Evaluation, Measurement, and Verification of CPS Energy's FY 2024 DSM Portfolio

May 2024

FRONTIER energy
TETRA TECH
TEESI Engineering

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1. EXECUTIVE SUMMARY

CPS Energy's Sustainable Tomorrow Energy Plan (STEP) is an initiative aiming to reduce community demand by 410 MW, achieve 1 percent energy savings per year, weatherize 16,000 homes, and contribute to 1.85 million tons of avoided carbon over five years through equitable programs designed to help customers save energy and money. Through this initiative, CPS Energy leveraged community input related to the future of energy efficiency and conservation program offerings and identified the program outcomes that mattered most to the community. In addition to energy demand reduction, community stakeholders asked that this new program help create customer bill savings, support customers most in need, and contribute to a low-carbon future.

This report encompasses all STEP-funded Demand-Side Management (DSM) program activity accounted for by CPS Energy within Fiscal Year (FY) 2024, which ran from February 1, 2023 through January 31, 2024. After a partial year in FY 2023, FY 2024 marked the first full year to count toward the five-year plan.

This report describes the evaluation, measurement, and verification (EM&V) methodology, process, and findings. The process focused primarily on verifying annual energy and demand savings achieved by way of CPS Energy's FY 2024 DSM programs. Additionally, the evaluation team reviewed program expenditures to determine cost effectiveness and made recommendations for enhancements to program design and implementation.

The Retail Lighting Discounts and Small Business Solutions programs represent the top FY 2024 contributors for residential and commercial energy efficiency, respectively, driven primarily by a strong emphasis on light-emitting diode (LED) lighting retrofits distributed through retail, midstream, and direct install programs. The residential High-Performance Tune-up program increased performance by a factor of approximately six for energy savings and a factor of approximately five for non-coincident peak (NCP) demand savings. The Bring Your Own Thermostat (BYOT) and Commercial & Industrial (C&I) programs represent key contributors from the demand response (DR) sector. The BYOT DR program delivered the highest energy savings (kWh) totals of all programs, increasing 13 percent compared to FY 2023. The C&I DR program was the highest-performing program from a peak demand (kW) perspective, followed by BYOT. While the program was sunset in December 2022, the Residential Solar Photovoltaic (PV) program still delivered significant savings through legacy projects. However, rebated Residential Solar PV installations yielded less than half of FY 2023 savings totals. Because total portfolio energy savings were relatively consistent between fiscal years, this change indicates a more even distribution across various program designs, measure mix, and participant types.

Portfolio performance dropped slightly for all savings categories by amounts ranging from 2-13 percent. However, this is a strong indicator that CPS Energy programs are working effectively despite competing forces. For example, residential energy efficiency programs were significantly impacted by a baseline shift for general service LEDs and air conditioning equipment retrofits. Despite increasing federal

standards having a negative impact on savings potential for these popular measures, overall energy savings increased by 78 percent for this sector due to a greater focus on air conditioning tune-ups and whole-home energy audits. This performance measure helps demonstrate that the program is accomplishing its goals and positively affects measure adoption in the San Antonio market.

1.1 PORTFOLIO IMPACTS AND COST EFFECTIVENESS

The FY 2024 portfolio consists of residential weatherization, residential and commercial energy efficiency, residential and commercial demand response, and residential and commercial renewable programs implemented by a combination of internal CPS Energy staff and external implementation vendors. The FY 2024 report includes the evaluation of 19 different active programs across all categories. Net energy and demand savings are listed in the following table. The savings are represented on an annualized basis to simplify the reporting structure streamline year-to-year comparisons.

Table 1-1: FY 2024 Portfolio Impacts and Cost Effectiveness[1]

Program	NTG Ratio	Net Energy Savings (kWh)	Net CP Demand Savings (kW)	Net NCP Demand Savings (kW)	Net ERCOT 4CP Demand Savings (kW)	Rebate $	Admin and Marketing $	Total Program $	PACT*
Weatherization Program									
Weatherization	100%	6,622,790	3,187	7,327	3,004	$12,992,324	$2,253,065	$15,245,389	0.66
Energy Efficiency Programs									
Residential HVAC	95%	12,592,299	3,348	3,786	3,348	$3,140,242	$105,853	$3,246,095	3.67
Home Efficiency	93%	2,733,817	792	1,491	721	$848,726	$28,609	$877,335	3.23
New Home Construction	100%	8,374,027	4,868	7,210	5,194	$8,318,018	$280,388	$8,598,406	1.91
Retail Lighting Discounts	77%	18,817,534	1,945	9,369	3,266	$1,318,677	$44,451	$1,363,128	9.23
Home Energy Assessment	84%	2,103,124	119	428	135	$799,222	$26,941	$826,163	1.06
High-Performance AC Tune-up	95%	12,351,504	4,906	5,050	4,363	$1,669,444	$56,274	$1,725,718	3.08
Residential Subtotal		56,972,305	15,979	27,334	17,027	$16,094,330	$542,516	$16,636,846	3.00
Commercial & Industrial Solutions	96%	24,612,306	3,580	5,996	3,548	$4,084,299	$153,425	$4,237,724	3.55
Schools & Institutions	96%	25,781,991	6,894	8,739	6,519	$2,544,512	$95,584	$2,640,096	2.69
Small Business Solutions	95%	45,137,784	8,434	11,775	8,319	$5,300,896	$199,126	$5,500,022	4.71
Commercial Subtotal		95,532,081	18,908	26,510	18,386	$11,929,707	$448,135	$12,377,842	3.88
Energy Efficiency Subtotal		152,504,385	34,887	53,844	35,413	$28,024,037	$990,651	$29,014,688	3.38

* The Program Administrator Cost Test (PACT) output, the benefit-cost ratio, is the ratio of the net present value (NPV) of avoided energy and capacity benefits, divided by the program's incentives and administrative costs. A PACT ratio greater than 1.0 indicates that the program delivered more benefits than costs incurred from the utility's perspective. The PACT is sometimes referred to as the Utility Cost Test (UCT).

Table continues on next page.

[1] NTG = Net-to-gross, NCP = Non-coincident peak, CP = Coincident peak, 4CP = ERCOT four coincident peak, PACT = Program administrator benefit-cost ratio.

Program	NTG Ratio	Net Energy Savings (kWh)	Net CP Demand Savings (kW)	Net NCP Demand Savings (kW)	Net ERCOT 4CP Demand Savings (kW)	Rebate $	Admin and Marketing $	Total Program $	PACT*
Demand Response Programs*									
Smart Thermostat	100%	1,403,729	12,017	17,067	9,534	$902,070	$30,407	$932,477	N/A
Power Players	100%	1,590,973	17,686	20,473	16,864	$1,333,125	$44,938	$1,378,063	3.24
Direct Install Thermostats	100%	23,194,151	16,804	23,743	16,811	$329,078	$11,093	$340,171	3.54
Bring Your Own Thermostat (BYOT)	100%	58,429,232	47,203	66,136	44,343	$3,594,079	$121,151	$3,715,230	7.27
Commercial and Industrial DR (C&I DR)	100%	6,699,964	89,685	122,857	78,908	$5,439,015	$252,510	$5,691,525	3.52
FlexEV Smart Rewards	100%	–	67	124	78	$43,320	$168,448	$211,768	0.23
FlexEV Off-Peak Rewards	100%	–	60	131	67	$19,450	$75,630	$95,080	0.31
Demand Response Subtotal		91,318,050	183,523	250,531	166,606	$11,660,136	$704,177	$12,364,313	4.39
Renewable Energy Programs**									
Residential Solar PV	100%	34,964,624	11,817	28,546	9,934	$6,100,128	$1,524,324	$7,624,452	6.65
Commercial Solar PV	100%	17,051,852	6,005	13,370	5,041	$3,738,788	$934,263	$4,673,051	3.24
Roofless Solar	100%	–	–	–	–	–	–	–	–
Solar Energy Subtotal		52,016,475	17,822	41,916	14,975	$9,838,916	$2,458,587	$12,297,503	5.36
Grand Total		**302,461,700**	**239,420**	**353,619**	**219,997**	**$62,515,413**	**$6,406,480**	**$68,921,893**	**3.30**

**The PACT for Demand Response Programs is calculated based on the net present value of avoided cost benefits divided by the net present value of program costs attributable to new, incremental participants during the program year. Because total program costs in the table represent the costs attributable to all participants, the PACT for Demand Response Programs cannot be directly calculated from data presented in the table. Demand response program net energy and demand savings (in lighter shade) represent end-of-fiscal year program capability based on end-of-fiscal year enrollment.

The Smart Thermostat program is a legacy program that is no longer enrolling new customers. No PACT score is calculated because there was no incremental participation. Savings and costs reported for this program are for end-of-year participation.

***CPS Energy's solar rebate programs are evaluated independently from the utility's net metering rate policy. If the estimated costs of net metering credits are factored in, the Residential and Commercial Solar program PACTs would be adjusted to 1.60 and 1.05, respectively.

Additional table notes: Net savings = gross savings x Net-to-Gross ratio / (1 - line loss factor). Rows may not sum to total due to rounding.

1.2 STEP ANNUAL CUMULATIVE ACHIEVED DEMAND REDUCTION

In FY 2024, CPS Energy added 87 MW to its STEP achievements, accumulating a total NCP demand reduction of 184 MW. Annual STEP contributions are counted as the net avoided non-coincident peak (NCP) MW delivered by incremental program participants.

87 MW	184 MW
NCP demand reduction, FY 2024 Annual STEP	Cumulative demand reduction, FY 2023-FY2024 Total STEP

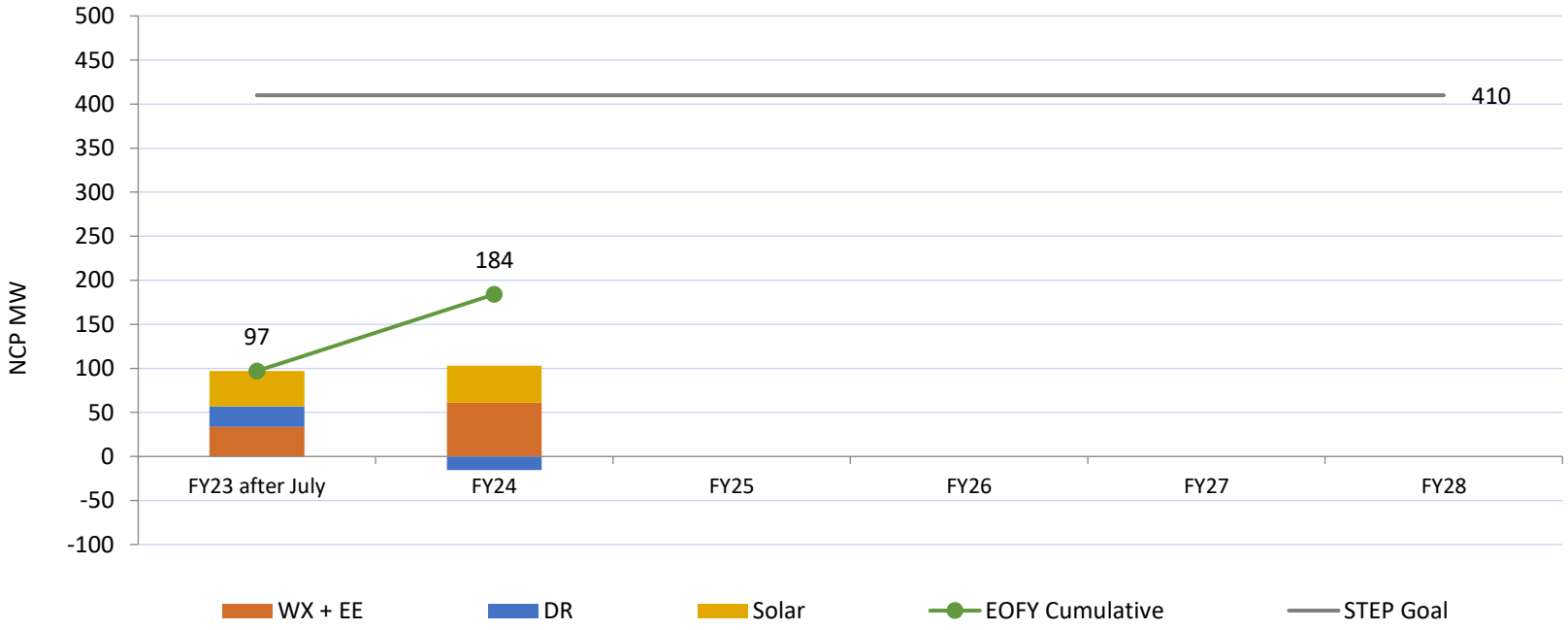


Figure 1-1: Cumulative progress toward STEP Goal
In the figure: NCP = Non-coincident peak, FY = Fiscal year, WX = Weatherization, EE = Energy efficiency, and DR = Demand response.

1.3 PROGRAM MIX FOR ACHIEVED DEMAND REDUCTION

The STEP portfolio includes contributions from a diverse mix of programs reaching all customer sectors. FY 2024 incremental impacts saw significant increases in residential energy efficiency, as well as a much more even distribution across program types compared to FY 2023. Approximately 94 percent of total NCP MW impacts came from the top three performing programs. However, despite lower contributions to overall NCP MW, residential Weatherization and Commercial Solar program impacts both increased marginally, delivering relatively consistent results compared to FY 2023. Similarly, demand response programs were strong performers despite seeing an overall reduction compared to FY 2023.

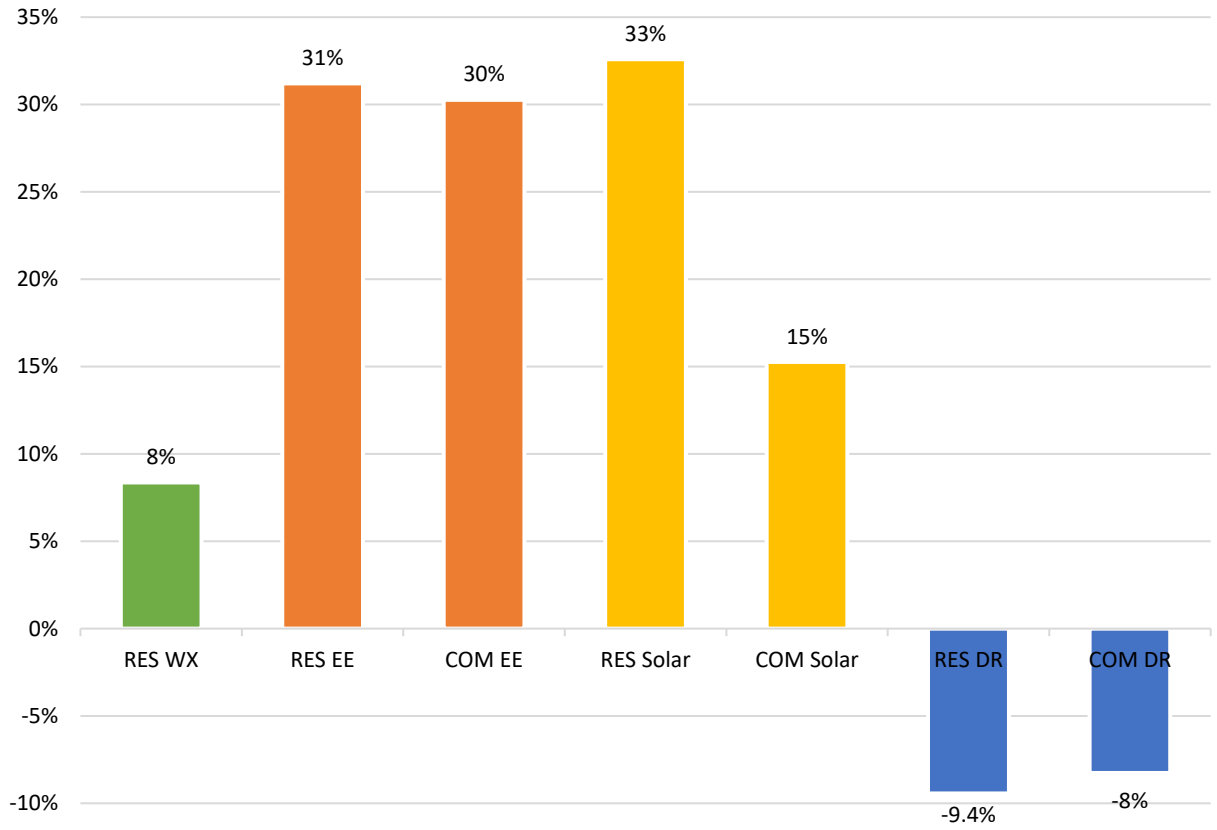


Figure 1-2: FY 2024 Net Incremental Contribution toward STEP by Portfolio and Sector
In the figure: Res = Residential, DR = Demand Response, Comm = Commercial, EE = Energy Efficiency, WX = Weatherization.

The FY 2024 STEP portfolio reached 537,391 residences and 2,761 businesses through the weatherization, energy efficiency, demand response, and solar programs. Additional customers were impacted by means of residential retail and commercial midstream lighting programs, although exact customer counts cannot be determined. Demand response programs reach the most customers due to their broad applicability and little to no investment cost for the participating customers. The participation counts listed in the following table represent enrolled/participating customers.

Table 1-2: FY 2024 Count of Customers Served

Portfolio	Residential	Commercial
Demand Response[2,3]	513,054	1,550
Energy Efficiency[4]	19,910	1,131
Solar[5]	2,452	80
Weatherization	1,975	–
Total	**537,391**	**2,761**

1.4 SUMMARY OF SAVINGS EVALUATION APPROACH

The evaluation team applied evaluation standards published in the FY 2024 CPS Energy Guidebook, which establishes a single common reference for estimating energy and peak demand savings resulting from the installation or implementation of energy efficiency and demand response measures provided through CPS Energy's programs. The methodologies included in the CPS Energy Guidebook are based on the Public Utility Commission of Texas' (PUCT) Technical Reference Manual (TRM), with certain modifications required to accommodate CPS Energy's weather zone and STEP program goals and metrics. The CPS Energy Guidebook is updated annually to maintain consistency with the TRM.

CPS Energy's implementation vendors operate under annual program years running from August 1st through July 31st. FY 2024 included contributions from the first two program years under the STEP Program, Program Year 1 (PY1) and Program Year 2 (PY2), respectively. FY 2024 includes PY1 projects completed between February 1, 2023 and July 31, 2023. Similarly, it also includes PY2 projects completed between August 1, 2023 and January 31, 2024.

Desk reviews were completed for a sampling of projects designed to deliver a 90/10 percent confidence and precision interval. The weatherization program is sampled at 90/5. Contributions for PY1 and PY2 were sampled separately. Adjustments were made to project-level input assumptions where the reported measure inputs did not match project documentation and inspection results.

1.5 SUMMARY OF ECONOMIC IMPACTS

As part of the evaluation process, data was collected on administrative, management, and marketing costs as well as total incentives paid. The following economic impact metrics were calculated as described in section 0.

[2] Demand response residential customer count includes a device per customer estimate that ranges from 1.19 to 1.33 depending on the program. The devices per customer estimate for small commercial dwellings ranges from 1.75 to 7.21.
[3] Power Players (Behavioral Demand Response) count includes 392,063 participants.
[4] The Residential and Commercial Energy Efficiency counts do not include customers affected by the Residential Retail Lighting Discounts or Small Business Solutions Midstream Lighting programs. Because impacts are quantified by lamp/fixture count, there is no way to align program participation metrics with other program designs.
[5] Solar participation does not include Roofless Solar program customers. However, there was no participation in FY 2024, as the program is fully subscribed.

- Benefit-Cost Ratio, representing the output of the Program Administrator Cost Test (PACT) run at the portfolio level, was 3.30.
- Cost of Saved Energy (CSE), representing the levelized program cost per annual kWh saved, was $0.0303/kWh. The FY 2024 value is a 20 percent increase compared to FY 2023 and approximately the same as the average since FY 2019.

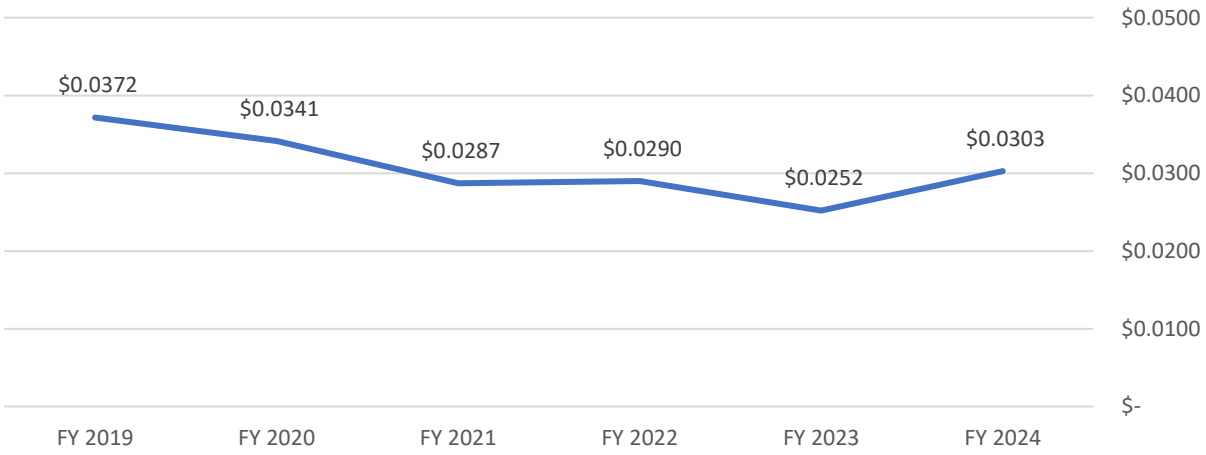


Figure 1-3: Levelized CSE Trend

- Net Avoided Cost Benefit, or Reduction in Revenue Requirements (RRR), was $156,049,769. This value represents the total avoided costs, or net reduction in utility costs, due to the impact of energy efficiency improvements. The FY 2024 value is an 8 percent increase compared to the average since FY 2019.

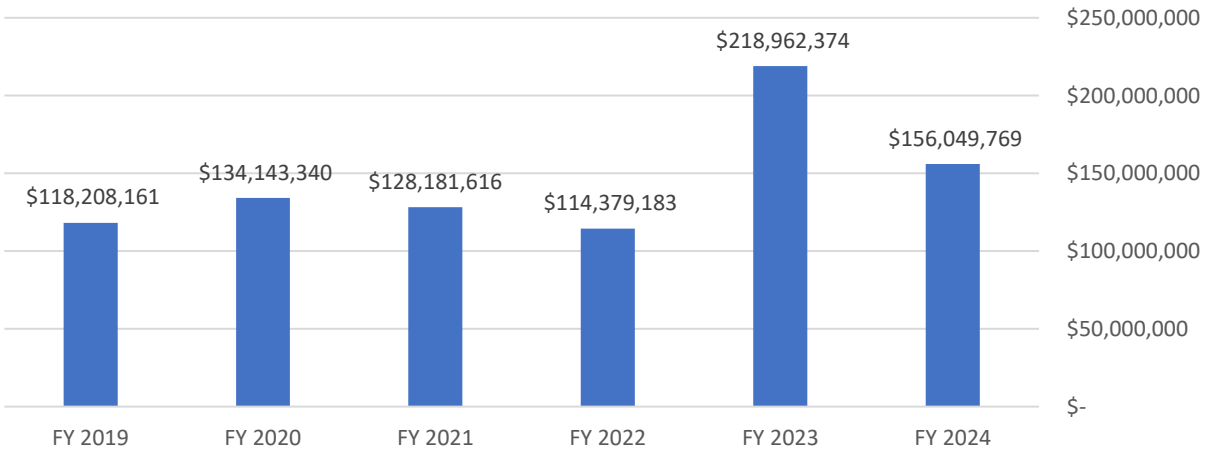
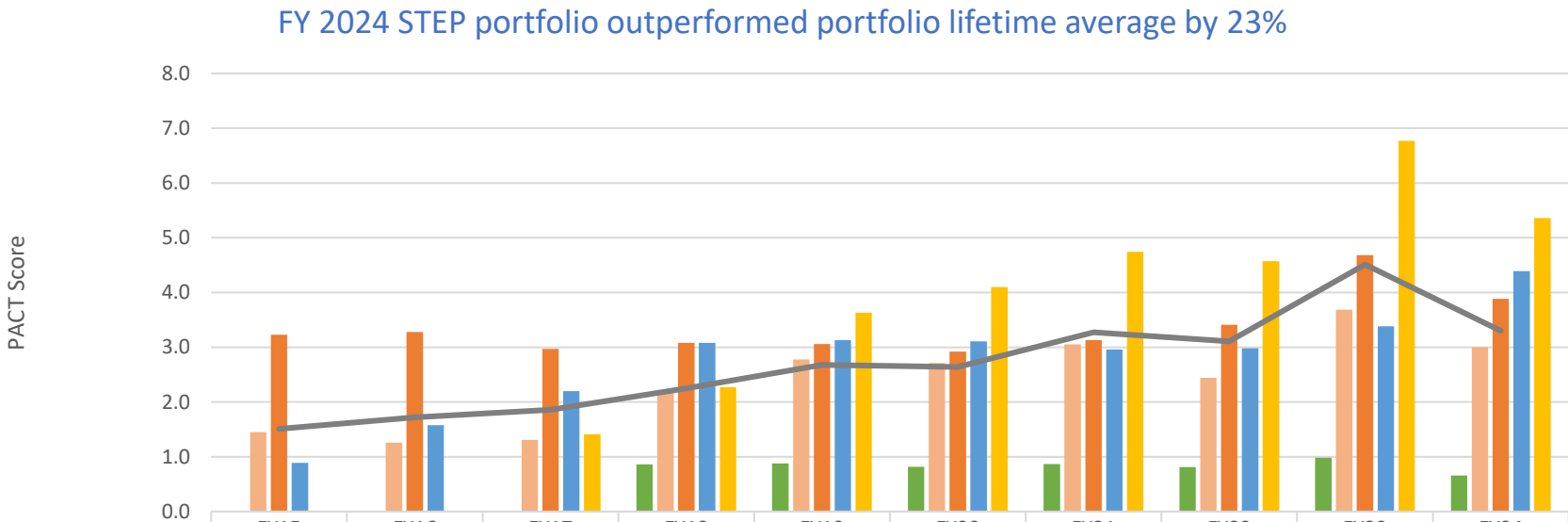


Figure 1-4: Levelized RRR Trend

1.6 YEAR-BY-YEAR COST-EFFECTIVENESS COMPARISON

CPS Energy's STEP portfolio continues to deliver cost-effective overall performance as measured by the PACT. Annual results should be interpreted within the overall context of each fiscal year evaluation and associated cost-effectiveness inputs.



	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24
WX				0.86	0.88	0.82	0.87	0.81	0.98	0.66
Res EE	1.45	1.26	1.31	2.18	2.78	2.71	3.05	2.44	3.69	3.00
Comm EE	3.23	3.28	2.97	3.08	3.06	2.92	3.13	3.41	4.68	3.88
DR	0.89	1.58	2.20	3.08	3.13	3.11	2.96	2.98	3.38	4.39
Solar			1.41	2.27	3.63	4.10	4.74	4.57	6.77	5.36
Portfolio Total	1.51	1.72	1.86	2.25	2.68	2.64	3.27	3.11	4.51	3.30

Figure 1-5: STEP Cost Effectiveness from FY 2015 through FY 2024

In the figure: Res = Residential, DR = Demand Response, Comm = Commercial, EE = Energy Efficiency, WX = Weatherization.
In 2015 and 2016, Solar programs were included in Residential and Commercial Energy Efficiency. From FY 2015 through FY 2017, Weatherization was included in Residential Energy Efficiency.

1.7 EVALUATION CONTRACTOR

Through a competitive solicitation in 2022, CPS Energy selected Frontier Energy, Inc. (Frontier) and subcontractors Tetra Tech, Inc. (Tetra Tech) and Texas Energy Engineering Services, Inc. (TEESI) to conduct a comprehensive and independent evaluation, measurement, and verification (EM&V) of demand side management (DSM) programs for FY 2024.

Frontier is an emerging organization with a long history. Starting in 2016, several companies merged to leverage strengths, relationships, and data to help reduce energy use and bring new ideas to life. The expanded company brings a fresh perspective to clients from the six preceding companies: BKi, Fisher-Nickel, Davis Energy Group, Frontier Associates, CDH Energy, and Energy Insight. Combined, Frontier brings together more than 170 years of experience from states and regions across North America and now offer specialized expertise in an even wider range of energy savings measures.

Since 1999, Frontier's Austin office (formerly Frontier Associates) has been a leading partner with electric and gas utilities in the design, implementation, and evaluation of energy efficiency, demand response, and renewable energy programs. Frontier has served as a primary consultant for the Texas electric investor-owned utilities, operating collaboratively as the Electric Utility Marketing Managers of Texas (EUMMOT). Through this partnership, Frontier has assisted with projects spanning the full energy efficiency program lifecycle, including regulatory filings, deemed savings development, program design, implementation, reporting, and evaluation. Frontier has proudly served as CPS Energy's independent third-party evaluator since 2015, partnering with the CPS Energy team in support of the STEP program.

Tetra Tech is a publicly-traded consulting and engineering company headquartered in Pasadena, California. The company was founded in 1966 to provide engineering services for waterways, harbors, and coastal areas. Over the next 50 years—through strategic acquisitions and internal growth—Tetra Tech expanded its service offerings to include engineering and consulting services for water, environment, sustainable infrastructure, energy, and international development sectors. Tetra Tech has over 21,000 associates working from its worldwide office locations, including eight Texas locations. Over the last 30 years, Tetra Tech has performed EM&V services for dozens of clients, including utilities, statewide programs, and regulatory bodies. The company's work ranges from target evaluations of individual programs to large-scale multiyear program portfolios.

As the statewide EM&V consultant to the Texas Public Utility Commission, Tetra Tech has worked collaboratively with Frontier since 2013 to produce the Texas Technical Reference Manual (on which the CPS Energy Guidebook is based) and support the investor-owned utilities across a vast number of energy efficiency challenges and opportunities.

TEESI is a Texas Corporation and Minority Owned Business (MBE #VS0000011064). Since its inception in 1989, TEESI has been involved in some of the state's most successful facilities energy efficiency programs. Over the years, TEESI has been selected as one of the lead engineering firms by the State Energy Conservation Office (SECO) to conduct Preliminary Energy Audits (PEA) and third–party engineering reviews for the LoanSTAR program. TEESI's staff specialize in conducting energy assessments, design and analysis for utility cost reduction measures, and application of International

Performance Measurement and Verification Protocol (IPMVP) for on-site field verification. TEESI has implemented energy assessments and energy cost reduction measures in the San Antonio area since 1990; notable clients include USAA, San Antonio ISD, Northside ISD, and Alamo Community Colleges. TEESI serves as the evaluation team's field verification and inspection lead.

Frontier's Austin office is located only 81 miles north of CPS Energy's McCullough Ave. main office building. Tetra Tech maintains a local office in downtown San Antonio, complemented by seven other Texas locations. TEESI's main Austin office is supplemented by a branch office in southwest San Antonio.

The overall evaluation team brings unparallelled experience in Texas energy efficiency, leveraging extensive resources and experience from across the country. Collectively, the team has been actively engaged with cross-cutting projects that align with the goals of the CPS Energy STEP evaluation.

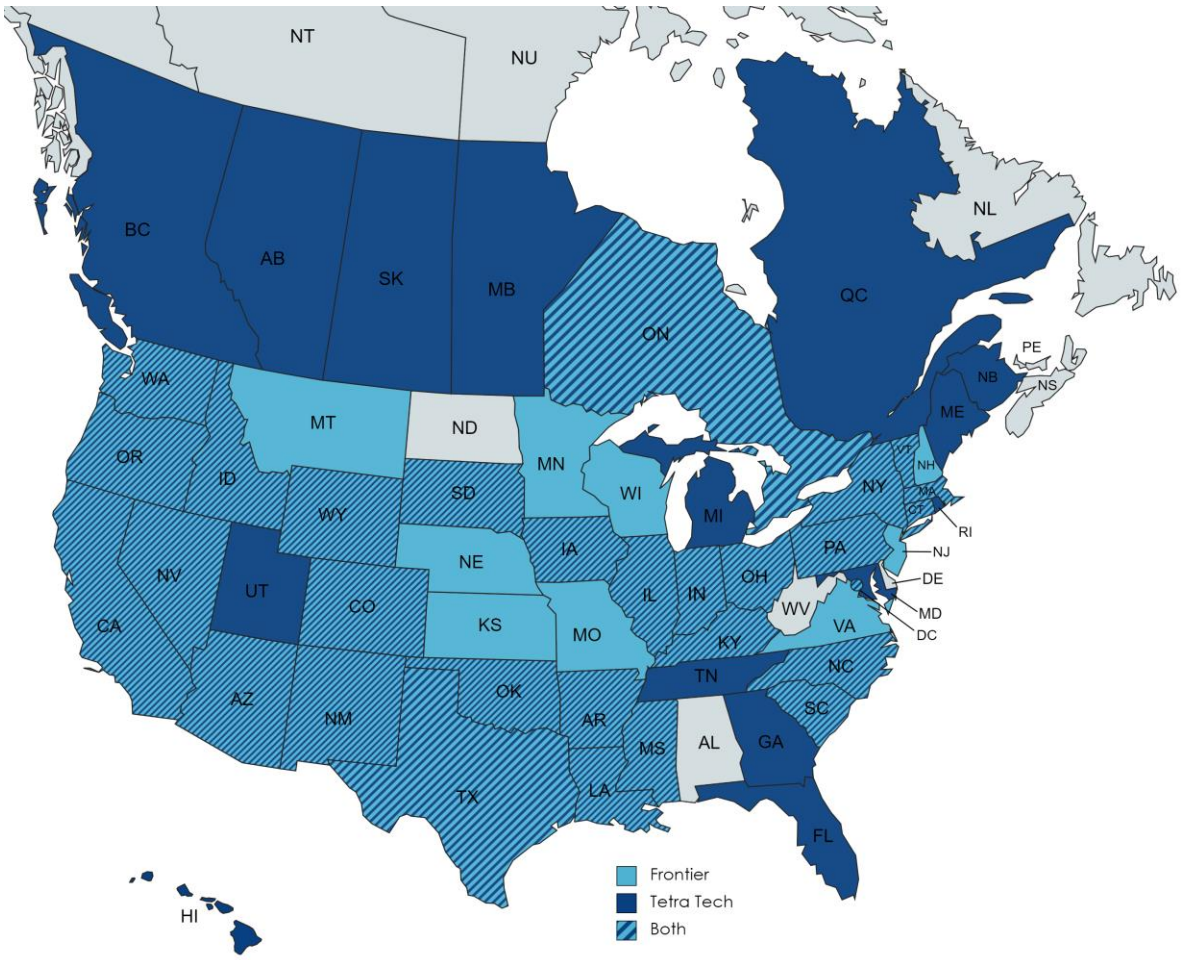


Figure 1-6: Frontier and Tetra Tech Energy Efficiency Work Experience

2. EVALUATION METHODS

2.1 ENERGY IMPACTS

The evaluation team's approach has been to leverage existing EM&V work previously conducted for CPS Energy and other electric utilities in Texas. For over two decades, investor-owned utilities and stakeholder groups have collaborated to develop accurate and comprehensive "deemed" savings for hundreds of residential and commercial energy efficiency measures, under the auspices of the Public Utility Commission of Texas (PUCT). This extended effort informs ongoing updates to the Texas Technical Reference Manual (Texas TRM),[6] a compendium of algorithms, baseline efficiency data, efficiency standards, energy savings calculations, and data tables.

In 2016, the evaluation team adapted the Texas TRM to be applied within CPS Energy's service territory. This provides CPS Energy with energy and demand impact estimates that have been vetted numerous times by independent third parties and are consistent with impact estimates being used by all the investor-owned utilities in Texas. The adapted Texas TRM, along with other measures required for CPS Energy programs, can be found in the CPS Energy Guidebook. The CPS Energy Guidebook has been utilized for the STEP evaluation since FY 2017 and is updated annually to comply with the latest Texas TRM updates. The FY 2024 CPS Energy Guidebook was used for this analysis, except where noted.

[6] Public Utility Commission of Texas (PUCT) Technical Reference Manual (TRM). Most recent version available for download at: http://texasefficiency.com/index.php/regulatory-filings/deemed-savings

2.2 DEFINITION OF NON-COINCIDENT, COINCIDENT, AND ERCOT 4CP PEAK DEMAND

2.2.1 Non-Coincident Peak (NCP)

For each measure and building type, annual kWh savings are allocated to each of the 8,760 hours in a year for the appropriate load shape. Non-coincident peak demand savings are the maximum difference between the pre- and post-retrofit demand, regardless of when that maximum value, or "peak," occurs. Conceptually, "demand" is instantaneous; in practice, demand savings are frequently estimated by calculating the difference in energy use between pre-and post-retrofit conditions over the course of a one-hour interval.

For measures where the Guidebook deemed savings estimates are prepared using load shapes and/or engineering algorithms, the maximum estimated reduction in demand over any given hour of the year is reported as the non-coincident peak. In some cases, when deemed savings are estimated using building simulation models, the 99.9th percentile hourly savings estimate is used in lieu of the absolute maximum value.[7]

2.2.2 Coincident Peak (CP)

The calculation of coincident peak demand savings relies upon a probabilistic analysis of a San Antonio typical meteorological year (TMY), which contains hourly values of solar radiation and meteorological elements for a one-year period. This analysis used a TMY3 data set, which contained data collected from the Kelly Field Air Force Base (Kelly AFB) weather station.[8] This approach relates the TMY3 data set's actual hourly weather, time-of-day, and day-of-week data to historical CPS Energy peak conditions. The calculation uses a probability-weighted estimate of the average kW savings during the twenty hours with the highest probability of occurring during CPS Energy's system peak.

The evaluation team used ERCOT data for this zone and added back in demand savings attributable to DR deployments to determine what the hours of highest demand would have been absent the programs. Estimates of the impacts of various energy efficiency measures during the top twenty hours associated with high demand in the TMY data are identified, and the probability-weighted estimate of an energy efficiency measure's demand savings during those peak hours is then calculated. This approach was adopted for use in Texas TRM version 3.1, used by all investor-owned electric utilities beginning in 2016.

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[7] This approach is taken with the residential envelope measures, developed with residential building simulation models, to account for some apparent time-displacement in when loads are met in the models. Given that single hour savings in some cases exceed the theoretical maximum hourly savings the measure could deliver according to engineering calculations, it appears that loads occasionally accumulate across hours giving hourly differences that may not realistically reflect the impacts of a measure.

[8] Data collected at the Kelly Field Air Force Base (Kelly AFB) station were generally used, because the temperature data series collected at the San Antonio International Airport is inexplicably higher than the readings collected at other local weather stations. (See Itron, CPS Energy June 2014 Electricity Forecast, Sept. 2014, pp. 8-9.).

Fundamentally, this approach requires several key steps:

1. Establish the predicted peak hours in summer for CPS Energy.

This estimation approach involves identifying a set of hours during which CPS Energy peaks are likely to happen. Given the variability in when peaks occur, using a wider range of potential peak hours within a logistic model is optimal for estimating the actual, expected impact for a single utility peak hour per year. In other words, a probabilistic approach using 20 hours provides a better chance of estimating the actual peak rather than an approach that relies on a single hour. The 20 most probable hours for this estimate are based on a regression of 2010-2019 June to September 2:00-6:00 PM historical load data plus CPS Energy's estimated hourly demand response load and provide a sufficient range of hours to assign the highest probability of being within the set of actual peak hours.

2. Correlate weather and load data.

A logistic regression model and CPS Energy historical load data are used to estimate a relationship between CPS Energy peak hours and a set of explanatory variables, including a temperature variable and dummy variables representing the time-of-day and month-of-year.

3. Select Peak Hours in TMY Weather Files.

This step applies regression results to San Antonio TMY3 weather data by calculating the probability of an hour coinciding with CPS Energy peak by using marginal probabilities assigned to the explanatory variables. The twenty hours selected are those with the highest probability of occurring during CPS Energy's peak.

The following table

shows the selected top 20 hours in order of decreasing relative probability. Additional hours are shown because some hours, such as those occurring on weekends or holidays, are eliminated for some measures. This analysis was completed in 2020 using weather and load data from 2016 to 2019.

Estimated coincident peak savings are calculated as the probability-weighted average of the kW in the top twenty applicable time periods for each measure. This approach was used for all measures, except where noted.

Table 2-1: [Evaluation Overview] Top Hours in Order of Relative Probability

Month	Day	Hour (start)	Temp (°F)	Peak Probability (with DR addback)	Month	Day	Hour (start)	Temp (°F)	Peak Probability (with DR addback)
6	19	15	104.00	0.868682	6	17	16	97.88	0.056450
6	19	16	102.92	0.846070	6	18	16	97.88	0.056450
6	20	16	102.92	0.846070	7	30	16	98.96	0.054889
6	20	15	101.84	0.488014	8	20	14	98.96	0.035089
6	19	14	102.92	0.354302	8	23	14	98.96	0.035089
6	20	14	102.92	0.354302	6	10	14	99.86	0.034069
6	19	17	100.94	0.327983	6	18	14	99.86	0.034069
6	10	15	100.94	0.298350	7	31	14	100.94	0.033105
6	18	15	100.94	0.298350	8	18	17	96.98	0.031332
7	31	15	102.02	0.292170	8	19	17	96.98	0.031332
8	20	15	99.86	0.271695	8	20	17	96.98	0.031332
8	19	16	98.96	0.267009	6	17	17	97.88	0.030418
8	20	16	98.96	0.267009	6	18	17	97.88	0.030418
6	10	16	99.86	0.261069	7	31	17	98.96	0.029554
8	17	15	98.96	0.142675	6	13	15	97.88	0.026605
7	31	16	100.04	0.132695	6	14	15	97.88	0.026605
8	18	16	97.88	0.121478	6	21	15	97.88	0.026605
6	20	17	98.96	0.076337	6	5	16	96.98	0.025995
6	17	15	98.96	0.067168	6	11	16	96.98	0.025995
8	18	15	97.88	0.059418	6	13	16	96.98	0.025995
8	19	15	97.88	0.059418	6	21	16	96.98	0.025995
8	17	16	96.98	0.058101	8	7	16	95.90	0.022879
8	23	16	96.98	0.058101	8	28	16	95.90	0.022879
6	12	16	97.88	0.056450	6	17	14	98.96	0.015490
6	16	16	97.88	0.056450	7	30	14	100.04	0.015044

2.2.3 Avoided Transmission Charge (ERCOT 4CP TCOS)

CPS Energy is electrically interconnected to the other electric utilities in the Electric Reliability Council of Texas (ERCOT) region, which encompasses most of Texas. All the users of the ERCOT transmission system share the annual cost of operating the high-voltage transmission system, called the ERCOT transmission cost of service (TCOS). Each user's share of the TCOS is allocated based upon their individual electrical demand during the prior year's monthly ERCOT system peak for the months of June through September, known as the four coincident peaks (4CP).

To reduce their allocated share of the ERCOT 4CP TCOS charge, CPS Energy anticipates likely 4CP events and deploys demand response resources to reduce demand accordingly. Energy efficiency measures also contribute to demand reduction during 4CP events.

To estimate gross demand reduction within each demand response program/subprogram, the estimated load reduction per participant is multiplied by the number of active participants and a "deployment success rate," the rate at which CPS Energy correctly anticipated and deployed each resource during historical 4CP events.

For energy efficiency programs, hourly load shapes for each measure provide the estimate of the impacts during 4CP event hours for each weekday during the months of June through September. Based on historical CPS Energy interval data, the 4CP has occurred in the hour ending 17 for each 4CP month since 2011. Hourly kW values are extracted from measure load shapes for the hour ending 17 for each day during the 4CP months. Finally, the 90th percentile maximum monthly value is averaged across the 4CP months to estimate the 4CP impact for each program. The CPS Energy FY 2016 evaluation saw the addition of ERCOT 4CP demand savings resulting from energy efficiency programs. In previous CPS Energy evaluations, ERCOT 4CP demand savings were calculated only for demand response programs.

2.3 NET IMPACTS

To derive net impacts, the evaluation team applies net-to-gross (NTG) ratios and line loss factors to the gross energy and peak demand impacts for each measure.

NTG ratios are estimated at the individual program level, and account for the net effects of free ridership and spillover. Free riders are defined as customers who would have delivered energy or demand savings without any program incentives but who received a financial incentive or rebate anyway. Spillover effects derive from customers who delivered energy or demand savings because of the program but did not participate in the program or receive a financial incentive or rebate. NTG ratios were provided by CPS Energy but are expected to be updated for FY 2025 based on a combination of industry benchmarking and a surveyed sample of FY 2024 program participants.

Line loss factors account for the fact that utilities must generate or import a greater amount of energy or demand than is required at the customer or end-user level because some energy is lost in distribution. Separate line loss factors relating to energy and demand are based on information provided by CPS Energy.

2.4 AVOIDED COST BENEFITS

Avoided cost benefits were calculated based on projected capacity and energy costs provided by CPS Energy. Between FY 2023 and FY 2024, changes in avoided cost inputs used to calculate cost effectiveness were mixed. Overall, updated avoided costs had a small negative impact on overall PACT ratios for individual programs and the overall portfolio.

2.4.1 Avoided Capacity and Energy

Avoided cost benefits were calculated using avoided energy and capacity costs provided by CPS Energy, and CPS Energy's standard discount rate. To calculate avoided energy benefits, annual kWh was allocated into the following seasonal blocks based on day of the week and hour of the day.

The evaluation team developed or adopted appropriate 8760-hour load shapes for each STEP measure to assign annual kWh to corresponding cost periods:

- Summer On-Peak
- Summer Mid-Peak
- Summer Off-Peak
- Non-Summer Mid-Peak
- Non-Summer Off-Peak

Avoided capacity costs (nominal $/kW-yr) were developed for on-peak and off-peak STEP measures. On-peak avoided capacity cost was defined as the forecasted capital and fixed operation and maintenance cost of a Reciprocating Internal Combustion Engine (RICE) brownfield plant with selective catalytic reduction (SCR) and carbon monoxide (CO) catalyst post-combustion controls, annuitized over 35 years. Off-peak avoided capacity cost was defined as the blended cost of CPS Energy's forecasted capital and fixed operation and maintenance cost of a RICE and a natural gas combined cycle (NGCC GE Flex 1X1), with the blending ratio defined as the ratio of the added NGCC/RICE capacity in CPS Energy's 25-year expansion plan.

2.4.2 Avoided Transmission Cost of Service (ERCOT 4CP TCOS)

ERCOT recovers the costs of transmission incurred by transmission service providers via a charge on load-serving entities, including CPS Energy. The charge is allocated to load-serving entities based on each entity's average demand during four ERCOT system peaks (known as "four coincident peaks," or "4CP events") from June to September each year. To minimize this charge, CPS Energy anticipates likely 4CP events and deploys demand response resources to reduce demand accordingly. Energy efficiency measures also contribute to demand reduction during 4CP events.

To estimate gross demand reduction during 4CP events within each demand response program/subprogram, we multiplied the estimated load reduction per participant by the number of active participants and a "deployment success rate," the rate at which CPS Energy correctly anticipated and deployed each resource during 4CP events.

For energy efficiency and renewable energy programs, we used hourly load shapes for each program measure to estimate the impacts during 4CP event hours for each weekday during the months of June through September. These monthly impacts were then averaged to estimate the 4CP impact for each program. The total reduction to 4CP demand is then valued at the expected future TCOS provided by CPS Energy.

2.4.3 Avoided Price Spikes Savings (kWh)

Avoiding intervals of especially high energy prices in the ERCOT market is another benefit of demand response programs. By reducing demand during price spikes, CPS Energy benefits by avoiding high energy prices, or by selling energy from its own or contracted generation sources into the market. Avoided price spike savings are calculated for DR programs, which can sometimes be deployed in anticipation of price spike events.

Price spikes in the ERCOT market have various causes, occur irregularly, and are hard to predict. Price spikes are difficult to react to in a timely manner with some demand response resources. For example, rapid response to an unexpected price spike event would be impossible for a program that requires day-ahead notice to the program implementer.

To estimate the value of energy (kWh) saved during price spike events, we compiled energy savings from all DR programs for every deployment interval and multiplied the sum within each interval by the corresponding ERCOT load zone energy price less CPS Energy's avoided cost of energy during the summer peak period. This method estimates the value of energy savings achieved during DR events without double counting the value of avoided energy costs.

2.5 ECONOMIC ANALYSIS

The following cost-effectiveness metrics were calculated for CPS Energy's programs. For results, see section 1.5.

Cost of Saved Energy (CSE) is the cost per kWh of energy efficiency and/or demand response program impact. The CSE is the ratio of the levelized program costs divided by the annual energy kWh savings. Levelized program costs are calculated using a Capital Recovery Factor (CRF), which incorporates the estimated useful life (EUL)[9] of the savings (weighted by measure) and an annual discount rate.

$$CSE = \frac{Levelized\ Program\ Costs}{Annual\ kWh\ savings}$$

Net Avoided Cost Benefit, or reduced revenue requirement (RRR), is the net reduction in utility costs from the energy and demand saved by CPS Energy's programs, calculated as the avoided cost benefit minus the total program costs.

$$RRR = PV\ of\ Avoided\ Energy + PV\ of\ Avoided\ Demand - Total\ Program\ Costs$$

Program Administrator Benefit-Cost (PACT) Ratio is the ratio of the net present value (NPV) of avoided energy and capacity benefit, divided by the program's incentives and administrative costs, expressed as:

$$Benefit\ Cost\ Ratio = \frac{NPV\ of\ Avoided\ Cost\ Benefit}{Program\ Incentives + Admin\ Costs}$$

For all DR programs except Automated Demand Response (ADR), benefit-cost calculations considered only the group of participants added during the current fiscal year. ADR participants are contracted for 10 years, but because the costs and impacts change each year, benefit-cost was calculated with an EUL of one year and the impacts include all active participants. This approach is consistent with other program benefit-cost calculations, but caution is advised when comparing DR results to benefit-cost calculations from prior years. This is especially the case where there are significant differences between cohorts from the current and past years, as significant differences in the composition of cohorts from year to year affect the outcome.

[9] The Estimated Useful Life (EUL) values from the Texas TRM were utilized for all STEP measures, except where noted.

3. CASA VERDE WEATHERIZATION PROGRAM

3.1 WEATHERIZATION PROGRAM IMPACTS

3.1.1 Overview

The Casa Verde Weatherization program (Weatherization) provides comprehensive retrofits for income-eligible residential customers. To qualify for the Weatherization program, customers must have an annual household income of less than or equal to 200 percent of the Federal Poverty Limit (FPL) or demonstrate an annual Energy Burden of greater than or equal to 10 percent.

Aligned with their dedication to equity and access, CPS Energy created a program to remove barriers to participate in their existing Weatherization program. The Weatherization Repair Assistance Program (WRAP) assists customers who need minor repair services like gas stove replacements, sheetrock work, and roof, plumbing, and electrical repairs. For more information, see section 3.1.4.

The Weatherization program assists families in need with reducing their monthly utility bills. Eligible participants receive free upgrades designed to increase the energy efficiency of their homes. In FY 2024, the program provided a range of services to 1,975 homes.

FY 2024 direct-install participation continues an upward trend back toward pre-pandemic levels. Program design shifts targeting repair measures will allow program to qualify more customers moving forward.

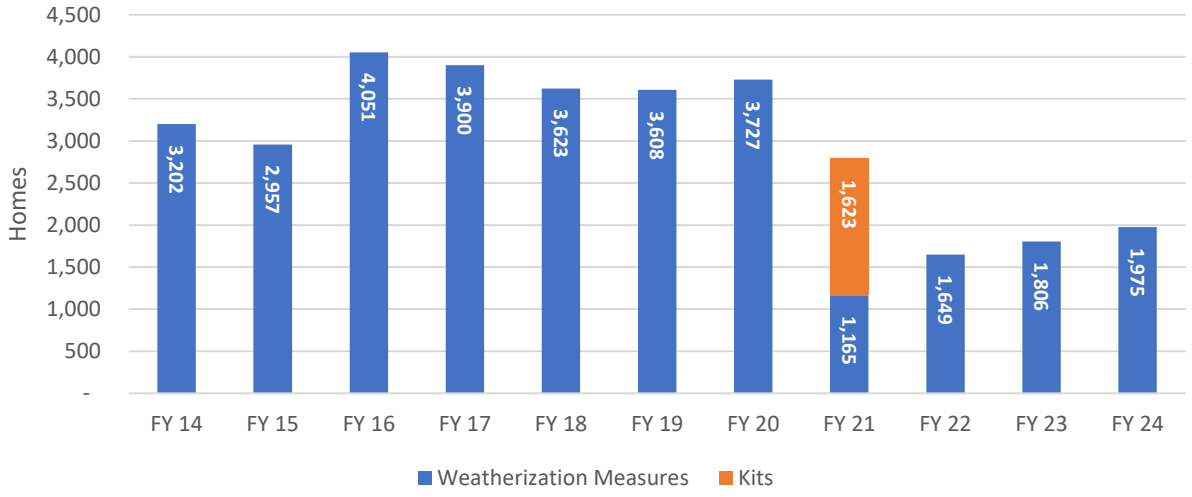


Figure 3-1: Weatherization – Participation Trends[10]

[10] Due to COVID-19 restrictions limiting access to customer homes in FY 2021, customers were offered kits containing LED light bulbs, faucet aerators, and pipe insulation.

Installed measures included repair, health & safety, and energy-saving measures. Energy-saving measures involved installation of the following equipment:

- Air infiltration reduction
- Duct sealing
- Faucet aerators
- Insulation (attic, floor, and wall)
- LED lighting
- Low-flow showerheads (LFSHs)
- Solar screens
- Water heater pipe insulation

The following figure demonstrates installation frequency by measure type.

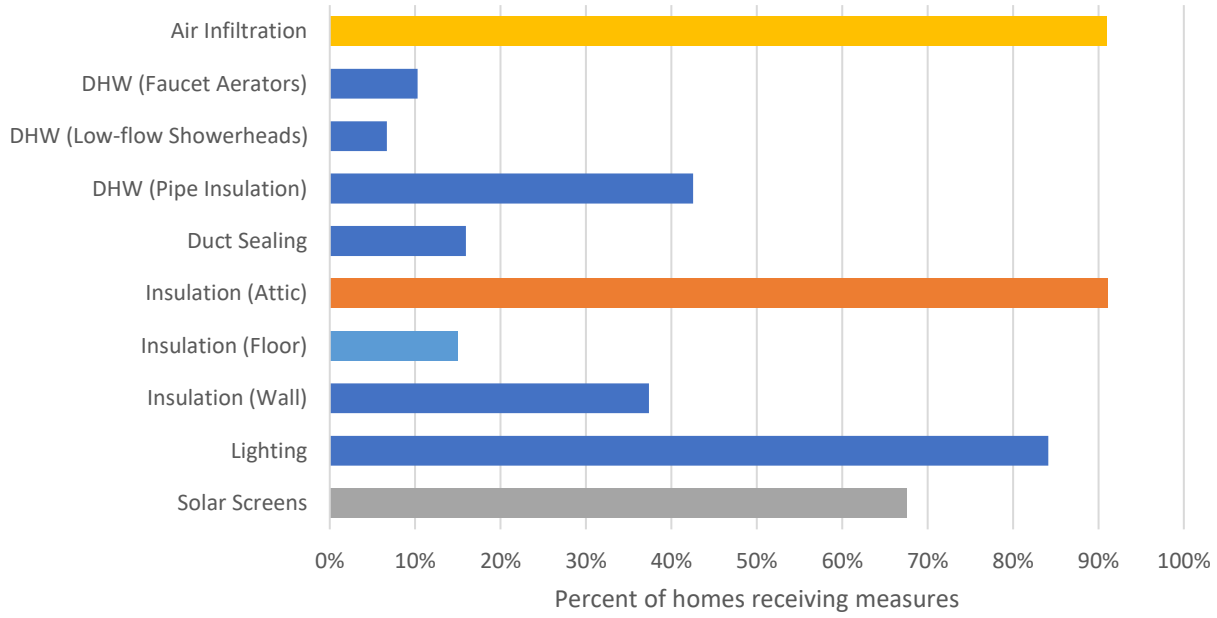


Figure 3-2: Weatherization – Frequency of Installation by Measure[11]

While the program features a diverse measure mix, envelope measures (listed in Figure 3-4) were by far the largest contributor to total program impacts for both energy and demand savings in FY 2024. 80+ percent of treated homes received air infiltration reduction, attic insulation, and LED lighting measures. Almost 70 percent received solar screens. Other measures are only applicable to specific home configurations or target only electric water heating fuel types.

[11] DHW refers to measures that are related to Domestic Hot Water end uses.

- Insulation was the largest single FY 2024 contributor in terms of energy savings and contributed approximately 58 percent of energy savings, 57 percent of NCP kW savings, and 71 percent of CP kW savings, increasing 5-10 percent compared to FY 2023.
- Lighting is next, contributing approximately 16 percent of energy savings. However, peak impacts are lower compared to envelope measures due to primary operation during evening hours.
- Air infiltration reduction and solar screens round out the top producing measures, with both contributing approximately 11-12 percent of energy savings. Air infiltration NCP demand impacts are higher than solar screens, but CP demand impacts are comparable.
- Duct sealing contributed approximately 2 percent of energy savings and 2-3 percent of demand savings, but it is only performed if existing ducts are in poor condition. Furthermore, many homes in the Weatherization program are not heated and cooled by central HVAC equipment. However, installation rates more than doubled to 16 percent.
- DHW measures are responsible for approximately 1 percent or less of total energy and demand savings. Faucet aerators and low-flow showerheads are distributed at a lower rate of 7 and 10 percent, respectively. In utility energy efficiency programs across the country, low DHW flow restriction measure adoption and persistence have historically been demonstrated to be driven by customer reluctance to reduce water pressure. Water heater pipe insulation is installed at a higher rate of approximately 42 percent due to higher customer demand. It is also installed in scenarios where no electric savings are claimed to support customer equity.

Percent contribution to gross program-level energy and demand impacts are shown in the following figure. Combined envelope measures contribute approximately 81 percent of gross energy impacts and 90-94 percent of gross demand impacts.

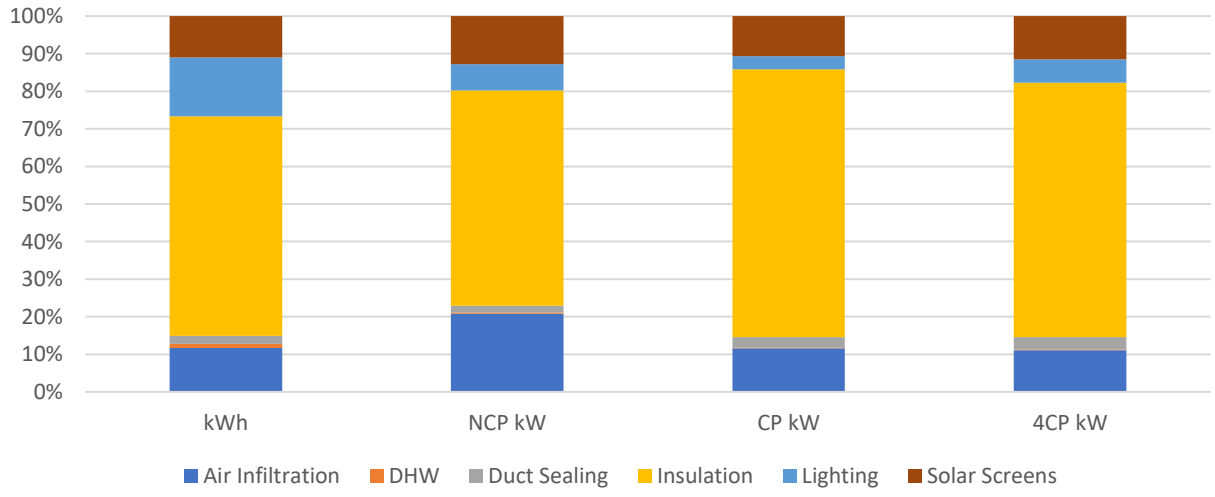


Figure 3-3: Weatherization – Gross Energy and Demand Impact Percentages by Measure

The home envelope is the primary boundary between conditioned and unconditioned space. Essentially, it's what protects the home from exterior elements. Envelope measures installed in the Weatherization program include air infiltration, insulation, and solar screens. The following figures demonstrate installation frequency and average per-residence energy and demand impacts by envelope measure. Attic and wall insulation delivered the largest average energy savings per treated home for envelope measures.

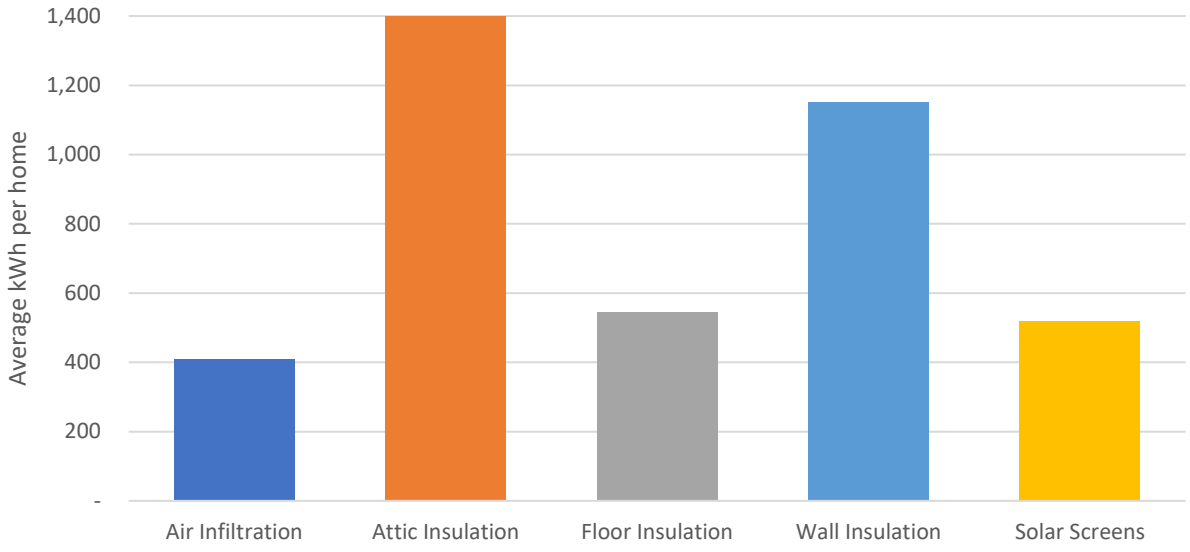


Figure 3-4: Weatherization – Average kWh/home by Envelope Measure

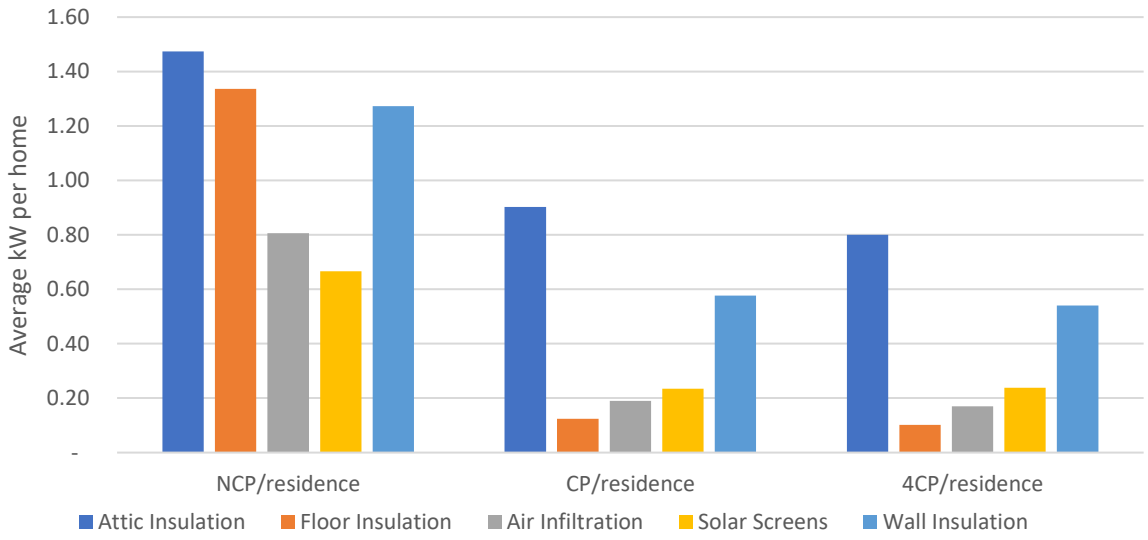


Figure 3-5: Weatherization – Average CP, NCP, and 4CP kW/residence by Envelope Measure

3.1.2 Results

A desk review was performed for a sample of projects incentivized in this program. The evaluation team selected a sample size to achieve a 90/5 percent confidence and precision interval. The savings verification results of the analyzed sample were applied to the entire program population. The following are the gross energy and demand savings for the Weatherization program, per residence and total by measure.

Table 3-1: Weatherization – Average Gross Savings per Residence

Measure	# Residences	kWh/Residence	NCP kW/ Residence	CP kW/ Residence	4CP kW/ Residence
Air Infiltration	1,796	409	0.81	0.19	0.17
DHW (Faucet Aerators)	203	54	0.02	0.001	0.001
DHW (Low-Flow Showerheads)	132	419	0.12	0.03	0.03
DHW (Pipe Insulation)	840	5	0.001	0.0005	0.0005
Duct Sealing	315	425	0.40	0.26	0.29
Insulation (Attic)	1,799	1,479	1.47	0.90	0.80
Insulation (Floor)	295	546	1.34	0.12	0.10
Insulation (Wall)	748	1,150	1.27	0.58	0.54
Lighting	1,661	593	0.29	0.06	0.10
Solar Screens	1,333	520	0.67	0.23	0.24
Average savings per residence[12]		**3,183**	**3.52**	**1.48**	**1.40**

[12] Average home values are not cumulative because each treated home did not receive every measure.

Table 3-2: Weatherization – Gross Energy and Demand Savings

Measure	Gross Energy Savings (kWh)	Gross NCP Demand Savings (kW)	Gross CP Demand Savings (kW)	Gross ERCOT 4CP Demand Savings (kW)
Air Infiltration	734,421	1,448.59	340.42	306.07
DHW	70,684	19.56	4.22	4.42
Duct Sealing	133,938	124.49	81.73	91.22
Insulation	3,669,562	3,984.62	2,085.44	1,868.59
Lighting	985,084	489.47	102.31	171.73
Solar Screens	692,663	888.43	313.10	316.94
Total[13]	**6,286,352**	**6,955.17**	**2,927.22**	**2,758.97**

3.1.3 Additional Considerations

LED Lighting

For this evaluation period, lighting savings were calculated using both first- and second-tier reduced baselines specified in the Energy Independence and Security Act of 2007 (EISA). In compliance with federal standards, full retail enforcement of the second-tier 45 lumens/watt backstop went into effect on July 1, 2023. However, since the CPS Energy implementation vendor program year runs through July 31, the evaluation team delayed enforcement to August 1, 2023 to better align with the program year transition. Future program years will use the second-tier baseline exclusively.

Additionally, the DOE final rule updates general service definition to remove most specialty designations. For projects that fell before the August 1, 2023 enforcement date, legacy specialty designations were allowed. All subsequent projects were subject to the new general service lamp definition, which removed most specialty lamp exceptions.

Water Heater Tank Insulation

Earlier versions of the CPS Energy Guidebook required that water heaters must be manufactured before 1991 to be eligible for this measure. Subsequently, no installations have been reported since FY 2022. However, subsequent measure guidelines have been updated to allow installation of water heaters manufactured prior to April 16, 2015.

[13] The sum of the individual measures may not match the total due to rounding.

3.1.4 Weatherization Repair Assistance Program

Aligned with their dedication to equity and access, CPS Energy created a program to enable acceptance into their existing Weatherization program. Since the Weatherization program's inception in 2012, CPS Energy received feedback from customers who need services but cannot participate due to program requirements prohibiting improvements that do not generate energy savings.

WRAP helps customers who lack the financial means for minor home repairs necessary to qualify and participate in the Weatherization program. This new assistance program is funded through donations to REAP that are designated specifically for weatherization. Through 2022, San Antonio residents have graciously donated over $25,000 towards WRAP. In 2023, the City of San Antonio's Neighborhood Housing and Services Department (NHSD) donated $1,000,000 towards the WRAP program over two years. NHSD will assess future donation opportunities based on current funding application run rate. In 2024, CPS Energy celebrated another $1,000,000 contribution to WRAP from the federal appropriations set forth by Congressman Joaquin Castro (TX-20).[14]

CPS Energy administers the WRAP program and supports the following program objectives:

- Providing minor home repairs to the 43 percent (fall out rate) of homes that do not qualify for weatherization due to repairs needed beyond existing guidelines
- CPS Energy's Weatherization program assessor and installers work in conjunction to make necessary repairs after initial assessment
- All repairs must be approved by CPS Energy prior to WRAP repairs, and cost must not exceed $3,500
- WRAP repairs and home weatherization are completed in tandem, where possible

Examples of measure types covered by the WRAP program:

- Gas stove replacement (for inoperable or high carbon monoxide emitting)
- Sheetrock work (over Casa Verde program limits)
- Minor roof repairs
- Plumbing and electrical repairs

The WRAP program greatly reduces the Casa Verde fall out rate and will aid in advancing CPS Energy efforts to help reduce energy burden and energy insecurity for customers while increasing health and safety equity for the San Antonio community. As of January 2024, WRAP has repaired 57 homes since its inception in December 2023, with plans for further investment and expansion. During this period, the WRAP program spent over $64,000 in just a few months on repairs, averaging $1,131 per residence, making previously deferred customers eligible for their homes to be weatherized.

[14] CPS Energy Newsroom announcement. https://newsroom.cpsenergy.com/congressman-joaquin-castro-secures-1-million-grant-to-grow-cps-energys-casa-verde-home-weatherization-program/.

3.2 WEATHERIZATION PROGRAM RECOMMENDATIONS

The updated CPS Energy Guidebook, applicable to FY 2025, contains updates that may impact savings. To ensure consistency of savings methodology between program tracking estimates and evaluation results for individual measures, we recommend revising input assumptions in program tracking systems to match the Guidebook.

The evaluation team has identified specific recommendations related to savings calculations and program documentation in a separate memo to program administrators. In addition to these savings calculations and documentation recommendations, the evaluation team makes the following general recommendations for Weatherization program offerings:

- DHW measures are only eligible to claim savings for homes with electric water heating. The evaluation team understands that these measures are sometimes installed in homes with gas water heating for equity purposes. However, no savings should be claimed in these cases.
- Envelope measures:
    - Sites participating in the Weatherization program often use multiple forms of cooling and heating. For example, a home may have central cooling but also use supplemental room/window air conditioning. Similarly, a home may have central gas heating but use supplemental electric resistance space heaters. Therefore, it is important to designate the primary heating and cooling source.
- Attic insulation:
    - Baseline R-value should be determined using a weighted average of the overall insulated area.
    - Homes insulated above R-30 are eligible to claim increased savings using the adjustment factors available in the CPS Energy Guidebook.
- Duct sealing:
    - Two paths are available to claim duct sealing savings. The first requires pre- and post-leakage testing, similar to the air infiltration measure. The second requires a visual inspection. When using the visual inspection approach, reported home characteristics are mapped to low, average, and high leakage categories. Corresponding savings are awarded based on historical program averages. Pre- and post-condition photos are collected to highlight key duct repairs.
- LEDs:
    - Most specialty LED designations have been removed. All LED products currently distributed through the program should use the general service lamp (GSL) LED savings

methodology.

- All calculated savings for GSL LEDs should use the reduced 45 lumens per watt tier 2 baseline outlined in the CPS Energy guidebook.
  - Rated lumens should be used to determine the applicable baseline.
  - For programs targeting low-income customers, the higher tier 1 baseline can be applied over the first two years of the measure lifetime before reverting to the tier 2 baseline for the remaining lifetime, calculated as estimated useful life (EUL) – 2. However, the savings calculation will also need to be updated to use the dual-baseline approach described in the CPS Energy Guidebook. Photo documentation demonstrating presence of existing incandescent or halogen lighting is required when claiming these additional savings.
- Coincident peak and HVAC interactive effects are available for lamps installed in conditioned spaces. For lamps that can be installed in both interior and exterior applications, specifying lamp location will justify additional savings.
- Lighting savings are claimed using the default 16-year rated life. Reporting lamp rated life will allow an increased 20-year measure life for products rated at 17,500+ hours.

- Consider adding the following new measures to existing program offerings:
  - Air purifiers (high-savings, low installation costs)
  - Cool roof coatings
  - DHW tank insulation (recommended reintroduction of measure)
  - Duct insulation (new measure in CPS Energy Guidebook)
  - HVAC replacements (mini-split ACs, mini-split HPs, WACs)
  - Low-E storm windows (lower cost alternative to window replacements)

4. RESIDENTIAL PROGRAMS

4.1 SUMMARY OF RESIDENTIAL IMPACTS

CPS Energy's portfolio of residential programs addresses all markets and major residential end-use loads. Residential demand response programs are included in Section 6. CPS Energy offered the following energy efficiency programs for the residential sector in FY 2024.

Home Efficiency – Targets a range of prescriptive energy efficiency measures that save on cooling and heating energy in existing homes.

Home Energy Assessment – Offers free in-person or virtual home assessments to help identify energy savings opportunities and direct install measures.

Residential Heating, Ventilation, and Air Conditioning (HVAC) – Rebates for high-efficiency cooling and heating equipment.

High-Performance A/C Tune-up – Free comprehensive check of HVAC equipment to help identify ways to improve existing central air conditioner or heat pump efficiency, performance, and maintenance.

New Home Construction – Rebates for developers to build homes that are at least 15 percent more energy efficient than current City of San Antonio building codes.

Retail Lighting Discounts – Point of purchase rebates on ENERGY STAR lighting at participating retailers.

All residential energy efficiency programs were implemented by CLEAResult for all of FY 2024 under the supervision of CPS Energy.

The contributions of each program to the residential portfolio's energy and peak demand savings are shown in the following figures, as measured at the participant or end-user level and adjusted to account for net-to-gross ratios and line losses. Program names are abbreviated in chart labels.[15]

[15] Home Efficiency = HE, Home Energy Assessment = HEA, Residential HVAC = HVAC, High-Performance A/C Tune-up = HPTU, New Home Construction = NHC, and Retail Lighting Discounts = Retail.

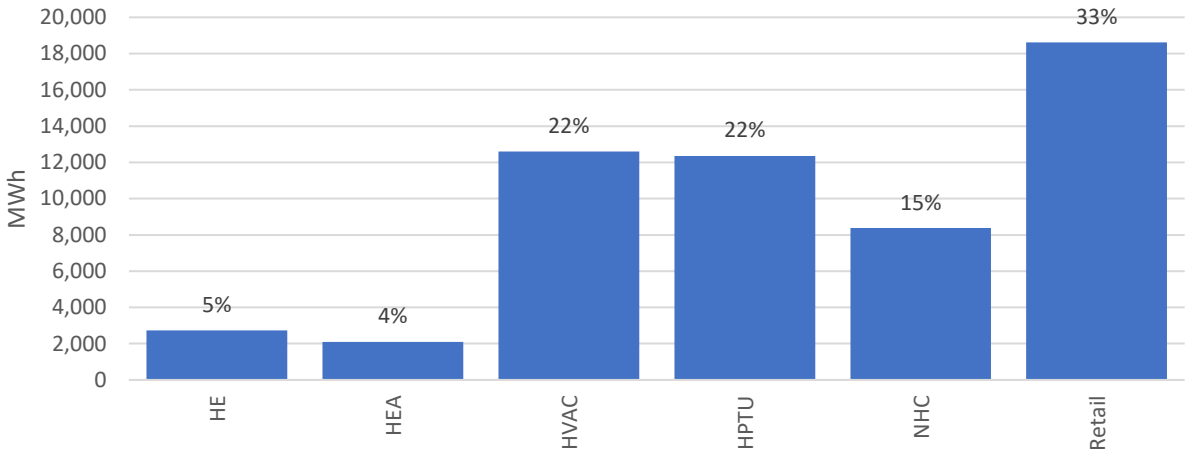


Figure 4-1: Summary of Residential Impacts – Net Avoided Energy by Program

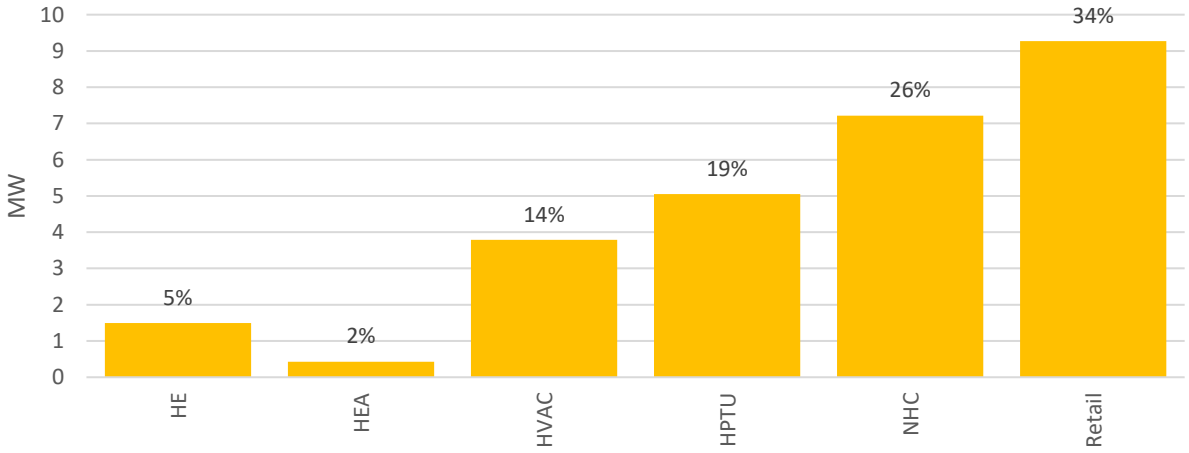


Figure 4-2: Summary of Residential Impacts – Net Avoided Non-Coincident Peak by Program

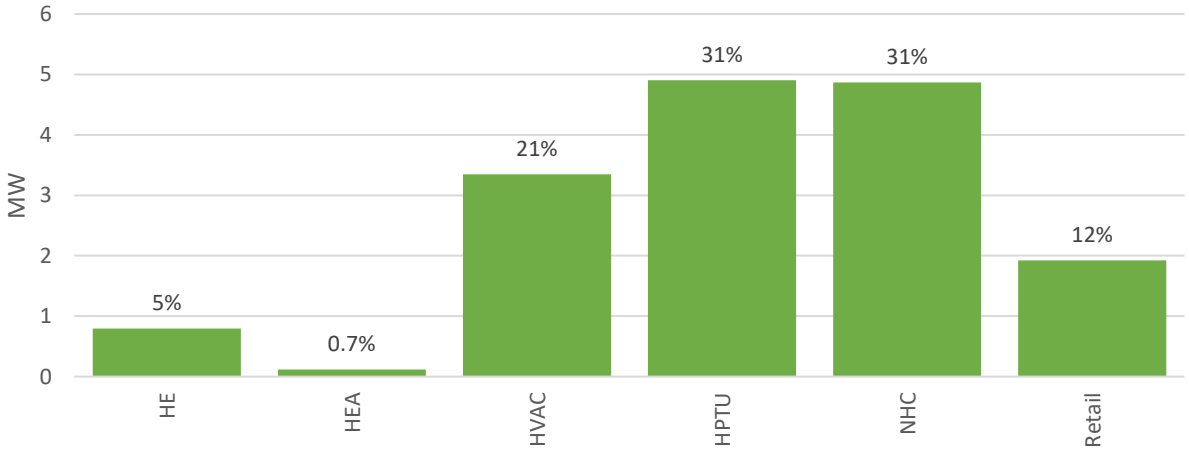


Figure 4-3: Summary of Residential Impacts – Net Avoided Coincident Peak by Program

4.2 HOME EFFICIENCY

4.2.1 Overview

The Home Efficiency program offers incentives for attic insulation, cool roof coatings, and variable-speed pool pumps. The program served 1,209 homes in FY 2024, compared to 1,190 homes in FY 2023. Cool roofs were added in FY 2023, and the program has an opportunity to continue targeting new measures or emerging technologies to return to historical participation levels.

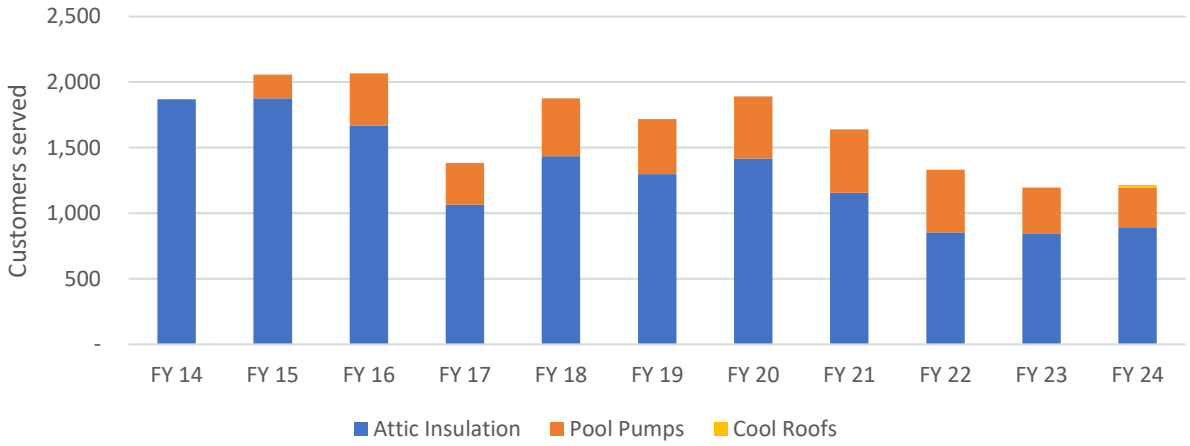


Figure 4-4: Home Efficiency – Participation Trends

The proportion of total program energy and peak impacts derived from each measure type is presented below. Pool pumps deliver a majority share of energy savings, while attic insulation achieves higher demand savings. Pool pumps see lower demand savings because they typically operate outside of peak hours.

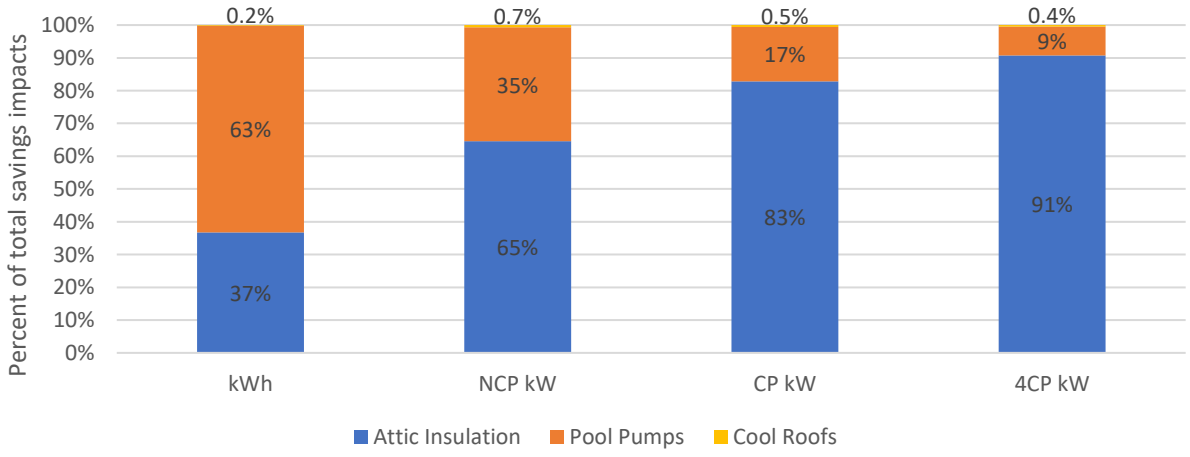


Figure 4-5: Home Efficiency – Gross Energy and Demand Impact Percentages by Measure

4.2.2 Results

A desk review was performed for a sample of projects incentivized in this program. The evaluation team selected a sample size to achieve a 90/10 percent confidence and precision interval. The savings verification results of the analyzed sample were applied to the entire program population. The following are the gross energy and demand savings for the Home Efficiency program, per residence and total by measure.

Table 4-1: Home Efficiency – Average Gross Savings per Residence

Measure	# Residences	kWh/ Residence	NCP kW/ Residence	CP kW/ Residence	4CP kW/ Residence
Attic Insulation	893	1,149	1.10	0.73	0.72
Cool Roofs	20	315	0.53	0.21	0.16
Pool Pumps	302	5,821	1.75	0.43	0.21
Average savings per residence[16]		**2,308**	**1.26**	**0.65**	**0.59**

Table 4-2: Home Efficiency – Gross Energy and Demand Savings

Measure	Gross Energy Savings (kWh)	Gross NCP Demand Savings (kW)	Gross CP Demand Savings (kW)	Gross ERCOT 4CP Demand Savings (kW)
Attic Insulation	1,025,952	982.31	648.24	646.27
Cool Roofs	6,304	10.50	4.22	3.18
Pool Pumps	1,758,001	528.94	130.17	62.48
Total[17]	**2,790,257**	**1,521.74**	**782.64**	**711.94**

[16] Average home values are not cumulative because each treated home did not receive every measure.
[17] The sum of the individual measures may not match the total due to rounding.

4.3 HOME ENERGY ASSESSMENT

4.3.1 Overview

The Home Energy Assessment (HEA) program provides energy-saving products to residential customers by means of an in-person home energy assessment. Measures include advanced power strips, faucet aerators, low-flow showerheads, LED lighting, and smart thermostats. After relaunching with a new implementation vendor in FY 2023 and serving 339 homes, the program expanded to serve 2,016 homes in FY 2024. Participation trends and measure frequency are displayed in the figures below.

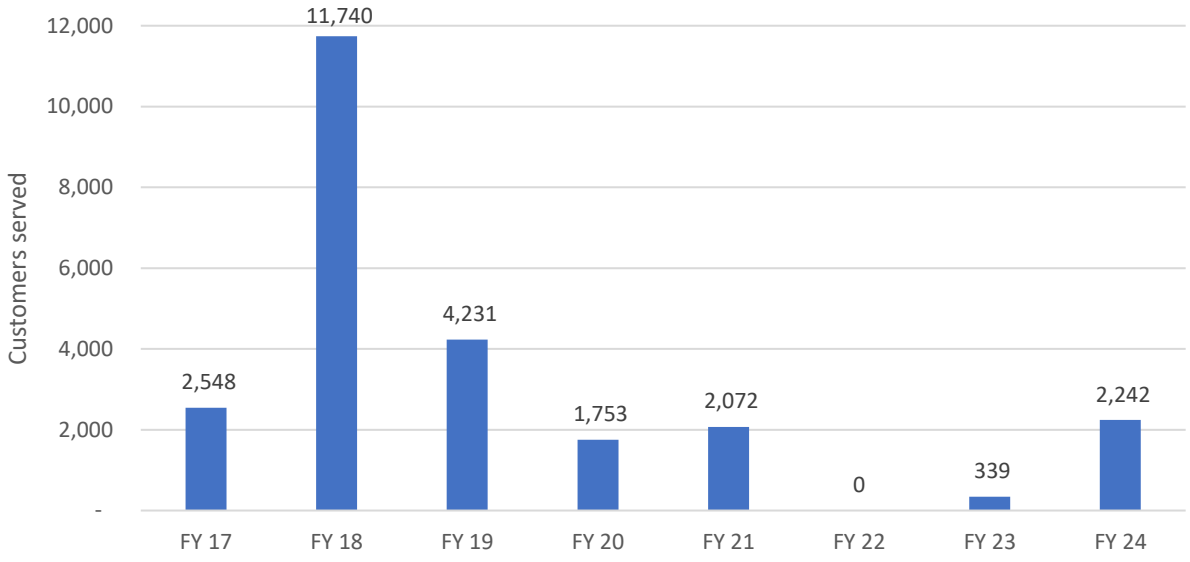


Figure 4-6: Home Energy Assessment – Participation Trends

80%+ of treated homes receive LED lighting and advanced power strips, but fewer than 10% receive other measures.

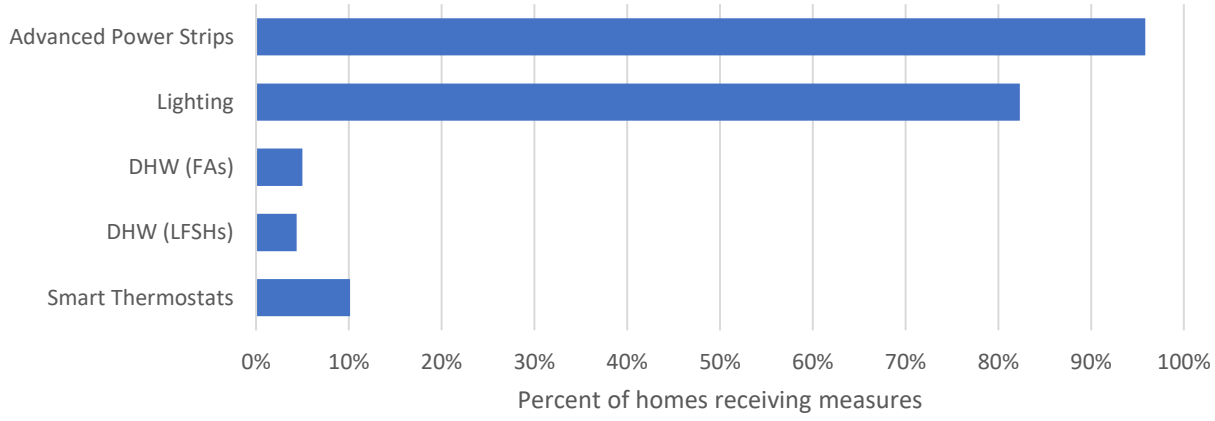


Figure 4-7: Home Energy Assessment – Installation Frequency by Measure

The percentage breakdown of program savings by measure type is presented below. Due to a baseline shift, advanced power strips surpassed LED lighting as the leading energy contributor, responsible for more than half of energy impacts. LED lighting remains the leading demand contributor, producing 52-76 percent of demand impacts. Smart thermostats are a significant contributor to energy savings but are only awarded demand savings if enrolled in a demand response program.

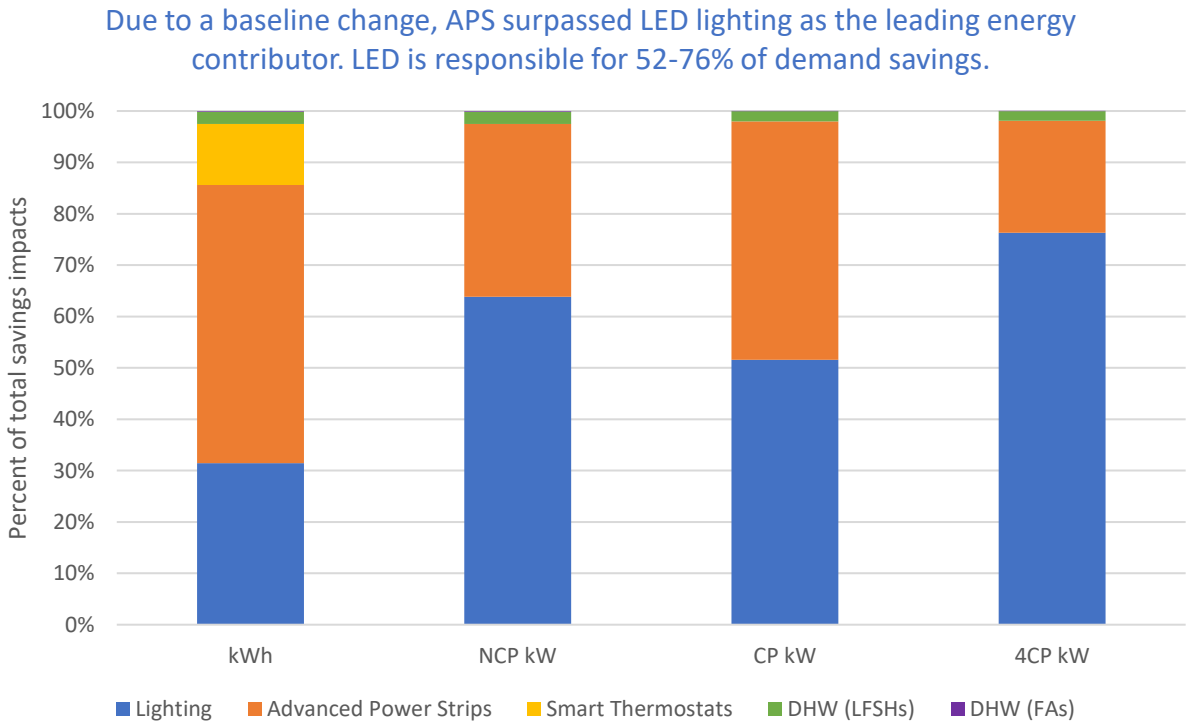


Figure 4-8: Home Energy Assessment – Gross Energy and Demand Impact Percentages by Measure

4.3.2 Results

A desk review was performed for a sample of projects incentivized in this program. The evaluation team selected a sample size to achieve a 90/10 percent confidence and precision interval. The savings verification results of the analyzed sample were applied to the entire program population. The following are the gross energy and demand savings for the Home Efficiency program, per residence and total by measure.

Table 4-3: Home Energy Assessments – Average Gross Savings per Residence

Measure	# Residences	kWh/ Residence	NCP kW/ Residence	CP kW/ Residence	4CP kW/ Residence
Advanced Power Strips	2,149	604	0.08	0.03	0.02
DHW (FAs)	112	574	0.12	0.03	0.03
DHW (LFSHs)	98	32	0.0063	0.0004	0.0005
Lighting	1,846	407	0.17	0.04	0.06
Smart Thermostats[18]	227	1,238	–	–	–
Average savings per residence[19]		**1,066**	**0.22**	**0.06**	**0.07**

Table 4-4: Home Energy Assessments – Gross Energy and Demand Savings

Measure	Gross Energy Savings (kWh)	Gross NCP Demand Savings (kW)	Gross CP Demand Savings (kW)	Gross ERCOT 4CP Demand Savings (kW)
Advanced Power Strips	1,298,779	163.64	60.97	32.53
DHW (FA/LFSHs)	59,852	12.38	2.68	2.82
Lighting	751,100	311.07	67.71	113.66
Smart Thermostats[20]	281,030	–	–	–
Total[21]	**2,390,761**	**487.09**	**131.36**	**149.01**

4.3.3 Additional Considerations

Advanced Power Strips

In-service rates (ISR) are used to account for the percentage of products that remain installed, operating effectively. Historically, no ISR has been applied to the advanced power strips measure. However, this measure is subject to low persistence rates due to having never been installed (leave-behinds program delivery strategy) or lack of customer education regarding proper installation. These products rely on having a single control load and several peripheral devices that are shut off when the control equipment is turned off. If devices are only connected to the control or override plugs, no savings are achieved. The

[18] Deemed demand savings are not awarded to smart thermostats because they are typically claimed separately through demand response programs.
[19] Average home values are not cumulative because each treated home did not receive every measure.
[20] Deemed demand savings are not awarded to smart thermostats because they are typically claimed separately through demand response programs.
[21] The sum of the individual measures may not match the total due to rounding.

evaluation team will work with CPS Energy and the implementation vendor to ensure that these continue to be areas of focus moving forward.

LED Lighting

For this evaluation period, lighting savings were calculated using both first- and second-tier reduced baselines specified in the Energy Independence and Security Act of 2007 (EISA). In compliance with federal standards, full retail enforcement of the second-tier 45 lumens/watt backstop went into effect on July 1, 2023. However, since the CPS Energy implementation vendor program year runs through July 31, the evaluation team delayed enforcement to August 1, 2023 to better align with the program year transition. Future program years will use the second-tier baseline exclusively.

Additionally, the DOE final rule updates general service definition to remove most specialty designations. For projects that fell before the August 1, 2023 enforcement date, legacy specialty designations were allowed. All subsequent projects were subject to the new general service lamp definition, which removed most specialty lamp exceptions.

4.4 RESIDENTIAL HVAC PROGRAM

4.4.1 Overview

The Residential HVAC program promotes the installation of energy-efficient heating, ventilation, and air conditioning (HVAC) equipment. The program covers the installation of central air conditioners (ACs), central heat pumps (HPs), and window air conditioners (WACs). During FY 2024, a total of 4,687 units were installed in 4,475 residences compared to 5,169 HVAC systems in 4,735 residences in FY 2023.

The following figures illustrate residential HVAC participation trends from FY 2014 to FY 2024. Total participation initially fell off in FY 2015 based on a federal standard change that went into effect January 1, 2015, raising the minimum efficiency requirement from 13 to 14 SEER. Total participation increased in FY 2016 and 2017 as the market caught up to the new standard, peaking in FY 2017 based on a combination of implementation efforts resulting from the transition from CPS Energy to third-party implementation. Participation continued to drop in subsequent years based on a combination of market saturation and the effects of COVID-19. A new federal standard change went into effect on January 1, 2023, changing HVAC testing procedures from SEER to SEER2 and increasing minimum efficiency standards to 13.8 or 14.3 SEER2 (equivalent of 14.5 or 15 SEER) based on system type and capacity. While this change had a minor negative impact on FY 2023, it continues to impact participation as existing stock is depleted and the market catches up to the new minimum efficiency standards.

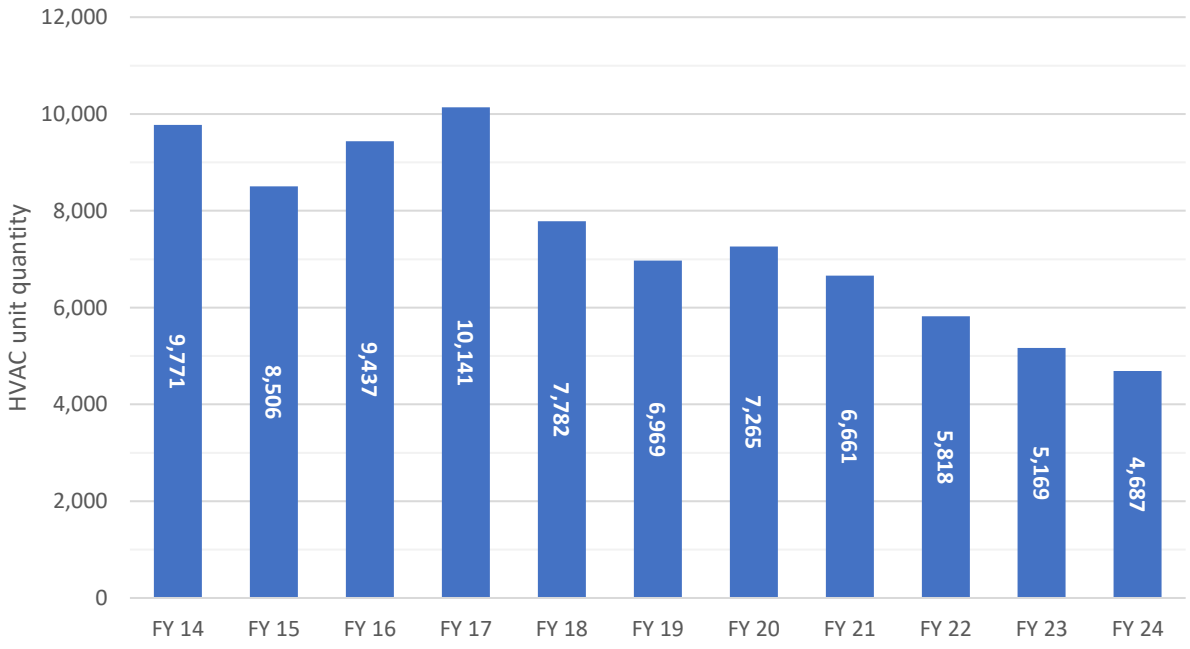


Figure 4-9: Residential HVAC – Participation Trends

Total participation (total system count) dropped more noticeably in FY 2018 based on program design shifts to provide a greater emphasis on central systems and a decreasing focus on window air conditioners. Individual system type trends show an increase in central air conditioners and heat pumps and a decrease in window air conditioners, with the net impact showing a decrease in total systems based on residences with window units having multiple units per residence.

Central ACs continue to be the primary driver of program participation. Window ACs are more often encountered in targeted low-income programs, but participation could be improved with a retail or midstream delivery mechanism.

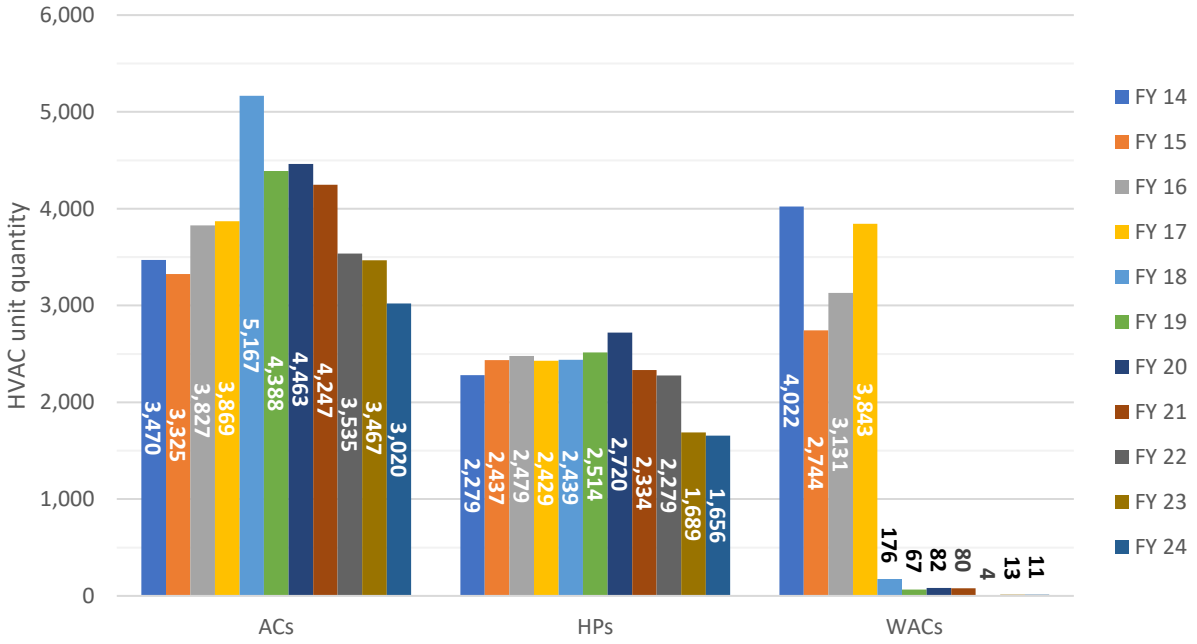


Figure 4-10: Residential HVAC – Participation Trends by System Type[22]

The figure below presents a percentage breakdown of program savings by system type. Central ACs make up approximately half of the energy impacts and two-thirds of demand impacts.

[22] The implementation vendor did not provide system type designations for a portion of FY 2022 and FY 2023 projects. System type designations for affected projects were determined using a ratio derived from the system type quantities of the remaining population.

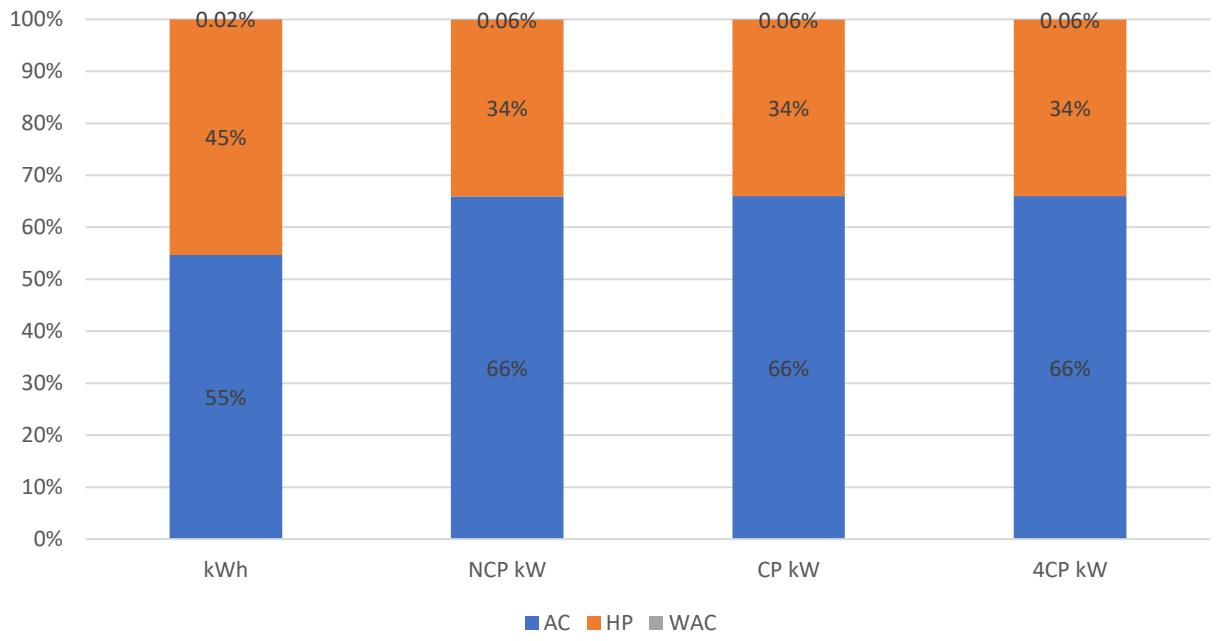


Figure 4-11: Residential HVAC – Gross Energy and Demand Impact Percentages by Measure

4.4.2 Results

A desk review was performed for a sample of projects incentivized in this program. The evaluation team selected a sample size to achieve a 90/10 percent confidence and precision interval. The savings verification results of the analyzed sample were applied to the entire program population. The following are the gross energy and demand savings for the Residential HVAC program, per residence and total by measure.

Table 4-5: Home Efficiency – Average Gross Savings per Residence

Measure	# Residences	kWh/ Residence	NCP kW/ Residence	CP kW/ Residence	4CP kW/ Residence
AC	2,868	2,397	0.87	0.74	0.74
HP	1,605	3,553	0.80	0.68	0.68
WAC	10	311	0.23	0.21	0.18
Average savings per residence[23]		**2,812**	**0.85**	**0.72**	**0.72**

[23] Average home values are not cumulative because each treated home did not receive every measure.

Table 4-6: Residential HVAC – Gross Energy and Demand Savings

Measure	Gross Energy Savings (kWh)	Gross NCP Demand Savings (kW)	Gross CP Demand Savings (kW)	Gross ERCOT 4CP Demand Savings (kW)
AC	6,875,611	2,494.09	2,136.24	2,136.24
HP	5,702,975	1,286.27	1,098.50	1,098.50
WAC	3,109	2.30	2.08	1.81
Total[24]	**12,581,695**	**3,782.66**	**3,236.83**	**3,236.56**

4.4.3 Additional Considerations

Equipment Verification

To verify the accuracy of the reported equipment specifications, reported system capacities and efficiencies were validated against the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) certified product directory[25] for AC/HPs and against the ENERGY STAR certified product listing[26] for WACs.

Early retirement projects use an alternate dual baseline that requires confirmation of several additional measure inputs. Reported existing system type, condition, model numbers, and age were validated against available project documentation. Savings were calculated against an adjusted replace-on-burnout baseline for projects where this documentation was inconsistent or unavailable.

For heat pump projects replacing air conditioners with an electric furnace, heating energy savings were calculated against an electric resistance baseline when the baseline heating type can be verified using project documentation. An adjusted heat pump baseline for projects where this documentation was inconsistent or unavailable.

[24] The sum of the individual measures may not match the total due to rounding.
[25] AHRI Directory. https://www.ahridirectory.org/Search/SearchHome.
[26] ENERGY STAR Certified Room Air Conditioners: https://www.energystar.gov/productfinder/product/certified-room-air-conditioners/.

4.5 HIGH-PERFORMANCE A/C TUNE-UP

4.5.1 Overview

The High-Performance A/C Tune-up (HPTU) program services air conditioners and heat pumps to improve operating efficiency for residential customers. Service items may include cleaning the condenser, evaporator, and blower assembly, changing filters, adjusting airflow, and adjusting refrigerant charge as needed.

There were 5,737 individual residential HVAC tune-ups across 4,542 residences performed in FY 2024, increasing from 1,087 tune-ups across 601 sites in FY 2023.

4.5.2 Results

A desk review was performed for a sample of projects incentivized in this program. The evaluation team selected a sample size to achieve a 90/10 percent confidence and precision interval. Adjustments were made to project-level input assumptions where the reported measure inputs did not match project documentation and inspection results. The savings verification results of the analyzed sample were applied to the entire program population.

High-Performance Tune-ups customers are identified and enrolled through two delivery channels, Home Energy Assessments (HEA) and Residential HVAC.

Table 4-7: HPTU – Average Gross Savings per Home

Program	# Residences	kWh/ Residence	NCP kW/ Residence	CP kW/ Residence	4CP kW/ Residence
HEA	464	3,057	1.22	1.14	0.99
RES HVAC	4,078	2,678	1.10	1.03	0.92

Table 4-8: HPTU – Gross Energy and Demand Savings

Program	Gross Energy Savings (kWh)	Gross NCP Demand Savings (kW)	Gross CP Demand Savings (kW)	Gross ERCOT 4CP Demand Savings (kW)
HEA	1,418,376	564.45	528.35	460.15
RES HVAC	10,922,726	4,480.86	4,215.18	3,757.94
Total[27]	**12,341,102**	**5,045.31**	**4,743.53**	**4,218.09**

4.5.3 Additional Considerations

The CPS Energy Guidebook contains a default efficiency loss factor used to estimate savings impacts for tune-ups. Energy savings are calculated by estimating the efficiency of the cooling equipment before the tune-up using an efficiency loss factor because of dirty coils, blower, and filter, improper airflow, and/or incorrect refrigerant charge. The implementation vendor requested that the evaluation team apply alternate efficiency loss factors obtained from field-measured performance data. Efficiency losses, calculated in the field in full for a sampled subset of tune-ups, are utilized alongside previous years' measurements to derive a rolling 3-year average efficiency loss of projects with valid EER-post ratings. These averages are then grouped by project characteristics which are statistically significant in affecting the efficiency loss. Currently, these variables are market sector and whether a refrigerant charge adjustment was made. The resulting average efficiency loss factors are applied to projects that do not have test-in field measurements but do exhibit identical project characteristics to the groupings used in the averaging procedure.

In FY 2021, the evaluation team concluded it was appropriate to utilize the implementer's efficiency loss as described above after conducting a thorough review of the variable using historical program data in Texas. Calculations referencing test-in and test-out field measurements were determined to be sound, being within one percent variability when compared to evaluated results. However, further work to determine that potential groups used for efficiency loss averaging have been sufficiently exhausted, the correct temperature/pressure readings are used, and that the sampling procedures used to select M&V tune-ups are statistically sound is ongoing and may influence subsequent evaluations.

[27] The sum of the individual measures may not match the total due to rounding.

4.6 NEW HOME CONSTRUCTION PROGRAM

4.6.1 Overview

The New Home Construction program offers an incentive to home builders to construct homes that are 15 percent or more efficient than the 2021 International Energy Conservation Code® (IECC) code requirements. IECC 2021 was approved by San Antonio on November 10, 2022 and went into effect on February 1, 2023.[28] Program savings are claimed for 15- and 30-percent improvement tiers.

Participants can qualify for higher incentives by obtaining certification through the Build San Antonio Green (BSAG) program. The BSAG single family new construction program incorporates additional elements to achieve certification, including water, site, and health requirements. BSAG also requires a Home Energy Rating System (HERS) rating in addition to meeting all ENERGY STAR New Homes program requirements.

Table 4-9: New Home Construction – Incentive Levels

Requirement	Incentive
15% or better than code without BSAG certification	$800
15% or better than code with BSAG certification	$1,000

CPS Energy's FY 2024 New Home Construction program provided incentives for 7,487 new homes compared to 3,020 homes in FY 2023.

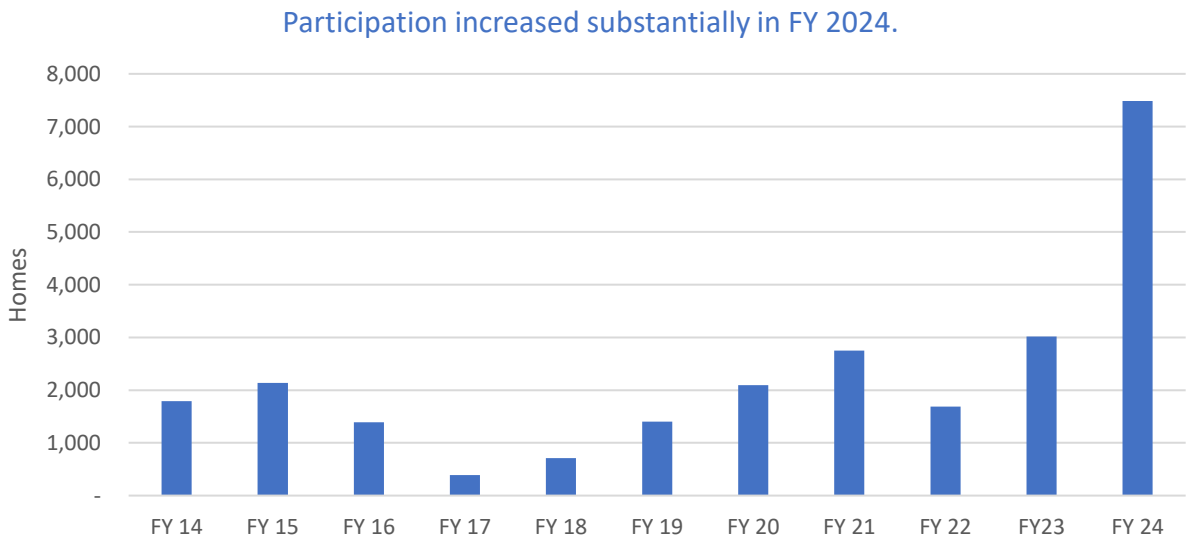


Figure 4-12: New Home Construction – Participation Trends

[28] Current Codes and Ordinances (sanantonio.gov).

In FY 2024, 7,289 homes were certified by BSAG, approximately 97 percent of the total population. This represents an increase of 7 percent compared to FY 2023. Six builders participated in the program, although one builder only submitted a single home. Among the top three builders, Lennar increased total home participation and BSAG certification by more than 300 percent.

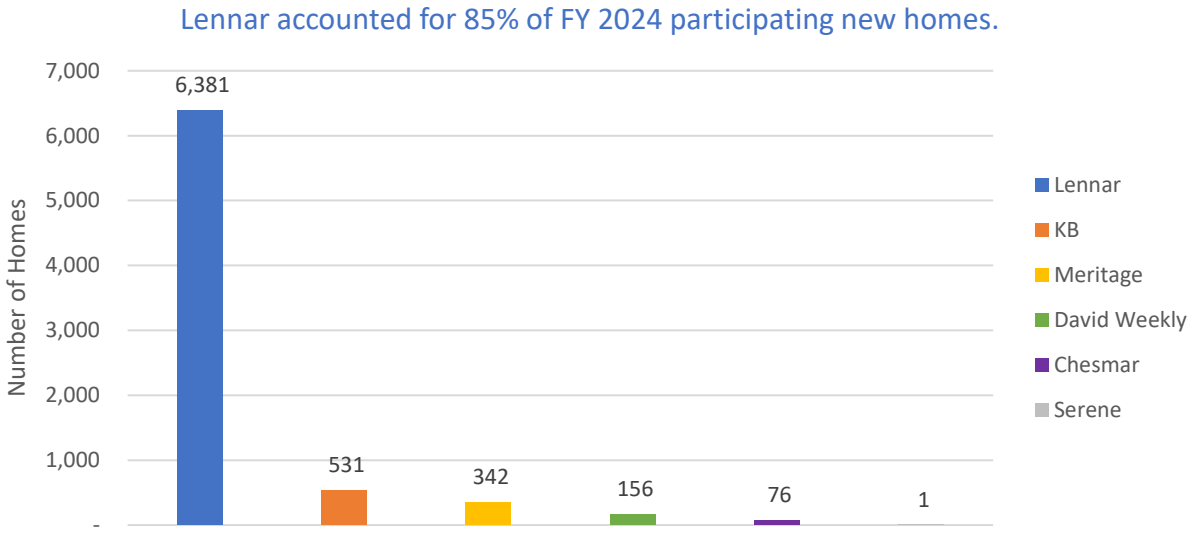


Figure 4-13: New Home Construction – Builder Participation

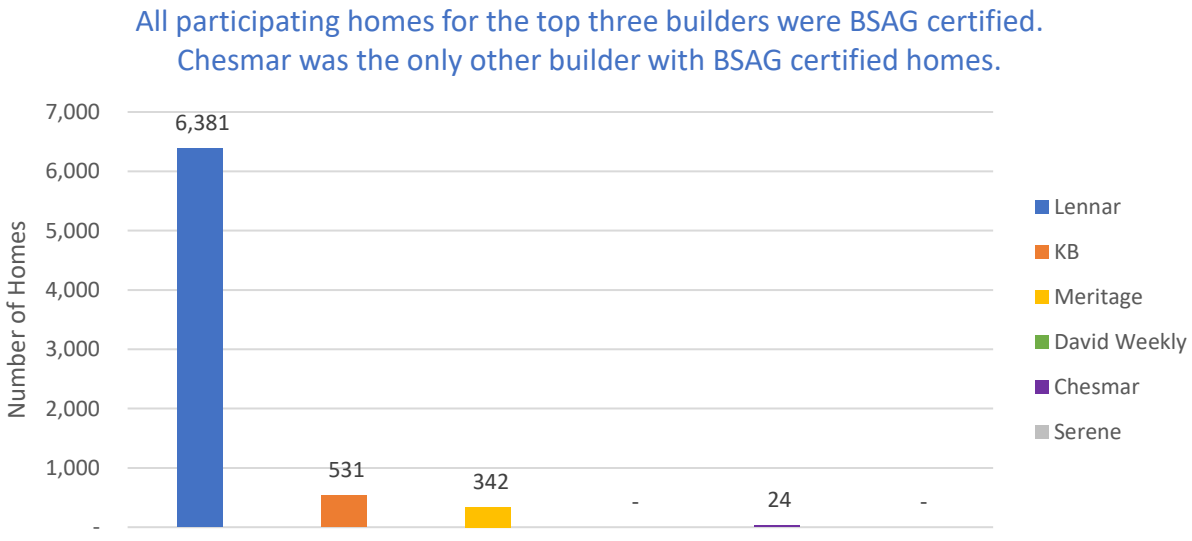


Figure 4-14: New Home Construction – BSAG Certified Builder Participation

4.6.2 Results

A desk review was performed for a sample of projects incentivized in this program. The evaluation team selected a sample size to achieve a 90/10 percent confidence and precision interval. The savings verification results of the analyzed sample were applied to the entire program population. The following are the gross energy and demand savings for the New Home Construction program, per home and total by measure.

Table 4-10: New Home Construction – Average Gross Savings per Home

Measure	# Residences	kWh/Residence	NCP kW/ Residence	CP kW/ Residence	4CP kW/ Residence
New Homes	7,487	1,062	0.91	0.60	0.64

Table 4-11: New Home Construction – Gross Energy and Demand Savings

Measure	Gross Energy Savings (kWh)	Gross NCP Demand Savings (kW)	Gross CP Demand Savings (kW)	Gross ERCOT 4CP Demand Savings (kW)
New Homes	7,948,626	6,843.84	4,471.10	4,771.03

4.6.3 Additional Considerations

The evaluation team employed BEopt residential building energy use simulation software to develop models representing the general suites of measures incorporated in participating homes by different builders. With these models, the evaluation team was able to verify the energy savings estimates from the rating tools and estimate CP, 4CP and NCP demand savings. The base model was a simple single-story square home with an unfinished attic built on a slab. The reference model was populated in accordance with the requirements for creating a standard reference model in Section R405 of the IECC 2015 and reviewed for compliance with the updated IECC 2021 code.

Builders are using a wide array of measures to meet program requirements: some have gone to 2x6 walls with R-19 insulation, while others are also adding continuous rigid insulation around the exterior of the homes. Most homes have 16 SEER air conditioners (or 16 SEER/8.5 and higher HSPF heat pumps), and some have tankless water heaters. Many are bringing the attics inside the envelope, insulating at the roof deck, and completely sealing the attic. Almost all are installing radiant barriers.

Perhaps the most important feature in determining by how much participating homes exceeded code regulations is in reducing air infiltration. Code requires that homes not allow more than 5 air changes per hour (ACH) during blower door testing (pressurized to 50 pascals): reported air infiltration rates from post-construction blower door tests were between 2 and 5 ACH_{50}.

After reviewing the data from the IC3 reports and supplemental information requested (as listed in the CPS Energy Guidebook section for this program), the evaluation team developed simulation models reflecting the basic packages implemented by each of the builders. The evaluation team then ran simulations on variations of these models reflecting important differences such as the size (conditioned floor area) and achieved air infiltration rate. The result of this calibrated modeling approach is a deemed savings value per home as shown in the following table.[29]

Table 4-12: New Home Construction – Deemed Savings per Home

Percentage Above Code	kWh/Residence	NCP kW/ Residence	CP kW/ Residence	4CP kW/ Residence
15%	1,072	0.603	0.923	0.724
30%	1,385	0.779	1.193	0.936

Measure savings for this program have been fully deemed since the inception of the STEP program. Moving forward, the evaluation team will consider moving to an approach where savings are extracted from existing industry modeling software. This approach will allow for better adaptation to changing codes and will provide more precise savings while allowing builders and implementers to leverage existing reporting tools and systems. This change will also bring the New Home Construction program into better alignment with the Texas TRM.

The Texas TRM is also considering implementing a process by which HERS Index is mapped to energy savings using historical utility program data. That approach will be considered as a secondary option as more information becomes available.

[29] This approach corresponds to homes that are 15 percent more efficient than the IECC 2018 baseline. However, recent developments resulted in homes being built that were 30 percent more efficient than the IECC 2018 baseline. These homes were originally reported to have savings equivalent to those homes with 15 percent improvement. In FY 2020, the evaluation team sought to award additional savings to the homes that are 30 percent better by algebraically reverse calculating the baseline consumption for the 15 percent improvement then calculating savings for a 30 percent improvement against that baseline estimate. Finally, that best-case savings for a fully electric home is adjusted down to account for the percentage of household appliances that are gas-fueled. Fuel type assumptions are derived from RECS end-use data. https://www.eia.gov/consumption/residential/.

4.7 RETAIL LIGHTING DISCOUNTS

4.7.1 Overview

The Retail Lighting Discounts program is designed to reach low-to-moderate-income customers through retail locations in their neighborhoods by offering in-store rebates for ENERGY STAR-certified lighting. After relaunching in FY 2023, the program expanded in FY 2024 to include 19,807 transactions from seven participating retailers (44 locations).[30] In FY 2024, 448,876 individual lamps were distributed through the program.

Average gross impacts per transaction were 1,161 kWh, 0.56 NCP kW, 0.12 CP kW, and 0.19 4CP kW. Average gross impacts per retail location were 522,840 kWh, 254.21 NCP kW, 52.26 CP kW, and 87.75 4CP kW. Energy and NCP demand impacts per retail location increased 50+ percent compared to FY 2023. CP and 4CP demand impacts increased 70+ percent.

4.7.2 Results

A desk review was performed for a sample of projects incentivized in this program. The evaluation team selected a sample size to achieve a 90/10 percent confidence and precision interval. The savings verification results of the analyzed sample were applied to the entire program population.

Table 4-13: Retail Lighting Discounts – Gross Energy and Demand Savings

Measure	Gross Energy Savings (kWh)	Gross NCP Demand Savings (kW)	Gross CP Demand Savings (kW)	Gross ERCOT 4CP Demand Savings (kW)
Lighting	23,004,962	11,185.26	2,299.49	3,860.81

4.7.3 Additional Considerations

EISA 45 Lumens per Watt Backstop

For this evaluation period, lighting savings were calculated using both first- and second-tier reduced baselines specified in the Energy Independence and Security Act of 2007 (EISA). In compliance with federal standards, full retail enforcement of the second-tier 45 lumens/watt backstop went into effect on July 1, 2023. However, since the CPS Energy implementation vendor program year runs through July 31, the evaluation team delayed enforcement to August 1, 2023 to better align with the program year transition. Future program years will use the second-tier baseline exclusively.

Additionally, the DOE final rule updates general service definition to remove most specialty designations. For projects that fell before the August 1, 2023 enforcement date, legacy specialty

[30] CPS Energy Retail Lighting Discounts program webpage. https://resi-savenow.cpsenergy.com/cps-energy/retailer-information.

designations were allowed. All subsequent projects were subject to the new general service lamp definition, which removed most specialty lamp exceptions.

In-Service Rate

In-service rates (ISR) are used to account for the percentage of products that remain installed and operating effectively. Historically, a 0.97 ISR has been applied to all lighting measures. However, this ISR is more consistent with direct install applications. Products distributed through retail programs may be installed outside the utility service territory (leakage), stored for future use, or never installed. This phenomenon is typical of a non-direct-install program design and is common in similar programs across the country. Despite this adjustment, retail program designs remain an effective strategy to reach customers that may otherwise not participate in utility energy efficiency program offerings. The FY 2025 CPS Energy Guidebook introduced a 0.76 ISR for retail LED Lighting to account for these factors moving forward.

4.8 RESIDENTIAL PROGRAM RECOMMENDATIONS

The updated CPS Energy Guidebook, applicable to FY 2025, contains updates that may impact savings. To ensure consistency of savings methodology between program tracking estimates and evaluation results for individual measures, we recommend revising input assumptions in program tracking systems to match the Guidebook.

The evaluation team has identified specific recommendations related to savings calculations and program documentation in a separate memo to program administrators. In addition to these savings calculations and documentation recommendations, the evaluation team makes the following general recommendations for residential program offerings:

4.8.1 General Recommendations

- Reported heating and cooling types should distinguish between central and space conditioning.
- Additional documentation is required when claiming central electric resistance heating. The FY 2025 CPS Energy Guidebook incorporated a documentation adjustment factor applicable to cases where supplemental documentation is not available.

4.8.2 Home Efficiency

- Pool pumps:
    - Measure savings in the FY 2025 CPS Energy Guidebook have been updated to comply with current federal standards. Minimum efficiency requirements are now measured in terms of hydraulic horsepower.
    - Additional optional energy efficiency standards were also added for FY 2025, aligning with recommendations from the Consortium for Energy Efficiency (CEE) residential swimming pool pump specification. For all in-ground pumps, CEE Tier 1 matches the current federal standard, and CEE Tier 2 matches the current ENERGY STAR specification for in-ground standard size pumps. Additional savings are only specified for CEE tiers where there is an incremental efficiency improvement above the ENERGY STAR specification.
- Consider adding the following new measures to existing program offerings:
    - Heat pump and solar water heaters
    - Solar screens
    - Window replacements

4.8.3 Home Energy Assessment

- Update the Home Energy Assessment report to include more granular home characteristics, including heating and cooling type designations from the CPS Energy Guidebook.
- Differentiate between central and space conditioning.

4.8.4 Residential HVAC

- Air Conditioners and Heat Pumps:
    - While not required, the evaluation team recommends a 15.2 SEER2 (16 SEER equivalent) minimum efficiency standard, as this efficiency corresponds to a reduced 9.8 EER2 full-load baseline. The recommended minimum efficiency requirement is reduced to the 14.3 SEER2 code requirement when replacing central electric resistance heat due to increased heating savings opportunities.
    - Currently, a heat pump baseline is used for all heat pump installations. Collect documentation of existing electric furnace equipment where applicable to validate use of reduced resistance heating baseline, significantly increasing savings opportunity for these replacements.
    - The FY 2025 CPS Energy Guidebook has removed the one-year exceptions for HPs less than 65,000 Btu/h with only a SEER rating. Moving forward, all HPs must have a SEER2 rating to comply with the current federal standard.
- Window Air Conditioners:
    - Moving forward, units with connected functionality will no longer receive a 5 percent energy credit after ENERGY STAR discontinued the policy.
    - Enforce updated ENERGY STAR version 5.0 specification and increased minimum CEER efficiency requirements for room air conditioners.

4.8.5 High-Performance A/C Tune-Up

- Routinely assess the regression diagnostics and variable selection process used to determine how efficiency loss is grouped for deemed averaging.

4.8.6 New Home Construction

- Measure savings for this program have been fully deemed since the inception of the STEP program. The evaluation team is working with CPS Energy to move toward an approach where savings are extracted from existing industry modeling software. This approach will allow for better adaptation to changing codes and will provide more precise savings while allowing builders and implementers to leverage existing reporting tools and systems. This change will

also bring the New Home Construction program into better alignment with the Texas TRM.

4.8.7 Retail Lighting Discounts

- Update product assumptions to incorporate desk review feedback from qualified product listing (QPL) review.

4.8.8 General Lighting Recommendations

- Most specialty LED designations have been removed. All LED products currently distributed through the program should use the general service lamp (GSL) LED savings methodology.
- All calculated savings for GSL LEDs should use the reduced 45 lumens per watt tier 2 baseline outlined in the CPS Energy guidebook. Rated lumens should be used to determine the applicable baseline.
- Savings may default to a 16-year measure life, but reporting lamp rated life will allow an increased 20-year measure life for products rated at 17,500+ hours.

5. COMMERCIAL PROGRAMS

5.1 SUMMARY OF COMMERCIAL IMPACTS

CPS Energy's portfolio of commercial programs addresses most markets and major commercial end-uses. Commercial demand response programs are included in Section 6. CPS Energy offered the following energy efficiency programs for the commercial sector in FY 2024:

- Commercial & Industrial Solutions (C&I) – Energy assessments to identify opportunities and rebates for a wide range of measures including lighting, HVAC, and refrigeration.
- Schools & Institutions (S&I) – Helps schools and government agencies reduce energy use through benchmarking, technical assistance, energy master planning, and rebate offerings.
- Small Business Solutions (SBS) – Contractor-driven incentive program for small business customers with less than 100 kW demand, primarily focused on lighting and HVAC tune-ups. Additionally, this program offers a midstream lighting component targeting distributors.

All programs were implemented by CLEAResult under the supervision of CPS Energy.

The contributions of each program to the commercial portfolio's energy and peak demand savings are shown in the following figures, as measured at the participant or end-user level, and adjusted to account for net-to-gross ratios and line losses. Program names are abbreviated in chart labels.[31]

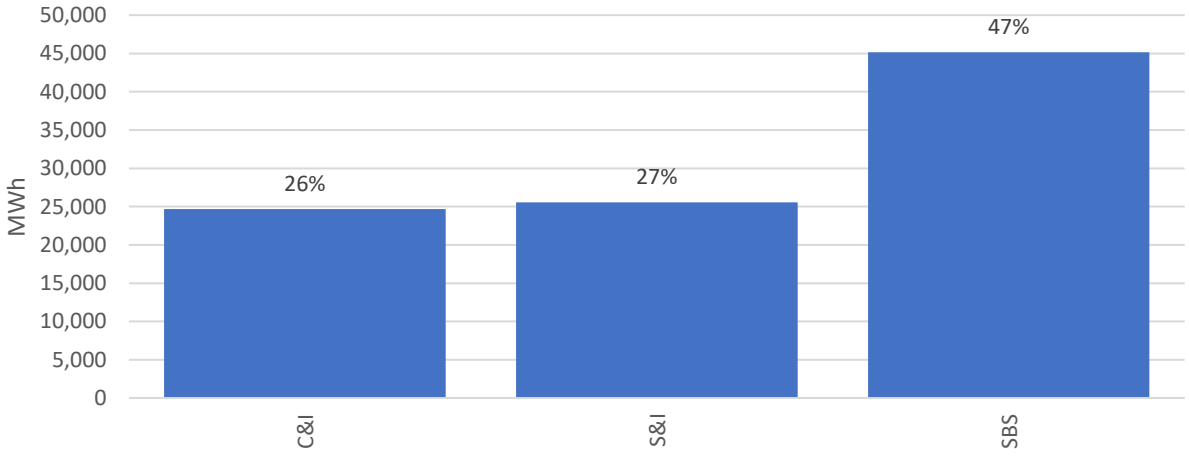


Figure 5-1: Summary of Commercial Impacts – Net Avoided Energy by Program

[31] C&I = Commercial and Industrial, S&I = Schools & Institutions, SBS = Small Business Solutions.

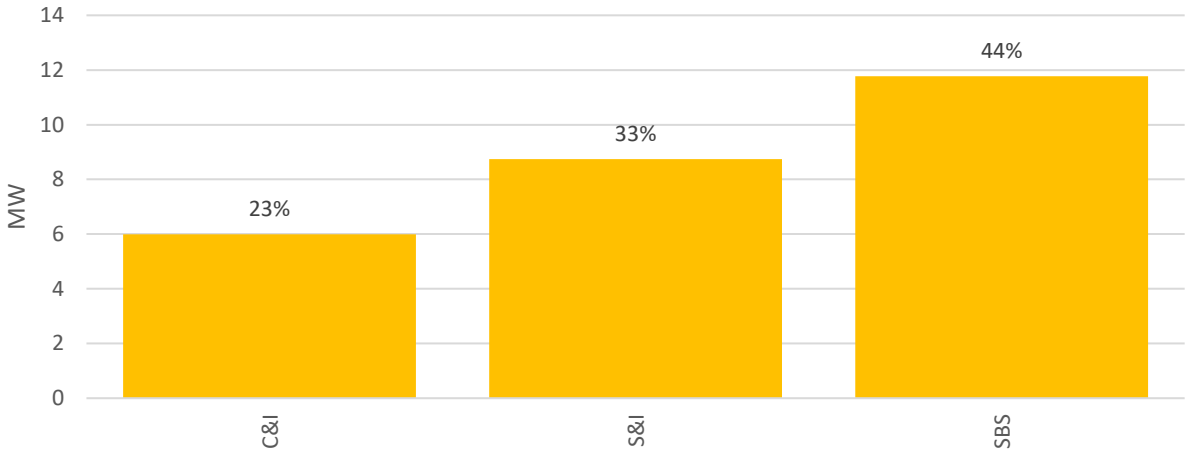


Figure 5-2: Summary of Commercial Impacts – Net Avoided NCP by Program

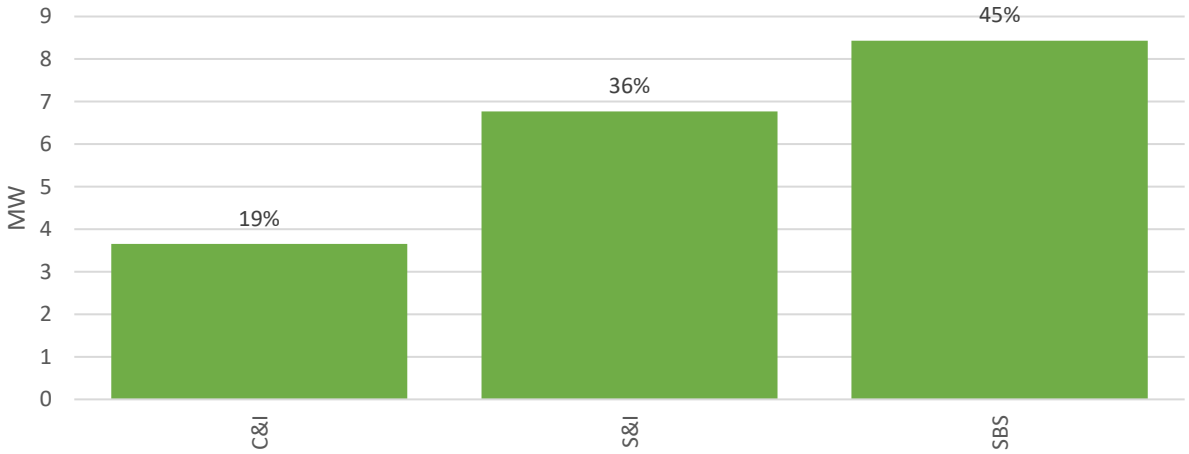


Figure 5-3: Summary of Commercial Impacts – Net Avoided CP by Program

5.2 COMMERCIAL & INDUSTRIAL SOLUTIONS

5.2.1 Overview

The Commercial & Industrial (C&I) Solutions program delivers energy savings primarily through air compressor, HVAC, lighting, retro-commissioning, variable frequency drive measures, and several other measures. In FY 2024, a total of 195 customers participated in the C&I program, compared to 288 in FY 2023.

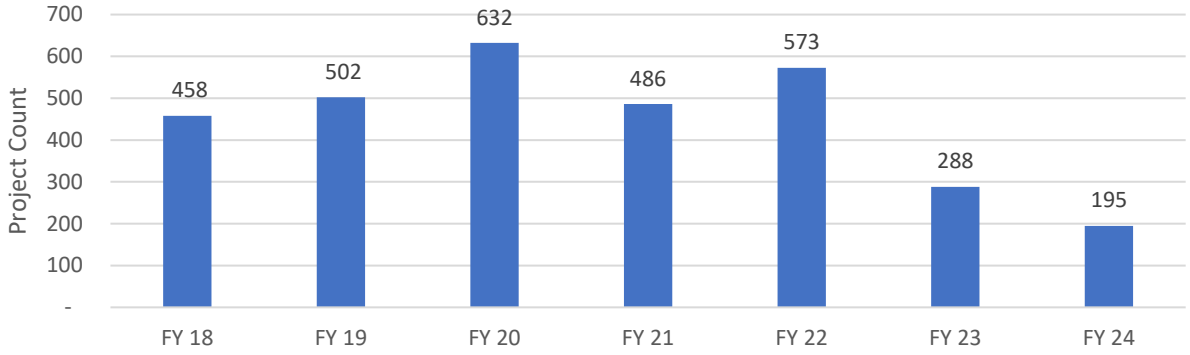


Figure 5-4: C&I Solutions – Participation Trends

The figure below presents a percentage breakdown of gross energy savings and demand savings. The C&I program is predominantly driven by lighting measures, with HVAC tune-up contributions declining in FY 2024.

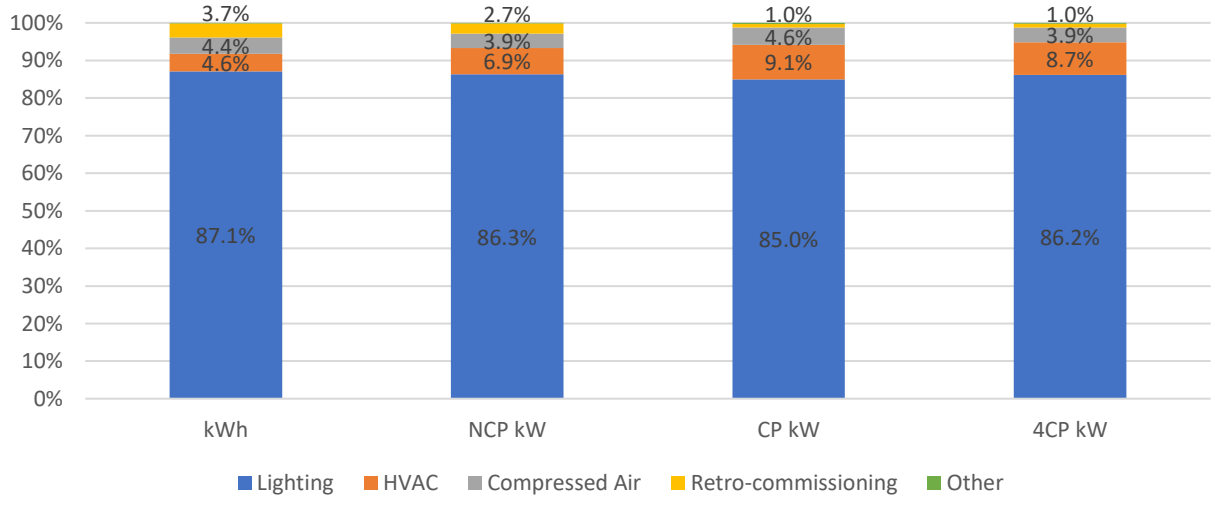


Figure 5-5: C&I Solutions – Gross Energy and Demand Impacts by Measure[32]

[32] Other measure percentages are not labeled in graph because they are less than 1 percent.

In FY 2023, approximately 58 percent of sampled lighting savings were attributed to the warehouse building type, and 21 percent were from outdoor lighting. In FY 2024, office and outdoor lighting made up 58 percent of total energy impacts, with warehouse contributions decreasing to 16 percent.

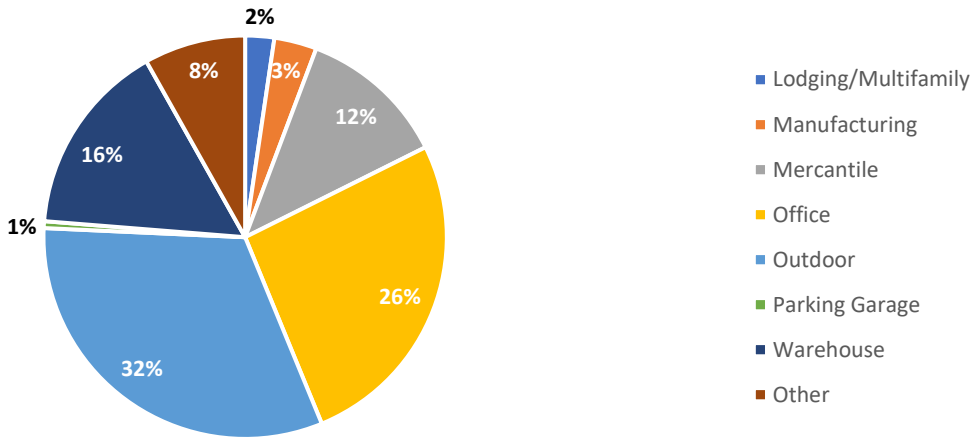


Figure 5-6: C&I Solutions – Percent of kWh Savings by Building Type for Sampled Lighting Projects[33]

Split and packaged air conditioners and heat pumps were responsible for approximately two-thirds of sampled HVAC retrofit energy impacts. Air-cooled chillers made up the remaining third. No water-cooled chillers were included in FY 2024 sampled projects.

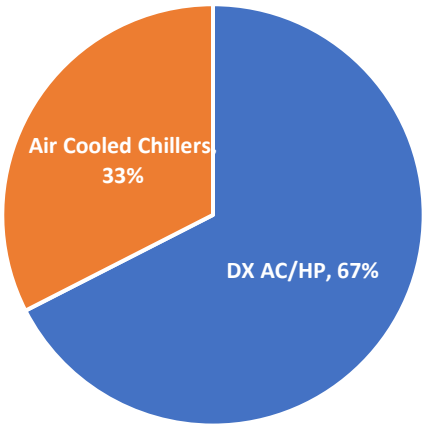


Figure 5-7: C&I Solutions – Percent of kWh Savings by System Type for Sampled HVAC Projects[34]

[33] Figure based on second half of FY participation.
[34] Ibid.

5.2.2 Results

A desk review was performed for a sample of projects incentivized in this program. The evaluation team selected a sample size to achieve a 90/10 percent confidence and precision interval. The savings verification results of the analyzed sample were applied to the entire program population.

Table 5-1: C&I Solutions – Gross Energy and Demand Savings

Measure	Gross Energy Savings (kWh)	Gross NCP Demand Savings (kW)	Gross CP Demand Savings (kW)	Gross ERCOT 4CP Demand Savings (kW)
Compressed Air	1,036,813	225.20	154.80	130.41
HVAC Retrofits	386,170	190.42	183.49	158.90
HVAC Tune-ups	195,838	78.66	74.93	64.93
HVAC VFDs	514,770	130.08	46.44	62.12
Lighting	20,613,940	4,975.94	2,833.30	2,848.05
Lodging Occupancy Sensors	25,894	7.92	7.92	6.85
Pool Pumps	13,518	1.54	1.54	1.54
Retro-commissioning	877,977	153.20	31.74	32.21
Total[35]	**23,629,836**	**5,760.03**	**3,331.24**	**3,344.34**

5.2.3 Additional Considerations

All Measures

Savings are calculated based on the applicable sector (i.e., residential, commercial). However, savings are claimed in a program that matches the applicable customer utility rate classification. For example, master-metered commercial utility accounts in multifamily applications are calculated using residential HVAC savings calculation methodologies but are attributed to commercial programs.

HVAC Tune-ups

The CPS Energy Guidebook contains a default efficiency loss factor used to estimate savings impacts for tune-ups. Energy savings are calculated by estimating the efficiency of the cooling equipment before the tune-up using an efficiency loss factor because of dirty coils, blower, and filter, improper airflow, and/or incorrect refrigerant charge. The implementation vendor requested that the evaluation team apply alternate efficiency loss factors obtained from field-measured performance data. Efficiency losses,

[35] The sum of the individual measures may not match the total due to rounding.

calculated in the field in full for a sampled subset of tune-ups, are utilized alongside previous years' measurements to derive a rolling 3-year average efficiency loss of projects with valid EER-post ratings. These averages are then grouped by project characteristics which are statistically significant in affecting the efficiency loss. Currently, these variables are market sector and whether a refrigerant charge adjustment was made. The resulting average efficiency loss factors are applied to projects that do not have test-in field measurements but do exhibit identical project characteristics to the groupings used in the averaging procedure.

In FY 2021, the evaluation team concluded it was appropriate to utilize the implementer's efficiency loss as described above after conducting a thorough review of the variable using historical program data in Texas. Calculations referencing test-in and test-out field measurements were determined to be sound, being within one percent variability when compared to evaluated results. However, further work to determine that potential groups used for efficiency loss averaging have been sufficiently exhausted, the correct temperature/pressure readings are used, and that the sampling procedures used to select M&V tune-ups are statistically sound is ongoing and may influence subsequent evaluations.

LED General Service Lamps

For this evaluation period, lighting savings were calculated using both first- and second-tier reduced baselines specified in the Energy Independence and Security Act of 2007 (EISA). In compliance with federal standards, full retail enforcement of the second-tier 45 lumens/watt backstop went into effect on July 1, 2023. However, since the CPS Energy implementation vendor program year runs through July 31, the evaluation team delayed enforcement to August 1, 2023 to better align with the program year transition. Future program years will use the second-tier baseline exclusively.

Additionally, the DOE final rule updates general service definition to remove most specialty designations. For projects that fell before the August 1, 2023 enforcement date, legacy specialty designations were allowed. All subsequent projects were subject to the new general service lamp definition, which removed most specialty lamp exceptions.

5.3 SCHOOLS & INSTITUTIONS SOLUTIONS

5.3.1 Overview

The Schools & Institutions (S&I) Solutions program delivers energy savings primarily through air compressor, behavioral, HVAC, lighting, retro-commissioning, variable frequency drive, and other measures. In FY 2024, a total of 124 customers participated in the S&I program, compared to 144 in FY 2023.

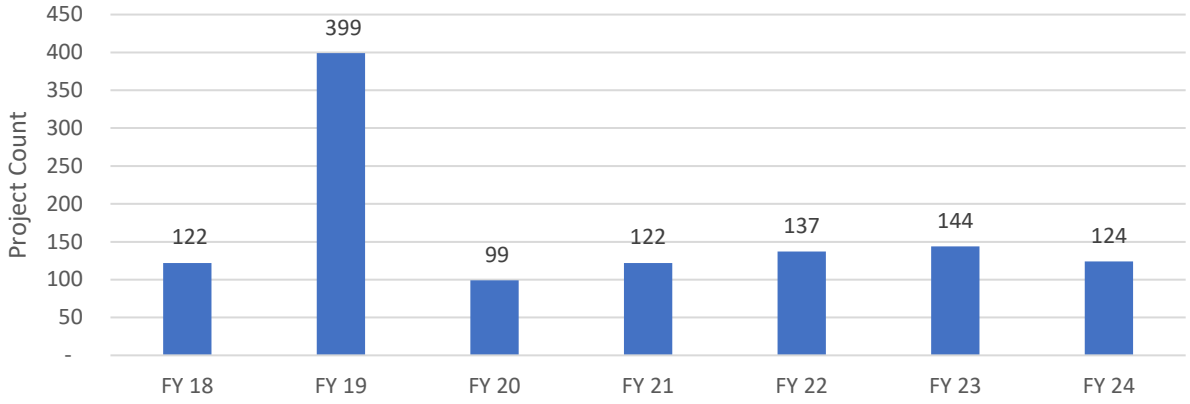


Figure 5-8: Schools & Institutions – Participation Trends

The figure below presents a percentage breakdown of gross energy savings and demand savings. The S&I program is predominantly driven by behavioral measures. HVAC measures are also a key contributor, including HVAC retrofits, tune-ups, and variable frequency drives.

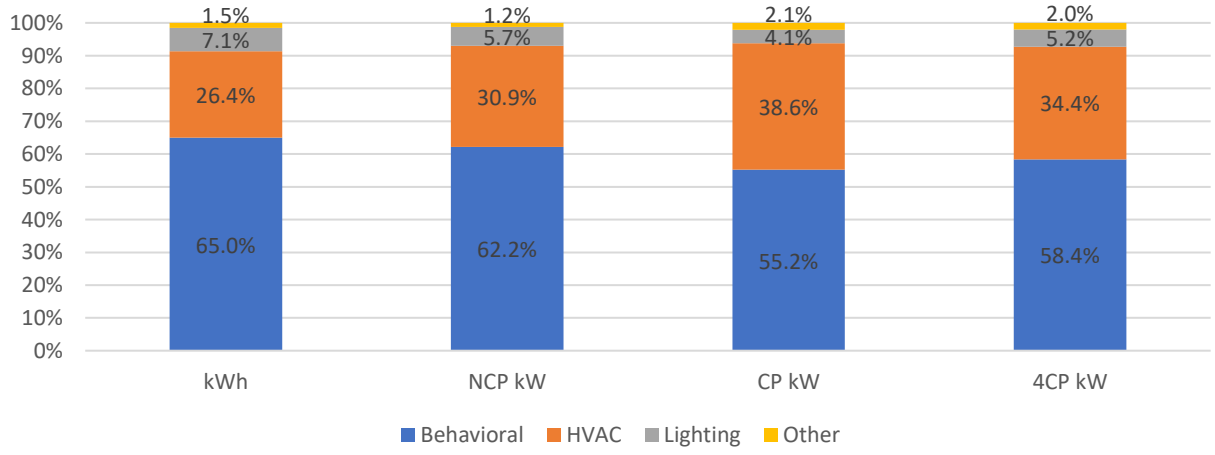


Figure 5-9: Schools & Institutions – Gross Energy and Demand Impacts by Measure Type[36]

[36] For FY 2024, "Other" refers to retro-commissioning and other custom measures.

In FY 2023, approximately 80 percent of sampled lighting savings were attributed to residential, multifamily, and outdoor applications. In FY 2024, approximately the same percentage was made up of lighting installed in schools with no projects for lighting installed in residential applications. Outdoor lighting contributions decreased to about one-third of FY 2023 levels.

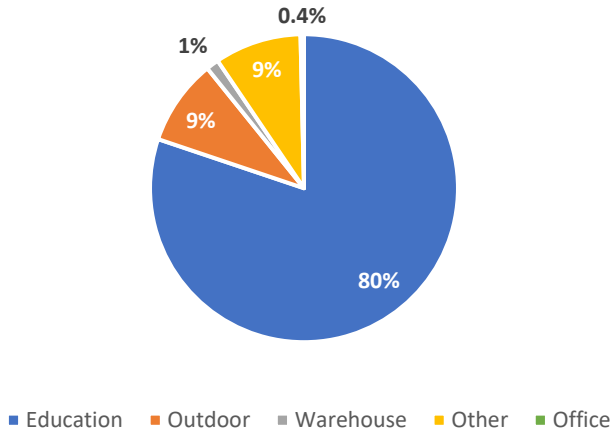


Figure 5-10: Schools & Institutions – Percent of kWh Savings by Building Type for Sampled Lighting Projects[37]

Air-cooled chillers were responsible for approximately 84 percent of sampled HVAC retrofit energy impacts. The remainder of energy impacts were evenly split between water-cooled chillers and split/packaged air conditioners and heat pumps.

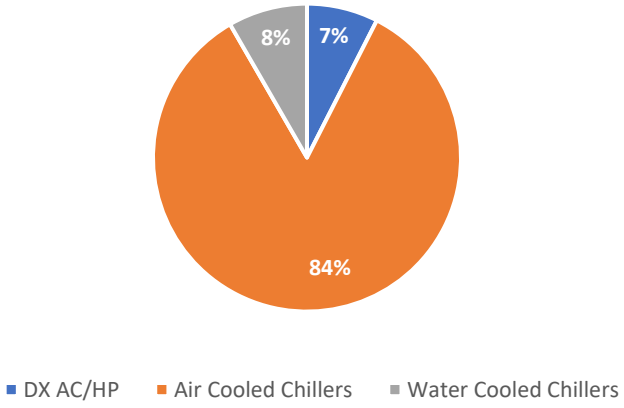


Figure 5-11: Schools & Institutions – Percent of kWh Savings by System Type for HVAC Projects[38]

[37] Figure based on second half of FY participation.
[38] Ibid.

5.3.2 Results

A desk review was performed for a sample of projects incentivized in this program. The evaluation team selected a sample size to achieve a 90/10 percent confidence and precision interval. The savings verification results of the analyzed sample were applied to the entire program population.

Table 5-2: Schools & Institutions – Gross Energy and Demand Savings

Measure	Gross Energy Savings (kWh)	Gross NCP Demand Savings (kW)	Gross CP Demand Savings (kW)	Gross ERCOT 4CP Demand Savings (kW)
Behavioral	16,563,682	5,371.90	3,640.40	3,640.40
Custom	222,023	52.70	86.85	73.84
HVAC Retrofits	717,291	433.79	404.57	333.67
HVAC Tune-up	2,854,321	1,872.69	1,782.86	1,450.36
HVAC VFDs	3,153,566	360.00	360.00	360.00
Lighting	1,817,064	494.89	269.82	326.89
Retro-commissioning	163,997	54.99	51.69	51.69
Total[39]	**25,491,944**	**8,640.96**	**6,596.20**	**6,236.85**

5.3.3 Additional Considerations

HVAC Tune-ups

The CPS Energy Guidebook contains a default efficiency loss factor used to estimate savings impacts for tune-ups. Energy savings are calculated by estimating the efficiency of the cooling equipment before the tune-up using an efficiency loss factor because of dirty coils, blower, and filter, improper airflow, and/or incorrect refrigerant charge. The implementation vendor requested that the evaluation team apply alternate efficiency loss factors obtained from field-measured performance data. Efficiency losses, calculated in the field in full for a sampled subset of tune-ups, are utilized alongside previous years' measurements to derive a rolling 3-year average efficiency loss of projects with valid EER-post ratings. These averages are then grouped by project characteristics which are statistically significant in affecting the efficiency loss. Currently, these variables are market sector and whether a refrigerant charge adjustment was made. The resulting average efficiency loss factors are applied to projects that do not have test-in field measurements but do exhibit identical project characteristics to the groupings used in the averaging procedure.

[39] The sum of the individual measures may not match the total due to rounding.

In FY 2021, the evaluation team concluded it was appropriate to utilize the implementer's efficiency loss as described above after conducting a thorough review of the variable using historical program data in Texas. Calculations referencing test-in and test-out field measurements were determined to be sound, being within one percent variability when compared to evaluated results. However, further work to determine that potential groups used for efficiency loss averaging have been sufficiently exhausted, the correct temperature/pressure readings are used, and that the sampling procedures used to select M&V tune-ups are statistically sound is ongoing and may influence subsequent evaluations.

LED General Service Lamps

For this evaluation period, lighting savings were calculated using both first- and second-tier reduced baselines specified in the Energy Independence and Security Act of 2007 (EISA). In compliance with federal standards, full retail enforcement of the second-tier 45 lumens/watt backstop went into effect on July 1, 2023. However, since the CPS Energy implementation vendor program year runs through July 31, the evaluation team delayed enforcement to August 1, 2023 to better align with the program year transition. Future program years will use the second-tier baseline exclusively.

Additionally, the DOE final rule updates general service definition to remove most specialty designations. For projects that fell before the August 1, 2023 enforcement date, legacy specialty designations were allowed. All subsequent projects were subject to the new general service lamp definition, which removed most specialty lamp exceptions.

5.4 SMALL BUSINESS SOLUTIONS

5.4.1 Overview

The Small Business Solutions program is a contractor-driven program for small business customers with less than 100 kW demand that delivers energy savings primarily through air infiltration reduction measures, HVAC tune-ups, and the installation of lighting and controls. A separate midstream lighting component is also offered to promote the sales of qualifying LED lighting.

In FY 2024, a total of 34 air infiltration, 840 HVAC tune-ups, 198 direct install lighting projects were completed in small businesses compared to 1,630 tune-up and 309 lighting projects in FY 2023. Direct install lighting participation decreased by 36 percent, and HVAC tune-up participation decreased by 48 percent. Air infiltration reduction was added as a new measure. Total direct install participation decreased by 45 percent, potentially due to a decreased focus on tune-ups or due to a trend toward market saturation.

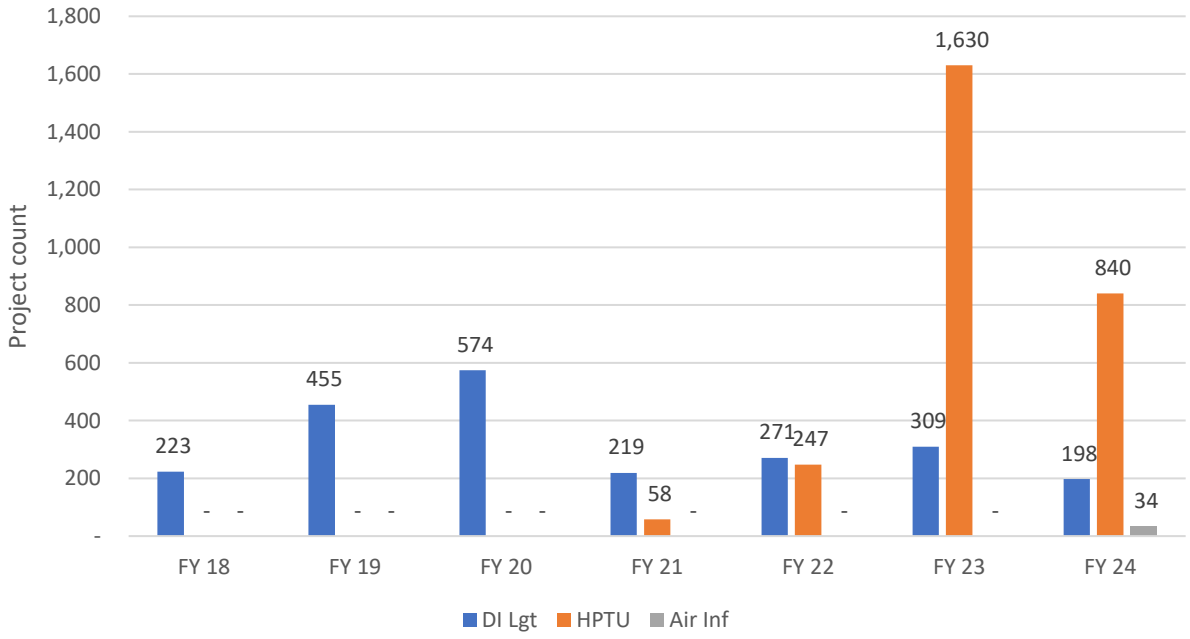


Figure 5-12: Small Business Solutions – Direct Install Participation Trends

Midstream lighting projects changed from being reported in batches to being reported for individual commercial customers. Therefore, participation trends from FY 2023 to FY 2024 cannot be compared directly. However, the evaluation team will track and report this metric moving forward.

Percentage breakdowns of gross energy, NCP, CP, and 4CP demand impacts are presented below by measure. Midstream lighting comprised approximately 75 percent of energy savings and more than 50 percent of demand impacts.

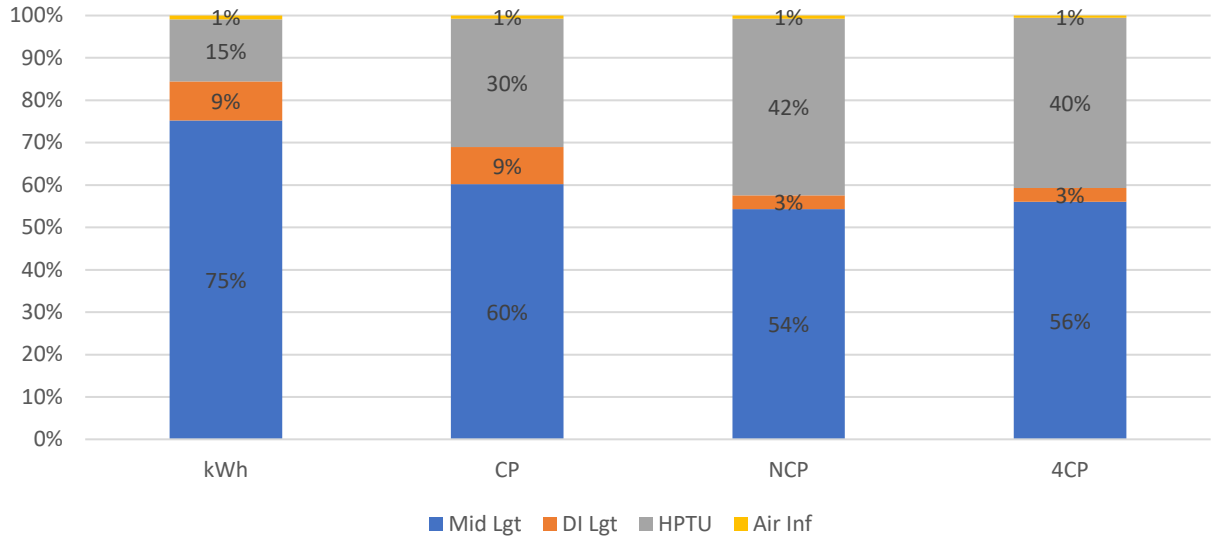


Figure 5-13: Small Business Solutions – Gross Energy and Demand Impacts by Measure

In FY 2024, outdoor and retail lighting made up approximately 94 percent of total energy impacts.

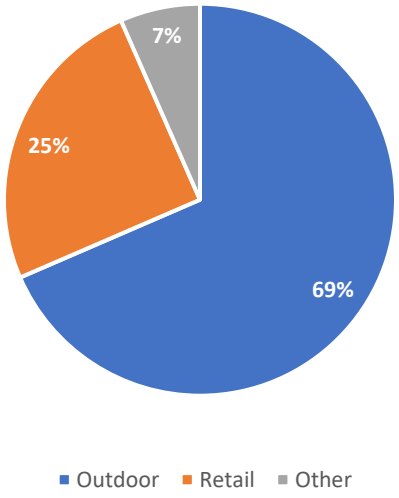


Figure 5-14: Small Business Solutions – Percent of kWh Savings by Building Type for Sampled Lighting Projects[40]

[40] Figure based on second half of FY participation.

5.4.2 Results

A desk review was performed for a sample of projects incentivized in this program. The evaluation team selected a sample size to achieve a 90/10 percent confidence and precision interval. The savings verification results of the analyzed sample were applied to the entire program population.

Table 5-3: Small Business Solutions – Gross Energy and Demand Savings

Measure	Gross Energy Savings (kWh)	Gross NCP Demand Savings (kW)	Gross CP Demand Savings (kW)	Gross ERCOT 4CP Demand Savings (kW)
Air Infiltration	396,838	91.85	63.16	41.10
HVAC Tune-up	6,633,562	3,555.19	3,372.38	3,211.53
Direct Install Lighting	4,141,630	1,029.79	266.88	259.95
Midstream Lighting	33,932,515	7,083.43	4,397.39	4,476.68
Total[41]	**45,104,545**	**11,760.27**	**8,099.82**	**7,989.26**

5.4.3 Additional Considerations

HVAC Tune-ups

Roughly half of the projects reported the generic "Service" building type, which was corrected where appropriate during desk reviews.

Table 5-4: Small Business Solutions – HVAC Tune-up Metrics

Building Type Allocation[42]	
Service	53%
Office	15%
Restaurant/fast food	12%
Retail	11%
All Other	9%

The CPS Energy Guidebook contains a default efficiency loss factor used to estimate savings impacts for tune-ups. Energy savings are calculated by estimating the efficiency of the cooling equipment before the tune-up using an efficiency loss factor because of dirty coils, blower, and filter, improper airflow, and/or incorrect refrigerant charge. The implementation vendor requested that the evaluation team apply

[41] The sum of the individual measures may not match the total due to rounding.
[42] Figure based on second half of FY participation.

alternate efficiency loss factors obtained from field-measured performance data. Efficiency losses, calculated in the field in full for a sampled subset of tune-ups, are utilized alongside previous years' measurements to derive a rolling 3-year average efficiency loss of projects with valid EER-post ratings. These averages are then grouped by project characteristics which are statistically significant in affecting the efficiency loss. Currently, these variables are market sector and whether a refrigerant charge adjustment was made. The resulting average efficiency loss factors are applied to projects that do not have test-in field measurements but do exhibit identical project characteristics to the groupings used in the averaging procedure.

In FY 2021, the evaluation team concluded it was appropriate to utilize the implementer's efficiency loss as described above after conducting a thorough review of the variable using historical program data in Texas. Calculations referencing test-in and test-out field measurements were determined to be sound, being within one percent variability when compared to evaluated results. However, further work to determine that potential groups used for efficiency loss averaging have been sufficiently exhausted, the correct temperature/pressure readings are used, and that the sampling procedures used to select M&V tune-ups are statistically sound is ongoing and may influence subsequent evaluations.

LED General Service Lamps

For this evaluation period, lighting savings were calculated using both first- and second-tier reduced baselines specified in the Energy Independence and Security Act of 2007 (EISA). In compliance with federal standards, full retail enforcement of the second-tier 45 lumens/watt backstop went into effect on July 1, 2023. However, since the CPS Energy implementation vendor program year runs through July 31, the evaluation team delayed enforcement to August 1, 2023 to better align with the program year transition. Future program years will use the second-tier baseline exclusively.

Additionally, the DOE final rule updates general service definition to remove most specialty designations. For projects that fell before the August 1, 2023 enforcement date, legacy specialty designations were allowed. All subsequent projects were subject to the new general service lamp definition, which removed most specialty lamp exceptions.

In-service rates (ISR) are used to account for the percentage of products that remain installed, operating effectively. Historically, a 0.97 ISR has been applied to all lighting measures. However, this ISR is more consistent with direct install applications. Products distributed through midstream programs may be installed outside the utility service territory (leakage), stored for future use, or never installed. The FY 2025 CPS Energy Guidebook will introduce a 0.76 ISR for retail LED Lighting to account for these factors moving forward.

5.5 COMMERCIAL PROGRAM RECOMMENDATIONS

The updated CPS Energy Guidebook, applicable to FY 2025, contains updates that may impact savings. To ensure consistency of savings methodology between program tracking estimates and evaluation results for individual measures, we recommend revising input assumptions in program tracking systems to match the Guidebook.

The evaluation team has identified specific recommendations related to savings calculations and program documentation in a separate memo to program administrators. In addition to these savings calculations and documentation recommendations, the evaluation team makes the following general recommendations for commercial program offerings:

5.5.1 General Lighting Recommendations

- Most specialty LED designations have been removed. Most screw-in or plug-in LED products currently distributed through the program should use the general service lamp (GSL) LED savings methodology.
- All calculated savings for GSL LEDs should use the reduced 45 lumens per watt tier 2 baseline outlined in the CPS Energy guidebook.
- Ensure that HVAC interactive effects are included for products installed in conditioned spaces.
- Savings should be claimed separately by measure life category. Specifically, savings should distinguish between fixture and control savings.
- Update commercial lighting fixture codes to align with the latest publication on the Texas Efficiency website at texasefficiency.com/dse.

5.5.2 General HVAC Recommendations

- The FY 2025 CPS Energy Guidebook has removed the one-year exceptions for heat pumps (HP) less than 65,000 Btu/h with only a SEER rating. Moving forward, all HPs must have a SEER2 rating to comply with the current federal standard.
- Incorporate updated new construction/replace-on-burnout efficiency baselines from the FY 2025 CPS Energy Guidebook for 65,000+ Btu/h systems.

5.5.3 Commercial & Industrial Solutions (C&I) and Schools & Institutions (S&I)

- Lighting:
    - The FY 2025 CPS Energy Guidebook specifies specific applications where building type combinations are appropriate, such as office—warehouse, office—manufacturing, manufacturing w/ different shift schedules, inpatient healthcare—outpatient healthcare, and lodging common areas—lodging rooms. Otherwise, select a single

predominant building type.

  - Increase documentation for lighting controls that use personal tuning or institutional controls. Without sufficient documentation demonstrating control configuration, savings will be adjusted to assume more conservative controls savings factors.

- HVAC:
  - If deemed savings are not available for a specific equipment—building type combination, projects may default to the "Other" building type. Additional savings may be available when obtaining evaluator pre-approval to map to one of the other deemed building types.
- HVAC Tune-up:
  - Ensure that the reported building type matches business function and location type.
  - Routinely assess the regression diagnostics and variable selection process used to determine how efficiency loss is grouped for deemed averaging. New chiller tune-up measures will be reviewed in similar detail.
- Custom:
  - For RMS projects, make all raw data utilized to produce regression parameters and goodness-of-fit statistics available upon request.
  - The evaluation team plans to routinely assess aggregate savings calculations for composite measures attributable to the retro-commissioning and RMS behavioral measures.

5.5.4 Small Business Solutions (SBS)

- Midstream Lighting:
  - When updating program qualified product listing (QPL) to include new products, the evaluation team requests that a record of legacy products is maintained in a single consolidated document. This will allow the evaluation team to apply a consistent QPL to the entire fiscal year population more easily.
- Direct-Install Lighting:
  - Ensure that the reported building type matches business function and location type.
- Air Infiltration:
  - Ensure that NCP and CP demand savings factors align with current CPS Energy Guidebook.

  - Ensure that reported gap widths align with photo documentation.

- HVAC Tune-up:
  - See recommendations from C&I/S&I section.

6. DEMAND RESPONSE PROGRAMS

6.1 SUMMARY OF DEMAND RESPONSE IMPACTS

CPS Energy has engaged customers through various demand response (DR) programs since early 2000. The portfolio of DR programs addresses both residential and commercial markets, with end-uses primarily focused on thermostats. Some programs are actively offered to customers, and other legacy programs are in maintenance mode and are no longer accepting new customers. Active programs will continue to grow as the programs move forward, and legacy programs will continue to decline with program attrition.

Demand response benefit-cost calculations only account for the incremental impacts of new participants added in the current fiscal year, consistent with the approach used in all energy efficiency program benefit-cost calculations. C&I DR is an exception and uses impacts from all active participants for benefit-cost calculations.

CPS Energy offered the following active and legacy demand response programs in FY 2024. Bring Your Own Thermostat (BYOT), Direct Install Thermostats, Power Players, and Commercial & Industrial (C&I) Demand Response are active programs accepting new customers. All others are legacy programs and are not open for new enrollments, though CPS Energy is still actively managing them.

Active Residential Demand Response

In FY 2024, CPS Energy implemented the following residential demand response programs:

Bring Your Own Thermostat (BYOT) – CPS Energy has teamed up with EnergyHub and Resideo (formerly Whisker Labs) platforms to offer customers who purchase or already own different brands of smart thermostats an opportunity to participate in CPS Energy's load management events.

Direct Install Thermostat Programs – CPS Energy offers thermostat installation programs, which offer a free smart thermostat device.

- The Home Energy Assessment (HEA) program is currently installing Google Nest, Emerson Sensi, Honeywell and ecobee thermostats.
- The Nest Weatherization (WX) program installs Wi-Fi thermostats for income-eligible residential customers at no cost.
- Smart Thermostat Upgrade (STU): CPS Energy offers a free upgrade to Wi-Fi thermostats for Smart Thermostat program customers with old traditional cycling thermostats.

Power Players Program (BDR) – CPS Energy partnered with Opower to implement a Behavioral Demand Response (BDR) program for residential customers. Participants receive messaging to encourage them to make minor adjustments to their home's energy use on peak energy days.

Legacy Residential Demand Response

Smart Thermostat – This program began in 2003 and has been running for more than 20 years. Customers were provided with free Honeywell traditional cycling (pager type) thermostats and no-cost installation. Thermostats are engaged to cycle off the compressors of participating air conditioners during periods of peak summer demand. This program is a legacy program, and therefore no longer accepting new enrollments. Existing customers are eligible for free upgrades through the Direct Install Thermostat Programs.

Direct Install Thermostat Programs – CPS Energy has offered multiple thermostat installation channels, which offer a free smart thermostat device.

- The Nest Direct Install (DI) program launched as an effort to replace older Home Manager Consert devices previously installed by CPS Energy in customer residences. This program offered Home Manager participants one or more Google Nest thermostats at no cost.
- Nest Mail Me a Thermostat (MMAT) was a first of its kind pilot program in which CPS Energy mailed customers one or more pre-enrolled Google Nest thermostats.

Active Commercial Demand Response

Commercial & Industrial (C&I) DR – C&I customers are incentivized to curtail during times of peak demand. DR customers lower their energy demand for a one to three-hour curtailment period, and incentives are tied to performance during this period. CPS Energy offers five commercial demand response participation paths: Options 1-4 and an Automated Demand Response (ADR) option. These options are described in section 6.6.

The contribution of each demand response program to energy, coincident peak (CP) demand, and non-coincident peak (NCP) demand savings are shown in Figure 6-1 through Figure 6-3. In these figures, Table 1-1, and Table 9-1, estimated savings are reported from all active participants to represent actual program capability most accurately at the end of FY 2024. These savings are adjusted to account for net-to-gross ratios and distribution line losses.

The contributions of each program to the demand response portfolio's energy and peak demand savings are shown in the following figures, as measured at the participant or end-user level, and adjusted to account for line losses.

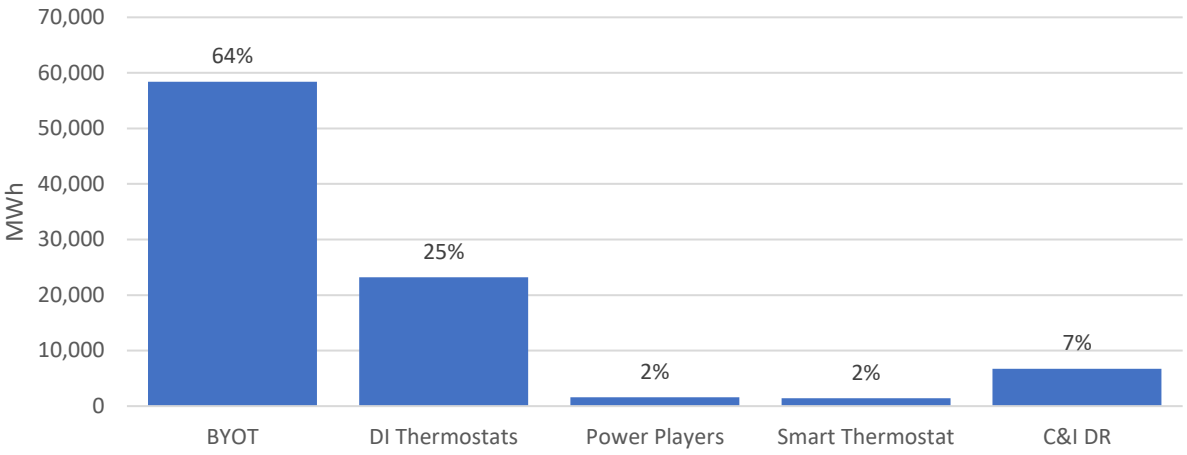


Figure 6-1: Summary of Demand Response Impacts – Energy (MWh) by Program

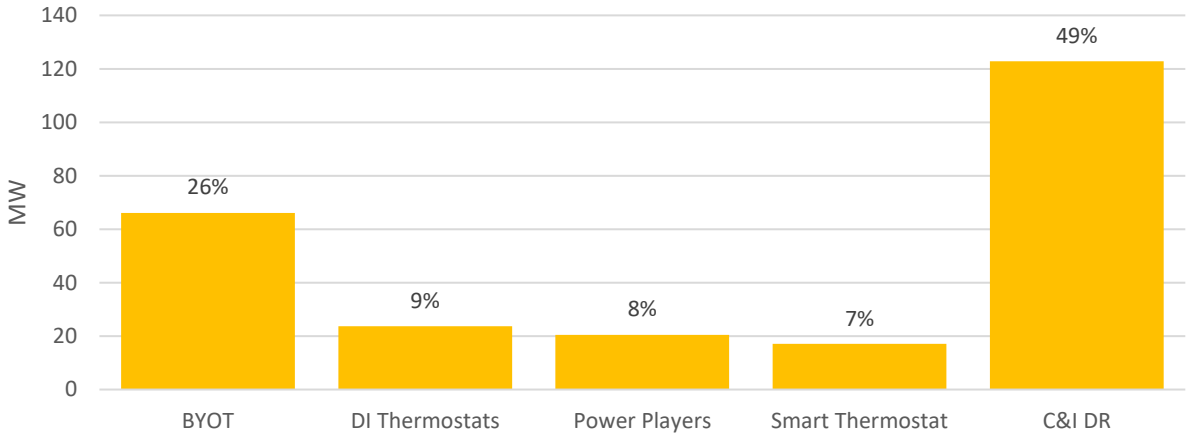


Figure 6-2: Summary of Demand Response Impacts – Non-Coincident Peak Demand (MW) by Program

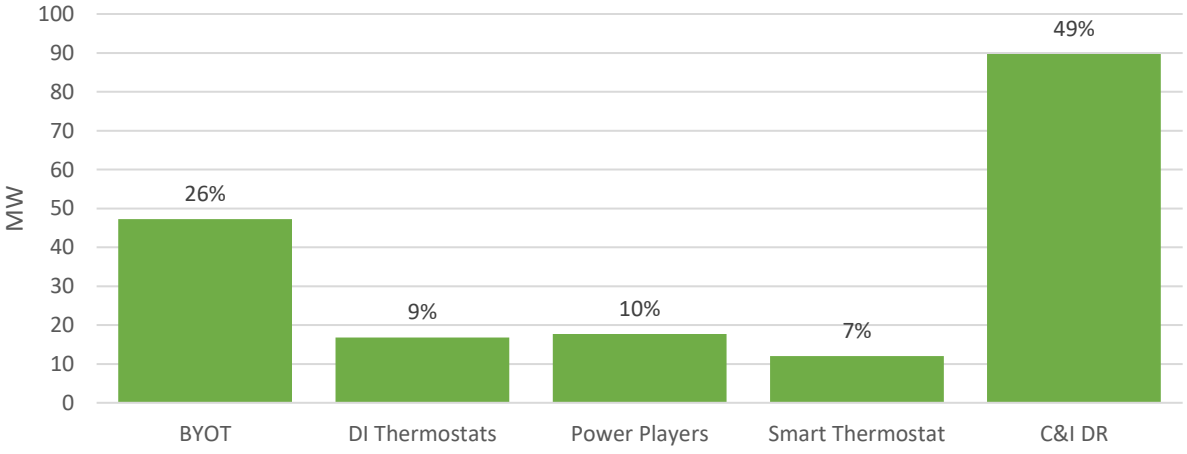


Figure 6-3: Summary of Demand Response Impacts – Coincident Peak Demand (MW) by Program

6.2 BRING YOUR OWN THERMOSTAT (BYOT) PROGRAM

6.2.1 Overview

Bring Your Own Thermostat (BYOT) is a program that integrates customers' own thermostats with load curtailment events. The program began in FY 2015 when CPS Energy partnered with Google Nest to implement the Rush Hour Rewards (RHR) pilot program for customers with Google Nest thermostats. RHR uses a combination of pre-cooling in anticipation of a 'rush hour' that coincides with a demand response event initiated by CPS Energy and air conditioner cycling during the events to achieve load reduction. Because of Google Nest's 'learning' capabilities, reductions may vary based on whether the home is occupied at the time of the event, or other variables. More information on Nest's RHR program is available from the Google Nest website.[43]

Starting in FY 2016, CPS Energy began incorporating existing Nest RHR customers into a more broadly defined BYOT program,[44] offering incentives to customers who self-install any of several qualifying thermostats. Starting in May 2020, ecobee thermostats on the EnergyHub platform were incorporated in the eco+ program, which can automatically adjust temperature settings of ecobee thermostats and help save energy year-round. In FY 2024, Emerson BYOT and Honeywell BYOT migrated to the Resideo platform, which also includes single family and commercial Wi-Fi thermostats in the Smart Thermostat platform. The result is a wider range of different brands of Wi-Fi thermostats that are eligible for the BYOT program including Google Nest, Honeywell, Emerson, ecobee and other brands.

To summarize, the FY 2024 BYOT program included several types of thermostats that operate as follows:

- Wi-Fi thermostats, including Google Nest, Honeywell, and Emerson run on the Resideo platform;
- Wi-Fi thermostats, including ecobee thermostats and other brands that run on the EnergyHub platform.

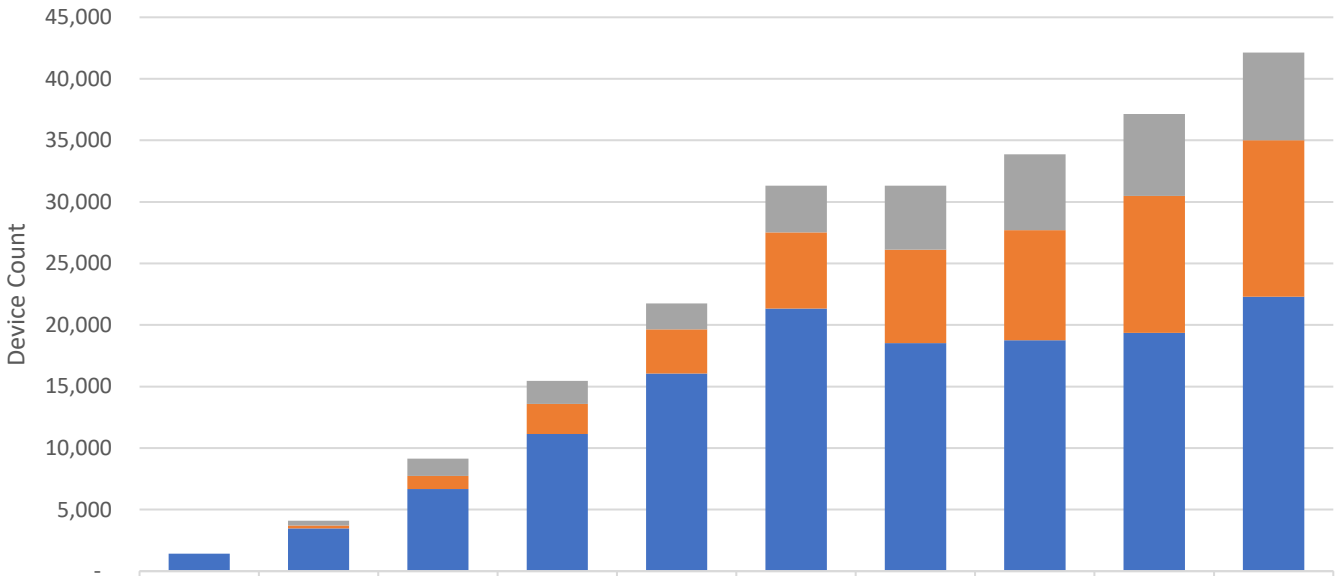
The key differentiator of BYOT relative to other residential DR programs is that the customer purchases and installs a qualifying thermostat, thus reducing direct install costs otherwise incurred by CPS Energy. The customer enrolling in the program will receive a one-time bill credit of $85 per thermostat device and an annual $30 bill credit at the end of each summer that they participate in the program.

[43] Google Nest Support. *Learn more about Rush Hour Rewards.* Online. Available: https://support.google.com/googlenest/answer/9244031?hl=en.
[44] CPS Energy has most recently marketed this program as Wi-Fi Thermostat Rewards: https://cpsenergy.com/wifithermostatrewards.

6.2.2 Program Participation

6.2.2.1 BYOT Program Level Overall Participation Trends

The following figure shows the number of enrolled BYOT devices by thermostat brand/platform from FY 2015 to FY 2024.



	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Resideo platform (except Nest)	-	387	1,410	1,859	2,104	3,802	5,222	6,158	6,646	7,108
EnergyHub platform	-	244	1,060	2,441	3,592	6,164	7,570	8,951	11,131	12,713
Nest	1,434	3,477	6,671	11,155	16,055	21,349	18,541	18,763	19,359	22,304

Figure 6-4: BYOT – FY 2015-2024 Participation Trends[45]

[45] DR events for Nest thermostats are being implemented on Resideo platform as well, however Nest has its own event calling schedule, which is different from other thermostats on Resideo platform, thus reported separately.

The total number of BYOT devices increased in FY 2024, with participation increase from all three platforms (Resideo, EnergyHub and Google Nest), respectively. The following figure breaks down end of FY 2024 participating BYOT thermostat counts by category. Google Nest thermostats account for slightly more than half (53 percent) of the total end of FY 2024 BYOT thermostats.

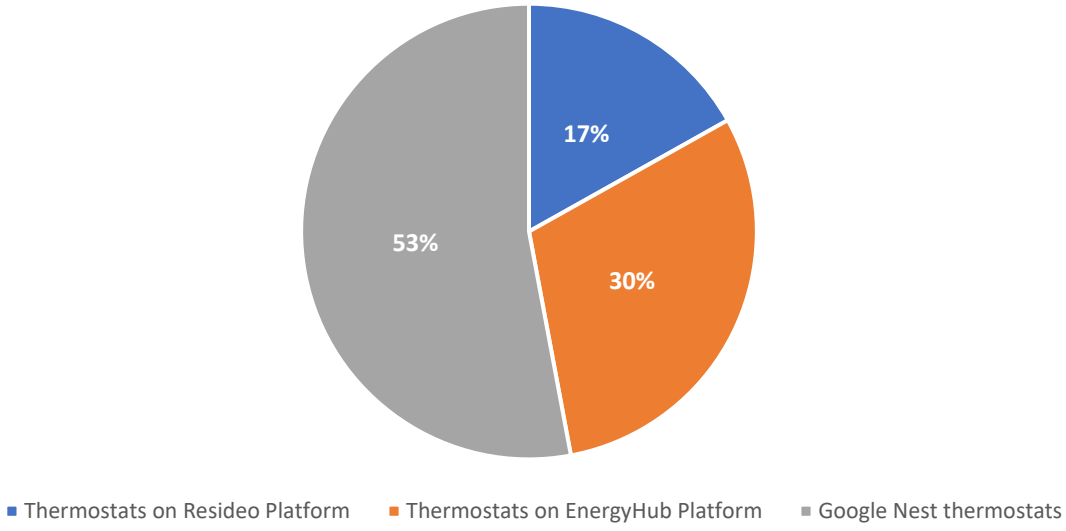


Figure 6-5: BYOT – EOFY 2024 Participating Thermostats by Category

The following figure shows incremental BYOT thermostat counts in FY 2024, with Google Nest thermostats contributing the largest proportion of incremental counts at 61 percent.

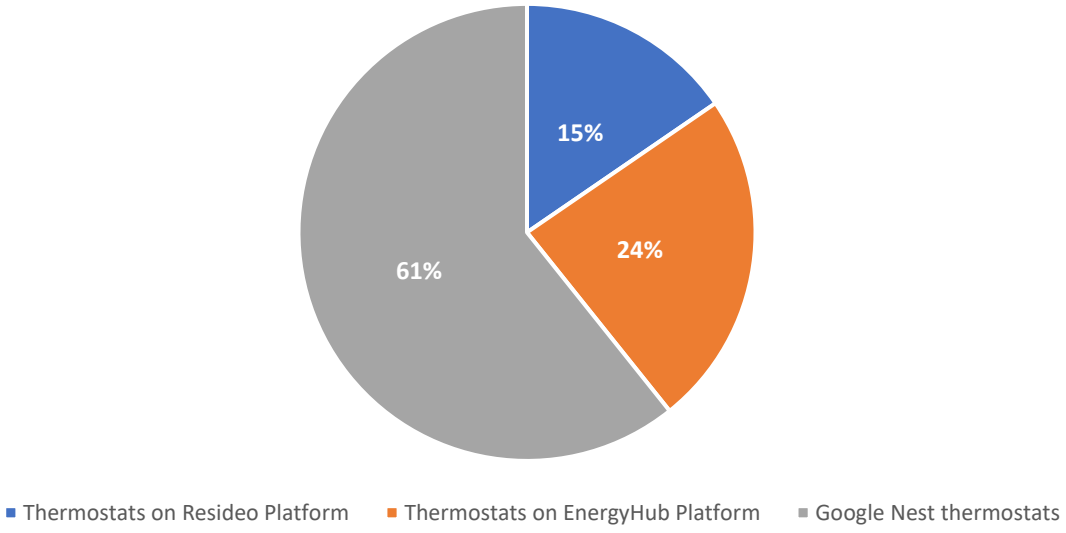


Figure 6-6: BYOT – Incremental Participating Thermostats by Category

6.2.3 Savings Calculation Method

6.2.3.1 Per-Device kW and kWh Savings

In FY 2017, the evaluation team developed a time temperature matrix (TTM) for Google Nest customers using per AMI account 15-minute interval data in that year. In FY 2018, temperature bins were developed for Honeywell and Emerson BYOT Wi-Fi thermostats on the Resideo platform, along with thermostats on the EnergyHub platform. Both TTM and temperature bins serve as an expedited method for estimating kW savings by omitting the steps of calculating savings using raw interval consumption data.

However, for the same reasons illustrated in the Smart Thermostat program section, BYOT program kW and kWh savings were estimated using actual interval consumption data starting in FY 2021 instead of applying pre-pandemic TTM and temperature bins.

There were two separate data sources for FY 2024 raw consumption interval data:

- CPS Energy residential DR dashboard: This data source contains aggregated 15-minute interval data for thermostats in residential dwellings. CPS Energy developed the residential DR dashboard and put it into use starting FY 2021. The DR dashboard aggregates 15-minute interval kW load along with the daily number of accounts by thermostat platform or cycling category. The thermostats included for the BYOT program on the Energy Hub platform include ecobee, Alarm.com, Lux, Vivant, etc. For the Resideo platform, thermostat brands include Google Nest and Honeywell thermostats.

- 15-minute interval kWh AMI data: This data source is used for analyzing savings of small commercial thermostats. This includes the following: small commercial ecobee, Alarm.com, on the Energy Hub platform; and small commercial Amazon, Emerson, Google Nest, and Honeywell thermostats the Resideo platform.[46]

Demand and energy savings per device by event can be estimated in the same manner as illustrated in section 6.4.3.1.

6.2.3.2 kWh Savings for Wi-Fi Thermostats

Since Wi-Fi thermostats are considered smart thermostats in the CPS Energy Guidebook, these thermostats can help save energy year-round. Deemed annual savings of 1,274 kWh per thermostat were applied for Wi-Fi thermostats.

[46] The Resideo platform hosted thermostats from both Smart Thermostat and BYOT programs in the summer of 2023. Thus, savings results generated from the Resideo category on CPS Energy's residential DR dashboard not only apply to residential Wi-Fi thermostats from the Smart Thermostat program, but also to the residential thermostats on the Resideo platform from the BYOT program.

6.2.3.3 Coincident Peak (CP) Demand Savings (kW)

To compute coincident peak (CP) demand savings, the per-device demand savings value is multiplied by the total number of devices for each event. The claimed achieved CP demand savings is the average kW savings during high temperature usual events.[47] Scaling the average kW savings by the EOFY customer count and newly installed customer count yield EOFY and incremental CP demand savings.

6.2.3.4 Non-Coincident Peak (NCP) Demand Savings (kW)

Achieved non-coincident peak savings for residential DR programs (Smart Thermostat, BYOT, Direct Install Thermostats) are the savings during the day when maximum demand savings of all residential DR programs occurred among all FY 2024 events. In the summer of 2023, all residential DR programs reached maximum program level demand reduction during the 6/19/2023 event, so the kW savings on 6/19/2023 is used as the NCP demand savings for BYOT program. EOFY and incremental estimates of NCP savings were obtained by scaling the achieved NCP by EOFY device count and newly installed devices, respectively.

6.2.3.5 ERCOT 4CP Demand Savings (kW)

In the summer of 2023, thermostats on both Resideo platform, EnergyHub platform and Google Nest thermostats successfully hit all four of the four 4CP intervals, with a success rate of 100 percent. To estimate the 4CP demand savings, we estimated kW savings for each event, selected the events which coincided with the ERCOT 4CPs, and multiplied the result by the ERCOT 4CP success rate. For the year-end capability and incremental calculations, we scaled the result to the number of devices at the end of FY 2024 and to the number of newly installed devices added during FY 2024, respectively.

6.2.4 Results

For the BYOT DR program, we present impacts in four sections:

1) Estimated per device kW and net kWh savings by thermostat type during the summer of 2023.
2) Estimated program impacts during the summer of 2023 DR events.
3) EOFY program capability based on program enrollment at the end of FY 2024.
4) EOFY program capability based on incremental enrollment during FY 2024. This information is used for program benefit-cost analysis, consistent with the methods used for energy efficiency programs.

6.2.4.1 Estimated per-Device kW and Net kWh Savings by Thermostat Category

The following table summarizes the achieved average per device per event (with both usual and voluntary events included) kW and net kWh savings by thermostat category in the summer of 2023

[47] The high-temperature threshold is set as 95°F for the event period. Voluntary events are also included in the CP kW savings calculation.

BYOT program.

Table 6-1: BYOT – Estimated Average per Device kW and Net kWh Savings by Thermostat Category

Platform	Dwelling Type/Brand	Average CP kW Savings per Device	Average NCP kW Savings per Device	Average net kWh Savings per Device per Event
EnergyHub	Residential	0.91	1.30	1.51
	Small commercial	0.91	1.99	1.39
Google Nest (on Resideo platform)	Residential	1.10	1.65	1.83
	Small commercial	0.69	2.09	1.14
Resideo	Residential	0.72	1.06	1.30

6.2.4.2 Estimated Impacts during the Summer of 2023 DR Events

Event schedules vary between platforms. The following table summarizes the number of events called and the average event duration in the summer of 2023 for Google Nest, EnergyHub and the Resideo platform.

Table 6-2: BYOT – Event Number and Duration Summary by Platform

Platform	# of Events Called[48]	Average Event Duration[49]
Google Nest (on Resideo platform)	26	2.33
EnergyHub	25	2.26
Resideo	29	2.24

BYOT program-level total achieved impacts of FY 2024 events ranged from 3,018 kW (9/6/2023 usual event) to 57,050 kW (6/19/2023), with the Google Nest thermostats group contributing most of the kW savings across all events except for events when no Google Nest DR events were called. These demand reduction estimates are shown below.

[48] Both usual and emergency events were included in this summary table. If excluding emergency events (the second event on 9/6/2023), the number of events called for Google Nest, EnergyHub and Resideo platform (except Google Nest thermostats) are 25, 25 and 28 respectively.
[49] Both usual and emergency events were included in this summary table while calculating event duration. If excluding emergency events (the second event on 9/6/2023), the average event duration called for Google Nest, EnergyHub and Resideo platform are 2.36, 2.26 and 2.28 respectively.

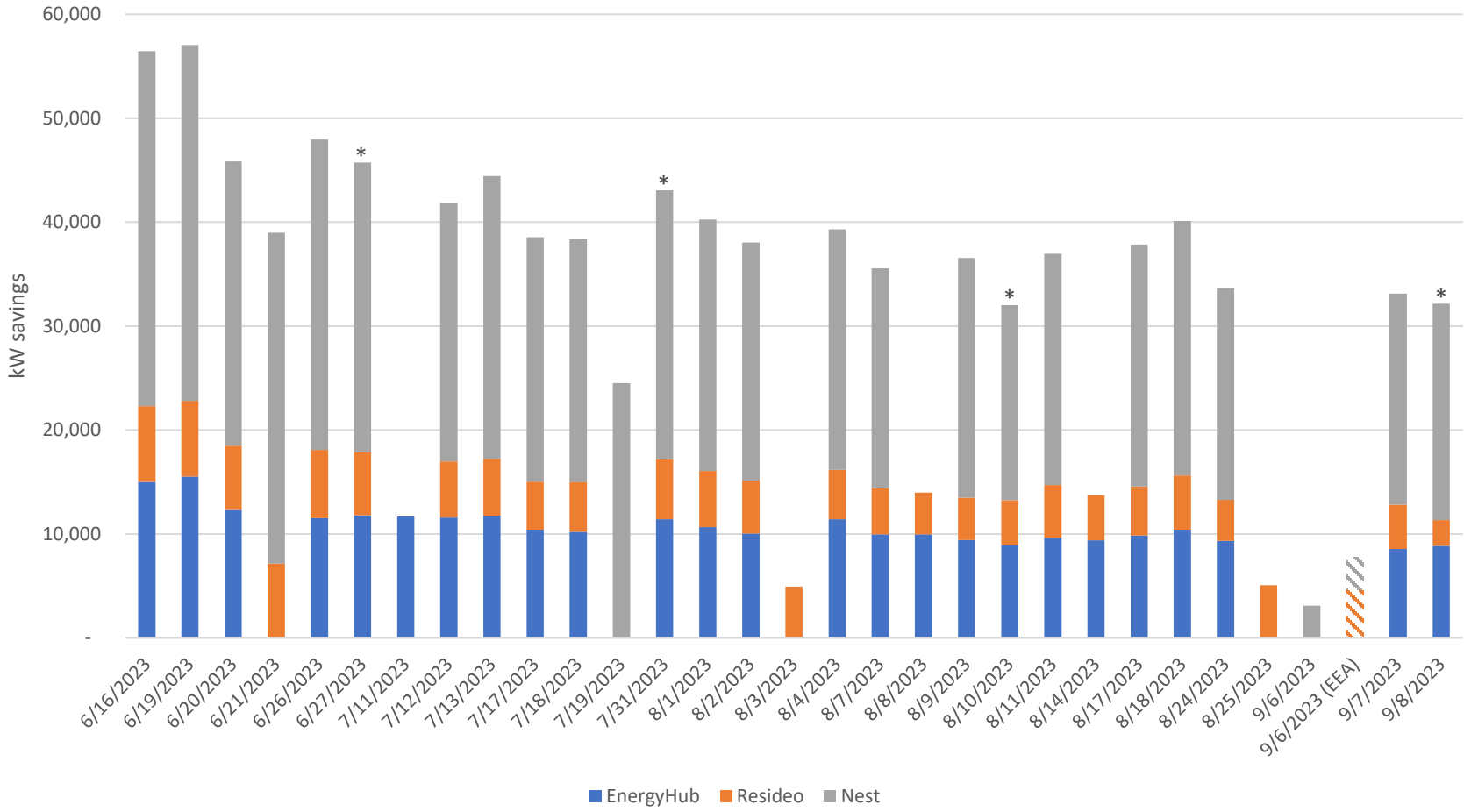


Figure 6-7: BYOT – Summer of 2023 Achieved Demand Reduction[50]

[50] Events coinciding with ERCOT 4CP intervals are designated with an asterisk (*). Diagonal stripes are used to identify any applicable emergency/EEA events. Only 3,102 Nest thermostats were deployed on Nest platform on both 9/6/2023 events, average device savings throughout all the other events were applied to these two events.

The following table shows estimated energy, peak demand, non-coincident peak demand, and ERCOT 4CP demand savings achieved by the program in FY 2024. For each type of thermostat, coincident peak demand savings are the average of estimated savings during high-temperature events. ERCOT 4CP savings are the average estimated savings during ERCOT 4CP events, multiplied by success rate. Non-coincident peak savings are the savings that occurred on June 19, 2023, which is the maximum demand savings day for all residential DR programs combined among all FY 2024 events. Due to variations in schedule and cycling strategy among the different thermostat types, total savings are presented as the sum of the savings achieved by each of the respective thermostat types.

Table 6-3: BYOT – Achieved Gross Energy and Demand Savings

Measure	Gross Energy Savings (kWh)	Gross NCP Demand Savings (kW)	Gross CP Demand Savings (kW)	Gross ERCOT 4CP Demand Savings (kW)
Nest	24,752,056	34,237	23,291	23,332
EnergyHub	15,188,628	15,513	10,791	10,250
Resideo	8,761,298	7,300	4,944	4,661
Total[51]	**48,701,982**	**57,050**	**39,027**	**38,242**

6.2.4.3 End-of-Fiscal Year Program Capability

EOFY program capability is based on EOFY enrollment as shown in the following table.

Table 6-4: BYOT – EOFY Gross Energy and Demand Savings

Measure	EOFY Enrollment	Gross Energy Savings (kWh)	Gross NCP Demand Savings (kW)	Gross CP Demand Savings (kW)	Gross ERCOT 4CP Demand Savings (kW)
Nest	22,304	28,415,296	36,659	26,738	24,981
EnergyHub	12,713	16,196,362	16,542	11,507	10,930
Resideo	8,560	9,055,592	7,545	5,110	4,817
Total[52]	**43,577**	**53,667,250**	**60,746**	**43,356**	**40,729**

[51] The sum of the individual measures may not match the total due to rounding.
[52] Ibid.

6.2.4.4 Incremental Impacts

The incremental impacts used in benefit-cost analysis are based on gross incremental enrollment during the program year as shown in the following table.

Table 6-5: BYOT – Incremental Gross Energy and Demand Savings

Measure	Gross Incremental Enrollment	Gross Energy Savings (kWh)	Gross NCP Demand Savings (kW)	Gross CP Demand Savings (kW)	Gross ERCOT 4CP Demand Savings (kW)
Nest	6,661	8,486,114	10,948	7,985	7,461
EnergyHub	2,614	3,330,236	3,401	2,366	2,247
Resideo	827	2,156,882	1,797	1,217	1,147
Total[53]	**10,102**	**13,973,232**	**16,146**	**11,569**	**10,856**

[53] Ibid.

6.3 DIRECT INSTALL THERMOSTATS

6.3.1 Overview

The Nest Direct Install (DI) program was launched in FY 2018. Starting in the early summer of 2017, Home Manager customers were gradually migrated to the Nest DI program. CPS Energy offered these customers one or more free Google Nest thermostats and free installation to replace the older Home Manager Consert devices in their homes.

The Nest DI program expanded to support the Nest Home Energy Assessment (HEA), Nest Weatherization (WX), and Nest Mail Me a Thermostat (MMAT) program pilots that launched in FY 2020. Nest HEA and Nest WX program customers (see section 4.3 and section 3.1 respectively for details), received an installation of one or more Google Nest thermostats through those two program channels. For MMAT, CPS Energy mailed selected customers one or more pre-enrolled Google Nest thermostats.

Starting in FY 2021, Nest DI, Nest HEA, Nest MMAT, and Nest WX were combined into one single Nest program due to their homogenous characteristics. These four programs all had residential Google Nest thermostats run by the Nest platform, which arranged the identical event schedule.

In FY 2022, all Google Nest thermostats were migrated from the Google Nest platform to the Resideo platform. During this migration, all customers had to accept new terms and conditions from Google to stay in the program.

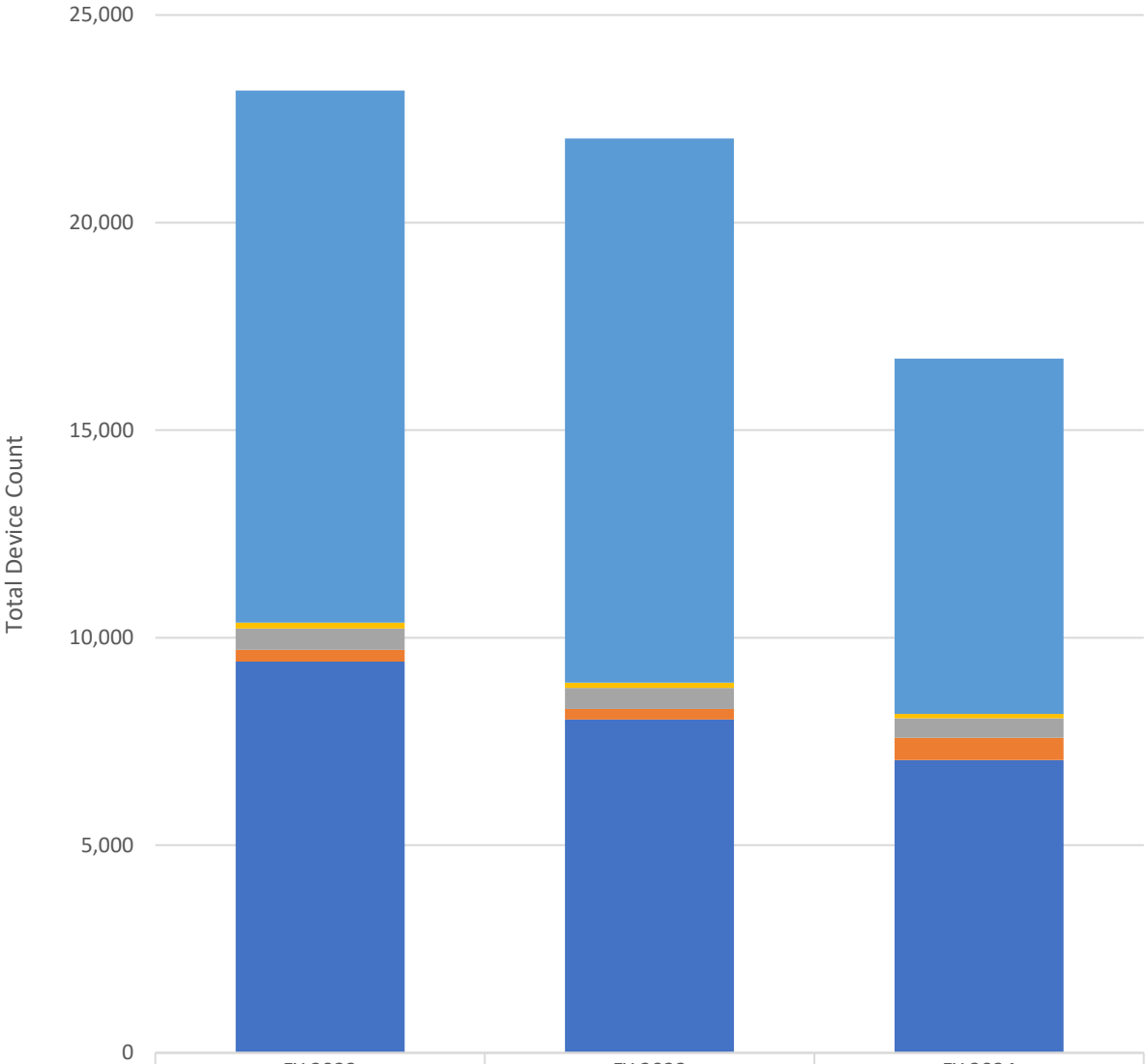
Starting in FY 2023, Emerson and ecobee thermostats were introduced in the HEA program alongside Google Nest thermostats. The program name was changed to “Direct Install Thermostats” to reflect the additional thermostat brands. Honeywell and Amazon thermostats were introduced in FY 2024.

Starting in FY 2024, all Wi-Fi thermostats in the Resideo platform from the Smart Thermostat program have been designated as Smart Thermostat Upgrades, abbreviated “STU”, and moved to the Direct Install Thermostats program.

6.3.2 Program Participation

The following figure shows participation trends for this program from FY 2018 to FY 2024. Although Direct Install Thermostats program keeps the declining trend in FY 2024, STU contributed to most of the new installs in the Direct Install Thermostats program, with 827 newly enrolled/replaced thermostats in this category. HEA also contributed 439 new installations in this program. Under the HEA subcategory, there were 297 newly installed Google Nest thermostats, 86 newly installed Emerson thermostats, 47 newly installed ecobee thermostats and nine newly installed Honeywell thermostats. For the Nest WX program, there were only two newly installed thermostats. There are no new installations in the legacy Nest DI and Nest MMAT programs, which are no longer accepting new enrollments.

The Direct Install Thermostats program experienced an overall participation drop in FY 2024, with a majority due to the STU category. This is mainly because CPS Energy conducted an account cleanup in August of 2023, which resulted in a loss of 4,834 residential Wi-Fi thermostats in this category.



	FY 2022	FY 2023	FY 2024
STU	12,814	13,106	8,560
Nest WX	146	125	103
Nest MMAT	514	510	471
HEA	283	249	534
Nest DI	9,424	8,033	7,054

Figure 6-8: Direct Install Program – Participation Trends

6.3.3 Savings Calculation Method

6.3.3.1 Per-Device kW and kWh Savings

Resideo, EnergyHub, and Google Nest thermostats received the same DR scheduling for their respective platforms as in other programs. Since participating thermostats in this program are incorporated in the same platforms along with thermostats in other residential DR programs, savings from this program are calculated the same way. Demand and energy savings per device by event can be estimated in the same manner as illustrated in section 6.4.3.1; those per-device savings will be directly applied to the direct install program.

Table 6-6: Direct Install Program – DI/HEA/MMAT/WX per Device Savings

Category	Savings per Device – Google Nest	Savings per Device – Emerson & Honeywell (Resideo)	Savings per Device – ecobee (EnergyHub)
CP per device demand savings	1.10 kW	0.72 kW	0.91 kW
NCP per device demand savings	1.65 kW	1.06 kW	1.30 kW
4CP per device demand savings	1.12 kW	0.68 kW	0.86 kW
Annual kWh per device savings[54]	–	–	–

6.3.3.2 Coincident Peak (CP) Demand Savings (kW)

To compute coincident peak (CP) demand savings, the per-device demand savings are multiplied by the total number of devices installed by each event. The claimed achieved CP demand savings is the average kW savings during high-temperature events.[55] Scaling the average kW savings by the EOFY customer count and newly installed customer count yields EOFY and incremental CP demand savings.

6.3.3.3 Non-Coincident Peak (NCP) Demand Savings (kW)

Achieved non-coincident peak savings are based on the maximum event demand savings of all residential programs combined (Smart Thermostat, BYOT, Direct Install Thermostats) among FY 2024 events occurring on June 19, 2023. Multiplying the NCP per-device demand savings from the previous table by the total number of devices in the summer of 2023 yields the total achieved NCP demand savings value. EOFY and incremental estimates of NCP savings were obtained by scaling the achieved NCP to the EOFY device count and newly installed devices, respectively.

[54] No energy savings were applied to direct install thermostats this year because they all belong to HEA program. Energy savings in the HEA program are already awarded in section 4.3.
[55] The high-temperature threshold is set as 95°F for the event period. Voluntary events are also included in calculating CP savings.

6.3.3.4 ERCOT 4CP Demand Savings (kW)

During the summer of 2023, all the thermostats in all platforms (Nest, Resideo and EnergyHub) coincided with all four of the ERCOT 4CP events, yielding a 100 percent success rate. To estimate ERCOT 4CP demand savings, we estimated the kW savings for each event, selected the events which coincided with the ERCOT 4CPs, and multiplied the result by the ERCOT 4CP success rate. For the year-end capability and incremental calculations, we scaled the result to the number of devices at the end of FY 2024 and to the number of new devices added during FY 2024.

6.3.4 Results

For the Nest DI program, we present impacts in three ways:

1) Estimated program impacts during the summer of 2023 DR events.
2) EOFY program capability based on program enrollment at the end of FY 2024.
3) EOFY program capability based on incremental enrollment during FY 2024.
   This information is used for program benefit-cost analysis, consistent with the methods used for energy efficiency programs.

6.3.4.1 Estimated Impacts During the Summer of 2023 DR Events

In the summer of 2023, 26 events were called for Google Nest thermostats, 29 events were called for thermostats on the Resideo platform, and 25 events were called for thermostats on the EnergyHub platform.[56] Event impacts ranged from 31 kW (7/11/2023 event) to 22,313 kW (6/19/2023 event). These demand reduction estimates are shown below.

[56] Google Nest and Resideo platform events include one emergency event due to an ERCOT EEA level 2 emergency alert called on 9/6/2023 7:36-9:24 PM, which was the second DR event called on that day.

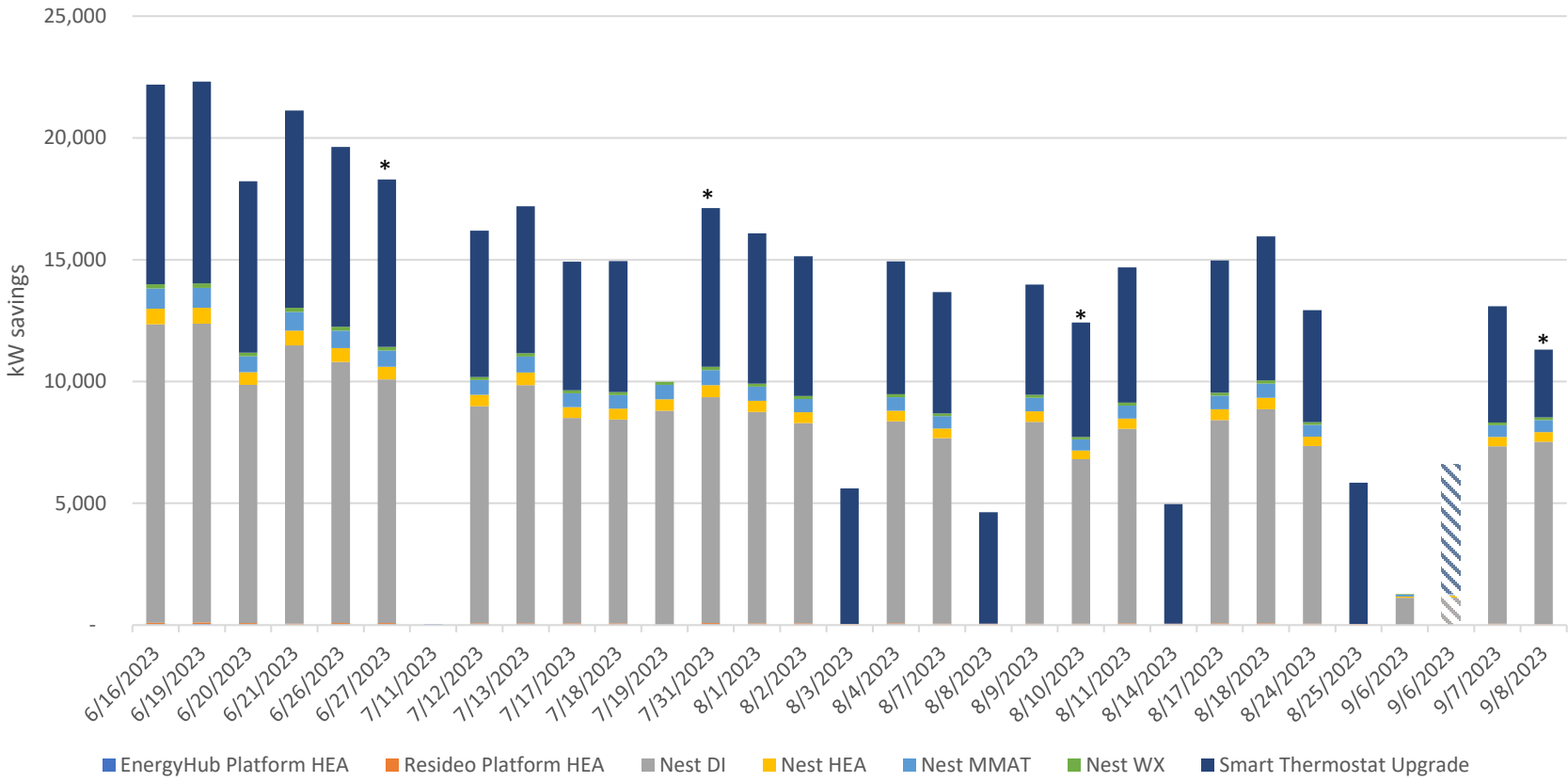


Figure 6-9: Direct Install Thermostats – Achieved Summer of 2023 Demand Reduction[57]

[57] Events coinciding with ERCOT 4CP intervals are designated with an asterisk (*). Diagonal stripes are used to identify any applicable emergency/EEA events. Only 3,102 Nest thermostats were deployed on Nest platform on both 9/6/2023 events. Average device savings throughout all the other events were applied to these two events.

The following table shows estimated energy, peak demand, non-coincident peak demand, and ERCOT 4CP demand savings achieved by the program in FY 2024.

Table 6-7: Direct Install Thermostats – Achieved Gross Energy and Demand Savings

Measure	Gross Energy Savings (kWh)	Gross NCP Demand Savings (kW)	Gross CP Demand Savings (kW)	Gross ERCOT 4CP Demand Savings (kW)
Nest DI	8,851,665	12,276	8,358	8,377
Nest MMAT	591,031	820	558	559
Nest WX	129,249	179	122	122
HEA	582,717	752	513	510
STU	10,721,984	8,285	5,580	5,217
Total[58]	**20,876,646**	**22,313**	**15,131**	**14,786**

6.3.4.2 End-of-Fiscal Year Program Capability

EOFY program capability is based on EOFY enrollment and is shown in the following table.

Table 6-8: Direct Install Thermostats – EOFY Gross Energy and Demand Savings

Measure	EOFY Enrollment	Gross Energy Savings (kWh)	Gross NCP Demand Savings (kW)	Gross CP Demand Savings (kW)	Gross ERCOT 4CP Demand Savings (kW)
Nest DI	7,054	8,986,796	11,624	8,485	7,933
Nest MMAT	471	600,054	776	567	530
Nest WX	103	131,222	170	124	116
HEA	907	680,316	800	575	539
STU	8,560	10,905,440	8,438	5,684	6,324
Total[59]	**17,095**	**21,303,828**	**21,808**	**15,435**	**15,441**

6.3.4.3 Incremental Impacts

Incremental impacts used in the benefit-cost analysis are based on gross incremental enrollment during the program year. FY 2024 Direct Install Thermostats incremental savings are shown in the following table.

[58] The sum of the individual measures may not match the total due to rounding.
[59] Ibid.

Table 6-9: Direct Install Thermostats – Incremental Demand Savings[60]

Measure	Gross Incremental Enrollment	Gross Energy Savings (kWh)	Gross NCP Demand Savings (kW)	Gross CP Demand Savings (kW)	Gross ERCOT 4CP Demand Savings (kW)
Nest DI	–	–	–	–	–
Nest MMAT	–	–	–	–	–
Nest WX	2	–	3	2	2
HEA	736	–	651	468	439
STU	827	1,053,598	878	595	560
Total[61]	**1,585**	**1,053,598**	**1,533**	**1,065**	**1,002**

[60] Incremental energy savings are not reported here (except STU) because energy savings due to HEA thermostats have already been incorporated in section 4.3.
[61] The sum of the individual measures may not match the total due to rounding.

6.4 SMART THERMOSTAT PROGRAM

6.4.1 Overview

The Smart Thermostat direct load control program has been available to residential sector participants in single family homes since 2003 and expanded to include multifamily and small commercial customers in 2010. The Smart Thermostat program is currently in maintenance mode, and the enrolled customers still actively participate in the demand response season. The program will continue to experience attrition as customers remove themselves from the program or move from their residence.

Through the program, Honeywell installs a programmable, controllable thermostat (PCT) at a participant's home or place of business at no cost to the customer. In return, CPS Energy is permitted to remotely control the customer's central air conditioning systems during demand response events. Once an event is called, CPS Energy can cycle the air conditioner compressor on and off for short periods of time on event days. Cycling events occur during the summer months of May through September between the weekday hours of 3:00-7:00 PM.

Single family, multifamily, and small commercial customers participate at either a 33 percent cycling rate (units are cycled off for 10 minutes during each half hour) or a 50 percent cycling rate (units are cycled off for 15 minutes during each half hour). Pager thermostats are available on either a 33 or 50 percent cycling rate, while Wi-Fi Thermostats have an offset strategy.

In FY 2018, a small portion of single family Wi-Fi enabled thermostats were selected as a pilot trial for a new thermostat offset strategy – a different load reduction pattern operated on the Resideo platform. The pilot trial showed that savings on the Resideo platform were higher than those from traditional cycling. As of FY 2021, all new enrollments or upgrades are Wi-Fi enabled and have been migrated to the Resideo platform. For convenience, thermostats that are not on the Resideo platform are referred to as "traditional cycling thermostats."

As of FY 2024, all Wi-Fi enabled thermostats in the Resideo platform in the Smart Thermostat program have been designated as Smart Thermostat Upgrades, abbreviated as "STU", and moved to the Direct Install Thermostats program. All remaining thermostats in the Smart Thermostat program are traditional cycling thermostats. Therefore, this program's participation will decrease over time due to natural program degradation and smart thermostat upgrades.

6.4.2 Program Participation

The following figure shows overall participation in the Smart Thermostat program at the beginning and end of fiscal year (EOFY) 2024 and at the time of DR events from June through September 2023.

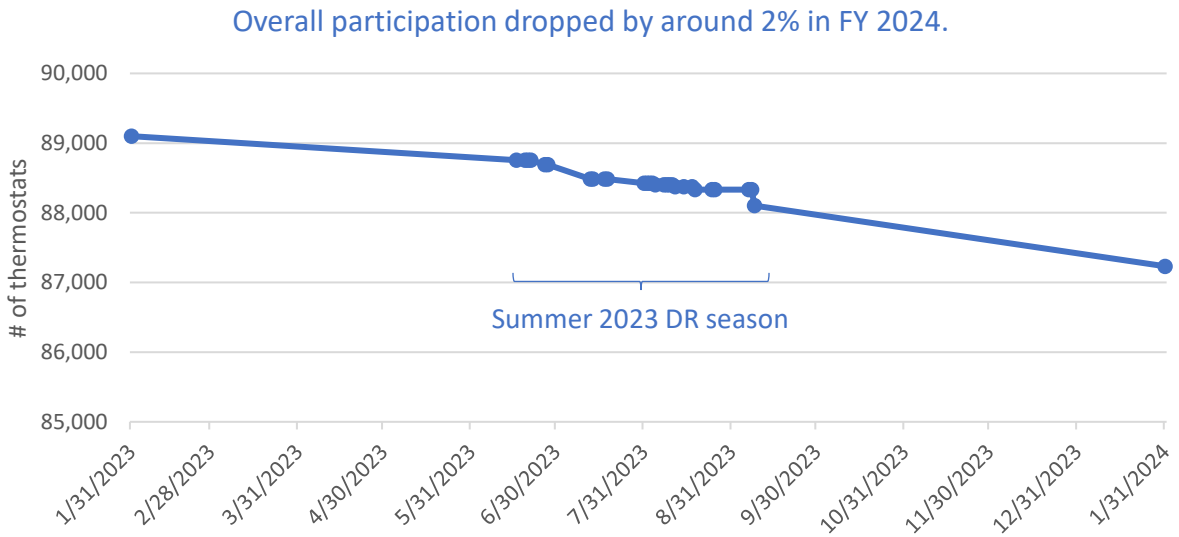


Figure 6-10: FY 2024 Smart Thermostat Participation Trend – Total Thermostat/Device Count

There was a two percent participation drop in overall participation in the Smart Thermostat program in FY 2024. The Smart Thermostat program has been running for more than 20 years and is no longer accepting new enrollments. As a result, there has been continuous natural participation decay among these traditional cycling thermostats.

The following figure shows participation trends by customer dwelling type over the past three fiscal years. As with the pattern in previous years, most participating thermostats in the Smart Thermostat program are in the residential sector, with the commercial sector comprising around 2.5 percent of total devices.

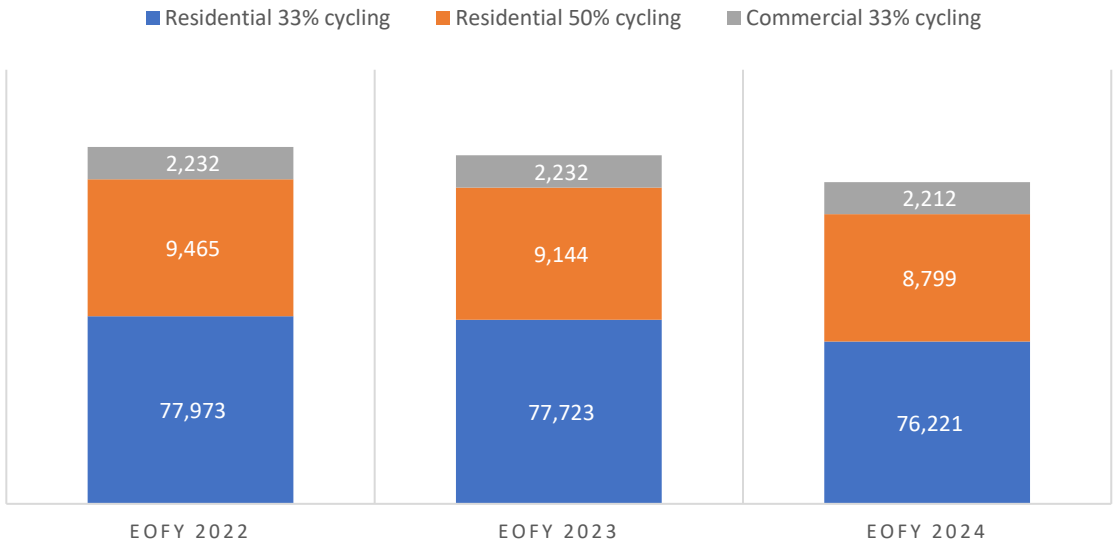


Figure 6-11: Smart Thermostat – FY 2022-2024 Participation Trends by Segment

The following table summarizes EOFY 2024 participation levels by customer segment and cycling strategy.

Table 6-10: Smart Thermostat – EOFY Participation by Group

Dwelling Type	Cycling/Temperature Setback Strategy	Device Count
Residential	33% cycling	76,221
	50% cycling	8,799
Commercial	33% cycling	2,212
	50% cycling	–
	Total	**87,232**

In FY 2024, there were 32 events called, with an average event duration of 2.61 hours. There were two events called on 9/6/2023, with the latter being an emergency event due to an ERCOT EEA – Level 2 emergency alert. If this emergency event is not included, the average duration is 2.63 hours.

6.4.3 Savings Calculation Methods

6.4.3.1 Per Device/Account kW and kWh Savings

In FY 2017 and FY 2018, the evaluation team used raw interval consumption data and developed temperature bins for estimating savings. Those temperature bins were designed to expedite the savings estimation process so that raw interval consumption data is not needed every year.

Several studies[62] have shown residential load profiles may have changed due to the COVID-19 pandemic beginning in 2020. However, the data extraction process was simplified given that the pre-pandemic data (temperature bins developed in FY 2017 and FY 2018) could not factor in the effects of COVID-19, and aggregated interval data from the CPS Energy residential DR dashboard has been available since FY 2021. As a result, the residential DR dashboard aggregated 15-minute consumption data and 15-minute interval data for small commercial participants were used to estimate kW and kWh savings instead of applying the pre-pandemic temperature bins starting FY 2021.

There were two separate data sources of FY 2024 raw consumption interval data:

[62] Example studies regarding possible changes of residential load profiles due to COVID-19 include but are not limited to the following: (1) Pecan Street, <COVID-19 is Changing Residential Electricity Demand>, source: https://www.pecanstreet.org/2020/05/covid/; (2) A.Smith et al., <Changes in Electricity Load Profiles Under COVID-19: Implications of "The New Normal" for Electricity Demand>, source: https://www.researchgate.net/publication/343216276_Changes_in_Electricity_Load_Profiles_Under_COVID-19_Implications_of_The_New_Normal_for_Electricity_Demand.

- CPS Energy residential DR dashboard: This data source contains aggregated 15-minute interval data for thermostats in residential dwellings. CPS Energy developed the residential DR dashboard and put it into use starting FY 2021. The DR dashboard aggregates 15-minute interval kW load along with the daily number of accounts by thermostat platform or cycling category. The categories pertinent to the Smart Thermostat program are Smart Thermostat 33 percent cycling and Smart Thermostat 50 percent cycling.

- 15-minute interval kWh AMI data: This data source is used for analyzing the savings of small commercial thermostats, which are not covered in the CPS Energy residential DR dashboard. This includes per-AMI-account raw meter data from all small commercial Smart Thermostat customers.

Savings analyses are conducted in the following steps:

Step 1: Converting CPS Energy residential DR dashboard interval consumption data and AMI raw interval data into averages on a per-account basis by each category. Specifically, for each category on the residential DR dashboard (Smart Thermostat 33 percent cycling and Smart Thermostat 50 percent cycling), dividing aggregated interval kW by the corresponding account count yields average per-account kW. The 15-minute interval kWh AMI data takes the mean kWh of each interval and multiplies it by four for each category, yielding average per-account kW for small commercial AMI data customers.

Step 2: For each event, using two methodologies—temperature-based regression and CPS Energy's "top 3 of 10" analysis.

Specifically, for each event, we take the event day along with the previous 10 eligible days and use those 11 days to conduct the following procedures:

(1) Regression: Average per account kW is modeled as a function of an *event* dummy variable indicating whether a time period is within the event period, a *precool* dummy variable indicating whether a time period is within the 1-hour precool period before each event,[63] a *snapback* dummy variable indicating whether a time period is within the 2-hour snapback period right after each event, a *cdh* variable (cooling degree hours, with a balance point set as 65°F), a *cdh-squared* variable (cooling degree hours squared, to account for the non-linear relationship between temperature an load to some extent), and 3 *time-of-day* dummy variables indicating time of day – 12:00-6:00 AM, 6:00 AM-12:00 PM, 12:00-6:00 PM or 6:00 PM-12:00 AM. The model equation can be expressed as follows:

[63] There was no obvious precooling consumption pattern for traditional 33% and 50% cycling thermostats and this dummy variable was therefore not included.

$$kW_t = \beta_0 + \beta_1 \times event_t + \beta_2 \times precool_t + \beta_3 \times snapback_t + \beta_4 \times cdh_t^2 + \beta_5 \times event_t + \sum_{i=6}^{8} \beta_i \times time - of - day_t$$

$-\beta_1$ is the estimated kW load reduction per account during a certain event with regression method. Similarly, β_2 is the estimated kW precool and β_3 is the estimate kW snapback per account during a certain event. Net energy (kWh) savings per account is calculated as $-\beta_1$ x event duration $-\beta_2 - \beta_3$ x 2 hours.

(2) CPS Energy's high 3-of-10 baseline analysis. This methodology ranks the last ten eligible days based on total kWh during the event period. The three days with the highest kWh during the event period are selected. These three days are then averaged for each interval to create a calculated baseline. An adjustment ratio to the calculated baseline is applied to factor in weather effects and customer operation levels on the event day. In this case, the adjustment ratio is calculated as the ratio between the average kW of the event day versus the three baseline days during the 1-hour adjustment window right before the precool period or event period (if there is no precool period). The average kW difference during the event period is the kW savings estimate; and the kWh difference during the combination of 1-hour precool period, event period and 2-hour snapback period is the estimated net kWh savings under the "high 3-of-10 baseline" analysis.

Step 3: Select the methodology that has the lowest Root Mean Square Error (RMSE) during the "test period." Compare the RMSE of these two analyses during the test period and select the results generated by the methodology that has the lower RMSE. Here, the "test period" consists of four separate periods. The first three periods are the event time periods during the "top previous 3 days" (i.e., the three baseline days illustrated in the "high 3-of-10 baseline analysis" section above); the last period is 10:00 AM to 2:00 PM during the event day. Taking the residential 50 percent cycling customers on the traditional platform during the June 26, 2023, 4:15-6:30 PM event as an example, the following table compares savings estimates using the two methodologies (regression and "high 3-of-10" baseline analysis).

Table 6-11: Smart Thermostat – Example kW and kWh Savings Per Device Analysis Process

Methodology	kW savings per device estimate	2-hour snapback kW pre device estimate	Net energy kWh savings per device estimate	RMSE
Regression	0.44	-0.37	1.61	0.20
High 3-of-10	0.29	0.04	0.57	0.13

As shown, the RMSE of the "high 3-of-10" methodology is lower than that of the regression methodology (0.13 vs 0.20), indicating a better fit during the test period. As a result, the savings from "high 3-of-10" were selected, yielding final per-account savings of 0.29 kW and 0.57 kWh.

Step 4: Apply the device/account ratio to estimate per device kW and kWh savings.

The following figure shows the residential 50 percent cycling thermostat event day versus the baseline load profile on June 26, 2023.

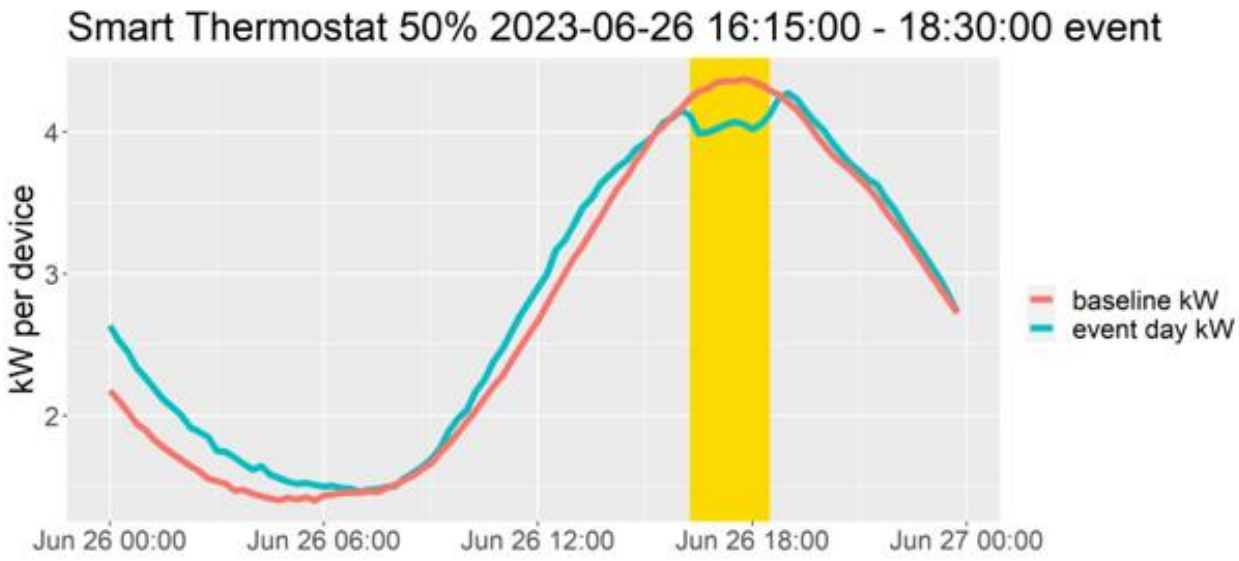


Figure 6-12: Smart Thermostat – Example 50% cycling per-account Load Profile vs. Baseline Profile – June 26, 2023 Event

Other dwelling type categories are calculated in a similar manner.

6.4.3.2 Coincident Peak (CP) Demand Savings (kW)

To estimate coincident peak demand kW savings, total demand savings were estimated using the per-device kW savings multiplied by the total number of devices by category for each event. The claimed achieved CP demand savings is the average kW savings during high-temperature usual events.[64] To estimate program capability based on EOFY and incremental enrollment, the result was scaled to the number of Smart Thermostats at the end of FY 2024 and to the number of new thermostats installed in FY 2024, respectively.

6.4.3.3 Non-Coincident Peak (NCP) Demand Savings (kW)

Achieved non-coincident peak savings for residential DR programs (Smart Thermostat, BYOT, and Direct Install Thermostats) are the savings on the day when the maximum demand savings of all residential DR

[64] The high-temperature threshold is set as 95°F for the event period. Voluntary events are also included while calculating CP kW savings.

programs occurred among all FY 2024 events. In the summer of 2023, all residential DR programs reached maximum program level demand reduction during the June 19, 2023 event, so the kW savings value from the event day is used as NCP demand savings for the Smart Thermostat program. EOFY and incremental estimates of NCP savings were obtained by scaling the achieved NCP to the number of installed devices at the end of FY 2024.

6.4.3.4 ERCOT 4CP Demand Savings (kW)

During the summer of 2023, Smart Thermostat program hit all four ERCOT 4CP events, with a program-wide success rate of 100 percent.[65] To estimate ERCOT 4CP demand savings, we estimated the total demand savings for each event, selected the four events which coincided with ERCOT 4CP, and multiplied the result by the ERCOT 4CP success rate, yielding 100 percent. For the fiscal year-end capability and incremental calculations, we scaled the result to the number of thermostats at the end of FY 2024 and to the number of newly installed thermostats throughout FY 2024.

6.4.4 Results

For demand response programs, we present impacts in four ways:

1) Estimated per-device kW and kWh savings during the summer of 2023 DR events.
2) Estimated program impacts during the summer of 2023 DR events.
3) EOFY program capability based on program enrollment at the end of FY 2024.
   This information is useful for planning purposes.
4) EOFY program capability based on incremental enrollment during FY 2024.
   This information is used for program benefit-cost analysis, consistent with the methods used for energy efficiency programs.

6.4.4.1 Estimated per-device kW and kWh Savings During the Summer of 2023 DR Events

The following table summarizes average per-device kW and kWh savings for each category across all summer of 2023 DR events (with both usual and voluntary events included):

[65] Success rate = # of 4CPs hit / 4. For example, in FY 2024, four of the 4CPs were hit for the traditional cycling thermostats, so the success rate was 4/4 = 100%.

Table 6-12: Smart Thermostat – Summer of 2023 Average per device kW and Net kWh Savings

Dwelling Type	Cycling/Temperature Setback Strategy	Average kW savings per device	Average net kWh savings per device per event
Residential	33% cycling	0.12	0.45
	50% cycling	0.18	0.58
Commercial	33% cycling	0.18	0.28

6.4.4.2 Estimated Impacts During the Summer of 2023 DR Events

During the summer of 2023, 32 events were called for the Smart Thermostat program, with a 4CP success rate of 100 percent. These demand reduction estimates are shown in the following figure. For the summer of 2023, total kW reduction ranged from 525 kW (8/3/2023) to 21,786 kW (8/26/2023).

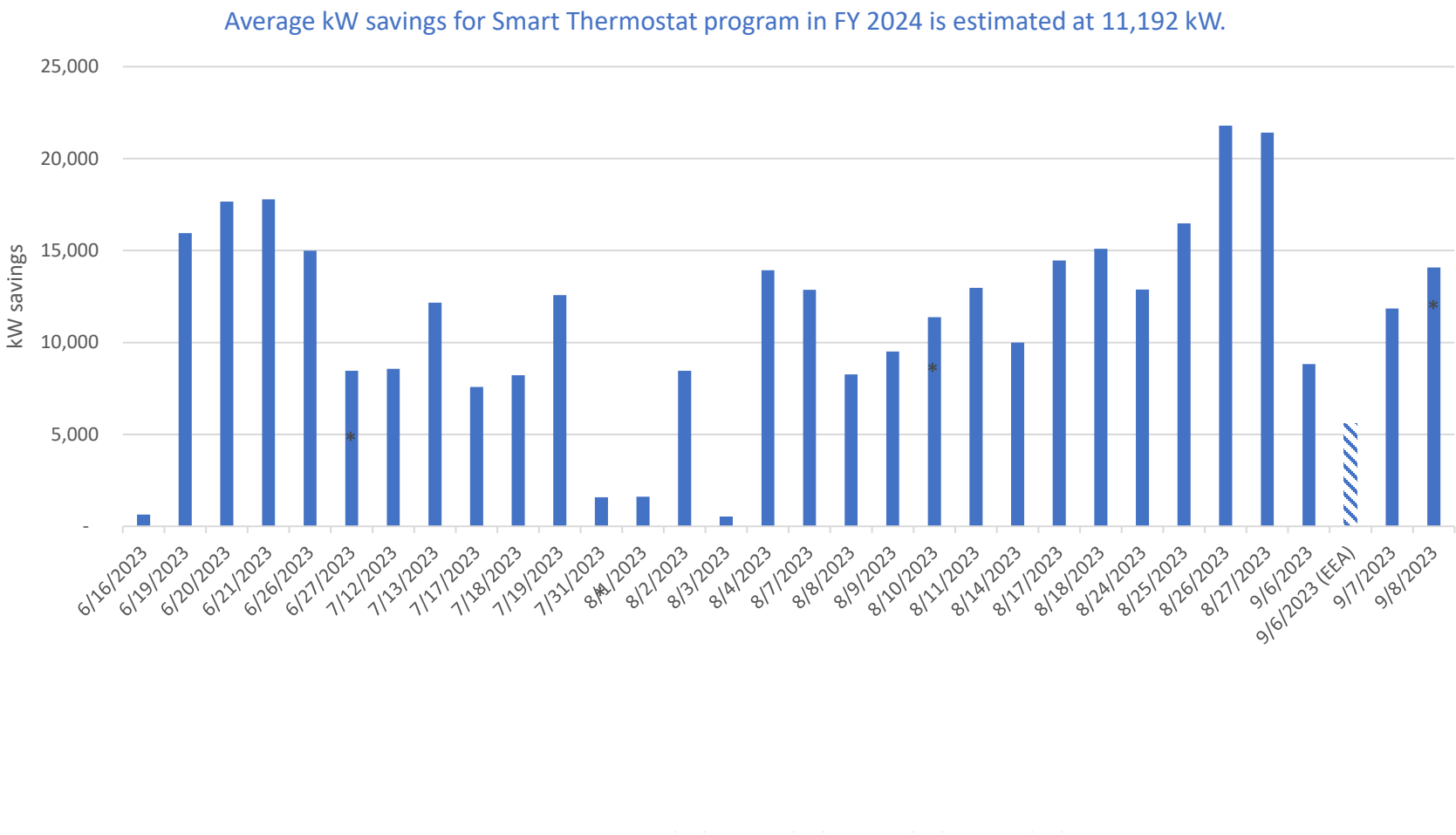


Figure 6-13: Smart Thermostat – Summer of 2023 Achieved Demand Reduction[66]

[66] Events coinciding with ERCOT 4CP intervals are designated with an asterisk (*). Diagonal stripes are used to identify any applicable emergency/EEA events.

The following table shows estimated energy, peak demand, non-coincident peak demand, and ERCOT 4CP demand savings achieved by the program in FY 2024. Peak demand savings are the average estimated savings across high-temperature events. ERCOT 4CP savings are the average estimated savings during ERCOT 4CP events. Non-coincident peak savings are the savings achieved on 6/19/2023, which is the day when maximum demand savings of all residential DR programs occurred among all FY 2024 events.

Table 6-13: Smart Thermostat – Achieved Gross Energy and Demand Savings

Measure	Gross Energy Savings (kWh)	Gross NCP Demand Savings (kW)	Gross CP Demand Savings (kW)	Gross ERCOT 4CP Demand Savings (kW)
Smart Thermostat	1,307,326	15,950	11,192	8,875

6.4.4.3 End-of-Fiscal Year Program Capability

EOFY program capability is based on EOFY enrollment. The following table shows the end of FY 2024 program capability values.

Table 6-14: Smart Thermostat – EOFY Gross Energy and Demand Savings

Measure	Device Count	Gross Energy Savings (kWh)	Gross NCP Demand Savings (kW)	Gross CP Demand Savings (kW)	Gross ERCOT 4CP Demand Savings (kW)
Smart Thermostat	87,232	1,289,325	15,676	11,038	8,757

6.4.4.4 Incremental Impacts

Incremental impacts used for cost-effectiveness analysis are based on gross incremental enrollment. This is a legacy program, so there are no new enrollments and no incremental impacts for this program.

6.5 POWER PLAYERS (BEHAVIORAL DEMAND RESPONSE)

6.5.1 Overview

CPS Energy partnered with Oracle to implement the Power Players program for residential customers beginning in 2017. The Power Players program deploys messaging to encourage customers to make minor adjustments in their home's energy use on peak energy days. This program was implemented as an opt-out randomized controlled trial (RCT). Eligible households/accounts must be equipped with AMI meters and not participating in other CPS Energy DR programs.

Participants receive a welcome letter before the annual program starts. Either one day before each event or in the morning of the event day, participants receive a notification message through an email and/or a phone call message. These notifications also contain information explaining what a peak day is and personalized energy conservation tips. After each event, customers receive a follow-up call and/or email containing personalized customer performance feedback.

Throughout the summer of 2023, 14 events were called. All events occurred between 3:00-8:00 PM, ranging from 3 hours to 5 hours.

6.5.2 Program Participation

Participation in FY 2024 was a combination of participants enrolled from summer 2017 to 2023 separately. Participation of each year is described as a "wave." For example, participants enrolled in the summer of 2017 are called the "2017 wave."

During the RCT selection process in early 2019, most of the control group participants from the 2017 and 2018 waves were accidentally selected into the 2019 wave treatment group and therefore received "treatment," causing the original control group from the 2017 and 2018 waves to become partially unusable. Only around 25 percent of control group participants were left in the 2017 wave and 13 percent in the 2018 wave.

In summer 2020, the control group participants who were accidentally selected into the treatment group in 2019 were then put back into their respective control groups, and therefore still regarded as valid control group members since summer 2020.

The following table shows the number of active customers throughout the summer of 2023 by waves.

Table 6-15: Power Players (BDR) – Summer of 2023 Participation

Wave	Treatment Group # of Households	Control Group # of Households
2017 Wave	64,308	14,505
2018 Wave	10,708	3,100
2019 Wave	111,200	14,011
2020 Wave	42,133	10,503
2021 Wave	28,021	6,714
2022 Wave	41,992	10,523
2023 Wave	93,701	23,497
Total	**392,063**	**82,853**

In the summer of 2023, there were 93,701 additional households participating who remained active in the Power Players program as the treatment group of the 2023 wave. However, the biggest share of treatment group participation was contributed by 2019 participants (111,200 remained active in the summer of 2023).

6.5.3 Savings Calculation Method

6.5.3.1 Per Household kW and kWh Savings

CPS Energy provided the evaluation team with aggregated 15-minute interval AMI meter level data from June 1, 2023 to September 30, 2023 for most of participants[67] by group and wave. A simple difference of the mean values of the two groups was calculated to estimate savings.

For each event, demand savings per household is simply the average household consumption difference between the treatment and control groups during the event period; the difference is calculated by each wave separately.

Energy savings per household is calculated based on the following rationale: participants were notified of most of the events either the previous day or early in the morning of the event day, so it is likely that participants took conservation actions in advance of the start of each of the events. To calculate energy savings, we assume that treatment group participants start taking conservation actions as early at 9am on the event day. In other words, energy savings is the consumption difference between the treatment and control groups during the event period and pre-event period, combined.

[67] Around 72% of all active customers were included in the aggregated 15-minute interval AMI data for analysis.

Take the first event (6/16/2023) of the 2022 wave as an example. The load per account by group and time period is tabulated below.

Table 6-16: Power Players (BDR) – Example: 2022 Wave Average Load by Group, Wave, and Time Period for 6/16/2023

Event period (3:00 PM to 6:00 PM) (kW per household)		Pre-event period (9:00 AM to 3:00 PM) (kW per household)	
Treatment Group	Control Group	Treatment Group	Control Group
3.467	3.418	2.458	2.455

For the June 16, 2023 event, per household kW savings for the 2022 wave is estimated at 3.467 – 3.418 = 0.049 kW. Total kW savings for the 2022 wave is 0.049 x 41,992 = 2,028 kW. Energy savings during the event period is calculated as 2,028 kW x 3 hours = 6,084 kWh.

kW savings during the pre-event period can be calculated in the same manner: (2.458 kW – 2.455 kW) x 41,992 = 163 kW.

Energy savings during the pre-event period is calculated as 163 kW x 6 = 978 kWh.

Total energy savings for the 2022 wave during the June 16, 2023 event is the combination of savings from the pre-event period and event period: 6,084 + 978 = 7,062 kWh.

Savings from the other three waves can be calculated in the same manner. The above calculations may not sum up exactly due to rounding.

6.5.3.2 Coincident Peak (CP) Demand Savings (kW)

Coincident peak demand savings are estimated by the average kW savings across all high-temperature events.[68] Since participants are recruited each year, the EOFY and incremental savings are identical to the FY 2024 achieved savings.

6.5.3.3 Non-Coincident Peak (NCP) Demand Savings (kW)

Achieved non-coincident peak savings represent the maximum event demand savings among FY 2024 events. Because all savings occur during the peak period, EOFY and incremental CP and NCP demand savings are equivalent to achieved maximum savings in FY 2024.

6.5.3.4 ERCOT 4CP Demand Savings (kW)

During the summer of 2023, four of the Power Players events coincided with the ERCOT 4CP events, with a success rate of 100 percent. To estimate ERCOT 4CP demand savings, we estimated kW savings for each event, selected the events that coincided with ERCOT 4CP, and multiplied the result by the

[68] Here "high-temperature events" are defined as events with average temperature no lower than 95°F.

ERCOT 4CP success rate. Year-end capability and incremental calculations are also the same as achieved 4CP savings.

6.5.4 Results

For the Power Players program, we present impacts in three ways:

1) Estimated program impacts during the summer of 2023 DR events.
2) EOFY program capability based on program enrollment at the end of FY 2024.
3) EOFY program capability based on incremental enrollment during FY 2024.
   This information is used for program benefit-cost analysis, consistent with the methods used for energy efficiency programs.

6.5.4.1 Estimated Impacts During the Summer of 2023 DR Events

In FY 2023, kW savings per account by wave is tabulated below.

Table 6-17: Power Players (BDR) – kW Savings per Household by Wave

Wave	Average kW savings per household
2017 wave	0.035
2018 wave	0.044
2019 wave	0.058
2020 wave	0.024
2021 wave	0.091
2022 wave	0.030
2023 wave	0.023

In the summer of 2023, 14 events were called for the Power Players program. Event impacts ranged from 12,098 kW (9/7/2023 event) to 18,805 kW (8/17/2023 event). These demand reduction estimates are shown in the following figure.

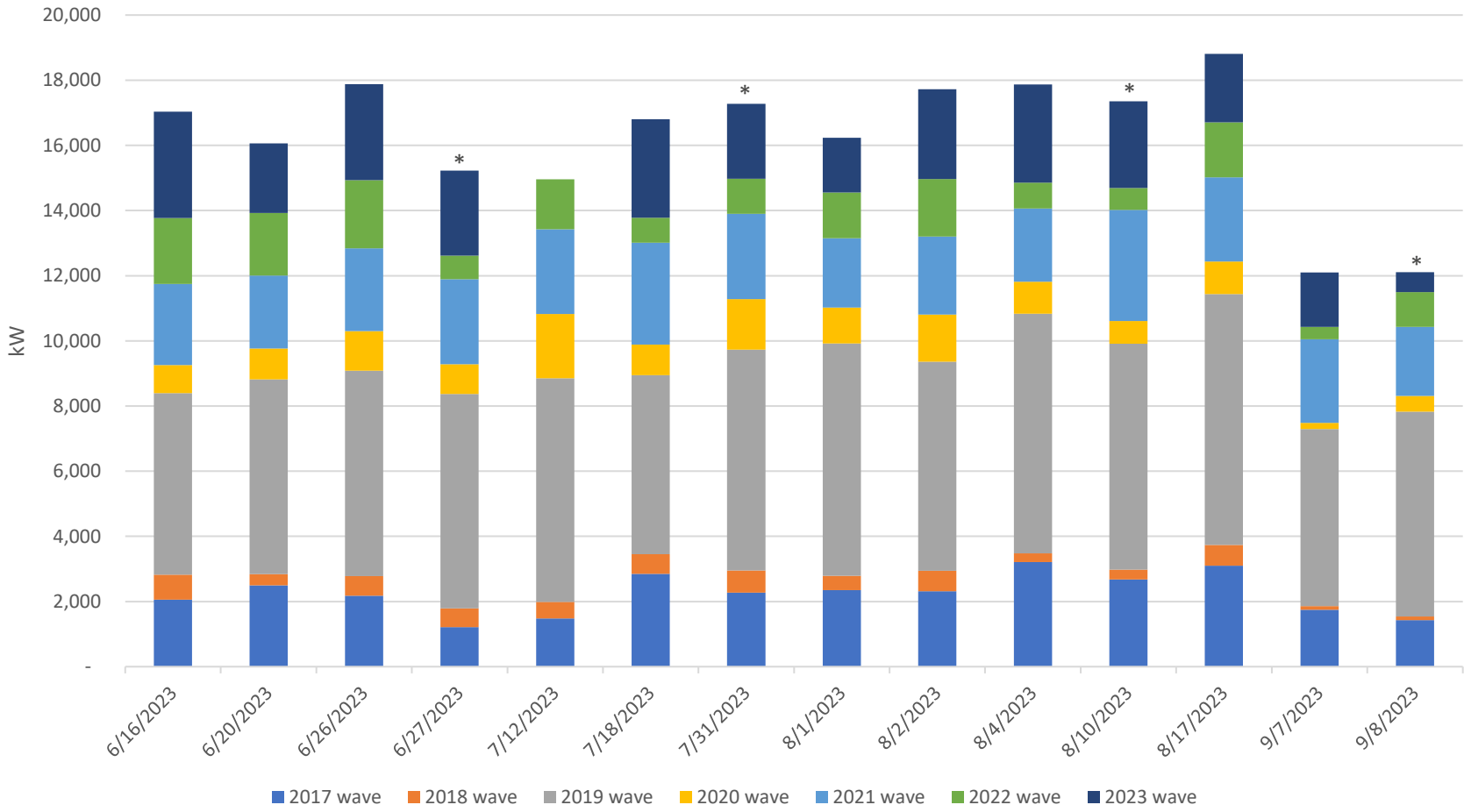


Figure 6-14: Power Players (BDR) – kW Reduction by Event[69]

[69] Events coinciding with ERCOT 4CP intervals are designated with an asterisk (*).

The following table shows estimated energy, peak demand, non-coincident peak demand, and ERCOT 4CP demand savings achieved by the program in FY 2024.

Table 6-18: Power Players (BDR) – Achieved Program Energy and Demand Savings

Measure	Energy Savings (kWh)	NCP Demand Savings (kW)	CP Demand Savings (kW)	ERCOT 4CP Demand Reduction (kW)
Power Players	1,461,309	18,805	16,245	15,490

6.5.4.2 End-of-Fiscal Year Program Capability

EOFY program capability is based on EOFY enrollment and is shown in the following table. These values are the same as the achieved savings.

Table 6-19: Power Players (BDR) – EOFY Program Energy and Demand Savings

Measure	EOFY Enrollment	Energy Savings (kWh)	NCP Demand Savings (kW)	CP Demand Savings (kW)	ERCOT 4CP Demand Reduction (kW)
Power Players	392,063	1,461,309	18,805	16,245	15,490

6.5.4.3 Incremental Impacts

Incremental impacts used in benefit-cost analysis are based on gross incremental enrollment during the program year. In this case, incremental impacts are the same as the achieved and EOFY impacts.

Table 6-20: Power Players (BDR) – Incremental Program Energy and Demand Savings

Measure	EOFY Enrollment	Energy Savings (kWh)	NCP Demand Savings (kW)	CP Demand Savings (kW)	ERCOT 4CP Demand Reduction (kW)
Power Players	392,063	1,461,309	18,805	16,245	15,490

6.6 COMMERCIAL AND INDUSTRIAL DEMAND RESPONSE PROGRAMS

6.6.1 Overview

CPS Energy's Commercial and Industrial DR (C&I DR) programs are voluntary load curtailment programs for commercial and industrial customers. They are designed to reduce peak load by incentivizing customers to shed electric loads on peak summer days. The programs run from June 1st through September 30th. Participating customers commit to be available to participate in events from 1:00-7:00 PM.[70]

Before FY 2019, the Commercial DR programs consisted of Options 1, 2, and 3, and Automated DR (ADR). In FY 2019, Option 4 was introduced to the program portfolio. Unlike Options 1, 2, and 3, customers were given notice only half an hour in advance. CPS Energy uses each of these programs differently because they have different purposes, capabilities, and contractual stipulations. The following table summarizes these differences.

Table 6-21: C&I DR – Program Characteristics

Measure	Performance Period	Time Period	Event Days	Max Events	Total Hours Available	Advance Notice (Hours)
Option 1	Jul 1 – Aug 31	13:00 – 19:00	Weekdays	18	55	2
Option 2	Jun 1 – Sep 30	13:00 – 19:00	Weekdays	25	75	2
Option 3	Jun 1 – Sep 30	13:00 – 19:00	Weekdays	6	25	1
Option 4	Jun 1 – Sep 30	13:00 – 19:00	Weekdays	25	75	0.5
ADR[71]	Jun 1 – Sep 30	24/7	All Days	–	50	–

Programs vary by performance period, events available, total hours available, and advance notice. Option 1 is not available in June and September, while other programs operate throughout the entire summer. ADR is the most responsive, with load being curtailed immediately after calling an event. Other programs have 0.5 to 2 hours advance notice.

In FY 2024, due to extremely hot weather and scarcity in the grid conditions, several voluntary events were deployed for options 1, 2, 3, and 4. Customers were encouraged to participate while not bound by contracts. These voluntary events are not limited to the time and event number restrictions in Table 6-21. Some events were called on evenings after 7:00 PM, and others were called on weekends.

[70] Except ADR program, which is introduced in the following paragraphs.
[71] There is also a non-summer ADR program offering that runs for the rest of the year, but its impacts are not evaluated here.

6.6.2 Program Participation

As shown below, compared with the previous year, the number of sponsors increased slightly from 158 to 175, the number of sites increased from 785 to 936, and contracted kW decreased from 94.5 MW to 82.0 MW. The total number of sponsors, sites, and contracted kW are shown in the graphs below.

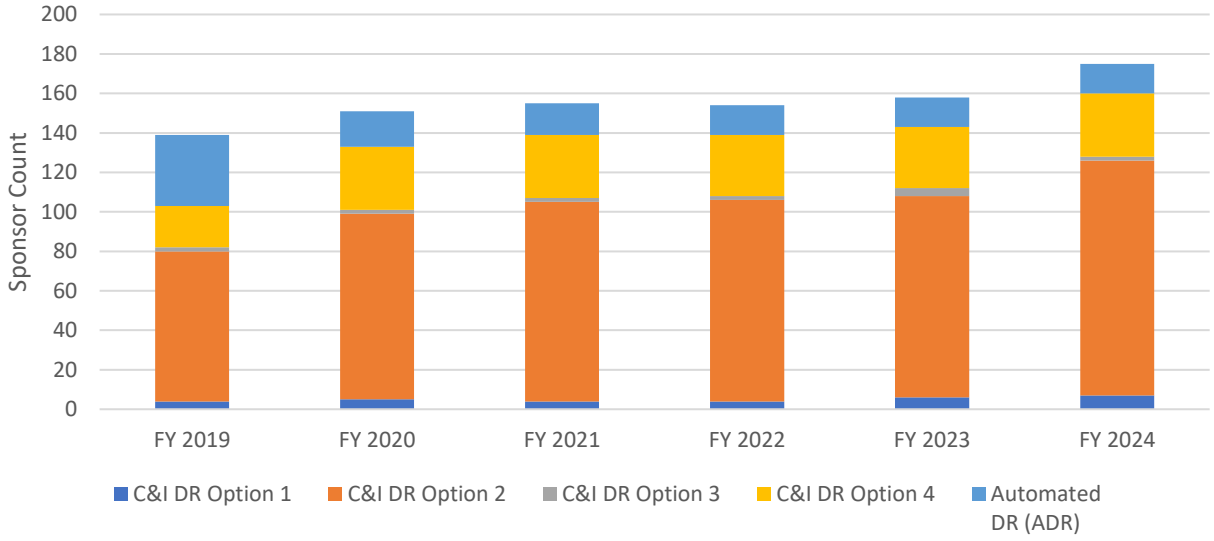


Figure 6-15: C&I DR – FY 2017-2024 Sponsor Counts

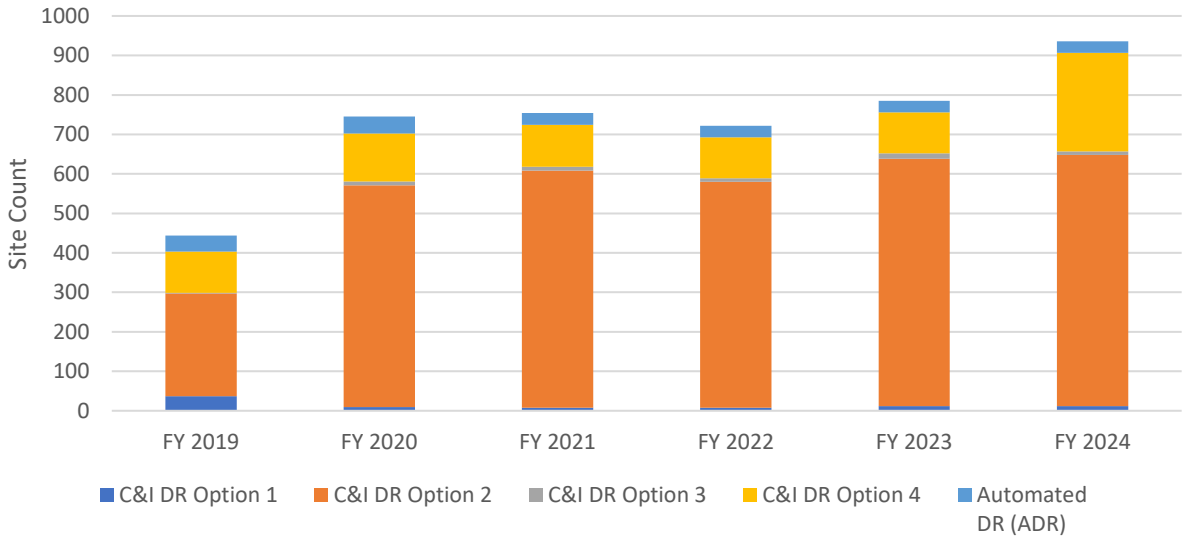


Figure 6-16: C&I DR – FY 2017-2024 Site Counts

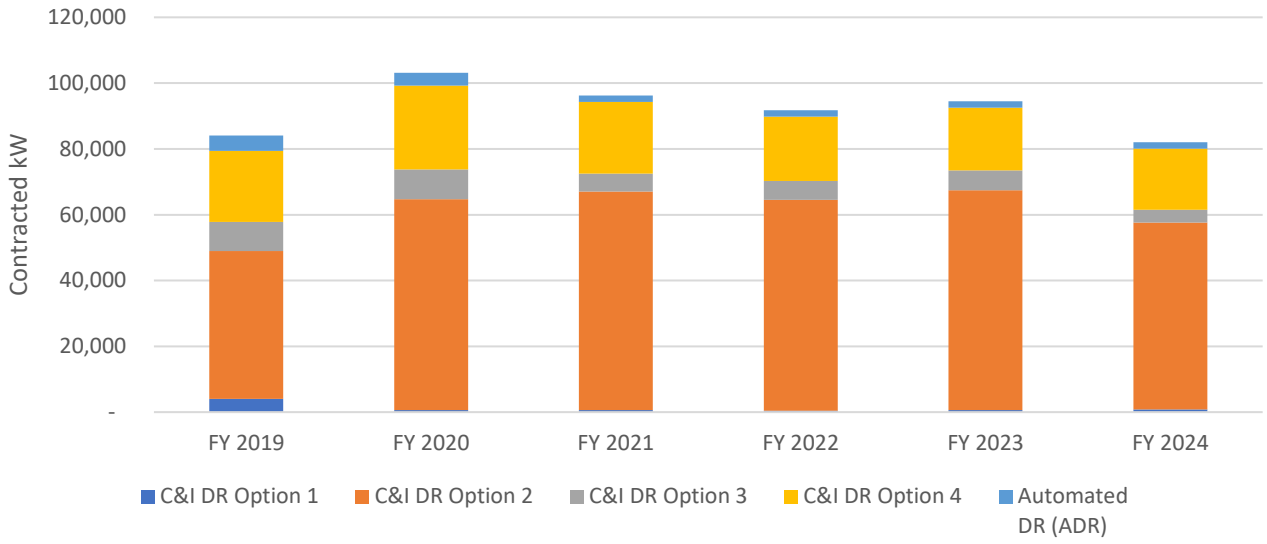


Figure 6-17: C&I DR – FY 2017-2024 Contracted kW

CPS Energy deployed its Commercial DR programs 33 days in FY 2024. As seen in the following table, Option 2, 4, and the ADR programs were called most frequently, while Option 3 was called six times due to a limit on the maximum number of events that could be called under that program. Note that usual events were marked with "X" while voluntary events were marked with "V" in the table.

The four days highlighted in yellow are 4CP days in FY 2024. On June 27, 2023, three C&I DR programs hit the 4CP event. On July 31, 2023, four C&I DR programs hit the 4CP event. On August 10, 2023, all C&I DR programs hit the 4CP event. On September 8, 2023, two C&I DR programs hit the 4CP event. And the events that coincided with 4CPs are all usual events instead of voluntary events. Detailed event scheduling summary is as follows:

Table 6-22: C&I DR – Event Date Distribution

Date	Option 1	Option 2	Option 3	Option 4	ADR
6/16/2023		X		X	X
6/19/2023		V	V	V	X
6/20/2023		X	X	X	X
6/21/2023		X		X	
6/26/2023		X		X	X
6/27/2023		X		X	X
6/28/2023		X			
7/11/2023					X
7/12/2023	X	X	X	X	X
7/13/2023	X	X		X	X
7/14/2023	X	X			
7/17/2023	X	X		X	X
7/18/2023	X	X	X	X	X

Date	Option 1	Option 2	Option 3	Option 4	ADR
7/19/2023	X	X		X	
7/20/2023	X				
7/31/2023	X	X		X	X
8/1/2023	X	X	X	X	X
8/2/2023	X	X		X	X
8/3/2023	X	X		X	X
8/4/2023				X	
8/7/2023	X	X		X	
8/9/2023	X	X		X	X
8/10/2023	X	X	X	X	X
8/11/2023	X			X	
8/17/2023	X	X		X	X
8/18/2023	X	X		X	X
8/24/2023		X		X	
8/25/2023	X	X			
8/26/2023	V	V	V	V	
8/27/2023	V	V	V	V	
9/6/2023		X V		X V	
9/7/2023		X	X	X	X
9/8/2023		V		X	

The following table shows the total number of events called for the past 6 years with a breakdown by program. In FY 2024, C&I DR program occurred on 33 days, reflecting more frequent DR calling on a hotter-than-usual summer.

Table 6-23: C&I DR – FY 2019-2024 Total Number of Events Called

C&I DR Program/ Option	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Option 1	14	11	12	13	13	20 (2 voluntary events)
Option 2	19	19	16	21	25	30 (5 voluntary events)
Option 3	6	6	5	6	6	9 (3 voluntary events)
Option 4	19	17	16	21	25	29 (4 voluntary events)
ADR	19	16	16	23	27	19
Total number of days that C&I DR program(s) occurred	**22**	**22**	**19**	**27**	**36**	**33**

The following figure compares the average event duration from FY 2019 to FY 2024. Event durations for all the programs except option 3 are longer in FY 2024 compared with previous years. The average usual event duration (excluding voluntary events) for all C&I programs in FY 2024 was 2.65 hours in FY 2024, approximately 0.4 hours longer than in FY 2023.

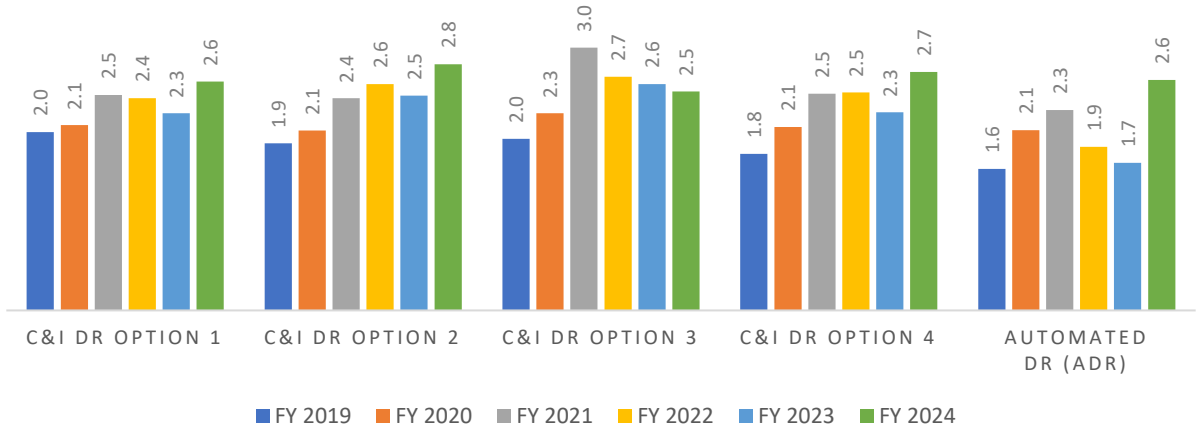


Figure 6-18: C&I DR – FY 2019-2024 Average Event Duration (only usual events were included in FY 2024 plot)

6.6.3 Savings Calculation Methods

For most cases in the summer of 2023, CPS Energy adopted the following methodologies to estimate savings for C&I DR programs:

- High 3 of 10
- Middle 8 of 10
- Matching Day Pair[72]

The "best fit" baseline was selected based on statistical criteria that determined how well each estimation method aligned with the 10:00 AM to 1:00 PM time frame for the event day.

Consistent with the methodology adopted in the past three fiscal years, the evaluation team has employed a "multiple-baselining method" to verify CPS Energy's savings estimates in FY 2024. This approach calculates savings using four different methods and then selects the savings generated by the most appropriate method by evaluating some statistical criteria.

Specifically, the general calculation process of this "multiple-baselining method" is as follows:

[72] The Matching Day Pair methodology uses a deterministic algorithm like the X of Y methodology. The algorithm looks for pairs of days that match a reference pair associated with the forecasted day. The similarity between two pairs of days is assessed using the mean squared error (MSE) between the two pairs. The 10 best pairs are then selected and averaged to obtain the baseline for the forecasted day.

Step 1: Data Selection. For each event and each customer, the previous 10 eligible days and the event day are selected. These 11 days of data are used for the analysis as outlined in the following steps.

Step 2: Calculation. For each customer on each event, kW savings are calculated using four methods:

- Regression: Load is modeled as a function of *cdh* (cooling degree hours), a *notify period* dummy variable indicating whether a time period is within the notification period, an *event* dummy variable indicating whether a time period is within the event period, 10 day-dummy variables indicating date, and three *time-of-day* dummy variables indicating time of day – 0:00-6:00, 6:00-12:00, 12:00-18:00 or 18:00-24:00. The model equation can be expressed as follows:

  $kW_t = \beta_0 + \beta_1 \times cdh_t + \beta_2 \times event_t + \beta_3 \times notify\text{-}period_t + \sum_{i=4}^{6} \beta_i \times time\text{-}of\text{-}day_t + \sum_{j=7}^{16} \beta_j \times date_t$

  $-\beta_2$ is the estimated load reduction for a certain customer during a certain event.

- CPS Energy's high 3-of-10 baseline analysis.

- Previous X hours: X = event duration + notifying period. For example, if an event duration is 2 hours, and CPS Energy notifies customers 2 hours in advance, then X = 4. If an event is from 3:30 PM to 5:30 PM, then the baseline would be the average load within the period from 11:30 AM to 1:30 PM.

- Average everything: This method calculates the average of all the load for the previous 10 eligible days to provide a baseline. This approach is designed for customers with a rather amorphous and irregular load.

Step 3: Evaluation. For the testing data period,[73] three measures including accuracy (root mean square error, RMSE), bias (difference), and variability (standard deviation) are calculated. This step measures how well-fit the model results are when compared with actual results for a similar time period.

Step 4: Final Selection. For the three measures described in Step 3, a pairwise comparison is conducted using a ranking method.[74] The method with the top ranking (lowest score) is selected.

6.6.3.1 Energy Savings (kWh)

Energy savings achieved from the Commercial DR programs are estimated by multiplying the demand savings estimated for each participant for each event by that event's duration and summing these energy reductions across all events (including both usual and voluntary events) for all the programs. The

[73] Here "testing data period" refers to the same time as the event period on the top three of the previous 10 eligible days, plus 9:00 AM to 1:00 PM on the event day.

[74] General rule for "pairwise comparison using ranking": if the difference for a pair of baselines is greater than 2%, the baseline with the higher one gets one point. Otherwise, both baselines get 0.5 point. At the end of this process, for each method respectively, the RMSE, bias, and standard deviation score are added together.

calculation assumes there is no load shifting (e.g., rescheduling of industrial processes), pre-cooling, or snapback.

6.6.3.2 Coincident Peak (CP) Demand Savings (kW)

To estimate coincident peak demand kW savings, the evaluation team estimated per event demand savings using "multiple-baselining" analysis for each customer. For each option/program, an average kW savings of all usual events (excluding voluntary events) in the summer of 2023 was then calculated. This is the number used to report achieved CP savings.

6.6.3.3 Non-Coincident Peak (NCP) Demand Savings (kW)

Non-coincident peak demand savings for the Commercial DR programs represent the maximum usual event (excluding voluntary events) demand savings among all events for each option/program. The achieved NCP savings reported for each sub-program (or program option) may have occurred on different event dates. EOFY and incremental estimates of NCP savings were estimated as the maximum event demand savings from those customers comprising the EOFY or incremental enrollees. For the Commercial DR program, the evaluation team sums the maximum event demand savings from each program option.

6.6.3.4 ERCOT 4CP Demand Savings (kW)

ERCOT 4CP demand savings obtained from the Commercial DR programs are directly estimated by evaluating the average load reductions achieved by all events (including voluntary events) when each month's 4CP event occurred, multiplied by the 4CP success rate[75] for each program in FY 2024.

6.6.4 Results

For demand response programs, we present impacts in three ways:

1) Estimated program impacts during the summer of 2023 DR events.

2) EOFY program capability based on program enrollment at the end of FY 2024; this information is useful for planning purposes.

3) EOFY program capability based on incremental enrollment during FY 2024;
this information is used for program benefit-cost analysis, consistent with the methods used for energy efficiency programs.

For C&I DR programs, there is no distinction between total EOFY participation and incremental enrollment – all participants are treated as new participants each program year. As such, the analysis of incremental impacts of these programs is no different than the analysis of total impacts.

[75] Success rate = # of 4CPs hit / 4. For example, in FY 2024, one of the 4CPs were hit for the Option 3 program, so the success rate was 1/4 = 25%.

6.6.4.1 Estimated Impacts During the Summer of 2023 DR Events

During the summer of 2023, C&I DR events were called on 33 days. The aggregated kW savings estimates are shown in the following figure.

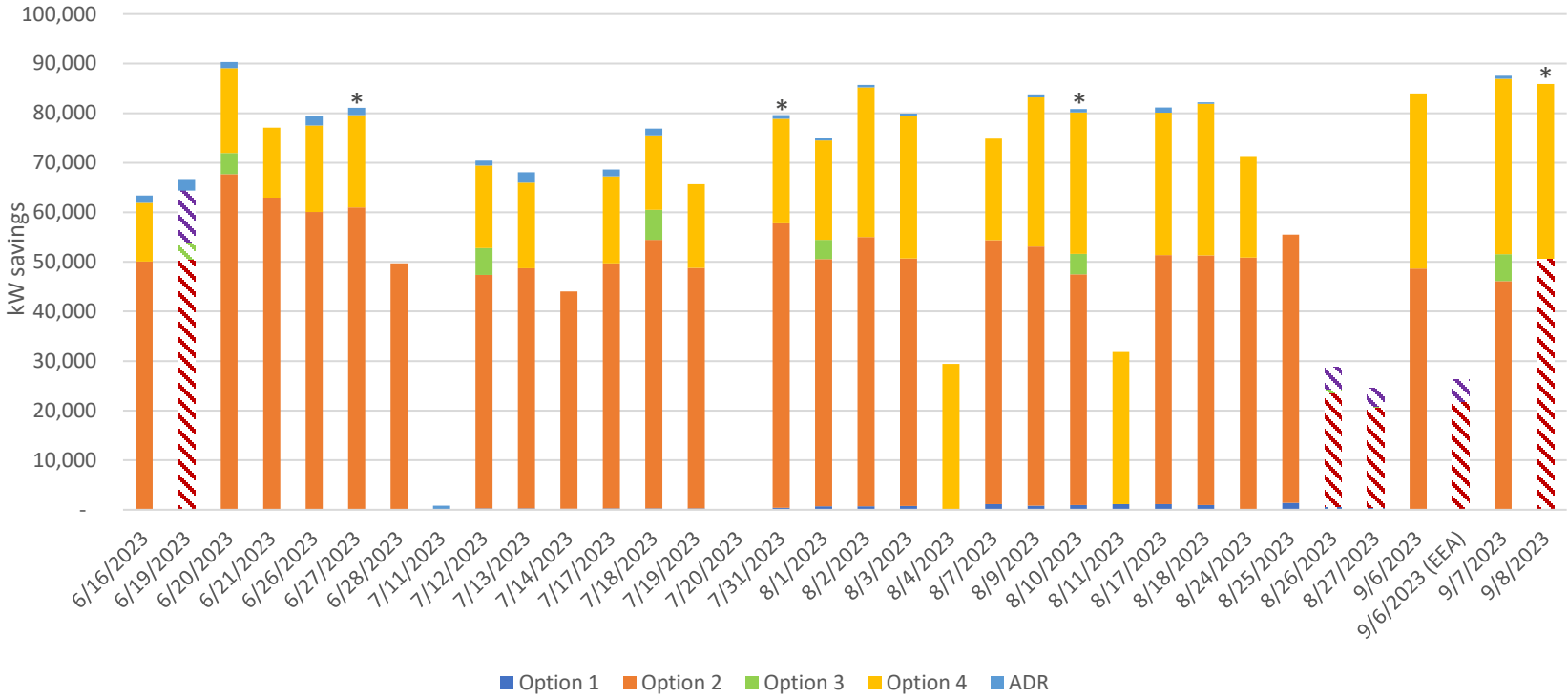


Figure 6-19: C&I DR – Summer of 2023 Achieved Demand Savings[76]

[76] Events coinciding with ERCOT 4CP intervals are designated with an asterisk (*). Diagonal stripes are used to identify any applicable voluntary or emergency/EEA events.

Maximum total demand reduction was achieved on 6/20/2023. The total demand reduction on this day from all C&I DR programs was 90.3 MW. Given the differences in how the individual C&I DR programs are used, the evaluation team estimates the demand savings achieved by each program individually. Total demand savings are presented as the sum of the demand savings achieved by each of the respective programs. The demand reduction and the number of customers participating in each option/program are shown in the following figures.

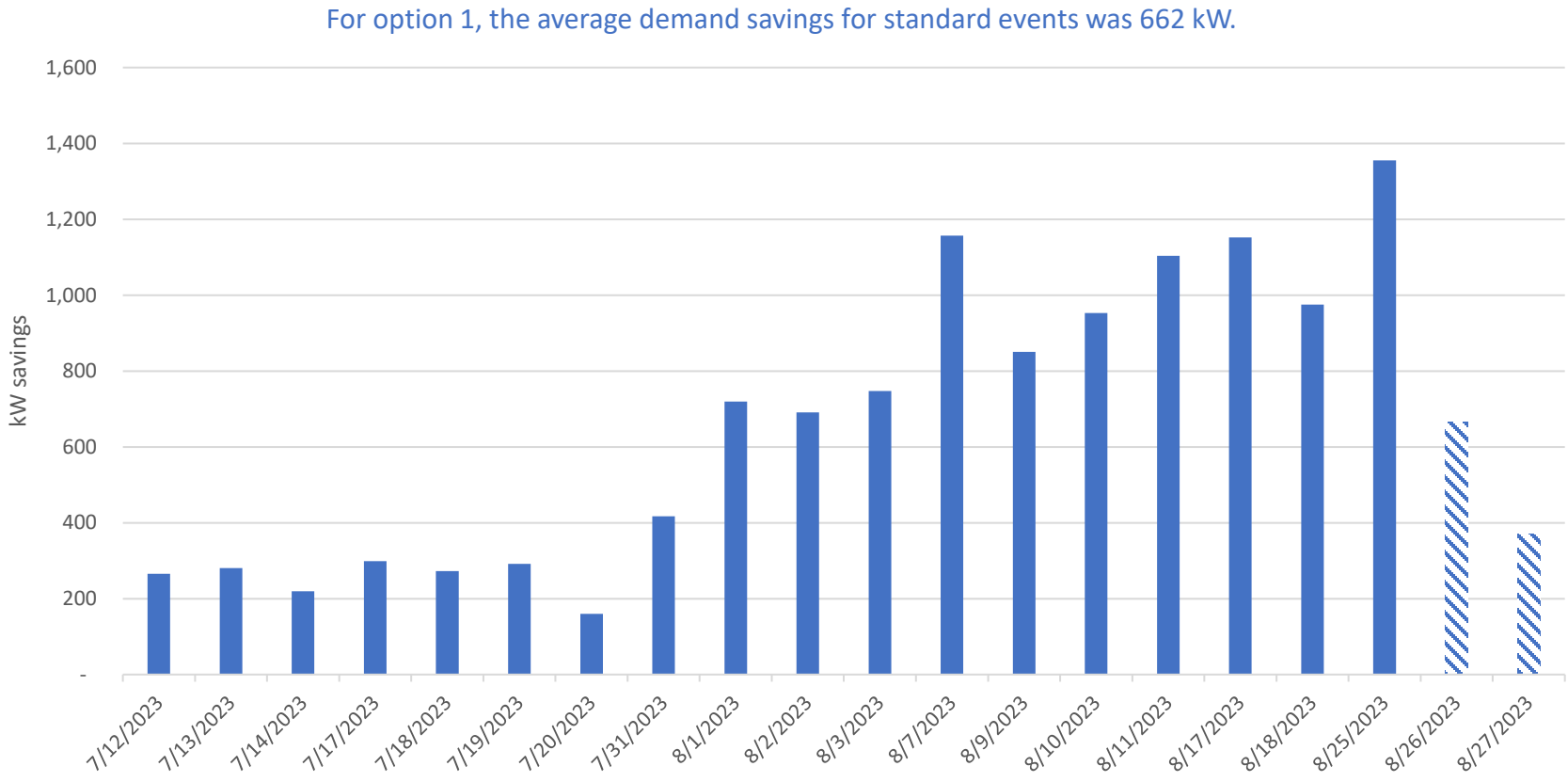


Figure 6-20: C&I DR – Option 1 Demand Savings by Event

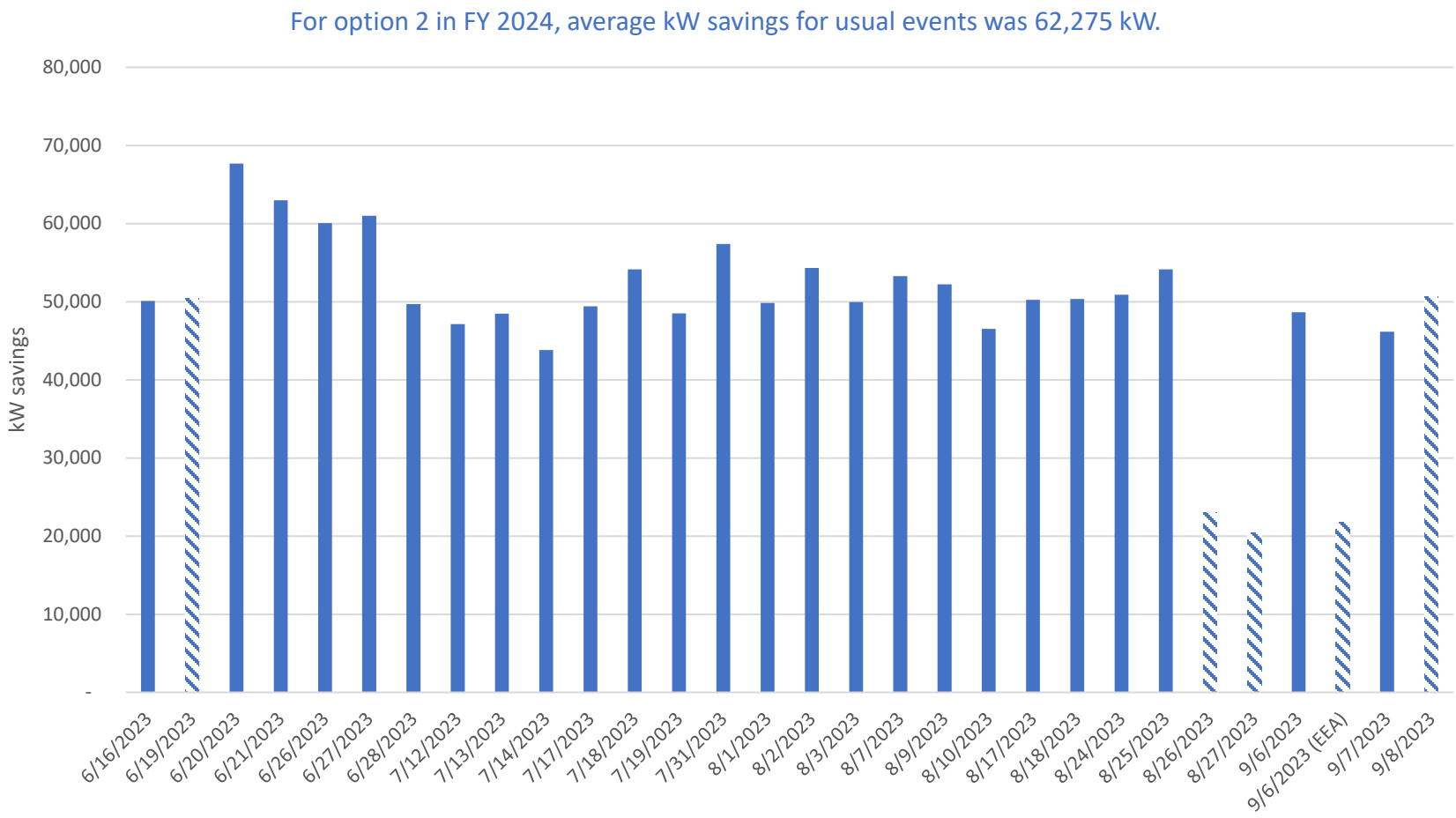


Figure 6-21: C&I DR – Option 2 Demand Savings by Event

For option 3 in FY 2024, the average demand savings for standard events was 4,874 kW.

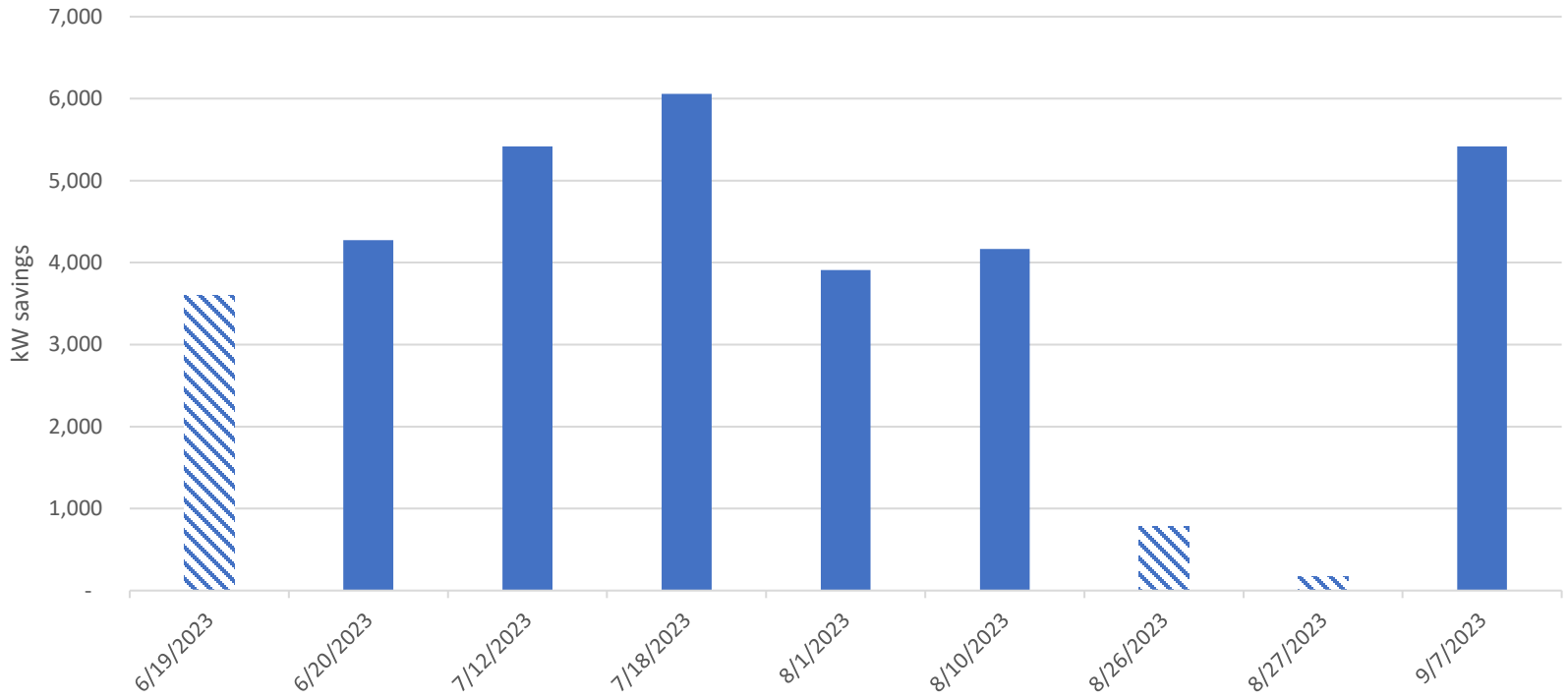


Figure 6-22: C&I DR – Option 3 Demand Savings by Event

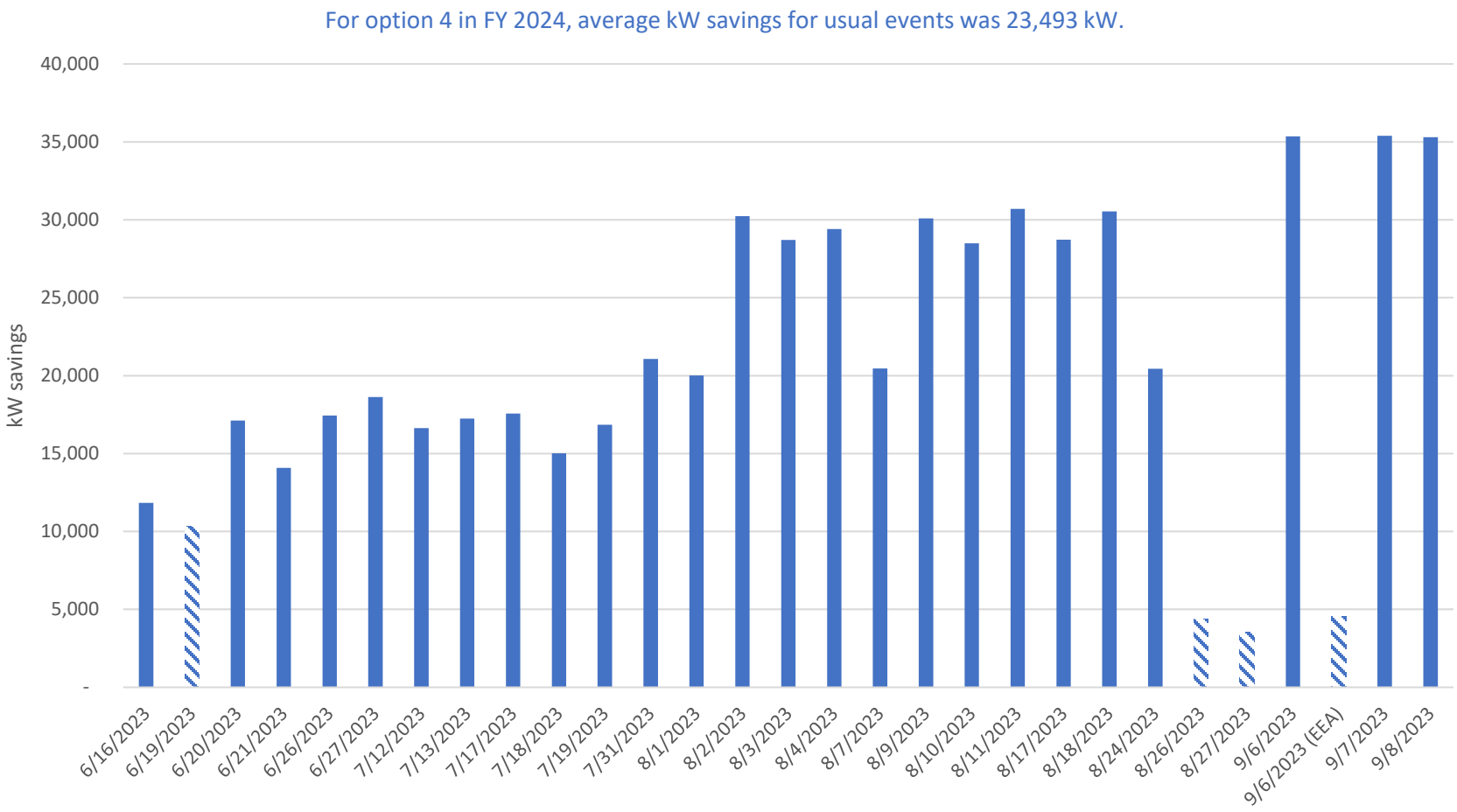


Figure 6-23: C&I DR – Option 4 Demand Savings by Event

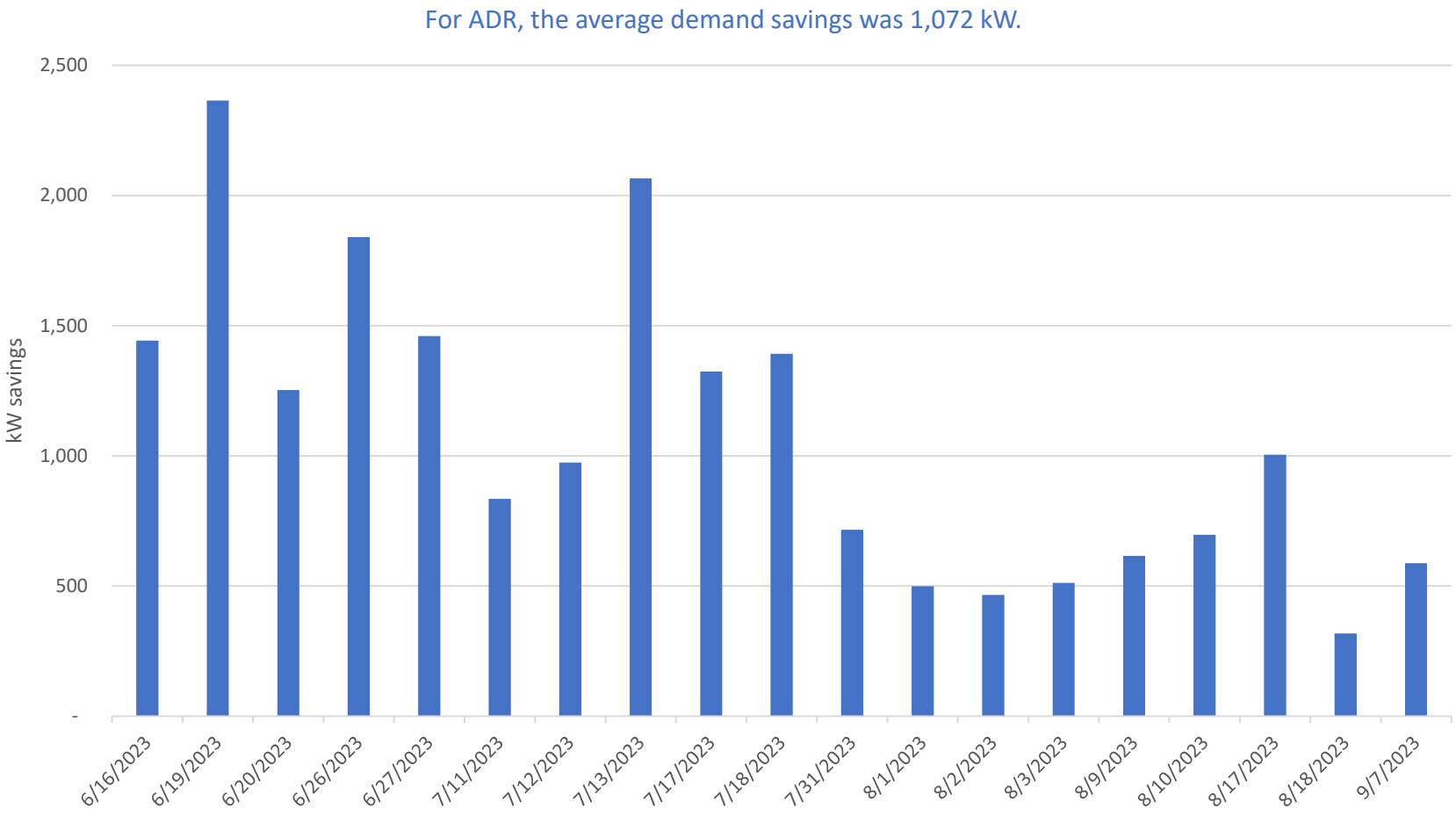


Figure 6-24: C&I DR – Automated DR Demand Savings by Event

A comparison of the estimated impacts from FY 2019 to FY 2024 is shown below:

Table 6-24: C&I DR – FY 2017-2024 Estimated Achieved kW Impacts Comparison

C&I DR Program/ Option	FY 2019 Average Savings (kW)	FY 2020 Average Savings (kW)	FY 2021 Average Savings (kW)	FY 2022 Average Savings (kW)	FY 2023 Average Savings (kW)	FY 2024 Average Savings (kW)[77]
Option 1	3,900	964	726	319	614	662
Option 2	43,216	57,302	65,746	55,955	65,373	52,275
Option 3	4,998	5,016	5,240	7,028	5,844	4,874
Option 4	20,647	22,877	20,671	20,377	18,862	23,493
ADR	3,662	2,510	637	555	923	1,072
Total[78]	**76,423**	**88,669**	**93,020**	**84,234**	**91,616**	**82,376**

6.6.4.2 Achieved Savings

The following table presents the estimates of savings achieved by the Commercial DR programs.

Table 6-25: C&I DR – Achieved Gross Energy and Demand Savings

Measure	Gross Energy Savings (kWh)[79]	Gross NCP Demand Savings (kW)	Gross CP Demand Savings (kW)[80]	Gross ERCOT 4CP Demand Savings (kW)
Option 1	38,162	1,355	662	342
Option 2	4,274,680	67,680	52,275	53,875
Option 3	84,440	6,057	4,874	1,041
Option 4	1,704,250	35,386	23,493	25,873
ADR	52,385	2,365	1,072	718
Total[81]	**6,153,917**	**112,845**	**82,376**	**81,850**

[77] Only usual savings are averaged in FY 2024.
[78] The sum of the individual measures may not match the total due to rounding.
[79] Energy savings contributed by voluntary events were included in this summary.
[80] Only usual events were included when calculating CP savings.
[81] The sum of the individual measures may not match the total due to rounding.

6.6.4.3 End-of-Fiscal Year Program Capability

Unlike residential DR programs which see recurring annual participation, most C&I DR programs are short and contract-based, lasting only one to two years—except for the ADR program. For energy savings (kWh), coincident peak savings (kW), and non-coincident peak savings (kW), the evaluation team uses the savings achieved in the summer of 2023 as an EOFY result. Because 4CP chasing has a certain success rate, the evaluation team considers it reasonable to use the average success rate of the past ten fiscal years[82] to estimate EOFY program capability for ERCOT 4CP demand savings. For example, the average success rate for Option 1 in the past ten fiscal years was 43 percent, as shown in the following table. With success rate as 50 percent in FY 2024, converting achieved 4CP demand savings to EOFY demand savings yields 342 kW/ 50% x 43% = 291 kW[83].

Table 6-26: C&I DR – EOFY ERCOT 4CP Demand Savings

Measure	Success Rate										Average Success Rate	Achieved ERCOT 4CP Demand Savings (kW)	EOFY ERCOT 4CP Demand Savings (kW)
	FY 15	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24			
Option 1	25%	50%	50%	25%	50%	25%	50%	50%	50%	50%	43%	342	291
Option 2	75%	75%	100%	75%	100%	75%	75%	100%	50%	100%	83%	53,875	44,447
Option 3	50%	75%	25%	75%	50%	50%	50%	75%	25%	25%	50%	1,041	2,082
Option 4	–	–	–	–	100%	100%	75%	100%	100%	100%	96%	25,873	24,795
ADR	75%	100%	100%	100%	100%	100%	75%	100%	75%	75%	90%	718	862
											Total[84]	**81,850**	**72,477**

[82] For option 4, we average the success rate of past six fiscal years since it was launched six fiscal years ago.
[83] Number may not exactly match due to rounding.
[84] The sum of the individual measures may not match the total due to rounding.

Option 1 participants are not available in June or September, meaning at least two 4CP events will always be missed with that program option and the maximum success rate for hitting 4CP would therefore be 50 percent. Option 3 participants are available for a maximum of six events, limiting CPS Energy's ability to use these program options for 4CP avoidance. Therefore, the EOFY program capability is summarized as follows:

Table 6-27: C&I DR – EOFY Gross Energy and Demand Savings

Measure	Energy Savings (kWh)	Gross CP Demand Savings (kW)	Gross NCP Demand Savings (kW)	ERCOT 4CP Demand Savings (kW)
Option 1	38,162	662	1,355	291
Option 2	4,274,680	52,275	67,680	44,447
Option 3	84,440	4,874	6,057	2,082
Option 4	1,704,250	23,493	35,386	24,795
Automated DR	52,385	1,072	2,365	862
Total[85]	**6,153,917**	**82,376**	**112,845**	**72,477**

6.6.4.4 Incremental Impacts

For all the C&I DR programs, there is no distinction between total participation and incremental participation – all participants are treated as new for FY 2024. As such, the analysis of incremental impacts of these programs is no different from the analysis of total impacts.

[85] The sum of the individual measures may not match the total due to rounding.

6.7 DEMAND RESPONSE PROGRAM RECOMMENDATIONS

The updated CPS Energy Guidebook, applicable to FY 2025, contains updates that may impact savings. To ensure the consistency of savings methodologies between program tracking estimates and evaluation results for individual measures, we recommend revising input assumptions in program tracking systems to match the Guidebook.

The evaluation team has identified specific recommendations related to savings calculations and program documentation in a separate memo to program administrators. In addition to these savings calculations and documentation recommendations, the evaluation team makes the following general recommendations for DR program offerings:

CPS Energy DR programs has leveraged their active and legacy DR programs to alleviate price volatility and balance several overall goals:

- Load shedding to avoid the ERCOT 4CP peak, which typically occurs around 4-5 PM
- Load reduction during CPS Energy load zone peak times, which typically occur slightly after ERCOT 4CP peak
- Overall NCP load reduction goals
- Cost effectiveness of each DR program
- Maximizing grid resiliency

Physical limitations were considered while trying to reach the above goals:

- Upper limits on the maximum number of events that can be called for most programs
- Time period limitations for select programs, especially C&I DR Option 1, where events can only be called in July and August
- For thermostat related DR programs, customer fatigue may occur if the event duration is longer, which can pose a challenge in covering both ERCOT and CPS Energy peaks
- For all DR programs, fatigue may occur from back-to-back events, which can happen during heat waves and multiple days with high demand
- For thermostat related DR programs, achievable kW savings can vary for each thermostat type. For example, the average savings of traditional cycling thermostats per device in the Smart Thermostat Legacy Program is significantly less than those from Wi-Fi thermostats. Additionally, savings continue to decline due to natural program decay.

Despite lower achieved NCP kW demand savings compared to the previous fiscal year (251 MW in FY 2024 compared to 266 MW in FY 2023), overall performance (such as 4CP, energy savings, and UCT score) performed better due to higher success rates of coinciding 4CP, longer event duration, and several voluntary events, which help protect customers from volatile market prices. Significantly higher FY 2024 real time market (RTM) energy prices also contributed to higher avoided cost of energy and peak time capacity benefits.

Texas experienced extremely hot weather in the summer of 2023, causing a higher average RTM price compared to the previous year. The average CPS Energy Load Zone RTM price between 2-8 PM during June – September 2023 was $286/MWh, while the average RTM price between 2-8 PM during June – September 2022 was only $168/MWh. Additionally, an ERCOT Energy Emergency Alert Level 2 (EEA 2) was implemented on September 6th, 2023 due to a low operating reserve.[86] Therefore, DR programs have required more flexibility in calling events, experiencing the following changes compared with the previous fiscal year:

- Longer average event durations for most of the DR programs. To use residential and small commercial thermostats on the Resideo platform as an example, the FY 2024 average event duration was 2.27 hours compared to 1.94 hours in FY 2023. For traditional cycling thermostats in the Smart Thermostat program, the FY 2024 average event duration was 2.27 hours compared to 1.94 hours in FY 2023.

- The ERCOT market experienced capacity issues outside of the traditional peak times of 4-5 PM, creating the need for some events to extend later into the night. For example, one event (8/24/2023) for traditional cycling thermostats in the Smart Thermostats program lasted until 10:00 PM. Other FY 2024 events commonly lasted until 7:00 PM.

- Usual events in both residential and commercial programs were supplemented by several voluntary events to accommodate low reserve, high RTM prices, and the total number of usual events' upper limits. These voluntary events typically occur outside of normal event hours, such as late evening and weekends.

The evaluation team recommends maintaining this flexibility to accommodate reaching multiple combined goals during another expected hot summer in 2024, as is predicted by preliminary ERCOT forecasting.[87] This flexibility may also assist in smoothing the incorporation of evening/winter DR, which began in early FY 2025.

[86] ERCOT News Release. September 6, 2023. https://www.ercot.com/news/release/2023-09-06-ercot-has-initiated.
[87] ERCOT 2024 Preliminary Summer Weather Outlook. March-April 2024. Page 23. https://www.ercot.com/files/docs/2024/05/03/0910-AM-2024-Preliminary-Summer-Weather-Outlook-Updated5-8-24-Morris-Coleman.pdf.

The evaluation team will also work with CPS Energy to refine cost-effectiveness design considering this demand for increased flexibility, which includes newly added voluntary/emergency events and night/winter DR programs.

6.7.1 Smart Thermostat Program

This is a legacy program with traditional cycling thermostats. The evaluation team recommends continuing to upgrade these legacy thermostats to new Wi-Fi thermostats, which yield significantly higher savings per device.

6.7.2 Direct Install Thermostat Program

In Direct Install Thermostat program, there is one sub-category called “Smart Thermostat Upgrade”. In this category, more than one-third of the Wi-Fi thermostat accounts were removed. This partly explains why CP and NCP savings were significantly less than last fiscal year. The evaluation team recommends working through an annual account cleanup to avoid savings volatility due to large amounts of removed thermostat devices.

6.7.3 Power Players Program

In FY 2024, CPS Energy enrolled almost 400,000 customers, representing an increase of almost 45,000 new customers. However, overall program savings experienced diminishing returns. The evaluation team recommends investigating further to determine whether there is a direct correlation between increased participation and lower per household savings.

6.7.4 Commercial and Industrial Demand Response Program

Several voluntary events were called in Options 1, 2, 3 and 4 of the C&I DR program. The evaluation team recommends expanding C&I DR offerings to include evening hours and help avoid the need for voluntary DR events beyond the usual event calling schedules for grid resiliency or other reasons. The evaluation team recommends CPS Energy examine the deployment strategy so that the same programs are not experiencing fatigue by bearing additional and longer event deployments.

7. ELECTRIC VEHICLE PROGRAMS

7.1 SUMMARY OF ELECTRIC VEHIHCLE PROGRAMS

CPS Energy launched two electric vehicle (EV) charging programs starting in June 2021: (1) *Flex*EV Smart Rewards program and (2) *Flex*EV Off-Peak Rewards program. Despite being deployed similarly to demand response resources, the evaluation team categorizes and presents Electric Vehicle program results separately due to the different end-uses. For simplicity, Electric Vehicle program results are combined with Demand Response in Table 1-1.

CPS Energy worked together with the evaluation team to develop a savings methodology that yielded appropriate savings estimates despite low participation rates. As additional participants are added to the programs and lessons are learned through the evaluation process, methodology changes related to baseline estimates and other factors may be warranted for future evaluations.

Customers with an eligible level 2 EV charger can choose to participate in either of the following programs.

*Flex*EV Smart Rewards Program – Launched in FY 2022, this load management Electric Vehicle (EV) program provides incentives to customers who allow CPS Energy to make remote adjustments to participating level 2 EV chargers during an event period. EV chargers can either be turned off or reduced to level 1 charging. Events can be scheduled throughout the year.

*Flex*EV Off-Peak Rewards Program - Launched in FY 2022, this behavioral EV program provides incentives to customers who enroll to not charge their EVs during peak hours (from 4:00-9:00 PM) throughout the year.

The contributions of each program to the electric vehicles portfolio's peak demand savings are shown in the following figures, as measured at the device level and adjusted to account for line losses.

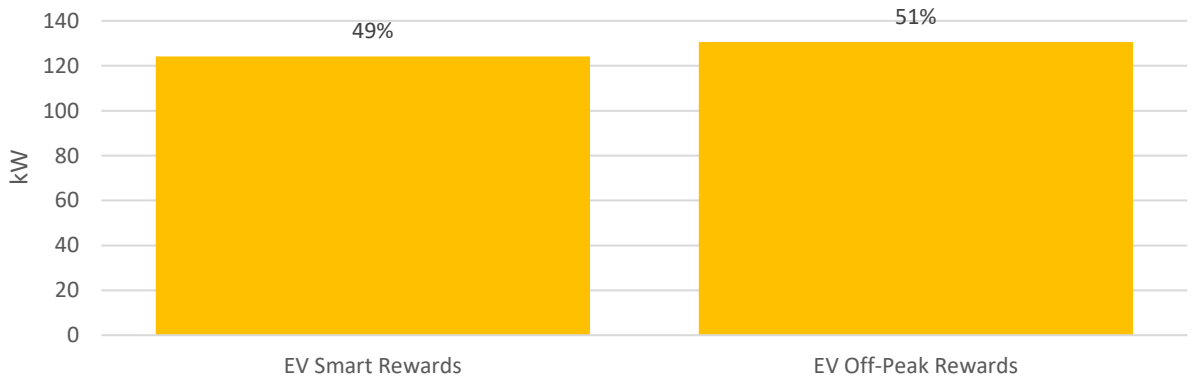


Figure 7-1: Summary of Demand Response Impacts – Non-Coincident Peak Demand (kW) by Program

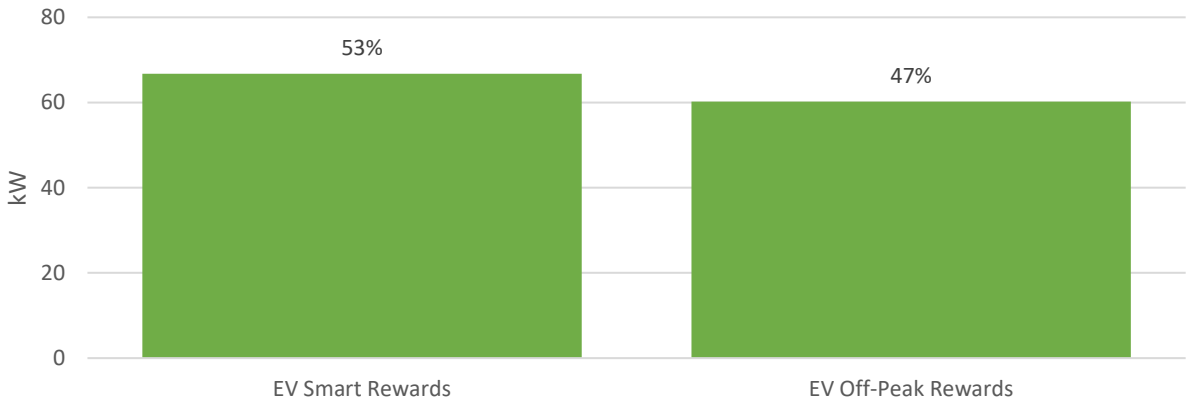


Figure 7-2: Summary of Demand Response Impacts – Coincident Peak Demand (kW) by Program

7.2 *FLEX*EV SMART REWARDS

7.2.1 Overview

Within the *Flex*EV Smart Rewards program, CPS Energy can make remote adjustments to participating EV chargers during event periods. EV chargers can be turned off or reduced to level 1 charging (charging rate no higher than 1.8 kW). Unlike other demand response programs, which usually have DR events during summer afternoons, events can be called from 2:00-9:00 PM during weekdays throughout the year. In return, customers receive a $250 credit on their utility bill, and a $5 credit toward the customer's bill each month if they remain enrolled in the program.[88]

*Flex*EV Smart Rewards program events can help alleviate "snap-back effect" (i.e., overconsumption) immediately after thermostat events (usually around 3:00-6:00 PM), as EV charging tends to begin coincidentally with the end of thermostat DR events (usually around 6:00-7:00 PM). By the end of FY 2024, there were 228 participants and 42 events in the *Flex*EV Smart Rewards program.

The following table shows the number of events by month in FY 2024.

Table 7-1 *Flex*EV Smart Rewards – Program Events by Month

Month/Year	# Events
February 2023	1
March 2023	3
April 2023	3
May 2023	2
June 2023	7
July 2023	9
August 2023	14
September 2023	3
Total	**42**

[88] CPS Energy Electric Vehicle Charging Solutions. https://www.cpsenergy.com/en/about-us/programs-services/electric-vehicles/ev-charging-solutions.html.

7.2.2 Program Participation

The following figure shows the participation trend by date throughout calendar year (CY) 2023, which was used to approximate FY 2024 participation.[89]

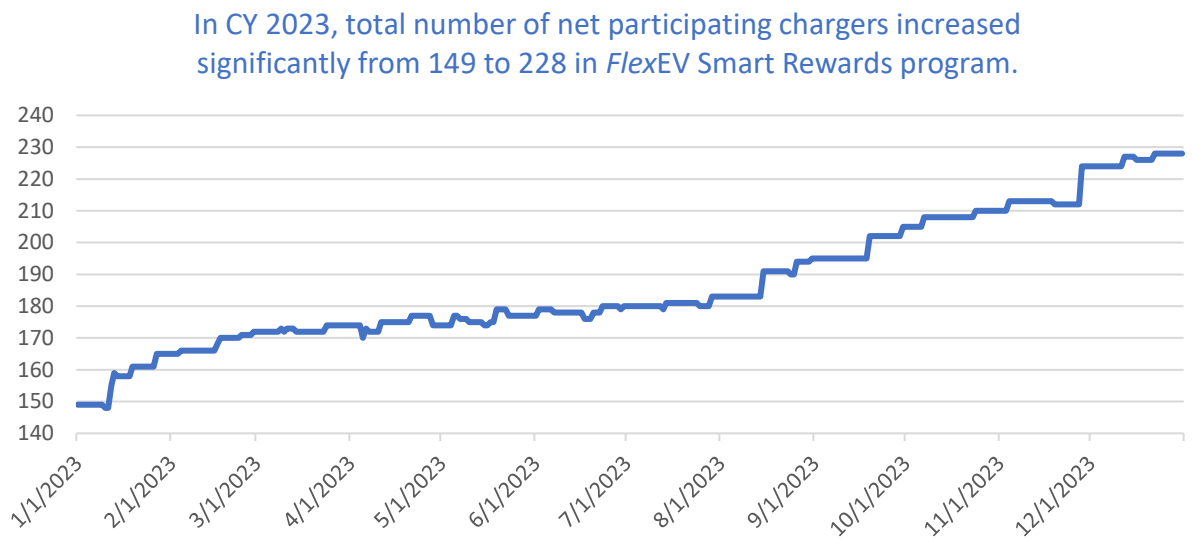


Figure 7-3: *Flex*EV Smart Rewards – CY 2023 Participation

By the end of EOFY 2024, providers of all participating chargers are either ChargePoint or Enel X.

7.2.3 Savings Calculation Methods

7.2.3.1 Per Device kW and kWh Savings

Consistent with the past two years of implementing *Flex*EV Smart Rewards program, the following challenges still exist in the second year of the program and are therefore considered when estimating savings:

(1) EV charging load profile is different from load profiles in residential thermostat DR programs, which are much more weather-sensitive. Factors that affect EV charging profile may include but are not limited to size, fullness, age, maximum charging rate of EV battery, and the customer's personal schedule. None of the above information was available in this program so far.
(2) Charger level 15-minute interval data is only available after a customer joins *Flex*EV Smart Rewards Program. Interval charging data is automatically set to 0 before joining the program. As

[89] CY 2023 covers 1/1/2023 – 12/31/2023, while FY 2024 spans 2/1/2023 – 1/31/2024.

a result, there is no a priori information on EV charging load profiles for any customers prior to their participation.

Device-level data includes 15-minute interval energy consumption (kWh), average power, and peak power (captured and stored on the EnergyHub platform). Customer enrollment data including enrollment/unenrollment date and device type are also available. The time period for the available data is CY 2023.

Savings analyses are conducted in the following steps:

Step 1: Plot aggregated average non-event day device-level load profile by month to have a brief visual inspection on whether there were any significant EV charging behavioral changes throughout year 2023.

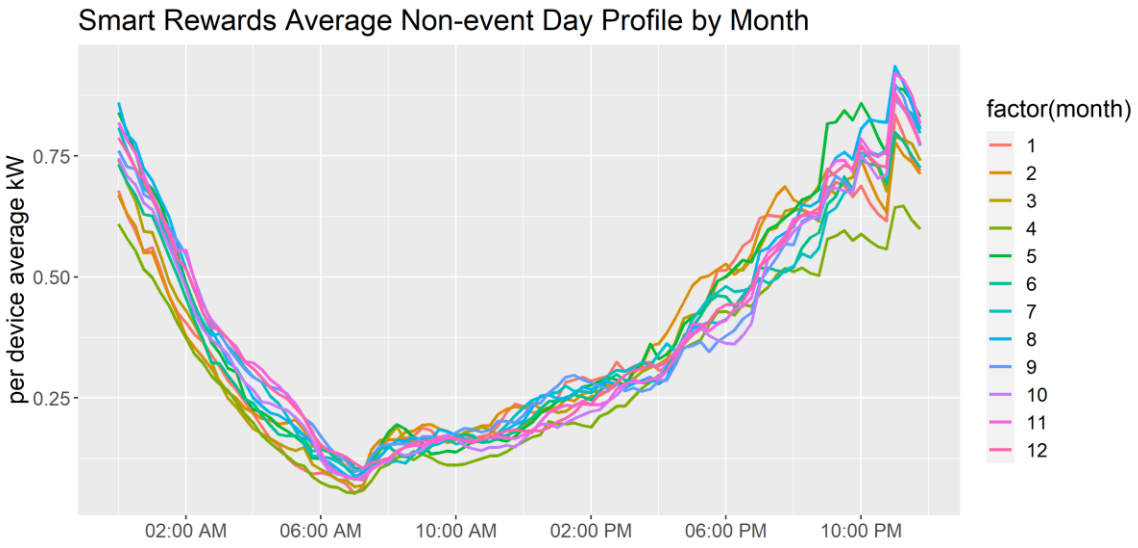


Figure 7-4: *Flex*EV Smart Rewards – Average Non-Event Day Profile by Month

As seen in the figure above, no significant EV charging behavioral changes have been detected from visual inspection. Therefore, we assume all non-event weekdays can serve as eligible days, and we adopt "10 previous + 10 post eligible days" analysis, which is illustrated in the following steps.

Step 2: Using device-level interval data, calculate baseline device-level load profile by aggregating load for 20 days – 10 eligible days prior to event day and 10 eligible days after event day. The baseline load profile is the average load profile for these 20 days.

Step 3: kW savings is the average kW difference during event-day load profile vs baseline-day load profile. Take 2/15/2023 event day as an example. As shown in figure above, demand savings for the 2/15/2023 event was calculated as 0.34 kW per device. Multiplying this value by the total number of

participating devices (166 devices) on that day yields achieved kW savings for that day: 0.34 kW x 166 = 56.44 kW.

7.2.3.2 Energy Savings (kWh)

Total energy savings (kWh) are zero by default because the program assumes only load shifting rather than energy savings.

7.2.3.3 Coincident Peak (CP) Demand Savings (kW)

To compute coincident peak (CP) demand savings, the per-device demand savings is multiplied by the total number of participated devices by each event. The claimed achieved CP kW savings are the average kW savings during June – September events. Therefore, events in other months were eliminated. Scaling the average kW savings by the EOFY customer count yields EOFY CP kW savings. Multiplying per device CP demand savings by number of newly added participants yield Incremental CP kW savings.

7.2.3.4 Non-Coincident Peak (NCP) Demand Savings (kW)

Achieved non-coincident peak savings for *Flex*EV Smart Rewards program is the maximum kW savings throughout all events in FY 2024. In FY 2024, this program reached maximum program level demand reduction during the 9/8/2023 event, so the kW savings on this day are used as the NCP kW savings for *Flex*EV Smart Rewards program. EOFY NCP kW savings in FY 2024 were calculated by multiplying maximum per device savings FY 2024 events by EOFY 2024 number of participants. Multiplying per device NCP demand savings by number of newly added participants yield Incremental CP kW savings.

7.2.3.5 ERCOT 4CP Demand Savings (kW)

During the summer of 2023, four *Flex*EV Smart Rewards DR events coincided with ERCOT 4CP events, yielding a 100 percent success rate in 4CP alignment. To estimate ERCOT 4CP demand savings, we estimated the kW savings for each event, selected the events that coincided with the ERCOT 4CPs, and multiplied the result by the ERCOT 4CP success rate. For the EOFY capability calculations, per device kW savings during 4CP intervals were scaled to the number of devices at the end of FY 2024. Like the NCP and CP demand calculation, we multiply per device 4CP demand savings by number of newly added participants to generate incremental 4CP kW savings Results.

For the *Flex*EV Smart Rewards DR program, we present impacts in four sections:

1) Estimated per device kW savings during FY 2024.
2) Estimated program impacts during FY 2024 DR events.
3) EOFY program capability based on program enrollment at the end of FY 2024.

4) EOFY program capability based on incremental enrollment during FY 2024. This information is used for program benefit-cost analysis, consistent with the methods used for energy efficiency programs.

7.2.3.6 Estimated Impacts During FY 2024 DR Events

As shown in the following figure, kW savings per device varied greatly by each DR event for *Flex*EV Smart Rewards program in FY 2024.

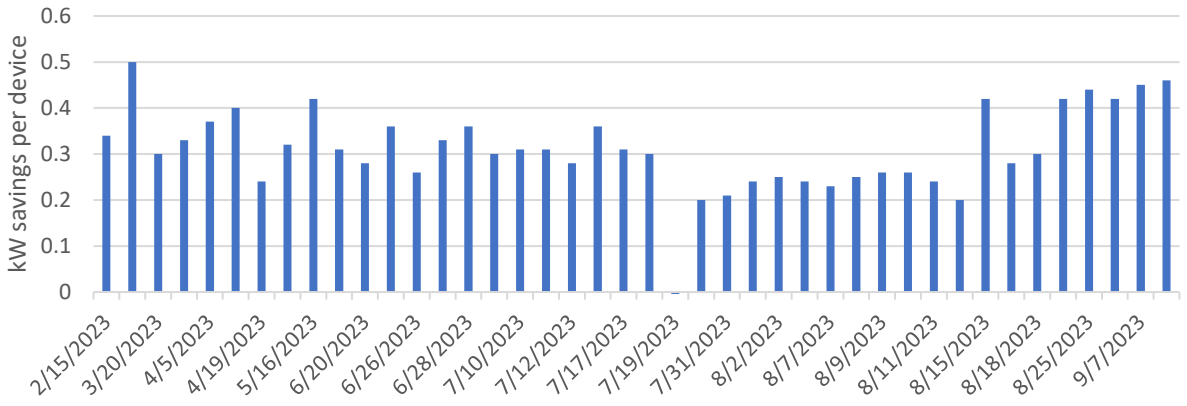


Figure 7-5: *Flex*EV Smart Rewards – Per Device/Charger kW Savings by Event

The figure above shows total kW savings by event throughout entire FY 2024. Average savings across all 42 events were estimated at 56.13 kW.

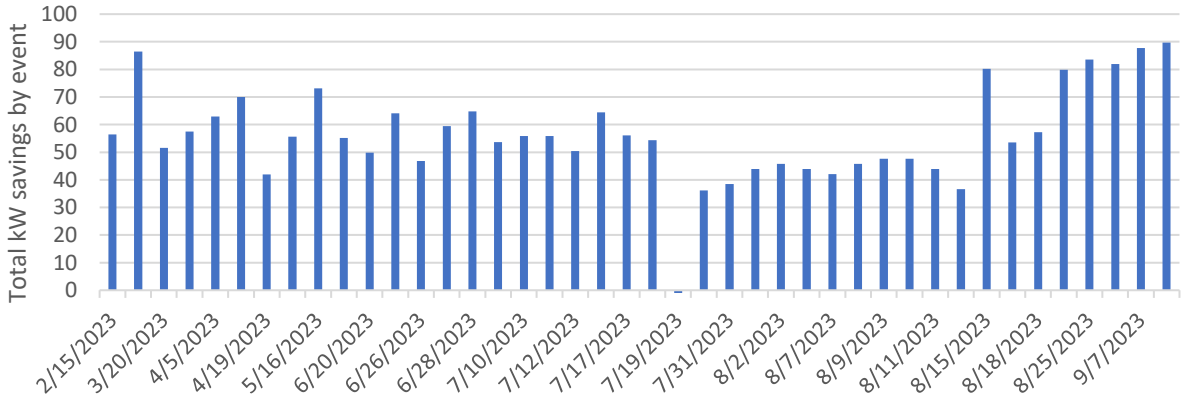


Figure 7-6: *Flex*EV Smart Rewards – Total kW Savings by Event

The following table shows estimated energy, peak demand, non-coincident peak demand, and ERCOT 4CP demand savings achieved by the *Flex*EV Smart Rewards program in FY 2024.

Table 7-2: *Flex*EV Smart Rewards – Achieved Energy and Demand Savings

Measure	Gross Energy Savings (kWh)	Gross NCP Demand Savings (kW)	Gross CP Demand Savings (kW)	Gross ERCOT 4CP Demand Savings (kW)
*Flex*EV Smart Rewards	–	89.70	56.13	58.78

7.2.3.7 End-of-Fiscal Year Program Capability

EOFY program capability is based on EOFY enrollment and is shown in the following table.

Table 7-3: *Flex*EV Smart Rewards – EOFY Program Energy and Demand Savings

Measure	EOFY Enrollment	Gross Energy Savings (kWh)	Gross NCP Demand Savings (kW)	Gross CP Demand Savings (kW)	Gross ERCOT 4CP Demand Savings (kW)
*Flex*EV Smart Rewards	228	–	114.00	61.31	71.82

7.2.3.8 Incremental Impacts

Incremental impacts used in benefit-cost analysis are based on gross incremental enrollment during the program year.

Table 7-4: *Flex*EV Smart Rewards – Incremental Program Energy and Demand Savings

Measure	Gross Incremental Enrollment	Gross Energy Savings (kWh)	Gross NCP Demand Savings (kW)	Gross CP Demand Savings (kW)	Gross ERCOT 4CP Demand Savings (kW)
*Flex*EV Smart Rewards	118	–	59.00	31.73	37.17

7.3 *FLEX*EV OFF-PEAK REWARDS

7.3.1 Overview

The *Flex*EV Off-Peak Rewards program incentivizes customers to voluntarily charge during off-peak hours (between 9:00-4:00 PM), without any direct intervention from CPS Energy. In return, customers receive a one-time $125 credit on their utility bill and can earn a $10 monthly credit if charging is limited to no more than twice monthly during peak hours.

Calendar year (CY) 2023 was used to approximate FY 2024.[90] At the end of calendar year (EOCY) 2023, there were 161 participants in the *Flex*EV Off-Peak Rewards program.

7.3.2 Program Participation

The following figure shows the participation trend by date throughout CY 2023.

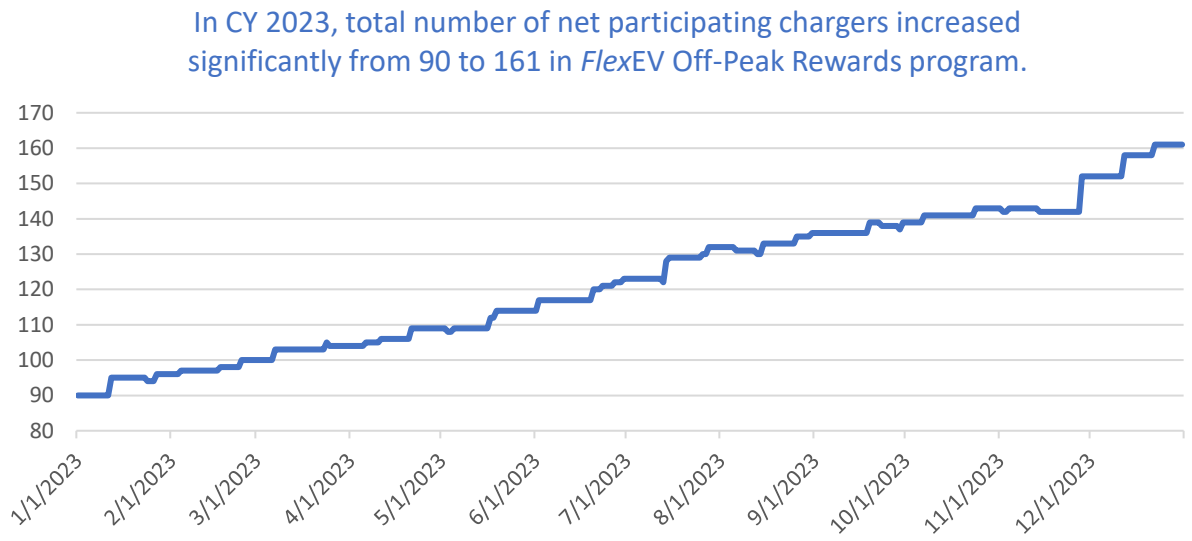


Figure 7-7: *Flex*EV Off-Peak Rewards – CY 2023 Participation

Same as *Flex*EV Smart Rewards program, participating charger providers were also limited to ChargePoint or Enel X by the EOCY 2023.

7.3.3 Savings Calculation Methods

Unlike *Flex*EV Smart Rewards program, the "10 previous + 10 post eligible days" methodology does not apply to *Flex*EV Off-Peak Rewards program because *Flex*EV Off-Peak Rewards is not an event-based program, and participant charging behaviors may have changed immediately after joining the program.

[90] CY 2023 covers 1/1/2023 – 12/31/2023, while FY 2024 spans 2/1/2023 – 1/31/2024.

In addition, with device-level 15-minute interval charging data from 1/1/2023 to 12/31/2023 alone, it is difficult to develop a valid baseline because there was neither a valid control group nor load profile before joining the program.

With both challenges considered above, we let eligible non-event days in *Flex*EV Smart Rewards program serve as the "control group" to generate baselines for estimation. As illustrated in the previous section for the *Flex*EV Smart Rewards program, non-event days were the best option for a "control group" because we have not detected significant charging behavior change for these days. Savings analysis is described in detail by the following steps:

Step 1: For both *Flex*EV Smart Rewards and *Flex*EV Off-Peak Rewards datasets, aggregate non-event, non-holiday weekdays to generate two separate average load profiles. The average daily *Flex*EV Smart Rewards charging amount was then calculated at 9.02 kW while average daily *Flex*EV Off-Peak Rewards was calculated at 8.21 kW.

Step 2: Calculate the adjusting ratio between *Flex*EV Off-Peak Rewards and *Flex*EV Smart Rewards: 8.21 kW ÷ 9.02 kW = 0.91.

Step 3: Apply adjusting ratio 0.91 to *Flex*EV Smart Rewards interval EV load to force the average load profile to be the same with that of *Flex*EV Off-Peak Rewards and therefore create a comparable "baseline." The following figure shows the average daily load profile of *Flex*EV Off-Peak Rewards and adjusted *Flex*EV Smart Rewards (baseline), with expected load shifting period (4:00-9:00 PM) highlighted in yellow.

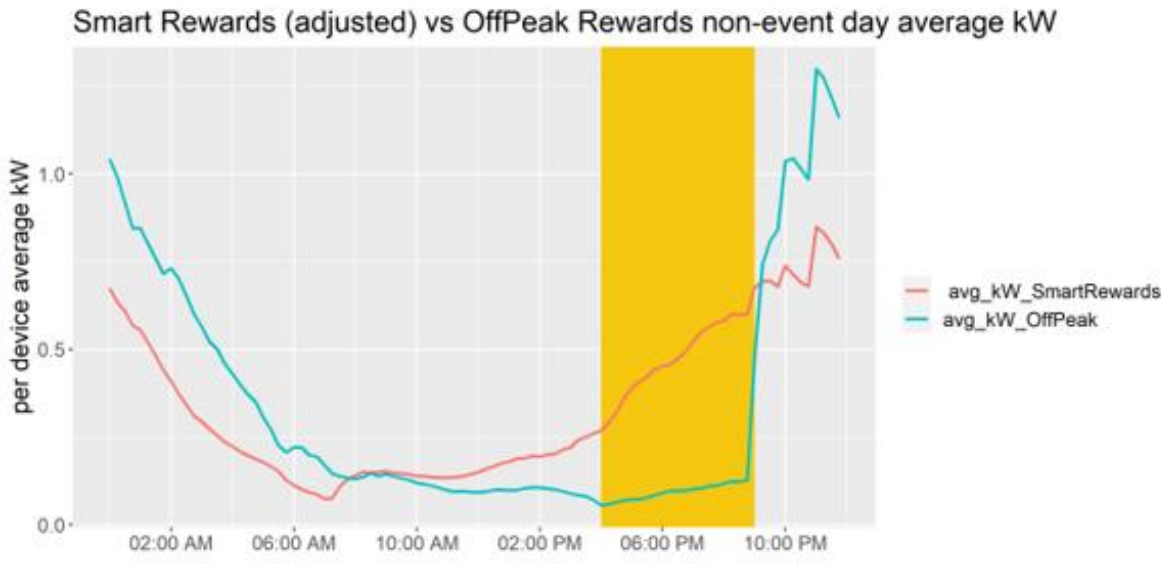


Figure 7-8: *Flex*EV Off-Peak Rewards – Comparison to Adjusted *Flex*EV Smart Rewards Non-Event Non-Holiday Weekday Average Load Profile

Step 4: For both adjusted *Flex*EV Smart Rewards and *Flex*EV Off-Peak Rewards datasets, calculate daily average kW level during 4:00-9:00 PM for every non-event, non-holiday weekday. The differences between 4:00-9:00 PM kW level for these two datasets are the estimated kW savings for each non-event, non-holiday weekday.

Step 5: For the days which fall on event days of the *Flex*EV Smart Rewards program, kW savings per device were assumed as the average kW savings level throughout CY 2023[91] – 0.38 kW.

7.3.3.1 Energy Savings (kWh)

Total energy savings (kWh) are zero by default because the program assumes only load shifting rather than energy savings.

7.3.3.2 Coincident Peak (CP) Demand Savings (kW)

To compute coincident peak (CP) demand savings, the per-device demand savings is multiplied by the total number of participated devices by each event. The claimed achieved CP kW savings is the average kW savings during the summer of 2023 from non-holiday weekdays. Scaling the per-device average kW savings by the EOCY customer count yields EOCY CP kW savings. Multiplying per device CP demand savings by number of newly added participants yield Incremental CP kW savings.

7.3.3.3 Non-Coincident Peak (NCP) Demand Savings (kW)

Achieved non-coincident peak savings for *Flex*EV Off-Peak Rewards program is the maximum kW savings throughout all events in CY 2024, which occurred during 11/30/2023 4:00-9:00 PM. Therefore, the kW savings on this day are used as the NCP kW savings for *Flex*EV Off-Peak Rewards program. EOCY NCP kW in CY 2024 were calculated as multiplying maximum per-device savings throughout CY 2024 non-holiday weekdays by EOCY number of participants. Multiplying per device CP demand savings by number of newly added participants yield Incremental CP kW savings.

7.3.3.4 ERCOT 4CP Demand Savings (kW)

During the summer of 2023, all 4CP intervals occurred after 4:00 PM, coinciding with the *Flex*EV Off-Peak Rewards load shifting period (4:00-9:00 PM). To estimate ERCOT 4CP demand savings in CY 2024, we average kW savings for these 4 days. For the EOCY capability calculations, we scaled the per-device kW savings during 4CP intervals to the number of devices at the end of CY 2024. Like NCP demand, multiplying per device 4CP demand savings by number of newly added participants yield Incremental CP kW savings.

[91] Savings for CY 2023 (1/1/2023 – 12/31/2023) was used to approximate for FY 2024 (2/1/2023 – 1/31/2024)

7.3.4 Results

For the *Flex*EV Off-Peak Rewards DR program, we present impacts in four sections:

1) Estimated per device kW savings during CY 2024.
2) Estimated program impacts throughout CY 2024.
3) EOCY program capability based on program enrollment at the end of CY 2024.
4) EOCY program capability based on incremental enrollment during CY 2024. This information is used for program benefit-cost analysis, consistent with the methods used for energy efficiency programs.

7.3.4.1 Estimated Impacts During CY 2024

As shown in the following figure, kW savings per device varied greatly every day for *Flex*EV Off-Peak Rewards program in CY 2023. The average demand savings was 0.38 kW.

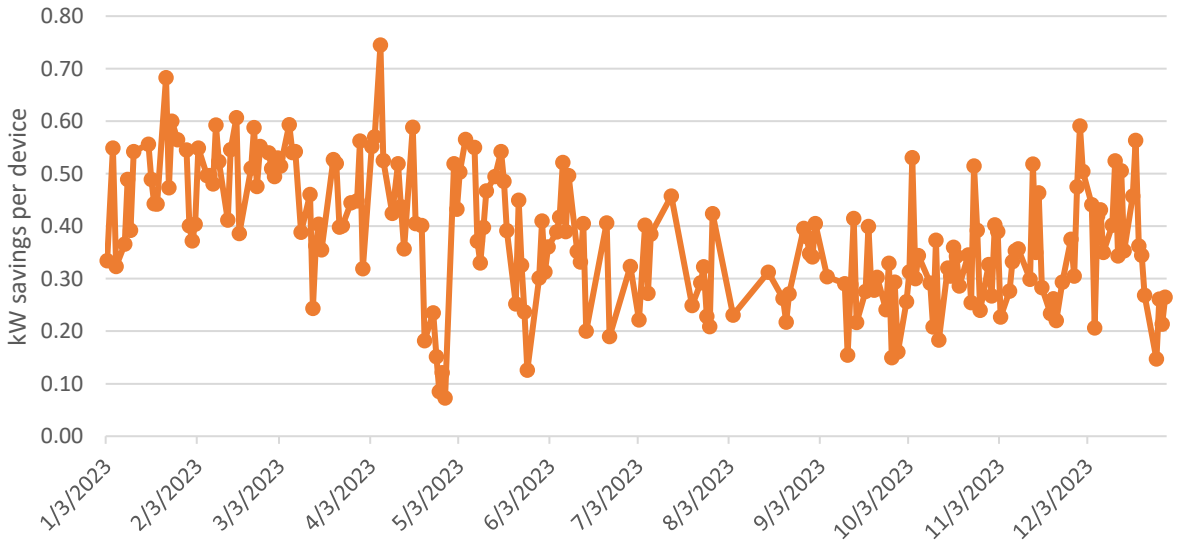


Figure 7-9: *Flex*EV Off-Peak Rewards kW Saving per Device in CY 2023

The figure below shows total kW savings from non-holiday weekdays throughout CY 2023. The average demand savings was estimated at 44 kW.

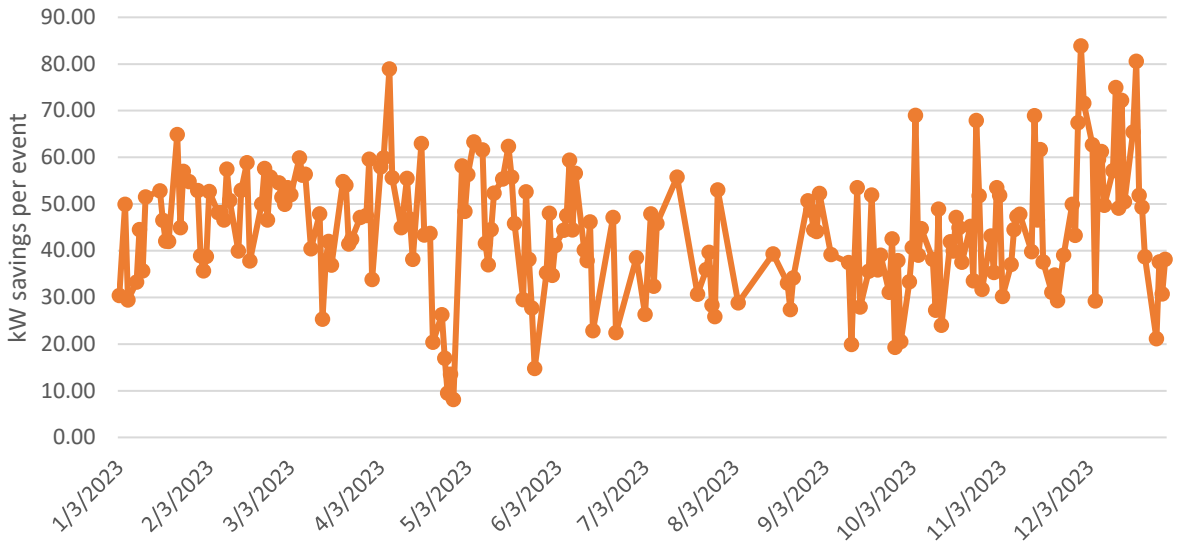


Figure 7-10: *Flex*EV Off-Peak Rewards total kW Savings by Day in CY 2023

The following table shows estimated energy, peak demand, non-coincident peak demand, and ERCOT 4CP demand savings achieved by the *Flex*EV Off-Peak Rewards program in CY 2024.

Table 7-5: *Flex*EV Off-Peak Rewards – Achieved Energy and Demand Savings

Measure	Gross Energy Savings (kWh)	Gross NCP Demand Savings (kW)	Gross CP Demand Savings (kW)	Gross ERCOT 4CP Demand Savings (kW)
*Flex*EV Off-Peak Rewards	–	83.91	42.11	47.53

7.3.4.2 End-of-Fiscal Year Program Capability

EOCY program capability is based on EOCY enrollment and is shown in the following table.

Table 7-6: *Flex*EV Off-Peak Rewards – EOCY Program Energy and Demand Savings

Measure	EOCY Enrollment	Gross Energy Savings (kWh)	Gross NCP Demand Savings (kW)	Gross CP Demand Savings (kW)	Gross ERCOT 4CP Demand Savings (kW)
*Flex*EV Off-Peak Rewards	161	–	119.92	55.29	61.59

7.3.4.3 Incremental Impacts

Incremental impacts used in benefit-cost analysis are based on gross incremental enrollment during the program year.

Table 7-7: *Flex*EV Off-Peak Rewards – Incremental Program Energy and Demand Savings

Measure	Gross Incremental Enrollment	Gross Energy Savings (kWh)	Gross NCP Demand Savings (kW)	Gross CP Demand Savings (kW)	Gross ERCOT 4CP Demand Savings (kW)
*Flex*EV Off-Peak Rewards	85	–	63.31	29.19	32.52

7.4 ELECTRIC VEHICLE PROGRAM RECOMMENDATIONS

The evaluation team makes the following recommendations for electric vehicle program offerings.

7.4.1 *Flex*EV Smart Rewards/Off-Peak Rewards Programs

Since their inception in June 2021, there has been significant participation growth in each program. The FlexEV Off-Peak Rewards program has yielded higher per device savings with lower incentives per customer over that same period.

Additionally, the evaluation team has conducted a preliminary analysis that shows those participating in at least two program years charged less on average in CY 2023 compared with CY 2022. This trend is especially obvious in the summer and fall months for both EV programs.

The evaluation team recommends that CPS Energy investigate these trends further, including whether the latter has to do with public charging applications.

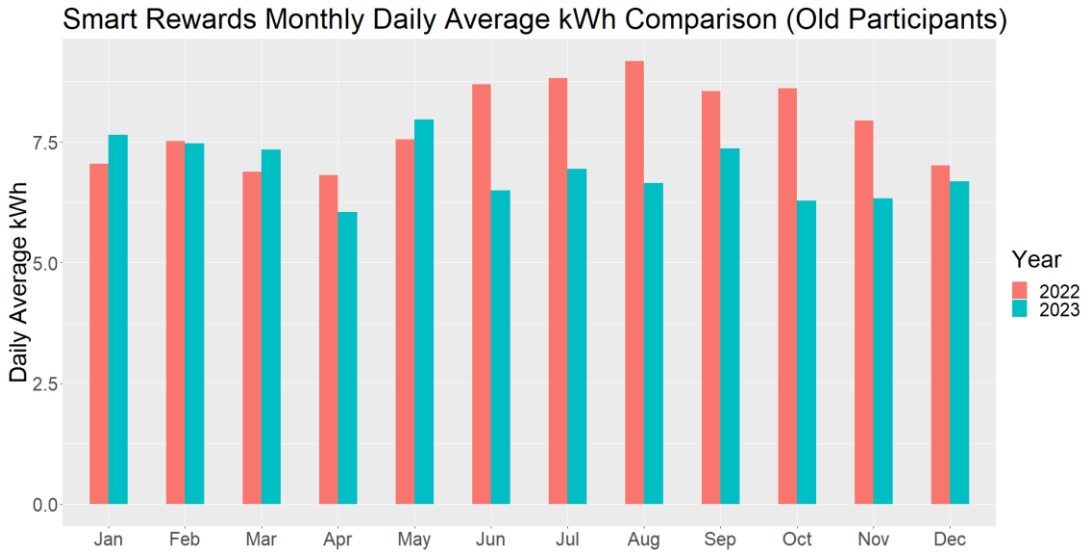


Figure 7-11: C&I DR – FlexEV Smart Rewards Daily Average kWh by Month Comparison – CY 2023 vs. 2022

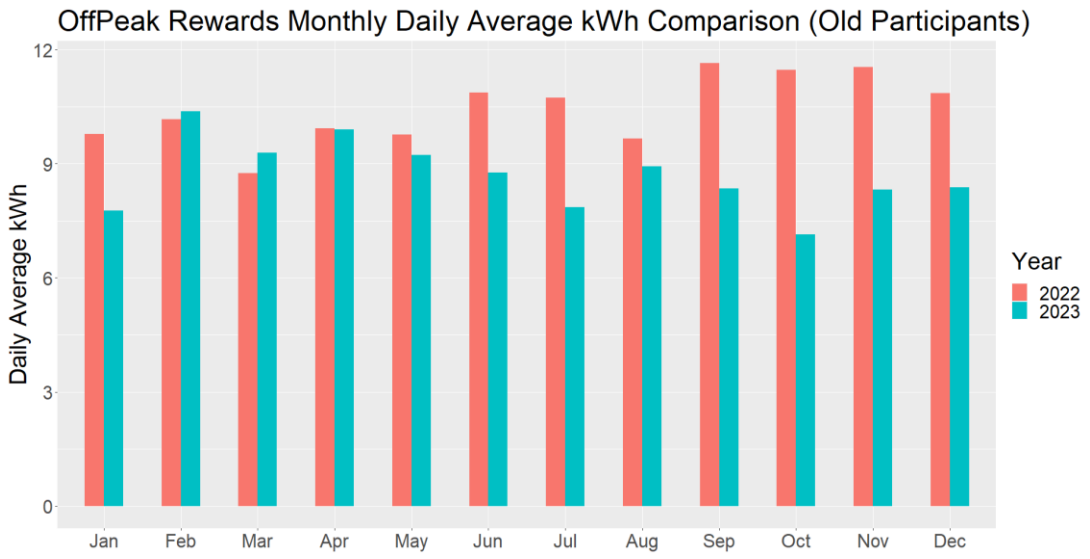


Figure 7-12: C&I DR – FlexEV Off-Peak Rewards Daily Average kWh by Month Comparison – CY 2023 vs. 2022

8. SOLAR ENERGY PROGRAMS

8.1 SUMMARY OF SOLAR ENERGY IMPACTS

The following CPS Energy solar energy programs resulted in new onsite solar energy generating capacity being installed during FY 2024:

- Residential Solar – Offered incentives for the installation of solar photovoltaic (PV) systems.
- Commercial Solar – Offered incentives for the installation of solar PV systems.

The contribution of new generating capacity added via each solar energy program to energy savings, non-coincident peak demand (NCP), and coincident peak demand (CP) are shown in Figure 8-1 through Figure 8-3.

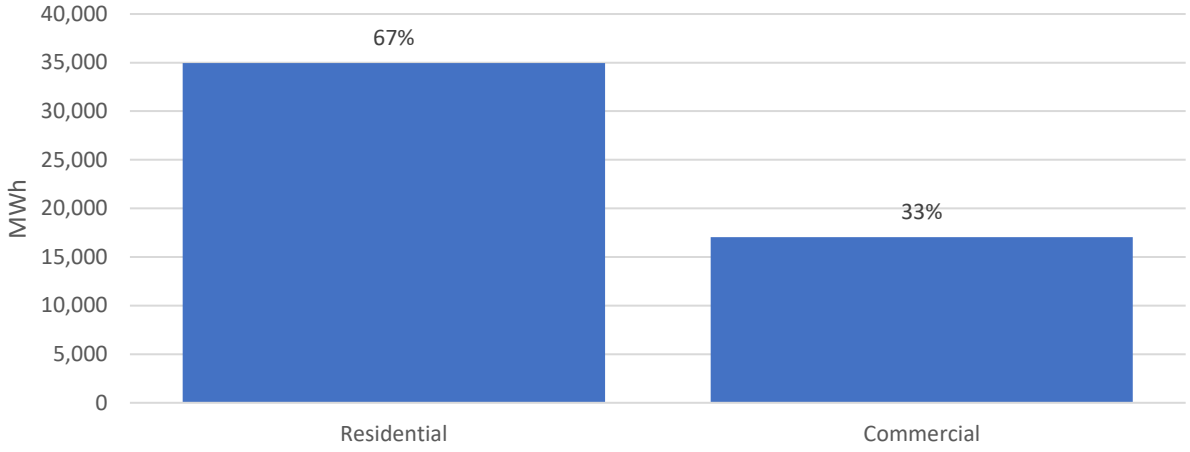


Figure 8-1: Summary of Solar Energy Impacts – Energy (MWh) by Program

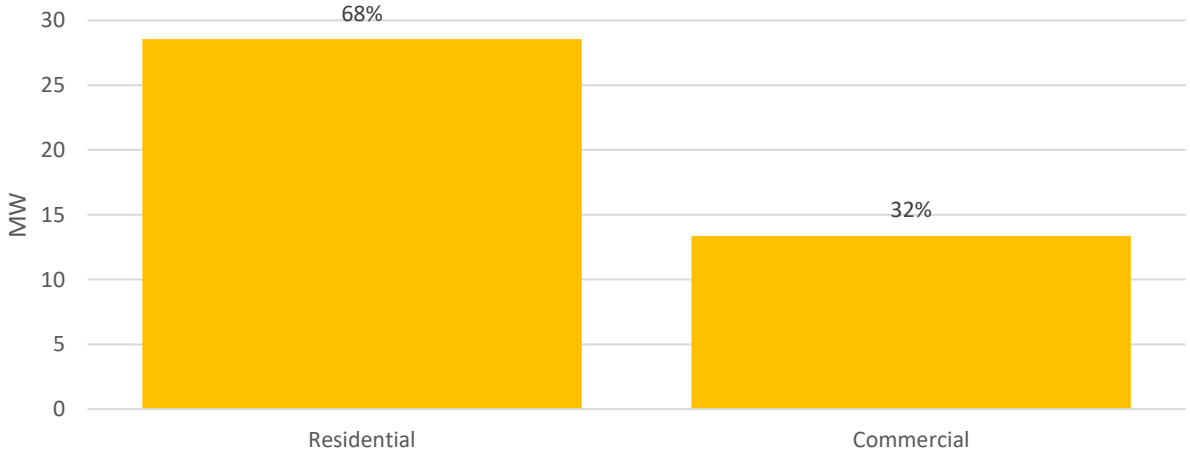


Figure 8-2: Summary of Solar Energy Impacts – Non-Coincident Peak Demand (MW) by Program

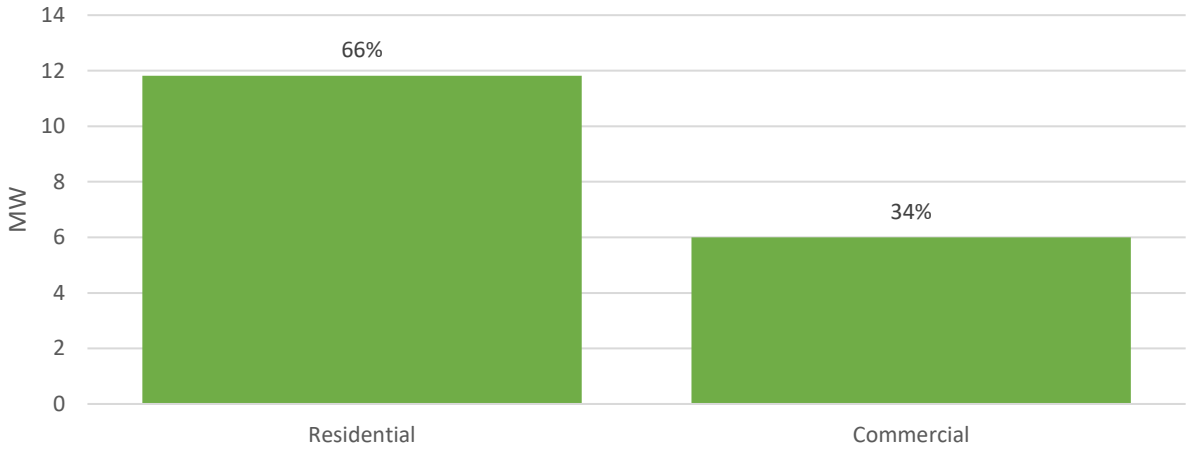


Figure 8-3: Summary of Solar Energy Impacts – Coincident Peak Demand (MW) by Program

8.2 RESIDENTIAL SOLAR PROGRAM

8.2.1 Overview

CPS Energy has offered rebates for residential solar PV systems for 17 years. During that time, rebate levels and the availability of rebates have been gradually reduced as the local and global solar markets have matured, and market prices for installed solar have declined dramatically. CPS Energy began sunsetting its residential solar rebate program in late 2022, accepting customer rebate applications through December 16, 2022. CPS Energy is now transitioning its focus to reducing barriers to solar adoption for low-to moderate income customers and is working with local stakeholders to help identify and address these barriers as they work to develop a new program offering.

All residential solar projects completed during FY 2024 thus represent incentives that were awarded in 2022 but have taken more than one calendar year to be completed and paid. These projects were awarded under a rebate design that offered a fixed rebate amount ranging from $1,350 to $3,000 per customer-owned project. Higher fixed incentive levels were offered for projects utilizing local installers and locally manufactured solar panels. Residential solar rebates are further limited to 50 percent of the project cost, and all PV systems are required to be installed by a CPS Energy registered contractor. Installed systems that did not receive a rebate are not counted in this analysis. This resulted in an effective average rebate level of $\$0.25/W_{DC}$, representing a decrease from FY 2023's $\$0.28/W_{DC}$.

All systems are required to be interconnected to the CPS Energy distribution system on the customer's side of the meter. Net metering is available to systems less than 25 kW. Systems must be approved, permitted, pass all required inspections, and comply with CPS Energy's requirements for interconnection.

In FY 2024, 2,452 residential solar PV systems were installed through the solar rebate program, totaling 25,067 kW_{DC} and $6.4 million in rebates distributed. These rebated systems represent a significant drop-off from FY 2023, during which more than twice as much rebated solar capacity was installed.

Despite the significant reduction in residential rebates provided, the residential solar market within CPS Energy's service area remained strong, with more than twice as many residential systems being installed without any rebate.

Table 8-1: Residential Solar – Rebated and Non-Rebated

Residential Solar Installations	FY 2024 Rebated	FY 2024 Non-Rebated	Total
Number of rebates	2,452	5,151	7,603
Total kW_{DC} installed	25,067	47,499	72,566
Total installed cost	$95,449,139	$204,083,256	$299,532,395
Total rebate cost	$6,373,470	$–	$6,373,470

The following figure summarizes the Residential Solar rebate program history in terms of annual capacity installed, average installed system prices, and average rebate levels. Rebates declined in FY 2024 as rebates were phased out.

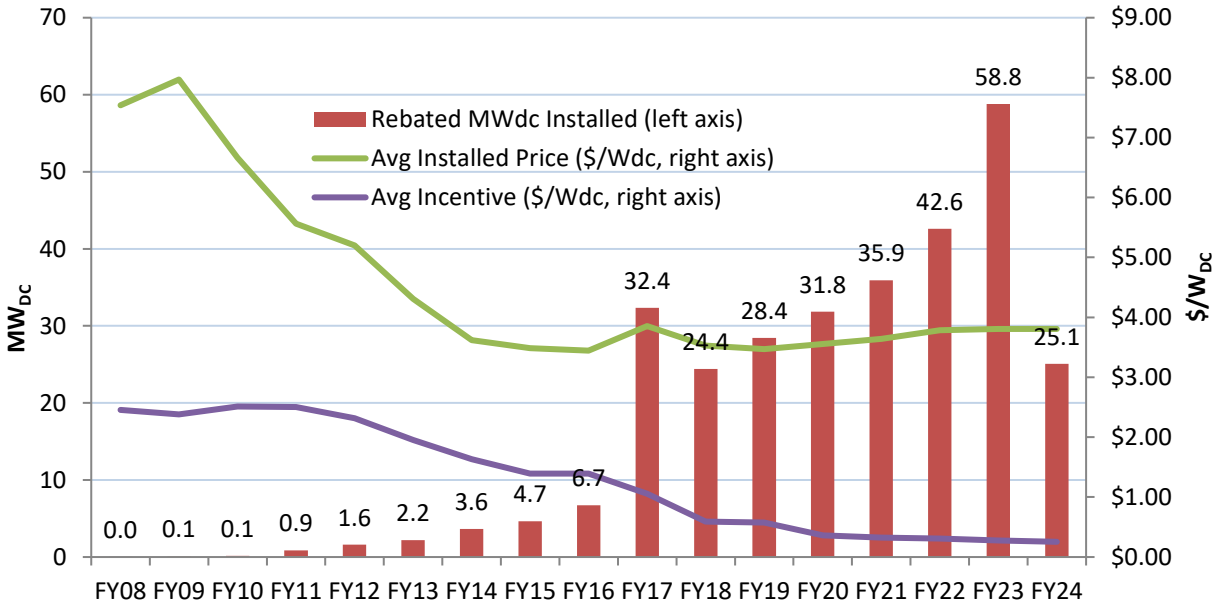


Figure 8-4: Residential Solar – Program History: Annual Capacity Installed, Average System Price, and Average Rebate Levels

CPS Energy's contribution to the total installation costs of residential solar has diminished over the program life. Utility rebates during FY 2024 covered about 7 percent of installed costs.

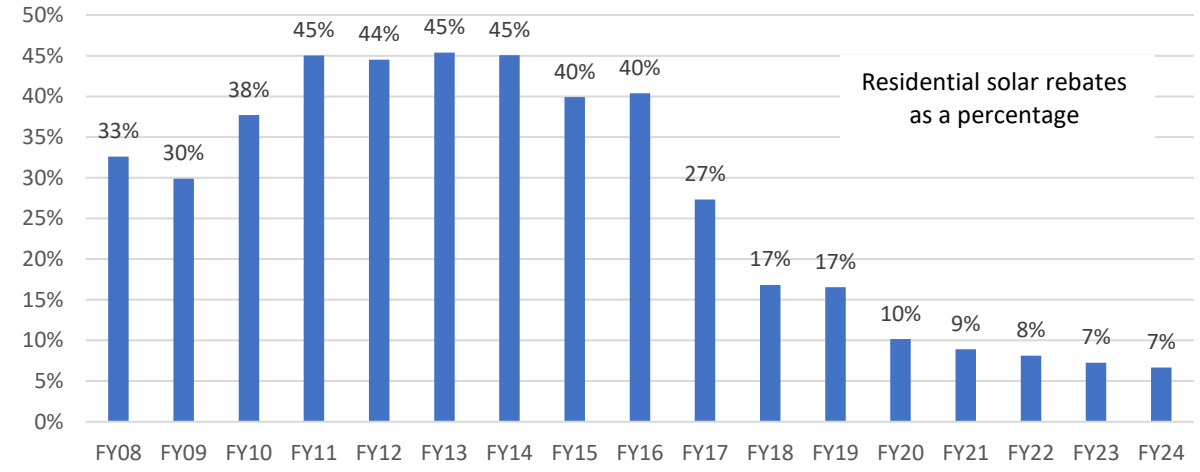


Figure 8-5: Residential Solar – Percentage of Installed System Costs Paid by Program Rebates

The capacity of rebated residential solar PV systems has increased gradually over the life of the program. During FY 2024, the average residential solar PV system grew to 10.2 kW_{DC}, and the median system size was 9.6 kW_{DC}.[92]

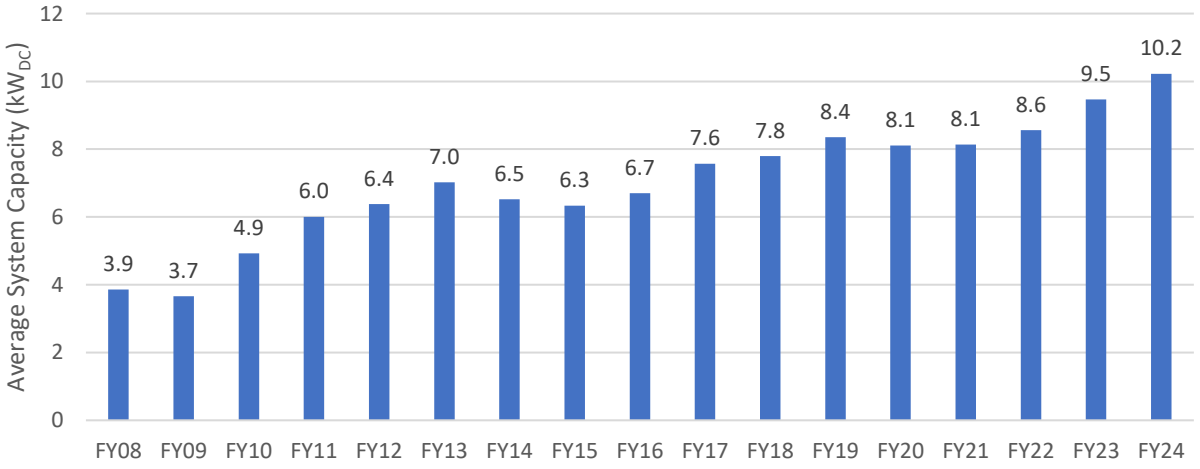


Figure 8-6: Residential Solar – Average Capacity Trend

[92] The average value tends to skew high due to the presence of a relatively small number of very large residential systems.

8.2.2 Results

The gross energy and demand savings for the Residential Solar Program are presented below.

Table 8-2: Residential Solar – Program Gross Energy and Demand Savings

Measure	Gross Energy Savings (kWh)	Gross NCP Demand Savings (kW)	Gross CP Demand Savings (kW)	Gross ERCOT 4CP Demand Savings (kW)
Residential Solar PV	33,188,421	26,220	10,854	9,124

In every program year, the evaluation team reviews all solar data, identifies outliers and potential miscalculations and other errors in the data, and works with CPS Energy staff to jointly confirm and resolve issues identified.

Deemed savings values originally developed by the evaluation team in FY 2017 were validated via desk and field reviews during FY 2019. All savings calculations were updated during FY 2022 based on evaluated metered solar data.

8.3 COMMERCIAL SOLAR PROGRAM

8.3.1 Overview

CPS Energy has offered rebates for solar PV systems installed on commercial buildings for 17 years. CPS Energy began sunsetting its commercial solar rebate program toward the end of FY 2023, accepting customer applications through December 16, 2022. CPS Energy has now transitioned its focus to reducing barriers to solar adoption and began offering rebates to small businesses (system size < 100 kW), schools, and non-profits.

Rebated commercial solar projects completed in FY 2024 mostly represent projects that received tiered incentive of \$0.60/W_{AC} for the first 25 kW installed, while a few projects received rebates as high as \$0.70/W_{AC} for the first 25 kW installed. All rebates were limited to \$80,000 or 50 percent of total project costs, whichever was lower. Installed systems that did not receive a rebate are not included in this analysis.

Commercial solar systems varied in size from 6 kW_{DC} to greater than 1,000 kW_{DC}. This year's large installations (>100 kW_{DC}) dominated the program in terms of new capacity added and rebates earned. Table 8-3 presents the number, capacity, and rebated amounts of commercial solar projects completed during FY 2024.

Table 8-3: Commercial Solar – Program Rebates

System Size (kW_{DC})	# of Projects	Total Capacity (kW_{DC})	Rebated Amount
<10	2	16.55	$8,963
10-<25	7	98.09	$54,694
25-<100	22	1,224.05	$623,193
100-<250	35	4,963.35	$2,055,490
250+	14	7,118.88	$1,120,000
Total	**80**	**13,420.91**	**$3,862,340**

All systems are required to be interconnected to the CPS Energy distribution system on the customer's side of the meter. Systems must be approved, permitted, pass all required inspections, and comply with CPS Energy's requirements for interconnection.

In FY 2024, there were 80 rebated commercial solar PV systems installed through the program, totaling 13,420.91 kW_{DC} and \$3.9 million in rebates distributed. The average rebated commercial system size was 168 kW_{DC}.

In contrast to the residential solar program, only 6 commercial solar projects were completed without rebates during FY 2024.

The figure below summarizes the Commercial Solar Program history in terms of capacity installed, average system prices, and rebate levels annually. FY 2024 was a record year for rebated installations.

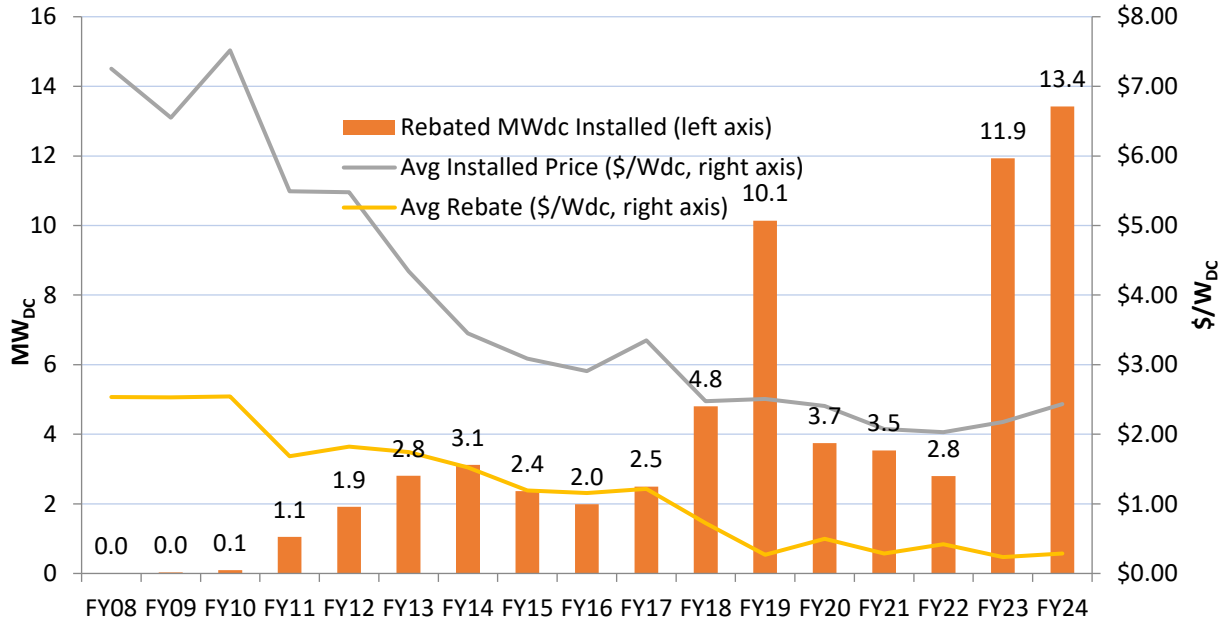


Figure 8-7: Commercial Solar – Program History: Annual Capacity Installed, Average System Price, and Average Rebate Levels

CPS Energy's contribution to the total installation costs of commercial solar has diminished over the program life. During FY 2024 utility rebates currently covered approximately 12 percent of installed costs.

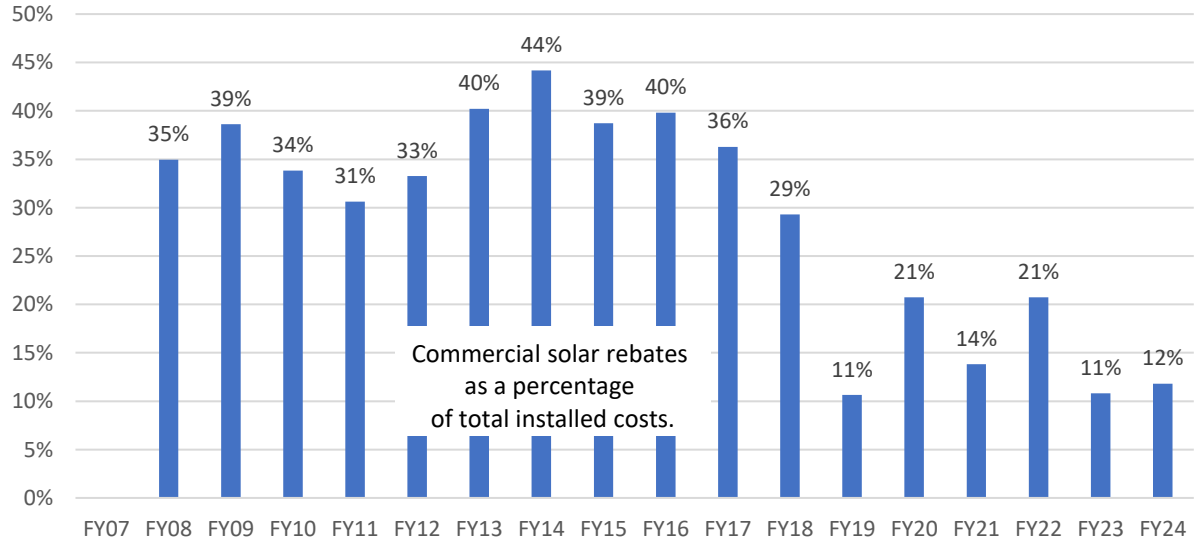


Figure 8-8: Commercial Solar – Percent of Installed System Costs Paid by Program Rebates

8.3.2 Results

The gross energy and demand savings for the Commercial Solar Program are presented below.

Table 8-4: Commercial Solar – Program Gross Energy and Demand Savings

Measure	Gross Energy Savings (kWh)	Gross NCP Demand Savings (kW)	Gross CP Demand Savings (kW)	Gross ERCOT 4CP Demand Savings (kW)
Commercial Solar PV	16,185,617	12,280	5,516	4,630

In every program year, the evaluation team reviews all solar data, identifies outliers and potential miscalculations and other errors in the data, and works with CPS Energy staff to jointly confirm and resolve issues identified.

Deemed savings values originally developed by the evaluation team in FY 2017 were validated via desk and field reviews during FY 2019. All savings calculations were updated during FY 2022 based on evaluated metered solar data.

8.4 OTHER SOLAR PROGRAMS

In August of 2023, CPS Energy launched a Request for Proposal (RFP) for up to 50 megawatts (MW) of community solar. The RFP encourages innovative and creative proposals, along with thoughtful approaches to serving the San Antonio community's low-to-moderate income (LMI) customers.[93]

8.5 SOLAR ENERGY PROGRAM RECOMMENDATIONS

The updated CPS Energy Guidebook, applicable to FY 2025, contains updates that may impact savings. To ensure consistency of savings methodology between program tracking estimates and evaluation results for individual measures, we recommend revising input assumptions in program tracking systems to match the Guidebook.

The evaluation team has identified specific recommendations related to savings calculations and program documentation in a separate memo to program administrators. In addition to these savings calculations and documentation recommendations, the evaluation team makes the following general recommendations for commercial program offerings:

8.5.1 Residential and Commercial Solar Programs

- Consider redesigning residential solar rebate program to support a more equitable adoption of rooftop solar.
- The solar market in CPS Energy's service area is strong and continues to grow despite elimination of residential rebates and incremental reductions to commercial incentive levels. Consider continued incremental rebate reductions in the commercial program.
- Updated incentive levels should be responsive to the effects of new/updated federal tax credits and spending programs, particularly those aimed at encouraging solar in income-qualified communities.

[93] Community Solar RFP announcement, CPS Energy Newsroom. https://newsroom.cpsenergy.com/cps-energy-launches-request-for-proposal-to-secure-up-to-50-mw-of-community-solar/.

9. TOTAL IMPACTS AND COST EFFECTIVENESS

9.1 NET PROGRAM IMPACTS & COST EFFECTIVENESS

Program impacts presented in the Weatherization, Residential Energy Efficiency, Commercial Energy Efficiency, Demand Response, and Solar Energy sections of this report are gross program impacts (measured at the customer's meter) without any adjustments for distribution losses or Net-to-Gross (NTG) adjustments.

Adjustments to gross impacts include accounting for energy losses in the transmission and distribution system at the time of peak demand.

- The net program energy savings values shown here and in the executive summary were derived by converting the program-level gross energy savings at the meter to savings at the source using an energy loss factor provided by CPS Energy equal to 5.08 percent.
- The net program capacity savings values were derived by converting the program-level gross capacity savings at the meter to savings at the source using a CPS Energy-provided capacity loss factor equal to 8.15 percent.

The gross energy and capacity savings were further adjusted using the NTG values as shown in Table 9-1 below. These values were provided by CPS Energy and based on previous evaluations, except for the Weatherization program. Based on the evaluation team's experience and industry standards for low-income programs in Texas, a 100 percent NTG factor was used for this program.

Overall, CPS Energy's Energy Efficiency, Demand Response, and Solar portfolio produced positive net benefits. The evaluation team also calculated the following three economic metrics, in line with previous evaluations:

1. Cost of Saved Energy (includes DR) ($/kWh) = $0.0303/kWh
2. Reduction in Revenue Requirements (includes DR) = $156,049,769
3. Benefit-Cost Ratio = 3.30

The net program impacts and results of the benefit-cost tests are provided in Table 9-1.

Table 9-1: FY 2024 Net Portfolio Impacts and Cost Effectiveness[94]

Program	NTG Ratio	Net Energy Savings (kWh)	Net CP Demand Savings (kW)	Net NCP Demand Savings (kW)	Net ERCOT 4CP Demand Savings (kW)	Rebate $	Admin and Marketing $	Total Program $	PACT*
Weatherization Program									
Weatherization	100%	6,622,790	3,187	7,327	3,004	$12,992,324	$2,253,065	$15,245,389	0.66
Energy Efficiency Programs									
Residential HVAC	95%	12,592,299	3,348	3,786	3,348	$3,140,242	$105,853	$3,246,095	3.67
Home Efficiency	93%	2,733,817	792	1,491	721	$848,726	$28,609	$877,335	3.23
New Home Construction	100%	8,374,027	4,868	7,210	5,194	$8,318,018	$280,388	$8,598,406	1.91
Retail Lighting Discounts	77%	18,817,534	1,945	9,369	3,266	$1,318,677	$44,451	$1,363,128	9.23
Home Energy Assessment	84%	2,103,124	119	428	135	$799,222	$26,941	$826,163	1.06
High-Performance AC Tune-up	95%	12,351,504	4,906	5,050	4,363	$1,669,444	$56,274	$1,725,718	3.08
Residential Subtotal		56,972,305	15,979	27,334	17,027	$16,094,330	$542,516	$16,636,846	3.00
Commercial & Industrial Solutions	96%	24,612,306	3,580	5,996	3,548	$4,084,299	$153,425	$4,237,724	3.55
Schools & Institutions	96%	25,781,991	6,894	8,739	6,519	$2,544,512	$95,584	$2,640,096	2.69
Small Business Solutions	95%	45,137,784	8,434	11,775	8,319	$5,300,896	$199,126	$5,500,022	4.71
Commercial Subtotal		95,532,081	18,908	26,510	18,386	$11,929,707	$448,135	$12,377,842	3.88
Energy Efficiency Subtotal		152,504,385	34,887	53,844	35,413	$28,024,037	$990,651	$29,014,688	3.38

*The Program Administrator Cost Test (PACT) output, the benefit-cost ratio, is the ratio of the net present value (NPV) of avoided energy and capacity benefits, divided by the program's incentives and administrative costs. A PACT ratio greater than 1.0 indicates that the program delivered more benefits than costs incurred from the utility's perspective. The PACT is sometimes referred to as the Utility Cost Test (UCT).

Table continues on next page.

[94] NTG = Net-to-gross, NCP = Non-coincident peak, CP = Coincident peak, 4CP = ERCOT four coincident peak, PACT = Program administrator benefit-cost ratio.

Program	NTG Ratio	Net Energy Savings (kWh)	Net CP Demand Savings (kW)	Net NCP Demand Savings (kW)	Net ERCOT 4CP Demand Savings (kW)	Rebate $	Admin and Marketing $	Total Program $	PACT*
Demand Response Programs*									
Smart Thermostat	100%	1,403,729	12,017	17,067	9,534	$902,070	$30,407	$932,477	N/A
Power Players	100%	1,590,973	17,686	20,473	16,864	$1,333,125	$44,938	$1,378,063	3.24
Direct Install Thermostats	100%	23,194,151	16,804	23,743	16,811	$329,078	$11,093	$340,171	3.54
Bring Your Own Thermostat (BYOT)	100%	58,429,232	47,203	66,136	44,343	$3,594,079	$121,151	$3,715,230	7.27
Commercial and Industrial DR (C&I DR)	100%	6,699,964	89,685	122,857	78,908	$5,439,015	$252,510	$5,691,525	3.52
FlexEV Smart Rewards	100%	–	67	124	78	$43,320	$168,448	$211,768	0.23
FlexEV Off-Peak Rewards	100%	–	60	131	67	$19,450	$75,630	$95,080	0.31
Demand Response Subtotal		91,318,050	183,523	250,531	166,606	$11,660,136	$704,177	$12,364,313	4.39
Renewable Energy Programs**									
Residential Solar PV	100%	34,964,624	11,817	28,546	9,934	$6,100,128	$1,524,324	$7,624,452	6.65
Commercial Solar PV	100%	17,051,852	6,005	13,370	5,041	$3,738,788	$934,263	$4,673,051	3.24
Roofless Solar	100%	–	–	–	–	–	–	–	–
Solar Energy Subtotal		52,016,475	17,822	41,916	14,975	$9,838,916	$2,458,587	$12,297,503	5.36
Grand Total		**302,461,700**	**239,420**	**353,619**	**219,997**	**$62,515,413**	**$6,406,480**	**$68,921,893**	**3.30**

**The PACT for Demand Response Programs is calculated based on the net present value of avoided cost benefits divided by the net present value of program costs attributable to new, incremental participants during the program year. Because total program costs in the table represent the costs attributable to all participants, the PACT for Demand Response Programs cannot be directly calculated from data presented in the table. Demand response program net energy and demand savings (in lighter shade) represent end-of-fiscal year program capability, based on end-of-fiscal year enrollment.

The Smart Thermostat program is a legacy program that is no longer enrolling new customers. No PACT score is calculated because there was no incremental participation. Savings and costs reported for this program are for end-of-year participation.

***CPS Energy's solar rebate programs are evaluated independently from the utility's net metering rate policy. If the estimated costs of net metering credits are factored in (assuming a residential energy value of 10.65¢/kWh and a commercial energy value of 8.8¢/kWh, both with 50% of generated energy returned to the grid) the Residential and Commercial Solar program PACTs would be adjusted to 1.60 and 1.05, respectively.

Additional table notes: Net savings = gross savings x Net-to-Gross ratio / (1 - line loss factor). Rows may not sum to total due to rounding.

9.2 EMISSIONS REDUCTION

Environmental emission reductions are based on annual energy savings and represent the emissions avoided through the STEP portfolio. Emission factors were provided by CPS Energy and include avoided Carbon Dioxide (CO_2) emissions factors in tons per kWh with a 25-year forecast, and emission factors in pounds per kWh for Nitrous Oxide (NOx), Sulfur Dioxide (SO_2) and Total Suspended Particles (TSP).[95]

First year avoided emissions include avoided CO_2 emissions attributable to the gross number of participants in FY 2024. Lifetime avoided emissions include avoided CO_2 emissions attributable to program impacts across the estimated useful lifetime (EUL) of each measure within each program. Measure EULs are documented in the CPS Energy Guidebook; program-level weighted average EULs are listed below.

Table 9-2: FY 2024 CO_2 Emissions Reduction Impacts by Program (tons)

Program	1st Year CO_2 Emissions (tons)	Lifetime CO_2 Emissions (tons)	Program Weighted Average EUL
Weatherization (Casa Verde)	2,470	26,184	20.0
Residential HVAC	4,697	45,952	16.6
Home Efficiency	1,020	9,185	15.5
New Home Construction	3,124	36,553	23.0
Retail Lighting Discounts	7,019	69,741	16.8
Home Energy Assessment	784	6,278	12.1
High-Performance AC Tune-up	4,607	20,866	5.0
Residential Subtotal	21,251	188,576	
Commercial & Industrial Solutions	9,181	81,471	14.1
Schools & Institutions	9,617	31,067	4.5
Small Business Solutions	16,837	139,489	12.5
Commercial Subtotal	35,635	252,026	
Energy Efficiency Subtotal	59,357	466,786	

Table continues on next page.

[95] First year emissions factors provided by CPS Energy. The evaluation team converted these values to report imperial tons of each pollutant, consistent with past evaluations. Lifetime CO_2 emissions were derived from a long-term forecast of CPS Energy emissions factors.

Program	1st Year CO_2 Emissions (tons)	Lifetime CO_2 Emissions (tons)	Program Weighted Average EUL
Smart Thermostat	–	–	–
Power Players	593	593	1.0
Direct Install Thermostats	8,652	61,801	10.0
BYOT	21,795	155,686	10.0
C&I DR	2,499	2,499	1.0
FlexEV Smart Rewards	–	–	10.0
FlexEV Off-Peak Rewards	–	–	10.0
Demand Response Subtotal	33,539	220,580	
Res Solar PV	13,042	174,458	30.0
Comm Solar PV	6,361	85,081	30.0
Roofless Solar	–	–	–
Solar Energy Subtotal	19,403	259,540	
Grand Total[96]	**112,299**	**946,905**	

Commercial EE programs delivered the most energy impacts and led first-year avoided CO_2 emissions. Due to long EULs for solar, the solar programs led the lifetime avoided CO_2 emissions. Based on their implementation design, C&I DR and the Power Players behavioral DR programs have a one-year EUL. This short EUL is a primary reason why DR programs contribute a lower share of overall lifetime avoided CO_2 compared to first-year avoided emissions.

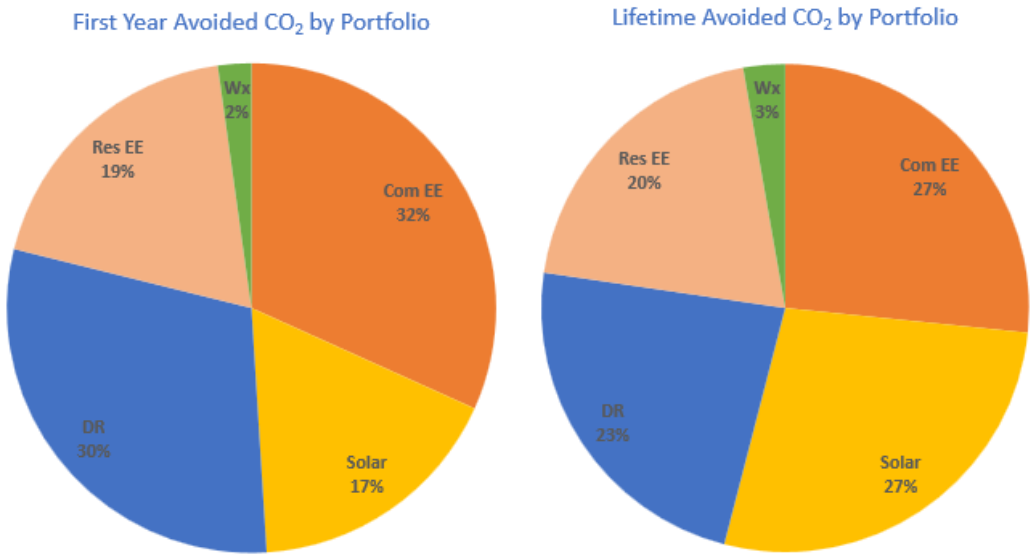


Figure 9-1: First Year and Lifetime Avoided CO_2 Emissions

[96] The sum of the individual measures may not match the total due to rounding.

Commercial EE programs provide the highest level of avoided emissions per customer due to the larger overall energy savings opportunity per site, followed by solar programs. Although Weatherization contributes only 2-3 percent of avoided emissions, it has a higher avoided emission value per participating home than residential EE or DR programs. Program participation counts are provided in section 1.3.

Table 9-3: FY 2024 First Year Avoided CO_2 Emissions per Program Participant[97]

Portfolio	1st Year Avoided CO_2 Emissions (tons) per Participant	Lifetime Avoided CO_2 Emissions (tons) per Participant
Weatherization	1.25	13.26
Residential Energy Efficiency	1.07	9.47
Commercial Energy Efficiency	31.51	222.84
Demand Response	0.07	0.43
Solar	7.66	102.50
Portfolio Average	**0.21**	**0.48**

First year avoided emissions for Nitrous Oxide (NOx), Sulfur Dioxide (SO_2) and Total Suspended Particles (TSP) are presented in Table 9-4.

Table 9-4: FY 2024 First Year Avoided NOx, SO_2, and TSP Emissions

Program	1st Yr NOx (lbs)	1st Yr SO_2 (lbs)	1st Yr TSP (lbs)
Weatherization (Casa Verde)	2,581	240	600
Residential HVAC	4,908	457	1,141
Home Efficiency	1,066	99	248
New Home Construction	3,264	304	759
Retail Lighting Discounts	7,335	682	1,706
Home Energy Assessment	820	76	191
High-Performance AC Tune-up	4,814	448	1,120
Residential Subtotal	22,207	2,066	5,164
Commercial & Industrial Solutions	9,593	892	2,231
Schools & Institutions	10,049	935	2,337
Small Business Solutions	17,594	1,637	4,092
Commercial Subtotal	37,237	3,464	8,660
Energy Efficiency Subtotal	62,025	5,770	14,424

[97] Due to a mid-year reporting change during FY 2024, residential retail and commercial midstream lighting participants are not included in participant counts. These participants will be reintroduced into the participant normalization in FY 2025.

Program	1st Yr NOx (lbs)	1st Yr SO_2 (lbs)	1st Yr TSP (lbs)
Smart Thermostat	–	–	–
Power Players (Behavioral DR)	620	58	144
Direct Install Thermostats	9,041	841	2,102
BYOT	22,775	2,119	5,296
C&I DR	2,612	243	607
FlexEV Smart Rewards	–	–	–
FlexEV Off-Peak Rewards	–	–	–
Demand Response Subtotal	35,047	3,260	8,151
Res Solar PV	13,629	1,268	3,169
Com Solar PV	6,647	618	1,546
Roofless Solar	–	–	–
Solar Energy Subtotal	20,275	1,886	4,715
Grand Total[98]	**117,348**	**10,916**	**27,290**

[98] The sum of the individual measures may not match the total due to rounding.

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