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Volume 1. Investor Owned Utilities (IOUs) Energy Efficiency Report Program Year 2023—DRAFT

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ENERGY BEES

July 2024

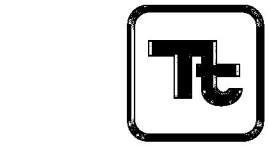

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACKNOWLEDGEMENTS

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- Oncor: Garry Jones, Tim McConkie, Joseph Nixon, and Paul Jacks;
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ACRONYMS

AEP	American Electric Power
C&I	Commercial and industrial
CNP	CenterPoint Energy Houston Electric, LLC
CSOP	Commercial standard offer program
DI	Direct install
EEIP	Energy efficiency implementation project
EECRF	Energy efficiency cost recovery filing
EEPR	Energy efficiency plan and report
EESP	Energy efficiency service provider
EM&V	Evaluation, measurement, and verification
Entergy	Entergy Texas, Inc.
EPE	El Paso Electric Company
EUL	Estimated useful life
HTR	Hard-to-reach
kW	Kilowatt
kWh	Kilowatt-hour
LI	Low-income
LM	Load management
M&V	Measurement and verification
mcf	1,000 cubic feet
MTP	Market transformation program
NTG	Net-to-gross
PUCT	Public Utility Commission of Texas
PV	Photovoltaic
PY	Program year
QA/QC	Quality assurance/quality control
Recommissioning	RCx
RFP	Request for proposals
RSOP	Residential standard offer program
SOP	Standard offer program
SWEPCO	Southwestern Electric Power Company
TEESI	Texas Energy Engineering Services, Inc.
TNMP	Texas-New Mexico Power Company
TRM	Technical Reference Manual
Xcel Energy SPS	Xcel Energy Southwest Public Service, Inc.

EXECUTIVE SUMMARY

OVERVIEW

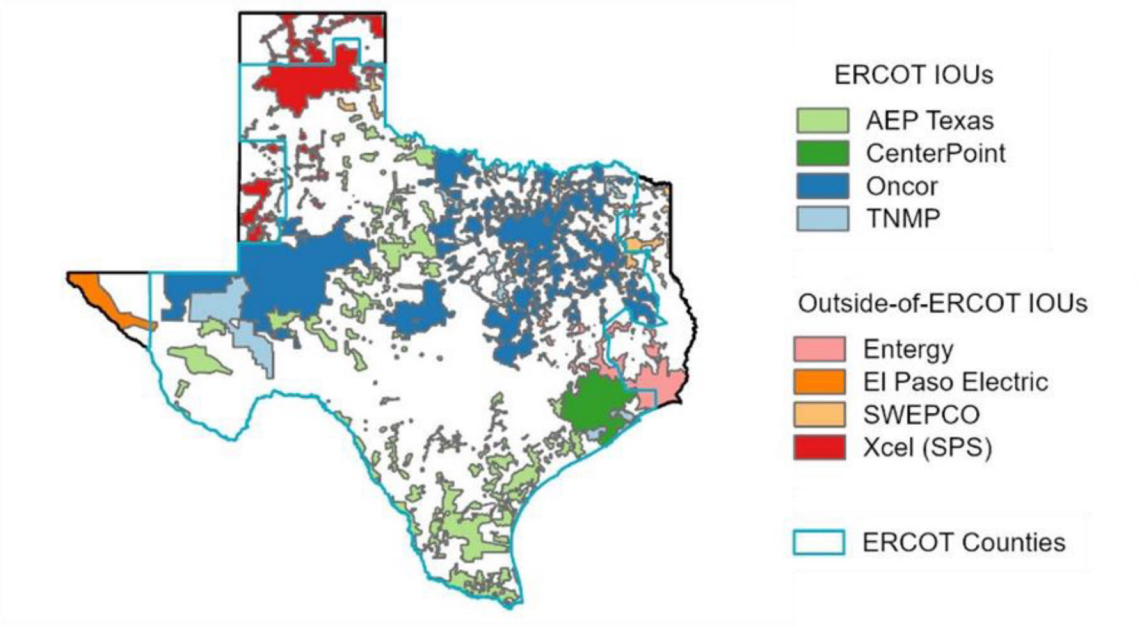
Texas has one of the longest histories in energy efficiency in the country, having established long-term demand reduction goals for investor-owned electric utilities ("IOUs" or "utilities") in Public Utility Regulatory Act (PURA) § 39.905 as part of its deregulation of the electricity market in 1999. Since 2013, legislated demand reduction goals for the IOUs have been at least 30 percent of annual demand growth. Further, once an IOU's 30 percent goal is equal to four-tenths of one percent of their summer weather-adjusted peak demand[1], the utility's demand reduction achievements must meet or exceed that goal in subsequent years.

The Public Utility Commission of Texas (PUCT) oversees the energy efficiency goals for the eight IOUs in Texas. The boundaries of the utilities' respective service territories are shown in Figure 1.

Four of the utilities operate within the Electric Reliability Council of Texas (ERCOT)[2] region: 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). In this report, these four utilities are collectively referred to as the "ERCOT IOUs."

The other four utilities are vertically integrated and operate outside of the ERCOT region: Entergy Texas, Inc. (Entergy); El Paso Electric Company (EPE); Southwestern Electric Power Company (SWEPCO); and Southwestern Public Service Company (Xcel SPS). In this report, these four utilities are collectively referred to as the "outside-of-ERCOT IOUs."

Figure 1. Texas IOU Territories



[1] This higher demand goal is now required of AEP Texas, CenterPoint, and Oncor.
[2] ERCOT is the grid operator for about 90 percent of the Texas power load, www.ercot.com.

All IOUs operating in Texas administer the following programs to improve the energy efficiency of homes and businesses and reduce annual electric use and demand on the electric grid[3].

Standard offer programs (SOPs) deliver high-efficiency products and services to customers through financial incentives by utilities developing and working with the contractor infrastructure, such as insulation and HVAC contractors.

Market transformation programs (MTPs) provide outreach, technical assistance, and education to customers in harder-to-serve markets (e.g., small business, education, health care, data centers, and local governments), or for select technologies (e.g., recommissioning, air conditioner (AC) tune-ups, pool pumps). SOPs and MTPs are executed by IOU-selected implementation contractors. Two common MTP delivery models are 'midstream' and 'upstream,' where programs work directly with distributors and retailers to increase inventory of energy-efficient equipment while reducing additional efficiency-related costs.

All IOUs are required to provide energy-efficiency products and services to hard-to-reach (HTR) customers[4] through **HTR programs[5].** HTR programs have similar delivery models to residential SOPs.

The ERCOT IOUs are also required to offer **targeted low-income (LI) programs** that coordinate with the existing federal weatherization program[6].

Finally, all IOUs offer **load management programs**, which are designed to reduce peak demand for a specified duration—typically, two to four hours—if needed for either grid or local IOU system reliability. In program year 2023 (PY2023), all IOUs offered summer commercial load management programs as part of their energy efficiency portfolios, and the ERCOT IOUs additionally offered winter commercial load management programs. Further, two ERCOT IOUs—CenterPoint and Oncor—and two outside-of-ERCOT IOUs—EPE and Entergy—offered residential summer load management programs.

[3] Industrial customers at distribution level voltage may also be served by IOU programs if they do not submit an identification notice to opt-out under 16 TAC §25.181(u).
[4] HTR customers are defined under 16 TAC §25.181(c)(27) as "residential customers with an annual household income at or below 200 percent of the federal poverty guidelines."
[5] Under 16 TAC § 25.181(e)(3)(F), all IOUs are required to achieve no less than five percent of their total demand reduction goal through programs serving HTR customers.
[6] Under 16 TAC § 25.181(r), ERCOT utilities are required to spend no less than ten percent of each program year's energy efficiency budget on targeted LI efficiency programs Outside-of-ERCOT utilities may offer targeted LI programs, but are not required to in PURA § 39.905.

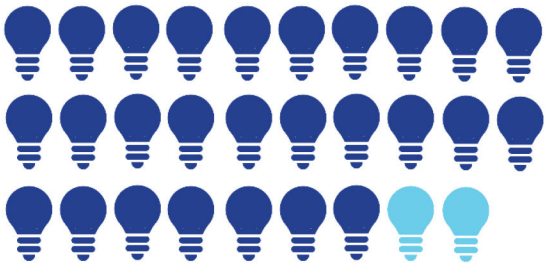
PROGRAM PARTICIPATION AND PERFORMANCE

In PY2023, **more than 141,788 residential households**[7] and **more than 30,811 commercial customers** participated in IOU energy efficiency programs. Program participation breakdowns are shown below by sector, program type, and ERCOT region.

RESIDENTIAL PROGRAMS

141,788+
PARTICIPATING RESIDENTIAL HOUSEHOLDS

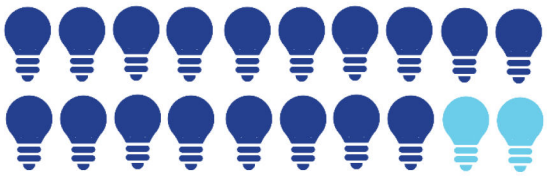
ERCOT IOUs



27 energy efficiency programs

2 summer smart thermostat load management programs

OUTSIDE-of-ERCOT IOUs



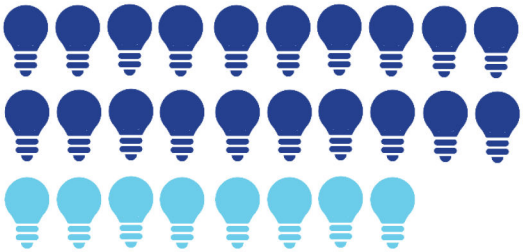
18 energy efficiency programs

2 summer smart thermostat load management programs[8]

COMMERCIAL PROGRAMS

30,811+
PARTICIPATING COMMERCIAL CUSTOMERS

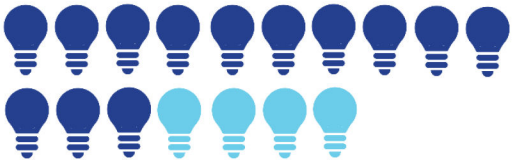
ERCOT IOUs



20 energy efficiency programs

8 load management programs (4 summer, 4 winter)

OUTSIDE-of-ERCOT IOUs



13 energy efficiency programs

4 load management programs (summer)

[7] Participation counts do not include energy efficiency measures delivered through retailer point-of-purchase discounts.
[8] While not a stand-alone program, Entergy piloted a load management component in its PY2023 Residential MTP.

PY2023 DEMAND REDUCTIONS

In PY2023, the eight IOUs reported total demand reductions of 580,596 kilowatts (kW). These demand reductions were achieved at a lifetime cost of $15.54 per kilowatt for energy efficiency programs and $49.25 per kilowatt for load management programs.[9] Energy efficiency program savings have a longer useful life (e.g., 15 years for an efficient HVAC), whereas load management program savings are based on annual participation, which increases the cost per kW.

DEMAND REDUCTIONS

580,596 kW

520,105 kW
delivered through ERCOT IOU programs

60,491 kW
delivered through outside-of-ERCOT IOU programs

DEMAND REDUCTIONS

$15.54/kW
achieved lifetime cost for energy efficiency

$49.25/kW
achieved lifetime cost for load management

Table 1 below shows the top five performing programs in terms of demand reductions (*Top kW savers*) for both ERCOT and outside-of-ERCOT IOU programs.

Table 1. Top Performers by Kilowatt—ERCOT and Outside-of-ERCOT IOU Programs

ERCOT IOU programs	Outside-of-ERCOT IOU programs
Top kW savers	**Top kW savers**
CenterPoint Commercial Load Management	**EPE** Residential Load Management MTP
Oncor Commercial Load Management SOP	**Entergy** Commercial Load Management SOP
AEP Texas Load Management SOP	**Entergy** Commercial Solutions MTP
CenterPoint Residential Load Management	**EPE** Commercial Load Management SOP
Oncor Residential Load Management	**SWEPCO** Commercial Load Management SOP

[9] Lifetime cost per kilowatt and kilowatt-hour is calculated by the evaluation, measurement, and verification (EM&V) team as a representation of program cost-effectiveness. See Section 2.0 of the full report for more information.

PY2023 ENERGY SAVINGS

In PY2023, the IOUs reported energy savings of 604,222,337 kilowatt-hours (kWh) at a lifetime cost of $0.018 per kWh for the ERCOT IOUs and $0.017 for the outside-of-ERCOT IOUs.

ELECTRICITY SAVINGS

604,222,337 kWh

506,555,439 kWh
delivered through ERCOT IOU programs

97,666,898 kWh
delivered through outside-of-ERCOT IOU programs

KILOWATT-HOUR REDUCTIONS

$0.018/kWh
achieved lifetime cost through ERCOT IOUs

$0.017/kWh
achieved lifetime cost through outside-of-ERCOT IOUs

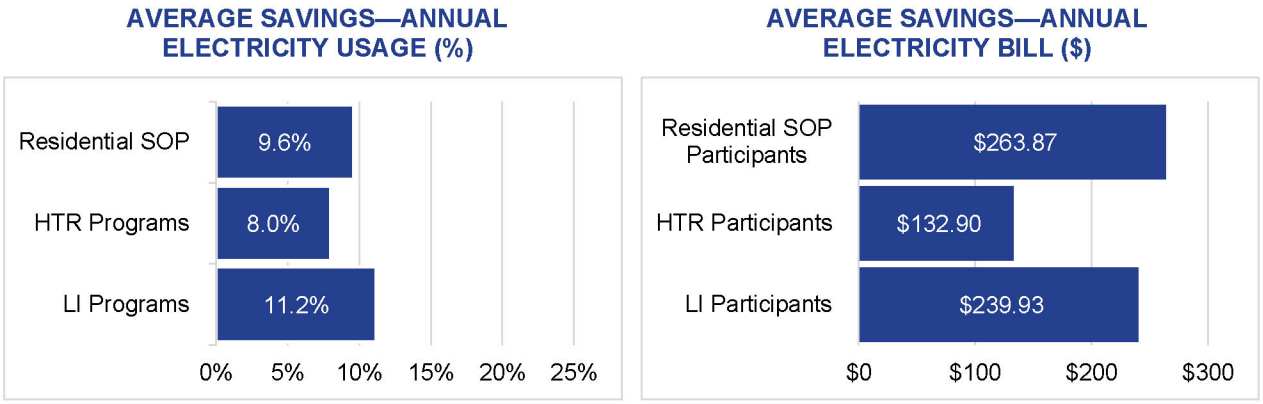
Table 2 below shows the top five performing programs in terms of energy savings (*Top kWh savers*) for both ERCOT and outside-of-ERCOT IOU programs.

Table 2. Top Performers by Kilowatt-Hour Saved—ERCOT and Outside-of-ERCOT IOU Programs

ERCOT IOU programs	Outside-of-ERCOT IOU programs
Top kWh savers	**Top kWh savers**
Oncor Retail Products MTP (residential)	**Entergy** Commercial Solutions MTP
CenterPoint Commercial SOP	**EPE** Large Commercial Solutions MTP
Oncor Commercial SOP	**Xcel** Home Lighting MTP (residential)
CenterPoint Commercial MTP (SCORE, Healthcare, Data Center)	**EPE** Texas SCORE MTP
CenterPoint High-Efficiency Home MTP	**Entergy** Residential Solutions MTP

The EM&V team conducted a consumption analysis of program participants' advanced meter infrastructure (AMI) data[10] from 12 months pre- and post-program participation and found that IOU residential retrofit programs are reducing energy usage (Figure 2, left) and producing customer energy bill savings[11] (Figure 2, right).

Figure 2. AMI-Measured Average Annual Energy Savings for Residential Retrofit Programs



SERVING LOW-INCOME CUSTOMERS

All IOUs **met or exceeded** LI and HTR program goals

22,166
participating households served

34,890 kW reductions and
59,205,040 kWh savings delivered

11%
average annual reduction of LI household electricity use through ERCOT utilities' targeted LI programs

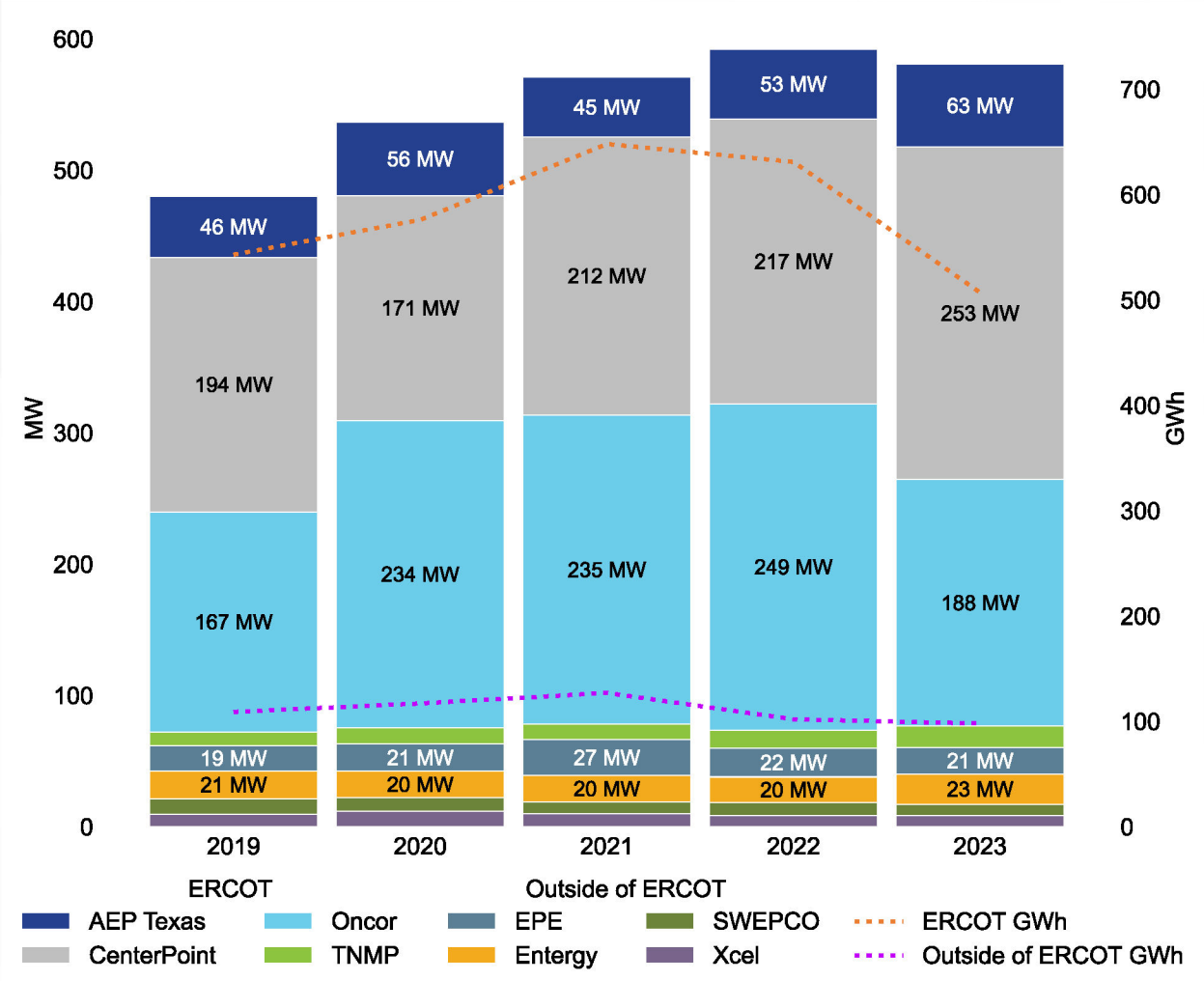
[10] The AMI analysis included PY2022 and PY2023 IOU residential retrofit programs. Five IOUs had residential AMI data to contribute for this time period: AEP Texas, CenterPoint, Entergy, Oncor, and TNMP. See Section 4 and Appendix A for details.

[11] Based on the average Texas electric retail rate of 9.14 cents/kWh, https://www.eia.gov/electricity/state/.

PY2019–PY2023

PY2023 saw a slight decrease in total demand reductions and energy savings across all portfolios, although this differed by IOU (Figure 3). Within ERCOT, both AEP Texas and CenterPoint had increased demand reductions, while Oncor's demand reductions decreased. Outside of ERCOT, Entergy had increased demand reductions while EPE's demand reductions decreased.

Figure 3. Total Texas IOU Portfolios—Demand Reductions and Energy Savings by IOU and Program Year[12]

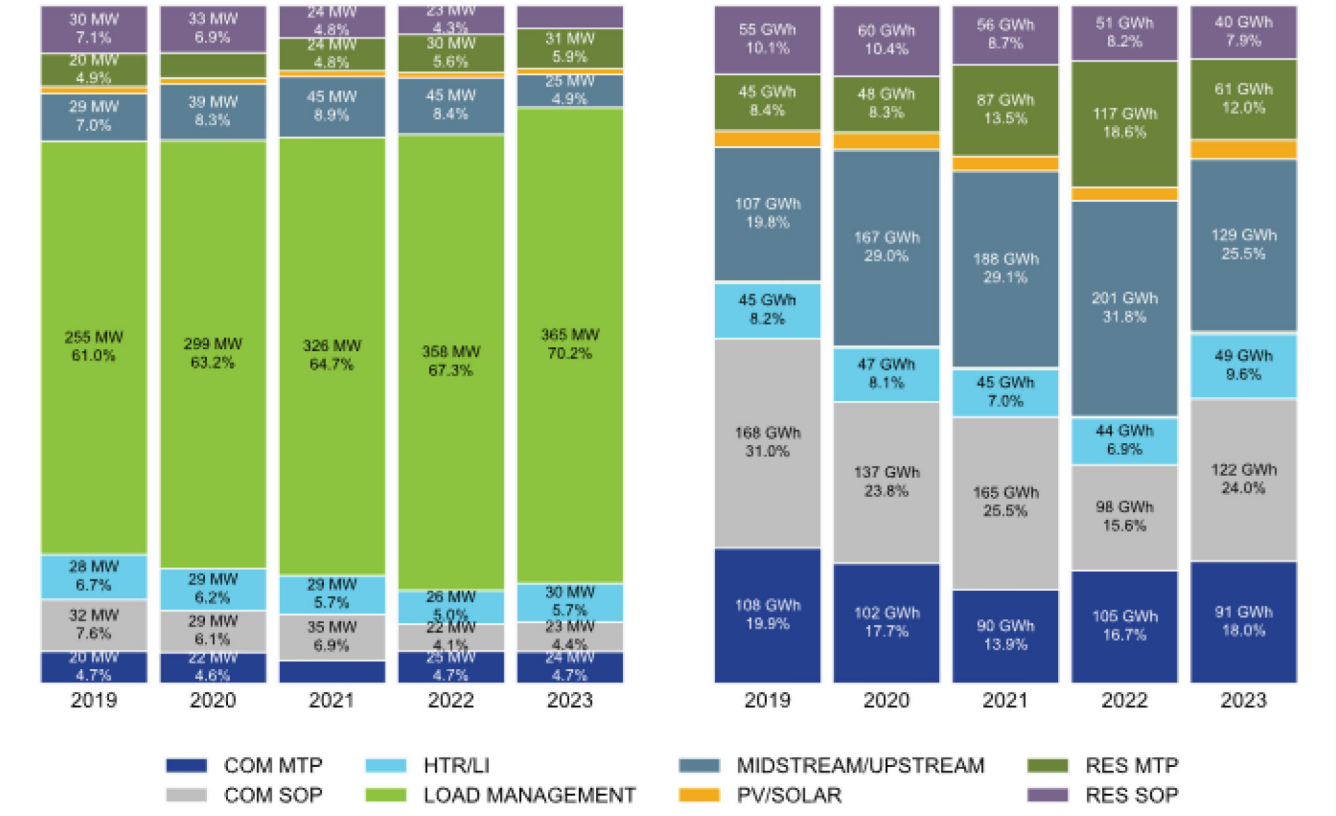


[12] Values not shown for TNMP, SWEPCO and Xcel in PY2019–PY2023 not shown due to size: TNMP achieved 10.43, 12.47, 11.63, 13.69 and 16.15 MW; SWEPCO achieved 11.83, 10.52, 8.857, 9.868, and 8.681 MW; and Xcel achieved 9.572, 11.67, 10.05, 8.431, and 8.558 MW.

In PY2023, ERCOT IOUs achieved 70 percent of demand reduction goals through load management programs, with the addition of winter load management programs as the main driver of the increased percentage from prior years (Figure 4 left).[13]

In terms of energy savings (Figure 4 right), upstream and midstream programs—in which residential customers are primarily served through retailers and commercial customers are primarily served through product distributors—have been increasingly attributable to ERCOT IOU portfolio savings in recent years. While these program types decreased to one-quarter of total ERCOT IOU portfolio savings in PY2023; this is primarily a result of changes to federal standards for residential lighting. In PY2023, Commercial SOPs accounted for approximately another one-quarter of total ERCOT IOU portfolio savings, which was similar to prior years except for PY2022, which saw a decreased percentage of savings from Commercial SOPs.

Figure 4. Demand Reduction and Energy Savings by Program Type—ERCOT IOU Programs[14]

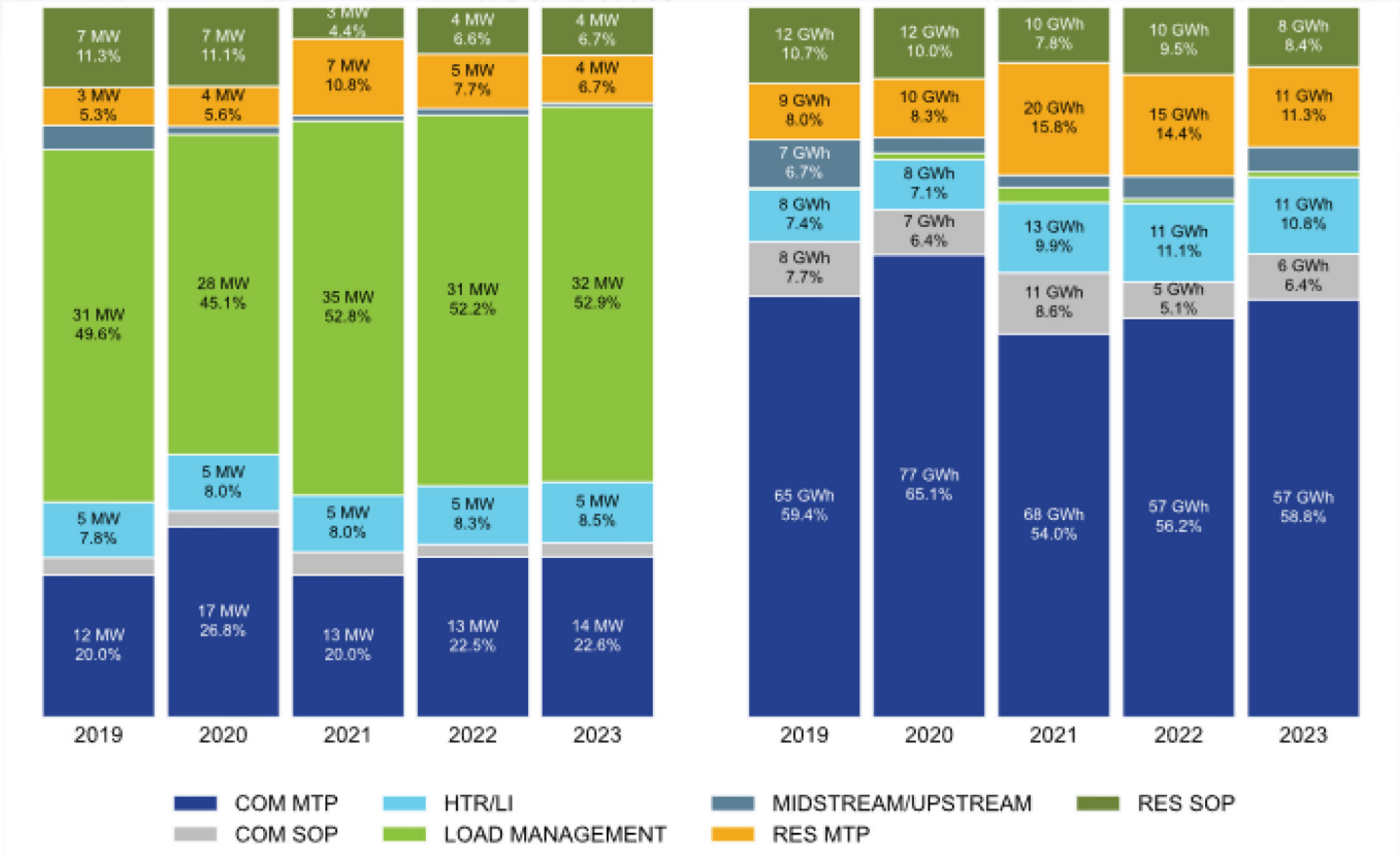


Just over one-half of outside-of-ERCOT IOU program demand reductions (Figure 5 left) were from load management programs in PY2023, followed by almost one-quarter of total demand reductions from Commercial MTPs, which also had the largest percentage of savings for outside-of-ERCOT IOU programs (Figure 5 right).

[13] AEP Texas, CenterPoint, and TNMP added winter load management programs to their energy efficiency portfolios in PY2023. Oncor added winter load management programs starting in PY2022.

[14] Due to the magnitude of savings, kilowatt reductions are reported in megawatts and kilowatt-hour reductions are reported in gigawatt-hours.

Figure 5. Demand Reduction and Energy Savings by Program Type—Outside-of-ERCOT Programs



PROGRAM BUDGETS AND COST-EFFECTIVENESS

In PY2023, IOU programs distributed a total of $121,968,130 in financial incentives to support the implementation of energy efficiency projects through technical assistance, project cost savings, and increased inventory and sales practices[15].

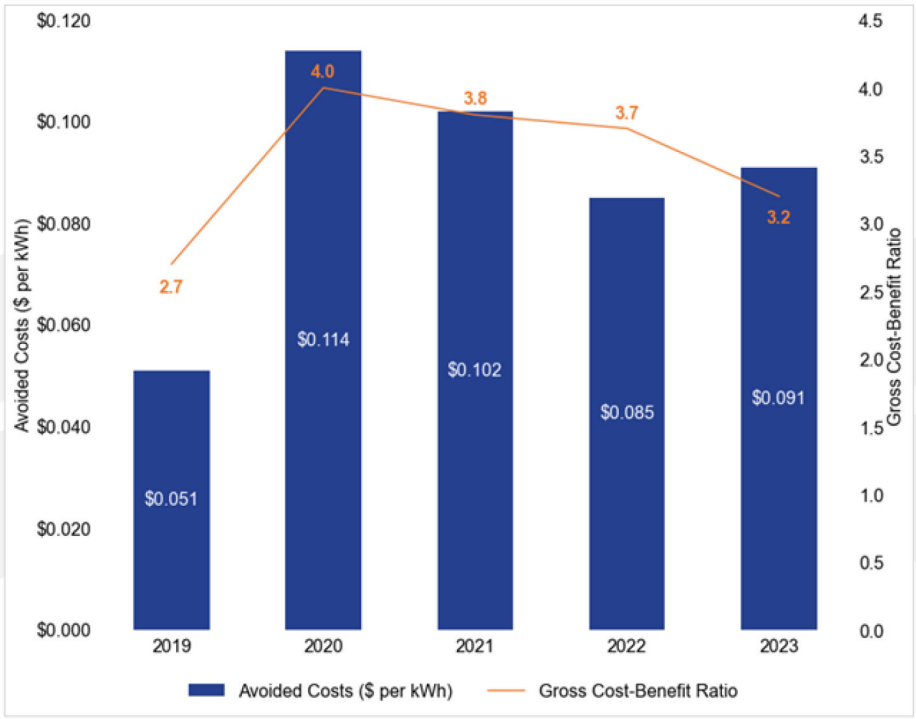
$121,968,130
IN FINANCIAL INCENTIVES

$102,680,963
through ERCOT IOU programs

$19,287,16
through outside-of-ERCOT programs

IOU program cost-effectiveness tests compare the benefits from the programs to the costs, with a ratio over 1.0 representing a cost-effective program. Figure 6 overviews the avoided costs and cost-effectiveness ratios for all IOUs over the last five years (PY2019 to PY2023). Using this program administrator cost test (benefits divided by costs), the overall cost-effectiveness ratio has consistently remained above 2.0. While PY2020 saw a high of 4.0, the cumulative cost-effectiveness of IOU programs remains healthy at 3.2 in PY2023. The higher cost-effectiveness ratios over the last four years have been largely due to the higher avoided costs of energy. Avoided costs were slightly higher in PY2023 than in PY2022 but less than in PY2020 and PY2021.

Figure 6. IOU Portfolios Gross Cost-Benefit Ratio and Avoided Cost by Program Year



[15] Not including administration and other program costs. See Appendix C of the full report for detailed IOU program budgets.

Figure 7 summarizes the cost-effectiveness of each IOU's energy efficiency portfolio. All portfolios were cost-effective, with ratios ranging from 2.7 (TNMP) to 4. 1 (EPE). The lifetime cost per kilowatt ranged from $13.45 to $16.95 across utility portfolios, and the lifetime cost per kilowatt-hour ranged from $0.015 to $0.019. These lifetime costs provide an alternate way of describing the cost-effectiveness of a portfolio of programs. Portfolios with a higher cost-effectiveness ratio will have a lower cost to acquire savings and vice versa.

Figure 7. PY2023 Savings Cost-Benefit Ratio and Cost of Lifetime Savings

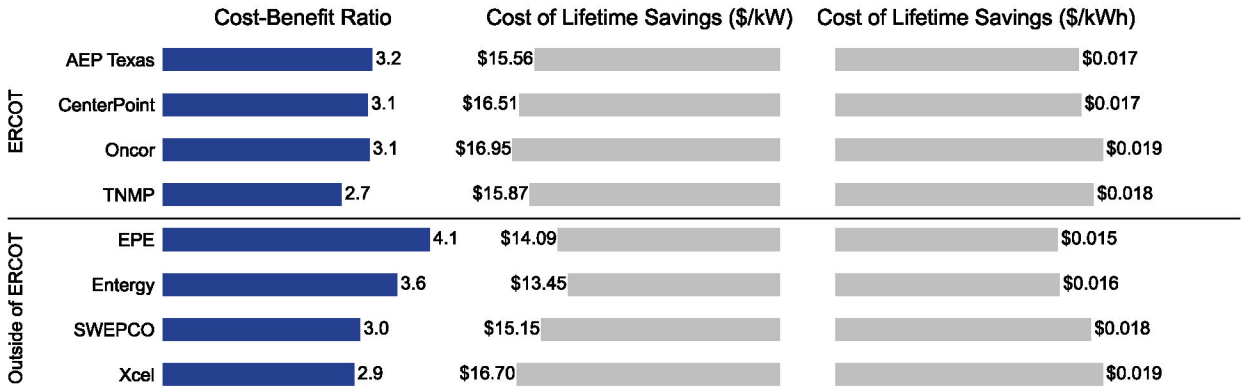


Table 3 below shows the top five performing programs across the IOUs in terms of cost-effectiveness for residential, LI, commercial, and load management programs.

Table 3. Most Cost-Effective Programs by Sector and Program Type

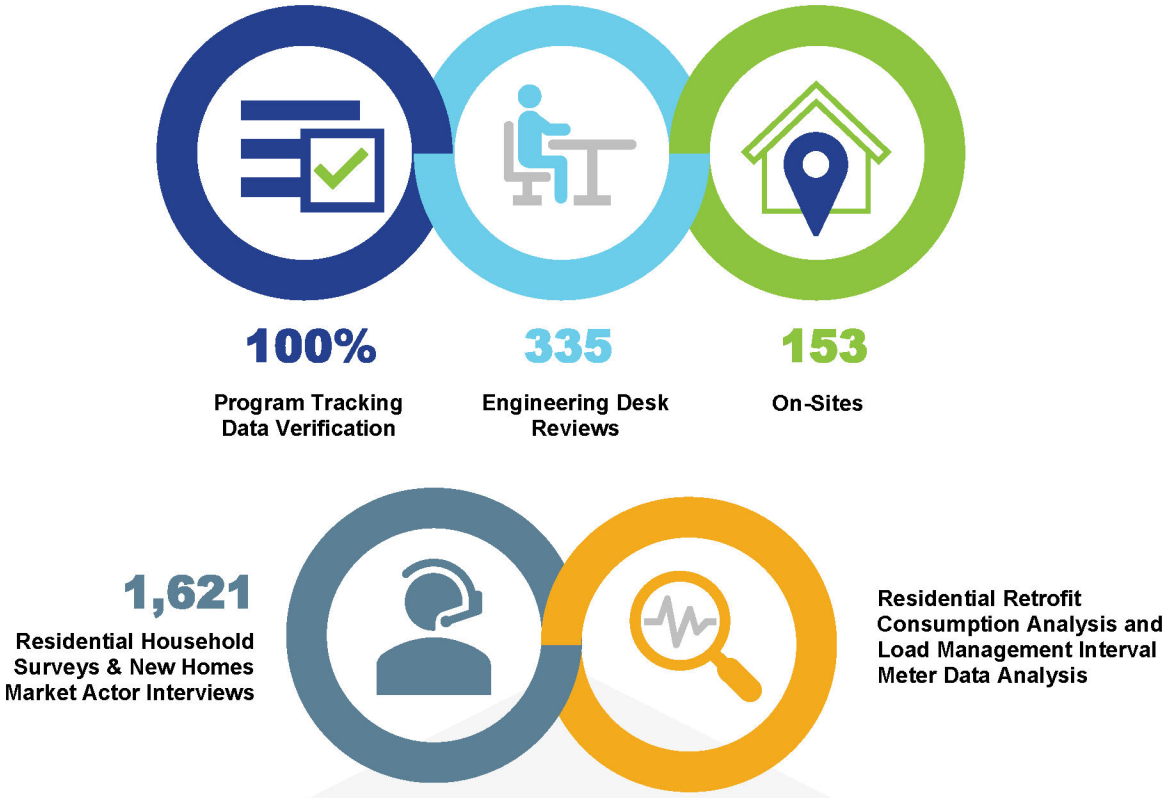
Residential programs	LI programs[16]	Commercial programs	Load management programs
Xcel Smart Thermostat MTP	**Oncor** Low-Income MF Smart Thermostat Direct Install (Pilot)	**Oncor** Retail Products MTP	**TNMP** Winter Load Management SOP
Oncor Retail Products MTP	**Oncor** Low-Income HVAC Tune-Up Program	**Xcel** Home Lighting MTP	**Entergy** Load Management SOP
Xcel Hard-to-Reach Food Bank	**TNMP** Low-Income Weatherization	**CenterPoint** Retail Products and Services Commercial MTP	**CenterPoint** Load Management SOP
CenterPoint Residential & Small Commercial SOP	**CenterPoint** Targeted Low-Income MTP (Agencies in Action)	**EPE** Texas SCORE MTP	**SWEPCO** Load Management SOP
AEP Texas SMART Sources Solar PV MTP	**Xcel** Low-Income Weatherization SOP	**EPE** Large C&I Solutions MTP	**AEP Texas** Load Management SOP

[16] This includes LI programs where cost-effectiveness is calculated according to a savings-to-investment ratio (SIR). HTR programs also serve LI households, but cost-effectiveness is calculated through the program administrator cost test (PACT) and therefore are included in the residential programs column.

The PUCT's EM&V contractor independently verifies utility-claimed savings across all programs through program tracking data. As summarized in Figure 8, additional EM&V activities—engineering desk reviews, on-site measurement and verification (M&V), interval meter data analysis, consumption analysis, participant surveys, and in-depth interviews—are conducted. Additional activities are based on annual evaluation prioritization of *high*, *medium*, or *low* by program type, which is informed by the magnitude and uncertainty of savings, importance to future portfolio performance, and changes in the markets in which programs operate.

This IOU Energy Efficiency Portfolio Report presents the PY2023 EM&V findings and recommendations for all eight Texas IOU energy efficiency portfolios[17]. Additionally, this report addresses gross and net demand and energy impacts, program cost-effectiveness, provides feedback on program and portfolio performance, and informs annual updates to the Texas Technical Reference Manual (TRM).

Figure 8. PY2023 Evaluation, Measurement, and Verification Activities



[17] The EM&V framework is embodied in 16 TAC §25.181, relating to the Energy Efficiency Goal. During the 82nd Legislative Session in 2011, the Texas Legislature enacted Senate Bill (SB) 1125, which required the PUCT to develop an EM&V framework that promotes effective energy efficiency program design and consistent and streamlined reporting. Through the Request for Proposals 473-20-0002, Project No. 51021, the PUCT selected an independent, third-party EM&V contractor led by Tetra Tech that includes Texas Energy Engineering Services, Inc. (TEESI) and Energy Bees.

EM&V KEY FINDINGS

The IOU programs achieved many new and continued successes in PY2023. Broad program achievements include:

- successfully adjusting to decreased availability of lighting savings due to the new federal standards for general service lamps,
- increasing HVAC measures in multifamily and HTR sectors through new and expanded program efforts,
- increasing the quantity and quality of custom energy efficiency project analysis,
- doubling the number of smart thermostats incentivized through the programs, and
- employing new delivery models to serve diverse commercial sectors, such as the food service industry, through midstream offerings.

ERCOT IOUs included winter programs in their portfolios for the first time in PY2023[18], and both CenterPoint and Oncor expanded their load management offerings to accommodate deployment 24 hours/7 days a week.

Finally, IOU and stakeholder engagement in the PUCT-administered, EM&V team-facilitated Heat Pump Working Group identified both barriers and solutions for the next TRM update to encourage the widespread implementation of variable speed heat pump technologies through IOU programs (Figure 9).

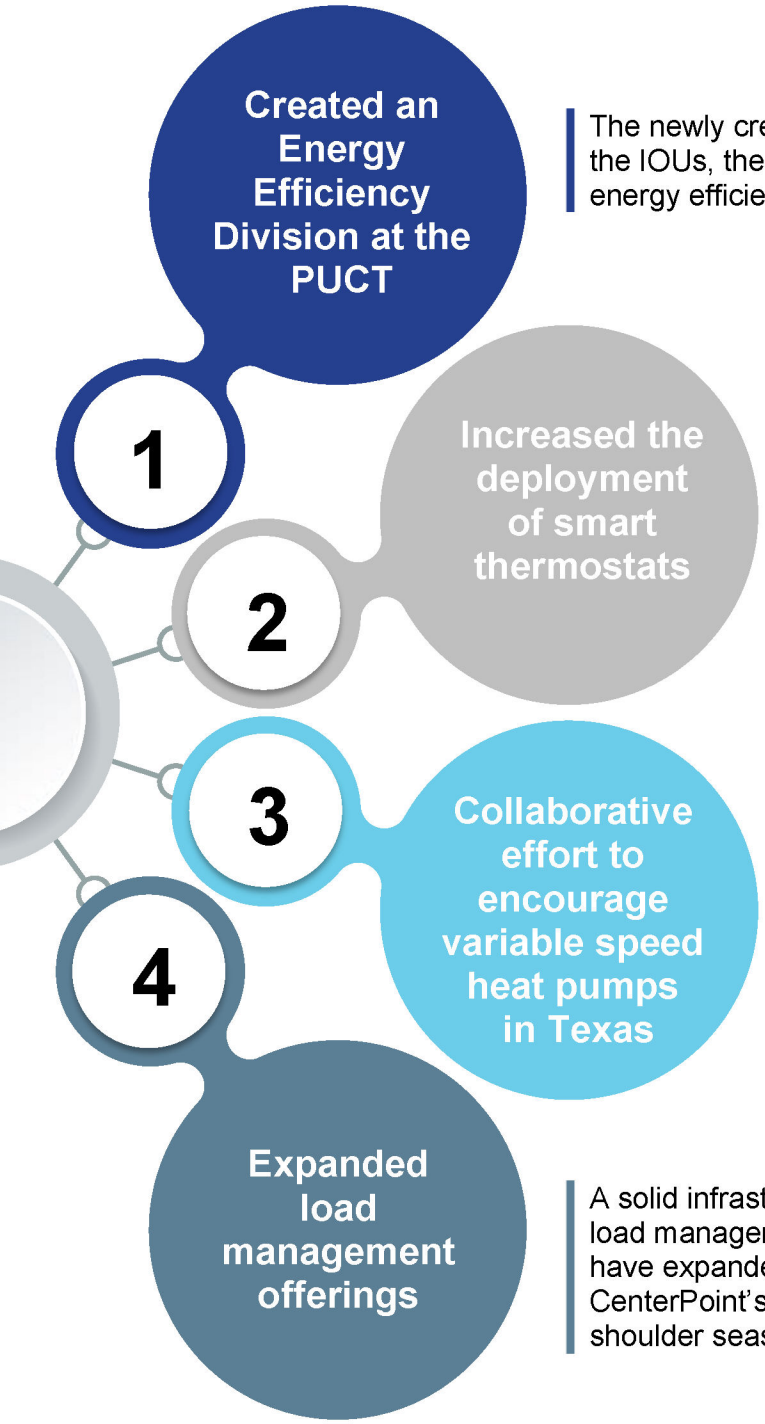
Overall, the PY2023 EM&V found utilities had improved program quality assurance/quality control (QA/QC) and training efforts, and the consumption analysis confirmed that prior updates to the TRM have resulted in more accurate deemed savings for residential retrofit measures.

In addition to continued efforts by the EM&V contractor team, the PUCT Energy Efficiency Division filed questions for stakeholder comment[19] regarding potential changes to current energy efficiency rules and practices. In response to stakeholder recommendations:

- the EM&V team added a low-income metrics section to this report, and
- the TRM Working Group is assessing the probability analysis of on-peak demand reductions for each hour of the day to determine if updates can better reflect the value of when energy efficiency savings occur.

[18] Oncor included a winter load management program in its PY2022 energy efficiency portfolio, with AEP Texas, CenterPoint and TNMP including winter programs starting in PY2023 portfolios.
[19] Project No. 56517, Energy Efficiency Questions: http://interchange/Document/List?controlNumber=56517.

Figure 9. Key Energy Efficiency Accomplishments



The newly created Energy Efficiency Division is working with the IOUs, the EM&V team, and stakeholders to address energy efficiency issues in Texas.

IOU programs more than doubled the number of smart thermostats incentivized in PY2023 (23,228) compared to PY2022 (9,412) and

The PUCT staff and EM&V team led a Heat Pump Working Group—which included IOUs, manufacturers, installers, designers, and contractors—to agree on TRM updates and process changes to encourage more variable speed heat pumps in the IOU programs. This is the first effort of this type in a warm weather climate.

A solid infrastructure is in place for ERCOT utilities offering load management programs. Oncor, TNMP, and CenterPoint have expanded programs to 24 hours/7 days a week and CenterPoint's PY2023 summer program continued into the fall shoulder season.

2.0 EM&V KEY FINDINGS AND RECOMMENDATIONS

This Investor-Owned-Utilities (IOU) Energy Efficiency Portfolio Report presents the program year (PY) 2023 (PY2023) 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 PY2025 Technical Reference Manual (TRM) update process and PY2025 program design and delivery continuous improvement.

First, we overview the EM&V methodology and PY2023 activities. This is followed by PY2023 key findings and recommendations that are to be implemented in PY2025. Section 3 of this report discusses portfolio-level and cross-sector results. Sections 4 through 6 of the report present the commercial, residential, and load management program results. Appendices provide detailed information referenced in Sections 1 through 6. A separate volume (Volume 2) of this report details PY2023 results for each utility's portfolio.

2.1 EVALUATION, MEASUREMENT, AND VERIFICATION

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 both PY2023 and the four-year EM&V contract period[20]. The EM&V team identified program types across utilities with similar program design, delivery, and target markets. 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.

[20] Appendix E contains the four-year EM&V contract period prioritization tables.

We conducted a streamlined EM&V effort that coupled broad due diligence verification of savings for all programs with targeted in-depth activities. These activities included engineering desk reviews, on-site measurement and verification (M&V), interval meter data analysis, benchmarking research and interviews, and consumption analyses based on the prioritization of the programs.

We carefully developed PY2020–PY2023 EM&V scopes across the four-year contract period to prioritize EM&V activities where they provided the greatest value. We implemented targeted in-depth impact evaluations for particular programs and end-uses. We coupled this with tracking system verification of claimed savings across all programs. This approach maximizes both the cost-effectiveness and the value of the proposed EM&V activities. We prioritized evaluation efforts regarding the level of effort for utility programs each year and summarize this prioritization by sector and program type below (see Appendix E for detailed prioritization tables).

Commercial. The commercial sector has the largest savings programs; commercial standard offer programs (CSOP) and commercial market transformation programs (CMTP) are at least a *medium* priority across the four program years. These programs represent the largest percentage of IOU savings and plan to explore new customer segments and technologies. While prior EM&V generally found evaluated savings similar to the utilities' claimed savings, it also resulted in several recommendations for changes to reported claimed savings and recommendations. Therefore, a *medium* priority is justifiable across the four program years due to the savings contributions, the heterogeneity of projects and customer types, and the associated levels of uncertainty in savings. For PY2020 and PY2021, we placed a *high* priority on the largest commercial savers to conduct consumption analyses. The consumption analyses gauged the effectiveness of the TRM for *lighting* for key building types. The CSOPs and largest CMTPs were also a *high* priority in PY2021 to update the net-to-gross (NTG) information and collect key information identified in the PY2020 consumption analysis through participant surveys. Small business programs were designated a *medium* priority twice in the four years (PY2021 and PY2023). While these programs are not large contributors to IOU savings, small businesses are recognized as an important sector to serve. This sector traditionally faces more barriers to energy efficiency program participation than other commercial sectors, and utilities have been trying to expand the range of measures offered.

Residential.

We have categorized the residential standard offer programs (RSOP), hard-to-reach (HTR), and low-income (LI) programs as *high* evaluation priorities in PY2021 and PY2023.

These programs comprised a substantial percentage of residential sector portfolio savings in the last five years and responded to TRM updates to the *heat pump* (HP) and *envelope* measures in PY2021. The programs were evaluated via desk reviews, on-sites, a targeted consumption analysis for PY2021, and a full consumption analysis in PY2023, along with a residential household survey completed in 2024 for the PY2023 consumption analysis. We conducted RSOP participant surveys to update NTG information, collect key process information, and confirm measure installation in PY2021. The HTR and LI programs implemented new eligibility processes in PY2022; therefore, these programs were also a *high* priority in PY2022 to support this process improvement.

Residential new construction programs were a *medium* evaluation priority in PY2022 and a *high* evaluation priority in PY2023 with builder and rater interviews and an updated NTG ratio. With rising baselines, these programs will need to continue to push the market in future program years.

Upstream, Midstream, and Pilot MTPS.

Upstream and midstream programs are a growing part of utility portfolios and were designated a *high* priority in PY2023. The evaluation activities to be conducted included desk reviews for high-impact measures depending on the level of participation in each of these MTPs.

In PY2022, the Strategic Energy Management pilot was a *medium* priority, but due to the complexity of this program and the size of projects, we designated it as a *medium* priority again in PY2023. Any other pilot programs in their second or third year of implementation are designated a *medium* priority, and we will provide feedback about whether these pilots are viable options for full programs.

All other MTP program types are *low* priorities for evaluation because they are small contributors to portfolio savings, have little uncertainty in savings, have homogenous projects, and have already been designated as a *medium* evaluation priority once in the four-year evaluation cycle.

Cross-Sector.

Load management programs are designated a *medium* priority in most years due to their significant contribution to capacity (kilowatt) savings. In PY2023, the load management programs were designated a *medium* priority after being a *high* priority in PY2022.

In PY2023, residential air conditioner (AC) tune-ups were a *medium* priority, while commercial AC tune-ups and photovoltaic (PV) programs were a *medium* priority in PY2022. The PY2023 EM&V results include cross-sector AC tune-up results, given the methodology applies across sectors.

2.1.1 PY2023 EM&V Activities

Table 4 shows the EM&V activities completed by program type and evaluation priority. 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 PY2023 TRM 10.0 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 and EM&V team on-site M&V;
- recommend updates to project-level claimed savings if EM&V results indicate a variation in project savings of at least ±5 percent;
- inform updates for the PY2025 TRM 12.0;
- provide performance feedback to improve program design, delivery, and reporting; and
- conduct cost-effectiveness testing using the *program administrator cost test* for savings results from all programs except LI, which are calculated using the *savings-to-investment ratio*.

Table 4. PY2023 Evaluation, Measurement, and Verification Priorities and Activities

Program type	Evaluation priority	Claimed savings verification approach	Cost-effectiveness testing	Project desk reviews	On-sites	Surveys	Interval meter/ consumption data analysis
Commercial SOPs, commercial MTPs, and SCORE MTPs	Medium	Sampled (see desk reviews)	✓	154	74	N/A	Completed on individual sampled projects
Commercial pilots and retro-commissioning (RCx)	Medium	Sampled (see desk reviews)	✓	20	12	N/A	Completed on individual sampled projects
HVAC tune-ups	Medium	Sampled (see desk reviews)	✓	16	0	N/A	N/A
Solar PV	Medium	Sampled (see desk reviews)	✓	9	4	N/A	N/A
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	✓	N/A	N/A	1,609	Participant consumption analysis
Residential New Homes MTPs	High	Sampled (see desk reviews)	✓	24	N/A	12	N/A
Residential upstream/midstream MTPs	High	Sampled (see desk reviews)	✓	38	N/A	N/A	N/A
All other programs	Low	Census	✓	N/A	N/A	N/A	N/A

2.2 KEY FINDINGS AND RECOMMENDATIONS OVERVIEW

The utilities have demonstrated a willingness to work with PUCT staff and the EM&V team to improve the accuracy of claimed savings. Examples include utilities:

- adjusting claimed savings in response to EM&V findings,
- requesting M&V reviews or additional technical assistance throughout the program year, and
- implementing TRM or program changes.

Utilities responded to all PY2023 EM&V recommended savings adjustments to claimed savings, as identified in Table 5 below.

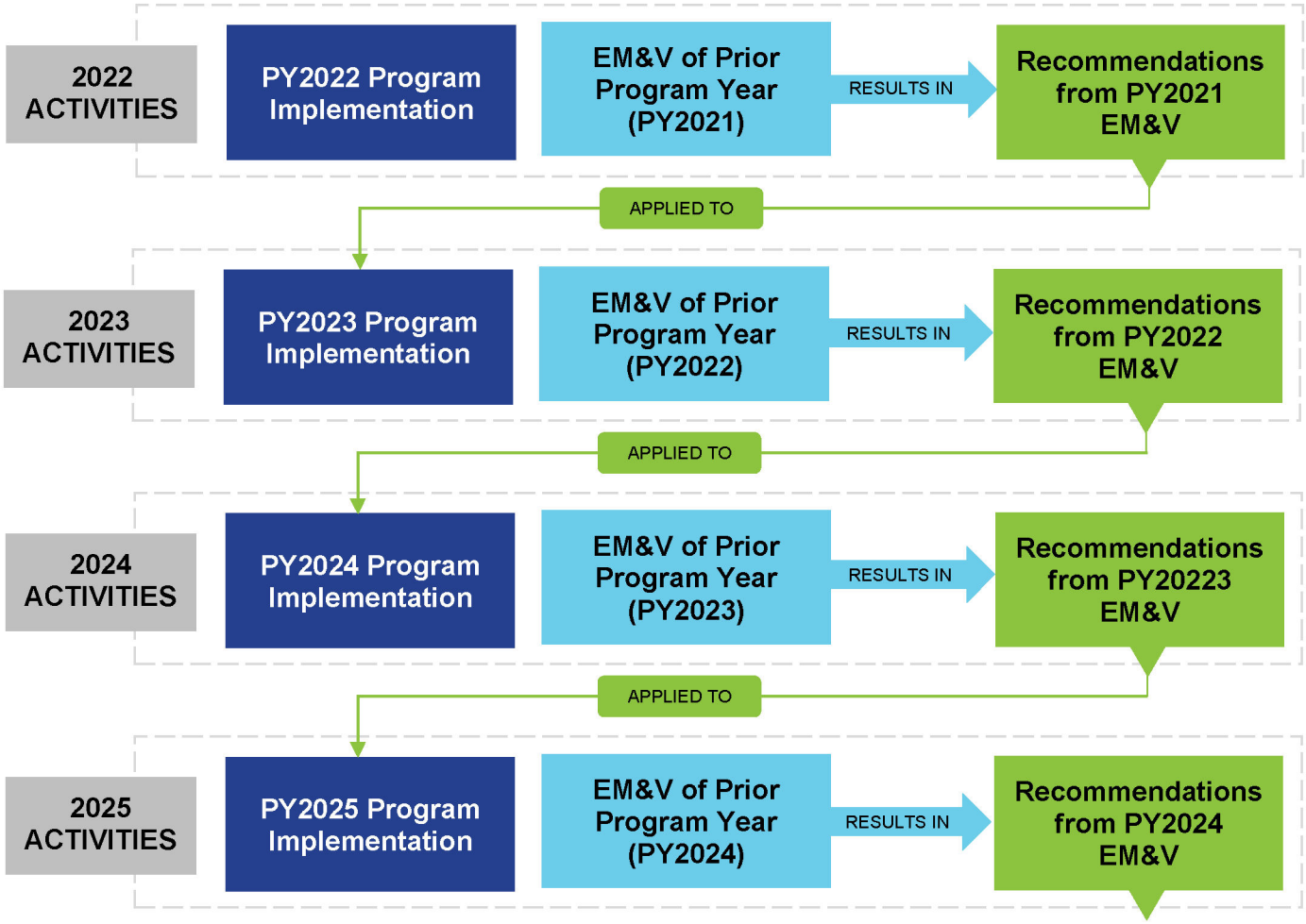
Table 5. PY2023 EM&V Savings Adjustments to Utility Claimed Savings

Utility	kW	kWh
ERCOT IOU programs		
AEP Texas	-47	-92,187
CenterPoint	448	743,895
Oncor	17	46,359
TNMP	-30	-93,873
Total	388	604,194
Outside-of-ERCOT IOU programs		
El Paso Electric	110	87,943
Entergy	-32	-13,417
SWEPCO	-24	-89,772
Xcel Energy	-114	-649,276
Total	**-60**	**-664,522**

The PUCT's EM&V recommendations are to facilitate more accurate, transparent, and consistent savings calculations and program reporting across the Texas IOU energy efficiency programs and provide feedback that can lead to improved program design and delivery.[21] PUCT staff and the EM&V team discuss with the utilities to agree on responses to recommendations; these are referred to as *action plans*. Recommendations and action plans are also vetted with the Energy Efficiency Implementation Project (EEIP), the PUCT energy efficiency collaborative group. Utilities then use these action plans to respond to program savings, design, and implementation recommendations within the next program year, consistent with § 25.181(q)(9). Recommendations made based on PY2021 evaluation research—completed in 2022—were expected to be implemented in PY2023 and their status ("complete" or "in progress") is included in this PY2023 report (Appendix D). Similarly, recommendations resulting from the PY2023 EM&V completed in 2024 are expected to be implemented in PY2025 (see Figure 10).

[21] The EM&V team recognizes that there may be a trade-off between the objectives of the recommendations, program administration costs, and program participation barriers. The EM&V team strives to recognize these trade-offs by making feasible recommendations and working with the utilities to agree upon reasonable action plans in response to recommendations.

Figure 10. Recommendations Timeline



2.3 PY2023 RECOMMENDATIONS AND ACTION PLANS

The EM&V team details PY2023 key findings and recommendations at the portfolio and cross-sector-level, commercial, residential, and load management programs in Sections 3 through 6 of this report. Below, we summarize these key findings and recommendations based on the party responsible for the action plan to respond to the EM&V recommendations as follows: IOUs, the TRM Working Group, the EM&V team, and the Energy Efficiency Division.

2.3.1 IOU Action Plans

The PY2023 EM&V resulted in 25 recommendations for IOU response: five at the portfolio- and cross-sector level, eight for commercial programs, ten for residential programs, and two for load management programs.

Table 6. PY2023 EM&V Recommendations and IOU Action Plans

Category	Topic	Key finding and recommendation	Action plan
Portfolio-level	Cost cap analysis	Individual IOU cost cap information in EECRFs can be difficult to find and is not generally included in EEPRs.	Work with Energy Efficiency Division Staff to standardize EEPR reporting followed by EECRF for consistency across utilities. Starting with 2025 filings, include a summary of sector projected program budgets as a percentage of sector cost cap in annual EEPRs; include actual program budgets as a percentage of sector cost cap in annual EECRFs.
		The percentage of actual budgets as a percentage of the IOU cost cap varied across IOUs and sectors.	Assess internal opportunities for cost-effective expansion of energy efficiency when program budgets are substantially under cost caps.
	Program tracking	While program tracking data communication has improved, there is still an opportunity to improve the quality of the data collected and reported on through (1) unique participant identifiers (except for upstream programs), (2) measure IDs, and (3) not including load management offerings in umbrella energy efficiency programs.	Include unique participant identifiers for all programs other than upstream and unique measure identifiers for all programs. Load management programs should be tracked and reported as separate programs from energy efficiency.
	Program documentation	New implementers appeared to have documentation available for evaluation but did not provide it for the evaluation request.	Discuss EM&V documentation expectations with new implementers prior to the documentation request.
	AC/HP tune-up	Greater transparency and confidence are needed in the AC/HP tune-up savings approach. The field-collected values had discrepancies with the documentation.	Implement the increased requirement of the *Program Tracking Data and Evaluation Requirements* section of the TRM measure and improve QA/QC processes for tracking data to ensure consistency with invoice dates, incentive amounts, unit capacities, building types, addresses, temperatures, and other data collected.

Category	Topic	Key finding and recommendation	Action plan
Commercial	Lighting	Many implemented programs did not identify non-operating lighting fixtures in the energy savings calculations.	Include the count of fully non-operational lighting fixtures in the calculation to verify the quantity does not exceed the limit in the TRM.
		New construction exterior lighting can include multiple exterior lighting types, such as parking lots, loading docks, and pedestrian walkways, which can detail the exterior lighting allowable baseline wattage. Evaluated projects consistently used only one exterior lighting type. The use of multiple exterior lighting zones tended to have one zone that did not meet the code without trading wattages.	Calculate exterior lighting savings using multiple exterior lighting zones and eliminate the code compliance verification in the calculation.
		New construction projects require measurement of both interior and exterior areas. This area is estimated at the time of the initial application and is not consistently updated at project closeout.	Incorporate QA checks to verify interior and exterior areas at project closeout.
	HVAC	PY2023 included the rollout of an efficiency rating system for HVAC equipment with a different baseline than the old rating system. The air conditioning and HP baseline efficiencies did not align with the efficiency rating of the installed equipment in the calculation.	Institute a QA check on the energy savings calculation to ensure the efficiency rating of HVAC equipment matches the baseline and installed equipment.
	Foodservices & refrigeration	The midstream foodservice programs did not provide documentation regarding the measure assumptions and the savings calculation to the evaluator.	Document the claimed savings assumptions per measure in available program documentation or the tracking system.
		The midstream foodservice and refrigeration implementation did not consistently match the equipment specifications to the deemed measure savings.	Document the equipment specifications of the program's accepted midstream measures and use them to select assumptions in the energy savings calculations. Alternately, use a documented conservative assumption for all equipment included in the program.

Category	Topic	Key finding and recommendation	Action plan
	Segment opportunities	Smart thermostats in small commercial operations have an opportunity to save energy with existing HVAC equipment.	Assess program opportunities to offer smart thermostats to small commercial customers.
		Product distributors in the foodservice and refrigeration markets have responded well to the newly implemented midstream delivery model.	Assess program opportunities to increase energy efficiency projects in foodservice and refrigeration through midstream delivery channels.
Residential	New homes programs	Financial incentives are helpful in reducing the costs of building higher-efficiency homes; however, customers may be largely unaware of the utility incentive and are resistant to paying for more efficiency. Several of the IOU programs offer tiered incentive levels that increase as both the efficiency above ENERGY STAR and HVAC equipment efficiency increase. These tiered incentive levels appear to be the most effective in pushing standard building practices based on the interviews.	Continue to offer tiered incentive levels for building above ENERGY STAR up to Net Zero and higher efficiency HVAC equipment and assess program materials for effectiveness in conveying the benefits of more efficient homes to customers.
		Builders would appreciate increased communication tools with IOU programs. A recurring theme in builder feedback was the lack of reporting on incentive status, leading to frustration and uncertainty about when they would receive their incentives.	Assess the timeliness of program incentive payments and consider an online program portal.
		Increased program training and outreach would be beneficial to trade allies, especially HVAC contractors.	Consider training and outreach events specifically geared toward HVAC contractors and other trade allies that work with builders and raters to construct more efficient homes.
		Some projects claimed alternative baselines or deemed savings for additional prescriptive measures along with the modeled new home savings. However, documentation and tracking data for these measures were not consistent with the requirements in the prescriptive Residential TRM 9.0, Volume 2.	Ensure all measures and savings are tracked individually, and documentation for additional prescriptive measures follows the *Program Tracking Data and Evaluation Requirements* Section in TRM Volume 2 under each measure. If reported savings differ from the modeled savings report, ensure calculations for reported savings are transparent.

Category	Topic	Key finding and recommendation	Action plan
		For hybrid programs where prescriptive measure savings from TRM 9.0 Volume 2 are claimed along with modeled savings using parameters for the reference home from TRM 9.0 Volume 4, in some instances, the EM&V team found that the modeled home included claimed prescriptive measures potentially double-counting savings.	Ensure all prescriptive measures are excluded from the modeled home and documented. Savings should be tracked individually for each prescriptive measure claimed, and the modeled home should be tracked as one measure. Documentation for hybrid programs should include reference home and modeled home characteristics for comparison to ensure prescriptive measures are claimed appropriately.
	Residential households	Survey respondents have low adoption of solar and electric vehicle technologies within the last year across all utilities.	Consider opportunities to include or expand solar projects in residential programs.
		Survey respondents seem disinterested or uninformed about the benefits of thermostat setbacks in terms of saving energy without sacrificing comfort.	Consider including more customer education in programs around the benefits of thermostat setbacks for heating and cooling and the use of smart thermostats.
		Almost all survey respondent participants (97 percent) across all the utilities reported that their comfort level remained the same (49 percent) or improved (48 percent) after installing energy-efficient HVAC equipment or tuning up their existing equipment.	Utilities may consider utilizing these data results as a means of further promoting energy-efficient HVAC equipment and incentives in their program marketing materials.
		Survey respondents are concerned with electricity rates and reliability (33 percent) coupled with compliments of the IOU energy efficiency programs (33 percent), with some customers expressing frustration with the program equipment or contractors (10 percent) and some (10 percent) looking for additional energy efficiency information or rebates.	As energy costs and grid reliability are top of mind for residential customers, IOU programs may want to consider education, highlighting how energy efficiency is part of the toolbox to address these issues.
	Retrofit programs consumption analysis	Residential retrofit program savings measured through weather-normalized AMI data showed variation in performance across IOUs RSOP, HTR, and LI programs, PY2022 and PY2023 and measures.	Investigate drivers of high and low performance across programs and measures; develop program strategies to address low performance and maintain high performance.

Category	Topic	Key finding and recommendation	Action plan
Load management	Commercial	Participants increased (1,884 participants in PY2023 compared to 1,348 in PY2022; 40 percent increase) while the average level of cooperation with curtailment events has continued to decrease (74 percent in PY2023, 81 percent in PY2022, 90 percent in PY2021). This decrease is driven by Oncor; participants through an aggregator accounted for many of the nonparticipating sites. AEP Texas had the highest cooperation rate of 94 percent, followed by CenterPoint (93 percent), Entergy (86 percent), and Xcel (85 percent). The ERCOT winter load management programs had an average level of cooperation of 82 percent.	Continue to follow up with participants who underperform during curtailment events to determine if future program participation or program-contract estimates of available demand reduction need to be revised.
		Utilities continue to demonstrate strong capabilities to apply the TRM calculation method to savings.	Continue implementing the demand savings algorithm described in the TRM and keep active communications with the EM&V team to resolve minor discrepancies in savings calculations. These recommendations will ensure consistency across utilities and enhance overall accuracy and transparency.

2.3.2 TRM Working Group Action Plans

The PY2023 EM&V resulted in 12 recommendations for TRM Working Group response: two at the cross-sector level, five for commercial programs, four for residential programs, and one for load management programs.

Table 7. PY2023 EM&V Recommendations and TRM Working Group Action Plans

Category	Topic	Key finding and recommendation	Action plan
Cross-sector	AC/HP tune-up	Improved transparency and confidence are needed in the AC/HP tune-up savings approach. A multi-step process is recommended, starting with PY2025 M&V updates and a future consumption analysis.	Adjust the calculation process to deem the atmospheric pressure (which is currently calculated from the elevation and altitude).

Category	Topic	Key finding and recommendation	Action plan
		The efficiency loss calculation includes three methods of determining airflow measurements. There is a significant variation in efficiency loss values between the three methods.	The sampled tune-ups for the efficiency loss factor determination should use direct air measurement (airflow method 1). Airflow methods 2 and 3 should not be used in the determination of the efficiency loss factor.
Commercial	Lighting	Lighting savings calculations were inconsistently completed across utilities when the baseline fixtures included occupancy sensors or other control devices.	Update the TRM measure for lighting equipment and lighting controls to specify calculations when baseline fixtures have lighting controls.
	HVAC	The HVAC energy savings calculation reduced energy savings when the installed equipment capacity exceeded the replaced equipment capacity. Current technology allows upsized equipment to match load better than historical and should not result in reduced savings.	Adjust the TRM savings calculation to determine savings from building HVAC loads instead of equipment capacity.
	M&V and custom	New implementers of custom projects needed support to claim peak kilowatt savings with the PDPF *top 20-hours* method and for regression analysis of peak kilowatt.	Update the TRM to clarify the use of the PDPF *top 20-hours* method in Volume 1.
		The regression analysis of hourly kilowatts for M&V projects regularly requires waivers to the statistical metrics in the TRM.	Update TRM Volume 4 to adjust the statistical metrics for the regression analysis of peak kilowatt demand reduction for summer and winter peak calculations.
	Envelope	The measurement of door seals for the *entrance and exit door air infiltration* measure was inconsistent with the detail of the TRM calculation.	Adjust the TRM calculation to account for the whole door measurement of door seals instead of door seal length.

Category	Topic	Key finding and recommendation	Action plan
Residential	New homes	Residential new construction standard practice has moved to or near ENERGY STAR® standards. Approximately one-half of the builders said they build to these standards, often independent of program incentives. Many local jurisdictions across IOU territories have adopted higher local codes.	Update the PY2025 TRM new homes baseline in Volume 4 to reflect both market baselines and local codes across the IOU territories.
	Upstream/midstream measures	New federal standards for ACs and HPs went into effect on January 1, 2024. The standard applied to ACs in the southern region at the installation date and HPs at the manufactured date. This distinction caused confusion as to which methodology and efficiency rating to apply for savings calculations.	Discuss if the PY2024 TRM update to one methodology for both ACs and HPs effectively addressed this issue or if clarifications are still needed in the PY2025 TRM update.
	Retrofit program consumption analysis	The consumption analysis of RSOP, HTR, and LI PY2022−PY2023 participants demonstrates the PY2021 TRM updates informed by the consumption analysis completed in 2020 have aligned savings seen in AMI meter data with TRM deemed savings estimates.	Discuss expanding the *air infiltration* measure to residential customers in the PY2025 TRM update along with implementation requirements to ensure tangible savings continue to result from this measure as found in the PY2023 consumption analysis, but not previous analysis.
		HP AMI-measured cooling savings are in-line with the TRM, similar to central AC, but heating baselines can impact how the heating savings are seen in the AMI meter data compared to TRM deemed savings estimates given pre-program heating sources vary.	Continue to adhere to the TRM requirement introduced in PY2024 to capture existing and planned baseline equipment for heat pumps.
Load Management	Residential	A deemed savings value for EPE and a statewide residential summer smart thermostat deemed value have been available in the TRM for utilities without AMI meters fully deployed for residential customers.	EPE is still deploying AMI meters in its territory in 2025 and therefore the deemed value may continue to be used for those without AMI meters. EPE should work with the EM&V team in PY2025 to begin AMI meter data analysis.

2.3.3 EM&V Team Action Plans

The PY2023 EM&V resulted in four recommendations for EM&V team response: two at the cross-sector level and two for residential programs.

Table 8. PY2023 EM&V Recommendations and EM&V Team Action Plans

Category	Topic	Key finding and recommendation	Action plan
Cross-sector	HVAC tune-ups	The amount of claimed savings delivered by this measure across IOUs requires a more detailed evaluation to ensure the accuracy of the energy savings.	Future evaluations should have high prioritization on the *tune-up* measures—for both residential and commercial—that includes consumption analyses and other efforts to support increased accuracy of the claimed savings.
	Heat pumps	The Heat Pump Working Group has developed a new algorithm for variable speed heat pumps starting with the PY2025 TRM. In addition, new existing equipment baseline documentation requirements for all heat pumps came into effect in PY2024.	Assess the standard heat pump and the variable speed heat pump algorithm developed through the Heat Pump Working Group in a future analysis (PY2025 at the earliest, possibly PY2026 depending on variable speed heat pump uptake).
Residential	New homes	Program attribution for the new homes programs has decreased slightly from 70 percent to 60 percent as builders' standard practices have become more efficient. More efficient HVAC equipment remains a barrier; all IOU new homes programs incentivized more efficient HVAC equipment through the programs in PY2023.	Reassess the NTG ratio for new homes programs as the IOU programs gain more participation at the higher-tiered incentive levels and/or as the TRM savings baseline is updated.
	Retrofit programs consumption analysis	Residential retrofit program savings measured through weather-normalized AMI data showed variation in performance across IOUs RSOP, HTR and LI program, PY2022 and PY2023 and measures.	Work with IOUs to understand their consumption analysis results, including drivers of high and low performance across programs and measures; assess program changes to address low performance and maintain high performance in a future consumption analysis.

2.3.4 Energy Efficiency Division Action Plans

The PY2023 EM&V resulted in four recommendations for the PUCT Energy Efficiency Division response: three at the portfolio level and one for load management.

Table 9. PY2023 EM&V Recommendations and Energy Efficiency Division Action Plans

Category	Topic	Key finding and recommendation	Action plan
Portfolio-level	Cost cap analysis	Individual IOU cost cap information in EECRFs can be difficult to find and understand and is not generally included in EEPRs.	Work with IOUs to develop EEPR and then EECRF templates for consistency across utility reports. It is recommended that the template include a summary of planned sector program budgets as a percentage of sector cost cap in annual EEPRs and that feedback on utility plans and budgets be provided.
		The percentage of actual budgets as a percentage of the IOU cost cap varied across IOUs and sectors; outside-of-ERCOT utilities are generally more constrained by cost cap maximums than ERCOT utilities.	If future rulemaking covers customer cost caps, assess the value of tailoring cost caps based on IOU territory characteristics.
	LI and HTR program performance again goals	While all utilities met their LI and HTR goals, all but one of the IOUs met HTR goals with HTR programs, while one IOU utilized LI and HTR programs. It is unclear if programs can overlap to meet both goals.	Discuss LI and HTR goals and eligible programs to meet these goals in a future rulemaking so they are consistently applied across IOUs and tracked by the EM&V team.
Load management	Residential	Due to budget and participation limits in utilities' PY2023 plans compared to prior years, savings and participants slightly decreased, as was also seen in PY2022. The average level of cooperation remained about the same; it slightly increased to 77 percent in PY2023 from 75 percent in PY2022.	Discuss residential load management programs within the context of grid and system reliability and the future rulemaking for SB 1699, 39.919 passed in the 2023 legislative session (88 R).

3.0 PORTFOLIO AND CROSS-SECTOR FINDINGS

This section presents portfolio trends that include energy efficiency cost-cap analysis and program performance against low-income (LI) and hard-to-reach (HTR) goals; this is followed by cross-sector results regarding program tracking, project documentation, and air conditioner (AC) tune-ups.

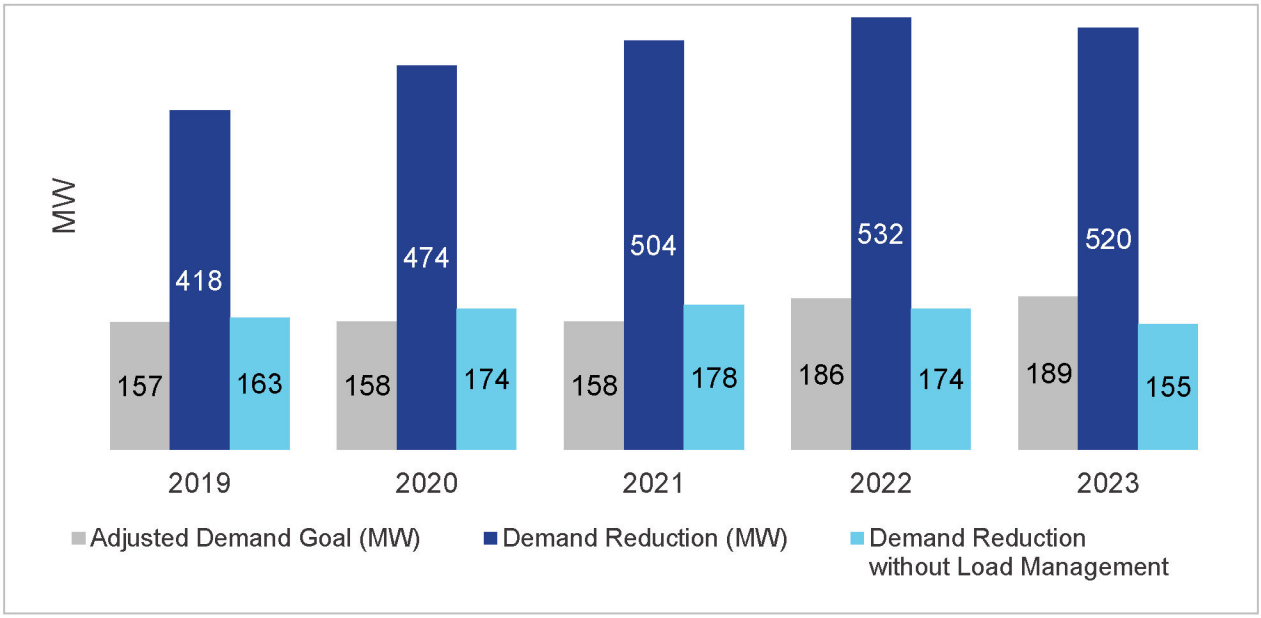
3.1 PORTFOLIO TRENDS

First, investor-owned utilities (IOU) trends in meeting their legislated demand reduction goals over the past five years are presented. This is followed by analysis for three years in their energy-efficiency-cost-recovery factors by customer rate class (referred to as *cost caps*). Next, IOU program performance against LI and (HTR) goals over three years is summarized.

3.1.1 Demand Reduction Goal Performance

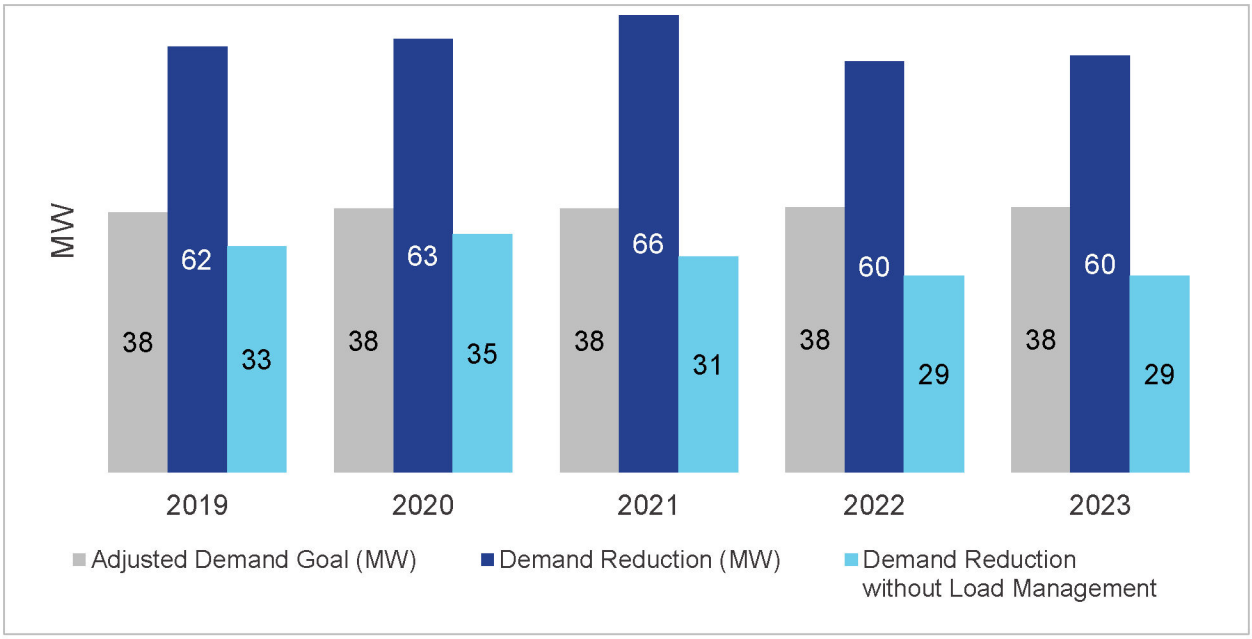
As shown in Figure 11 and Figure 12, the IOUs are significantly exceeding their legislated demand reduction goals, but this is primarily due to their load management programs. In PY2023, the ERCOT IOUs would not have met their demand reduction goals without their load management programs, although they were able to do so in previous years. During the last five years, as shown below, three ERCOT IOUs moved to the higher demand reduction goal of four-tenths of one percent of summer weather-adjusted peak demand instead of the previous "floor" of 30 percent of demand growth.

Figure 11. PY2019–PY2023 Legislated Goals and Demand Reduction—ERCOT Programs



The outside-of-ERCOT IOUs have also needed load management programs to meet their legislated demand reduction goals, even though just over one-half of their portfolios' peak demand reductions have been from load management.

Figure 12. PY2019–PY2023 Legislated Goals and Demand Reduction—Outside-of-ERCOT Programs



3.1.2 Cost Cap Analysis

Energy Efficiency Cost Recovery Factor (EECRF) is an electric tariff provision compliant with §25.182, which ensures timely and reasonable cost recovery for utility expenditures to satisfy the goals of PURA §39.905, which provides for a portfolio of cost-effective energy efficiency programs.

Annually, each electric utility is required to provide a portfolio of energy efficiency programs with incentives sufficient for residential and commercial customers, retail electric providers, and energy efficiency service providers to acquire additional cost-effective energy efficiency, which are subject to EECRF cost caps, also known as the *EECRF not-to-exceed amount*, established according to §25.182(d)(7).

Per §25.182(d)(7)(C), for the 2019 program year and thereafter, the residential and commercial EECRF cost caps shall be calculated to be the prior period's cost caps increased or decreased by a rate equal to the most recently available calendar year's percentage change in the South urban consumer price index (CPI), as determined by the Federal Bureau of Labor Statistics.

The EECRF not-to-exceed amount[22] is based on a per-kilowatt-hour basis and excludes EM&V costs, municipal EECRF proceeding expenses, and any interest amounts applied to over- or under-recoveries. Actual EECRF costs shall not exceed the EECRF not-to-exceed amounts unless a Good Cause Exception filed under §25.181(e)(2) was granted.

[22] The EECRF not-to-exceed amount is calculated by multiplying the appropriate billing determinants for each customer rate class times the approved EECRF.

Figures 13 through 16 show each ERCOT and outside-of-ERCOT IOUs' percentage of actual commercial and residential EECRF costs compared to the approved EECRF cost cap for program years 2021−2023. Over the three years (2021−2023), no utilities' actual EECRF costs exceeded the EECRF not-to-exceed amount unless a Good Cause Exception was filed. Additional details related to each program's actual EECRF costs are located in *Section VIII: Program Funding Calendar Year* of each utility's Energy Efficiency Plan and Report, included in their PY2024 EECRF Application filing.

Overall, ERCOT utilities tend to have more room to grow budgets under their cost caps than outside-of-ERCOT utilities. Amongst ERCOT utilities, CenterPoint is closest to its commercial cost cap, and TNMP is closest to its residential cost cap.

In order to maintain their current levels of energy efficiency programs and customer benefits, several of the outside-of-ERCOT utilities, EPE, Entergy, and SWEPCO, have requested and received a Good Cause Exception for at least one of the EECRF cost caps between the years 2021 through 2023 as allowed by § 25.181(e)(2) and 25.182(d)(7). EPE has received a Good Cause Exception for its commercial EECRF cost cap each year cost caps have been in effect, except for 2018. Entergy received a Good Cause Exception for its commercial EECRF cost cap in 2022 and SWEPCO for both customer classes in 2022 and 2023. Based on program design and delivery staff interviews, the primary drivers why outside-of-ERCOT IOUs are more likely to exceed, or at least be more constrained by, their cost caps than the ERCOT IOUs include:

- Outside-of-ERCOT IOUs tend to have more rural and less urban territories, making it more expensive to reach and deliver energy efficiency to their customers.
- Outside-of-ERCOT IOUs tend to be smaller in size, and there are economies in the scale of program design and delivery.
- Outside-of-ERCOT IOU portfolios tend to have more Market Transformation Programs (MTP) than Standard Offer Programs (SOP), and implementation firms are more expensive. The existing contractor/trade ally infrastructure is less developed for them to tap into, which is one reason MTPs comprise more of their portfolio than SOPs. Another reason is that they have less utility energy efficiency staff to manage programs.

Figure 13. PY2021–PY2023 Actual EECRF Cost Compared to EECRF Not-to-Exceed Cost for ERCOT Commercial Programs

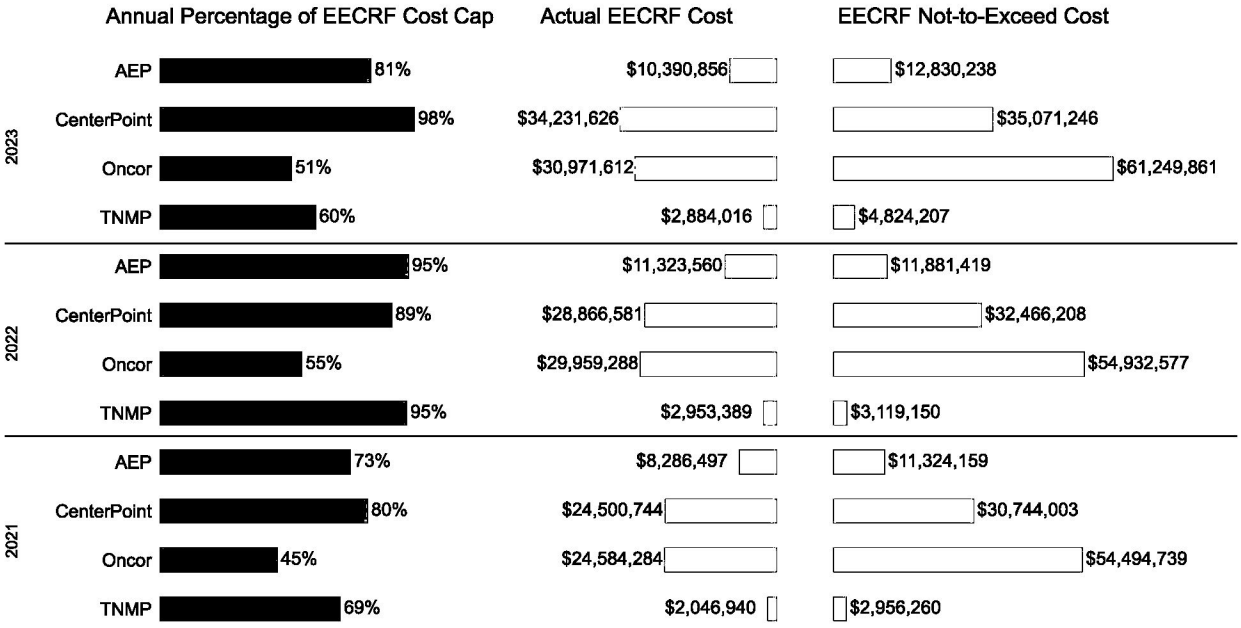
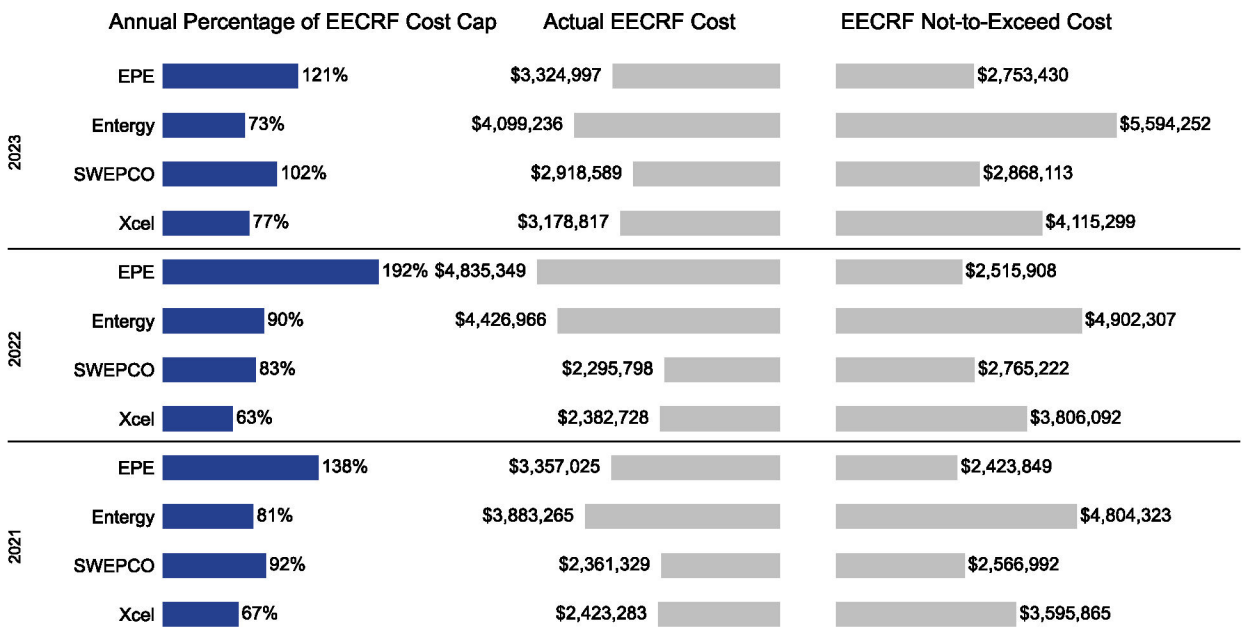


Figure 14. PY2021–PY2023 Actual EECRF Cost Compared to EECRF Not-to-Exceed Cost for Outside-of-ERCOT Commercial Programs



*Good Cause Exception approved for EPE's commercial EECRF cost cap each year shown.

**Good Cause Exception approved for Entergy's commercial EECRF cost cap in 2022.

***Good Cause Exception was filed and approved for SWEPCO in 2022 and 2023.

Figure 15. PY2021–PY2023 Actual EECRF Cost Compared to EECRF Not-to-Exceed Cost for ERCOT Residential Programs

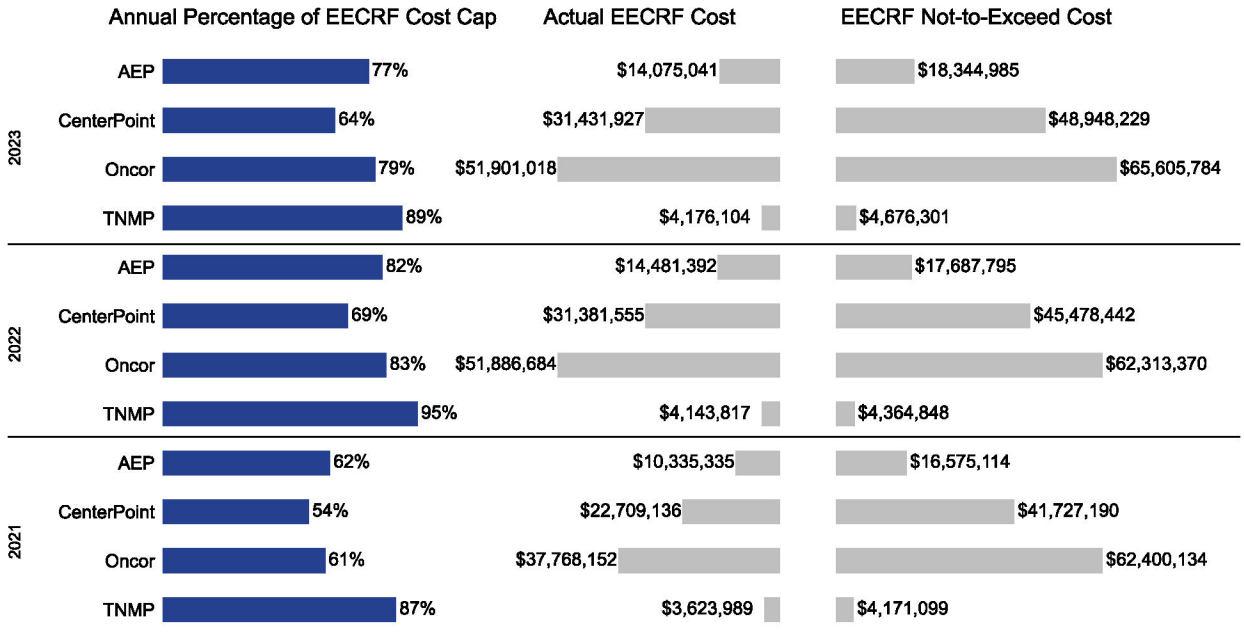
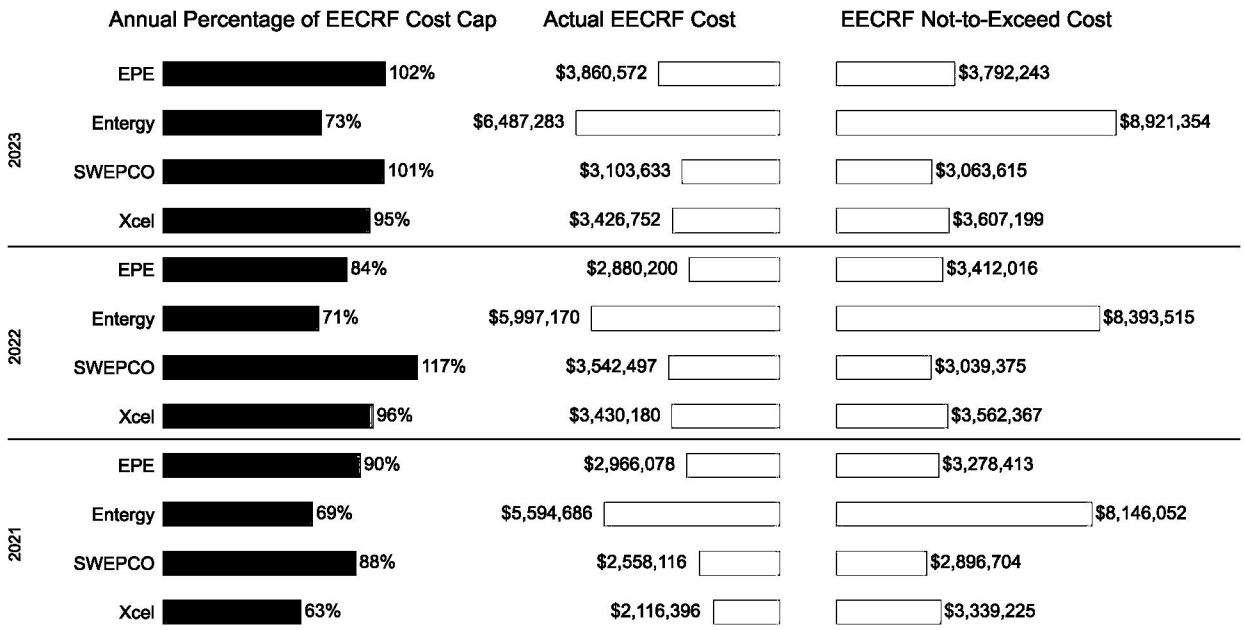


Figure 16. PY2021–PY2023 Actual EECRF Cost compared to EECRF Not-to-Exceed Cost for Outside of ERCOT Residential Programs



* 2022 was the first year a Good Cause Exception was requested and approved for EPE's residential EECRF cost cap.
**A Good Cause Exception was filed and approved for SWEPCO in 2022 and 2023.

Key Finding #1: Individual IOU cost cap information in EECRFs can be difficult for general audiences to find and understand.

The EM&V team found cost cap information detailed differently across the IOU EECRF filings, which necessitated a greater level of time and effort to find and understand the information presented. In addition, some IOUs had the information marked as *confidential,* requiring the EM&V team to ask for the information. Utility budgets in relation to cost caps have been a repeated question from stakeholders at Energy Efficiency Implementation Project (EEIP) meetings.

Recommendation #1: Include a summary of program sector budgets as a percentage of sector cost caps in annual Energy Efficiency Plans and Reports (EEPR) starting in 2025.

Key Finding #2: The percentage of actual budgets as a percentage of the IOU cost cap varied across IOUs and sectors, with outside-of-ERCOT utilities generally more constrained by cost cap maximums than ERCOT utilities.

Recognizing that actual and projected program budgets and some 'headroom' between budgets and cost cap maximums can ensure utilities do not have to request a Good Cause Exception to cost caps. IOUs that consistently have program budgets at less than 70 percent of a sector cost cap may want to consider cost-effective ways to deliver more energy efficiency for that sector. In addition, given the performance differences across IOUs, a future rulemaking may want to consider if different cost caps based on IOU size, geography, or being part of ERCOT are appropriate.

Recommendation #2a: Assess internal opportunities for cost-effective expansion of energy efficiency when program budgets are substantially under cost caps.

Recommendation #2b: If future rulemaking covers customer cost caps, assess if tailoring cost caps based on IOU territory characteristics will deliver more value to ratepayers.

3.1.3 Low-Income and Hard-to-Reach Goal Performance

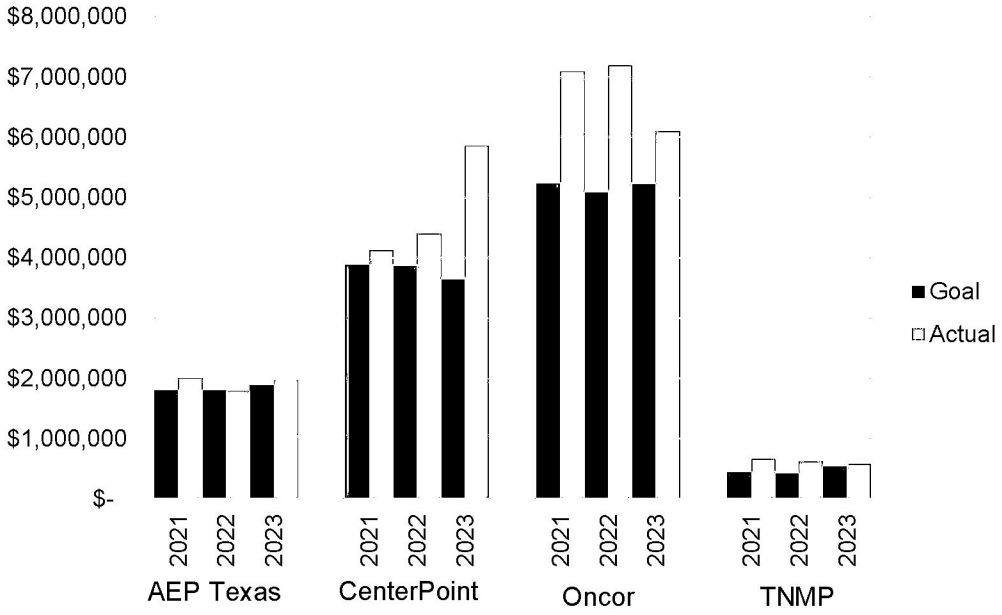
Texas utilities provide energy efficiency services to LI customers through a combination of HTR and LI programs as specified in 16 Tex. Admin. Code (TAC) § 25.181, relating to the energy efficiency goal. All regulated Texas electric utilities are required to achieve no less than five percent of their total demand reduction goal through programs serving HTR customers (16 TAC § 25.181(e)(3)(F)). 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 efficiency program (16 TAC § 25.181(r)). 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.

3.1.3.1 Low-Income Budget Goals

Figure 17 shows the four ERCOT IOU's performance against their required low-income goals of no less than ten percent of the annual energy efficiency budget. All ERCOT IOUs met the LI program budget goals for PY2023. In PY2023, Oncor saw a slight decrease in spending but still exceeded goals by nearly two percent. Oncor far exceeded its LI spending goal by $1.9 million and $2.1 million for PY2021 and PY2022, respectively. In PY2023, CenterPoint increased its spending substantially compared to previous years, jumping up from 10.6 and 11.4 percent of the portfolio budget in PY2021 and PY2022, respectively, to 16.1 percent in 2023.

AEP Texas did not meet its goal in PY2022 based on actual spending. In PY2022, ten percent of the total budget for AEP Texas was $1,795,902, based on the projected budget of $17,959,017. AEP Texas spent $1,790,210, just short of the goal by $5,692. However, in PY2022, AEP Texas' actual spending for the portfolio was less than the projected budget by four percent, $17,220,700. When comparing actual funds expended, AEP Texas spent 10.4 percent of its total portfolio on targeted LI. In PY2021 and PY2022, TNMP spent nearly 15 percent of its total portfolio budget on its LI weatherization program. However, while still achieving goals, TNMP's spending in PY2023 decreased to about 11 percent of total portfolio spending.

Figure 17. ERCOT IOU Low-income Goal Performance, 2021–2023



3.1.3.2 Hard-to-Reach Demand Goals

Figure 18 shows ERCOT IOU's performance against their required HTR goal of no less than five percent of demand reductions, followed by outside-of-ERCOT IOU's performance against HTR demand goals. All IOUs met or exceeded the HTR demand reduction goal of five percent of their total demand reduction goal based just on their HTR programs, except CenterPoint, which will be discussed more below.

Figure 18. ERCOT HTR Demand Goal Compared to Actual Demand Reduction, 2021–2023

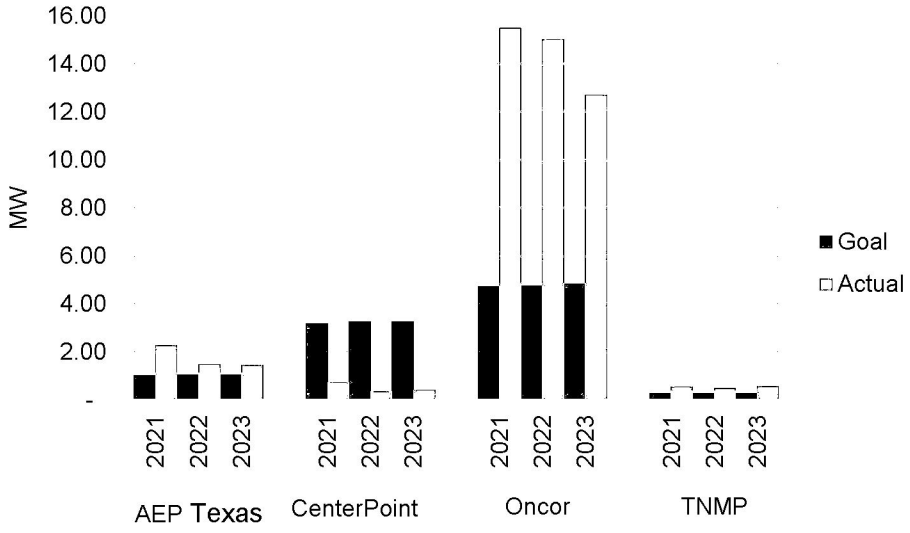
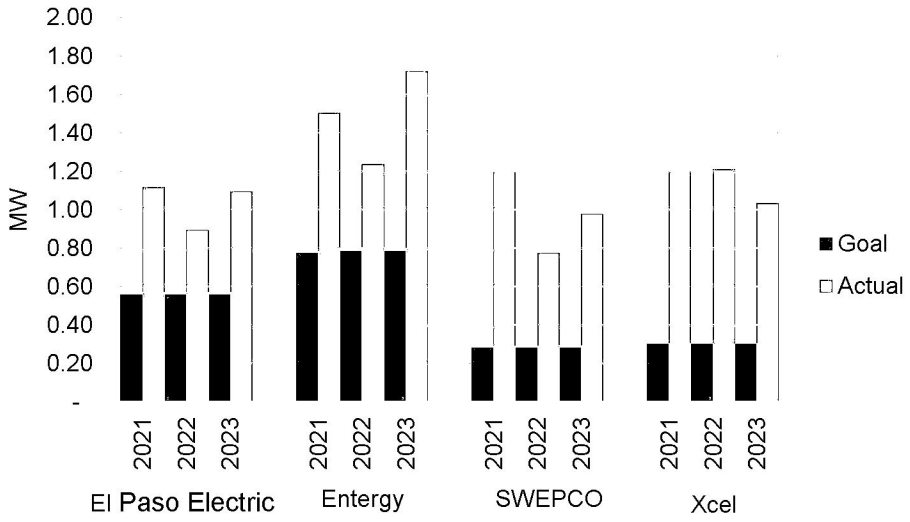
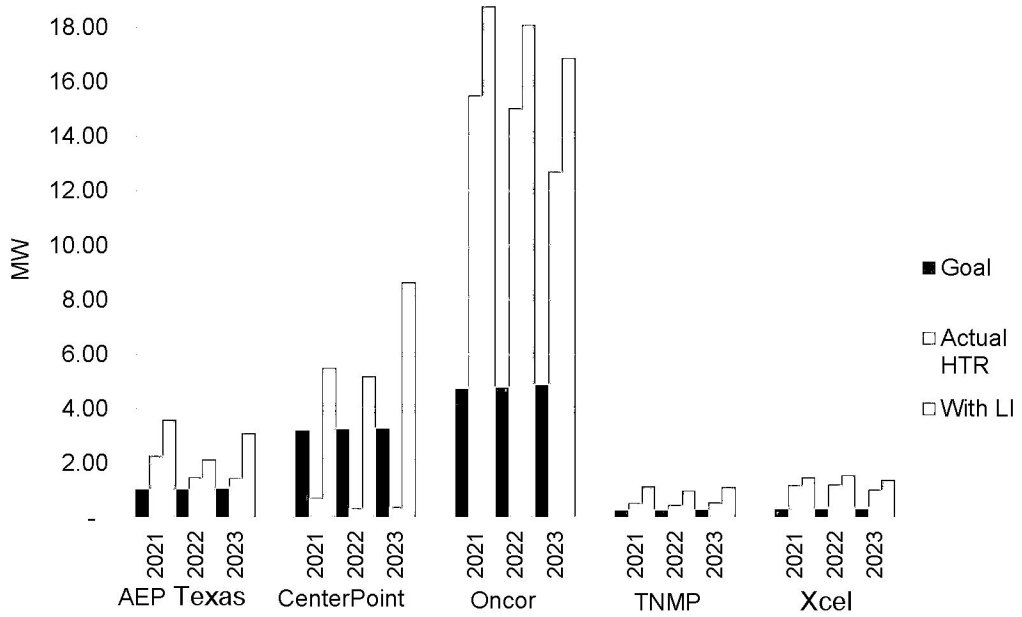


Figure 19. Outside-of-ERCOT HTR Demand Goal Compared to Actual Demand Reduction



As can be seen in Figure 20, CenterPoint exceeded the HTR goal when the demand reduction from their Targeted Low-Income program was included. Outside-of-ERCOT IOUs and Oncor far exceeded their HTR goal, while the remaining ERCOT IOUs slightly exceeded goals. ERCOT IOUs also serve HTR customers through their targeted LI programs and split resources between the HTR and LI programs. Outside-of-ERCOT IOUs do not have the same requirement for targeted LI programs; however, Xcel offers a targeted LI program in addition to the HTR program. Figure 20 shows the megawatt reduction, including the targeted LI programs, compared to the goals for the ERCOT IOUs and Xcel.

Figure 20. ERCOT IOU HTR Demand Reduction Compared to Goal with Low-Income, 2021-2023



3.1.4 Program Tracking

Tetra Tech received all the energy efficiency program tracking data from the utilities and uploaded the harmonized program tracking data in an automated fashion to a centralized database. The team's key findings during the data harmonization process resulted in the development of recommendations for the data providers to improve the process:

Key Finding #1: The documentation and clarity of program tracking data have greatly improved, especially for umbrella programs with subprograms, but there are still opportunities for improvement.

The EM&V team appreciates the improved communication with the utilities and their tracking system providers; this improved communication has improved the verification of all claimed savings with program tracking data. However, there are still some areas in need of consistency across utilities to keep improving the value of the information provided through the program tracking data.

Recommendation #1: Include a definition of "participant" when providing the tracking data. For ERCOT utilities, each participant should have their own unique identifier, "ESIID." For outside-of-ERCOT utilities, however, there is no ESIID; a meter number or account number should be provided for each qualified participant in the tracking data, and the description should be provided. Also, we recommend storing the ESIID in string/text format instead of in a number format.

Recommendation #2: It is nice to have detailed information on the load management program data; however, it should be separated from the other energy efficiency program data. For example, Entergy provided the load management information along with the other residential energy efficiency programs this year, but the load management savings cannot be claimed with the other energy efficiency programs.

Recommendation #3: A unique measure ID, not only the name and description, should be included for each specific measure. The data providers should provide a way to uniquely identify the measure in the respective programs, as there are measures with the same name and description. Without providing a measure ID by the data providers, the process of tracking the actual measures is complicated and adds difficulties to the evaluation and verification process.

Recommendation #4: A unique ID assigned to each tracking record should be provided throughout the year. Due to the lack of a unique ID, connecting the data from quarter to quarter is sometimes hard and may impede the evaluation process.

3.1.5 Program Documentation

Tetra Tech collected and reviewed project documentation from individual sampled projects for programs with *high* and *medium* evaluation priorities in PY2023. The review evaluates the overall documentation's completeness, identifies discrepancies between the tracking system and the installed measure, and reviews the energy savings calculations for compliance with the technical reference manual (TRM). Based on this work, the EM&V team offers the following key findings and recommendations:

Key Finding #1: New implementers appeared to have documentation available for evaluation but did not provide it for the evaluation request.

Several new third-party implementation teams and staff were leading programs that were evaluated this year. The EM&V team provided the documentation request for all utility programs. All participants could upload documentation to SharePoint, but the files uploaded by first-time program managers and new implementation teams were minimal and did not match the TRM requirements for documentation. Upon further discussion, many of the first-time project managers had the documentation available; it was just not uploaded or not easily accessible for the EM&V team review. Many first-time implementation teams reached out to the EM&V team before the evaluation period to request technical assistance for projects to verify consistency with EM&V expectations, so the impact of the missing documentation was limited. Most utilities and implementers accepted the lower documentation score but with discussions of what would be improved next program year.

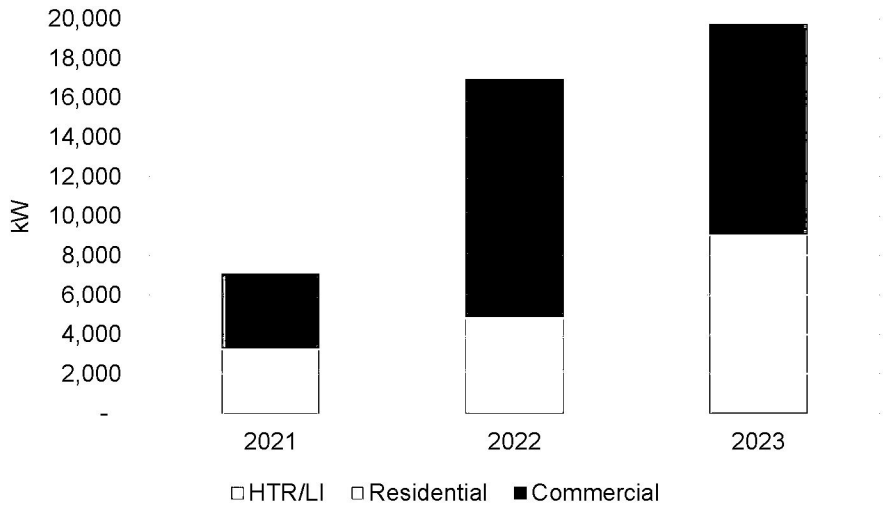
Recommendation #1: The EM&V team should discuss documentation expectations with new implementers before the documentation request.

3.2 CROSS-SECTOR RESULTS

3.2.1 AC/HP Tune-Up

Texas energy efficiency has seen a large growth in the savings generated by AC and heat pump (HP) tune-ups in the previous three years. There has been a steady increase of over 30 percent for the residential tune-ups, including the addition of LI and HTR participant-specific programs. The commercial tune-ups were first introduced in 2021 and fully adopted in 2022. The AC and HP tune-up measures claimed over 19 MW of peak demand reduction in 2023.

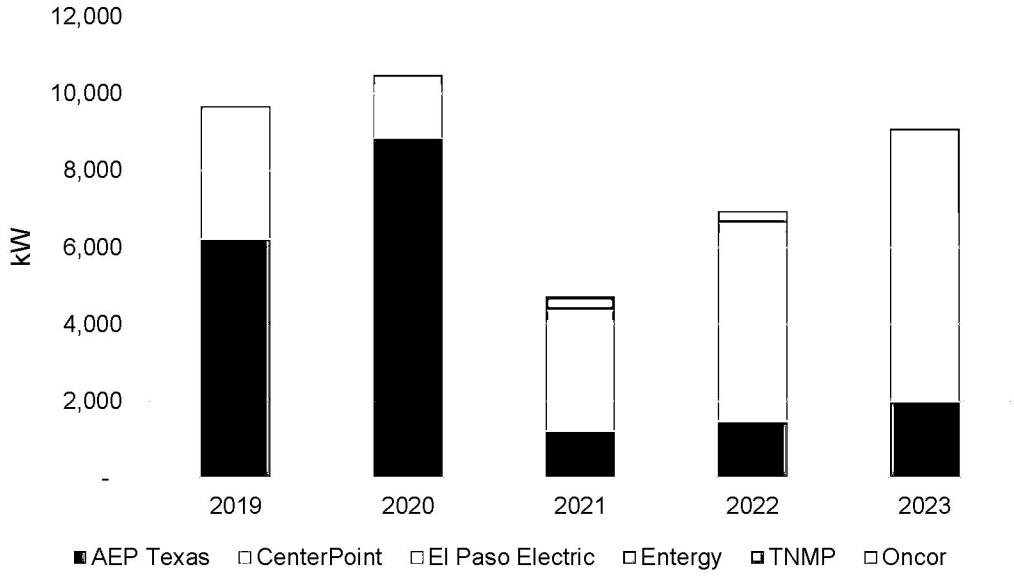
Figure 21. AC/HP Tune-Up Claimed Savings by Sector



3.2.1.1 Residential Trend Analysis

In 2023, six utilities implemented residential tune-up measures and claimed 9,000 kW of peak demand savings. Starting in 2019 and 2020, savings were primarily driven by AEP Texas and CenterPoint; however, 2021 saw a noticeable decline in total kilowatt savings. The COVID-19 pandemic likely influenced the drop in savings, and after that point, AEP Texas had a much smaller program. Over the past three years, savings have steadily increased because more utilities deliver tune-ups and each utility increases the volume year after year. Combined, the savings in 2023 nearly reached the levels of 2019 and 2020. Included in this growth is Oncor's implementation of a program specifically for LI participants.

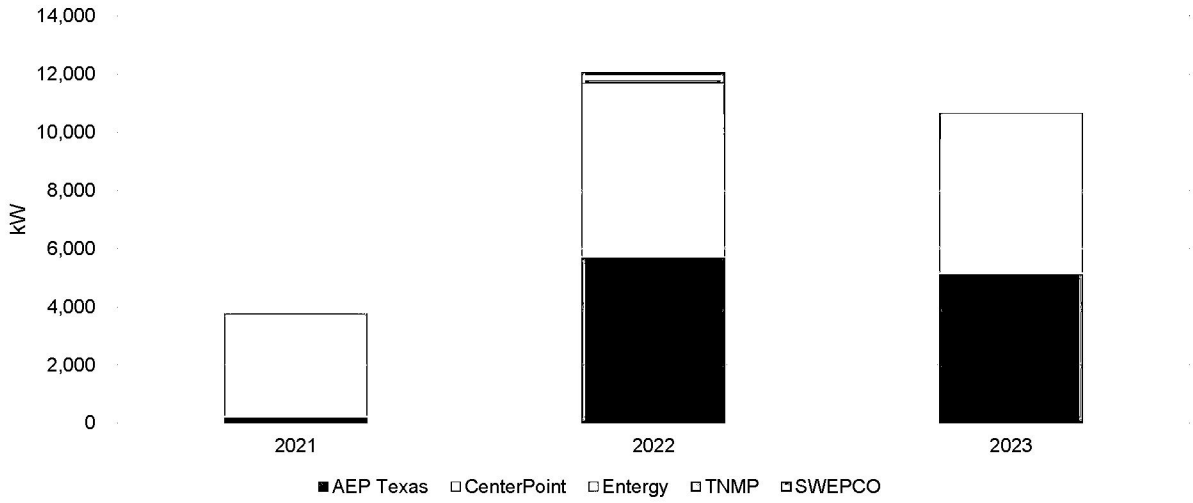
Figure 22. Residential Tune-Up Trend by Utility



3.2.1.2 Commercial Trend Analysis

In 2023, five utilities implemented commercial tune-up measures and claimed 10,600 kW of peak demand savings. Commercial tune-ups were started in 2021 by AEP Texas and CenterPoint; in the following year, five utilities started delivering commercial tune-ups and nearly tripled the amount of claimed savings. In 2023, the combined savings from all utilities remained at a similar level, with all utilities except CenterPoint, which reduced the volume slightly.

Figure 23. Commercial Tune-Up Trend by Utility



3.2.1.3 Tune-Up Evaluation Findings

The number of residential and commercial tune-ups is predicted to continue to grow as more utility programs are launched, and the local contractors become more efficient at delivering the service with existing utilities. These programs continue to provide value to participants, and with the recent expansion of the tune-up measure, the EM&V team has several findings for the implementation and calculation of savings.

Most of the tune-up measure savings are being calculated using Measure 2.1.1 in Volume 4 of the TRM. This measure defines a measurement process and sampling, which is used to estimate savings based on the post-tune-up measurements for the remaining tune-ups implemented. A series of pre-tune-up measurements and post-tune-up measurements are provided for all sampled units serviced. The variation between the pre-service and post-service measurements is used to estimate the sampled unit's efficiency improvement through a conversion of the measurements to estimated energy consumption. The sampled units are used to develop an efficiency loss factor, which is applied to each post-tune-up measurement to determine program savings. The efficiency loss factor is an average of the previous three years' values because of the high level of variability, but nearly all the units show improvement in the performance characteristics.

The PY2023 EM&V completed desk reviews of residential tune-ups, a review of the pre-tune-up and post-tune-up sampled measurements, and a review of the calculation process to convert the measurements into estimated energy consumption. The key findings and recommendations below apply to all implemented AC and HP tune-up measures implemented in programs in Texas. The goal is to (1) provide a program that meets the high QA levels expected by the TRM measure to continue to use the sampling procedure of pre-service measurements and (2) simplify the energy savings calculation from those measurements.

Key Finding #1: Greater transparency and confidence are needed in the AC/HP tune-up savings approach. The field-collected values had discrepancies with the documentation.

- The *estimated project completion date*, *submitted date*, and *invoice date* had discrepancies, indicating the process was not followed.
- The building type (single-family vs. multifamily) did not consistently match the actual building type. In PY2022, the evaluation found that the commercial building type did not consistently match the actual building type.
- The capacity of the serviced unit in the documentation did not match the tracking system consistently. In the PY2022, the evaluation found the unit capacity did not consistently match the actual capacity of the units.
- One unit was identified as an AC unit, which was actually an HP.
- Invoices:
    - Two projects had missing invoices in the documentation.
    - One project address on the invoice did not match the tracking data.
    - Incentive amounts between invoices and tracking data varied.
- The reported elevation and altitude for projects were not consistent with the addresses of the tune-ups.
- The reported ambient temperature did not consistently match the recorded airport weather data nearest to the project site.

Based on similar findings in the PY2022 evaluation, the PY2023 evaluation resulted in recommendations to increase the QA of the tracking system data prior to the calculation of savings. As part of the follow-up from that recommendation, Measure 2.1.1 in Volume 4 of the TRM Version 11 (for 2024 implementation) was updated to increase the *Program Tracking Data and Evaluation Requirements* components to provide increased clarity of the implemented process for each project.

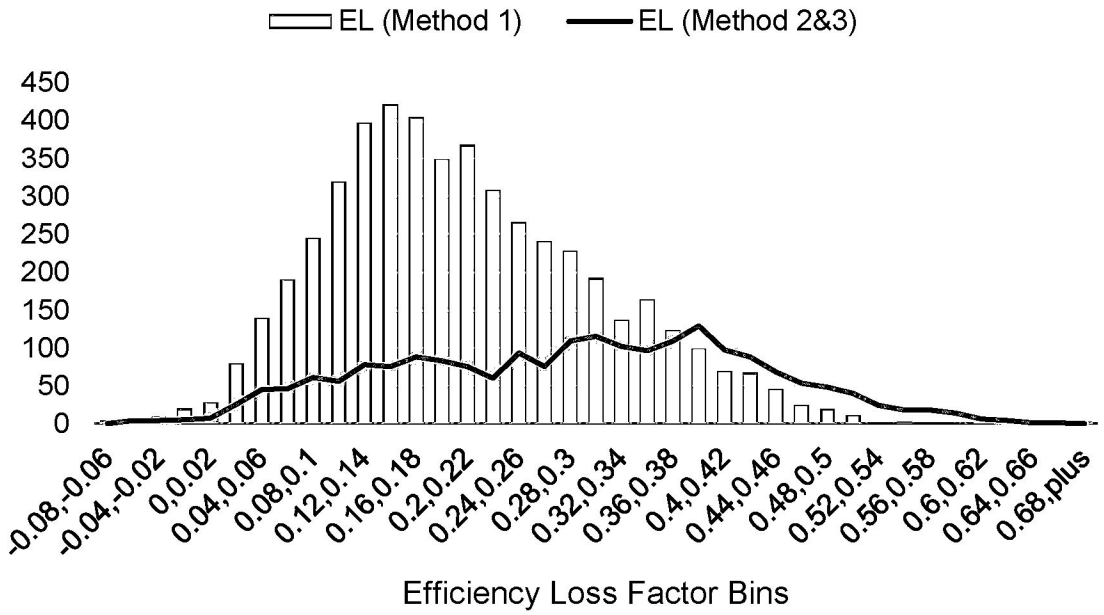
Recommendation #1A: Implement the increased requirement of the *Program Tracking Data and Evaluation Requirements* in the TRM measure and improve QA/QC processes for tracking data to ensure consistency with invoice dates, incentive amounts, unit capacities, building types, addresses, temperatures, and other data collected.

Recommendation #1B: Adjust the calculation process to deem the atmospheric pressure (which is currently calculated from the elevation and altitude).

Key Finding #2: The efficiency loss calculation includes three methods of determining airflow measurements. There is a significant variation in efficiency loss values between the three methods.

Airflow methods 2 (generic fan charts) and 3 (manufacturer fan charts) resulted in higher efficiency loss values compared to airflow method 1 (direct air measurement) over the past three years; this is likely because of the difficulty of locating an operating point on a fan curve, and the assumptions associated with that effort appear to be increasing the efficiency improvement values. Figure 24 shows the histogram of the number of projects by the efficiency loss factor bin. Although the number of method 2 and 3 projects is much lower than the number of method 1 projects, the different distribution of efficiency loss factors impacts the overall efficiency loss factor determination.

Figure 24. Histogram of 2021–2023 Projects in Efficiency Loss Factor Bins by Airflow Method



In addition, the evaluation found that manufacturer fan charts were not collected, and generic fan charts were used for all projects reported as using airflow methods 2 or 3. The generic fan chart that was used provided a straight line between estimated operating points, which does not reflect the detail of actual fan charts measuring power from static pressure and airflow.

The update to Volume 4 in TRM 11.0 requires the provision of marked-up manufacturer fan charts and will exclude generic fan charts in TRM 12.0.

Recommendation #2: The sampled tune-ups for the efficiency loss factor calculation should use direct air measurement (airflow method 1). Airflow methods 2 and 3 should not be used in the determination of the efficiency loss factor.

Key Finding #3: The amount of savings delivered by this measure across Texas requires a more detailed evaluation to ensure the accuracy of the energy savings.

Both the residential and commercial trend analysis of this measure indicate a more detailed level of evaluation is required over multiple years. Prior to the 2025 implementation, recommendation #2 should be implemented on the previous three years of sampled tune-ups to determine the efficiency loss factor for use by implementers. Dialog should continue during the evaluation to coordinate additional QA improvements, ensuring the tracking values match the actual conditions. The TRM measure should be updated to eliminate complexity, reduce specific equipment restrictions, and develop a pathway for implementation when a three-year history of projects is not available. In 2025, a multi-year EM&V plan for the specific measure should be completed and presented in the evaluation planning process. The EM&V team recommends that the plan include a consumption analysis, contractor interviews, participant surveys, and site visits.

Recommendation #3: Future evaluations should have high prioritization on the tune-up measures for both residential and commercial that include consumption analyses and other efforts to support increased accuracy of the claimed savings.

4.0 COMMERCIAL ENERGY EFFICIENCY PROGRAMS

4.1 SUMMARY RESULTS

This section presents investor-owned utility (IOU) summary results, followed by key findings and recommendations from all relevant evaluation, measurement, and verification (EM&V) activities.

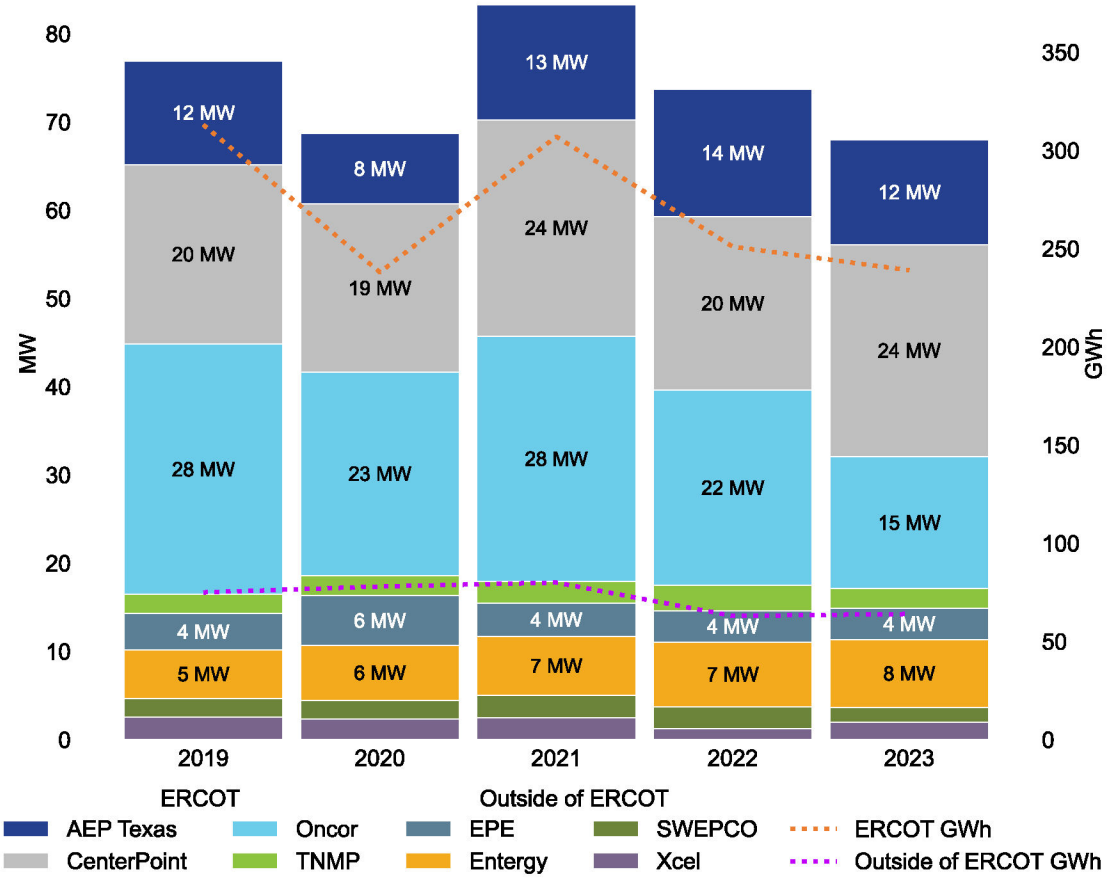
4.1.1 Savings

The IOU program year (PY) 2023 (PY2023) gross savings from commercial sector programs were:

- 67,951 kilowatts (kW) (demand reduction) and
- 302,421,596 kilowatt-hours (kWh) (energy savings).

As shown in Figure 25, demand reduction results reflected a decrease from PY2019 to PY2020 (77 megawatts (MW) to 69 MW, respectively) but rebounded in PY2021 to 83 MW. Similar results occurred with energy savings; there was a decrease from PY2019 to PY2020 (388 gigawatt-hours (GWh) to 317 GWh, respectively) and an increase from PY2020 to PY2021 (317 GWh to 385 GWh, respectively). PY2021 and PY2022 saw consecutive demand savings dip from 83 MW to 74 MW, and energy savings were reduced from 385 GWh to 314 GWh. There were also similar decreases in demand and energy savings from PY2022 to PY2023, where demand decreased from 74 MW to 68 MW, and energy decreased from 314 GWh to 302 GWh.

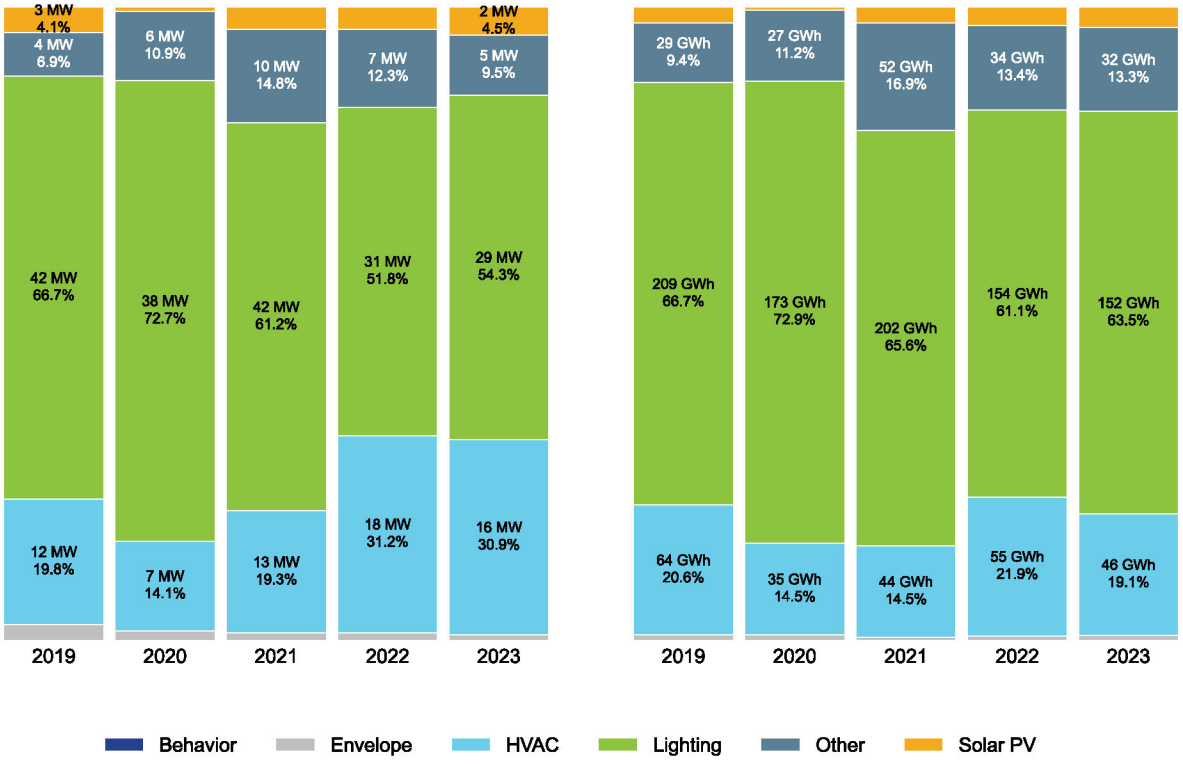
Figure 25. Total IOU Demand Reduction and Energy Savings by Program Year—Commercial Programs Excluding Load Management, PY2019–PY2023[23]



Lighting measures, while still accounting for over one-half of the demand reduction (54 percent) and energy savings (64 percent), have decreased over the past five years for the ERCOT utilities. The ERCOT programs have substantially increased *HVAC* in the last two years to approximately 30 percent of demand reductions and 19 percent of energy savings, almost double the prior-year savings (Figure 26).

[23] The following data points consist of the MW savings values that were unable to make it on the graph due to limited space: TNMP: PY2019, 2.150 MW; PY2020, 2.282 MW; PY2021, 2.420 MW; PY2022, 2.877 MW; PY2023, 2.221 MW. SWEPCO: PY2019, 2.131 MW; PY2020, 2.102 MW; PY2021, 2.564 MW; PY2022, 2.459 MW; PY2023, 1.684 MW. Xcel: PY2019, 2.567 MW; PY2020, 2.369 MW; PY2021, 2.462 MW; PY2022, 1.285 MW; PY2023, 1.958 MW.

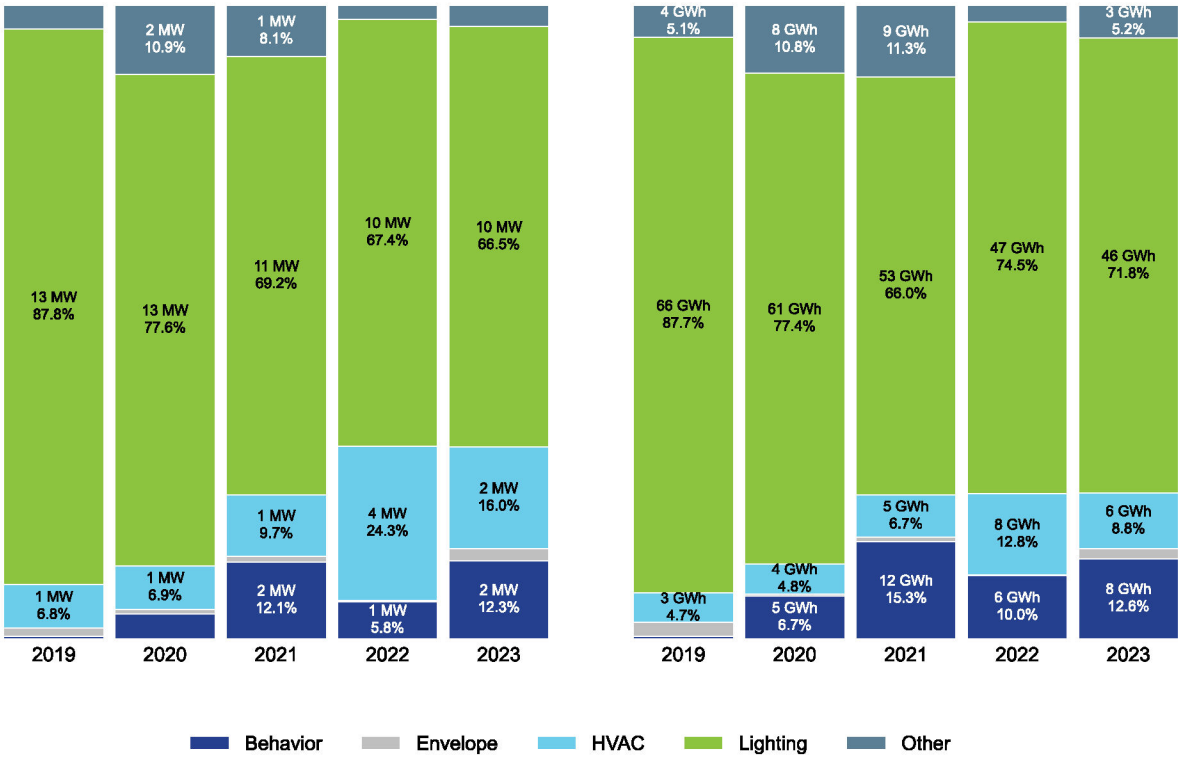
Figure 26. Distribution of IOU Demand Reduction and Energy Savings by Measure Category—Commercial ERCOT Programs Excluding Load Management PY2019–PY2023[24]



While *lighting* measures remain the majority of the outside of ERCOT utilities' demand reductions (67 percent) and energy savings (72 percent), the last three years have seen *HVAC* and *behavioral* measures account for approximately a quarter of demand reductions and energy savings, which is an increase from earlier years (Figure 27).

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

Figure 27. Distribution of IOU Demand Reduction and Energy Savings by Measure Category—Commercial Outside of ERCOT Programs Excluding Load Management PY2019–PY2023[25]



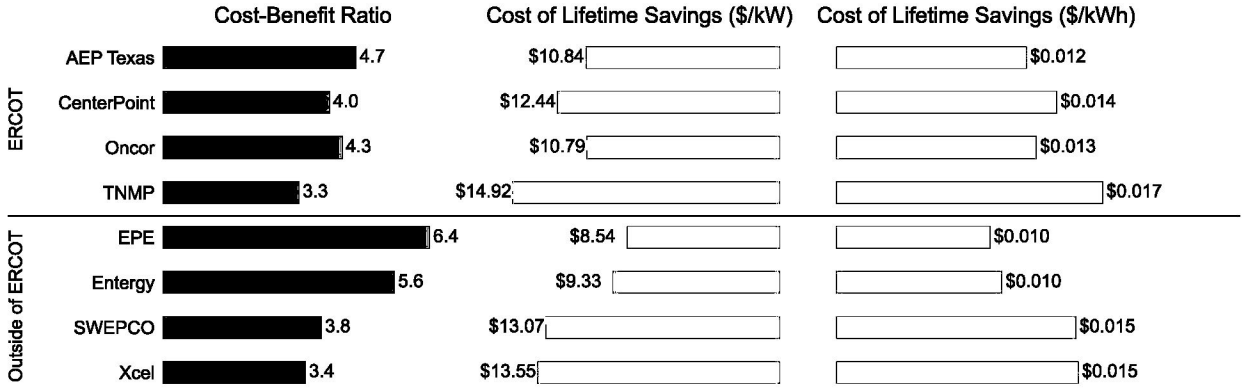
4.1.2 Cost-Effectiveness

Figure 28 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 4. There is variation in the utilities' results in the commercial sector because of the diversity of program designs offered by the utilities.

Figure 28 summarizes the cost of lifetime kilowatt-hours and kilowatts for each utility's commercial sector programs. The cost per kilowatt-hour ranges from $0.010 to $0.017, and the cost per kilowatt ranges from $8.54 to $14.92. These costs provide an alternate way of describing the cost-effectiveness of a portfolio of commercial programs; portfolios with a higher cost-effectiveness ratio will have a lower cost to acquired savings and vice versa.

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

Figure 28. Cost-Benefit Ratio and Cost of Lifetime Savings—Commercial Programs PY2023



4.2 COMMERCIAL PROGRAMS

4.2.1 Program Overviews

This section summarizes the key findings and recommendations from the PY2023 evaluation of commercial energy efficiency projects. All commercial energy efficiency programs and the Strategic Energy Management pilot were a *medium* evaluation priority in PY2023. The utilities will consider the recommendations for PY2025 implementation and incorporate them into the PY2025 Texas TRM 12.0 as appropriate.

The EM&V team conducted a streamlined EM&V effort that couples broad due diligence verification of savings for the commercial programs with targeted in-depth activities, including engineering desk reviews, on-site verification, and interval meter data analysis based on the prioritization of the programs.

The EM&V team evaluated the commercial energy efficiency programs described below. There are two program types: standard offer programs (SOP) and market transformation programs (MTP). An SOP is a program under which a utility administers standard offer contracts between the utility and energy efficiency service providers (EESP). These contracts specify standard payments based on energy and peak demand savings achieved through energy efficiency measures, measurement and verification (M&V) protocols, and other terms and conditions. An MTP is a strategic program intended to induce lasting structural or behavioral changes in the market, resulting in increased adoption of energy-efficient technologies, services, and practices.[26] SOP and MTP programs continue to represent the most significant percentage of IOU savings.

Commercial SOP: The Commercial SOP provides new construction and retrofit installation incentives for various measures that reduce demand and save energy in nonresidential facilities. Incentives are paid to EESPs (project sponsors) based on deemed savings or verified demand and energy savings at eligible commercial customers' facilities. The utility has a limited group of participating project sponsors, determined through a selection process. This selection process is based on meeting minimum eligibility criteria, complying with all program rules and procedures, submitting documentation describing their projects, and entering into a standard agreement with the IOU.

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

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.

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.

HVAC Tune-Up MTP: The HVAC Tune-Up MTPs are dedicated programs that directly implement HVAC system tune-ups. The program typically serves residential and commercial participants through the same service network. The programs have various names and are often included under the MTP programs.

Solar Photovoltaic (PV) MTP and SOP: The Solar PV programs are both MTP- and SOP-type programs, depending on the utility. These dedicated programs provide financial incentives for commercial customers to install solar PV on-site power generation systems and use the electricity to offset electricity consumption on the electrical grid. The programs have various names, and solar PV projects are also included under either MTPs or SOPs.

Small Business MTP: The Small Business MTP is sometimes referred to as the Open MTP by Texas utilities. It is designed to assist small business customers with identifying and implementing cost-effective energy efficiency solutions at their workplace. The program typically offers limited measures that are applicable to most small businesses. Small business customers are defined as business customers that do not have the in-house capacity or 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.

4.2.2 Commercial Market Transformation Programs

This section presents the Commercial Solutions and SCORE program results, which were a *medium* evaluation priority. The MTP programs also include the small business, midstream, and custom savings programs, which were also designated as *medium* evaluation priority in PY2023.

Some utilities have dedicated midstream, small business, and custom savings programs, while others roll those services into their standard MTP programs. Therefore, commercial measures are implemented through a variety of programs. The findings are identified by the type of measure and may apply to all implementation methods or a subset of methods.

The EM&V team conducted desk reviews and on-site verification visits for a sample of projects from the *medium*-priority commercial MTP programs. For the desk reviews, the EM&V team applied the method prescribed in the PY2023 TRM 10.0 to verify energy savings and demand reduction for each project sampled. Comparing the evaluated savings to the original utility-claimed savings (ex-ante) showed agreement in about one-half of the projects. The results of the 2023 evaluation found that fewer project adjustments and the range of savings adjustment decreased over the previous year. Although some individual projects had extensive adjustments when evaluated, nearly two-thirds of the projects were within five percent of the claimed savings. Table 10 presents the range of evaluated project-adjusted savings for MTP projects when comparing evaluated ex-post savings to ex-ante savings. The range identifies the variability in evaluated results for various MTP programs and provides additional context for the key findings and recommendations.

Table 10. Range of Evaluated Adjusted Savings for Market Transformation Program

Program	Evaluated adjusted savings comparison (kW)	Evaluated adjusted savings comparison (kWh)
Commercial Solutions MTP	52%-143%	65%–279%
SCORE MTP	78%–159%	83%–146%
Small Commercial MTP	27%-134%	33%–131%
M&V and Custom MTP	9%–134%	47%–126%
Midstream MTP	62%-113%	54%–106%

4.2.3 Commercial Standard Offer Program

The Commercial SOP programs were a *medium* evaluation priority in PY2023. These programs included the prescriptive and deemed savings measures also delivered in the MTPs.

The EM&V team conducted desk reviews and on-site verification visits for a sample of projects from the *medium*-priority Commercial SOP program. For the desk reviews, the EM&V team applied the method prescribed in PY2023 TRM 10.0 to verify energy savings and demand reduction for each project sampled. Comparing the evaluated savings to the utility-claimed savings showed agreement in about one-half of the projects; this is nearly equivalent to last year's evaluation. However, many adjustments resulted from a transition in HVAC efficiency ratings, which caused market-wide confusion and should be resolved naturally in the coming year. There were still measures and projects that had extensive adjustments, including one that reduced the savings to zero because the new construction area was incorrectly measured. Table 11 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 11. Range of Evaluated Adjusted Savings for Standard Offer Program

Program	Evaluated adjusted savings comparison (kW)	Evaluated adjusted savings comparison (kWh)
Commercial SOP[27]	53%-166%	52%–230%

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

4.2.4 Key Findings and Recommendations

All key findings and recommendations outlined apply to the measures for multiple implementation types of commercial MTP and SOP programs. Across utilities, programs include many of the same deemed and prescriptive calculations. In addition, many programs include custom calculations and M&V methodology to claim project savings.

4.2.4.1 Lighting Energy Savings

This section presents the lighting measures in various MTP and SOP programs. These programs and measures were a *medium* evaluation priority in PY2023.

The EM&V team conducted desk reviews and on-site verification visits for a sample of projects from the *medium*-priority lighting measures. For the desk reviews, the EM&V team applied the method prescribed in the PY2023 TRM 10.0 to verify energy savings and demand reduction for each project sampled. Comparing the evaluated savings to the utility-claimed savings showed agreement in slightly more than one-half of the cases. The lighting projects were implemented by many different programs and utilities, leading to a varied realization of 16 percent to 229 percent.

Based on the evaluation results, the EM&V team has outlined key findings and recommendations described below.

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

Key Finding #1: Lighting savings calculations were inconsistently completed across utilities when the baseline fixtures included occupancy sensors or other control devices.

The lighting savings calculations apply a reduction to installed lighting wattage, which translates to consistent savings when lighting controls are installed on a project that previously did not have lighting controls. However, the TRM does not indicate how to apply this factor when lighting controls are on the retrofitted lighting equipment. The uncertainty in the TRM created variability across utility program calculations.

Recommendation #1: Update the TRM measure for lighting equipment and lighting controls to specify calculations when baseline fixtures have lighting controls.

Key Finding #2: Many implemented programs did not identify non-operating lighting fixtures in the energy savings calculations.

The TRM applies an adjustment to the lighting calculations if the number of non-operating fixtures exceeds ten percent of the lighting equipment retrofit. Many programs did not appear to count and log non-operating fixtures to verify that the ten percent limit was not met. The evaluation could not apply a comprehensive value because the photograph documentation of the baseline condition captures limited fixtures.

Recommendation #2: Include the count of fully non-operational lighting fixtures in the calculation to verify the quantity does not exceed the limit in the TRM.

Key Finding #3: New construction exterior lighting can include multiple exterior lighting types, such as parking lots, loading docks, and pedestrian walkways, which can detail the exterior lighting allowable baseline wattage.

The exterior lighting savings calculation develops a baseline allowable lighting wattage from the area and an applied lighting wattage density based on area type. Evaluated projects consistently used only one exterior lighting area type, the parking and drive area. However, this simplification tends to underestimate the allowable wattage, which decreases savings.

The baseline development is based on code compliance, although the simplified calculation can create subareas that appear to not meet code. Some lighting calculators eliminate exterior lighting savings in this condition, which is not the intention of the TRM calculation.

Recommendation #3: Calculate exterior lighting savings using multiple exterior lighting zones and eliminate the code compliance verification in the calculation.

Key Finding #4: New construction projects require measurement of both interior and exterior areas. This area is estimated at the time of the initial application and is not consistently updated at project closeout.

The lighting baseline for new construction multiplies the allowable lighting wattage density by the area. The evaluation found that the area claimed in the calculation did not consistently match the area of the new construction facilities. The EM&V team understands the difficulty of claiming the area before the construction. However, the final QA verification of the projects should incorporate a review of the interior and exterior area of the construction to verify that it matches the constructed facilities.

Recommendation #4: Incorporate QA checks to verify interior and exterior areas at project closeout.

4.2.4.2 HVAC Energy Savings

This section presents the HVAC measures in various MTP and SOP programs. These programs and measures were a *medium* evaluation priority in PY2023.

The EM&V team conducted desk reviews and on-site verification visits for a sample of projects from the *medium*-priority HVAC measures. For the desk reviews, the EM&V team applied the method prescribed in the PY2023 TRM 10.0 to verify energy savings and demand reduction for each project sampled. Comparing the evaluated savings to the utility-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 37 percent to 279 percent.

Based on the evaluation results, the EM&V team has outlined key findings and recommendations described below.

Key Finding #1: PY2023 included the rollout of an efficiency rating system for HVAC equipment with a different baseline than the old rating system. The AC and HP baseline efficiencies did not align with the efficiency rating of the installed equipment in the calculation.

The market conditions in PY2023 created a transitional situation where equipment could have one of two different efficiency-rated values. The different values had differing baselines, so confirming that the calculation had the proper baseline for each HVAC equipment item was complicated. Since this was a transitional year, the indication of which rating baseline to use was misapplied in many projects reviewed; this slightly adjusted the claimed savings value in both positive and negative directions.

Recommendation #1: Institute a QA check on the energy savings calculation to ensure the efficiency rating of HVAC equipment matches between the baseline and installed equipment.

Key Finding #2: The HVAC energy savings calculation reduced energy savings when the installed equipment capacity exceeded the replaced equipment capacity. Current technology allows upsized equipment to match load better than historical and should not result in reduced savings.

Technological advances in HVAC equipment made the condition where the new technology had a larger capacity than the replaced units more common. The result of this adjustment in the calculation was to reduce the energy savings for the equipment replacement, although the technology included would not result in the calculated reduction in energy savings. The reason for this variation between calculated savings and expected actual savings is that the TRM calculation assumes the capacity of the equipment is matched to the load of the building. Although this is a prevalent situation, it was not always the actual situation. Adjusting the calculation to the estimated building load will eliminate the penalty when advanced equipment with a larger capacity is installed.

Recommendation #2: Adjust the TRM savings calculation to determine savings from building HVAC loads instead of equipment capacity.

4.2.4.3 M&V Methodology and Custom Energy Savings

The M&V methodology claims 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 savings 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 original utility claimed (ex-ante) savings for about two-thirds of the projects. 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 46 percent to 134 percent.

Key Finding #1: New implementers of custom projects needed support to claim peak kilowatt savings with the PDPF *top 20-hours* method and for regression analysis of peak kilowatts.

Programs with implementers that consistently submit custom and M&V project savings use the PDPF *top 20 hours* method in response to comments from previous evaluations and accessing technical assistance. However, staff and third-party implementers have recently started to complete these calculations and tend to use peak demand calculations that do not match the Texas TRM. The PDPF *top 20 hours* method is unique to the Texas TRM, and staff that has not previously implemented a custom calculated energy efficiency measure should be notified that the peak calculation is different. Utilities and the EM&V team have resources to support implementers in completing their first custom or M&V calculations and analysis.

Recommendation #1: Update the TRM to clarify using the PDPF *top 20-hours* method in Volume 1.

Key Finding #2: The regression analysis of hourly kilowatts for M&V projects regularly requires waivers to the statistical metrics in the TRM.

The M&V analysis requires a regression analysis of the hourly energy consumption, which can be applied to identify the annual kilowatt-hour energy efficiency. The hourly regression analysis tends to smooth out the consumption in each hour so that the overall year consumption represents the annual consumption. Volume 4 of the TRM identifies the statistical metrics required for this type of analysis to be valid without special approval. The implementers have had to create separate models that can be used for the peak demand reduction using the PDPF *top 20 hours* method. However, those models still smooth out the consumption during the peak periods that are to be measured.

The EM&V team has been providing specific technical assistance to implementers calculating the peak demand reduction to ensure that the peak demand calculation is acceptable because it infrequently meets the statistical metrics analyzed. The EM&V team recognizes that the metrics identified in the TRM are unobtainable for the peak kilowatt demand reduction calculation for most projects.

Recommendation #2: Update TRM Volume 4 to adjust the statistical metrics for peak kilowatt demand reduction regression analysis in both summer and winter peak calculations.

4.2.4.4 Foodservice and Refrigeration Energy Savings

This section presents the food service and refrigeration measures in either the Commercial High-Efficiency Food Service MTPs or other generalized MTPs. These programs and measures were a *medium* evaluation priority in PY2023.

The EM&V team conducted desk reviews and on-site verification visits for a sample of projects from the *medium*-priority food service and refrigeration MTPs. For the desk reviews, the EM&V team applied the method prescribed in the PY2023 TRM 10.0 to verify energy savings and demand reduction for each project sampled. Comparing the evaluated savings to the utility-claimed savings showed agreement in about one-third of the cases. Nearly all of the food service and refrigeration measures were implemented through a midstream delivery using streamlined assumptions, leading to project-level realization ranging between 38 percent and 113 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.

Based on the evaluation results, the EM&V team has outlined key findings and recommendations described below.

Key Finding #1: The midstream food service programs did not provide documentation regarding the measure assumptions and the savings calculation to the evaluator.

The midstream implementation for food service and refrigeration equipment included a set of standard assumptions about equipment. The documentation provided did not indicate the assumptions made, and the EM&V team was not able to recreate the savings value. Documenting the standard assumptions for equipment in midstream programs increases the transparency of the savings.

Recommendation #1: Document claimed savings assumptions per measure in available program documentation or the tracking system.

Key Finding #2: The midstream food service and refrigeration implementation did not consistently match the equipment specifications to the deemed measure savings.

The midstream implementation provided a system to ensure that equipment that received an incentive qualified per the requirements of the associated TRM measure. However, the documentation of the equipment did not track or utilize the individual equipment specifications to detail assumptions in the energy savings calculation from the TRM measure. Documenting the individual make and model specifications and using them to select the assumptions in the energy savings calculation will increase the accuracy of the program's claimed energy savings.

Recommendation #2: Document the equipment specifications of the program's accepted midstream measures and use them to select assumptions in the energy savings calculations. Alternately, use a documented conservative assumption for all equipment included in the program.

4.2.4.5 Envelope Energy Savings

This section presents the envelope measures in generalized MTPs. These programs and measures were a *medium* evaluation priority in PY2023.

The EM&V team conducted desk reviews and on-site verification visits for a sample of envelope projects from the *medium*-priority Small Business and SCORE MTPs. For the desk reviews, the EM&V team applied the method prescribed in the PY2023 TRM 10.0 to verify energy savings and demand reduction for each project sampled. Comparing the evaluated savings to the utility-claimed savings showed agreement for all projects except one with a project-level realization of 60 percent.

Based on the evaluation results, the EM&V team has outlined key findings and recommendations described below.

Key Finding #1: The measurement of door seals for the *entrance and exit door air infiltration* measure was inconsistent with the detail of the TRM calculation.

The *door seal* measure was the only envelope measure with a finding from the EM&V team. The measure was well implemented and met the objective of the TRM requirement; however, it underestimated the value of the existing door seals replaced. The project had many doors and provided good documentation of pre- and post-installation conditions. The EM&V team estimated that the pre-installation door seals were still 40 percent effective as a conservative assumption. A conservative assumption should be standard in the deemed savings values to streamline the measure implementation and savings claimed.

Recommendation #1: Adjust the TRM calculation to account for a whole-door measurement of door seals instead of door seal length.

4.3 MEASURE OPPORTUNITY ANALYSIS

Several measures have an opportunity to expand the number of commercial installations incentivized by the programs. Both the *smart thermostats* and *food service and refrigeration* measures are ideal for retrofit opportunities with implementation-type adjustments.

4.3.1 Smart Thermostats

Nearly one-half of commercial buildings in Texas were between 1,001 and 5,000 square feet, and approximately 75 percent of the floor area had space heating and cooling, according to the CBECS Survey[28]. Typical equipment used for HVAC is packaged heating and AC units controlled by a thermostat or a more comprehensive control system. In the CBECS Survey, only nine percent of the existing building stock identified using a smart thermostat to control the HVAC systems. Since 2018, smart thermostats and more comprehensive control systems in these spaces have significantly increased in new construction and major retrofits. However, smart thermostats can provide immediate savings from existing equipment without replacing HVAC equipment.

[28] Commercial Buildings Energy Consumption Survey (CBECS) 2018.

The Texas TRM has developed an estimate of energy savings for small commercial buildings that upgraded from a standard programmable thermostat to a smart thermostat in Measure 2.2.11 in TRM 11.0. The measure estimates heating and cooling savings of ten percent and eight percent of the estimated HVAC energy consumption, respectively. To identify the savings, the data collected to implement the measure includes the building type, HVAC equipment type, and HVAC capacity. Implementation of the measure can be completed as a midstream program. However, it will still require that the program collects the size and capacity of the equipment controlled in addition to the smart thermostat specification. Measure 2.2.2 for HVAC equipment sets out the baseline assumptions for midstream implementation for the assumptions associated with building type and climate zone that a midstream implementation of smart thermostats can utilize.

Utilities in Texas incentivized an average of 4,000 smart thermostats over the last three years. There is a significant opportunity to increase the number of small commercial participants by implementing this measure, which can lead to savings with existing equipment.

4.3.2 Food Service and Refrigeration Midstream Implementation

Foodservice buildings accounted for 5.3 percent of the total commercial buildings (around 40,000) and 1.7 percent of the total commercial floor space (193 million square feet) in Texas[29]. In addition to the traditional food service industry building, the 2018 CBECS Survey identified that refrigeration and food service equipment were widely used across many additional commercial buildings. Specifically, 71,000 buildings had walk-in units, 112,000 had refrigerated cases or cabinets, 11,000 had large cold storage areas, 125,000 had commercial ice makers, 450,000 had residential-type or compact units, and over 150,000 had food preparation or serving areas in non-food-service buildings. These figures highlight the extensive use of energy-intensive equipment throughout the commercial sector, presenting significant opportunities for energy savings through adopting more efficient technologies and spreading participant contacts across many different markets.

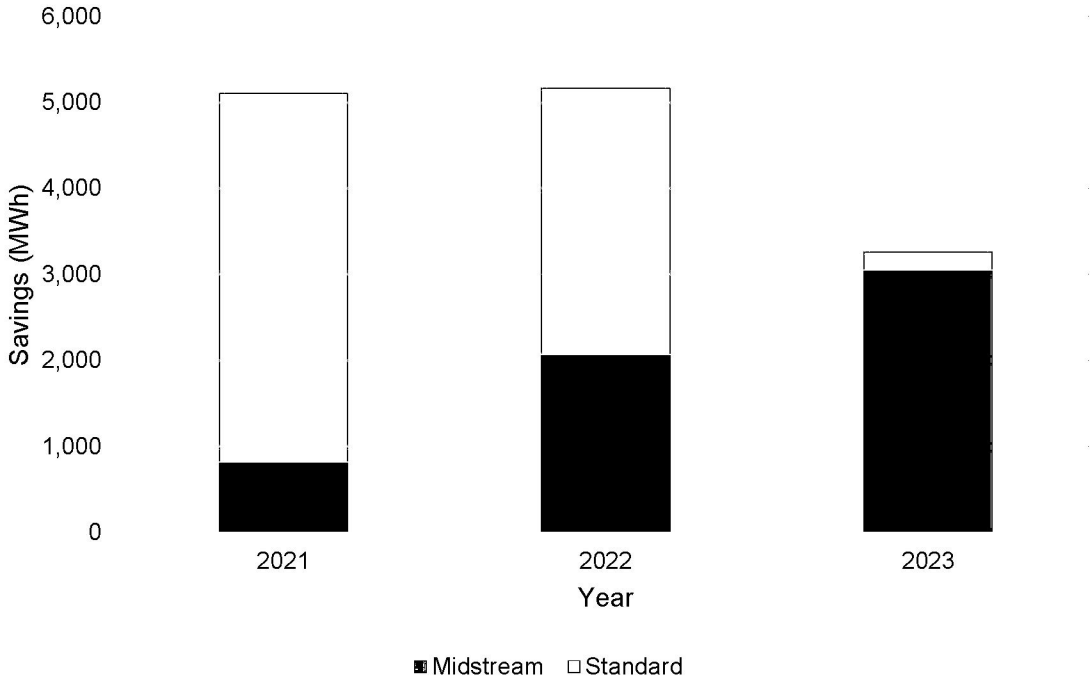
Expanding the *food service* and *refrigeration* measures is important because the commercial buildings that include this equipment have significantly increased energy consumption per square foot because of the food preparation and associated ventilation equipment. ENERGY STAR provides certification of this equipment to provide businesses with an indication of which equipment will impact energy consumption least when installed. However, a 2020 market study completed by ENERGY STAR found that about 25 percent of commercial food service equipment sold in the US was ENERGY STAR-certified[30]. For the programs to succeed, the benefits of ENERGY STAR equipment must be apparent to the equipment-purchasing individuals from the various building types.

CenterPoint piloted a midstream program in 2021 and has since converted it to an MTP[31]. This program provides incentives for energy-efficient food service and refrigeration equipment at the distributor level; therefore, it can reach all commercial buildings that include food service and refrigeration equipment in all building types. In the past three years, this midstream program consistently increased savings while the remainder of the standard programs implemented have seen decreased savings each year. Figure 29 shows the growth of the midstream implementation from about 16 percent of the savings for *food service* and *refrigeration*

[29] Commercial Buildings Energy Consumption Survey (CBECS) 2018.
[30] https://www.energystar.gov/sites/default/files/asset/document/2020%20USD%20Summary%20Report_Lighting%20%20EVSE%20Update_0.pdf.
[31] Center Point Commercial High-Efficiency Foodservice (CHEF) program.

measures. The program has expanded by about an additional 1,000 MWh per year for the past two years. The implementation through a midstream program is an opportunity for utilities to reach all participants who have food service equipment.

Figure 29. Claimed Savings from Food Service and Refrigeration Measures



The TRM currently includes electric energy efficient measures for refrigerators, freezers, ice makers, dishwashers, ovens, griddles, fryers, steamers, and demand-controlled ventilation. Beyond these measures, the utilities have provided research and propose to expand the TRM to include rack ovens, conveyor ovens and toasters, rotisseries, induction cooktops, electric deck ovens, hand wrap machines, ultra-low-temperature freezers, refrigerated chef bases, steam tables, and induction soup wells. In addition to the electric savings, food service equipment that saves natural gas can also be identified by the ENERGY STAR rating. Combining the energy-efficient commercial kitchen equipment can save a restaurant around $5,300 per year on energy bills. Expanding the measure availability and increasing the ability for incentives to support the purchase of energy-efficient equipment for all market sectors is an opportunity available across Texas.

5.0 RESIDENTIAL ENERGY EFFICIENCY PROGRAMS

5.1 SUMMARY RESULTS

This section presents the portfolio summary results for investor-owned utilities (IOU), followed by key findings and recommendations from all relevant evaluation, measurement, and verification (EM&V) activities.

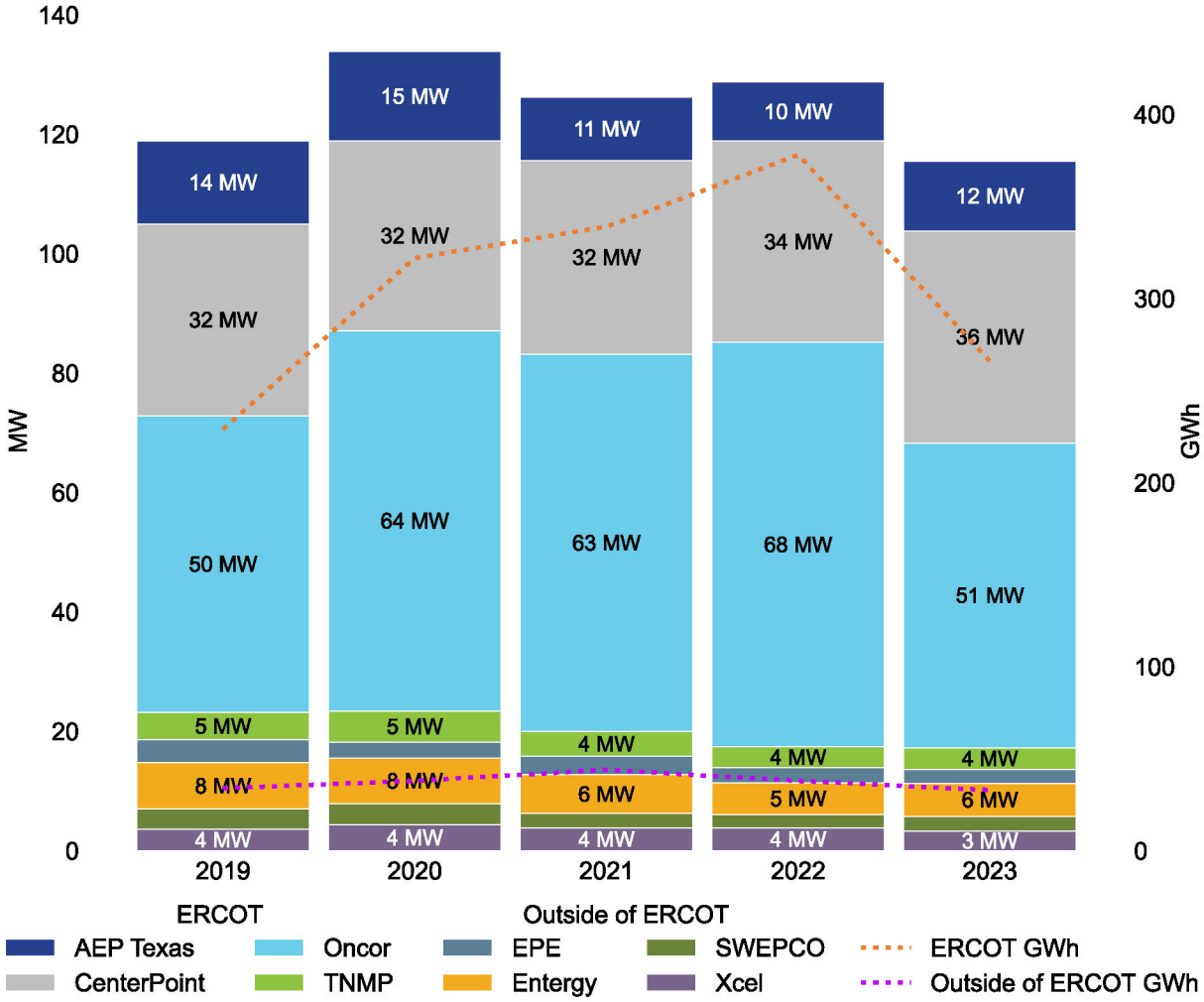
5.1.1 Savings

The IOU program year (PY) 2023 (PY2023) gross savings from residential sector programs (excluding load management) were:

- 115,509 kilowatts (kW) (demand reduction) and
- 299,659,010 kilowatt-hours (kWh) (energy savings).

As seen in Figure 30, the residential demand reduction achieved in PY2023 is the lowest in the last five years, and energy savings are the second lowest. One driver of this decrease is the updates to the TRM in PY2021 in response to results from the residential consumption analysis completed in 2020. The 2020 residential consumption analysis found that the residential deemed savings were overestimating savings found in the AMI meter data; several changes to the TRM were made to address these differences. This consumption analysis was updated as part of the PY2023 EM&V and discussed later in this section. In addition, PY2022 was the last year of residential lighting savings not affected by the Energy Independence and Security Act (EISA) backstop. Residential lighting savings were expected to decrease significantly in PY2023, which did occur across all IOU portfolios with the largest impact on Oncor's residential savings.

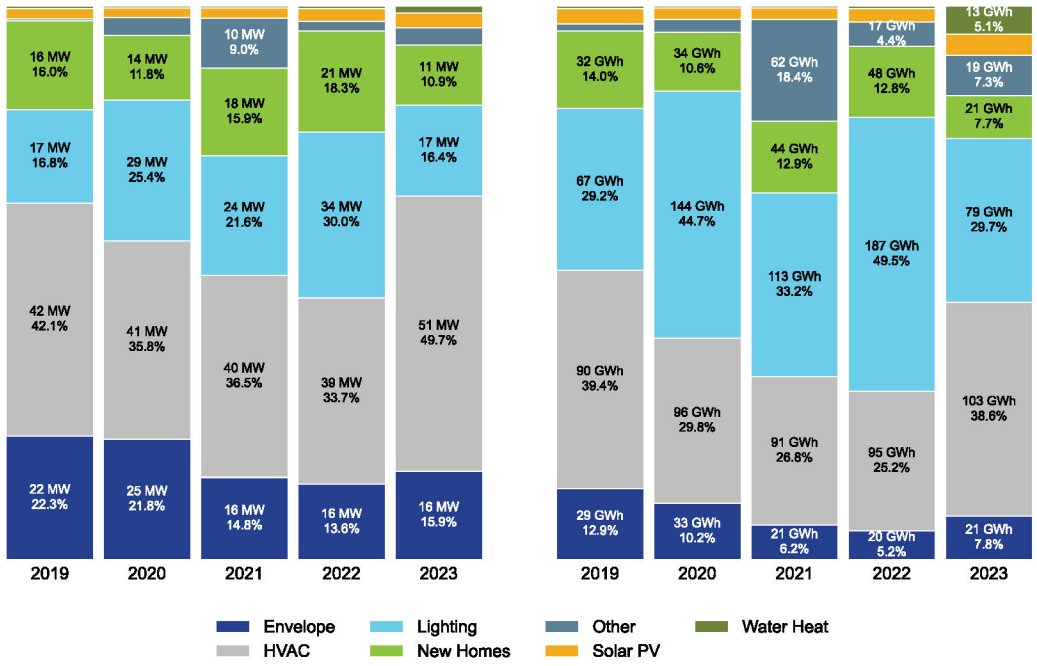
Figure 30. Total IOU Demand Reduction and Energy Savings by Program Year—Residential Programs PY2019–PY2023[32]



For PY2023, ERCOT IOU residential demand savings (excluding load management) and energy savings were primarily derived from *HVAC* measures representing almost one-half of kilowatts and over one-third of kilowatt-hours. Figure 31 presents the breakdown of savings by measure category and demonstrates that the ERCOT IOUs have successfully increased *HVAC* measures in their residential portfolios. While *lighting* has decreased substantially as a percentage of impacts, it is still the second highest contributor to demand reductions and energy savings, although *envelope* measures are a close third for demand reductions at 16 percent.

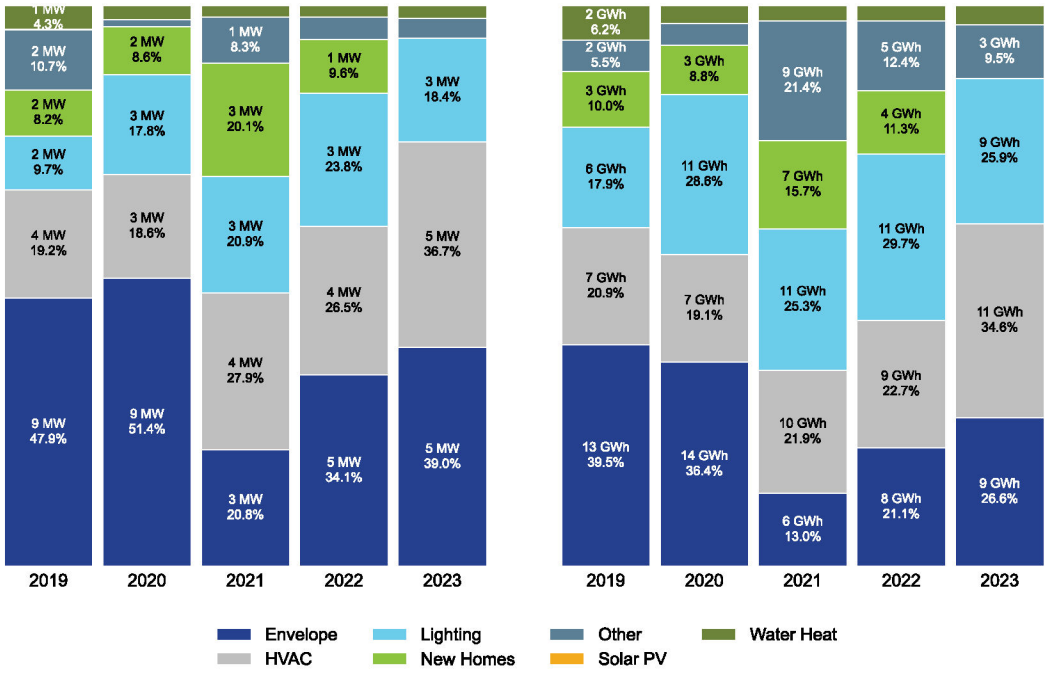
[32] The following data points consist of the MW savings values that were unable to make it on the graph due to limited space: TNMP: PY2019, 4.615 MW; PY2020, 5.183 MW; PY2021, 4.133 MW; PY2022, 3.506 MW; PY2023, 3.653 MW. EPE: PY2019, 3.798 MW; PY2020, 2.728 MW; PY2021, 3.118 MW; PY2022, 2.496 MW; PY2023, 2.334 MW. SWEPCO: PY2019, 3.382 MW; PY2020, 3.528 MW; PY2021, 2.457 MW; PY2022, 2.149 MW; PY2023, 2.442 MW. Xcel: PY2019, 3.588 MW; PY2020, 4.381 MW; PY2021, 3.820 MW; PY2022, 3.864 MW; PY2023, 3.325 MW.

Figure 31. Distribution of IOU Demand Reduction and Energy Savings by Measure Category—Residential ERCOT Programs PY2019–PY2023[33]



Outside-of-ERCOT IOU portfolios also saw an increase in *HVAC* measures as PY2023 programs achieved over one-third of kilowatt and kilowatt-hour savings from HVAC. *Envelope* measures are similar contributors to portfolio kilowatt and kilowatt-hour savings (Figure 32).

Figure 32. Distribution of IOU Demand Reduction and Energy Savings by Measure Category—Residential Outside-of-ERCOT Programs PY2019–PY2023[34]



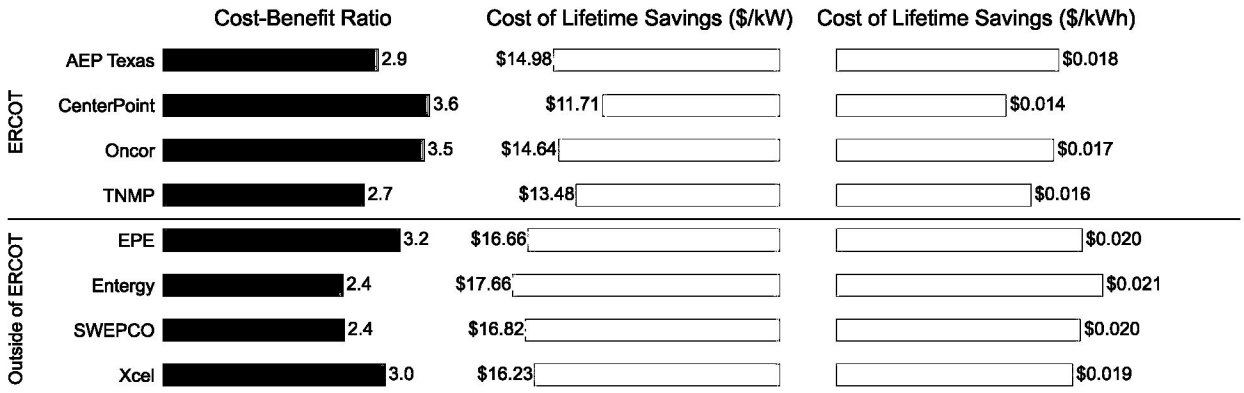
[33] Values less than four percent have been suppressed for visualization purposes.
[34] Values less than four percent have been suppressed for visualization purposes.

5.1.2 Cost-Effectiveness

The cost-effectiveness of residential sector programs across all IOUs is 3.0 based on gross claimed savings. Like the commercial sector, the residential sector's cost-effectiveness varied among utilities, ranging from 2.4 to 3.6; similarly, this is partly due to the differences in the types of programs offered by different utilities.

Figure 33 summarizes the cost-effectiveness of each utility's residential energy efficiency portfolio and the cost of lifetime kilowatt-hours and kilowatts for each utility's residential sector programs. The cost per kilowatt-hour ranges from $0.014 to $0.021, and the cost per kilowatt ranges from $11.71 to $17.66. These costs provide an alternative way of describing the cost-effectiveness of a portfolio of residential programs. Those portfolios with a higher cost-effectiveness ratio will have a lower cost to acquire savings and vice versa.

Figure 33. Cost-Benefit Ratio and Cost of Lifetime Savings—Residential Programs PY2023



5.2 RESIDENTIAL PROGRAMS

5.2.1 Program Overviews

This section summarizes the key findings and recommendations from the PY2023 evaluation of residential energy efficiency projects. The residential standard offer programs (SOP), hard-to-reach (HTR), low-income (LI) programs, and certain residential market transformation programs (MTP) were *high* or *medium* evaluation priorities. The recommendations are to be considered by the utilities for PY2025 implementation and will also be incorporated into the PY2025 Texas Technical Reference Manual (TRM) 11.0 as appropriate.

The EM&V team evaluated the residential energy efficiency programs described below. Like the commercial energy efficiency programs, there are residential SOPs and market transformation programs (MTP). The residential SOPs provided by the Texas utilities offer standard incentives for a wide range of measures that are bundled together as a project to reduce system peak demand, energy consumption, and energy costs. The residential MTPs offered in Texas are designed as a strategic effort to make lasting changes in the market that result in increased adoption of energy-efficient technologies, services, and practices. MTPs are designed to overcome specific market barriers that prevent energy-efficient technologies from being accepted. HTR and LI programs are also offered to provide comprehensive energy efficiency retrofits for single-family and multifamily customers who meet the program's income guidelines on the residential side.

Residential SOP: The Residential SOP provides incentives to project sponsors for a wide range of retrofit measures that reduce demand and save energy, targeting retrofit measures for residential customers in single-family and multifamily buildings. Incentives are paid to project sponsors for qualifying measures that provide verifiable demand and energy savings. The program is open to all qualifying energy efficiency measures, including but not limited to *air conditioning*, *duct sealing*, *weatherization*, *ceiling insulation*, *water-saving* measures, and *ENERGY STAR® windows*.

Hard-to-Reach SOP: The Hard-to-Reach SOP provides incentives to project sponsors for a wide range of retrofit measures that reduce demand and save energy in residential buildings. This program is available to customers whose annual total household income is at or below 200 percent of the current federal poverty level (FPL). Incentives are paid to project sponsors 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: The Residential Solutions MTP provides incentives to customers—through participating contractors—for a wide range of retrofit and new construction measures that reduce demand and save energy in residential buildings. The program also provides technical assistance and education on energy efficiency measures. This program is operated by one utility and is included in this section as it operates similarly to a residential SOP.

Residential New Construction MTP: The Residential New Construction MTP provides incentives to builders to increase the efficiency of new homes above minimum code efficiency. The utilities partner with raters on this program, who inspect homes and provide energy models to describe the program-sponsored homes. The utilities compare these energy models with code to estimate energy savings.

Residential Upstream/Midstream MTP: The Upstream and Midstream MTPs provide incentives to residential and small commercial customers through in-store discounts at participating retailers and distributors or through an online marketplace for qualifying high-efficiency *LED lighting*, *smart thermostats*, *energy-efficient appliances*, and *other efficient equipment*. Offering and delivery vary by utility.

Hard-to-Reach Solutions MTP: The Hard-to-Reach Solutions MTP provides incentives to customers—through participating contractors—whose annual total household income is at or below 200 percent of current FPL. Incentives are provided for a wide range of retrofits and new construction measures that reduce demand and save energy in residential buildings. The program also provides technical assistance and education on energy efficiency measures. This program is operated by one utility and is included in this section as it operates similarly to an HTR SOP.

Targeted Low-Income Solutions: The Targeted Low-Income Solutions program offers an energy audit to qualified LI residents of Texas. Alternatively, the program offers a review of the home's energy efficiency and the installation of weatherization measures to increase the home's energy efficiency. A household qualifies if the income is at or below 200 percent of the FPL, and their home must be able to benefit from being weatherized. Then, after the audit is completed, the program gives financial and installation assistance to improve the home's energy efficiency.

5.2.2 Residential New Homes and Upstream/Midstream Key Findings and Recommendations

Key findings and recommendations are presented first for New Homes programs and upstream/midstream measures. This is then followed by the detailed research that supports the key findings and recommendations.

5.2.2.1 New Homes

Key Finding #1: Residential new construction standard practice has moved to or near ENERGY STAR standards.

Most interviewed builders report they already build to ENERGY STAR standards or beyond. Many say they build to International Energy Conservation Code (IECC) 2018 or 2021, which some jurisdictions in the IOU territories have adopted as the local code. Approximately one-half of the builders said they build to these standards, often independent of program incentives. Several builders also reported that customers expect energy efficiency as a standard feature of new homes, which also influences them to exceed energy codes. Similarly, raters report working with multiple builders and programs, ensuring homes meet or exceed these standards.

Recommendation #1: Consider updates to the PY2025 TRM new homes baseline in Volume 4 that reflects both market baselines and local codes across the IOU territories.

Key Finding #2: Program attribution for the new homes programs has decreased slightly from 70 percent to 60 percent as builders' standard practices have become more efficient.

The last net-to-gross research was conducted in 2020 as part of the PY2019 EM&V. In 2020, the State Energy Conservation Office (SECO) recently adopted IECC 2015 as the IOU code, and builders were adjusting to increased ENERGY STAR levels, which are defined as 10 percent more efficient than code. The same research also found that HVAC equipment was an opportunity to gain efficiency levels beyond standard practice. The same series of net-to-gross (NTG) questions asked of builders in 2024 indicate a 50 percent NTG based on standard building practices. However, more efficient HVAC equipment remains a barrier in new homes; builders reported incentives were still needed to coordinate with HVAC contractors to install more efficient equipment. The EM&V team's review of IOU new homes programs found that all programs incentivized more efficient HVAC equipment through the programs, resulting in the EM&V team increasing the NTG by 10 percent to 60 percent. The NTG ratio for the Texas IOU programs is used to calculate cost-effectiveness based on net savings; all the programs are still passing at 60 percent.

Recommendation #2: Reassess the NTG ratio for new homes programs as the IOU programs gain more participation at the higher-tiered incentive levels and/or as the TRM savings baseline is updated.

Key Finding #3: Financial incentives are helpful in reducing the costs of building more efficient homes, although customers may be largely unaware of the utility incentive and are resistant to paying for more efficiency.

Builders report they primarily use the incentives to reduce their costs rather than passing the discount to the customer; a minority of builders consistently inform customers about the utility incentives. Some builders and raters reported that the costs of incorporating energy-efficient measures are still high and find the incentive value insufficient compared to the incremental costs of increased efficiency. In addition, builders indicated that despite customers expecting an "efficient new home," customers also frequently question the tangible monthly savings from

energy-efficient products, which affects their willingness to pay for more efficiency. Several of the IOU programs offer tiered incentive levels that increase as both the efficiency above ENERGY STAR and HVAC equipment increase. These tiered incentive levels appear to be the most effective in pushing standard building practices based on the interviews.

Recommendation #3: Continue to offer tiered incentive levels for building above ENERGY STAR up to Net Zero and higher efficiency HVAC equipment and assess program materials for effectiveness in conveying the benefits of more efficient homes to customers.

Key Finding #4: Builders would appreciate increased communication tools with IOU programs.

Some builders reported dissatisfaction with the clarity of program requirements. A recurring theme in their feedback was the lack of reporting on incentive status, leading to frustration and uncertainty about when they would receive their incentives. Utilities may consider streamlining the process for submitting and tracking incentive applications, such as an online portal where builders can easily check the status of incentives. Providing regular updates could reduce builder frustration and uncertainty. Ensuring timely delivery of incentives and monitoring the disbursement process to address any delays can help maintain builder participation in the program.

Recommendation #4: Assess the timeliness of program incentive payments and consider an online program portal.

Key Finding #5: Increased program training and outreach would be beneficial to trade allies, especially HVAC contractors.

Additionally, builders and raters highlighted the need for better communication and training from programs for trade allies. Raters specifically mentioned program events geared toward HVAC contractors would be particularly beneficial in successfully promoting and having more efficient HVAC installed through the programs.

Recommendation #5: Consider training and outreach events specifically geared toward HVAC contractors and other trade allies that work with builders and raters to construct more efficient homes.

Key Finding #6: Documentation was incomplete or not readily available for all components of the projects.

Some projects claimed alternative baselines or deemed savings for additional prescriptive measures along with the modeled new home savings. However, documentation and tracking data for these measures were not consistent with the requirements in the prescriptive Residential TRM 9.0, Volume 2.

Recommendation #6a: Ensure all measures and savings are tracked individually, and documentation for additional prescriptive measures follows the *Program Tracking Data and Evaluation Requirements* Section in TRM Volume 2 under each measure.

Recommendation #6b: Ensure all savings calculations are readily available for all projects. If reported savings differ from the modeled savings report, ensure calculations for reported savings are transparent.

Key Finding #7: Some double counting of prescriptive savings was found when both prescriptive and modeled home participation paths were available.

For hybrid programs where prescriptive measure savings from TRM 9.0, Volume 2 are claimed along with modeled savings using parameters for the reference home from TRM 9.0, Volume 4, in some instances, the EM&V team found that the modeled home included claimed prescriptive measures potentially double-counting savings.

Recommendation #7: Ensure all prescriptive measures are excluded from the modeled home and documented as such. Savings should be tracked individually for each prescriptive measure claimed, and the modeled home should be tracked as one measure. Documentation for hybrid programs should include characteristics of the reference home and modeled home for comparison to ensure prescriptive measures are claimed appropriately.

5.2.2.2 Upstream/Midstream

Key Finding #1: Updates in federal HVAC standards caused confusion as to how to determine savings.

New federal standards for air conditioners (AC) and heat pumps (HP) went into effect on January 1, 2024, updating the efficiency standards and terminology from SEER/HSPF to SEER2/HSPF2. The standard applied to ACs in the Southern region at the installation date and HPs at the manufactured date. This distinction caused confusion as to which methodology and efficiency rating to apply for savings calculations.

Recommendation #1: For 2024 and beyond, the TRM has been streamlined to one methodology for both ACs and HPs. Both ACs and HPs should use the Air Conditioning, Heating, and Refrigeration Institute or equivalent SEER2/HSPF2 ratings to calculate savings.

5.2.3 New Homes

This section presents the EM&V findings of the new homes programs offered by five Texas IOUs: AEP Texas, CenterPoint, Oncor, and TNMP in the ERCOT market and Entergy in the outside-of-ERCOT market[35]. The impact evaluation allowed for an assessment of the accuracy of the gross savings, while the process evaluation included research to understand the effectiveness of the programs and update the NTG value used to calculate net savings. The Residential New Construction MTPs provide incentives to builders to increase the efficiency of new homes above minimum code efficiency. The programs partner with home energy raters, who inspect homes and provide the programs with energy models to describe the program-sponsored homes. The utilities and their implementers compare these energy models with code to estimate energy savings. Table 12 describes the five IOU programs.

Table 12. New Homes Program Attributes

Utility	Program name	Whole house M&V—incentive levels	Whole house M&V—minimum requirements	Add-on prescriptive incentives	Add-on prescriptive savings
AEP Texas	High-Performance New Homes MTP	2 Tiers: Exceeds Code, ENERGY STAR-certified with complete foam encapsulation	Savings of at least five percent above the IECC 2015, meet all minimum energy code requirements	Yes	None

[35] SWEPCO also offers a new homes program, but it offers prescriptive rebates only. The focus of this section is programs that have a whole house M&V approach to new homes.

Utility	Program name	Whole house M&V—incentive levels	Whole house M&V—minimum requirements	Add-on prescriptive incentives	Add-on prescriptive savings
CenterPoint	Energy High-Efficiency Home MTP	3 Tiers: Exceeds Code, ENERGY STAR-certified, DOE Net-Zero-Ready-certified	Savings of at least ten percent above IECC 2015, rated and registered in the RESNET[36] registry	Yes	HVAC equipment, heat pump water heaters, ENERGY STAR connected thermostats and appliances
Oncor	Residential New Home Construction MTP	2 Tiers: ENERGY STAR-certified, DOE Net-Zero-Ready-certified	ENERGY STAR certification	Yes	HVAC equipment, ENERGY STAR appliances
TNMP	High-Performance Homes MTP	2 Tiers: Exceeds Code, ENERGY STAR-certified.	Savings of at least five percent above IECC 2015 with HVAC SEER2 ≥15.2	Yes	ENERGY STAR connected thermostats, electric vehicle supply equipment, right-sizing HVAC bonus
Entergy	Residential Solutions MTP—New Homes MTP	3 Tiers: Exceeds Code, ENERGY STAR-certified, DOE Net-Zero-Ready-certified.	RESNET HERS rated	Yes	HVAC equipment, domestic hot water equipment, and ENERGY STAR-connected thermostats, appliances, and electric vehicle supply equipment

[36] RESNET is the Residential Energy Services Network

5.2.3.1 Process Results

The EM&V team gathered feedback from a combination of builders and raters to provide a comprehensive understanding of the New Homes programs' performance and areas for improvement. In addition, the EM&V team reviewed local codes, which are also summarized in this section. The detailed insights below inform the key findings and recommendations presented above.

i. Interview Overview

The EM&V team completed builder and rater (market actors) in-depth interviews for the Texas new homes programs in April and May 2024. The EM&V team also captured process-related information provided by builders and raters, such as:

- program awareness,
- satisfaction with various components of the program(s),
- perceptions of the market and barriers to adoption,
- areas the program is working well and opportunities for improvements, and
- standard building practices.

The EM&V team obtained the market actor sample from the PY2023 program tracking databases provided by IOUs. At a minimum, the market actors' company names and telephone numbers were received. Some market actor data also included an individual contact name, email address, number of projects completed, and associated savings.

The EM&V team completed 12 unique market actor interviews—8 builder interviews and 4 rater interviews. Because most of the raters and some builders work with different utility programs, the 12 unique market actor interviews represent an overall 19 utility-specific, program-level completed interviews. The EM&V team reached out to all the raters and builders on the provided list, contacting them twice via email (if an email address was provided) and twice by phone. Table 13 documents the number of completed interviews by utility and market actor type.

Table 13. Number of Builder- and Rater-Completed Interviews by IOU*

Utility	Number of builder interviews completed (n=8)	Number of rater interviews completed (n=4)
ERCOT		
AEP Texas	4	0
CenterPoint	3	1
Oncor	2	4
TNMP	1	1
Outside-of-ERCOT		
Entergy	2	1
Total	**12**	**7**

*The counts represent the number of market actors working within each IOU. Market actors that serve customers in multiple territories are represented more than once.

Since the number of market actors interviewed for each IOU program is limited, results are qualitative and may not be representative of the entire population of interest. All numeric results (e.g., satisfaction ratings) are presented in responses rather than percentages to reflect the data's qualitative nature. Additionally, the information presented reflects the perception of the market actors, which may or may not accurately reflect the intended program design and delivery.

Next, we present the results of the homebuilder interviews, followed by rater interviews.

ii. Builder Interview Summary

The EM&V team spoke with a mix of builders that work across the five new homes programs in Texas. Organizations included in the study vary by the number of homes built annually (under ten homes to over 1,000 homes) as well as the type of home (primarily *production* but some *custom* homes). Five of the eight (5 of 8) builders said that all the homes they build are built in areas that enforce the IECC 2015 energy code and that their rater completes a full rating on all their homes, whether they receive utility incentives or not. In addition to home ratings, raters provide various other key services for builders—they handle utility incentive paperwork and online submittals, as well as provide builders with code change information and training. About one-half of the interviewed builders report that, due to how much raters handle for them, they need less training or technical support provided by the IOU programs; however, the other half of interviewed builders do use program technical assistance.

Most home builders interviewed have been building homes through the Texas IOU programs for two to five years, with some (2 of 8) noting they have been participating for over ten years. The primary way builders interviewed first heard about the program was through HERS raters (3 of 8), followed by another program (2 of 8), with one builder reporting discussions with utility staff and one from another builder/contractor.

Satisfaction

Builders were asked to rate their level of satisfaction with various elements of the program (*very satisfied*, *satisfied*, *somewhat satisfied*, and *not satisfied*). As reflected in Table 14, the majority of builders said they were *very satisfied* or *satisfied* with most of the areas discussed. *Responses to questions and concerns* received the most *very satisfied* ratings, and the *amount of incentive offered* received the most *somewhat satisfied* ratings.

Table 14. Builders Satisfaction with New Homes Programs Components

Program component	Number very satisfied	Number satisfied	Number somewhat satisfied	Number not satisfied	Total responders*
Support received from the utility	3	4	4	0	11
Clarity of program eligibility requirements	3	4	0	4	11
Responses to questions/concerns raised	4	0	3	1	8
Training received	3	6	2	0	11
Amount of incentive offered	1	4	3	4	12

Program component	Number very satisfied	Number satisfied	Number somewhat satisfied	Number not satisfied	Total responders*
Amount of paperwork required	2	3	2	2	9
Utility online program application process	3	1	0	2	6

* n=12 When the number of responders does not equal 12, responses were either *not applicable* or *don't know*.

Use of Incentives and Participation Barriers

Builders stated they use the incentive to reduce their cost of building the home by offsetting the increased cost of more efficient products and practices. No builders reported that the incentive goes directly to the customer. Only one builder mentioned *always* informing customers about the utility's contribution, while others either *sometimes* (2 of 12) or *never* (4 of 12) do so, with 2 of 12 *unsure*.

Builders highlighted *cost* as the most significant barrier to customers purchasing energy-efficient homes, a recurring theme in past findings. This cost barrier manifests in several ways:

- **Market Competitiveness:** The new homes market, especially for production homes, is highly competitive. Some builders noted they couldn't afford substantial energy efficiency upgrades without additional incentives, as it would price them out of the market.

  "As an example, foam was really expensive at the time when the city raised code. About that time when people got involved with foam prices dropping, we jumped on the bandwagon. With the higher cost of this foam—very few people would have been able to afford it without the [utility] incentive."

- **Customer Expectations:** Most builders indicated that consumers expect homes to be energy efficient, leading them to build to ENERGY STAR standards and transition to IECC 2021 standards in anticipation of code changes. The incentives help offset some of the costs associated with meeting these expectations.

  "We just build that way—we build above code to ENERGY STAR—the incentives are helpful though."

- **Uncertainty About Savings:** Builders reported that many home buyers are concerned about tangible cost savings. Customers frequently question the real dollar savings per month from using energy-efficient products and worry about balancing the costs of the latest technologies, especially when transitioning to all-electric versus natural gas systems.

  "What does it translate to real dollars. You say you are putting these products in but how much am I saving each month?"

Satisfaction with Incentives and Program Requirements

The two items rated lowest for satisfaction were *the amount of incentive offered by the utility* and *the clarity of the program requirements*. Several reasons contribute to this dissatisfaction:

- **Low Incentive Value:** Builders mentioned that while the incentive is beneficial, its dollar value is low compared to the additional cost of building homes with higher energy-efficient equipment as required by the program.

- **Established Practices:** As indicated above, most respondents stated that they already build homes that meet or exceed program requirements as a standard practice. Many builders have been constructing energy-efficient homes for so long that they wouldn't do otherwise, indicating an increase in free-ridership.

- **Market Influences:** Other program influences, such as ENERGY STAR and Environments for Living®, compel builders to construct more efficient homes to stay competitive. Some builders believe utility programs should enhance management and training to ease the burden on builders participating in multiple programs.

  ". . . a program with better training and management of the program. Better communication from the management of the program to equip us with more information. We really need more communication. Participating in the program is just one additional thing we are trying to do, and it just shouldn't be this hard to participate. We have even contemplated is this even worth our time to participate?"

- **Communication and Technology Issues:** Builders expressed frustration with the complexity of submitting and reporting program participation. Some are unaware of their incentive status, with some waiting over five to six months and still having no idea where their incentive is.

  "It's complex to determine what to submit and how to submit and that's a barrier - lots of clicks - needs to be a more streamlined process to find data and submit it. Having a place where you can check your rebate status vs what's been submitted - what's the status. I have to call somebody - I want to go online and check where my rebate is – a self-help portal or customer portal would be helpful."

Technical Support, Training, Marketing

Builders were asked if they employ or contract with a home energy rater, and 3 of 12 builders reported employing a rater, whereas 8 of 12 indicated they contract their rater. Additionally, when builders were asked whether the home energy rater completes a full rating for all homes or only for the homes that are incented through the program, 9 of 12 builders responded that the rater completes a full rating for all homes, while the other 3 builders answered they did not know.

The EM&V team also surveyed builders regarding their utilization of training since they started participating in the program. Just over one-half of the 12 respondents utilize training offerings; however, 4 of 12 builders surveyed informed that they do not utilize any training. Builders offered an array of reasons for how training has been applied to their building practices:

"ENERGY STAR - We go above and beyond code."

"We usually attend the program kick off / annual onboarding."

"We've talked to our program rep a couple times."

"Email out of information on programs - videos and other materials"

"Use of the Program, like how to get started and the requirements when we first started."

Three of 12 builders shared that they utilize technical support when it is offered. However, one-half of the builders we spoke with (6 of 12) do not use technical support. Builders shared these comments regarding the influence of technical support on their building practices and general operations.

"[we used a] Googling the website methodology for how to submit questions [and for] what was actually needed to compile to submit for incentives. Rater was not so great so created challenges for us."

"Influenced a little maybe over the years but we build to ENERGY STAR as standard practice."

"Somewhat helpful the training and technical support"

Just one builder informed us that they utilize program marketing resources such as signs in the yard, doormats, and brochures. Most builders (10 of 12) do not use any marketing resources.

"We just have verbally communicated that we have upgraded equipment if asked using the program. It would be great if you had lawn signs or something to indicate that this home has participated in the program. We would use them."

"Having social media [content] posts ready to go would also be helpful marketing for us."

5.2.3.2 Raters Interview Summary

The EM&V team spoke with raters working in four of the five new homes programs in Texas. Rater organizations included in the study vary by the number of home ratings annually (hundreds to thousands) and work with multiple builders. Raters reported that 80−90 percent of homes they rate are program-participating homes. All four raters said they anticipate about the same amount of new homes business in 2024. Many of the builders that these raters work with are building to ENERGY STAR standards or similar types of programs (e.g., Environments for Living®).

All four raters we spoke with work with builders across multiple utility new homes programs.

The interviews probed these raters on differences in program requirements, marketing, program interactions, etc., by utility. Other than a few variations in program responsiveness, raters did not identify differences among the various utilities for this program.

When we asked how many builders work in jurisdictions that have not adopted or are not enforcing the IECC 2015 code, all four raters responded *none*. Likewise, for the builders that work in jurisdictions that have adopted/enforced the IECC 2015 code, raters said all builders they worked with in 2023 had reached compliance, and most are achieving IECC 2018 or above.

Satisfaction

Raters were asked to rate their level of satisfaction with various elements of the program (*very satisfied*, *satisfied*, *somewhat satisfied*, and *not satisfied*). As reflected in Table 15, all raters said they were *very satisfied* or *satisfied* with the areas discussed.

Table 15. Raters Satisfaction with New Homes Programs Components (n=7)

Program component	Number very satisfied	Number satisfied	Number somewhat satisfied	Number not satisfied	Total responders*
Overall program satisfaction	7	0	0	0	7
Ease of filling out and submitting required program documentation	7	0	0	0	7
Responsiveness of program staff to questions	1	6	0	0	7
On-site inspection process	1	5	0	0	6
Technical support	2	5	0	0	7

* n=7 When the number of responders does not equal 7, responses were either *not applicable* or *don't know*.

Program Requirements and Interactions

All raters indicated that communication related to program requirements has continued to be "pretty clear" and is understood. When asked about what program requirements builders or subcontractors find hardest to meet, one rater said:

"ENERGY STAR is challenging, coordinating that through all the levels of the builder and working with the AC companies, [also] heat pump water heaters but then they couldn't find them for a while so finding the right equipment in the service territory, to have consistency. Same with AC systems, [we] just couldn't find them. SEER change was confusing for everyone.."

When probed for feedback regarding any needed program requirement changes, the same rater suggested:

"ENERGY STAR is a great program, but at the same time ENERGY STAR assumes we have more control over what the AC companies do. Bringing in some oversight of the AC companies more than just the raters would help."

Raters indicated that the process for certifying to the IECC 2015 specifications has been fine. One rater said:

". . . we address any problems related to the new specifications by consulting with Purchasing [departments] at the Builders, that's where it starts."

And again, all raters believed and communicated that builder's subcontractors know what is required of the IECC 2015 requirements and that training is not needed as most builders are building to IECC 2018 or higher.

Regarding technical support, two of seven raters indicated they were *very satisfied,* and five of seven) raters were *satisfied* with the level of support. The raters reported that technical support provided by utilities helps them:

- bring on new clients,
- get quick responses for technical issues, and
- get answers to questions about uploading documents.

Considering marketing, just one rater voiced they promote the advantages of newly constructed energy efficiency homes to real estate agents; other groups of raters identified for promoting the program to were HVAC companies and builders. Building better homes and informing builders about the rebates were the benefits identified by raters promoting the program to these groups. All the raters confirmed that they didn't know whether realtors understand the benefits of the program or are actively promoting the advantages of energy-efficient homes.

We asked raters how QA/QC is done for files and software review, and one rater told us:

"we use Ekotrope and QA/QC is integrated into the software using an Ekotrope ID."

Another rater said:

"we use Fast Field Forms; it's really changed things and fast tracked it"

They can take pictures and check the boxes on checklists and time-stamp and date files. Internally, the rater uses design review checklists and reports. This same rater may also consider going to third-party QA per the ENERGY STAR requirements because it may reduce liability. Three of four raters did not know if QA/QC differed by utility however, one rater indicated QA/QC differs for Oncor:

"…where an inspection report and pictures are documented, then they go out into the field, each program has their own process."

Only one rater provided feedback on how QA/QC could be improved, recommending that utilities provide a standard number of projects to QA/QC.

When asked how the program participation process could be improved, raters replied that integrating direct contact with AC companies and the onboarding process could be improved to bring in new builders more rapidly to increase program participation. The most critical support the program could provide to raters in the near future brought this comment.

"Training for AC company, Subcontractor, Raters – on-site meetings to demonstrate what they need to do before they can participate. Offering trainings for builder staff as well."

Raters were unanimous in the type of software they use to model homes, which is Ekotrope, and they do not foresee any major program changes in the past year that will affect the software modeling. No raters had any issues reporting to meet program requirements.

Primary barriers to builder participation in the program included covering the cost of energy efficiency equipment, issues with the different service territories and eligibility, meeting ENERGY STAR requirements, and getting HVAC companies on board. The biggest challenge for raters participating in the programs is primarily the manual data collection. Plus, all of the raters confirmed there are incremental costs associated with building program-incented homes, and these additional costs are a challenge for their builders. Likewise, there was agreement that the biggest challenge for constructing and/or selling energy-efficient homes going forward is cost; increased rebates were offered as a suggestion to overcome this.

"[Name] is awesome! Involve the AC companies more and look at a second tier receiving incentives that isn't just based off of ENERGY STAR, Manual J and testing perhaps or a different code."

5.2.3.3 Local Codes

In the past few years, many Texas cities have adopted energy codes that are more advanced than the state residential energy code (IECC 2015). As shown in Table 16 below, 14 of the top 20 largest cities by population have adopted IECC 2021. New homes built in cities that have adopted newer codes must adhere to them during permitting.

Table 16. Local Energy Code Adoption for Top 20 Largest Texas Cities

Rank	City	Local energy code	Effective date of newer code
1	Houston	IECC 2021	January 1, 2024
2	San Antonio	IECC 2021	February 1, 2023
3	Dallas	IECC 2021	May 12, 2023
4	Austin	IECC 2021	September 1, 2021
5	Fort Worth	IECC 2015	Statewide code level
6	El Paso	IECC 2021	October 1, 2023
7	Arlington	IECC 2021	January 1, 2023
8	Corpus Christi	IECC 2015	Statewide code level
9	Plano	IECC 2021	February 1, 2022
10	Lubbock	IECC 2021	June 3, 2024
11	Laredo	IECC 2018	October 4, 2021
12	Irving	IECC 2021	February 13, 2023
13	Garland	IECC 2015	Statewide code level
14	Frisco	IECC 2021	January 1, 2023
15	McKinney	IECC 2021	January 1, 2023
16	Amarillo	IECC 2015	Statewide code level
17	Grand Prairie	IECC 2021	January 1, 2022
18	Brownsville	IECC 2015[37]	Statewide code level
19	Killeen	IECC 2021	March 1, 2022
20	Denton	IECC 2021	June 1, 2022

[37] Brownsville's local code is IECC 2009, but new homes would follow the more stringent state code of IECC 2015.

5.2.3.4 Impact Results

The EM&V team conducted desk reviews for a sample of projects from the residential new homes programs. For the desk reviews, the EM&V team applied the method prescribed in the PY2023 TRM 10.0 to verify energy savings and demand reduction for each project sampled. New homes programs can include modeled whole-home savings as well as prescriptive *HVAC* and *appliance* measures. Table 17 shows the quantity, incentive amount, and reported demand and energy savings by measure and utility for the sampled new homes projects. The desk review findings inform the key findings and recommendations presented in Section 5.2.2 above.

Table 17. New Homes Program Savings by Measure

Utility	Measure description	Measure quantity	Incentives	Demand savings kW	Energy savings kWh
AEP Texas	R-AtticEncapsulation	5	$250.00	0.00	0
	R-HPBonus	1	$200.00	0.00	0
	R-NewHm	5	$1,550.00	15.02	27,897
CenterPoint	ENERGY STAR Connected Thermostats	3	$45.00	0.00	1,701
	HVAC Unit	5	$600	3.28	2,208
	Rater Bonus	5	$75	0.00	0
	Whole Home	5	$1100	1.52	3,139
Entergy	Fulfillment	2	$30	0.00	0
	R-CentAC	1	$400	0.76	1,362
	R-CentACSeer1	2	$375	1.42	1,058
	R-ESPool	1	$800	0.50	6,015
	R-NewHm	2	$250	0.00	0
	R-SmtTstat	3	$174.98	0.00	3,084
Oncor	Central Air Conditioner	3	$1716.1	2.01	1,980
	Central Heat Pump	2	$669.89	0.95	1,417
	ENERGY STAR Dishwasher	1	$7.38	0.01	37
	ENERGY STAR Refrigerator	1	$6.23	0.01	61
	ENERGY STAR Thermostat	5	$0	0.00	3195
	Whole House-New Homes	5	$1819.98	2.90	5325
TNMP	R-CentACSEER2	1	$50	0.57	463
	R-NewHm	5	$2000	4.52	12364

5.2.4 Upstream/Midstream

The EM&V team conducted desk reviews for a sample of projects from upstream and midstream programs. For the desk reviews, the EM&V team applied the methods prescribed in the PY2023 TRM 10.0 to verify energy savings and demand reduction for each measure for the projects sampled. Sampled measures included *HVAC*, *pool pumps*, *smart thermostats*, and *lighting*.

5.2.4.1 Impact Results

Project savings adjustments were primarily driven by *HVAC* measures responding to changes in federal standards or confusion on how to determine rightsizing savings. The desk review findings inform the key findings and recommendations presented in Section 5.2.2.

5.2.5 Air Conditioner and Heat Pump Tune-Ups

The EM&V team conducted desk reviews for a sample of tune-up measures in residential programs. Tune-ups can be offered under a retrofit program or as a standalone program under the residential sector. Tune-ups were sampled at the measure level across programs. Tune-ups can also be offered under the commercial sector. In PY2023, the evaluation efforts focused on tune-ups in the residential sector, as the commercial sector was evaluated in a prior year. The desk review findings from the residential evaluation in PY2023 and the commercial evaluation in PY2022 inform the key findings and recommendations presented in Section 3.2, where cross-sector results are presented.

5.3 PARTICIPANT HOUSEHOLD TRENDS

This section summarizes the findings from the Texas residential household survey that was completed to inform the retrofit consumption analysis (see Section 5.5). The survey collected input from residential program participants who received an energy efficiency installation in 2022 or the first half of 2023.

5.3.1 Participant Household Trends Key Findings and Recommendations

Finding #1: Survey respondents have low adoption of solar and electric vehicle (EV) technologies within the last year across all utilities.

Recommendation #1: As IOU programs include solar technologies, the responses indicate an opportunity for programs to continue to address the barriers and increase awareness and incentives to help promote greater adoption of solar energy systems.

Finding #2: Survey respondents seem disinterested or uninformed about the benefits of thermostat setbacks in terms of saving energy without sacrificing comfort.

Recommendation #2: IOU programs may consider including more customer education campaigns around the benefits of thermostat setbacks for heating and cooling and the use of smart thermostats in their programs.

Finding #3: Almost all survey respondent participants (97 percent) across all the utilities reported that their comfort level remained the same or improved after installing energy-efficient HVAC equipment or tuning up their existing equipment.

Recommendation #3: Utilities may consider utilizing these data results as a means of further promoting energy-efficient HVAC equipment and incentives in their program marketing materials.

Finding #4: Survey respondents are concerned with electricity rates and reliability coupled while also being complimentary of the IOU energy efficiency programs, with some customers expressing frustration and some looking for additional energy efficiency information or rebates.

Many customers provided feedback unrelated to the program, such as *higher energy bills* or *increased energy rates*, and *outages* or *reliability issues* (33 percent of the total 252 respondents when responding to open-ended/additional comments questions). Another third of the respondents shared positive comments; 16 percent talked about *achieved energy cost reductions and improved comfort*, and another 16 percent *expressed gratitude for the program, utility, or service overall*. Ten percent expressed *frustration with the contractor, equipment, or service in general*, and another ten percent were *looking for additional information about energy efficiency programs or rebates*. The remaining comments with about ten respondents or less included *requests for more incentives and discounts* and *enhanced transparency.*

Recommendation #4: As energy costs and grid reliability are top-of-mind for residential customers, IOU programs may want to consider education, highlighting how energy efficiency and demand response are part of the toolbox to address these issues.

5.3.2 Methodology

The residential household survey collected input from residential program participants who received an energy efficiency installation in 2022 or the first half of 2023. Survey responses supported the Texas residential retrofit consumption analysis described in Section 5.3. The survey focused on the following topics:

- lifestyle changes (i.e., working from home),
- occupancy changes (i.e., number in household),
- equipment changes (i.e., EV),
- behavioral changes (i.e., temperature set-point),
- major renovation, and
- perceived comfort level pre- and post-installation.

In addition, the survey concluded with an open-ended question that allowed respondents to share any other energy efficiency concerns.

The EM&V team administered the survey online, with a link distributed via postcards and emails. First, an invitation postcard was sent to all residential program participants, inviting them to complete the survey online. Email invitations were sent to customers whose email addresses were available. The postcard and email briefly explained the purpose of the study, provided login information, and included a toll-free telephone number and email address for assistance or if the recipient preferred to participate by telephone. Additional postcards and reminder emails were sent to nonrespondents as needed to maximize the online survey completion rate.

The survey was launched in March 2024 and concluded in April 2024, with a total of 1,609 respondents (exceeding the initial target of 1,000 respondents). Customers who completed the survey received a $10 electronic gift card.

To overcome language barriers, the survey was available in English and Spanish, and all communication with the customers (postcards and emails) included a Spanish section.

Table 18 below shows a breakdown of respondents by utility, highlighting the levels of survey participation in various energy efficiency programs.

Program types represented include:

- Hard-to-Reach Standard Offer
- Residential Standard Offer
- Low-Income Weatherization

Table 18. Participant Totals by Utility (n=1609)

Utility	Participant totals
AEP Texas	516
CenterPoint	93
Entergy	155
Oncor	778
TNMP	67
Grand total	**1,609**

Note that the utilities vary in size to their respective respondent base. Thus, in general, the smaller utilities had less of a base to survey and, therefore, fewer respondents.

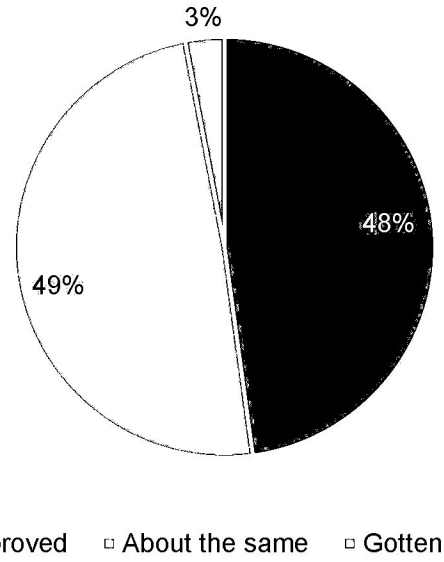
5.3.3 Home Comfort

Respondents were asked to confirm their participation in the utility's energy efficiency program. Those who answered *yes* were asked about their comfort level after equipment installation or tune-up.

5.3.3.1 Perceived Comfort Level Pre- and Post-Installation

Figure 34 shows the response from survey participants in terms of their level of comfort after installing energy-efficient HVAC equipment or having a tune-up of their existing equipment.

Figure 34. Level of Comfort After Energy-Efficient Equipment Installation or Tune-Up (n=1,231)



Almost all participants (97 percent) across the utilities reported that their comfort level remained the same or improved. Only three percent of respondents reported a worsening of comfort.

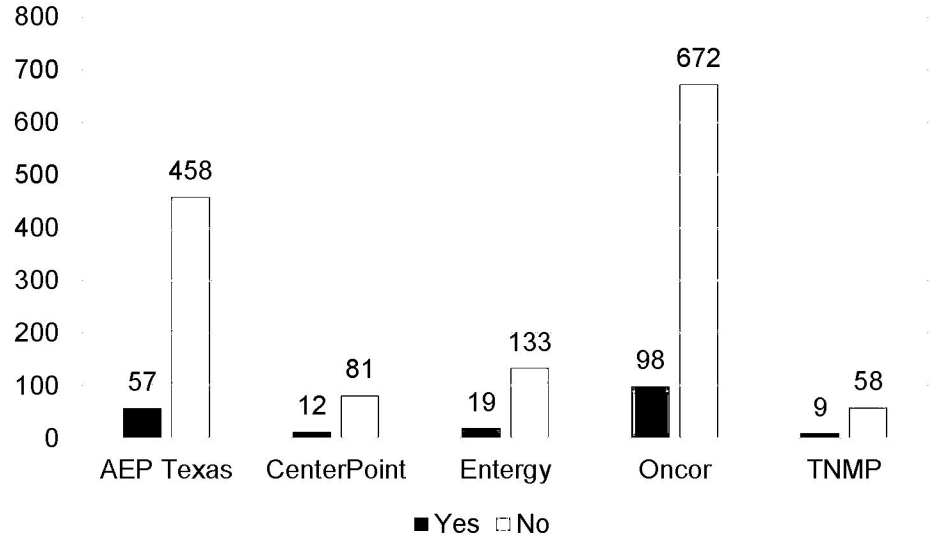
5.3.4 Household Changes

The survey asked about a number of household changes since their participation in the program, which included lifestyle, occupancy, equipment and behavior questions.

5.3.4.1 Lifestyle Changes

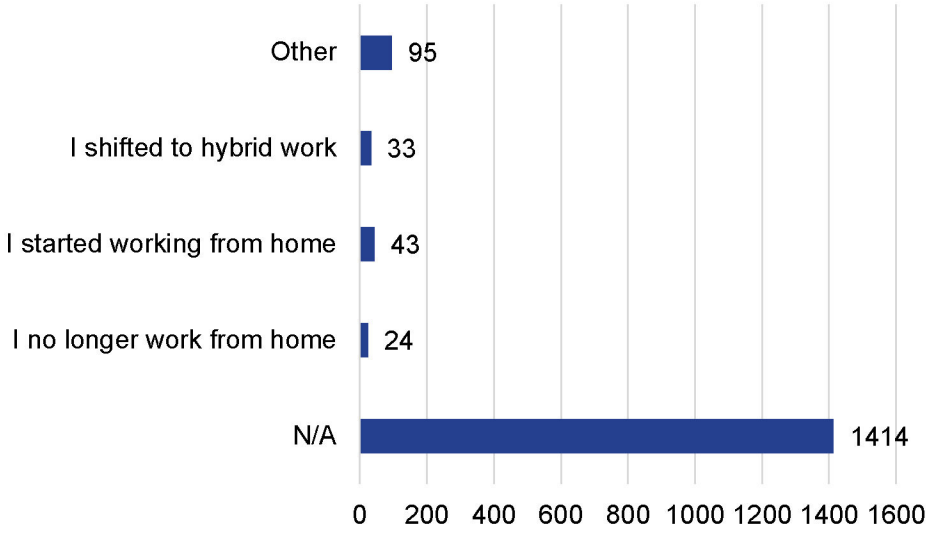
Figure 35 and Figure 36 below inform on whether the respondents had lifestyle changes impacting residence occupancy within the last year along with the descriptions if provided.

Figure 35. Lifestyle Changes in the Last 12 Months (n=1,597)



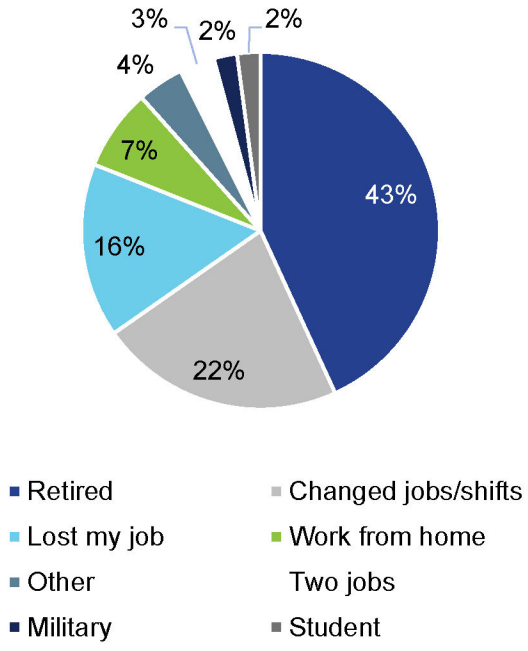
Note: *N/A* responses were not included (n=12)

Figure 36. Lifestyle Change Descriptions in the Last 12 Months (n=1,609)



The survey data revealed that most respondents did not specify their lifestyle changes (indicated by the high ***N/A*** count). Very few respondents noted changes like *shifting to hybrid work, starting to work from home*, or *stopping working from home*. The *other* category, although containing minimal responses, provided further insights into the types of lifestyle changes reported, as indicated in Figure 37.

Figure 37. Specified Lifestyle Changes in *Other* Category (n=95)

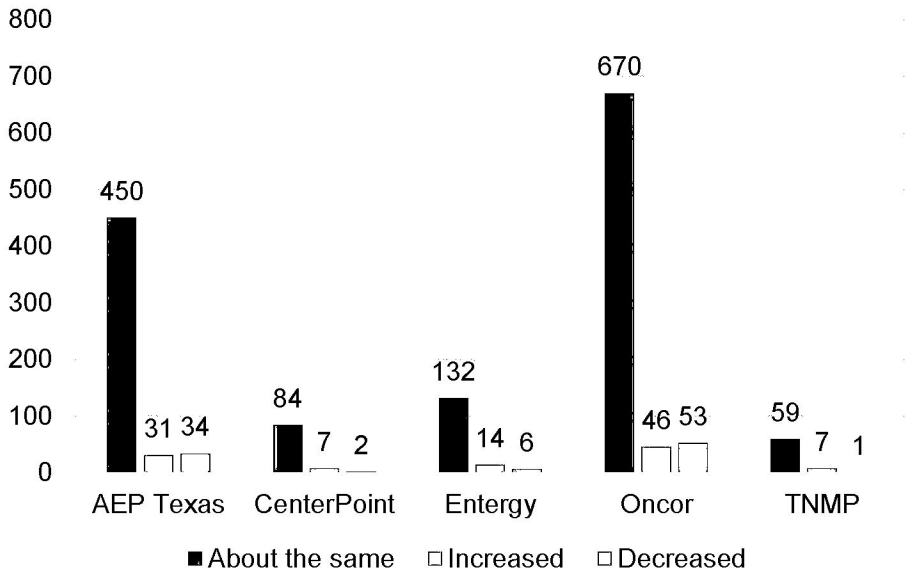


The most common *other* specified lifestyle changes in the last 12 months were *retiring* (43 percent), *changing jobs or shifts at work* (22 percent), and *losing their job* (16 percent).

5.3.4.2 Occupancy Changes—Household Size

Respondents were asked about any changes to their household size in the last 12 months. Figure 38 shows that, across all utilities, most respondents (n=1395) said their household size *stayed about the same*.

Figure 38. Household Size Changes in the Last 12 Months (n=1,596)



Note: *N/A* responses were not included (n=13)

5.3.4.3 Equipment Changes—Solar Installation and Electric Vehicle Purchased

Figure 39 shows whether respondents have installed solar energy systems within the last 12 months by utility. Most respondents (96 percent) indicated that they *had not installed solar energy systems within the previous year*.

Additionally, Figure 40 indicates the number of respondents who *purchased EVs within the last year*, compared to those who did not, across the various utilities. Many respondents across all utilities indicated they *did not purchase EVs in the previous year*, and the overall adoption of EVs was low, with a remarkably high number of respondents (97 percent) indicating no EV purchases. The analysis also shows that of the 45 respondents who indicated purchasing an EV in the last 12 months, nine respondents (or 20 percent) also installed solar panels.

Figure 39. Solar Panels Installed in the Last 12 Months (n=1,609)

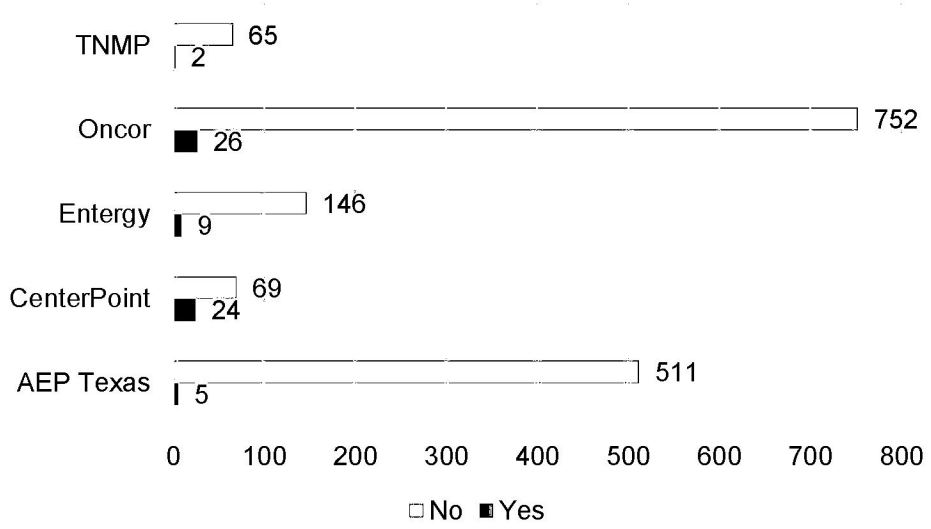
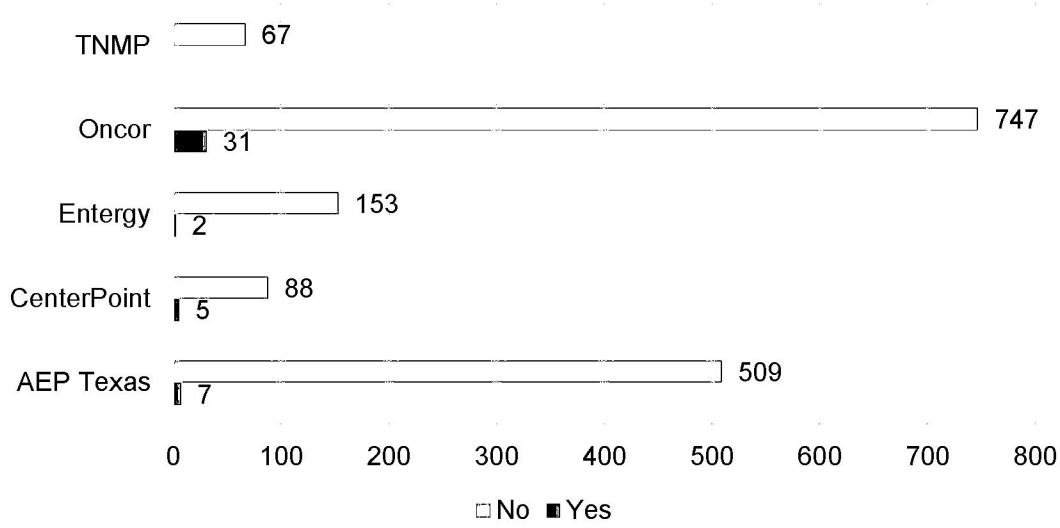


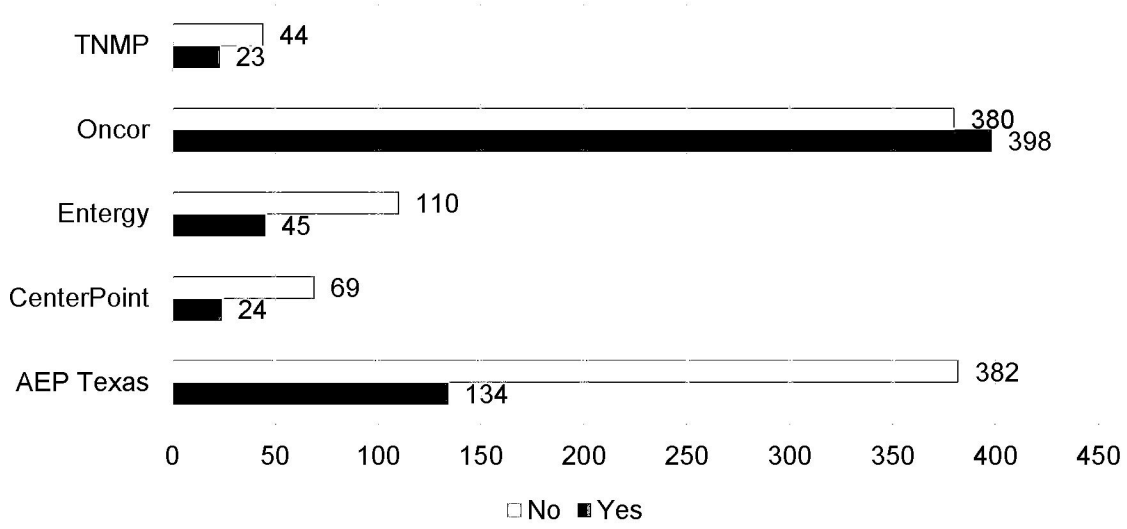
Figure 40. EVs Purchased in the Last 12 Months (n=1,609)



5.3.4.4 Equipment Changes—Addition of Major Energy-Using Equipment

Program participants were asked if they have added major energy-using equipment in their home (other than an EV), such as a *refrigerator*, *freezer*, *washer*, *dryer*, *dishwasher*, or *heating and air conditioning equipment*. Figure 41 shows how many program participants added major energy-using equipment to their homes in the last 12 months. In total, 624 of the 1,609 survey respondents (39 percent) indicated they had added major energy-using equipment to their homes.

Figure 41. Added Major Energy-Using Equipment in the Last 12 Months (n=1,609)



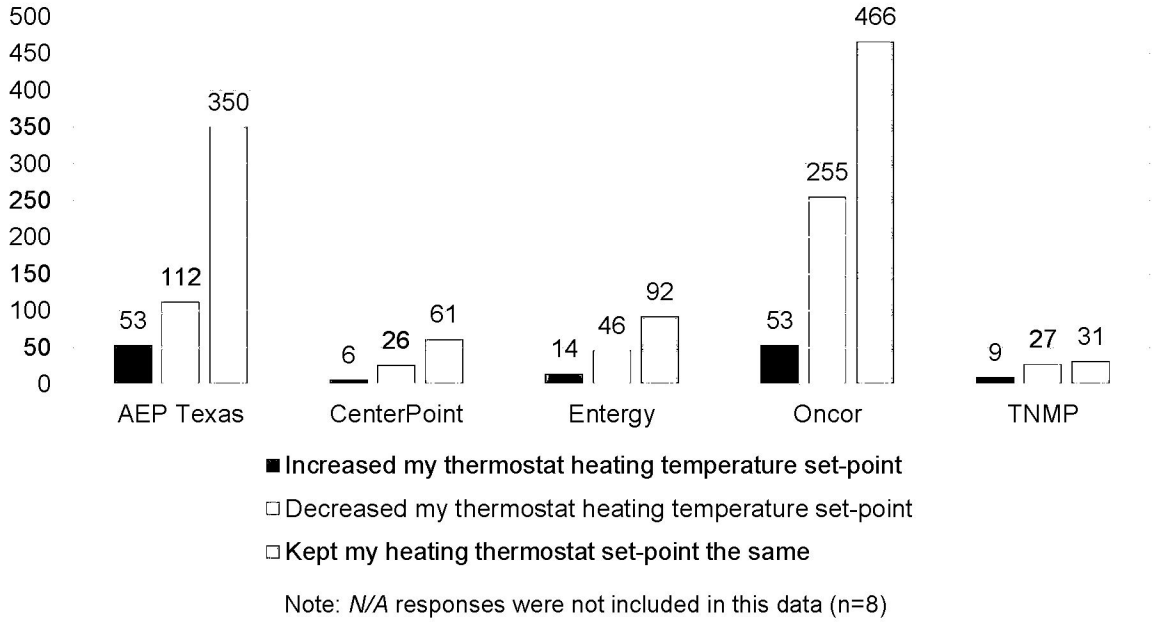
5.3.4.5 Behavioral Changes—Thermostat Settings

Program participants were asked to describe their thermostat settings as it relates to heating and cooling in their home. They were given the following options for both heating and cooling settings:

- I increased my thermostat heating/cooling temperature setpoint
- I decreased my thermostat heating/cooling temperature setpoint
- I kept my heating/cooling temperature set point the same

Figure 42 displays the response to the survey question regarding their thermostat heat settings.

Figure 42. Adjustments to Heating Temperature Setpoints in the Last 12 Months (n=1,601)

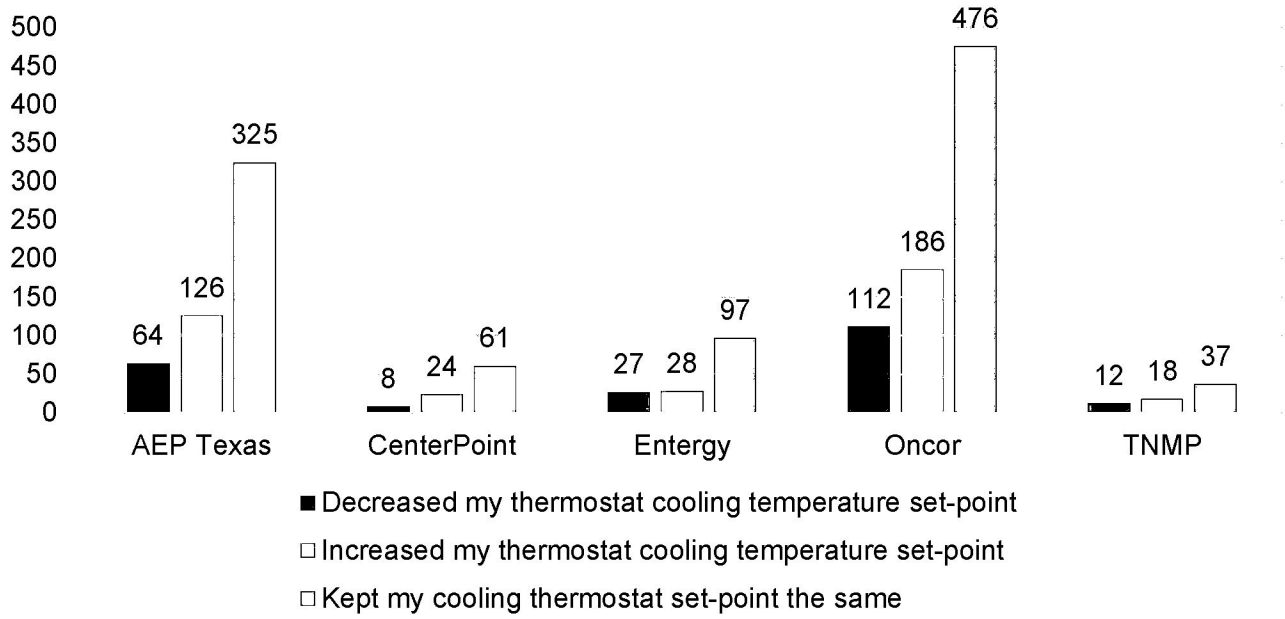


Note: *N/A* responses were not included in this data (n=8)

There is a general trend of respondents preferring to keep their heating thermostat setpoints the same (1,000 respondents). From the remaining survey participants, 466 respondents said they *decreased* their thermostat heating setpoint, and only 135 respondents said they *increased* their heating thermostat setpoint.

Figure 43 provides data on how respondents are adjusting thermostat cooling settings. Like the heating settings, this chart indicates a strong trend of respondents preferring to keep their cooling thermostat setpoints *the same* (996 respondents). From the remaining survey participants, 382 respondents said they *increased* their thermostat cooling setpoint, and 223 respondents said they *decreased* their cooling thermostat setpoint.

Figure 43. Adjustments to Cooling Temperature Setpoints in the Last 12 Months (n=1,601)



Note: *N/A* responses were not included in this data (n=8)

5.3.4.6 Major Renovation

Respondents were asked if they had completed any major renovations, such as adding one or more rooms to their homes. Very few respondents indicated they had completed major home renovations in the last 12 months. Just 47 of 1,609 respondents (three percent) indicated they had a major renovation on their homes last year.

5.3.5 Feedback

Survey participants were asked if they had any additional comments or feedback to share. Most respondents (84 percent) did not provide any responses. Of the remaining 16 percent (252 respondents) who entered a response, 39 provided either off-topic comments or responded *don't know.*

Relevant comments and suggestions (n=213) are outlined in Table 19. Many customers provided feedback unrelated to the program, such as *higher energy bills* or *increased energy rates*, and *outages or reliability issues* (33 percent total). Another third of the respondents shared positive comments; 16 percent talked about *achieved energy cost reductions* and *improved comfort*, and another 16 percent *expressed gratitude for the program, utility, or service overall*. Ten percent expressed *frustration with the contractor, equipment, or service in general,* and another ten percent were *looking for additional information about energy efficiency programs or rebates*. The remaining comments with about ten respondents or less included *requests for more incentives and discounts* and *enhanced transparency*.

Table 19. Additional Comments and Feedback from Survey Participants

Energy saving tip	Percentage
Higher energy bills and increased energy rates	25.4%
Energy cost reduction and improved comfort	16.4%
Gratitude for the program, utility, or service overall	16.4%
Problems with contractor, equipment, or service in general	13.1%
Additional actions taken to increase efficiency or reduce energy bill	10.3%
Request for additional information or assistance	10.3%
Outages and reliability issues	7.5%
More incentives/discounts	5.2%
No or minimal improvement in energy cost reduction	1.9%
Enhanced transparency about electric plans	0.5%
Respondents	**213**

5.4 MEASURE OPPORTUNITY ANALYSIS

This section presents trend analysis regarding savings opportunities in heat pumps, smart thermostats and insulation. All three measure savings opportunities expanded in PY2023 though this varied by utility.

5.4.1 Heat Pumps

Key Finding: The *heat pump* measure continues to be a top savings measure in residential programs.

In PY2023, all eight utilities installed *air-source, ground-source,* or *mini-split HPs* under residential retrofit or new construction programs. Program-incentivized *HPs* collectively saved 38 megawatts (MW) and 57,669 megawatt-hours (MWh) in PY2023. As

Figure 44 and Figure 45 below show, the IOU programs have again increased HP savings incentivized through the programs. While Oncor has implemented the most HP projects in recent years, CenterPoint had the most HP savings in PY2023 and significantly increased savings from prior years. AEP Texas also saw an increase in HP savings in PY2023 from prior years. Most of the IOUs had HP measures in their LI and HTR programs. The IOUs target LI and HTR customers who replace inefficient electric resistance equipment with high-efficiency HPs. In PY2023, HTR and LI programs made up nearly 38 percent of HP demand savings.