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Volume 1. Investor-Owned Utilities (IOUs) Energy Efficiency Report Program Year 2024—DRAFT

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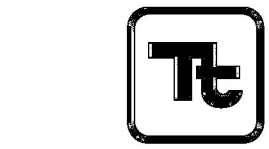
September 2025



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ACKNOWLEDGEMENTS

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GLOSSARY: ACRONYMS/ABBREVIATIONS/DEFINITIONS

Acronym	Description
AC	Air conditioner
AEP Texas	American Electric Power Texas
AHRI	Air Conditioning, Heating, and Refrigeration Institute
C&I	Commercial and industrial
CF	Coincidence factor
CMTP	Commercial market transformation program
CNP	CenterPoint Energy Houston Electric, LLC
CSOP	Commercial standard offer program
DHP	Ductless heat pump
DI	Direct install
DLC	DesignLights Consortium
ECM	Energy conservation measure
EECRF	Energy efficiency cost recovery factor
EEIP	Energy Efficiency Implementation Project
EEPR	Energy Efficiency Plan and Report
EESP	Energy efficiency service provider
EISA	Energy Independence and Security Act of 2007
EM&V	Evaluation, measurement, and verification
EPE	El Paso Electric Company
ER	Early replacement
ERCOT	Electric Reliability Council of Texas
ERS	Emergency Response Service
ESCO	Energy service company
ESIID	Electric service identifier ID
ESNH	ENERGY STAR® New Homes
ETI	Entergy Texas, Inc.
EUL	Estimated useful life
EUMMOT	Electric Utility Marketing Managers of Texas
GSHP	Ground-source heat pump
GW	Gigawatt
GWh	Gigawatt-hour
HCIF	Heating/cooling interactive factor
HOU	Hours of use
HTR	Hard-to-reach
HVAC	Heating, ventilation, and air conditioning
IECC	International Energy Conservation Code
IPMVP	International Performance Measurement and Verification Protocol
kW	Kilowatt
kWh	Kilowatt-hour
LED	Light emitting diode

Acronym	Description
LI	Low-income
LI/HTR	Low-income/hard-to-reach
LM	Load management
M&V	Measurement and verification
mcf	1,000 cubic feet
MF	Multifamily
MTP	Market transformation program
MW	Megawatt
MWh	Megawatt-hour
NTG	Net-to-gross
Oncor	Oncor Electric Delivery Company LLC
PUCT	Public Utility Commission of Texas
PV	Photovoltaics
PY	Program year
QA/QC	Quality assurance/quality control
QPL	Qualified Products List
RCx	Retro-commissioning
RFP	Request for proposal
RMTP	Residential market transformation program
ROB	Replace-on-burnout
RSOP	Residential standard offer program
SEM	Strategic energy management
SIR	Savings-to-investment ratio
SOP	Standard offer program
SRA	Self-report approach
SWEPCO	Southwestern Electric Power Company
TEESI	Texas Energy Engineering Services, Inc.
TMY	Typical meteorological year
TNMP	Texas-New Mexico Power Company
TRM	Technical reference manual
WACC	Weighted average cost of capital
Xcel SPS	Xcel Energy Southwest Public Service, Inc.

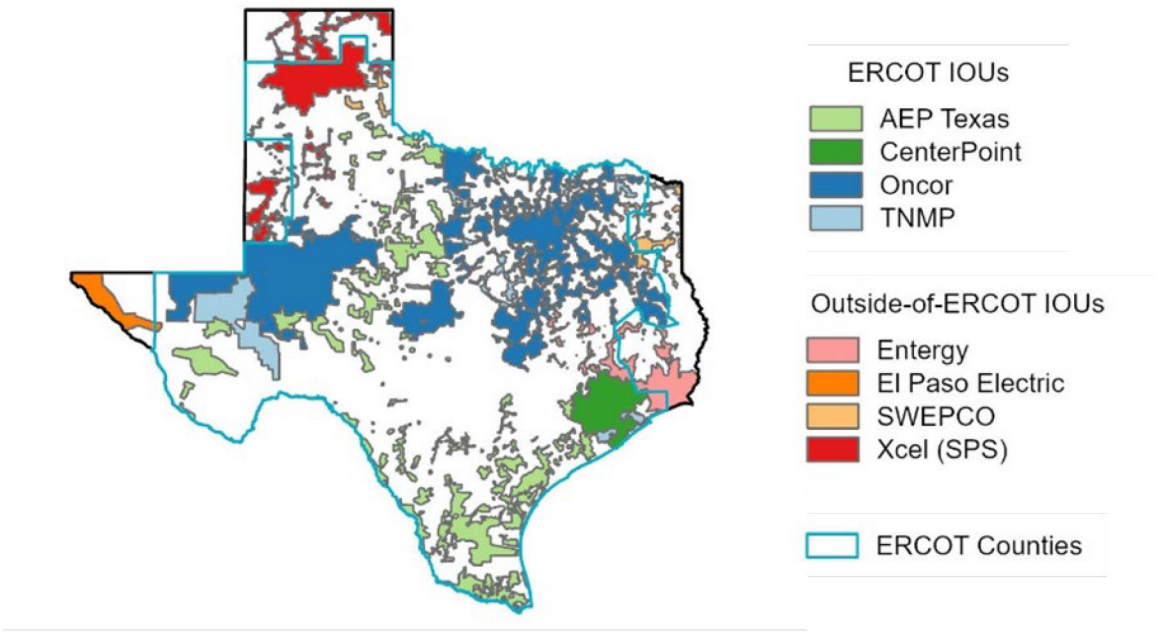
EXECUTIVE SUMMARY

INTRODUCTION

The Energy Efficiency Report presents findings and recommendations for the eight investor-owned utilities (IOUs) within program year 2024 (PY2024).[1] This report details how each utility achieved its statutory energy efficiency goals, at what cost, and how each utility may improve its performance. In PY2024, the eight IOUs reported total demand reductions of 609 megawatts (MW)—a 4 percent increase from PY2023—and total energy savings of 603 gigawatt-hours (GWh)—a 0.7 percent decrease from PY2023. The MW increase was achieved through:

- 197 MW from energy efficiency projects—a 7 percent increase from PY2023, and
- 412 MW from load management—a 4 percent increase from PY2023.

The Public Utility Commission of Texas (PUCT) oversees the IOUs' energy efficiency goals and the third-party evaluation, measurement and verification (EM&V) of the IOU programs.[2] Four of the utilities operate within the Electric Reliability Council of Texas (ERCOT) region, and the other four utilities are vertically integrated and operate outside of the ERCOT region. The boundaries of the utilities' respective service territories are shown in the map below.



[1] ERCOT IOUs: American Electric Power Texas, Inc. (AEP Texas), CenterPoint Energy Houston Electric, LLC (CenterPoint), Oncor Electric Delivery, LLC (Oncor), and Texas-New Mexico Power Company (TNMP). Outside-of-ERCOT IOUs: Entergy Texas, Inc. (ETI); El Paso Electric Company (EPE); Southwestern Electric Power Company (SWEPCO); and Southwestern Public Service (Xcel SPS).

[2] PURA § 39.905(b)(6) requires the PUCT to establish an EM&V framework, which is embodied in 16 Texas Administrative Code (TAC) § 25.181.

TYPES OF ENERGY EFFICIENCY PROGRAMS

Texas IOUs administer the following energy efficiency programs to reduce annual electric use and demand for all distribution-voltage-level customers.[3] If requested, industrial customers at distribution voltage may opt out.

Standard offer programs (SOPs) deliver high-efficiency products and services to customers through financial incentives. Utilities develop and work with contractors to provide measures, such as *insulation* and *HVAC*. SOPs can be implemented directly by IOU staff, or through IOU-selected implementation contractors.

Market transformation programs (MTPs) provide financial and non-financial incentives, such as technical assistance and education, to customers in harder-to-serve markets (e.g., small businesses) or for select energy efficiency technologies. MTPs allow for the transition from extensive market intervention activities toward a largely self-sustaining market and are executed by IOU-selected implementation contractors.

Hard-to-Reach (HTR) programs serve residential customers with an annual household income at or below 200 percent of the federal poverty guidelines. All IOUs are required to achieve no less than five percent of their total demand reduction goal through HTR programs.[4] HTR programs have similar delivery models to residential SOPs.

Targeted low-income (LI) programs coordinate with the existing federal weatherization program[5] and are required by PURA § 39.905 for ERCOT IOUs. ERCOT IOUs must spend no less than ten percent of each program year's energy efficiency budget on targeted LI efficiency programs. The outside-of-ERCOT utilities can also choose to offer LI programs.

Load management programs are designed to reduce peak demand for periods of two to four hours when called for by ERCOT or for local IOU system reliability. Load management programs are specific to the season (winter or summer) and are offered to both commercial and residential customers.

[3] The distribution system is part of the electric delivery system operating under 60 kV.
[4] 16 TAC § 25.181(e)(3)(F).
[5] The Texas Department of Housing and Community Affairs (THDCA) operates the Weatherization Assistance Program with funds from the U.S. Department of Energy (DOE), and the U.S. Department of Health and Human Services Low Income Home Energy Assistance Program (LIHEAP).

PROGRAM PARTICIPATION AND PERFORMANCE

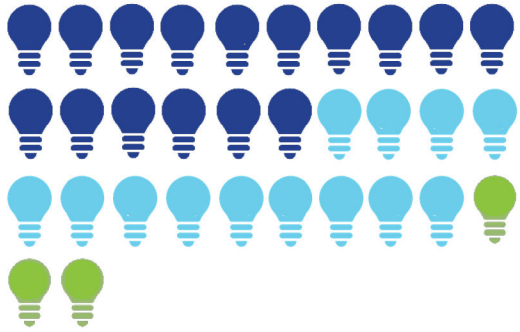
Residential and commercial programs continued to see healthy participation in Texas IOU energy efficiency programs and load management programs in PY2024 as shown in the images below.

RESIDENTIAL PROGRAMS

115,385+
HOUSEHOLDS PARTICIPATING IN ENERGY EFFICIENCY

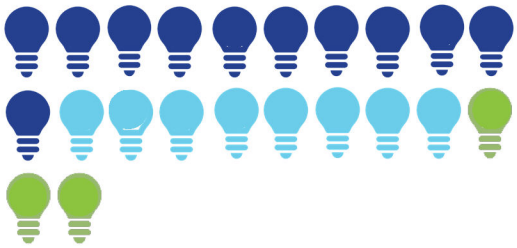
119,840
HOUSEHOLDS PARTICIPATING IN LOAD MANAGEMENT

ERCOT IOUs



1 MTP 13 SOP 3 load management program

OUTSIDE-of-ERCOT IOUs



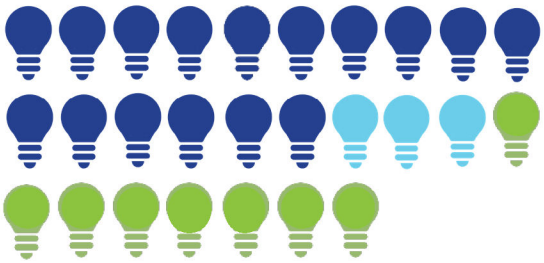
11 MTP 8 SOP 3 load management program

COMMERCIAL PROGRAMS

6,836+
CUSTOMERS PARTICIPATING IN ENERGY EFFICIENCY

2,128+
CUSTOMERS PARTICIPATING IN LOAD MANAGEMENT

ERCOT IOUs



16 MTP 3 SOP 8 load management program

OUTSIDE-of-ERCOT IOUs

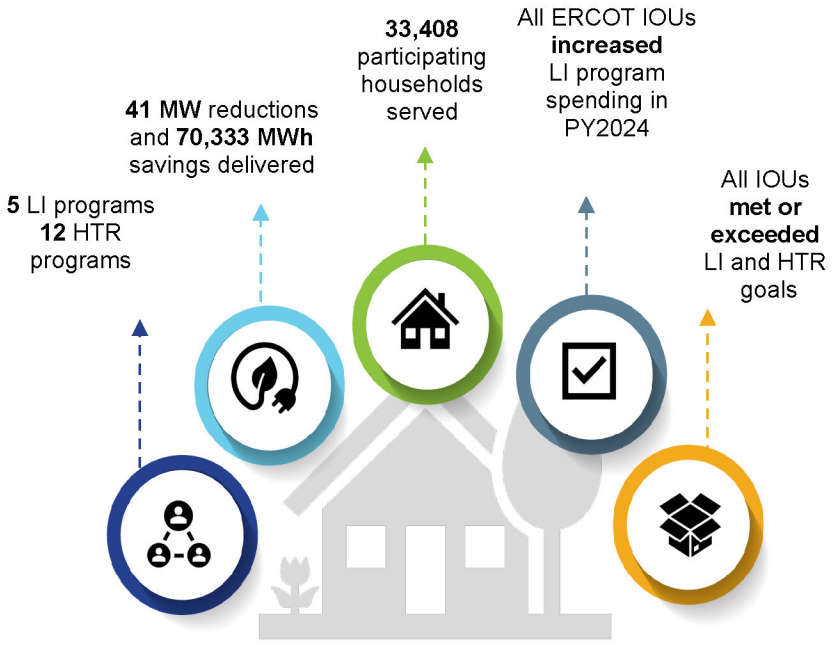
10 MTP 2 SOP 4 load management program

Key take-aways from Program Participation and Performance

- MTPs remain the most numerous energy efficiency program across commercial and residential sector.
- Making a home or business energy efficient first, followed by participating in load management, is considered an industry best practice.

SERVING LOW-INCOME CUSTOMERS

All IOUs in Texas serve low-income customers through various energy efficiency programs. ERCOT IOUs have a statutory energy efficiency requirement for low-income programs, and statute also requires outside-of-ERCOT IOUs to administer programs to hard-to-reach customers as part of the demand reduction goal. All LI programs are SOPs while IOUs use both SOPs and MTPs to meet HTR goals.



Key take-aways from Serving Low-Income Customers

- In PY2024, 17 different IOU programs served LI customers, with 33,408 residential households participating.
- ERCOT IOUs increased LI program spending and exceed their LI and HTR goals.
- Outside-of-ERCOT IOUs exceeded their HTR demand reduction goals by more than 100 percent.

A high-level review of the collective energy efficiency portfolios provides insight into how utility customers are served by their IOU's energy efficiency programs over the past five years. Figure 1 and Figure 2 provide a breakdown of programs by type.

Figure 1. Demand Reductions (MW) and Energy Savings (GWh) by Program Type—ERCOT IOU Programs

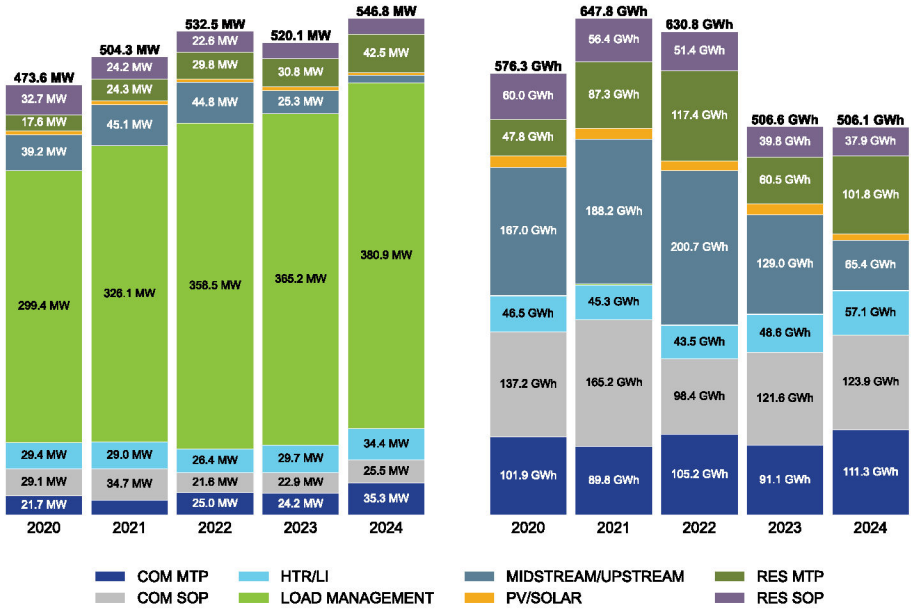
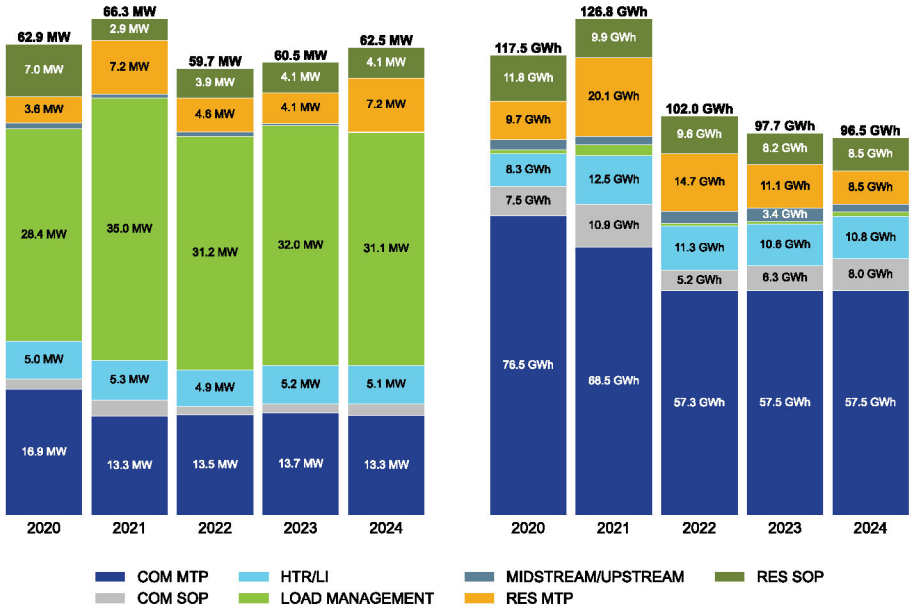


Figure 2. Demand Reductions (MW) and Energy Savings (GWh) by Program Type—Outside-of-ERCOT Programs



Key take-aways from the PY2020-PY2024 Comparisons

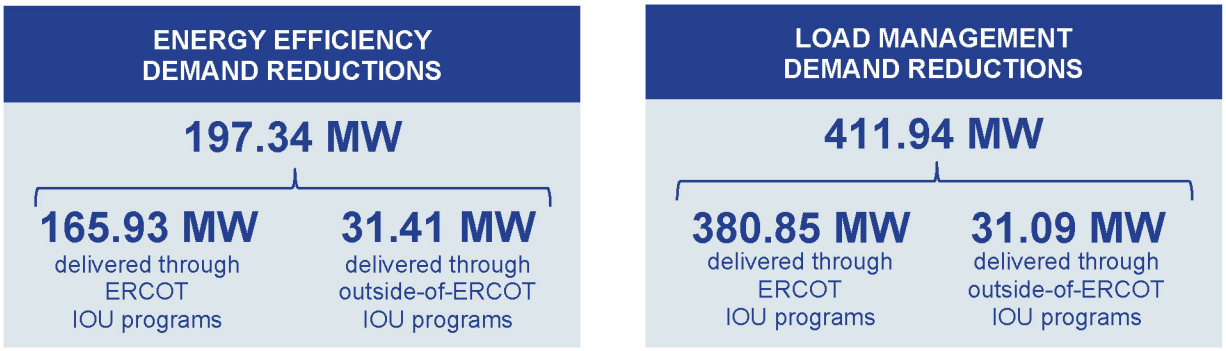
> Over 70 percent of ERCOT IOU demand reduction goals were achieved through load management programs.[6] However, ERCOT does not deploy load management program unless under specific emergency conditions, resulting in load management never deployed to date.[7]

> Outside-of-ERCOT IOUs achieved just under one-half of their demand reductions from load management programs.

> HVAC projects within residential MTP and HTR/LI programs contributed to increased demand reductions and energy savings for ERCOT IOUs. For outside-of-ERCOT IOUs, commercial MTPs contributed over half of total energy savings in PY2024, and LI/HTR programs contributed over 10 percent of total energy savings.

PY2024 DEMAND REDUCTIONS

ERCOT IOUs used significant load management in their portfolios; less than a third of ERCOT IOUs' demand reductions resulted from energy efficiency projects in PY2024. In contrast, outside-of-ERCOT IOUs delivered half of total demand reductions with energy efficiency projects in PY2024.



Energy efficiency savings have a multi-year useful life (e.g., 15 years of savings from a more efficient HVAC unit). In contrast, load management savings are based on annual participation (one-year enrollment of customers to curtail load if requested for grid or system reliability).

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[6] ERCOT does not deploy load management programs until an Energy Emergency Level 2 alert is reached. See ERCOT Nodal Protocols, § 6.5.9.4.2(2)(a)(ii), EEA Levels (June 1, 2025), https://www.ercot.com/files/docs/2024/06/28/06-060125_Nodal.docx; Energy Efficiency Implementation Project under 16 TAC § 25.181, Project No. 38578, ERCOT Letter regarding Summer and Winter Load Management MOU (Dec. 4, 2023), https://interchange.puc.texas.gov/search/documents/?controlNumber=38578&itemNumber=116.

[7] Review of Energy Efficiency Planning, Project No. 56517, Electric Reliability Council of Texas, Inc.'s Response to Commission Staff's First Request for Information to ERCOT Question Nos. RFI 1-1 through 1-8 (Apr. 3, 2025), https://interchange.puc.texas.gov/search/documents/?controlNumber=56517&itemNumber=31.

ENERGY EFFICIENCY LIFETIME COST PER KW

$23.70/kW

$26.48/kW achieved lifetime cost: ERCOT IOU programs

$19.25/kW achieved lifetime cost: outside-of-ERCOT IOU programs

LOAD MANAGEMENT LIFETIME COST PER KW

$62.64/kW

$60.46/kW achieved lifetime cost: ERCOT IOU programs

$64.82/kW achieved lifetime cost: outside-of-ERCOT IOU programs

Key take-aways from the PY2024 demand reductions

- Energy efficiency measures are more cost effective and useful to customers over time.
- While load management programs can contribute more to demand reduction in an emergency or when the system requires, they are expensive and do not offer longer-term solutions for customers.

PY2024 ENERGY SAVINGS

IOU energy savings reflect quantifiable reductions in a customer's energy consumption. PY2024's average lifetime cost per kWh savings were higher compared to prior years. Primary drivers of this finding included higher utility performance bonuses earned for PY2024 and higher baselines for energy efficiency measures such as *lighting* and *HVAC*.

ELECTRICITY SAVINGS

602.6 GWh

506.1 GWh delivered through ERCOT IOU programs

96.5 GWh delivered through outside-of-ERCOT IOU programs

LIFETIME COST OF kWh

$0.026/kWh achieved lifetime cost through ERCOT IOUs

$0.019/kWh achieved lifetime cost through outside-of-ERCOT IOUs

Key take-aways from the PY2024 energy savings

- ERCOT IOUs are delivering energy efficiency at a cost similar to national averages,[8] while outside-of-ERCOT IOUs achieve energy savings at lower cost.
- PY2024's average lifetime cost per kWh savings increased when compared to prior years—a range of $.014 to $.018 in PY2021-PY2023.
- Utility performance bonuses are a primary driver of ERCOT IOUs' higher average lifetime costs, increasing the difference in cost per kWh between ERCOT IOUs and outside-of-ERCOT IOUs.[9]

[8] Lawrence Berkley National Laboratory estimated average lifetime cost per kWh at $.024, https://emp.lbl.gov/sites/all/files/total-cost-of-saved-energy.pdf. The American Council for an Energy-Efficient Economy estimated the average lifetime cost per kWh at $.028, https://www.aceee.org/sites/default/files/cost-of-ee.pdf

[9] PY2024 performance bonuses increased 72 percent compared to PY2023. Prior to PY2024, the next highest average lifetime cost was $0.020 per kWh in PY2020. PY2020 also had the second highest utility performance bonuses after PY2024.

PROGRAM BUDGETS AND COST-EFFECTIVENESS

In PY2024, the consumers paid a grand total of $247,751,446 for receiving energy efficiency from Texas IOUs. Texas IOUs paid a total of $134,835,830 in program incentives for the implementation of energy efficiency projects. The funds covered technical assistance, project cost savings, and increased inventory and sales practices.[10]

$134,835,830
IN INCENTIVES

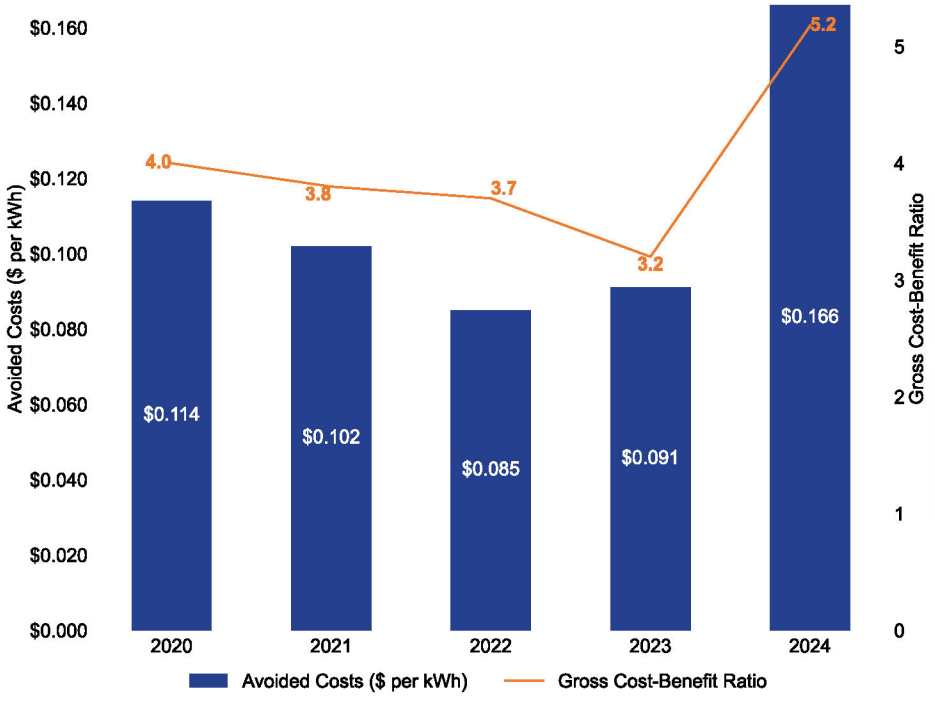
$115,628,285
through ERCOT IOU programs

$19,207,545
through outside-of-ERCOT programs

IOU program cost-effectiveness tests compare the benefits from the programs to the costs.[11] A ratio over 1.0 represents a cost-effective program.

Figure 3 shows the avoided costs and cost-effectiveness ratios for all IOUs over the last five years (PY2020 to PY2024). While the overall cost-effectiveness ratio has consistently remained above 3.0, an increase in ERCOT avoided cost of energy resulted in an overall cost-effectiveness ratio of 5.2 in PY2024.[12]

Figure 3. IOU Portfolios Gross Cost-Benefit Ratio and Avoided Cost by Program Year



[10] Not including administration and other program costs. See Appendix D of the full report for detailed IOU program budgets.
[11] EM&V cost-effectiveness calculations include the utility performance bonus awarded for PY2024.
[12] Calculated according to 16 TAC § 25.181(d)(3).

COST CAPS

Each program year, the PUCT by rule imposes cost caps for residential and commercial sectors—a uniform dollar amount per kWh that changes annually based on the current year consumer price index. The percentage of actual residential and commercial program costs compared to the cost caps provides insight into the budget adequacy for each IOU to:

- Maintain current levels of energy efficiency program delivery,
- Spend on achieving and exceeding statutory goals, and
- Grow energy efficiency program offerings.

The difference between program costs and the cost caps juxtaposes current spend alongside the utilities' capacity to bolster and expand energy efficiency programs, as shown in Figure 4 through 7.

Figure 4. Actual Program Costs Compared to Not-to-Exceed Cost Caps ERCOT Commercial Programs PY2022–PY2024

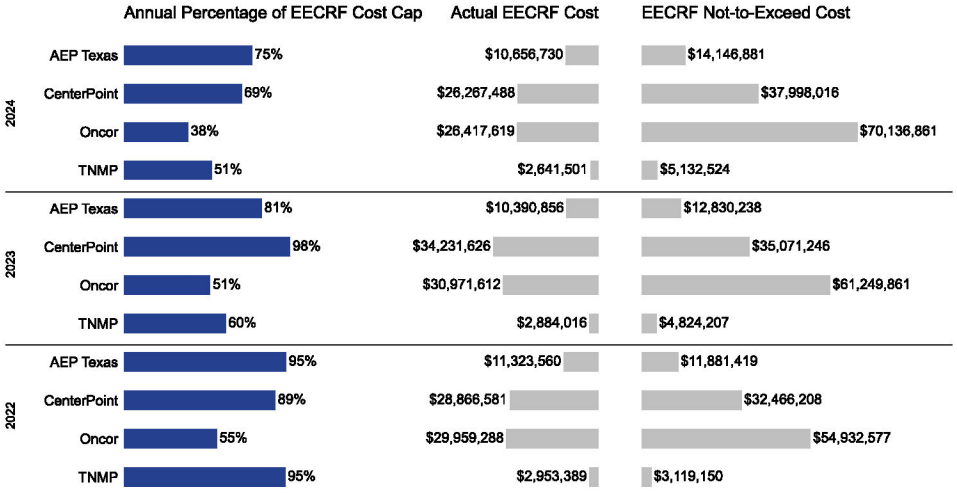
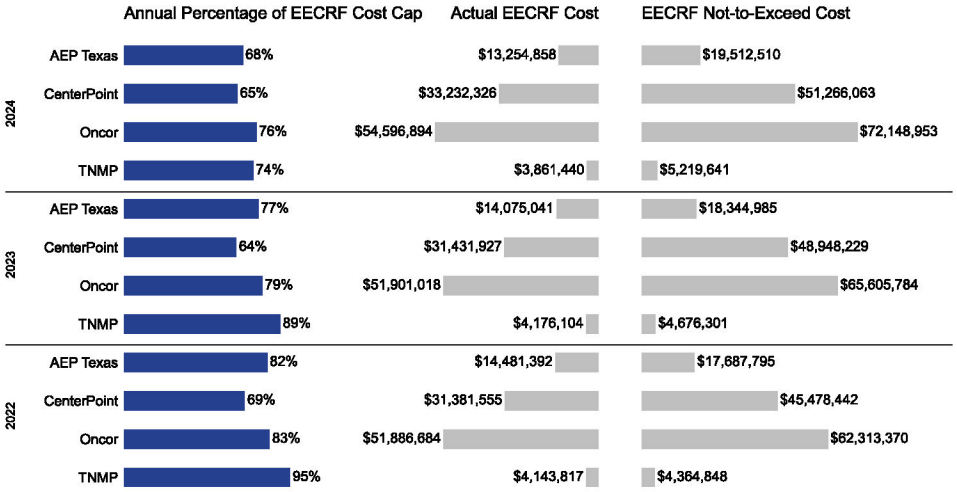
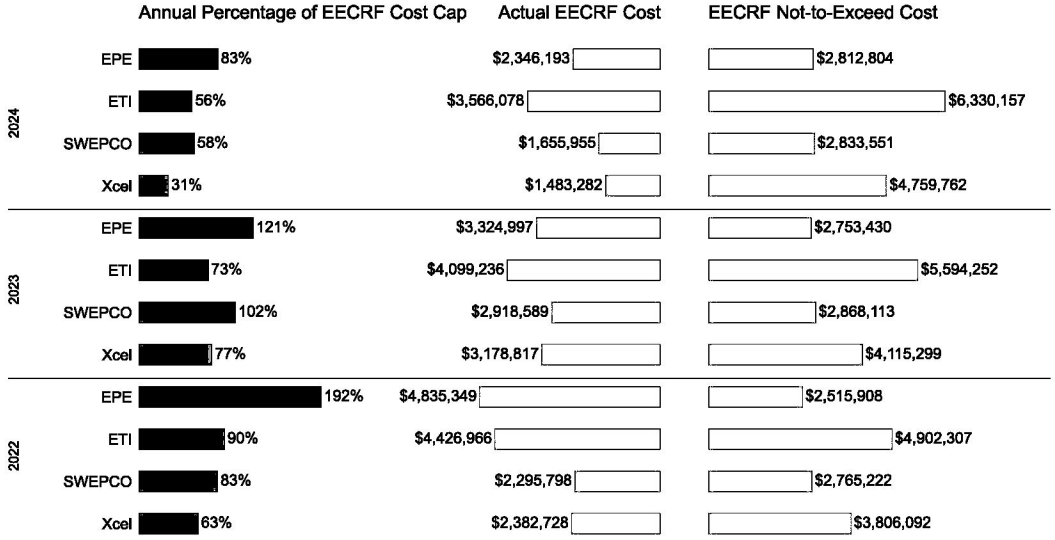


Figure 5. Actual Program Costs Compared to Not-to-Exceed Cost Caps ERCOT Residential Programs PY2022-PY2024



An IOU's actual EECRF cost is calculated by finding the summation of actual program costs for PY2024, the utility's PY2022 performance bonus, and any over/under recovery without interest. This sum must be less than the cost cap. In previous years, with the PUCT's approval, some outside-of-ERCOT utilities requested good cause exceptions to exceed their cost caps. However, in PY2024, outside-of-ERCOT utilities spent as little as 31 percent of their cost cap on commercial programs, in the case of Xcel, and as little as 54 percent on residential programs, as with El Paso Electric. As such, no good cause exceptions were requested for PY2024.

Figure 6. Actual Program Costs Compared to Not-to-Exceed Cost Caps Outside-of-ERCOT Commercial Programs PY2022-PY2024

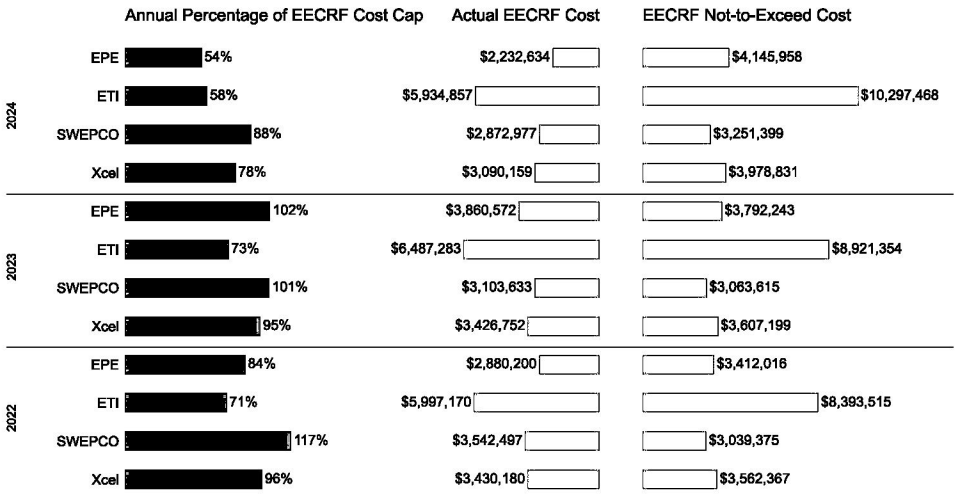


*Good Cause Exception approved for EPE's commercial cost cap in PY2022 and PY2023.

**Good Cause Exception approved for ETI's commercial cost cap in PY2022.

***Good Cause Exception approved for SWEPCO's commercial cost cap in PY2022 and PY2023.

Figure 7. Actual Program Costs Compared to Not-to-Exceed Cost Caps Outside-of-ERCOT Residential Programs PY2022-PY2024



* Good Cause Exception approved for EPE's residential EECRF cost cap in PY2022 and PY2023.

**Good Cause Exception approved for SWEPCO's residential cost cap in PY2022 and PY2023.

Key take-aways from the PY2024 cost cap analysis:

> In PY2024, all IOUs had ample room to increase spending on commercial and residential programs.

> The average PY2024 cost caps increased by approximately 9 percent for all eight IOUs compared to PY2023.

> One ERCOT IOU spent more on commercial programs, and two other ERCOT IOUs spent more on residential programs; otherwise, IOU program costs decreased.

EM&V KEY FINDINGS

In addition to monitoring changes in savings, cost-effectiveness, and energy efficiency goal pursuits, this report highlights successful IOU programs and best practices used in customer households and businesses across Texas. Volumes 2 and 3 provide more context for the snapshot shown below.

The IOU programs achieved many successes in PY2024:

> Adjusting to dynamic markets—changes in *lighting* baselines coupled with increased baselines for *HVAC* equipment (Volume 2 and Volume 3 IOU-specific results);

> Delivering energy efficiency commercial programs with high customer satisfaction (Volume 1 Section 5.2.3 and 5.3.3);

> Employing new delivery models to serve diverse commercial sectors such as small businesses in rural areas and data centers' cooling needs (Volume 2 and Volume 3 IOU-specific results);

> Increasing energy efficiency opportunity and access for LI and HTR customers through *HVAC*, *PV*, and multifamily focused offerings (Volume 1 Section 3.3 and Section 6.1); and

> Expanding reach across residential customers through *HVAC tune-ups*, garnering tangible energy savings (Volume 1 Section 4.1).

Table 1. PY2024 Portfolio Highlights ERCOT and Outside-of-ERCOT IOU Portfolios

ERCOT IOU Portfolio	Outside-of-ERCOT IOU Portfolio
Key successes	**Key successes**
AEP Texas has consistently met its statutory demand reduction goal through energy efficiency programs, exceeding its PY2024 demand reduction goal with energy efficiency by 6 percent.	**ETI** delivered the most demand reduction from energy efficiency programs (17.5 MW) with increased *HVAC* projects across both residential and commercial sectors.
CenterPoint's High Efficiency Home MTP delivered the most demand reduction (8.4 MW) from energy efficiency across all ERCOT programs.	**EPE** maintained consistent energy efficiency for its LI/HTR customers (1.5 GWh of energy savings), even as overall portfolio savings decreased.
Oncor launched the first retail electric provider pilot program in PY2024 to expand *smart thermostat* delivery to customers.	**SWEPCO** achieved its highest demand reductions (10.8 MW) and energy savings (20.0 GWh) with increased commercial *HVAC* and residential *insulation* projects.
TNMP achieved over two-and-a-half times its demand reduction goal for HTR customers.	**Xcel SPS** increased *HVAC* projects to residential customers (1.3 GWh), even as overall energy savings decreased.

EVALUATION, MEASUREMENT, AND VERIFICATION OVERVIEW

The PUCT selects and retains the EM&V contractor to plan, conduct, and report on energy efficiency evaluation activities. The EM&V contractor engages with Staff and IOUs in ongoing technical data analysis and support to provide feedback on program and portfolio performance.

EM&V recommendations facilitate accurate, transparent, and consistent savings calculations and program reporting across the Texas IOU energy efficiency programs. The EM&V team uses program tracking data to independently verify claimed savings across each utility's programs. PY2024 EM&V activities also included engineering desk reviews, interval meter data analysis, consumption analysis, and participant surveys (Figure 8). Additionally, the EM&V team collaborates with IOU stakeholders to update the Texas Technical Reference Manual annually.

The EM&V team gives its series of recommendations during the fall meeting of the Energy Efficiency Implementation Project where stakeholders can review, comment, and ask questions about EM&V feedback and analysis.

Figure 8. PY2024 Evaluation, Measurement, and Verification Activities

2.0 INTRODUCTION

This Investor-Owned-Utilities (IOU) Energy Efficiency Portfolio Report presents the program year (PY) 2024 (PY2024) evaluation, measurement, and verification (EM&V) key findings and recommendations, looking across all eight electric utilities' portfolios.

The report addresses gross and net demand and energy impacts, program cost-effectiveness, and provides performance feedback. It includes findings and recommendations that inform the PY2026 Technical Reference Manual (TRM) update process and PY2026 program design and delivery continuous improvement.

This section overviews the EM&V methodology and PY2024 activities. Next, EM&V key findings and recommendations to be implemented in PY2026 are summarized. This is followed by portfolio-level and cross-sector results then commercial, residential, and load management program results.

Separate volumes of this report detail PY2024 results for each utility's portfolio; Volume 2 addresses ERCOT utilities and Volume 3 addresses outside-of-ERCOT utilities. Technical appendices provide detailed information as referenced in each Volume.

2.1 EVALUATION, MEASUREMENT, AND VERIFICATION OVERVIEW

The objectives of the EM&V effort are to:

- document gross and net demand and energy impacts of the utilities' energy efficiency portfolios,
- determine program cost-effectiveness,
- provide feedback to the PUCT, utilities, and other stakeholders on program and portfolio performance, and
- prepare and maintain a technical reference manual (TRM).

The EM&V methodology is based on the prioritization for the EM&V effort that includes PY2024 within the context of the four-year EM&V contract period.[13] The EM&V team identified program types across utilities with similar program design, delivery, and target markets. We developed PY2024–PY2027 EM&V scopes, updated annually with the PUCT, across the four-year contract period to prioritize EM&V activities where they provide the greatest value. We reviewed each program type and prioritized (*high*, *medium*, *low*) based on the following considerations:

- the magnitude of savings—the percentage of contribution to the portfolio of programs' impacts,
- level of relative uncertainty in estimated savings,
- stage of the program or programmatic component (e.g., pilot, early implementation, mature),
- importance to future portfolio performance and priority to PUCT and Texas utilities,
- prior EM&V results, and
- known and anticipated changes in the markets in which the programs operate.

[13] The PY2024 EM&V Plans are filed in Project No. 38578, Item 154. Interchange - Documents

For PY2024, the EM&V team conducted a streamlined EM&V effort that coupled broad due diligence verification of savings for all programs through program tracking data with targeted in-depth activities. These activities included engineering desk reviews, interval meter data analysis, participant surveys, and consumption analyses based on the prioritization of the programs.

The EM&V team placed a *high* priority on ***HVAC tune-ups.*** The number of *HVAC tune-ups* incentivized through the programs has increased rapidly in recent years, and more information on both gross and net savings (as measured through a net-to-gross ratio) is needed. The PY2024 EM&V scope included a consumption analysis for *HVAC tune-ups* for both residential and commercial customers and participant surveys for major commercial end-uses.

The EM&V team placed a *high* priority on ***smart thermostats***. The number of *smart thermostats* incentivized through the programs has also increased rapidly in recent years, necessitating more information on both gross and net savings. In addition, IOU program-incentivized smart devices can be utilized for demand response, which is relevant to broader PUCT initiatives. As part of the PY2024 EM&V scope, the EM&V team conducted IOU program staff interviews for the first retail electric provider (REP) pilot, which focused on *smart thermostats*, and designed an interview guide for the IOU to implement with REPs. The EM&V team will continue to support IOU REP pilot efforts as they roll out across ERCOT IOUs during this contract period. The annual investor-owned utility (IOU) Energy Efficiency Report will also include trend analysis on *smart thermostats*.

Major commercial end-uses (e.g., *lighting*, *HVAC*, and *custom*) also received a *high* priority. Commercial projects delivered through Commercial Standard Offer Programs (CSOP) and Market Transformation Programs (CMTP) have seen increased complexity of projects where engineering desk reviews provide more information on the savings. In addition, through commercial participant surveys, the EM&V team verified measure installation, updated the net-to-gross ratios used to calculate net savings for major end-uses and collected process information such as program satisfaction for each IOU.

The EM&V team prioritized **residential retrofit measures** as a *medium* priority for PY2024 EM&V. For residential retrofit measures, the EM&V team assessed baseline documentation requirements that were added to the TRM to align better deemed savings with measured savings and complete desk reviews for measures that are heavily dependent on proper implementation, such as *air infiltration* and *duct sealing*. These measures are implemented across Residential Standard Offer Programs (RSOPs), Residential Market Transformation Programs (RMPTs), Hard-to-Reach Programs (HTR SOPs), and Low-income Weatherization programs (LI programs). In addition, the PY2024 EM&V scope includes working with each IOU in 2025 to design a residential survey to pilot embedding in PY2026 implementation. Finally, the EM&V is mapping program participation metrics for residential retrofit programs across outside-of-ERCOT IOU territories to provide the IOUs, PUCT, and stakeholders insight into the percentage of residential customers served.

The EM&V team prioritized **load management** as a *medium* priority for PY2024 EM&V. We analyzed interval meter data analysis for a census of load management, given that load management programs account for half or more of demand reductions across most IOU portfolios.

2.1.1 Impact Evaluation Methodology Overview

The EM&V database with complete PY2024 program tracking data requested from the utilities was the foundation for the evaluation process. The EM&V database allowed the EM&V team to complete the following:

- due diligence verification of all claimed savings,
- program tracking system reviews, and
- efficient sampling across utilities and programs engineering desk reviews.

The EM&V team performed a tracking system review and a series of desk reviews for an initial assessment of the claimed savings' reasonableness. Program documentation and primary data were then collected for sampled projects to assess the accuracy of the claimed savings further.

The EM&V team assigned a program documentation score of *good*, *fair*, or *limited* based on the level of program documentation provided to complete a third-party due diligence review of claimed savings. See Appendix A in Volumes 2 and 3 for additional detail.

The impact evaluations are used to calculate realization rates. The realization rate is determined by dividing the evaluated savings by the utility-claimed savings. Utility-claimed savings are verified in the EM&V database from the tracking systems.

2.1.1.1 Net Savings

Starting with the PY2024 EM&V scope, net-to-gross (NTG) ratios, which are applied to verified claimed savings to calculate net savings, are researched for each IOU portfolio at the sector and program-level. The NTG ratio is calculated as 1-free-ridership. For example, an IOU commercial MTP with a free-ridership rate of 20 percent would have a NTG ratio of 80 percent. Free-ridership represents energy savings that would have occurred in the absence of the programs.

NTG ratios researched prior to PY2024 reflect average NTG ratios across the applicable IOU program type and include spillover estimates. While NTG ratios starting in PY2024 are more conservative because they exclude spillover, IOUs' claimed savings are based on gross savings in Texas. Therefore, NTG ratios of 1-free ridership are more useful to the objectives of the NTG research in Texas, which is to assess the effectiveness of programs in minimizing free ridership.

The EM&V team updated commercial MTP and commercial SOP NTG ratios in PY2024 as applicable to each IOU portfolio. The EM&V team used commercial participant survey research with an industry-standard self-report approach methodology, which was also similar to the PY2021 commercial participant survey methodology to allow trend analysis. See Appendix C for additional details.

2.1.1.2 Cost-Effectiveness

The EM&V team conducts cost-effectiveness testing using the program administrator cost test (PACT), also known as the utility cost test (UCT), using actual results except for LI programs, as discussed below. The EM&V team conducts cost-effectiveness tests separately using verified claimed savings and net savings as determined by a NTG ratio discussed in 1.1.1.1 above.

All benefits and costs are expressed in PY dollars. Benefits resulting from energy savings occurring in future years are net-to-PY dollars using the utility's weighted average cost of capital (WACC) as the discount rate.

When tests are conducted at a more disaggregated level than data are available, allocations will be made proportionate to costs. For example, the utility performance incentive is calculated for the overall portfolio and allocated to individual programs proportionate to the programs' costs associated with meeting demand and energy goals. Program costs include program administrative and incentive costs; portfolio-level costs include the utility performance earned for that PY; and EM&V, administrative, and R&D costs.

LI programs are evaluated using the savings-to-investment ratio (SIR). This model only includes net incentive payments under program costs. The SIR methodology is only used when specifically testing LI programs.

Portfolio-level cost-effectiveness analyses are based on the PACT and shown both including and excluding LI programs.

The calculations used for the PACT cost-effectiveness methodology are in Appendix B in Volumes 2 and 3.

In addition, the EM&V team calculates the average cost per lifetime kilowatt-hours and kilowatts; this is calculated by attributing costs to energy savings and avoided demand based on their portion of total benefits and then applying that proportion to the total program costs.

2.1.2 PY2024 EM&V Activities

EM&V activities:

- verify that the measures and their associated savings are in program tracking systems,
- check that the claimed savings estimates in the tracking system are consistent with the savings calculated in the deemed calculation tools or tables in accordance with the PY2024 TRM 11.0 or M&V methods used to estimate project savings,
- review savings assumptions and, when available, utility M&V reports gathered through the supplemental data request for sampled projects,
- recommend updates to project-level claimed savings if EM&V results indicate a variation in project savings of at least ±5 percent,
- inform annual TRM updates,
- provide performance feedback to improve program design, delivery, and reporting, and
- conduct cost-effectiveness testing using the PACT for savings results from all programs except LI, which are calculated using the SIR.

Table 2 shows the EM&V activities completed by program type and evaluation priority for PY2024.

Table 2. PY2024 Evaluation, Measurement, and Verification Priorities and Activities

Program type	Evaluation priority	Claimed savings verification approach	Cost effective-ness testing	Project desk reviews	On-sites	Surveys	Interval meter/ consumption data analysis
Commercial SOPs, commercial MTPs, and SCORE MTPs	High	Sampled (see desk reviews)	✓	94	N/A	315	Completed on individual sampled projects
Commercial SEM and retro-commissioning (RCx)	Medium	Sampled (see desk reviews)	✓	6	N/A	26	Completed on individual sampled projects
HVAC tune-ups	High	Sampled (see desk reviews)	✓	N/A	N/A	29	Participant consumption analysis
Commercial load management	Medium	Census	✓	N/A	N/A	N/A	Census
Residential load management	Medium	Census	✓	N/A	N/A	N/A	Census
Residential SOPs, HTR, LI	High	Census	✓	56	N/A	N/A	N/A
Residential New Homes MTPs	High	Sampled (see desk reviews)	✓	N/A	N/A	N/A	N/A
Residential upstream/midstream MTPs	High	Sampled (see desk reviews)	✓	N/A	N/A	N/A	N/A
All other programs	Low	Census	✓	N/A	N/A	N/A	N/A

3.0 KEY FINDINGS AND RECOMMENDATIONS

The EM&V team works with the utilities to improve the accuracy of energy efficiency programs by:

- Utilities adjusting claimed savings in response to EM&V findings,
- EM&V providing technical assistance to utilities throughout the program year,
- Working together to implement TRM or program changes in response to EM&V recommendations, and
- Utilities revising EEPRs in response to EM&V reviews.

Table 3 illustrates the adjustments by utility to EM&V recommended savings adjustments. ERCOT IOU demand reductions and savings increased after evaluation adjustments and the outside-of-ERCOT demand reductions and savings decreased due to evaluation adjustments, which varied by project as discussed in Volume 2 and 3 of this report.

Table 3. PY2024 EM&V Demand Reduction and Savings Adjustments to Utility Claimed Savings

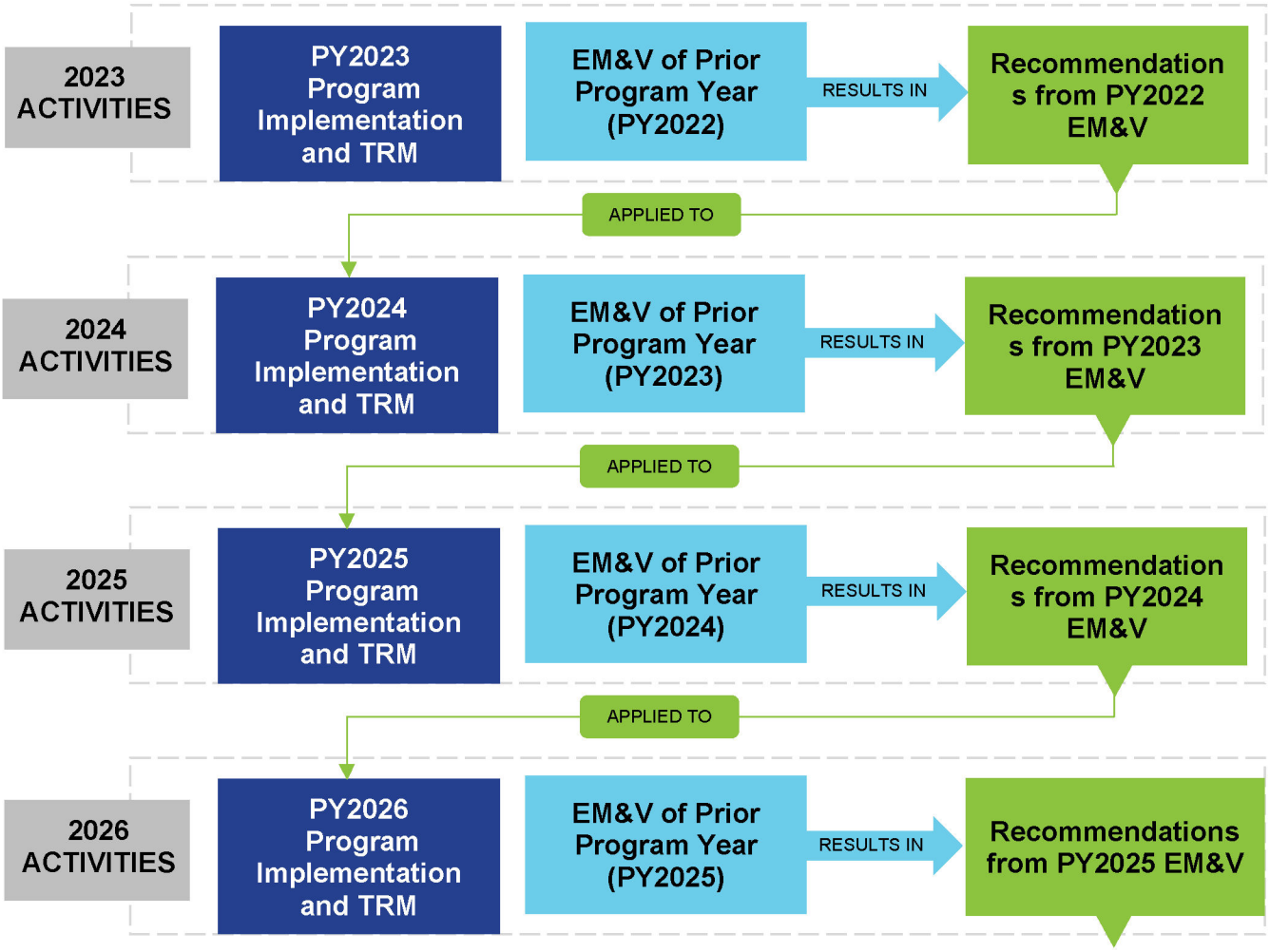
Utility	kW	kWh
ERCOT IOU programs		
AEP Texas	-58	335,331
CenterPoint	-78	162,875
Oncor	657	273,629
TNMP	13	38,128
Total	543	256,404
Outside-of-ERCOT IOU programs		
EPE	110	87,943
ETI	-1,200	1,068,101
SWEPCO	-369	-3,379,694
Xcel SPS	-25	-107,900
Total	**-1,484**	**-2,331,550**

The PUCT's EM&V recommendations are intended to:

- facilitate accurate, transparent, and consistent savings and program reporting,
- improve program design and delivery, and
- update the TRM annually.

EM&V recommendations are vetted during the Energy Efficiency Implementation Project (EEIP) – the energy efficiency collaborative group hosted by the PUCT. PUCT staff and the EM&V team meet with each utility to discuss utility-specific EM&V recommendations and utilities are required to respond with their action plans (Figure 9 illustrates the energy efficiency timeline).[14]

Figure 9. Recommendations Timeline



[14] Utilities response to EM&V recommendations in the next program year is consistent with § 25.181(q)(9).

This report details PY2024 EM&V key findings and recommendations at the portfolio and cross-sector-level for the commercial, residential, and load management programs in Sections 4 through 8. Portfolio-level details for each IOU are in Volume 2 for ERCOT utilities and Volume 3 for outside-of-ERCOT utilities.

Key findings and recommendations for the IOUs,[15] the TRM Working Group, the EM&V team, and the Energy Efficiency Division are summarized below.

In addition to the key findings and recommendations summarized below, the PY2024 commercial participant surveys identified key commercial program successes:

- 90 percent of participants reported they were very satisfied with the programs,
- 100 percent measure persistence for surveyed projects with all incentivized measures reported installed and operating as intended, and
- Low free-ridership at 19 percent for CSOP energy savings and 17 percent for CMTP energy savings.

3.1 IOU ACTION PLANS

The PY2024 EM&V resulted in 20 recommendations for IOU action plan response:

Table 4. PY2024 EM&V Key Findings and Recommendations for IOUs

Report Section	Topic	Key finding	Recommendation
Portfolio Section 4.3	LI goals	Utilities calculated program costs differently for the purposes of the LI goal; lack of transparency into cost categories added complexity for the EM&V to consistently calculate IOU performance against the LI goal.	Report costs by categories included in the customer cost cap (incentives, administrative, and research and development) and those excluded (EM&V and rate case expenses).
Portfolio Section 4.5	Energy Efficiency Plan and Reports (EEPRs)	IOU EEPRs provide inconsistent levels of program information impeding stakeholder understanding of program design and delivery.	Future EEPRs must highlight program success and innovations and include required program information.
	SOP and MTP offerings	SOP and MTP offerings vary across IOUs. Five utilities have built on SOP offerings, strategically adding MTPs to portfolios while three utilities rely more on MTPs.	Consider baseline studies to inform the correct balance of SOP and MTP offerings in order to best serve the IOU's unique customers and territory.
Portfolio Section 4.5 and Commercial Participant Survey Section 6. 2 (SOP) and Section 6.3 (MTP)	SOP and MTP offerings	Commercial participant survey results found high satisfaction and program influence across SOP and MTP respondents. While both programs primarily served owned and occupied facilities, SOPs are reaching more leased spaces. In addition, SOPs are appealing to customers who value project payback and the financial incentive over technical assistance or other information.	IOUs that do not offer commercial SOPs should consider piloting a commercial SOP.

[15] Additional IOU program-specific recommendations are in Volume 2 and Volume 3.

Report Section	Topic	Key finding	Recommendation
Cross-sector Consumption Analysis Section 5.1	Residential *AC/HP tune-ups* consumption analysis	Residential *tune-ups'* measured savings align fairly well with the tune-up deemed savings in TRM Vol. 2. While the consumption analysis determined that residential *tune-ups* saved energy, measured savings are substantially lower than claimed savings as calculated following the residential *tune-up* M&V Plan.	Use TRM Vol. 2 deemed savings instead of the M&V approach to improve accuracy of claimed savings. If a M&V approach is preferred, engage the EM&V team to better align the residential *tune-up* M&V plan with measured savings. IOUs without an EM&V approved M&V Plan a must use the deemed savings.
	Commercial *AC/HP tune-ups* consumption analysis	Substantial variability in commercial *tune-ups'* measured savings across four of the five participating IOUs was found. Only one of the five IOUs showed significantly positive savings.	Engage the EM&V team to improve the rigor of the commercial tune-up M&V Plan; an EM&V approved M&V Plan for each IOU offering this measure is required starting with the PY2025 TRM.
Cross-sector Section 5.2	*Variable speed heat pumps* (*VSHP*s) and *heat pumps* winter peak demand analysis	Analysis by TRM climate zones identified climate zone 1 with the most benefits from *VSHP*. For all climate zones, electric resistance should be replaced with standard *HPs*.	Identify program strategies to encourage *VSHP*s in climate zone 1. Ensure replacement of electric resistance heat with *heat pumps* for all climate zones.
Commercial Summary Analysis Section 6.1	Measure mix	Some IOUs still predominantly incentivize *lighting*.	Explore program design and delivery strategies to diversify commercial measures beyond *lighting*. See Volume 2 & 3 for applicable IOU-specific recommendations.
Commercial Measure Opportunity Analysis Section 6.4	Measure mix	Strategic Energy Management (SEM) programs are an effective way to gain deeper energy efficiency savings. While SEM requires a start-up period, once mature, it creates a pathway for utilities to engage customers in sustained energy management practices.	Work with the EM&V team for opportunities specific to each IOU territory.
Commercial Impact Evaluation Section 6. 2 (SOP) and	New construction lighting	New construction exterior *lighting* often includes multiple exterior types; missing exterior *lighting* types impacts the energy savings.	Calculate exterior *lighting* savings using multiple exterior *lighting* area types.

Report Section	Topic	Key finding	Recommendation
Section 6.3 (MTP)		Fixture wattages and quantities were often inaccurately reported or incomplete, leading to inconsistent *lighting* savings calculations.	Verify fixture wattages against certified product lists and confirm fixture quantities with documentation (e.g., invoices, *lighting* plans).
	Custom M&V	Custom M&V approaches such as those used in SEM projects showed significant variability in savings estimates depending on weather normalization, load shape modeling, and regression methods.	Post-energy consumption data and pre-regression models adjusted with post-period weather data should be used for projects with an one-year-EUL. For all other projects, normalize both pre- and post-regression models to Typical Meteorological Year (TMY) 3 weather data.
		Several SEM projects did not update baseline energy consumption in accordance with TRM guidelines. This was heavily observed in programs working with a facility for over five years, which must establish a new baseline energy model.	Follow TRM baseline protocols to ensure valid savings calculations and promotion of continuous energy improvement.
	Custom M&V	Technical assistance and early project reviews promote alignment of savings methodologies for custom and SEM projects.	For SEM projects, consult the EM&V team early in the project lifecycle to review and agree upon savings methodologies and calculation algorithms.
Residential Summary Analysis Section 7.1	Measure mix	Excluding load management, over half of ERCOT IOUs' residential energy savings and demand reduction and a third of outside-of ERCOTs' are from *HVAC* projects.	Diversify residential measures. See Volume 2 & 3 for applicable IOU-specific recommendations.
Residential Measure Opportunities Analysis section 7.4	Measure mix	*Insulation* projects were mostly *ceiling* and *attic insulation*, with few *floor* and *wall insulation* projects.	Explore program design options that encourage whole home *insulation* projects. For example, new methods (blowing in *insulation* from the exterior) may make whole home *insulation* less intrusive to homeowners.
Residential Impact Evaluation Section 7.3	*HVAC* projects	Some *HVAC* projects (e.g. early retirement, replace-on-burnout, or new construction) were not clearly tracked. Based on available documentation, the EM&V team will use a conservative approach.	Track project action type and methods clearly and consistently.
	Direct install measures	Some projects had no documentation confirming direct install measures.	Provide documentation confirming installation and location as specified in the TRM.

Report Section	Topic	Key finding	Recommendation
	Multiple measures	Insufficient documentation across multiple measures (e.g., *LEDs*, *duct sealing*, *HVAC*) was found during EM&V desk reviews.	Include savings calculations in the documentation package for EM&V sampled projects to ensure transparency in calculations and to aid in determining the potential differences between claimed and evaluated savings.
Commercial Load Management Section 8.2	Curtailment event cooperation	For ERCOT IOUs, a quarter of program participating sites do *not* curtail during test events.	Follow up with participants who do not perform or underperform during test events.

3.2 TRM WORKING GROUP ACTION PLANS

The TRM Working Group is a collaborative group that updates the TRM annually and includes the EM&V team, PUCT staff, the IOUs, and the IOUs' contractor(s). The TRM Working Group engages broader stakeholder input through EEIP and TRM Project No 56768. The PY2024 EM&V resulted in 9 recommendations to address during PY2026 TRM update.

Table 5. PY2024 EM&V Key Findings and Recommendations for the TRM Working Group

Report Section	Topic	Key finding	Recommendation
Cross-sector Consumption Analysis Section 5.1	*AC/HP tune-up* consumption analysis	The residential M&V tune-up approach overestimated savings and the commercial *tune-up* measured savings were too variable for significant results.	Revise the Volume 4 tune-up M&V guidance to better facilitate implementation best practices.
Commercial Impact Evaluation Section 6. 2 (SOP) and Section 6.3 (MTP)	*Lighting*	The *lighting* baselines for specialty new construction building types, such as athletic fields and greenhouses, have alternate determination methods, which can result in inaccurate calculated energy savings.	Update the TRM measure for *lighting* new construction baselines for specialty buildings.
	M&V and *custom*	Custom M&V approaches for measures with an one-year-EUL are directed by the Volume 4 measure to weather normalize to the TMY3 value.	Adjust the TRM to allow for M&V measures with an one-year-EUL to use post-energy consumption data and pre-regression models adjusted with post-period weather data to identify the actual energy savings for the year.
Volume 2 and 3 Impact Evaluation Sections	Project documentation	Some IOU programs did not provide sufficient project documentation to fully verify claimed savings through desk reviews. Historically this has most often been the case for new programs or new implementation contractors with improvement after EM&V recommendations.	Clarify commercial documentation requirements at the measure-level in the TRM and savings adjustments the EM&V team will implement if a *fair* or *poor* documentation score does

Report Section	Topic	Key finding	Recommendation
			not improve after an EM&V recommendation is made.
Residential Measure Opportunities Analysis section 7.4	Multifamily	The residential new construction baseline for *HVAC* is a federal standard *heat pump*. However, market actors report multifamily trends toward electric resistance heat rather than *heat pumps* when the primary heating fuel is electricity.	Explore the potential for a separate multifamily new construction *HVAC* baseline in the TRM Working Group, engaging the heat pump working group (HPWG) for Texas-specific market baseline information.
	Insulation	*Insulation* is an important measure for demand reduction and energy savings. A recent trend of increased *insulation* savings in the IOU programs reversed in PY2024.	Consider streamlining documentation requirements or allowing a lower baseline when applicable for IOUs with *insulation* realization rates at 90 percent or above in its most recent residential retrofit consumption analysis.
Commercial Load Management 8.2	Winter programs	ERCOT utilities applied the varying baseline for the *High 8 of 10* for the winter programs differently.	Update the TRM to clarify the varying baseline *High 8 of 10* for winter load management programs needs to be consistent at the event level, not the customer level.
Residential Load Management 8.3	Winter programs	The first residential winter program launched in PY2024 using the residential M&V method that does not include the varying baseline as in use for commercial to account for Texas winter weather.	Add a residential winter load management M&V methodology to Volume 4 of the TRM.
	Summer programs	In the *High 3 of 5* method, when the *uncapped additive adjustment* is negative, the *additive adjustment* used to calculate the *final baseline* should be negative. One IOU did not do this correctly resulting in a large EM&V adjustment to claimed savings.	Include an example to describe the calculation steps in the case where the *uncapped additive adjustment* is negative to the TRM residential load management M&V methodology in Volume 4.

3.3 EM&V TEAM ACTION PLANS

The PY2024 EM&V resulted in three action items for the EM&V team.

Table 6. PY2024 EM&V Key Findings and Recommendations for the EM&V Team

Report Section	Topic	Key finding	Recommendation
Portfolio-level section 4.7.4	Planning estimates	There were variations in projected and actual demand reduction and energy savings across IOUs.	Analyze projected vs. actual savings at the IOU program level for the PY2025 Energy Efficiency Portfolio Report to provide additional insight into IOU planning estimates.
Cross-sector	HVAC tune-ups consumption analysis	The consumption analysis usage data for commercial accounts was too varied to accurately measure savings.	Incorporate additional commercial *HVAC tune-ups* into the consumption analysis.
	Heat pumps	TRM clime zone analysis identified the priority of replacing electric resistance heat with heat pumps. In addition, the *VSHP* measure developed by the heat pump working group has not seen program uptake.	Identify barriers for implementation and better understand measure uptake and baseline equipment, including new technologies to replace electric resistance heat with heat pump and support VSHPs for TRM climate zone 1.

3.4 ENERGY EFFICIENCY DIVISION ACTION PLANS

The PY2024 EM&V resulted in six recommendations for the consideration of the PUCT's Energy Efficiency Division.

Table 7. PY2024 EM&V Key Findings and Recommendations for the Energy Efficiency Division

Report Section	Topic	Key finding	Recommendation
Executive Summary	Utility performance incentive	PY2024 utility performance bonuses increased the average lifetime cost per kWh saved.	Assess the utility performance incentive calculation and the impacts on the energy efficiency portfolios offered by the IOUs.
		Clear impacts of the utility performance incentive on program costs was seen in relation to customer cost caps.	
Executive Summary and Portfolio Section 4.1	Demand reduction goals	More than two-thirds of ERCOT IOUs' demand reductions resulted from load management in PY2024. Outside-of-ERCOT IOUs delivered half of total demand reductions with energy efficiency.	There must be an appropriate balance of load management and energy efficiency to meet demand reduction goals.
Portfolio Section 4.2	Energy savings goals	The ERCOT IOUs exceeded energy savings goals by 50 percent. EPE did not meet its energy savings goal.	Consider updating the energy savings goal. Explore varying goals for ERCOT and outside-of-ERCOT IOUs based on IOU characteristics.

Report Section	Topic	Key finding	Recommendation
Portfolio Section 4.3	LI goals	ERCOT IOUs calculated performance against the LI goal differently in terms of using projected or actual costs and costs excluded from the customer cost cap.	Clarify if projected or actual costs should be used for the LI goal as well as costs outside of the customer cost cap.
	HTR goals	Two ERCOT IOUs and all four outside-of-ERCOT IOUs substantially exceeded HTR goals, indicating the flexibility allowed in program designs to meet HTR goals may be beneficial in expanding customer reach when compared to the LI program design, which is more prescribed.	Assess the role of the HTR goal in serving low-income customers. Explore increasing HTR goal with possible expansion to other underserved customer segments.
	LI and HTR goals	All but one of the eight IOUs met HTR goals with HTR programs; one ERCOT IOU utilized LI and HTR programs to meet its HTR goal. It is unclear if programs can overlap to meet both goals.	Address LI and HTR goals and eligible programs to meet these goals so they are consistently applied across IOUs.

4.0 PORTFOLIO FINDINGS

This section presents IOU portfolio performance in meeting legislated demand reduction goals, energy savings goals, and LI goals. This section also presents analysis of projected and actual portfolio savings and key findings in Energy Efficiency Plan and Reports (EEPRs).

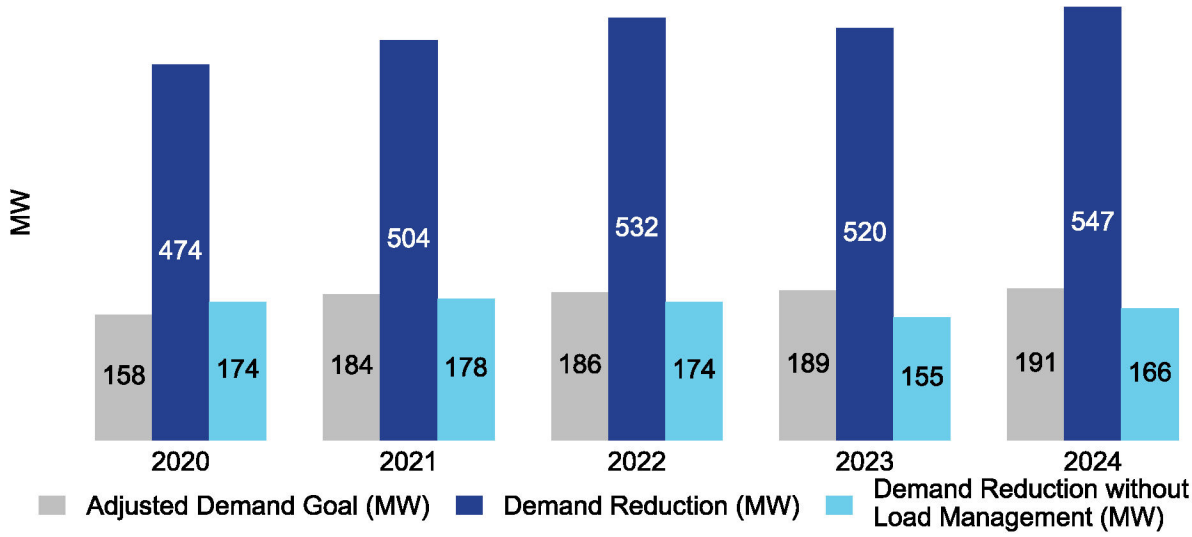
4.1 DEMAND REDUCTION GOALS

Figure 10 (ERCOT IOUs) and Figure 11 (outside-of-ERCOT IOUs) shows that the IOUs are significantly exceeding their legislated demand reduction goals through load management programs.

In PY2024, three of the four ERCOT IOUs met legislated demand reduction goals with energy efficiency programs. Five utilities' goals are set to four-tenths of one percent of summer weather adjusted peak demand. The other three IOUs—EPE, ETI, and SWEPCO—are still at the lower goal of 30 percent of demand growth.

ERCOT load management programs are deployed by ERCOT during an Energy Emergency Level 2 alert[16] but never been utilized in the history of this program.

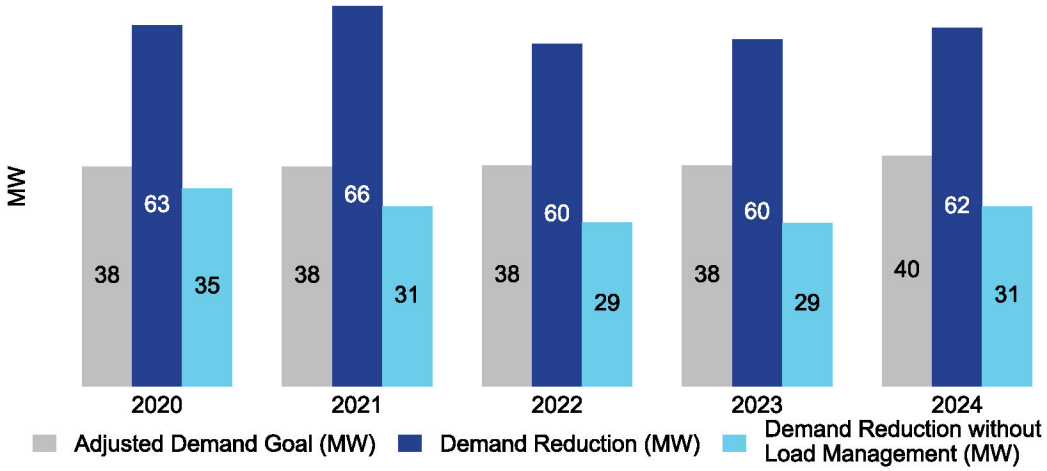
Figure 10. Legislated Demand Reduction (MW) Goals
ERCOT Portfolios PY2020–PY2024



Vertically integrated outside-of-ERCOT utilities have consistently used load management programs to manage system demand and to meet statutory demand reduction goals.

[16] See ERCOT Nodal Protocols, § 6.5.9.4.2(2)(a)(ii), EEA Levels (June 1, 2025), https://www.ercot.com/files/docs/2024/06/28/06-060125_Nodal.docx; Energy Efficiency Implementation Project under 16 TAC § 25.181, Project No. 38578, ERCOT Letter regarding Summer and Winter Load Management MOU (Dec. 4, 2023), https://interchange.puc.texas.gov/search/documents/?controlNumber=38578&itemNumber=116.

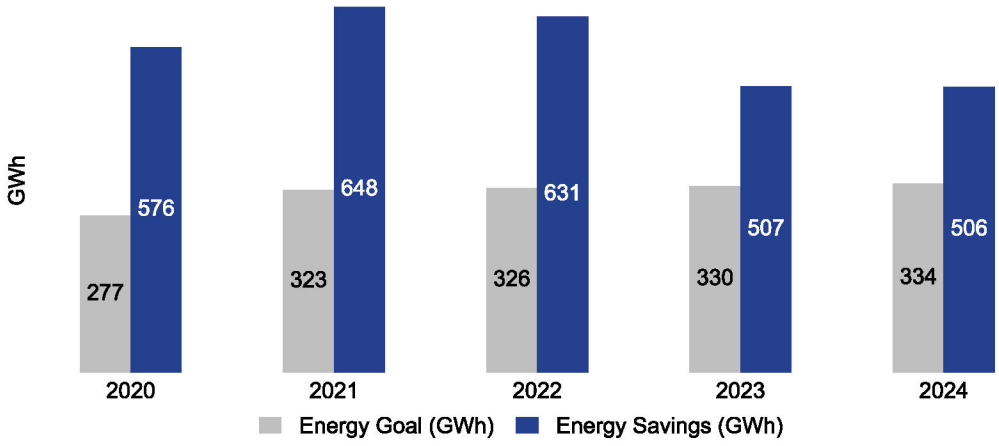
Figure 11. Legislated Demand Reduction (MW) Goals Outside-of-ERCOT Portfolios PY2020–PY2024



4.2 ENERGY SAVINGS GOALS

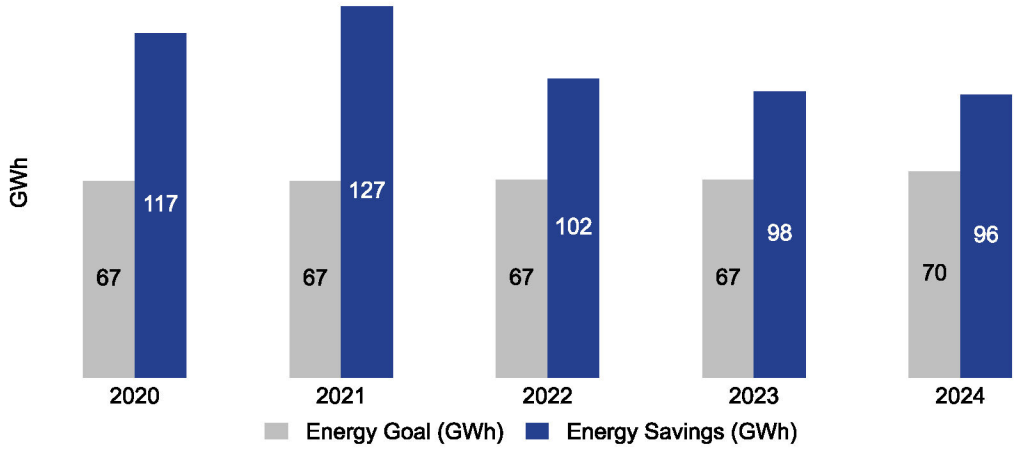
Figure 12 and Figure 13 [17] gives a comparative look back on the utilities energy savings achievements over the past five years.

Figure 12. Energy Savings (GWh) Goals ERCOT Portfolios PY2020–PY2024



[17] Energy savings goals are set in relation to the statutory demand reduction goal through the energy conservation factor as defined in §25.181.

Figure 13. Energy Savings (GWh) Goals
Outside-of-ERCOT Portfolios PY2020–PY2024



4.3 LOW-INCOME AND HARD-TO-REACH GOALS

Texas utilities provide energy efficiency services to low-income (LI) customers through a combination of hard-to-reach (HTR) and LI programs as specified in 16 Tex. Admin. Code TAC § 25.181, relating to the energy efficiency goal. All regulated Texas electric utilities are required to achieve no less than five percent of their total demand reduction goal through programs serving HTR customers.[18]

In addition, the ERCOT utilities are required to spend no less than ten percent of each program year's energy efficiency budget on a targeted LI energy efficiency program.[19] The qualifying income level of 200 percent of the federal poverty level is the same for HTR and LI programs, though the programs are implemented differently.

4.3.1 Low-Income Goals

Figure 14 shows the four ERCOT IOUs' performance against required LI goals of no less than ten percent of the annual energy efficiency budget. All ERCOT IOUs exceeded the LI program budget goals for PY2024.[20]

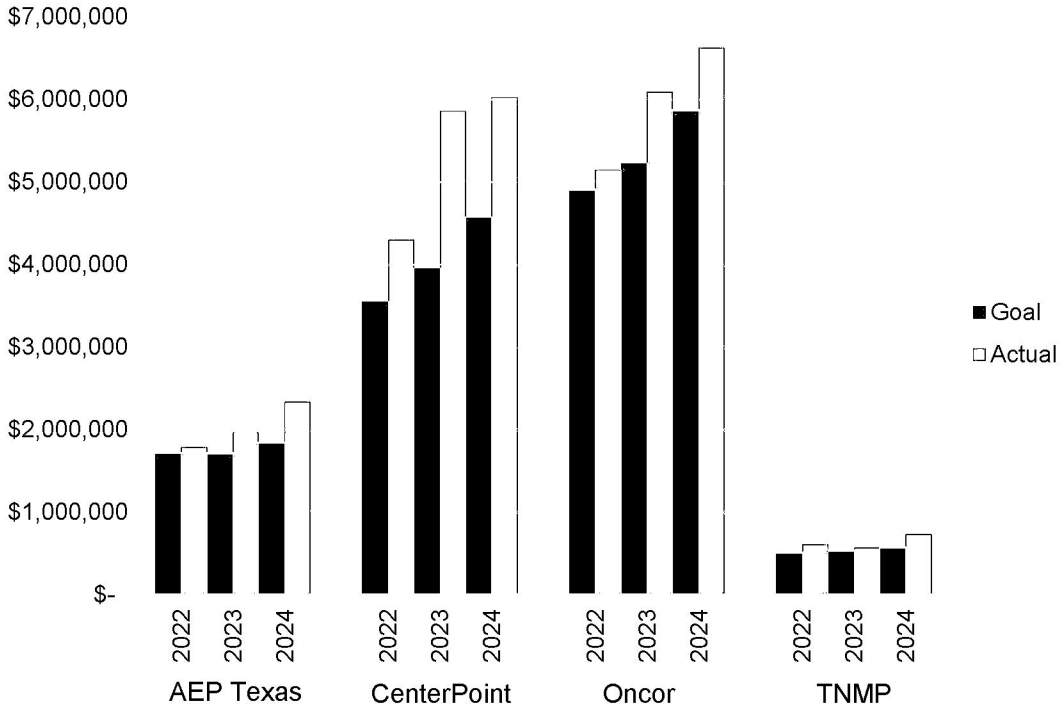
While this goal analysis focuses on program spending, spending alone does not measure the effectiveness of programs. The EM&V team analyzes if the programs are producing measurable savings for each EM&V contract period. In PY2023, the ERCOT IOU targeted LI programs delivered an average annual reduction of 11 percent of household electricity use to participants.

In PY2024, all ERCOT IOUs increased LI spending compared to PY2023:

[18] § 25.181(e)(3)(F)).
[19] 16 TAC § 25.181(r)).
[20] There are no legislative LI goals for outside-of-ERCOT IOUs.

- AEP Texas exceeded its PY2024 goal. Over the past three years, the share of total expenditures dedicated to AEP's LI program has steadily increased, rising from 10.5 percent in PY2022 to 12.8 percent in PY2024.
- CenterPoint met its goal in PY2024 with LI and HTR programs, with LI spending accounting for 13.2 percent of portfolio spending. While LI spending increased in PY2024, the percentage of budget allocated to their LI program slightly decreased from PY2023, from 14.8 percent to 13.2 percent.
- Oncor saw a slight increase in LI spending compared to PY2023 and also surpassed its goal, with 11.3 percent of total spending devoted to its LI program.[21]
- TNMP achieved its goal in PY2024 by spending 13.1 percent of total expenditures on its LI program, a substantial increase from the 11.0 percent spent on LI in PY2023.

Figure 14. ERCOT IOU Low-Income Goal Performance PY2022–PY2024



The EM&V team evaluated the LI goals for all four ERCOT IOUs as actual expended program incentive and administrative costs for the LI program being greater than or equal to 10 percent of total PY2024 funds expended. The EM&V team included incentive, administrative, and research and development costs.[22]

[21] In PY2024, only targeted LI weatherization programs are considered for LI goals. Oncor's *Low-Income HVAC Tune-Up MTP* and *Low-Income Smart Thermostat Direct Install* programs are considered HTR programs. In PY2023, these programs were considered LI programs.

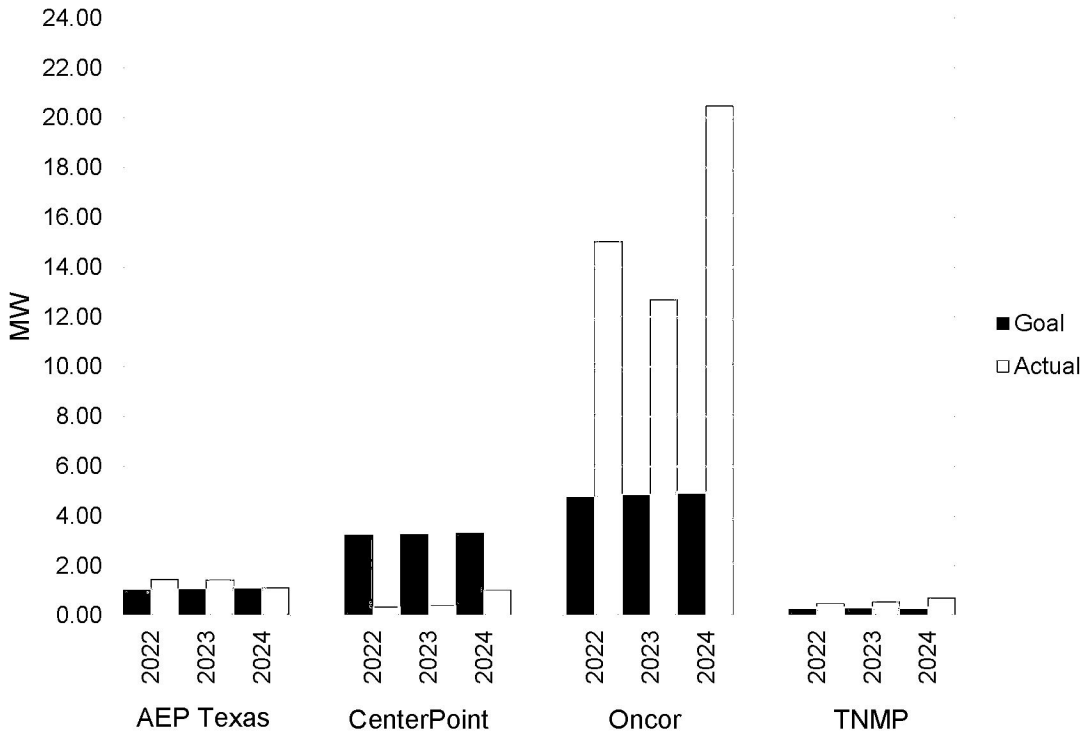
[22] EM&V and rate case expenses were not included in total spending by the EM&V team as they are outside of the customer cost cap.

4.3.2 Hard-to-Reach Demand Goals

Figure 15 shows ERCOT IOUs' performance against the required HTR goal of no less than five percent of demand reductions. Three of the four ERCOT IOUs met or exceeded the HTR goal through their HTR programs.

- TNMP and Oncor far exceeded their HTR goal.
  - Oncor's actual HTR demand reduction was almost four times its goal[23].
  - TNMP exceeded its goal achieving over two-and-a-half times in HTR demand reduction.
- AEP Texas slightly exceeded its goal but delivered less demand reduction through its HTR program than in previous years.

Figure 15. ERCOT HTR Demand Goal Compared to Actual Demand Reduction (MW) PY2022–PY2024[24]

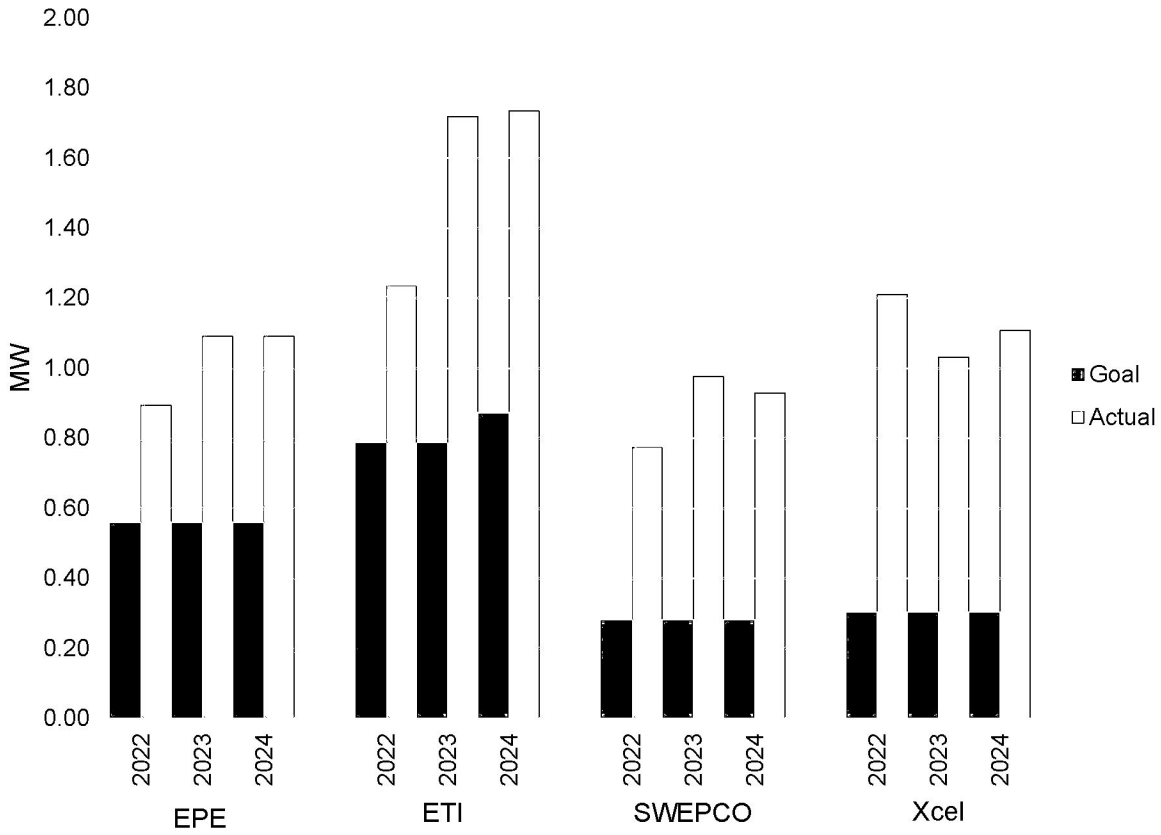


[23] Oncor's *Low-Income HVAC Tune-Up MTP* and *Low-Income Smart Thermostat Direct Install* programs are considered HTR programs in PY2024.

[24] CenterPoint did not meet its HTR goal through HTR programs alone and calculated its HTR goal by combining HTR and LI programs (Figure 17).

All outside-of-ERCOT IOUs exceeded HTR demand goals (Figure 16). EPE and ETI delivered demand reduction almost double of PY2024 HTR goals. SWEPCO and Xcel SPS more than tripled the HTR goal demand reductions delivered to customers.

Figure 16. Outside-of-ERCOT HTR Demand Goal Compared to Actual Demand Reduction (MW), PY2022-PY2024

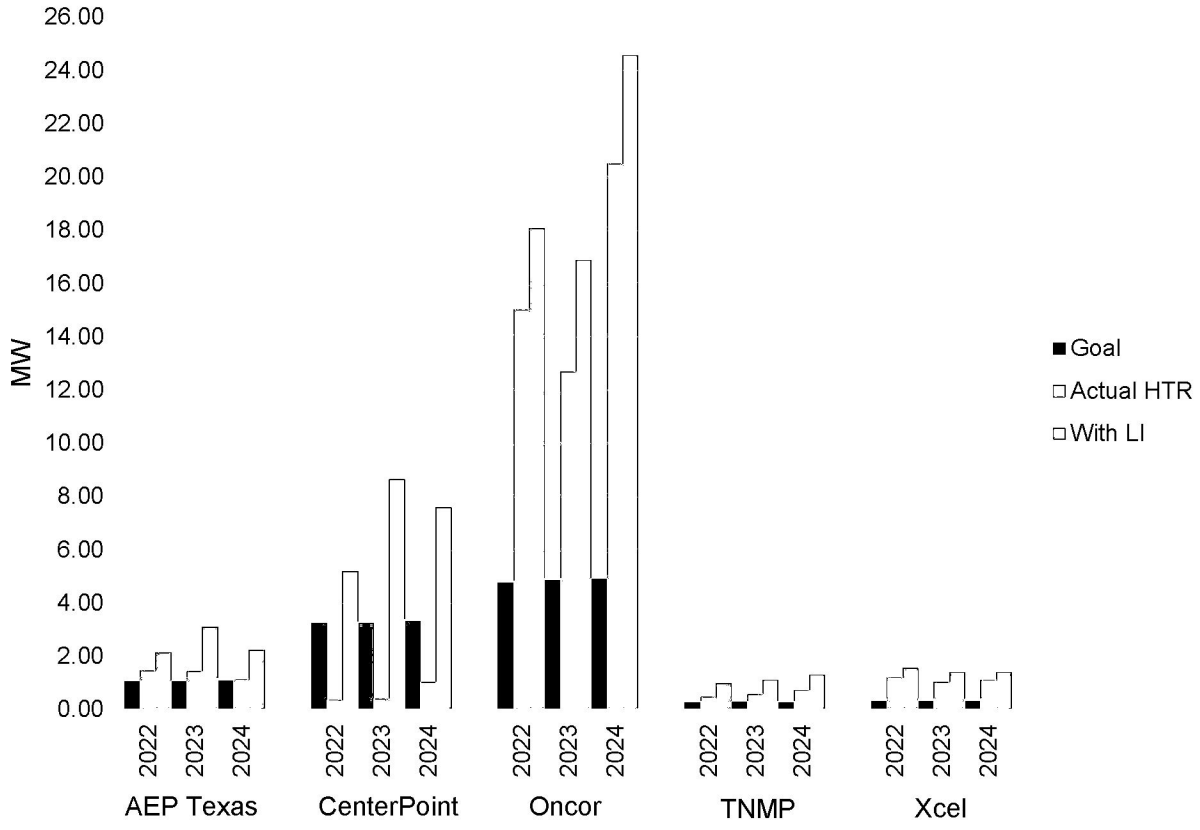


ERCOT IOUs also serve customers through targeted LI programs and split resources between the HTR and LI programs. Although there is no requirement for outside-of-ERCOT IOUs to offer targeted LI programs, Xcel offers a targeted LI program in addition to the HTR program.

Figure 17 shows demand reduction, including the targeted LI programs and HTR programs, compared to the goals for the ERCOT IOUs and Xcel Energy SPS.

As can be seen in Figure 17, CenterPoint exceeded the HTR goal when the demand reduction from its Targeted Low-Income Program was included.

Figure 17. IOU HTR Demand Reduction (MW) Compared to Goal with Low-Income PY2022-PY2024



4.4 PORTFOLIO PERFORMANCE: PLANS VS. ACTUAL SAVINGS

Figure 18 compares each IOU's projected savings as presented in the "plan" section of annual EEPRs with actual achievements as verified in the "report" section of annual EEPRs for PY2022-PY2024.

When the planned budget varies 10 percent or more from the actual spend, the utilities provide an explanation in EEPRs. Assessing differences in demand reductions and energy savings provides additional insight into the effectiveness of program planning.

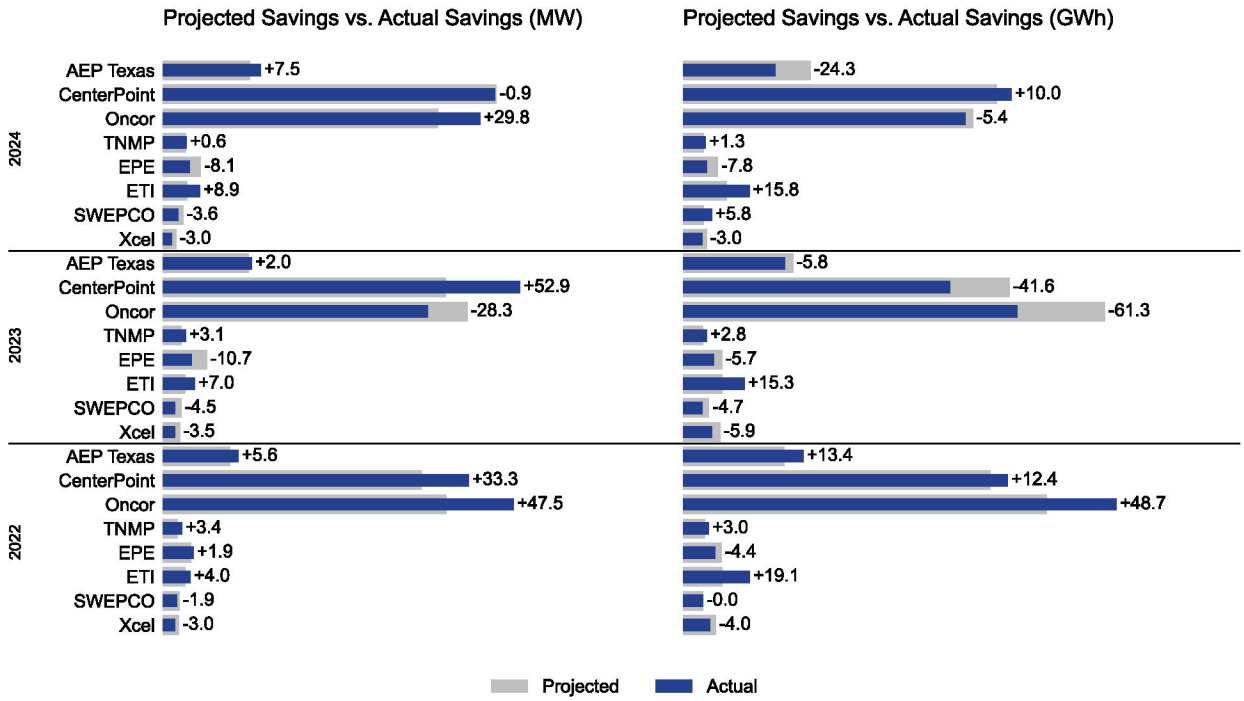
While realities in the field make it unrealistic to expect projected savings to match actuals, it is important to understand how better alignment can help identify opportunities.

While actual achievements trended higher than projected in PY2022, the pattern reversed in PY2023 likely due to the increased baselines (Figure 18). Several utilities were better matched in their projected demand reductions or energy savings with actual achievements for PY2024.

Key PY2024 highlights between projected and actual achievements by IOU:

- ETI and TNMP performed above both projected MW and projected GWh
- AEP and Oncor performed above projected MW but below projected GWh
- SWEPCO and CenterPoint performed below projected MW but above projected GWh
- EPE and Xcel SPS performed below both projected MW and projected GWh

Figure 18. Projected vs. Actual Demand Reductions (MW) and Energy Savings (GWh) PY2022-PY2024



4.5 ENERGY EFFICIENCY PLAN AND REPORT REVIEWS

This section presents key findings and recommendations from the EM&V reviews of 2025 EEPRs, which report on PY2024 achievements as well as PY2025 progress and PY2026 plans.

IOUs collaborated with the EM&V reviews of annual EEPRs, filing amended EEPRs in response to identified corrections. In addition, the EM&V team provided two main categories of forward-looking recommendations to improve future EEPRs: Program Information and Portfolio Balance.

4.5.1 Program Information

The EM&V reviewers found inconsistent information across IOU EEPRs making it difficult to find details across IOU portfolios. To more consistently and effectively convey program information to stakeholders, the EM&V team made the following recommendations:

1. *Provide additional program information to improve understanding of program design and delivery.*
   - List incentivized measures to demonstrate diversification of measure offerings.
   - Highlight program strategies such as tiered incentives, QA/QC protocols, trade ally training, and outreach efforts to underserved segments or geographic areas.
   - Include links to program manuals to provide streamlined access to additional program implementation details.
2. *Highlight new developments across programs to demonstrate continuous improvement of programs.*
   - Discuss how the utility is employing new strategies such as increased customer education in its marketing and diversifying its measure mix to both residential and commercial customers.
3. *Develop visuals for key metrics of interest to stakeholders such as budgets and expenditures in relation to customer cost caps.*

- Provide projected cost cap percentage graphs by customer class for plans and actual cost cap performance graphs by customer class for reports.

4. *Explain how research and development (R&D) expenditures will inform future program strategies or improve the management and evaluability of programs.*

- Discuss specifically how R&D activities are responding to prior EM&V recommendations or other program design or implementation barriers.

5. *Complete a program template for new programs or components added to an umbrella program.*[25]

Types of program information specific to each IOU portfolio can be found in each IOU section in Volumes 2 and 3 of this report.

4.5.2 Balance of Portfolio Offerings

SOPs build upon the existing market infrastructure such as contractors and larger commercial customers to incentivize energy efficiency projects while MTPs use implementation contractors

[25] This can be filed in EEIP or an amended EEPR.

to address specific market barriers to *achieve the transition from extensive market intervention activities toward a largely self-sustaining market.*[26]

Volumes 2 and 3 analyze SOPs' and MTPs' contribution to each IOU portfolio. Five utilities successfully built on SOP offerings and offer strategic MTPs as necessitated for certain sectors or technologies. The other three utilities have primarily offered MTPs and may now have sufficient market infrastructure to pilot SOP offerings.

IOUs may want to conduct or update baseline studies to inform the correct balance of SOP and MTP offerings for their customers and territory. A baseline study can:

a. expand and update the MTP information required in EEPRs, including
    - program strategies to address market barriers and achieve goals,
    - program design successes and challenges, and
    - progress toward market goals.
b. inform portfolio strategies to facilitate SOP participation and identify persistent market barriers that may require continued MTP interventions.

[26] §25.181 (k)(3)(G).

5.0 CROSS-SECTOR RESULTS

This section discusses two energy efficiency measures delivered to residential and commercial customers:

- EM&V consumption analysis with measured savings results for *air conditioner (AC)* and *heat pump (HP) tune-ups*, and
- Measure opportunity analysis for *variable speed heat pumps* (*VSHP*s).

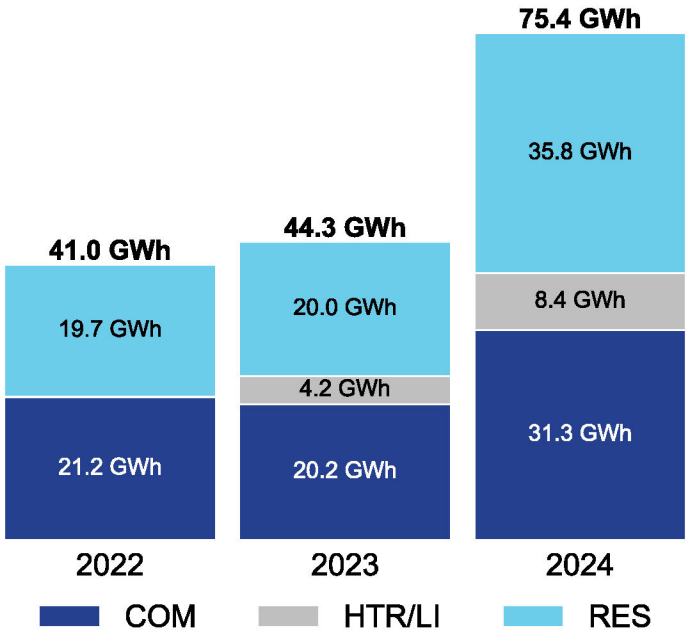
5.1 AIR CONDITIONER AND HEAT PUMP TUNE-UPS

5.1.1 Background

Energy efficiency portfolios have seen substantial growth in the energy savings claimed from *AC* and *HP tune-ups* in the previous three years (Figure 19). The claimed savings from residential *tune-ups* (res in figure below) doubled between PY2022 and PY2024. Some IOUs also added HTR *tune-up* programs starting in PY2023.

The commercial *tune-ups* (com in figure below) were introduced into IOU programs in PY2021 and fully integrated in PY2022. IOUs have claimed over 31 GWh of energy savings from commercial tune-ups in PY2024.

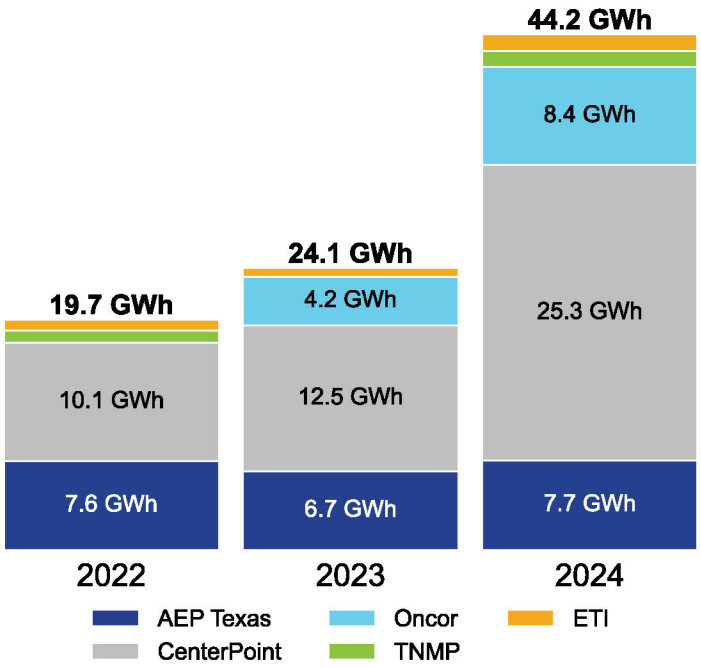
Figure 19. AC/HP Tune-Up Claimed Energy Savings (GWh) by Sector



5.1.1.1 PY2022-PY2024 Trends

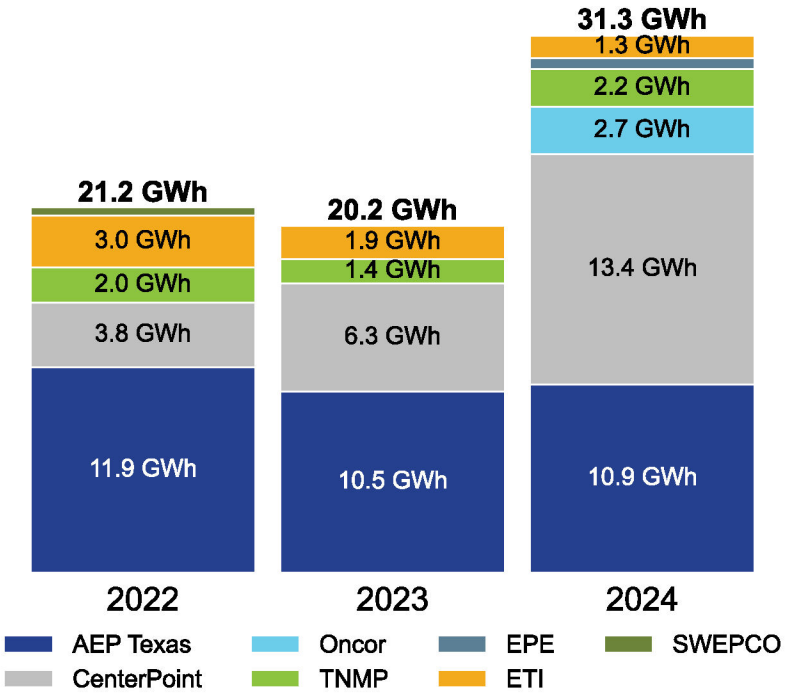
Five IOUs implemented residential *tune-up* measures and claimed over 44 GWh of energy savings in PY2024. Figure 20 shows the steady increase in the claimed savings over the last three years as each utility increases participants and the resultant energy savings. CenterPoint is the largest driver of growth accounting for over half of the savings. Oncor has a program specifically for low-income participants. Other utilities also provided *tune-ups* in the low-income sector, but they were included in the standard program implementation.

Figure 20. Residential Tune-Up Claimed Energy Savings (GWh) by Utility PY2022-PY2024



Seven IOUs implemented commercial *tune-up* measures and claimed over 31 GWh of energy savings in PY2024. Figure 21 shows the claimed savings by each utility over the past three years. Savings provided by each commercial program show less consistent savings patterns due to less participation and higher variability in the *tune-up's* claimed savings.

Figure 21. Commercial Tune-Up Demand Reduction (kW) Trend by Utility PY2022-PY2024



5.1.2 Consumption Analysis Results

5.1.2.1 Overview

The EM&V team conducted a consumption analysis on residential and commercial *AC/HP tune-ups* to directly measure the weather normalized impacts of the *tune-ups* on actual energy usage.

The consumption analysis focused on the hours when *HVAC* cooling occurs and included *tune-ups* completed on *ACs* or *HPs* between September 1, 2023, and July 31, 2024.

Consumption analysis assessed:

- if the IOU programs' residential and commercial *AC/HP tune-ups* effectively reduced participants' annual electricity usage; and
- how the IOU claimed savings for residential and commercial *AC/HP tune-ups* compared to measured savings.

To conduct this analysis, the EM&V team collected advanced metering infrastructure (AMI) meter data from IOUs offering *AC/HP tune-ups* to customers. During the consumption analysis study period, only six of the eight IOUs had fully deployed AMI meters and submitted program participant data for analysis: AEP Texas, CenterPoint, ETI, Oncor, SWEPCO, and TNMP.

Across these six IOUs, over 16,600 households or businesses with unique AMI meter data received a tune-up between September 1, 2023, and July 31, 2024, and were included in the consumption analysis.[27]

Using the data provided by the IOUs, the EM&V team analyzed each household's AMI meter data by:

- measuring the data for the summer months (June through September) up to two years before they participated in a program,
- measuring the data for the summer months after the tune-up date,
- normalizing the data for the weather to the cooling degree hours of the typical meteorological year (TMY3), and
- analyzing the data for normalized energy savings (*measured savings*) attributable to the *HVAC* tune-up.

Throughout this section, the energy savings represent the difference between a location's normalized annual kWh usage during cooling hours (defined as any hour where the local temperature is above 74 degrees Fahrenheit[28]) before the *tune-up* and the same location's normalized annual kWh usage during cooling hours after the *tune-up.*

Technical Appendix A, AC/HP Tune-Up Consumption Analysis, discusses the detailed methodology and results of the consumption analysis and includes summary tables with results by IOU, sector, and TRM climate zone.

Key findings and recommendations are discussed separately for the residential and commercial sectors and provide program-level performance of the *AC/HP tune-up* measure.

5.1.2.2 Residential Tune-Ups Key Findings

The residential tune-ups in the analysis are completed across the state and have different capacities at each residence. However, only one implementation contractor manages this measure for all IOUs across all of Texas; they train local *HVAC* contractors to complete the *tune-up* work and site measurements. The implementation contractor team also completes the quality assurance on the program activities. Therefore, the aggregated look across IOUs provides more robust savings results for the average residential participant. Individual IOU results provide insight into each program's design and implementation effectiveness.

The key findings, recommendations, and tables below provide measured savings results for the five[29] IOUs with residential *tune-ups* included in the PY2024 consumption analysis. Overall, the analysis included 15,598 residential *tune-ups*, a robust number of data points for statistically significant results.

[27] Participant meter data were received for a census of the six IOU programs, totaling 18,449 participants. Almost 90 percent of the participants' data were retained in the analysis after the data cleaning process; details on the data cleaning process and reasons why meters were excluded from the analysis can be found in *Appendix A: HVAC Tune-Up Consumption Analysis*.

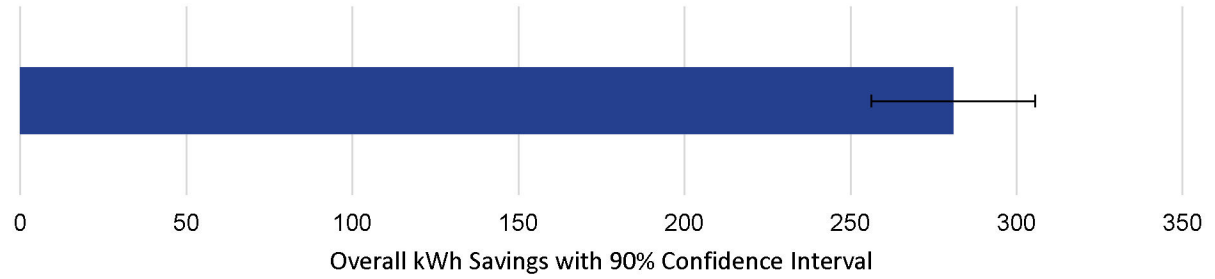
[28] The set-point temperature was determined to be the most statistically likely average set-point among participants. Details can be found in Appendix A.

[29] SWEPCO did not have residential participants.

Key Finding: Overall, the residential *tune-ups* deliver energy savings to participants; however, savings varied across IOUs.

The *HVAC* tune-ups for residential customers across all IOUs resulted in an average savings of 281 kWh per residence. At a 90 percent confidence level, the average savings fall between 256 kWh and 306 kWh (Figure 22).

Figure 22. Average Annual Residential kWh Savings During Cooling Hours – Overall



Each of the five IOUs demonstrated savings for its residential *tune-ups*. The 90 percent intervals show the likelihood of the measure to result in savings when implemented. The measured savings for each IOU, along with its 90 percent confidence intervals, are shown in Table 8.

For all IOUs, the lower 90 percent confidence interval is positive, demonstrating the probability of measured savings being above zero. We can reliably conclude all IOU programs are producing positive savings from residential tune-ups. However, those savings differ by IOU:

- ETI and CenterPoint *tune-up* measured savings were above the overall average.
- Oncor, AEP, and TNMP *tune-up* measured savings were below the overall average.

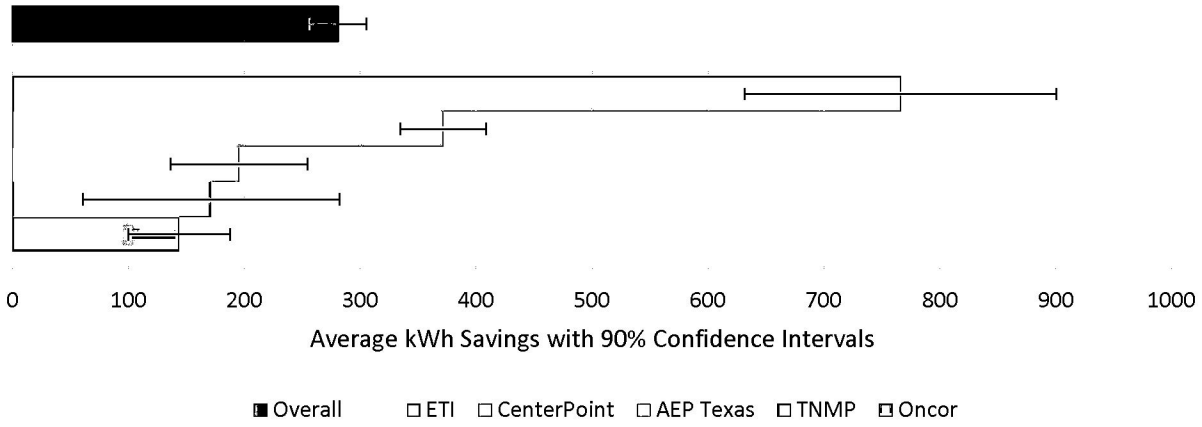
Table 8. Average Annual Residential kWh Savings During Cooling Hours by IOU

IOU	n	Average kWh Measured Savings	Lower 90% Confidence Interval	Upper 90% Confidence Interval
Overall	**15,598**	**281**	**256**	**306**
AEP Texas	2,763	196	137	255
CenterPoint	7,358	372	335	409
ETI	493	766	632	901
Oncor	4,543	144	100	188
TNMP	441	171	61	282

Figure 23 visualizes the measured savings and confidence intervals (grey bars), comparing each IOU in descending order of measured savings in comparison to the overall average at the top of the figure (dark blue).

ETI has the largest *tune-up* measured savings, followed by CenterPoint, which is also above the overall average. AEP Texas, TNMP and Oncor descend below the overall average while still demonstrating positive savings.

Figure 23. Average Annual kWh Savings During Cooling Hours by IOU



Key Finding: The measured savings from the residential *HVAC tune-ups* were consistently lower than claimed savings determined through the M&V methodology.

With utility-provided tracking data, the EM&V team compiled claimed savings. The IOU claimed savings are based on calculations following the TRM Volume 4 Measure 2.1.2 (Vol. 4 savings) M&V methodology with inputs provided by the implementation contractor.

- TRM Vol. 4 savings utilize the prescriptive *HVAC* replacement parameters (equivalent full-load hours, tonnage, coincidence factor) with the efficiency of the *tune-up* unit.
- The *HVAC* efficiency following the *tune-up* is calculated from on-site measurements. The *HVAC* efficiency before the tune-up is determined by applying the average efficiency improvement from a sample of *HVAC tune-ups*[30] from the prior three years (PY2021 through PY2023 in the case of PY2024).
- The EM&V team has provided recommendations in the past two evaluations to improve the rigor and transparency of the on-site measurements, data collection, and the efficiency loss calculations to validate assumptions used to claim energy savings.
    - To ensure these recommendations are implemented, starting with the PY2025 TRM, each IOU must have its *tune-up* M&V plan approved by the EM&V team.

[30] A sample of 10 percent of all *tune-ups* is selected to determine the average efficiency improvement (or efficiency loss). For those 10% of *tune-ups*, technicians collect both pre-tune-up and post tune-up measurements. For the remaining 90% of *tune-ups*, technicians only collect post *tune-up* measurements. Separate efficiency improvement values are determined for units receiving a refrigerant charge adjustment as part of the *tune-up* and those that do not receive a refrigerant charge adjustment as part of the *tune-up*.

Table 9 shows the average measured savings and claimed savings per residence. Overall, the measured savings were 14.1 percent of the average claimed savings across all IOUs.

While ETI and CenterPoint have the measured savings closest to the claimed savings, the realization rate of 38 percent and 22 percent respectively still indicate the TRM Vol. 4 methodology is significantly overestimating savings. When comparing measured and claimed savings, AEP Texas and Oncor had the lowest realization rates at 7.1 percent and 7.2 percent respectively. Oncor first started incentivizing *tune-ups* in PY2023, which is included in this analysis.

Table 9. Residential Tune-up Claimed Savings (kWh) and Realization Rate by IOU

IOU	n	Average kWh Measured Savings	Average Claimed kWh Savings[31]	Realization Rate
Overall	**15,598**	**281**	**1,992**	**14.1%**
AEP Texas	2,763	196	2,770	7.1%
Center Point	7,358	372	1,705	21.8%
ETI	493	766	2,012	38.1%
Oncor	4,543	144	1,997	7.2%
TNMP	441	171	1,837	9.3%

Realization rates are based on averages; some residences saw measured savings higher than the claimed savings and others saw less. A separate distribution analysis of measured savings found that ETI and CenterPoint respectively had 18 percent and 19 percent of the residences where the measured savings exceeded the average claimed savings. The other three utilities each had 7 percent to 10 percent of the residences that exceeded the average claimed savings.

Overall, the analysis finds that the measured savings associated with the cooling load are less than the claimed savings. The overall realization rate of 14.1 percent indicates that the claimed savings calculation is overestimating the savings per residence.

Key Finding: The residential *AC/HP tune-up* deemed savings from PY2024 TRM Volume 2 match the measured savings more accurately.

The Texas TRM includes a deemed energy savings for residential *tune-ups* in Volume 2, Measure 2.2.1 of the TRM Version 12 (Vol. 2 savings), Table 24.

The TRM Vol. 2 savings use engineering assumptions for operating hours and pre-*tune-up* efficiency with a five percent efficiency coefficient improvement to identify deemed savings per capacity (tons). The deemed savings are set by climate zone using the same normalized TMY3 weather file as this measured analysis. This deemed savings has seen very little use with IOUs typically using the M&V approach discussed for Vol. 4 savings. Why IOUs have chosen not to use the deemed savings is a discussion item for each IOU.

[31] Claimed kWh savings are for a combination of *air conditioners* and *heat pump* units. The claimed savings includes heat pumps which derive savings from the improved efficiency in heating mode. This is not accounted for in the cooling load analysis. Using the detailed M&V data collection to determine the efficiency loss, *heat pumps* account for 3 percent of the total units tuned up.

Table 10 shows the measured savings per residence and the 90 percent confidence intervals reorganized by the climate zone to align with the deemed savings table of the TRM. The residential participants in each climate zone combine IOU programs but as discussed earlier have the same implementation contractor team.

- The savings are concentrated in Climate Zone 3, which also has the highest measured savings including the CenterPoint and ETI programs, and
- The other two climate zones have fewer participants and lower average savings.

Table 10. Average Annual Residential Savings (kWh) During Cooling Hours - by TRM Climate Zone

Climate Zone	n	Average kWh Measured Savings	Lower 90% Confidence Interval	Upper 90% Confidence Interval
Climate Zone 2	4,548	145	101	189
Climate Zone 3	8,377	383	349	417
Climate Zone 4	2,673	192	132	253

The measured savings are the savings per residence, while the deemed savings from the TRM are the energy savings per the cooling capacity of the *HVAC* unit. To compare the measured energy savings to the deemed energy savings value, each unit's measured savings is divided by the unit's capacity in nominal tons. The nominal capacity was collected for all meters but was not fully available in the tracking data.[32] The population for this portion of the analysis is slightly smaller than the total population analyzed. Table 11 displays the average measured savings per ton and the deemed savings per ton for the units with available nominal tonnage.

Table 11. Measured and TRM Vol. 2 Savings (kWh) Per Capacity - by Climate Zone

Climate Zone	n with tracked nominal capacity	kWh Measured Savings per ton	Deemed kWh Savings per ton	Measured to Deemed Savings percentage
Climate Zone 2	4,548	58.2	108.6	53.6%
Climate Zone 3	5,510	169.3	124.6	135.9%
Climate Zone 4	2,673	79.5	166.8	47.6%

The measured savings per nominal ton more closely match the TRM Vol. 2 savings than the Vol. 4 savings. The average measured savings in Climate Zone 3 exceed the Vol. 2 deemed savings, while Climate Zones 2 and 4 are approximately half of the Vol. 2 deemed savings.

The measured savings per ton and the realization rate for the utilities in Climate Zone 3 (ETI and CenterPoint) indicate that the design and implementation of programs are more effective compared to those in other regions. IOUs should discuss with the implementation contractor ways to identify characteristics of contractors, residences and *HVAC* units that lead to the higher savings in Climate Zone 3.

[32] AEP Texas, TNMP, and ETI tracking systems included unit capacity. Oncor provided additional detailed information that included capacity. CenterPoint tracking data had 61 percent of residential meters included tonnage information during the analysis.

- **Recommendation:** Revise the TRM Volume 4 *HVAC tune-up* M&V methodology to better align claimed savings estimates with measured savings for the PY2026 TRM.
- **Recommendation:** Identify best practices from CenterPoint and ETI (Climate Zone 3) implementation in the residential sector to improve energy efficiency delivered per tune-up in other climate zones.

5.1.2.3 Commercial Tune-Ups Key Findings

Key Finding: The commercial usage data was too varied to accurately measure savings for the smaller sample size.

The number of commercial participants was much smaller than the residential participants, with 1,010 total commercial participants distributed across the five IOUs. In addition, the building types in the commercial sector vary more widely than in the residential sector. Buildings range from master-metered multifamily properties to schools to offices. This smaller sample size and larger variation of building types lead to a higher standard error and wider confidence intervals.

Measured savings for the five[33] IOUs with commercial *HVAC tune-ups* included in the PY2024 consumption analysis are summarized below.

Because of the smaller sample sizes, specifically for ETI, SWEPCO, and TNMP, the average savings are highly dependent on the commercial building types and individual building operations included in the analysis. A change at one location, e.g., a change in occupancy, can impact the kWh consumption that overshadows any effect from the *HVAC* tune-up.

Confidence intervals for four of the five IOUs include zero, indicating that we cannot statistically distinguish the average kWh savings from zero. The measured savings and confidence intervals are shown in Table 12:

- SWEPCO is the only IOU with tune-up savings significantly above zero, and with much higher average kWh savings,
- ETI saw the second highest average kWh savings, but this is not a statistically significant positive result since the lower 90 percent confidence interval is negative, and
- Both CenterPoint and TNMP showed negative average kWh savings.

Table 12. Average Annual Commercial Savings (kWh) During Cooling Hours - by IOU

IOU	n	Average kWh Savings	Lower 90% Confidence Interval	Upper 90% Confidence Interval
Overall	1,010	-887	-4,200	2,427
AEP Texas	649	1,931	-2,124	5,985
CenterPoint	320	-6,846	-13,139	-553
ETI	30	7,604	-4,354	19,563
SWEPCO	4	13,567	2,180	24,954
TNMP	7	-34,294	-62,992	-5,596

Due to the small number of participants for three IOUs (ETI, SWEPCO and TNMP) and large confidence intervals due to variability in savings results for the other two IOUs (AEP Texas and

[33] Oncor did not have any commercial participants.

CenterPoint), the EM&V concludes that the PY2024 sample is not sufficient to provide confidence in the results.

- **Recommendation:** Additional commercial *HVAC tune-ups* should be incorporated into the consumption analysis as part of the PY2025 EM&V scope and reanalyzed with the current sample of *tune-ups* to provide more robust data points.

5.2 VARIABLE SPEED HEAT PUMPS

5.2.1 Background

In recent years, stakeholders have requested the PUCT and EM&V team consider savings methodologies to recognize increased benefits from *variable speed heat pumps* (*VSHP*s) in the TRM. In response, the PUCT convened a 2024 Heat Pump Working Group (HPWG) facilitated by the EM&V team to better reflect the *VSHP* technology and usage throughout Texas climate zones in the PY2025 TRM.

The HPWG identified the key variation between different *heat pump* performances was the winter peak demand reduction because of the ability to reduce or eliminate electric resistance heating. The standard *heat pump* measure claims the energy savings as the difference between the existing heating system and the newly installed *heat pump*. The greatest opportunity to reduce winter peak demand was to replace electric resistance heat with a standard *heat pump*. The VSHP measure that is now included in TRM Volume 4, beginning with the PY2025 TRM, details the differences between the performance of VSHP and standard *heat pumps* which captures the peak demand difference between the standard *heat pump* and the VSHP.

5.2.2 Measure Opportunity Analysis

Key Finding: TRM climate zone savings winter peak demand reduction analysis identified the following:

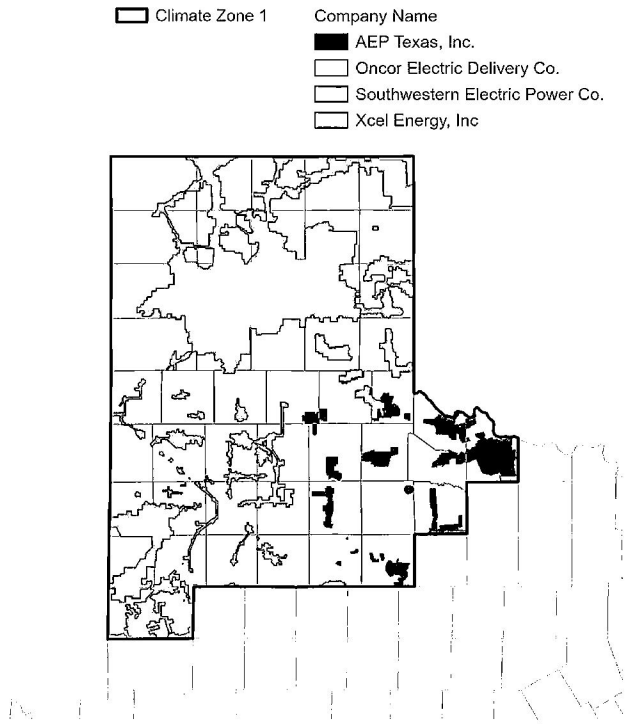
- Climate Zone 1 sees the most benefit from *VSHP* adoption,
- Climate Zones 2 and 3 may realize some *VSHP* peak winter benefits,
- Climate Zones 4 and 5 can be effectively served by standard *heat pumps*, and
- All climate zones realize substantial winter peak demand reduction when replacing electric resistance heat with *heat pumps*.

The TRM measure developed by the HPWG captures the difference between *heat pumps* that turn on the auxiliary heat at different temperatures in single-family and multi-family residences.[34] Volume 1 of the TRM identifies five climate zones for use in energy efficiency calculations. Standard and variable speed *heat pumps* act similarly and during the winter peak hours[35] of the warmest climate zones, 4 and 5. That means both a variable speed and standard heat pump will likely replace 100 percent of the electric resistance heat in these climate zones. In Climate Zones 2 and 3 the auxiliary electric resistance heat is partially replaced by a standard *heat pump* during the peak hours. A variable speed *heat pump* further reduces the number of hours that auxiliary electric resistance is necessary. Climate Zone 1, as shown in Figure 24 has the coldest winter temperatures in Texas. This creates the greatest savings opportunity for the IOU to provide programs for variable speed heat pump technology to replace standard *heat pumps*.

[34] Commercial facilities typically have more advanced HVAC systems and are not impacted in the same way.

[35] As identified by the Peak Demand tables (PDPF tables) in the TRM

Figure 24. IOUs in Climate Zone 1[36]



To capture the variations in impact of varying levels of heat pump technology, the TRM reviews the capacity ratio between the heating capacity at 17 degrees[37] and the overall cooling capacity of the unit. The TRM created three categories for the ratio (Cap_{17}/Cap_C):

1. Less than 0.6: Standard heat pump technology,
2. 0.6 – 0.9: This group identifies heat pumps which provide increased cold weather performance but are losing capacity as the temperature decreases, and
3. Greater than 0.9: This group includes the most advanced heat pumps able to provide nearly full capacity and performance as the temperature decreases.

The impact on the winter peak kW varies by climate zone because the winter weather temperatures vary significantly across the state. The typical temperatures in each zone impact the equipment's heating performance and, therefore, the electric demand in each hour. The figures below compare the winter peak demand savings calculated by the TRM for an efficient[38] 2-ton *heat pump*, using the standard *heat pump* measure with both a *heat pump* and electric resistance baseline compared to the new *VSHP* measure in each of the three capacity ratios with a standard *heat pump* baseline. When a *heat pump* replaces electric resistance systems there is a great benefit gained by installing any type of *heat pump*, standard or VSHP. Although not shown in the figures, the VSHP measure provides similar peak demand reduction when

[36] See Appendix A for a map of all climate zones in Texas.

[37] 17 degrees is the temperature which certified performance results are available from AHRI, not the temperature of winter in the Texas climate.

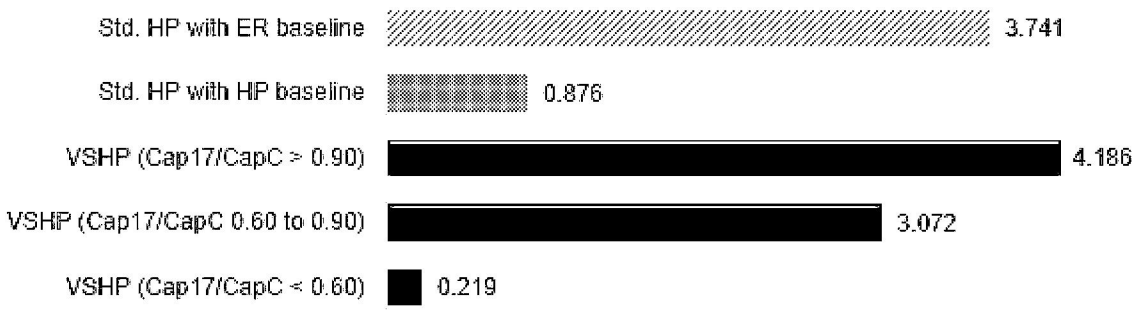
[38] Tested AHRI rating: CAPC = 24,000 btu/hr, EER2 = 10.0, SEER2 = 18.0, HSPF2 = 9.5

replacing electric resistance systems. A key component of the *VSHP* measure is that the savings shown do not require verifying or documenting the electric resistance baseline.

Climate Zone 1 had the largest impact from improved technology seen in *VSHP*s; however, this does vary by *VSHP* and replacing electric resistance heat with a standard *heat pump* also delivers significant winter peak savings. Figure 25 shows the variation in winter peak demand with the varying measure and technology.

- Using the most advanced *heat pump*, a *VSHP* with a ratio *Greater than 0.90* (Cap17/CapC > 0.90), has increased winter peak reduction over the standard *heat pump* with electric resistance baseline (St. HP with ER baseline).
- The standard *heat pump* measure (Std. HP with HP baseline) had increased savings with a *heat pump* baseline over the *Less than 0.6* (Cap17/CapC < 0.60) category of the *VSHP* measure. This *VSHP* measure savings is a result of the performance of the installed unit being greater than the baseline *heat pump* unit.
- However, the *VSHP* slightly improved technology (Cap17/CapC 0.60-0.90) category finds that the impact to the grid is over 80 percent of the calculation when a standard *heat pump* replaces electric resistance and over three times greater than a standard *heat pump*

Figure 25. Winter Peak Demand (kW) in TRM Climate Zone 1 for VSHP Technology



Climate Zones 2 and 3 both had similar impacts from improved technology. Figure 26 and Figure 27 show the variation in winter peak demand with the varying measure and technology in these climate zones.

Like Climate Zone 1, the standard *heat pump* measure had increased savings with a *heat pump* baseline over the *VSHP* measure category of *Less than 0.6* (Cap17/CapC < 0.60), but the variation is not as great. Again, the category of *VSHP* with slightly improved technology (Cap17/CapC 0.60-0.90) has an impact on the grid over two times greater than a standard *heat pump* with an *HP* baseline, but it does not reach the peak demand reduction of the verified and documented electric resistance baseline. If an electric resistance baseline is verified and documented for the *VSHP* measure, the peak demand savings is within 2 percent of the standard *heat pump* measure winter peak demand savings for these two climate zones.

Figure 26. Winter Peak Demand (kW) in TRM Climate Zone 2 for VSHP Technology

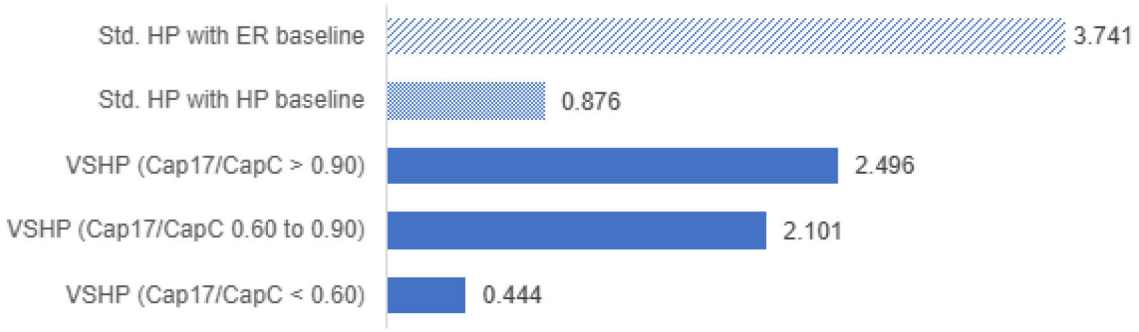
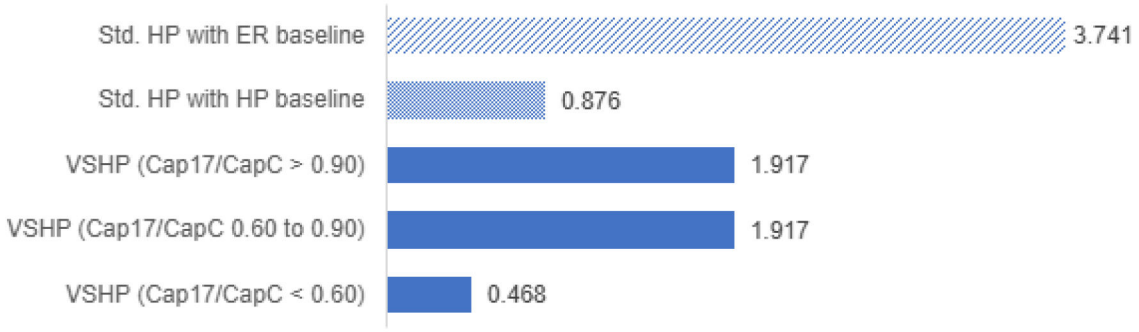


Figure 27. Winter Peak Demand (kW) in TRM Climate Zone 3 for VSHP Technology



Climate Zones 4 and 5 do not have the variation between the various *VSHP* categories. In Climate Zones 4 and 5, the *VSHP* measure winter peak kW savings is 0.71 kW and 0.92 kW, respectively. This is compared to 0.88 kW for the standard *heat pump* measure with the same *heat pump* baseline. When there is a verified and documented electric resistance baseline, the winter peak kW is 3.4 kW for Climate Zone 4 and 4.5 kW for Climate Zone 5 in the *VSHP* measure compared to 3.7 kW for the standard *heat pump* measure.

The value of the *heat pump* install will vary based on the equipment and the climate zones. The opportunity in Climate Zone 1 is the greatest while Climate Zones 2 and 3 also have an opportunity to increase the savings of programs that include *heat pump* measures. Climate Zones 4 and 5 do not have an opportunity to use the new *VSHP* equipment to gain additional savings.

5.2.3 PY2025 Implementation and Research

Starting in PY2025, IOUs are developing tracking systems to collect the equipment data necessary for implementing the new *VSHP* measure and tracking *VSHP* separately from standard *heat pumps*.

Key Finding: *VSHP*s have a significant incremental cost difference, have not gained traction in the IOU programs and may not be commonly stocked and available.

A major barrier to installing *VSHP* as an advanced technology over a standard energy efficient *heat pump* is the cost of the equipment. *VSHP*s can cost up to 50 percent more than the standard energy efficiency technology, although installation costs do not differ greatly. The EM&V team also hypothesizes that *VSHP*s may not be readily stocked and available in Texas.

From a review of the first half of the PY2025 program tracking system data provided by IOUs, IOUs have not installed any *VSHP* projects. The EM&V team proposes interviewing IOU program design and delivery staff in climate zones 1 to identify barriers.

The evaluation team also plans to engage members of the HPWG to complete individual interviews to better understand measure uptake in Climate Zone 1. Interviews will collect information on baseline equipment, new technology available, and any new research. The EM&V team will both conduct secondary research and collect Texas-specific data through the following interview plan. Questions for the different stakeholder groups are below:

- Utility Staff
  - Does the measure work?
  - What additional barriers have been identified?
  - Do you have data regarding baseline equipment for each market sector from your implementation tracking?
- Manufactures
  - What is your definition of the expected operation of your equipment in the Texas climate? Do you provide design guidelines to installers?
  - Can you provide an overview of the new technology released?
  - What are the pricing differences between your various equipment levels?
- Installation contractors
  - What *VSHP*s are stocked in Texas?
  - What are your equipment capacity/sizing practices?
  - Can you provide an overview of installation cost variations between equipment technologies?
  - What are your auxiliary heat installation practices?
  - What are your controller and commissioning practices?

6.0 COMMERCIAL ENERGY EFFICIENCY PROGRAMS

This section presents commercial summary analysis, followed by key findings and recommendations from PY2024 EM&V activities—desk reviews, participant surveys and measure opportunity analysis.

Key findings and recommendations from the desk reviews and participant surveys are presented separately for commercial SOPs followed by commercial MTPs.

6.1 SUMMARY ANALYSIS

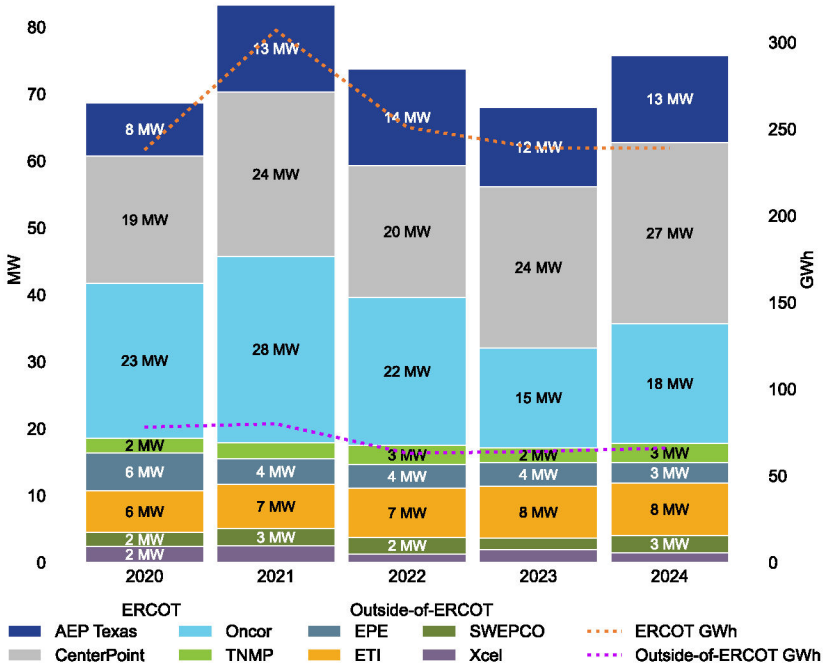
6.1.1 Savings

The IOU PY2024 gross savings from commercial sector programs were:

- 75,760 kW in demand reductions, and
- 304,336,717 kWh in energy savings

As shown in Figure 28, commercial energy efficiency demand reduction rebounded in PY2024 to 76 MW, which is the second highest demand reduction total in the past five years. Energy savings in PY2024 remained stable from PY2023 and slightly increased from 302 GWh to 304 GWh.

Figure 28. Total IOU Demand Reduction (MW) and Energy Savings (GWh) by Program Year—Commercial Programs Excluding Load Management, PY2020-PY2024[39]

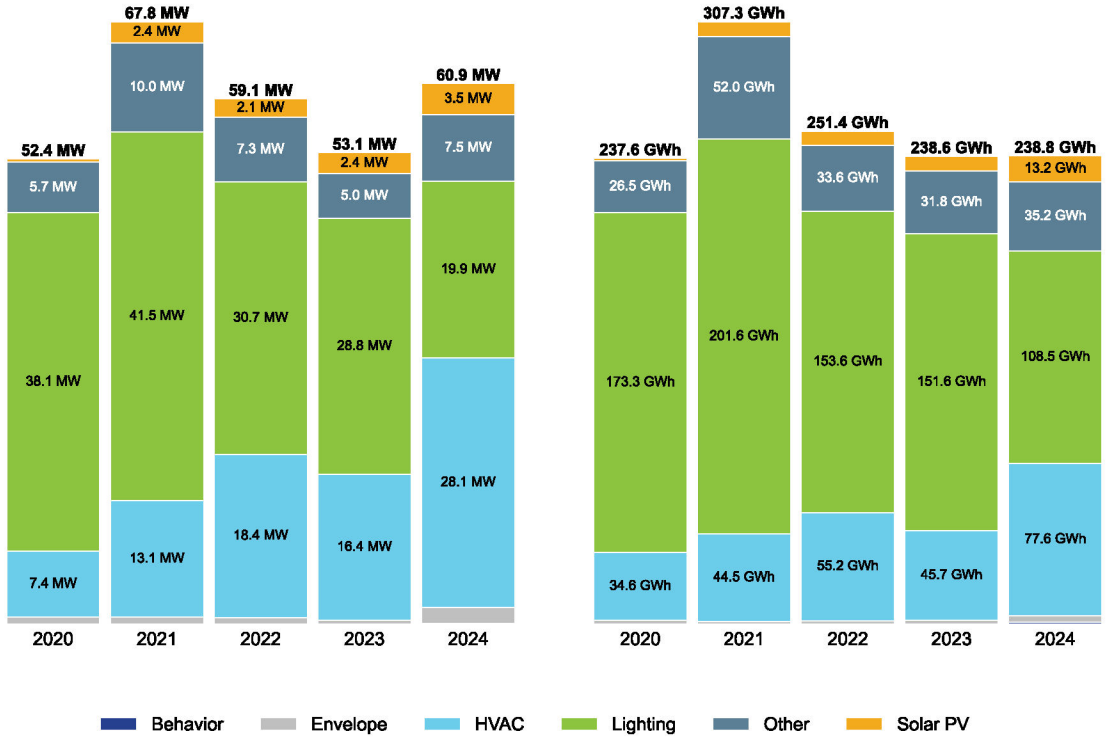


[39] The following data points consist of the MW savings values that were unable to make it on the graph due to limited space: TNMP: PY2021, 2.420 MW. SWEPCO: PY2023, 1.684 MW. Xcel: PY2021, 2.462 MW; PY2022, 1.285 MW; PY2023, 1.958 MW; PY2024, 1.464 MW.

Lighting measures accounted for about one-third of the demand reduction (33 percent, Figure 29, left graph) and almost one-half of the energy savings (45 percent, Figure 29, right graph) in PY2024 and have decreased over the past five years for the ERCOT utilities.

The ERCOT IOU commercial programs have substantially increased *HVAC* measure savings in the past five years to approximately 46 percent of demand reductions and 32 percent of energy savings, almost double the prior-year savings.

Figure 29. Distribution of IOU Demand Reduction (MW) and Energy Savings (GWh) by Measure Category—Commercial ERCOT Programs Excluding Load Management PY2020–PY2024[40]

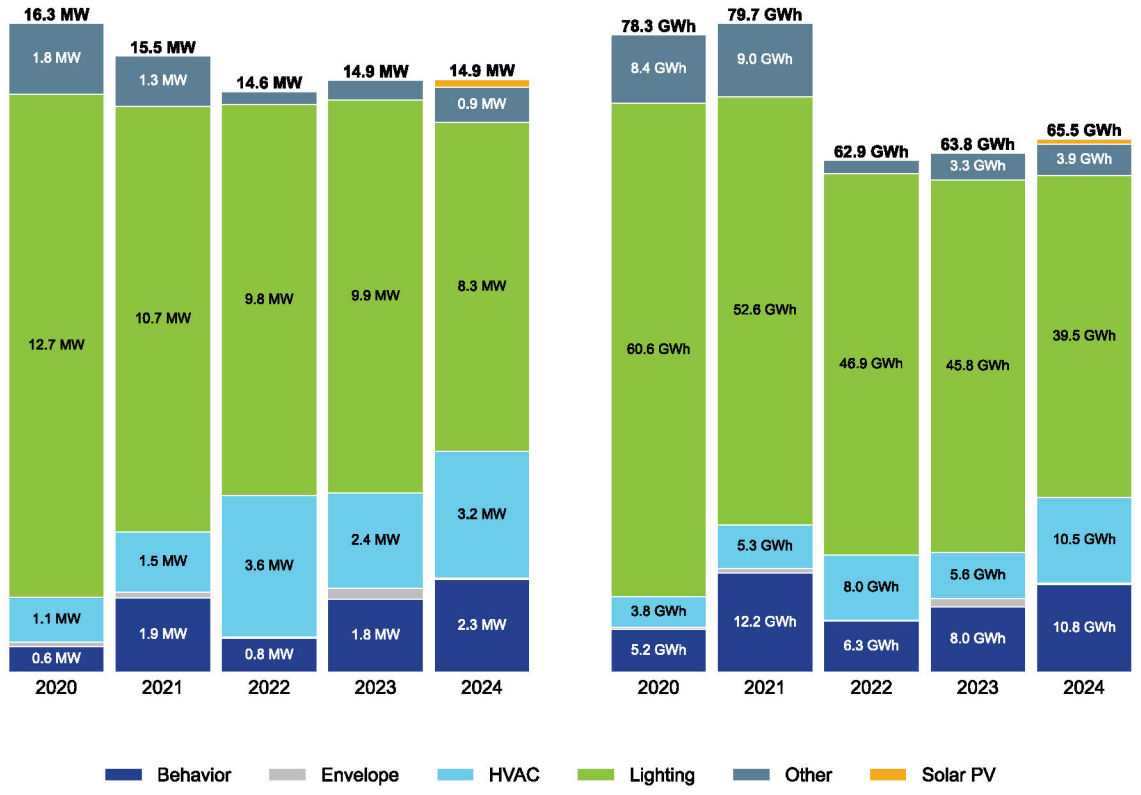


[40] Values less than five percent have been suppressed for visualization purposes.

While *lighting* measures remain the majority of the outside-of-ERCOT utilities' demand reduction (56 percent, Figure 30 left graph) and energy savings (60 percent, Figure 30 right graph), there is some diversification away from *lighting*.

The last three years have seen *HVAC* and *behavioral* measures together account for approximately one-third of demand reductions and energy savings, which is an increase from earlier years (Figure 30).

Figure 30. Distribution of IOU Demand Reduction (MW) and Energy Savings (GWh) by Measure Category—Commercial Outside-of-ERCOT Programs Excluding Load Management PY2020–PY2024[41]



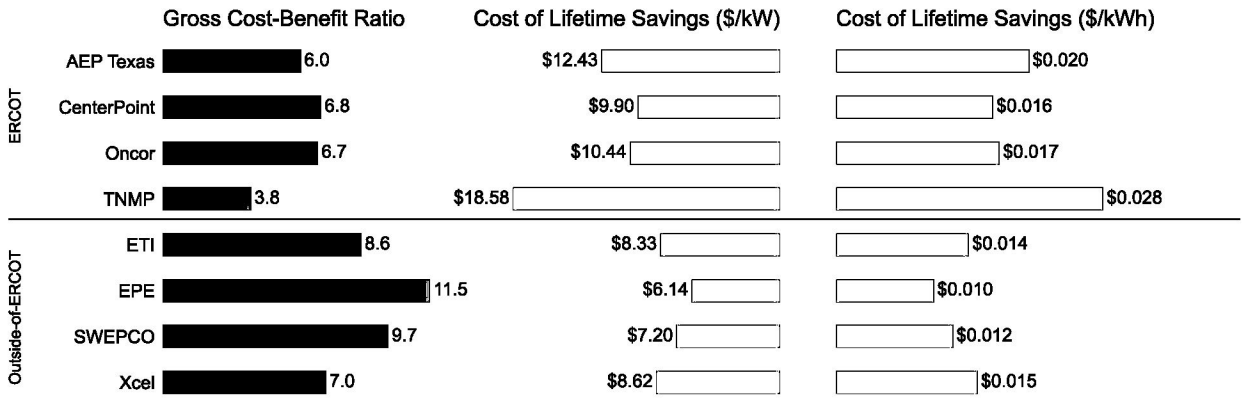
[41] Values less than five percent have been suppressed for visualization purposes.

6.1.2 Cost-Effectiveness

Figure 31 summarizes the cost-effectiveness of each utility's commercial energy efficiency portfolio. Commercial sector programs were the most cost-effective programs in IOU portfolios, with an overall cost-effectiveness over 7.0. There is variation in the utilities' results in the commercial sector because of the diversity of program designs offered by the utilities.

Figure 31 also summarizes the average cost of lifetime kWh and kW for each utility's commercial programs. The average cost per kWh saved ranges from $0.010 to $0.028, and the cost per kW reduced ranges from $6.12 to $18.58.

Figure 31. Cost-Benefit Ratio and Cost of Lifetime Savings—Commercial Programs PY2024



6.2 COMMERCIAL STANDARD OFFER PROGRAMS

6.2.1 Background

Commercial SOPs provide new construction and retrofit installation incentives for various measures that reduce demand and save energy in nonresidential facilities. Utilities establish standard offer contracts with energy efficiency service providers (EESPs), commonly referred to as "project sponsors". EESPs include a range of trade allies and larger commercial customers. SOP contracts specify standard payments based on energy and peak demand savings achieved through energy efficiency measures installed for eligible customers. Commercial SOPs include both deemed savings and M&V protocols, among other terms and conditions.

All commercial SOPs were designated as either *high* or *medium* evaluation priorities in PY2024. Five IOUs—AEP Texas, CenterPoint, Oncor, SWEPCO, and Xcel SPS—offer commercial SOPs, all of which were included in the PY2024 evaluation.

Commercial SOPs and MTPs (discussed next) represent the most significant percentage of IOU portfolio energy savings and incentivize similar types of projects.

6.2.2 Impact Evaluation Results

The EM&V team conducted desk reviews for sampled projects. For the desk reviews, the EM&V team applied the method prescribed in PY2024 TRM 11.0 to verify energy savings and demand reduction for each project sampled.

Comparing the evaluated savings (ex post) to utilities' unadjusted claimed savings (ex ante) showed agreement in about one-half of the projects; this is nearly equivalent to last year's evaluation. Many adjustments resulted from new construction projects, which had adjustments to the reported wattage, quantity, and exterior area. In many cases, dividing exterior lighting zones into different areas resulted in increased energy savings.

Table 13 presents the range of evaluated project-adjusted savings for SOP projects when comparing evaluated ex post savings to ex ante savings, excluding the project that eliminated savings. The range identifies the variability in evaluated results for various SOP programs and provides additional context for the key findings and recommendations.

Table 13. Range of Evaluated Adjusted Demand Reduction (kW) and Savings (kWh) for Standard Offer Program

Program	Evaluated adjusted savings comparison (kW)	Evaluated adjusted savings comparison (kWh)
Commercial SOP[42]	75%-138%	75%–800%

Based on the desk reviews, the EM&V team has outlined key findings and recommendations below.

6.2.2.1 Lighting Energy Savings

Comparing the evaluated savings to the unadjusted utility-claimed savings showed agreement in about one-third of the cases (9 out of 24 projects). The *lighting* projects were implemented by many different EESPs across utilities, leading to a varied realization of 75 percent to 155 percent.

Key Finding: New construction exterior *lighting* can include multiple exterior types--parking lots, loading docks, and pedestrian walkways. These are not included in most new construction project calculations, but they significantly impact the energy savings.

Evaluated projects consistently used only one exterior *lighting* area type, the parking and drive area. Exterior lighting areas such as loading docks, parking drives, and pedestrian walkways were frequently omitted or simplified. This causes exterior new construction projects to consistently underestimate the allowable baseline wattage, which decreases savings.

- **Recommendation:** IOUs should calculate exterior *lighting* savings using multiple exterior lighting area types.

Key Finding: Fixture wattages and quantities were often inaccurately reported or incomplete, leading to inconsistent *lighting* savings calculations.

Many projects reported installed fixture wattages or quantities that did not match certified product lists or supporting documentation such as invoices and site photos. This caused

[42] Range of adjusted savings excludes the project which received zero savings.

variability in energy and demand reduction estimates, sometimes resulting in under- or overestimation of savings.

- **Recommendation**: IOUs should verify fixture wattages against certified product lists and confirm fixture quantities with supporting documentation such as invoices and *lighting* plans during project review and savings calculations.

6.2.2.2 HVAC Energy Savings

This section presents the *HVAC* measures in various SOP programs, which were assigned *medium* or *high* evaluation priority in PY2024.

The EM&V team conducted desk reviews for sampled projects that included *HVAC* measures. Comparing the evaluated savings to the utility unadjusted claimed savings showed agreement in slightly more than one-half of the cases. Many different implementers supplied the *HVAC* projects, leading to a varied realization of 85 percent to 800 percent.

Based on the evaluation results, the EM&V team did not have overarching key findings and recommendations although IOU-specific recommendations are noted as applicable in Volumes 2 and 3.

6.2.3 Participant Survey Results

6.2.3.1 Overview

The EM&V team conducted a commercial participant telephone survey as part of the PY2024 EM&V scope; the survey methodology and response rate are discussed in detail in Technical Appendix B. This section summarizes participants' feedback from the Commercial SOP.

The survey's main objectives were to assess measure persistence, calculate net-to-gross (NTG), and collect key process information. Table 14 shows the number of completed CSOP surveys by utility and utility group. The ERCOT IOU CSOPs had a healthy number of completed surveys for quantitative results, with outside-of-ERCOT IOUs having fewer completed surveys due to less program participation.

Table 14. CSOP—Surveys Completed by Utility and Utility Group

Utility Group	Utility	Program	Completed surveys by utility	Completed surveys by utility group
ERCOT	AEP Texas	Commercial SOP	32	120
	CenterPoint	Commercial SOP	39	
	Oncor	Commercial SOP	49	
Outside-of-ERCOT	SWEPCO	Commercial SOP	4	12
	Xcel Energy	Commercial SOP	8	
		Total		**132**

6.2.3.2 Process Results

Detailed findings from the survey with commercial SOP participants are summarized below for firmographics, program awareness, program satisfaction, measure persistence, and program influence.

i. Firmographics

The survey included questions regarding the participating organization and facility where the measure was implemented.

Key Finding: Commercial SOPs are serving a wide variety of business types and buildings; the majority of projects are retrofits although one-fifth were new construction.

As in the PY2021 commercial participant survey, responses indicate that the PY2024 CSOP programs reached a wide variety of business types and buildings.

- The most commonly-upgraded business types among ERCOT CSOP survey respondents were *office, education*, *service*, and *warehouse*, and
- Among outside-of-ERCOT CSOP respondents, the most common business types were *service* and *public assembly*.

When examining responses from all CSOP respondents for each of the business types, *education, office,* and *service* accounted for around 15 percent. These results are largely consistent with PY2021. The facilities ranged widely in age—from about a century old to new construction projects.

Notably, one-fifth of the CSOP respondents' facilities were built between 2022 and 2024. Since commercial new construction projects have higher baselines based on codes from which to claim savings than retrofit, it is promising that CSOP is also serving new construction.

Key Finding: While most survey respondents own and occupy the participating facility, commercial SOPs are also effectively serving leased spaces.

Customers who both own and occupy the upgraded facility represented most participants (see Table 15). About a quarter of survey participants represent leased space, with some participants as the renter and the other as the landlord. Leased facilities can present a barrier to commercial program participation. For example, facility owners who control the building's equipment may not pay the energy bills; thus, they have a lower incentive to implement efficiency projects. Likewise, it may be harder for renters to make efficient upgrades. It is notable that commercial SOPs are still effectively serving this sector.

Table 15. CSOP—Respondent Company's Role in Facility

Company's role	ERCOT IOUs	Outside-of-ERCOT IOUs	Total
Owns and occupies	41	6	74.6%
Rent or lease	7	2	14.3%
Owns but it is rented/leased to someone else	7	0	11.1%
Respondents (n)	**55**	**8**	**63**

Source: Question FIRM2, Commercial Participant Survey.
Don't know, *refused*, and multiples were excluded from this analysis.

ii. Program Awareness

CSOP program participants were asked how they first heard about the program. Participant responses are displayed in Table 16. ERCOT utilities and outside-of-ERCOT utilities' responses are highlighted separately. Participants could report more than one answer.

Key Finding: EESPs are the primary source of awareness for ERCOT participants, while the utility is the primary source of awareness for outside-of-ERCOT participants. For both ERCOT and outside-of-ERCOT IOUs, participants are aware that the IOU is involved in the program.

These main sources of awareness mostly align with those resulting from the survey conducted for PY2021. In PY2024, however, more respondents were made aware of the program through *other contractors or vendors*. Hearing about the program through *email* was a new source of awareness, while still not a primary source.

Table 16. CSOP—Top Ten Sources of Program Awareness

Source	ERCOT IOUs (n)	Outside-of-ERCOT IOUs (n)	Total
EESP or contractor that helped with program	19	2	31%
Utility	10	5	22%
Other contractor or vendor	10	1	15%
Website	5	1	9%
Prior participation—current organization	6	0	9%
Bill insert	1	1	3%
Builder/ engineer/ architect/ developer	2	0	3%
Conference/ industry trade show/ expo	2	0	3%
Other business contacts	2	0	3%
Email	2	0	3%
Respondents (n)	**57**	**10**	**67**

Source: Question A1, Commercial Participant Survey.
The figure shows the top ten sources of program awareness. *Don't know*, *refused*, and multiples were excluded.

Table 17 illustrates that most participants were aware that the utility was coordinating the energy efficiency programs. About 90 percent of all CSOP respondents were aware; an increase from the last commercial participant survey in PY2021 when only a quarter (25 percent) were aware.

Table 17. CSOP—Awareness with Utility Involvement in Energy Efficiency Program

Awareness (Y/N)	ERCOT IOUs	Outside-of-ERCOT IOUs	Total
Yes	45	8	89.8%
No	5	1	10.2%
Respondents (n)	**50**	**9**	**59**

Source: Question INC0, Commercial Participant Survey.
Don't know, *refused*, and multiples were excluded from this analysis.

iii. Program Satisfaction

The survey included a short series of questions to gauge customer satisfaction with their participation experience.

Key Finding: 90 percent of CSOP participants reported they were very satisfied with the program, averaging very high satisfaction scores, over 4 on a 5-point scale where 5 is very satisfied (4.5).

Mean satisfaction across CSOP respondents was 4.5, with only slightly higher mean satisfaction for ERCOT utilities (Table 18). 73 percent of overall respondents reported their satisfaction at a 5, indicating they were *very satisfied* with the program[43].

[43] While this indicates general high satisfaction amongst CSOP participants, it is worth noting that in PY2021, almost 87 percent of CSOP participants were very satisfied. Over 90 percent of the total respondents rated their satisfaction at 4 or 5.

Table 18. CSOP—Satisfaction with CSOP Programs

Satisfaction rating	ERCOT IOUs	Outside-of-ERCOT IOUs	Total
0—Very dissatisfied	0	0	0.0%
1	2	1	4.5%
2	1	0	1.5%
3	2	0	3.0%
4	10	2	17.9%
5—Very satisfied	42	7	73.1%
Mean	**4.6**	**4.4**	**4.5**
Respondents (n)	**57**	**10**	**67**

Source: Question SA2, Commercial Participant Survey.

Totals may not sum to 100 percent due to rounding. Multiples were excluded from this analysis.

Some of the reasons listed for the high satisfaction with the energy efficiency programs included:

- quality or performance of the new equipment,
- financial benefits (rebates and energy bill reductions),
- customer service and communication,
- positive experience with contractors, and
- general ease of the administrative process.

Less-than-satisfied respondents who rated satisfaction a 3 or lower (n=6) mentioned:

- benefits were low, and
- noted inefficiencies in project execution, including difficulty understanding the measurement and verification process.

Participants were also asked if they would change any aspects of the energy efficiency program services or equipment based on their experiences. 76 percent responded with “nothing”, “not applicable”, or “don’t know”.

Suggestions from one-fourth of the respondents were related to:

- streamlining the application process and required paperwork (n=6),
- expanding the equipment qualified for the program or scope of eligible projects (n=5), or
- increasing the program incentives and budget (n=2),

Other suggestions that were provided by one respondent each were: providing more information about how incentives are calculated, ensuring projects perform as expected, and facilitating contractor consistency.

Table 19 outlines that 46 percent of all CSOP respondents reported recommending the program to others, an increase from PY2021 (36 percent).

Table 19. CSOP—Recommendation of the Energy Efficiency Program to Others

Recommendation (Y/N)	ERCOT IOUs	Outside-of-ERCOT IOUs	Total
Yes	27	4	46.3%
No	30	6	53.7%
Respondents (n)	**57**	**10**	**67**

Source: Question SA5, Commercial Participant Survey.
Multiples were excluded from this analysis.

iv. Measure Persistence

CSOP survey respondents reported that all measures implemented through the program are still installed and operating.

v. Program Influence

Commercial SOP participants were asked about the key factors that influenced their ultimate decision to make an energy-efficient upgrade. The results presented below indicate *moderate* to *high* program influence.

Key Finding: Commercial SOP participants value project paybacks and financial incentives over technical assistance and information.

We reviewed the participant responses to key program influence indicators. Table 20 includes the average rating for each of the 12 factors (for both ERCOT and outside-of-ERCOT utilities) on a scale from 0–10, where 0 means *not at all important* and 10 means *very important*.

When asked about the importance of 12 different factors in influencing their decision to purchase or implement energy efficiency upgrades, the highest rated factor among ERCOT respondents was *payback on investment.* For outside-of-ERCOT respondents, the highest rated factor was *previous experience with the contractor or a utility energy efficiency project.*

Financial assistance or rebate from another organization had the least influence on respondents participating in ERCOT utility programs, and *information provided through a study, energy assessment, or other technical assistance* was the lowest rated for outside-of-ERCOT respondents. Notably, *information provided through a study, energy assessment, or other technical assistance* had a higher influence in PY2021. Generally, PY2024 findings indicate that *payback on investment, the availability of the markdown or financial assistance,* and *previous experience with the contractor or a utility energy efficiency project* had more influence than in PY2021.

Table 20. CSOP—Rating of Importance of Factors that Influenced Customers' Energy Efficiency Upgrades

Factor	ERCOT IOUs		Outside-of-ERCOT IOUs	
	Average rating	Number of respondents	Average rating	Number of respondents
Payback on investment	8.5	125	8.3	11
Information provided through a study, energy assessment, or other technical assistance	7.6	30	2.0	1
Availability of the markdown or financial assistance	7.3	97	8.8	8
Previous experience with contractor or a utility energy efficiency project	6.9	133	8.9	8
General concerns about the environment	7.6	135	5.7	10
Standard practice or corporate policy regarding equipment installation	7.8	127	7.3	6
Information or recommendations provided by program staff or contractor	7.1	132	8.3	6
The age or condition of the old equipment	7.9	97	8.3	6
Recommendation from a vendor or supplier	7.3	132	8.0	6
Information from utility program informational materials	6.3	119	6.0	6
Financial assistance or rebate from another organization	2.3	93	5.0	4
Information from a training course or seminar offered by a service provider	4.1	115	5.4	5

Source: Question N3, Commercial Participant Survey.

Don't know and *not applicable* responses were excluded from this analysis.

Participants were also asked to rate the likelihood that they would have purchased or implemented the program-qualifying equipment in the absence of the program incentive on a 0–10 scale, where 0 is *not at all likely* and 10 is *very likely*. As shown in Table 21, the average ranking was 6.9 among ERCOT respondents and 6.0 among outside-of-ERCOT respondents, which is a higher average ranking compared to PY2021, where the average rating was 4.8 for all CSOP respondents.

Table 21. CSOP—Likelihood that Consumers Would Have Bought and Sold Energy Efficient Equipment in the Absence of the Program

Scale	ERCOT IOUs participant responses	Outside-of-ERCOT IOUs participant responses
0—Not at all likely	5	2
1	2	0
2	4	0
3	8	0
4	3	3
5	14	0
6	20	0
7	5	2
8	3	0
9	43	0
10—Very likely	17	4
Mean	**6.9**	**6.0**
Respondents (n)	**124**	**11**

Source: Question N5a, Commercial Participant Survey.
Don't know and *refused* were excluded from this analysis.

vi. Future Participation

The survey asked a short series of questions related to continued participation in energy efficiency projects.

- Thirty-six percent of CSOP respondents reported completing additional energy efficiency projects since the installation of the program-affiliated project in question. These results were comparable between ERCOT and outside-of-ERCOT respondents.
- Of those respondents who had completed an additional project, 54 percent installed the upgrade in the same facility, followed by 38 percent in multiple different facilities.
- Additionally, 82 percent of CSOP respondents said they are planning on installing new energy efficient equipment in the future. This was consistent between ERCOT and outside-of-ERCOT participants.

6.2.3.3 Net-to-Gross Results

This section presents the general methodology and key findings from commercial NTG research, which was the same for both CSOP and CMTP. Results are shown at the utility and utility group levels. See Appendix C for more details on the methodology. Results at the end-use level for each utility are presented in the IOU Energy Efficiency Report, Volumes 2 and 3.

Survey responses were used to calculate free-ridership and NTG ratios.

Table 22 presents the number of customer surveys completed for NTG analysis at the measure level by utility and utility group.

Table 22. CSOP—Completed Surveys at the Measure Level by Utility and Utility Group

Utility group	Utility	Completed survey by utility	Completed survey by utility group
ERCOT	AEP Texas	32	155
	CenterPoint	71	
	Oncor	52	
	TNMP	N/A	
Outside-of-ERCOT	SWEPCO	4	13
	Xcel Energy	9	
	EPE	N/A	
	ETI	N/A	
Total			**168**

To develop overall program estimates of free-ridership, the individual customer free-ridership estimates were weighted by the individual respondent's share of claimed savings. Therefore, a free-ridership value associated with a large project will have more influence on the overall rate of free-ridership. Next, the utility-level estimates of free-ridership were weighted by each utility's share of claimed savings before being summed to produce the overall program estimates of free-ridership.

vii. Free-Ridership

Free-ridership analyses estimate the proportion of savings that stem from customer actions that would have happened in the absence of the program. Customers who would have completed the same project at the same time without the program's intervention are considered free riders. For PY2024, free-ridership was calculated using the participants' self-report surveys.

Key Finding: CSOP free-ridership decreased for kWh and increased for kW with a free-ridership rate of 19 percent for kWh savings and 25 percent for kW savings.

The free-ridership for ERCOT utilities was higher compared to outside-of-ERCOT utilities. Note that the completed surveys for ERCOT utilities (n=152) are much higher than outside-of-ERCOT utilities (n=13).

The surveys resulted in free-ridership of 19 percent for ERCOT utilities' SOPs (based on 152 responses) and 14 percent for outside-of-ERCOT utilities' SOPs (based on 13 responses), weighted by kWh savings. The results were different for ERCOT utilities using kW savings (26 percent and 21 percent, respectively). Across both utility groups, the CSOP free-ridership was 19 percent for kWh and 25 percent for kW; lower than the kWh free-ridership calculated in PY2021 (23 percent for kWh) and slightly higher than the PY2021 kW free-ridership (22 percent for kW).

Table 23 outlines the kWh and kW free-ridership rates by utility for ERCOT utilities, respectively, along with the relative precision associated with each estimate. Oncor had the lowest free-ridership and AEP Texas had the highest free-ridership. Table 24 shows the same free-ridership information for the two outside-of-ERCOT utilities offering CSOPs. Both SWEPCO and Xcel SPS had low CSOP free-ridership.

Table 23. CSOP—Free-Ridership Results for ERCOT Utilities

Program type	n	Customer kWh free-ridership rate	Customer kWh precision at a 90% confidence interval	Customer kW free-ridership rate	Customer kW precision at a 90% confidence interval
AEP Texas	32	32.3%	7.3%	35.7%	8.5%
CenterPoint	70	25.8%	4.9%	26.0%	5.5%
Oncor	50	16.7%	3.9%	24.3%	5.5%
Total	**152**	**19.1%**	**2.3%**	**25.9%**	**3.0%**

Table 24. CSOP—Free-Ridership Results for Outside-of-ERCOT Utilities

Program type	n	Customer kWh free-ridership rate	Customer kWh precision at a 90% confidence interval	Customer kW free-ridership rate	Customer kW precision at a 90% confidence interval
SWEPCO	4	10.9%	33.5%	13.6%	39.6%
Xcel Energy-SPS	9	13.8%	13.6%	12.9%	12.0%
Total	**13**	**13.7%**	**10.9%**	**12.9%**	**9.8%**

viii. Spillover

Spillover refers to additional energy-saving equipment that was installed in the utilities' service areas without receiving an incentive or direct intervention from the utility.

Spillover was not calculated as additional research would be needed to verify additional projects. Since the IOUs claim gross savings, the NTG research is used to inform program design and delivery improvements to minimize free-ridership. About 10 percent of CSOP

respondents reported they installed an additional project without applying for a utility-incentive for the upgrade, *which does indicate some spillover*. Spillover is more likely for ERCOT IOUs since outside-of-ERCOT participants were more likely to apply for an incentive than those in ERCOT programs.

Recent NTG benchmarking research[44] suggests that spillover for similar commercial measures can range between 0 percent and 38 percent, indicating the IOU CSOPs are comparable to other commercial spillover estimates.

ix. Net-to-Gross Ratio

The NTG ratio was calculated using the following formula; it is worth noting the resulting ratio is conservative since it does not include spillover.

NTG Ratio = (1– Free-ridership Rate)

The final commercial SOP NTG ratio is 81 percent for kWh and 75 percent for kW. Table 25 and Table 26 show NTG ratios for ERCOT and outside-of-ERCOT utilities, respectively. The EM&V team applies the IOU program NTG ratio to the IOU program savings to determine the final net savings value.

Table 25. CSOP—NTG Ratios (1-FR) for ERCOT Utilities

Utility	n	kWh NTG ratio (1-FR)	kW NTG ratio (1-FR)
AEP Texas	32	67.7%	64.3%
CenterPoint	70	74.2%	74.0%
Oncor	50	83.3%	75.7%
Total	**152**	**80.9%**	**74.1%**

Table 26. CSOP—NTG Ratios (1-FR) for Outside-of-ERCOT Utilities

Utility	n	kWh NTG ratio (1-FR)	kW NTG ratio (1-FR)
SWEPCO	4	89.1%	86.4%
Xcel Energy	9	86.2%	87.1%
Total	**13**	**86.3%**	**87.1%**

The referenced recent benchmarking study shows that these NTG ratios compare favorably to other commercial programs and measures. The study reviewed 15 entities for programs taking place between 2021 and 2023, which include spillover, ranged between 48 percent and 102 percent. Specifically, *HVAC* equipment ranged between 83 percent and 92 percent, *LED lighting* was between 57 percent and 97 percent, and *custom* & *other* measures ranged between 53

[44] Net-to-Gross Study for NV Energy's Demand Side Management Programs, Volume1. Prepared for NV Energy. Prepared by Tetra Tech. Submitted on February 9, 2024. Reviewed utilities in the benchmarking research included: Massachusetts Program Administrators, Black Hills Service Company, Commonwealth Edison Company, Duquesne Light Company, Focus on Energy, MidAmerican, Nicor, North Shore Gas, Northern Indiana Public Service Company, Orange and Rockland, Pacific Gas & Electric, People's Gas and North Shore Gas, PECO, Penelec, San Diego Gas & Electric.

percent and 102 percent, among other measures. These values confirm that the NTG values are what would be expected without spillover from well-designed programs.

6.3 COMMERCIAL MARKET TRANSFORMATION PROGRAMS

6.3.1 Background

This section summarizes the key findings and recommendations from the PY2024 evaluation of commercial MTPs (CMTPs). CMTPs are intended to induce lasting structural or behavioral changes in the market, resulting in increased adoption of energy-efficient technologies, services, and practices.[45]

Many CMTPs were a *high* or *medium* evaluation priority in PY2024 cutting across all eight IOUs. The EM&V team evaluated the CMTPs described below.

Commercial Solutions MTP: The Commercial Solutions MTP targets commercial customers that do not have the in-house expertise to (1) identify, evaluate, and undertake energy efficiency improvements; (2) properly evaluate energy efficiency proposals from vendors; or (3) understand how to leverage their energy savings to finance projects. Assistance from the program includes communications support and technical assistance to identify, assess, and implement energy efficiency measures. Financial incentives are provided for eligible energy efficiency measures installed in new or retrofit applications, resulting in verifiable demand and energy savings. Commercial Solutions MTPs can include midstream programs that offer incentives at the distribution point to installation contractors who intend to install the equipment for eligible commercial or industrial customers. Specialty midstream programs are implemented using the Commercial Solutions MTP framework but are operated separately within utilities.

SCORE MTP: The SCORE MTP helps educational facilities (public and private schools, K–12, and higher education) and local government institutions to lower their energy use; this is done by providing education and assistance with integrating energy efficiency into their short- and long-term planning, budgeting, and operational practices. Lowering energy use is also completed through energy master planning workshops; energy performance benchmarking; and identifying, assessing, and implementing energy efficiency measures. Energy efficiency improvements include capital-intensive projects and implementing operational and maintenance practices and procedures. Financial incentives are provided for energy efficiency measures that reduce peak electricity demand.

Recommissioning MTP: The Recommissioning MTP offers commercial customers the opportunity to make operational performance improvements in their facilities based on low-cost/no-cost measures identified by engineering analysis. Financial incentives are provided to facility owners and retro-commissioning (RCx) agents to implement energy efficiency measures and complete projects by approved project deadlines. This program is evaluated as part of the M&V and custom energy savings.

Strategic Energy Management MTP: The Strategic Energy Management (SEM) MTP is a pilot program offering commercial and industrial participants technical support to make operational adjustments, equipment adjustments, or maintenance improvements to reduce the energy consumption of existing activities. Technical support and financial incentives are provided to facility owners to implement energy efficiency measures and projects completed by approved project deadlines. This program is evaluated as part of the M&V and custom energy savings.

[45] PUCT Order, Chapter 25: Substantive Rules Applicable to Electric Service Providers.

Commercial High-Efficiency Food Service MTP: The Commercial High-Efficiency Food Service MTP provides midstream financial incentives through food equipment dealers. The incentives reduce the initial cost of ENERGY STAR-certified commercially rated equipment purchased by restaurants and other commercial kitchens. This program is evaluated as part of the food service and refrigeration energy savings.

6.3.2 Impact Results

The EM&V team conducted desk reviews for a sample of projects from the *medium- or high-*priority commercial MTP programs. For the desk reviews, the EM&V team applied the method prescribed in the PY2024 TRM 11.0 to verify energy savings and demand reduction for each project sampled. Comparing the evaluated savings to the original utility unadjusted claimed savings showed agreement in about one-half of the projects (33 of 61).

The results of the 2024 evaluation saw similar project adjustments from the previous year (104 of 232). Although some individual projects had extensive adjustments when evaluated, over three-fourths of the projects (47 of 61) were within five percent of the claimed savings.

Table 27 presents the range of evaluated project-adjusted savings for MTP projects when comparing evaluated savings to unadjusted claimed savings. The range identifies the variability in evaluated results for various MTP programs and provides additional context for the key findings and recommendations.

Table 27. Range of Evaluated Adjusted Demand Reduction (kW) and Savings (kWh) for Market Transformation Program

Program	Evaluated adjusted savings comparison (kW)	Evaluated adjusted savings comparison (kWh)
Commercial Solutions MTP	50-269%	50–394%
SCORE MTP	31–113%	31–117%
M&V and Custom MTP	96–102%	96–107%
Food Service/Midstream MTP	100-109%	99-105%

6.3.2.1 Lighting Energy Savings

This section presents the *lighting* measures in various MTP programs but does not restate the key findings of the *lighting* measures from the CSOPs.

The EM&V team conducted desk reviews for a sample of projects from MTP program that included *lighting* measures. Comparing the evaluated savings to the utility-claimed savings showed agreement in slightly less than one-half (22 of 47) of the cases. The *lighting* projects were implemented by many different programs and utilities, leading to a varied realization of 31 percent to 150 percent.

Key Finding: The *lighting* baselines for specialty new construction building types, such as athletic fields and greenhouses, have alternate determination methods, which can result in inaccurate calculated energy savings.

The *lighting* new construction baselines for specialty buildings, which do not have a code-specified *lighting* watts per square foot have an alternate method to determine the baseline fixtures for the energy efficiency calculation. The athletic field *lighting* baseline matches the

lumen output of the installed *LEDs* to an estimate of metal halide wattage. Although this tends to work in standard situations, *LED lighting* can produce lumen levels that are not possible through metal halide fixtures. The table of metal halide equivalents for *LED* lumen outputs should be adjusted to match that reality.

The newly constructed agricultural buildings use *lighting* as an agricultural product production support. Each agricultural facility has specific needs based on their production process and facility. The long-day lighting building type estimated the needs of a dairy cow barn to support milk production and three greenhouse building types were developed to estimate greenhouse lighting needs. It is expected that the agricultural *lighting* projects have specific calculation for the facility and production needs, these custom hour assumptions should be submitted as a custom-building type for agricultural buildings.

- **Recommendation:** Update the TRM measure regarding the lighting new construction baseline for specialty buildings, including the athletic field and agricultural buildings.

6.3.2.2 M&V Methodology and Custom Energy Savings

M&V methodologies are used to claim energy savings for RCx, behavioral, operational, controls, and an expanding collection of custom energy efficiency projects. In addition, custom energy savings calculations can determine the energy savings from projects with defined scopes and outputs. The M&V methods provide a framework for high-quality verified savings for projects that cannot be readily isolated through engineering equations or modeling and provide significant energy savings. The M&V methodology identifies and claims savings from more complicated projects. Custom engineering calculations are used to determine energy savings associated with projects. The custom calculation is used where projects are easily defined, do not require long-term monitoring to identify savings, and do not meet prescriptive measure conditions in the TRM. The calculation determines the energy savings and the peak demand reduction separately, with the peak demand being determined using the PDPF *top 20-hours* method outlined in Volume 1 of the TRM.

Overall, the evaluation found that the M&V and custom-calculated projects had agreement with the unadjusted utility claimed savings for half of the projects (4 of 8). The projects using the M&V methodology and the custom calculation for energy claimed energy savings were supplied by many different implementers, leading to a variation of 71 percent to 394 percent.

Based on the evaluation results, the EM&V team has identified three key findings and recommendations.

Key Finding: Custom M&V approaches showed significant variability in savings estimates depending on weather normalization, load shape modeling, and regression methods.

The EM&V team found that custom M&V approaches, such as those used in SEM programs, showed significant variability in savings estimates depending on weather normalization, load shape modeling, and regression methods. Some projects calculated energy savings by weather normalizing pre- and post- regression models to TMY3 weather. Meanwhile, other projects calculated energy savings by taking the difference between post- energy consumption and a pre-regression model adjusted to use post weather data. Adjustments to incorporate updated weather data or refined regression models greatly affected peak demand and energy savings, leading to realization rates ranging widely.

- **Recommendation:** Use post-energy consumption data and pre-regression models adjusted with post-period weather data only for projects with an EUL of one year. For all other projects, normalize both pre- and post-regression models to TMY3 weather data

Key Finding: Technical assistance and early project reviews promote alignment of savings methodologies for custom and SEM projects.

The EM&V team found that technical assistance and early project reviews promote alignment of savings methodologies for custom and SEM projects. The EM&V team's early support and guidance to implementers on acceptable methods for calculating energy and peak demand reduction reduced the need for adjustments during final evaluations. This collaboration will improve the EM&V team's understanding of project goals, data collection processes, and calculation approaches, leading to more accurate and reliable savings estimates. Utilities that actively engaged in these technical assistance sessions also experienced fewer end-of-year savings discrepancies.

- **Recommendation:** Consult the EM&V team for SEM projects to review and agree upon savings methodologies and calculation algorithms early in the project lifecycle.

Key Finding: Several SEM projects did not update baseline energy consumption in accordance with TRM guidelines. This was an issue for programs working with a facility for longer than five years, which must establish a new baseline energy model.

Finally, the EM&V team found that several SEM projects did not update baseline energy consumption in accordance with TRM guidelines. The EM&V team found multiple instances of projects where implementers were claiming SEM savings compared to baselines that were established over five years ago. While these behaviors taken by the facility to reduce energy may persist, the *behavior* measure in Texas TRM Volume 4 states that a "baseline normalized energy model can be used for a maximum five years from the start of the baseline period to the start of the performance period".

- **Recommendation**: Follow TRM baseline protocols to ensure valid savings calculations and promotion of continuous energy improvement.

6.3.2.3 Food Service Energy Savings

This section presents the food service measures in either the Commercial High-Efficiency Food Service MTPs or other generalized MTPs. These programs and measures were a *medium* or *high* evaluation priority in PY2024.

The EM&V team conducted desk reviews for sampled projects that included food service measures. Comparing the evaluated savings to the utility-claimed savings showed agreement in half of the cases. All the food service measures were implemented through a midstream delivery using streamlined assumptions, leading to project-level realization ranging between 99 percent and 105 percent.

The key findings and recommendations of the food service and refrigeration MTPs do not restate the key findings and recommendations for other programs. However, since measures and program delivery occur across the programs, the findings and recommendations from The High-Efficiency Food Service MTP also apply to *food service* and *refrigeration* measures in other commercial programs.

6.3.3 Participant Survey Results

6.3.3.1 Overview

Table 28 shows the number of completed CMTP surveys by utility and utility group.

Table 28. CMTP—Completed Surveys by Utility and Utility Group

Utility group	Utility	Program	Completed surveys	Completed surveys by utility	Completed surveys by utility group
ERCOT	AEP Texas	SCORE/ CitySmart MTP	15	77	158
		Commercial CoolSaver A/C Tune-Up MTP	29		
		Commercial Solutions MTP	28		
		SMART Source Solar PV MTP	5		
	CenterPoint	Commercial MTP (SCORE, Healthcare, Data Center)	38	57	
		Commercial CoolSaver A/C Tune-Up MTP	0		
		Retro-Commissioning MTP	19		
	TNMP	SCORE/ CitySmart MTP	18	24	
		Commercial Solutions MTP	6		
Outside-of-ERCOT	EPE	Large Commercial Plus Solutions MTP	6	6	80
	ETI	Commercial Solutions MTP	52	52	
	SWEPCO	COMPASS Schools MTP	9	15	
		COMPASS Large Commercial MTP	6		
	Xcel Energy	Retro-Commissioning MTP	7	7	
			Total		**238**

6.3.3.2 Process Results

Detailed findings from the survey with CMTP participants are summarized below for firmographics, program awareness, program satisfaction, measure persistence, and program influence.

x. Firmographics

Key Finding: While Commercial MTPs are serving a variety of business types and buildings, education is by far the most served segment.

As with CSOPs, responses indicate that CMTPs' projects are spread across a variety of business types and buildings. Among all CMTP respondents, *education* accounted for 35 percent of business types, followed by *retail* (13 percent). The most commonly-upgraded business types among ERCOT CMTP survey respondents were *education, retail,* and *office.*

Outside-of-ERCOT utilities had a similar distribution of business types represented in CMTP programs, with *education* and *retail* also accounting for the most commonly-upgraded firms. Outside-of-ERCOT utilities had notably more *public assembly* businesses represented (11 percent) as compared to ERCOT utilities (5 percent). The facilities ranged widely in age, from over a century old to new construction projects.

Key Finding: Most survey respondents own and occupy the participating facility. Commercial MTPs are serving less leased spaces than SOPs which may indicate SOPs are more effectively serving leased spaces than MTPs.

Consistent with the most recent PY2021 survey, most participating facilities were upgraded directly by the owner (see Table 29). Just over 15 percent of surveyed CMTP projects were completed in a facility occupied by an organization other than the participant.

Table 29. CMTP—Respondent Company's Role in Facility

Company's role	ERCOT IOUs	Outside-of-ERCOT IOUs	Total
Owns and occupies	84.6%	85.3%	84.9%
Rent or lease	5.8%	8.8%	7.0%
Owns but it is rented/leased to someone else	9.6%	5.9%	8.1%
Respondents (n)	**52**	**34**	**86**

Source: Question FIRM2, Commercial Participant Survey.

Don't know, *refused*, and multiples were excluded from this analysis.

xi. Program Awareness

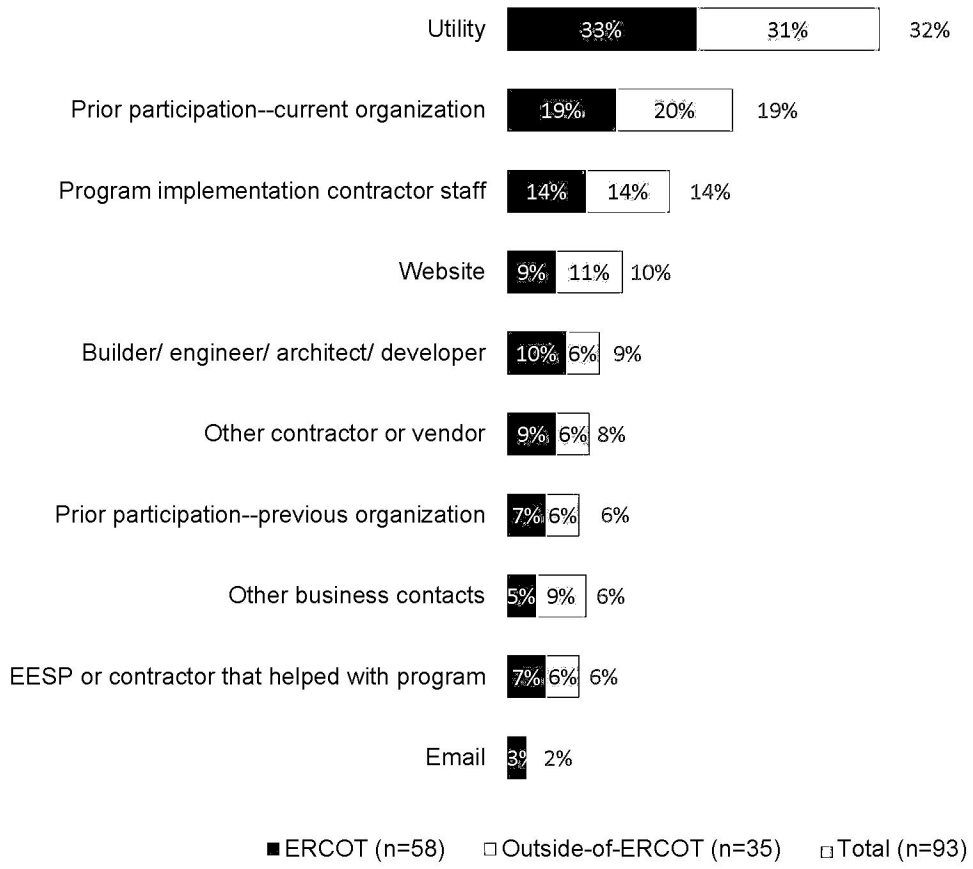
CMTP program participants were asked how they first heard about the energy efficiency program. Participant responses are displayed in Figure 32. ERCOT utilities and outside-of-ERCOT utilities' responses are highlighted separately. Participants could report more than one answer.

Key Finding: Utilities, implementation contractors, and previous program participants are the primary sources of awareness for MTPs and are similar across ERCOT and outside-of-ERCOT.

Respondents participating in ERCOT utility CMTP programs reported similar top ten sources of program awareness to outside-of-ERCOT utility respondents.

These results are similar to those from PY2021; however, hearing from an EESP or contractor that helped with the program was more common in PY2021. Additionally, in PY2021, prior participation in the utility's energy efficiency programs at the current organization was reported by only 7 percent of respondents, and prior participation in the utility's energy efficiency programs at a previous organization was more frequently reported (10 percent). Other sources of awareness mentioned in PY2024 were through the state energy conservation office (SECO) and independent research.

Figure 32. CMTP—Top Ten Sources of Program Awareness



Source: Question A1, Commercial Participant Survey.
The figure shows the top ten sources of program awareness. *Don't know*, *refused*, and multiples were excluded.

Participants were asked if they were aware that the program services or upgrades they received were coordinated by their utility (see Table 30). Just under 90 percent of all CMTP respondents were aware, and ERCOT utilities' participants demonstrated slightly higher awareness than outside-of-ERCOT utilities' participants. This is consistent with results found in the PY2021 survey, which reported 88 percent awareness of utility involvement among CMTP respondents.

Table 30. CMTP—Awareness with Utility Involvement in Energy Efficiency Program

Awareness (Y/N)	ERCOT IOUs	Outside-of-ERCOT IOUs	Total
Yes	92.2%	81.3%	88.0%
No	7.8%	18.8%	12.0%
Respondents (n)	**51**	**32**	**83**

Source: Question INC0, Commercial Participant Survey.
Don't know, *refused*, and multiples were excluded from this analysis.

xii. Program Satisfaction

Key Finding: 90 percent of CMTP participants reported they were very satisfied with the program, averaging very high satisfaction scores, over 4 on a 5-point scale where 5 is very satisfied (4.7).

Mean satisfaction across all CMTP respondents was 4.7. Eighty-four percent of overall respondents reported their satisfaction at a 5, or indicated they were *very satisfied* with the program. This was a slight decrease from the PY2021 survey, where 88 percent indicated that they were *very satisfied* with the program. Participants in ERCOT utility programs were marginally more likely to be *very satisfied* than participants in outside-of-ERCOT programs. Over 90 percent of the total respondents rated their satisfaction as 4 or 5. Just under seven percent of all CMTP participants rated their experience below a 4.

Table 31. CMTP—Satisfaction with CMTP Programs

Satisfaction rating	ERCOT IOUs	Outside-of-ERCOT IOUs	Total
0—Very dissatisfied	0.0%	0.0%	0.0%
1	3.6%	5.7%	4.4%
2	0.0%	0.0%	0.0%
3	1.8%	2.9%	2.2%
4	7.3%	11.4%	8.9%
5—Very satisfied	87.3%	80.0%	84.4%
Mean	**4.7**	**4.6**	**4.7**
Respondents (n)	**55**	**35**	**90**

Source: Question SA2, Commercial Participant Survey.
Totals may not sum to 100 percent due to rounding. *Don't know*, *refused*, and multiples were excluded from this analysis.

The highly satisfied customers mentioned a wide range of subjects that contributed to their satisfaction, including:

- financial benefits (rebates and energy bill reductions),
- performance of new equipment,
- customer service and communication, and

- general ease of the administrative process.

Among the respondents who expressed less-than-satisfied ratings of 3 or lower (n=6), the most frequently cited reasons were:

- low financial benefits, and
- dissatisfaction with the upgraded equipment.

Participants were also asked if they would change any aspects of the energy efficiency program services or equipment based on their experiences. Most respondents said "nothing" (84 percent), and only 16 percent of the respondents provided some suggestions.

Most of the suggestions were related to:

- expanding the equipment qualified for the program or scope of eligible projects (n=7),
- increasing the program incentives and budget (n=5), or
- streamlining the application process and required paperwork (n=3).

One respondent suggested providing more education about the equipment to facility staff, while another emphasized the need to increase public awareness of the program. Finally, a respondent suggested that utility staff supervise qualified contractors.

About half of CMTP respondents had recommended the energy efficiency program to others, as outlined in Table 32.

Table 32. CMTP—Recommendation of the Energy Efficiency Program to Others

Recommendation (Y/N)	ERCOT IOUs	Outside-of-ERCOT IOUs	Total
Yes	50.9%	45.7%	48.9%
No	49.1%	54.3%	51.1%
Respondents (n)	**55**	**35**	**90**

Source: Question SA5, Commercial Participant Survey.
Don't know, *refused*, and multiples were excluded from this analysis.

xiii. Measure Persistence

CMTP survey respondents reported that all measures implemented through the program are still installed and operating.

xiv. Program Influence

CMTP participants were asked about the key factors that influenced their ultimate decision to make an energy-efficient upgrade. The results presented below indicate *moderate* to *high* program influence.

The EM&V team reviewed the participant responses for key program influence indicators. Table 33 includes the average rating for each of the 12 factors (for both ERCOT and outside-of-ERCOT utilities) on a scale from 0–10, where 0 means *not at all important* and 10 means *very important*.

When asked about the importance of 12 different factors in influencing their decision to purchase or implement energy efficiency upgrades, the highest rated factor among all respondents was *payback on investment.* These responses are consistent with results from the PY2021 Commercial Participant Survey. As compared to PY2021, *information provided through a study, energy assessment, or other technical assistance* and *general concerns about the environment* were more influential factors in PY2024.

Table 33. CMTP—Rating of Importance of Factors that Influenced Customers' Energy Efficiency Upgrades

Factor	ERCOT IOUs		Outside-of-ERCOT IOUs	
	Average rating	Number of respondents	Average rating	Number of respondents
Payback on investment	8.5	134	9.4	65
Information provided through a study, energy assessment, or other technical assistance	7.9	81	8.5	28
Availability of the markdown or financial assistance	8.4	101	8.9	35
Previous experience with contractor or a utility energy efficiency project	8.7	149	7.9	69
General concerns about the environment	7.4	154	7.8	73
Standard practice or corporate policy regarding equipment installation	8.1	128	7.8	73
Information or recommendations provided by program staff or contractor	8.2	152	7.5	72
The age or condition of the old equipment	8.5	96	8.7	42
Recommendation from a vendor or supplier	7.3	153	7.9	61
Information from utility program informational materials	7.9	154	7.1	63
Financial assistance or rebate from another organization	6.2	73	7.7	40
Information from a training course or seminar offered by a service provider	7.2	110	7.4	43

Source: Question N3, Commercial Participant Survey.

Don't know and *not applicable* responses were excluded from this analysis.

Participants were also asked to rate the likelihood that they would have purchased or implemented the program-qualifying equipment in the absence of the program incentive on a 0–10 scale, where 0 is *not at all likely* and 10 is *very likely*. As shown in Table 34, the average ranking was 6.0 among ERCOT respondents and 7.3 among outside-of-ERCOT respondents,

which is overall a higher average ranking compared to PY2021, when the average rating was 5.3 for all CMTP respondents.

Table 34. CMTP—Likelihood that Consumers Would Have Bought and Sold Energy Efficient Equipment in the Absence of the Program

Scale	ERCOT IOUs participant responses	Outside-of-ERCOT IOUs participant responses
0—Not at all likely	33	5
1	0	0
2	4	0
3	6	1
4	1	1
5	17	7
6	1	10
7	21	10
8	23	1
9	12	5
10—Very likely	38	26
Mean	**6.0**	**7.3**
Respondents (n)	**156**	**66**

Source: Question N5a, Commercial Participant Survey.

Don't know, *refused*, and multiples were excluded from this analysis.

xv. Future Participation

The survey included a short series of questions related to continued participation in energy efficiency projects. Forty-five percent of CMTP respondents reported completing additional energy efficiency projects since the installation of the program-affiliated project in question. Participants from ERCOT utilities were slightly more likely to complete an additional project than those from outside-of-ERCOT utilities. Of those respondents who had completed an additional project, the majority installed the upgrade in multiple different facilities (49 percent) followed by the same facility (34 percent). While ERCOT CMTP respondents were most likely to install the project in multiple different locations, outside-of-ERCOT CMTP respondents were most likely to install the new project in the same facility as the original one. Seventeen percent of all CMTP respondents installed the project in a different facility.

Just over one-half of those who installed an additional project applied to receive an incentive from their utility for the new upgrade. Additionally, eighty-five percent of all CMTP respondents reported that they plan on installing new energy-efficient equipment in the future. Among ERCOT participants, 89 percent plan to install more equipment in the future, compared to 79 percent of outside-of-ERCOT participants.

6.3.3.3 Net-to-Gross Results

Table 35 presents the number of surveys completed for CMTP NTG analysis by utility and utility group.

Table 35. CMTP—Survey Completes at the Measure Level by Utility and Utility Group

Utility group	Utility	Completed surveys by utility	Completed surveys by utility group
ERCOT	AEP Texas	79	176
	CenterPoint	71	
	TNMP	26	
	Oncor	0	
Outside-of-ERCOT	ETI	62	91
	SWEPCO	15	
	EPE	7	
	Xcel Energy	7	
	Total		**267**

xvi. Free-Ridership

Key Finding: Free-ridership decreased for commercial MTPs with a free-ridership rate of 17 percent for both kWh and kW savings. The free-ridership for ERCOT utilities was slightly higher compared to outside-of-ERCOT utilities.

The surveys responses found free-ridership of 18 percent for CMTP ERCOT utilities (175 responses) and 15 percent for CMTP outside-of-ERCOT utilities (88 responses), weighted by kWh and kW savings. Across both utility groups, the CMTP free-ridership was 17 percent for kWh and kW; slightly lower than the free-ridership calculated in PY2021 (19 percent for kWh and 20 percent for kW).

Table 36 reports the program-level kWh and kW free-ridership rates by utility for ERCOT utilities, respectively, along with the relative precision associated with each estimate. AEP Texas had the lowest kWh free-ridership rate, and TNMP had the highest free-ridership. Table 37 shows the same free-ridership information for outside-of-ERCOT utilities. EPE had the highest free-ridership and ETI had the lowest free-ridership.

Table 36. CMTP—Free-Ridership Results for ERCOT Utilities

Program type	n	Customer kWh free-ridership rate	Customer kWh precision at a 90% confidence interval	Customer kW free-ridership rate	Customer kW precision at a 90% confidence interval
AEP Texas	79	17.3%	2.9%	19.8%	3.1%
CenterPoint	70	17.9%	2.8%	14.1%	2.4%
TNMP	26	22.9%	5.8%	20.9%	6.0%
Total	**175**	**18.1%**	**1.8%**	**18.7%**	**1.8%**

Table 37. CMTP—Free-Ridership Results for Outside-of-ERCOT Utilities

Program type	n	Customer kWh free-ridership rate	Customer kWh precision at a 90% confidence interval	Customer kW free-ridership rate	Customer kW precision at a 90% confidence interval
EPE	7	18.8%	8.0%	18.8%	7.0%
ETI	61	12.1%	3.0%	12.8%	3.1%
SWEPCO	13	17.4%	13.9%	17.2%	12.2%
Xcel Energy-SPS	7	14.5%	8.5%	15.0%	10.4%
Total	**88**	**14.9%**	**2.6%**	**14.9%**	**2.4%**

xvii. Spillover

Over 10 percent of respondents reported they installed an additional project without applying for a utility-incentive for the upgrade, *which does indicate some spillover*, and therefore the NTG ratio is conservative.

xviii. Net-to-Gross Ratio

Table 38 and Table 39 show the CMTP total free-ridership rate and NTG ratios for ERCOT and outside-of-ERCOT utilities, respectively.

Table 38. CMTP—Final NTG Ratios (1-FR) for ERCOT Utilities

Utility	n	kWh NTG ratio (1-FR)	kW NTG ratio (1-FR)
AEP Texas	79	82.7%	80.2%
CenterPoint	70	82.1%	85.9%
TNMP	26	77.1%	79.1%
Total	**175**	**81.9%**	**81.3%**

Table 39. CMTP—Final NTG Ratios (1-FR) for Outside-of-ERCOT Utilities

Utility	n	kWh NTG ratio (1-FR)	kW NTG ratio (1-FR)
EPE	7	81.2%	81.2%
ETI	61	87.9%	87.2%
SWEPCO	13	82.6%	82.8%
Xcel Energy-SPS	7	85.5%	85.0%
Total	**88**	**85.1%**	**85.1%**

6.4 MEASURE OPPORTUNITY ANALYSIS

Over the past several years, several utilities have expanded their implementation activities with individual engaged participants to support their annual commitment to energy efficiency and participation in the programs. The Strategic Energy Management (SEM) program structure is an opportunity to work with select customers to deliver energy efficiency.

6.4.1 Strategic Energy Management

SEM programs are implemented to work with participants that have an individual or department responsible for energy consumption at the property, typically education facilities, large commercial buildings, or industrial participants. The implementation team consults with the participant to identify low and no-cost energy efficiency opportunities through behavioral and operational changes, alongside capital equipment upgrades.

SEM combines custom projects and ongoing operational improvements to deliver sustained energy savings. Participants develop energy management plans, set goals, and track progress, promote a culture of continuous energy efficiency. Savings include both direct project impacts and lasting benefits from improved energy practices, resulting in measurable cost and energy reductions. The initial energy savings from a participant is initially modest because the data gathering and project identification takes time. However, the initial data collection and investigations tend to provide the foundation for many future projects. Typically, participants in the program will see minimal savings in the first year and increased savings in future years.

ETI has operated a Behavioral Program under their Commercial MTP for many years and recently expanded the scope to include SEM in addition to behavior adjustments. The program delivered custom measures targeting motors, variable frequency drives (VFDs), and commercial miscellaneous efficiency in addition to behavior changes. In 2022, ETI reported savings of 6,297 MWh from six participants. In 2023, ETI achieved substantial savings of approximately 9,509 MWh from nine participants, followed by about 10,803 MWh of savings from six participants in 2024. The program's longevity and evaluation reflect ETI's sustained commitment to SEM measures.

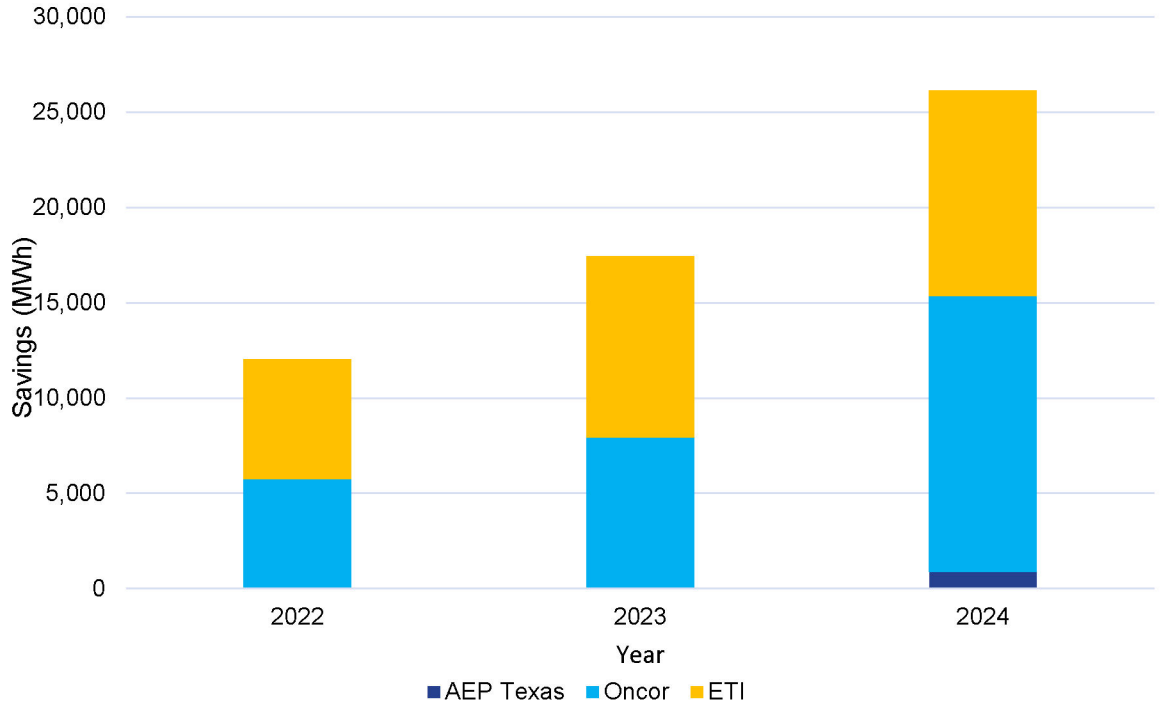
AEP Texas started a SEM program in Program Year 2024 with a similar approach to the updated ETI program. Before the program, custom commercial *HVAC* and miscellaneous commercial efficiency improvements implemented through the program, but without the technical support of the SEM program. In 2024, AEP reported approximately 865 MWh across two participants.

Oncor started implementing a SEM program three years ago. Oncor's implementation focused more on industrial and large commercial participants, improving the efficiency of their manufacturing process or *HVAC* systems. The projects require a deep understanding of the details of the participant sites and coordination of the details in design. The implementation team has increased communication with Oncor and the EM&V team to foster a consistent understanding of the project details and the energy efficiency measurement and calculation.

The Oncor program has demonstrated strong growth delivering a variety of measure types including *compressed air*, *variable speed drives*, *HVAC*, *industrial heating and cooling*, *controlled shutdowns*, and *lighting* measures. In 2022, Oncor achieved savings of about 5,736 MWh across six participants, increasing to nearly 7,909 MWh in 2023 from 24 participants. In 2024, Oncor's SEM program showed the growth associated with longer term participants and claimed total savings of approximately 14,466 MWh from 28 participants through custom and deemed energy calculations and measured M&V savings.

The growth trajectory of the ETI and Oncor program, shown in Figure 33, shows the opportunity for mature SEM programs to drive energy efficiency across a broad range of types of engaged commercial and industrial facilities. Both these programs continue to build the savings claimed even after the program has matured. ETI has achieved growth by working with the same number of participants and continuing to engage them with new projects. Oncor has grown by adding new participants while continuing to engage the past years participants. Both programs demonstrate energy efficiency opportunities in managing energy consumption at the right participant sites.

Figure 33. SEM Program Annual Savings (MWh) by Utility



A challenge for the SEM programs is to measure and claim peak kW savings in accordance with the Texas TRM peak demand PDPF tables. Nearly all the projects include interactive effects and custom calculations of energy savings which provide a unique impact on the PDPF peak hours each year. The implementers and evaluators have been coordinating on the custom analysis to claim peak kW savings, or it has not been claimed. There is an opportunity to improve the peak kW calculations through the increased use of AMI data and a consistent approach per SEM delivered program to identify and estimate a conservative amount of peak kW reduction associated with projects.

The costs to implement this program include more time from the implementation team, which increases the labor associated to deliver the energy efficiency, however, the costs of incentives are reduced because of the low-cost or no-cost improvements. Since the relationship with the participant and communication is key to this growth, the programs need to commit to several year timelines to balance the costs with energy savings. Generally, projects begin with smaller, low-cost operational or behavioral changes that can be implemented quickly. In the second year, these efforts typically expand as participants gain familiarity and confidence with the program. By the third year, participants often undertake larger capital projects that require budgeting and planning but offer strong payback through significant energy savings. This gradual progression requires that utilities scale the programs into their portfolio over several years to manage annual budgets.

Once mature, the SEM programs create critical pathways for utilities to engage customers in sustained energy management practices which deliver cost-effective energy efficiency.

7.0 RESIDENTIAL ENERGY EFFICIENCY PROGRAMS

This section presents the residential summary analysis followed by results from the PY2024 EM&V activities—desk reviews and measure opportunity analysis.

7.1 SUMMARY ANALYSIS

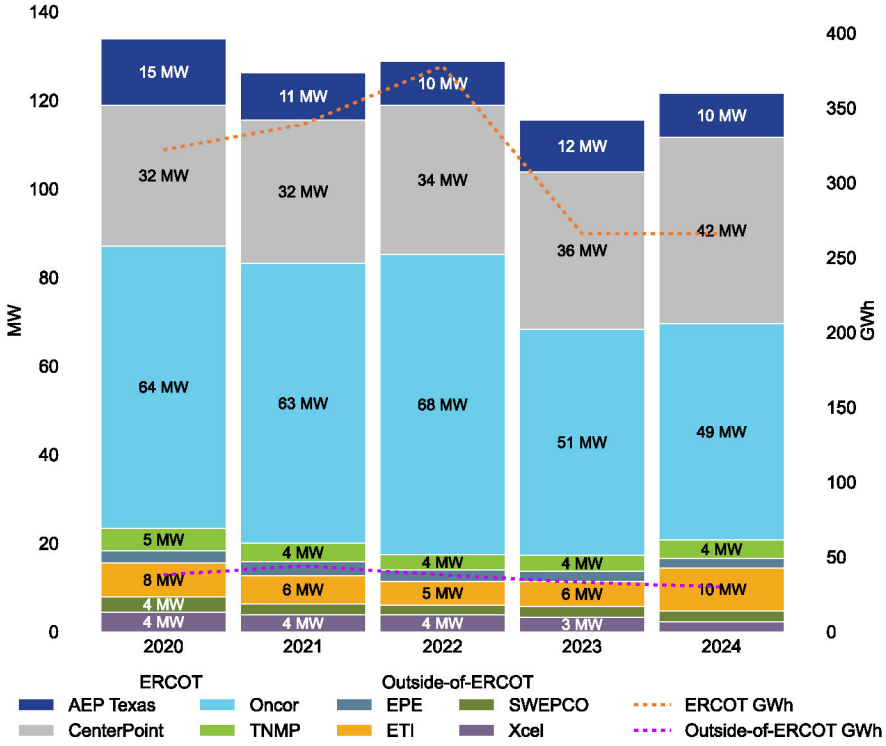
7.1.1 Savings

The program year 2024 (PY2024) gross savings from residential sector programs (excluding load management) were:

- 121,580 kilowatts (kW) (demand reduction) and
- 296,115,650 kilowatt-hours (kWh) (energy savings).

Figure 34 highlights that the residential demand reduction achieved in PY2024 is the second lowest in the last five years and energy savings are the lowest.

Figure 34. Total IOU Demand Reduction (MW) and Energy Savings (GWh) by Program Year—Residential Programs PY2020-PY2024[46]

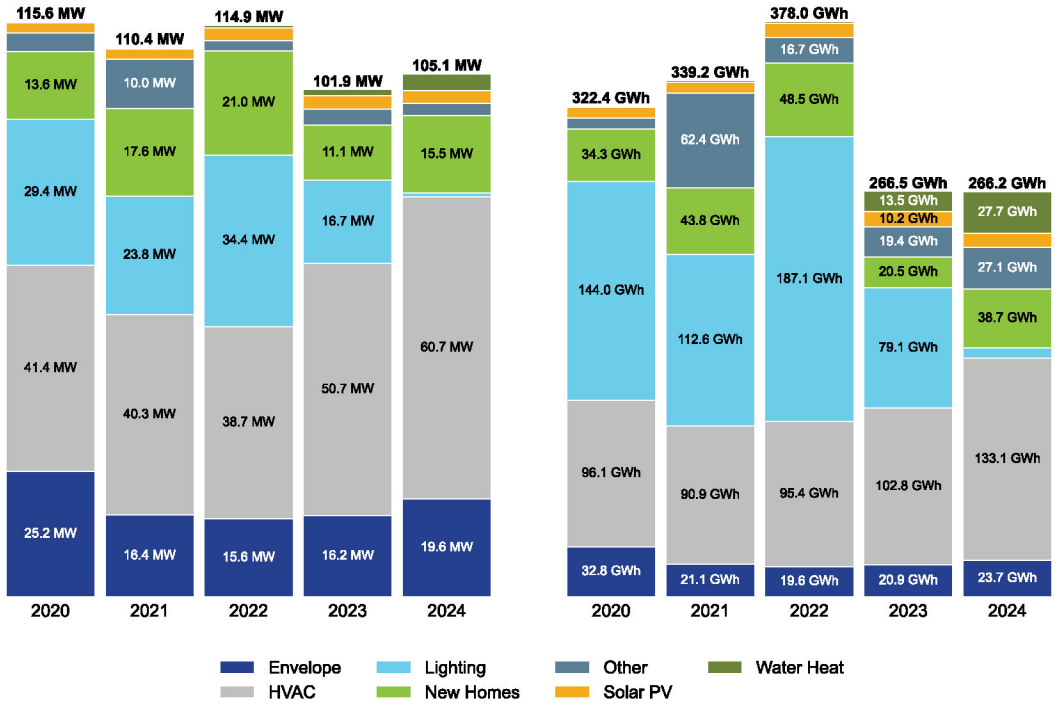


[46] The following data points consist of the MW savings values that were unable to make it on the graph due to limited space: EPE: PY2020, 2.728 MW; PY2021, 3.118 MW; PY2022, 2.496 MW; PY2023, 2.334 MW; PY2024, 2.115 MW. SWEPCO: PY2021, 2.457 MW; PY2022, 2.149 MW; PY2023, 2.443 MW; PY2024, 2.519 MW. Xcel: PY2024, 2.193 MW.

For PY2024, ERCOT IOU residential demand reduction (Figure 35, left graph) and energy savings (Figure 35, right graph) were primarily derived from *HVAC* measures representing over one-half of kilowatts and kilowatt-hours. ERCOT IOUs have successfully increased *HVAC* measures in their residential portfolios.

While *lighting* was still the second highest contributor to demand reductions and energy savings in PY2023, it decreased to the lowest contributor in PY2024. *Envelope* measures were the second highest contributor for demand reductions and *water heat* measures were the second highest contributor for energy savings (Figure 35).

Figure 35. Distribution of IOU Demand Reduction (MW) and Energy Savings (GWh) by Measure Category—Residential ERCOT Programs PY2020–PY2024[47]

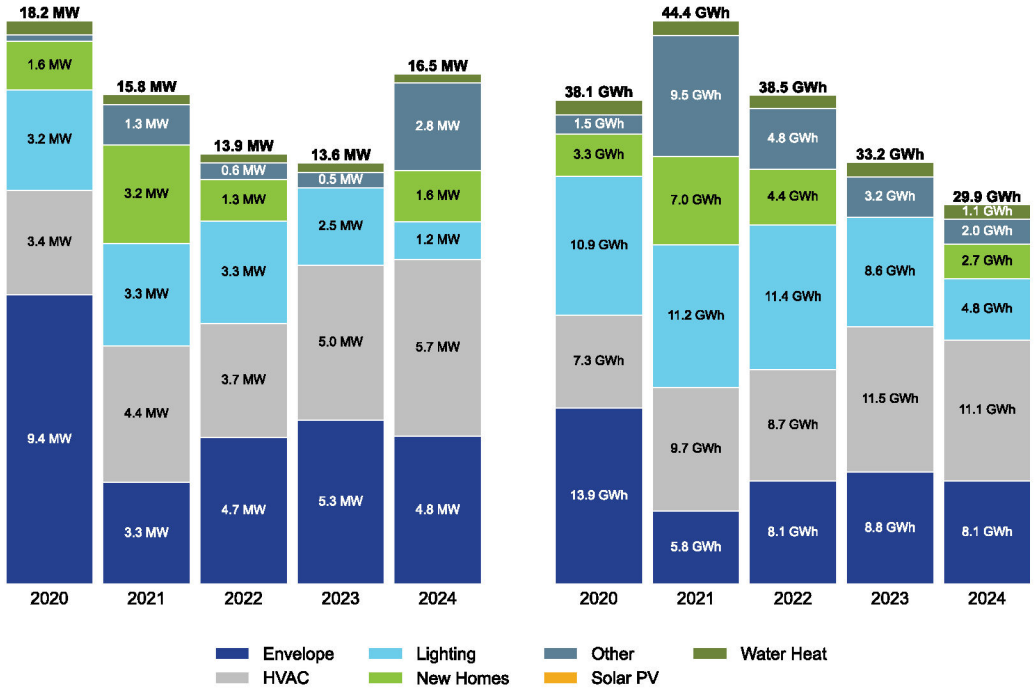


[47] Values of less than four percent have been suppressed for visualization purposes.

Outside-of-ERCOT IOU portfolios also saw the highest contribution of savings from *HVAC* measures in PY2024 as in PY2023 programs. *HVAC* measures achieved approximately one-third of kilowatt (Figure 36, left graph) and kilowatt-hour savings (Figure 36, right graph).

Envelope measures followed *HVAC* measures closely as the second highest contributors to portfolio kilowatt and kilowatt-hour savings (Figure 36).

Figure 36. Distribution of IOU Demand Reduction (MW) and Energy Savings (GWh) by Measure Category—Residential ERCOT Programs PY2020-PY2024[48]



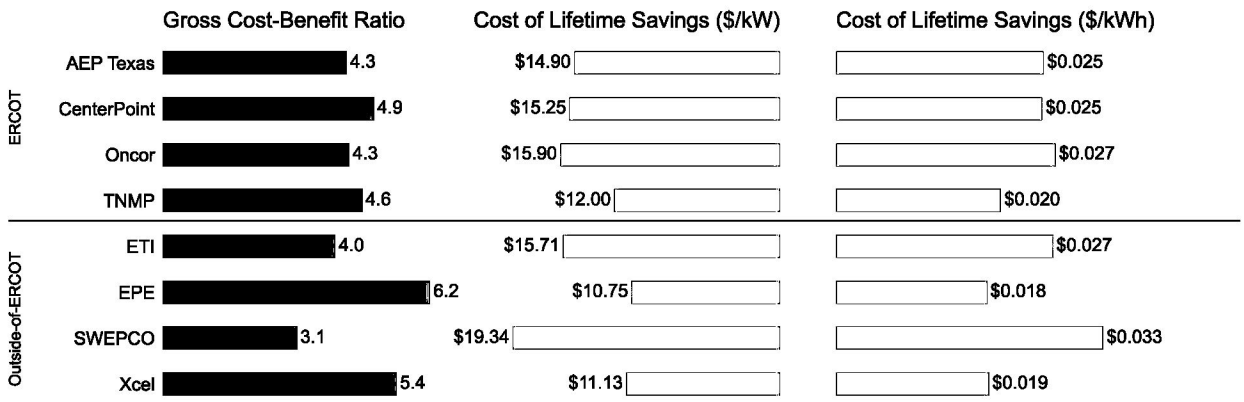
7.1.2 Cost-Effectiveness

The cost-effectiveness of residential sector programs across all IOUs is 4.6 based on gross evaluated savings. Like the commercial sector, the residential sector's cost-effectiveness varied among utilities, ranging from 3.1 to 6.2; similarly, this is partly due to the differences in the types of programs offered by different utilities.

Figure 37 summarizes the cost-effectiveness of each utility's residential energy efficiency portfolio and the average cost of lifetime kWh and kW for each utility's residential sector programs. The average lifetime cost per kWh ranges from $0.019 to $0.033, and the average lifetime cost per kW ranges from $10.78 to $19.34.

[48] Values less than four percent have been suppressed for visualization purposes.

Figure 37. Cost-Benefit Ratio and Cost of Lifetime Savings—Residential Programs PY2024



7.2 RESIDENTIAL PROGRAMS

7.2.1 Background

The EM&V team evaluated the residential energy efficiency programs described below. The residential SOP, HTR, LI programs, and certain residential MTP were *high* or *medium* evaluation priorities.

Residential SOP	Provides incentives to project sponsors for a wide range of retrofit measures like *air conditioning*, *duct sealing*, *weatherization*, *ceiling insulation*, *water-saving* measures, and *ENERGY STAR® windows.*
Hard-to-reach (HTR) SOP	Through participating contractors, this program provides incentives to customers whose annual total household income is at or below 200 percent of the current federal poverty level (FPL) for qualifying installed measures such as *air conditioning*, *air conditioner tune-ups*, *duct sealing*, *weatherization*, *ceiling insulation*, *water-saving* measures, and *ENERGY STAR windows*.
Residential Solutions MTP[49]	Provides incentives to customers—through participating contractors—for a wide range of retrofit and new construction measures. Also provides technical assistance and education on energy efficiency measures.
Residential Midstream MTP	Provide incentives to residential and small commercial customers through discounts at participating distributors for qualifying high-efficiency *HVAC equipment*, *smart thermostats*, *pool pumps,* and *other efficient equipment*. Offerings and delivery vary by utility.

[49] This program is operated by one utility, EPE, and is included in this section as it operates similarly to a residential SOP.

HTR Solutions MTP	Through participating contractors, for HTR customers, this program provides a wide range of retrofits and new construction measures including technical assistance and education. One utility provides this program and it operates similar to HTR SOP.
Targeted Low-Income (LI) Solutions	Offers energy audits to qualified LI residents, a review of the home's energy efficiency and the installation of weatherization measures to increase the home's energy efficiency. A household qualifies for this program if the income is at or below 200 percent of the FPL, and the home must be able to benefit from being weatherized. Once the audit is completed, the program gives financial and installation assistance to improve the home's energy efficiency.

7.3 IMPACT EVALUATION RESULTS

For the *medium* priority programs, the EM&V team conducted desk reviews for sampled projects applying methods prescribed in the PY2024 TRM 11.0 to verify savings. . Sampled measures included *HVAC*, *ceiling insulation*, *air infiltration*, *duct sealing*, and *appliances.*

Project savings adjustments were primarily driven by *envelope, HVAC,* and *appliance* measure issues with documentation and discrepancies in equipment specifications. The desk review findings inform the key findings and recommendations presented in Section 6.3.1.

As similar issues were found across residential SOP, MTP, HTR and LI programs, key findings and recommendations are presented across all programs.

7.3.1 Key Findings and Recommendations

Key finding: For some *HVAC* projects' action types, e.g. early retirement, replace-on-burnout (ROB), or new construction (NC,) were not clearly tracked and the EM&V team evaluated savings using a conservative approach based on the available documentation.

- **Recommendation:** Track project action type and method used to calculate savings in the tracking data system and/or project documentation package such as the application, field notes, etc.

Key finding: For some ROB *HVAC* system and *smart thermostat* projects, the nominal capacity of the HVAC system was used to calculate savings rather than the AHRI or other third party rated capacity of the installed system.

- **Recommendation:** Ensure the AHRI or other third party rated cooling and heating capacity is used to calculate energy and demand reduction as stipulated in the TRM.

Key finding: In some cases, there was no documentation confirming direct install measures such as advanced power strips.

- **Recommendation:** Utilities should provide documentation confirming installation and location if applicable for all measures, including direct install measures. Example: including but not limited to photo documentation showing type of system the advanced power strip is installed in.