heat Pumps, Mini-Split - RET Only - Electric	0.3
22	Com - LED Refrigerator Case Lighting - RET Only - Electric	0.3
23	Res - Thermostats - RET Only - Electric	0.2
24	Com - VFD (Process Fans) - RET Only - Electric	0.2
25	Ind - Lighting - ROB and NEW - Electric	0.2
26	Com - Thermostats - RET Only - Gas	0.2
27	Com - LED Fixture - RET Only - Electric	0.2
28	Res - Heat Pumps, Mini-Split, Cold Climate - ROB and NEW - Electr	0.2
29	Res - LED Fixtures - RET Only - Electric	0.1
30	Res - LED Fixtures Exterior - RET Only - Electric	0.1
31	Com - VFD (Process Pumps) - RET Only - Electric	0.1
32	Com - LED troffer - RET Only - Electric	0.1
33	Ind - Injection Molding Machines - ROB and NEW - Electric	0.1
34	Com - IT Server - RET Only - Electric	0.1
35	Ind - Pump VFDs - RET Only - Electric	0.1
36	Res - Power Strips - RET Only - Electric	0.1
37	Res - Clothes Dryers - ROB and NEW - Electric	0.1
38	Com - LED Bulb - RET Only - Electric	0.1
39	Com - Lighting Controls, Exterior - RET Only - Electric	0.1
40	Com - Thermostats - RET Only - Electric	0.1



Residential 2021 Electricity Economic Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Water Heaters, Heat Pump - ROB and NEW - Electric	28.8
2	Res - Thermostats - RET Only - Electric	25.9
3	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	15.6
4	Res - Heat Pumps, VRF - ROB and NEW - Electric	13.3
5	Res - LED Bulbs - RET Only - Electric	11.9
6	Res - Home Energy Reports - RET Only - Elec	9.5
7	Res - Heat Pumps, Mini-Split - RET Only - Electric	8.3
8	Res - Power Strips - RET Only - Electric	8.0
9	Res - LED Bulb Exterior - ROB and NEW - Electric	6.4
10	Res - LED Specialty Bulbs - RET Only - Electric	6.1
11	Res - Clothes Dryers - ROB and NEW - Electric	5.4
12	Res - Res Appliance - ROB and NEW - Electric	4.7
13	e - Heat Pumps, Mini-Split, Cold Climate - ROB and NEW - Ele	4.0
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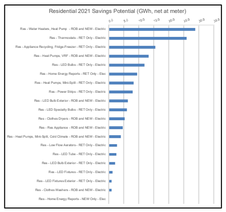

Commercial 2021 Electricity Economic Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
[illegible]	[illegible]	[illegible]
24	Com - Lighting Pole Mounted - RET Only - Electric	0.6
25	Com - LED Bulb - RET Only - Electric	0.5
26	Com - LED Specialty Bulbs - RET Only - Electric	0.3
27	Com - Lighting Pole Mounted - ROB and NEW - Electric	0.2
28	Com - Chiller Tune-up - RET Only - Electric	0.2
29	'om - Packaged Terminal Heat Pump - ROB and NEW - Elect	0.2
30	Com - LED Grow Light - RET Only - Electric	0.1
31	Com - Air Source Heat Pump - ROB and NEW - Electric	0.1
32	Com - Lighting Controls, Garage - RET Only - Electric	0.0
33	Com - Air Compressors - RET Only - Electric	0.0
34	'om - Lighting Controls (Occ and Daylight) - New Only - Elect	0.0
35	Com - Ag Lighting - RET Only - Electric	0.0
36	Com - Demand Controlled Ventilation - New Only - Gas	0.0
37	Com - Demand Controlled Ventilation - New Only - Electric	0.0
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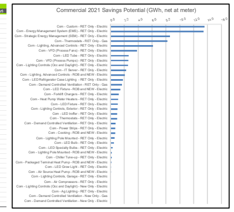

Industrial 2021 Electricity Economic Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Lighting - RET Only - Electric	21.3
2	Ind - Custom Electric - RET Only - Electric	18.5
3	nd - Strategic Energy Management (SEM) - RET Only - Elect	11.7
4	Ind - Injection Molding Machines - ROB and NEW - Electric	7.6
5	Ind - Lighting - ROB and NEW - Electric	7.2
6	Ind - Air Compressors Controls - RET Only - Electric	5.4
7	Ind - Pump VFDs - RET Only - Electric	2.1
8	Ind - Process Motors - RET Only - Electric	1.0
9	Ind - Air Compressors - RET Only - Electric	0.7
10	Ind - Fan VFDs - RET Only - Electric	0.5
11	Ind - Refrigeration Optimization - RET Only - Electric	0.2
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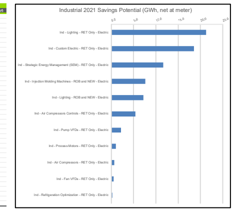
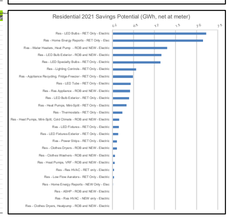


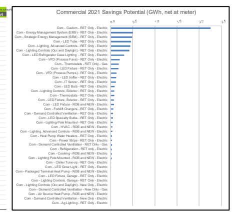
Residential 2021 Electricity Cumulative Annual Achievable Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
[illegible]	[illegible]	[illegible]



Commercial 2021 Electricity Cumulative Annual Achievable Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - Custom - RET Only - Electric	2.3
2	'om - Energy Management System (EMS) - RET Only - Elect	0.5
3	'om - Strategic Energy Management (SEM) - RET Only - Elec	0.5
4	Com - LED Tube - RET Only - Electric	0.5
5	Com - Lighting, Advanced Controls - RET Only - Electric	0.4
6	'om - Lighting Controls (Occ and Daylight) - RET Only - Elect	0.4
7	Com - LED Refrigerator Case Lighting - RET Only - Electric	0.3
8	Com - VFD (Process Fans) - RET Only - Electric	0.2
9	Com - Thermostats - RET Only - Gas	0.2
10	Com - LED Fixture - RET Only - Electric	0.2
11	Com - VFD (Process Pumps) - RET Only - Electric	0.1
12	Com - LED troffer - RET Only - Electric	0.1
13	Com - IT Server - RET Only - Electric	0.1
14	Com - LED Bulb - RET Only - Electric	0.1
15	Com - Lighting Controls, Exterior - RET Only - Electric	0.1
16	Com - Thermostats - RET Only - Electric	0.1
17	Com - LED Fixture, Exterior - RET Only - Electric	0.1
18	Com - LED Fixture - ROB and NEW - Electric	0.1
19	Com - Forklift Chargers - RET Only - Electric	0.1
20	Com - Demand Controlled Ventilation - RET Only - Electric	0.1
21	Com - LED Specialty Bulbs - RET Only - Electric	0.1
22	Com - Lighting Pole Mounted - RET Only - Electric	0.0
23	Com - HVAC - ROB and NEW - Electric	0.0
24	Com - Lighting, Advanced Controls - ROB and NEW - Electri	0.0
25	Com - Heat Pump Water Heaters - RET Only - Electric	0.0
26	Com - Power Strips - RET Only - Electric	0.0
27	Com - Demand Controlled Ventilation - RET Only - Gas	0.0
28	Com - Refrigeration - RET only - Electric	0.0
29	Com - Cooking - ROB and NEW - Electric	0.0
30	Com - Lighting Pole Mounted - ROB and NEW - Electric	0.0
31	Com - Chiller Tune-up - RET Only - Electric	0.0
32	Com - LED Grow Light - RET Only - Electric	0.0
33	'om - Packaged Terminal Heat Pump - ROB and NEW - Elect	0.0
34	Com - LED Fixture, Garage - RET Only - Electric	0.0
35	Com - Lighting Controls, Garage - RET Only - Electric	0.0
36	'om - Lighting Controls (Occ and Daylight) - New Only - Elect	0.0
37	Com - Demand Controlled Ventilation - New Only - Gas	0.0
38	Com - Air Source Heat Pump - ROB and NEW - Electric	0.0
39	Com - Demand Controlled Ventilation - New Only - Electric	0.0
40	Com - Ag Lighting - RET Only - Electric	0.0



Industrial 2021 Electricity Cumulative Annual Achievable Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Custom Electric - RET Only - Electric	3.1
2	Ind - Lighting - RET Only - Electric	2.8
3	nd - Strategic Energy Management (SEM) - RET Only - Elect	0.7
4	Ind - Air Compressors Controls - RET Only - Electric	0.4
5	Ind - Lighting - ROB and NEW - Electric	0.2
6	Ind - Injection Molding Machines - ROB and NEW - Electric	0.1
7	Ind - Pump VFDs - RET Only - Electric	0.1
8	Ind - Fan VFDs - RET Only - Electric	0.0
9	Ind - Air Compressors - RET Only - Electric	0.0
10	Ind - Refrigeration Optimization - RET Only - Electric	0.0
11	Ind - Process Motors - RET Only - Electric	0.0
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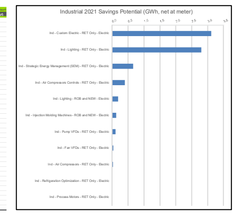
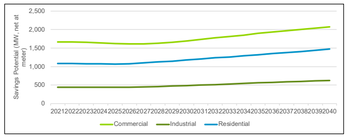


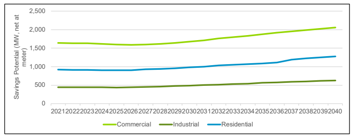
Lower Peninsula Electric Demand Technical Potential by Sector (MW, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	1,669	441	1,084
Lower Peninsula | Total	2022	1,663	441	1,083
Lower Peninsula | Total	2023	1,653	443	1,075
Lower Peninsula | Total	2024	1,639	443	1,074
Lower Peninsula | Total	2025	1,620	440	1,066
Lower Peninsula | Total	2026	1,611	442	1,074
Lower Peninsula | Total	2027	1,619	454	1,100
Lower Peninsula | Total	2028	1,634	464	1,125
Lower Peninsula | Total	2029	1,661	476	1,151
Lower Peninsula | Total	2030	1,694	487	1,179
Lower Peninsula | Total	2031	1,736	502	1,208
Lower Peninsula | Total	2032	1,780	518	1,237
Lower Peninsula | Total	2033	1,816	531	1,263
Lower Peninsula | Total	2034	1,851	544	1,290
Lower Peninsula | Total	2035	1,898	562	1,321
Lower Peninsula | Total	2036	1,934	576	1,354
Lower Peninsula | Total	2037	1,971	589	1,381
Lower Peninsula | Total	2038	2,004	602	1,410
Lower Peninsula | Total	2039	2,036	615	1,439
Lower Peninsula | Total	2040	2,073	630	1,471



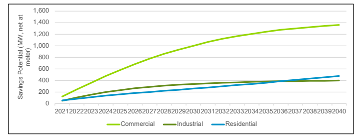
Lower Peninsula Electric Demand Economic Potential by Sector (MW, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	1,643	441	918
Lower Peninsula | Total	2022	1,636	441	916
Lower Peninsula | Total	2023	1,630	443	909
Lower Peninsula | Total	2024	1,617	443	907
Lower Peninsula | Total	2025	1,597	440	901
Lower Peninsula | Total	2026	1,589	442	905
Lower Peninsula | Total	2027	1,597	454	925
Lower Peninsula | Total	2028	1,612	464	942
Lower Peninsula | Total	2029	1,639	476	959
Lower Peninsula | Total	2030	1,672	487	979
Lower Peninsula | Total	2031	1,714	502	998
Lower Peninsula | Total	2032	1,758	518	1,031
Lower Peninsula | Total	2033	1,794	531	1,048
Lower Peninsula | Total	2034	1,829	544	1,068
Lower Peninsula | Total	2035	1,878	562	1,087
Lower Peninsula | Total	2036	1,915	576	1,110
Lower Peninsula | Total	2037	1,951	589	1,194
Lower Peninsula | Total	2038	1,985	602	1,221
Lower Peninsula | Total	2039	2,017	615	1,248
Lower Peninsula | Total	2040	2,054	630	1,276



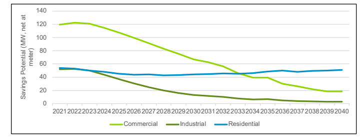
Lower Peninsula Electric Demand Cumulative Annual Achievable Potential by Sector (MW, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	120	52	54
Lower Peninsula | Total	2022	242	105	84
Lower Peninsula | Total	2023	363	154	112
Lower Peninsula | Total	2024	477	198	137
Lower Peninsula | Total	2025	585	235	159
Lower Peninsula | Total	2026	684	266	180
Lower Peninsula | Total	2027	775	290	201
Lower Peninsula | Total	2028	858	310	221
Lower Peninsula | Total	2029	933	326	240
Lower Peninsula | Total	2030	1,001	339	260
Lower Peninsula | Total	2031	1,063	351	280
Lower Peninsula | Total	2032	1,119	361	301
Lower Peninsula | Total	2033	1,166	369	321
Lower Peninsula | Total	2034	1,205	375	341
Lower Peninsula | Total	2035	1,244	382	364
Lower Peninsula | Total	2036	1,274	386	387
Lower Peninsula | Total	2037	1,300	390	409
Lower Peninsula | Total	2038	1,322	394	431
Lower Peninsula | Total	2039	1,341	397	453
Lower Peninsula | Total	2040	1,359	400	477



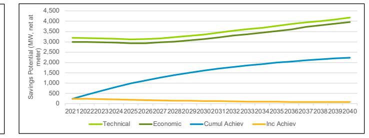
Lower Peninsula Electric Demand Incremental Annual Achievable Potential by Sector (MW, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	120	52	54
Lower Peninsula | Total	2022	122	52	53
Lower Peninsula | Total	2023	121	50	50
Lower Peninsula | Total	2024	115	44	48
Lower Peninsula | Total	2025	107	37	45
Lower Peninsula | Total	2026	99	30	44
Lower Peninsula | Total	2027	91	25	44
Lower Peninsula | Total	2028	83	20	43
Lower Peninsula | Total	2029	75	16	43
Lower Peninsula | Total	2030	67	13	44
Lower Peninsula | Total	2031	62	12	45
Lower Peninsula | Total	2032	56	10	45
Lower Peninsula | Total	2033	46	8	45
Lower Peninsula | Total	2034	39	6	46
Lower Peninsula | Total	2035	39	7	48
Lower Peninsula | Total	2036	30	5	50
Lower Peninsula | Total	2037	26	4	48
Lower Peninsula | Total	2038	22	3	50
Lower Peninsula | Total	2039	19	3	50
Lower Peninsula | Total	2040	19	3	51



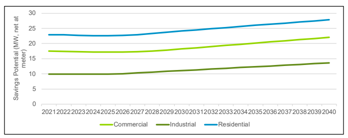
Lower Peninsula Electric Demand Potential (MW, net at meter)

Service Territory	Year	Technical	Economic	Cumul Achiev	Inc Achiev
Lower Peninsula | Total	2021	3,194	3,001	226	226
Lower Peninsula | Total	2022	3,187	2,994	430	227
Lower Peninsula | Total	2023	3,171	2,982	629	221
Lower Peninsula | Total	2024	3,156	2,966	813	206
Lower Peninsula | Total	2025	3,125	2,938	979	189
Lower Peninsula | Total	2026	3,127	2,936	1,130	173
Lower Peninsula | Total	2027	3,172	2,975	1,267	160
Lower Peninsula | Total	2028	3,222	3,017	1,389	146
Lower Peninsula | Total	2029	3,288	3,074	1,500	135
Lower Peninsula | Total	2030	3,360	3,138	1,600	124
Lower Peninsula | Total	2031	3,446	3,214	1,694	119
Lower Peninsula | Total	2032	3,535	3,307	1,781	112
Lower Peninsula | Total	2033	3,610	3,374	1,855	99
Lower Peninsula | Total	2034	3,685	3,442	1,921	92
Lower Peninsula | Total	2035	3,781	3,528	1,990	95
Lower Peninsula | Total	2036	3,864	3,600	2,048	85
Lower Peninsula | Total	2037	3,940	3,734	2,099	78
Lower Peninsula | Total	2038	4,016	3,808	2,147	75
Lower Peninsula | Total	2039	4,091	3,880	2,191	72
Lower Peninsula | Total	2040	4,174	3,960	2,236	73



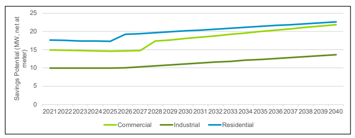
Upper Peninsula Electric Demand Technical Potential by Sector (MW, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	17	10	23
Upper Peninsula | Total	2022	17	10	23
Upper Peninsula | Total	2023	17	10	23
Upper Peninsula | Total	2024	17	10	23
Upper Peninsula | Total	2025	17	10	23
Upper Peninsula | Total	2026	17	10	23
Upper Peninsula | Total	2027	17	10	23
Upper Peninsula | Total	2028	18	11	23
Upper Peninsula | Total	2029	18	11	24
Upper Peninsula | Total	2030	18	11	24
Upper Peninsula | Total	2031	19	11	24
Upper Peninsula | Total	2032	19	12	25
Upper Peninsula | Total	2033	19	12	25
Upper Peninsula | Total	2034	20	12	26
Upper Peninsula | Total	2035	20	12	26
Upper Peninsula | Total	2036	21	13	26
Upper Peninsula | Total	2037	21	13	27
Upper Peninsula | Total	2038	21	13	27
Upper Peninsula | Total	2039	22	13	27
Upper Peninsula | Total	2040	22	14	28



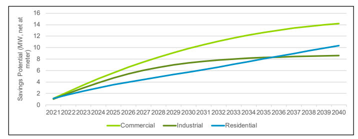
Upper Peninsula Electric Demand Economic Potential by Sector (MW, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	15	10	18
Upper Peninsula | Total	2022	15	10	18
Upper Peninsula | Total	2023	15	10	17
Upper Peninsula | Total	2024	15	10	17
Upper Peninsula | Total	2025	15	10	17
Upper Peninsula | Total	2026	15	10	19
Upper Peninsula | Total	2027	15	10	19
Upper Peninsula | Total	2028	17	11	20
Upper Peninsula | Total	2029	18	11	20
Upper Peninsula | Total	2030	18	11	20
Upper Peninsula | Total	2031	18	11	20
Upper Peninsula | Total	2032	19	12	21
Upper Peninsula | Total	2033	19	12	21
Upper Peninsula | Total	2034	20	12	21
Upper Peninsula | Total	2035	20	12	21
Upper Peninsula | Total	2036	20	13	22
Upper Peninsula | Total	2037	21	13	22
Upper Peninsula | Total	2038	21	13	22
Upper Peninsula | Total	2039	21	13	22
Upper Peninsula | Total	2040	22	14	23



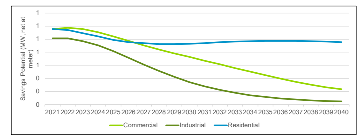
Upper Peninsula Electric Demand Cumulative Annual Achievable Potential by Sector (MW, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	1	1	1
Upper Peninsula | Total	2022	2	2	2
Upper Peninsula | Total	2023	3	3	2
Upper Peninsula | Total	2024	5	4	3
Upper Peninsula | Total	2025	6	5	4
Upper Peninsula | Total	2026	7	5	4
Upper Peninsula | Total	2027	7	6	4
Upper Peninsula | Total	2028	8	7	5
Upper Peninsula | Total	2029	9	7	5
Upper Peninsula | Total	2030	10	7	6
Upper Peninsula | Total	2031	11	8	6
Upper Peninsula | Total	2032	11	8	7
Upper Peninsula | Total	2033	12	8	7
Upper Peninsula | Total	2034	12	8	8
Upper Peninsula | Total	2035	13	8	8
Upper Peninsula | Total	2036	13	8	9
Upper Peninsula | Total	2037	13	8	9
Upper Peninsula | Total	2038	14	9	9
Upper Peninsula | Total	2039	14	9	10
Upper Peninsula | Total	2040	14	9	10



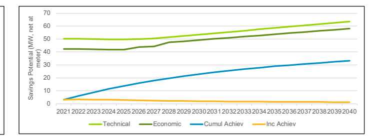
Upper Peninsula Electric Demand Incremental Annual Achievable Potential by Sector (MW, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	1	1	1
Upper Peninsula | Total	2022	1	1	1
Upper Peninsula | Total	2023	1	1	1
Upper Peninsula | Total	2024	1	1	1
Upper Peninsula | Total	2025	1	1	1
Upper Peninsula | Total	2026	1	1	1
Upper Peninsula | Total	2027	1	1	1
Upper Peninsula | Total	2028	1	1	1
Upper Peninsula | Total	2029	1	0	1
Upper Peninsula | Total	2030	1	0	1
Upper Peninsula | Total	2031	1	0	1
Upper Peninsula | Total	2032	1	0	1
Upper Peninsula | Total	2033	1	0	1
Upper Peninsula | Total	2034	1	0	1
Upper Peninsula | Total	2035	0	0	1
Upper Peninsula | Total	2036	0	0	1
Upper Peninsula | Total	2037	0	0	1
Upper Peninsula | Total	2038	0	0	1
Upper Peninsula | Total	2039	0	0	1
Upper Peninsula | Total	2040	0	0	1



Upper Electric Demand Electricity Potential (MW, net at meter)

Service Territory	Year	Technical	Economic	Cumul Achiev	Inc Achiev
Upper Peninsula | Total	2021	50	42	3	3
Upper Peninsula | Total	2022	50	42	6	3
Upper Peninsula | Total	2023	50	42	9	3
Upper Peninsula | Total	2024	50	42	11	3
Upper Peninsula | Total	2025	50	42	14	3
Upper Peninsula | Total	2026	50	44	16	3
Upper Peninsula | Total	2027	51	44	18	2
Upper Peninsula | Total	2028	51	47	20	2
Upper Peninsula | Total	2029	52	48	21	2
Upper Peninsula | Total	2030	53	49	23	2
Upper Peninsula | Total	2031	54	50	24	2
Upper Peninsula | Total	2032	55	51	26	2
Upper Peninsula | Total	2033	56	52	27	2
Upper Peninsula | Total	2034	58	53	28	2
Upper Peninsula | Total	2035	59	54	29	2
Upper Peninsula | Total	2036	60	55	30	1
Upper Peninsula | Total	2037	61	55	31	1
Upper Peninsula | Total	2038	62	56	32	1
Upper Peninsula | Total	2039	62	57	32	1
Upper Peninsula | Total	2040	63	58	33	1



Customer Segment	Service Territory	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Single Family	Lower Peninsula | Total	710	709	704	703	698	703	721	738	756	775	796	815	833	851	872	895	913	933	954	975
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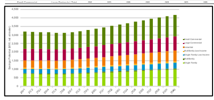
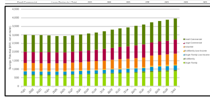
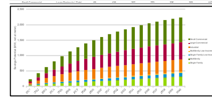
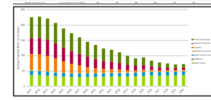
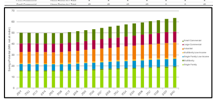
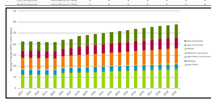


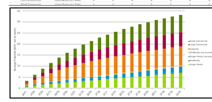


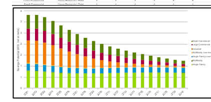


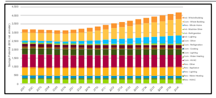


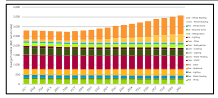


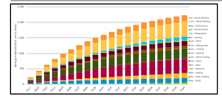


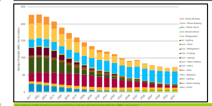


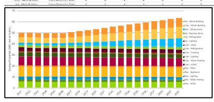


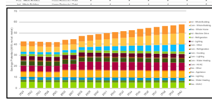


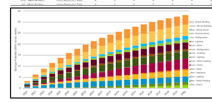


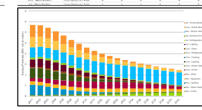






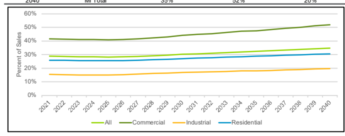






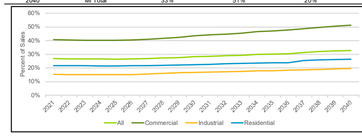
Michigan Total Electric Demand Technical Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	29%	41%	15%	26%
2022	MI Total	29%	41%	15%	26%
2023	MI Total	28%	41%	15%	26%
2024	MI Total	28%	41%	15%	26%
2025	MI Total	28%	41%	15%	26%
2026	MI Total	28%	41%	15%	26%
2027	MI Total	29%	42%	16%	26%
2028	MI Total	29%	42%	16%	26%
2029	MI Total	30%	43%	16%	27%
2030	MI Total	30%	44%	17%	27%
2031	MI Total	31%	45%	17%	27%
2032	MI Total	31%	45%	17%	28%
2033	MI Total	31%	46%	18%	28%
2034	MI Total	32%	47%	18%	28%
2035	MI Total	32%	48%	18%	29%
2036	MI Total	33%	48%	18%	29%
2037	MI Total	33%	49%	19%	30%
2038	MI Total	34%	50%	19%	30%
2039	MI Total	34%	51%	19%	30%
2040	MI Total	35%	52%	20%	31%



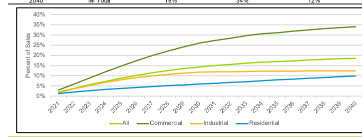
Michigan Total Electric Demand Economic Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	27%	41%	15%	22%
2022	MI Total	27%	41%	15%	22%
2023	MI Total	27%	40%	15%	22%
2024	MI Total	27%	40%	15%	22%
2025	MI Total	27%	40%	15%	22%
2026	MI Total	27%	41%	15%	22%
2027	MI Total	27%	41%	16%	22%
2028	MI Total	27%	42%	16%	22%
2029	MI Total	28%	42%	16%	22%
2030	MI Total	28%	44%	17%	22%
2031	MI Total	29%	44%	17%	23%
2032	MI Total	29%	45%	17%	23%
2033	MI Total	29%	46%	18%	23%
2034	MI Total	30%	47%	18%	24%
2035	MI Total	30%	47%	18%	24%
2036	MI Total	31%	48%	18%	24%
2037	MI Total	31%	49%	19%	26%
2038	MI Total	32%	50%	19%	26%
2039	MI Total	32%	51%	19%	26%
2040	MI Total	33%	51%	20%	26%



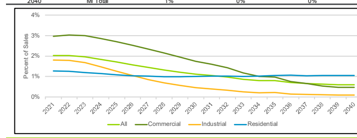
Michigan Total Electric Demand Cumulative Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	2%	3%	2%	1%
2022	MI Total	4%	6%	4%	2%
2023	MI Total	6%	9%	5%	3%
2024	MI Total	7%	12%	7%	3%
2025	MI Total	9%	15%	8%	4%
2026	MI Total	10%	17%	9%	4%
2027	MI Total	11%	20%	10%	5%
2028	MI Total	13%	22%	11%	5%
2029	MI Total	13%	24%	11%	6%
2030	MI Total	14%	26%	12%	6%
2031	MI Total	15%	27%	12%	6%
2032	MI Total	16%	28%	12%	7%
2033	MI Total	16%	30%	12%	7%
2034	MI Total	17%	31%	12%	8%
2035	MI Total	17%	31%	12%	8%
2036	MI Total	17%	32%	12%	8%
2037	MI Total	18%	32%	12%	9%
2038	MI Total	18%	33%	12%	9%
2039	MI Total	18%	34%	12%	10%
2040	MI Total	19%	34%	12%	10%



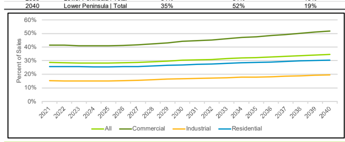
Michigan Total Electric Demand Incremental Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	2%	3%	2%	1%
2022	MI Total	2%	3%	2%	1%
2023	MI Total	2%	3%	2%	1%
2024	MI Total	2%	3%	1%	1%
2025	MI Total	2%	3%	1%	1%
2026	MI Total	2%	3%	1%	1%
2027	MI Total	1%	2%	1%	1%
2028	MI Total	1%	2%	1%	1%
2029	MI Total	1%	2%	1%	1%
2030	MI Total	1%	2%	0%	1%
2031	MI Total	1%	2%	0%	1%
2032	MI Total	1%	1%	0%	1%
2033	MI Total	1%	1%	0%	1%
2034	MI Total	1%	1%	0%	1%
2035	MI Total	1%	1%	0%	1%
2036	MI Total	1%	1%	0%	1%
2037	MI Total	1%	1%	0%	1%
2038	MI Total	1%	1%	0%	1%
2039	MI Total	1%	0%	0%	1%
2040	MI Total	1%	0%	0%	1%



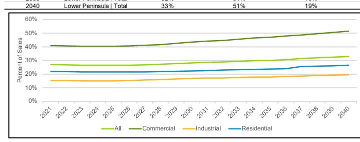
Lower Peninsula Electric Demand Technical Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula | Total	29%	41%	15%	26%
2022	Lower Peninsula | Total	29%	41%	15%	26%
2023	Lower Peninsula | Total	28%	41%	15%	26%
2024	Lower Peninsula | Total	28%	41%	15%	25%
2025	Lower Peninsula | Total	28%	41%	15%	25%
2026	Lower Peninsula | Total	28%	41%	15%	26%
2027	Lower Peninsula | Total	29%	42%	16%	26%
2028	Lower Peninsula | Total	29%	42%	16%	26%
2029	Lower Peninsula | Total	30%	43%	16%	26%
2030	Lower Peninsula | Total	30%	44%	17%	27%
2031	Lower Peninsula | Total	31%	45%	17%	27%
2032	Lower Peninsula | Total	31%	45%	17%	28%
2033	Lower Peninsula | Total	31%	46%	17%	28%
2034	Lower Peninsula | Total	32%	47%	18%	28%
2035	Lower Peninsula | Total	32%	48%	18%	29%
2036	Lower Peninsula | Total	33%	48%	18%	29%
2037	Lower Peninsula | Total	33%	49%	19%	29%
2038	Lower Peninsula | Total	34%	50%	19%	30%
2039	Lower Peninsula | Total	34%	51%	19%	30%
2040	Lower Peninsula | Total	35%	52%	19%	30%



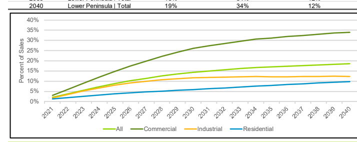
Lower Peninsula Electric Demand Economic Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula | Total	27%	41%	15%	22%
2022	Lower Peninsula | Total	27%	41%	15%	22%
2023	Lower Peninsula | Total	27%	40%	15%	22%
2024	Lower Peninsula | Total	27%	40%	15%	22%
2025	Lower Peninsula | Total	27%	40%	15%	22%
2026	Lower Peninsula | Total	27%	41%	15%	22%
2027	Lower Peninsula | Total	27%	41%	16%	22%
2028	Lower Peninsula | Total	27%	42%	16%	22%
2029	Lower Peninsula | Total	28%	42%	16%	22%
2030	Lower Peninsula | Total	28%	44%	17%	22%
2031	Lower Peninsula | Total	29%	44%	17%	22%
2032	Lower Peninsula | Total	29%	45%	17%	23%
2033	Lower Peninsula | Total	29%	46%	17%	23%
2034	Lower Peninsula | Total	30%	47%	18%	24%
2035	Lower Peninsula | Total	30%	47%	18%	24%
2036	Lower Peninsula | Total	30%	48%	18%	24%
2037	Lower Peninsula | Total	31%	49%	19%	25%
2038	Lower Peninsula | Total	32%	50%	19%	26%
2039	Lower Peninsula | Total	32%	51%	19%	26%
2040	Lower Peninsula | Total	33%	51%	19%	26%



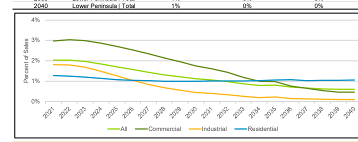
Lower Peninsula Electric Demand Cumulative Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula | Total	2%	3%	2%	1%
2022	Lower Peninsula | Total	4%	6%	4%	2%
2023	Lower Peninsula | Total	6%	9%	5%	3%
2024	Lower Peninsula | Total	7%	12%	7%	3%
2025	Lower Peninsula | Total	9%	15%	8%	4%
2026	Lower Peninsula | Total	10%	17%	9%	4%
2027	Lower Peninsula | Total	11%	20%	10%	5%
2028	Lower Peninsula | Total	13%	22%	11%	5%
2029	Lower Peninsula | Total	14%	24%	11%	6%
2030	Lower Peninsula | Total	14%	26%	12%	6%
2031	Lower Peninsula | Total	15%	27%	12%	6%
2032	Lower Peninsula | Total	16%	28%	12%	7%
2033	Lower Peninsula | Total	16%	30%	12%	7%
2034	Lower Peninsula | Total	17%	31%	12%	8%
2035	Lower Peninsula | Total	17%	31%	12%	8%
2036	Lower Peninsula | Total	17%	32%	12%	8%
2037	Lower Peninsula | Total	18%	32%	12%	9%
2038	Lower Peninsula | Total	18%	33%	12%	9%
2039	Lower Peninsula | Total	18%	34%	12%	9%
2040	Lower Peninsula | Total	19%	34%	12%	10%



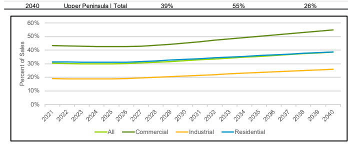
Lower Peninsula Electric Demand Incremental Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula | Total	2%	3%	2%	1%
2022	Lower Peninsula | Total	2%	3%	2%	1%
2023	Lower Peninsula | Total	2%	3%	2%	1%
2024	Lower Peninsula | Total	2%	3%	1%	1%
2025	Lower Peninsula | Total	2%	3%	1%	1%
2026	Lower Peninsula | Total	2%	3%	1%	1%
2027	Lower Peninsula | Total	1%	2%	1%	1%
2028	Lower Peninsula | Total	1%	2%	1%	1%
2029	Lower Peninsula | Total	1%	2%	1%	1%
2030	Lower Peninsula | Total	1%	2%	0%	1%
2031	Lower Peninsula | Total	1%	2%	0%	1%
2032	Lower Peninsula | Total	1%	1%	0%	1%
2033	Lower Peninsula | Total	1%	1%	0%	1%
2034	Lower Peninsula | Total	1%	1%	0%	1%
2035	Lower Peninsula | Total	1%	1%	0%	1%
2036	Lower Peninsula | Total	1%	1%	0%	1%
2037	Lower Peninsula | Total	1%	1%	0%	1%
2038	Lower Peninsula | Total	1%	1%	0%	1%
2039	Lower Peninsula | Total	1%	0%	0%	1%
2040	Lower Peninsula | Total	1%	0%	0%	1%



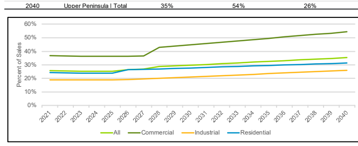
Upper Peninsula Electric Demand Technical Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula | Total	30%	43%	19%	31%
2022	Upper Peninsula | Total	30%	43%	19%	31%
2023	Upper Peninsula | Total	30%	43%	19%	31%
2024	Upper Peninsula | Total	30%	43%	19%	31%
2025	Upper Peninsula | Total	30%	43%	19%	31%
2026	Upper Peninsula | Total	30%	43%	19%	31%
2027	Upper Peninsula | Total	31%	43%	20%	32%
2028	Upper Peninsula | Total	31%	44%	20%	32%
2029	Upper Peninsula | Total	32%	44%	21%	33%
2030	Upper Peninsula | Total	32%	45%	21%	33%
2031	Upper Peninsula | Total	33%	46%	22%	34%
2032	Upper Peninsula | Total	34%	47%	22%	34%
2033	Upper Peninsula | Total	34%	48%	23%	35%
2034	Upper Peninsula | Total	35%	49%	23%	35%
2035	Upper Peninsula | Total	35%	50%	24%	36%
2036	Upper Peninsula | Total	36%	51%	24%	37%
2037	Upper Peninsula | Total	37%	52%	25%	37%
2038	Upper Peninsula | Total	37%	53%	25%	38%
2039	Upper Peninsula | Total	38%	54%	26%	38%
2040	Upper Peninsula | Total	39%	55%	26%	39%



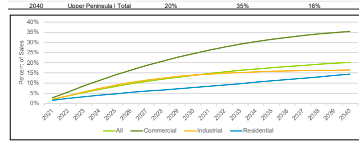
Upper Peninsula Electric Demand Economic Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula | Total	26%	37%	19%	24%
2022	Upper Peninsula | Total	26%	37%	19%	24%
2023	Upper Peninsula | Total	25%	36%	19%	24%
2024	Upper Peninsula | Total	25%	36%	19%	24%
2025	Upper Peninsula | Total	25%	36%	19%	24%
2026	Upper Peninsula | Total	27%	36%	19%	26%
2027	Upper Peninsula | Total	27%	37%	20%	27%
2028	Upper Peninsula | Total	29%	43%	20%	27%
2029	Upper Peninsula | Total	29%	44%	21%	27%
2030	Upper Peninsula | Total	30%	45%	21%	28%
2031	Upper Peninsula | Total	30%	46%	22%	28%
2032	Upper Peninsula | Total	31%	47%	22%	28%
2033	Upper Peninsula | Total	31%	48%	23%	29%
2034	Upper Peninsula | Total	32%	49%	23%	29%
2035	Upper Peninsula | Total	33%	50%	24%	30%
2036	Upper Peninsula | Total	33%	51%	24%	30%
2037	Upper Peninsula | Total	34%	52%	25%	30%
2038	Upper Peninsula | Total	34%	52%	25%	31%
2039	Upper Peninsula | Total	35%	53%	26%	31%
2040	Upper Peninsula | Total	35%	54%	26%	31%



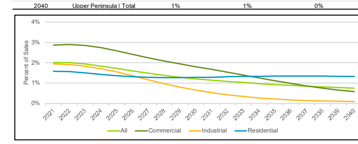
Upper Peninsula Electric Demand Cumulative Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula | Total	2%	3%	2%	2%
2022	Upper Peninsula | Total	4%	6%	4%	2%
2023	Upper Peninsula | Total	5%	9%	6%	3%
2024	Upper Peninsula | Total	7%	11%	7%	4%
2025	Upper Peninsula | Total	8%	14%	9%	5%
2026	Upper Peninsula | Total	10%	16%	10%	5%
2027	Upper Peninsula | Total	11%	19%	11%	6%
2028	Upper Peninsula | Total	12%	21%	12%	7%
2029	Upper Peninsula | Total	13%	23%	13%	7%
2030	Upper Peninsula | Total	14%	24%	14%	8%
2031	Upper Peninsula | Total	15%	26%	14%	9%
2032	Upper Peninsula | Total	15%	28%	15%	9%
2033	Upper Peninsula | Total	16%	29%	15%	10%
2034	Upper Peninsula | Total	17%	30%	16%	10%
2035	Upper Peninsula | Total	18%	31%	16%	11%
2036	Upper Peninsula | Total	18%	32%	16%	12%
2037	Upper Peninsula | Total	19%	33%	16%	12%
2038	Upper Peninsula | Total	19%	34%	16%	13%
2039	Upper Peninsula | Total	20%	35%	16%	14%
2040	Upper Peninsula | Total	20%	35%	16%	14%



Upper Peninsula Electric Demand Incremental Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula | Total	2%	3%	2%	2%
2022	Upper Peninsula | Total	2%	3%	2%	1%
2023	Upper Peninsula | Total	2%	3%	2%	1%
2024	Upper Peninsula | Total	2%	3%	2%	1%
2025	Upper Peninsula | Total	2%	3%	2%	1%
2026	Upper Peninsula | Total	2%	2%	1%	1%
2027	Upper Peninsula | Total	1%	2%	1%	1%
2028	Upper Peninsula | Total	1%	2%	1%	1%
2029	Upper Peninsula | Total	1%	2%	1%	1%
2030	Upper Peninsula | Total	1%	2%	1%	1%
2031	Upper Peninsula | Total	1%	2%	1%	1%
2032	Upper Peninsula | Total	1%	1%	1%	1%
2033	Upper Peninsula | Total	1%	1%	0%	1%
2034	Upper Peninsula | Total	1%	1%	0%	1%
2035	Upper Peninsula | Total	1%	1%	0%	1%
2036	Upper Peninsula | Total	1%	1%	0%	1%
2037	Upper Peninsula | Total	1%	1%	0%	1%
2038	Upper Peninsula | Total	1%	1%	0%	1%
2039	Upper Peninsula | Total	1%	1%	0%	1%
2040	Upper Peninsula | Total	1%	1%	0%	1%



Residential 2021 Electric Demand Technical Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Thermostats - RET Only - Electric	261.5
2	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric	205.8
3	Res - Home Energy Reports - RET Only - Elec	111.2
4	Res - Res HVAC - RET only - Electric	99.1
5	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	81.8
6	Res - LED Bulbs - RET Only - Electric	70.7
7	Res - Power Strips - RET Only - Electric	57.7
8	Res - Water Heaters, Heat Pump - ROB and NEW - Electric	53.3
9	Res - LED Specialty Bulbs - RET Only - Electric	38.3
10	Res - Res Appliance - ROB and NEW - Electric	25.8
11	Res - Low Flow Aerators - RET Only - Electric	24.6
12	Res - LED Fixtures - RET Only - Electric	20.1
13	Res - LED Tube - RET Only - Electric	19.2
14	Res - Clothes Washers - ROB and NEW - Electric	9.4
15	Res - Heat Pumps, VRF - ROB and NEW - Electric	2.9
16	Res - Home Energy Reports - NEW Only - Elec	0.9
17	Res - Res HVAC - NEW only - Electric	0.8
18	Res - Heat Pumps, Ground Source - NEW Only - Electric	0.7
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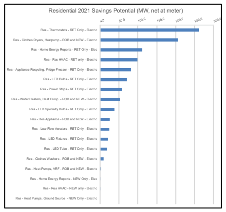
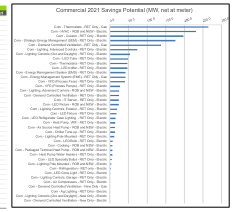


Commercial 2021 Electric Demand Technical Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1–24	[illegible]	[illegible]
25	Com - Lighting Pole Mounted - RET Only - Electric	11.5
26	Com - LED Bulb - RET Only - Electric	7.6
27	Com - Cooking - ROB and NEW - Electric	6.4
28	om - Packaged Terminal Heat Pump - ROB and NEW - Elect	6.2
29	Com - Heat Pump Water Heaters - RET Only - Electric	6.1
30	Com - LED Specialty Bulbs - RET Only - Electric	5.1
31	Com - Lighting Pole Mounted - ROB and NEW - Electric	3.8
32	Com - Refrigeration - RET only - Electric	2.5
33	Com - LED Grow Light - RET Only - Electric	1.5
34	Com - Lighting Controls, Garage - RET Only - Electric	0.8
35	Com - Air Compressors - RET Only - Electric	0.3
36	Com - Demand Controlled Ventilation - New Only - Gas	0.2
37	Com - Ag Lighting - RET Only - Electric	0.1
38	om - Lighting Controls (Occ and Daylight) - New Only - Elect	0.1
39	Com - Demand Controlled Ventilation - New Only - Electric	0.0
40		



Industrial 2021 Electric Demand Technical Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Custom Electric - RET Only - Electric	134.7
2	Ind - Lighting - RET Only - Electric	122.0
3	nd - Strategic Energy Management (SEM) - RET Only - Elect	66.9
4	Ind - Injection Molding Machines - ROB and NEW - Electric	43.6
5	Ind - Lighting - ROB and NEW - Electric	41.1
6	Ind - Pump VFDs - RET Only - Electric	11.3
7	Ind - Process Motors - RET Only - Electric	5.9
8	Ind - Refrigeration Optimization - RET Only - Electric	4.4
9	Ind - Air Compressors - RET Only - Electric	3.9
10	Ind - Air Compressors Controls - RET Only - Electric	3.9
11	Ind - Fan VFDs - RET Only - Electric	2.9
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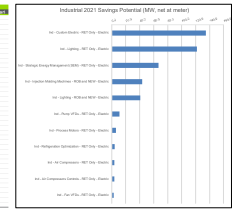
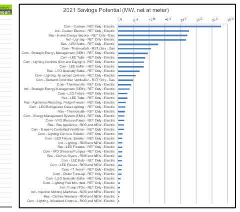


All Sectors 2021 Electric Demand Cumulative Annual Achievable Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - Custom - RET Only - Electric	32.9
2	Ind - Custom Electric - RET Only - Electric	22.7
3	Res - Home Energy Reports - RET Only - Elec	22.2
4	Ind - Lighting - RET Only - Electric	21.8
5	Res - LED Bulbs - RET Only - Electric	12.9
6	Com - Thermostats - RET Only - Gas	10.6
7	Com - Strategic Energy Management (SEM) - RET Only - Electric	9.6
8	Com - LED Tube - RET Only - Electric	8.8
9	Com - Lighting Controls (Occ and Daylight) - RET Only - Electric	8.4
10	Com - LED troffer - RET Only - Electric	8.3
11	Res - LED Specialty Bulbs - RET Only - Electric	7.0
12	Com - Lighting, Advanced Controls - RET Only - Electric	5.7
13	Com - Demand Controlled Ventilation - RET Only - Gas	4.9
14	Com - Thermostats - RET Only - Electric	4.3
15	Ind - Strategic Energy Management (SEM) - RET Only - Electric	3.8
16	Com - LED Fixture - RET Only - Electric	3.1
17	Res - LED Tube - RET Only - Electric	3.1
18	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	2.6
19	Com - LED Refrigerator Case Lighting - RET Only - Electric	2.4
20	Res - Thermostats - RET Only - Electric	2.2
21	Com - Energy Management System (EMS) - RET Only - Electric	2.2
22	Com - VFD (Process Fans) - RET Only - Electric	2.1
23	Res - Res Appliance - ROB and NEW - Electric	2.1
24	Com - Demand Controlled Ventilation - RET Only - Electric	2.1
25	Com - Lighting Controls, Exterior - RET Only - Electric	1.6
26	Com - LED Fixture, Exterior - RET Only - Electric	1.5
27	Ind - Lighting - ROB and NEW - Electric	1.4
28	Res - LED Fixtures - RET Only - Electric	1.4
29	Com - VFD (Process Pumps) - RET Only - Electric	1.4
30	Res - Clothes Dryers - ROB and NEW - Electric	1.4
31	Com - LED Bulb - RET Only - Electric	1.3
32	Com - LED Fixture - ROB and NEW - Electric	1.3
33	Com - IT Server - RET Only - Electric	1.2
34	Com - Chiller Tune-up - RET Only - Electric	1.2
35	Com - LED Specialty Bulbs - RET Only - Electric	0.9
36	Com - Lighting Pole Mounted - RET Only - Electric	0.8
37	Ind - Pump VFDs - RET Only - Electric	0.7
38	Ind - Injection Molding Machines - ROB and NEW - Electric	0.7
39	Res - Clothes Washers - ROB and NEW - Electric	0.5
40	Com - Lighting, Advanced Controls - ROB and NEW - Electric	0.5



Residential 2021 Electric Demand Economic Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Thermostats - RET Only - Electric	261.5
2	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric	139.4
3	Res - Home Energy Reports - RET Only - Elec	111.2
4	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	81.8
5	Res - LED Bulbs - RET Only - Electric	70.7
6	Res - Water Heaters, Heat Pump - ROB and NEW - Electric	53.3
7	Res - Power Strips - RET Only - Electric	43.8
8	Res - LED Specialty Bulbs - RET Only - Electric	38.3
9	Res - Res Appliance - ROB and NEW - Electric	25.8
10	Res - Clothes Dryers - ROB and NEW - Electric	25.1
11	Res - Low Flow Aerators - RET Only - Electric	24.6
12	Res - LED Tube - RET Only - Electric	19.2
13	Res - LED Fixtures - RET Only - Electric	13.4
14	Res - Clothes Washers - ROB and NEW - Electric	6.3
15	Res - Heat Pumps, VRF - ROB and NEW - Electric	2.1
16	Res - Home Energy Reports - NEW Only - Elec	0.9
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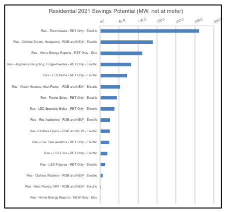

Commercial 2021 Electric Demand Economic Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - Thermostats - RET Only - Gas	264.8
2	Com - HVAC - ROB and NEW - Electric	231.4
3	Com - Custom - RET Only - Electric	197.4
4	om - Strategic Energy Management (SEM) - RET Only - Elec	176.2
5	Com - Demand Controlled Ventilation - RET Only - Gas	137.0
6	Com - Lighting, Advanced Controls - RET Only - Electric	73.6
7	om - Lighting Controls (Occ and Daylight) - RET Only - Elect	53.8
8	Com - LED Tube - RET Only - Electric	49.0
9	Com - Thermostats - RET Only - Electric	47.4
10	Com - LED troffer - RET Only - Electric	46.6
11	om - Energy Management System (EMS) - RET Only - Elect	41.7
12	Com - Energy Management System (EMS) - RET Only - Gas	41.7
13	Com - VFD (Process Fans) - RET Only - Electric	40.2
14	Com - VFD (Process Pumps) - RET Only - Electric	27.1
15	Com - Lighting, Advanced Controls - ROB and NEW - Electri	24.6
16	Com - Demand Controlled Ventilation - RET Only - Electric	24.6
17	Com - IT Server - RET Only - Electric	24.2
18	Com - LED Fixture - ROB and NEW - Electric	23.4
19	Com - Lighting Controls, Exterior - RET Only - Electric	19.6
20	Com - LED Fixture - RET Only - Electric	17.4
21	Com - LED Refrigerator Case Lighting - RET Only - Electric	14.8
22	Com - Chiller Tune-up - RET Only - Electric	13.2
23	Com - Lighting Pole Mounted - RET Only - Electric	11.5
24	Com - LED Bulb - RET Only - Electric	7.6
25	Com - Cooking - ROB and NEW - Electric	6.4
26	om - Packaged Terminal Heat Pump - ROB and NEW - Elect	6.2
27	Com - Heat Pump Water Heaters - RET Only - Electric	6.1
28	Com - LED Specialty Bulbs - RET Only - Electric	5.1
29	Com - Lighting Pole Mounted - ROB and NEW - Electric	3.8
30	Com - Air Source Heat Pump - ROB and NEW - Electric	3.4
31	Com - LED Grow Light - RET Only - Electric	1.5
32	Com - Lighting Controls, Garage - RET Only - Electric	0.8
33	Com - Air Compressors - RET Only - Electric	0.3
34	Com - Demand Controlled Ventilation - New Only - Gas	0.2
35	Com - Ag Lighting - RET Only - Electric	0.1
36	om - Lighting Controls (Occ and Daylight) - New Only - Elect	0.1
37	Com - Demand Controlled Ventilation - New Only - Electric	0.0
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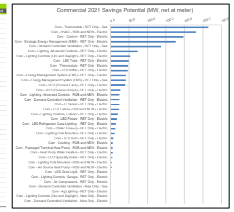

Industrial 2021 Electric Demand Economic Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Custom Electric - RET Only - Electric	134.7
2	Ind - Lighting - RET Only - Electric	122.0
3	nd - Strategic Energy Management (SEM) - RET Only - Elect	66.9
4	Ind - Injection Molding Machines - ROB and NEW - Electric	43.6
5	Ind - Lighting - ROB and NEW - Electric	41.1
6	Ind - Pump VFDs - RET Only - Electric	11.3
7	Ind - Process Motors - RET Only - Electric	5.9
8	Ind - Refrigeration Optimization - RET Only - Electric	4.4
9	Ind - Air Compressors - RET Only - Electric	3.9
10	Ind - Air Compressors Controls - RET Only - Electric	3.9
11	Ind - Fan VFDs - RET Only - Electric	2.9
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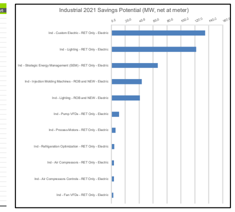

Residential 2021 Electric Demand Cumulative Annual Achievable Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Home Energy Reports - RET Only - Elec	22.2
2	Res - LED Bulbs - RET Only - Electric	12.9
3	Res - LED Specialty Bulbs - RET Only - Electric	7.0
4	Res - LED Tube - RET Only - Electric	3.1
5	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	2.6
6	Res - Thermostats - RET Only - Electric	2.2
7	Res - Res Appliance - ROB and NEW - Electric	2.1
8	Res - LED Fixtures - RET Only - Electric	1.4
9	Res - Clothes Dryers - ROB and NEW - Electric	1.4
10	Res - Clothes Washers - ROB and NEW - Electric	0.5
11	Res - Power Strips - RET Only - Electric	0.4
12	Res - Water Heaters, Heat Pump - ROB and NEW - Electric	0.4
13	Res - Low Flow Aerators - RET Only - Electric	0.3
14	Res - Res HVAC - RET only - Electric	0.3
15	Res - Home Energy Reports - NEW Only - Elec	0.2
16	Res - ASHP - ROB and NEW - Electric	0.0
17	Res - Res HVAC - NEW only - Electric	0.0
18	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric	0.0
19	Res - Heat Pumps, VRF - ROB and NEW - Electric	0.0
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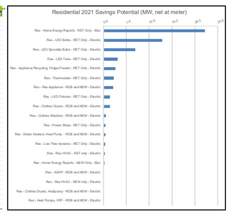
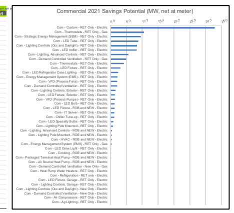


Commercial 2021 Electric Demand Cumulative Annual Achievable Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - Custom - RET Only - Electric	32.9
2	Com - Thermostats - RET Only - Gas	10.6
3	om - Strategic Energy Management (SEM) - RET Only - Elec	9.6
4	Com - LED Tube - RET Only - Electric	8.8
5	om - Lighting Controls (Occ and Daylight) - RET Only - Elect	8.4
6	Com - LED troffer - RET Only - Electric	8.3
7	Com - Lighting, Advanced Controls - RET Only - Electric	5.7
8	Com - Demand Controlled Ventilation - RET Only - Gas	4.9
9	Com - Thermostats - RET Only - Electric	4.3
10	Com - LED Fixture - RET Only - Electric	3.1
11	Com - LED Refrigerator Case Lighting - RET Only - Electric	2.4
12	om - Energy Management System (EMS) - RET Only - Elect	2.2
13	Com - VFD (Process Fans) - RET Only - Electric	2.1
14	Com - Demand Controlled Ventilation - RET Only - Electric	2.1
15	Com - Lighting Controls, Exterior - RET Only - Electric	1.6
16	Com - LED Fixture, Exterior - RET Only - Electric	1.5
17	Com - VFD (Process Pumps) - RET Only - Electric	1.4
18	Com - LED Bulb - RET Only - Electric	1.3
19	Com - LED Fixture - ROB and NEW - Electric	1.3
20	Com - IT Server - RET Only - Electric	1.2
21	Com - Chiller Tune-up - RET Only - Electric	1.2
22	Com - LED Specialty Bulbs - RET Only - Electric	0.9
23	Com - Lighting Pole Mounted - RET Only - Electric	0.8
24	Com - Lighting, Advanced Controls - ROB and NEW - Electri	0.5
25	Com - Lighting Pole Mounted - ROB and NEW - Electric	0.4
26	Com - HVAC - ROB and NEW - Electric	0.4
27	Com - Energy Management System (EMS) - RET Only - Gas	0.4
28	Com - LED Grow Light - RET Only - Electric	0.2
29	Com - Cooking - ROB and NEW - Electric	0.2
30	om - Packaged Terminal Heat Pump - ROB and NEW - Elect	0.2
31	Com - Air Source Heat Pump - ROB and NEW - Electric	0.1
32	Com - Demand Controlled Ventilation - New Only - Gas	0.1
33	Com - Heat Pump Water Heaters - RET Only - Electric	0.1
34	Com - Refrigeration - RET only - Electric	0.1
35	Com - LED Fixture, Garage - RET Only - Electric	0.1
36	Com - Lighting Controls, Garage - RET Only - Electric	0.1
37	om - Lighting Controls (Occ and Daylight) - New Only - Elect	0.0
38	Com - Demand Controlled Ventilation - New Only - Electric	0.0
39	Com - Air Compressors - RET Only - Electric	0.0
40	Com - Ag Lighting - RET Only - Electric	0.0



Industrial 2021 Electric Demand Cumulative Annual Achievable Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Custom Electric - RET Only - Electric	22.7
2	Ind - Lighting - RET Only - Electric	21.8
3	nd - Strategic Energy Management (SEM) - RET Only - Elect	3.8
4	Ind - Lighting - ROB and NEW - Electric	1.4
5	Ind - Pump VFDs - RET Only - Electric	0.7
6	Ind - Injection Molding Machines - ROB and NEW - Electric	0.7
7	Ind - Air Compressors Controls - RET Only - Electric	0.3
8	Ind - Fan VFDs - RET Only - Electric	0.2
9	Ind - Refrigeration Optimization - RET Only - Electric	0.2
10	Ind - Process Motors - RET Only - Electric	0.2
11	Ind - Air Compressors - RET Only - Electric	0.2
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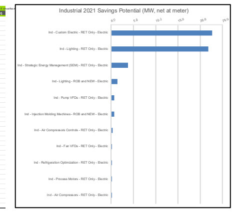
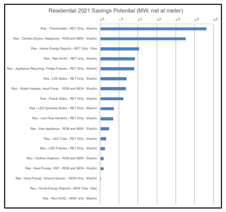


Rank	Measure Name	Potential (cumul. impact/year)
[illegible]	[illegible]	[illegible]



Rank	Measure Name	Potential (cumul. impact/year)
[illegible]	[illegible]	[illegible]
27	Com - Heat Pump Water Heaters - RET Only - Electric	0.1
28	Com - Chiller Tune-up - RET Only - Electric	0.1
29	Com - LED Specialty Bulbs - RET Only - Electric	0.1
30	Com - Lighting Pole Mounted - ROB and NEW - Electric	0.0
31	'om - Packaged Terminal Heat Pump - ROB and NEW - Elect	0.0
32	Com - Refrigeration - RET only - Electric	0.0
33	Com - LED Grow Light - RET Only - Electric	0.0
34	Com - Lighting Controls, Garage - RET Only - Electric	0.0
35	Com - Demand Controlled Ventilation - New Only - Gas	0.0
36	Com - Air Compressors - RET Only - Electric	0.0
37	'om - Lighting Controls (Occ and Daylight) - New Only - Elect	0.0
38	Com - Ag Lighting - RET Only - Electric	0.0
39	Com - Demand Controlled Ventilation - New Only - Electric	0.0
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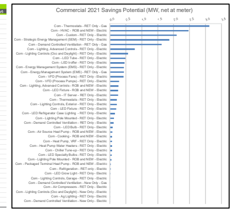
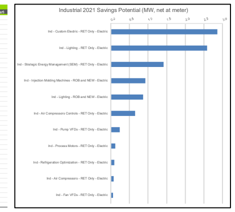
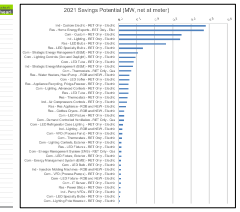


Rank	Measure Name	Potential (cumul. impact/year)
[illegible]	[illegible]	[illegible]

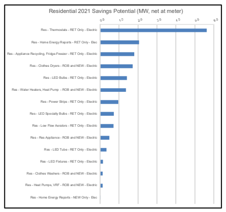


All Sectors 2021 Electric Demand Cumulative Annual Achievable Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Custom Electric - RET Only - Electric	0.5
2	Res - Home Energy Reports - RET Only - Elec	0.5
3	Com - Custom - RET Only - Electric	0.3
4	Ind - Lighting - RET Only - Electric	0.3
5	Res - LED Bulbs - RET Only - Electric	0.3
6	Res - LED Specialty Bulbs - RET Only - Electric	0.1
7	Com - Strategic Energy Management (SEM) - RET Only - Electric	0.1
8	Com - Lighting Controls (Occ and Daylight) - RET Only - Electric	0.1
9	Com - LED Tube - RET Only - Electric	0.1
10	Ind - Strategic Energy Management (SEM) - RET Only - Electric	0.1
11	Com - Thermostats - RET Only - Gas	0.1
12	Res - Water Heaters, Heat Pump - ROB and NEW - Electric	0.1
13	Com - LED troffer - RET Only - Electric	0.1
14	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	0.1
15	Com - Lighting, Advanced Controls - RET Only - Electric	0.1
16	Res - LED Tube - RET Only - Electric	0.1
17	Res - Thermostats - RET Only - Electric	0.1
18	Ind - Air Compressors Controls - RET Only - Electric	0.0
19	Res - Res Appliance - ROB and NEW - Electric	0.0
20	Res - Clothes Dryers - ROB and NEW - Electric	0.0
21	Com - LED Fixture - RET Only - Electric	0.0
22	Com - Demand Controlled Ventilation - RET Only - Gas	0.0
23	Com - LED Refrigerator Case Lighting - RET Only - Electric	0.0
24	Ind - Lighting - ROB and NEW - Electric	0.0
25	Com - VFD (Process Fans) - RET Only - Electric	0.0
26	Com - Thermostats - RET Only - Electric	0.0
27	Com - Lighting Controls, Exterior - RET Only - Electric	0.0
28	Res - LED Fixtures - RET Only - Electric	0.0
29	Com - Energy Management System (EMS) - RET Only - Gas	0.0
30	Com - LED Fixture, Exterior - RET Only - Electric	0.0
31	Com - Energy Management System (EMS) - RET Only - Electric	0.0
32	Com - LED Bulb - RET Only - Electric	0.0
33	Ind - Injection Molding Machines - ROB and NEW - Electric	0.0
34	Com - VFD (Process Pumps) - RET Only - Electric	0.0
35	Com - LED Fixture - ROB and NEW - Electric	0.0
36	Com - IT Server - RET Only - Electric	0.0
37	Res - Power Strips - RET Only - Electric	0.0
38	Ind - Pump VFDs - RET Only - Electric	0.0
39	Com - LED Specialty Bulbs - RET Only - Electric	0.0
40	Com - Lighting Pole Mounted - RET Only - Electric	0.0



Rank	Measure Name	Potential (cumul. impact/year)
[illegible]	[illegible]	[illegible]



Commercial 2021 Electric Demand Economic Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - Thermostats - RET Only - Gas	2.1
2	Com - Custom - RET Only - Electric	2.1
3	'om - Strategic Energy Management (SEM) - RET Only - Elec	1.9
4	Com - Demand Controlled Ventilation - RET Only - Gas	1.6
5	Com - Lighting, Advanced Controls - RET Only - Electric	0.8
6	'om - Lighting Controls (Occ and Daylight) - RET Only - Elect	0.6
7	Com - LED Tube - RET Only - Electric	0.5
8	Com - LED troffer - RET Only - Electric	0.5
9	'om - Energy Management System (EMS) - RET Only - Elect	0.4
10	Com - Energy Management System (EMS) - RET Only - Gas	0.4
11	Com - VFD (Process Fans) - RET Only - Electric	0.4
12	Com - VFD (Process Pumps) - RET Only - Electric	0.3
13	Com - Lighting, Advanced Controls - ROB and NEW - Electri	0.3
14	Com - LED Fixture - ROB and NEW - Electric	0.3
15	Com - IT Server - RET Only - Electric	0.3
16	Com - Thermostats - RET Only - Electric	0.2
17	Com - Lighting Controls, Exterior - RET Only - Electric	0.2
18	Com - LED Fixture - RET Only - Electric	0.2
19	Com - LED Refrigerator Case Lighting - RET Only - Electric	0.2
20	Com - Lighting Pole Mounted - RET Only - Electric	0.1
21	Com - Demand Controlled Ventilation - RET Only - Electric	0.1
22	Com - LED Bulb - RET Only - Electric	0.1
23	Com - Cooking - ROB and NEW - Electric	0.1
24	Com - Heat Pump Water Heaters - RET Only - Electric	0.1
25	Com - Chiller Tune-up - RET Only - Electric	0.1
26	Com - LED Specialty Bulbs - RET Only - Electric	0.1
27	Com - Lighting Pole Mounted - ROB and NEW - Electric	0.0
28	'om - Packaged Terminal Heat Pump - ROB and NEW - Elect	0.0
29	Com - Air Source Heat Pump - ROB and NEW - Electric	0.0
30	Com - LED Grow Light - RET Only - Electric	0.0
31	Com - Lighting Controls, Garage - RET Only - Electric	0.0
32	Com - Demand Controlled Ventilation - New Only - Gas	0.0
33	Com - Air Compressors - RET Only - Electric	0.0
34	'om - Lighting Controls (Occ and Daylight) - New Only - Elect	0.0
35	Com - Ag Lighting - RET Only - Electric	0.0
36	Com - Demand Controlled Ventilation - New Only - Electric	0.0
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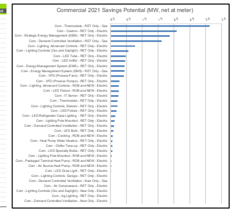

Industrial 2021 Electric Demand Economic Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Custom Electric - RET Only - Electric	2.9
2	Ind - Lighting - RET Only - Electric	2.6
3	nd - Strategic Energy Management (SEM) - RET Only - Elect	1.4
4	Ind - Injection Molding Machines - ROB and NEW - Electric	0.9
5	Ind - Lighting - ROB and NEW - Electric	0.9
6	Ind - Air Compressors Controls - RET Only - Electric	0.7
7	Ind - Pump VFDs - RET Only - Electric	0.2
8	Ind - Process Motors - RET Only - Electric	0.1
9	Ind - Refrigeration Optimization - RET Only - Electric	0.1
10	Ind - Air Compressors - RET Only - Electric	0.1
11	Ind - Fan VFDs - RET Only - Electric	0.1
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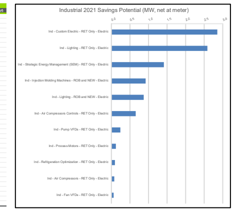
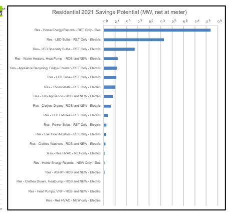
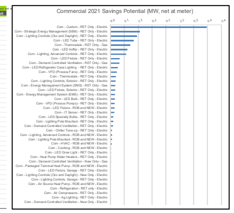


Rank	Measure Name	Potential (cumul. impact/year)
[illegible]	[illegible]	[illegible]



Commercial 2021 Electric Demand Cumulative Annual Achievable Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - Custom - RET Only - Electric	0.3
2	'om - Strategic Energy Management (SEM) - RET Only - Elec	0.1
3	'om - Lighting Controls (Occ and Daylight) - RET Only - Elect	0.1
4	Com - LED Tube - RET Only - Electric	0.1
5	Com - Thermostats - RET Only - Gas	0.1
6	Com - LED troffer - RET Only - Electric	0.1
7	Com - Lighting, Advanced Controls - RET Only - Electric	0.1
8	Com - LED Fixture - RET Only - Electric	0.0
9	Com - Demand Controlled Ventilation - RET Only - Gas	0.0
10	Com - LED Refrigerator Case Lighting - RET Only - Electric	0.0
11	Com - VFD (Process Fans) - RET Only - Electric	0.0
12	Com - Thermostats - RET Only - Electric	0.0
13	Com - Lighting Controls, Exterior - RET Only - Electric	0.0
14	Com - Energy Management System (EMS) - RET Only - Gas	0.0
15	Com - LED Fixture, Exterior - RET Only - Electric	0.0
16	'om - Energy Management System (EMS) - RET Only - Elect	0.0
17	Com - LED Bulb - RET Only - Electric	0.0
18	Com - VFD (Process Pumps) - RET Only - Electric	0.0
19	Com - LED Fixture - ROB and NEW - Electric	0.0
20	Com - IT Server - RET Only - Electric	0.0
21	Com - LED Specialty Bulbs - RET Only - Electric	0.0
22	Com - Lighting Pole Mounted - RET Only - Electric	0.0
23	Com - Demand Controlled Ventilation - RET Only - Electric	0.0
24	Com - Chiller Tune-up - RET Only - Electric	0.0
25	Com - Lighting, Advanced Controls - ROB and NEW - Electri	0.0
26	Com - Lighting Pole Mounted - ROB and NEW - Electric	0.0
27	Com - HVAC - ROB and NEW - Electric	0.0
28	Com - Cooking - ROB and NEW - Electric	0.0
29	Com - LED Grow Light - RET Only - Electric	0.0
30	Com - Heat Pump Water Heaters - RET Only - Electric	0.0
31	Com - Demand Controlled Ventilation - New Only - Gas	0.0
32	'om - Packaged Terminal Heat Pump - ROB and NEW - Elect	0.0
33	Com - LED Fixture, Garage - RET Only - Electric	0.0
34	'om - Lighting Controls (Occ and Daylight) - New Only - Elect	0.0
35	Com - Lighting Controls, Garage - RET Only - Electric	0.0
36	Com - Air Source Heat Pump - ROB and NEW - Electric	0.0
37	Com - Refrigeration - RET only - Electric	0.0
38	Com - Air Compressors - RET Only - Electric	0.0
39	Com - Ag Lighting - RET Only - Electric	0.0
40	Com - Demand Controlled Ventilation - New Only - Electric	0.0



Industrial 2021 Electric Demand Cumulative Annual Achievable Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Custom Electric - RET Only - Electric	0.5
2	Ind - Lighting - RET Only - Electric	0.3
3	nd - Strategic Energy Management (SEM) - RET Only - Elect	0.1
4	Ind - Air Compressors Controls - RET Only - Electric	0.0
5	Ind - Lighting - ROB and NEW - Electric	0.0
6	Ind - Injection Molding Machines - ROB and NEW - Electric	0.0
7	Ind - Pump VFDs - RET Only - Electric	0.0
8	Ind - Fan VFDs - RET Only - Electric	0.0
9	Ind - Air Compressors - RET Only - Electric	0.0
10	Ind - Refrigeration Optimization - RET Only - Electric	0.0
11	Ind - Process Motors - RET Only - Electric	0.0
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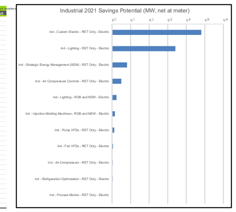
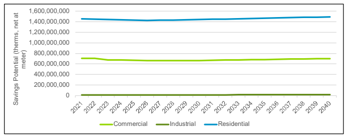


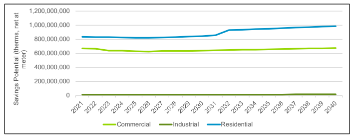
Lower Peninsula Natural Gas Technical Potential by Sector (therms, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	707,602,443	16,147,592	1,454,194,527
Lower Peninsula | Total	2022	704,709,296	16,078,157	1,448,481,133
Lower Peninsula | Total	2023	676,863,841	15,919,536	1,442,245,657
Lower Peninsula | Total	2024	673,393,299	15,815,904	1,436,326,420
Lower Peninsula | Total	2025	667,471,235	15,691,186	1,426,083,410
Lower Peninsula | Total	2026	663,019,410	15,703,208	1,423,703,492
Lower Peninsula | Total	2027	661,772,039	15,856,857	1,426,754,505
Lower Peninsula | Total	2028	661,374,766	16,009,724	1,430,979,017
Lower Peninsula | Total	2029	663,071,113	16,161,899	1,435,437,846
Lower Peninsula | Total	2030	665,249,490	16,313,471	1,440,356,743
Lower Peninsula | Total	2031	669,468,753	16,464,528	1,445,480,746
Lower Peninsula | Total	2032	674,096,460	16,615,156	1,450,521,195
Lower Peninsula | Total	2033	677,284,754	16,765,443	1,454,968,545
Lower Peninsula | Total	2034	680,193,846	16,915,474	1,459,630,479
Lower Peninsula | Total	2035	685,224,788	17,065,335	1,464,974,810
Lower Peninsula | Total	2036	688,505,784	17,215,112	1,470,776,942
Lower Peninsula | Total	2037	691,887,353	17,364,889	1,475,364,534
Lower Peninsula | Total	2038	694,882,701	17,514,751	1,480,428,163
Lower Peninsula | Total	2039	697,796,044	17,664,782	1,485,518,376
Lower Peninsula | Total	2040	701,388,535	17,815,066	1,490,927,780



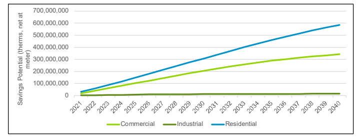
Lower Peninsula Natural Gas Economic Potential by Sector (therms, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	670,109,030	16,147,592	834,418,721
Lower Peninsula | Total	2022	667,403,350	16,078,157	831,574,886
Lower Peninsula | Total	2023	640,134,451	15,919,536	828,409,836
Lower Peninsula | Total	2024	636,965,374	15,815,904	825,354,705
Lower Peninsula | Total	2025	631,475,287	15,691,186	819,558,334
Lower Peninsula | Total	2026	627,412,637	15,703,208	819,954,130
Lower Peninsula | Total	2027	635,206,988	15,856,857	825,278,166
Lower Peninsula | Total	2028	634,982,781	16,009,724	832,189,013
Lower Peninsula | Total	2029	636,810,726	16,161,899	839,271,865
Lower Peninsula | Total	2030	639,135,600	16,313,471	846,703,498
Lower Peninsula | Total	2031	643,485,069	16,464,528	857,067,798
Lower Peninsula | Total	2032	648,242,332	16,615,156	929,642,614
Lower Peninsula | Total	2033	651,559,533	16,765,443	936,334,314
Lower Peninsula | Total	2034	654,596,889	16,915,474	943,185,377
Lower Peninsula | Total	2035	659,755,453	17,065,335	950,561,859
Lower Peninsula | Total	2036	663,163,432	17,215,112	958,288,382
Lower Peninsula | Total	2037	666,671,351	17,364,889	965,057,116
Lower Peninsula | Total	2038	669,792,416	17,514,751	972,190,534
Lower Peninsula | Total	2039	672,830,847	17,664,782	979,337,337
Lower Peninsula | Total	2040	676,547,802	17,815,066	986,726,631



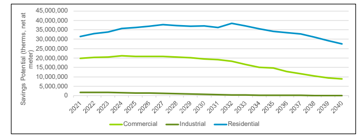
Lower Peninsula Natural Gas Cumulative Annual Achievable Potential by Sector (therms, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	19,886,026	1,716,965	31,510,817
Lower Peninsula | Total	2022	40,189,525	3,422,316	59,150,614
Lower Peninsula | Total	2023	60,770,197	5,078,801	87,748,223
Lower Peninsula | Total	2024	81,962,944	6,647,379	118,136,926
Lower Peninsula | Total	2025	102,820,888	8,099,061	148,835,485
Lower Peninsula | Total	2026	123,676,046	9,413,916	180,259,505
Lower Peninsula | Total	2027	144,462,100	10,576,632	212,473,267
Lower Peninsula | Total	2028	165,038,867	11,577,218	244,097,310
Lower Peninsula | Total	2029	185,302,563	12,414,597	275,353,852
Lower Peninsula | Total	2030	204,786,220	13,096,794	306,780,335
Lower Peninsula | Total	2031	224,022,345	13,639,349	337,282,698
Lower Peninsula | Total	2032	242,333,787	14,062,406	370,072,836
Lower Peninsula | Total	2033	258,880,205	14,387,546	401,352,273
Lower Peninsula | Total	2034	274,026,356	14,635,264	431,175,623
Lower Peninsula | Total	2035	288,721,666	14,823,457	459,547,721
Lower Peninsula | Total	2036	301,497,938	14,966,840	487,120,599
Lower Peninsula | Total	2037	313,156,300	15,076,993	513,931,111
Lower Peninsula | Total	2038	323,605,760	15,162,750	538,982,560
Lower Peninsula | Total	2039	333,072,279	15,230,698	562,168,253
Lower Peninsula | Total	2040	341,975,752	15,285,937	583,639,771



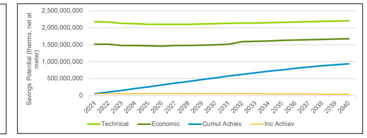
Lower Peninsula Natural Gas Incremental Annual Achievable Potential by Sector (therms, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	19,886,026	1,716,965	31,510,817
Lower Peninsula | Total	2022	20,303,499	1,705,351	32,907,374
Lower Peninsula | Total	2023	20,580,672	1,656,485	33,915,426
Lower Peninsula | Total	2024	21,192,747	1,568,578	35,800,245
Lower Peninsula | Total	2025	20,857,944	1,451,682	36,144,189
Lower Peninsula | Total	2026	20,855,158	1,314,855	36,875,031
Lower Peninsula | Total	2027	20,786,054	1,162,716	37,706,091
Lower Peninsula | Total	2028	20,576,767	1,000,586	37,160,679
Lower Peninsula | Total	2029	20,263,697	837,379	36,837,593
Lower Peninsula | Total	2030	19,483,657	682,198	37,051,790
Lower Peninsula | Total	2031	19,236,125	542,555	36,172,037
Lower Peninsula | Total	2032	18,311,442	423,057	38,504,206
Lower Peninsula | Total	2033	16,546,418	325,140	37,037,925
Lower Peninsula | Total	2034	15,146,151	247,718	35,626,291
Lower Peninsula | Total	2035	14,695,310	188,193	34,219,521
Lower Peninsula | Total	2036	12,776,272	143,383	33,464,822
Lower Peninsula | Total	2037	11,658,362	110,153	32,747,013
Lower Peninsula | Total	2038	10,449,460	85,757	31,032,549
Lower Peninsula | Total	2039	9,466,519	67,948	29,211,437
Lower Peninsula | Total	2040	8,903,473	55,239	27,541,950



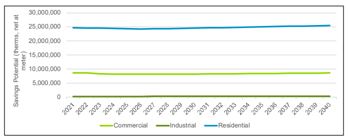
Lower Peninsula Natural Gas Potential (therms, net at meter)

Service Territory	Year	Technical	Economic	Cumul Achiev	Inc Achiev
Lower Peninsula | Total	2021	2,177,944,562	1,520,675,343	53,113,808	53,113,808
Lower Peninsula | Total	2022	2,169,268,586	1,515,056,394	102,762,455	54,916,224
Lower Peninsula | Total	2023	2,135,029,034	1,484,463,822	153,597,221	56,152,583
Lower Peninsula | Total	2024	2,125,535,623	1,478,135,983	206,747,249	58,561,570
Lower Peninsula | Total	2025	2,109,245,831	1,466,724,807	259,755,434	58,453,815
Lower Peninsula | Total	2026	2,102,426,111	1,463,069,975	313,349,468	59,045,044
Lower Peninsula | Total	2027	2,104,383,400	1,476,342,011	367,511,999	59,654,861
Lower Peninsula | Total	2028	2,108,363,507	1,483,181,518	420,713,395	58,738,032
Lower Peninsula | Total	2029	2,114,670,858	1,492,244,490	473,071,012	57,938,579
Lower Peninsula | Total	2030	2,121,919,704	1,502,152,569	524,663,350	57,217,645
Lower Peninsula | Total	2031	2,131,414,026	1,517,017,395	574,944,392	55,950,717
Lower Peninsula | Total	2032	2,141,232,812	1,594,500,102	626,469,029	57,238,705
Lower Peninsula | Total	2033	2,149,018,742	1,604,659,290	674,620,024	53,909,483
Lower Peninsula | Total	2034	2,156,739,799	1,614,697,740	719,837,243	51,020,160
Lower Peninsula | Total	2035	2,167,264,934	1,627,382,647	763,092,844	49,103,024
Lower Peninsula | Total	2036	2,176,497,838	1,638,666,927	803,585,377	46,384,477
Lower Peninsula | Total	2037	2,184,616,776	1,649,093,355	842,164,403	44,515,528
Lower Peninsula | Total	2038	2,192,825,614	1,659,497,700	877,751,070	41,567,767
Lower Peninsula | Total	2039	2,200,979,201	1,669,832,966	910,471,230	38,745,904
Lower Peninsula | Total	2040	2,210,131,382	1,681,089,499	940,901,460	36,500,662



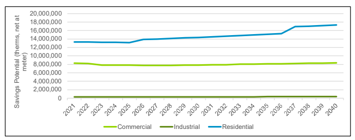
Upper Peninsula Natural Gas Technical Potential by Sector (therms, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	8,683,933	289,381	24,716,959
Upper Peninsula | Total	2022	8,645,733	289,381	24,624,973
Upper Peninsula | Total	2023	8,277,701	289,381	24,544,049
Upper Peninsula | Total	2024	8,258,304	289,381	24,437,952
Upper Peninsula | Total	2025	8,217,275	289,381	24,322,665
Upper Peninsula | Total	2026	8,188,589	291,773	24,284,854
Upper Peninsula | Total	2027	8,181,634	296,570	24,316,749
Upper Peninsula | Total	2028	8,186,791	301,389	24,405,176
Upper Peninsula | Total	2029	8,206,627	306,230	24,494,880
Upper Peninsula | Total	2030	8,240,902	311,096	24,585,707
Upper Peninsula | Total	2031	8,275,864	315,987	24,677,743
Upper Peninsula | Total	2032	8,311,545	320,905	24,770,539
Upper Peninsula | Total	2033	8,347,950	325,851	24,864,167
Upper Peninsula | Total	2034	8,385,022	330,827	24,958,454
Upper Peninsula | Total	2035	8,422,703	335,834	25,053,468
Upper Peninsula | Total	2036	8,461,009	340,873	25,149,118
Upper Peninsula | Total	2037	8,499,968	345,946	25,245,615
Upper Peninsula | Total	2038	8,539,678	351,054	25,342,705
Upper Peninsula | Total	2039	8,580,211	356,199	25,440,581
Upper Peninsula | Total	2040	8,621,622	361,381	25,539,823



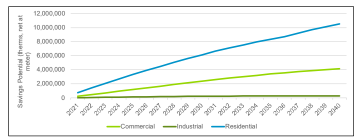
Upper Peninsula Natural Gas Economic Potential by Sector (therms, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	8,235,023	289,381	13,305,063
Upper Peninsula | Total	2022	8,199,068	289,381	13,259,839
Upper Peninsula | Total	2023	7,838,357	289,381	13,230,410
Upper Peninsula | Total	2024	7,820,736	289,381	13,175,731
Upper Peninsula | Total	2025	7,781,493	289,381	13,111,615
Upper Peninsula | Total	2026	7,754,547	291,773	13,883,894
Upper Peninsula | Total	2027	7,749,047	296,570	13,964,631
Upper Peninsula | Total	2028	7,755,877	301,389	14,102,890
Upper Peninsula | Total	2029	7,777,385	306,230	14,242,100
Upper Peninsula | Total	2030	7,813,317	311,096	14,382,125
Upper Peninsula | Total	2031	7,849,913	315,987	14,523,038
Upper Peninsula | Total	2032	7,887,203	320,905	14,664,509
Upper Peninsula | Total	2033	8,030,064	325,851	14,806,572
Upper Peninsula | Total	2034	8,068,702	330,827	14,949,129
Upper Peninsula | Total	2035	8,107,940	335,834	15,092,207
Upper Peninsula | Total	2036	8,147,797	340,873	15,235,769
Upper Peninsula | Total	2037	8,188,297	345,946	16,899,869
Upper Peninsula | Total	2038	8,229,541	351,054	17,036,909
Upper Peninsula | Total	2039	8,271,602	356,199	17,174,583
Upper Peninsula | Total	2040	8,314,532	361,381	17,313,381



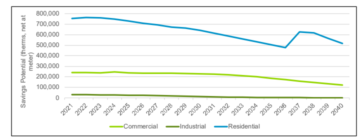
Upper Peninsula Natural Gas Cumulative Annual Achievable Potential by Sector (therms, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	241,446	30,652	752,707
Upper Peninsula | Total	2022	482,293	61,337	1,409,835
Upper Peninsula | Total	2023	720,727	91,276	2,063,319
Upper Peninsula | Total	2024	966,198	119,797	2,701,089
Upper Peninsula | Total	2025	1,202,357	146,354	3,318,641
Upper Peninsula | Total	2026	1,437,539	170,560	3,917,478
Upper Peninsula | Total	2027	1,672,987	192,135	4,498,619
Upper Peninsula | Total	2028	1,906,480	210,880	5,058,858
Upper Peninsula | Total	2029	2,138,326	226,749	5,608,145
Upper Peninsula | Total	2030	2,367,814	239,853	6,133,077
Upper Peninsula | Total	2031	2,593,257	250,438	6,631,538
Upper Peninsula | Total	2032	2,812,394	258,838	7,101,883
Upper Peninsula | Total	2033	3,022,871	265,423	7,543,286
Upper Peninsula | Total	2034	3,222,515	270,554	7,955,527
Upper Peninsula | Total	2035	3,409,618	274,552	8,339,042
Upper Peninsula | Total	2036	3,583,134	277,688	8,694,730
Upper Peninsula | Total	2037	3,742,700	280,180	9,197,885
Upper Peninsula | Total	2038	3,888,604	282,198	9,690,288
Upper Peninsula | Total	2039	4,021,616	283,870	10,130,536
Upper Peninsula | Total	2040	4,142,828	285,294	10,518,897



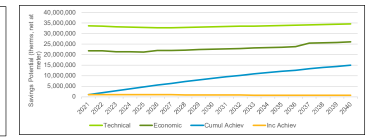
Upper Peninsula Natural Gas Incremental Annual Achievable Potential by Sector (therms, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	241,446	30,652	752,707
Upper Peninsula | Total	2022	240,847	30,685	761,821
Upper Peninsula | Total	2023	238,434	29,939	759,436
Upper Peninsula | Total	2024	245,471	28,521	746,950
Upper Peninsula | Total	2025	236,160	26,557	727,416
Upper Peninsula | Total	2026	235,181	24,206	708,702
Upper Peninsula | Total	2027	235,448	21,575	692,199
Upper Peninsula | Total	2028	233,494	18,745	672,539
Upper Peninsula | Total	2029	231,846	15,869	662,828
Upper Peninsula | Total	2030	229,488	13,104	639,720
Upper Peninsula | Total	2031	225,443	10,585	614,497
Upper Peninsula | Total	2032	219,137	8,400	587,633
Upper Peninsula | Total	2033	210,477	6,585	559,944
Upper Peninsula | Total	2034	199,645	5,130	532,039
Upper Peninsula | Total	2035	187,103	3,998	504,573
Upper Peninsula | Total	2036	173,516	3,136	478,010
Upper Peninsula | Total	2037	159,566	2,492	626,743
Upper Peninsula | Total	2038	145,905	2,018	617,260
Upper Peninsula | Total	2039	133,012	1,672	566,377
Upper Peninsula | Total	2040	121,211	1,423	515,767

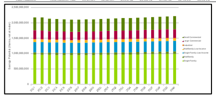


Upper Peninsula Natural Gas Potential (therms, net at meter)

Service Territory	Year	Technical	Economic	Cumul Achiev	Inc Achiev
Upper Peninsula | Total	2021	33,690,274	21,829,467	1,024,805	1,024,805
Upper Peninsula | Total	2022	33,560,087	21,748,287	1,953,465	1,033,354
Upper Peninsula | Total	2023	33,111,132	21,358,148	2,875,322	1,027,809
Upper Peninsula | Total	2024	32,985,637	21,285,848	3,787,084	1,020,942
Upper Peninsula | Total	2025	32,829,321	21,182,489	4,667,352	990,133
Upper Peninsula | Total	2026	32,765,216	21,930,214	5,525,577	968,090
Upper Peninsula | Total	2027	32,794,953	22,010,248	6,363,740	949,221
Upper Peninsula | Total	2028	32,893,356	22,160,156	7,176,218	924,777
Upper Peninsula | Total	2029	33,007,737	22,325,715	7,973,219	910,543
Upper Peninsula | Total	2030	33,137,705	22,506,538	8,740,743	882,312
Upper Peninsula | Total	2031	33,269,594	22,688,938	9,475,233	850,526
Upper Peninsula | Total	2032	33,402,989	22,872,617	10,173,115	815,170
Upper Peninsula | Total	2033	33,537,968	23,162,488	10,831,580	777,006
Upper Peninsula | Total	2034	33,674,303	23,348,658	11,448,596	736,814
Upper Peninsula | Total	2035	33,812,004	23,535,982	12,023,212	695,674
Upper Peninsula | Total	2036	33,951,000	23,724,439	12,555,552	654,662
Upper Peninsula | Total	2037	34,091,529	25,434,113	13,220,765	788,801
Upper Peninsula | Total	2038	34,233,436	25,617,505	13,861,091	765,183
Upper Peninsula | Total	2039	34,376,991	25,802,384	14,436,022	701,062
Upper Peninsula | Total	2040	34,522,827	25,989,294	14,947,018	638,402



Customer Segment	Service Territory	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Single Family	Lower Peninsula | Total	963,258,756	959,541,491	955,505,570	951,634,004	944,867,686	943,415,056	945,682,350	948,717,991	951,931,984	955,457,525	959,121,858	962,738,506	965,932,287	969,381,110	973,092,370	977,213,746	980,510,396	984,139,525	987,766,134	991,618,817
Multifamily	Lower Peninsula | Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Multifamily Low-Income	Lower Peninsula | Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Small Commercial	Lower Peninsula | Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]



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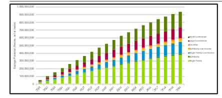
[illegible]	[illegible]	[illegible]



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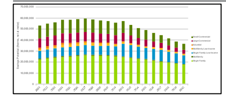

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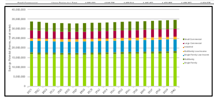

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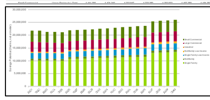
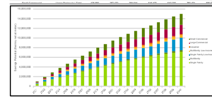


[illegible]	[illegible]	[illegible]



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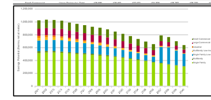
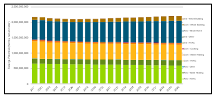
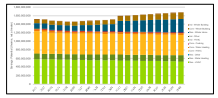
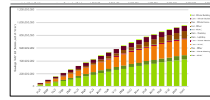
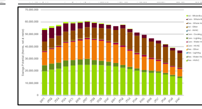
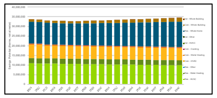


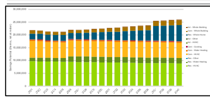


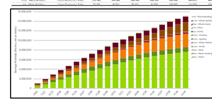


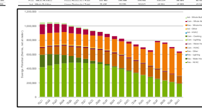






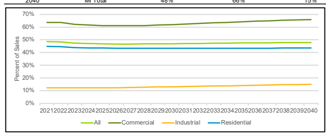






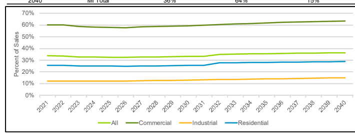
Michigan Total Natural Gas Technical Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	49%	64%	12%	45%
2022	MI Total	48%	64%	12%	45%
2023	MI Total	47%	62%	12%	44%
2024	MI Total	47%	62%	12%	44%
2025	MI Total	47%	61%	12%	43%
2026	MI Total	47%	61%	12%	43%
2027	MI Total	47%	61%	12%	43%
2028	MI Total	47%	61%	13%	43%
2029	MI Total	47%	62%	13%	43%
2030	MI Total	47%	62%	13%	43%
2031	MI Total	47%	62%	13%	43%
2032	MI Total	47%	63%	13%	43%
2033	MI Total	47%	63%	14%	43%
2034	MI Total	47%	64%	14%	43%
2035	MI Total	47%	64%	14%	43%
2036	MI Total	48%	65%	14%	43%
2037	MI Total	48%	65%	14%	43%
2038	MI Total	48%	65%	15%	43%
2039	MI Total	48%	66%	15%	43%
2040	MI Total	48%	66%	15%	44%



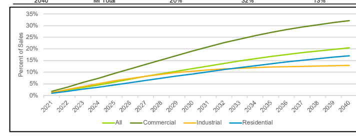
Michigan Total Natural Gas Economic Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	34%	60%	12%	26%
2022	MI Total	34%	60%	12%	26%
2023	MI Total	33%	59%	12%	25%
2024	MI Total	33%	58%	12%	25%
2025	MI Total	33%	58%	12%	25%
2026	MI Total	32%	58%	12%	25%
2027	MI Total	33%	59%	12%	25%
2028	MI Total	33%	59%	13%	25%
2029	MI Total	33%	59%	13%	25%
2030	MI Total	33%	59%	13%	25%
2031	MI Total	33%	60%	13%	26%
2032	MI Total	35%	61%	13%	28%
2033	MI Total	35%	61%	14%	28%
2034	MI Total	35%	61%	14%	28%
2035	MI Total	36%	62%	14%	28%
2036	MI Total	36%	62%	14%	28%
2037	MI Total	36%	63%	14%	28%
2038	MI Total	36%	63%	15%	29%
2039	MI Total	36%	63%	15%	29%
2040	MI Total	36%	64%	15%	29%



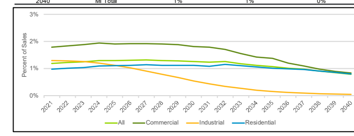
Michigan Total Natural Gas Cumulative Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	1%	2%	1%	1%
2022	MI Total	2%	4%	3%	2%
2023	MI Total	3%	6%	4%	3%
2024	MI Total	5%	7%	5%	4%
2025	MI Total	6%	9%	6%	5%
2026	MI Total	7%	11%	7%	6%
2027	MI Total	8%	13%	8%	6%
2028	MI Total	9%	15%	9%	7%
2029	MI Total	10%	17%	10%	8%
2030	MI Total	12%	19%	10%	9%
2031	MI Total	13%	21%	11%	10%
2032	MI Total	14%	23%	11%	11%
2033	MI Total	15%	24%	12%	12%
2034	MI Total	16%	26%	12%	13%
2035	MI Total	17%	27%	12%	14%
2036	MI Total	18%	28%	12%	14%
2037	MI Total	18%	29%	13%	15%
2038	MI Total	19%	30%	13%	16%
2039	MI Total	20%	31%	13%	16%
2040	MI Total	20%	32%	13%	17%



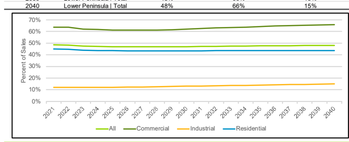
Michigan Total Natural Gas Incremental Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	1%	2%	1%	1%
2022	MI Total	1%	2%	1%	1%
2023	MI Total	1%	2%	1%	1%
2024	MI Total	1%	2%	1%	1%
2025	MI Total	1%	2%	1%	1%
2026	MI Total	1%	2%	1%	1%
2027	MI Total	1%	2%	1%	1%
2028	MI Total	1%	2%	1%	1%
2029	MI Total	1%	2%	1%	1%
2030	MI Total	1%	2%	1%	1%
2031	MI Total	1%	2%	0%	1%
2032	MI Total	1%	2%	0%	1%
2033	MI Total	1%	2%	0%	1%
2034	MI Total	1%	1%	0%	1%
2035	MI Total	1%	1%	0%	1%
2036	MI Total	1%	1%	0%	1%
2037	MI Total	1%	1%	0%	1%
2038	MI Total	1%	1%	0%	1%
2039	MI Total	1%	1%	0%	1%
2040	MI Total	1%	1%	0%	1%



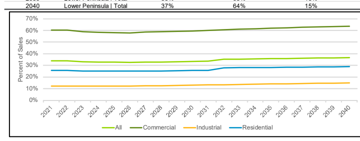
Lower Peninsula Natural Gas Technical Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula | Total	49%	64%	12%	45%
2022	Lower Peninsula | Total	48%	64%	12%	45%
2023	Lower Peninsula | Total	47%	62%	12%	44%
2024	Lower Peninsula | Total	47%	62%	12%	44%
2025	Lower Peninsula | Total	47%	61%	12%	44%
2026	Lower Peninsula | Total	47%	61%	12%	43%
2027	Lower Peninsula | Total	47%	61%	12%	43%
2028	Lower Peninsula | Total	47%	61%	13%	43%
2029	Lower Peninsula | Total	47%	62%	13%	43%
2030	Lower Peninsula | Total	47%	62%	13%	43%
2031	Lower Peninsula | Total	47%	62%	13%	43%
2032	Lower Peninsula | Total	47%	63%	13%	44%
2033	Lower Peninsula | Total	47%	63%	14%	44%
2034	Lower Peninsula | Total	47%	64%	14%	44%
2035	Lower Peninsula | Total	48%	64%	14%	44%
2036	Lower Peninsula | Total	48%	65%	14%	44%
2037	Lower Peninsula | Total	48%	65%	14%	44%
2038	Lower Peninsula | Total	48%	65%	15%	44%
2039	Lower Peninsula | Total	48%	66%	15%	44%
2040	Lower Peninsula | Total	48%	66%	15%	44%



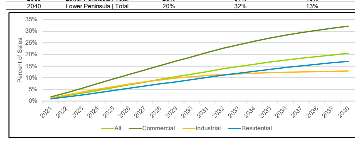
Lower Peninsula Natural Gas Economic Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula | Total	34%	60%	12%	26%
2022	Lower Peninsula | Total	34%	60%	12%	26%
2023	Lower Peninsula | Total	33%	59%	12%	25%
2024	Lower Peninsula | Total	33%	58%	12%	25%
2025	Lower Peninsula | Total	33%	58%	12%	25%
2026	Lower Peninsula | Total	33%	58%	12%	25%
2027	Lower Peninsula | Total	33%	59%	12%	25%
2028	Lower Peninsula | Total	33%	59%	13%	25%
2029	Lower Peninsula | Total	33%	59%	13%	25%
2030	Lower Peninsula | Total	33%	60%	13%	26%
2031	Lower Peninsula | Total	34%	60%	13%	26%
2032	Lower Peninsula | Total	35%	61%	13%	28%
2033	Lower Peninsula | Total	35%	61%	14%	28%
2034	Lower Peninsula | Total	36%	61%	14%	28%
2035	Lower Peninsula | Total	36%	62%	14%	28%
2036	Lower Peninsula | Total	36%	62%	14%	28%
2037	Lower Peninsula | Total	36%	63%	14%	29%
2038	Lower Peninsula | Total	36%	63%	15%	29%
2039	Lower Peninsula | Total	36%	63%	15%	29%
2040	Lower Peninsula | Total	37%	64%	15%	29%



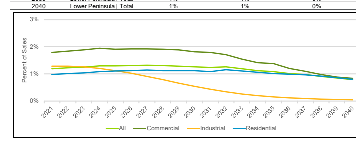
Lower Peninsula Natural Gas Cumulative Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula | Total	1%	2%	1%	1%
2022	Lower Peninsula | Total	2%	4%	3%	2%
2023	Lower Peninsula | Total	3%	6%	4%	3%
2024	Lower Peninsula | Total	5%	8%	5%	4%
2025	Lower Peninsula | Total	6%	9%	6%	5%
2026	Lower Peninsula | Total	7%	11%	7%	6%
2027	Lower Peninsula | Total	8%	13%	8%	6%
2028	Lower Peninsula | Total	9%	15%	9%	7%
2029	Lower Peninsula | Total	10%	17%	10%	8%
2030	Lower Peninsula | Total	12%	19%	10%	9%
2031	Lower Peninsula | Total	13%	21%	11%	10%
2032	Lower Peninsula | Total	14%	23%	11%	11%
2033	Lower Peninsula | Total	15%	24%	12%	12%
2034	Lower Peninsula | Total	16%	26%	12%	13%
2035	Lower Peninsula | Total	17%	27%	12%	14%
2036	Lower Peninsula | Total	18%	28%	12%	14%
2037	Lower Peninsula | Total	18%	29%	13%	15%
2038	Lower Peninsula | Total	19%	30%	13%	16%
2039	Lower Peninsula | Total	20%	31%	13%	17%
2040	Lower Peninsula | Total	20%	32%	13%	17%



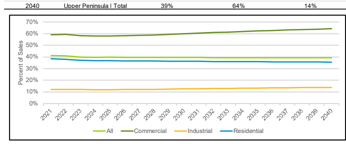
Lower Peninsula Natural Gas Incremental Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula | Total	1%	2%	1%	1%
2022	Lower Peninsula | Total	1%	2%	1%	1%
2023	Lower Peninsula | Total	1%	2%	1%	1%
2024	Lower Peninsula | Total	1%	2%	1%	1%
2025	Lower Peninsula | Total	1%	2%	1%	1%
2026	Lower Peninsula | Total	1%	2%	1%	1%
2027	Lower Peninsula | Total	1%	2%	1%	1%
2028	Lower Peninsula | Total	1%	2%	1%	1%
2029	Lower Peninsula | Total	1%	2%	1%	1%
2030	Lower Peninsula | Total	1%	2%	1%	1%
2031	Lower Peninsula | Total	1%	2%	0%	1%
2032	Lower Peninsula | Total	1%	2%	0%	1%
2033	Lower Peninsula | Total	1%	2%	0%	1%
2034	Lower Peninsula | Total	1%	1%	0%	1%
2035	Lower Peninsula | Total	1%	1%	0%	1%
2036	Lower Peninsula | Total	1%	1%	0%	1%
2037	Lower Peninsula | Total	1%	1%	0%	1%
2038	Lower Peninsula | Total	1%	1%	0%	1%
2039	Lower Peninsula | Total	1%	1%	0%	1%
2040	Lower Peninsula | Total	1%	1%	0%	1%



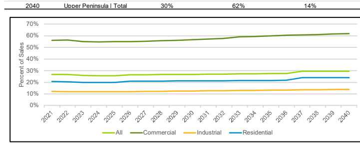
Upper Peninsula Natural Gas Technical Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula | Total	41%	59%	12%	38%
2022	Upper Peninsula | Total	41%	59%	12%	38%
2023	Upper Peninsula | Total	40%	58%	12%	37%
2024	Upper Peninsula | Total	40%	58%	12%	37%
2025	Upper Peninsula | Total	40%	58%	12%	37%
2026	Upper Peninsula | Total	40%	58%	12%	37%
2027	Upper Peninsula | Total	40%	59%	12%	37%
2028	Upper Peninsula | Total	39%	59%	12%	36%
2029	Upper Peninsula | Total	39%	59%	12%	36%
2030	Upper Peninsula | Total	39%	60%	13%	36%
2031	Upper Peninsula | Total	39%	60%	13%	36%
2032	Upper Peninsula | Total	39%	61%	13%	36%
2033	Upper Peninsula | Total	39%	61%	13%	36%
2034	Upper Peninsula | Total	39%	62%	13%	36%
2035	Upper Peninsula | Total	39%	62%	13%	36%
2036	Upper Peninsula | Total	39%	63%	13%	36%
2037	Upper Peninsula | Total	39%	63%	14%	36%
2038	Upper Peninsula | Total	39%	63%	14%	36%
2039	Upper Peninsula | Total	39%	64%	14%	36%
2040	Upper Peninsula | Total	39%	64%	14%	36%



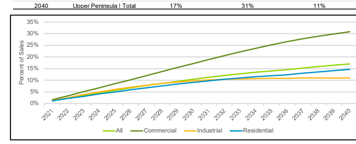
Upper Peninsula Natural Gas Economic Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula | Total	27%	56%	12%	21%
2022	Upper Peninsula | Total	27%	56%	12%	20%
2023	Upper Peninsula | Total	26%	55%	12%	20%
2024	Upper Peninsula | Total	26%	55%	12%	20%
2025	Upper Peninsula | Total	26%	55%	12%	20%
2026	Upper Peninsula | Total	27%	55%	12%	21%
2027	Upper Peninsula | Total	27%	55%	12%	21%
2028	Upper Peninsula | Total	27%	56%	12%	21%
2029	Upper Peninsula | Total	27%	56%	12%	21%
2030	Upper Peninsula | Total	27%	57%	13%	21%
2031	Upper Peninsula | Total	27%	57%	13%	21%
2032	Upper Peninsula | Total	27%	58%	13%	21%
2033	Upper Peninsula | Total	27%	59%	13%	21%
2034	Upper Peninsula | Total	27%	59%	13%	22%
2035	Upper Peninsula | Total	27%	60%	13%	22%
2036	Upper Peninsula | Total	28%	60%	13%	22%
2037	Upper Peninsula | Total	29%	61%	14%	24%
2038	Upper Peninsula | Total	29%	61%	14%	24%
2039	Upper Peninsula | Total	30%	62%	14%	24%
2040	Upper Peninsula | Total	30%	62%	14%	24%



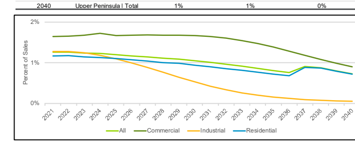
Upper Peninsula Natural Gas Cumulative Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula | Total	1%	2%	1%	1%
2022	Upper Peninsula | Total	2%	3%	3%	2%
2023	Upper Peninsula | Total	3%	5%	4%	3%
2024	Upper Peninsula | Total	5%	7%	5%	4%
2025	Upper Peninsula | Total	6%	8%	6%	5%
2026	Upper Peninsula | Total	7%	10%	7%	6%
2027	Upper Peninsula | Total	8%	12%	8%	7%
2028	Upper Peninsula | Total	9%	14%	9%	8%
2029	Upper Peninsula | Total	10%	15%	9%	8%
2030	Upper Peninsula | Total	10%	17%	10%	9%
2031	Upper Peninsula | Total	11%	19%	10%	10%
2032	Upper Peninsula | Total	12%	21%	10%	10%
2033	Upper Peninsula | Total	13%	22%	11%	11%
2034	Upper Peninsula | Total	13%	24%	11%	11%
2035	Upper Peninsula | Total	14%	25%	11%	12%
2036	Upper Peninsula | Total	15%	27%	11%	12%
2037	Upper Peninsula | Total	15%	28%	11%	13%
2038	Upper Peninsula | Total	16%	29%	11%	14%
2039	Upper Peninsula | Total	17%	30%	11%	14%
2040	Upper Peninsula | Total	17%	31%	11%	15%



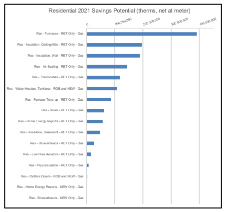
Upper Peninsula Natural Gas Incremental Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula | Total	1%	2%	1%	1%
2022	Upper Peninsula | Total	1%	2%	1%	1%
2023	Upper Peninsula | Total	1%	2%	1%	1%
2024	Upper Peninsula | Total	1%	2%	1%	1%
2025	Upper Peninsula | Total	1%	2%	1%	1%
2026	Upper Peninsula | Total	1%	2%	1%	1%
2027	Upper Peninsula | Total	1%	2%	1%	1%
2028	Upper Peninsula | Total	1%	2%	1%	1%
2029	Upper Peninsula | Total	1%	2%	1%	1%
2030	Upper Peninsula | Total	1%	2%	1%	1%
2031	Upper Peninsula | Total	1%	2%	0%	1%
2032	Upper Peninsula | Total	1%	2%	0%	1%
2033	Upper Peninsula | Total	1%	2%	0%	1%
2034	Upper Peninsula | Total	1%	1%	0%	1%
2035	Upper Peninsula | Total	1%	1%	0%	1%
2036	Upper Peninsula | Total	1%	1%	0%	1%
2037	Upper Peninsula | Total	1%	1%	0%	1%
2038	Upper Peninsula | Total	1%	1%	0%	1%
2039	Upper Peninsula | Total	1%	1%	0%	1%
2040	Upper Peninsula | Total	1%	1%	0%	1%



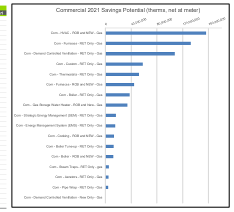
Residential 2021 Natural Gas Technical Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Furnaces - RET Only - Gas	391 118 621
2	Res - Insulation, Ceiling/Attic - RET Only - Gas	195 824 114
3	Res - Insulation, Wall - RET Only - Gas	188 888 937
4	Res - Air Sealing - RET Only - Gas	144 562 900
5	Res - Thermostats - RET Only - Gas	118 302 249
6	Res - Water Heaters, Tankless - ROB and NEW - Gas	107 893 868
7	Res - Furnace Tune-up - RET Only - Gas	86 861 361
8	Res - Boiler - RET Only - Gas	62 662 911
9	Res - Home Energy Reports - RET Only - Gas	57 385 886
10	Res - Insulation, Basement - RET Only - Gas	47 641 918
11	Res - Showerheads - RET Only - Gas	27 131 855
12	Res - Low Flow Aerators - RET Only - Gas	15 390 962
13	Res - Pipe Insulation - RET Only - Gas	7 544 385
14	Res - Clothes Dryers - ROB and NEW - Gas	2 272 774
15	Res - Home Energy Reports - NEW Only - Gas	503 036
16	Res - Showerheads - NEW Only - Gas	208 748



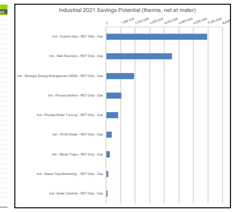
Commercial 2021 Natural Gas Technical Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
[illegible]	[illegible]	[illegible]



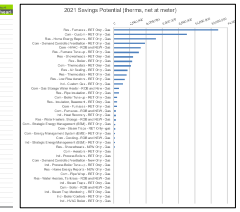
Industrial 2021 Natural Gas Technical Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
[illegible]	[illegible]	[illegible]



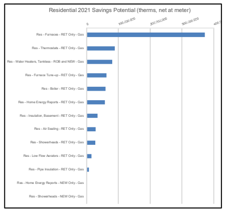
2021 Natural Gas Cumulative Annual Achievable Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
[illegible]	[illegible]	[illegible]



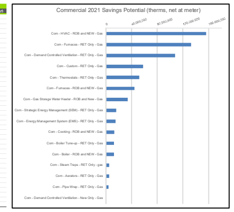
Residential 2021 Natural Gas Economic Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Furnaces - RET Only - Gas	372 151 200
2	Res - Thermostats - RET Only - Gas	88 952 064
3	Res - Water Heaters, Tankless - ROB and NEW - Gas	80 209 567
4	Res - Furnace Tune-up - RET Only - Gas	62 852 054
5	Res - Boiler - RET Only - Gas	59 730 041
6	Res - Home Energy Reports - RET Only - Gas	57 385 886
7	Res - Insulation, Basement - RET Only - Gas	34 059 705
8	Res - Air Sealing - RET Only - Gas	28 299 217
9	Res - Showerheads - RET Only - Gas	27 131 855
10	Res - Low Flow Aerators - RET Only - Gas	15 390 962
11	Res - Pipe Insulation - RET Only - Gas	7 544 385
12	Res - Home Energy Reports - NEW Only - Gas	503 036
13	Res - Showerheads - NEW Only - Gas	208 748



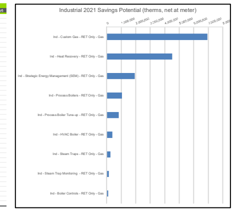
Commercial 2021 Natural Gas Economic Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - HVAC - ROB and NEW - Gas	156 193 027
2	Com - Furnaces - RET Only - Gas	132 626 786
3	Com - Demand Controlled Ventilation - RET Only - Gas	107 606 383
4	Com - Custom - RET Only - Gas	57 885 847
5	Com - Thermostats - RET Only - Gas	52 229 459
6	Com - Furnaces - ROB and NEW - Gas	44 404 100
7	Com - Gas Storage Water Heater - ROB and New - Gas	34 255 564
8	Com - Strategic Energy Management (SEM) - RET Only - Gas	16 125 309
9	Com - Energy Management System (EMS) - RET Only - Gas	15 225 934
10	Com - Cooking - ROB and NEW - Gas	13 291 827
11	Com - Boiler Tune-up - RET Only - Gas	12 872 662
12	Com - Boiler - ROB and NEW - Gas	12 553 262
13	Com - Steam Traps - RET Only - gas	5 429 913
14	Com - Aerators - RET Only - Gas	4 992 070
15	Com - Pipe Wrap - RET Only - Gas	4 260 650
16	Com - Demand Controlled Ventilation - New Only - Gas	155 230



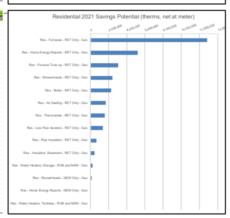
Industrial 2021 Natural Gas Economic Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Custom Gas - RET Only - Gas	6 937 370
2	Ind - Heat Recovery - RET Only - Gas	4 514 572
3	Ind - Strategic Energy Management (SEM) - RET Only - Gas	1 932 549
4	Ind - Process Boilers - RET Only - Gas	1 042 544
5	Ind - Process Boiler Tune-up - RET Only - Gas	819 262
6	Ind - HVAC Boiler - RET Only - Gas	395 891
7	Ind - Steam Traps - RET Only - Gas	268 680
8	Ind - Steam Trap Monitoring - RET Only - Gas	144 638
9	Ind - Boiler Controls - RET Only - Gas	104 086



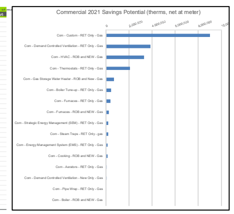
Residential 2021 Natural Gas Cumulative Annual Achievable Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Furnaces - RET Only - Gas	12 831 917
2	Res - Home Energy Reports - RET Only - Gas	5 217 274
3	Res - Furnace Tune-up - RET Only - Gas	3 077 719
4	Res - Showerheads - RET Only - Gas	2 426 795
5	Res - Boiler - RET Only - Gas	2 282 059
6	Res - Air Sealing - RET Only - Gas	1 704 109
7	Res - Thermostats - RET Only - Gas	1 573 131
8	Res - Low Flow Aerators - RET Only - Gas	1 361 510
9	Res - Pipe Insulation - RET Only - Gas	681 270
10	Res - Insulation, Basement - RET Only - Gas	448 058
11	Res - Water Heaters, Storage - ROB and NEW - Gas	235 656
12	Res - Showerheads - NEW Only - Gas	136 030
13	Res - Home Energy Reports - NEW Only - Gas	50 304
14	Res - Water Heaters, Tankless - ROB and NEW - Gas	22 898



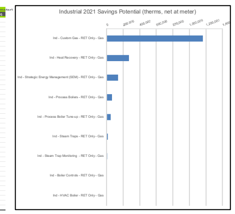
Commercial 2021 Natural Gas Cumulative Annual Achievable Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - Custom - RET Only - Gas	9 018 399
2	Com - Demand Controlled Ventilation - RET Only - Gas	3 872 670
3	Com - HVAC - ROB and NEW - Gas	3 302 748
4	Com - Thermostats - RET Only - Gas	2 093 809
5	Com - Gas Storage Water Heater - ROB and New - Gas	704 722
6	Com - Boiler Tune-up - RET Only - Gas	453 834
7	Com - Furnaces - RET Only - Gas	399 820
8	Com - Furnaces - ROB and NEW - Gas	275 235
9	Com - Strategic Energy Management (SEM) - RET Only - Gas	215 775
10	Com - Steam Traps - RET Only - gas	212 097
11	Com - Energy Management System (EMS) - RET Only - Gas	155 557
12	Com - Cooking - ROB and NEW - Gas	141 258
13	Com - Aerators - RET Only - Gas	66 315
14	Com - Demand Controlled Ventilation - New Only - Gas	63 201
15	Com - Pipe Wrap - RET Only - Gas	45 848
16	Com - Boiler - ROB and NEW - Gas	6 879



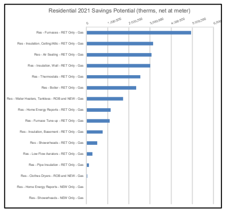
Industrial 2021 Natural Gas Cumulative Annual Achievable Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Custom Gas - RET Only - Gas	1 161 342
2	Ind - Heat Recovery - RET Only - Gas	271 704
3	Ind - Strategic Energy Management (SEM) - RET Only - Gas	140 702
4	Ind - Process Boilers - RET Only - Gas	65 447
5	Ind - Process Boiler Tune-up - RET Only - Gas	50 590
6	Ind - Steam Traps - RET Only - Gas	17 049
7	Ind - Steam Trap Monitoring - RET Only - Gas	6 199
8	Ind - Boiler Controls - RET Only - Gas	3 918
9	Ind - HVAC Boiler - RET Only - Gas	14



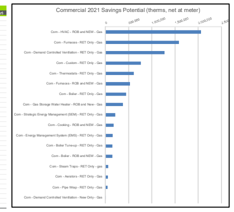
Residential 2021 Natural Gas Technical Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Furnaces - RET Only - Gas	4 930 809
2	Res - Insulation, Ceiling/Attic - RET Only - Gas	3 150 353
3	Res - Air Sealing - RET Only - Gas	3 067 025
4	Res - Insulation, Wall - RET Only - Gas	3 001 513
5	Res - Thermostats - RET Only - Gas	2 546 547
6	Res - Boiler - RET Only - Gas	2 343 893
7	Res - Water Heaters, Tankless - ROB and NEW - Gas	1 726 085
8	Res - Home Energy Reports - RET Only - Gas	1 140 646
9	Res - Furnace Tune-up - RET Only - Gas	1 094 576
10	Res - Insulation, Basement - RET Only - Gas	755 525
11	Res - Showerheads - RET Only - Gas	512 071
12	Res - Low Flow Aerators - RET Only - Gas	274 649
13	Res - Pipe Insulation - RET Only - Gas	120 020
14	Res - Clothes Dryers - ROB and NEW - Gas	36 394
15	Res - Home Energy Reports - NEW Only - Gas	12 573
16	Res - Showerheads - NEW Only - Gas	4 279


Residential 2021 Savings Potential (therms, net at meter)

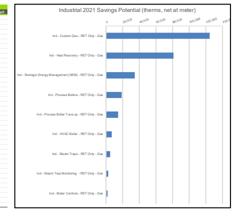
Commercial 2021 Natural Gas Technical Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - HVAC - ROB and NEW - Gas	2 063 181
2	Com - Furnaces - RET Only - Gas	1 584 134
3	Com - Demand Controlled Ventilation - RET Only - Gas	1 271 823
4	Com - Custom - RET Only - Gas	764 989
5	Com - Thermostats - RET Only - Gas	616 254
6	Com - Furnaces - ROB and NEW - Gas	533 577
7	Com - Boiler - RET Only - Gas	[illegible]
8	Com - Gas Storage Water Heater - ROB and New - Gas	379 139
9	Com - Strategic Energy Management (SEM) - RET Only - Gas	213 104
10	Com - Cooking - ROB and NEW - Gas	175 573
11	Com - Energy Management System (EMS) - RET Only - Gas	161 333
12	Com - Boiler Tune-up - RET Only - Gas	154 315
13	Com - Boiler - ROB and NEW - Gas	150 922
14	Com - Steam Traps - RET Only - gas	64 728
15	Com - Aerators - RET Only - Gas	53 514
16	Com - Pipe Wrap - RET Only - Gas	45 808
17	Com - Demand Controlled Ventilation - New Only - Gas	3 630


Commercial 2021 Savings Potential (therms, net at meter)

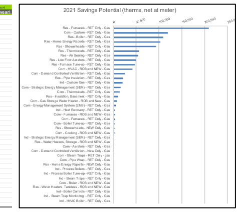
Industrial 2021 Natural Gas Technical Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Custom Gas - RET Only - Gas	124 325
2	Ind - Heat Recovery - RET Only - Gas	80 906
3	Ind - Strategic Energy Management (SEM) - RET Only - Gas	34 633
4	Ind - Process Boilers - RET Only - Gas	18 683
5	Ind - Process Boiler Tune-up - RET Only - Gas	14 682
6	Ind - HVAC Boiler - RET Only - Gas	6 018
7	Ind - Steam Traps - RET Only - Gas	4 779
8	Ind - Steam Trap Monitoring - RET Only - Gas	2 592
9	Ind - Boiler Controls - RET Only - Gas	1 865


Industrial 2021 Savings Potential (therms, net at meter)

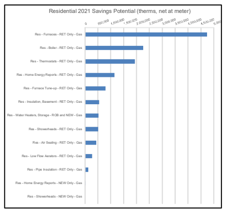
All Sectors 2021 Natural Gas Cumulative Annual Achievable Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Furnaces - RET Only - Gas	209 153
2	Com - Custom - RET Only - Gas	119 153
3	Res - Boiler - RET Only - Gas	109 394
4	Res - Home Energy Reports - RET Only - Gas	103 436
5	Res - Showerheads - RET Only - Gas	94 497
6	Res - Thermostats - RET Only - Gas	56 803
7	Res - Air Sealing - RET Only - Gas	55 165
8	Res - Low Flow Aerators - RET Only - Gas	50 312
9	Res - Furnace Tune-up - RET Only - Gas	47 588
10	Com - HVAC - ROB and NEW - Gas	42 425
11	Com - Demand Controlled Ventilation - RET Only - Gas	25 413
12	Res - Pipe Insulation - RET Only - Gas	22 304
13	Ind - Custom Gas - RET Only - Gas	20 902
14	Com - Strategic Energy Management (SEM) - RET Only - Gas	16 362
15	Com - Thermostats - RET Only - Gas	14 170
16	Res - Insulation, Basement - RET Only - Gas	10 380
17	Com - Gas Storage Water Heater - ROB and New - Gas	8 580
18	Com - Energy Management System (EMS) - RET Only - Gas	6 287
19	Ind - Heat Recovery - RET Only - Gas	4 890
20	Com - Furnaces - ROB and NEW - Gas	4 322
21	Com - Furnaces - RET Only - Gas	3 702
22	Com - Boiler Tune-up - RET Only - Gas	3 287
23	Res - Showerheads - NEW Only - Gas	3 115
24	Com - Cooking - ROB and NEW - Gas	3 099
25	Ind - Strategic Energy Management (SEM) - RET Only - Gas	2 532
26	Res - Water Heaters, Storage - ROB and NEW - Gas	2 425
27	Com - Aerators - RET Only - Gas	1 717
28	Com - Demand Controlled Ventilation - New Only - Gas	1 474
29	Com - Steam Traps - RET Only - gas	1 462
30	Com - Pipe Wrap - RET Only - Gas	1 293
31	Res - Home Energy Reports - NEW Only - Gas	1 257
32	Ind - Process Boilers - RET Only - Gas	990
33	Ind - Process Boiler Tune-up - RET Only - Gas	911
34	Ind - Steam Traps - RET Only - Gas	307
35	Com - Boiler - ROB and NEW - Gas	154
36	Res - Water Heaters, Tankless - ROB and NEW - Gas	110
37	Ind - Boiler Controls - RET Only - Gas	71
38	Ind - Steam Trap Monitoring - RET Only - Gas	48
39	Ind - HVAC Boiler - RET Only - Gas	0


2021 Savings Potential (therms, net at meter)

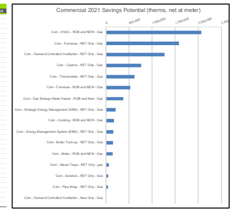
Residential 2021 Natural Gas Economic Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Furnaces - RET Only - Gas	4 930 809
2	Res - Boiler - RET Only - Gas	2 343 893
3	Res - Thermostats - RET Only - Gas	[illegible]
4	Res - Home Energy Reports - RET Only - Gas	1 140 646
5	Res - Furnace Tune-up - RET Only - Gas	[illegible]
6	Res - Insulation, Basement - RET Only - Gas	[illegible]
7	Res - Water Heaters, Storage - ROB and NEW - Gas	[illegible]
8	Res - Showerheads - RET Only - Gas	512 071
9	Res - Air Sealing - RET Only - Gas	[illegible]
10	Res - Low Flow Aerators - RET Only - Gas	274 649
11	Res - Pipe Insulation - RET Only - Gas	120 020
12	Res - Home Energy Reports - NEW Only - Gas	12 573
13	Res - Showerheads - NEW Only - Gas	4 279


Residential 2021 Savings Potential (therms, net at meter)

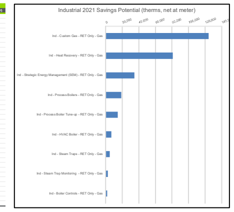
Commercial 2021 Natural Gas Economic Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - HVAC - ROB and NEW - Gas	2 063 181
2	Com - Furnaces - RET Only - Gas	1 584 134
3	Com - Demand Controlled Ventilation - RET Only - Gas	1 271 823
4	Com - Custom - RET Only - Gas	764 989
5	Com - Thermostats - RET Only - Gas	616 254
6	Com - Furnaces - ROB and NEW - Gas	533 577
7	Com - Gas Storage Water Heater - ROB and New - Gas	379 139
8	Com - Strategic Energy Management (SEM) - RET Only - Gas	213 104
9	Com - Cooking - ROB and NEW - Gas	175 573
10	Com - Energy Management System (EMS) - RET Only - Gas	161 333
11	Com - Boiler Tune-up - RET Only - Gas	154 315
12	Com - Boiler - ROB and NEW - Gas	150 922
13	Com - Steam Traps - RET Only - gas	64 728
14	Com - Aerators - RET Only - Gas	53 514
15	Com - Pipe Wrap - RET Only - Gas	45 808
16	Com - Demand Controlled Ventilation - New Only - Gas	3 630


Commercial 2021 Savings Potential (therms, net at meter)

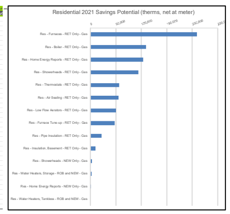
Industrial 2021 Natural Gas Economic Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Custom Gas - RET Only - Gas	124 325
2	Ind - Heat Recovery - RET Only - Gas	80 906
3	Ind - Strategic Energy Management (SEM) - RET Only - Gas	34 633
4	Ind - Process Boilers - RET Only - Gas	18 683
5	Ind - Process Boiler Tune-up - RET Only - Gas	14 682
6	Ind - HVAC Boiler - RET Only - Gas	6 018
7	Ind - Steam Traps - RET Only - Gas	4 779
8	Ind - Steam Trap Monitoring - RET Only - Gas	2 592
9	Ind - Boiler Controls - RET Only - Gas	1 865


Industrial 2021 Savings Potential (therms, net at meter)

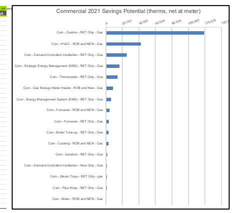
Residential 2021 Natural Gas Cumulative Annual Achievable Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Furnaces - RET Only - Gas	209 153
2	Res - Boiler - RET Only - Gas	109 394
3	Res - Home Energy Reports - RET Only - Gas	103 436
4	Res - Showerheads - RET Only - Gas	94 497
5	Res - Thermostats - RET Only - Gas	56 803
6	Res - Air Sealing - RET Only - Gas	55 165
7	Res - Low Flow Aerators - RET Only - Gas	50 312
8	Res - Furnace Tune-up - RET Only - Gas	47 588
9	Res - Pipe Insulation - RET Only - Gas	22 304
10	Res - Insulation, Basement - RET Only - Gas	10 380
11	Res - Showerheads - NEW Only - Gas	3 115
12	Res - Water Heaters, Storage - ROB and NEW - Gas	2 425
13	Res - Home Energy Reports - NEW Only - Gas	1 257
14	Res - Water Heaters, Tankless - ROB and NEW - Gas	110


Residential 2021 Savings Potential (therms, net at meter)

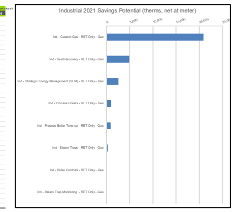
Commercial 2021 Natural Gas Cumulative Annual Achievable Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - Custom - RET Only - Gas	119 153
2	Com - HVAC - ROB and NEW - Gas	42 425
3	Com - Demand Controlled Ventilation - RET Only - Gas	25 413
4	Com - Strategic Energy Management (SEM) - RET Only - Gas	16 362
5	Com - Thermostats - RET Only - Gas	14 170
6	Com - Gas Storage Water Heater - ROB and New - Gas	8 580
7	Com - Energy Management System (EMS) - RET Only - Gas	6 287
8	Com - Furnaces - ROB and NEW - Gas	4 322
9	Com - Furnaces - RET Only - Gas	3 702
10	Com - Boiler Tune-up - RET Only - Gas	3 287
11	Com - Cooking - ROB and NEW - Gas	3 099
12	Com - Aerators - RET Only - Gas	1 717
13	Com - Demand Controlled Ventilation - New Only - Gas	1 474
14	Com - Steam Traps - RET Only - gas	1 462
15	Com - Pipe Wrap - RET Only - Gas	1 293
16	Com - Boiler - ROB and NEW - Gas	154


Commercial 2021 Savings Potential (therms, net at meter)

Industrial 2021 Natural Gas Cumulative Annual Achievable Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Custom Gas - RET Only - Gas	20 902
2	Ind - Heat Recovery - RET Only - Gas	4 890
3	Ind - Strategic Energy Management (SEM) - RET Only - Gas	2 532
4	Ind - Process Boilers - RET Only - Gas	990
5	Ind - Process Boiler Tune-up - RET Only - Gas	911
6	Ind - Steam Traps - RET Only - Gas	307
7	Ind - Boiler Controls - RET Only - Gas	71
8	Ind - Steam Trap Monitoring - RET Only - Gas	48


Industrial 2021 Savings Potential (therms, net at meter)

Lower Peninsula	Net UCT Test Ratio = (a) / (b)	Net PV UCT Benefits NPV 2021 $ Million (a)	Net PV UCT Costs NPV 2021 $ Million (b) = (c) + (d)	Program Administrative Costs NPV 2021 $ Million (c)	Program Incentive Costs NPV 2021 $ Million (d)
Residential Electric Program Bundle					
2021	1.6	$162,387,979	$99,910,379	$33,303,460	$66,606,919
2030	1.7	$197,263,825	$118,290,628	$39,430,209	$78,860,419
2040	1.5	$231,023,906	$153,643,344	$51,214,448	$102,428,896
Residential Natural Gas Program Bundle					
2021	1.5	$90,612,525	$59,538,994	$19,846,331	$39,692,663
2030	1.6	$123,438,289	$77,653,421	$25,884,474	$51,768,947
2040	1.6	$110,280,677	$67,424,779	$22,474,926	$44,949,853
Commercial & Industrial Electric Program Bundle					
2021	1.0	$604,372,440	$598,855,604	$199,618,535	$399,237,069
2030	1.1	$323,820,199	$281,829,502	$93,943,167	$187,886,335
2040	1.1	$157,210,027	$144,962,167	$48,320,722	$96,641,445
Commercial & Industrial Natural Gas Program Bundle					
2021	1.5	$105,847,174	$72,165,972	$24,055,324	$48,110,648
2030	2.4	$154,368,342	$64,843,192	$21,614,397	$43,228,794
2040	2.5	$61,568,928	$24,793,304	$8,264,435	$16,528,869
Residential Programs Total					
2021	1.6	$253,000,504	$159,449,373	$53,149,791	$106,299,582
2030	1.6	$320,702,114	$195,944,049	$65,314,683	$130,629,366
2040	1.5	$341,304,582	$221,068,124	$73,689,375	$147,378,749
Commercial & Industrial Programs Total					
2021	1.1	$710,219,614	$671,021,576	$223,673,859	$447,347,717
2030	1.4	$478,188,540	$346,672,693	$115,557,564	$231,115,129
2040	1.3	$218,778,955	$169,755,471	$56,585,157	$113,170,314
Lower Peninsula Portfolio Total					
2021	**1.2**	**$963,220,118**	**$830,470,949**	**$276,823,650**	**$553,647,299**
2030	**1.5**	**$798,890,654**	**$542,616,742**	**$180,872,247**	**$361,744,495**
2040	**1.4**	**$560,083,537**	**$390,823,595**	**$130,274,532**	**$260,549,063**

Upper Peninsula	Net UCT Test Ratio = (a) / (b)	Net PV UCT Benefits NPV 2021 $ Million (a)	Net PV UCT Costs NPV 2021 $ Million (b) = (c) + (d)	Program Administrativ e Costs NPV 2021 $ Million (c)	Program Incentive Costs NPV 2021 $ Million (d)
Residential Electric Program Bundle					
2021	1.5	$3,802,535	$2,610,686	$870,229	$1,740,457
2030	1.3	$3,245,751	$2,554,196	$851,399	$1,702,797
2040	1.1	$2,486,776	$2,234,279	$744,760	$1,489,520
Residential Natural Gas Program Bundle					
2021	1.3	$2,081,115	$1,543,654	$514,551	$1,029,103
2030	1.5	$1,948,076	$1,339,307	$446,436	$892,871
2040	1.5	$1,466,255	$947,493	$315,831	$631,662
Commercial & Industrial Electric Program Bundle					
2021	1.2	$7,131,662	$5,871,857	$1,957,286	$3,914,571
2030	1.1	$3,294,839	$3,028,836	$1,009,612	$2,019,224
2040	0.91	$1,195,237	$1,314,604	$438,201	$876,403
Commercial & Industrial Natural Gas Program Bundle					
2021	1.3	$1,164,717	$913,004	$304,335	$608,669
2030	2.1	$1,585,166	$756,069	$252,023	$504,046
2040	2.5	$706,232	$283,520	$94,507	$189,014
Residential Programs Total					
2021	1.4	$5,883,650	$4,154,340	$1,384,780	$2,769,560
2030	1.3	$5,193,826	$3,893,503	$1,297,834	$2,595,669
2040	1.2	$3,953,031	$3,181,772	$1,060,591	$2,121,181
Commercial & Industrial Programs Total					
2021	1.2	$8,296,380	$6,784,860	$2,261,620	$4,523,240
2030	1.3	$4,880,006	$3,784,905	$1,261,635	$2,523,270
2040	1.2	$1,901,469	$1,598,125	$532,708	$1,065,417
Lower Peninsula Portfolio Total					
2021	**1.3**	**$14,180,030**	**$10,939,200**	**$3,646,400**	**$7,292,800**
2030	**1.3**	**$10,073,832**	**$7,678,408**	**$2,559,469**	**$5,118,939**
2040	**1.2**	**$5,854,499**	**$4,779,897**	**$1,593,299**	**$3,186,598**

Program UCT Benefits ($)

Lower Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential Electric Programs	$162,387,979	$166,072,942	$161,483,014	$166,522,102	$159,834,696	$167,863,822	$189,480,966	$178,155,627	$186,397,359	$197,263,825	$205,479,343	$208,894,067	$202,549,694	$208,792,965	$223,720,677	$236,867,913	$209,299,524	$220,625,593	$221,089,246	$231,023,906
C&I Electric Programs	$604,372,440	$638,017,204	$644,639,955	$614,271,369	$568,622,505	$515,965,050	$460,789,227	$410,818,593	$368,299,557	$323,820,199	$316,728,846	$294,538,016	$240,208,103	$207,156,293	$248,370,207	$180,517,298	$168,851,959	$149,131,505	$136,646,979	$157,210,027
Residential Gas Programs	$90,612,525	$96,367,486	$101,108,801	$106,117,327	$109,207,059	$113,561,683	$118,669,199	$119,627,957	$121,765,555	$123,438,289	$124,267,537	$124,250,910	$123,158,396	$122,500,042	$122,006,498	$120,881,437	$117,317,125	$115,504,812	$112,828,164	$110,280,677
C&I Gas Programs	$105,847,174	$115,146,540	$124,521,014	$135,641,598	$141,940,386	$149,176,144	$154,640,218	$157,804,714	$158,629,908	$154,368,342	$152,783,479	$145,016,026	$129,932,916	$117,109,952	$111,729,718	$94,757,015	$84,612,241	$74,070,390	$65,830,737	$61,568,928

*Benefits based on savings net of free ridership

Program UCT Costs ($)

Lower Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential Electric Programs	$99,910,379	$99,836,959	$94,273,086	$94,013,382	$86,319,332	$90,851,242	$107,117,673	$101,179,224	$108,750,407	$118,290,628	$125,465,796	$128,645,469	$123,848,942	$129,549,206	$142,766,715	$155,100,183	$131,912,899	$142,963,522	$144,398,945	$153,643,344
C&I Electric Programs	$598,855,604	$618,201,217	$611,367,739	$568,844,670	$515,633,394	$461,166,133	$407,898,691	$360,544,834	$321,427,989	$281,829,502	$277,464,283	$259,753,489	$211,448,832	$183,268,777	$224,837,143	$162,896,605	$153,774,080	$135,776,912	$124,751,026	$144,962,167
Residential Gas Programs	$59,538,994	$62,776,268	$65,594,708	$67,968,149	$69,867,277	$71,958,701	$74,089,517	$75,670,409	$76,897,523	$77,653,421	$77,949,056	$77,829,731	$77,308,655	$76,575,301	$75,641,273	$74,435,094	$72,796,259	$71,182,298	$69,348,968	$67,424,779
C&I Gas Programs	$72,165,972	$73,631,025	$74,360,288	$73,806,953	$73,040,354	$72,418,074	$71,440,849	$70,003,181	$68,345,932	$64,843,192	$64,043,055	$60,401,387	$52,876,778	$47,159,562	$46,312,139	$38,154,124	$34,052,466	$29,470,588	$26,016,704	$24,793,304

Program UCT Ratio

Lower Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential Electric Programs	1.6	1.7	1.7	1.8	1.9	1.8	1.8	1.8	1.7	1.7	1.6	1.6	1.6	1.6	1.6	1.5	1.6	1.5	1.5	1.5
C&I Electric Programs	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Residential Gas Programs	1.5	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
C&I Gas Programs	1.5	1.6	1.7	1.8	1.9	2.1	2.2	2.3	2.3	2.4	2.4	2.4	2.5	2.5	2.4	2.5	2.5	2.5	2.5	2.5

Sector and Portfolio UCT Benefits ($)

Lower Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential	253,000,504	262,440,428	262,591,815	272,639,430	269,041,755	281,425,505	308,150,165	297,783,584	308,162,915	320,702,114	329,746,880	333,144,977	325,708,091	331,293,006	345,727,175	357,749,349	326,616,649	336,130,405	333,917,411	341,304,582
Commercial & Industrial	710,219,614	753,163,744	769,160,969	749,912,967	710,562,892	665,141,194	615,429,445	568,623,306	526,929,465	478,188,540	469,512,325	439,554,042	370,141,019	324,266,245	360,099,925	275,274,313	253,464,201	223,201,895	202,477,715	218,778,955
Total Portfolio	963,220,118	1,015,604,172	1,031,752,784	1,022,552,397	979,604,647	946,566,698	923,579,610	866,406,890	835,092,380	798,890,654	799,259,205	772,699,019	695,849,109	655,559,251	705,827,100	633,023,662	580,080,850	559,332,300	536,395,126	560,083,537

Sector and Portfolio UCT Costs ($)

Lower Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential	159,449,373	162,613,227	159,867,794	161,981,531	156,186,609	162,809,942	181,207,190	176,849,633	185,647,930	195,944,049	203,414,852	206,475,201	201,157,597	206,124,507	218,407,989	229,535,277	204,709,158	214,145,820	213,747,913	221,068,124
Commercial & Industrial	671,021,576	691,832,242	685,728,028	642,651,623	588,673,748	533,584,207	479,339,540	430,548,015	389,773,921	346,672,693	341,507,338	320,154,876	264,325,610	230,428,339	271,149,282	201,050,729	187,826,546	165,247,500	150,767,730	169,755,471
Total Portfolio	830,470,949	854,445,469	845,595,822	804,633,154	744,860,357	696,394,150	660,546,730	607,397,648	575,421,851	542,616,742	544,922,190	526,630,077	465,483,207	436,552,846	489,557,270	430,586,006	392,535,705	379,393,321	364,515,644	390,823,595

Sector and Portfolio UCT Ratio

Lower Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential	1.6	1.6	1.6	1.7	1.7	1.7	1.7	1.7	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.5
Commercial & Industrial	1.1	1.1	1.1	1.2	1.2	1.2	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.3	1.4	1.3	1.4	1.3	1.3
Total Portfolio	1.2	1.2	1.2	1.3	1.3	1.4	1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.4	1.5	1.5	1.5	1.5	1.4

Program UCT Benefits ($)

Upper Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential Electric Programs	$3,802,535	$3,771,687	$3,604,893	$3,493,205	$3,376,497	$3,292,926	$3,329,170	$3,250,231	$3,250,722	$3,245,751	$3,233,881	$3,202,626	$3,157,613	$3,093,778	$3,016,014	$2,922,926	$2,823,022	$2,707,494	$2,591,907	$2,486,776
C&I Electric Programs	$7,131,662	$7,330,559	$7,171,082	$6,803,783	$6,240,980	$5,594,620	$4,949,149	$4,326,180	$3,773,831	$3,294,839	$2,879,774	$2,525,913	$2,228,505	$1,980,990	$1,776,380	$1,608,521	$1,471,093	$1,359,499	$1,268,871	$1,195,237
Residential Gas Programs	$2,081,115	$2,123,288	$2,126,309	$2,105,430	$2,067,649	$2,031,735	$2,010,971	$1,988,007	$1,969,562	$1,948,076	$1,922,727	$1,891,784	$1,855,147	$1,812,316	$1,763,895	$1,710,390	$1,652,983	$1,592,128	$1,529,383	$1,466,255
C&I Gas Programs	$1,164,717	$1,243,481	$1,315,218	$1,429,396	$1,460,977	$1,521,940	$1,576,160	$1,599,867	$1,604,806	$1,585,166	$1,538,833	$1,467,168	$1,375,548	$1,270,778	$1,160,419	$1,051,376	$948,809	$856,251	$775,292	$706,232

*Benefits based on savings net of free ridership

Program UCT Costs ($)

Upper Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential Electric Programs	$2,610,686	$2,602,473	$2,482,486	$2,408,425	$2,329,053	$2,305,940	$2,416,140	$2,423,599	$2,496,610	$2,554,196	$2,597,857	$2,616,635	$2,618,361	$2,598,936	$2,564,369	$2,513,328	$2,454,962	$2,377,951	$2,300,733	$2,234,279
C&I Electric Programs	$5,871,857	$6,042,036	$5,925,285	$5,657,373	$5,236,411	$4,756,359	$4,279,747	$3,811,555	$3,393,922	$3,028,836	$2,705,992	$2,425,698	$2,186,228	$1,983,699	$1,813,538	$1,671,877	$1,554,254	$1,457,831	$1,378,960	$1,314,604
Residential Gas Programs	$1,543,654	$1,556,383	$1,543,528	$1,512,809	$1,471,006	$1,435,267	$1,408,344	$1,387,528	$1,364,837	$1,339,307	$1,310,671	$1,278,694	$1,243,516	$1,205,410	$1,164,881	$1,122,490	$1,078,929	$1,034,783	$990,752	$947,493
C&I Gas Programs	$913,004	$919,911	$911,108	$907,283	$887,507	$870,303	$853,935	$825,071	$793,712	$756,069	$711,025	$659,518	$603,734	$546,311	$489,977	$437,164	$389,490	$347,953	$312,725	$283,520

Program UCT Ratio

Upper Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential Electric Programs	1.5	1.4	1.5	1.5	1.4	1.4	1.4	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1
C&I Electric Programs	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.0	1.0	1.0	0.98	0.96	0.95	0.93	0.92	0.91
Residential Gas Programs	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
C&I Gas Programs	1.3	1.4	1.4	1.6	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.2	2.3	2.3	2.4	2.4	2.4	2.5	2.5	2.5

Sector and Portfolio UCT Benefits ($)

Upper Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential	5,883,650	5,894,976	5,731,202	5,598,636	5,444,145	5,324,661	5,340,141	5,238,238	5,220,284	5,193,826	5,156,608	5,094,410	5,012,761	4,906,093	4,779,909	4,633,317	4,476,005	4,299,622	4,121,291	3,953,031
Commercial & Industrial	8,296,380	8,574,040	8,486,300	8,233,179	7,701,957	7,116,560	6,525,309	5,926,047	5,378,637	4,880,006	4,418,607	3,993,081	3,604,054	3,251,768	2,936,798	2,659,897	2,419,902	2,215,751	2,044,163	1,901,469
Total Portfolio	14,180,030	14,469,016	14,217,501	13,831,815	13,146,103	12,441,220	11,865,450	11,164,285	10,598,921	10,073,832	9,575,215	9,087,491	8,616,815	8,157,862	7,716,707	7,293,213	6,895,908	6,515,373	6,165,454	5,854,499

Sector and Portfolio UCT Costs ($)

Upper Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential	4,154,340	4,158,856	4,026,014	3,921,234	3,800,059	3,741,207	3,824,484	3,811,127	3,861,447	3,893,503	3,908,527	3,895,328	3,861,877	3,804,346	3,729,250	3,635,818	3,533,891	3,412,733	3,291,485	3,181,772
Commercial & Industrial	6,784,860	6,961,946	6,836,393	6,564,656	6,123,918	5,626,662	5,133,683	4,636,626	4,187,634	3,784,905	3,417,017	3,085,215	2,789,962	2,530,010	2,303,514	2,109,041	1,943,744	1,805,784	1,691,684	1,598,125
Total Portfolio	10,939,200	11,120,802	10,862,407	10,485,890	9,923,977	9,367,870	8,958,167	8,447,754	8,049,081	7,678,408	7,325,545	6,980,544	6,651,839	6,334,356	6,032,764	5,744,860	5,477,635	5,218,518	4,983,169	4,779,897

Sector and Portfolio UCT Ratio

Upper Peninsula Program Bundles	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.2
Commercial & Industrial	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2
Total Portfolio	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2

Lower Peninsula Program Budget by Budget Type ($)

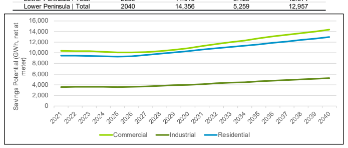
Service Territory	Program Bundles	Budget Type	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Lower Peninsula | Total	Residential Electric Programs	Incentives	$66,606,919	$66,557,973	$62,848,724	$62,675,588	$57,546,221	$60,567,494	$71,411,782	$67,452,816	$72,500,272	$78,860,419	$83,643,864	$85,763,646	$82,565,961	$86,366,137	$95,177,810	$103,400,122	$87,941,933	$95,309,015	$96,265,963	$102,428,896
Lower Peninsula | Total	C&I Electric Programs	Incentives	$399,237,069	$412,134,144	$407,578,493	$379,229,780	$343,755,596	$307,444,089	$271,932,461	$240,363,223	$214,285,326	$187,886,335	$184,976,188	$173,168,992	$140,965,888	$122,179,185	$149,891,429	$108,597,737	$102,516,053	$90,517,941	$83,167,351	$96,641,445
Lower Peninsula | Total	Residential Gas Programs	Incentives	$39,692,663	$41,850,846	$43,729,805	$45,312,099	$46,578,185	$47,972,467	$49,393,011	$50,446,939	$51,265,015	$51,768,947	$51,966,037	$51,886,488	$51,539,104	$51,050,200	$50,427,515	$49,623,396	$48,530,839	$47,454,865	$46,232,645	$44,949,853
Lower Peninsula | Total	C&I Gas Programs	Incentives	$48,110,648	$49,087,350	$49,573,526	$49,204,635	$48,693,570	$48,278,716	$47,627,233	$46,668,787	$45,563,955	$43,228,794	$42,695,370	$40,267,592	$35,251,185	$31,439,708	$30,874,759	$25,436,083	$22,701,644	$19,647,059	$17,344,469	$16,528,869
Lower Peninsula | Total	Residential Electric Programs	Program Admin	$33,303,460	$33,278,986	$31,424,362	$31,337,794	$28,773,111	$30,283,747	$35,705,891	$33,726,408	$36,250,136	$39,430,209	$41,821,932	$42,881,823	$41,282,981	$43,183,069	$47,588,905	$51,700,061	$43,970,966	$47,654,507	$48,132,982	$51,214,448
Lower Peninsula | Total	C&I Electric Programs	Program Admin	$199,618,535	$206,067,072	$203,789,246	$189,614,890	$171,877,798	$153,722,044	$135,966,230	$120,181,611	$107,142,663	$93,943,167	$92,488,094	$86,584,496	$70,482,944	$61,089,592	$74,945,714	$54,298,868	$51,258,027	$45,258,971	$41,583,675	$48,320,722
Lower Peninsula | Total	Residential Gas Programs	Program Admin	$19,846,331	$20,925,423	$21,864,903	$22,656,050	$23,289,092	$23,986,234	$24,696,506	$25,223,470	$25,632,508	$25,884,474	$25,983,019	$25,943,244	$25,769,552	$25,525,100	$25,213,758	$24,811,698	$24,265,420	$23,727,433	$23,116,323	$22,474,926
Lower Peninsula | Total	C&I Gas Programs	Program Admin	$24,055,324	$24,543,675	$24,786,763	$24,602,318	$24,346,785	$24,139,358	$23,813,616	$23,334,394	$22,781,977	$21,614,397	$21,347,685	$20,133,796	$17,625,593	$15,719,854	$15,437,380	$12,718,041	$11,350,822	$9,823,529	$8,672,235	$8,264,435
Lower Peninsula | Total	Residential Electric Programs	Program Total	$99,910,379	$99,836,959	$94,273,086	$94,013,382	$86,319,332	$90,851,242	$107,117,673	$101,179,224	$108,750,407	$118,290,628	$125,465,796	$128,645,469	$123,848,942	$129,549,206	$142,766,715	$155,100,183	$131,912,899	$142,963,522	$144,398,945	$153,643,344
Lower Peninsula | Total	C&I Electric Programs	Program Total	$598,855,604	$618,201,217	$611,367,739	$568,844,670	$515,633,394	$461,166,133	$407,898,691	$360,544,834	$321,427,989	$281,829,502	$277,464,283	$259,753,489	$211,448,832	$183,268,777	$224,837,143	$162,896,605	$153,774,080	$135,776,912	$124,751,026	$144,962,167
Lower Peninsula | Total	Residential Gas Programs	Program Total	$59,538,994	$62,776,268	$65,594,708	$67,968,149	$69,867,277	$71,958,701	$74,089,517	$75,670,409	$76,897,523	$77,653,421	$77,949,056	$77,829,731	$77,308,655	$76,575,301	$75,641,273	$74,435,094	$72,796,259	$71,182,298	$69,348,968	$67,424,779
Lower Peninsula | Total	C&I Gas Programs	Program Total	$72,165,972	$73,631,025	$74,360,288	$73,806,953	$73,040,354	$72,418,074	$71,440,849	$70,003,181	$68,345,932	$64,843,192	$64,043,055	$60,401,387	$52,876,778	$47,159,562	$46,312,139	$38,154,124	$34,052,466	$29,470,588	$26,016,704	$24,793,304
Lower Peninsula | Total	Portfolio Total	Incentives	$553,647,299	$569,630,313	$563,730,548	$536,422,103	$496,573,571	$464,262,766	$440,364,487	$404,931,765	$383,614,567	$361,744,495	$363,281,460	$351,086,718	$310,322,138	$291,035,230	$326,371,514	$287,057,337	$261,690,470	$252,928,881	$243,010,429	$260,549,063
Lower Peninsula | Total	Portfolio Total	Program Admin	$276,823,650	$284,815,156	$281,865,274	$268,211,051	$248,286,786	$232,131,383	$220,182,243	$202,465,883	$191,807,284	$180,872,247	$181,640,730	$175,543,359	$155,161,069	$145,517,615	$163,185,757	$143,528,669	$130,845,235	$126,464,440	$121,505,215	$130,274,532
Lower Peninsula | Total	Portfolio Total	Program Total	$830,470,949	$854,445,469	$845,595,822	$804,633,154	$744,860,357	$696,394,150	$660,546,730	$607,397,648	$575,421,851	$542,616,742	$544,922,190	$526,630,077	$465,483,207	$436,552,846	$489,557,270	$430,586,006	$392,535,705	$379,393,321	$364,515,644	$390,823,595

Upper Peninsula Program Budget by Budget Type ($)

Service Territory	Program Bundles	Budget Type	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Upper Peninsula | Total	Residential Electric Programs	Incentives	$1,740,457	$1,734,982	$1,654,991	$1,605,617	$1,552,702	$1,537,294	$1,610,760	$1,615,733	$1,664,406	$1,702,797	$1,731,904	$1,744,423	$1,745,574	$1,732,624	$1,709,580	$1,675,552	$1,636,641	$1,585,300	$1,533,822	$1,489,520
Upper Peninsula | Total	C&I Electric Programs	Incentives	$3,914,571	$4,028,024	$3,950,190	$3,771,582	$3,490,941	$3,170,906	$2,853,165	$2,541,037	$2,262,615	$2,019,224	$1,803,995	$1,617,132	$1,457,486	$1,322,466	$1,209,025	$1,114,585	$1,036,169	$971,887	$919,306	$876,403
Upper Peninsula | Total	Residential Gas Programs	Incentives	$1,029,103	$1,037,589	$1,029,018	$1,008,539	$980,671	$956,845	$938,896	$925,019	$909,891	$892,871	$873,781	$852,462	$829,011	$803,607	$776,587	$748,327	$719,286	$689,855	$660,501	$631,662
Upper Peninsula | Total	C&I Gas Programs	Incentives	$608,669	$613,274	$607,405	$604,855	$591,671	$580,202	$569,290	$550,048	$529,142	$504,046	$474,017	$439,679	$402,489	$364,207	$326,651	$291,443	$259,660	$231,969	$208,483	$189,014
Upper Peninsula | Total	Residential Electric Programs	Program Admin	$870,229	$867,491	$827,495	$802,808	$776,351	$768,647	$805,380	$807,866	$832,203	$851,399	$865,952	$872,212	$872,787	$866,312	$854,790	$837,776	$818,321	$792,650	$766,911	$744,760
Upper Peninsula | Total	C&I Electric Programs	Program Admin	$1,957,286	$2,014,012	$1,975,095	$1,885,791	$1,745,470	$1,585,453	$1,426,582	$1,270,518	$1,131,307	$1,009,612	$901,997	$808,566	$728,743	$661,233	$604,513	$557,292	$518,085	$485,944	$459,653	$438,201
Upper Peninsula | Total	Residential Gas Programs	Program Admin	$514,551	$518,794	$514,509	$504,270	$490,335	$478,422	$469,448	$462,509	$454,946	$446,436	$436,890	$426,231	$414,505	$401,803	$388,294	$374,163	$359,643	$344,928	$330,251	$315,831
Upper Peninsula | Total	C&I Gas Programs	Program Admin	$304,335	$306,637	$303,703	$302,428	$295,836	$290,101	$284,645	$275,024	$264,571	$252,023	$237,008	$219,839	$201,245	$182,104	$163,326	$145,721	$129,830	$115,984	$104,242	$94,507
Upper Peninsula | Total	Residential Electric Programs	Program Total	$2,610,686	$2,602,473	$2,482,486	$2,408,425	$2,329,053	$2,305,940	$2,416,140	$2,423,599	$2,496,610	$2,554,196	$2,597,857	$2,616,635	$2,618,361	$2,598,936	$2,564,369	$2,513,328	$2,454,962	$2,377,951	$2,300,733	$2,234,279
Upper Peninsula | Total	C&I Electric Programs	Program Total	$5,871,857	$6,042,036	$5,925,285	$5,657,373	$5,236,411	$4,756,359	$4,279,747	$3,811,555	$3,393,922	$3,028,836	$2,705,992	$2,425,698	$2,186,228	$1,983,699	$1,813,538	$1,671,877	$1,554,254	$1,457,831	$1,378,960	$1,314,604
Upper Peninsula | Total	Residential Gas Programs	Program Total	$1,543,654	$1,556,383	$1,543,528	$1,512,809	$1,471,006	$1,435,267	$1,408,344	$1,387,528	$1,364,837	$1,339,307	$1,310,671	$1,278,694	$1,243,516	$1,205,410	$1,164,881	$1,122,490	$1,078,929	$1,034,783	$990,752	$947,493
Upper Peninsula | Total	C&I Gas Programs	Program Total	$913,004	$919,911	$911,108	$907,283	$887,507	$870,303	$853,935	$825,071	$793,712	$756,069	$711,025	$659,518	$603,734	$546,311	$489,977	$437,164	$389,490	$347,953	$312,725	$283,520
Upper Peninsula | Total	Portfolio Total	Incentives	$7,292,800	$7,413,868	$7,241,604	$6,990,593	$6,615,985	$6,245,246	$5,972,111	$5,631,836	$5,366,054	$5,118,939	$4,883,696	$4,653,696	$4,434,560	$4,222,904	$4,021,843	$3,829,906	$3,651,757	$3,479,012	$3,322,113	$3,186,598
Upper Peninsula | Total	Portfolio Total	Program Admin	$3,646,400	$3,706,934	$3,620,802	$3,495,297	$3,307,992	$3,122,623	$2,986,056	$2,815,918	$2,683,027	$2,559,469	$2,441,848	$2,326,848	$2,217,280	$2,111,452	$2,010,921	$1,914,953	$1,825,878	$1,739,506	$1,661,056	$1,593,299
Upper Peninsula | Total	Portfolio Total	Program Total	$10,939,200	$11,120,802	$10,862,407	$10,485,890	$9,923,977	$9,367,870	$8,958,167	$8,447,754	$8,049,081	$7,678,408	$7,325,545	$6,980,544	$6,651,839	$6,334,356	$6,032,764	$5,744,860	$5,477,635	$5,218,518	$4,983,169	$4,779,897

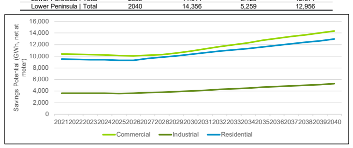
Lower Peninsula Electricity Technical Potential by Sector (GWh, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	10,384	3,601	9,480
Lower Peninsula | Total	2022	10.344	3.608	9.477
Lower Peninsula | Total	2023	10.295	3.618	9.384
Lower Peninsula | Total	2024	10.210	3.617	9.375
Lower Peninsula | Total	2025	10.089	3.592	9.307
Lower Peninsula | Total	2026	10.056	3.615	9.379
Lower Peninsula | Total	2027	10.147	3.719	9.618
Lower Peninsula | Total	2028	10.305	3.806	9.839
Lower Peninsula | Total	2029	10.562	3.914	10.073
Lower Peninsula | Total	2030	10.873	4.013	10.328
Lower Peninsula | Total	2031	11.253	4.143	10.593
Lower Peninsula | Total	2032	11.650	4.279	10.853
Lower Peninsula | Total	2033	11.987	4.398	11.083
Lower Peninsula | Total	2034	12.308	4.509	11.325
Lower Peninsula | Total	2035	12.733	4.667	11.601
Lower Peninsula | Total	2036	13.067	4.784	11.906
Lower Peninsula | Total	2037	13.403	4.899	12.142
Lower Peninsula | Total	2038	13.714	5.015	12.406
Lower Peninsula | Total	2039	14.015	5.129	12.671
Lower Peninsula | Total	2040	14,356	5,259	12,957



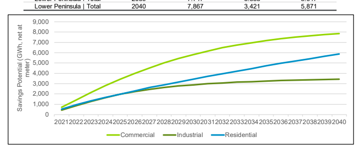
Lower Peninsula Electricity Economic Potential by Sector (GWh, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	10,368	3,601	9,480
Lower Peninsula | Total	2022	10.329	3.608	9.477
Lower Peninsula | Total	2023	10.294	3.618	9.384
Lower Peninsula | Total	2024	10.210	3.617	9.375
Lower Peninsula | Total	2025	10.089	3.592	9.307
Lower Peninsula | Total	2026	10.056	3.615	9.309
Lower Peninsula | Total	2027	10.147	3.719	9.617
Lower Peninsula | Total	2028	10.305	3.806	9.839
Lower Peninsula | Total	2029	10.562	3.914	10.073
Lower Peninsula | Total	2030	10.873	4.013	10.328
Lower Peninsula | Total	2031	11.253	4.143	10.592
Lower Peninsula | Total	2032	11.650	4.279	10.852
Lower Peninsula | Total	2033	11.987	4.398	11.082
Lower Peninsula | Total	2034	12.308	4.509	11.324
Lower Peninsula | Total	2035	12.733	4.667	11.601
Lower Peninsula | Total	2036	13.066	4.784	11.906
Lower Peninsula | Total	2037	13.403	4.899	12.142
Lower Peninsula | Total	2038	13.714	5.015	12.405
Lower Peninsula | Total	2039	14.014	5.129	12.671
Lower Peninsula | Total	2040	14,356	5,259	12,956



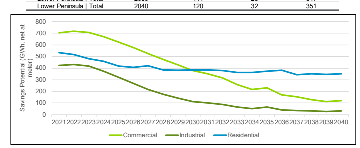
Lower Peninsula Electricity Cumulative Annual Achievable Potential by Sector (GWh, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	703	423	533
Lower Peninsula | Total	2022	1.420	855	946
Lower Peninsula | Total	2023	2.127	1.273	1.323
Lower Peninsula | Total	2024	2.798	1.647	1.678
Lower Peninsula | Total	2025	3.423	1.968	1.991
Lower Peninsula | Total	2026	3.999	2.236	2.293
Lower Peninsula | Total	2027	4.525	2.454	2.609
Lower Peninsula | Total	2028	5.001	2.630	2.886
Lower Peninsula | Total	2029	5.430	2.772	3.159
Lower Peninsula | Total	2030	5.807	2.884	3.433
Lower Peninsula | Total	2031	6.159	2.986	3.705
Lower Peninsula | Total	2032	6.476	3.074	3.971
Lower Peninsula | Total	2033	6.734	3.139	4.217
Lower Peninsula | Total	2034	6.952	3.190	4.462
Lower Peninsula | Total	2035	7.182	3.254	4.717
Lower Peninsula | Total	2036	7.354	3.294	4.978
Lower Peninsula | Total	2037	7.508	3.329	5.200
Lower Peninsula | Total	2038	7.635	3.360	5.427
Lower Peninsula | Total	2039	7.747	3.388	5.647
Lower Peninsula | Total	2040	7,867	3,421	5,871



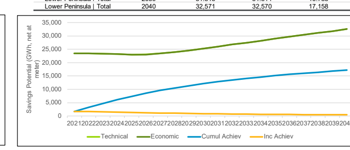
Lower Peninsula Electricity Incremental Annual Achievable Potential by Sector (GWh, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	703	423	533
Lower Peninsula | Total	2022	717	432	516
Lower Peninsula | Total	2023	707	419	481
Lower Peninsula | Total	2024	671	374	458
Lower Peninsula | Total	2025	625	321	418
Lower Peninsula | Total	2026	576	268	406
Lower Peninsula | Total	2027	526	218	421
Lower Peninsula | Total	2028	476	176	386
Lower Peninsula | Total	2029	429	142	382
Lower Peninsula | Total	2030	378	112	385
Lower Peninsula | Total	2031	352	103	385
Lower Peninsula | Total	2032	317	88	380
Lower Peninsula | Total	2033	258	65	363
Lower Peninsula | Total	2034	218	51	363
Lower Peninsula | Total	2035	230	64	374
Lower Peninsula | Total	2036	172	40	383
Lower Peninsula | Total	2037	154	35	345
Lower Peninsula | Total	2038	128	32	352
Lower Peninsula | Total	2039	111	28	347
Lower Peninsula | Total	2040	120	32	351



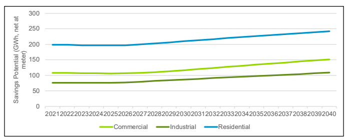
Lower Peninsula Electricity Potential (GWh, net at meter)

Service Territory	Year	Technical	Economic	Cumul Achiev	Inc Achiev
Lower Peninsula | Total	2021	23,465	23,449	1,659	1,659
Lower Peninsula | Total	2022	23.429	23.414	3.221	1.665
Lower Peninsula | Total	2023	23.296	23.296	4.724	1.606
Lower Peninsula | Total	2024	23.202	23.202	6.123	1.503
Lower Peninsula | Total	2025	22.989	22.988	7.382	1.363
Lower Peninsula | Total	2026	23.050	22.980	8.529	1.251
Lower Peninsula | Total	2027	23.484	23.483	9.588	1.165
Lower Peninsula | Total	2028	23.951	23.950	10.517	1.037
Lower Peninsula | Total	2029	24.549	24.548	11.360	953
Lower Peninsula | Total	2030	25.215	25.214	12.124	875
Lower Peninsula | Total	2031	25.989	25.988	12.851	839
Lower Peninsula | Total	2032	26.782	26.782	13.521	784
Lower Peninsula | Total	2033	27.468	27.467	14.090	685
Lower Peninsula | Total	2034	28.142	28.141	14.603	631
Lower Peninsula | Total	2035	29.001	29.001	15.153	668
Lower Peninsula | Total	2036	29.757	29.756	15.626	594
Lower Peninsula | Total	2037	30.445	30.444	16.036	533
Lower Peninsula | Total	2038	31.135	31.134	16.422	511
Lower Peninsula | Total	2039	31.815	31.814	16.783	486
Lower Peninsula | Total	2040	32,571	32,570	17,158	503



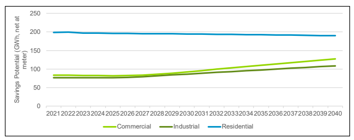
Upper Peninsula Electricity Technical Potential by Sector (GWh, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	108	76	199.10
Upper Peninsula | Total	2022	108	77	199.20
Upper Peninsula | Total	2023	107	77	197.21
Upper Peninsula | Total	2024	107	76	196.77
Upper Peninsula | Total	2025	106	76	196.33
Upper Peninsula | Total	2026	107	78	197.16
Upper Peninsula | Total	2027	108	80	199.64
Upper Peninsula | Total	2028	110	82	203.02
Upper Peninsula | Total	2029	113	84	206.41
Upper Peninsula | Total	2030	117	86	209.79
Upper Peninsula | Total	2031	120	89	213.18
Upper Peninsula | Total	2032	124	91	216.54
Upper Peninsula | Total	2033	127	93	219.87
Upper Peninsula | Total	2034	131	95	223.16
Upper Peninsula | Total	2035	134	98	226.42
Upper Peninsula | Total	2036	138	100	229.64
Upper Peninsula | Total	2037	141	102	232.82
Upper Peninsula | Total	2038	145	104	235.95
Upper Peninsula | Total	2039	148	107	239.03
Upper Peninsula | Total	2040	152	109	242.11



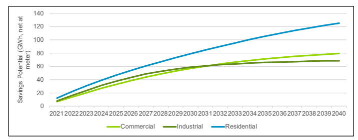
Upper Peninsula Electricity Economic Potential by Sector (GWh, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	84	76	199
Upper Peninsula | Total	2022	83	77	199
Upper Peninsula | Total	2023	83	77	197
Upper Peninsula | Total	2024	83	76	197
Upper Peninsula | Total	2025	82	76	196
Upper Peninsula | Total	2026	83	78	196
Upper Peninsula | Total	2027	84	80	196
Upper Peninsula | Total	2028	86	82	195
Upper Peninsula | Total	2029	89	84	195
Upper Peninsula | Total	2030	92	86	194
Upper Peninsula | Total	2031	96	89	194
Upper Peninsula | Total	2032	100	91	194
Upper Peninsula | Total	2033	103	93	193
Upper Peninsula | Total	2034	107	95	193
Upper Peninsula | Total	2035	110	98	192
Upper Peninsula | Total	2036	114	100	192
Upper Peninsula | Total	2037	117	102	192
Upper Peninsula | Total	2038	121	104	191
Upper Peninsula | Total	2039	124	107	191
Upper Peninsula | Total	2040	128	109	190



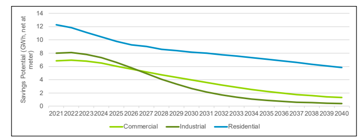
Upper Peninsula Electricity Cumulative Annual Achievable Potential by Sector (GWh, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	7	8	12
Upper Peninsula | Total	2022	14	16	22
Upper Peninsula | Total	2023	21	24	31
Upper Peninsula | Total	2024	27	31	39
Upper Peninsula | Total	2025	33	38	47
Upper Peninsula | Total	2026	39	44	54
Upper Peninsula | Total	2027	44	49	61
Upper Peninsula | Total	2028	49	53	67
Upper Peninsula | Total	2029	53	56	73
Upper Peninsula | Total	2030	57	59	79
Upper Peninsula | Total	2031	61	61	85
Upper Peninsula | Total	2032	64	63	90
Upper Peninsula | Total	2033	67	64	96
Upper Peninsula | Total	2034	69	65	101
Upper Peninsula | Total	2035	71	66	105
Upper Peninsula | Total	2036	73	67	110
Upper Peninsula | Total	2037	75	67	114
Upper Peninsula | Total	2038	77	68	118
Upper Peninsula | Total	2039	78	68	122
Upper Peninsula | Total	2040	79	69	125



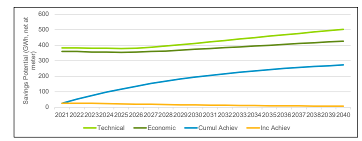
Upper Peninsula Electricity Incremental Annual Achievable Potential by Sector (GWh, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	7	8	12
Upper Peninsula | Total	2022	7	8	12
Upper Peninsula | Total	2023	7	8	11
Upper Peninsula | Total	2024	6	7	10
Upper Peninsula | Total	2025	6	7	10
Upper Peninsula | Total	2026	6	6	9
Upper Peninsula | Total	2027	5	5	9
Upper Peninsula | Total	2028	5	4	9
Upper Peninsula | Total	2029	4	3	8
Upper Peninsula | Total	2030	4	3	8
Upper Peninsula | Total	2031	4	2	8
Upper Peninsula | Total	2032	3	2	8
Upper Peninsula | Total	2033	3	1	8
Upper Peninsula | Total	2034	3	1	7
Upper Peninsula | Total	2035	2	1	7
Upper Peninsula | Total	2036	2	1	7
Upper Peninsula | Total	2037	2	1	7
Upper Peninsula | Total	2038	2	1	6
Upper Peninsula | Total	2039	1	0	6
Upper Peninsula | Total	2040	1	0	6

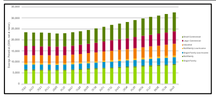


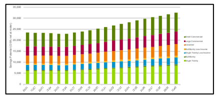
Upper Peninsula Electricity Potential (GWh, net at meter)

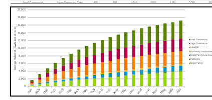
Service Territory	Year	Technical	Economic	Cumul Achiev	Inc Achiev
Upper Peninsula | Total	2021	383	359	27	27
Upper Peninsula | Total	2022	383	359	52	27
Upper Peninsula | Total	2023	381	357	75	26
Upper Peninsula | Total	2024	380	356	98	24
Upper Peninsula | Total	2025	379	355	118	22
Upper Peninsula | Total	2026	381	356	136	21
Upper Peninsula | Total	2027	387	359	153	19
Upper Peninsula | Total	2028	395	363	168	17
Upper Peninsula | Total	2029	404	368	182	16
Upper Peninsula | Total	2030	413	373	195	15
Upper Peninsula | Total	2031	422	379	206	14
Upper Peninsula | Total	2032	431	384	217	13
Upper Peninsula | Total	2033	440	390	226	12
Upper Peninsula | Total	2034	449	395	235	11
Upper Peninsula | Total	2035	458	400	243	10
Upper Peninsula | Total	2036	467	406	250	10
Upper Peninsula | Total	2037	476	411	257	9
Upper Peninsula | Total	2038	485	416	263	8
Upper Peninsula | Total	2039	494	421	268	8
Upper Peninsula | Total	2040	503	427	273	8

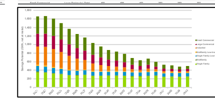


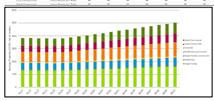
Customer Segment	Service Territory	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Single Family	Lower Peninsula | Total	6,109	6,107	6,046	6,040	5,996	6,045	6,204	6,355	6,514	6,686	6,865	7,041	7,197	7,361	7,547	7,753	7,913	8,096	8,270	8,463
Multifamily Low Income	Lower Peninsula | Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Small Commercial	Lower Peninsula | Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

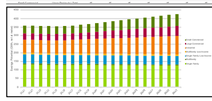


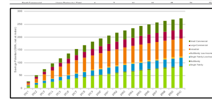


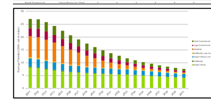


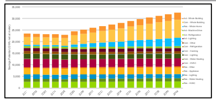
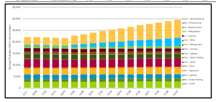
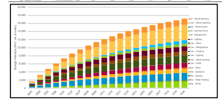
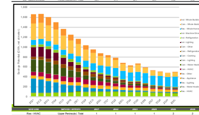
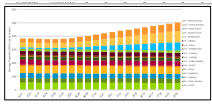
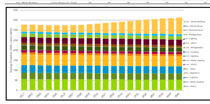
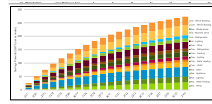
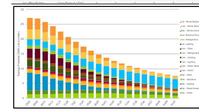






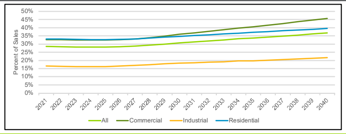




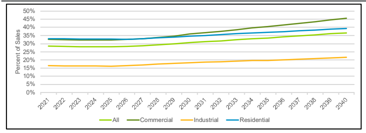
Michigan Total Electricity Technical Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	29%	33%	17%	33%
2022	MI Total	28%	33%	16%	33%
2023	MI Total	28%	32%	16%	33%
2024	MI Total	28%	32%	16%	33%
2025	MI Total	28%	32%	16%	33%
2026	MI Total	28%	33%	16%	33%
2027	MI Total	29%	33%	17%	33%
2028	MI Total	29%	34%	17%	34%
2029	MI Total	30%	35%	18%	34%
2030	MI Total	31%	36%	18%	35%
2031	MI Total	31%	37%	19%	35%
2032	MI Total	32%	38%	19%	36%
2033	MI Total	32%	39%	19%	36%
2034	MI Total	33%	40%	20%	37%
2035	MI Total	34%	41%	20%	37%
2036	MI Total	34%	42%	20%	38%
2037	MI Total	35%	43%	21%	38%
2038	MI Total	36%	44%	21%	39%
2039	MI Total	36%	45%	21%	39%
2040	MI Total	37%	46%	22%	39%



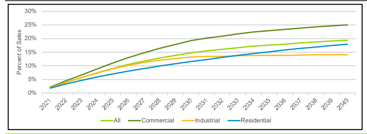
Michigan Total Electricity Economic Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	29%	33%	17%	33%
2022	MI Total	28%	33%	16%	33%
2023	MI Total	28%	32%	16%	33%
2024	MI Total	28%	32%	16%	33%
2025	MI Total	28%	32%	16%	33%
2026	MI Total	28%	33%	16%	33%
2027	MI Total	29%	33%	17%	33%
2028	MI Total	29%	34%	17%	34%
2029	MI Total	30%	35%	18%	34%
2030	MI Total	31%	36%	18%	35%
2031	MI Total	31%	37%	19%	35%
2032	MI Total	32%	38%	19%	36%
2033	MI Total	32%	39%	19%	36%
2034	MI Total	33%	40%	20%	37%
2035	MI Total	34%	40%	20%	37%
2036	MI Total	34%	41%	20%	37%
2037	MI Total	35%	42%	21%	38%
2038	MI Total	35%	44%	21%	38%
2039	MI Total	36%	45%	21%	39%
2040	MI Total	37%	46%	22%	39%



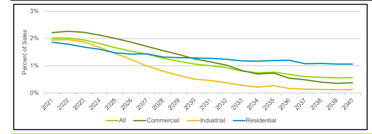
Michigan Total Electricity Cumulative Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	2%	2%	2%	2%
2022	MI Total	4%	4%	4%	3%
2023	MI Total	6%	7%	6%	5%
2024	MI Total	7%	9%	7%	6%
2025	MI Total	9%	11%	9%	7%
2026	MI Total	10%	13%	10%	8%
2027	MI Total	12%	15%	11%	9%
2028	MI Total	13%	16%	12%	10%
2029	MI Total	14%	18%	13%	11%
2030	MI Total	15%	19%	13%	12%
2031	MI Total	15%	20%	13%	12%
2032	MI Total	16%	21%	14%	13%
2033	MI Total	17%	22%	14%	14%
2034	MI Total	17%	22%	14%	14%
2035	MI Total	18%	23%	14%	15%
2036	MI Total	18%	23%	14%	16%
2037	MI Total	18%	24%	14%	16%
2038	MI Total	19%	24%	14%	17%
2039	MI Total	19%	25%	14%	17%
2040	MI Total	19%	25%	14%	18%



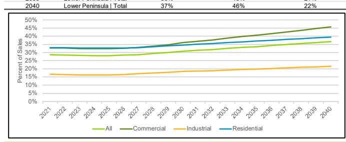
Michigan Total Electricity Incremental Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	2%	2%	2%	2%
2022	MI Total	2%	2%	2%	2%
2023	MI Total	2%	2%	2%	2%
2024	MI Total	2%	2%	2%	2%
2025	MI Total	2%	2%	1%	1%
2026	MI Total	2%	2%	1%	1%
2027	MI Total	1%	2%	1%	1%
2028	MI Total	1%	2%	1%	1%
2029	MI Total	1%	1%	1%	1%
2030	MI Total	1%	1%	1%	1%
2031	MI Total	1%	1%	0%	1%
2032	MI Total	1%	1%	0%	1%
2033	MI Total	1%	1%	0%	1%
2034	MI Total	1%	1%	0%	1%
2035	MI Total	1%	1%	0%	1%
2036	MI Total	1%	1%	0%	1%
2037	MI Total	1%	0%	0%	1%
2038	MI Total	1%	0%	0%	1%
2039	MI Total	1%	0%	0%	1%
2040	MI Total	1%	0%	0%	1%



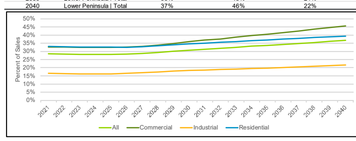
Lower Peninsula Electricity Technical Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula | Total	29%	33%	17%	33%
2022	Lower Peninsula | Total	28%	33%	16%	33%
2023	Lower Peninsula | Total	28%	32%	16%	33%
2024	Lower Peninsula | Total	28%	32%	16%	33%
2025	Lower Peninsula | Total	28%	32%	16%	33%
2026	Lower Peninsula | Total	28%	33%	16%	33%
2027	Lower Peninsula | Total	29%	33%	17%	33%
2028	Lower Peninsula | Total	29%	34%	17%	34%
2029	Lower Peninsula | Total	30%	35%	18%	34%
2030	Lower Peninsula | Total	31%	36%	18%	35%
2031	Lower Peninsula | Total	31%	37%	19%	35%
2032	Lower Peninsula | Total	32%	38%	19%	36%
2033	Lower Peninsula | Total	32%	39%	19%	36%
2034	Lower Peninsula | Total	33%	40%	20%	37%
2035	Lower Peninsula | Total	34%	41%	20%	37%
2036	Lower Peninsula | Total	34%	42%	20%	37%
2037	Lower Peninsula | Total	35%	43%	21%	38%
2038	Lower Peninsula | Total	35%	44%	21%	38%
2039	Lower Peninsula | Total	36%	45%	21%	39%
2040	Lower Peninsula | Total	37%	46%	22%	39%



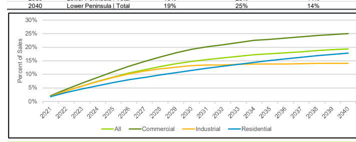
Lower Peninsula Electricity Economic Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula | Total	29%	33%	17%	33%
2022	Lower Peninsula | Total	28%	33%	16%	33%
2023	Lower Peninsula | Total	28%	32%	16%	33%
2024	Lower Peninsula | Total	28%	32%	16%	33%
2025	Lower Peninsula | Total	28%	32%	16%	33%
2026	Lower Peninsula | Total	28%	33%	16%	33%
2027	Lower Peninsula | Total	29%	33%	17%	33%
2028	Lower Peninsula | Total	29%	34%	17%	34%
2029	Lower Peninsula | Total	30%	35%	18%	34%
2030	Lower Peninsula | Total	31%	36%	18%	35%
2031	Lower Peninsula | Total	31%	37%	19%	35%
2032	Lower Peninsula | Total	32%	38%	19%	36%
2033	Lower Peninsula | Total	32%	39%	19%	36%
2034	Lower Peninsula | Total	33%	40%	20%	37%
2035	Lower Peninsula | Total	34%	41%	20%	37%
2036	Lower Peninsula | Total	34%	42%	20%	37%
2037	Lower Peninsula | Total	35%	43%	21%	38%
2038	Lower Peninsula | Total	35%	44%	21%	38%
2039	Lower Peninsula | Total	36%	45%	21%	39%
2040	Lower Peninsula | Total	37%	46%	22%	39%



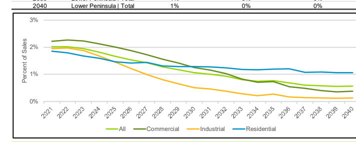
Lower Peninsula Electricity Cumulative Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula | Total	2%	2%	2%	2%
2022	Lower Peninsula | Total	4%	4%	4%	3%
2023	Lower Peninsula | Total	6%	7%	6%	5%
2024	Lower Peninsula | Total	7%	9%	7%	6%
2025	Lower Peninsula | Total	9%	11%	9%	7%
2026	Lower Peninsula | Total	10%	13%	10%	8%
2027	Lower Peninsula | Total	12%	15%	11%	9%
2028	Lower Peninsula | Total	13%	16%	12%	10%
2029	Lower Peninsula | Total	14%	18%	13%	11%
2030	Lower Peninsula | Total	15%	19%	13%	11%
2031	Lower Peninsula | Total	15%	20%	13%	12%
2032	Lower Peninsula | Total	16%	21%	14%	13%
2033	Lower Peninsula | Total	17%	22%	14%	14%
2034	Lower Peninsula | Total	17%	22%	14%	14%
2035	Lower Peninsula | Total	18%	23%	14%	15%
2036	Lower Peninsula | Total	18%	23%	14%	16%
2037	Lower Peninsula | Total	18%	24%	14%	16%
2038	Lower Peninsula | Total	19%	24%	14%	17%
2039	Lower Peninsula | Total	19%	25%	14%	17%
2040	Lower Peninsula | Total	19%	25%	14%	18%



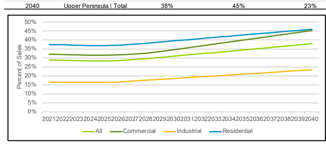
Lower Peninsula Electricity Incremental Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula | Total	2%	2%	2%	2%
2022	Lower Peninsula | Total	2%	2%	2%	2%
2023	Lower Peninsula | Total	2%	2%	2%	2%
2024	Lower Peninsula | Total	2%	2%	2%	2%
2025	Lower Peninsula | Total	2%	2%	1%	1%
2026	Lower Peninsula | Total	2%	2%	1%	1%
2027	Lower Peninsula | Total	1%	2%	1%	1%
2028	Lower Peninsula | Total	1%	2%	1%	1%
2029	Lower Peninsula | Total	1%	1%	1%	1%
2030	Lower Peninsula | Total	1%	1%	1%	1%
2031	Lower Peninsula | Total	1%	1%	0%	1%
2032	Lower Peninsula | Total	1%	1%	0%	1%
2033	Lower Peninsula | Total	1%	1%	0%	1%
2034	Lower Peninsula | Total	1%	1%	0%	1%
2035	Lower Peninsula | Total	1%	1%	0%	1%
2036	Lower Peninsula | Total	1%	1%	0%	1%
2037	Lower Peninsula | Total	1%	0%	0%	1%
2038	Lower Peninsula | Total	1%	0%	0%	1%
2039	Lower Peninsula | Total	1%	0%	0%	1%
2040	Lower Peninsula | Total	1%	0%	0%	1%



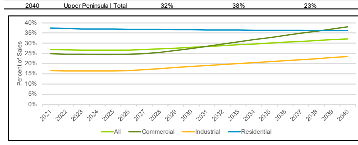
Upper Peninsula Electricity Technical Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula | Total	29%	32%	17%	37%
2022	Upper Peninsula | Total	29%	32%	16%	37%
2023	Upper Peninsula | Total	28%	32%	16%	37%
2024	Upper Peninsula | Total	28%	32%	16%	37%
2025	Upper Peninsula | Total	28%	32%	16%	37%
2026	Upper Peninsula | Total	29%	32%	17%	37%
2027	Upper Peninsula | Total	29%	32%	17%	37%
2028	Upper Peninsula | Total	30%	33%	18%	38%
2029	Upper Peninsula | Total	30%	33%	18%	39%
2030	Upper Peninsula | Total	31%	35%	19%	39%
2031	Upper Peninsula | Total	32%	36%	19%	40%
2032	Upper Peninsula | Total	32%	37%	20%	41%
2033	Upper Peninsula | Total	33%	38%	20%	41%
2034	Upper Peninsula | Total	34%	39%	20%	42%
2035	Upper Peninsula | Total	34%	40%	21%	43%
2036	Upper Peninsula | Total	35%	41%	21%	43%
2037	Upper Peninsula | Total	36%	42%	22%	44%
2038	Upper Peninsula | Total	36%	43%	22%	45%
2039	Upper Peninsula | Total	37%	44%	23%	45%
2040	Upper Peninsula | Total	38%	45%	23%	46%



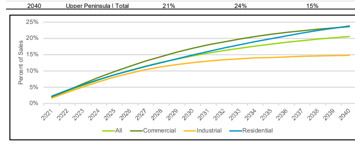
Upper Peninsula Electricity Economic Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula | Total	27%	25%	17%	37%
2022	Upper Peninsula | Total	27%	25%	16%	37%
2023	Upper Peninsula | Total	27%	25%	16%	37%
2024	Upper Peninsula | Total	27%	24%	16%	37%
2025	Upper Peninsula | Total	27%	24%	16%	37%
2026	Upper Peninsula | Total	27%	25%	17%	37%
2027	Upper Peninsula | Total	27%	25%	17%	37%
2028	Upper Peninsula | Total	27%	25%	18%	37%
2029	Upper Peninsula | Total	28%	26%	18%	37%
2030	Upper Peninsula | Total	28%	27%	19%	37%
2031	Upper Peninsula | Total	28%	29%	19%	37%
2032	Upper Peninsula | Total	29%	30%	20%	36%
2033	Upper Peninsula | Total	29%	31%	20%	36%
2034	Upper Peninsula | Total	30%	32%	20%	36%
2035	Upper Peninsula | Total	30%	33%	21%	36%
2036	Upper Peninsula | Total	30%	34%	21%	36%
2037	Upper Peninsula | Total	31%	35%	22%	36%
2038	Upper Peninsula | Total	31%	36%	22%	36%
2039	Upper Peninsula | Total	32%	37%	23%	36%
2040	Upper Peninsula | Total	32%	38%	23%	36%



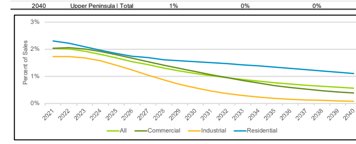
Upper Peninsula Electricity Cumulative Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula | Total	2%	2%	2%	2%
2022	Upper Peninsula | Total	4%	4%	3%	4%
2023	Upper Peninsula | Total	6%	6%	5%	6%
2024	Upper Peninsula | Total	7%	8%	7%	7%
2025	Upper Peninsula | Total	9%	10%	8%	9%
2026	Upper Peninsula | Total	10%	11%	9%	10%
2027	Upper Peninsula | Total	11%	13%	10%	11%
2028	Upper Peninsula | Total	13%	14%	11%	13%
2029	Upper Peninsula | Total	14%	16%	12%	14%
2030	Upper Peninsula | Total	15%	17%	13%	15%
2031	Upper Peninsula | Total	15%	18%	13%	16%
2032	Upper Peninsula | Total	16%	19%	13%	17%
2033	Upper Peninsula | Total	17%	20%	14%	18%
2034	Upper Peninsula | Total	18%	21%	14%	19%
2035	Upper Peninsula | Total	18%	21%	14%	20%
2036	Upper Peninsula | Total	19%	22%	14%	21%
2037	Upper Peninsula | Total	19%	22%	14%	22%
2038	Upper Peninsula | Total	20%	23%	15%	22%
2039	Upper Peninsula | Total	20%	23%	15%	23%
2040	Upper Peninsula | Total	21%	24%	15%	24%



Upper Peninsula Electricity Incremental Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula | Total	2%	2%	2%	2%
2022	Upper Peninsula | Total	2%	2%	2%	2%
2023	Upper Peninsula | Total	2%	2%	2%	2%
2024	Upper Peninsula | Total	2%	2%	2%	2%
2025	Upper Peninsula | Total	2%	2%	1%	2%
2026	Upper Peninsula | Total	2%	2%	1%	2%
2027	Upper Peninsula | Total	1%	2%	1%	2%
2028	Upper Peninsula | Total	1%	1%	1%	2%
2029	Upper Peninsula | Total	1%	1%	1%	2%
2030	Upper Peninsula | Total	1%	1%	1%	2%
2031	Upper Peninsula | Total	1%	1%	0%	2%
2032	Upper Peninsula | Total	1%	1%	0%	1%
2033	Upper Peninsula | Total	1%	1%	0%	1%
2034	Upper Peninsula | Total	1%	1%	0%	1%
2035	Upper Peninsula | Total	1%	1%	0%	1%
2036	Upper Peninsula | Total	1%	1%	0%	1%
2037	Upper Peninsula | Total	1%	1%	0%	1%
2038	Upper Peninsula | Total	1%	0%	0%	1%
2039	Upper Peninsula | Total	1%	0%	0%	1%
2040	Upper Peninsula | Total	1%	0%	0%	1%



Residential 2021 Electricity Technical Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Thermostats - RET Only - Electric	1,204.5
2	Res - Water Heaters, Heat Pump - ROB and NEW - Electric	1,125.3
3	Res - Heat Pumps, Mini-Split - RET Only - Electric	1,062.8
4	Res - Res HVAC - RET only - Electric	971.3
5	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	704.0
6	Res - LED Bulbs - RET Only - Electric	596.3
7	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric	576.4
8	Res - Home Energy Reports - RET Only - Elec	510.3
9	Res - Power Strips - RET Only - Electric	482.3
10	Res - LED Specialty Bulbs - RET Only - Electric	323.3
11	Res - Heat Pumps, VRF - ROB and NEW - Electric	289.0
12	Res - LED Bulb Exterior - ROB and NEW - Electric	288.7
13	Res - Res Appliance - ROB and NEW - Electric	253.2
14	Res - Lighting Controls - RET Only - Electric	252.1
15	e - Heat Pumps, Mini-Split, Cold Climate - ROB and NEW - Elec	183.7
16	Res - LED Fixtures - RET Only - Electric	167.1
17	Res - LED Tube - RET Only - Electric	151.5
18	Res - Low Flow Aerators - RET Only - Electric	97.2
19	Res - LED Bulb Exterior - RET Only - Electric	95.5
20	Res - Clothes Washers - ROB and NEW - Electric	70.9
21	Res - LED Fixtures Exterior - RET Only - Electric	59.9
22	Res - Res HVAC - NEW only - Electric	8.0
23	Res - Home Energy Reports - NEW Only - Elec	4.2
24	Res - Heat Pumps, Ground Source - NEW Only - Electric	2.5
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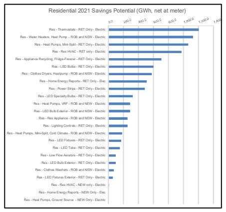
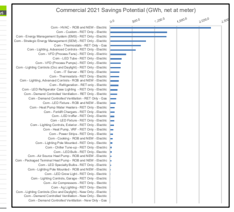


Rank	Measure Name	Potential (cumul. impact/year)
1	Com - HVAC - ROB and NEW - Electric	2,287.0
2	Com - Custom - RET Only - Electric	1,282.1
3	'om - Energy Management System (EMS) - RET Only - Elect	1,267.4
4	om - Strategic Energy Management (SEM) - RET Only - Elec	808.0
5	Com - Thermostats - RET Only - Gas	694.3
6	Com - Lighting, Advanced Controls - RET Only - Electric	581.6
7	Com - VFD (Process Fans) - RET Only - Electric	361.8
8	Com - LED Tube - RET Only - Electric	265.3
9	Com - VFD (Process Pumps) - RET Only - Electric	243.9
10	'om - Lighting Controls (Occ and Daylight) - RET Only - Elect	239.9
11	Com - IT Server - RET Only - Electric	211.7
12	Com - Thermostats - RET Only - Electric	206.4
13	Com - Lighting, Advanced Controls - ROB and NEW - Electri	194.7
14	Com - Refrigeration - RET only - Electric	193.6
15	Com - LED Refrigerator Case Lighting - RET Only - Electric	170.1
16	Com - Demand Controlled Ventilation - RET Only - Electric	162.4
17	Com - Demand Controlled Ventilation - RET Only - Gas	139.2
18	Com - LED Fixture - ROB and NEW - Electric	128.7
19	Com - Heat Pump Water Heaters - RET Only - Electric	107.7
20	Com - Forklift Chargers - RET Only - Electric	100.3
21	Com - LED troffer - RET Only - Electric	97.8
22	Com - LED Fixture - RET Only - Electric	96.1
23	Com - Lighting Controls, Exterior - RET Only - Electric	92.2
24	Com - Heat Pump, VRF - RET Only - Electric	73.7
25	Com - Power Strips - RET Only - Electric	66.9
26	Com - Cooking - ROB and NEW - Electric	63.1
27	Com - Lighting Pole Mounted - RET Only - Electric	54.5
28	Com - Chiller Tune-up - RET Only - Electric	43.1
29	Com - LED Bulb - RET Only - Electric	41.1
30	Com - Air Source Heat Pump - ROB and NEW - Electric	33.7
31	'om - Packaged Terminal Heat Pump - ROB and NEW - Elect	32.6
32	Com - LED Specialty Bulbs - RET Only - Electric	28.0
33	Com - Lighting Pole Mounted - ROB and NEW - Electric	18.2
34	Com - LED Grow Light - RET Only - Electric	10.1
35	Com - Lighting Controls, Garage - RET Only - Electric	3.9
36	Com - Air Compressors - RET Only - Electric	1.2
37	Com - Ag Lighting - RET Only - Electric	0.5
38	'om - Lighting Controls (Occ and Daylight) - New Only - Elect	0.3
39	Com - Demand Controlled Ventilation - New Only - Electric	0.3
40	Com - Demand Controlled Ventilation - New Only - Gas	0.2



Industrial 2021 Electricity Technical Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Lighting - RET Only - Electric	1,005.1
2	Ind - Custom Electric - RET Only - Electric	875.0
3	nd - Strategic Energy Management (SEM) - RET Only - Elect	551.4
4	Ind - Injection Molding Machines - ROB and NEW - Electric	358.9
5	Ind - Lighting - ROB and NEW - Electric	338.3
6	Ind - Air Compressors Controls - RET Only - Electric	253.9
7	Ind - Pump VFDs - RET Only - Electric	101.0
8	Ind - Process Motors - RET Only - Electric	48.7
9	Ind - Air Compressors - RET Only - Electric	32.1
10	Ind - Fan VFDs - RET Only - Electric	25.6
11	Ind - Refrigeration Optimization - RET Only - Electric	11.0
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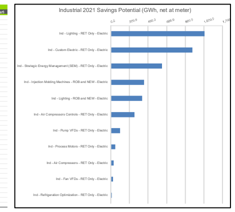
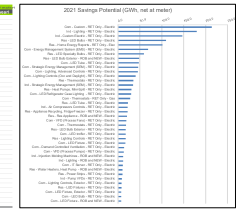


All Sectors 2021 Electricity Cumulative Annual Achievable Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - Custom - RET Only - Electric	213.9
2	Ind - Lighting - RET Only - Electric	179.6
3	Ind - Custom Electric - RET Only - Electric	147.1
4	Res - LED Bulbs - RET Only - Electric	109.2
5	Res - Home Energy Reports - RET Only - Elec	101.7
6	'om - Energy Management System (EMS) - RET Only - Elect	68.7
7	Res - LED Specialty Bulbs - RET Only - Electric	59.5
8	Res - LED Bulb Exterior - ROB and NEW - Electric	48.2
9	Com - LED Tube - RET Only - Electric	47.4
10	om - Strategic Energy Management (SEM) - RET Only - Elec	46.0
11	Com - Lighting, Advanced Controls - RET Only - Electric	45.0
12	'om - Lighting Controls (Occ and Daylight) - RET Only - Elect	40.4
13	Res - Thermostats - RET Only - Electric	35.2
14	nd - Strategic Energy Management (SEM) - RET Only - Elect	34.5
15	Res - Heat Pumps, Mini-Split - RET Only - Electric	30.5
16	Com - LED Refrigerator Case Lighting - RET Only - Electric	29.9
17	Com - Thermostats - RET Only - Gas	27.8
18	Res - LED Tube - RET Only - Electric	22.8
19	Ind - Air Compressors Controls - RET Only - Electric	22.1
20	Res - Appliance Recycling, Fridge-Freezer - RET Only - Elect	22.1
21	Res - Res Appliance - ROB and NEW - Electric	20.7
22	Com - VFD (Process Fans) - RET Only - Electric	19.3
23	Com - Thermostats - RET Only - Electric	18.5
24	Res - LED Bulb Exterior - RET Only - Electric	17.6
25	Com - LED troffer - RET Only - Electric	17.5
26	Res - Lighting Controls - RET Only - Electric	17.3
27	Com - LED Fixture - RET Only - Electric	17.1
28	Com - Demand Controlled Ventilation - RET Only - Electric	13.7
29	Com - VFD (Process Pumps) - RET Only - Electric	13.0
30	Ind - Injection Molding Machines - ROB and NEW - Electric	11.8
31	Ind - Lighting - ROB and NEW - Electric	11.7
32	Com - IT Server - RET Only - Electric	11.3
33	Res - Water Heaters, Heat Pump - ROB and NEW - Electric	10.2
34	Res - Power Strips - RET Only - Electric	10.1
35	Ind - Pump VFDs - RET Only - Electric	9.0
36	Com - Lighting Controls, Exterior - RET Only - Electric	8.2
37	Res - LED Fixtures - RET Only - Electric	7.9
38	Com - LED Fixture, Exterior - RET Only - Electric	7.5
39	Com - LED Bulb - RET Only - Electric	7.3
40	Com - LED Fixture - ROB and NEW - Electric	7.1



Residential 2021 Electricity Economic Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Thermostats - RET Only - Electric	1,204.5
2	Res - Water Heaters, Heat Pump - ROB and NEW - Electric	1,125.3
3	Res - Heat Pumps, Mini-Split - RET Only - Electric	1,062.8
4	Res - Res HVAC - RET only - Electric	971.3
5	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	704.0
6	Res - LED Bulbs - RET Only - Electric	596.3
7	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric	576.4
8	Res - Home Energy Reports - RET Only - Elec	510.3
9	Res - Power Strips - RET Only - Electric	482.3
10	Res - LED Specialty Bulbs - RET Only - Electric	323.3
11	Res - Heat Pumps, VRF - ROB and NEW - Electric	289.0
12	Res - LED Bulb Exterior - ROB and NEW - Electric	288.7
13	Res - Res Appliance - ROB and NEW - Electric	253.2
14	Res - Lighting Controls - RET Only - Electric	252.1
15	e - Heat Pumps, Mini-Split, Cold Climate - ROB and NEW - Elec	183.7
16	Res - LED Fixtures - RET Only - Electric	167.1
17	Res - LED Tube - RET Only - Electric	151.5
18	Res - Low Flow Aerators - RET Only - Electric	97.2
19	Res - LED Bulb Exterior - RET Only - Electric	95.5
20	Res - Clothes Washers - ROB and NEW - Electric	70.9
21	Res - LED Fixtures Exterior - RET Only - Electric	59.9
22	Res - Res HVAC - NEW only - Electric	8.0
23	Res - Home Energy Reports - NEW Only - Elec	4.2
24	Res - Heat Pumps, Ground Source - NEW Only - Electric	2.5
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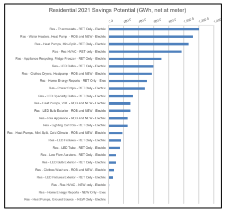

Commercial 2021 Electricity Economic Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - HVAC - ROB and NEW - Electric	2,287.0
2	Com - Custom - RET Only - Electric	1,282.1
3	'om - Energy Management System (EMS) - RET Only - Elect	1,267.4
4	om - Strategic Energy Management (SEM) - RET Only - Elec	808.0
5	Com - Thermostats - RET Only - Gas	694.3
6	Com - Lighting, Advanced Controls - RET Only - Electric	581.6
7	Com - VFD (Process Fans) - RET Only - Electric	361.8
8	Com - LED Tube - RET Only - Electric	265.3
9	Com - VFD (Process Pumps) - RET Only - Electric	243.9
10	'om - Lighting Controls (Occ and Daylight) - RET Only - Elect	239.9
11	Com - IT Server - RET Only - Electric	211.7
12	Com - Thermostats - RET Only - Electric	206.4
13	Com - Lighting, Advanced Controls - ROB and NEW - Electri	194.7
14	Com - Refrigeration - RET only - Electric	193.6
15	Com - LED Refrigerator Case Lighting - RET Only - Electric	170.1
16	Com - Demand Controlled Ventilation - RET Only - Electric	162.4
17	Com - Demand Controlled Ventilation - RET Only - Gas	139.2
18	Com - LED Fixture - ROB and NEW - Electric	128.7
19	Com - Heat Pump Water Heaters - RET Only - Electric	107.7
20	Com - Forklift Chargers - RET Only - Electric	100.3
21	Com - LED troffer - RET Only - Electric	97.8
22	Com - LED Fixture - RET Only - Electric	96.1
23	Com - Lighting Controls, Exterior - RET Only - Electric	92.2
24	Com - Heat Pump, VRF - RET Only - Electric	73.7
25	Com - Power Strips - RET Only - Electric	66.9
26	Com - Cooking - ROB and NEW - Electric	63.1
27	Com - Lighting Pole Mounted - RET Only - Electric	54.5
28	Com - Chiller Tune-up - RET Only - Electric	43.1
29	Com - LED Bulb - RET Only - Electric	41.1
30	'om - Packaged Terminal Heat Pump - ROB and NEW - Elect	32.6
31	Com - LED Specialty Bulbs - RET Only - Electric	28.0
32	Com - Air Source Heat Pump - ROB and NEW - Electric	18.5
33	Com - Lighting Pole Mounted - ROB and NEW - Electric	18.2
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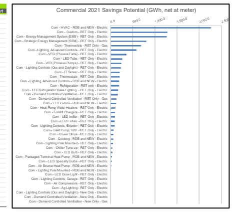
35	[illegible]	[illegible]
36	[illegible]	[illegible]
37	[illegible]	[illegible]
38	[illegible]	[illegible]
39	[illegible]	[illegible]
40	[illegible]	[illegible]



Industrial 2021 Electricity Economic Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Lighting - RET Only - Electric	1,005.1
2	Ind - Custom Electric - RET Only - Electric	875.0
3	nd - Strategic Energy Management (SEM) - RET Only - Elect	551.4
4	Ind - Injection Molding Machines - ROB and NEW - Electric	358.9
5	Ind - Lighting - ROB and NEW - Electric	338.3
6	Ind - Air Compressors Controls - RET Only - Electric	253.9
7	Ind - Pump VFDs - RET Only - Electric	101.0
8	Ind - Process Motors - RET Only - Electric	48.7
9	Ind - Air Compressors - RET Only - Electric	32.1
10	Ind - Fan VFDs - RET Only - Electric	25.6
11	Ind - Refrigeration Optimization - RET Only - Electric	11.0
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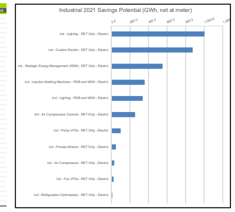
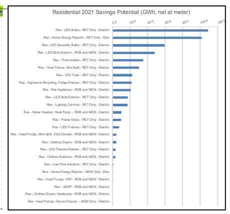


Rank	Measure Name	Potential (cumul. impact/year)
[illegible]	[illegible]	[illegible]



Rank	Measure Name	Potential (cumul. impact/year)
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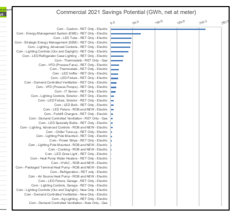
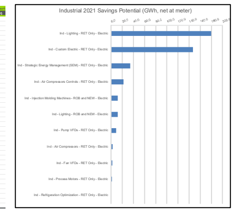


Rank	Measure Name	Potential (cumul. impact/year)
[illegible]	[illegible]	[illegible]



Residential 2021 Electricity Technical Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Water Heaters, Heat Pump - ROB and NEW - Electric	28.8
2	Res - Thermostats - RET Only - Electric	25.9
3	Res - Heat Pumps, VRF - ROB and NEW - Electric	18.4
4	Res - Res HVAC - RET only - Electric	18.0
5	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	15.6
6	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric	12.7
7	Res - LED Bulbs - RET Only - Electric	11.9
8	Res - Power Strips - RET Only - Electric	10.4
9	Res - Home Energy Reports - RET Only - Elec	9.5
10	Res - Heat Pumps, Mini-Split - RET Only - Electric	8.3
11	Res - LED Bulb Exterior - ROB and NEW - Electric	6.4
12	Res - LED Specialty Bulbs - RET Only - Electric	6.1
13	Res - Lighting Controls - RET Only - Electric	5.6
14	Res - Res Appliance - ROB and NEW - Electric	4.7
15	e - Heat Pumps, Mini-Split, Cold Climate - ROB and NEW - Elec	4.0
16	Res - Low Flow Aerators - RET Only - Electric	2.8
17	Res - LED Tube - RET Only - Electric	2.6
18	Res - LED Bulb Exterior - RET Only - Electric	2.1
19	Res - LED Fixtures - RET Only - Electric	2.1
20	Res - Clothes Washers - ROB and NEW - Electric	1.5
21	Res - LED Fixtures Exterior - RET Only - Electric	1.3
22	Res - Heat Pumps, Ground Source - NEW Only - Electric	0.2
23	Res - Res HVAC - NEW only - Electric	0.1
24	Res - Home Energy Reports - NEW Only - Elec	0.1
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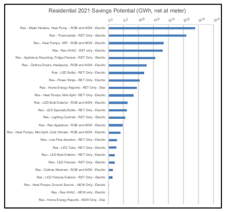
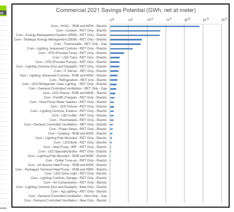


Commercial 2021 Electricity Technical Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	[illegible]	[illegible]
2	[illegible]	[illegible]
3	[illegible]	[illegible]
4	[illegible]	[illegible]
5	[illegible]	[illegible]
6	[illegible]	[illegible]
7	[illegible]	[illegible]
8	[illegible]	[illegible]
9	[illegible]	[illegible]
10	[illegible]	[illegible]
11	[illegible]	[illegible]
12	[illegible]	[illegible]
13	[illegible]	[illegible]
14	[illegible]	[illegible]
15	[illegible]	[illegible]
16	[illegible]	[illegible]
17	[illegible]	[illegible]
18	[illegible]	[illegible]
19	[illegible]	[illegible]
20	[illegible]	[illegible]
21	[illegible]	[illegible]
22	[illegible]	[illegible]
23	[illegible]	[illegible]
24	[illegible]	[illegible]
25	[illegible]	[illegible]
26	Com - Lighting Pole Mounted - RET Only - Electric	0.6
27	Com - LED Bulb - RET Only - Electric	0.5
28	Com - Heat Pump, VRF - RET Only - Electric	0.3
29	Com - LED Specialty Bulbs - RET Only - Electric	0.3
30	Com - Lighting Pole Mounted - ROB and NEW - Electric	0.2
31	Com - Chiller Tune-up - RET Only - Electric	0.2
32	Com - Air Source Heat Pump - ROB and NEW - Electric	0.2
33	'om - Packaged Terminal Heat Pump - ROB and NEW - Elect	0.2
34	Com - LED Grow Light - RET Only - Electric	0.1
35	Com - Lighting Controls, Garage - RET Only - Electric	0.0
36	Com - Air Compressors - RET Only - Electric	0.0
37	'om - Lighting Controls (Occ and Daylight) - New Only - Elect	0.0
38	Com - Ag Lighting - RET Only - Electric	0.0
39	Com - Demand Controlled Ventilation - New Only - Gas	0.0
40	Com - Demand Controlled Ventilation - New Only - Electric	0.0



Industrial 2021 Electricity Technical Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Lighting - RET Only - Electric	21.3
2	Ind - Custom Electric - RET Only - Electric	18.5
3	nd - Strategic Energy Management (SEM) - RET Only - Elect	11.7
4	Ind - Injection Molding Machines - ROB and NEW - Electric	7.6
5	Ind - Lighting - ROB and NEW - Electric	7.2
6	Ind - Air Compressors Controls - RET Only - Electric	5.4
7	Ind - Pump VFDs - RET Only - Electric	2.1
8	Ind - Process Motors - RET Only - Electric	1.0
9	Ind - Air Compressors - RET Only - Electric	0.7
10	Ind - Fan VFDs - RET Only - Electric	0.5
11	Ind - Refrigeration Optimization - RET Only - Electric	0.2
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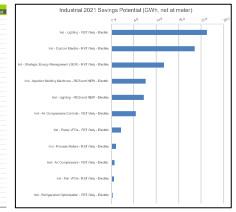
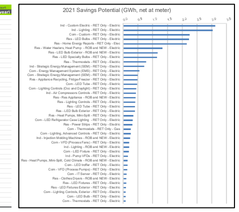


All Sectors 2021 Electricity Cumulative Annual Achievable Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Custom Electric - RET Only - Electric	3.1
2	Ind - Lighting - RET Only - Electric	3.0
3	Com - Custom - RET Only - Electric	2.3
4	Res - LED Bulbs - RET Only - Electric	2.2
5	Res - Home Energy Reports - RET Only - Elec	2.2
6	Res - Water Heaters, Heat Pump - ROB and NEW - Electric	1.3
7	Res - LED Bulb Exterior - ROB and NEW - Electric	1.2
8	Res - LED Specialty Bulbs - RET Only - Electric	1.2
9	Res - Thermostats - RET Only - Electric	0.8
10	Ind - Strategic Energy Management (SEM) - RET Only - Electric	0.7
11	Com - Energy Management System (EMS) - RET Only - Electric	0.6
12	Com - Strategic Energy Management (SEM) - RET Only - Electric	0.5
13	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	0.5
14	Com - LED Tube - RET Only - Electric	0.5
15	Com - Lighting Controls (Occ and Daylight) - RET Only - Electric	0.4
16	Ind - Air Compressors Controls - RET Only - Electric	0.4
17	Res - Res Appliance - ROB and NEW - Electric	0.4
18	Res - Lighting Controls - RET Only - Electric	0.4
19	Res - LED Tube - RET Only - Electric	0.4
20	Res - LED Bulb Exterior - RET Only - Electric	0.4
21	Res - Heat Pumps, Mini-Split - RET Only - Electric	0.3
22	Com - LED Refrigerator Case Lighting - RET Only - Electric	0.3
23	Res - Power Strips - RET Only - Electric	0.3
24	Com - Thermostats - RET Only - Gas	0.3
25	Com - Lighting, Advanced Controls - RET Only - Electric	0.3
26	Ind - Injection Molding Machines - ROB and NEW - Electric	0.2
27	Com - VFD (Process Fans) - RET Only - Electric	0.2
28	Ind - Lighting - ROB and NEW - Electric	0.2
29	Com - LED Fixture - RET Only - Electric	0.2
30	Ind - Pump VFDs - RET Only - Electric	0.2
31	Res - Heat Pumps, Mini-Split, Cold Climate - ROB and NEW - Electr	0.2
32	Com - LED troffer - RET Only - Electric	0.2
33	Com - VFD (Process Pumps) - RET Only - Electric	0.1
34	Com - IT Server - RET Only - Electric	0.1
35	Res - Clothes Dryers - ROB and NEW - Electric	0.1
36	Res - LED Fixtures - RET Only - Electric	0.1
37	Res - LED Fixtures Exterior - RET Only - Electric	0.1
38	Com - Lighting Controls, Exterior - RET Only - Electric	0.1
39	Com - LED Bulb - RET Only - Electric	0.1
40	Com - Thermostats - RET Only - Electric	0.1



Residential 2021 Electricity Economic Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Water Heaters, Heat Pump - ROB and NEW - Electric	28.8
2	Res - Thermostats - RET Only - Electric	25.9
3	Res - Heat Pumps, VRF - ROB and NEW - Electric	18.4
4	Res - Res HVAC - RET only - Electric	18.0
5	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	15.6
6	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric	12.7
7	Res - LED Bulbs - RET Only - Electric	11.9
8	Res - Power Strips - RET Only - Electric	10.4
9	Res - Home Energy Reports - RET Only - Elec	9.5
10	Res - Heat Pumps, Mini-Split - RET Only - Electric	8.3
11	Res - LED Bulb Exterior - ROB and NEW - Electric	6.4
12	Res - LED Specialty Bulbs - RET Only - Electric	6.1
13	Res - Lighting Controls - RET Only - Electric	5.6
14	Res - Res Appliance - ROB and NEW - Electric	4.7
15	e - Heat Pumps, Mini-Split, Cold Climate - ROB and NEW - Elec	4.0
16	Res - Low Flow Aerators - RET Only - Electric	2.8
17	Res - LED Tube - RET Only - Electric	2.6
18	Res - LED Bulb Exterior - RET Only - Electric	2.1
19	Res - LED Fixtures - RET Only - Electric	2.1
20	Res - Clothes Washers - ROB and NEW - Electric	1.5
21	Res - LED Fixtures Exterior - RET Only - Electric	1.3
22	Res - Heat Pumps, Ground Source - NEW Only - Electric	0.2
23	Res - Res HVAC - NEW only - Electric	0.1
24	Res - Home Energy Reports - NEW Only - Elec	0.1
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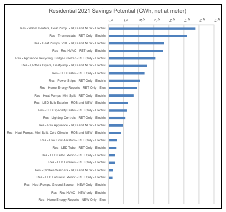

Commercial 2021 Electricity Economic Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - Custom - RET Only - Electric	13.6
2	'om - Energy Management System (EMS) - RET Only - Elect	13.4
3	'om - Strategic Energy Management (SEM) - RET Only - Elec	8.6
4	Com - Thermostats - RET Only - Gas	8.2
5	Com - Lighting, Advanced Controls - RET Only - Electric	6.1
6	Com - VFD (Process Fans) - RET Only - Electric	3.8
7	Com - LED Tube - RET Only - Electric	2.6
8	Com - VFD (Process Pumps) - RET Only - Electric	2.6
9	'om - Lighting Controls (Occ and Daylight) - RET Only - Elect	2.5
10	Com - IT Server - RET Only - Electric	2.2
11	Com - Lighting, Advanced Controls - ROB and NEW - Electr	2.1
12	Com - Refrigeration - RET only - Electric	2.1
13	Com - LED Refrigerator Case Lighting - RET Only - Electric	1.8
14	Com - Demand Controlled Ventilation - RET Only - Gas	1.6
15	Com - LED Fixture - ROB and NEW - Electric	1.4
16	Com - Forklift Chargers - RET Only - Electric	1.2
17	Com - Heat Pump Water Heaters - RET Only - Electric	1.1
18	Com - LED Fixture - RET Only - Electric	1.1
19	Com - Lighting Controls, Exterior - RET Only - Electric	1.0
20	Com - LED troffer - RET Only - Electric	1.0
21	Com - Thermostats - RET Only - Electric	1.0
22	Com - Demand Controlled Ventilation - RET Only - Electric	0.8
23	Com - Power Strips - RET Only - Electric	0.7
24	Com - Cooking - ROB and NEW - Electric	0.7
25	Com - Lighting Pole Mounted - RET Only - Electric	0.6
26	Com - LED Bulb - RET Only - Electric	0.5
27	Com - Heat Pump, VRF - RET Only - Electric	0.3
28	Com - LED Specialty Bulbs - RET Only - Electric	0.3
29	Com - Lighting Pole Mounted - ROB and NEW - Electric	0.2
30	Com - Chiller Tune-up - RET Only - Electric	0.2
31	'om - Packaged Terminal Heat Pump - ROB and NEW - Elect	0.2
32	Com - LED Grow Light - RET Only - Electric	0.1
33	Com - Air Source Heat Pump - ROB and NEW - Electric	0.1
34	Com - Lighting Controls, Garage - RET Only - Electric	0.0
35	Com - Air Compressors - RET Only - Electric	0.0
36	'om - Lighting Controls (Occ and Daylight) - New Only - Elect	0.0
37	Com - Ag Lighting - RET Only - Electric	0.0
38	Com - Demand Controlled Ventilation - New Only - Gas	0.0
39	Com - Demand Controlled Ventilation - New Only - Electric	0.0
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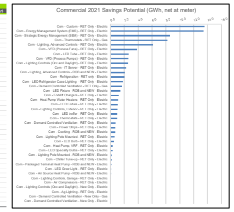

Industrial 2021 Electricity Economic Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Lighting - RET Only - Electric	21.3
2	Ind - Custom Electric - RET Only - Electric	18.5
3	nd - Strategic Energy Management (SEM) - RET Only - Elect	11.7
4	Ind - Injection Molding Machines - ROB and NEW - Electric	7.6
5	Ind - Lighting - ROB and NEW - Electric	7.2
6	Ind - Air Compressors Controls - RET Only - Electric	5.4
7	Ind - Pump VFDs - RET Only - Electric	2.1
8	Ind - Process Motors - RET Only - Electric	1.0
9	Ind - Air Compressors - RET Only - Electric	0.7
10	Ind - Fan VFDs - RET Only - Electric	0.5
11	Ind - Refrigeration Optimization - RET Only - Electric	0.2
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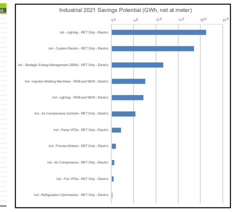

Residential 2021 Electricity Cumulative Annual Achievable Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - LED Bulbs - RET Only - Electric	2.2
2	Res - Home Energy Reports - RET Only - Elec	2.2
3	Res - Water Heaters, Heat Pump - ROB and NEW - Electric	1.3
4	Res - LED Bulb Exterior - ROB and NEW - Electric	1.2
5	Res - LED Specialty Bulbs - RET Only - Electric	1.2
6	Res - Thermostats - RET Only - Electric	0.8
7	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	0.5
8	Res - Res Appliance - ROB and NEW - Electric	0.4
9	Res - Lighting Controls - RET Only - Electric	0.4
10	Res - LED Tube - RET Only - Electric	0.4
11	Res - LED Bulb Exterior - RET Only - Electric	0.4
12	Res - Heat Pumps, Mini-Split - RET Only - Electric	0.3
13	Res - Power Strips - RET Only - Electric	0.3
14	e - Heat Pumps, Mini-Split, Cold Climate - ROB and NEW - Elec	0.2
15	Res - Clothes Dryers - ROB and NEW - Electric	0.1
16	Res - LED Fixtures - RET Only - Electric	0.1
17	Res - LED Fixtures Exterior - RET Only - Electric	0.1
18	Res - Clothes Washers - ROB and NEW - Electric	0.1
19	Res - Heat Pumps, VRF - ROB and NEW - Electric	0.1
20	Res - Low Flow Aerators - RET Only - Electric	0.0
21	Res - Home Energy Reports - NEW Only - Elec	0.0
22	Res - ASHP - ROB and NEW - Electric	0.0
23	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric	0.0
24	Res - Heat Pumps, Ground Source - NEW Only - Electric	0.0
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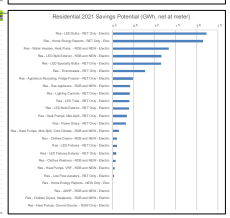
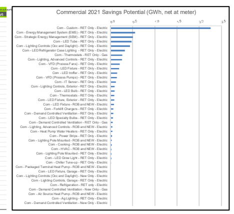


Commercial 2021 Electricity Cumulative Annual Achievable Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - Custom - RET Only - Electric	2.3
2	'om - Energy Management System (EMS) - RET Only - Elect	0.6
3	'om - Strategic Energy Management (SEM) - RET Only - Elec	0.5
4	Com - LED Tube - RET Only - Electric	0.5
5	'om - Lighting Controls (Occ and Daylight) - RET Only - Elect	0.4
6	Com - LED Refrigerator Case Lighting - RET Only - Electric	0.3
7	Com - Thermostats - RET Only - Gas	0.3
8	Com - Lighting, Advanced Controls - RET Only - Electric	0.3
9	Com - VFD (Process Fans) - RET Only - Electric	0.2
10	Com - LED Fixture - RET Only - Electric	0.2
11	Com - LED troffer - RET Only - Electric	0.2
12	Com - VFD (Process Pumps) - RET Only - Electric	0.1
13	Com - IT Server - RET Only - Electric	0.1
14	Com - Lighting Controls, Exterior - RET Only - Electric	0.1
15	Com - LED Bulb - RET Only - Electric	0.1
16	Com - Thermostats - RET Only - Electric	0.1
17	Com - LED Fixture, Exterior - RET Only - Electric	0.1
18	Com - LED Fixture - ROB and NEW - Electric	0.1
19	Com - Forklift Chargers - RET Only - Electric	0.1
20	Com - Demand Controlled Ventilation - RET Only - Electric	0.1
21	Com - LED Specialty Bulbs - RET Only - Electric	0.1
22	Com - Demand Controlled Ventilation - RET Only - Gas	0.0
23	Com - Lighting, Advanced Controls - ROB and NEW - Electri	0.0
24	Com - Heat Pump Water Heaters - RET Only - Electric	0.0
25	Com - Power Strips - RET Only - Electric	0.0
26	Com - Lighting Pole Mounted - ROB and NEW - Electric	0.0
27	Com - Cooking - ROB and NEW - Electric	0.0
28	Com - HVAC - ROB and NEW - Electric	0.0
29	Com - Lighting Pole Mounted - RET Only - Electric	0.0
30	Com - LED Grow Light - RET Only - Electric	0.0
31	Com - Chiller Tune-up - RET Only - Electric	0.0
32	'om - Packaged Terminal Heat Pump - ROB and NEW - Elect	0.0
33	Com - LED Fixture, Garage - RET Only - Electric	0.0
34	'om - Lighting Controls (Occ and Daylight) - New Only - Elect	0.0
35	Com - Lighting Controls, Garage - RET Only - Electric	0.0
36	Com - Refrigeration - RET only - Electric	0.0
37	Com - Demand Controlled Ventilation - New Only - Gas	0.0
38	Com - Air Source Heat Pump - ROB and NEW - Electric	0.0
39	Com - Ag Lighting - RET Only - Electric	0.0
40	Com - Demand Controlled Ventilation - New Only - Electric	0.0



Industrial 2021 Electricity Cumulative Annual Achievable Potential Top Measures (GWh, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Custom Electric - RET Only - Electric	3.1
2	Ind - Lighting - RET Only - Electric	3.0
3	nd - Strategic Energy Management (SEM) - RET Only - Elect	0.7
4	Ind - Air Compressors Controls - RET Only - Electric	0.4
5	Ind - Injection Molding Machines - ROB and NEW - Electric	0.2
6	Ind - Lighting - ROB and NEW - Electric	0.2
7	Ind - Pump VFDs - RET Only - Electric	0.2
8	Ind - Fan VFDs - RET Only - Electric	0.0
9	Ind - Air Compressors - RET Only - Electric	0.0
10	Ind - Refrigeration Optimization - RET Only - Electric	0.0
11	Ind - Process Motors - RET Only - Electric	0.0
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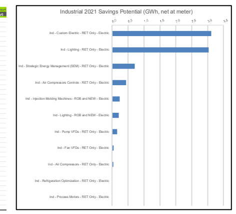
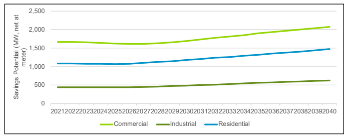


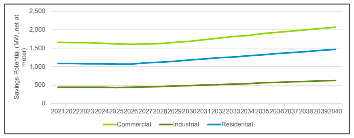
Lower Peninsula Electric Demand Technical Potential by Sector (MW, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	1,669	441	1,084
Lower Peninsula | Total	2022	1,663	441	1,083
Lower Peninsula | Total	2023	1,653	443	1,075
Lower Peninsula | Total	2024	1,639	443	1,074
Lower Peninsula | Total	2025	1,620	440	1,066
Lower Peninsula | Total	2026	1,611	442	1,074
Lower Peninsula | Total	2027	1,619	454	1,100
Lower Peninsula | Total	2028	1,634	464	1,125
Lower Peninsula | Total	2029	1,661	476	1,151
Lower Peninsula | Total	2030	1,694	487	1,179
Lower Peninsula | Total	2031	1,736	502	1,208
Lower Peninsula | Total	2032	1,780	518	1,237
Lower Peninsula | Total	2033	1,816	531	1,263
Lower Peninsula | Total	2034	1,851	544	1,290
Lower Peninsula | Total	2035	1,898	562	1,321
Lower Peninsula | Total	2036	1,934	576	1,354
Lower Peninsula | Total	2037	1,971	589	1,381
Lower Peninsula | Total	2038	2,004	602	1,410
Lower Peninsula | Total	2039	2,036	615	1,439
Lower Peninsula | Total	2040	2,073	630	1,471



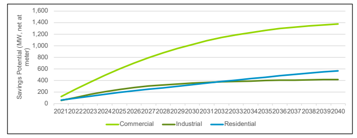
Lower Peninsula Electric Demand Economic Potential by Sector (MW, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	1,659	441	1,084
Lower Peninsula | Total	2022	1,653	441	1,083
Lower Peninsula | Total	2023	1,646	443	1,075
Lower Peninsula | Total	2024	1,633	443	1,074
Lower Peninsula | Total	2025	1,614	440	1,066
Lower Peninsula | Total	2026	1,605	442	1,066
Lower Peninsula | Total	2027	1,612	454	1,100
Lower Peninsula | Total	2028	1,628	464	1,124
Lower Peninsula | Total	2029	1,655	476	1,151
Lower Peninsula | Total	2030	1,688	487	1,179
Lower Peninsula | Total	2031	1,729	502	1,208
Lower Peninsula | Total	2032	1,773	518	1,237
Lower Peninsula | Total	2033	1,810	531	1,263
Lower Peninsula | Total	2034	1,844	544	1,290
Lower Peninsula | Total	2035	1,891	562	1,320
Lower Peninsula | Total	2036	1,928	576	1,354
Lower Peninsula | Total	2037	1,964	589	1,381
Lower Peninsula | Total	2038	1,997	602	1,410
Lower Peninsula | Total	2039	2,030	615	1,439
Lower Peninsula | Total	2040	2,067	630	1,471



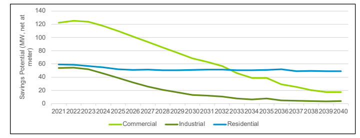
Lower Peninsula Electric Demand Cumulative Annual Achievable Potential by Sector (MW, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	122	54	59
Lower Peninsula | Total	2022	247	108	96
Lower Peninsula | Total	2023	371	160	130
Lower Peninsula | Total	2024	489	206	162
Lower Peninsula | Total	2025	599	245	191
Lower Peninsula | Total	2026	700	277	219
Lower Peninsula | Total	2027	793	303	248
Lower Peninsula | Total	2028	878	324	274
Lower Peninsula | Total	2029	955	340	301
Lower Peninsula | Total	2030	1,023	354	328
Lower Peninsula | Total	2031	1,086	366	355
Lower Peninsula | Total	2032	1,143	376	381
Lower Peninsula | Total	2033	1,189	384	406
Lower Peninsula | Total	2034	1,228	390	431
Lower Peninsula | Total	2035	1,267	398	456
Lower Peninsula | Total	2036	1,296	403	481
Lower Peninsula | Total	2037	1,322	407	504
Lower Peninsula | Total	2038	1,342	411	526
Lower Peninsula | Total	2039	1,360	414	547
Lower Peninsula | Total	2040	1,378	418	568



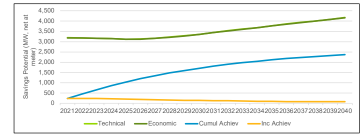
Lower Peninsula Electric Demand Incremental Annual Achievable Potential by Sector (MW, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	122	54	59
Lower Peninsula | Total	2022	125	54	59
Lower Peninsula | Total	2023	124	52	57
Lower Peninsula | Total	2024	118	46	55
Lower Peninsula | Total	2025	110	39	52
Lower Peninsula | Total	2026	102	32	51
Lower Peninsula | Total	2027	93	26	51
Lower Peninsula | Total	2028	85	21	50
Lower Peninsula | Total	2029	77	17	50
Lower Peninsula | Total	2030	68	13	51
Lower Peninsula | Total	2031	63	12	51
Lower Peninsula | Total	2032	57	10	51
Lower Peninsula | Total	2033	46	8	50
Lower Peninsula | Total	2034	39	6	50
Lower Peninsula | Total	2035	39	8	51
Lower Peninsula | Total	2036	29	5	52
Lower Peninsula | Total	2037	25	4	49
Lower Peninsula | Total	2038	21	4	49
Lower Peninsula | Total	2039	17	3	49
Lower Peninsula | Total	2040	18	4	49



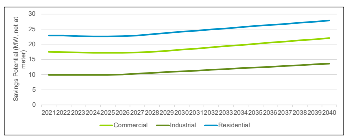
Lower Peninsula Electric Demand Potential (MW, net at meter)

Service Territory	Year	Technical	Economic	Cumul Achiev	Inc Achiev
Lower Peninsula | Total	2021	3,194	3,184	235	235
Lower Peninsula | Total	2022	3,187	3,177	451	238
Lower Peninsula | Total	2023	3,171	3,164	661	232
Lower Peninsula | Total	2024	3,156	3,149	857	218
Lower Peninsula | Total	2025	3,125	3,119	1,035	201
Lower Peninsula | Total	2026	3,127	3,112	1,197	185
Lower Peninsula | Total	2027	3,172	3,166	1,344	170
Lower Peninsula | Total	2028	3,222	3,215	1,476	156
Lower Peninsula | Total	2029	3,288	3,281	1,596	144
Lower Peninsula | Total	2030	3,360	3,354	1,705	132
Lower Peninsula | Total	2031	3,446	3,440	1,807	127
Lower Peninsula | Total	2032	3,535	3,528	1,900	118
Lower Peninsula | Total	2033	3,610	3,604	1,979	105
Lower Peninsula | Total	2034	3,685	3,678	2,049	96
Lower Peninsula | Total	2035	3,781	3,774	2,121	98
Lower Peninsula | Total	2036	3,864	3,857	2,181	86
Lower Peninsula | Total	2037	3,940	3,933	2,232	79
Lower Peninsula | Total	2038	4,016	4,009	2,279	74
Lower Peninsula | Total	2039	4,091	4,084	2,321	70
Lower Peninsula | Total	2040	4,174	4,168	2,364	71



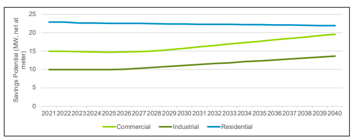
Upper Peninsula Electric Demand Technical Potential by Sector (MW, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	17	10	23
Upper Peninsula | Total	2022	17	10	23
Upper Peninsula | Total	2023	17	10	23
Upper Peninsula | Total	2024	17	10	23
Upper Peninsula | Total	2025	17	10	23
Upper Peninsula | Total	2026	17	10	23
Upper Peninsula | Total	2027	17	10	23
Upper Peninsula | Total	2028	18	11	23
Upper Peninsula | Total	2029	18	11	24
Upper Peninsula | Total	2030	18	11	24
Upper Peninsula | Total	2031	19	11	24
Upper Peninsula | Total	2032	19	12	25
Upper Peninsula | Total	2033	19	12	25
Upper Peninsula | Total	2034	20	12	26
Upper Peninsula | Total	2035	20	12	26
Upper Peninsula | Total	2036	21	13	26
Upper Peninsula | Total	2037	21	13	27
Upper Peninsula | Total	2038	21	13	27
Upper Peninsula | Total	2039	22	13	27
Upper Peninsula | Total	2040	22	14	28



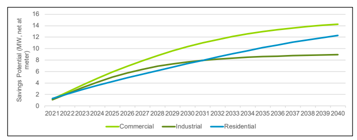
Upper Peninsula Electric Demand Economic Potential by Sector (MW, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	15	10	23
Upper Peninsula | Total	2022	15	10	23
Upper Peninsula | Total	2023	15	10	23
Upper Peninsula | Total	2024	15	10	23
Upper Peninsula | Total	2025	15	10	23
Upper Peninsula | Total	2026	15	10	22
Upper Peninsula | Total	2027	15	10	22
Upper Peninsula | Total	2028	15	11	22
Upper Peninsula | Total	2029	15	11	22
Upper Peninsula | Total	2030	16	11	22
Upper Peninsula | Total	2031	16	11	22
Upper Peninsula | Total	2032	17	12	22
Upper Peninsula | Total	2033	17	12	22
Upper Peninsula | Total	2034	17	12	22
Upper Peninsula | Total	2035	18	12	22
Upper Peninsula | Total	2036	18	13	22
Upper Peninsula | Total	2037	18	13	22
Upper Peninsula | Total	2038	19	13	22
Upper Peninsula | Total	2039	19	13	22
Upper Peninsula | Total	2040	20	14	22



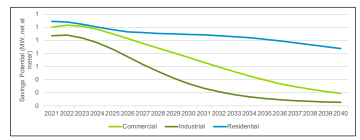
Upper Peninsula Electric Demand Cumulative Annual Achievable Potential by Sector (MW, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	1	1	1
Upper Peninsula | Total	2022	2	2	2
Upper Peninsula | Total	2023	4	3	3
Upper Peninsula | Total	2024	5	4	4
Upper Peninsula | Total	2025	6	5	4
Upper Peninsula | Total	2026	7	6	5
Upper Peninsula | Total	2027	8	6	6
Upper Peninsula | Total	2028	9	7	6
Upper Peninsula | Total	2029	10	7	7
Upper Peninsula | Total	2030	10	8	7
Upper Peninsula | Total	2031	11	8	8
Upper Peninsula | Total	2032	12	8	9
Upper Peninsula | Total	2033	12	8	9
Upper Peninsula | Total	2034	13	8	10
Upper Peninsula | Total	2035	13	9	10
Upper Peninsula | Total	2036	13	9	11
Upper Peninsula | Total	2037	14	9	11
Upper Peninsula | Total	2038	14	9	12
Upper Peninsula | Total	2039	14	9	12
Upper Peninsula | Total	2040	14	9	12



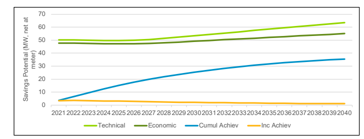
Upper Peninsula Electric Demand Incremental Annual Achievable Potential by Sector (MW, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	1	1	1
Upper Peninsula | Total	2022	1	1	1
Upper Peninsula | Total	2023	1	1	1
Upper Peninsula | Total	2024	1	1	1
Upper Peninsula | Total	2025	1	1	1
Upper Peninsula | Total	2026	1	1	1
Upper Peninsula | Total	2027	1	1	1
Upper Peninsula | Total	2028	1	1	1
Upper Peninsula | Total	2029	1	0	1
Upper Peninsula | Total	2030	1	0	1
Upper Peninsula | Total	2031	1	0	1
Upper Peninsula | Total	2032	1	0	1
Upper Peninsula | Total	2033	1	0	1
Upper Peninsula | Total	2034	0	0	1
Upper Peninsula | Total	2035	0	0	1
Upper Peninsula | Total	2036	0	0	1
Upper Peninsula | Total	2037	0	0	1
Upper Peninsula | Total	2038	0	0	1
Upper Peninsula | Total	2039	0	0	1
Upper Peninsula | Total	2040	0	0	1

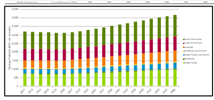


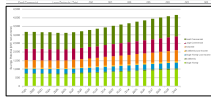
Upper Electric Demand Electricity Potential (MW, net at meter)

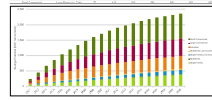
Service Territory	Year	Technical	Economic	Cumul Achiev	Inc Achiev
Upper Peninsula | Total	2021	50	48	4	4
Upper Peninsula | Total	2022	50	48	7	4
Upper Peninsula | Total	2023	50	47	10	3
Upper Peninsula | Total	2024	50	47	13	3
Upper Peninsula | Total	2025	50	47	15	3
Upper Peninsula | Total	2026	50	47	18	3
Upper Peninsula | Total	2027	51	48	20	3
Upper Peninsula | Total	2028	51	48	22	3
Upper Peninsula | Total	2029	52	49	24	2
Upper Peninsula | Total	2030	53	49	25	2
Upper Peninsula | Total	2031	54	50	27	2
Upper Peninsula | Total	2032	55	50	28	2
Upper Peninsula | Total	2033	56	51	30	2
Upper Peninsula | Total	2034	58	52	31	2
Upper Peninsula | Total	2035	59	52	32	2
Upper Peninsula | Total	2036	60	53	33	1
Upper Peninsula | Total	2037	61	53	33	1
Upper Peninsula | Total	2038	62	54	34	1
Upper Peninsula | Total	2039	62	54	35	1
Upper Peninsula | Total	2040	63	55	36	1

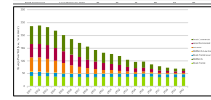


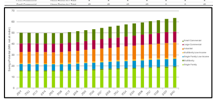
Customer Segment	Service Territory	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Single Family	Lower Peninsula | Total	710	709	704	703	698	703	721	738	756	775	796	815	833	851	872	895	913	933	954	975
Multifamily	Lower Peninsula | Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Multifamily Low-Income	Lower Peninsula | Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Small Commercial	Lower Peninsula | Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

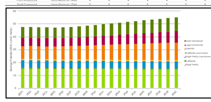


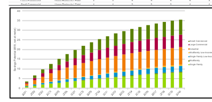


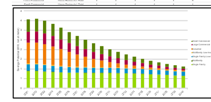


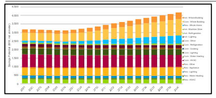


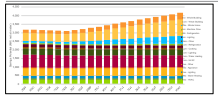


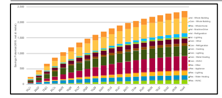


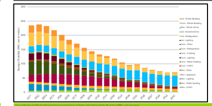


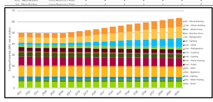


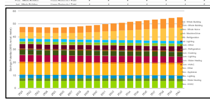


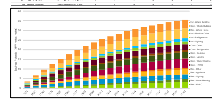


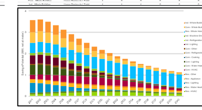






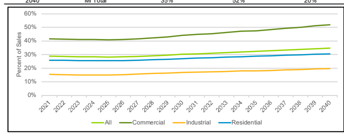






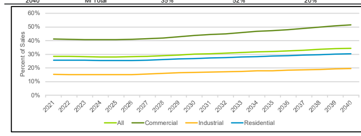
Michigan Total Electric Demand Technical Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	29%	41%	15%	26%
2022	MI Total	29%	41%	15%	26%
2023	MI Total	28%	41%	15%	26%
2024	MI Total	28%	41%	15%	26%
2025	MI Total	28%	41%	15%	26%
2026	MI Total	28%	41%	15%	26%
2027	MI Total	29%	42%	16%	26%
2028	MI Total	29%	42%	16%	26%
2029	MI Total	30%	43%	16%	27%
2030	MI Total	30%	44%	17%	27%
2031	MI Total	31%	45%	17%	27%
2032	MI Total	31%	45%	17%	28%
2033	MI Total	31%	46%	18%	28%
2034	MI Total	32%	47%	18%	28%
2035	MI Total	32%	48%	18%	29%
2036	MI Total	33%	48%	18%	29%
2037	MI Total	33%	49%	19%	30%
2038	MI Total	34%	50%	19%	30%
2039	MI Total	34%	51%	19%	30%
2040	MI Total	35%	52%	20%	31%



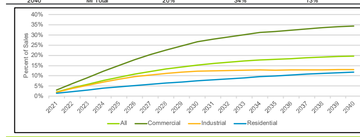
Michigan Total Electric Demand Economic Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	29%	41%	15%	26%
2022	MI Total	28%	41%	15%	26%
2023	MI Total	28%	41%	15%	26%
2024	MI Total	28%	41%	15%	26%
2025	MI Total	28%	41%	15%	26%
2026	MI Total	28%	41%	15%	25%
2027	MI Total	29%	41%	16%	26%
2028	MI Total	29%	42%	16%	26%
2029	MI Total	30%	43%	16%	27%
2030	MI Total	30%	44%	17%	27%
2031	MI Total	31%	45%	17%	27%
2032	MI Total	31%	45%	17%	28%
2033	MI Total	31%	46%	18%	28%
2034	MI Total	32%	47%	18%	28%
2035	MI Total	32%	47%	18%	29%
2036	MI Total	33%	48%	18%	29%
2037	MI Total	33%	49%	19%	29%
2038	MI Total	34%	50%	19%	30%
2039	MI Total	34%	51%	19%	30%
2040	MI Total	35%	52%	20%	30%



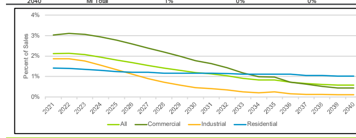
Michigan Total Electric Demand Cumulative Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	2%	3%	2%	1%
2022	MI Total	4%	6%	4%	2%
2023	MI Total	6%	9%	5%	3%
2024	MI Total	8%	12%	7%	4%
2025	MI Total	9%	15%	8%	5%
2026	MI Total	11%	18%	10%	5%
2027	MI Total	12%	20%	10%	6%
2028	MI Total	13%	23%	11%	6%
2029	MI Total	14%	25%	12%	7%
2030	MI Total	15%	27%	12%	8%
2031	MI Total	16%	28%	12%	8%
2032	MI Total	17%	29%	13%	9%
2033	MI Total	17%	30%	13%	9%
2034	MI Total	18%	31%	13%	10%
2035	MI Total	18%	32%	13%	10%
2036	MI Total	18%	32%	13%	10%
2037	MI Total	19%	33%	13%	11%
2038	MI Total	19%	34%	13%	11%
2039	MI Total	19%	34%	13%	12%
2040	MI Total	20%	34%	13%	12%



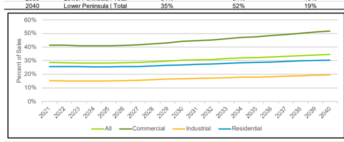
Michigan Total Electric Demand Incremental Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	2%	3%	2%	1%
2022	MI Total	2%	3%	2%	1%
2023	MI Total	2%	3%	2%	1%
2024	MI Total	2%	3%	2%	1%
2025	MI Total	2%	3%	1%	1%
2026	MI Total	2%	3%	1%	1%
2027	MI Total	2%	2%	1%	1%
2028	MI Total	1%	2%	1%	1%
2029	MI Total	1%	2%	1%	1%
2030	MI Total	1%	2%	0%	1%
2031	MI Total	1%	2%	0%	1%
2032	MI Total	1%	1%	0%	1%
2033	MI Total	1%	1%	0%	1%
2034	MI Total	1%	1%	0%	1%
2035	MI Total	1%	1%	0%	1%
2036	MI Total	1%	1%	0%	1%
2037	MI Total	1%	1%	0%	1%
2038	MI Total	1%	1%	0%	1%
2039	MI Total	1%	0%	0%	1%
2040	MI Total	1%	0%	0%	1%



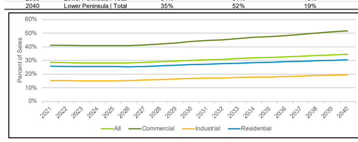
Lower Peninsula Electric Demand Technical Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula | Total	29%	41%	15%	26%
2022	Lower Peninsula | Total	29%	41%	15%	26%
2023	Lower Peninsula | Total	28%	41%	15%	26%
2024	Lower Peninsula | Total	28%	41%	15%	25%
2025	Lower Peninsula | Total	28%	41%	15%	25%
2026	Lower Peninsula | Total	28%	41%	15%	25%
2027	Lower Peninsula | Total	29%	42%	16%	26%
2028	Lower Peninsula | Total	29%	42%	16%	26%
2029	Lower Peninsula | Total	30%	43%	16%	26%
2030	Lower Peninsula | Total	30%	44%	17%	27%
2031	Lower Peninsula | Total	31%	45%	17%	27%
2032	Lower Peninsula | Total	31%	45%	17%	28%
2033	Lower Peninsula | Total	31%	46%	17%	28%
2034	Lower Peninsula | Total	32%	47%	18%	28%
2035	Lower Peninsula | Total	32%	48%	18%	29%
2036	Lower Peninsula | Total	33%	48%	18%	29%
2037	Lower Peninsula | Total	33%	49%	19%	29%
2038	Lower Peninsula | Total	34%	50%	19%	30%
2039	Lower Peninsula | Total	34%	51%	19%	30%
2040	Lower Peninsula | Total	35%	52%	19%	30%



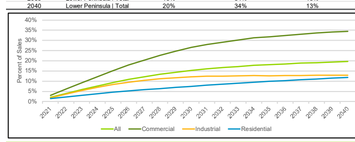
Lower Peninsula Electric Demand Economic Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula | Total	29%	41%	15%	26%
2022	Lower Peninsula | Total	28%	41%	15%	26%
2023	Lower Peninsula | Total	28%	41%	15%	26%
2024	Lower Peninsula | Total	28%	41%	15%	25%
2025	Lower Peninsula | Total	28%	41%	15%	25%
2026	Lower Peninsula | Total	28%	41%	15%	25%
2027	Lower Peninsula | Total	29%	41%	16%	26%
2028	Lower Peninsula | Total	29%	42%	16%	26%
2029	Lower Peninsula | Total	30%	43%	16%	26%
2030	Lower Peninsula | Total	30%	44%	17%	27%
2031	Lower Peninsula | Total	31%	45%	17%	27%
2032	Lower Peninsula | Total	31%	45%	17%	28%
2033	Lower Peninsula | Total	31%	46%	17%	28%
2034	Lower Peninsula | Total	32%	47%	18%	28%
2035	Lower Peninsula | Total	32%	47%	18%	29%
2036	Lower Peninsula | Total	33%	48%	18%	29%
2037	Lower Peninsula | Total	33%	49%	19%	29%
2038	Lower Peninsula | Total	34%	50%	19%	29%
2039	Lower Peninsula | Total	34%	51%	19%	30%
2040	Lower Peninsula | Total	35%	52%	19%	30%



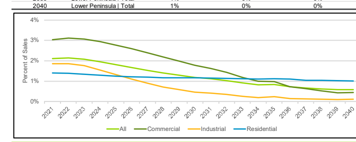
Lower Peninsula Electric Demand Cumulative Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula | Total	2%	3%	2%	1%
2022	Lower Peninsula | Total	4%	6%	4%	2%
2023	Lower Peninsula | Total	6%	9%	5%	3%
2024	Lower Peninsula | Total	8%	12%	7%	4%
2025	Lower Peninsula | Total	9%	15%	8%	5%
2026	Lower Peninsula | Total	11%	18%	10%	5%
2027	Lower Peninsula | Total	12%	20%	10%	6%
2028	Lower Peninsula | Total	13%	23%	11%	6%
2029	Lower Peninsula | Total	14%	25%	12%	7%
2030	Lower Peninsula | Total	15%	27%	12%	7%
2031	Lower Peninsula | Total	16%	28%	12%	8%
2032	Lower Peninsula | Total	17%	29%	12%	8%
2033	Lower Peninsula | Total	17%	30%	13%	9%
2034	Lower Peninsula | Total	18%	31%	13%	9%
2035	Lower Peninsula | Total	18%	32%	13%	10%
2036	Lower Peninsula | Total	18%	32%	13%	10%
2037	Lower Peninsula | Total	19%	33%	13%	11%
2038	Lower Peninsula | Total	19%	34%	13%	11%
2039	Lower Peninsula | Total	19%	34%	13%	11%
2040	Lower Peninsula | Total	20%	34%	13%	12%



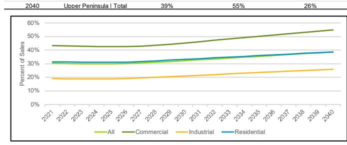
Lower Peninsula Electric Demand Incremental Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula | Total	2%	3%	2%	1%
2022	Lower Peninsula | Total	2%	3%	2%	1%
2023	Lower Peninsula | Total	2%	3%	2%	1%
2024	Lower Peninsula | Total	2%	3%	2%	1%
2025	Lower Peninsula | Total	2%	3%	1%	1%
2026	Lower Peninsula | Total	2%	3%	1%	1%
2027	Lower Peninsula | Total	2%	2%	1%	1%
2028	Lower Peninsula | Total	1%	2%	1%	1%
2029	Lower Peninsula | Total	1%	2%	1%	1%
2030	Lower Peninsula | Total	1%	2%	0%	1%
2031	Lower Peninsula | Total	1%	2%	0%	1%
2032	Lower Peninsula | Total	1%	1%	0%	1%
2033	Lower Peninsula | Total	1%	1%	0%	1%
2034	Lower Peninsula | Total	1%	1%	0%	1%
2035	Lower Peninsula | Total	1%	1%	0%	1%
2036	Lower Peninsula | Total	1%	1%	0%	1%
2037	Lower Peninsula | Total	1%	1%	0%	1%
2038	Lower Peninsula | Total	1%	1%	0%	1%
2039	Lower Peninsula | Total	1%	0%	0%	1%
2040	Lower Peninsula | Total	1%	0%	0%	1%



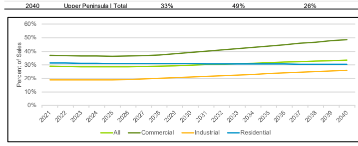
Upper Peninsula Electric Demand Technical Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula | Total	30%	43%	19%	31%
2022	Upper Peninsula | Total	30%	43%	19%	31%
2023	Upper Peninsula | Total	30%	43%	19%	31%
2024	Upper Peninsula | Total	30%	43%	19%	31%
2025	Upper Peninsula | Total	30%	43%	19%	31%
2026	Upper Peninsula | Total	30%	43%	19%	31%
2027	Upper Peninsula | Total	31%	43%	20%	32%
2028	Upper Peninsula | Total	31%	44%	20%	32%
2029	Upper Peninsula | Total	32%	44%	21%	33%
2030	Upper Peninsula | Total	32%	45%	21%	33%
2031	Upper Peninsula | Total	33%	46%	22%	34%
2032	Upper Peninsula | Total	34%	47%	22%	34%
2033	Upper Peninsula | Total	34%	48%	23%	35%
2034	Upper Peninsula | Total	35%	49%	23%	35%
2035	Upper Peninsula | Total	35%	50%	24%	36%
2036	Upper Peninsula | Total	36%	51%	24%	37%
2037	Upper Peninsula | Total	37%	52%	25%	37%
2038	Upper Peninsula | Total	37%	53%	25%	38%
2039	Upper Peninsula | Total	38%	54%	26%	38%
2040	Upper Peninsula | Total	39%	55%	26%	39%



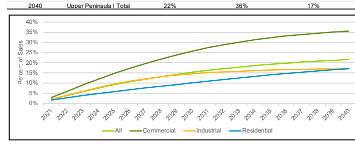
Upper Peninsula Electric Demand Economic Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula | Total	29%	37%	19%	31%
2022	Upper Peninsula | Total	29%	37%	19%	31%
2023	Upper Peninsula | Total	29%	37%	19%	31%
2024	Upper Peninsula | Total	29%	37%	19%	31%
2025	Upper Peninsula | Total	28%	36%	19%	31%
2026	Upper Peninsula | Total	29%	37%	19%	31%
2027	Upper Peninsula | Total	29%	37%	20%	31%
2028	Upper Peninsula | Total	29%	37%	20%	31%
2029	Upper Peninsula | Total	29%	38%	21%	31%
2030	Upper Peninsula | Total	30%	39%	21%	31%
2031	Upper Peninsula | Total	30%	40%	22%	31%
2032	Upper Peninsula | Total	30%	41%	22%	31%
2033	Upper Peninsula | Total	31%	42%	23%	31%
2034	Upper Peninsula | Total	31%	43%	23%	31%
2035	Upper Peninsula | Total	32%	44%	24%	31%
2036	Upper Peninsula | Total	32%	45%	24%	31%
2037	Upper Peninsula | Total	32%	46%	25%	31%
2038	Upper Peninsula | Total	33%	47%	25%	31%
2039	Upper Peninsula | Total	33%	48%	26%	30%
2040	Upper Peninsula | Total	33%	49%	26%	30%



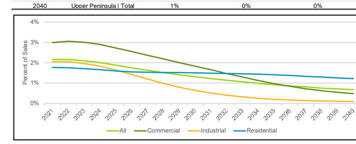
Upper Peninsula Electric Demand Cumulative Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula | Total	2%	3%	2%	2%
2022	Upper Peninsula | Total	4%	6%	4%	3%
2023	Upper Peninsula | Total	6%	9%	6%	4%
2024	Upper Peninsula | Total	8%	12%	8%	5%
2025	Upper Peninsula | Total	9%	15%	10%	6%
2026	Upper Peninsula | Total	11%	17%	11%	7%
2027	Upper Peninsula | Total	12%	20%	12%	8%
2028	Upper Peninsula | Total	13%	22%	13%	9%
2029	Upper Peninsula | Total	14%	24%	14%	9%
2030	Upper Peninsula | Total	15%	26%	15%	10%
2031	Upper Peninsula | Total	16%	27%	15%	11%
2032	Upper Peninsula | Total	17%	29%	16%	12%
2033	Upper Peninsula | Total	18%	30%	16%	13%
2034	Upper Peninsula | Total	19%	31%	16%	13%
2035	Upper Peninsula | Total	19%	32%	16%	14%
2036	Upper Peninsula | Total	20%	33%	17%	15%
2037	Upper Peninsula | Total	20%	34%	17%	15%
2038	Upper Peninsula | Total	21%	34%	17%	16%
2039	Upper Peninsula | Total	21%	35%	17%	17%
2040	Upper Peninsula | Total	22%	36%	17%	17%



Upper Peninsula Electric Demand Incremental Annual Achievable Potential as a Percent of Sales by Sector (%)

Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula | Total	2%	3%	2%	2%
2022	Upper Peninsula | Total	2%	3%	2%	2%
2023	Upper Peninsula | Total	2%	3%	2%	2%
2024	Upper Peninsula | Total	2%	3%	2%	2%
2025	Upper Peninsula | Total	2%	3%	2%	2%
2026	Upper Peninsula | Total	2%	3%	1%	2%
2027	Upper Peninsula | Total	2%	2%	1%	2%
2028	Upper Peninsula | Total	2%	2%	1%	2%
2029	Upper Peninsula | Total	1%	2%	1%	2%
2030	Upper Peninsula | Total	1%	2%	1%	2%
2031	Upper Peninsula | Total	1%	2%	1%	1%
2032	Upper Peninsula | Total	1%	1%	0%	1%
2033	Upper Peninsula | Total	1%	1%	0%	1%
2034	Upper Peninsula | Total	1%	1%	0%	1%
2035	Upper Peninsula | Total	1%	1%	0%	1%
2036	Upper Peninsula | Total	1%	1%	0%	1%
2037	Upper Peninsula | Total	1%	1%	0%	1%
2038	Upper Peninsula | Total	1%	1%	0%	1%
2039	Upper Peninsula | Total	1%	1%	0%	1%
2040	Upper Peninsula | Total	1%	0%	0%	1%



Residential 2021 Electric Demand Technical Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Thermostats - RET Only - Electric	261.5
2	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric	205.8
3	Res - Home Energy Reports - RET Only - Elec	111.2
4	Res - Res HVAC - RET only - Electric	99.1
5	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	81.8
6	Res - LED Bulbs - RET Only - Electric	70.7
7	Res - Power Strips - RET Only - Electric	57.7
8	Res - Water Heaters, Heat Pump - ROB and NEW - Electric	53.3
9	Res - LED Specialty Bulbs - RET Only - Electric	38.3
10	Res - Res Appliance - ROB and NEW - Electric	25.8
11	Res - Low Flow Aerators - RET Only - Electric	24.6
12	Res - LED Fixtures - RET Only - Electric	20.1
13	Res - LED Tube - RET Only - Electric	19.2
14	Res - Clothes Washers - ROB and NEW - Electric	9.4
15	Res - Heat Pumps, VRF - ROB and NEW - Electric	2.9
16	Res - Home Energy Reports - NEW Only - Elec	0.9
17	Res - Res HVAC - NEW only - Electric	0.8
18	Res - Heat Pumps, Ground Source - NEW Only - Electric	0.7
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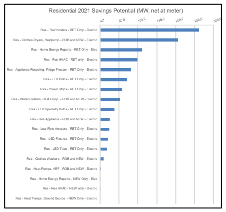
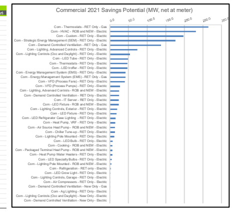


Commercial 2021 Electric Demand Technical Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	[illegible]	[illegible]
2	[illegible]	[illegible]
3	[illegible]	[illegible]
4	[illegible]	[illegible]
5	[illegible]	[illegible]
6	[illegible]	[illegible]
7	[illegible]	[illegible]
8	[illegible]	[illegible]
9	[illegible]	[illegible]
10	[illegible]	[illegible]
11	[illegible]	[illegible]
12	[illegible]	[illegible]
13	[illegible]	[illegible]
14	[illegible]	[illegible]
15	[illegible]	[illegible]
16	[illegible]	[illegible]
17	[illegible]	[illegible]
18	[illegible]	[illegible]
19	[illegible]	[illegible]
20	[illegible]	[illegible]
21	[illegible]	[illegible]
22	[illegible]	[illegible]
23	[illegible]	[illegible]
24	[illegible]	[illegible]
25	Com - Lighting Pole Mounted - RET Only - Electric	11.5
26	Com - LED Bulb - RET Only - Electric	7.6
27	Com - Cooking - ROB and NEW - Electric	6.4
28	Com - Packaged Terminal Heat Pump - ROB and NEW - Elect	6.2
29	Com - Heat Pump Water Heaters - RET Only - Electric	6.1
30	Com - LED Specialty Bulbs - RET Only - Electric	5.1
31	Com - Lighting Pole Mounted - ROB and NEW - Electric	3.8
32	Com - Refrigeration - RET only - Electric	2.5
33	Com - LED Grow Light - RET Only - Electric	1.5
34	Com - Lighting Controls, Garage - RET Only - Electric	0.8
35	Com - Air Compressors - RET Only - Electric	0.3
36	Com - Demand Controlled Ventilation - New Only - Gas	0.2
37	Com - Ag Lighting - RET Only - Electric	0.1
38	Com - Lighting Controls (Occ and Daylight) - New Only - Elect	0.1
39	Com - Demand Controlled Ventilation - New Only - Electric	0.0
40		



Industrial 2021 Electric Demand Technical Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Custom Electric - RET Only - Electric	134.7
2	Ind - Lighting - RET Only - Electric	122.0
3	Ind - Strategic Energy Management (SEM) - RET Only - Elect	66.9
4	Ind - Injection Molding Machines - ROB and NEW - Electric	43.6
5	Ind - Lighting - ROB and NEW - Electric	41.1
6	Ind - Pump VFDs - RET Only - Electric	11.3
7	Ind - Process Motors - RET Only - Electric	5.9
8	Ind - Refrigeration Optimization - RET Only - Electric	4.4
9	Ind - Air Compressors - RET Only - Electric	3.9
10	Ind - Air Compressors Controls - RET Only - Electric	3.9
11	Ind - Fan VFDs - RET Only - Electric	2.9
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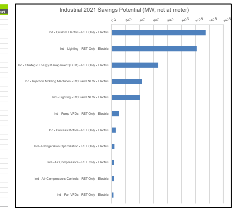
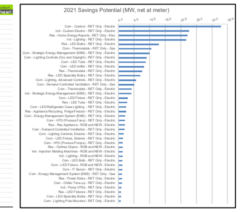


All Sectors 2021 Electric Demand Cumulative Annual Achievable Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - Custom - RET Only - Electric	32.9
2	Ind - Custom Electric - RET Only - Electric	22.7
3	Res - Home Energy Reports - RET Only - Elec	22.2
4	Ind - Lighting - RET Only - Electric	21.8
5	Res - LED Bulbs - RET Only - Electric	12.9
6	Com - Thermostats - RET Only - Gas	10.6
7	Com - Strategic Energy Management (SEM) - RET Only - Electric	10.0
8	Com - Lighting Controls (Occ and Daylight) - RET Only - Electric	9.1
9	Com - LED Tube - RET Only - Electric	8.8
10	Com - LED troffer - RET Only - Electric	8.3
11	Res - Thermostats - RET Only - Electric	7.6
12	Res - LED Specialty Bulbs - RET Only - Electric	7.0
13	Com - Lighting, Advanced Controls - RET Only - Electric	5.7
14	Com - Demand Controlled Ventilation - RET Only - Gas	5.1
15	Com - Thermostats - RET Only - Electric	4.3
16	Ind - Strategic Energy Management (SEM) - RET Only - Electric	4.2
17	Com - LED Fixture - RET Only - Electric	3.1
18	Res - LED Tube - RET Only - Electric	2.9
19	Com - LED Refrigerator Case Lighting - RET Only - Electric	2.6
20	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	2.6
21	Com - Energy Management System (EMS) - RET Only - Electric	2.3
22	Com - VFD (Process Fans) - RET Only - Electric	2.1
23	Res - Res Appliance - ROB and NEW - Electric	2.1
24	Com - Demand Controlled Ventilation - RET Only - Electric	2.1
25	Com - Lighting Controls, Exterior - RET Only - Electric	1.7
26	Com - LED Fixture, Exterior - RET Only - Electric	1.6
27	Com - VFD (Process Pumps) - RET Only - Electric	1.4
28	Res - Clothes Dryers - ROB and NEW - Electric	1.4
29	Ind - Injection Molding Machines - ROB and NEW - Electric	1.4
30	Ind - Lighting - ROB and NEW - Electric	1.4
31	Com - LED Bulb - RET Only - Electric	1.3
32	Com - LED Fixture - ROB and NEW - Electric	1.3
33	Com - IT Server - RET Only - Electric	1.3
34	Com - Energy Management System (EMS) - RET Only - Gas	1.2
35	Res - Power Strips - RET Only - Electric	1.2
36	Com - Chiller Tune-up - RET Only - Electric	1.2
37	Ind - Pump VFDs - RET Only - Electric	1.0
38	Res - LED Fixtures - RET Only - Electric	1.0
39	Com - LED Specialty Bulbs - RET Only - Electric	0.9
40	Com - Lighting Pole Mounted - RET Only - Electric	0.8



Residential 2021 Electric Demand Economic Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Thermostats - RET Only - Electric	261.5
2	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric	205.8
3	Res - Home Energy Reports - RET Only - Elec	111.2
4	Res - Res HVAC - RET only - Electric	99.1
5	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	81.8
6	Res - LED Bulbs - RET Only - Electric	70.7
7	Res - Power Strips - RET Only - Electric	57.7
8	Res - Water Heaters, Heat Pump - ROB and NEW - Electric	53.3
9	Res - LED Specialty Bulbs - RET Only - Electric	38.3
10	Res - Res Appliance - ROB and NEW - Electric	25.8
11	Res - Low Flow Aerators - RET Only - Electric	24.6
12	Res - LED Fixtures - RET Only - Electric	20.1
13	Res - LED Tube - RET Only - Electric	19.2
14	Res - Clothes Washers - ROB and NEW - Electric	9.4
15	Res - Heat Pumps, VRF - ROB and NEW - Electric	2.9
16	Res - Home Energy Reports - NEW Only - Elec	0.9
17	Res - Res HVAC - NEW only - Electric	0.8
18	Res - Heat Pumps, Ground Source - NEW Only - Electric	0.7
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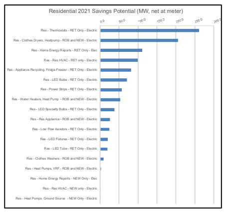

Commercial 2021 Electric Demand Economic Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - Thermostats - RET Only - Gas	264.8
2	Com - HVAC - ROB and NEW - Electric	231.4
3	Com - Custom - RET Only - Electric	197.4
4	Com - Strategic Energy Management (SEM) - RET Only - Elec	176.2
5	Com - Demand Controlled Ventilation - RET Only - Gas	137.0
6	Com - Lighting, Advanced Controls - RET Only - Electric	73.6
7	Com - Lighting Controls (Occ and Daylight) - RET Only - Elect	53.8
8	Com - LED Tube - RET Only - Electric	49.0
9	Com - Thermostats - RET Only - Electric	47.4
10	Com - LED troffer - RET Only - Electric	46.6
11	Com - Energy Management System (EMS) - RET Only - Elect	41.7
12	Com - Energy Management System (EMS) - RET Only - Gas	41.7
13	Com - VFD (Process Fans) - RET Only - Electric	40.2
14	Com - VFD (Process Pumps) - RET Only - Electric	27.1
15	Com - Lighting, Advanced Controls - ROB and NEW - Electri	24.6
16	Com - Demand Controlled Ventilation - RET Only - Electric	24.6
17	Com - IT Server - RET Only - Electric	24.2
18	Com - LED Fixture - ROB and NEW - Electric	23.4
19	Com - Lighting Controls, Exterior - RET Only - Electric	19.6
20	Com - LED Fixture - RET Only - Electric	17.4
21	Com - LED Refrigerator Case Lighting - RET Only - Electric	14.8
22	Com - Heat Pump, VRF - RET Only - Electric	14.1
23	Com - Chiller Tune-up - RET Only - Electric	13.2
24	Com - Lighting Pole Mounted - RET Only - Electric	11.5
25	Com - LED Bulb - RET Only - Electric	7.6
26	Com - Cooking - ROB and NEW - Electric	6.4
27	Com - Packaged Terminal Heat Pump - ROB and NEW - Elect	6.2
28	Com - Heat Pump Water Heaters - RET Only - Electric	6.1
29	Com - LED Specialty Bulbs - RET Only - Electric	5.1
30	Com - Lighting Pole Mounted - ROB and NEW - Electric	3.8
31	Com - Air Source Heat Pump - ROB and NEW - Electric	3.4
32	Com - Refrigeration - RET only - Electric	2.5
33	Com - LED Grow Light - RET Only - Electric	1.5
34	Com - Lighting Controls, Garage - RET Only - Electric	0.8
35	Com - Air Compressors - RET Only - Electric	0.3
36	Com - Demand Controlled Ventilation - New Only - Gas	0.2
37	Com - Ag Lighting - RET Only - Electric	0.1
38	Com - Lighting Controls (Occ and Daylight) - New Only - Elect	0.1
39	Com - Demand Controlled Ventilation - New Only - Electric	0.0
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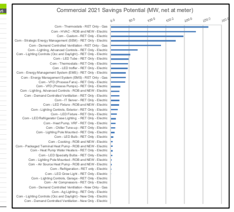

Industrial 2021 Electric Demand Economic Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Custom Electric - RET Only - Electric	134.7
2	Ind - Lighting - RET Only - Electric	122.0
3	Ind - Strategic Energy Management (SEM) - RET Only - Elect	66.9
4	Ind - Injection Molding Machines - ROB and NEW - Electric	43.6
5	Ind - Lighting - ROB and NEW - Electric	41.1
6	Ind - Pump VFDs - RET Only - Electric	11.3
7	Ind - Process Motors - RET Only - Electric	5.9
8	Ind - Refrigeration Optimization - RET Only - Electric	4.4
9	Ind - Air Compressors - RET Only - Electric	3.9
10	Ind - Air Compressors Controls - RET Only - Electric	3.9
11	Ind - Fan VFDs - RET Only - Electric	2.9
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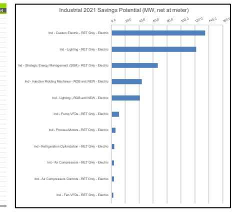

Residential 2021 Electric Demand Cumulative Annual Achievable Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Home Energy Reports - RET Only - Elec	22.2
2	Res - LED Bulbs - RET Only - Electric	12.9
3	Res - Thermostats - RET Only - Electric	7.6
4	Res - LED Specialty Bulbs - RET Only - Electric	7.0
5	Res - LED Tube - RET Only - Electric	2.9
6	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	2.6
7	Res - Res Appliance - ROB and NEW - Electric	2.1
8	Res - Clothes Dryers - ROB and NEW - Electric	1.4
9	Res - Power Strips - RET Only - Electric	1.2
10	Res - LED Fixtures - RET Only - Electric	1.0
11	Res - Water Heaters, Heat Pump - ROB and NEW - Electric	0.5
12	Res - Clothes Washers - ROB and NEW - Electric	0.5
13	Res - Low Flow Aerators - RET Only - Electric	0.3
14	Res - Home Energy Reports - NEW Only - Elec	0.2
15	Res - ASHP - ROB and NEW - Electric	0.1
16	Res - Heat Pumps, VRF - ROB and NEW - Electric	0.0
17	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric	0.0
18	Res - Heat Pumps, Ground Source - NEW Only - Electric	0.0
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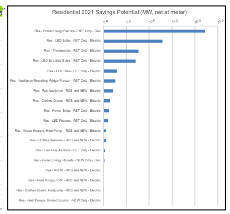
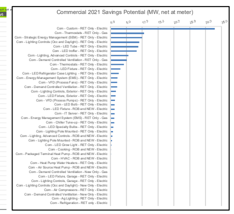


Commercial 2021 Electric Demand Cumulative Annual Achievable Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - Custom - RET Only - Electric	32.9
2	Com - Thermostats - RET Only - Gas	10.6
3	Com - Strategic Energy Management (SEM) - RET Only - Elec	10.0
4	Com - Lighting Controls (Occ and Daylight) - RET Only - Elect	9.1
5	Com - LED Tube - RET Only - Electric	8.8
6	Com - LED troffer - RET Only - Electric	8.3
7	Com - Lighting, Advanced Controls - RET Only - Electric	5.7
8	Com - Demand Controlled Ventilation - RET Only - Gas	5.1
9	Com - Thermostats - RET Only - Electric	4.3
10	Com - LED Fixture - RET Only - Electric	3.1
11	Com - LED Refrigerator Case Lighting - RET Only - Electric	2.6
12	Com - Energy Management System (EMS) - RET Only - Elect	2.3
13	Com - VFD (Process Fans) - RET Only - Electric	2.1
14	Com - Demand Controlled Ventilation - RET Only - Electric	2.1
15	Com - Lighting Controls, Exterior - RET Only - Electric	1.7
16	Com - LED Fixture, Exterior - RET Only - Electric	1.6
17	Com - VFD (Process Pumps) - RET Only - Electric	1.4
18	Com - LED Bulb - RET Only - Electric	1.3
19	Com - LED Fixture - ROB and NEW - Electric	1.3
20	Com - IT Server - RET Only - Electric	1.3
21	Com - Energy Management System (EMS) - RET Only - Gas	1.2
22	Com - Chiller Tune-up - RET Only - Electric	1.2
23	Com - LED Specialty Bulbs - RET Only - Electric	0.9
24	Com - Lighting Pole Mounted - RET Only - Electric	0.8
25	Com - Lighting, Advanced Controls - ROB and NEW - Electri	0.6
26	Com - Lighting Pole Mounted - ROB and NEW - Electric	0.5
27	Com - LED Grow Light - RET Only - Electric	0.3
28	Com - Cooking - ROB and NEW - Electric	0.2
29	Com - Packaged Terminal Heat Pump - ROB and NEW - Elect	0.2
30	Com - HVAC - ROB and NEW - Electric	0.1
31	Com - Heat Pump Water Heaters - RET Only - Electric	0.1
32	Com - Air Source Heat Pump - ROB and NEW - Electric	0.1
33	Com - Demand Controlled Ventilation - New Only - Gas	0.1
34	Com - LED Fixture, Garage - RET Only - Electric	0.1
35	Com - Lighting Controls, Garage - RET Only - Electric	0.1
36	Com - Lighting Controls (Occ and Daylight) - New Only - Elect	0.0
37	Com - Air Compressors - RET Only - Electric	0.0
38	Com - Demand Controlled Ventilation - New Only - Electric	0.0
39	Com - Ag Lighting - RET Only - Electric	0.0
40	Com - Refrigeration - RET only - Electric	0.0



Industrial 2021 Electric Demand Cumulative Annual Achievable Potential Top Measures (MW, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Custom Electric - RET Only - Electric	22.7
2	Ind - Lighting - RET Only - Electric	21.8
3	Ind - Strategic Energy Management (SEM) - RET Only - Elect	4.2
4	Ind - Injection Molding Machines - ROB and NEW - Electric	1.4
5	Ind - Lighting - ROB and NEW - Electric	1.4
6	Ind - Pump VFDs - RET Only - Electric	1.0
7	Ind - Air Compressors Controls - RET Only - Electric	0.3
8	Ind - Air Compressors - RET Only - Electric	0.3
9	Ind - Fan VFDs - RET Only - Electric	0.3
10	Ind - Refrigeration Optimization - RET Only - Electric	0.2
11	Ind - Process Motors - RET Only - Electric	0.2
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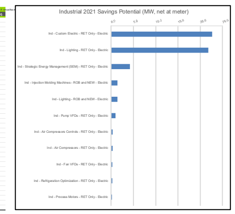

Residential 2021 Electric Demand Technical Potential Top Measures (MW, net at meter)		
Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Thermostats - RET Only - Electric	5.6
2	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric	4.5
3	Res - Home Energy Reports - RET Only - Elec	2.1
4	Res - Res HVAC - RET only - Electric	1.8
5	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	1.8
6	Res - LED Bulbs - RET Only - Electric	1.4
7	Res - Water Heaters, Heat Pump - ROB and NEW - Electric	1.4
8	Res - Power Strips - RET Only - Electric	1.2
9	Res - LED Specialty Bulbs - RET Only - Electric	0.7
10	Res - Low Flow Aerators - RET Only - Electric	0.7
11	Res - Res Appliance - ROB and NEW - Electric	0.5
12	Res - LED Tube - RET Only - Electric	0.3
13	Res - LED Fixtures - RET Only - Electric	0.3
14	Res - Clothes Washers - ROB and NEW - Electric	0.2
15	Res - Heat Pumps, VRF - ROB and NEW - Electric	0.2
16	Res - Heat Pumps, Ground Source - NEW Only - Electric	0.0
17	Res - Home Energy Reports - NEW Only - Elec	0.0
18	Res - Res HVAC - NEW only - Electric	0.0
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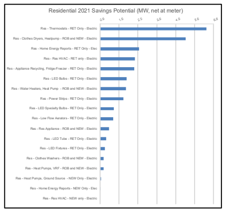

Commercial 2021 Electric Demand Technical Potential Top Measures (MW, net at meter)		
Rank	Measure Name	Potential (cumul. impact/year)
1–24	[illegible]	[illegible]
25	Com - Cooking - ROB and NEW - Electric	0.1
26	Com - Heat Pump, VRF - RET Only - Electric	0.1
27	Com - Heat Pump Water Heaters - RET Only - Electric	0.1
28	Com - Chiller Tune-up - RET Only - Electric	0.1
29	Com - LED Specialty Bulbs - RET Only - Electric	0.1
30	Com - Lighting Pole Mounted - ROB and NEW - Electric	0.0
31	'om - Packaged Terminal Heat Pump - ROB and NEW - Elect	0.0
32	Com - Refrigeration - RET only - Electric	0.0
33	Com - LED Grow Light - RET Only - Electric	0.0
34	Com - Lighting Controls, Garage - RET Only - Electric	0.0
35	Com - Demand Controlled Ventilation - New Only - Gas	0.0
36	Com - Air Compressors - RET Only - Electric	0.0
37	'om - Lighting Controls (Occ and Daylight) - New Only - Elect	0.0
38	Com - Ag Lighting - RET Only - Electric	0.0
39	Com - Demand Controlled Ventilation - New Only - Electric	0.0
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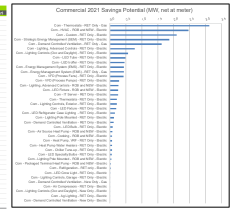
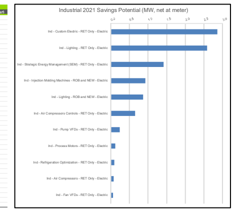


Industrial 2021 Electric Demand Technical Potential Top Measures (MW, net at meter)		
Rank	Measure Name	Potential (cumul. impact/year)
[illegible]	[illegible]	[illegible]



[illegible]		
Rank	Measure Name	Potential (cumul. impact/year)
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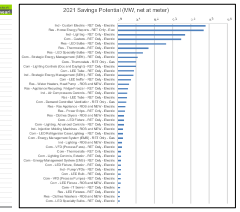
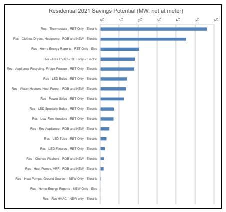


Residential 2021 Electric Demand Economic Potential Top Measures (MW, net at meter)		
Rank	Measure Name	Potential (cumul. impact/year)
[illegible]	[illegible]	[illegible]



Commercial 2021 Electric Demand Economic Potential Top Measures (MW, net at meter)		
Rank	Measure Name	Potential (cumul. impact/year)
1	Com - Thermostats - RET Only - Gas	3.1
2	Com - Custom - RET Only - Electric	2.1
3	'om - Strategic Energy Management (SEM) - RET Only - Elec	1.9
4	Com - Demand Controlled Ventilation - RET Only - Gas	1.6
5	Com - Lighting, Advanced Controls - RET Only - Electric	0.8
6	'om - Lighting Controls (Occ and Daylight) - RET Only - Elect	0.6
7	Com - LED Tube - RET Only - Electric	0.5
8	Com - LED troffer - RET Only - Electric	0.5
9	'om - Energy Management System (EMS) - RET Only - Elect	0.4
10	Com - Energy Management System (EMS) - RET Only - Gas	0.4
11	Com - VFD (Process Fans) - RET Only - Electric	0.4
12	Com - VFD (Process Pumps) - RET Only - Electric	0.3
13	Com - Lighting, Advanced Controls - ROB and NEW - Electri	0.3
14	Com - LED Fixture - ROB and NEW - Electric	0.3
15	Com - IT Server - RET Only - Electric	0.3
16	Com - Thermostats - RET Only - Electric	0.2
17	Com - Lighting Controls, Exterior - RET Only - Electric	0.2
18	Com - LED Fixture - RET Only - Electric	0.2
19	Com - LED Refrigerator Case Lighting - RET Only - Electric	0.2
20	Com - Lighting Pole Mounted - RET Only - Electric	0.1
21	Com - Demand Controlled Ventilation - RET Only - Electric	0.1
22	Com - LED Bulb - RET Only - Electric	0.1
23	Com - Cooking - ROB and NEW - Electric	0.1
24	Com - Heat Pump, VRF - RET Only - Electric	0.1
25	Com - Heat Pump Water Heaters - RET Only - Electric	0.1
26	Com - Chiller Tune-up - RET Only - Electric	0.1
27	Com - LED Specialty Bulbs - RET Only - Electric	0.1
28	Com - Lighting Pole Mounted - ROB and NEW - Electric	0.0
29	'om - Packaged Terminal Heat Pump - ROB and NEW - Elect	0.0
30	Com - Air Source Heat Pump - ROB and NEW - Electric	0.0
31	Com - Refrigeration - RET only - Electric	0.0
32	Com - LED Grow Light - RET Only - Electric	0.0
33	Com - Lighting Controls, Garage - RET Only - Electric	0.0
34	Com - Demand Controlled Ventilation - New Only - Gas	0.0
35	Com - Air Compressors - RET Only - Electric	0.0
36	'om - Lighting Controls (Occ and Daylight) - New Only - Elect	0.0
37	Com - Ag Lighting - RET Only - Electric	0.0
38	Com - Demand Controlled Ventilation - New Only - Electric	0.0
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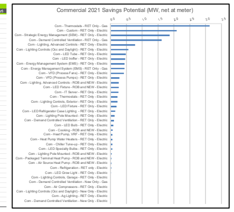

Industrial 2021 Electric Demand Economic Potential Top Measures (MW, net at meter)		
Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Custom Electric - RET Only - Electric	2.9
2	Ind - Lighting - RET Only - Electric	2.6
3	Ind - Strategic Energy Management (SEM) - RET Only - Elect	1.4
4	Ind - Injection Molding Machines - ROB and NEW - Electric	0.9
5	Ind - Lighting - ROB and NEW - Electric	0.9
6	Ind - Air Compressors Controls - RET Only - Electric	0.7
7	Ind - Pump VFDs - RET Only - Electric	0.2
8	Ind - Process Motors - RET Only - Electric	0.1
9	Ind - Refrigeration Optimization - RET Only - Electric	0.1
10	Ind - Air Compressors - RET Only - Electric	0.1
11	Ind - Fan VFDs - RET Only - Electric	0.1
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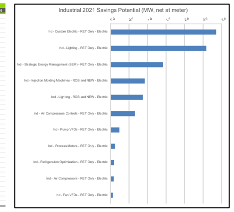

Residential 2021 Electric Demand Cumulative Annual Achievable Potential Top Measures (MW, net at meter)		
Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Home Energy Reports - RET Only - Elec	0.5
2	Res - LED Bulbs - RET Only - Electric	0.3
3	Res - Thermostats - RET Only - Electric	0.2
4	Res - LED Specialty Bulbs - RET Only - Electric	0.1
5	Res - Water Heaters, Heat Pump - ROB and NEW - Electric	0.1
6	Res - Appliance Recycling, Fridge-Freezer - RET Only - Electric	0.1
7	Res - LED Tube - RET Only - Electric	0.1
8	Res - Res Appliance - ROB and NEW - Electric	0.0
9	Res - Power Strips - RET Only - Electric	0.0
10	Res - Clothes Dryers - ROB and NEW - Electric	0.0
11	Res - LED Fixtures - RET Only - Electric	0.0
12	Res - Clothes Washers - ROB and NEW - Electric	0.0
13	Res - Low Flow Aerators - RET Only - Electric	0.0
14	Res - Home Energy Reports - NEW Only - Elec	0.0
15	Res - ASHP - ROB and NEW - Electric	0.0
16	Res - Heat Pumps, VRF - ROB and NEW - Electric	0.0
17	Res - Clothes Dryers, Heatpump - ROB and NEW - Electric	0.0
18	Res - Heat Pumps, Ground Source - NEW Only - Electric	0.0
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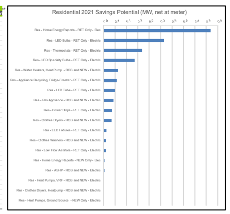
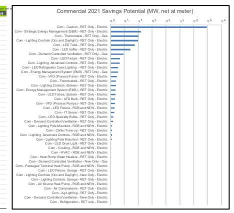
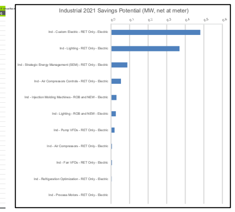


Commercial 2021 Electric Demand Cumulative Annual Achievable Potential Top Measures (MW, net at meter)		
Rank	Measure Name	Potential (cumul. impact/year)
1	Com - Custom - RET Only - Electric	0.3
2	'om - Strategic Energy Management (SEM) - RET Only - Elec	0.1
3	Com - Thermostats - RET Only - Gas	0.1
4	'om - Lighting Controls (Occ and Daylight) - RET Only - Elect	0.1
5	Com - LED Tube - RET Only - Electric	0.1
6	Com - LED troffer - RET Only - Electric	0.1
7	Com - Demand Controlled Ventilation - RET Only - Gas	0.0
8	Com - LED Fixture - RET Only - Electric	0.0
9	Com - Lighting, Advanced Controls - RET Only - Electric	0.0
10	Com - LED Refrigerator Case Lighting - RET Only - Electric	0.0
11	Com - Energy Management System (EMS) - RET Only - Gas	0.0
12	Com - VFD (Process Fans) - RET Only - Electric	0.0
13	Com - Thermostats - RET Only - Electric	0.0
14	Com - Lighting Controls, Exterior - RET Only - Electric	0.0
15	'om - Energy Management System (EMS) - RET Only - Elect	0.0
16	Com - LED Fixture, Exterior - RET Only - Electric	0.0
17	Com - LED Bulb - RET Only - Electric	0.0
18	Com - VFD (Process Pumps) - RET Only - Electric	0.0
19	Com - LED Fixture - ROB and NEW - Electric	0.0
20	Com - IT Server - RET Only - Electric	0.0
21	Com - LED Specialty Bulbs - RET Only - Electric	0.0
22	Com - Demand Controlled Ventilation - RET Only - Electric	0.0
23	Com - Lighting Pole Mounted - ROB and NEW - Electric	0.0
24	Com - Chiller Tune-up - RET Only - Electric	0.0
25	Com - Lighting, Advanced Controls - ROB and NEW - Electri	0.0
26	Com - Lighting Pole Mounted - RET Only - Electric	0.0
27	Com - LED Grow Light - RET Only - Electric	0.0
28	Com - Cooking - ROB and NEW - Electric	0.0
29	Com - HVAC - ROB and NEW - Electric	0.0
30	Com - Heat Pump Water Heaters - RET Only - Electric	0.0
31	Com - Demand Controlled Ventilation - New Only - Gas	0.0
32	'om - Packaged Terminal Heat Pump - ROB and NEW - Elect	0.0
33	Com - LED Fixture, Garage - RET Only - Electric	0.0
34	'om - Lighting Controls (Occ and Daylight) - New Only - Elect	0.0
35	Com - Lighting Controls, Garage - RET Only - Electric	0.0
36	Com - Air Source Heat Pump - ROB and NEW - Electric	0.0
37	Com - Air Compressors - RET Only - Electric	0.0
38	Com - Ag Lighting - RET Only - Electric	0.0
39	Com - Demand Controlled Ventilation - New Only - Electric	0.0
40	Com - Refrigeration - RET only - Electric	0.0

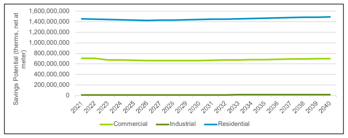


[illegible]		
Rank	Measure Name	Potential (cumul. impact/year)
[illegible]	[illegible]	[illegible]



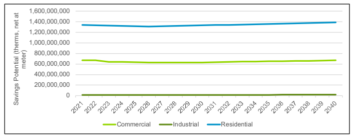
Lower Peninsula Natural Gas Technical Potential by Sector (therms, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	707,602,443	16,147,592	1,454,194,527
Lower Peninsula | Total	2022	704,709,296	16,078,157	1,448,481,133
Lower Peninsula | Total	2023	676,863,841	15,919,536	1,442,245,657
Lower Peninsula | Total	2024	673,393,299	15,815,904	1,436,326,420
Lower Peninsula | Total	2025	667,471,235	15,691,186	1,426,083,410
Lower Peninsula | Total	2026	663,019,410	15,703,208	1,423,703,492
Lower Peninsula | Total	2027	661,772,039	15,856,857	1,426,754,505
Lower Peninsula | Total	2028	661,374,766	16,009,724	1,430,979,017
Lower Peninsula | Total	2029	663,071,113	16,161,899	1,435,437,846
Lower Peninsula | Total	2030	665,249,490	16,313,471	1,440,356,743
Lower Peninsula | Total	2031	669,468,753	16,464,528	1,445,480,746
Lower Peninsula | Total	2032	674,096,460	16,615,156	1,450,521,195
Lower Peninsula | Total	2033	677,284,754	16,765,443	1,454,968,545
Lower Peninsula | Total	2034	680,193,846	16,915,474	1,459,630,479
Lower Peninsula | Total	2035	685,224,788	17,065,335	1,464,974,810
Lower Peninsula | Total	2036	688,505,784	17,215,112	1,470,776,942
Lower Peninsula | Total	2037	691,887,353	17,364,889	1,475,364,534
Lower Peninsula | Total	2038	694,882,701	17,514,751	1,480,428,163
Lower Peninsula | Total	2039	697,796,044	17,664,782	1,485,518,376
Lower Peninsula | Total	2040	701,388,535	17,815,066	1,490,927,780



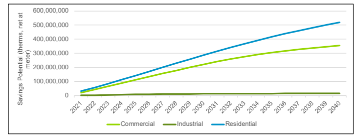
Lower Peninsula Natural Gas Economic Potential by Sector (therms, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	670,109,030	16,147,592	1,337,930,844
Lower Peninsula | Total	2022	667,403,350	16,078,157	1,332,798,769
Lower Peninsula | Total	2023	640,134,451	15,919,536	1,327,141,704
Lower Peninsula | Total	2024	636,965,374	15,815,904	1,321,797,987
Lower Peninsula | Total	2025	631,475,287	15,691,186	1,312,389,422
Lower Peninsula | Total	2026	627,412,637	15,703,208	1,310,577,974
Lower Peninsula | Total	2027	626,376,160	15,856,857	1,314,194,614
Lower Peninsula | Total	2028	626,209,641	16,009,724	1,318,981,926
Lower Peninsula | Total	2029	628,054,743	16,161,899	1,324,000,740
Lower Peninsula | Total	2030	630,428,449	16,313,471	1,329,476,823
Lower Peninsula | Total	2031	634,685,964	16,464,528	1,335,155,225
Lower Peninsula | Total	2032	639,321,695	16,615,156	1,340,747,302
Lower Peninsula | Total	2033	642,629,517	16,765,443	1,345,743,521
Lower Peninsula | Total	2034	645,680,805	16,915,474	1,350,951,581
Lower Peninsula | Total	2035	650,692,683	17,065,335	1,356,839,306
Lower Peninsula | Total	2036	654,090,343	17,215,112	1,363,182,116
Lower Peninsula | Total	2037	657,582,495	17,364,889	1,368,307,682
Lower Peninsula | Total	2038	660,719,891	17,514,751	1,373,906,595
Lower Peninsula | Total	2039	663,783,481	17,664,782	1,379,529,416
Lower Peninsula | Total	2040	667,476,183	17,815,066	1,385,468,765



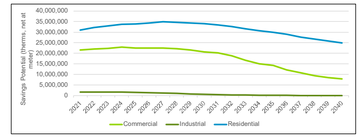
Lower Peninsula Natural Gas Cumulative Annual Achievable Potential by Sector (therms, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	21,493,368	1,756,738	31,044,371
Lower Peninsula | Total	2022	43,455,298	3,513,337	57,940,941
Lower Peninsula | Total	2023	65,784,719	5,230,477	85,576,418
Lower Peninsula | Total	2024	88,700,176	6,864,097	113,843,088
Lower Peninsula | Total	2025	111,262,394	8,377,861	142,232,915
Lower Peninsula | Total	2026	133,797,984	9,744,043	171,117,415
Lower Peninsula | Total	2027	156,210,272	10,940,614	200,579,349
Lower Peninsula | Total	2028	178,311,923	11,953,786	229,603,857
Lower Peninsula | Total	2029	199,952,972	12,783,215	258,383,015
Lower Peninsula | Total	2030	220,559,792	13,441,446	286,752,295
Lower Peninsula | Total	2031	240,723,979	13,950,376	314,485,241
Lower Peninsula | Total	2032	259,648,248	14,336,319	341,398,348
Lower Peninsula | Total	2033	276,368,240	14,625,563	367,233,579
Lower Peninsula | Total	2034	291,335,000	14,841,481	392,144,521
Lower Peninsula | Total	2035	305,686,608	15,003,274	416,182,906
Lower Peninsula | Total	2036	317,780,616	15,125,864	439,270,333
Lower Peninsula | Total	2037	328,597,859	15,220,413	461,008,976
Lower Peninsula | Total	2038	338,084,133	15,295,045	481,788,979
Lower Peninsula | Total	2039	346,541,123	15,355,566	501,518,336
Lower Peninsula | Total	2040	354,479,801	15,406,312	520,285,181



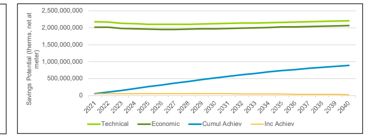
Lower Peninsula Natural Gas Incremental Annual Achievable Potential by Sector (therms, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Lower Peninsula | Total	2021	21,493,368	1,756,738	31,044,371
Lower Peninsula | Total	2022	21,961,930	1,756,598	32,164,147
Lower Peninsula | Total	2023	22,329,421	1,717,140	32,953,294
Lower Peninsula | Total	2024	22,915,457	1,633,620	33,678,213
Lower Peninsula | Total	2025	22,562,218	1,513,764	33,835,457
Lower Peninsula | Total	2026	22,535,589	1,366,182	34,335,511
Lower Peninsula | Total	2027	22,412,288	1,196,571	34,954,263
Lower Peninsula | Total	2028	22,101,652	1,013,172	34,561,144
Lower Peninsula | Total	2029	21,641,049	829,429	34,360,119
Lower Peninsula | Total	2030	20,606,820	658,231	33,994,587
Lower Peninsula | Total	2031	20,164,187	508,930	33,402,620
Lower Peninsula | Total	2032	18,924,269	385,943	32,613,175
Lower Peninsula | Total	2033	16,719,992	289,244	31,607,720
Lower Peninsula | Total	2034	14,966,759	215,918	30,713,882
Lower Peninsula | Total	2035	14,351,608	161,793	29,885,808
Lower Peninsula | Total	2036	12,094,008	122,590	28,979,371
Lower Peninsula | Total	2037	10,817,243	94,549	27,675,145
Lower Peninsula | Total	2038	9,486,274	74,632	26,761,103
Lower Peninsula | Total	2039	8,456,990	60,521	25,755,100
Lower Peninsula | Total	2040	7,938,678	50,746	24,837,276



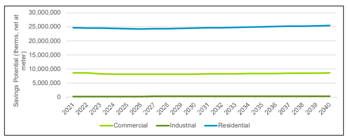
Lower Peninsula Natural Gas Potential (therms, net at meter)

Service Territory	Year	Technical	Economic	Cumul Achiev	Inc Achiev
Lower Peninsula | Total	2021	2,177,944,562	2,024,187,466	54,294,476	54,294,476
Lower Peninsula | Total	2022	2,169,268,586	2,016,280,276	104,909,575	55,882,676
Lower Peninsula | Total	2023	2,135,029,034	1,983,195,690	156,591,614	56,999,855
Lower Peninsula | Total	2024	2,125,535,623	1,974,579,266	209,407,362	58,227,290
Lower Peninsula | Total	2025	2,109,245,831	1,959,555,895	261,873,170	57,911,439
Lower Peninsula | Total	2026	2,102,426,111	1,953,693,820	314,659,442	58,237,282
Lower Peninsula | Total	2027	2,104,383,400	1,956,427,631	367,730,235	58,563,122
Lower Peninsula | Total	2028	2,108,363,507	1,961,201,291	419,869,566	57,675,968
Lower Peninsula | Total	2029	2,114,670,858	1,968,217,382	471,119,201	56,830,596
Lower Peninsula | Total	2030	2,121,919,704	1,976,218,744	520,753,533	55,259,638
Lower Peninsula | Total	2031	2,131,414,026	1,986,305,717	569,159,596	54,075,737
Lower Peninsula | Total	2032	2,141,232,812	1,996,684,154	615,368,915	51,923,387
Lower Peninsula | Total	2033	2,149,018,742	2,005,138,482	658,227,382	48,616,956
Lower Peninsula | Total	2034	2,156,739,799	2,013,547,860	698,321,002	45,896,559
Lower Peninsula | Total	2035	2,167,264,934	2,024,597,325	736,872,788	44,399,209
Lower Peninsula | Total	2036	2,176,497,838	2,034,487,572	772,176,813	41,195,969
Lower Peninsula | Total	2037	2,184,616,776	2,043,255,066	804,827,249	38,586,937
Lower Peninsula | Total	2038	2,192,825,614	2,052,141,237	835,168,158	36,322,009
Lower Peninsula | Total	2039	2,200,979,201	2,060,977,679	863,415,025	34,272,610
Lower Peninsula | Total	2040	2,210,131,382	2,070,760,014	890,171,294	32,826,701



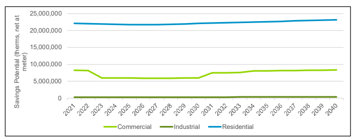
Upper Peninsula Natural Gas Technical Potential by Sector (therms, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	8,683,933	289,381	24,716,959
Upper Peninsula | Total	2022	8,645,733	289,381	24,624,973
Upper Peninsula | Total	2023	8,277,701	289,381	24,544,049
Upper Peninsula | Total	2024	8,258,304	289,381	24,437,952
Upper Peninsula | Total	2025	8,217,275	289,381	24,322,665
Upper Peninsula | Total	2026	8,188,589	291,773	24,284,854
Upper Peninsula | Total	2027	8,181,634	296,570	24,316,749
Upper Peninsula | Total	2028	8,186,791	301,389	24,405,176
Upper Peninsula | Total	2029	8,206,627	306,230	24,494,880
Upper Peninsula | Total	2030	8,240,902	311,096	24,585,707
Upper Peninsula | Total	2031	8,275,864	315,987	24,677,743
Upper Peninsula | Total	2032	8,311,545	320,905	24,770,539
Upper Peninsula | Total	2033	8,347,950	325,851	24,864,167
Upper Peninsula | Total	2034	8,385,022	330,827	24,958,454
Upper Peninsula | Total	2035	8,422,703	335,834	25,053,468
Upper Peninsula | Total	2036	8,461,009	340,873	25,149,118
Upper Peninsula | Total	2037	8,499,968	345,946	25,245,615
Upper Peninsula | Total	2038	8,539,678	351,054	25,342,705
Upper Peninsula | Total	2039	8,580,211	356,199	25,440,581
Upper Peninsula | Total	2040	8,621,622	361,381	25,539,823



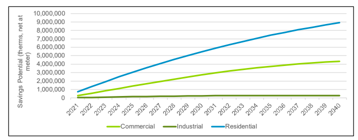
Upper Peninsula Natural Gas Economic Potential by Sector (therms, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	8,235,023	289,381	22,088,429
Upper Peninsula | Total	2022	8,199,068	289,381	22,009,586
Upper Peninsula | Total	2023	5,973,789	289,381	21,941,739
Upper Peninsula | Total	2024	5,964,023	289,381	21,848,653
Upper Peninsula | Total	2025	5,932,658	289,381	21,746,313
Upper Peninsula | Total	2026	5,913,422	291,773	21,721,383
Upper Peninsula | Total	2027	5,914,630	296,570	21,766,095
Upper Peninsula | Total	2028	5,928,920	301,389	21,867,276
Upper Peninsula | Total	2029	5,957,876	306,230	21,969,669
Upper Peninsula | Total	2030	6,001,198	311,096	22,073,123
Upper Peninsula | Total	2031	7,466,472	315,987	22,177,722
Upper Peninsula | Total	2032	7,503,862	320,905	22,283,017
Upper Peninsula | Total	2033	7,541,909	325,851	22,389,083
Upper Peninsula | Total	2034	8,049,614	330,827	22,495,746
Upper Peninsula | Total	2035	8,088,852	335,834	22,603,073
Upper Peninsula | Total	2036	8,128,709	340,873	22,710,974
Upper Peninsula | Total	2037	8,169,209	345,946	22,819,663
Upper Peninsula | Total	2038	8,210,453	351,054	22,928,882
Upper Peninsula | Total	2039	8,252,514	356,199	23,038,827
Upper Peninsula | Total	2040	8,295,444	361,381	23,150,078



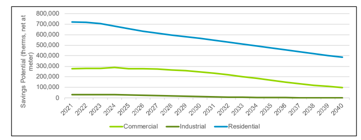
Upper Peninsula Natural Gas Cumulative Annual Achievable Potential by Sector (therms, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	277,645	31,549	719,155
Upper Peninsula | Total	2022	557,459	63,398	1,331,153
Upper Peninsula | Total	2023	836,964	94,722	1,928,758
Upper Peninsula | Total	2024	1,124,628	124,747	2,501,159
Upper Peninsula | Total	2025	1,402,801	152,763	3,046,235
Upper Peninsula | Total	2026	1,678,624	178,203	3,568,466
Upper Peninsula | Total	2027	1,951,869	200,626	4,071,683
Upper Peninsula | Total	2028	2,218,275	219,733	4,556,316
Upper Peninsula | Total	2029	2,476,487	235,478	5,023,484
Upper Peninsula | Total	2030	2,724,336	248,061	5,472,703
Upper Peninsula | Total	2031	2,959,232	257,868	5,903,437
Upper Peninsula | Total	2032	3,178,782	265,376	6,315,018
Upper Peninsula | Total	2033	3,381,317	271,070	6,706,996
Upper Peninsula | Total	2034	3,566,030	275,390	7,079,038
Upper Peninsula | Total	2035	3,732,997	278,698	7,431,087
Upper Peninsula | Total	2036	3,883,080	281,277	7,763,279
Upper Peninsula | Total	2037	4,017,685	283,343	8,076,032
Upper Peninsula | Total	2038	4,138,559	285,050	8,369,844
Upper Peninsula | Total	2039	4,247,552	286,511	8,645,484
Upper Peninsula | Total	2040	4,346,459	287,807	8,903,931



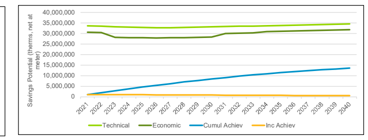
Upper Peninsula Natural Gas Incremental Annual Achievable Potential by Sector (therms, net at meter)

Service Territory	Year	Commercial	Industrial	Residential
Upper Peninsula | Total	2021	277,645	31,549	719,155
Upper Peninsula | Total	2022	279,814	31,849	716,692
Upper Peninsula | Total	2023	279,506	31,325	703,557
Upper Peninsula | Total	2024	287,664	30,025	681,580
Upper Peninsula | Total	2025	278,173	28,016	654,941
Upper Peninsula | Total	2026	275,823	25,440	632,096
Upper Peninsula | Total	2027	273,245	22,423	614,276
Upper Peninsula | Total	2028	266,407	19,107	596,932
Upper Peninsula | Total	2029	258,211	15,745	580,710
Upper Peninsula | Total	2030	247,849	12,583	564,006
Upper Peninsula | Total	2031	234,897	9,807	546,770
Upper Peninsula | Total	2032	219,550	7,508	528,869
Upper Peninsula | Total	2033	202,535	5,695	510,519
Upper Peninsula | Total	2034	184,713	4,320	491,841
Upper Peninsula | Total	2035	166,967	3,308	473,108
Upper Peninsula | Total	2036	150,083	2,580	454,514
Upper Peninsula | Total	2037	134,604	2,065	436,340
Upper Peninsula | Total	2038	120,875	1,707	418,670
Upper Peninsula | Total	2039	108,992	1,462	401,769
Upper Peninsula | Total	2040	98,907	1,295	385,854



Upper Peninsula Natural Gas Potential (therms, net at meter)

Service Territory	Year	Technical	Economic	Cumul Achiev	Inc Achiev
Upper Peninsula | Total	2021	33,690,274	30,612,833	1,028,348	1,028,348
Upper Peninsula | Total	2022	33,560,087	30,498,034	1,952,009	1,028,355
Upper Peninsula | Total	2023	33,111,132	28,204,909	2,860,444	1,014,387
Upper Peninsula | Total	2024	32,985,637	28,102,057	3,750,534	999,269
Upper Peninsula | Total	2025	32,829,321	27,968,352	4,601,799	961,130
Upper Peninsula | Total	2026	32,765,216	27,926,578	5,425,292	933,358
Upper Peninsula | Total	2027	32,794,953	27,977,296	6,224,177	909,943
Upper Peninsula | Total	2028	32,893,356	28,097,584	6,994,324	882,446
Upper Peninsula | Total	2029	33,007,737	28,233,775	7,735,449	854,666
Upper Peninsula | Total	2030	33,137,705	28,385,417	8,445,100	824,439
Upper Peninsula | Total	2031	33,269,594	29,960,181	9,120,537	791,473
Upper Peninsula | Total	2032	33,402,989	30,107,784	9,759,176	755,927
Upper Peninsula | Total	2033	33,537,968	30,256,843	10,359,383	718,749
Upper Peninsula | Total	2034	33,674,303	30,876,187	10,920,458	680,874
Upper Peninsula | Total	2035	33,812,004	31,027,759	11,442,783	643,383
Upper Peninsula | Total	2036	33,951,000	31,180,556	11,927,637	607,176
Upper Peninsula | Total	2037	34,091,529	31,334,819	12,377,059	573,010
Upper Peninsula | Total	2038	34,233,436	31,490,390	12,793,453	541,252
Upper Peninsula | Total	2039	34,376,991	31,647,540	13,179,547	512,223
Upper Peninsula | Total	2040	34,522,827	31,806,903	13,538,197	486,056



Customer Segment	Service Territory	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Single Family	Lower Peninsula | Total	963,258,756	959,541,491	955,505,570	951,634,004	944,867,666	943,415,056	945,682,350	948,717,996	951,931,984	955,457,525	959,121,858	962,738,506	965,932,287	969,391,110	973,092,370	977,213,746	980,510,396	984,139,525	987,766,134	991,618,817
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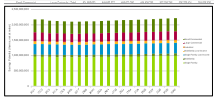

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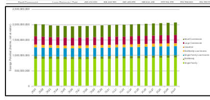

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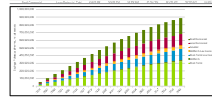

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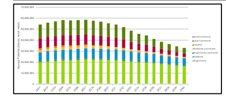

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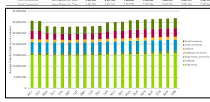

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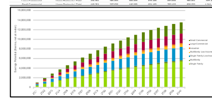
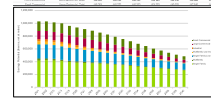
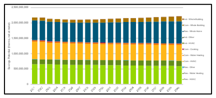
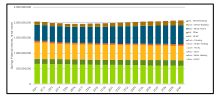
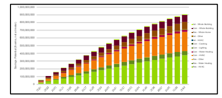


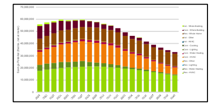
[illegible]

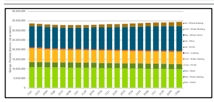


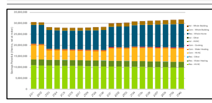


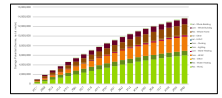


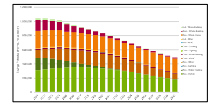




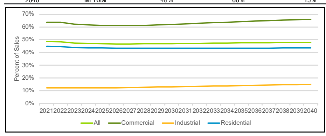




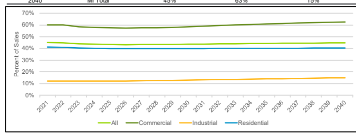




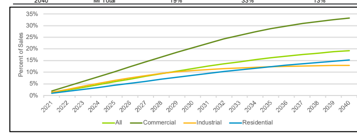
Michigan Total Natural Gas Technical Potential as a Percent of Sales by Sector (%)					
Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	49%	64%	12%	45%
2022	MI Total	48%	64%	12%	45%
2023	MI Total	47%	62%	12%	44%
2024	MI Total	47%	62%	12%	44%
2025	MI Total	47%	61%	12%	43%
2026	MI Total	47%	61%	12%	43%
2027	MI Total	47%	61%	12%	43%
2028	MI Total	47%	61%	13%	43%
2029	MI Total	47%	62%	13%	43%
2030	MI Total	47%	62%	13%	43%
2031	MI Total	47%	62%	13%	43%
2032	MI Total	47%	63%	13%	43%
2033	MI Total	47%	63%	14%	43%
2034	MI Total	47%	64%	14%	43%
2035	MI Total	47%	64%	14%	43%
2036	MI Total	48%	65%	14%	43%
2037	MI Total	48%	65%	14%	43%
2038	MI Total	48%	65%	15%	43%
2039	MI Total	48%	66%	15%	43%
2040	MI Total	48%	66%	15%	44%



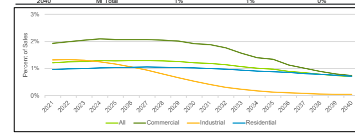
Michigan Total Natural Gas Economic Potential as a Percent of Sales by Sector (%)					
Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	45%	60%	12%	41%
2022	MI Total	45%	60%	12%	41%
2023	MI Total	44%	59%	12%	40%
2024	MI Total	44%	58%	12%	40%
2025	MI Total	43%	58%	12%	40%
2026	MI Total	43%	58%	12%	40%
2027	MI Total	43%	58%	12%	40%
2028	MI Total	43%	58%	13%	40%
2029	MI Total	43%	58%	13%	40%
2030	MI Total	44%	59%	13%	40%
2031	MI Total	44%	59%	13%	40%
2032	MI Total	44%	60%	13%	40%
2033	MI Total	44%	60%	14%	40%
2034	MI Total	44%	61%	14%	40%
2035	MI Total	44%	61%	14%	40%
2036	MI Total	44%	61%	14%	40%
2037	MI Total	45%	62%	14%	40%
2038	MI Total	45%	62%	15%	40%
2039	MI Total	45%	62%	15%	40%
2040	MI Total	45%	63%	15%	40%



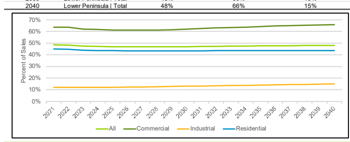
Michigan Total Natural Gas Cumulative Annual Achievable Potential as a Percent of Sales by Sector (%)					
Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	1%	2%	1%	1%
2022	MI Total	2%	4%	3%	2%
2023	MI Total	3%	6%	4%	3%
2024	MI Total	5%	8%	5%	3%
2025	MI Total	6%	10%	6%	4%
2026	MI Total	7%	12%	8%	5%
2027	MI Total	8%	14%	9%	6%
2028	MI Total	9%	17%	9%	7%
2029	MI Total	10%	19%	10%	8%
2030	MI Total	12%	21%	11%	9%
2031	MI Total	13%	22%	11%	9%
2032	MI Total	14%	24%	12%	10%
2033	MI Total	14%	26%	12%	11%
2034	MI Total	15%	27%	12%	12%
2035	MI Total	16%	29%	12%	12%
2036	MI Total	17%	30%	12%	13%
2037	MI Total	18%	31%	13%	14%
2038	MI Total	18%	32%	13%	14%
2039	MI Total	19%	33%	13%	15%
2040	MI Total	19%	33%	13%	15%



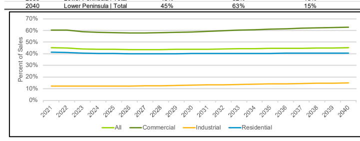
Michigan Total Natural Gas Incremental Annual Achievable Potential as a Percent of Sales by Sector (%)					
Year	Service Territory	All	Commercial	Industrial	Residential
2021	MI Total	1%	2%	1%	1%
2022	MI Total	1%	2%	1%	1%
2023	MI Total	1%	2%	1%	1%
2024	MI Total	1%	2%	1%	1%
2025	MI Total	1%	2%	1%	1%
2026	MI Total	1%	2%	1%	1%
2027	MI Total	1%	2%	1%	1%
2028	MI Total	1%	2%	1%	1%
2029	MI Total	1%	2%	1%	1%
2030	MI Total	1%	2%	1%	1%
2031	MI Total	1%	2%	0%	1%
2032	MI Total	1%	2%	0%	1%
2033	MI Total	1%	2%	0%	1%
2034	MI Total	1%	1%	0%	1%
2035	MI Total	1%	1%	0%	1%
2036	MI Total	1%	1%	0%	1%
2037	MI Total	1%	1%	0%	1%
2038	MI Total	1%	1%	0%	1%
2039	MI Total	1%	1%	0%	1%
2040	MI Total	1%	1%	0%	1%



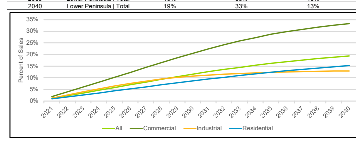
Lower Peninsula Natural Gas Technical Potential as a Percent of Sales by Sector (%)					
Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula I Total	49%	64%	12%	45%
2022	Lower Peninsula I Total	48%	64%	12%	45%
2023	Lower Peninsula I Total	47%	62%	12%	44%
2024	Lower Peninsula I Total	47%	62%	12%	44%
2025	Lower Peninsula I Total	47%	61%	12%	44%
2026	Lower Peninsula I Total	47%	61%	12%	43%
2027	Lower Peninsula I Total	47%	61%	12%	43%
2028	Lower Peninsula I Total	47%	61%	13%	43%
2029	Lower Peninsula I Total	47%	62%	13%	43%
2030	Lower Peninsula I Total	47%	62%	13%	43%
2031	Lower Peninsula I Total	47%	62%	13%	43%
2032	Lower Peninsula I Total	47%	63%	13%	44%
2033	Lower Peninsula I Total	47%	63%	14%	44%
2034	Lower Peninsula I Total	47%	64%	14%	44%
2035	Lower Peninsula I Total	48%	64%	14%	44%
2036	Lower Peninsula I Total	48%	65%	14%	44%
2037	Lower Peninsula I Total	48%	65%	14%	44%
2038	Lower Peninsula I Total	48%	65%	15%	44%
2039	Lower Peninsula I Total	48%	66%	15%	44%
2040	Lower Peninsula I Total	48%	66%	15%	44%



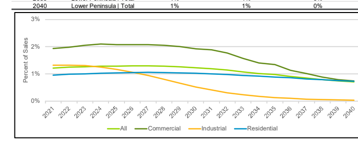
Lower Peninsula Natural Gas Economic Potential as a Percent of Sales by Sector (%)					
Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula I Total	45%	60%	12%	41%
2022	Lower Peninsula I Total	45%	60%	12%	41%
2023	Lower Peninsula I Total	44%	59%	12%	40%
2024	Lower Peninsula I Total	44%	58%	12%	40%
2025	Lower Peninsula I Total	44%	58%	12%	40%
2026	Lower Peninsula I Total	44%	58%	12%	40%
2027	Lower Peninsula I Total	44%	58%	12%	40%
2028	Lower Peninsula I Total	44%	58%	13%	40%
2029	Lower Peninsula I Total	44%	58%	13%	40%
2030	Lower Peninsula I Total	44%	59%	13%	40%
2031	Lower Peninsula I Total	44%	59%	13%	40%
2032	Lower Peninsula I Total	44%	60%	13%	40%
2033	Lower Peninsula I Total	44%	60%	14%	40%
2034	Lower Peninsula I Total	44%	61%	14%	40%
2035	Lower Peninsula I Total	45%	61%	14%	40%
2036	Lower Peninsula I Total	45%	61%	14%	40%
2037	Lower Peninsula I Total	45%	62%	14%	40%
2038	Lower Peninsula I Total	45%	62%	15%	41%
2039	Lower Peninsula I Total	45%	62%	15%	41%
2040	Lower Peninsula I Total	45%	63%	15%	41%



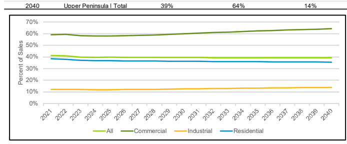
Lower Peninsula Natural Gas Cumulative Annual Achievable Potential as a Percent of Sales by Sector (%)					
Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula I Total	1%	2%	1%	1%
2022	Lower Peninsula I Total	2%	4%	3%	2%
2023	Lower Peninsula I Total	3%	6%	4%	3%
2024	Lower Peninsula I Total	5%	8%	5%	3%
2025	Lower Peninsula I Total	6%	10%	6%	4%
2026	Lower Peninsula I Total	7%	12%	8%	5%
2027	Lower Peninsula I Total	8%	14%	9%	6%
2028	Lower Peninsula I Total	9%	17%	9%	7%
2029	Lower Peninsula I Total	10%	19%	10%	8%
2030	Lower Peninsula I Total	12%	21%	11%	9%
2031	Lower Peninsula I Total	13%	22%	11%	9%
2032	Lower Peninsula I Total	14%	24%	12%	10%
2033	Lower Peninsula I Total	15%	26%	12%	11%
2034	Lower Peninsula I Total	15%	27%	12%	12%
2035	Lower Peninsula I Total	16%	29%	12%	12%
2036	Lower Peninsula I Total	17%	30%	13%	13%
2037	Lower Peninsula I Total	18%	31%	13%	14%
2038	Lower Peninsula I Total	18%	32%	13%	14%
2039	Lower Peninsula I Total	19%	33%	13%	15%
2040	Lower Peninsula I Total	19%	33%	13%	15%



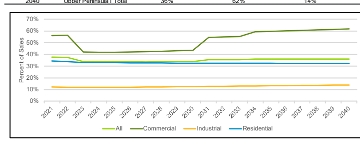
Lower Peninsula Natural Gas Incremental Annual Achievable Potential as a Percent of Sales by Sector (%)					
Year	Service Territory	All	Commercial	Industrial	Residential
2021	Lower Peninsula I Total	1%	2%	1%	1%
2022	Lower Peninsula I Total	1%	2%	1%	1%
2023	Lower Peninsula I Total	1%	2%	1%	1%
2024	Lower Peninsula I Total	1%	2%	1%	1%
2025	Lower Peninsula I Total	1%	2%	1%	1%
2026	Lower Peninsula I Total	1%	2%	1%	1%
2027	Lower Peninsula I Total	1%	2%	1%	1%
2028	Lower Peninsula I Total	1%	2%	1%	1%
2029	Lower Peninsula I Total	1%	2%	1%	1%
2030	Lower Peninsula I Total	1%	2%	1%	1%
2031	Lower Peninsula I Total	1%	2%	0%	1%
2032	Lower Peninsula I Total	1%	2%	0%	1%
2033	Lower Peninsula I Total	1%	2%	0%	1%
2034	Lower Peninsula I Total	1%	1%	0%	1%
2035	Lower Peninsula I Total	1%	1%	0%	1%
2036	Lower Peninsula I Total	1%	1%	0%	1%
2037	Lower Peninsula I Total	1%	1%	0%	1%
2038	Lower Peninsula I Total	1%	1%	0%	1%
2039	Lower Peninsula I Total	1%	1%	0%	1%
2040	Lower Peninsula I Total	1%	1%	0%	1%



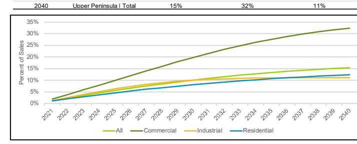
Upper Peninsula Natural Gas Technical Potential as a Percent of Sales by Sector (%)					
Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula I Total	41%	59%	12%	38%
2022	Upper Peninsula I Total	41%	59%	12%	38%
2023	Upper Peninsula I Total	40%	58%	12%	37%
2024	Upper Peninsula I Total	40%	58%	12%	37%
2025	Upper Peninsula I Total	40%	58%	12%	37%
2026	Upper Peninsula I Total	40%	58%	12%	37%
2027	Upper Peninsula I Total	40%	59%	12%	37%
2028	Upper Peninsula I Total	39%	59%	12%	36%
2029	Upper Peninsula I Total	39%	59%	12%	36%
2030	Upper Peninsula I Total	39%	60%	13%	36%
2031	Upper Peninsula I Total	39%	60%	13%	36%
2032	Upper Peninsula I Total	39%	61%	13%	36%
2033	Upper Peninsula I Total	39%	61%	13%	36%
2034	Upper Peninsula I Total	39%	62%	13%	36%
2035	Upper Peninsula I Total	39%	62%	13%	36%
2036	Upper Peninsula I Total	39%	63%	13%	36%
2037	Upper Peninsula I Total	39%	63%	14%	36%
2038	Upper Peninsula I Total	39%	63%	14%	36%
2039	Upper Peninsula I Total	39%	64%	14%	36%
2040	Upper Peninsula I Total	39%	64%	14%	36%



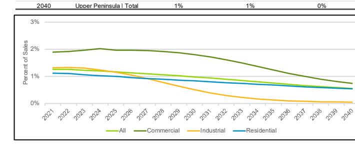
Upper Peninsula Natural Gas Economic Potential as a Percent of Sales by Sector (%)					
Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula I Total	38%	56%	12%	34%
2022	Upper Peninsula I Total	37%	56%	12%	34%
2023	Upper Peninsula I Total	34%	42%	12%	33%
2024	Upper Peninsula I Total	34%	42%	12%	33%
2025	Upper Peninsula I Total	34%	42%	12%	33%
2026	Upper Peninsula I Total	34%	42%	12%	33%
2027	Upper Peninsula I Total	34%	42%	12%	33%
2028	Upper Peninsula I Total	34%	43%	12%	33%
2029	Upper Peninsula I Total	34%	43%	12%	33%
2030	Upper Peninsula I Total	34%	44%	13%	33%
2031	Upper Peninsula I Total	36%	54%	13%	33%
2032	Upper Peninsula I Total	36%	55%	13%	33%
2033	Upper Peninsula I Total	36%	55%	13%	32%
2034	Upper Peninsula I Total	36%	59%	13%	32%
2035	Upper Peninsula I Total	36%	60%	13%	32%
2036	Upper Peninsula I Total	36%	60%	13%	32%
2037	Upper Peninsula I Total	36%	61%	14%	32%
2038	Upper Peninsula I Total	36%	61%	14%	32%
2039	Upper Peninsula I Total	36%	61%	14%	32%
2040	Upper Peninsula I Total	36%	62%	14%	32%



Upper Peninsula Natural Gas Cumulative Annual Achievable Potential as a Percent of Sales by Sector (%)					
Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula I Total	1%	2%	1%	1%
2022	Upper Peninsula I Total	2%	4%	3%	2%
2023	Upper Peninsula I Total	3%	6%	4%	3%
2024	Upper Peninsula I Total	5%	8%	5%	4%
2025	Upper Peninsula I Total	6%	10%	6%	5%
2026	Upper Peninsula I Total	7%	12%	7%	5%
2027	Upper Peninsula I Total	8%	14%	8%	6%
2028	Upper Peninsula I Total	8%	16%	9%	7%
2029	Upper Peninsula I Total	9%	18%	10%	7%
2030	Upper Peninsula I Total	10%	20%	10%	8%
2031	Upper Peninsula I Total	11%	22%	10%	9%
2032	Upper Peninsula I Total	12%	23%	11%	9%
2033	Upper Peninsula I Total	12%	25%	11%	10%
2034	Upper Peninsula I Total	13%	26%	11%	10%
2035	Upper Peninsula I Total	13%	28%	11%	11%
2036	Upper Peninsula I Total	14%	29%	11%	11%
2037	Upper Peninsula I Total	14%	30%	11%	11%
2038	Upper Peninsula I Total	15%	31%	11%	12%
2039	Upper Peninsula I Total	15%	32%	11%	12%
2040	Upper Peninsula I Total	15%	32%	11%	12%



Upper Peninsula Natural Gas Incremental Annual Achievable Potential as a Percent of Sales by Sector (%)					
Year	Service Territory	All	Commercial	Industrial	Residential
2021	Upper Peninsula I Total	1%	2%	1%	1%
2022	Upper Peninsula I Total	1%	2%	1%	1%
2023	Upper Peninsula I Total	1%	2%	1%	1%
2024	Upper Peninsula I Total	1%	2%	1%	1%
2025	Upper Peninsula I Total	1%	2%	1%	1%
2026	Upper Peninsula I Total	1%	2%	1%	1%
2027	Upper Peninsula I Total	1%	2%	1%	1%
2028	Upper Peninsula I Total	1%	2%	1%	1%
2029	Upper Peninsula I Total	1%	2%	1%	1%
2030	Upper Peninsula I Total	1%	2%	1%	1%
2031	Upper Peninsula I Total	1%	2%	0%	1%
2032	Upper Peninsula I Total	1%	2%	0%	1%
2033	Upper Peninsula I Total	1%	1%	0%	1%
2034	Upper Peninsula I Total	1%	1%	0%	1%
2035	Upper Peninsula I Total	1%	1%	0%	1%
2036	Upper Peninsula I Total	1%	1%	0%	1%
2037	Upper Peninsula I Total	1%	1%	0%	1%
2038	Upper Peninsula I Total	1%	1%	0%	1%
2039	Upper Peninsula I Total	1%	1%	0%	1%
2040	Upper Peninsula I Total	1%	1%	0%	1%



Residential 2021 Natural Gas Technical Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Furnaces - RET Only - Gas	391,118,621
2	Res - Insulation, Ceiling/Attic - RET Only - Gas	195,824,114
3	Res - Insulation, Wall - RET Only - Gas	188,888,937
4	Res - Air Sealing - RET Only - Gas	144,562,900
5	Res - Thermostats - RET Only - Gas	118,302,249
6	Res - Water Heaters, Tankless - ROB and NEW - Gas	107,893,868
7	Res - Furnace Tune-up - RET Only - Gas	86,861,361
8	Res - Boiler - RET Only - Gas	62,662,911
9	Res - Home Energy Reports - RET Only - Gas	57,385,886
10	Res - Insulation, Basement - RET Only - Gas	47,641,918
11	Res - Showerheads - RET Only - Gas	27,131,855
12	Res - Low Flow Aerators - RET Only - Gas	15,390,962
13	Res - Pipe Insulation - RET Only - Gas	7,544,385
14	Res - Clothes Dryers - ROB and NEW - Gas	2,272,774
15	Res - Home Energy Reports - NEW Only - Gas	503,036
16	Res - Showerheads - NEW Only - Gas	208,748
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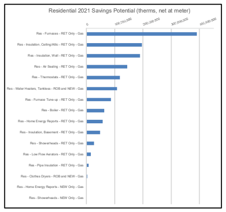

Commercial 2021 Natural Gas Technical Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	[illegible]	[illegible]
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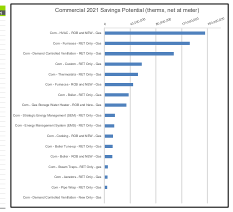

Industrial 2021 Natural Gas Technical Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	[illegible]	[illegible]
2	[illegible]	[illegible]
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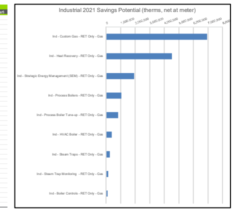

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Rank	Measure Name	Potential (cumul. impact/year)
1	[illegible]	[illegible]
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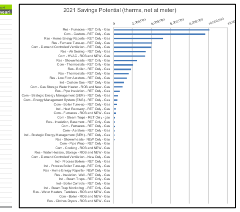

Residential 2021 Natural Gas Economic Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	[illegible]	[illegible]
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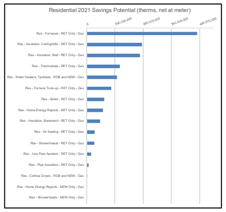

Commercial 2021 Natural Gas Economic Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - HVAC - ROB and NEW - Gas	156,103,027
2	Com - Furnaces - RET Only - Gas	132,626,786
3	Com - Demand Controlled Ventilation - RET Only - Gas	107,606,383
4	Com - Custom - RET Only - Gas	57,885,847
5	Com - Thermostats - RET Only - Gas	52,229,459
6	Com - Furnaces - ROB and NEW - Gas	44,404,100
7	Com - Gas Storage Water Heater - ROB and New - Gas	34,255,584
8	Com - Strategic Energy Management (SEM) - RET Only - Gas	16,125,309
9	Com - Energy Management System (EMS) - RET Only - Gas	15,225,934
10	Com - Cooking - ROB and NEW - Gas	13,291,827
11	Com - Boiler Tune-up - RET Only - Gas	12,872,662
12	Com - Boiler - ROB and NEW - Gas	12,553,262
13	Com - Steam Traps - RET Only - gas	5,429,913
14	Com - Aerators - RET Only - Gas	4,992,070
15	Com - Pipe Wrap - RET Only - Gas	4,260,650
16	Com - Demand Controlled Ventilation - New Only - Gas	155,230
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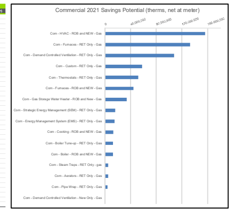

Industrial 2021 Natural Gas Economic Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Custom Gas - RET Only - Gas	6,037,370
2	Ind - Heat Recovery - RET Only - Gas	4,514,572
3	Ind - Strategic Energy Management (SEM) - RET Only - Gas	1,932,549
4	Ind - Process Boilers - RET Only - Gas	1,042,544
5	Ind - Process Boiler Tune-up - RET Only - Gas	819,262
6	Ind - HVAC Boiler - RET Only - Gas	395,901
7	Ind - Steam Traps - RET Only - Gas	266,680
8	Ind - Steam Trap Monitoring - RET Only - Gas	144,638
9	Ind - Boiler Controls - RET Only - Gas	104,086
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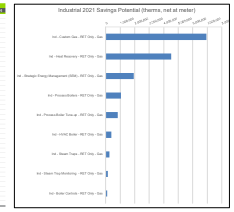

Residential 2021 Natural Gas Cumulative Annual Achievable Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Furnaces - RET Only - Gas	10,092,212
2	Res - Home Energy Reports - RET Only - Gas	5,217,274
3	Res - Furnace Tune-up - RET Only - Gas	4,097,511
4	Res - Air Sealing - RET Only - Gas	3,403,958
5	Res - Showerheads - RET Only - Gas	2,506,171
6	Res - Boiler - RET Only - Gas	1,869,963
7	Res - Thermostats - RET Only - Gas	1,617,207
8	Res - Low Flow Aerators - RET Only - Gas	1,422,707
9	Res - Pipe Insulation - RET Only - Gas	693,778
10	Res - Insulation, Basement - RET Only - Gas	215,720
11	Res - Showerheads - NEW Only - Gas	137,024
12	Res - Water Heaters, Storage - ROB and NEW - Gas	84,564
13	Res - Home Energy Reports - NEW Only - Gas	50,304
14	Res - Insulation, Wall - RET Only - Gas	32,457
15	Res - Water Heaters, Tankless - ROB and NEW - Gas	5,366
16	Res - Clothes Dryers - ROB and NEW - Gas	1,044
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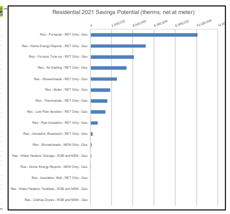

Commercial 2021 Natural Gas Cumulative Annual Achievable Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - Custom - RET Only - Gas	9,658,218
2	Com - Demand Controlled Ventilation - RET Only - Gas	4,029,785
3	Com - HVAC - ROB and NEW - Gas	3,372,495
4	Com - Thermostats - RET Only - Gas	2,093,809
5	Com - Gas Storage Water Heater - ROB and New - Gas	975,018
6	Com - Strategic Energy Management (SEM) - RET Only - Gas	503,475
7	Com - Energy Management System (EMS) - RET Only - Gas	444,416
8	Com - Boiler Tune-up - RET Only - Gas	424,638
9	Com - Furnaces - ROB and NEW - Gas	275,235
10	Com - Steam Traps - RET Only - gas	218,110
11	Com - Furnaces - RET Only - Gas	200,609
12	Com - Aerators - RET Only - Gas	155,505
13	Com - Pipe Wrap - RET Only - Gas	132,832
14	Com - Cooking - ROB and NEW - Gas	100,584
15	Com - Demand Controlled Ventilation - New Only - Gas	65,687
16	Com - Boiler - ROB and NEW - Gas	2,759
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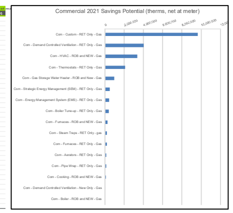

Industrial 2021 Natural Gas Cumulative Annual Achievable Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	[illegible]	[illegible]
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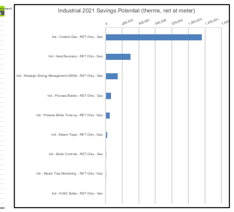
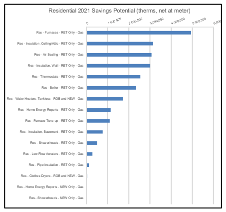


Residential 2021 Natural Gas Technical Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Furnaces - RET Only - Gas	4,930,809
2	Res - Insulation, Ceiling/Attic - RET Only - Gas	3,150,353
3	Res - Air Sealing - RET Only - Gas	3,067,025
4	Res - Insulation, Wall - RET Only - Gas	3,001,513
5	Res - Thermostats - RET Only - Gas	2,546,547
6	Res - Boiler - RET Only - Gas	2,343,893
7	Res - Water Heaters, Tankless - ROB and NEW - Gas	1,726,085
8	Res - Home Energy Reports - RET Only - Gas	1,140,646
9	Res - Furnace Tune-up - RET Only - Gas	1,094,576
10	Res - Insulation, Basement - RET Only - Gas	755,525
11	Res - Showerheads - RET Only - Gas	512,071
12	Res - Low Flow Aerators - RET Only - Gas	274,649
13	Res - Pipe Insulation - RET Only - Gas	120,020
14	Res - Clothes Dryers - ROB and NEW - Gas	36,394
15	Res - Home Energy Reports - NEW Only - Gas	12,573
16	Res - Showerheads - NEW Only - Gas	4,279



Commercial 2021 Natural Gas Technical Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
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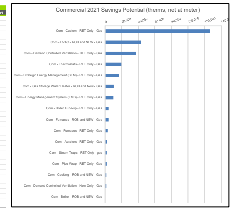
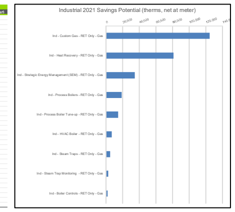
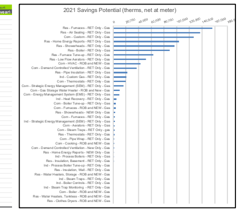


Industrial 2021 Natural Gas Technical Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
[illegible]	[illegible]	[illegible]

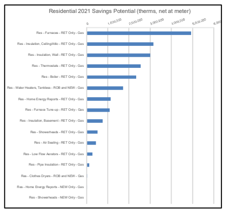


Rank	Measure Name	Potential (cumul. impact/year)
[illegible]	[illegible]	[illegible]



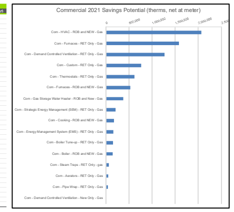
Residential 2021 Natural Gas Economic Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Furnaces - RET Only - Gas	4,930,809
2	Res - Insulation, Ceiling/Attic - RET Only - Gas	3,150,353
3	Res - Insulation, Wall - RET Only - Gas	3,001,513
4	Res - Thermostats - RET Only - Gas	2,546,547
5	Res - Boiler - RET Only - Gas	2,343,893
6	Res - Water Heaters, Tankless - ROB and NEW - Gas	1,726,085
7	Res - Home Energy Reports - RET Only - Gas	1,140,646
8	Res - Furnace Tune-up - RET Only - Gas	1,094,576
9	Res - Insulation, Basement - RET Only - Gas	755,525
10	Res - Showerheads - RET Only - Gas	512,071
11	Res - Air Sealing - RET Only - Gas	438,404
12	Res - Low Flow Aerators - RET Only - Gas	274,649
13	Res - Pipe Insulation - RET Only - Gas	120,020
14	Res - Clothes Dryers - ROB and NEW - Gas	36,394
15	Res - Home Energy Reports - NEW Only - Gas	12,573
16	Res - Showerheads - NEW Only - Gas	4,279



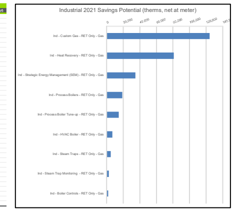
Commercial 2021 Natural Gas Economic Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - HVAC - ROB and NEW - Gas	2,063,181
2	Com - Furnaces - RET Only - Gas	1,584,134
3	Com - Demand Controlled Ventilation - RET Only - Gas	1,271,823
4	Com - Custom - RET Only - Gas	764,989
5	Com - Thermostats - RET Only - Gas	616,254
6	Com - Furnaces - ROB and NEW - Gas	532,577
7	Com - Gas Storage Water Heater - ROB and New - Gas	379,139
8	Com - Strategic Energy Management (SEM) - RET Only - Gas	213,104
9	Com - Cooking - ROB and NEW - Gas	175,573
10	Com - Energy Management System (EMS) - RET Only - Gas	161,333
11	Com - Boiler Tune-up - RET Only - Gas	154,315
12	Com - Boiler - ROB and NEW - Gas	150,922
13	Com - Steam Traps - RET Only - gas	64,728
14	Com - Aerators - RET Only - Gas	53,514
15	Com - Pipe Wrap - RET Only - Gas	45,808
16	Com - Demand Controlled Ventilation - New Only - Gas	3,630



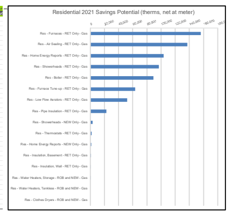
Industrial 2021 Natural Gas Economic Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Custom Gas - RET Only - Gas	124,325
2	Ind - Heat Recovery - RET Only - Gas	80,906
3	Ind - Strategic Energy Management (SEM) - RET Only - Gas	34,633
4	Ind - Process Boilers - RET Only - Gas	18,683
5	Ind - Process Boiler Tune-up - RET Only - Gas	14,682
6	Ind - HVAC Boiler - RET Only - Gas	6,016
7	Ind - Steam Traps - RET Only - Gas	4,779
8	Ind - Steam Trap Monitoring - RET Only - Gas	2,592
9	Ind - Boiler Controls - RET Only - Gas	1,865



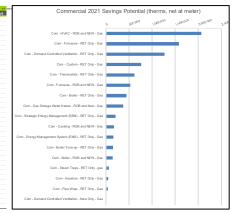
Residential 2021 Natural Gas Cumulative Annual Achievable Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Res - Furnaces - RET Only - Gas	155,987
2	Res - Air Sealing - RET Only - Gas	136,935
3	Res - Home Energy Reports - RET Only - Gas	103,436
4	Res - Showerheads - RET Only - Gas	96,767
5	Res - Boiler - RET Only - Gas	89,075
6	Res - Furnace Tune-up - RET Only - Gas	63,417
7	Res - Low Flow Aerators - RET Only - Gas	51,954
8	Res - Pipe Insulation - RET Only - Gas	22,607
9	Res - Showerheads - NEW Only - Gas	3,132
10	Res - Thermostats - RET Only - Gas	2,053
11	Res - Home Energy Reports - NEW Only - Gas	1,257
12	Res - Insulation, Basement - RET Only - Gas	1,128
13	Res - Insulation, Wall - RET Only - Gas	626
14	Res - Water Heaters, Storage - ROB and NEW - Gas	434
15	Res - Water Heaters, Tankless - ROB and NEW - Gas	33
16	Res - Clothes Dryers - ROB and NEW - Gas	9



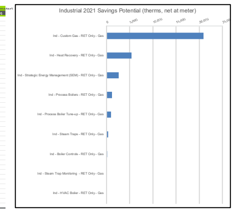
Commercial 2021 Natural Gas Cumulative Annual Achievable Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Com - HVAC - ROB and NEW - Gas	2,063,181
2	Com - Furnaces - RET Only - Gas	1,584,134
3	Com - Demand Controlled Ventilation - RET Only - Gas	1,271,823
4	Com - Custom - RET Only - Gas	764,989
5	Com - Thermostats - RET Only - Gas	616,254
6	Com - Furnaces - ROB and NEW - Gas	532,577
7	Com - Boiler - RET Only - Gas	448,910
8	Com - Gas Storage Water Heater - ROB and New - Gas	379,139
9	Com - Strategic Energy Management (SEM) - RET Only - Gas	213,104
10	Com - Cooking - ROB and NEW - Gas	175,573
11	Com - Energy Management System (EMS) - RET Only - Gas	161,333
12	Com - Boiler Tune-up - RET Only - Gas	154,315
13	Com - Boiler - ROB and NEW - Gas	150,922
14	Com - Steam Traps - RET Only - gas	64,728
15	Com - Aerators - RET Only - Gas	53,514
16	Com - Pipe Wrap - RET Only - Gas	45,808
17	Com - Demand Controlled Ventilation - New Only - Gas	3,630



Industrial 2021 Natural Gas Cumulative Annual Achievable Potential Top Measures (therms, net at meter)

Rank	Measure Name	Potential (cumul. impact/year)
1	Ind - Custom Gas - RET Only - Gas	20,902
2	Ind - Heat Recovery - RET Only - Gas	5,420
3	Ind - Strategic Energy Management (SEM) - RET Only - Gas	2,630
4	Ind - Process Boilers - RET Only - Gas	1,178
5	Ind - Process Boiler Tune-up - RET Only - Gas	938
6	Ind - Steam Traps - RET Only - Gas	320
7	Ind - Boiler Controls - RET Only - Gas	113
8	Ind - Steam Trap Monitoring - RET Only - Gas	48
9	Ind - HVAC Boiler - RET Only - Gas	0



Note: Unique measure names are a combination of common measure name, replacement type, primary fuel type, and peninsula.

Electricity Incremental Annual Achievable Potential by Unique Measure (kWh, net at meter)

Unique Measure Name	2021	2022	2023	2024	2025	2026	2027	2028
Com - Aerators - RET Only - Gas | Lower Peninsula	0	0	0	0	0	0	0	0
Com - Aerators - RET Only - Gas | Upper Peninsula	0	0	0	0	0	0	0	0
Com - Ag Lighting - RET Only - Electric | Lower Peninsula	83,412	83,128	77,370	67,091	54,562	42,043	30,780	21,698
Com - Ag Lighting - RET Only - Electric | Upper Peninsula	880	874	804	681	535	391	271	180
Com - Air Compressors - RET Only - Electric | Lower Peninsula	48,686	54,171	59,284	63,683	67,279	70,120	71,583	71,648
Com - Air Compressors - RET Only - Electric | Upper Peninsula	571	640	707	767	817	851	865	859
Com - Air Source Heat Pump - ROB and NEW - Electric | Lower Peninsula	462,505	500,066	270,506	234,253	233,925	230,837	224,509	216,469
Com - Air Source Heat Pump - ROB and NEW - Electric | Upper Peninsula	1,755	1,893	816	815	823	824	849	798
Com - Boiler - RET Only - Gas | Lower Peninsula	0	0	0	0	0	0	0	0
Com - Boiler - RET Only - Gas | Upper Peninsula	0	0	0	0	0	0	0	0
Com - Boiler - ROB and NEW - Gas | Lower Peninsula	0	0	0	0	0	0	0	0
Com - Boiler - ROB and NEW - Gas | Upper Peninsula	0	0	0	0	0	0	0	0
Com - Boiler Tune-up - RET Only - Gas | Lower Peninsula	0	0	0	0	0	0	0	0
Com - Boiler Tune-up - RET Only - Gas | Upper Peninsula	0	0	0	0	0	0	0	0
Com - Chiller Tune-up - RET Only - Electric | Lower Peninsula	3,882,348	4,279,951	4,526,203	4,565,640	4,396,456	4,048,002	3,545,817	2,967,754
Com - Chiller Tune-up - RET Only - Electric | Upper Peninsula	18,127	20,010	21,228	21,530	20,789	19,068	16,615	13,794
Com - Cooking - ROB and NEW - Electric | Lower Peninsula	1,960,848	2,130,387	2,385,126	2,258,007	2,313,839	2,346,341	2,344,707	2,317,109
Com - Cooking - ROB and NEW - Electric | Upper Peninsula	25,725	27,221	27,232	28,086	28,594	28,950	30,020	28,638
Com - Cooking - ROB and NEW - Gas | Lower Peninsula	0	0	0	0	0	0	0	0
Com - Cooking - ROB and NEW - Gas | Upper Peninsula	0	0	0	0	0	0	0	0
Com - Custom - RET Only - Electric | Lower Peninsula	213,852,835	195,442,955	171,495,470	144,790,958	118,623,032	95,089,669	74,503,139	57,429,174
Com - Custom - RET Only - Electric | Upper Peninsula	2,253,840	2,060,605	1,815,207	1,544,756	1,274,770	1,024,613	805,794	622,723
Com - Custom - RET Only - Gas | Lower Peninsula	0	0	0	0	0	0	0	0
Com - Custom - RET Only - Gas | Upper Peninsula	0	0	0	0	0	0	0	0
Com - Demand Controlled Ventilation - New Only - Electric | Lower Peninsula	103,871	103,331	219,879	0	0	0	0	0
Com - Demand Controlled Ventilation - New Only - Electric | Upper Peninsula	880	879	510	543	571	667	1,149	807
Com - Demand Controlled Ventilation - New Only - Gas | Lower Peninsula	81,785	81,337	174,579	0	0	0	0	0
Com - Demand Controlled Ventilation - New Only - Gas | Upper Peninsula	1,908	1,905	1,037	1,069	1,110	1,295	2,234	1,587
Com - Demand Controlled Ventilation - RET Only - Electric | Lower Peninsula	13,731,840	15,064,991	15,922,409	16,134,556	15,698,176	14,694,396	13,162,957	11,328,542
Com - Demand Controlled Ventilation - RET Only - Electric | Upper Peninsula	61,225	66,985	70,987	72,588	71,404	67,460	61,212	53,440
Com - Demand Controlled Ventilation - RET Only - Gas | Lower Peninsula	5,011,470	5,740,070	6,466,544	7,146,285	7,765,956	8,311,540	8,692,863	8,886,423
Com - Demand Controlled Ventilation - RET Only - Gas | Upper Peninsula	32,886	38,303	44,290	50,774	57,620	64,619	71,488	77,868
Com - Energy Management System (EMS) - RET Only - Electric | Lower Peninsula	66,874,545	75,430,523	83,120,779	89,174,699	93,312,066	95,356,439	94,449,316	90,761,527

Note: Unique measure names are a combination of common measure name, replacement type, primary fuel type, and peninsula.

Electric Demand Incremental Annual Achievable Potential by Unique Measure (kW, net at meter)

	2021	2022	2023	2024	2025	2026	2027	2028
Com - Aerators - RET Only - Gas | Lower Peninsula	0	0	0	0	0	0	0	0
Com - Aerators - RET Only - Gas | Upper Peninsula	0	0	0	0	0	0	0	0
Com - Ag Lighting - RET Only - Electric | Lower Peninsula	13	13	12	10	8	6	5	3
Com - Ag Lighting - RET Only - Electric | Upper Peninsula	0	0	0	0	0	0	0	0
Com - Air Compressors - RET Only - Electric | Lower Peninsula	14	15	17	18	19	20	20	20
Com - Air Compressors - RET Only - Electric | Upper Peninsula	0	0	0	0	0	0	0	0
Com - Air Source Heat Pump - ROB and NEW - Electric | Lower Peninsula	84	91	51	44	44	44	43	41
Com - Air Source Heat Pump - ROB and NEW - Electric | Upper Peninsula	1	1	0	0	0	0	0	0
Com - Boiler - RET Only - Gas | Lower Peninsula	0	0	0	0	0	0	0	0
Com - Boiler - RET Only - Gas | Upper Peninsula	0	0	0	0	0	0	0	0
Com - Boiler - ROB and NEW - Gas | Lower Peninsula	0	0	0	0	0	0	0	0
Com - Boiler - ROB and NEW - Gas | Upper Peninsula	0	0	0	0	0	0	0	0
Com - Boiler Tune-up - RET Only - Gas | Lower Peninsula	0	0	0	0	0	0	0	0
Com - Boiler Tune-up - RET Only - Gas | Upper Peninsula	0	0	0	0	0	0	0	0
Com - Chiller Tune-up - RET Only - Electric | Lower Peninsula	1,190	1,311	1,387	1,399	1,347	1,240	1,086	909
Com - Chiller Tune-up - RET Only - Electric | Upper Peninsula	6	6	7	7	6	6	5	4
Com - Cooking - ROB and NEW - Electric | Lower Peninsula	200	217	243	230	236	239	239	236
Com - Cooking - ROB and NEW - Electric | Upper Peninsula	3	3	3	3	3	3	3	3
Com - Cooking - ROB and NEW - Gas | Lower Peninsula	0	0	0	0	0	0	0	0

Note: Unique measure names are a combination of common measure name, replacement type, primary fuel type, and peninsula.

Natural Gas Incremental Annual Achievable Potential by Unique Measure (therms, net at meter)

	2021	2022	2023	2024	2025	2026	2027
Com - Aerators - RET Only - Gas | Lower Peninsula	66,315	79,070	93,477	109,409	127,224	147,342	168,717
Com - Aerators - RET Only - Gas | Upper Peninsula	1,717	2,021	2,346	2,681	3,008	3,302	3,536
Com - Ag Lighting - RET Only - Electric | Lower Peninsula	0	0	0	0	0	0	0
Com - Ag Lighting - RET Only - Electric | Upper Peninsula	0	0	0	0	0	0	0
Com - Air Compressors - RET Only - Electric | Lower Peninsula	0	0	0	0	0	0	0
Com - Air Compressors - RET Only - Electric | Upper Peninsula	0	0	0	0	0	0	0
Com - Air Source Heat Pump - ROB and NEW - Electric | Lower Peninsula	0	0	0	0	0	0	0
Com - Air Source Heat Pump - ROB and NEW - Electric | Upper Peninsula	0	0	0	0	0	0	0
Com - Boiler - RET Only - Gas | Lower Peninsula	0	0	0	0	0	0	0
Com - Boiler - RET Only - Gas | Upper Peninsula	0	0	0	0	0	0	0
Com - Boiler - ROB and NEW - Gas | Lower Peninsula	0	0	0	0	0	0	0
Com - Boiler - ROB and NEW - Gas | Upper Peninsula	0	0	0	0	0	0	0
Com - Boiler Tune-up - RET Only - Gas | Lower Peninsula	0	0	0	0	0	0	0
Com - Boiler Tune-up - RET Only - Gas | Upper Peninsula	0	0	0	0	0	0	0
Com - Chiller Tune-up - RET Only - Electric | Lower Peninsula	0	0	0	0	0	0	0
Com - Chiller Tune-up - RET Only - Electric | Upper Peninsula	0	0	0	0	0	0	0
Com - Cooking - ROB and NEW - Electric | Lower Peninsula	0	0	0	0	0	0	0
Com - Cooking - ROB and NEW - Electric | Upper Peninsula	0	0	0	0	0	0	0
Com - Cooking - ROB and NEW - Gas | Lower Peninsula	141,258	166,856	185,117	218,329	211,026	209,681	206,438

Note: Unique measure names are a combination of common measure name, replacement type, primary fuel type, and peninsula.

Electricity Incremental Annual Achievable Potential by Unique Measure (kWh, net at meter)

Unique Measure Name	2021	2022	2023	2024	2025	2026	2027	2028
Com - Aerators - RET Only - Gas | Lower Peninsula	0	0	0	0	0	0	0	0
Com - Aerators - RET Only - Gas | Upper Peninsula	0	0	0	0	0	0	0	0
Com - Ag Lighting - RET Only - Electric | Lower Peninsula	83,412	83,128	77,370	67,091	54,562	42,043	30,780	21,698
Com - Ag Lighting - RET Only - Electric | Upper Peninsula	880	874	804	681	535	391	271	180
Com - Air Compressors - RET Only - Electric | Lower Peninsula	48,686	54,171	59,284	63,663	67,279	70,120	71,583	71,648
Com - Air Compressors - RET Only - Electric | Upper Peninsula	571	640	707	767	817	851	865	859
Com - Air Source Heat Pump - ROB and NEW - Electric | Lower Peninsula	462,505	500,066	270,506	234,253	233,925	230,837	224,509	216,469
Com - Air Source Heat Pump - ROB and NEW - Electric | Upper Peninsula	1,755	1,893	816	815	823	824	849	798
Com - Boiler - RET Only - Gas | Lower Peninsula	0	0	0	0	0	0	0	0
Com - Boiler - RET Only - Gas | Upper Peninsula	0	0	0	0	0	0	0	0
Com - Boiler - ROB and NEW - Gas | Lower Peninsula	0	0	0	0	0	0	0	0
Com - Boiler - ROB and NEW - Gas | Upper Peninsula	0	0	0	0	0	0	0	0
Com - Boiler Tune-up - RET Only - Gas | Lower Peninsula	0	0	0	0	0	0	0	0
Com - Boiler Tune-up - RET Only - Gas | Upper Peninsula	0	0	0	0	0	0	0	0
Com - Chiller Tune-up - RET Only - Electric | Lower Peninsula	3,882,348	4,279,951	4,526,203	4,565,640	4,396,456	4,048,002	3,545,817	2,967,754
Com - Chiller Tune-up - RET Only - Electric | Upper Peninsula	18,127	20,010	21,228	21,530	20,789	19,068	16,615	13,794
Com - Cooking - ROB and NEW - Electric | Lower Peninsula	1,960,848	2,130,387	2,385,126	2,258,007	2,313,839	2,346,341	2,344,707	2,317,109
Com - Cooking - ROB and NEW - Electric | Upper Peninsula	25,725	27,221	27,232	28,086	28,594	28,950	30,020	28,638
Com - Cooking - ROB and NEW - Gas | Lower Peninsula	0	0	0	0	0	0	0	0
Com - Cooking - ROB and NEW - Gas | Upper Peninsula	0	0	0	0	0	0	0	0
Com - Custom - RET Only - Electric | Lower Peninsula	213,852,835	195,442,955	171,495,470	144,790,958	118,623,032	95,089,669	74,503,139	57,429,174
Com - Custom - RET Only - Electric | Upper Peninsula	2,253,840	2,060,605	1,815,207	1,544,756	1,274,770	1,024,613	805,794	622,723
Com - Custom - RET Only - Gas | Lower Peninsula	0	0	0	0	0	0	0	0
Com - Custom - RET Only - Gas | Upper Peninsula	0	0	0	0	0	0	0	0
Com - Demand Controlled Ventilation - New Only - Electric | Lower Peninsula	103,871	103,331	219,879	0	0	0	0	0
Com - Demand Controlled Ventilation - New Only - Electric | Upper Peninsula	880	879	510	543	571	667	1,149	807
Com - Demand Controlled Ventilation - New Only - Gas | Lower Peninsula	81,785	81,337	174,579	0	0	0	0	0
Com - Demand Controlled Ventilation - New Only - Gas | Upper Peninsula	1,908	1,905	1,037	1,069	1,110	1,295	2,234	1,587
Com - Demand Controlled Ventilation - RET Only - Electric | Lower Peninsula	13,731,840	15,064,991	15,922,409	16,134,556	15,698,176	14,694,396	13,162,957	11,328,542
Com - Demand Controlled Ventilation - RET Only - Electric | Upper Peninsula	61,225	66,985	70,987	72,588	71,404	67,460	61,212	53,440
Com - Demand Controlled Ventilation - RET Only - Gas | Lower Peninsula	5,011,470	5,740,070	6,466,544	7,146,285	7,765,956	8,311,540	8,692,863	8,886,423
Com - Demand Controlled Ventilation - RET Only - Gas | Upper Peninsula	32,886	38,303	44,290	50,774	57,620	64,619	71,488	77,868
Com - Energy Management System (EMS) - RET Only - Electric | Lower Peninsula	66,874,545	75,430,523	83,120,779	89,174,699	93,312,066	95,356,439	94,449,316	90,761,527

Electric Demand Incremental Annual Achievable Potential by Unique Measure (kW, net at meter)

Unique Measure Name	2021	2022	2023	2024	2025	2026	2027	2028
Com - Aerators - RET Only - Gas | Lower Peninsula	0	0	0	0	0	0	0	0
Com - Aerators - RET Only - Gas | Upper Peninsula	0	0	0	0	0	0	0	0
Com - Ag Lighting - RET Only - Electric | Lower Peninsula	13	13	12	10	8	6	5	3
Com - Ag Lighting - RET Only - Electric | Upper Peninsula	0	0	0	0	0	0	0	0
Com - Air Compressors - RET Only - Electric | Lower Peninsula	14	15	17	18	19	20	20	20
Com - Air Compressors - RET Only - Electric | Upper Peninsula	0	0	0	0	0	0	0	0
Com - Air Source Heat Pump - ROB and NEW - Electric | Lower Peninsula	84	91	51	44	44	44	43	41
Com - Air Source Heat Pump - ROB and NEW - Electric | Upper Peninsula	1	1	0	0	0	0	0	0
Com - Boiler - RET Only - Gas | Lower Peninsula	0	0	0	0	0	0	0	0
Com - Boiler - RET Only - Gas | Upper Peninsula	0	0	0	0	0	0	0	0
Com - Boiler - ROB and NEW - Gas | Lower Peninsula	0	0	0	0	0	0	0	0
Com - Boiler - ROB and NEW - Gas | Upper Peninsula	0	0	0	0	0	0	0	0
Com - Boiler Tune-up - RET Only - Gas | Lower Peninsula	0	0	0	0	0	0	0	0
Com - Boiler Tune-up - RET Only - Gas | Upper Peninsula	0	0	0	0	0	0	0	0
Com - Chiller Tune-up - RET Only - Electric | Lower Peninsula	1,190	1,311	1,387	1,399	1,347	1,240	1,086	909
Com - Chiller Tune-up - RET Only - Electric | Upper Peninsula	6	6	7	7	6	6	5	4
Com - Cooking - ROB and NEW - Electric | Lower Peninsula	200	217	243	230	236	239	239	236
Com - Cooking - ROB and NEW - Electric | Upper Peninsula	3	3	3	3	3	3	3	3
Com - Cooking - ROB and NEW - Gas | Lower Peninsula	0	0	0	0	0	0	0	0
Com - Cooking - ROB and NEW - Gas | Upper Peninsula	0	0	0	0	0	0	0	0

Natural Gas Incremental Annual Achievable Potential by Unique Measure (therms, net at meter)

Unique Measure Name	2021	2022	2023	2024	2025	2026	2027	2028
Com - Aerators - RET Only - Gas | Lower Peninsula	66,315	79,070	93,477	109,409	127,224	147,342	168,717	191,090
Com - Aerators - RET Only - Gas | Upper Peninsula	1,717	2,021	2,346	2,681	3,008	3,302	3,536	3,684
Com - Ag Lighting - RET Only - Electric | Lower Peninsula	0	0	0	0	0	0	0	0
Com - Ag Lighting - RET Only - Electric | Upper Peninsula	0	0	0	0	0	0	0	0
Com - Air Compressors - RET Only - Electric | Lower Peninsula	0	0	0	0	0	0	0	0
Com - Air Compressors - RET Only - Electric | Upper Peninsula	0	0	0	0	0	0	0	0
Com - Air Source Heat Pump - ROB and NEW - Electric | Lower Peninsula	0	0	0	0	0	0	0	0
Com - Air Source Heat Pump - ROB and NEW - Electric | Upper Peninsula	0	0	0	0	0	0	0	0
Com - Boiler - RET Only - Gas | Lower Peninsula	0	0	0	0	0	0	0	0
Com - Boiler - RET Only - Gas | Upper Peninsula	0	0	0	0	0	0	0	0
Com - Boiler - ROB and NEW - Gas | Lower Peninsula	6,879	7,462	1,217	427	465	494	511	521
Com - Boiler - ROB and NEW - Gas | Upper Peninsula	154	163	23	17	18	19	21	20
Com - Boiler Tune-up - RET Only - Gas | Lower Peninsula	453,834	518,519	583,009	643,439	698,834	748,145	783,538	802,927
Com - Boiler Tune-up - RET Only - Gas | Upper Peninsula	3,267	3,833	4,462	5,144	5,864	6,598	7,311	7,963
Com - Chiller Tune-up - RET Only - Electric | Lower Peninsula	0	0	0	0	0	0	0	0
Com - Chiller Tune-up - RET Only - Electric | Upper Peninsula	0	0	0	0	0	0	0	0
Com - Cooking - ROB and NEW - Electric | Lower Peninsula	0	0	0	0	0	0	0	0
Com - Cooking - ROB and NEW - Electric | Upper Peninsula	0	0	0	0	0	0	0	0
Com - Cooking - ROB and NEW - Gas | Lower Peninsula	141,258	166,856	185,117	218,329	211,026	209,681	206,438	200,785
Com - Cooking - ROB and NEW - Gas | Upper Peninsula	3,099	3,213	3,340	3,791	3,462	3,449	3,397	3,313

Note: Unique measure names are a combination of common measure name, replacement type, primary fuel type, and peninsula.

Electricity Incremental Annual Achievable Potential by Unique Measure (kWh, net at meter)

Unique Measure Name	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Com - Aerators - RET Only - Gas | Lower Peninsula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Com - Aerators - RET Only - Gas | Upper Peninsula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Com - Ag Lighting - RET Only - Electric | Lower Peninsula	89,609	89,092	81,861	69,304	54,465	40,231	28,093	18,845	12,255	7,815	4,916	3,065	1,901	1,175	724	446	274	169	104	64
Com - Ag Lighting - RET Only - Electric | Upper Peninsula	910	903	824	690	531	380	256	165	104	64	39	23	14	8	5	3	2	1	1	0
Com - Air Compressors - RET Only - Electric | Lower Peninsula	60,346	68,608	76,241	82,516	87,129	89,846	89,772	86,958	81,438	73,861	64,938	55,484	46,213	37,653	30,114	23,719	18,453	14,216	10,869	8,260
Com - Air Compressors - RET Only - Electric | Upper Peninsula	630	715	796	866	921	953	958	933	880	805	714	616	518	425	343	272	213	165	127	97
Com - Air Source Heat Pump - ROB and NEW - Electric | Lower Peninsula	462,505	500,066	270,506	234,253	233,925	230,837	224,509	216,469	226,624	197,208	277,776	287,261	203,317	178,549	280,418	179,298	176,896	144,125	130,424	157,872
Com - Air Source Heat Pump - ROB and NEW - Electric | Upper Peninsula	1,532	1,653	623	616	623	625	645	606	586	564	542	519	496	472	449	426	404	384	365	348
Com - Boiler - RET Only - Gas | Lower Peninsula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Com - Boiler - RET Only - Gas | Upper Peninsula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Com - Boiler - ROB and NEW - Gas | Lower Peninsula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Com - Boiler - ROB and NEW - Gas | Upper Peninsula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Com - Boiler Tune-up - RET Only - Gas | Lower Peninsula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Com - Boiler Tune-up - RET Only - Gas | Upper Peninsula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Com - Chiller Tune-up - RET Only - Electric | Lower Peninsula	3,882,348	4,279,951	4,526,203	4,565,640	4,396,456	4,048,002	3,545,817	2,967,754	2,380,048	1,841,821	1,383,734	1,015,645	732,365	521,194	367,382	257,197	179,192	124,425	86,196	59,618
Com - Chiller Tune-up - RET Only - Electric | Upper Peninsula	18,164	20,054	21,275	21,574	20,822	19,086	16,617	13,781	10,943	8,372	6,216	4,508	3,212	2,259	1,574	1,089	750	515	353	241
Com - Cooking - ROB and NEW - Electric | Lower Peninsula	1,992,861	2,164,997	2,423,909	2,294,796	2,351,665	2,384,820	2,383,237	2,355,223	2,440,379	2,227,427	2,890,568	2,982,008	2,246,783	1,999,872	2,841,329	1,924,676	1,847,793	1,545,166	1,387,054	1,589,553
Com - Cooking - ROB and NEW - Electric | Upper Peninsula	25,960	27,469	27,481	28,342	28,856	29,215	30,294	28,899	28,161	27,272	26,268	25,150	23,951	22,680	21,366	20,065	18,798	17,610	16,499	15,461
Com - Cooking - ROB and NEW - Gas | Lower Peninsula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Com - Cooking - ROB and NEW - Gas | Upper Peninsula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Com - Custom - RET Only - Electric | Lower Peninsula	213,852,835	195,442,955	171,495,470	144,790,958	118,623,032	95,089,669	74,503,139	57,429,174	43,622,707	32,800,328	24,462,384	18,133,468	13,382,183	9,844,039	7,224,778	5,293,992	3,875,025	2,834,423	2,072,410	1,514,947
Com - Custom - RET Only - Electric | Upper Peninsula	2,253,840	2,060,605	1,815,207	1,544,756	1,274,770	1,024,613	805,794	622,723	474,709	358,105	268,025	199,439	147,777	109,167	80,475	59,240	43,568	32,025	23,535	17,294
Com - Custom - RET Only - Gas | Lower Peninsula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Com - Custom - RET Only - Gas | Upper Peninsula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Com - Demand Controlled Ventilation - New Only - Electric | Lower Peninsula	103,871	103,331	219,879	0	0	0	0	0	116,107	0	631,013	782,624	256,375	143,358	908,910	258,663	278,771	128,665	83,318	317,621
Com - Demand Controlled Ventilation - New Only - Electric | Upper Peninsula	895	893	519	552	580	678	1,168	820	825	848	885	917	943	953	948	939	928	927	930	937
Com - Demand Controlled Ventilation - New Only - Gas | Lower Peninsula	85,003	84,536	182,170	0	0	0	0	0	102,033	0	534,985	659,555	211,204	117,181	780,537	217,550	241,048	106,060	68,736	275,612
Com - Demand Controlled Ventilation - New Only - Gas | Upper Peninsula	1,980	1,977	1,087	1,127	1,172	1,369	2,361	1,675	1,700	1,764	1,856	1,939	2,007	2,040	2,039	2,028	2,010	2,011	2,023	2,040
Com - Demand Controlled Ventilation - RET Only - Electric | Lower Peninsula	13,731,840	15,064,991	15,922,409	16,134,556	15,698,176	14,694,396	13,162,957	11,328,542	9,383,114	7,524,371	5,870,029	4,478,727	3,358,121	2,484,527	1,819,903	1,323,296	957,092	689,616	495,583	355,510

Note: Unique measure names are a combination of common measure name, replacement type, primary fuel type, and peninsula.

Electric Demand Incremental Annual Achievable Potential by Unique Measure (kW, net at meter)

Note: Unique measure names are a combination of common measure name, replacement type, primary fuel type, and peninsula.

Natural Gas Incremental Annual Achievable Potential by Unique Measure (therms, net at meter)