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February 01, 2024

Via Electronic Delivery
Ms. Lora W. Johnson, CMC, LMMC
Clerk of Council
Council of the City of New Orleans
Room 1E09, City Hall
1300 Perdido Street
New Orleans, LA 70112

Re: **2024 TRIENNIAL INTEGRATED RESOURCE PLAN OF ENTERGY NEW ORLEANS, LLC**
Docket No. UD-23-01

Dear Ms. Johnson:

Attached please find Entergy New Orleans, LLC's ("ENO") Demand-Side Management ("DSM") Potential Study for filing in the above-referenced docket. ENO makes this filing in compliance with the requirements of Resolution No. R-23-254, issued on August 10, 2023, by the Council of the City of New Orleans. As a result of the remote operations of the Council's office related to COVID-19, ENO submits this filing electronically and will submit the requisite original and number of hard copies once the Council resumes normal operations, or as you or the Council otherwise directs. ENO requests that you file this submission in accordance with Council regulations as modified for the present circumstances.

If you have any questions, please do not hesitate to call me. Thank you for your courtesy and assistance with this matter.

Sincerely,

Leslie M. LaCoste

LML/jlc
Enclosures
cc: Official Service List (Public Version *via email)*

Entergy New Orleans, LLC

2024 Integrated Resource Plan

DSM Potential Study

Draft Report

Submitted by:

Guidehouse Inc.
guidehouse.com

Reference No.: 224821

February 1, 2024

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1. Executive Summary

1.1 Introduction

In support of the development of the 2024 Integrated Resource Plan (IRP), Entergy New Orleans, LLC (ENO), engaged Guidehouse, Inc. (Guidehouse or the team) to prepare a demand-side management (DSM) potential study for the 2024-2043 period (20 years). The study assesses the long-term potential for reducing energy consumption in the commercial and industrial (C&I) and residential sectors by using energy efficiency (EE) and peak load reduction measures and improving end-user behaviors.

ENO previously engaged Guidehouse to prepare a DSM potential study to be used in its 2021 IRP. The 2021 study included four cases that informed both the 2021 IRP analysis and the Implementation Plan for Energy Smart (ES) program years (PYs) 13 to 14 (2023-2024) that were later approved by the Council of the City of New Orleans (Council) in Dockets UD-20-02 and UD-08-02. The 2021 study projected certain levels of achievable energy savings and program costs based on business assumptions, existing ES implementation plans, and historical results of ES at the time. The PY 13-15 Implementation Plan developed with ENO's third-party administrator, APTIM, and subsequent actual program results reflect the original energy savings target set forth by the Council of 2% of total annual sales by 2025 (PY 15). The actual PY 10-12 (2020-2022) results reflected a lower savings achievement, particularly for the C&I sector, at about 75% of goal, and lower utilization of behavioral efficiency programs than were identified in the 2021 study for that three-year period.[1] This 2024 study highlights the long-term effects of moderated C&I savings trajectories and the impacts of adopted federal equipment standards for residential lighting.

For the 2024 study, the team approached the EE component of the potential study with a rigorous analysis of input data. This data was necessary for Guidehouse to run the DSM Simulator (DSMSim) model, which calculates various levels of EE savings potential across the ENO service area. Guidehouse further delineated the achievable potential using a range of assumptions for alternative cases to estimate the effect on customer participation of changes in funding for customer incentives, awareness, and other factors.

For the peak load reduction, or demand response (DR), potential component of this study, the team similarly began with a rigorous analysis of input data necessary for the DR Simulator (DRSim) model. Inputting a range of reasonable assumptions, the team used the DRSim model to estimate the DR potential for a range of cases.

ENO intends to inform the 2024 IRP with the results from this potential study. Although the results may also be used to further ENO's DSM planning and long-term conservation goals, EE program design efforts, and long-term load forecasts, a long-term (20-year) potential study does not replace the need for detailed near-term implementation planning and program design. Accordingly, ENO should use this study only to inform such program planning and design efforts in combination with ENO's ES program experience and the market intelligence and insights of the Council and its Advisors and stakeholders.

[1] Lower savings might be attributed to the COVID-19 pandemic. Lower behavior program savings compared to the study may be a result of a smaller program rollout with fewer behavioral measures.

1.1 Study Objectives

ENO will use the results of the potential study as an input to its 2024 IRP, providing a long-range outlook on the cost-effective potential for delivering demand-side resources such as EE and DR and the associated levels of investment required to implement such programs. Guidehouse designed its project approach to ensure the study results adequately address ENO's objectives and the Council's IRP rules. Table 1 summarizes the study's objectives and how Guidehouse met those objectives.

Table 1. Guidehouse's Approach to Addressing ENO's Objectives

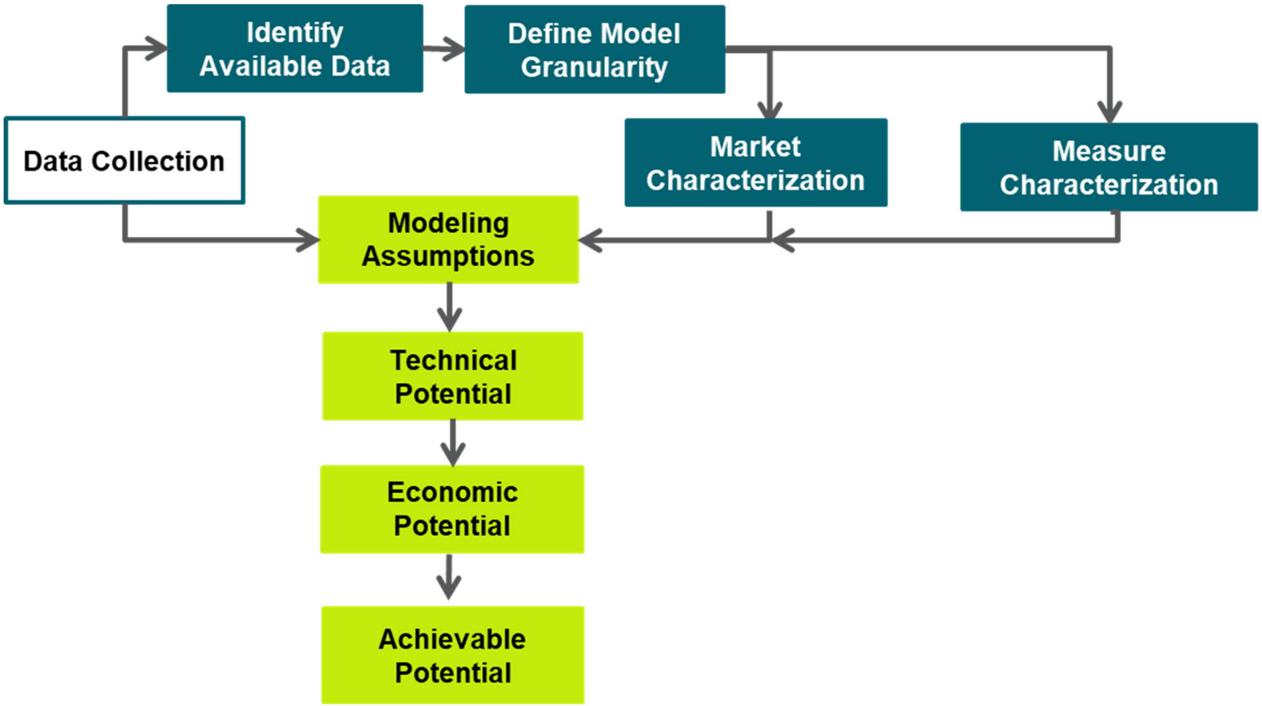
Objective		Guidehouse's Approach
1	Use consistent methodology and planning assumptions	Guidehouse developed analytical tools and approaches to inform DSM planning and the establishment of long-term conservation targets. The team worked closely with ENO to ensure transparency and vet methodology.
2	Reflect current information	With ENO's support, Guidehouse collected inputs, such as the New Orleans technical reference manual (TRM), and other up-to-date information (new codes and standards, saturation data from surveys and ES programs, avoided costs, etc.).
3	Quantify achievable potential	Guidehouse quantifies achievable potential for EE by first calculating the technical and economic (EE only) potential. The achievable potential Reference case is then calibrated to the historical ES program data, primarily PY 10-12 (2020-2022). For DR, Guidehouse estimated achievable potential from DR that represents ENO's current offers (calibrated to historical program achievements) and new DR programs/rates that the Company could potentially offer.
4	Provide input to the IRP	Guidehouse's approach will provide the following for all modeled cases: • Supply curve of potential savings for input to ENO's IRP; • Output available with 8,760 hourly EE impact load shapes; and • DR annual savings and levelized costs

Source: Guidehouse

1.2 EE Potential

Guidehouse analyzed EE savings potential in the ENO service area for 2024-2043 (20 years). After gathering existing data sources (step 1), the team characterized the market and measures (step 2), and estimated EE potential using the DSMSim tool, a bottom-up stock forecasting model (step 3). The third step involved three sequential stages—calculating technical, economic, and achievable potential. Figure 1 illustrates Guidehouse's EE analysis approach.

Figure 1. EE Analysis Approach Overview



Source: Guidehouse

1.2.1 EE Market Characterization

Characterizing the EE market involved identifying and understanding key factors defining the service area or market and codifying assumptions for the model to accurately represent the market. Specifically, the market characterization required defining the sales and stock[2] for 2022 (the study's base year),[3] then forecasting sales and stock out from 2022-2043 to create the study's Reference case, or baseline. To complete this effort, Guidehouse collected multiple datasets, including:

- 2022 ENO billing and customer account data
- 2022 Residential Appliance Saturation Survey (RASS) conducted for ENO
- ENO Business Plan 2024 (BP24) forecast sales and customer counts
- US Energy Information Administration (EIA) Commercial Buildings Energy Consumption Survey (CBECS)[4]
- US Department of Labor SIC[5]

[2] Guidehouse defines sales as the kilowatt-hour consumption, typically by sector. The customer count defines the stock, typically per household for the residential sector and per 1,000 square feet for the non-residential (C&I) sector. For the potential analysis, Guidehouse prefers more disaggregated analysis at the segment level (or building types).

[3] The base year is typically the most recent full year of utility available data for sales and stock.

[4] US Energy Information Administration, Commercial Buildings Energy Consumption Survey, 2018, https://www.eia.gov/consumption/commercial/building-type-definitions.php.

[5] US Securities and Exchange Commission, Division of Corporation Finance: Standard Industrial Classification (SIC) Code List, https://www.sec.gov/corpfin/division-of-corporation-finance-standard-industrial-classification-sic-code-list.

- Guidehouse research

After defining sales and stock for the base year and Reference case, the team determined energy use at the customer segment and end use levels. Guidehouse based the level of disaggregation for the segments and end uses on existing program definitions, data availability to accomplish disaggregation, and the level of granularity needed for stakeholders to draw meaningful conclusions from the study. The study details the selected customer segments and assumptions about the stock, electricity sales, end use breakdown, and energy use intensity (EUI) for each segment.

The team also aggregated additional inputs from ENO for inclusion in the model, including various economic and financial parameters such as carbon pricing, avoided costs, inflation rate, weighted average cost of capital (WACC), societal discount rate, and historic program costs.

1.2.2 EE Measure Characterization

EE measure characterization consisted of defining enough data points for all measures in the study to accurately model them. Key data points used to characterize measures included assumptions about energy and demand savings, codes and standards, measure life, and measure costs. Guidehouse used data provided by ENO, data from regional efficiency programs offered by other utilities, and TRMs, primarily the New Orleans TRM version 7.0,[6] and other TRMs to fill the gaps.

The team used a measure list with sufficient characteristics to identify and focus its efforts on technologies likely to have the highest feasible, cost-effective contribution to savings potential over the 20-year study horizon. The study does not account for unknown or emerging but unproven technologies that might arise and increase savings opportunities over the forecast horizon. The analysis also does not account for broader societal changes that might affect levels of energy use in unanticipated ways.

1.2.3 Estimation of EE Potential

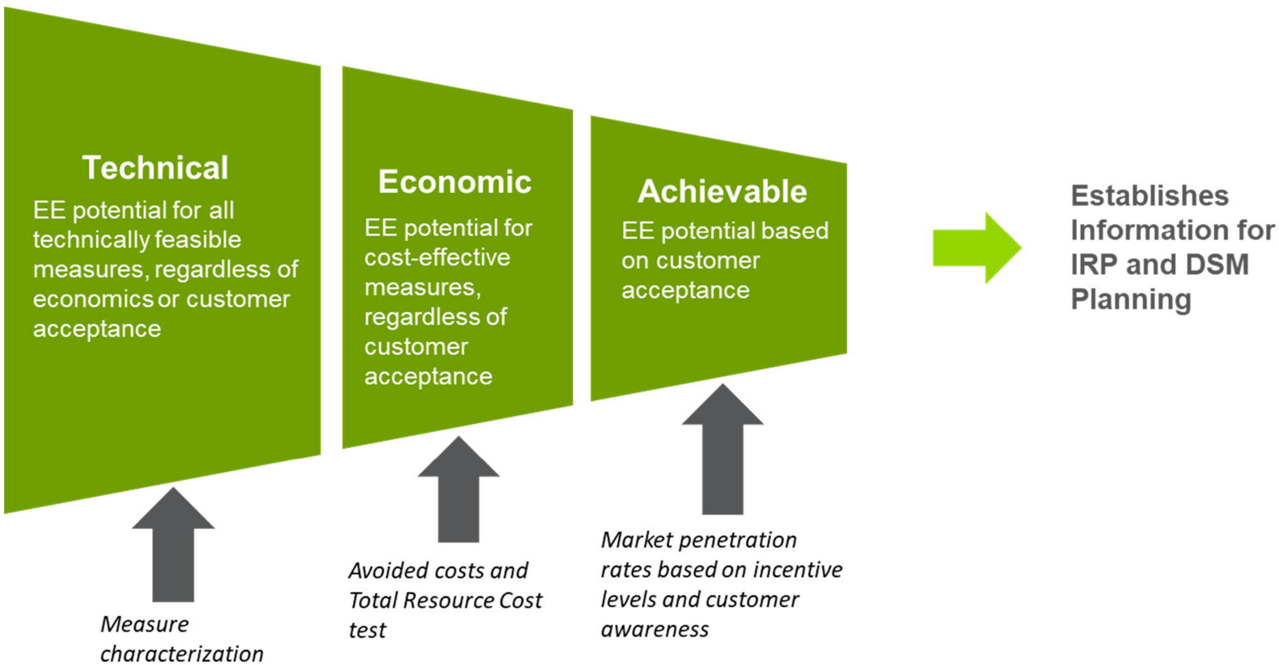
After defining the EE market and measure characteristics, Guidehouse employed its DSMSim potential model to estimate the technical, economic, and achievable savings potential for electric energy and demand across ENO's service area from 2024 to 2043. Each type of potential is defined here and in Figure 2:

- **Technical potential** is the total energy savings available assuming all installed measures can immediately be replaced with the efficient measure or technology—wherever technically feasible—regardless of cost, market acceptance, or whether a measure has failed and must be replaced.
- **Economic potential** is a subset of technical potential, using the same assumptions regarding immediate replacement as in technical potential but including only those measures that have passed the benefit-cost test chosen for measure screening; in this study, that is the total resource cost (TRC) test at various thresholds depending on the case.

[6] New Orleans Energy Smart Technical Reference Manual: Version 7.0, November 2023, prepared by ADM Associates, Inc. https://www.entergy-neworleans.com/energy_efficiency/energy_smart_filings/

- **Achievable potential** is a subset of economic potential. The team determined achievable potential by modifying economic potential to account for measure adoption rates and the diffusion of technology through the market. Figure 2 depicts each potential type and the respective data inputs.

Figure 2. EE Potential Analysis Approach



Source: Guidehouse

With these definitions and data inputs, the DSMSim model uses a bottom-up technology diffusion and stock tracking model implemented by means of a system dynamics framework to estimate the different potential types.[7] The model outputs technical, economic, and achievable savings potential for the service area, sector, customer segment, end use category, and highest impact measures.

Given ENO's objective to quantify the achievable potential for use in the 2024 IRP and gain a better understanding of the best path for planning ENO's ES programs, the project team modeled several possible future cases of EE program portfolio performance, including:

- **Reference:** Assumes both current (PY 12, 2022, and PY 13, 2023) incentive levels (as a percentage of incremental costs) and expected behavior participation and aligns with historic program achievements. Administrative costs on a dollar per kilowatt-hour (kWh)-saved basis are the same as the historic program expenditure and are carried through the other cases. The TRC measure screening threshold for all measures is 0.9, recognizing the fact that numerous viable measures implemented through Energy Smart meet or exceed this level.
- **Two Percent (2%) Savings:** Uses the parameters defined by the Reference case. The savings goal under this case is the Council's goal of 2% of ENO sales by PY 15, 2025. The

[7] John D. Sterman, *Business Dynamics: Systems Thinking and Modeling for a Complex World*, Irwin McGraw-Hill, 2000, provides detail on System Dynamics modeling.

incentives assume ten times the existing levels up to a maximum of 100% and estimated aggressive behavior program participation rollout plan. The TRC measure screening threshold is relaxed to 0.75 from 0.9.

- **Low:** Uses the same inputs as the Reference case, except for lower levels of behavior program participation rollout. Incentives are set to 50% of current (or Reference case) levels.
- **High:** Assumes higher incentives at 100 times the Reference case (up to 100% of incremental measure costs) and no change in administrative cost levels on a dollar per kWh saved basis. Model assumptions us the same aggressive behavior program rollout for all sectors as used in the 2% savings case. There is no TRC measure screening threshold, as every measure is passed on to the achievable potential analysis.

In all cases, a measure's incentive is capped at 100% of incremental measure cost. Income-qualified (IQ) measures are incentivized at 100% in all cases except for low.

As with the prior 2021 potential study, the 2024 study reports gross savings, which do not account for free ridership or spillover impacts, as would net savings. Providing gross potential is advantageous because it permits a reviewer to more easily calculate net potential when new information about net-to-gross (NTG) ratios or changing EUIs with natural occurring energy usage becomes available. Study results then can be used to define the portfolio energy savings goals, projected costs, and forecasts.

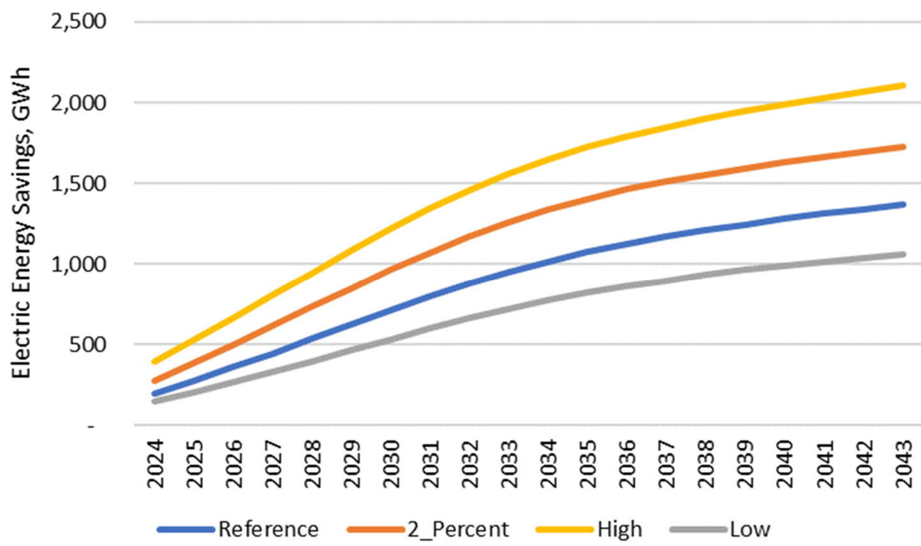
This study includes only known, market-ready, quantifiable measures. However, over the lifetime of EE programs, new technologies and innovative program interventions could result in additional, cost-effective savings. ENO should periodically revisit and reanalyze the potential forecast to account for these technologies and programs (typically every 3 to 5 years).

1.2.4 EE Analysis Results

Figure 3 shows the cumulative annual electric energy savings for each case using the WACC.[8] The range of savings increases over the 20-year period, from the Low case which shows more than 1,000 GWh of savings through the High case with savings in excess of 2,000 GWh. The pace of savings slows by 2031 due to increasing saturation of the existing set of measures.

[8] In the Executive Summary, tables and figures only reflect savings using the WACC for the sake of brevity. Complete screening results reflecting the societal discount rate are included in the body of the study as required by the IRP Resolution R-23-254. Additionally, the residential sector savings are provided as income qualified versus market rate customers in the appendix.

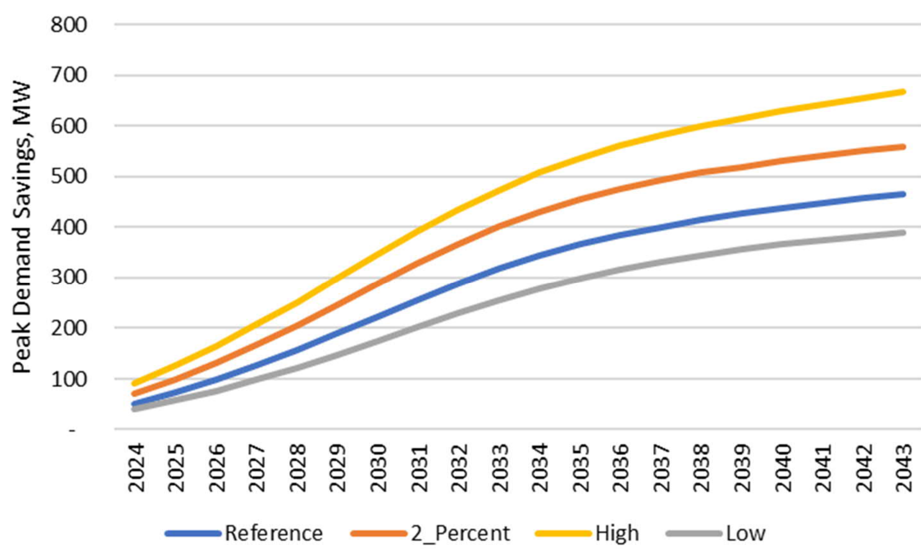
Figure 3. Cumulative Annual Achievable Potential – Electricity Savings by Case



Source: Guidehouse analysis

Figure 4 show the cumulative annual peak demand savings for each EE case using the WACC. The range of savings increases over the 20-year period, with the Low case more than 400 MW and the high case 700 MW, with the pace of savings slowing by 2031 similar to the electric energy savings.

Figure 4. Cumulative Annual Achievable Potential – Peak Demand Savings by EE Case



Source: Guidehouse analysis

The four cases show significantly different results from each other, thanks to marked differences in program design (i.e., changes in ENO-influenced parameters, including incentive level setting and behavioral program rollout).[9] Table 2 summarizes the EE potential study results, showing achievable annual incremental energy and peak demand savings by case in 5-year increments.

Table 2. Incremental Annual Achievable Potential – Savings by Case

Year	Electric Energy (GWh)				Peak Demand (MW)			
	Reference Case	2% Savings Case	High Case	Low Case	Reference Case	2% Savings Case	High Case	Low Case
2024	70	98	119	49	19	25	30	14
2028	89	117	141	66	30	39	45	24
2033	73	89	102	58	29	34	39	25
2038	40	44	51	34	14	14	18	13
2043	29	31	37	22	9	9	12	7

Source: Guidehouse analysis

Table 3 shows the incremental annual achievable energy savings as a percentage of ENO's total electricity sales for each case in 5-year increments. The 2% savings case, which was calibrated with the historical achievement through mid-year 2023 and not to the current PY 13-15 Implementation Plan (which targets 2% savings by 2025), achieves at least 2% of sales savings from 2027 through 2029. The 2% case and the High case fall below 2% in later years because most of the measures will have been adopted, depleting the available potential in future years.

Table 3. Incremental Annual Achievable Potential, Percentage of Electricity Sales, by Case

Year	Reference Case	2% Savings Case	High Case	Low Case
2024	1.25%	1.74%	2.11%	0.87%
2028	1.54%	2.04%	2.44%	1.15%
2033	1.24%	1.51%	1.72%	0.99%
2038	0.58%	0.62%	0.70%	0.50%
2043	0.38%	0.39%	0.47%	0.29%

Source: Guidehouse analysis

The total administrative and incentive costs for each case are provided in 5-year increments for the 20-year study period, as Table 4 shows. Administrative spending is relatively consistent between the cases, while the incentive spending varies significantly between the cases, with higher spending correlated to higher savings.

[9] Incentive levels influence the customer payback period, which results in a change in the payback acceptance curve influencing the market share potential of the energy efficient option. The payback acceptance curves for ENO were developed based on the results of customer surveys and are the same as used in the 2021 Potential Study.

Table 4. Achievable Potential, Annual Investment by Case

Year	Total Investment				Incentives				Administrative Costs			
	Ref.	2%	High	Low	Ref.	2%	High	Low	Ref.	2%	High	Low
2024	$11	$32	$81	$6	$6	$25	$71	$2	$5	$8	$10	$4
2028	$18	$42	$115	$9	$10	$32	$101	$3	$8	$11	$13	$6
2033	$17	$35	$95	$10	$10	$27	$85	$4	$7	$9	$11	$6
2038	$8	$15	$54	$6	$4	$11	$49	$3	$4	$4	$5	$4
2043	$4	$8	$39	$4	$2	$6	$36	$2	$2	$2	$3	$2
20-Year Total	**$250**	**$558**	**$209**	**$152**	**$139**	**$415**	**$1,439**	**$56**	**$111**	**$143**	**$174**	**$96**

Note: Values in nominal dollars, rounded to the nearest million, which may result in rounding errors.
Source: Guidehouse analysis

Table 5 shows the portfolio TRC test ratios[10] to be cost-effective for all cases except for the High case, which is less than 1.0. One of the screening criteria in the potential analysis is for the measures to pass a certain TRC threshold. A handful of measures were allowed into the analysis that fell below a TRC threshold of 0.9 for the Reference case. As a result, the portfolio is still cost-effective. Typically, the more aggressive the portfolio, the lower the TRC as less cost-effective measures are added and administrative efforts to address more services to the market are increased.

Table 5. Achievable Potential – Portfolio Cost Test Ratios

Study Period	WACC (TRC)			
	Reference	2% Savings	High	Low
2024-2043	1.78	1.51	0.72	2.16

Source: Guidehouse analysis

1.3 DR Potential

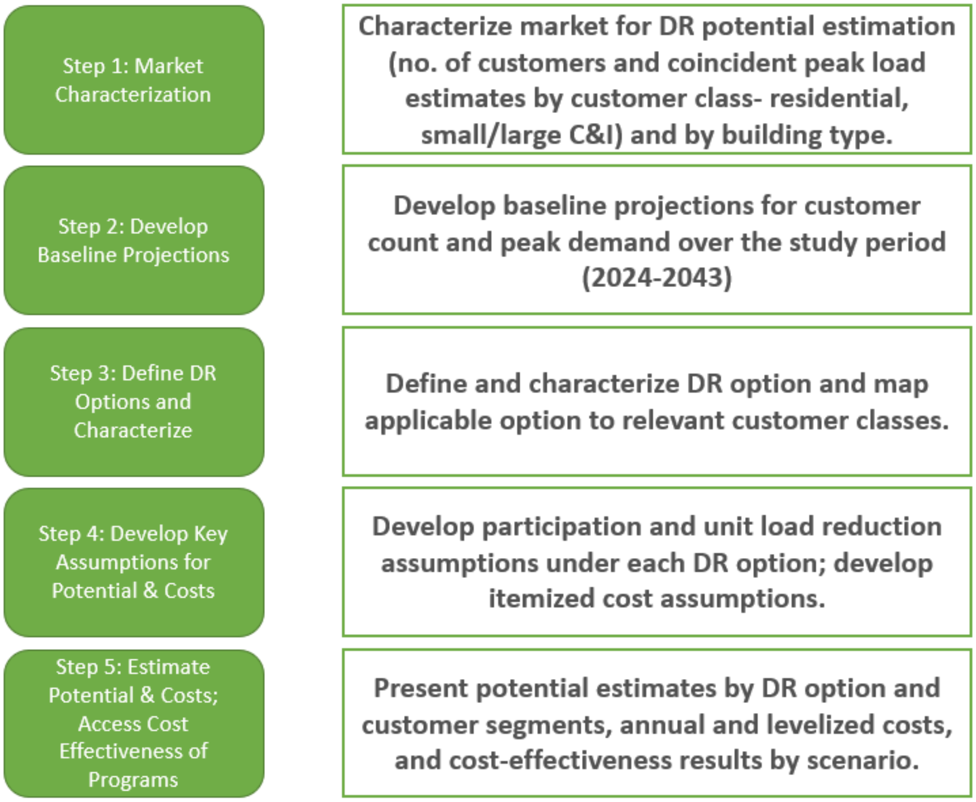
Guidehouse developed ENO's DR potential and cost estimates using a bottom-up modeling approach consisting of five steps:

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

[10] The study also included analysis and cost-effectiveness calculations using the societal discount rate. The resulting values are provided in the body of the report, below.

Figure 5 summarizes the DR potential estimation approach.

Figure 5. DR Potential Assessment Steps



Source: Guidehouse

1.3.1 DR Market Characterization

The team segmented the market appropriately for analysis in the market characterization process for the DR assessment. Guidehouse aggregated data on key characteristics including customer count and peak demand by customer class and segment and end use to input to the model. The customer segmentation for the DR analysis is based on an examination of ENO's rate schedules combined with the customer segments established in the EE potential study.

As part of characterizing the market, the team identified the peak period during which DR events are likely to be called. ENO expressed a desire to align the peak period definition with times used by the Midcontinent Independent System Operator (MISO). Per MISO's business practice manual, the expected peak occurs during the summer (June through August) during the hours from 2:00 p.m. through 6:00 p.m."[11] Guidehouse included only the top 40 weekday hours within this window, which is the typical limit for calling summer DR events. This approach allows ENO to use the findings of the DR potential assessment should it seek to register any DR resources as load modifying resources with MISO.

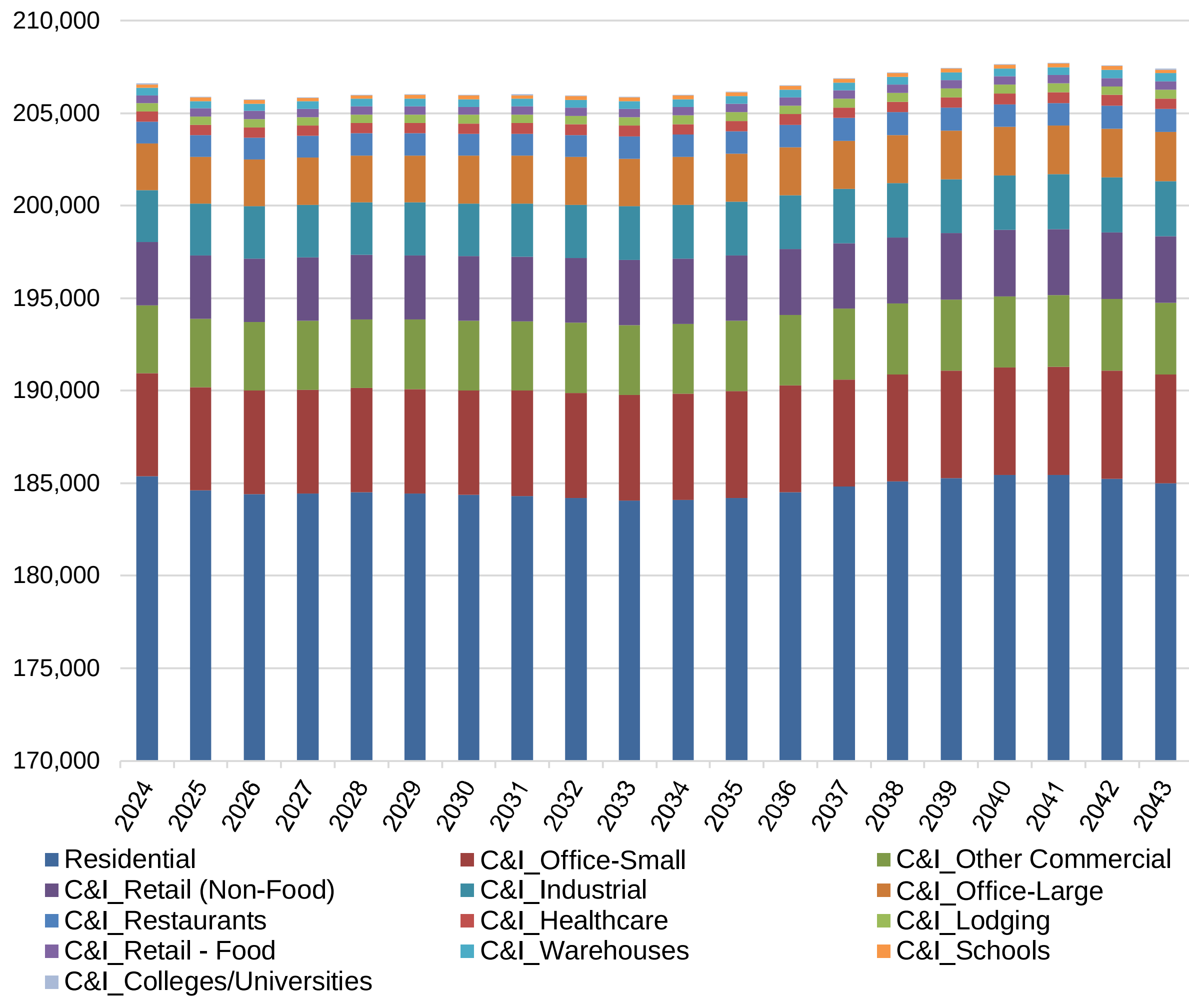
[11] Midcontinent Independent System Operator, *Business Practices Manual*, Demand Response, Manual No. 026, effective date October 1, 2023, page 20.

1.3.2 DR Baseline Projections

Baseline projections in the DR potential assessment are a forecast of customer demand over the study period based on existing trends and market characteristics, similar to the Reference case in the EE potential study. The project team used these projections as a basis for modeling savings. More specifically, Guidehouse applied the year-over-year change in the stock forecast of the 2022 customer count data broken out by customer class and segment for the projections. These projections are calibrated to the sector-level customer count forecast ENO provided.

Figure 6 shows the aggregate customer count forecast by segment, summed across all customer segments for the Reference case.

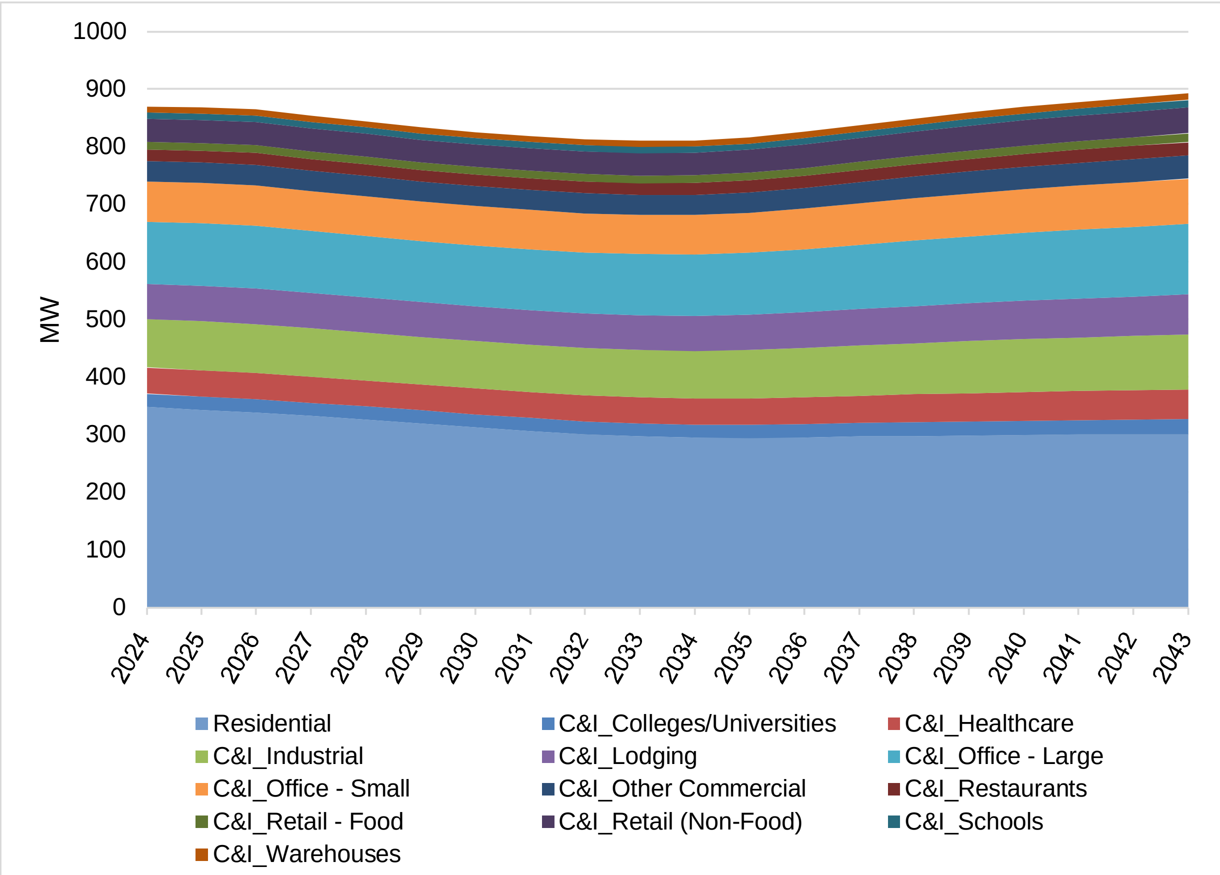
Figure 6. Customer Count Projections by Segment for DR Potential Assessment



Source: Guidehouse analysis

Figure 7 shows the Reference case summer peak demand projections Guidehouse developed by combining 2022 hourly system load data, 2022 customer count and sales data by segment, load profiles by revenue class, and sales projections by revenue class. Section 4 of the report describes the approach Guidehouse used to develop disaggregate peak demand projections by customer class and segment. The peak demand projections are adjusted with EE potential estimated to derive the net load post EE, which serves as the baseline load for DR potential estimation. Guidehouse developed the baseline peak demand projections for all three cases (Reference, Low, High) corresponding to the EE achievable potential estimates for these three cases. The baseline peak demand projections progressively decline over time due to higher penetration of EE.

Figure 7. Reference Case Peak Load Projections by Customer Segment



Source: Guidehouse analysis

1.3.3 DR Options

The team characterized different types of DR options that could be used to reduce peak demand from the developed baseline peak demand projections. Table 6 summarizes the DR options included in the analysis. The DR options represent ENO's current DR program offers and those that are commonly deployed in the industry. These programs align with the Council's IRP rules, which state that DR programs should include those "… enabled by the deployment of advanced meter infrastructure, including both direct load control and DR pricing programs for both Residential and Commercial customer classes."

Table 6. Summary of DR Options

DR Option	Characteristics	Eligible Customer Classes	Targeted End Use or Technology
DLC[12] • Thermostat for space cooling • Switch for water heating	Control of cooling load using smart thermostat; control of water heating load using a load control switch	Residential	Cooling, water heating
C&I Curtailment • Manual • Auto-DR enabled	Firm capacity reduction commitment with pay-for-performance ($/kW) based on nominated amount or actual performance	Large C&I	Various load types including HVAC, lighting, refrigeration, and industrial process loads (based on facility type)
Dynamic pricing[13] • Without enabling technology • With enabling technology	Voluntary opt-in dynamic pricing offer, such as Critical Peak Pricing (CPP)	All customer classes	All
BTMS[14] • Solar-paired battery storage	Dispatch of BTM batteries for load reductions during peak demand periods	Residential[15]	Batteries
EV managed charging (BYOC)[16]	BYOC program that will reward customers for shifting their EV charging load to off-peak hours	EVs	Light Duty Vehicles with L2 chargers
PTR	Opt-in offer that provides a $/kWh rebate to customers for energy reduced during DR events	Residential Small C&I	All

Source: Guidehouse

1.3.4 Estimation of DR Potential

With the market, baseline projections, and DR options characterized, Guidehouse estimated achievable potential by inputting those parameters into its model. Guidehouse developed

[12] DLC, or direct load control, represents the smart thermostat-based EasyCool program offered by ENO to residential customers (switch-based option offered only for water heater control).

[13] Guidehouse did not include TOU rates in the DR options mix because this study includes only event-based dispatchable DR options. TOU rates lead to a permanent reduction in the baseline load and are not considered a DR option.

[14] BTMS = behind the meter storage

[15] The DR potential assessment from BTM batteries only considered residential batteries. No battery forecast was available from ENO. Guidehouse used the NEM forecast data to project residential BTM batteries paired with solar. However, for C&I, there was no basis to develop battery forecasts and therefore this analysis did not consider DR potential from BTM batteries for C&I customers. Future potential studies should consider this update as and when C&I BTM battery forecast data is available.

[16] BYOC=bring your own charger

programmatic assumptions such as participation, unit impacts, and costs to estimate potential and assess cost-effectiveness. The team developed variations in assumptions across the three cases to assess variations in potential estimates with varying levels of incentives and participation projections. The achievable potential estimates presented in the results represent potential from cost-effective DR options that pass the benefit-cost threshold of 1.0 based on the TRC test.

Guidehouse used the following key variables for potential and cost estimates:

- Program participation and enrollment assumptions and the rates at which these ramp up;
- Technology market penetration (e.g., penetration of DR-enabling technologies such as smart thermostats and energy management systems [EMSs]);
- Realizable load reduction from different types of control mechanisms, referred to as unit impacts;
- Annual attrition and event opt-out rates; and
- Incentive and non-incentive costs.

Guidehouse used the following definitions for calculating technical and achievable DR potential:

- **Technical potential** refers to load reduction that results from 100% of eligible customers and load enrolled in DR programs. This value is a theoretical maximum.
- **Achievable potential** estimates are derived by applying participation assumptions to the technical potential estimates. The team calculated this value by multiplying achievable participation assumptions (subject to program participation hierarchy) by the technical potential estimates.

Unlike EE, the DR analysis does not develop separate economic potential estimates for DR because the cost-effectiveness screening of DR options takes place at the program level under achievable participation assumptions. The achievable potential results presented later in the report include only cost-effective DR options.

1.3.5 DR Results

Among the DR options analyzed in the study, switch-based water heating under DLC, Peak Time Rebate, and EV Managed Charging are the only three options that are not cost-effective. All other DR options are cost-effective and are included in the DR achievable potential results discussed below.

Achievable peak demand reduction potential is estimated to grow from 15 MW in 2024 to 75 MW in 2043. Cost-effective achievable potential makes up approximately 8.4% of ENO's peak demand in 2043. The team made several key observations:

- C&I Curtailment has the greatest cost-effective achievable potential: 51% share of total cost-effective potential in 2043. C&I Curtailment potential grows rapidly starting from 9.0 MW in 2024. This growth is calibrated to evaluated programs and implementation plan values before 2026. Beginning in 2026, C&I Curtailment follows the S-shaped ramp assumed for the program over a 5-year period. By 2031, the program attains a steady participation level with 26 MW of cost-effective potential, which increases gradually to 38.3 MW in 2043.

- DLC-Thermostat-Res has a 22% share of the total cost-effective achievable potential in 2043. The potential for this measure grows from 5.7 MW in 2024 to 16.6 MW in 2043. DLC-Switch-Water Heating is not cost-effective and does not contribute to achievable potential.

- Dynamic Pricing has a 20% share of the total cost-effective achievable potential in 2043. The dynamic pricing offer is assumed to begin in 2026 since ENO would need lead time to design and file a Critical Peak Pricing tariff and have that approved to start offering it to customers. The program ramps up over a 5-year period (2026-2030) until it reaches a value of 12 MW. From then on, potential slowly increases from 1.6 MW in 2026 to 14.8 MW in 2043.

- BTMS contributes the remainder of the 7% share of the total cost-effective achievable potential in 2043. This program uses a linear ramp to reach steady state by 2033 and increases in residential battery count grows from 0.2 MW in 2024 to 4.9 MW in 2043.

Table 7 lists the DR potential results by option in 5-year increments. The calculated achievable potential for peak load reduction in the Reference case is 75 MW in 2043.

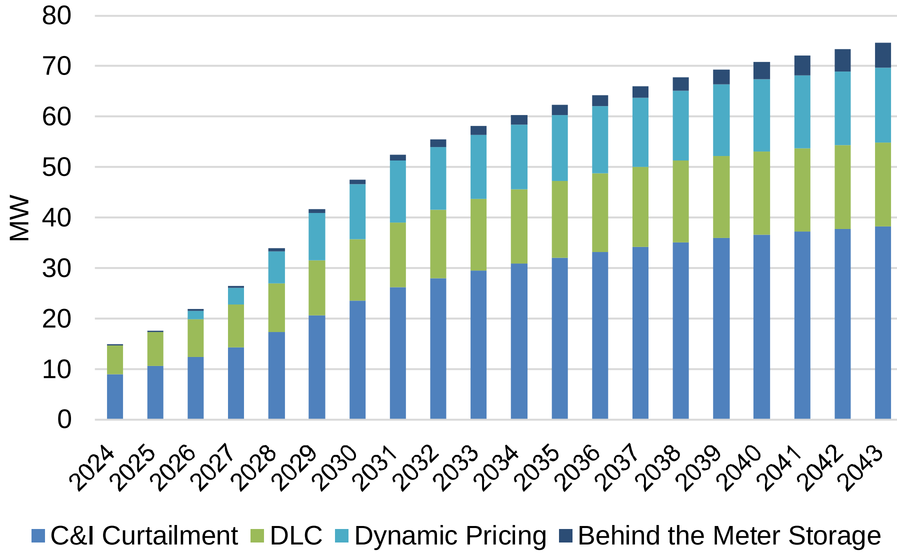
Table 7. Achievable Summer DR Potential by Option (MW)

Year	C&I Curtailment	DLC-Res Thermostat	Dynamic Pricing	BTM Batteries	Total
2024	9.0	5.7	-	0.2	**14.9**
2028	17.3	9.6	6.4	0.6	**33.9**
2033	29.6	14.1	12.7	1.8	**58.1**
2038	35.1	16.1	13.9	2.6	**67.7**
2043	38.2	16.6	14.8	4.9	**74.6**

Source: Guidehouse analysis

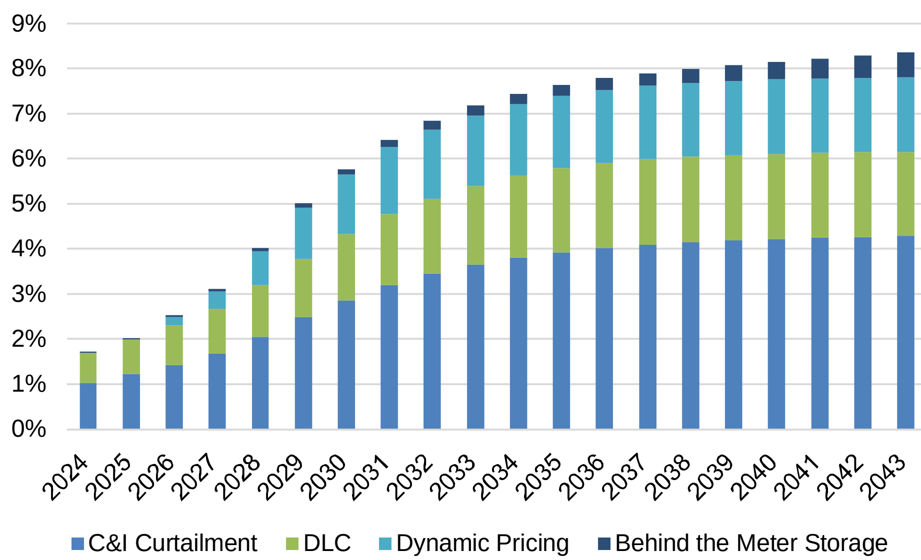
Figure 8 and Figure 9 summarize the cost-effective, programs where the benefits exceed the costs (TRC ≥1.0) achievable potential by DR option for the Reference case in megawatts and as a percentage of ENO’s peak demand.

Figure 8. Summer Peak Achievable Potential by DR Option (MW)



Source: Guidehouse analysis

Figure 9. Summer DR Achievable Potential by DR Option (% of Peak Demand)



Source: Guidehouse analysis

Figure 10 summarizes the cost-effective achievable potential by DR option for the Reference case. Guidehouse had the following key observations:

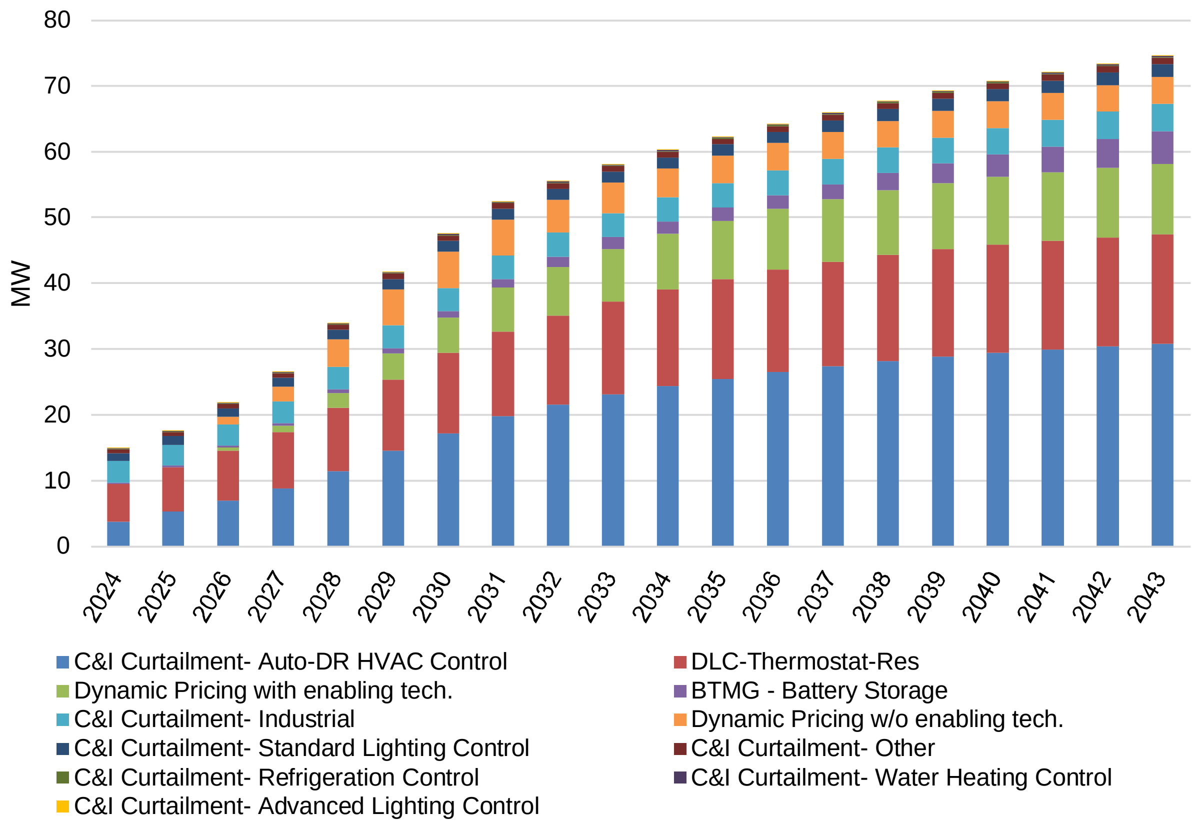
- Most of the C&I Curtailment reductions are associated with Auto-DR HVAC control, which reaches 30.8 MW or 41% of the total cost-effective potential in 2043. Other C&I Curtailment suboptions total to contribute 10% of the total cost-effective potential in 2043. Overall, C&I Curtailment options are projected to reach 38.3 MW by 2043.

- Only direct control of residential HVAC loads under the DLC-Thermostat suboption is cost-effective (and not water heating). This suboption makes up about 22% of the total cost-effective achievable potential in 2043 at 16.6 MW.

- Dynamic pricing makes up 20% of the total cost-effective achievable potential in 2043. Potential from customers with enabling technology in the form of thermostats/energy management systems is more than two times higher than that from customers without enabling technology—10.7 MW versus 4.1 MW in 2043.

- Battery storage projected to reach 4.9 MW of savings or 7% of the total cost-effective potential in 2043.

Figure 10. Summer DR Achievable Potential by DR Suboption



Source: Guidehouse analysis

1.4 Conclusions and Next Steps

The team benchmarked the study results against the 2021 study and identified how the results could be used in ENO's 2024 IRP. The 2021 and 2024 potential studies leveraged the same methodology and similar data sources; however, there are key differences between the two studies, aside from data updates.

1.4.1 EE

The differences in results and projected achievable potential between the 2021 and 2024 studies were driven in part by the following changes in methodology and approach:

- Calibration targets differed for the two studies, as explained in detail in Appendix D:
    - The 2021 study used the planned targets for savings from the PY10-12 implementation plan, with a 2% savings goal for 2025;
    - The 2024 study used the actual savings and budget from PY 10-12 (2020-2022) and performance to date for PY 13 (2023). Underperformance was seen in the C&I sector across the years 2020-2023 and was consistent with results in other jurisdictions, based on Guidehouse's research;
- Different assumptions on planned rollout for home energy reports and savings percentage of consumption (from 1.3% in 2021 to 0.8% 2024);
- Updated data on residential saturation and density using the 2022 ENO RASS data;
- Updates to commercial saturation values based on year-over-year program data (for measures where data was available);
- Changes in federal residential lighting standards, eliminating any residential lighting end use potential;
- Updates in the N.O. TRM from version 4.0 to version 7.0, resulting in many changes in residential measure assumptions, including those reflecting updated state building code changes; and
- Removal of behavior programs that do not show any promise for implementation or significant savings in the ENO service area, or in other utility territories.

1.4.2 DR

The 2024 and 2021 DR analysis differed in the following ways:

- Current peak definition for MISO is slightly altered from the one used in the 2021 study in defining the peak period for calling DR programs;
- Added new DR options to the analysis (EV Managed Charging and Peak Time Rebate) in recognition of programs currently being offered through Energy Smart;
- Used historical program implementation data for Smart Thermostats and for C&I Curtailment and pilot program information from ENO's most recent activities. There has been growth in residential and C&I program participation compared with the data from 3 years ago;
- Updated BTM battery projections and assumed all batteries are paired with solar for the DR analysis and updated cost assumptions with a Bring Your Own Battery (BYOB) type program offer, which leads to the program being cost-effective.
- Updated data on the penetration of smart thermostats and other control technologies based on the EE analysis.

These changes resulted in differences in program potential.[17]

1.4.3 Program Planning

This potential study provides ENO with a wealth of data to support and inform DSM program planning efforts. However, programmatic design considerations, such as delivery methods and marketing strategies, will impact savings goals and costs. As a result, near-term savings potential, actual achievable goals, and program investment costs for measure-level implementation will differ from the savings potential and costs estimated in this long-term study. The findings from this study can effectively be used along with historical program participation, current marketing conditions, and other relevant factors to aid in program design.

Key findings from this potential study may inform program planning and include the following observations on high potential measures that have not varied much from the 2021 study:

- Significant savings potential exists in promoting retrocommissioning, occupancy sensor controls, and interior high bay and 4 ft. LEDs for the C&I sector. For any measure not reaching its potential to date may be experience barriers such as limited supply, workforce readiness, or other independent factors.
- There is high potential in O&M (residential duct sealing and AC tune-up) and behavior-type programs, such as home energy reports, in the residential sector.
- There is significant DR potential with large C&I customers from both C&I Curtailment (with increased adoption of DR-enabling control technologies) and dynamic pricing. Residential sector contribution from smart thermostat DLC is projected to grow progressively with increasing adoption of smart thermostats along with contribution from dynamic pricing.

[17] The two added DR options – Peak Time Rebate and EV Managed Charging are both not cost-effective and are therefore not included in the achievable potential results.

2. DSM Potential Study Introduction

2.1 Context and Study Goals

ENO engaged Guidehouse to prepare a DSM potential study for electricity as an input to its 2024 IRP for the 2024-2043 period (20 years). The study assesses the long-term potential for reducing energy consumption in the C&I and residential sectors by analyzing EE and peak load reduction measures with DR and improving end-user behaviors. The EE and behavior potential analysis efforts provide input data to Guidehouse's DSMSim model, which calculates achievable savings potential across the service area. This study also includes DR program potential analyzed within Guidehouse's DRSim. While ENO primarily plans to use the results from the potential study to inform the IRP, these results may also be used as inputs to DSM planning, long-term conservation goals, and program design.

2.1.1 Study Objectives

Potential studies provide utilities with a long-range outlook on the cost-effective potential for delivering demand-side resources such as EE and DR. A thorough review of achievable potential across ENO's service area helps predict the effects customer actions can have over the forecast period. The current study will allow ENO to incorporate DSM into its IRP modeling and analysis, inform the design of future customer EE and DR programs, and understand the level of investment needed to pursue various demand-side resource options.

Guidehouse designed its study approach to ensure the results adequately address ENO's objectives and the Council's rules. Table 8 details these objectives and presents Guidehouse's approach to meeting each objective.

Table 8. Guidehouse's Approach to Addressing ENO's Objectives

Objective		Guidehouse's Approach
1	**Use consistent methodology and planning assumptions**	Guidehouse developed analytical tools and approaches to inform DSM planning and the establishment of long-term conservation targets. The team worked closely with ENO to ensure transparency and vet methodology.
2	**Reflect current information**	With ENO's support, Guidehouse collected inputs, such as the New Orleans TRM and other up-to-date information (new codes and standards, saturation data from surveys and ES programs, avoided costs, etc.).
3	**Quantify achievable potential**	Guidehouse quantifies achievable potential for EE and DR by first calculating the technical and economic (EE only) potential. The achievable potential Reference case is then calibrated to the historical ES program data, primarily PY 10-12 (2020-2022).
4	**Provide input to the IRP**	Guidehouse's approach will provide the following for all modeled cases: • Supply curve of potential for input to ENO's IRP • Output available with 8,760 hourly EE impact load shapes

Source: Guidehouse

2.2 Organization of the Study

Guidehouse organized this study into five sections that detail the study's approach, results, and conclusions, as follows:

- Section 2 summarizes the study, including its background and purpose.
- Section 3 and 4 describes the methodologies and approaches Guidehouse used to estimate EE and DR potential respectively, including discussions of base year calibration, Reference case forecast, and measure characterization.
- Section 5 details the EE achievable potential forecast, including the approach and results by case, segment, end use, and measure.
- Section 6 describes the process for estimating DR potential and details the achievable potential savings forecast for ENO, including the modeling results by customer segment.
- Section 7 summarizes the next steps that result from this study's findings and discusses findings in comparison with the previous ENO potential study from 2021.

The appendices detail model results and additional context around modeling assumptions.

2.3 Study Overview

The Guidehouse potential analysis includes a set of parameters and limitations that are important to highlight prior to presenting the study's data sources, analysis, and results.

2.3.1 Limitations

There are several limitations associated with the results of this study. Potential studies typically begin as a bottom-up, measure-level effort and are calibrated to system, sector, and sometimes end-use base loads. The calibration parameters are used with a reference consumption forecast to calculate the future potential. Potential studies are an exercise in data management and analysis requiring a careful balancing of abundant, quality data for some inputs with scarce, low-quality data for other inputs. Accordingly, the team must understand what data gaps exist and determine how to fill those to provide reasonable and realistic savings potential estimates. This study documents Guidehouse's approach and the decisions made in cases where appropriate data was not available.

Guidehouse obtained historic and forecast energy sales and customer counts by sector from ENO. Each rate class forecast (i.e., residential and C&I) contains its own set of assumptions based on ENO's expertise, models, and data collection. The team leveraged these assumptions frequently as inputs to develop the Reference case stock and peak demand projections. Where sufficient information could not be extracted due to the limited granularity of the available data, Guidehouse developed independent projections based on better sources. These independent projections were based on secondary data resources and produced in collaboration with ENO. Secondary resources and any underlying assumptions used are referenced throughout the study.

As a result, there are inherent uncertainty or probability bands in the results due to the error bands of the inputs. Furthermore, calibration anchors the analysis based on existing ENO programmatic conditions.

2.3.2 Segmentation

Guidehouse obtained data from ENO to segment the residential and C&I sectors, including customer counts by premise type for residential and industry type for C&I. The team supplemented this data through its subject matter expertise and ENO's experience and judgment to ensure alignment of sales and stock data within segments. Government customers were included as part of the C&I sector. As was the case in the 2021 Study, City-owned streetlighting is not included in this study as the majority of (if not all) lamps have been converted to LEDs, and ne large industrial customer also is not included as it has opted out of participating in ENO's DSM programs.

2.3.3 Measure Characterization

Efficiency potential studies might employ a variety of primary data collection techniques (e.g., customer surveys, onsite equipment saturation studies, and telephone interviews) that can enhance the accuracy of the results, though not without considerable cost and time considerations. Guidehouse deemed existing primary and secondary data sources as most appropriate to this study.

EE measures: The study's scope did not include primary data collection. The EE potential analysis relied on the New Orleans TRM[18] version 7.0. Other data sources for characterizing EE measures included data from ENO and other regional efficiency programs and utilities. Guidehouse sourced density and saturation data for the residential section from ENO's 2022 RASS. Guidehouse used historical program participation data for the C&I programs to provide evidence on saturation levels of efficient technologies.

Guidehouse developed the measure list in this study to focus on those technologies likely to contribute the highest level of savings over the study horizon. As the study excluded nascent technologies not yet marketed, emerging technologies may arise that could increase savings opportunities over the forecast horizon. There also is the potential for broader societal changes (which are not captured in this study) to affect levels of energy use in unforeseen ways. The study does not model these potentially disruptive and unforeseen changes.

DR programs: The scope of this study leveraged available ENO data from the DLC pilot and EasyCool program to characterize DR program participation and costs. Additional DR characterization is based on Guidehouse's research on programs nationwide and other potential studies. The team used anonymized ENO load and account data to size the market eligible for DR program participation.

2.3.4 Measure Interactive Effects

This study models EE measures independently. The total aggregated EE potential estimates may be higher or lower than the actual potential available if a customer installs multiple measures in a home or business. Multiple measure installations at a single site generate two types of interactive effects: within end-use interactive effects and cross end-use interactive effects. An example of a within end-use interactive effect is when a customer implements temperature control strategies and installs a more efficient cooling unit. If the controls reduce cooling requirements at the cooling unit, the savings from the efficient cooling unit are reduced.

[18] New Orleans Energy Smart Technical Reference Manual: Version 7.0, November 2023, prepared by ADM Associates, Inc.. https://www.entergy-neworleans.com/energy_efficiency/energy_smart_filings/

An example of a cross end-use interactive effect is when a homeowner replaces heat-producing less-efficient light bulbs with efficient LEDs. This change influences the cooling and heating load of the space, however slightly, by increasing the amount of heat and decreasing the amount of cooling generated by the HVAC system.

Guidehouse employed the following methods to account for measure interactive effects:

- Where measures compete for the same application (e.g., an air source Heat Pump (HP) being replaced by a more efficient air source HP or a ground source HP), the team created competition groups to eliminate the potential for double counting savings.
- For measures with significant interactive effects (e.g., HVAC control upgrades and building automation systems), the team adjusted applicability percentages to reflect varying degrees of interaction.
- Wherever cross end-use interactive effects were appreciable (e.g., lighting and HVAC), the team typically characterized those interactive effects for the same fuel (e.g., lighting and electric heating) applications, but not for cross-fuel because no natural gas savings or consumption were considered in this study.

The team did not always consider the stacking of savings. These instances included mostly measures from the TRM, the primary source for the measure characterization that is based on ENO-specific historical program savings. For example, if an efficient cooling unit is installed at the same time as improved insulation, the overall effects will be lower than the sum of individual effects. Guidehouse addressed stacking for residential behavior programs due to the planned rollout of the residential behavior program to a large percentage of ENO residential customers.

2.3.5 Gross Savings

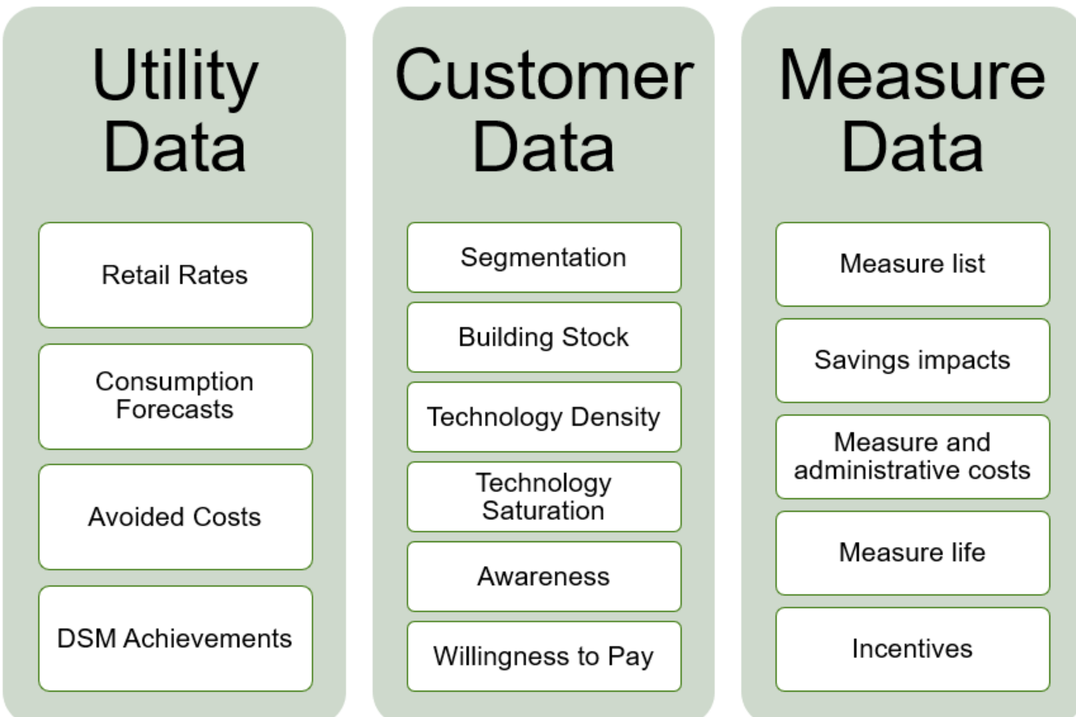
As in prior IRP potential studies, savings are shown at the gross level to account for natural change (either natural conservation or natural growth in consumption). Accordingly, free ridership and spillover are not included in the savings estimates. Providing gross potential is advantageous because it permits a reviewer to easily calculate net potential when new information about changing EUI (natural changes in consumption), considerations of program design, or NTG ratios become available from program evaluation studies.

3. EE Study Approach and Data

This section provides the study approach for EE and DR. The study approach includes the data inputs, including developing the market characterization, gathering the global inputs, and characterizing the measures and programs.

Guidehouse modeled technical, economic, and program achievable electricity savings potential in the ENO service area from 2024 through 2043 (20 years) using a bottom-up potential model. These efficiency forecasts relied on disaggregated estimates of building stock and electricity sales before conservation and a set of detailed measure characteristics for a thorough list of EE measures relevant to ENO's service area. This section details the team's approach and methodology to develop the key inputs to the EE potential model, as Figure 11 illustrates.

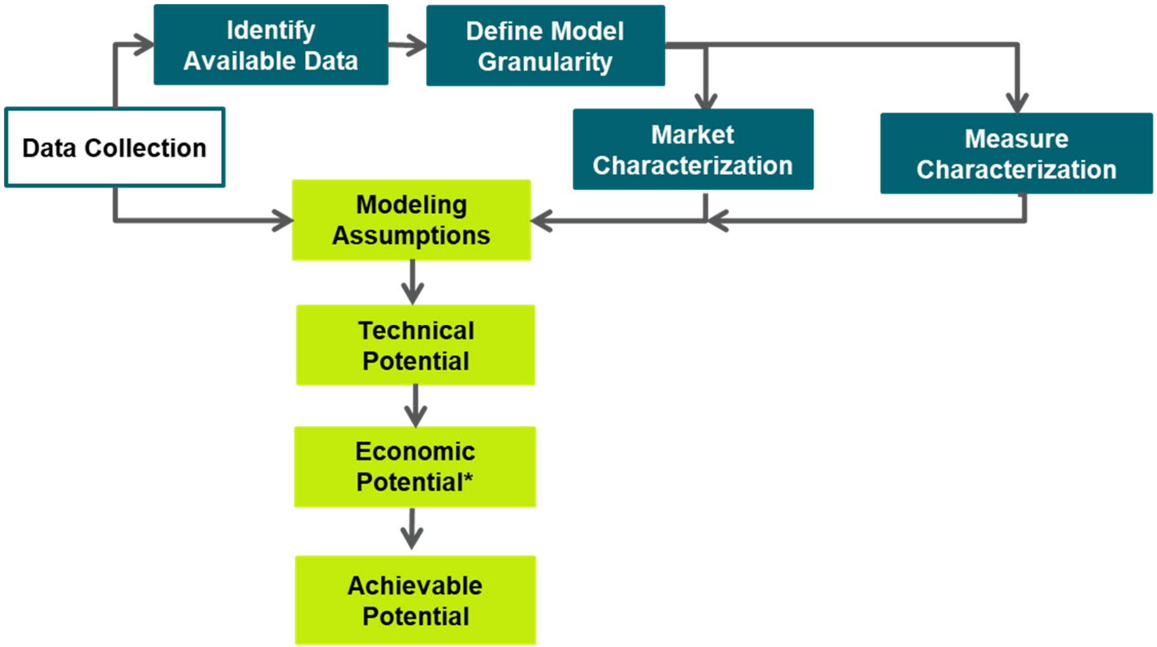
Figure 11. EE Potential Study Inputs



Source: Guidehouse

Calculating achievable potential includes a base year calibration, a Reference case forecast, and full measure characterization. Figure 12 shows how these elements interact to result in the achievable savings potential.

Figure 12. EE Potential Study Methodology



*Not calculated for DR potential

Source: Guidehouse

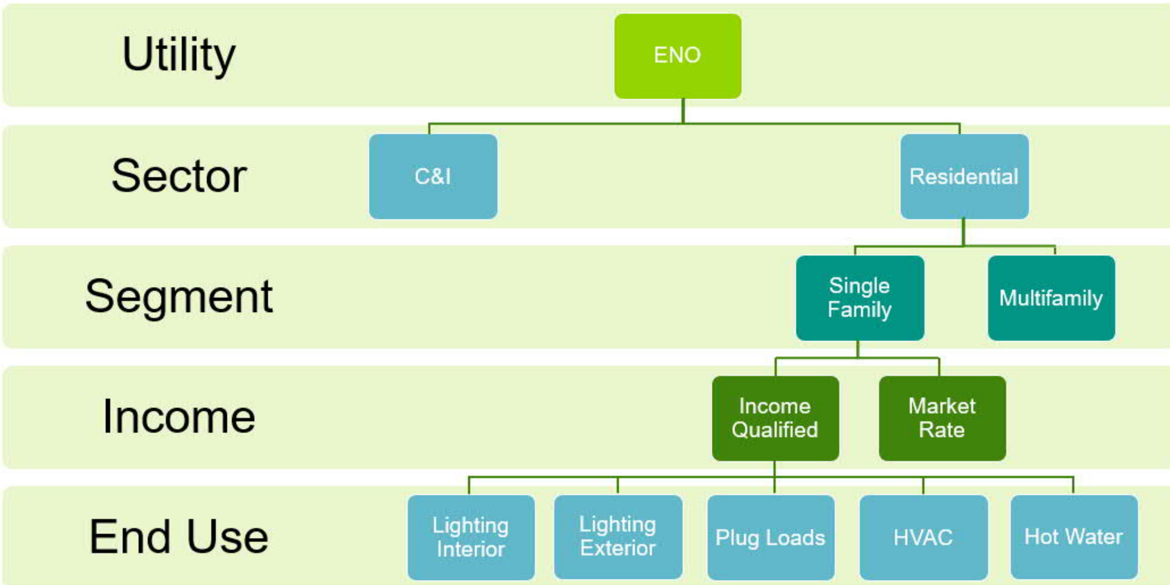
3.1 Market Characterization

Guidehouse's model uses inputs from two workflows: market characterization and measure characterization. This section describes the steps involved in the first workflow, market characterization. The market characterization workflow aims to define the base year profile and Reference case used to calculate potential. Furthermore, the market characterization includes the gathering of global inputs such as inflation rates and avoided cost data.

3.1.1 Base Year Profile

This section describes the approach used to develop the base year (2022) profile of electricity use in ENO's service area, a key input to the potential model. The objective of the base year is to define a detailed profile of electricity sales by customer sector and segment (see Figure 13). The end-use level data is not used in calculating potential but more quality control review of the model outputs. The selected year is the most recent year with actual (not forecast) reported data. The model uses the base year as the foundation to develop the Reference case forecast of peak demand from 2024 through 2043. Given that 2022 is the base year, the analysis also forecasts 2023; however, 2023 is not in the IRP forecast timeline.

Figure 13. Base Year Electricity Profile – Residential Example



Source: Guidehouse

Guidehouse developed the base year profile based on ENO's anonymized 2022 billing and customer account data because it was the most recent year with a fully complete and verified dataset. Where ENO-specific information was unavailable, Guidehouse used data from publicly available sources such as the US EIA CBECS and the US Department of Labor Standard Industrial Classification (SIC) system, in addition to internal Guidehouse data sources. The team used these resources to support ENO's data sources and to ensure consistency.

3.1.2 Defining Customer Sectors and Segments

The first major task to develop the base year electricity calibration involved disaggregating the main sectors—residential and C&I—into specific customer segments. The team selected customer segments based on several factors, including the previous study, TRM characterization, data availability, and sufficient planning level of detail. Table 9 shows the segmentation used for the residential and C&I sectors. The following subsections describe the characterization for the segmentation used for these sectors.

Table 9. Customer Segments by Sector

Residential	C&I	
Single-Family Market Rate	Colleges / Universities	Small Office
Single-Family Income Qualified	Healthcare	Other
Multifamily Market Rate	Industrial / Warehouse	Retail – Food
Multifamily Income Qualified	Lodging	Retail – Non-Food
-	Large Office	Restaurants
-	Schools	

Source: Guidehouse

3.1.3 Residential Segments

After establishing the study sectors and segments, Guidehouse and ENO aligned ENO's data to the segments established in Table 10. The team divided the residential sector into two segments based on consumption: single-family and multifamily. ENO provided Guidehouse with 2022 RASS data, which divided residential customers by household segment. Guidehouse mapped the household segments to the appropriate customer segment (single-family or multifamily). Table 10 provides the descriptions for each residential segment.

Table 10. Residential Segment Descriptions

Segment	Description
Single-Family	Detached, duplex/triplex/fourplex, attached row and/or townhouses (condominium), and mobile homes residential dwellings
Multifamily	Apartment units located in low-rise or high-rise apartment buildings

Source: Guidehouse

For the 2024 study, Guidehouse further disaggregated the residential sector into market rate and income qualified. Guidehouse used 2022 American Census Survey data,[19] along with data provided by ENO, to calculate the proportion of residential counts for each income level according to ENO's IQ definition of less than 200% of the Federal Poverty Level.[20]

3.1.4 C&I Segments

Guidehouse combined the commercial, industrial, and government sectors, noted as C&I. Working with ENO, the team divided the C&I sector into 11 customer segments. Table 11 describes each segment. The team selected these C&I segments to be representative of the population of C&I customers in ENO's service area by comparing similar building characteristics such as patterns of electricity use, operating and mechanical systems, and annual operating hours. Generally, the selection of these segments aligned with the New Orleans TRM version 7.0 and the SIC code for the account and kilowatt-hour sales data from ENO. Table 11 provides details on the allocation of the sales and stock data into the C&I sector.

Table 11. C&I Segment Descriptions

Segment	Description
Large Office	Larger offices engaged in administration, clerical services, consulting, professional, or bureaucratic work; excludes retail sales
Small Office	Smaller offices engaged in personal services (e.g., dry cleaning), insurance, real estate, auto repair, and miscellaneous work; excludes retail sales
Retail – Food	Retail and distribution of food; excludes restaurants
Retail – Non-Food	Retail services and distribution of merchandise; excludes retailers involved in food and beverage products services

19 https://data.census.gov/table/ACSST1Y2022.S1701?q=Federal+Poverty+level+in+New+Orleans+2022

20 The Federal Poverty Level can be defined by total income per household and depends on the number of residents living in that household. Guidehouse research used base year values and definitions for its analysis, https://www.healthcare.gov/glossary/federal-poverty-level-fpl/.

Segment	Description
Healthcare	Health services, including diagnostic and medical treatment facilities, such as hospitals and clinics
Lodging	Short-term lodging and related services, such as restaurants and recreational facilities; includes residential care, nursing, or other types of long-term care
Restaurant	Establishments engaged in preparation of meals, snacks, and beverages for immediate consumption including restaurants, taverns, and bars
School	Primary schools, secondary schools (K-12), and miscellaneous educational centers such as libraries and information centers
College/University	Post-secondary education facilities such as colleges, universities, and related training centers
Industrial/Warehouse	Establishments that engage in the production, manufacturing, or storing of goods, including warehouses, manufacturing facilities, and storage facilities for general merchandise, refrigerated goods, and other wholesale distribution
Other	Establishments not categorized under any other sector including but not limited to recreational, entertainment, and other miscellaneous activities

Source: Guidehouse

3.1.5 Defining End Uses

The next step in the base year analysis was to establish end uses for each customer sector. Guidehouse defined these end uses based on common industry frameworks, the TRM, past ENO potential studies, and internal expertise. The end uses in Table 12 are important for reporting and defining savings. For instance, the team uses the categories to report achievable savings with more granularity than at the sector and segment levels. Guidehouse derives these reported end-use savings by rolling up individual EE measures that map to the broader end-use categories. For example, savings from ENERGY STAR refrigerators and freezers are reported under the plug load end use.

Table 12. End Uses by Sector

Residential	C&I
Lighting Interior	Lighting Interior
Lighting Exterior	Lighting Exterior
Plug Loads	Plug Loads
HVAC	HVAC
Hot Water	Hot Water
-	Refrigeration

Source: Guidehouse

In addition to the end uses, Guidehouse reports savings for total facility. These savings represent the sum of all the individual end uses and any miscellaneous loads not captured.

3.1.6 Base Year Inputs

This section summarizes the breakdown of stock (households), electricity sales, and End Use Intensities (EUIs) at the sector, segment, and end-use levels. The team used adjusted base year sales as direct inputs to the potential model. Adjusted base year sales indicate that the sales value is converted to gross load minus the EV load. The proliferation of BTM distributed energy resources (DER) is causing shifts to the usage profiles. To properly estimate EE and DR potential, Guidehouse wanted a gross consumption value. Figure 14 provides the calculation methodology for gross consumption.

Figure 14. Calculating Adjusted Base Year Sales

Source: Guidehouse

describes the methodology used to develop these estimates. Table 13 shows the high-level breakdown of electricity sales by sector. Of total electricity sales, 58% comes from the C&I[21] sector with 42% from the residential sector. The DR portion of this study reconciles and derives the breakdown of demand across the sectors, segments, and end uses.[22] For the potential analysis, Guidehouse removes from the C&I sector sales consumption data for streetlighting and any customers who are ineligible to participate in DSM programs.

Table 13. 2022 Base Year Electricity Sector Sales (GWh and Percentage)

Sector	GWh	Percentage
Residential	2,364	42%
C&I	3,274	58%
Total	**5,638**	**100%**

Source: Guidehouse analysis

All other base year inputs are presented in the following sections, with additional details provided in Appendix A.

3.1.6.1 Residential Sector

To define the base year residential sector inputs, Guidehouse began by determining the base year stock using ENO's number of households in the class breakdown, which was an estimated number of households in 2022 using analysis of ENO 2022 RASS data, shown in Table 14.

[21] As noted in Section 2.1.1.4, C&I includes commercial, industrial, and government sales.

[22] Guidehouse developed the peak demand for the base year using the average peak demand factors from the 2022 sales data for the top 40 weekday hours in the summer season (June-August) consistent with the MISO Business Practice Manual definition. Further description included in Section 4.1.1.2 .

Table 14. 2022 RASS Analysis Percentages

Household Type	Percentage of Total
Single-Family Detached House	60%
Manufactured or Mobile Home	2%
Duplex or Town Home	18%
Apartment or Condominium	17%
Other	3%

Source: ENO RASS data

Base year consumption values used the 2022 reported sales provided by ENO and adjusted per Table 14. Guidehouse used the 2022 analysis of the RASS data to calculate the segment-level base year sales based on the definition of single-family and multifamily provided in Table 10. The "other" category is assumed to be multifamily.

Table 15 shows the base year residential stock, electricity sales, and average electricity usage per home by segment. The EUI by segment comes from the 2022 RASS and was scaled to the sales and stock forecast provided by ENO. It is assumed that the kilowatt-hour per account from RASS is based on actual meter consumption which may or may not include EV charging or solar PV.

As a part of the 2024 study, Guidehouse needed to disaggregate values for IQ and market rate residential customers. Guidehouse used 2022 American Census Survey data,[23] along with data provided by ENO, to calculate the proportion of residential counts for each income level according to ENO's IQ definition of less than 200% of the Federal Poverty Level.[24] Details of this analysis are provided in Appendix A.

Table 15. Base Year Residential Results

Segment	Income	Stock (Accounts)	Total Electricity Use (GWh)	kWh per Account
Multifamily	IQ	22,558	214	9,488
	Market Rate	24,437	232	
Single-Family	IQ	68,575	971	14,162
	Market Rate	74,289	1,052	
Total or Weighted Average	**-**	**189,859**	**2,469**	**12,592[1]**

[1] This number represents the average annual kilowatt-hour consumption for all households (total electricity use/ total accounts), not the sum of the kilowatt-hour per account for the two segments.

Source: Guidehouse analysis of ENO data

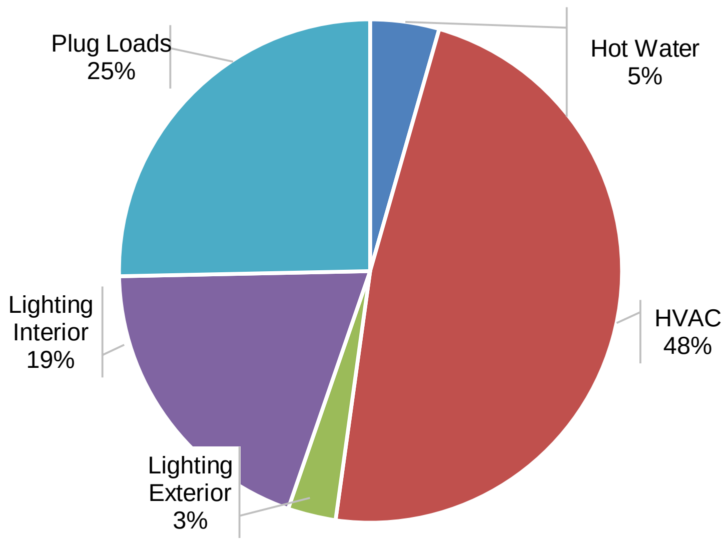
Figure 15 shows the breakdown of base year residential electricity sales by end use and segment. In terms of end uses, lighting, HVAC, and plug loads represent the largest residential end uses and account for 90% of residential electricity sales. HVAC represents the largest

[23] https://data.census.gov/table/ACSST1Y2022.S1701?q=Federal+Poverty+level+in+New+Orleans+2022

[24] The Federal Poverty Level can be defined by total income per household and depends on the number of residents living in that household. Guidehouse research used base year values and definitions for its analysis, https://www.healthcare.gov/glossary/federal-poverty-level-fpl/.

portion of the residential end uses at 48% of the total and includes the sum of heating, cooling, and ventilation. This end-use allocation was based on the allocation used in the ENO 2018 and 2021 IRP potential studies prepared by Guidehouse.[25]

Figure 15. Base Year Residential Electricity Usage by End Use (Percentage, GWh)



Source: Guidehouse analysis

3.1.6.2 C&I Sector

Similar to the residential sector, Guidehouse needed to determine the base year stock (thousands square feet [SF]) by segment, sales (kilowatt-hour) by segment, and EUIs (kilowatt-hour/thousands SF) by end use. Guidehouse followed multiples steps to determine these values for the base year, with details provided in Appendix A.3.

For step 1, Guidehouse used a mapping of SIC codes to customer segment to aggregate ENO's account and billing data to the segment level for the base year 2022. Once the segment mapping was complete, Guidehouse used the segment-level intensities from EIA that were used in the 2018 study for the industrial sector. For commercial and government intensities, Guidehouse took the EIA segment-level intensities[26] used in 2018 and 2021 and adjusted these so that the C&I sector-level intensity equaled the Itron-developed intensity for 2022. Using the resulting intensities, Guidehouse calculated stock (square feet) for each segment by dividing sales by intensity. Table 16 shows the base year C&I stock (SF of floor space), electricity sales, and average electricity usage per SF by segment.

[25] ENO provided Guidehouse end-use breakdown analysis for its load forecast. The residential allocation was like Guidehouse previous estimates. Furthermore, the 2022 RASS did not provide a breakdown of end use EUIs.

[26] Table C.20 Electricity consumption and conditional energy intensity by climate zone. Guidehouse used the hot/very hot climate zone designation, https://www.eia.gov/consumption/commercial/data/2018/ce/xls/c20.xlsx.

Table 16. Base Year C&I Results

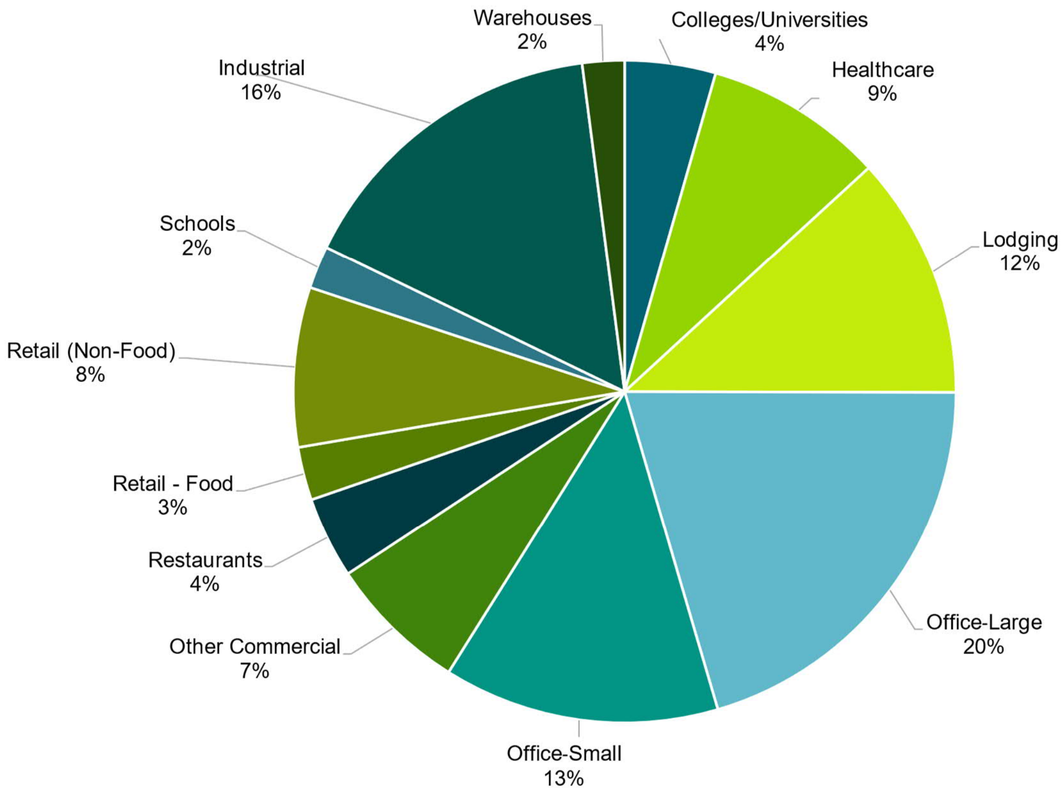
Segment	Stock (1,000 SF)	Total Electricity Use (GWh)	kWh per SF
Colleges / Universities	20,071	149	7
Healthcare	17,522	294	17
Lodging	35,556	398	11
Office-Large	50,083	686	14
Office-Small	44,173	452	10
Other Commercial	11,366	229	20
Restaurants	4,041	134	33
Retail – Food	3,110	87	28
Retail (Non-Food)	21,273	261	12
Schools	9,486	70	7
Industrial	18,940	530	28
Warehouses	14,233	69	5
Total	**249,853**	**3,360**	**-**

Note: Totals may not sum due to rounding.

Source: Guidehouse analysis

Figure 16 shows the breakdown of base year C&I electricity sales by segment. Offices and lodging consume the most electricity, accounting for almost half (46%) of C&I electricity sales.

Figure 16. Base Year C&I Electricity Usage by Segment (Percentage, GWh)



Source: Guidehouse analysis

3.2 Reference Case Forecast

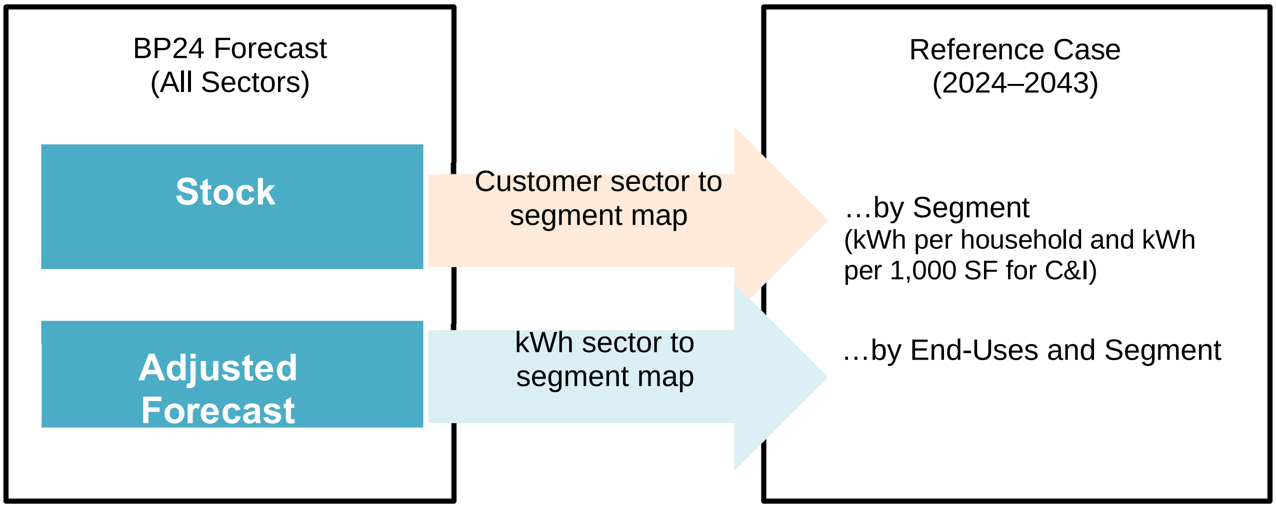
This section presents the Reference case forecast from 2024 to 2043. The Reference case represents the expected level of electricity sales and adjusted consumption over the study period, absent incremental DSM activities (including adoption of EVs) and load impacts from rates, and removing any offset of sales attributed to BTM PV generation, Figure 17 shows.

Figure 17.Adjusted Reference Case Consumption

Source: Guidehouse

The Reference case is significant because it acts as the point of comparison (i.e., the reference) for the calculation of achievable potential cases. Figure 18 illustrates the process Guidehouse used to develop the Reference case forecast. The Reference case uses the BP24 forecast as its foundation and converts that to the required customer segments to develop the residential and C&I forecasts.

Figure 18. Schematic of Reference Case



Source: Guidehouse

Guidehouse constructed the Reference case forecast by using the BP24 sales forecast, adjusting to gross consumption values and then disaggregating from ENO sectors[27] to customer segments. The forecast applies growth rates from ENO's account and load forecasts directly to the base year stock, sales, and EUI values.

The following sections describe the approach and assumptions employed and present the results of the residential and C&I Reference case forecasts. Appendix A provides further details.

3.2.1 Residential Reference Case

Guidehouse used the BP24 residential customer count forecast to develop the Reference case for stock. Using the same analysis of RASS data from ENO and described in Section 1.5, Guidehouse disaggregated the residential forecast to the segment level (single-family and multifamily) by multiplying the household segment percentages by the total residential forecast. Table 17 shows the growth in the residential stock forecast from 2023 to 2043. Residential stock decreases at an annual growth rate of -0.08%, from approximately 190,000 accounts in 2023 to around 187,000 accounts in 2043.

As a part of the 2024 report, Guidehouse needed to disaggregate values for IQ and market rate residential customers. Guidehouse used 2022 American Census Survey data,[28] along with data provided by ENO, to calculate the proportion of residential counts for each income level according to ENO's income qualified definition of less than 200% of the Federal Poverty Level.[29]

[27] ENO sectors were residential, commercial, industrial, and government.

[28] https://data.census.gov/table/ACSST1Y2022.S1701?q=Federal+Poverty+level+in+New+Orleans+2022

[29] The Federal Poverty Level can be defined by total income per household and depends on the number of residents living in that house, Guidehouse research used base year values and definitions for its analysis: https://www.healthcare.gov/glossary/federal-poverty-level-fpl/

Table 17. Residential Reference Case Stock Forecast (Accounts)

Segment	Type	2023	2043
Single-Family	Income Qualified	68,193	67,493
	Market Rate	73,876	73,118
Multifamily	Income Qualified	22,432	22,202
	Market Rate	24,301	24,052
Total		**188,802**	**186,864**

Note: Totals may not sum due to rounding.

Source: Guidehouse analysis of ENOs residential load forecast

Guidehouse followed a similar methodology for sales, using ENO's forecasting. The team used the BP24 sales forecasts and disaggregated to the segment level using the class breakdowns adjusted for energy use, as Section 3.1 describes. Finally, Guidehouse used the end-use proportion forecast from the previous study. Appendix A details this process.

3.2.2 C&I Reference Case

Like the residential Reference case, Guidehouse built the C&I Reference case based on the BP24 sales forecast from ENO with adjustments for a gross consumption value. Appendix A.3 describes the process used to develop the C&I stock forecast.

To forecast the customer counts and sales, Guidehouse used the ENO forecast, which was at the ENO sector level (commercial, industrial, and government). Guidehouse converted the forecast to the segment level using a customer segment to sector map derived from the account and billing data.

To forecast the stock, Guidehouse developed escalators using the sales forecast and the Itron-developed intensity forecast. For non-industrial segments, Guidehouse divided the sales forecast by the Itron intensity forecast and converted the resulting time series into an escalation factor. For industrial segments, Guidehouse escalated stock based on the forecast number of customers. Then the escalation factors were applied to the base year stock to develop the Reference case forecast through 2043. Table 18 shows the results of the Reference case analysis.

Table 18. C&I Reference Case Stock Forecast (Thousands SF)

Segment	2023	2043
Colleges / Universities	19,686	24,641
Healthcare	17,186	21,511
Lodging	34,875	43,653
Office-Large	49,122	61,486
Office-Small	43,326	54,231
Other Commercial	11,148	13,954
Restaurants	3,963	4,961
Retail – Food	3,050	3,818

Segment	2023	2043
Retail (Non-Food)	20,865	26,117
Schools	9,304	11,646
Industrial	19,507	21,431
Warehouses	13,960	17,474
Total	**245,993**	**304,924**

Note: Totals may not sum due to rounding.

Source: Guidehouse analysis

Guidehouse used the 2018 and 2021 end-use proportions to distribute energy use among end uses.

3.3 EE Measure Characterization

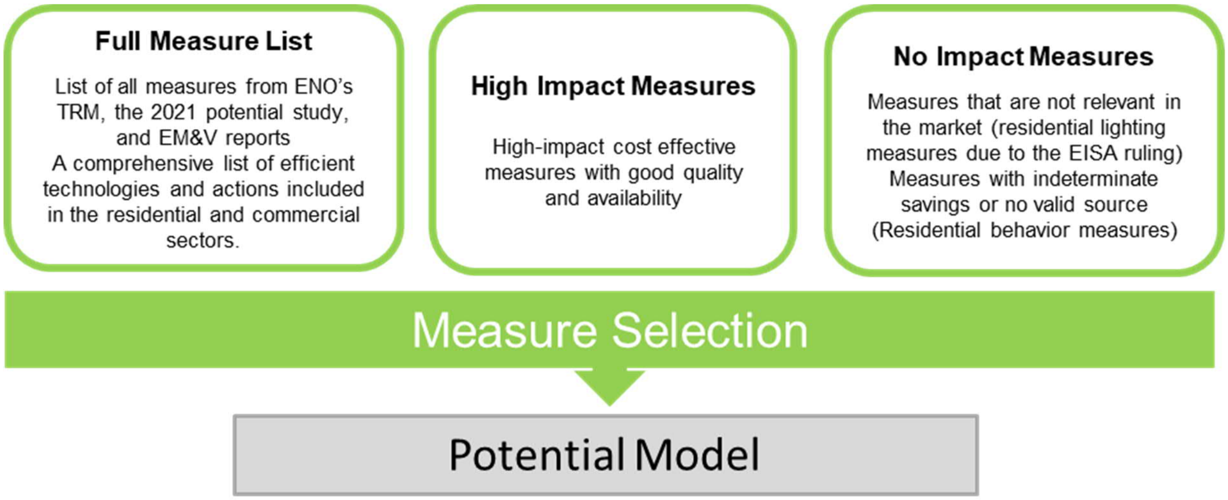
Guidehouse characterized 128 measures across ENO's residential and C&I sectors. While finalizing the measure list, the team prioritized high-impact, cost-effective measures with good data quality and availability.

3.3.1 Measure List

Guidehouse developed a thorough list of EE measures likely to contribute to achievable potential. To identify EE measures with the highest expected economic impact, the team used the measure list from the 2021 ENO potential study as the basis and updated it with measures in the New Orleans Energy Smart (ES) TRM version 7.0, current ENO ES program offerings, and potential model measure lists from other states. The team supplemented the measure list using secondary data from publicly available sources such as TRMs from various US regions, including California, Illinois, and the mid-Atlantic. Guidehouse prioritized measures in existing ENO ES programs based on data availability for appropriate characterization and the measures most likely to be cost-effective. The team worked with ENO to finalize the measure list and ensure it contained technologies viable for future ENO program planning activities. Guidehouse removed 16 measures from the 2021 study and added two new ones. One set of measures removed included residential lighting measures to reflect the impacts of the updated EISA standards.[30] The other set was behavior-based programs that have low savings and most likely will not be included in future portfolios. Figure 19 shows the process Guidehouse implemented to finalize the measure list.

[30] In 2022, the DOE released its two final rules (Federal Register: Energy Conservation Program: Backstop Requirement for General Service Lamps (federalregister.gov) and Energy Conservation Program: Energy Conservation Standards for General Service Lamps pertaining to General Service Lamps (GSLs) and their definitions (2022-05-09 Energy Conservation Program: Definitions for General Service Lamps; Final rule (Regulations.gov). The DOE finalized the rules, which expand the definition of GSLs to include reflectors and candelabras that were previously exempt and that all GSLs must meet a 45 lumen/watt minimum efficiency.

Figure 19. Measure Screening Process



Source: Guidehouse

There measures were included in the initial screen that did not make it into the study. Working sessions with ENO staff revealed the following measure information:

- **Residential and commercial behavior measures:** Guidehouse retained only Home Energy Reports, Building Benchmarking, and Retrocommissioning as the behavior measures applicable to the ENO service area. Other measures, such as Building Energy Information Management System, Business Energy Reports, Web-based Real-time Feedback, Large Residential Competitions, and Prepay Electricity Bills were removed as these measures did not have adequate and reliable data to continue supporting the characterization or were no longer deemed relevant in the ENO market.

- **Industrial measures:** ENO reported that its industrial energy use is relatively low compared with the commercial and residential sectors. Guidehouse retained the industrial measures from the 2021 potential study and did not add any new industrial measures. The team aggregated the industrial sector potential with the commercial sector potential.

3.3.2 Measure Characterization Key Parameters

The EE measure characterization involved defining nearly 50 individual parameters for each measure included in this study. This section defines the top 14 parameters and how each influences the technical and economic (and therefore achievable) potential savings estimates. Table 19 includes parameters used to qualitatively define each characterized measure.

Table 19. EE Measure Characterization Parameter Definitions

Parameter Name	Definition	Example
Baseline Measure	Existing inefficient equipment or process to be replaced.	Baseline storage water heater
EE Measure	Efficient equipment, process, or project to replace the baseline.	HP Water Heater (HPWH)

Parameter Name	Definition	Example
Measure Lifetime	Lifetime in years for the base and energy efficient technologies. Base and energy efficient lifetimes only differ in instances where the two cases represent inherently different technologies, such as solar water heaters compared with a baseline of regular storage water heaters.	Baseline storage water heater: 10 years HPWH: 10 years
Measure Costs	Calculated in two ways. Either the incremental cost is the full installation cost (typically for retrofit applications) or the incremental cost is calculated between the assumed baseline and efficient technology using the following variables: • Base Costs of the base equipment, including both material and labor costs • Energy Efficient Costs of the energy efficient equipment, including both material and labor costs	Incremental cost of HPWH = 1050 per water heater
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 as well as the duration of savings and is discussed in greater detail in Section 2.1.4.1	Retrofit (RET), replace-on-burnout (ROB), and new construction (NEW)
Annual Energy Consumption / Savings	Annual energy consumption in electricity (kWh) and demand (kW) for each baseline and EE measure or energy savings if that is available.	HPWH: 882.75 kwh savings
Unit Basis	Normalizing unit for energy, demand, cost, and density estimates.	Per widget (e.g., water heater, dryer, clothes washer), per square foot, per hp, per kWh consumed
Scaling Basis	Unit used to scale the energy, demand, cost, and density estimate for each measure according to the Reference forecast.	Per residential household, per kwh consumption 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 across ENO's service area. Section 2.1.1 describes the breakdown of customer segments within each sector.	HPWHs are mapped to the hot water end use for all residential segments
Measure Density	Used to characterize the occurrence or count of a baseline or EE measure, or stock, within a residential household or within 1,000 square feet of a commercial building. This	1.02 water heaters per home

Parameter Name	Definition	Example
	parameter was not defined for industrial measures.	
EE Saturation	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.	11% of all water heaters are tankless water heaters, so efficient saturation of tankless water heaters is 11%
Technical Suitability	Percentage of the base technology that can be reasonably and practically replaced with the specified efficient technology.	Ground source HPs have a technical applicability of less than 1.0 because their installation may not be feasible for 100% of the sites
Competition Group	Identifies measures competing to replace the same baseline density to avoid double counting of savings. Section 2.1.4.1 provides further explanation on competition groups.	Efficient tankless water heater, solar water heater, or an HPWH can replace an inefficient storage water heater, but not all three of them

Source: Guidehouse

3.3.3 Measure Characterization Approaches and Sources

This section provides approaches and sources for the main EE measure characterization variables. Table 20 provides the sources by input type.

Table 20. EE Measure Characterization Input Data Sources

Measure Input	Data Sources
Measure Costs, Measure Life, Energy Savings	• New Orleans ES TRM version 7.0 • ES program tracking data • 2021 ENO potential study data • Engineering analyses • Other TRMs • Guidehouse measure database and previous potential studies
Fuel Type Applicability Splits, Density, Baseline Initial Saturation, Technical Suitability, End-Use Consumption Breakdown	• ENO 2022 RASS • ES program tracking and participation data • Guidehouse's previous potential studies
Codes and Standards	• Local building codes

Source: Guidehouse

3.3.3.1 Energy Savings

Guidehouse used three bottom-up approaches to analyze residential and C&I measure energy savings:

1. **New Orleans TRM calculations:** The New Orleans ES TRM version 7.0 was the primary source for unit energy savings calculations. The TRM provided deemed (default) savings values for the majority of the EE measures in the study.
2. **Standard algorithms:** Guidehouse used standard algorithms for unit energy savings calculations for most EE measures not contained in the New Orleans TRM. To supplement that data, the team used ENO ES Program Evaluation Reports, other relevant TRMs such as the Illinois and Mid-Atlantic TRMs, and DOE Appliance Standards and Rulemaking supporting documents.
3. **Engineering analysis and engineering studies:** Guidehouse used engineering algorithms to calculate energy savings for any EE measures not included in the New Orleans TRM or other TRMs. The team also referenced established engineering studies with savings estimates in the absence of engineering algorithms. The team used its internal expertise with potential studies to calculate energy savings for measures that were not a part of the New Orleans TRM version 7.0.

3.3.3.2 Peak Demand Savings

Peak demand savings were either from the New Orleans ES TRM version 7.0 or calculated by dividing the annual energy use by the annual hours of use and then multiplying by a coincidence factor. The coincidence factor is an expression of how much of the equipment’s demand occurs during the system’s peak period. According to the TRM, the defined peak period is the average peak demand savings, Monday-Friday, non-holidays from 4 p.m.-5 p.m. in June, July, and August.

3.3.3.3 Incremental Costs

New Orleans ES TRM version 7.0 was the primary source for incremental cost information. The team used other publicly available cost data sources such as the California, Illinois, and the Mid-Atlantic TRMs, ENERGY STAR, and US DOE Appliance Standards and Rulemaking for EE measures where cost information was not available in the ENO TRM.

3.3.3.4 Densities

For the residential density values, the team used the ENO 2022 results to extract home square footage by housing type, space heating and cooling system splits, density, and saturation values for EE measures such as dishwashers, clothes washers, dryers, refrigerators, thermostats, windows, attic insulation, central ACs and room ACs. The team cross tabulated the data for each housing type to get these values for single-family and multifamily segments. As this cross tabulation was not available for the IQ segments, Guidehouse used the single-family values for the IQ single-family values and vice versa for the multifamily segment.

For commercial measures, the density values from the previous potential study were retained for most EE measures. Measure saturations were updated for EE measures available in the ES program data. The Commercial Building Stock Assessment and previous potential studies in other jurisdictions were reviewed for any other overall updates to the saturation values. For water and space heating measures, the fuel type multipliers from the previous ENO potential study were incorporated directly into the measures.

3.3.3.5 Measure Quality Control

Guidehouse fully vetted and characterized each EE measure in terms of its energy savings, costs, and applicability. The characterization includes the following:

- Measure descriptions and baseline assumptions
- Energy savings and cost associated with the measure
- Cost of conserved energy, including O&M costs
- Lifetime of the measure (effective useful life [EUL] and remaining useful life)
- Applicability factors including initial energy efficient market penetration and technical suitability
- Load shape of measure
- Replacement type of measure

3.4 Potential Estimation Approach

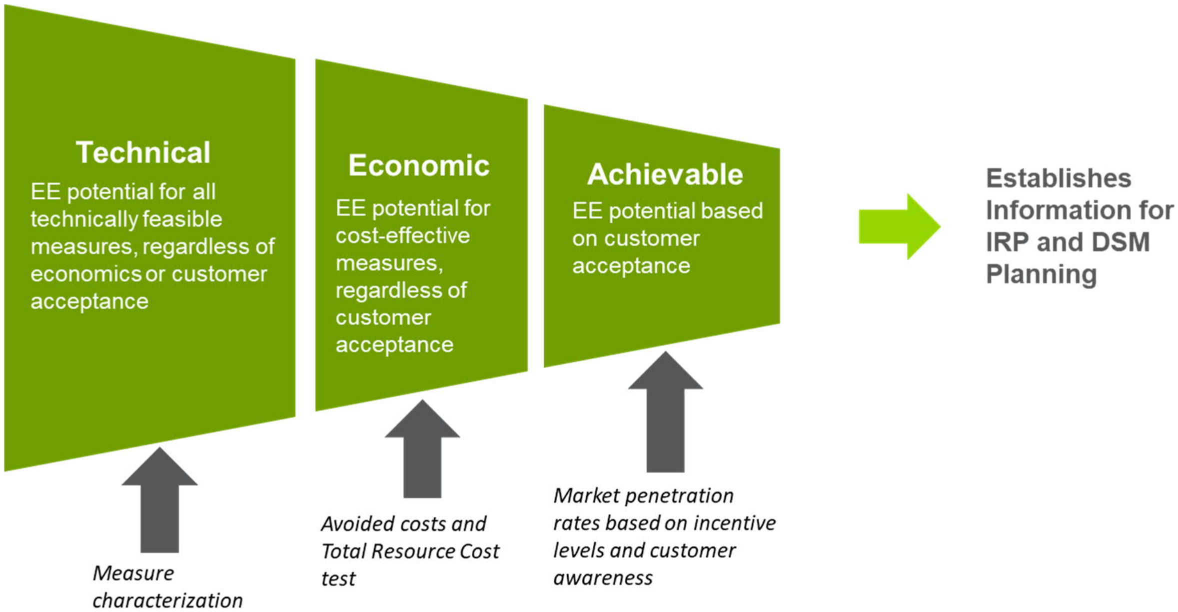
Guidehouse used its proprietary DSMSim potential model to estimate the technical, economic, and achievable savings potential for electricity and demand across ENO's service area. DSMSim is a bottom-up technology diffusion and stock tracking model implemented using a System Dynamics[31] framework. The DSMSim model accounts for different efficiency measures such as RET, ROB, and NEW and the effects the measures have on savings potential. The model then reports the technical, economic, and achievable potential savings in aggregate for the service area, sector, customer segment, end-use category, and highest impact measures.

This study defines technical potential as the total energy savings available assuming all installed measures can immediately be replaced with the efficient measure or technology—wherever technically feasible. This assumption is made regardless of the cost, market acceptance, or whether a measure has failed and must be replaced. Economic potential is a subset of technical potential, using the same assumptions regarding immediate replacement as in technical potential but including only those measures that have passed the benefit-cost test chosen for measure screening; in this case, that is a TRC test ratio of 0.9 (for the Reference case).[32] Finally, the achievable potential is analyzed based on the measure adoption ramp rates and the diffusion of technology through the market. Figure 20 provides the methodology overview.

[31] John D. Sterman, *Business Dynamics: Systems Thinking and Modeling for a Complex World*, Irwin McGraw-Hill, 2000, provides detail on System Dynamics modeling.

[32] Typically, the TRC threshold is set to 1.0. However, due to the drop in avoided energy costs as compared to the 2021 Study, many typical measures were deemed no longer cost-effective. The overall portfolio impact on cost-effectiveness does not change and remains above 1.0.

Figure 20. EE Potential Calculation Methodology



Source: Guidehouse

The study reports gross savings, which do not account for free ridership or spillover impacts, as would net savings. Providing gross potential permits a reviewer to more easily calculate net potential when new information about NTG ratios or changing EUIs becomes available.

Once the potential results and cases are analyzed, the outputs can help define the portfolio energy savings goals, costs, and forecast for alignment into other utility planning efforts, such as the IRP. This study does not examine the impact of future end-user electricity rates on sales or projected EE savings on electricity rates.

3.4.1 Technical Potential

This study defines technical potential as the total energy savings available assuming all installed measures can immediately be replaced with the efficient measure or technology—wherever technically feasible. This assumption is made 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 saves energy. The savings can be defined in numerous ways depending on which method is most appropriate for a given measure. Measures that consist of a change to a single, discrete product, or piece of equipment (e.g., lighting fixture replacements) are best characterized as some fixed amount of savings per fixture. Measures related to products or equipment that vary by size (e.g., AC equipment) are best characterized on a basis that is normalized to a certain aspect of the equipment, such as per ton of AC capacity. Other measures that could affect multiple pieces of equipment (e.g., behavior-based measures) are characterized as a percentage of customer segment sales saved.

The calculation of technical potential in this study differs depending on the assumed measure replacement type. 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 for residential or per 1,000 SF of floor space for C&I), and total building stock in the service area. The study accounts for three replacement types, where potential from RET and ROB measures are calculated differently from potential for NEW measures. Equation 1 through Equation 2 show the formulae used to calculate technical potential by replacement type.

3.4.1.1 Retrofit and Replace on Burnout Measures

Commonly referred to as advancement or early retirement measures, RET measures are replacements of existing equipment before the equipment fails. RET measures also can be efficient processes that are not in place and that are not required for operational purposes. These measures usually 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 thus would incur no costs.

In contrast, ROB measures—sometimes referred to as lost opportunity measures—are replacements of existing equipment that failed and must be replaced or are 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 model uses the existing building stock to calculate technical potential.[33] This method does not limit the calculated technical potential to any pre-assumed adoption rate of RET 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 added throughout the simulation. For RET and ROB measures, annual potential is equal to total potential, offering an instantaneous view of technical potential. Equation 1 calculates technical potential for RET and ROB measures.

Equation 1. Annual or Total Technical Potential for RET / ROB Measures

$$\textit{Total Potential} = \textit{Existing Stock x Measure Density x Savings x Technical Suitability x Baseline Initial Saturation}$$

Where:

- Total Potential: kWh
- Existing Stock:[34] C&I floor space per year or residential households per year
- Measure Density: Widgets per unit of stock
- Savings: kWh per widget per year
- Technical Suitability: Percentage of applicable stock
- Baseline Initial Saturation: Percentage of energy efficient stock

[33] In some cases, customer segment-level and end-use-level sales are used as proxies for building stock. These sales figures are treated like building stock and are subject to demolition rates and stock tracking dynamics.

[34] Units for building stock and measure densities may vary by measure and customer segment (e.g., 1,000 SF of building space, number of residential homes, customer segment sales).

3.4.1.2 New Construction Measures

The cost of implementing NEW measures is incremental to the cost of a baseline (and less efficient) measure. However, NEW technical potential is driven by equipment installations in new building stock rather than by equipment in existing building stock.[35] New building stock is added to keep up with forecast 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; this study uses a demolition rate of 0.5% per year for residential and C&I stock. New building stock determines the incremental annual addition to technical potential, which is then added to the total from the previous year to calculate the total potential in any given year. Equation 2 and Equation 3 provide calculations of technical potential for new construction measures.

Equation 2. Annual Incremental Technical Potential for NEW Measures

$$\begin{aligned}&\boldsymbol{Annual\ Incremental\ NEW\ Technical\ Potential}\\&= \boldsymbol{New\ Stock\ x\ Measure\ Density\ x\ Savings\ x\ Technical\ Suitability}\end{aligned}$$

Where:

- Annual Incremental NEW Technical Potential: kWh
- New Stock:[36] C&I floor space per year or residential households per year
- Measure Density: Widgets per unit of stock
- Savings: kWh per widget per year
- Technical Suitability: Percentage of the total baseline measures that could be replaced with the efficient measure. Occupancy sensors have a technical applicability of less than 1.0 because these are only practical for interior lighting fixtures that do not need to be on at all times.

Equation 3. Total NEW Technical Potential

$$\textit{Total NEW Technical Potential} = \sum_{\boldsymbol{YEAR=2024}}^{\boldsymbol{YEAR=2043}} \boldsymbol{Annual\ Incremental\ Technical\ Potential_{YEAR}}$$

3.4.1.3 Competition Groups

Guidehouse's modeling approach recognizes that some efficient technologies will compete against each other in the calculation of potential. The study defines competition as an efficient measure competing for the same installation as another efficient measure. For instance, a consumer has the choice to replace an air source HP with a more efficient air source HP or a ground source HP, but not both. These efficient technologies compete for the same installation.

Guidehouse used several competing technologies characteristics to define competition groups in this study:

- Competing efficient technologies share the same baseline technology characteristics, including baseline technology densities, costs, and consumption.

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[35] In some cases, customer segment-level and end-use-level sales are used as proxies for building stock. These sales figures are treated like building stock and are subject to demolition rates and stock tracking dynamics.

[36] Units for new building stock and measure densities may vary by measure and customer segment (e.g., 1,000 SF of building space, number of residential homes, customer segment consumption).

- The total (baseline plus efficient) measure 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 selected one measure per competition group to include in the summation of technical potential across measures (e.g., at the end use, customer segment, sector, service area, or total level). The measure with the largest energy savings potential in each competition group was used to calculate total technical potential of that competition group. This approach ensures that the aggregated technical potential does not double count savings. The model does, however, still calculate the technical potential for each individual measure outside of the summations.

3.4.2 Economic Potential

This section describes the economic savings potential—potential that meets a prescribed level of cost-effectiveness—available in ENO's service area. The section explains Guidehouse's approach to calculating economic potential.

Economic potential is a subset of technical potential, using the same assumptions regarding immediate replacement as in technical potential but including only those measures that have passed the benefit-cost test chosen for measure screening (in this study, the TRC test, as per the Council's IRP rules). The TRC ratio for each measure is calculated each year and compared against the measure-level TRC ratio. A measure with a TRC 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 TRC meets or exceeds the threshold, it is included in the economic potential. However, for this study, the TRC screening threshold has been selected to be below a 1.0 while ensuring that the portfolio TRC would be at 1.0 in aggregate. Furthermore, measures installed because of programs targeting IQ residential customers do not have a TRC requirement. Therefore, there is no TRC screening threshold for IQ measures for the IQ portion of the residential sector.

The TRC test is a benefit-cost metric that measures the net benefits of EE measures from the combined stakeholder viewpoint of the utility (or program administrator) and the customers. The TRC benefit-cost ratio is calculated in the model using Equation 4.

Equation 4. Benefit-Cost Ratio for the TRC Test

$$\boldsymbol{TRC} = \frac{\boldsymbol{PV}(\boldsymbol{Avoided\ Costs} + \boldsymbol{Externalties})}{\boldsymbol{PV}(\boldsymbol{Incremental\ Cost} + \boldsymbol{Admin\ Costs})}$$

Where:

- PV( ): The present value calculation that discounts cost streams over time
- Avoided Costs: The monetary benefits that result from electric energy and capacity savings—e.g., avoided or deferred costs of infrastructure investments and avoided long-run marginal cost (commodity costs) due to electric energy conserved by efficient measures

- Externalities: The monetary or quantifiable benefits associated with greenhouse gas reductions (i.e., the market cost of carbon)
- Incremental Cost: The measure cost as defined (see definition in Section 3.3.3.3)
- Admin Costs: The administrative costs incurred by the utility or program administrator (excluding incentive costs paid to participants)

Guidehouse calculated TRC ratios for each measure based on the present value of benefits and costs (as defined in the numerator and denominator, respectively) over each measure's life. presents the avoided costs, discount rates, and other key data inputs used in the TRC calculation. The study's results did not include the effects of free ridership or spillover, so the team did not apply an NTG factor. Providing gross savings results will allow ENO to easily apply updated NTG assumptions in the future and allows for variations in NTG assumptions by reviewers. Although the TRC equation includes administrative costs, the study did not consider these costs during the economic screening process, except for behavioral programs, because the study is concerned with an individual measure's cost-effectiveness on the margin.

Like technical potential, only one economic measure from each competition group was included in the summation of economic potential across measures (e.g., at the end-use category, customer segment, sector, service area, or total level). If a competition group was composed of more than one measure that passes the TRC test, then the economic measure that provides the greatest electricity savings potential was included in the summation of economic potential. This approach ensures that double counting is avoided in the reported economic potential, though economic potential for each individual measure is still calculated and reported outside of the summation.

3.4.3 Achievable Potential

Achievable market potential further considers the likely rate of DSM resource acquisition, given factors such as 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 calculation of the equilibrium market share and calculation of the dynamic approach to equilibrium market share, as discussed in more detail below.

Achievable potential differs from program potential because 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 EE programs. Achievable potential in this report relies on a TRC measure screen for cost-effectiveness, with the threshold set at a TRC of 0.90 for the majority of measures (and those that are targeting IQ with no TRC threshold), intended to reflect a target portfolio-level TRC of 1.0.

Table 21 summarizes the key methodology considerations and decision points informing the analysis in this report. Guidehouse decided upon this methodology through discussions with

ENO about which approach best serves the objective of the study to understand achievable potential.

Table 21. EE Achievable Potential Methodology Overview

Methodology Parameters	Approach
Benefit-cost test screen	Use the TRC 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 ENO’s sector-level historical achievements.
Budget constraints	Do not apply budget constraints.
Incentive strategy	Set incentive levels equal to historical program levels where applicable and 50% of incremental costs.
Treatment of administrative costs	Include program-level incentive to administrative cost ratios, benchmarked to historical performance, that scale administrative costs with calculated incentive budget.
NTG	Develop achievable potential estimates using gross savings, which allows for post-processing analysis of the savings with an NTG other than 1.0.
Re-participation	Assume 100% of measures participate as an efficient measure at the end of the measure life.

Source: Guidehouse

3.4.4 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-saving 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. Of course, 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 the incorporation of incentives will have higher equilibrium market share, which reflects consumers’ economically rational decision-making. While such approaches certainly have limitations, these are nonetheless 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, the team used equilibrium payback acceptance curves that Guidehouse developed using primary research from 2015. To develop these curves, Guidehouse relied on surveys of residential and C&I customers. These surveys presented decision makers with numerous choices between technologies with low upfront costs and high annual energy costs, and measures with higher upfront costs and lower annual energy costs. 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 are used in this study.

For measures involved in competition groups, an additional computational step is required to compute achievable potential to ensure no double counting of savings. While the technical and economic potential for a competition group reflects only the measure in that group with the greatest savings potential, all measures in a competition group may be allocated achievable potential based on their attractiveness (relative to one another).

Guidehouse allocated the economic potential proportionally across the various competing measures within the group based on their relative customer economics (payback). The team computed the relative customer economics ratio to reflect all costs and savings a customer would experience as a result of implementing the measure. The team multiplied the resulting market share splits by the maximum achievable potential for the group to get the achievable potential for each individual measure. This methodology ensured that final estimates of achievable potential reflected the relative economic attractiveness of measures in a competition group and that the sum of achievable potential from all measures in a competition group reflected the maximum achievable potential of the whole group. More details are provided in Appendix C.

4. DR Approach and Data

Guidehouse prepared a DR potential assessment for ENO's electricity service area from 2024 to 2043 as part of the DSM potential study. The objective of this assessment was to estimate the potential for using DR to reduce customer loads during peak demand during summer periods.

Guidehouse identified and analyzed a suite of DR options for potential implementation in ENO's service area based on what ENO currently offers and similar program offers in other jurisdictions, including:

1. **Direct Load Control (DLC):** This program controls water heating and cooling loads for residential customers using either a DLC device (switch for water heaters only) or a programmable controlling thermostat (PCT). For AC control, this option represents the EasyCool Bring Your Own Thermostat (BYOT) program that ENO offers to residential customers.
2. **C&I Curtailment:** This program represents the ES Large Commercial DR program that ENO currently offers, where large commercial customers agree to reduce load by a specific amount when called and get paid an incentive based on performance.
3. **Dynamic Pricing:** This program encourages load reduction through a Critical Peak Pricing (CPP) tariff, with a 6:1 critical peak-to-off-peak price ratio. All customer types are eligible to participate.
4. **Peak Time Rebate (PTR):** This program represents ENO's planned opt-in PTR offer to residential customers. ENO could call PTR events year-round. Enrolled customers receive a $/kWh rebate on the amount of energy reduced during events over the baseline energy use. The customer participation pathway for this option is designed to integrate with existing customer engagement and behavioral EE customer offerings.
5. **BTM Storage (BTMS):** This program triggers power dispatch from BTM battery storage systems that are grid-connected during peak load conditions. Battery dispatch helps reduce net system load during DR event periods.
6. **EV Managed Charging (Bring Your Own Charger [BYOC]):** ENO offers a BYOC program that rewards customers for shifting their EV charging load to off-peak hours. This program would be open to all EV customers with Level 2 chargers.

Guidehouse developed programmatic assumptions (participation, unit impacts, and costs) for these DR options and estimated potential and cost-effectiveness under "achievable" participation assumptions. The team developed achievable potential estimates for each of these DR options at various levels of disaggregation, along with the costs associated with rolling out and implementing a DR program portfolio. The DR assessment considered both conventional and advanced control methods to curtail load at customer premises. Guidehouse assessed the cost-effectiveness of DR and included only cost-effective DR options in the final achievable DR potential estimates.

Guidehouse developed ENO's DR potential and cost estimates using a bottom-up analysis, which used primary data from ENO and relevant secondary sources. For this study, the team configured its DRSim model, which uses this data as inputs. The following subsections detail Guidehouse's DR potential and cost estimation methodology:

- **Characterize the Market:** Segment ENO's customer base into customer classes eligible to participate in DR programs.
- **Develop Baseline Projections:** Develop baseline projections for customer count and peak demand over the 20-year forecast period.
- **Characterize DR Options:** Define DR program options and map these to applicable customer classes.
- **Develop Model Inputs for Potential and Cost Estimates:** Develop participation, load reduction, and cost assumptions that feed the DRSim model.
- **Analyze Cases:** Estimate DR potential and associated implementation costs for the Low case and High case relative to the Reference case.

4.1 Market Characterization for DR Potential Assessment

Market characterization was the first step in the DR potential assessment process. Table 22 presents the different levels of market segmentation for the DR potential assessment, which are based on Guidehouse's examination of ENO's rate schedules, and the customer segments established in the EE potential study. The team finalized the market segmentation for the DR potential assessment in consultation with ENO.

The methodology Guidehouse used to segment the market at these levels is described below. Government customers are included as part of the C&I sector. As in prior studies, savings potential from streetlighting is not included in this study.

Table 22. Market Segmentation for DR Potential Assessment

Level	Description
Level 1: Sector	• Residential • C&I • EVs

Level 2: Customer Class	• Residential
	• C&I customers by size based on maximum demand values:
	   o Small C&I: <= 100 kW maximum demand
	   o Large C&I: >100 kW maximum demand
	• EVs

Level 3: Customer Segment	• Residential
	• C&I customer segments
	   o Colleges/Universities
	   o Healthcare
	   o Industrial/Warehouse

Level	Description
	o Lodging o Office – Large o Office – Small o Other o Restaurants o Retail – Food o Retail – Non-Food o Schools • EVs

Source: Guidehouse

Guidehouse first segmented customers into residential and C&I. Electric Vehicles (EVs) were considered as its own sector and segment. For residential, the team combined single-family and multifamily customers into a single residential category because DR program and pricing offers are typically not distinguished by dwelling type. Furthermore, there is no distinction between IQ and market rate residential program participants.

Next, Guidehouse segmented C&I customers into two sizes (small and large based on a 100 kW maximum demand threshold) and further segmented these into customer segments.[37] This cutoff value was determined in consultation with ENO and is aligned to ENO's EE programs when there is a specific offer to the small business segment. To determine the size cutoff, the team requested 2022 account-level maximum billed demand data from ENO. 2022 was chosen as the base year because it was the most recent year with a fully complete and verified dataset. However, the account-level maximum demand data was not available as part of this study's data request. Therefore, Guidehouse used the segment-level small/large split from the 2021 potential study.

The team mapped the SIC codes associated with individual accounts to customer segments in the analysis, which is aligned with the segmentation used for the EE analysis in the current study. Then, the team used the split of customers into small and large C&I by customer segment, as previously described, to get small and large C&I customer count splits within each segment. These splits were then used to develop a customer count and sales forecast by customer class and segment for the DR study. This segmentation is necessary because the type of DR program offer varies by customer size.

4.1.1 Baseline Projections

4.1.1.1 Customer Count Projections

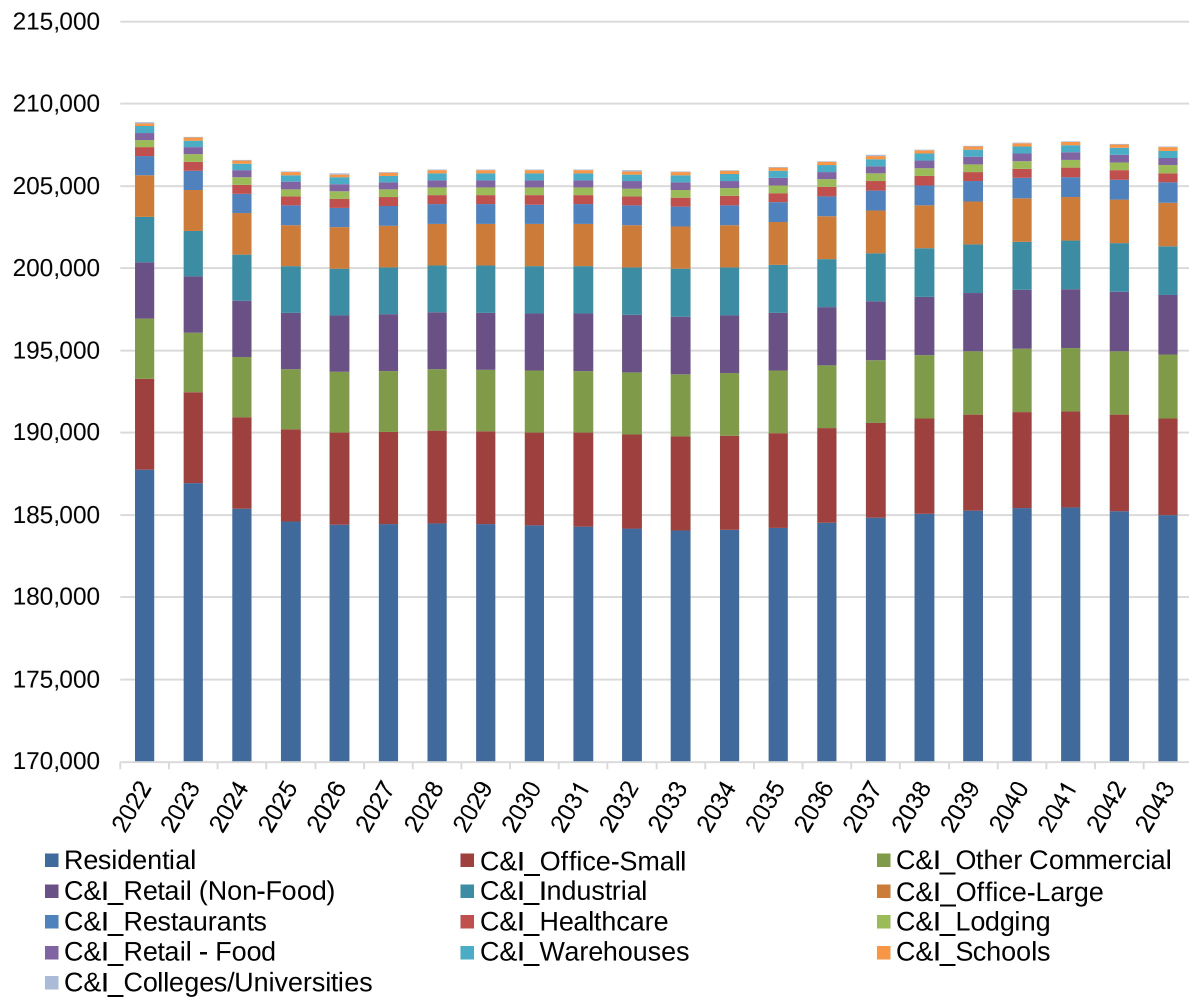
Guidehouse applied the split by customer size and segment, as previously described, to the aggregate count forecast by revenue class to produce a customer count forecast by customer class and segment, as described in Table . Commercial, industrial, and government account

[37] As specific SIC codes map to small and large offices, Guidehouse did not use the 100-kW cutoff to segment office customers into the small and large categories. The small versus large distinction for offices is solely based on the NAICS code mapping.

count forecasts are all combined into C&I count forecasts. The residential sector is kept in aggregate because there is no further segmentation needed for the DR analysis. The underlying assumption in the account count projections is that the split by size and segment within C&I remains the same as the base year (2022) split. This simplifying assumption needs to be made because segment-level account count forecast is not available from ENO.

Figure 21 shows the aggregate customer count forecast by segment only, summed across all customer classes.

Figure 21. Customer Count Projections for DR Potential Assessment



Source: Guidehouse

4.1.1.2 Peak Demand Projections

The approach for developing disaggregate baseline peak demand projections (peak demand projections net of EE) by customer class, segment, and end-use is described here:

1. **Define peak period:** The first step in developing peak demand projections is to define the peak period. This study considered only DR potential for summer peak reduction. Guidehouse used the 8760 system load data to develop the load duration curve and

identified the top 40 system load hours that fit within MISO's defined peak period. Per MISO's business practice manual, "… the expected peak occurs during the summer (June through August) during the hours from 2:00 p.m. through 6:00 p.m."[38] Guidehouse included only the top 40 weekday hours within this window, which is the typical limit for calling summer DR events.

2. **Disaggregate sales forecast by customer class and customer segment:** Guidehouse developed the disaggregate sales forecast by customer class and segment using the same approach previously described for account count projections. The 2022 (base year) sales data by segment is aligned with the data used for EE analysis (obtained by mapping the 2022 SIC code-level sales from ENO to study segment). The size split for sales (small and large C&I) is aligned with the account count size split previously described. The disaggregate sales by size and segment for 2022 is applied to the sales projections by revenue class for forecast years to develop sales projections by size and segment for C&I customers (the underlying assumption is that the 2022 split of sales by C&I segments applies to the rest of the forecast years because the sales forecast from ENO is only at the revenue class level). Residential sales data is treated in aggregate as there is no further segmentation of the residential sector in the DR analysis.

3. **Use 8760 load profiles by revenue class to calculate coincident peak load factors:** Guidehouse received 8760 load profiles by revenue class (residential, commercial, industrial, government) from ENO for 2021 and 2022. Based on the peak period definition, the team calculated the coincident peak load factors according to Equation 5:

Equation 5. Coincident Peak Load Factor

$$Coincident\ Peak\ Load\ Factor = \frac{Annual\ Sales}{Average\ Hourly\ Coincident\ Peak\ Demand * 8{,}760}$$

As the analysis in the study is done by residential and C&I customer in aggregate, Guidehouse aggregated the hourly demand data for commercial, industrial, and government and determined the coincident peak load factor in aggregate for commercial, industrial, and government revenue classes to obtain C&I peak load factor.

Guidehouse calculated average coincident peak load factors for residential and C&I customers for each year (2021 and 2022) and took the average of the two load factors. Table 23 shows the individual years and aggregate coincident peak load factors at the system level and for residential and C&I sectors.

Table 23. Coincident Peak Load Factors

Year	System/Sector	Peak Load Factor
2021	System	0.710
	Residential	0.627
	C&I	0.793
2022	System	0.604

[38] Midcontinent Independent System Operator, *Business Practices Manual*, Demand Response, Manual No. 026, effective date October 1, 2023, page 20.

Year	System/Sector	Peak Load Factor
	Residential	0.699
	C&I	0.694
Average (2021 and 2022)	**System**	**0.66**
	Residential	**0.66**
	C&I	**0.74**

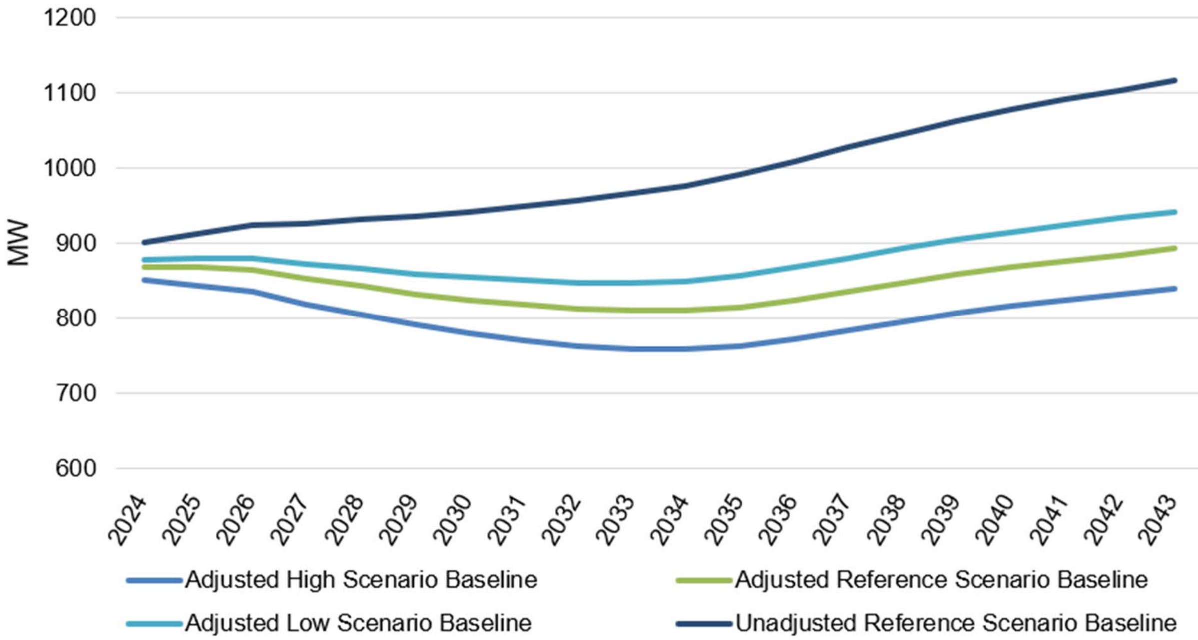
Source: Guidehouse

4. **Apply coincident peak load factors to disaggregate sales projections to estimate peak demand by customer class and segment:** Guidehouse applied the average coincident peak load factors by customer class and segment, developed in step 3 to the disaggregate sales projections by customer class and segment (described in step 2) to develop average coincident summer peak demand projections by customer class and segment. The peak demand by customer class and segment developed through this approach includes only residential, commercial, industrial, and government revenue classes and does not include EVs as the sales used as a starting point to develop the peak demand did not include charging energy consumption.
5. **Develop end-use shares in peak demand:** The DR potential assessment for C&I customers requires end-use breakdown of the peak demand (because the unit savings from DR for C&I are specified as "% of enduse load"). Therefore, Guidehouse needed to develop end-use shares in peak demand. The team referred to the National Renewable Energy Laboratory (NREL) ComStock data[39] for buildings in the region that use the New Orleans International Airport weather station., The ComStock data provides load profiles for different C&I building types. The team mapped the study segments to NREL's building types and used the peak period definition (described in step 1) to determine end-use shares in peak demand for the different C&I segments and building types. Only commercial and government revenue class loads are disaggregated by end use. Industrial segment load is kept at the total facility level and is not disaggregated by end use.
6. **Adjust baseline load for DR potential estimation with EE achievable potential estimates:** As EE leads to permanent load reductions in the baseline load, the baseline load for DR needs to be adjusted with EE potential estimates. Figure 22 shows the disaggregate peak demand projections before and after EE adjustments. The team used the EE savings forecasts for the Reference, Low, and High EE scenarios to develop corresponding baseline peak demand projections for these three scenarios for DR potential analysis. The "unadjusted Reference case baseline" represents the bottom-up disaggregate peak demand projections by customer class and segment, developed through the previously described steps. This projection is adjusted with the EE achievable potential estimates for all three cases (Reference, Low, and High) to derive the downward sloping "adjusted baseline" projections for all three cases. Figure 22 indicates that the baseline peak demand projections progressively decline over time with higher penetration of EE. As Figure 22 illustrates, the baseline demand net of Energy Efficiency is lower in the High case than in the Reference case due to higher energy

[39] https://comstock.nrel.gov/

efficiency savings in High than in Reference. Conversely, for the Low case, the baseline demand for DR is higher than Reference since the energy efficiency savings in Low are lower than in the Reference case, which in turn leads to higher baseline demand for DR.

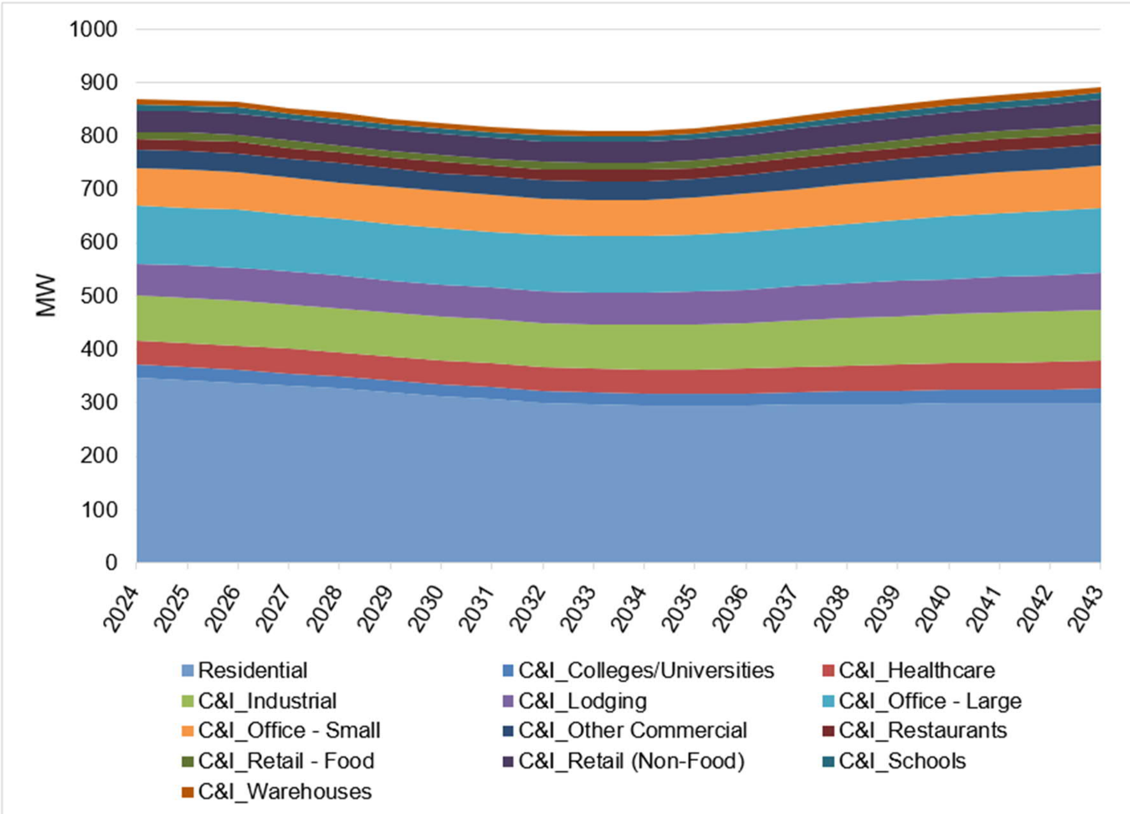
Figure 22. Peak Demand Forecast Comparisons



Source: Guidehouse

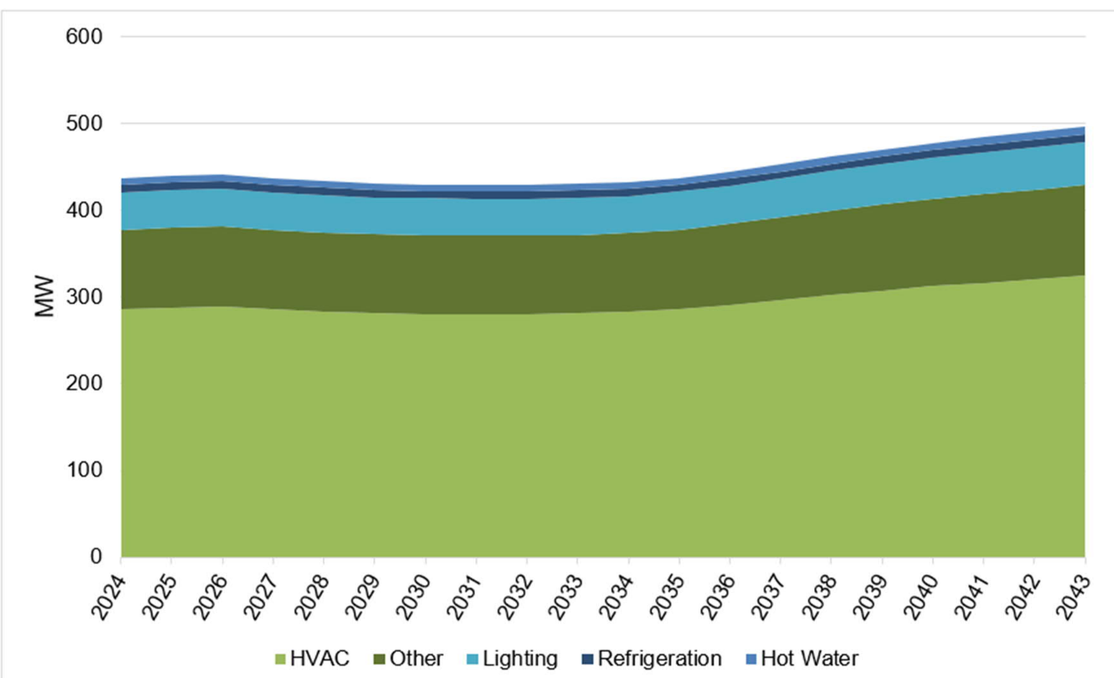
Figure 23 shows the disaggregate peak demand projections by customer segment. Figure 24 shows the disaggregate C&I peak demand by end use for the Reference case, derived from all six steps previously described. The disaggregate peak demand projections establish the foundation for DR potential estimates.

Figure 23. Peak Load Forecast by Customer Segment (MW)



Source: Guidehouse

Figure 24. Peak Load Forecast by End Use for C&I Customers (MW)



Source: Guidehouse

4.2 Descriptions of DR Options

Once the baseline peak demand projections were developed, the team characterized different types of DR options that could be used to reduce peak demand. Table 24 summarizes the DR options included in the analysis. The DR options represent ENO's current DR program offers and those that are commonly deployed in the industry. These programs also align with the Council's IRP rules, which state that DR programs should include those "… enabled by the deployment of advanced meter infrastructure, including both direct load control and DR pricing programs for both Residential and Commercial customer class."

Table 24. Summary of DR Options

DR Option	Characteristics	Eligible Customer Classes	Targeted End Use or Technology
DLC[40] • Thermostat for space cooling • Switch for water heating	Control of cooling load using smart thermostat; control of water heating load using a load control switch	Residential	Cooling, water heating
C&I Curtailment • Manual • Auto-DR enabled	Firm capacity reduction commitment with pay-for-performance ($/kW) based on nominated amount or actual performance	Large C&I	Various load types including HVAC, lighting, refrigeration, and industrial process loads (based on facility type)
Dynamic pricing[41] • Without enabling technology • With enabling technology	Voluntary opt-in dynamic pricing offer, such as CPP	All customer classes	All
BTMS • Standalone battery storage	Dispatch of BTM batteries for load reductions during peak demand periods	Residential[42]	Batteries
EV managed charging (BYOC)	BYOC program that will reward customers for shifting their EV charging load to off-peak hours	EVs	Light Duty Vehicles with L2 chargers

[40] DLC represents the smart thermostat-based EasyCool program offered by ENO to residential customers (switch-based option considered for water heater control).

[41] Guidehouse did not include TOU rates in the DR options mix because this study includes only event-based dispatchable DR options. TOU rates lead to a permanent reduction in the baseline load and are not considered a DR option.

[42] The DR potential assessment from BTM batteries only considered residential batteries. No battery forecast was available from ENO. Guidehouse used the NEM forecast data to project residential BTM batteries paired with solar. However, for C&I, there was no basis to develop battery forecasts and therefore this analysis did not consider DR potential from BTM batteries for C&I customers. Future potential studies could consider this update as and when C&I BTM battery forecast data is available.

DR Option	Characteristics	Eligible Customer Classes	Targeted End Use or Technology
PTR	Opt-in offer that provides a $/kWh rebate to customers for energy reduced during DR events	Residential Small C&I	All

Source: Guidehouse

Each DR option was segmented into several DR suboptions, each of which was tied to a specific end use or control strategy. Table 25 summarizes this segmentation. Detailed descriptions of the different types of DR options follow.

Table 25. Segmentation of DR Options into DR Suboptions

DR Option	DR Suboption	Eligible Customer Classes
DLC	Switch-Water Heating	Residential
	Thermostat-Central AC (CAC)/HP (BYOT)	
	Thermostat-HVAC (BYOT)	
C&I Curtailment	Curtailment-Manual HVAC Control	Large C&I
	Curtailment-Auto-DR HVAC Control	
	Curtailment-Standard Lighting Control	
	Curtailment-Advanced Lighting Control	
	Curtailment-Water Heating Control	
	Curtailment-Refrigeration Control	
	Curtailment-Compressed Air	
	Curtailment-Fans/Ventilation	
	Curtailment-Industrial Process	
	Curtailment-Pumps	
	Curtailment-Other	
Dynamic Pricing (CPP)	Dynamic pricing with enabling tech	Residential, Small C&I, Large C&I
	Dynamic pricing without enabling tech	
BTMS	BTMS-Battery Storage	Residential
PTR	PTR	Residential, Small C&I
EV Managed Charging (BYOC)	EV Managed Charging (BYOC)	Residential (LDVs)

Source: Guidehouse

4.2.1 DLC

This program controls water heating and cooling loads for residential customers using either a DLC device (switch for water heaters only) or a PCT. For AC control, this option represents the EasyCool BYOT program that ENO offers to residential customers. Table 26 summarizes the DLC program characteristics considered in this study.

Table 26. DLC Programs Characteristics

Item	Description
Program Name	DLC
Program Description	• Under space cooling control, this program represents the EasyCool BYOT program in which residential customers purchase and install qualifying connected thermostats on their own or via the ES Online Marketplace and voluntarily enroll these devices in the program. • Switch-based electric water heating load control apply only to residential customers, where ENO would switch off the water heating load during event hours using smart switches. This program is not currently offered by ENO.
Purpose/Trigger	DLC events will be called primarily to meet capacity shortfalls during summer, triggered primarily by a high day-ahead temperature forecast.
Key Program Design Parameters	• Events will be called during peak demand periods in summer (June 1 through September 30), only on non-holiday weekdays • Smart thermostat-based option[43] o Maximum 15 events called during summer o Enrolled customers receive upfront $50 incentive payment, per device, at the time of enrollment, plus $25 each season they participate, starting in the second year they remain enrolled; customers can earn incentives for up to two devices o Eligible thermostats listed in the EasyCool program site o Event notification varies by thermostat provider o Load reduction achieved through a max. 4-degree temperature offset o Event window: 12 p.m. to 8 p.m. o Max. event duration: 4 hours o Customers can opt-out any time at the thermostat, mobile device, or web app • Customers may be precooled prior to an event taking place o Water heating control characteristics (program currently does not exist)
Participation Eligibility	• Residential customers with CAC and HPs • Residential customers with electric water heaters.
Dependent Technology and Metering	**Technology:** Switches control water heating. Smart thermostats control CAC or HPs. **Metering:** Standard meter (no interval meter required). The program can use data loggers on a sample of participants to record interval usage for measurement and verification.

Source: Guidehouse

4.2.2 C&I Curtailment

The C&I curtailment program modeled in the potential assessment represents the ES Large Commercial DR program that ENO currently offers.[44] Under this program, ENO contracts with a DR service provider to deliver a fixed amount of load reduction. Enrolled participants nominate a certain amount of load reduction. In return, they receive a fixed incentive payment in the form of capacity credits or reservation payments (expressed as $/kW-year) for being on call. Participants are paid based on performance when DR events are called. Only customers with greater than or equal to 100 kW demand qualify for enrollment. Once enrolled, customers are required to fulfill the nominated amount of load reduction when DR events are called. A specific site could curtail a variety of end-use loads depending on the types of business processes. Table 27 describes the C&I curtailment program characteristics considered in this study.

Table 27. C&I Curtailment Program Characteristics

Item	Description
Program Name	C&I Curtailment[45]
Program Description	The Large Commercial DR program (DR program) is a voluntary program that pays incentives to C&I customers for reducing a specified level of load reduction through onsite load reduction equipment. Customers receive fixed $/kW-yr. payment for being on call to deliver load reductions when DR events take place. When DR events are called, customers are paid based on the actual kilowatts reduced during an event against their baseline load. This program is currently being administered by a third party. Participating sites enrolled in the program curtail a variety of end uses (e.g., HVAC, water heating, lighting, refrigeration, process loads), depending on the business type.
Purpose/Trigger	DR events could be triggered by operating, reliability, or economic purposes.[46]
Key Program Design Parameters	• Events will be called during peak demand periods in summer (June 1 through September 30), only on non-holiday weekdays; additionally, events may be called at other times outside the summer season. • Event notification: 24 hours. prior to event via text and email • Incentive: $50/kW for summer; $10/kW for non-summer • There are no performance penalties for opting out at any time before or during an event
Participation Eligibility	Large C&I customers with greater than 100 kW peak demand

[43] Energy Smart, EasyCool, https://enrollmythermostat.com/faqs/entergyno/.

[44] Energy-Smart-Entergy-Large-Commercial-Automated-Demand-Response-Brochure-May-2022-Web.pdf (energysmartadr.com)

[45] Represents the Energy Smart Large Commercial DR program currently offered by ENO.

[46] This study estimates summer peak reduction potential only from this program.

Item	Description
Dependent Technology and Metering	**Dependent technology:** Auto-DR requires a building automation system, a load control device, or breakers on specific circuits. All control mechanisms must be able to receive an electronic signal from the program administrator and initiate the curtailment procedure without manual intervention. Auto-DR dispatches are called using an open communication protocol known as Open-ADR. For Auto-DR customers, the vendor installs an Open-ADR-compliant gateway at the participating site, which is then able to notify the EMSs or other control systems at the facility to run their preprogramed curtailment scripts. The vendor monitors energy reduction in real time and provides visual access to this demand data to the participant through a web-based software platform. This platform may be integrated for overall energy optimization, which may help realize EE benefits along with DR benefits. **Metering:** Interval meters or smart meters

Source: Guidehouse

4.2.3 Dynamic Pricing

Dynamic pricing refers to a CPP rate offer across all customer classes. This rate is the most deployed dynamic rate in the industry. Customers who opt to participate in the program are placed on a CPP rate with a significantly higher rate during certain critical peak periods in the year and a lower off-peak rate than the standard offer rate. Customers enrolled in the CPP rate pay the higher critical peak rate for electricity consumption during the critical peak periods, which incentivizes them to reduce consumption during those periods. Customers enrolled in the CPP rate receive either day-of or day-ahead notification of the critical peak period.

The unit impacts or per-customer load reductions depend on the critical peak to off-peak price ratio. This study assumes a 6:1 critical peak to on-peak price ratio. The off-peak rate is lower than the customer's otherwise applicable Tariff and therefore customers have an incentive to enroll in the CPP rate vis-à-vis their existing tariff. It is best practice in the industry to provide bill protection during the first year of enrollment in the tariff so that customer bills do not exceed what they would have paid under their existing tariff. Industry experience suggests that enabling technology such as smart thermostats and Auto-DR can substantially enhance load reductions when customers on CPP rates are equipped with these technologies. ENO could offer CPP either as an opt-in rate or as a default rate with opt out. This study assumes an opt-in offer type for CPP.

The CPP offer requires AMI meters for settlement purposes. Hence, the rate offer is tied to AMI deployment. This study assumes that ENO offers the CPP rate from 2023 onward to account for lead time for rate design and approval before launching the program. Table 28 describes the dynamic pricing program characteristics considered in this study.

Table 28. Dynamic Pricing Program Characteristics

Item	Description
Program Name	Dynamic Pricing
Program Description	Opt-in CPP offer to all customers with a 6:1 critical peak to off-peak price ratio
Purpose/Trigger	• Events are primarily called for economic purposes (high market prices)

Item	Description
	• Events can be called during both summer and winter months • Current study estimates potential for summer peak reduction
Key Program Design Parameters	• Event window: May 1 to September 30 during summer; October 1 to April 30 during winter • Event notification is typically day-ahead • Average event duration assumed to be 4 hours; no more than one event is called in a day; calling events for more than 2 consecutive days may lead to customer dissatisfaction and disenrollment • Annual maximum event hours set at 80-100 hours
Participation Eligibility	All customers
Dependent Technology and Metering	All customers need smart meters for settlement purposes

Source: Guidehouse

4.2.4 BTMS

The Bring Your Own Battery (BYOB) program is offered by ENO with Honeywell. It targets residential customers with existing solar-connected smart battery systems and connects the battery systems to the Enbala Concerto distributed energy resource management system (DERMS) platform currently being used by Honeywell to administer the Large Commercial DR program. Table 29 describes the BTMS program characteristics.

Table 29. BTMS Program Characteristics

Item	Description
Program Name	BTMS
Program Description	BYOB program that targets residential customers with solar-connected battery systems. Batteries are dispatched to address ENO's grid needs and participants are incentivized for allowing ENO to control their batteries and export energy.
Purpose/Trigger	Events are called any time of the year to meet grid needs. Events could be triggered by emergency or reliability needs, economic purposes, and to fulfill operating reserve requirements (spin, non-spin, regulation).
Key Program Design Parameters	• Summer: May 1 to September 30 during summer (current); however, batteries can be dispatched year-round • Average event duration: 2-3 hours per event • Event notification is typically day-ahead or 1-2 hours ahead[47]

[47] The notification time will vary based on the on the type of trigger. If ENO were to use batteries for meeting operating reserve requirements (spin, non-spin, regulation), the notification time could be considerably shorter as these services require fast response.

Item	Description
	• Number of annual events: Can go considerably higher than other programs/technologies because batteries are highly dispatchable; o ENO's proposed pilot is designed to call no more than 15-20 events with a duration between 2-3 hours per event.[48] o However, in future, ENO may be able to dispatch batteries for greater duration than what is specified in the pilot, similar to the MA utilities.[49]
Participation Eligibility	• Residential NEM customers (customers with solar)
Dependent Technology and Metering	All customers need PV-tied batteries with grid interconnection.

Source: Guidehouse

4.2.5 EV Managed Charging – BYOC Program

This passive managed charging program incentivizes customers for off-peak charging. The objective of the program is to shift EV load to off-peak hours, when demands on the electric system are lowest. BYOC leverages existing investments in AMI smart meter infrastructure to monitor customer EV charging behavior. The program is open to any make or model of EV using any Level 2 charger. Sagewell, in coordination with ENO, will recruit, enroll, monitor charging, and issue incentives to participating EV drivers in ENO territory. The pilot will enroll up to 350 participants each year, with cumulative totals of 350 and 750, EVs across the two PYs 2023-24.

This program does not reduce overall kilowatt-hour consumption but can have a significant impact on distribution system health and save ENO customers money by enabling ENO to procure energy at lower off-peak hour costs. EV charging, particularly at 10 kW and above, can negatively impact neighborhood-level power quality and may overload transformers. While immediate transformer failures or damage due to overloading are rare, shortened transformer life can result from frequent overloading and increase the utility operating costs due to premature equipment replacement. Because BYOC effectively shifts high charging rate EV load to off-peak hours every day, it mitigates potential infrastructure stress and can improve neighborhood power quality. Table 30 describes the BYOC program characteristics.

Table 30. BYOC Program Characteristics

Item	Description
Program Name	BYOC
Program Description	ENO provides incentives to customers to shift their EV charging from peak to off-peak periods. All customers with Level 2 chargers are eligible.

[48] "Filing of Entergy New Orleans LLC's Request for Approval of a Demand Response Battery Storage Pilot Program for Program Year 12", March 9, 2022.

[49] National Grid's Connected Solutions sets the maximum number of events at 60, https://www.nationalgridus.com/media/pdfs/bus-ways-to-save/connectedsolutions-madailydispatchflyer.pdf.

Item	Description
Purpose/Trigger	Events are called any time of the year to meet grid needs. Events could be triggered by emergency or reliability needs, economic purposes, to fulfill operating reserve requirements (spin, non-spin, regulation), and to help address local distribution constraints with progressive increase in EV charging load.
Key Program Design Parameters	This program is not event based. Customers are incentivized to shift their EV charging from peak to off-peak periods.
Participation Eligibility	All vehicles with Level 2 chargers
Dependent Technology and Metering	AMI needed for monitoring of charging and for incentive calculation

Source: Guidehouse

4.2.6 PTR Program

This program represents ENO's planned opt-in PTR offer to residential customers. Per ENO's current pilot design, ENO can call events year-round (limited to a certain maximum number of events) and provide a $/kWh rebate on the amount of energy reduced during events over a customer's baseline energy use.[50] The customer participation pathway for this program is designed to integrate with existing customer engagement and behavioral EE customer offerings and includes customer engagement through email and SMS text messaging. Email communications will notify customers when events are imminent and provide clear recommendations and share tips on actions to reduce energy use during events. Participants also are informed at the end of the event, notifying customers that the event has ended, and an email at the end of the season that informs participants on the amount of energy saved and the incentives earned. Table 31 describes the PTR program characteristics.

Table 31. PTR Program Characteristics

Item	Description
Program Name	PTR
Program Description	ENO provides customers with a $/kWh rebate for reducing energy during events, capped at $50 per year. Enrolled customers receive pre-event, during, and post-event alerts that remind and guide them to behaviorally shift or reduce their variable electric loads to help earn their total potential incentive.
Purpose/Trigger	Events are called any time of the year to meet grid needs. Events could be triggered by emergency or reliability needs, economic purposes, and to fulfill operating reserve requirements (spin, non-spin, regulation).

[50] 2023-2025 Energy Smart DR Plan; Energy Smart, Reduce your energy usage and earn up to $50 cash with the Peak Time Rebate Pilot, https://www.energysmartnola.info/peak-time-rebate-pilot/#:~:text=Reduce%20your%20energy%20usage%20and,periods%20of%20high%20electricity%20usage.

Item	Description
Key Program Design Parameters	• Event duration: Max. of 4 hours • Event notification: 24-72 hours in advance via email • Number of annual events: Max. of 15 events
Participation Eligibility	• Residential – all customers (currently being offered) • Small C&I customers (not currently being offered)
Incentives	• $/kWh incentive with up to a maximum of $50 per year
Dependent Technology and Metering	AMI for baseline energy and reduction measurement

Source: Guidehouse

4.3 Key Assumptions for DR Potential and Cost Estimation

This study includes two key variables that feed the DR potential calculation:

- Customer participation rates
- Amount of load reduction that could be realized from different types of control mechanisms, referred to as unit impacts

Other variables that impact DR potential calculation include participation opt-out rates, technology market penetration, and enrollment attrition rates. Guidehouse calculated both the technical and achievable potential associated with implementing DR programs for this study. Technical potential refers to load reduction that results from 100% customer participation, which is a theoretical maximum. The team calculated technical potential by multiplying the eligible load/customers by the unit impact for each DR suboption. The technical potential calculation does not account for participation overlaps between the DR suboptions. Technical potential across the various suboptions is not additive and should not be added together to obtain a total technical potential. In other words, the technical potential estimates for each DR suboption should be considered independently. Equation 6 summarizes the technical potential calculation.

Equation 6. DR Technical Potential

$$\begin{aligned} \textit{Technical Potential}_{\textit{DR Sub Option},\textit{End Use},\textit{Year}} &= \textit{Eligible Load}_{\textit{DR Sub Option},\textit{Segment},\textit{End Use},\textit{Year}} \\ &* \textit{Unit Impact}_{\textit{DR Sub Option},\textit{Segment},\textit{Year}} \end{aligned}$$

Guidehouse calculated the achievable potential by multiplying achievable participation assumptions (subject to the program participation hierarchy) by the technical potential estimates. Market potential also accounts for customers opting out during DR events. Equation 7 shows the calculation for achievable potential.

Equation 7. DR Achievable Potential

$$
\begin{aligned}
&\boldsymbol{Achievable\ Potential} \\
&\quad = \boldsymbol{Technical\ Potential}_{\boldsymbol{DR\ Sub\ Option, Segment, End\ Use, Year}} \\
&\quad * \boldsymbol{Achievable\ Participation\ Rate}_{\boldsymbol{DR\ Sub\ Option, Segment, Year}} \\
&\quad * (\boldsymbol{1} - \boldsymbol{Event\ Opt\ Out\ Rate})_{\boldsymbol{DR\ Sub\ Option, Year}}
\end{aligned}
$$

In addition to the potential estimates, the team developed annual and levelized costs by DR option and suboption. Guidehouse subsequently assessed the cost-effectiveness of each suboption and DR option in aggregate. Developing annual and levelized costs involves itemizing various cost components, such as program development costs, equipment costs, participant marketing and recruitment costs, annual program administration costs, technology lifetimes, and a discount rate. Table 32 summarizes the variables Guidehouse used to calculate DR potential and its associated costs in this analysis. These variables are discussed further in the following subsections.

Table 32. Key Variables for DR Potential and Cost Estimates

Key Variables	Description
Participation Rates	Percentage of eligible customers by program type and customer class
Unit Impacts	• Kilowatt reduction per device for DLC • Percentage of enrolled load by end use for C&I curtailment • Percentage of total facility load for dynamic pricing • Percentage of battery load for BTMS
Costs	• One-time fixed costs related to program development • One-time variable costs for customer recruitment, program marketing, and equipment installation and enablement • Recurring fixed and variable costs such as annual program administrative costs, customer incentives, O&M, etc.
Global Parameters	Program lifetime, discount rate, inflation rate, line losses, avoided costs

Source: Guidehouse

4.3.1 Participation Assumptions and Hierarchy

Participation assumptions differ by customer class and segment. Participation assumptions are informed by ENO's current program enrollment data and projections from program implementers and benchmarking with similar programs offered by other utilities.

Participation assumptions are developed as "% of eligible customers":

- For the EasyCool program, eligible customers are those with CAC/HP and electric water heating.
- For the BYOT option within DLC, the DR team obtained smart thermostat penetration from the EE study and used that data to inform total number of eligible customers for the BYOT program. The team applied participation assumptions to these eligible customers.

- Residential customers not enrolled in DLC participate in PTR.

- For the C&I curtailment program, for commercial customers with HVAC control, only automated DR is considered based on ENO's current Large Commercial DR program offer. Therefore, customers with EMSs that can be preprogrammed to execute curtailment strategies in response to DR event signals are eligible to participate. In this case, the DR team obtained EMS saturation projections from the EE analysis and used that information to establish eligibility in C&I curtailment DR program participation. In addition to HVAC control using Auto-DR, the analysis also assessed potential available from other end uses such as lighting, water heating, and industrial loads.

  Large C&I customers who are not enrolled in the C&I Curtailment program are eligible to enroll in dynamic pricing.

- Small C&I customers are eligible to enroll in either PTR or Dynamic Pricing.

- For Dynamic Pricing, Guidehouse assumed that the CPP rate is offered to customers once AMI is deployed. Customers not enrolled in DLC, C&I Curtailment, and PTR (based on customer class) are eligible for Dynamic Pricing.

- For the BTMS program, only customers with BTM batteries tied to solar PV can participate and therefore participation in the DR program is tied to battery adoption projections.

- For EV managed charging, customers with Level 2 chargers are eligible; this does not overlap with any of the other DR options.

Table 33 presents the participation hierarchy for this study, whereby achievable participation estimates are applied to eligible customers only. The participation hierarchy presented here is a well-tested approach that has been followed in DR potential studies in other jurisdictions. The participation hierarchy helps avoid double counting of potential through common load participation across multiple programs and is necessary to arrive at an aggregate potential estimate for the entire portfolio of DR programs.

Table 33. Program Hierarchy to Account for Participation Overlaps

Customer Class	DR Options	Eligible Customers
Residential	DLC - Thermostat	Customers with CAC or HPs controlled using smart thermostats
	DLC - Switch	For water heating control: customers with electric water heating
	PTR	Customers not enrolled in DLC
	Dynamic Pricing	Customers not enrolled in DLC and PTR
	BTMS	NEM customers with BTM batteries
	EV Managed Charging	All customers with Level 2 chargers
Small C&I	PTR	All customers
	Dynamic Pricing	Customers not enrolled in PTR
Large C&I	C&I Curtailment	All customers
	Dynamic Pricing	Customers not enrolled in C&I curtailment

Source: Guidehouse

The Low and High scenarios for DR assumed lower and higher participation levels in DR programs than the Reference Case. The Low scenario assumed lower incentive levels than what was assumed for the Reference case and consequently lower levels of program participation. The High scenario similarly assumed higher levels of incentive than the Reference case and consequently higher participation levels in DR. The degree of change in participation with respect to incentives is based on data available from other jurisdictions. For dynamic pricing, which does not have any incentive level associated with it since it is a rate-based offer, the High and Low scenarios assumed higher and lower marketing efforts than the Reference case, which in turn lead to changes in enrollment levels for dynamic pricing when compared with the Reference case.

4.3.2 Unit Impact Assumptions

The unit impacts specify the amount of load that could be reduced during a DR event by customers enrolled in a DR program. Unit impacts differ by suboption because these are tied to specific end uses and control strategies. Unit impacts can be specified either directly as kilowatt reduction per participant or as percentage of enrolled load (as "% of end use" for some sub-options or as "% of total load" for other suboptions): [51]

- DLC suboptions (for smart thermostat) use kilowatt reduction per thermostat and per participant values based on EasyCool program evaluation
- C&I curtailment suboptions use percentage of the enduse load or total facility load
- PTR uses load reduction per participant based on Plan information

[51] The unit impact values assume a 4-hour event duration, and the values represent the average load reduction over the 4-hour event duration.

- Dynamic pricing uses a percentage of the total facility load
- BTMS uses load reduction per battery based on pilot data
- EV managed charging uses charging load reduction per vehicle based on Plan information

This study used ENO's program accomplishments, plan information, and the latest available secondary sources of information for other programs for the unit impact assumptions.

4.3.3 Cost Assumptions

Guidehouse developed itemized cost assumptions for each DR option to calculate annual program costs and levelized costs for each option. These assumptions also feed the cost-effectiveness calculations in this study. For DR options which represent ENO's current and planned program/pilot activities, cost assumptions are sourced from the program/pilot cost data provided by ENO. These cost assumptions are broadly categorized into incentive and non-incentive costs. The proportion of incentive and non-incentive costs is based on program/pilot data provided by ENO. For new DR options, such as Dynamic Pricing, Guidehouse developed itemized cost assumptions based on experiences from other jurisdictions.

In addition to the cost assumptions for DR options, the following variables feed the cost-effectiveness calculations in this study:

- **Nominal discount rate, societal discount rate,** and **inflation rate** are described in Appendix A
- **Transmission and distribution (T&D) line loss** of 4.4% (supplied by ENO)
- **Program life**, assumed to be 10 years for DLC, C&I curtailment, and BTMS and 20 years for dynamic pricing

To assess the benefits associated with DR programs, Guidehouse used the avoided generation capacity projections provided by ENO. Guidehouse calculated benefit-cost ratios for the TRC and Utility Cost Test (UCT), consistent with the Council's IRP rules. The TRC benefit-cost ratios are used for screening for cost-effectiveness using a 1.0 benefit-cost ratio threshold.

5. EE Achievable Potential

This section provides the results of the EE achievable potential analysis.

5.1 Model Calibration

Calibrating a predictive model is challenging, as future data is not available to compare against model predictions. Whereas engineering models can often be calibrated to a high degree of accuracy because simulated performance can be compared directly with performance of actual hardware, predictive models do not have this luxury. DSM models must rely on other techniques to provide the developer and the recipient with a level of comfort that simulated results are reasonable. More details are provided in Appendix D. For this study, Guidehouse took several steps to ensure that the forecast model results are reasonable and consider historic adoption:

- Comparing forecast values by sector and end use, typically against historic achieved savings (e.g., program savings from 2020-2022) and savings for PY 13 (2023) as of Q3 2023. Although some studies indicate DSM potential models are calibrated to ensure first-year simulated savings precisely equal prior-year reported savings, Guidehouse notes that forcing such precise agreement may 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., a program is rapidly ramping up or savings estimates have changed). Although the team endeavored to achieve reasonable agreement between past results and forecast first-year results, the team's approach did not force the model to do so, providing confidence that the model is internally consistent.[52]

- Identifying and ensuring an explanation exists for significant discrepancies between forecast savings and prior-year savings, recognizing that some ramp up is expected, especially for new measures or archetype programs.

- Calculating $/first-year kilowatt-hour costs and comparing those to past results.

- Calculating the split (percentage) in spending between incentives and variable administrative costs predicted by the model to historic values.

- Calculating total spending and comparing the resulting values to historical spending.

This calibration cycle was challenging as there have been significant shifts in measures. Through June 2023, residential lighting has been a large proportion of ENO programs. Going forward, ENO's portfolio will not have the relative low cost and highly cost-effective residential lighting savings due to federal standards. Therefore, in calibration, Guidehouse adjusted the historical reference points to address this shift. Furthermore, as of PY 10 (2020), ES program achievements in the C&I sector have been below the plan values. C&I program changes may be a result of the COVID-19 pandemic and other market impacts.

[52] Certain adjustments to historical data were made to address the market changes such as removing residential lighting from the portfolio, which impacts both savings and costs per unit saved.

5.2 Achievable Potential Cases

A key component of a potential study is determining the appropriate level to set measure incentives for each case. For ENO, the incentive-level strategy characterized is the percentage of incremental measure cost approach. This approach calculates measure-level incentives based on a specified percentage of incremental measure costs. For example, if the specified incentive percentage was 50% and a measure's incremental cost was $100, then the calculated incentive for that measure would be $50. Guidehouse used the percentages provided by ENO's program administrator, APTIM, by sector and end use. In all cases, a measure's incentive is capped at 100% of incremental measure cost and IQ measures are incentivized at 100% (except for the Low case).

Guidehouse ran multiple cases for achievable potential summarized in Table 34. The following subsections describe these approaches.

Table 34. Overview of Achievable Potential Cases

Case	Behavior Participation	Incentives	TRC Threshold	Purpose
Low	Reduced	50% of current levels	1.0	Dampened program efforts
Reference	Expected	Current levels	0.9	Align with historic program achievements
2% Savings	Aggressive	Increased, 10x current levels	0.75	Target 2% electricity savings in 2025
High	Aggressive	Aggressive, 100x current levels	None	Demonstrating effect from aggressive program rollout

Note: In all cases, a measure's incentive is capped at 100% of incremental measure cost and IQ measures are incentivized at 100% (except for the Low savings case).

Source: Guidehouse

5.2.1 Reference Case

Because the actual program results for the PY 10-12 (2020-2022) plan were lower than forecast and PY 13 (2023) savings also are tracking to lower levels, Guidehouse used the historical achievements as the focus of the Reference case. The Reference case is the calibrated case. All other cases use the calibrated parameters defined by the Reference case as described in Appendix D.

This Reference case reflects the PY 10-12 and existing PY 13 data which include the savings achieved and the program administrative costs on a dollar per kWh saved basis. Administrative costs on a dollar per kilowatt-hour (kWh)-saved basis are the same as the historic program expenditure and are carried through the other cases.

APTIM, the ES program implementer, provided the incentive structure which ranges from 15% to 100% of incremental measure costs dependent on sector and end use. The TRC measure screening threshold for all measures is 0.9, recognizing the fact that numerous viable measures implemented through Energy Smart meet or exceed this level. Behavior program roll out matches the existing program planned rollout for participants, with the home energy reports program expected to achieve up to 70% participation in future years.

5.2.2 2% Savings Case

The savings goal under this case is the Council's goal of 2% of ENO sales by PY 15, 2025. The incentives assume ten times the existing levels up to a maximum of 100% and estimated aggressive behavior program participation rollout plan. The TRC measure screening threshold is relaxed to 0.75 from 0.9.

5.2.3 Low Case

The Low case uses the same inputs as the Reference case, except for lower levels of behavior program participation rollout. Incentives are set to 50% of current (or Reference case) levels.

5.2.4 High Case

The High case assumes higher incentives at 100 times the Reference case (up to 100% of incremental measure cost) and no change in administrative cost levels, on a dollar per kilowatt-hour-saved basis. Model assumptions use the same aggressive behavior program rollout for all sectors as used in the 2% savings case. There is no TRC measure screening threshold, as every measure is passed on to the achievable potential analysis.

5.3 Achievable Potential Results

Achievable potential values are termed annual incremental potential—they represent the incremental new potential available in each year. The total cumulative annual potential over the time period is the sum of each year's annual incremental achievable potential.[53] Economic potential can be thought of as a reservoir of cost-effective potential[54] from which programs can draw over time. Achievable potential represents the draining of that reservoir, the rate of which is governed by several factors including the lifetime of measures (for ROB technologies), market effectiveness, incentive levels, and customer willingness to adopt, among others. If the cumulative achievable potential ultimately reaches the economic potential, it will signify that all economic potential in the reservoir has been drawn down or harvested. However, achievable potential levels rarely reach the full economic potential level due to a variety of market and customer constraints that inhibit full economic adoption.[55]

All tables and figures that follow in this section (except for Section 5.3.1) present the potential savings for the Reference case only. Details for other cases have been prepared and are available.

[53] Cumulative potential for calculating reduction as a percentage of sales uses a value that does not double count savings. For example, the home energy reports behavior measure has a one-year life. However, subsequent savings in future years may not be new savings.

[54] Cost-effectiveness threshold is based on a TRC threshold. There were measures that were passed with TRC ratios below the set threshold where it was reasonable to assume that the measure is important to program implementation or included in past program delivery.

[55] Constraints on achievable potential that inhibit realization of the full economic potential include the rate at which homes and businesses will adopt efficient technologies, as well as the word of mouth and marketing effectiveness for the technology. If a technology already has high saturation at the beginning of the study, it may theoretically be possible to fully saturate the market and achieve 100% of the economic potential for that technology.

5.3.1 Achievable Potential by Case

As explained in Section 3.4.3, the achievable potential analysis was modeled with four cases. The cases are based on the incremental measure cost capping and shown in Table 35.

Table 35. Incentive Setting and Behavioral Program Participation by Case

Program Type	Reference	2% Savings	Low	High
Res Incentives	Based on historical values	10x Reference	50% of Reference	100x Reference
C&I Incentives				
Behavioral Participation	Planned rollout	High forecast	Low forecast	High forecast

Source: Guidehouse

Table 36 and Table 37 shows the incremental annual energy and peak demand potential for each case for WACC and Societal discount rate, respectively.

Table 36. Incremental Annual Achievable Potential by Case (WACC)

Year	Electricity (GWh)				Peak Demand (MW)			
	Reference	2%	High	Low	Reference	2%	High	Low
2024	70	98	119	49	19	25	30	14
2025	79	110	133	57	23	29	35	17
2026	84	114	138	61	25	33	38	19
2027	85	115	138	63	28	36	41	21
2028	89	117	141	66	30	39	45	24
2029	91	117	139	68	32	41	47	26
2030	89	114	135	68	34	42	48	27
2031	86	108	127	66	33	41	46	28
2032	79	99	115	62	32	38	43	27
2033	73	89	102	58	29	34	39	25
2034	65	78	88	53	26	29	34	23
2035	56	67	76	47	22	25	29	20
2036	50	58	65	42	19	20	24	18
2037	45	50	57	37	16	17	21	15
2038	40	44	51	34	14	14	18	13
2039	36	39	46	31	12	12	16	11
2040	34	37	44	28	11	11	15	10
2041	32	34	41	25	10	10	14	9
2042	30	32	38	23	9	10	13	8
2043	29	31	37	22	9	9	12	7

Source: Guidehouse analysis

Table 37. Incremental Annual Achievable Potential by Case (Societal)

Year	Electricity (GWh)				Peak Demand (MW)			
	Reference	2%	High	Low	Reference	2%	High	Low
2024	85	102	119	60	21	27	30	16
2025	85	115	133	68	23	31	35	19
2026	90	120	138	70	26	35	38	21
2027	92	121	138	71	29	38	41	23
2028	98	125	142	75	32	42	45	25
2029	99	123	139	75	34	44	47	27
2030	99	120	135	75	35	45	48	28
2031	96	114	127	73	35	44	46	29
2032	90	104	115	69	34	41	43	28
2033	82	94	102	64	31	37	39	26
2034	76	82	88	59	28	32	34	24
2035	67	70	76	54	24	27	29	21
2036	59	61	65	48	21	23	24	19
2037	53	53	57	45	18	19	21	16
2038	48	47	51	40	16	17	18	14
2039	44	43	46	36	14	15	16	12
2040	41	40	44	34	13	14	15	11
2041	38	38	41	31	12	12	14	9
2042	35	36	38	28	11	12	13	8
2043	33	34	37	28	10	11	12	8

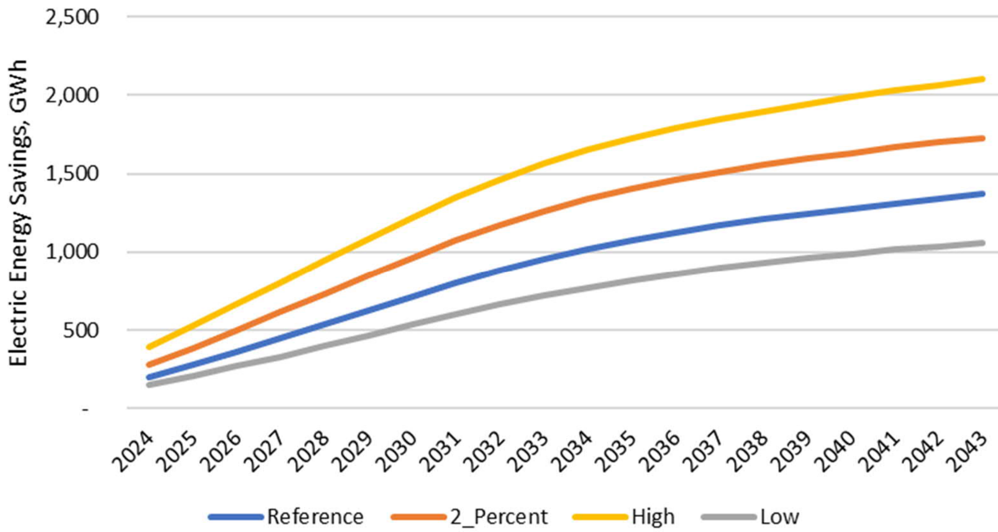
Source: Guidehouse analysis

Figure 25 and Figure 26 show the cumulative annual electric energy and peak demand savings for each case using the WACC. The range of savings increases over the 20-year period, with the Low case more than 1,000 GWh and the High case twice as large, with the pace of savings slowing by 2031 due to increasing saturation of existing set of measures. Each case has marked differences in the program design, i.e., changes in ENO-influenced parameters, including incentive level setting and behavioral program rollout.[56]

In comparison, the 2043 cumulative GWh and MW savings by discount rate is provided in Table 38. Discount rate for the high case does not impact the overall results since the high case has no cost-effectiveness threshold for the economic potential.

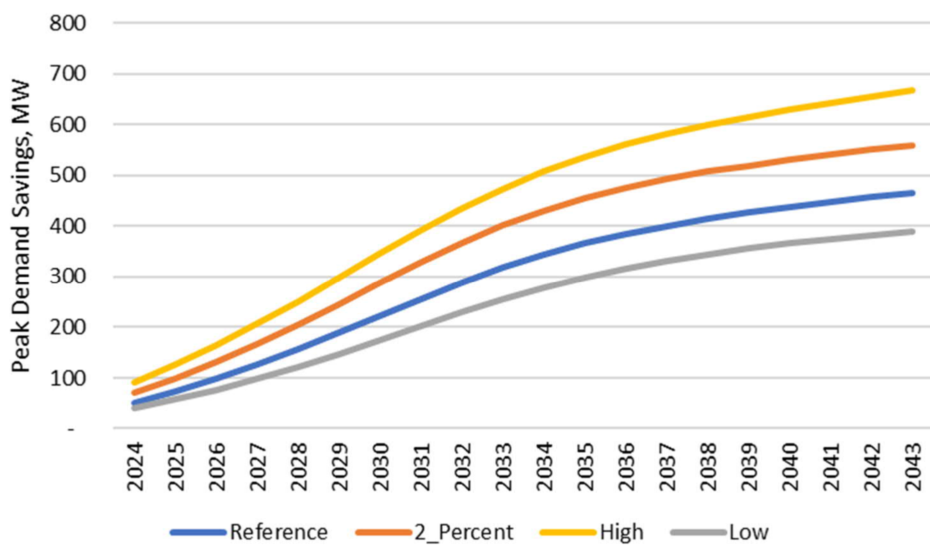
[56] Incentive levels influence the customer payback period, which results in a change in the payback acceptance curve influencing the market share potential of the energy efficient option. The payback acceptance curves for ENO were developed based on the results of customer surveys for a Midwest utility previously conducted by Guidehouse in 2015.

Figure 25. Cumulative Annual Achievable Electricity Potential by Case (GWh) (WACC)



Source: Guidehouse analysis

Figure 26. Cumulative Annual Achievable Peak Demand Potential by Case (MW) (WACC)



Source: Guidehouse analysis

Table 38. Cumulative 2043 Achievable Potential by Case, by Discount Rate

Discount Rate	Reference	2% Savings	High	Low
		Annual Energy Savings (GWh/year)		
WACC	1,370	1,729	2,105	1,060
Societal	1,563	1,858	2,106	1,221
		Peak Demand Savings (MW)		
WACC	466	560	668	389
Societal	499	616	668	411

Source: Guidehouse analysis

Table 39 shows the incremental annual achievable electricity potential as a percentage of ENO's total sales for each case using the WACC and Societal discount rate for the cost-effectiveness analysis. The 2% savings case, which targets achieving 2% by 2025, was based on calibrated adoption parameters based on the Reference case. As a result, the portfolio target with the WACC discount rate for saving at least 2% of sales shifts to 2027 through 2029. The 2% savings case, as well as the High case, falls below 2% in later years because most of the measures will be adopted, depleting the available potential in the future years.

This study only includes known, market-ready, quantifiable measures without introducing new measures in later years. However, over the lifetime of EE programs, new technologies and innovative program interventions could result in additional cost-effective energy savings. Therefore, the need to periodically revisit and reanalyze the potential forecast is necessary.

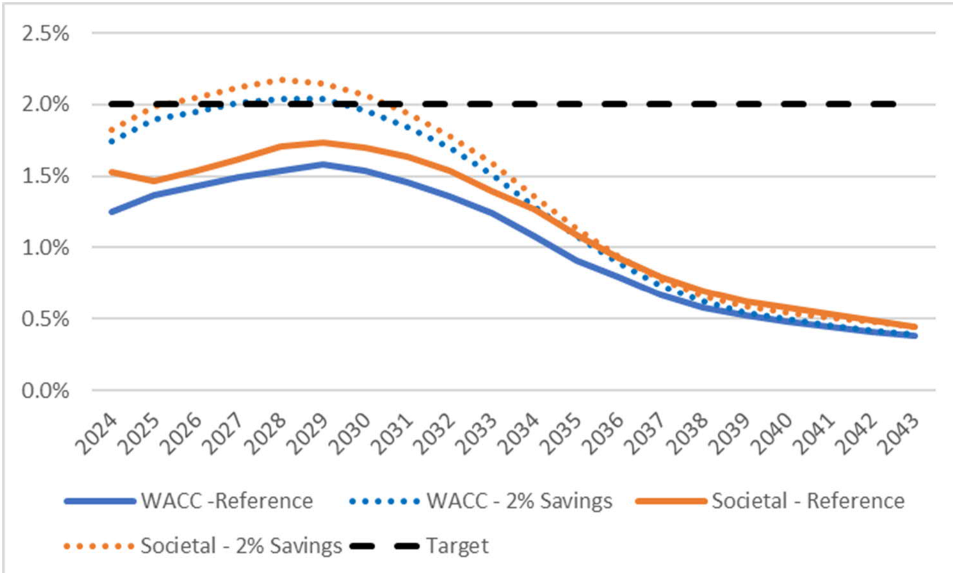
Table 39. Incremental Annual Achievable Electricity Potential, Percentage (%) of Sales (GWh) by Case by Discount Rate

	WACC				Societal			
Year	**Reference**	**2% Savings**	**High**	**Low**	**Reference**	**2% Savings**	**High**	**Low**
2024	1.25%	1.74%	2.11%	0.87%	1.53%	1.83%	2.11%	1.07%
2025	1.37%	1.90%	2.30%	0.99%	1.47%	1.99%	2.30%	1.18%
2026	1.43%	1.95%	2.34%	1.05%	1.54%	2.05%	2.34%	1.20%
2027	1.49%	2.01%	2.42%	1.11%	1.62%	2.12%	2.42%	1.24%
2028	1.54%	2.04%	2.44%	1.16%	1.71%	2.17%	2.46%	1.31%
2029	1.58%	2.04%	2.43%	1.20%	1.73%	2.15%	2.42%	1.31%
2030	1.54%	1.96%	2.32%	1.18%	1.70%	2.07%	2.32%	1.29%
2031	1.46%	1.84%	2.16%	1.14%	1.63%	1.94%	2.16%	1.24%
2032	1.36%	1.70%	1.97%	1.08%	1.54%	1.78%	1.97%	1.19%
2033	1.24%	1.51%	1.72%	0.99%	1.40%	1.59%	1.72%	1.09%
2034	1.08%	1.29%	1.46%	0.89%	1.26%	1.36%	1.46%	0.98%
2035	0.91%	1.08%	1.21%	0.77%	1.09%	1.13%	1.21%	0.88%
2036	0.79%	0.89%	1.00%	0.66%	0.93%	0.94%	1.00%	0.76%
2037	0.67%	0.73%	0.82%	0.57%	0.80%	0.77%	0.82%	0.68%
2038	0.58%	0.62%	0.70%	0.50%	0.70%	0.66%	0.70%	0.60%
2039	0.52%	0.54%	0.62%	0.44%	0.63%	0.59%	0.62%	0.53%
2040	0.48%	0.50%	0.58%	0.40%	0.58%	0.54%	0.58%	0.48%
2041	0.44%	0.45%	0.54%	0.35%	0.53%	0.50%	0.54%	0.44%
2042	0.41%	0.42%	0.50%	0.32%	0.49%	0.48%	0.50%	0.40%
2043	0.38%	0.39%	0.47%	0.29%	0.45%	0.44%	0.47%	0.38%

Source: Guidehouse analysis

Figure 27 provides the percentage of sales results when using WACC and societal discount rate. In these results, the portfolio savings achieve at least 2% of sales in 2025 through 2030 in the 2% case with societal discount rate. For both the WACC and societal discount rate analysis, the latter years (after 2035) converge as the market is saturated.

Figure 27. Incremental Annual Achievable Electricity Potential, Percentage (%) of Sales by Reference and 2% Savings Case by Discount Rate



Source: Guidehouse analysis

The total, administrative, and incentive costs for each case are provided in Table 40 and Table 41 for each year of the study period for WACC and Societal discount rate, respectively. It is important to note the differences in these cases as compared with the savings achieved. Administrative spending is relatively consistent between the cases, while incentive spending varies between the cases, with higher spending correlated to higher savings. The differences in discount rate are reflected by a larger portfolio with more measure cost-effective.

Table 40. Achievable Potential using WACC, Annual Investment by Case (million $)[57]

	Total Investment				Incentives				Administrative Costs			
Year	**Ref.**	**2%**	**High**	**Low**	**Ref.**	**2%**	**High**	**Low**	**Ref.**	**2%**	**High**	**Low**
2024	$11	$32	$81	$6	$6	$25	$71	$2	$5	$8	$10	$4
2025	$13	$37	$98	$7	$7	$28	$87	$2	$6	$9	$11	$5
2026	$15	$39	$104	$8	$8	$29	$91	$2	$7	$10	$12	$5
2027	$16	$41	$107	$8	$9	$30	$95	$3	$7	$10	$13	$6
2028	$18	$42	$115	$9	$10	$32	$101	$3	$8	$11	$13	$6
2029	$19	$43	$116	$10	$11	$32	$102	$3	$8	$11	$14	$7

[57] Totals may not sum due to rounding.

	Total Investment				Incentives				Administrative Costs			
2030	$20	$43	$117	$10	$11	$32	$103	$4	$9	$11	$14	$7
2031	$20	$42	$113	$11	$11	$31	$100	$4	$8	$11	$13	$7
2032	$19	$39	$105	$10	$11	$29	$93	$4	$8	$10	$12	$7
2033	$17	$36	$95	$10	$10	$27	$85	$4	$7	$9	$11	$6
2034	$15	$31	$86	$10	$9	$23	$76	$4	$6	$8	$9	$6
2035	$12	$26	$75	$9	$7	$20	$67	$3	$5	$7	$8	$5
2036	$11	$22	$67	$8	$6	$16	$60	$3	$5	$6	$7	$5
2037	$9	$18	$59	$7	$5	$14	$54	$3	$4	$5	$6	$4
2038	$8	$15	$54	$6	$4	$11	$49	$3	$4	$4	$5	$4
2039	$7	$13	$50	$6	$4	$9	$45	$2	$3	$3	$4	$3
2040	$6	$11	$47	$5	$3	$8	$43	$2	$3	$3	$4	$3
2041	$5	$10	$44	$4	$3	$7	$40	$2	$2	$3	$4	$3
2042	$5	$8	$41	$4	$2	$6	$38	$2	$2	$2	$3	$2
2043	$4	$8	$39	$4	$2	$6	$36	$2	$2	$2	$3	$2
Total	**$250**	**$558**	**$1,613**	**$152**	**$139**	**$415**	**$1,439**	**$56**	**$111**	**$143**	**$174**	**$96**

Source: Guidehouse analysis

Table 41. Achievable Potential using Societal, Annual Investment by Case (million $)[58]

	Total Investment				Incentives				Administrative Costs			
Year	**Ref.**	**2%**	**High**	**Low**	**Ref.**	**2%**	**High**	**Low**	**Ref.**	**2%**	**High**	**Low**
2024	$14	$38	$81	$7	$8	$30	$71	$3	$7	$8	$10	$5
2025	$15	$44	$98	$9	$8	$34	$87	$3	$7	$10	$11	$6
2026	$17	$47	$103	$9	$9	$37	$91	$3	$8	$10	$12	$6
2027	$19	$50	$107	$10	$10	$39	$94	$3	$8	$11	$13	$6
2028	$21	$53	$115	$11	$12	$41	$101	$4	$9	$12	$13	$7
2029	$22	$54	$115	$11	$13	$42	$102	$4	$9	$12	$14	$7

[58] Totals may not sum due to rounding.

	Total Investment				Incentives				Administrative Costs			
2030	$23	$55	$117	$12	$14	$43	$103	$4	$10	$12	$14	$8
2031	$24	$54	$113	$12	$14	$42	$100	$4	$10	$12	$13	$8
2032	$23	$50	$105	$12	$14	$40	$93	$4	$9	$11	$12	$7
2033	$21	$47	$95	$11	$13	$37	$84	$4	$8	$10	$11	$7
2034	$20	$42	$85	$11	$12	$33	$76	$4	$8	$9	$9	$6
2035	$18	$36	$75	$10	$11	$29	$67	$4	$7	$7	$8	$6
2036	$16	$32	$67	$9	$10	$26	$60	$4	$6	$6	$7	$5
2037	$14	$28	$59	$9	$9	$23	$53	$4	$5	$5	$6	$5
2038	$12	$25	$53	$8	$8	$20	$48	$4	$5	$4	$5	$5
2039	$11	$22	$49	$7	$7	$18	$45	$3	$4	$4	$4	$4
2040	$10	$21	$47	$7	$6	$17	$43	$3	$4	$4	$4	$4
2041	$9	$19	$43	$6	$6	$16	$40	$3	$3	$3	$4	$3
2042	$8	$18	$40	$6	$5	$15	$37	$3	$3	$3	$3	$3
2043	$7	$17	$38	$6	$5	$14	$35	$3	$3	$3	$3	$3
Total	**$325**	**$750**	**$1,605**	**$183**	**$193**	**$595**	**$1,431**	**$70**	**$132**	**$155**	**$174**	**$113**

Source: Guidehouse analysis

The TRC test is a benefit-cost metric that measures the net benefits of EE measures from the combined stakeholder viewpoint of the program administrator (utility) and program participants. The TRC benefit-cost ratio is calculated in the model using Equation 4.

Guidehouse calculated TRC ratios for each measure based on the present value of benefits and costs (as defined by the numerator and denominator, respectively) over each measure's life. Avoided costs, discount rates, and other key data inputs used in the TRC calculation are presented in Appendix A.8. Effects of free ridership and spillover are not present in the results from this study, so the team did not apply an NTG factor. Providing gross savings results will allow the utility to easily apply updated NTG assumptions in the future and allow for variations in NTG assumptions by reviewers.

The TRC ratios for these cases are provided by year in Table 42. All cases are cost-effective except for the High case where the TRC screening is not used in the achievable potential calculation. The large increases in incentives for the High case do not impact the cost-effectiveness. Increasing incentives do not necessarily translate to a lower TRC because incentives are considered a transfer cost. However, higher incentives may make higher cost measures more attractive to end users and spur their adoption. Thus, where incentives increase as a percentage of measure cost, TRC ratios can be lower even though incentives are not part of the TRC calculation.

One of the screening criteria in the potential analysis is for the measures to pass the TRC test. A handful of measures with a TRC < 1.0 were included in the analysis. As a result, the portfolio is still cost-effective. Typically, the more aggressive the portfolio, the lower the TRC, as more lower cost-effective measures are added and administrative efforts increase to address more services to the market.

Table 42 provides the TRC for each case and for each discount rate. Guidehouse calculated the ratio for both the WACC and the societal discount rate. The results with the societal discount rate also use the lower discount rate for the economic screening.

Table 42. Portfolio TRC Test Ratios, Achievable Potential, by Case and by Discount Rate

Year	Reference		2% Savings		High		Low	
Discount Rate	WACC	Societal	WACC	Societal	WACC	Societal	WACC	Societal
2024	1.57	1.96	1.33	1.73	0.71	0.89	2.04	2.40
2025	1.63	2.24	1.35	1.76	0.69	0.88	2.06	2.51
2026	1.69	2.34	1.40	1.81	0.72	0.92	2.12	2.73
2027	1.73	2.41	1.44	1.86	0.75	0.96	2.15	2.88
2028	1.79	2.50	1.51	1.93	0.76	0.99	2.20	3.03
2029	1.87	2.57	1.60	1.98	0.79	1.03	2.28	3.19
2030	1.92	2.61	1.68	2.02	0.80	1.05	2.36	3.24
2031	1.98	2.61	1.77	2.05	0.82	1.07	2.44	3.28
2032	2.02	2.59	1.86	2.05	0.83	1.08	2.53	3.26
2033	2.00	2.55	1.93	2.02	0.82	1.08	2.62	3.21
2034	2.02	2.42	2.00	1.98	0.80	1.05	2.71	3.11
2035	2.06	2.32	2.06	1.92	0.78	1.02	2.79	2.93
2036	2.09	2.20	2.10	1.85	0.75	0.98	2.72	2.80
2037	2.06	2.09	2.06	1.78	0.71	0.94	2.34	2.51
2038	2.09	1.99	2.08	1.72	0.68	0.90	2.20	2.38
2039	2.11	1.92	2.07	1.67	0.66	0.87	2.08	2.26
2040	2.17	1.89	2.11	1.66	0.64	0.84	2.13	2.18
2041	2.20	1.85	2.12	1.63	0.63	0.83	2.13	2.09
2042	2.22	1.84	2.13	1.61	0.62	0.82	2.15	2.03
2043	2.21	1.85	2.15	1.59	0.62	0.81	2.18	1.85
2024-2043	1.78	2.31	1.51	1.86	0.72	0.95	2.16	2.80

Source: Guidehouse analysis

5.3.2 Achievable Potential by Sector

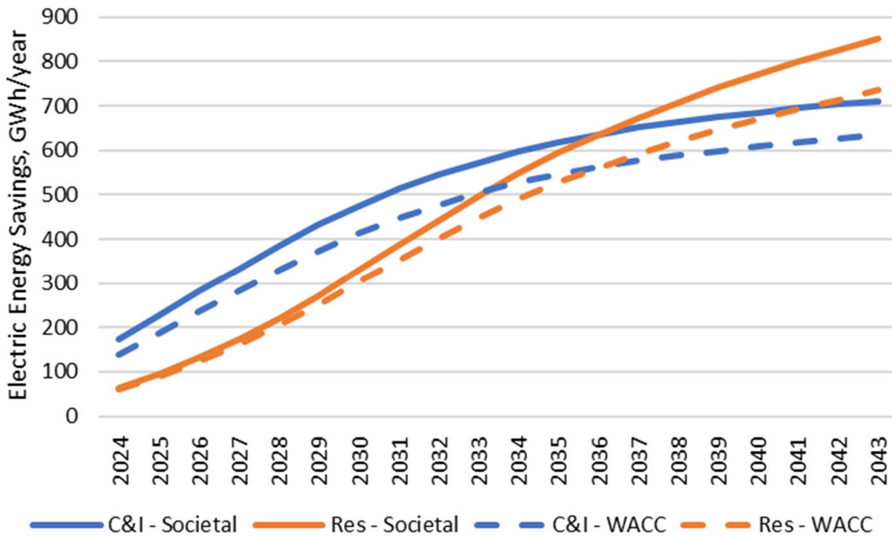
Table 43 provides the incremental achievable electric energy savings by sector for the Reference case. The Residential savings grow through 2031 and then start declining as technologies saturate, but level off. The C&I savings grow for the first 3 years and then gradual decline through to 2043. Breakdown of the residential sector into market rate and income qualified customers is provided in Appendix 7.4B.

Table 43. Incremental Annual Achievable Electric Savings (GWh) Potential by Sector, Reference Case

Year	Res - WACC	C&I - WACC	Res - Societal	C&I - Societal
2024	25.4	44.8	27.0	58.4
2025	29.1	49.8	31.2	54.0
2026	33.5	50.2	36.2	54.1
2027	38.3	46.9	41.6	50.7
2028	43.0	45.9	47.1	51.3
2029	47.1	43.6	52.0	47.2
2030	49.9	39.5	55.7	42.9
2031	50.8	34.7	57.5	38.0
2032	49.4	29.7	56.9	32.7
2033	45.9	26.7	54.3	27.7
2034	41.9	22.7	50.5	25.2
2035	36.9	19.0	46.1	20.7
2036	34.3	16.1	41.9	17.4
2037	31.0	13.9	38.2	14.7
2038	28.0	12.0	35.1	12.6
2039	25.7	10.7	32.5	11.1
2040	24.1	10.2	30.3	10.7
2041	22.7	9.1	28.4	9.5
2042	21.6	8.3	26.6	8.6
2043	20.9	7.7	25.3	7.9

Figure 28 shows the cumulative annual achievable electricity potential by sector for the Reference case, which is calibrated based on the historical ENO portfolio performance. In following the existing drop-off for the C&I savings, the forecast shows that C&I savings increases initially until market penetration of efficiency levels off.

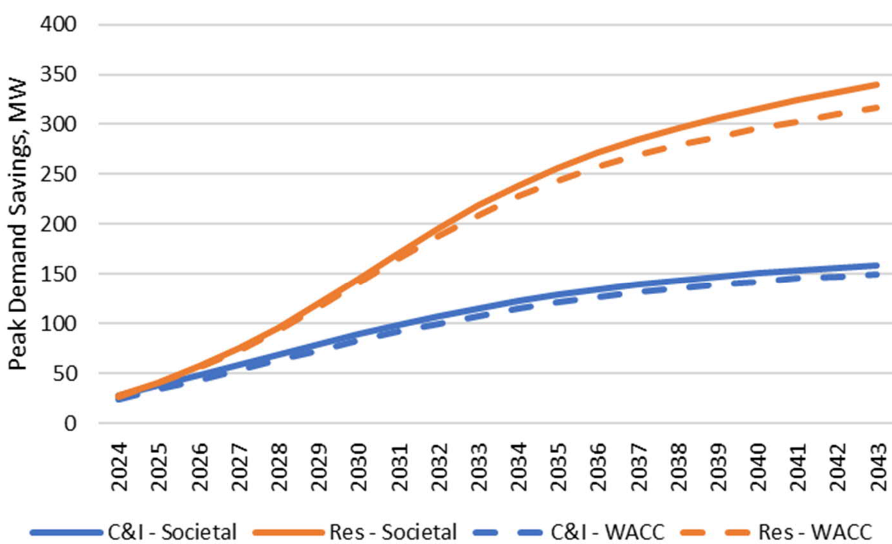
Figure 28. Cumulative Annual Achievable Electric Savings (GWh) Potential by Sector, Reference Case



Source: Guidehouse analysis

Figure 29 shows the cumulative annual achievable peak demand potential by sector for the Reference case.

Figure 29. Cumulative Annual Achievable Peak Demand (MW) Potential by Sector, Reference Case



Source: Guidehouse analysis

Table 44 shows the cumulative annual achievable electricity potential as a percentage of ENO's total sales for each sector for the Reference case. The residential sector accounts for a larger percentage than the C&I sector. Changing the discount rate increases the residential sector more than the commercial sector energy efficiency impacts.

Table 44. Cumulative Annual Achievable Electricity Potential by Sector, Percentage of Sales, Reference Case (%, GWh)

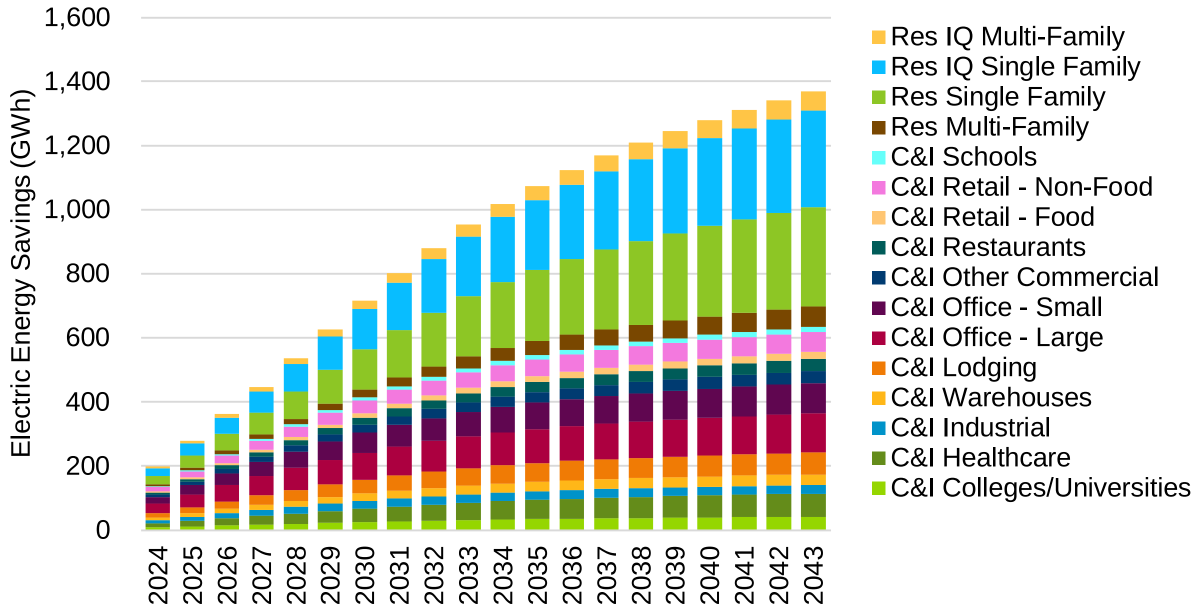
	WACC			Societal		
Year	**Total**	**Res**	**C&I**	**Total**	**Res**	**C&I**
2024	3.6%	2.7%	4.2%	4.3%	2.8%	5.3%
2025	4.9%	4.0%	5.6%	5.8%	4.2%	6.8%
2026	6.4%	5.4%	7.0%	7.3%	5.8%	8.3%
2027	7.9%	7.1%	8.4%	8.9%	7.6%	9.8%
2028	9.4%	9.0%	9.7%	10.6%	9.7%	11.3%
2029	11.0%	11.0%	11.0%	12.4%	11.9%	12.7%
2030	12.5%	13.2%	12.1%	14.1%	14.3%	13.9%
2031	14.0%	15.4%	13.1%	15.7%	16.8%	14.9%
2032	15.3%	17.5%	13.9%	17.2%	19.2%	15.9%
2033	16.6%	19.4%	14.7%	18.6%	21.5%	16.7%
2034	17.7%	21.2%	15.3%	19.9%	23.7%	17.4%
2035	18.6%	22.7%	15.8%	21.0%	25.5%	17.9%
2036	19.3%	24.0%	16.2%	21.9%	27.2%	18.3%
2037	20.0%	25.2%	16.5%	22.7%	28.6%	18.7%
2038	20.6%	26.2%	16.8%	23.4%	29.9%	19.0%
2039	21.1%	27.1%	17.1%	24.0%	31.1%	19.2%
2040	21.6%	28.0%	17.3%	24.6%	32.2%	19.4%
2041	22.0%	28.8%	17.5%	25.1%	33.2%	19.6%
2042	22.5%	29.5%	17.6%	25.6%	34.2%	19.8%
2043	22.8%	30.3%	17.8%	26.1%	35.1%	19.9%

Source: Guidehouse analysis

5.3.3 Achievable Potential by Customer Segment

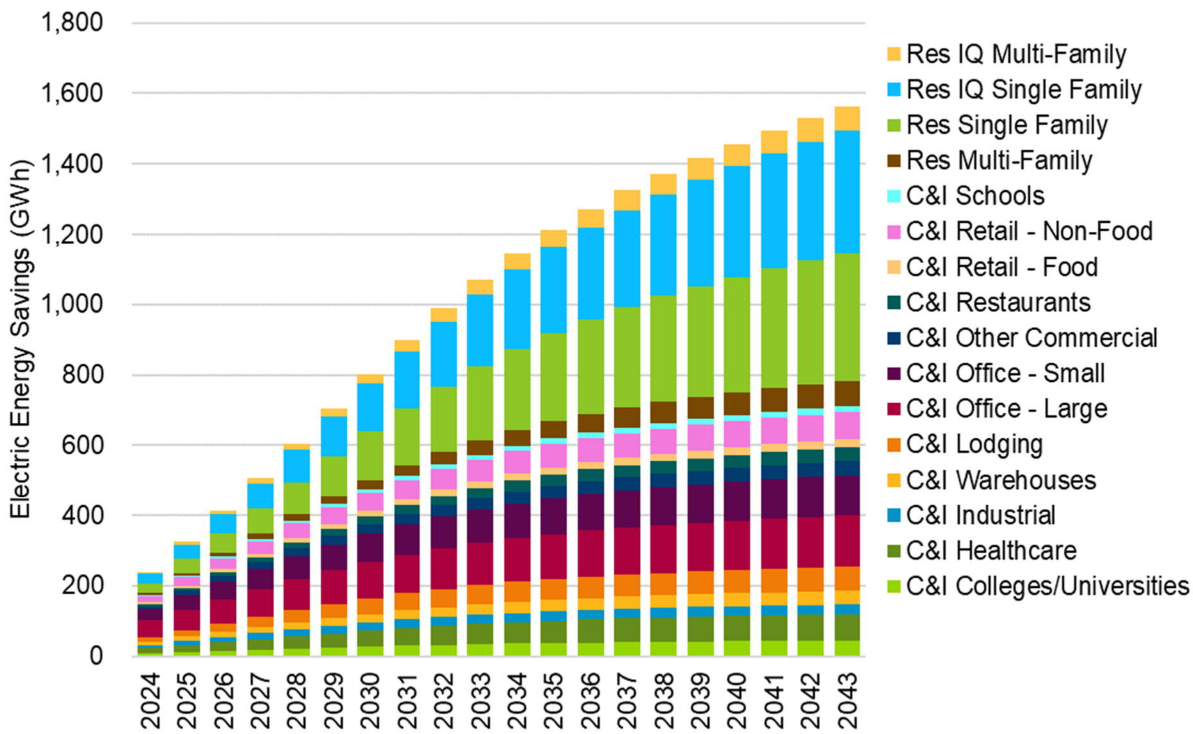
Figure 30 and Figure 31 shows the cumulative annual achievable electric energy potential by customer segment for the Reference case by WACC and Societal discount rate, respectively. The potential which grows from 200 GWh in 2024 to almost 1,400 GWh in 2043 for the WACC. The Societal discount rate case shows a larger growth over time but the same relative distribution across segments. Single-family (IQ and non-IQ) homes make up the largest residential segment, while large and small offices contribute the most savings to the C&I sector.

Figure 30. Reference Case Cumulative Annual Achievable Energy Savings Potential by Customer Segment, WACC



Source: Guidehouse analysis

Figure 31. Reference Case Cumulative Annual Achievable Energy Savings Potential by Customer Segment, Societal



Source: Guidehouse analysis

5.3.4 Achievable Potential by End Use

Figure 32 and Figure 33 show the percentage Reference case achievable potential by end use for the residential and C&I sectors in 2030 for WACC, respectively. The lighting interior for C&I only and HVAC end use for both sectors have the largest potential. The high HVAC end use savings contribution are associated with envelope and systems that affect both heating and cooling. ENO has a relatively high penetration of electric heating, which contributes to this factor even though New Orleans experiences rather low heating degree days and high cooling degree days. The total facility end use are for holistic measures, such as the behavior program.

Figure 32. Residential Achievable Electricity Potential by End Use, Reference Case, 2030 (%), WACC

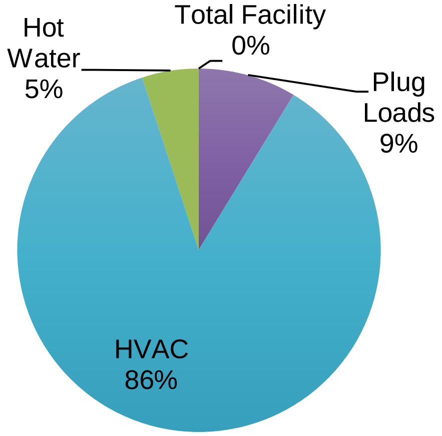
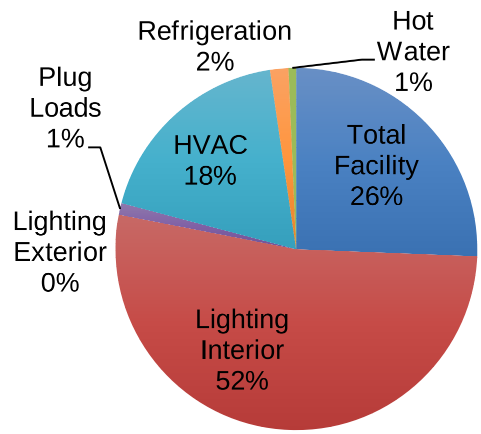


Figure 33. C&I Achievable Electricity Potential by End Use, Reference Case, 2030 (%), WACC



Source: Guidehouse analysis

Figure 34 and Figure 35 show the percentage Reference case achievable potential by end use for the residential and C&I sectors in 2030 using the societal discount rate. The discount rate slightly shifts the impacts to more plug loads as a percentage of sector level savings for the Societal discount rate.

Figure 34. Residential Achievable Electricity Potential by End Use, Reference Case, 2030 (%), Societal

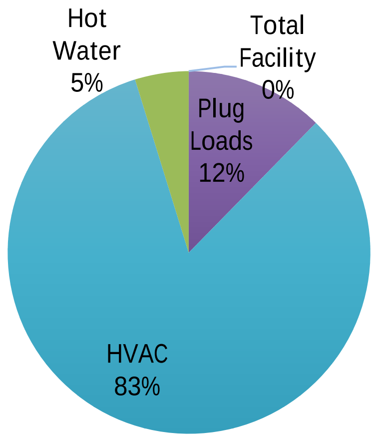
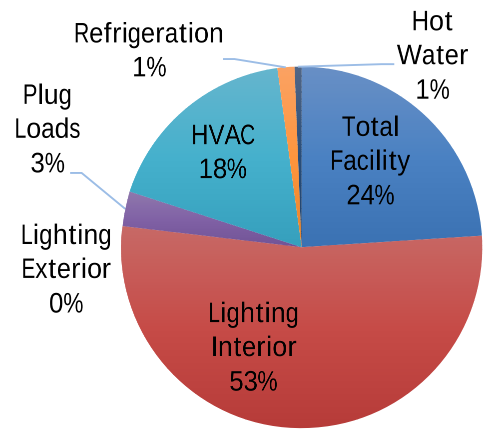


Figure 35. C&I Achievable Electricity Potential by End Use, Reference Case, 2030 (%), Societal



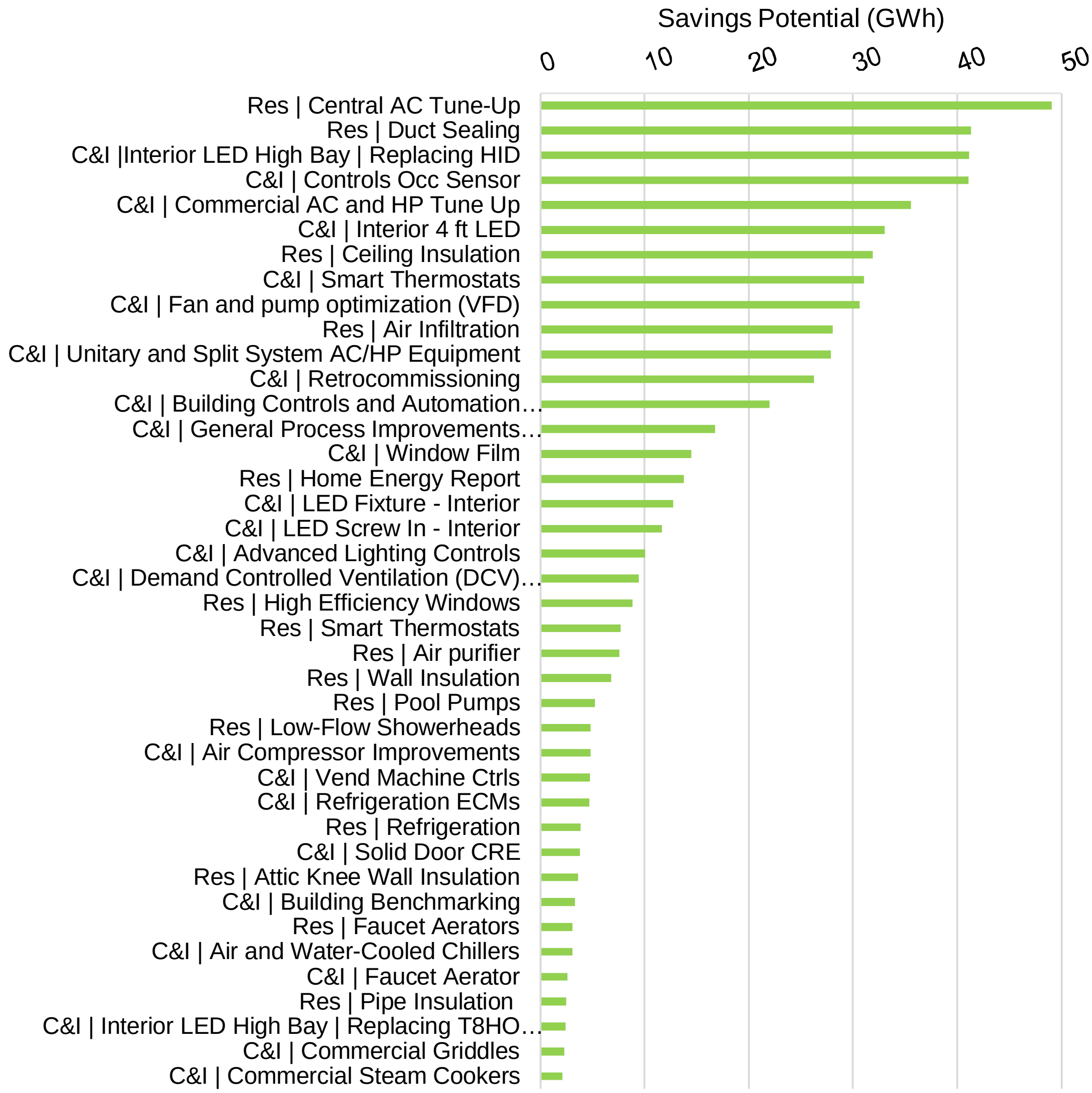
Source: Guidehouse analysis

5.3.5 Achievable Potential by Measure

Figure 36 and Figure 37 show the top 40 measures contributing to the cumulative achievable electricity savings potential in 2030 for WACC and Societal discount rate, respectively. For the WACC, interior high bay LEDs and occupancy sensor controls in the C&I sector provide the most savings, followed by AC and HP tune-up, 4-foot LEDs, and smart thermostats. For the Societal discount rate, C&I sector occupancy controls, retrocommissioning, and interior high bay LEDs are the top three measures. The order of largest measure has shifted.

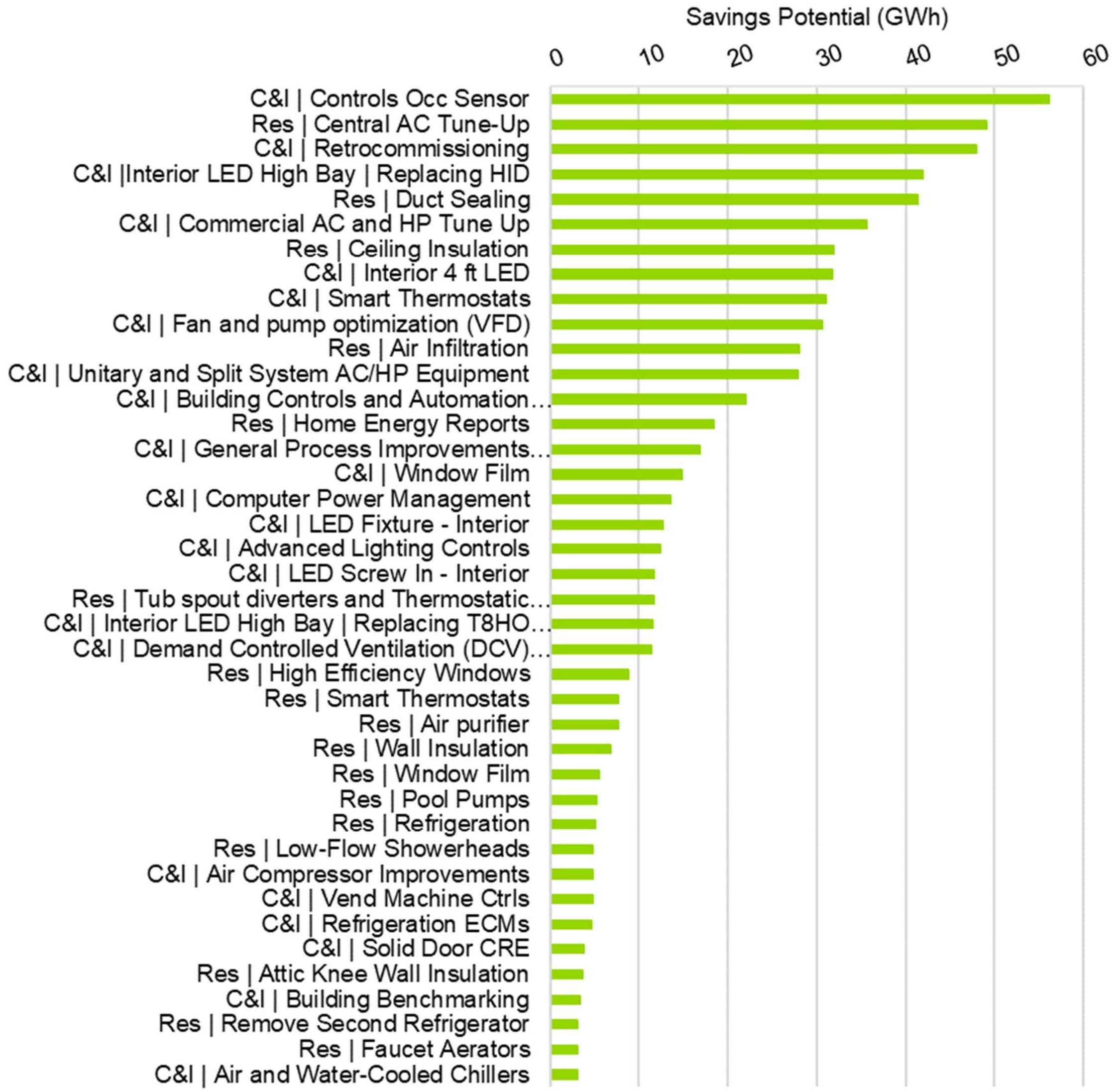
Central AC tune-up and duct sealing contribute the most residential sector savings in 2030 for the WACC. For societal discount rate, the order of highest residential savings has not changed. Home energy reports do not show up as the savings do not accumulate year over year and must be renewed with program intervention.

Figure 36. Cumulative Achievable Potential, Reference Case, 2030 Electricity Savings (GWh) – Top 40 Measures, WACC



Source: Guidehouse analysis

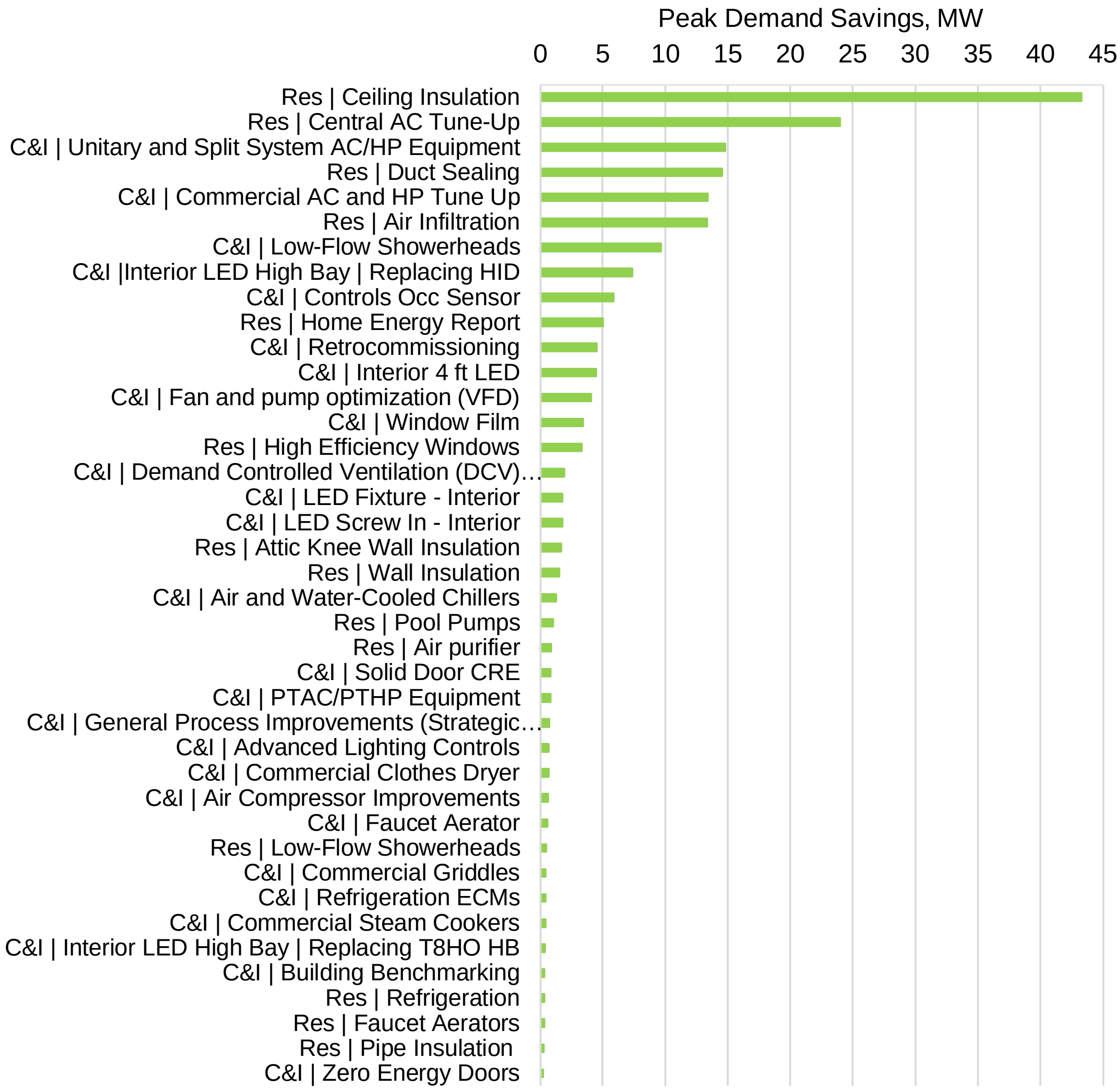
Figure 37. Cumulative Achievable Potential, Reference Case, 2030 Electricity Savings (GWh) – Top 40 Measures, Societal



Source: Guidehouse analysis

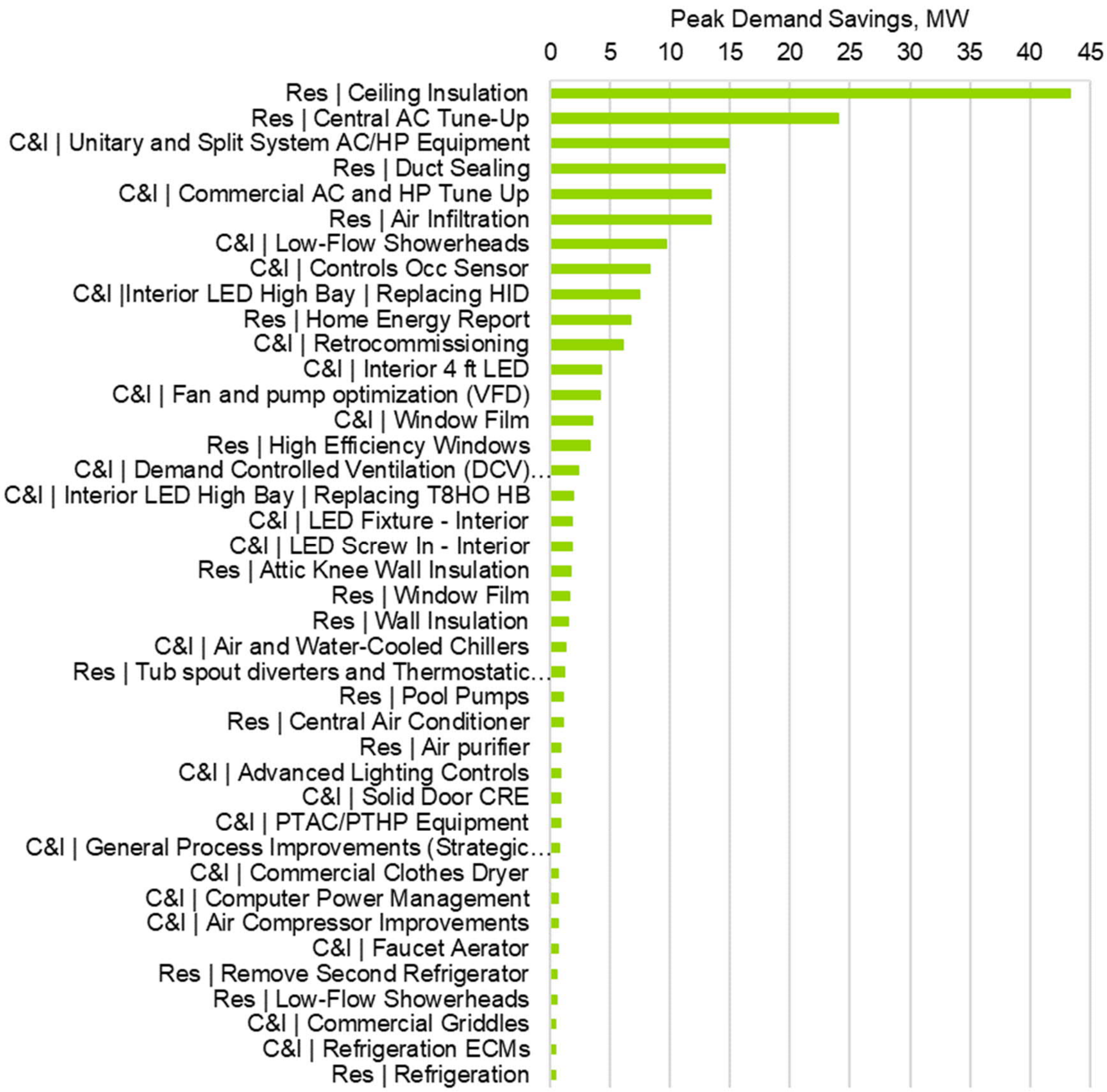
Figure 38 and Figure 39 show the top 40 measures contributing to the cumulative achievable peak demand potential in 2030 for the Reference savings case with WACC and Societal discount rate, respectively. The top measures are different than those listed for electric energy. Residential sector ceiling insulation and CAC tune-ups are the highest demand savings. For the C&I sector, the highest savings are unitary and split system AC/HP equipment. There is no difference in the top few measures between the discount rates, however, measures with less demand impact vary in contribution between the two cases. These measures' unit energy and peak demand savings are sourced from the TRM version 7.0.

Figure 38. Cumulative Achievable Potential, Reference Case, 2030 Peak Demand Savings (MW), Reference Case, WACC – Top 40 Measures



Source: Guidehouse analysis

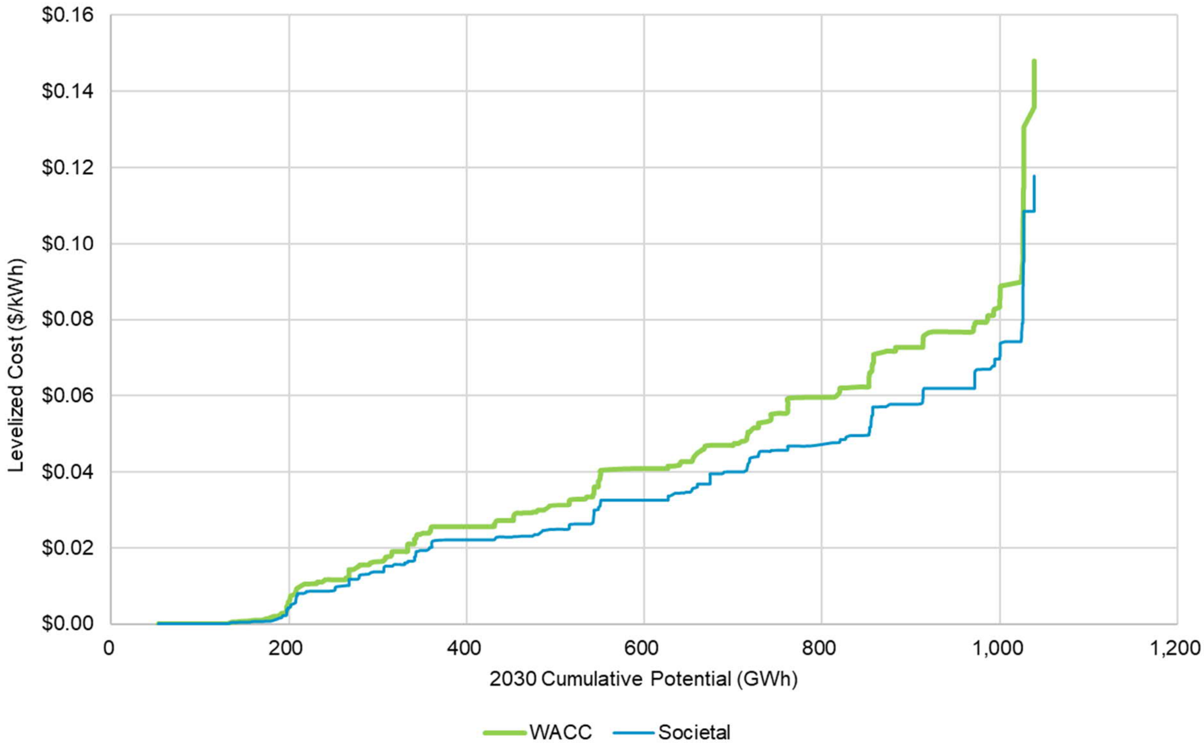
Figure 39. Cumulative Achievable Potential, Reference Case, 2030 Peak Demand Savings (MW), Reference Case, Societal – Top 40 Measures



Source: Guidehouse analysis

Figure 35 provides a supply curve of savings potential versus the levelized cost of savings in $/kWh for all measures considered in the study. The achievable potential levels out at about $0.09/kWh for WACC and $0.07 for Societal; incremental savings above this level become costlier.

Figure 40. Achievable Electricity Potential, Supply Curve (GWh/year) vs. Levelized Cost ($/kWh), 2030

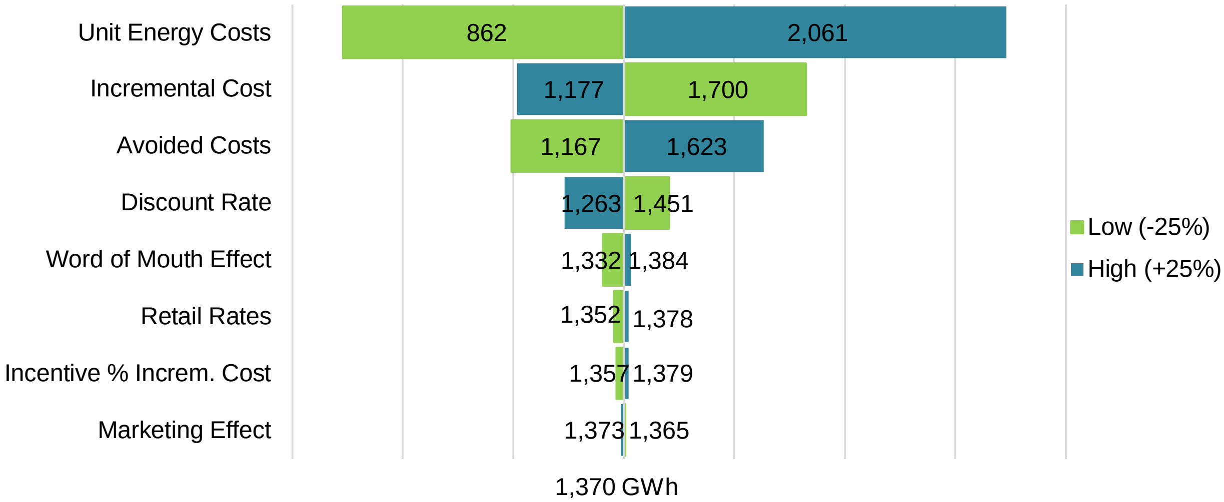


Source: Guidehouse analysis

5.3.6 Achievable Potential Sensitivity Analysis

Figure 41 shows a sensitivity analysis of the effect on electricity savings potential that results from varying the most influential factors by +/- 25%. Table 45 shows the percentage change to the cumulative energy savings potential for each sensitivity parameter in 2043. Unit energy savings have the largest impact, followed by incremental costs, avoided costs, and word of mouth effect. Such understandings are critical to evaluating related policy decisions and informing effective program design.

Figure 41. Cumulative Annual Achievable Electricity Potential, 2043, Sensitivity to Key Variables, WACC



Source: Guidehouse analysis

Table 45. Percentage Change to Cumulative Annual Electricity Potential, 2043, with 25% Parameter Change, WACC

Parameter	Low (-25%)	High (+25%)
Unit Energy Costs	-37%	51%
Incremental Cost	24%	-14%
Avoided Costs	-15%	18%
Discount Rate	6%	-8%
Word of Mouth Effect	-3%	1%
Incentive % Incremental Cost	-1%	1%
Retail Rates	-1%	1%
Marketing Effect	0.2%	-0.4%

Source: Guidehouse analysis

6. DR Achievable Potential

This chapter presents the DR achievable potential and cost results based on the approach described in Section 4. DR program delivery is agnostic to residential segmentation between income qualified and market rate. As such, the potential is reported only for the residential sector as a whole.

6.1 Cost-Effectiveness Results

This section presents cost-effectiveness results by DR option and suboption based on the TRC test. Guidehouse also calculated the cost-effectiveness results based on UCT.

6.1.1 Cost-Effectiveness Assessment Results

Table 46 shows benefit-cost ratios calculated for the different DR options based on TRC and UCT. It also shows the ratios using the two different discount rates used in the study – weighted average cost of capital (WACC) and societal discount rate. There are minimal changes in the benefit-cost ratios between the TRC and SCT results using WACC and societal discount rate respectively – the benefit-cost ratios are slightly greater using the societal discount rate, but the cost-effectiveness screening of the DR options does not result in a change to the achievable potential.

Switch-based water heating under DLC, Peak Time Rebate, and EV Managed Charging are the only three options that are not cost-effective.[59] The TRC benefit-cost ratios are greater than the UCT benefit-cost ratios since incentives are not included as a cost in TRC. Dynamic pricing has the same ratio for TRC and UCT since there are no incentive costs considered in dynamic pricing.

Based on data made available by ENO, the only benefit stream captured by the TRC test is the avoided cost of generation capacity. ENO does not currently have a way to value avoided T&D capacity nor for reliability or resource adequacy. These cost-effectiveness results would improve if avoided T&D capacity benefits also were included in the cost-effectiveness assessment. Only cost-effective DR options are shown in the achievable potential results in subsequent sections.

Table 46. Reference Case Benefit-Cost Ratios by DR Options

DR Option	TRC B/C Ratio	UCT B/C Ratio	SCT B/C Ratio
Dynamic Pricing	4.75	4.75	5.31
BTMS - Battery Storage	3.18	1.00	3.18
C&I Curtailment	3.16	1.21	3.16
DLC-Thermostat-Res	1.63	0.91	1.63
DLC-Switch-Water Heating	0.39	0.33	0.40
Peak Time Rebate	0.70	0.47	0.70
EV Managed Charging	0.57	0.43	0.57

Source: Guidehouse

[59] ENO is piloting Peak Time Rebate. The analysis assumed incentive levels that the pilot currently offers. Based on that, PTR benefit-cost assessment shows that the option is not cost-effective.

As described in Section 4.3, in addition to the Reference case, Guidehouse modeled potential results for Low and High cases. For these cases, the team adjusted assumed participation levels and incentive amounts to determine the impacts on the DR achievable potential. The screening of cost-effective options does not change for the High and Low scenarios when compared with the Reference case, however the B/C ratios are different.

6.2 Achievable Potential Results

This section presents cost-effective achievable potential results by DR option, suboption, customer class and segment.[60] The discount rate change from WACC to societal does not impact the results as discussed above. Therefore, only one set of savings are provided for DR potential.

6.2.1 Achievable Potential by DR Option

Figure 42 summarizes the cost-effective achievable potential by DR option for the Reference case. Figure 43 shows the cost-effective achievable potential as a percentage of ENO's peak demand. Achievable peak demand reduction potential is estimated to grow from 15 MW in 2024 to 75 MW in 2043. Cost-effective achievable potential makes up approximately 8.4% of ENO's peak demand in 2043. The team made several key observations:

- C&I Curtailment has the greatest cost-effective achievable potential: 51% share of total cost-effective potential in 2043. C&I Curtailment potential grows rapidly starting from 14.9 MW in 2024. This growth is calibrated to evaluated programs and implementation plan values before 2026. Beginning in 2026, C&I Curtailment follows the S-shaped ramp assumed for the program over a 5-year period. By 2031, the program attains a steady participation level with 26 MW of cost-effective potential, which increases slightly to 38.3 MW in 2043.

- DLC-Thermostat-Res has a 22% share of the total cost-effective achievable potential in 2043. The potential for this measure grows from 5.7 MW in 2024 to 16.6 MW in 2043. DLC-Switch-Water Heating is not cost-effective and does not contribute to achievable potential.

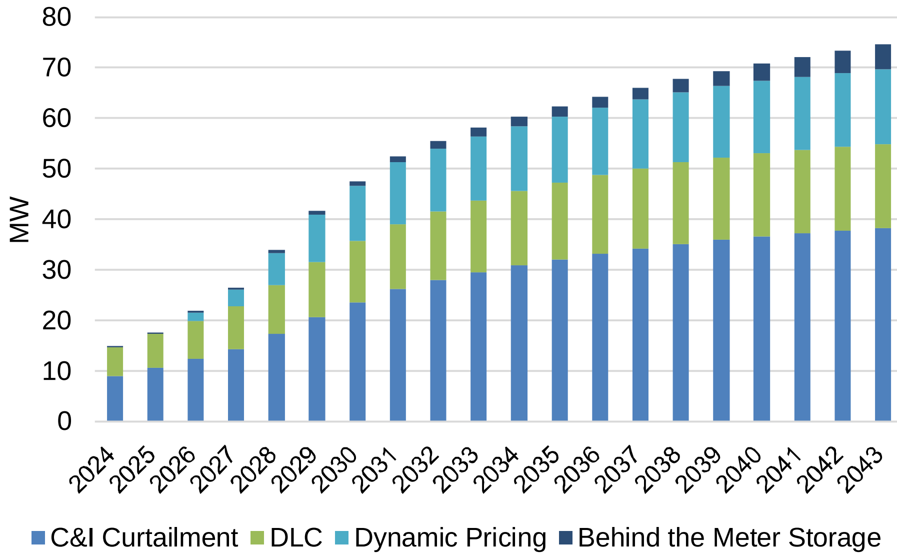
- Dynamic Pricing has a 20% share of the total cost-effective achievable potential in 2043. The dynamic pricing offer is assumed to begin in 2026 since ENO would need lead time to design and file a CPP tariff and have that approved to start offering it to customers. The program ramps up over a 5-year period (2026-2030) until it reaches a value of 12 MW. From then on, potential slowly increases from 1.6 MW in 2026 to 14.8 MW in 2043.

- BTMS contributes the remainder of the 7% share of the total cost-effective achievable potential in 2043. This program uses a linear ramp to reach steady state by 2033 and increases in residential battery count grows from 0.2 MW in 2024 to 4.9 MW in 2043.

DLC switch-based water heating, EV Managed Charging and Peak Time Rebate are not cost-effective, so do not contribute toward DR achievable potential.

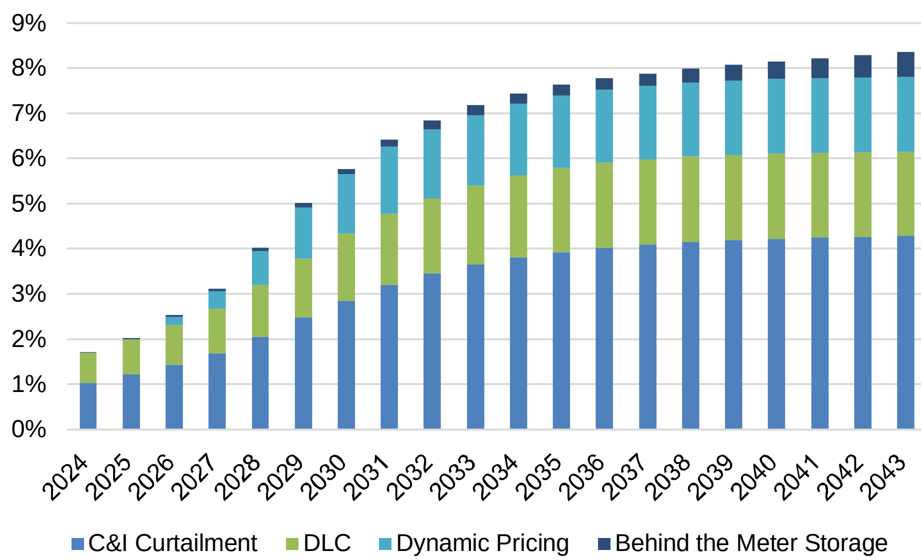
[60] Results for all DR options are presented in the Excel Results file.

Figure 42. Summer Peak Achievable Potential by DR Option (MW)



Source: Guidehouse analysis

Figure 43. Summer DR Achievable Potential by DR Option (% of Peak Demand)



Source: Guidehouse analysis

6.2.2 Achievable Potential by Case

Guidehouse developed DR potential estimates for three different cases. These cases are based on the DR program incentive levels:

- **Reference case:** Reflects DR program participation based on incentives at levels that match current programs (e.g., ENO's Smart EasyCool program) and industry best practice.

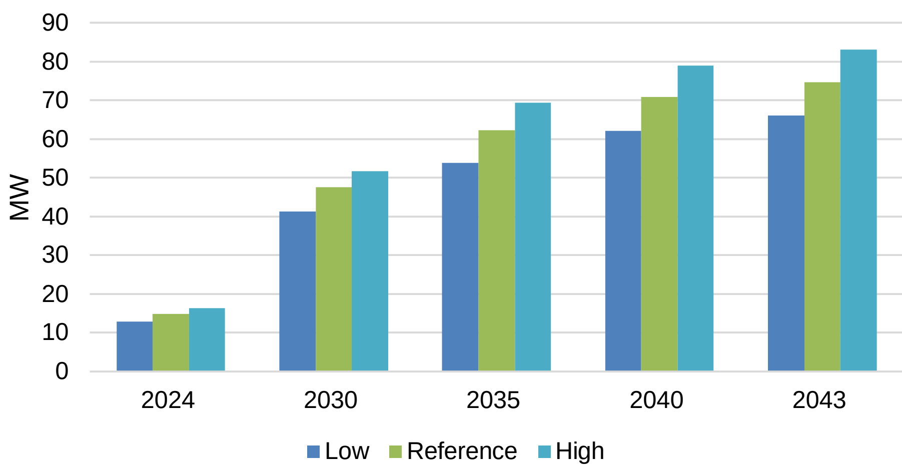
- **Low case:** Assumes incentives are 50% lower than in the Reference case. This drives program participation down and results in lower implementation costs.
- **High case:** Assumes incentives are 50% higher than in the Reference case. This drives program participation up and results in higher implementation costs.

The changes in participation with incentives are drawn on data presented in the California Demand Response Potential Study conducted by the Lawrence Berkeley National Lab.[61]

For dynamic pricing, which does not consider incentives since it is based on CPP rate offer, higher and lower participation levels in the High and Low scenarios than the Reference case are associated with variations in marketing effort, which affects program enrollment. The High case assumed 20% higher marketing costs than the Reference case while the Low case assumed 20% lower marketing costs than the Reference case.

Figure 44 and Figure 45 show the achievable potential results in terms of MW and percentage of peak demand by case, respectively. Under the Reference case, the achievable potential makes up approximately 8.4% of ENO's peak load in 2043. Under the Low and High cases, the achievable potential represents approximately 7.0% and 9.9% of ENO's peak demand in 2043, respectively.

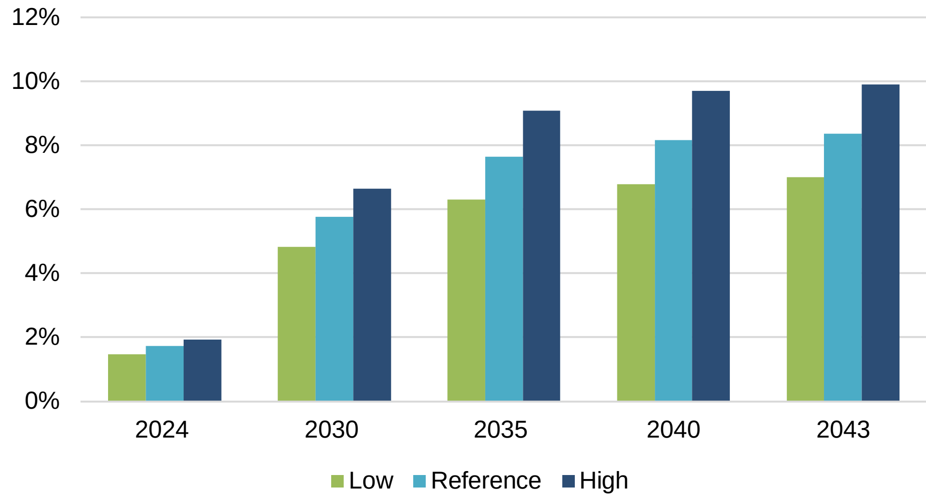
Figure 44. Summer DR Achievable Potential by Case (MW)



Source: Guidehouse analysis

[61] 2025 California Demand Response Potential Study. We also used data available in the Phase 4 California Demand Response Potential Study draft report, which has not yet been publicly released.

Figure 45. Summer DR Achievable Potential by Case (% of Peak Demand)



Source: Guidehouse analysis

6.2.3 Achievable Potential by DR Suboption

This section presents the breakdown of cost-effective potential by DR suboption. Each suboption is tied to a specific control technology and/or end use. Any suboption that is tied to a control technology is tied to the penetration of that technology in the market. This penetration trajectory is informed by saturation values from the EE potential study.

Figure 51 summarizes the cost-effective achievable potential by DR option for the Reference case. Guidehouse had the following key observations:

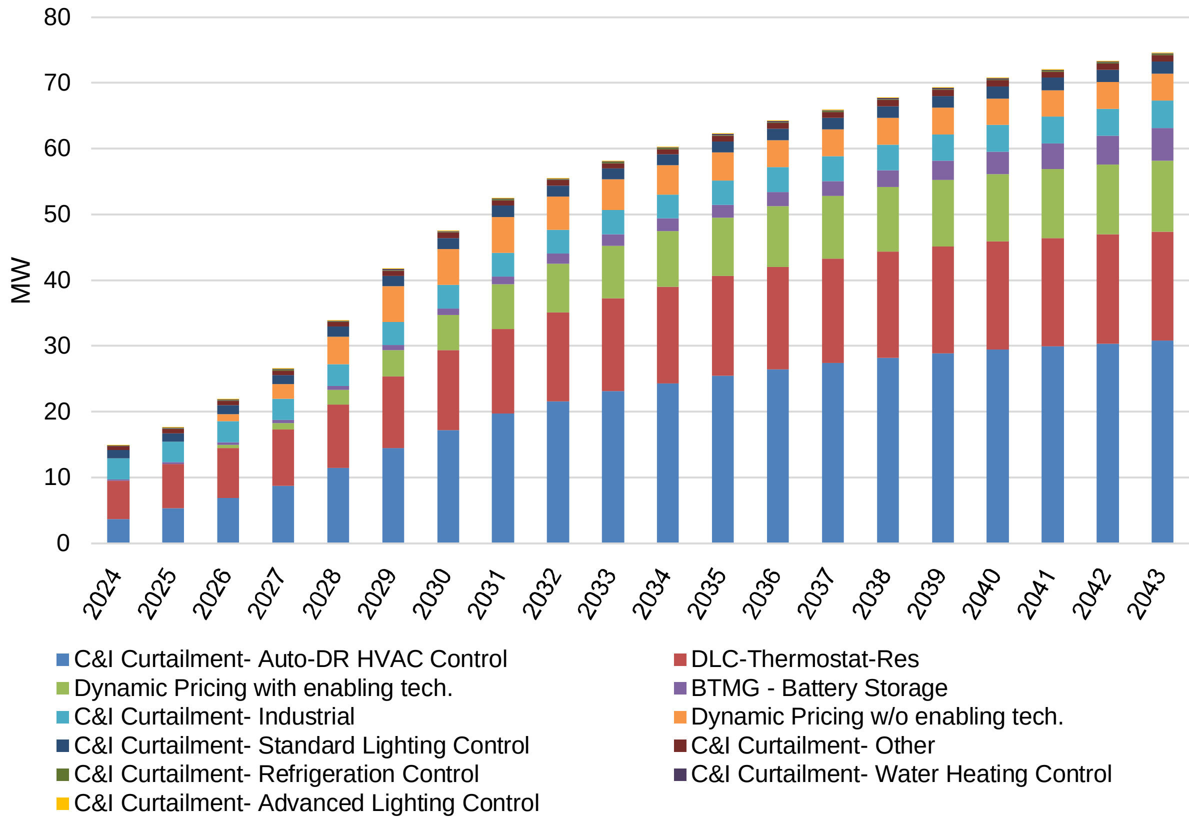
- Most of the C&I Curtailment reductions are associated with Auto-DR HVAC control, which reaches 30.8 MW or 41% of the total cost-effective potential in 2043. Other C&I Curtailment suboptions total to contribute 10% of the total cost-effective potential in 2043. Overall, C&I Curtailment options are projected to reach 38.3 MW by 2043.

- Only direct control of HVAC loads under the DLC-Thermostat suboption is cost-effective (and not water heating). This suboption makes up about 22% of the total cost-effective achievable potential in 2043 at 16.6 MW.

- Dynamic pricing makes up 20% of the total cost-effective achievable potential in 2043. Potential from customers with enabling technology in the form of thermostats/energy management systems is more than two times higher than that from customers without enabling technology—10.7 MW versus 4.1 MW in 2043.

- Batteries are projected to reach 4.9 MW of savings or 7% of the total cost-effective potential in 2043.

Figure 46. Summer DR Achievable Potential by DR Suboption



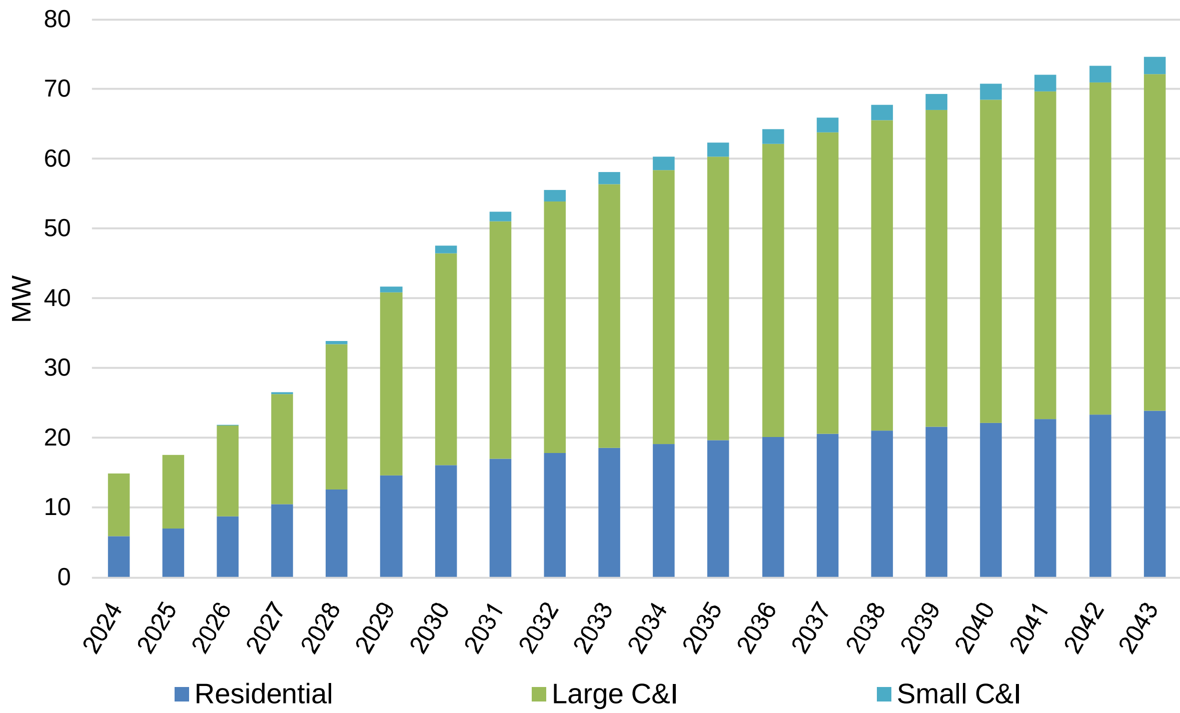
Source: Guidehouse analysis

6.2.4 Achievable Potential by Customer Class

This section presents the breakdown of cost-effective potential by customer class. The three customer classes included in the study are residential, small C&I, and large C&I. Figure 52 summarizes the cost-effective achievable potential by customer class for the Reference case. The team had the following key observations:

- Potential from residential customers makes up 32% (24 MW) of the total cost-effective achievable potential in 2043. C&I customers make up the remaining 68%.
- Potential from large C&I customers makes up 65% (48.2 MW) of the total cost-effective achievable potential in 2043. C&I curtailment with auto-DR HVAC control makes up 41% at 30.8 MW.
- Potential from small C&I customers makes up 3% (2.5 MW) of the total cost-effective achievable potential in 2043. This potential comes from Dynamic Pricing with enabling tech, the only cost-effective suboption for the small C&I customer class.

Figure 47. Summer DR Achievable Potential by Customer Class (MW)



Source: Guidehouse analysis

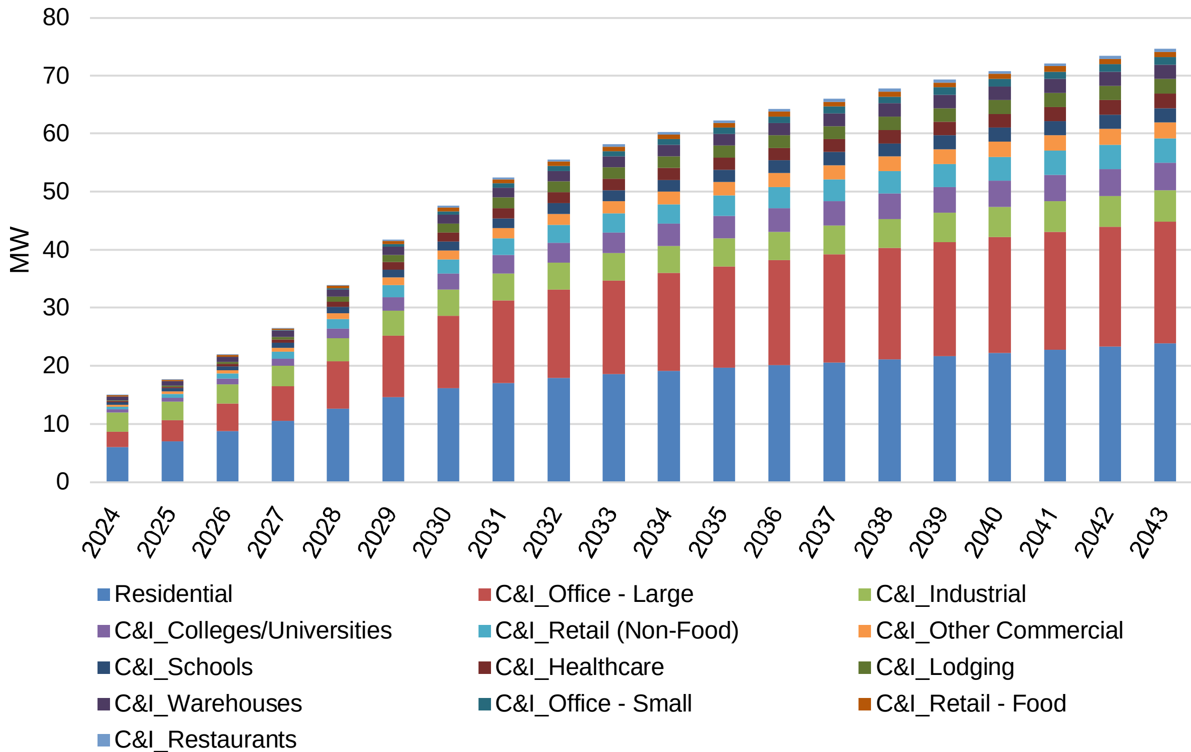
6.2.5 Achievable Potential by Customer Segment

This section presents the breakdown of cost-effective potential by customer segment. As previously discussed in the DR methodology section, these segments align with those included in the EE potential study. Guidehouse combined single family and multifamily customers into a single residential category because DR program and pricing offers are typically not distinguished by dwelling type. Government customers are included as part of the C&I sector. Savings potential analysis from streetlighting is not included in this study.

Figure 48 summarizes the cost-effective achievable potential by customer segment for the Reference case. Guidehouse had the following key observations:

- Potential from C&I customers primarily comes from large offices, which make up 28% (20.9 MW) of the total cost-effective achievable potential in 2043. This is followed by retail, colleges/universities, and industrial customers, which each make up between 5% and 7% of the total cost-effective achievable DR potential in 2043—4.2 MW, 4.7 MW, and 5.4 MW, respectively.
- All other C&I segments make up about 21% of the cost-effective achievable potential in 2043, which is 15.5 MW.

Figure 48. Summer DR Achievable Potential by Customer Segment



Source: Guidehouse analysis

6.3 Program Costs Results

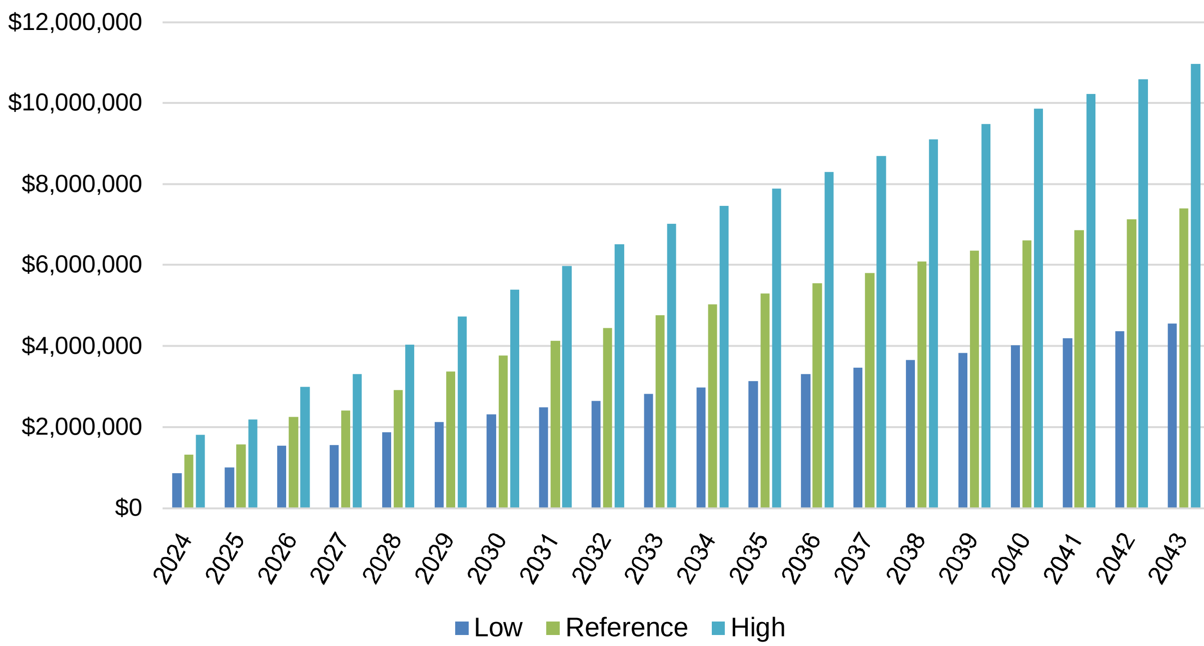
This section presents annual program costs by case and DR option.

6.3.1 Annual Costs by Case

Figure 49 shows annual implementation costs for the entire cost-effective DR portfolio by case. These costs represent the estimated total annual costs that ENO is likely to incur to realize the potential values discussed in Section 6.2. Relative to the Reference case, costs are lower and higher in the Low and High cases, respectively, due to varied incentive levels paid to customers and due to variations in marketing costs for dynamic pricing.[62]

[62] The cost results by case for all DR options is provided in the Excel Results file.

Figure 49. Annual DR Portfolio Costs by Case



Source: Guidehouse analysis

6.3.2 Annual Costs by DR Option

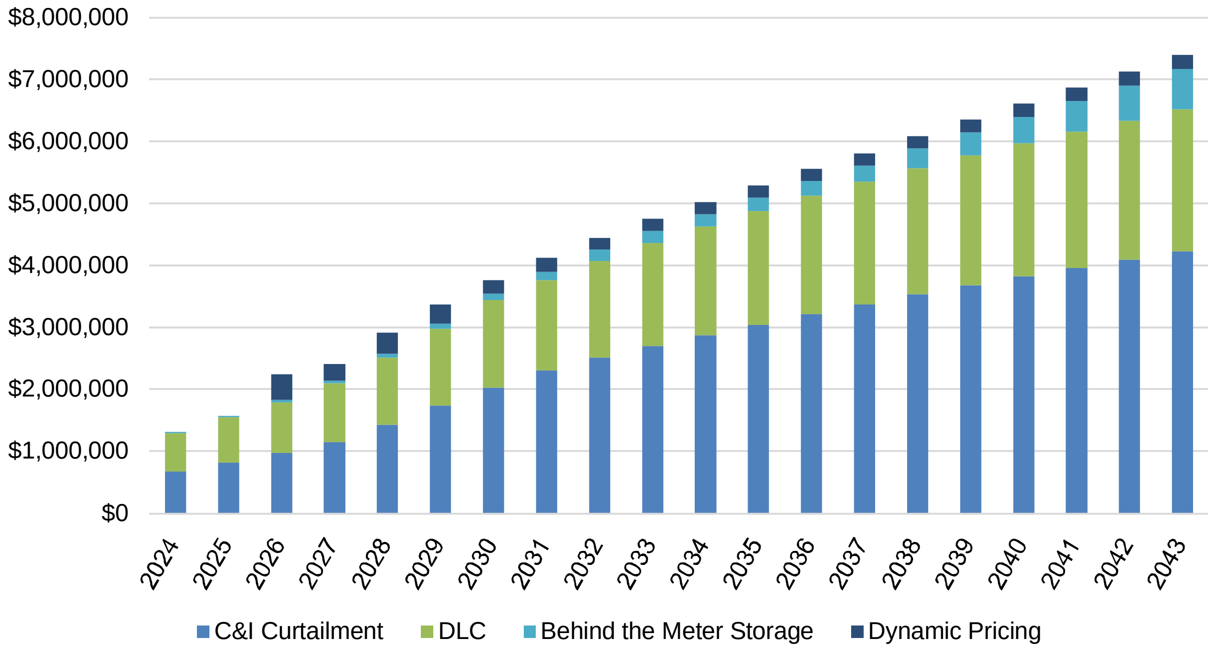
Figure 45 summarizes the annual program costs by DR option. The team observed the following:

- The program costs for DLC increase steadily from 2024 to 2043. Costs fluctuate in accordance with program participation, which is tied in part to thermostat market penetration, until it reaches its final value of $2.3 million in 2043.
- The program costs for C&I curtailment increase steadily from 2024 to 2031 until the program is fully ramped up. Costs steadily climb with program participation until it reaches its final value of $4.2 million in 2043.
- Dynamic pricing program costs are relatively high during its initial ramp up between 2026 and 2031, and then drop in 2032 when the program is fully ramped up. There is a spike in dynamic pricing costs attributed to the program development cost in 2026, which is when the ramp for this program begins. By 2030, 90% of the program is ramped up, so the incremental cost to recruit new customers is lower in 2031. Beyond 2031, costs remain low and relatively steady.
- Annual BTMS program costs increase steadily from 2024 to 2033 in line with the linear participation ramp during those years. When steady-state participation is reached, the annual rate of costs climbs with residential battery participation until it reaches its final value of $0.7 million in 2043.

Costs for the DR options that are not cost-effective (DLC-water heating, EV Managed Charging, and Peak Time Rebate) are not included in Figure 50.[63]

[63] Cost results for all DR Options are included in the Excel Results file.

Figure 50. Reference Case Annual Program Costs by DR Option

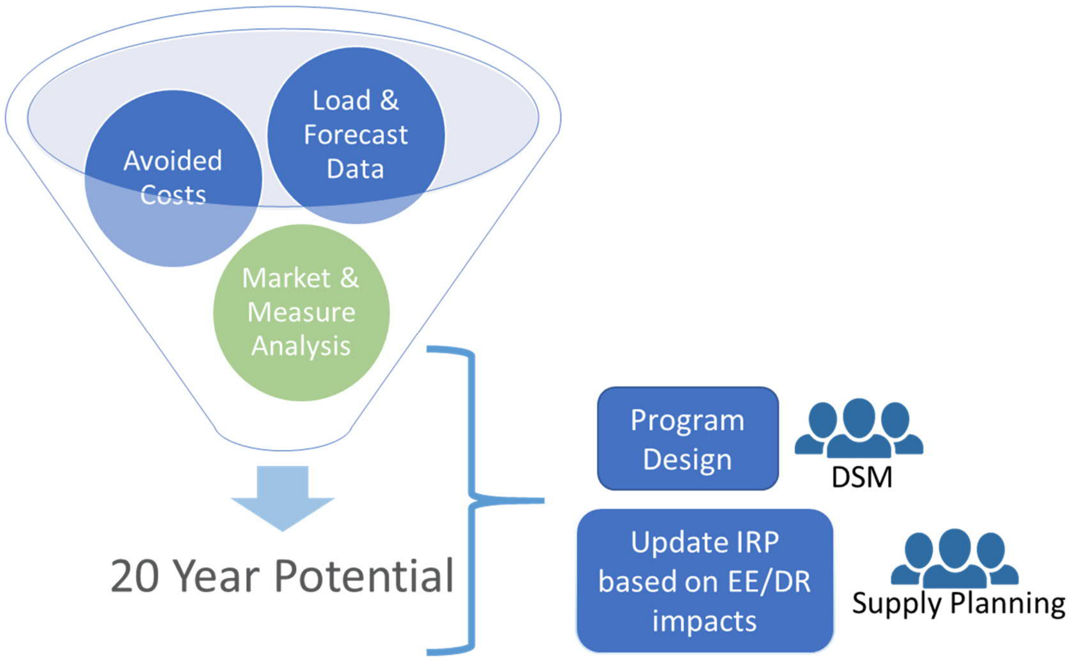


Source: Guidehouse analysis

7. Conclusions and Next Steps

Figure 50 illustrates the data inputs and outputs of the potential study, most notably for IRP and program planning.

Figure 51. Integrating Potential Study Outputs to IRP and DSM Planning



Source: Guidehouse

7.1 Benchmarking the Results to Previous Study

The team benchmarked the study results against the 2021 study and identified how the results could be used in ENO's 2024 IRP. The 2021 and 2024 potential studies leveraged the same methodology and similar data sources, however, there are key differences between the results of the two studies, aside from data updates. Table 47 provides a review of the key fields that have changed and their impact on potential.

Table 47. Key Study Input Differences

Field Type	Difference from Previous Study	Impact Potential
Building Stock (household count; 1000s sf for CI)	Res: Decrease ~5% starting in 2024 C&I: Decrease ~4% until 2025, then remain steady. Value is tied to kWh sales	Impacts of code changes could be influencing average household energy consumption Decrease technical potential
kWh Sales	Res: Steady C&I: Decrease ~3%	Large drop in one C&I account confirmed by ENO Decrease technical potential

Field Type	Difference from Previous Study	Impact Potential
kWh Avoided Cost	Decrease; this cycle is 85% of the value of last cycle in terms of present value for a measure life of 20 years	In initial years, there is a an increase and then a subsequent decrease of the BP23 Annual Load Weighted OpCo avoided energy costs (Nominal $/MWh) compared to the 2021 study. Avoided energy cost embeds price of carbon – last cycle used a separate price of carbon as an additional benefit in 2026 and beyond – ~4.2% reduction in benefits compared to last cycle. For BP23, carbon starts in 2036. Decrease economic potential and risks overall portfolio cost-effectiveness
kW Avoided Cost	Increase	118% of the value in the last cycle since BP24 uses a combustion turbine with hydrogen co-firing capability. Helps for summer peaking measures (HVAC)
Discount Rate	WACC: Decrease 7.09% to 6.86% New Societal (3%) cost analysis	Increases value of future stream of benefits Using a societal discount rate increases value to DSM
Variable Program Cost	Increase for Res; decrease for CI	Lighting removed from Residential Hinders cost-effectiveness for Res

Source: Guidehouse

EE

The differences in results and projected achievable potential between the 2021 and 2024 studies were driven in part by the following changes in methodology and approach:

- Calibration targets differed for the two studies:
    - The 2021 study used the planned targets for savings from the PY10-12 implementation plan, with a 2% savings goal for 2025.
    - The 2024 study used the actual savings and budget from PY 10-12 (2020-2022) and performance to date for PY 13 (2023). Underperformance was seen in the C&I sector across the years 2020-2023 and was consistent with results in other jurisdictions, based on Guidehouse's research.
- Different assumptions on planned rollout for home energy reports and savings percentage of consumption (from 1.3% in 2021 to 0.8% 2024)
- Updated data on residential saturation and density using the 2022 ENO RASS data

- Updates to commercial saturation values based on year-over-year program data (for measures where data was available)
- Changes in federal residential lighting standards, eliminating any residential lighting end use potential
- Updates in the TRM from version 4.0 to version 7.0, resulting in many changes in residential measure assumptions including those reflecting updated state building code changes
- Removal of behavior programs that do not show any promise for implementation or significant savings in the ENO service area, or in other utility territories

DR

The 2024 and 2021 DR analysis differed in the following ways:

- Current peak definition for MISO is slightly altered from the one used in the 2021 study in defining the peak period for calling DR programs.
- Added new DR options to the analysis (EV Managed Charging and Peak Time Rebate)
- Used historical program implementation data for Smart Thermostats and for C&I Curtailment and pilot program information from ENO's most recent activities. There has been growth in residential and C&I program participation compared with the data from 3 years ago.
- Updated BTM battery projections and assumed all batteries are paired with solar for the DR analysis, with battery projections tied to solar projections.
- Updated data on the penetration of smart thermostat data and for other control technologies based on the EE analysis.

7.2 IRP

The potential study provides forecast savings inputs for use in the IRP modeling. These inputs are provided by sector, segment, and end use because each combination of these items is mapped to a load shape . Each measure is mapped to one or more DSM programs. Guidehouse then developed a load shape representative of each DSM program. The DSM program load shape represents the aggregate hourly energy savings for the group of measures included in the program over the 20-year planning period. These load shapes are what define the hourly usage profiles for the DSM program portfolio. The data is aligned with the Council's IRP rules, which request that the data supplied include a description of each demand side resource considered, including a description of resource expected penetration levels by year, hourly load reduction profiles for each DSM program, results shown using both the utility's WACC and the societal discount rate, and results of all four standard cost-effectiveness tests were calculated.

7.3 Program Planning

DSM potential studies are inherently different from DSM program portfolio designs. The long-term achievable potential identified for a 20-year period through this study is different from the short-term savings potential that would be identified through a DSM program portfolio design effort targeting a 3-year period. However, programmatic design (such as delivery methods and marketing strategies) will have implications for the overall savings goals and projected cost.

As mentioned, near-term savings potential, actual achievable goals, and program costs for a measure-level implementation will vary from the savings potential and costs estimated in this long-term study. This potential study is one element to consider in program design, along with historical program participation and current market conditions (with the team members on the ground):

- Significant savings potential exists in promoting retrocommissioning, occupancy sensor controls, and interior high bay and 4-foot LEDs for the C&I sector.
- There is high potential in O&M (residential duct sealing and AC tune-up) and behavior-type programs such as home energy reports in the residential sector.
- There is significant DR potential with large C&I customers from both C&I Curtailment (with increased adoption of DR-enabling control technologies) and dynamic pricing. Residential sector contribution from smart thermostat DLC is projected to grow progressively with increasing adoption of smart thermostats along with contribution from dynamic pricing.

7.4 Further Research

Finally, the potential study identified data gaps in characterizing ENO's market and measures. This is common for most utilities; however, for ENO to have more accurate potential estimates and information to support DSM planning, there is ENO-specific data that could support this end goal:

- Baseline and saturation studies for non-residential (C&I) such as an end use and technology survey
- Customer payback acceptance analysis or other market adoption study specific to the ENO service area either via customer survey, Delphi panel of regional stakeholders, or other method
- Exploration of behavior program opportunities in the ENO service territory

As ENO proceeds to future PYs, the Guidehouse team suggests research in the following areas:

- Review and update the TRM for high impact measures especially those that have changed values from one evaluation cycle to another to understand the differences over time
- Consider including dynamic pricing options as the AMI rollout is completed
- Analyze the merits of time of day usage as it aligns to grid-based energy resources and their associated costs; peak savings may have a very different valuation in addressing the time of day of the savings versus an annualized avoided cost
- Explore cost-effective opportunities, pricing structures, and research on additional benefits to BTM, including battery storage.

A. EE Detailed Methodology

Appendix A includes the various data inputs, definitions, assumptions, and analysis needed for the potential analysis.

A.1 End-Use Definitions

Table 48. Description of End Uses

Segment	End Use	Definition
Residential	Total Facility	Consumption of all electric end uses in aggregate
	Lighting Interior	Overhead lights, lamps, etc.
	Lighting Exterior	Spotlighting, security lights, holiday/seasonal lighting, etc.
	Plug Loads	Large/small appliances including ovens, refrigerators, freezers, clothes washers, etc. Televisions, computers and related peripherals, and other electronic systems
	HVAC	All cooling, including both CAC and room or portable AC; all heating, including both primary heating and supplementary heating; motor drives associated with heating and cooling
	Water Heating	Heating of water for domestic hot water use
	Other	Miscellaneous loads
C&I	Total Facility	Consumption of all electric end uses in aggregate
	Lighting Interior	Overhead lights, lamps, etc. (main building and secondary buildings)
	Lighting Exterior	Spotlighting, security lights, holiday/seasonal lighting, etc. (main building and secondary buildings)
	Plug Loads	Computers, monitors, servers, printers, copiers, and related peripherals
	HVAC	All cooling equipment, including chillers and direct expansion cooling; all heating equipment, including boilers, furnaces, unit heaters, and baseboard units; motor drives associated with heating and cooling
	Refrigeration	Refrigeration equipment including fridges, coolers, and display cases
	Water Heating	Hot water boilers, tank heaters, and others
	Other	Miscellaneous loads including elevators, gym equipment, and other plug loads

Source: Guidehouse

A.2 Residential Sector

The following sections detail the approach used to determine electricity consumption by segment, the approach used to estimate end-use proportions, and the resulting residential household stock. To do so, Guidehouse needed to determine three pieces of information:

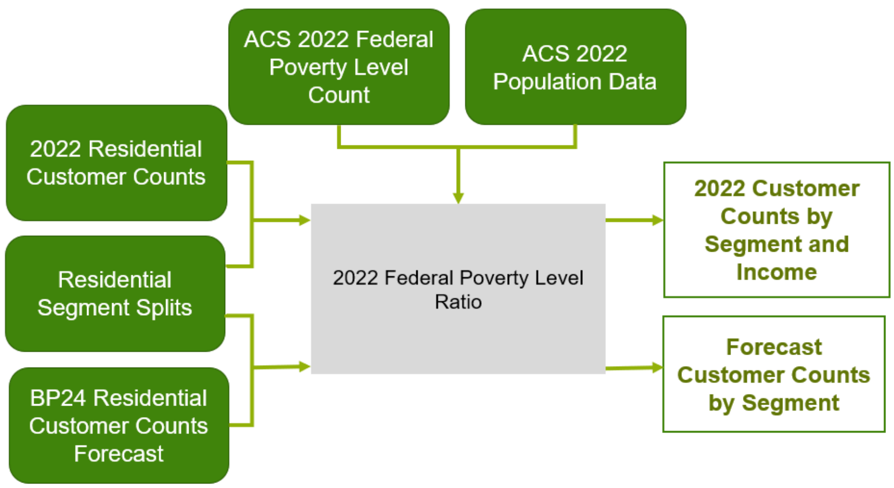
- Base year and forecast stock
- Base year and forecast total consumption

- Base year and forecast consumption by end use

1. Base Year and Forecast Residential Stock

Figure 52 outlines Guidehouse's approach to determining the base year and forecast residential stock. As a part of the 2024 report, Guidehouse needed to disaggregate values for IQ and market rate residential customers. Guidehouse used 2022 American Census Survey data,[64] along with data provided by ENO to calculate the proportion of residential counts for each income level according to ENO's IQ definition of less than 200% of the Federal Poverty Level.[65]

Figure 52. Residential Stock Base Year and Reference Case Approach



Source: Guidehouse

To define the base year residential sector inputs, Guidehouse determined the total base year stock using ENO's number of households in the class breakdown. Guidehouse needed to divide this total into single-family and multifamily segments. To do so, Guidehouse used the class breakdown from analysis of the 2022 RASS data provided by ENO and multiplied these splits by the total base year stock. To define the forecast residential sector inputs, Guidehouse used the same class breakdown from analysis of the 2022 RASS data and multiplied these splits by the total residential customer counts in the BP24 sales forecast.

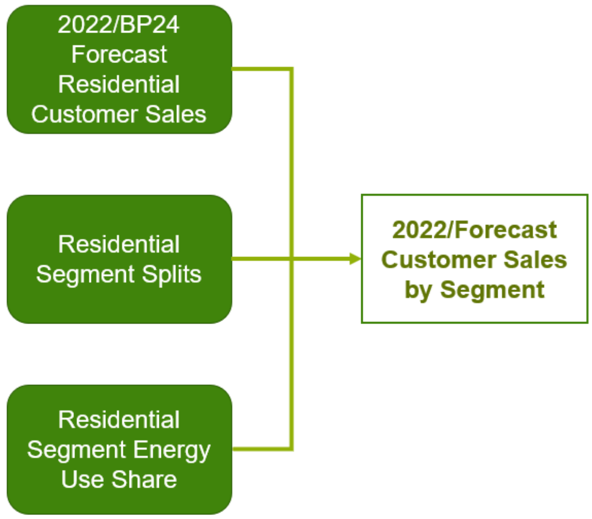
2. Base Year and Forecast Total Consumption

Figure 53 outlines Guidehouse's approach to determining the base year and forecast residential sales.

64 https://data.census.gov/table/ACSST1Y2022.S1701?q=Federal+Poverty+level+in+New+Orleans+2022

65 The Federal Poverty Level can be defined by total income per household and depends on the number of residents living in that house. Guidehouse research used base year values and definitions for its analysis: https://www.healthcare.gov/glossary/federal-poverty-level-fpl/.

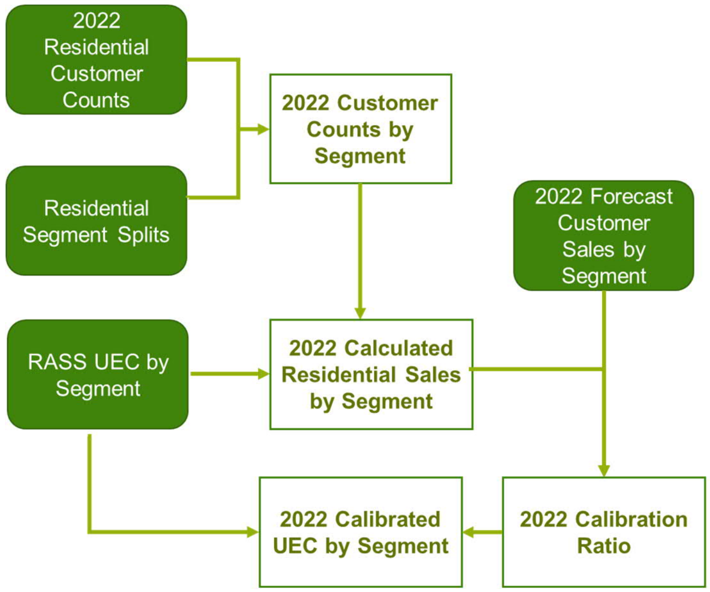
Figure 53. Base Year and Forecast Residential Sales Approach



Source: Guidehouse

Base year sales used the 2022 reported sales provided by ENO. Guidehouse calculated the residential UEC using analysis of the 2022 ENO RASS data by segment level and calibrated using the stock and sales by household split for an adjusted UEC. Therefore, the total 2022 stock times the adjusted UEC equals the total residential sales for 2022. Figure 54 and Table 49 provide the flow diagram of the analysis and results, respectively.

Figure 54. Base Year Calibrated UEC by Residential Segment



Source: Guidehouse

Table 49. 2022 Unit Energy Consumption (kWh/Account)

Building Segment	RASS 2022 UEC	Calibrated UEC
Single-Family	15,235	13,686
Multifamily	9,349	8,398

Source: Guidehouse analysis

3. Base Year and Forecast Consumption by End Use

To disaggregate the total residential consumption for single-family and multifamily customers to the end-use level, Guidehouse relied on end-use proportions used in the 2021 study.[66] Guidehouse calculated the proportion of energy used by each end use (e.g., this proportion of the consumption is a percentage of the total segment-level consumption). Guidehouse derived these proportions using Guidehouse DOE's EnergyPLUS prototypical models with adjustments to reflect ENO building stock and other Guidehouse adjustments based on lessons learned across utility jurisdictions. Guidehouse assumed the end-use proportions were constant across the forecast period. This assumption has minimal impact to the overall potential because all the residential sector savings calculations are not dependent on end-use consumption proportions except for behavioral measures. Table 50 shows the resulting end-use proportions by residential end use, which is an overall percentage of each household.

Table 50. Residential End Use Proportion (% of whole building kWh)

End Use	Percentage
Hot Water	4.4%

[66] The 2022 RASS provided by ENO included no data concerning end-use proportions. Guidehouse used the previous study methodology.

End Use	Percentage
HVAC	47.8%
Lighting Exterior	3.1%
Lighting Interior	19.4%
Plug Loads	25.3%
Total	**100.0%**

Source: Guidehouse analysis

A.3 C&I Sector

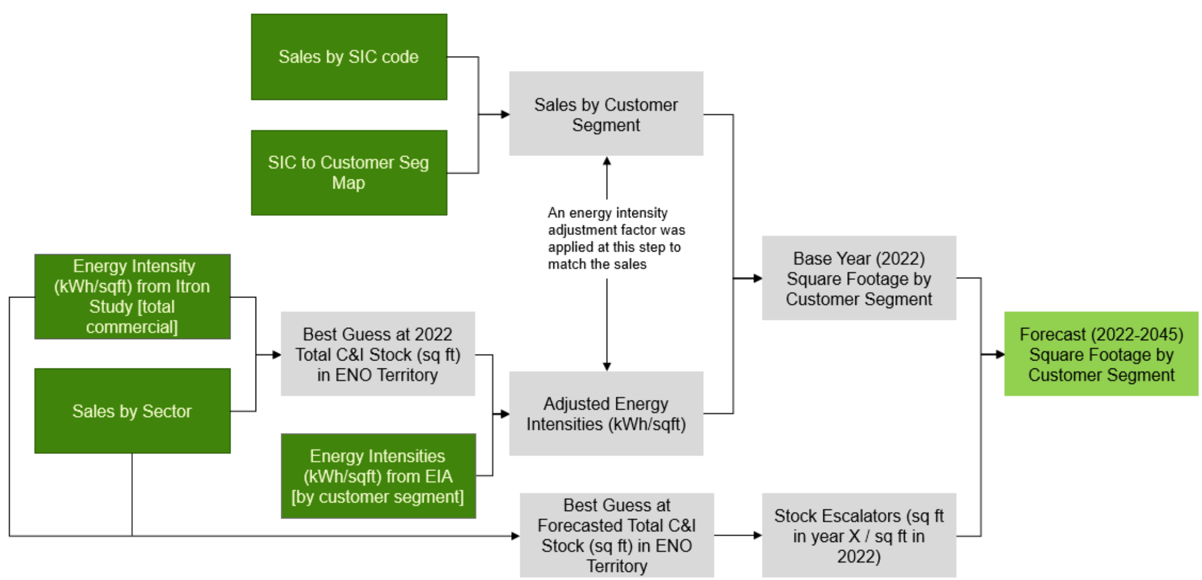
The following sections describe the detailed approach used to determine electricity consumption by segment, the approach used to estimate end-use proportions, and the resulting C&I stock. Guidehouse needed to determine two pieces of information:

- Base year and forecast stock and total consumption
- Base year and forecast consumption by end use

1. Base Year and Forecast C&I Stock and Total Consumption

Figure 55 outlines Guidehouse's approach to determining the base year and forecast C&I stock.

Figure 55. C&I Base Year and Forecast Approach



Source: Guidehouse

To define the base year C&I sector stock inputs, Guidehouse began with customer-level billing data, which included customers' SIC codes and 2022 annual consumption. This data came in three datasets: commercial, industrial, and governmental. Guidehouse used a mapping of SIC codes to customer segments derived as part of the 2018 study. By joining the mapping file to each of the three consumption datasets, Guidehouse aggregated the 2022 consumption to the customer segment level for each of the commercial, industrial, and governmental subsectors. ENO also provided 2022 total consumption for each of the commercial, industrial, and governmental subsectors in the class breakdown dataset.

To estimate square footage from segment-level energy usage, Guidehouse developed segment-level energy intensities (kWh/square foot). Guidehouse began with segment-level intensities from US EIA.[67] Table 51 shows the mapping of segments in the EIA intensity data to the segments of this study.

Table 51. C&I EUI Segments to Study Segment Mappings

EIA Principal Building Activity	Study Segment
Education	Colleges/Universities and Schools
Health Care	Healthcare
Buildings with Manufacturing	Industrial/Warehouses
Lodging	Lodging
Office	Office – Large and Office – Small
Public Assembly	Other Commercial
Food Service	Restaurants
Food Sales	Retail – Food
Mercantile	Retail – Non-Food

Source: Guidehouse analysis

For the non-industrial segments, Guidehouse used overall commercial sector intensities from Itron to adjust the segment-level intensities from EIA. To do so, Guidehouse calculated the best estimate of overall square footage in the commercial sector by dividing total 2022 sales by the Itron intensity. Guidehouse then calculated an adjustment factor by dividing the best estimate of total stock by the sum of the segment-level stock derived from EIA intensities. Guidehouse multiplied the adjustment factor by the segment-level EIA intensities to produce final segment-level EIA intensities that average out to the Itron overall intensity. For industrial, Guidehouse used the EIA intensity directly as the final intensity for the industrial segment. Finally, Guidehouse divided the segment-level base year sales (kWh) by the adjusted segment-level intensities (kWh/square feet) to calculate segment-level stock (square feet) in the base year.

Guidehouse used the base year segment-level stock as the foundation for the stock forecast (2024-2043). For the non-industrial segments, Guidehouse used the BP24 sales forecast divided by the Itron sector-level intensity forecasts to calculate forecast stock (square feet) for the C&I sector as a whole. Guidehouse used this stock forecast to establish escalation factors (square feet in year X/square feet in 2022) for the C&I stock forecast. In doing so, the escalators account for assumed DSM over time for both the sales and intensity. For the industrial segment, Guidehouse used the BP24 sales forecast to calculate escalation factors. Once derived, Guidehouse multiplied the escalation factors by the base year segment-level stock to calculate the segment-level stock forecast.

2. Base Year and Forecast Consumption by End Use

To disaggregate the total C&I consumption for each segment to the end-use level, Guidehouse relied on end-use proportions used in the 2021 study. Guidehouse calculated the proportion of

[67] Table C.20 Electricity consumption and conditional energy intensity by climate zone. Guidehouse used the hot/very hot climate zone designation. https://www.eia.gov/consumption/commercial/data/2018/ce/xls/c20.xlsx

energy used by each end use (e.g., this proportion of the consumption is X% of the total consumption). Guidehouse derived these proportions using Guidehouse's DOE EnergyPLUS prototypical models with adjustments to reflect ENO building stock and other Guidehouse adjustments based on lessons learned across utility jurisdictions. Guidehouse assumed the end-use proportions were constant across the forecast period. This assumption has minimal impact to the overall potential because most of the commercial sector savings calculations (except for behavioral) are independent from end-use consumption proportions. Table 52 shows the resulting end-use proportions by C&I end use, which is an overall percentage of each building type segment consumption.

Table 52. C&I Reference Case End-Use Proportions Forecast (% of kWh)

Segment	End Use	2022-2043
Colleges/Universities	Hot Water	1.5%
	HVAC	55.0%
	Lighting Exterior	2.7%
	Lighting Interior	25.4%
	Plug Loads	14.2%
	Refrigeration	1.2%
	Total Facility	**100.0%**
Healthcare	Hot Water	1.2%
	HVAC	52.0%
	Lighting Exterior	0.8%
	Lighting Interior	21.0%
	Plug Loads	24.5%
	Refrigeration	0.5%
	Total Facility	**100.0%**
Industrial/Warehouses	Hot Water	12.6%
	HVAC	44.2%
	Lighting Exterior	1.6%
	Lighting Interior	33.2%
	Plug Loads	5.4%
	Refrigeration	3.1%
	Total Facility	**100.0%**
Lodging	Hot Water	25.3%
	HVAC	32.3%
	Lighting Exterior	1.2%
	Lighting Interior	15.9%
	Plug Loads	24.5%
	Refrigeration	0.8%
	Total Facility	**100.0%**
Office - Large	Hot Water	0.4%
	HVAC	49.3%

Segment	End Use	2022-2043
	Lighting Exterior	0.2%
	Lighting Interior	31.1%
	Plug Loads	19.1%
	Total Facility	**100.0%**
Office - Small	Hot Water	0.4%
	HVAC	50.5%
	Lighting Exterior	0.2%
	Lighting Interior	30.3%
	Plug Loads	18.6%
	Total Facility	**100.0%**
Other Commercial	Hot Water	6.8%
	HVAC	30.5%
	Lighting Exterior	0.9%
	Lighting Interior	13.7%
	Plug Loads	44.5%
	Refrigeration	3.6%
	Total Facility	**100.0%**
Restaurants	Hot Water	5.2%
	HVAC	37.0%
	Lighting Exterior	4.5%
	Lighting Interior	7.4%
	Plug Loads	42.7%
	Refrigeration	3.2%
	Total Facility	**100.0%**
Retail - Food	Hot Water	0.1%
	HVAC	24.8%
	Lighting Exterior	1.2%
	Lighting Interior	22.4%
	Plug Loads	11.5%
	Refrigeration	40.1%
	Total Facility	**100.0%**
Retail (Non-Food)	Hot Water	11.0%
	HVAC	33.5%
	Lighting Exterior	3.0%
	Lighting Interior	44.3%
	Plug Loads	5.0%
	Refrigeration	3.2%
	Total Facility	**100.0%**
Schools	Hot Water	2.0%

Segment	End Use	2022-2043
	HVAC	57.1%
	Lighting Exterior	2.6%
	Lighting Interior	23.9%
	Plug Loads	13.3%
	Refrigeration	1.1%
	Total Facility	**100.0%**

Source: Guidehouse analysis

A.4 Measure List and Characterization Assumptions

Guidehouse developed the measure list and characterizations based on internal expertise, ENO-specific data, the New Orleans TRM version 7.0, and secondary sources where necessary. The measure characterization is provided in a separate workbook.

A.5 Avoided Costs and Cost-Effectiveness

Guidehouse input several cost-related inputs to determine the cost-effectiveness of measures over the study period. This section details those inputs.

Avoided Energy Costs

ENO provided the BP23[68] avoided costs through 2067 in nominal dollars. Guidehouse projected these costs over the remainder of the study period plus the longest measure life (25 years) using 2% inflation rate starting in 2043 to input into the model. Figure 56 shows the avoided energy cost projections or forecast locational marginal prices in nominal dollars.

[68] BP23 refers to the vintage of a set of planning and modeling assumptions. At the time of this study, BP24 values were available for avoided capacity, but not yet avoided energy. Therefore, BP23 was the latest assumption set of avoided energy values available.

Figure 56. ENO BP 23 Avoided Energy Cost Projections

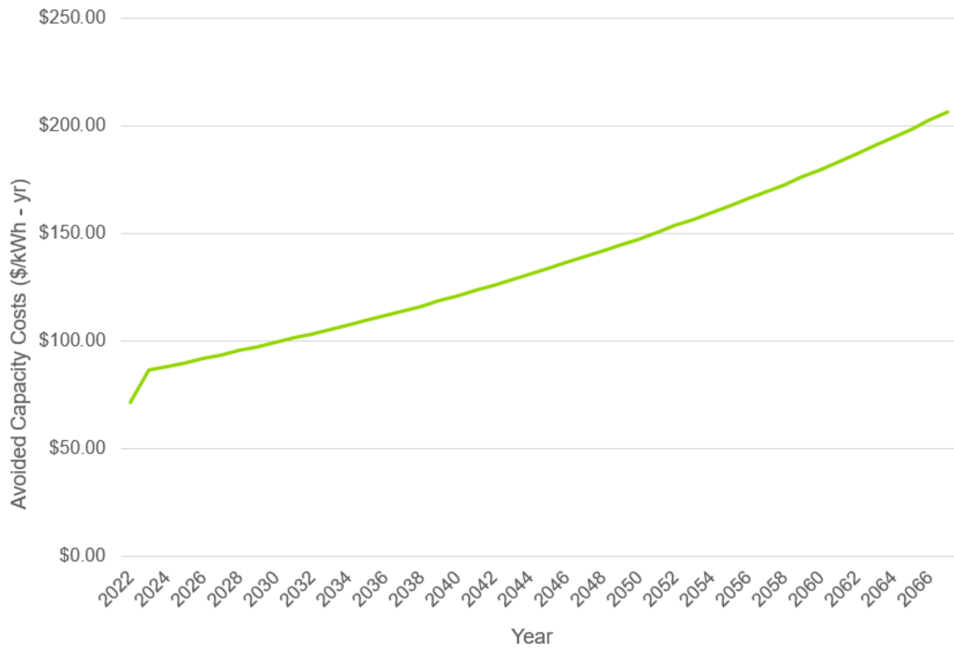
- CO_2 price is lower in BP23. The CO_2 price did not start until 2035 in BP23 and started in 2026 in BP20, which was used in the 2021 IRP potential study.
- The big driver is the amount of solar added in BP23. BP23 projects almost twice the amount of solar being added to the MISO market as compared to BP20, which has the effect of driving LMPs lower.
- Carbon costs are embedded in the BP23 values.

Avoided Capacity Cost

ENO provided the BP24[69] avoided capacity costs through 2052 in nominal dollars. Guidehouse projected these costs over the remainder of the study period plus the longest measure life (15 years) using a 2% inflation rate starting in 2053 to input into the model. Figure 57 shows these costs over the study period in nominal dollars.

[69] BP24 refers to the vintage of a set of business planning and modeling assumptions used by ENO. At the time of this study, BP24 was the latest assumption set available for avoided capacity costs.

Figure 57. ENO BP24 Avoided Capacity Projections



Source: Guidehouse

A.6 Cost-Effectiveness Calculations

The potential analysis uses two forms of cost-effectiveness calculations. The TRC test is for utility cost-effectiveness. There also is the PCT, which is mostly addressed by calculating the participant payback period instead of the benefit-cost ratio for the PCT. This section describes these tests, the inputs, and how they are used for the potential study.

TRC Test

The TRC test is a benefit-cost metric that measures the net benefits of EE measures from the combined stakeholder viewpoint of the utility (or program administrator) and the customers. The TRC benefit-cost ratio is calculated in the model using Equation 8.

Equation 8. Benefit-Cost Ratio for TRC Test

$$\boldsymbol{TRC} = \frac{\boldsymbol{PV}(\boldsymbol{Avoided\ Costs})}{\boldsymbol{PV}(\boldsymbol{Technology\ Cost} + \boldsymbol{Admin\ Costs})}$$

Where:

- PV( ): The present value calculation that discounts cost streams over time
- Avoided Costs: The monetary benefits resulting from electric energy and capacity savings—e.g., avoided costs of infrastructure investments and avoided fuel (commodity costs) due to electric energy conserved by efficient measures
- Technology Cost: The incremental equipment cost to the customer
- Admin Costs: The administrative costs incurred by the utility or program administrator

Guidehouse calculated TRC ratios for each measure based on the present value of benefits and costs over each measure's life. Free ridership's effects are not present in the results from this study, so the team did not apply an NTG factor. Providing gross savings results will allow ENO to easily apply updated NTG assumptions in the future and allow for variations in NTG assumptions.

The administrative costs are included when reporting sector-specific or portfolio-wide cost-effectiveness. However, they are not included at the measure level for economic potential screening. For this screening, the focus is to identify measures that are cost-effective on the margin prior to assessing effects for the achievable potential where administrative costs are considered depending on the amount and level of programmatic spend.

Participant Payback Period

Guidehouse calculates the customer payback period to assess customer potential to implement the energy-saving action. The payback period is used to assess customer acceptance and adoption of the measure. Additional details are described in Section 4.3. The payback period is calculated after the incentive is applied to the measure cost. Equation 9 demonstrates the calculation.

Equation 9. Participant Payback Period

$$\boldsymbol{Payback} = \frac{\boldsymbol{Annual\ kWh\ Saved}\ \times \boldsymbol{Annualized\ Retail\ Rate}\ \left({}^{\$}/_{\boldsymbol{kWh}}\right)}{\boldsymbol{Incremental\ Measure\ Cost} - \boldsymbol{Incentive}}$$

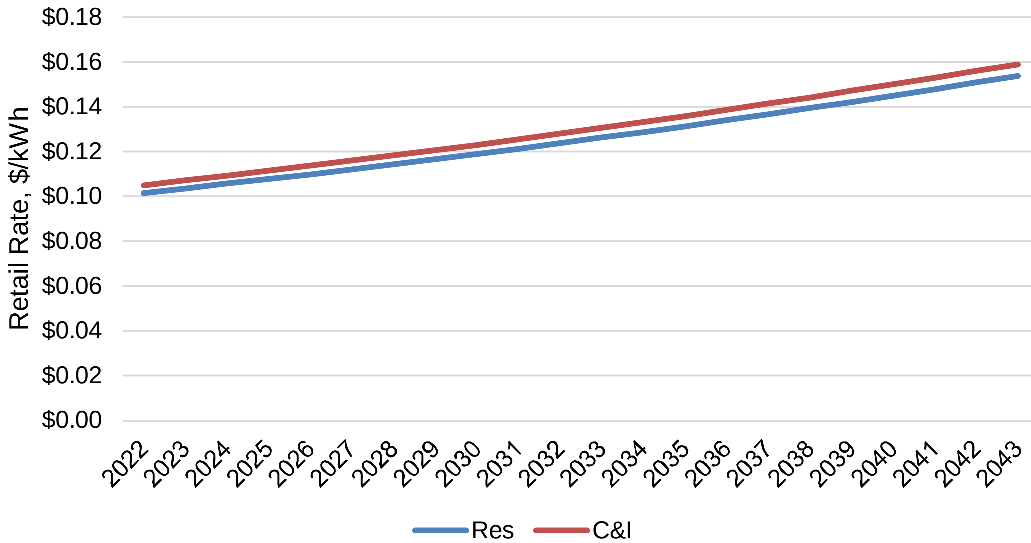
Where:

- Annual kWh Saved: Calculated for each measure and segment (as appropriate)
- Annualized Retail Rate: The overall cost a customer pays per kilowatt-hour consumed (see Appendix A.7)
- Incremental Measure Costs: The costs the participant would pay (without an incentive) to implement the measure; in ROB and NEW, depending on the measure, the difference in the cost of the efficiency and standard equipment is used instead of the full cost of installation (material and labor costs)
- Incentives: The incentive costs paid for a customer's out of pocket costs to be reduced

A.7 Retail Rates

Customer economics is a primary driver of EE measure adoption, so Guidehouse used a forecast of electric retail rates for each sector to estimate achievable energy and demand potential. Because ENO did not have a forecast of retail rates readily available, the team calculated the retail rates based on historic sales. ENO provided 2021 - August 2023 (revenue ($) and sales (kWh) by rate class and rate schedule, as well as customer counts by rate class and rate schedule. For each rate schedule, Guidehouse divided revenue by sales to calculate an average rate ($/kWh). Then, for each sector (residential and non-residential), Guidehouse calculated an average rate ($/kWh) weighted by the number of customers on each rate schedule. Guidehouse then assumed the rates would increase with inflation, or 2% per year shown in Figure 58.

Figure 58. Electricity Retail Rate Forecast: 2022-2043



Source: Guidehouse analysis

A.8 Other Key Input Assumptions

As Table 53 shows, Guidehouse used the discount rates provided by ENO and an inflation rate consistent with the utility's planning.

Table 53. Potential Study Assumptions

Variable Name	Percentage
Discount Rate (WACC)	6.86%
Discount Rate (Societal)	3.00%
Inflation Rate	2.00%

Source: ENO

B. Residential Segment Level Results

The Guidehouse team analyzed the residential segment for the 2024 Study by market rate and income qualified customers. The market characterization details are provided in Table 15 and Appendix A.2. Guidehouse concluded that the Residential sector is composed of 48% income qualified and 52% market rate customers. The incentive structure for income qualified measures is at 100% of measure costs for all cases, except for the Low case.

Table 54 and Table 55 provide the incremental energy savings for WACC and Societal discount rates, respectively. The savings split is almost even despite the income qualified sector being almost 5% smaller. Since the High case does not differentiate by housing segment for the incentive levels, the savings potential between income qualified and market rate reflects the difference in population size.

Table 54. Income Qualified vs. Market Rate by Case Incremental Energy Savings (GWh/year), WACC

	Income Qualified				Market Rate			
Year	Reference	2% Savings	High	Low	Reference	2% Savings	High	Low
2024	12.6	15.0	17.2	7.9	12.8	15.6	18.8	8.2
2025	14.5	17.5	20.2	9.2	14.6	18.2	22.2	9.5
2026	16.8	20.5	23.8	10.8	16.7	21.2	26.2	11.0
2027	19.2	23.7	27.6	12.5	19.1	24.5	30.3	12.7
2028	21.6	27.0	31.1	14.2	21.4	27.9	34.2	14.5
2029	23.7	29.9	34.1	15.9	23.4	30.9	37.5	16.2
2030	25.1	32.0	36.0	17.2	24.9	33.1	39.6	17.6
2031	25.4	32.9	36.4	18.1	25.4	34.1	40.1	18.6
2032	24.5	32.3	35.0	18.3	24.9	33.5	38.6	18.9
2033	22.6	30.2	32.3	18.0	23.3	31.4	35.5	18.8
2034	20.4	27.2	28.8	17.0	21.5	28.4	31.6	17.9
2035	17.8	23.8	25.1	15.5	19.1	25.0	27.5	16.5
2036	16.5	20.6	22.0	13.8	17.8	21.7	24.0	14.9
2037	14.8	17.7	19.3	12.2	16.2	18.8	21.0	13.2
2038	13.4	15.5	17.2	10.7	14.6	16.6	18.7	11.7
2039	12.3	13.9	15.7	9.5	13.4	14.9	17.0	10.2
2040	11.5	12.7	14.6	8.5	12.6	13.7	15.8	9.1
2041	10.9	11.9	13.7	7.7	11.8	12.8	14.9	8.1
2042	10.3	11.2	12.9	7.1	11.2	12.1	14.0	7.3
2043	10.0	10.8	12.5	7.0	10.9	11.7	13.6	7.2

Source: Guidehouse analysis

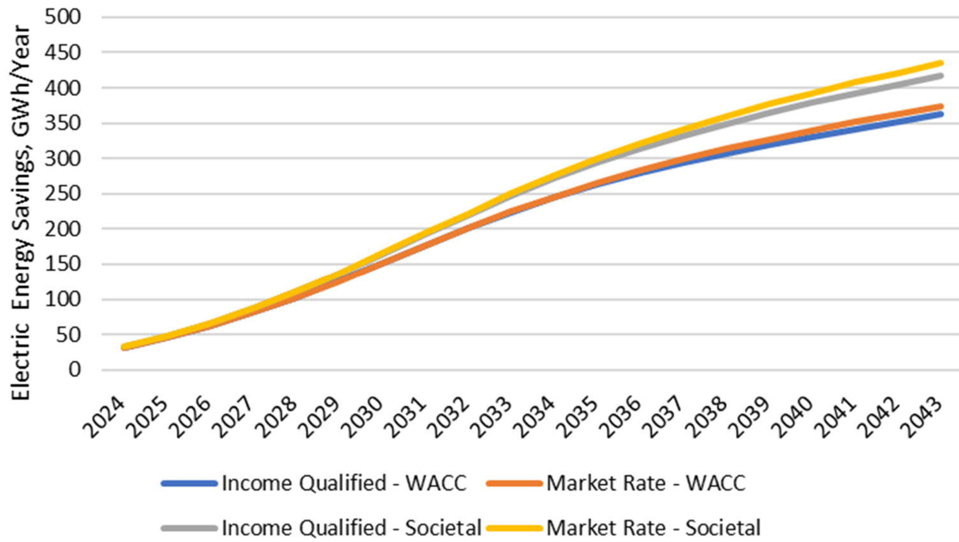
Table 55. Income Qualified vs. Market Rate by Case Incremental Energy Savings (GWh/year), Societal

	Income Qualified				Market Rate			
Year	Reference	2% Savings	High	Low	Reference	2% Savings	High	Low
2024	13.4	16.2	17.2	8.0	13.7	17.0	18.9	8.3
2025	15.5	19.1	20.3	9.3	15.7	19.9	22.2	9.6
2026	18.1	22.6	23.9	10.9	18.1	23.5	26.2	11.2
2027	20.8	26.2	27.6	12.7	20.8	27.2	30.4	12.9
2028	23.6	29.8	31.2	14.4	23.5	30.9	34.3	14.7
2029	26.0	32.9	34.2	16.1	26.0	34.1	37.6	16.4
2030	27.8	35.0	36.1	17.8	27.9	36.3	39.7	18.2
2031	28.6	35.7	36.5	18.8	28.9	37.1	40.2	19.4
2032	28.1	34.6	35.1	19.2	28.8	36.0	38.7	19.8
2033	26.6	32.1	32.3	18.8	27.7	33.5	35.6	19.6
2034	24.5	28.8	28.9	17.8	26.0	30.2	31.7	18.8
2035	22.2	25.2	25.2	16.7	23.9	26.5	27.6	17.9
2036	20.1	21.9	22.0	15.2	21.8	23.2	24.1	16.4
2037	18.2	19.2	19.3	14.6	20.0	20.4	21.1	15.9
2038	16.7	17.0	17.2	13.3	18.3	18.2	18.7	14.5
2039	15.5	15.4	15.7	12.1	17.0	16.6	17.0	13.2
2040	14.5	14.3	14.6	11.2	15.9	15.4	15.8	12.1
2041	13.6	13.5	13.7	10.5	14.8	14.5	14.9	11.1
2042	12.7	12.7	12.9	9.8	13.9	13.7	14.0	10.3
2043	12.1	12.3	12.5	9.9	13.2	13.3	13.6	10.3

Source: Guidehouse analysis

Figure 59 provides the cumulative energy savings by residential market rate customers versus income qualified segments. The market rate has a slightly higher savings forecast in the latter years.

Figure 59. Reference Case – Market Rate vs. Income Qualified Cumulative Energy Savings, GWh



Source: Guidehouse analysis

Table 56 and Table 57 provide the total program costs (incentives and administrative costs) for the income qualified versus market rate residential segments for WACC and Societal discount rates, respectively. The combined total of these values equal the residential sector costs.

Table 56. Program Costs for Income Qualified versus Market Rate Residential Segments, WACC ($millions)

	Income Qualified				Market Rate			
Year	Reference	2% Savings	High	Low	Reference	2% Savings	High	Low
2024	$2.4	$3.8	$10.4	$1.0	$1.8	$3.5	$11.9	$0.9
2025	$3.1	$4.9	$13.1	$1.3	$2.3	$4.5	$15.0	$1.2
2026	$4.0	$6.3	$16.5	$1.7	$3.0	$5.8	$19.0	$1.5
2027	$5.0	$7.9	$19.9	$2.0	$3.7	$7.3	$22.9	$1.9
2028	$6.0	$9.6	$23.1	$2.5	$4.5	$8.9	$26.6	$2.3
2029	$6.9	$11.2	$25.7	$2.9	$5.2	$10.4	$29.7	$2.6
2030	$7.6	$12.5	$27.6	$3.3	$5.7	$11.7	$31.9	$3.0
2031	$7.8	$13.2	$28.4	$3.6	$6.0	$12.5	$32.8	$3.3
2032	$7.5	$13.3	$27.6	$3.7	$5.9	$12.6	$31.9	$3.5
2033	$6.8	$12.5	$25.7	$3.8	$5.5	$12.1	$29.6	$3.6
2034	$5.9	$11.3	$23.4	$3.7	$4.9	$11.0	$26.8	$3.5
2035	$4.8	$9.6	$20.6	$3.4	$4.1	$9.5	$23.4	$3.3
2036	$4.2	$8.0	$18.2	$3.1	$3.8	$7.9	$20.5	$3.0
2037	$3.4	$6.4	$15.9	$2.7	$3.2	$6.4	$17.8	$2.6
2038	$2.8	$5.1	$14.0	$2.4	$2.7	$5.2	$15.6	$2.2

	Income Qualified				Market Rate			
Year	Reference	2% Savings	High	Low	Reference	2% Savings	High	Low
2039	$2.3	$12.6	$2.1	$2.1	$2.3	$4.2	$13.9	$1.9
2040	$1.9	$11.5	$1.8	$1.8	$1.9	$3.5	$12.6	$1.6
2041	$1.6	$10.5	$1.6	$1.6	$1.7	$3.0	$11.5	$1.3
2042	$1.4	$9.5	$1.5	$1.5	$1.4	$2.6	$10.3	$1.1
2043	$1.2	$8.9	$1.4	$1.4	$1.3	$2.3	$9.7	$1.1

Source: Guidehouse analysis

Table 57. Program Costs for Income Qualified versus Market Rate Residential Segments, Societal ($millions)

	Income Qualifed				Market Rate			
Year	Reference	2% Savings	High	Low	Reference	2% Savings	High	Low
2024	$2.7	$5.4	$10.4	$1.1	$2.1	$5.2	$11.9	$1.0
2025	$3.5	$7.1	$13.1	$1.3	$2.7	$6.9	$15.0	$1.2
2026	$4.5	$9.3	$16.5	$1.7	$3.5	$9.1	$18.9	$1.6
2027	$5.7	$11.6	$19.9	$2.1	$4.5	$11.3	$22.9	$1.9
2028	$6.9	$13.9	$23.0	$2.5	$5.4	$13.6	$26.6	$2.3
2029	$8.0	$16.0	$25.6	$2.9	$6.3	$15.6	$29.6	$2.7
2030	$8.8	$17.6	$27.5	$3.4	$7.1	$17.2	$31.8	$3.2
2031	$9.3	$18.4	$28.2	$3.7	$7.7	$18.2	$32.7	$3.5
2032	$9.2	$18.3	$27.4	$3.9	$7.8	$18.1	$31.7	$3.7
2033	$8.7	$17.3	$25.5	$4.0	$7.6	$17.3	$29.4	$3.8
2034	$8.0	$15.9	$23.1	$3.9	$7.2	$16.0	$26.5	$3.7
2035	$7.1	$14.1	$20.3	$3.7	$6.6	$14.3	$23.2	$3.6
2036	$6.2	$12.5	$17.9	$3.4	$6.1	$12.9	$20.3	$3.3
2037	$5.5	$10.9	$15.6	$3.4	$5.5	$11.4	$17.5	$3.3
2038	$4.8	$9.7	$13.7	$3.1	$5.0	$10.1	$15.3	$3.0
2039	$4.3	$8.6	$12.2	$2.8	$4.5	$9.1	$13.5	$2.7
2040	$3.9	$7.9	$11.2	$2.6	$4.1	$8.4	$12.3	$2.5
2041	$3.5	$7.2	$10.2	$2.4	$3.7	$7.7	$11.2	$2.2
2042	$3.1	$6.5	$9.2	$2.3	$3.3	$7.0	$10.0	$2.0
2043	$2.8	$6.2	$8.7	$2.4	$3.0	$6.7	$9.4	$2.2

Source: Guidehouse analysis

C. Achievable Potential Modeling Methodology

This appendix demonstrates Guidehouse's approach to calculating achievable potential, which is fundamentally more complex than calculating technical or economic potential.

The critical first step in the process to accurately estimate achievable potential is to simulate market adoption of energy efficient measures. The team's approach to simulating the adoption of energy efficient technologies for purposes of calculating achievable potential can be broken down into the following two strata:

1. Calculation of the dynamic approach to equilibrium market share
2. Calculation of the equilibrium market share

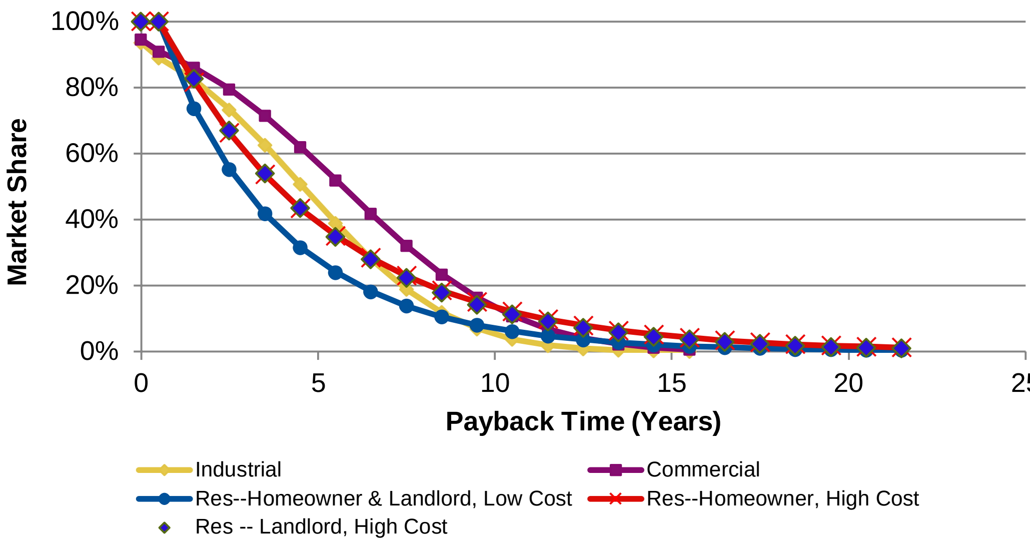
Calculation of Dynamic Equilibrium Market Share

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 energy efficient technologies, a key differentiating factor between the base technology and the efficient technology includes the energy and cost savings associated with the efficient technology. That additional efficiency often comes at a premium in initial cost. In efficiency potential studies, equilibrium market share is often calculated as a function of the payback time of the efficient technology relative to the inefficient technology. While such approaches have limitations, they are nonetheless directionally reasonable and simple enough to permit estimation of market share for the dozens or even hundreds of technologies that are often considered in potential studies.

Guidehouse uses equilibrium payback acceptance curves that were developed using primary research it conducted in the Midwest US.[70] To develop these curves, the team surveyed 400 residential, 400 commercial, and 150 industrial customers. These surveys presented 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. Guidehouse conducted statistical analysis to develop the set of curves shown in Figure 60, which were leveraged in this study. Though ENO-specific data is not currently available to estimate these curves, Guidehouse considers that the nature of the decision-making process is such that the data developed using these surveyed customers represents the best data available for this study at this time. Furthermore, as the previous two potential study cycles were followed up with Council-sponsored studies, there has been a unique situation where different methodologies and data collection efforts were tested and compared against each other in the same jurisdiction and year of study. This unique situation specifically includes different approaches to assess customer affinity to adoption. As the results between the Guidehouse study and the other consultants' reports were aligned in the final adoption forecast, Guidehouse does not believe that these older datasets will mislead the analysis.

[70] A detailed discussion of the methodology and findings of this research is contained in the *Demand Side Resource Potential Study*, prepared for Kansas City Power and Light, August 2013.

Figure 60. Payback Acceptance Curves



Source: Guidehouse, 2015

Because the payback time of a technology can change over time, as do technology costs or energy costs, the equilibrium market share also can evolve. The equilibrium market share is recalculated for every time-step within the market simulation to ensure the dynamics of technology adoption considers this effect. The term 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. It is used nonetheless to facilitate understanding of the approach.

Calculation of the Approach to Equilibrium Market Share

The team used two approaches to calculate 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 (i.e., lost opportunity) measures.[71] The following sections summarize each approach at a high level.

Retrofit/New Technology Adoption Approach

Retrofit and new technologies employ an enhanced version of the classic Bass diffusion model[72,73] to simulate the S-shaped approach to equilibrium commonly observed for technology adoption. Figure 61 illustrates the causal influences underlying the Bass model. In this model, achievable potential flows to adopters through two primary mechanisms: adoption from external influences such as program marketing/advertising, and adoption from internal influences including word of mouth. Figure 54 illustrates the fraction of the population willing to adopt is estimated using the payback acceptance curves.

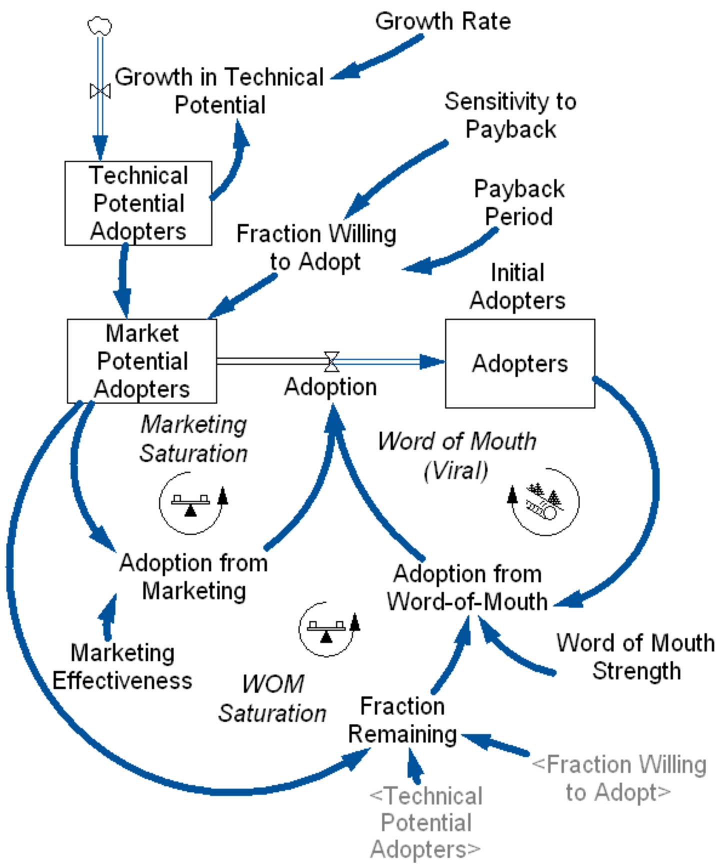
[71] Each of these approaches can be better understood by visiting Guidehouse's technology diffusion simulator, available at: http://forio.com/simulate/Guidehousesimulations/technology-diffusion-simulation.

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

[73] John D. Sterman, Business Dynamics: Systems Thinking and Modeling for a Complex World, Irwin McGraw-Hill, 2000. p. 332.

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.[74] Additionally, the calibration process permits adjusting these parameters as warranted (e.g., to better align with historic adoption patterns within the ENO market). Recognition of the positive or self-reinforcing feedback generated by the word of mouth mechanism is evidenced by increasing discussion of concepts like social marketing and the term viral, which has been popularized and strengthened by social networking sites such as Facebook and YouTube. However, the underlying positive feedback associated with this mechanism has been part of the Bass diffusion model of product adoption since its inception in 1969.

Figure 61. Stock/Flow Diagram of Diffusion Model for New Products and Retrofits



Source: Guidehouse, 2015

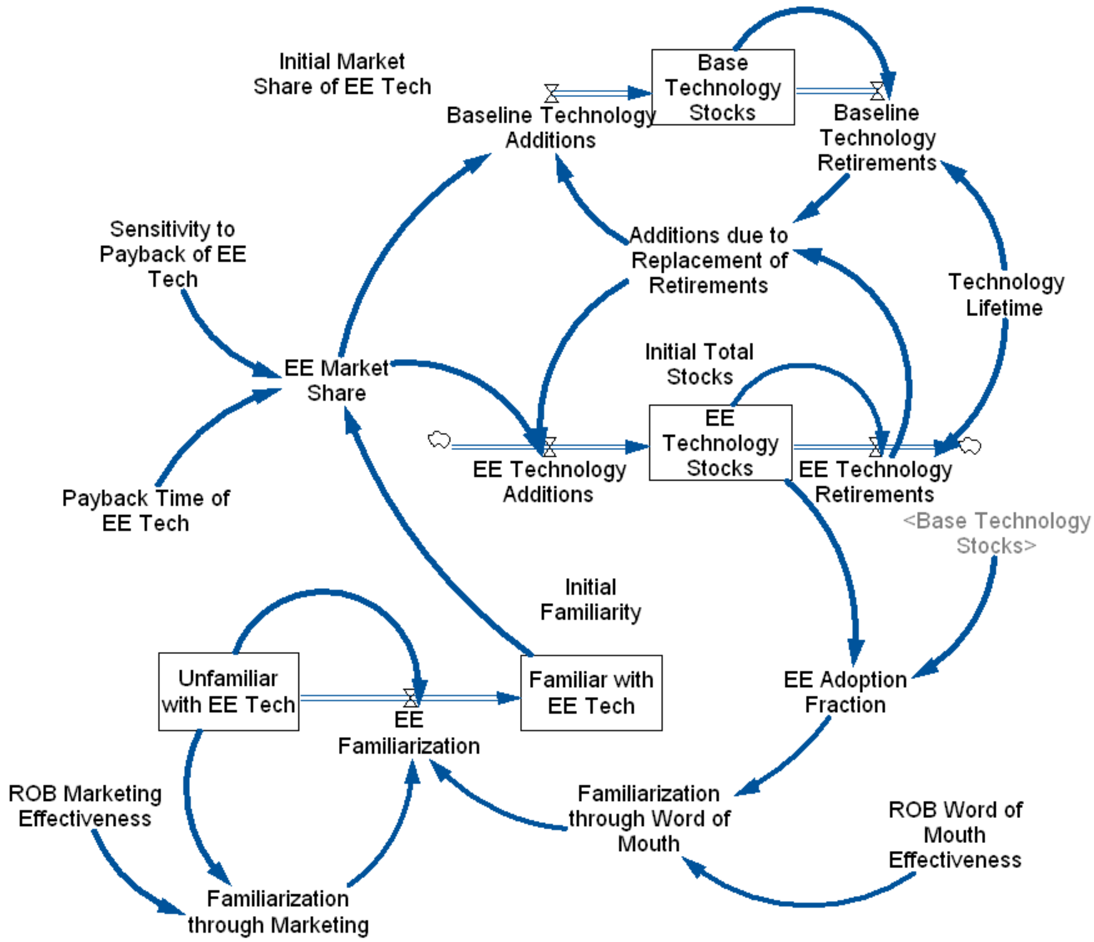
ROB Technology Adoption Approach

The dynamics of adoption for ROB technologies are more complicated than for new/retrofit technologies because it requires simulating the turnover of long-lived technology stocks. To account for this, the DSMSim model tracks the stock of all technologies, both base and efficient,

[74] See Mahajan, V., Muller, E., and Wind, Y. (2000). *New Product Diffusion Models.* Springer. Chapter 12 for estimation of the Bass diffusion parameters for dozens of technologies. This model uses the median value of 0.365 for the word of mouth strength in the base case. The Marketing Effectiveness parameter was assumed to be 0.04, representing a somewhat aggressive value that exceeds the most likely value of 0.021 (75th percentile value is 0.055) per Mahajan 2000.

and explicitly calculates technology retirements and additions consistent with the lifetime of the technologies. Such an approach ensures that technology churn is considered in the estimation of achievable potential, as 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, is overlaid on the stock tracking model to capture the dynamics associated with the diffusion of technology familiarity. Figure 62 illustrates a simplified version of the model employed in DSMSim.

Figure 62. Stock/Flow Diagram of Diffusion Model for ROB Measures



Source: Guidehouse, 2015

D. Calibration

Forecasting is the inherently uncertain process of estimating future outcomes by applying a model to historical and current observations. As with all forecasts, the Guidehouse results cannot be empirically validated *a priori* because there is no future basis against which one can compare simulated versus actual results. Even though all future estimates are untestable at the time they are developed, forecasts can still warrant confidence when historical observations can be shown to reliably correspond with generally accepted theory and models.

“Calibration” refers to the standard process of adjusting model parameters such that model results align with observed data. Calibration provides the forecaster and stakeholders with a degree of confidence that simulated results are reasonable and reliable. Calibration is intended to achieve three main purposes:

- Anchor the model in actual market conditions and ensure the bottom-up approach to calculating potential can replicate previous market conditions;
- Establish a realistic starting point from which future projections are made; and
- Account for varying levels of market barriers and influences across different types of technologies.

The Guidehouse approach applies general market and consumer parameters to forecast technology adoption. There are often reasons why markets for certain end uses or technologies behave differently than the norm—both higher and lower. Calibration offers a mechanism for using historical observations to account for these differences.

The calibration process is not a regression of savings or spending (i.e., it does not draw a future trend line of savings based on past program accomplishments). Rather, calibration develops parameters that describe the customer decision-making process and the velocity of the market based on recent history. Once these parameters are set, the model uses them as a starting point for the forecast period.

For the 2024 IRP study, the team calibrated the ENO model based on historical program and market data from 2020 through 2022 and 2023 achievements to date for EE measures. Program accomplishments prior to 2020 were judged by the Guidehouse team as too different in terms of the measures offered by programs and the baselines set by code or policy. For the calibration, any new measures or programmatic aspects not applicable in the historical years were removed from the analysis to optimize the model compatibility to the historical period. For the DR analysis, the program participation was calibrated to historical program achievements for DR options that represent DR programs ENO currently offers.

Necessity of Calibration

In evaluative statistical models, calibration is called regression, and goodness of fit is typically the main focus because the models are usually simple. In situations of complex dynamics and non-linearity (as in this study), model sophistication and adequacy can become the main focus. However, grounding the model in observation remains equally necessary. The ability of a forecast to reasonably simulate observed data affords credibility and confidence to forecast estimates.

Although data supports all underlying parameters in the model, much of the data is at an aggregate level that can be inadequate to forecast differences across the various classes of technologies and end uses. The incentive costs are a good example of this effect. The model uses incentives to forecast customer purchase tendencies (thus their adoption of technologies) based on the upfront and lifetime cost factors for which customers have self-reported their importance. The incentive inputs read into the model are provided at the sector and end use level, yet calibration allows the Guidehouse team to scale up and down these inputs to better match historical market activity.

Calibration is not an optional exercise in modeling. One might suggest that the average customer data should be sufficient to make a reliable aggregated forecast. Nevertheless, two important non-linearities compel a more granular parameterization:

- Program portfolios are not evenly composed across end uses. Straight averaging of customer willingness and awareness may not lead to reliable total savings and costs calculations due to unevenness of adoption of technologies.

- The dynamics in the model regarding the timing of adoption can become incompatible with the remaining potential indicated by program achievements. For example, if the forecast results were not calibrated for LED lighting in the residential sector, the saturation may remain inaccurately low in early years and indicate a larger remaining potential in future years. Calibrating upward may increase potential in the early years but decrease potential in later years. Without the calibration, the model adoption would imply that in the absence of utility program intervention, residential LED lighting would have historically had much lower adoption. Calibration allows us to capture these program influences to reflect more accurately remaining potential.

The team treats the calibrated results as the most basic set of interpretable results from which to develop alternate cases.

Interpreting Calibration

Calibration can constrain achievable potential for certain end uses when aligning model results with past EE portfolio accomplishments. Although calibration provides a reasonable historical basis for estimating future achievable potential, past program achievements may not capture the potential because of structural changes in future programs or changes in consumer values. Calibration can be viewed as holding constant certain factors that might otherwise change future program potential, such as:

- Consumer values and attitudes toward energy efficient measures
- Market barriers associated with different end uses
- Program efficacy in delivering measures
- Program spending constraints and priorities

Allowing changing values and shifting program characteristics would likely cause deviations from achievable potential estimates when calibrating to past program achievements.

Does calibrating to historical data constrain the future forecast? In a strictly numeric sense, yes. If a certain end use is calibrated downward or upward, then future adoption and its timing are affected. Nevertheless, this should not be interpreted as “calibration constrains the level of adoption thought possible.” Rather, calibration provides a more accurate estimate of the rate of technology turnover in the market, current state of customer willingness, market barriers, program characteristics, and remaining adoption potential.

One interpretation is that the calibration process creates a floor for the remaining potential. Market barriers, customer attitudes, and program efficacy generally move in the direction of improvement.

Implementing Calibration

The process primarily seeks to develop a set of consumer decision and market parameters that represent recent history. Once developed, these parameters are used as the starting point for the model's stock turnover algorithms and consumer decision algorithms. Developing these parameters requires historical market data. The model uses 2020-2022 program data (gross savings and program spending data) and performs a backcast to fit model parameters such that historical achievements are generally matched.

The Guidehouse team calibrated by reviewing the EE portfolio data from 2020 through 2022 to assess how the market has reacted to program offerings in the past. This method calibrated gross program savings in the model to gross program savings in the 2020-2022 period. After reviewing the gross savings calibration, the Guidehouse team additionally calibrated on the resulting program cost to further tune the incentive levels offered to each end use. In some cases, the first calibration step of gross savings matched the historical gross savings, but the resulting program costs may have been significantly different. This result implies the model overpredicts or underpredicts the sensitivity of customers to rebates. The Guidehouse team further tuned the incentive levels (within their specified caps under each case). Changing incentives would result in a change in gross savings, so an iterative process of adjusting factors to calibrate gross savings and program budget was needed in some cases.

For some sectors and end uses, this primary calibration method was not possible because program offerings and the market have significantly changed. When the primary calibration method was not possible, a secondary method was used that focused on tuning saturation and penetration rates of the end use as a whole to market data. For example, the 2022 RASS provides data on the saturation of technologies. This saturation is a more reliable calibration target because it seeds the model with an accurate starting point to assess the potential for future high efficiency savings.

To execute calibration, the Guidehouse team adjusted model parameters and compared the back cast of the model against historical program data. Guidehouse made individual adjustments to four key levers (listed in Table 58 primarily at the sector and end use levels until achieving a reasonable match with historical data. In some cases where a specific technology witnessed adoption at unexpectedly high or low levels, the team adjusted these levers at the technology level; adjusting at the end use level in these cases would cause the entire end use to undershoot or overshoot the historical program targets.

Table 58. Calibration Levers

Lever	Drivers and Impact on Model Results
Awareness	• Increasing initial awareness shortens the time required for a measure to reach 100% consumer awareness and accelerates adoption. • Increasing marketing strength increases the adoption rate of technologies in the nascent stage (i.e., having low initial consumer awareness). • Increasing word of mouth strength increases the adoption rate of technologies in the mid to later stages of adoption (i.e., having medium to high consumer awareness).
Willingness	• Increasing incentive levels increases adoption, budget, and savings. • Overriding a technology’s cost-effectiveness allows it to be considered for adoption (otherwise, non-cost-effective measures are not considered in achievable potential). • Adjusting the weighted utility adjusts the attractiveness of a technology relative to the others in its competition. • Adjusting the consumer-implied discount rate can account for non-cost-related market barriers that may be higher or lower than normal.
Stock Turnover	• Adjusting turnover rates allows the model to better reflect real-world market dynamics. The model assumes technologies turn over based on EUL. However, the real velocity of the market and turnover dynamics are not this perfect or exact.
Adoption	• Adjusting adoption by end use enables better alignment of the model’s backcast with limited historic program data.

Source: Guidehouse

CERTIFICATE OF SERVICE
UD-23-01

I hereby certify that I have served the required number of copies of the foregoing pleading upon all other known parties of this proceeding individually and/or through their attorney of record or other duly designated individual.

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