GROUP D

2024 Custom Industrial, Agricultural, and Commercial (CIAC) Impact Evaluation

California Public Utilities Commission
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Glossary of key terms and acronyms

Accelerated Replacement (AR) – A measure application type (MAT) used for the replacement of existing equipment that could and would remain operational without program intervention. It is used in direct contrast to the Normal Replacement MAT, which is used when existing equipment either could not or would not remain operational. Accelerated replacement (non-capacity expansion) measures and replacement of "operating equipment that when broken, non-functional, or unable to provide the intended service is typically repaired" can be classified as AR.

Add-On Equipment (AOE) – A measure application type (MAT) used for installations of new equipment onto pre-existing equipment, improving the nominal efficiency of the host system. The existing host system must be operational without the AOE equipment, continue to operate as the primary service equipment for the existing load, and be able to fully meet the existing load without the add-on component. The add-on equipment must not be able to operate on its own. The actual energy reduction occurs at the host equipment, not at the add-on component, although any add-on component energy usage must be subtracted from the host energy savings.

Behavioral, Retro-commissioning, and Operational (BRO) – A measure application type (MAT) used for measures that either restore or improve energy efficiency and that can be reasonably expected to produce multi-year energy efficiency savings. By definition, BRO measures result in performance that does not exceed the nominal (rated or original) efficiency of the pre-existing condition. EE savings from correcting deferred maintenance, performance restoration, and operational characteristics fall within the BRO category. In the case of either normal or accelerated equipment replacement, separate claims should be made for energy savings related to the equipment replacement and energy savings related to operational factors and updating maintenance. There are three BRO subtypes: BRO Behavioral (BRO-Bhv), BRO Operational (BRO-Op), and BRO Retro-commissioning (BRO-RCx).

California Energy Data and Reporting System (CEDARS) – This database securely manages California Energy Efficiency Program data reported to the Commission by investor-owned utilities, regional energy networks (RENs), and certain community choice aggregators (CCAs).[1]

California Technical Forum (Cal TF) – A collaborative of experts who use independent professional judgment and a transparent, technically robust process to review and issue technical information related to California's integrated demand side management portfolio. The Cal TF was created in 2014 by a broad group of stakeholders and is funded by participating PAs.

Custom Core Template (CCT) – DNV created an Excel-based CCT to organize and communicate evaluation information for each claimed project in a sample. This spreadsheet is used to ensure a uniform and systematic approach to determining and communicating gross savings methods, calculations, and results.

Custom Project Review (CPR) – The process of selecting custom projects, submitted biweekly by the PAs, for review of all forecasted savings parameters and project documents.

Database for Energy Efficiency Resources (DEER) – This database contains information on energy efficient technologies and measures. DEER provides estimates of the energy-savings potential for these technologies in residential and non-residential applications. DEER is used by California Energy Efficiency (EE) PAs, private sector implementers, and the EE industry across the country to develop and design energy efficiency programs.[2]

Design Light Consortium (DLC) – Provides a list of certified lighting products used for energy efficiency lighting projects.

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[1] California Energy Data and Reporting System (CEDARS), "Welcome to CEDARS," cedars.sound-data.com, https://cedars.sound-data.com/

[2] Public utilities commission of California, Resolution E-5152, August 5, 2021. http://www.deeresources.com/files/DEER2023/Resolution%20E-5152%20DEER2023%20Complete.pdf

Energy Division (ED) – The division of the California Public Utilities Commission (CPUC) responsible for regulating and overseeing the state's energy utilities and policies. The ED ensures that California's investor-owned utilities (IOUs) provide safe, reliable, and affordable electric and gas services while advancing the State's climate and clean energy goals.

ED tracking data – The officially claimed electric and gas impacts as captured in the CEDARS (defined above) data and reporting system.

Energy efficiency measure (EEM) or measure – An energy using appliance, equipment, control system, or practice the installation or implementation of which results in reduced energy use (purchased from the distribution utility) while maintaining a comparable or higher level of energy service as perceived by the customer. In all cases, energy efficiency measures decrease the amount of energy used to provide a specific service or to accomplish a specific amount of work (e.g., kWh per cubic foot of a refrigerator held at a specific temperature, therms per gallon of hot water at a specific temperature, etc.). For the purpose of CPUC rules, solar-powered, non-generating technologies are eligible energy efficiency measures (D.09-12-022, OP 1).

Effective useful life (EUL) – An estimate of the median number of years that the measures installed under the program will remain in place and operable.

Free rider – Program participant who would have installed the program measure or equipment in the absence of the program.

Gross realization rate (GRR) – The ratio of achieved energy savings to forecasted energy savings. A realization rate of 100% means the evaluated savings match exactly those forecasted, while lower or higher realization rates means forecasted savings were over- or under-forecasted, respectively.

Gross savings – The energy savings from installed energy efficiency measures irrespective of whether those savings are from free riders, i.e., those customers who would have installed the measure(s) even without the incentives offered under the program.

High Opportunity Projects or Programs (HOPPs) – A program offering a systematic process to identify operational and maintenance improvements that optimize building performance and ensure that building systems function efficiently and effectively. HOPPs RCx is designed to ensure persistence of savings by requiring customers to commit to a three-year maintenance plan.

Interactive effects – The secondary impacts that energy-saving measures have on other systems within a building or facility, and which can influence the overall energy savings and cost-effectiveness of energy efficiency measures.

International Performance Measurement and Verification Protocol (IPMVP)[3] – A standardized approach to measuring and verifying energy efficiency investments. IPMVP incorporates M&V best practices in a non-prescriptive framework, allowing it to be applied flexibly based on a measure's application and the available information.

Lifecycle savings – The savings associated with the lifetime of an efficiency measure undertaken by a program participant. Equipment replaced early in its useful life might receive reduced savings to account for the untapped useful life of the outgoing equipment.

Measure application type (MAT) – The installation basis for efficiency claims. There are seven approved measure application types: Add-on Equipment, Accelerated Replacement, BRO-Behavioral, BRO-Operational, BRO-Retro-commissioning (RCx), New Construction, and Normal Replacement.

[3] IPMVP - Efficiency Valuation Organization (EVO), evo-world.org, https://evo-world.org/en/

Metric million British thermal unit (MMBtu) – A unit traditionally used to measure heat content or energy value. MMBtu is the common unit upon which sampling is based.

Modified Lighting Calculator (MLC) – A standardized tool used for calculating deemed energy savings from lighting retrofits and installations in utility energy efficiency programs across California. It was designed to bring consistency, transparency, and accuracy to the estimation of savings from lighting projects that are claimed by program administrators (PAs), third-party implementers, and evaluators.

Net savings – The savings realized after accounting for free-ridership, calculated by multiplying gross savings by the net-to-gross ratio.

Net-to-gross ratio (NTGR) – A ratio or percentage of net program savings divided by gross or total impacts; used to estimate and describe the free-ridership that may be occurring within energy efficiency programs.

New Construction (NC) – A measure application type (MAT) used where equipment is installed in either a new area or an area that has been subject to a major renovation, to expand capacity of existing systems, or to serve a new load. The NC MAT is used where there is no reference operation for existing conditions, such as with new construction, expansions, added load, a change in the function of the space (e.g., office to laboratory), or a substantial change (e.g., ~30% or more) in design occupancy. New construction, capacity expansion, and replacing "equipment that is actually broken, nonfunctional, or unable to provide the intended service" is eligible for the Normal Replacement MAT, but ineligible for Accelerated Replacement.

Normal Replacement (NR) – A measure application type (MAT) used where existing equipment (including Add-On Equipment) has either failed, no longer meets current or anticipated needs, or is planned to be replaced for reasons unrelated to the program. The NR MAT may be applied to any measure or program, with certain exceptions, and without a burden of proof. This MAT includes measures that previously fit into the now-retired Replace on Burnout (ROB) MAT.

Normalized metered energy consumption (NMEC) – High opportunity programs or projects (HOPPs) that provide incentives based on metered energy consumption. This initiative fulfills the directive for utilities to quickly identify high energy-efficiency savings opportunities in existing buildings using a program and project approach where incentive payment and claimed savings are based on NMEC and include only approved NMEC building programs.

Outdoor air temperature (OAT) – Local climate zone (CZ) weather data used to regress equipment operation for weather dependent data to estimate annual operation.

On Bill Financing (OBF) – A program that provides zero-interest loans to businesses, government entities, and non-residential customers to implement energy efficiency projects with no upfront capital costs. The repayment is conveniently added to the monthly utility bill, with the energy savings from the installed measures meant to offset the loan payments.

Preponderance of evidence (POE) – The standard to demonstrate that the replacement of inefficient equipment or processes with a more energy efficient alternative more likely than not resulted from an energy efficiency program offering and would not have happened without that program.

Program Administrator (PA) – An entity tasked with the functions of portfolio management of energy efficiency programs and program choice, i.e., Marin Clean Energy (MCE),[4] Pacific Gas & Electric (PG&E), Southern California Edison (SCE), Southern California Gas (SoCalGas), San Diego Gas & Electric (SDG&E).

[4] MCE is a not-for-profit public agency that MCE provides electricity service to more than one million residents and businesses in 37 member communities across four Bay Area counties: Contra Costa, Marin, Napa, and Solano.

Peak demand – The maximum level of metered demand during a specified peak demand period for installed or implemented measures. CPUC Resolution E-4952 approved the Database for Energy-Efficient Resources (DEER) for 2020 and revised the DEER Peak Period definition to 4:00 p.m. – 9:00 p.m., effective January 1, 2020.

Relative precision – A ratio of the error bound divided by the value of the measurement itself. This provides the error on a relative basis, frequently used to show uncertainty as a fraction of a quantity. In this report, all relative precisions are provided at the 90% confidence interval, which means that in repeated sampling, 90 times out of 100 the true value will fall within the lower and upper bounds of the estimate.

Remaining useful life (RUL) – An estimate of the median number of years that a measure being replaced under the program would have remained in place and operable had the program intervention not caused its replacement.

Savings by Design (SBD) – A sunset statewide energy efficiency program in California, approved by the California Public Utilities Commission (CPUC) and designed to encourage high-performance, energy-efficient design and construction practices in non-residential new construction and major renovation projects.

Standard Practice Baseline – An estimate of the activity or installation that would take place absent the energy efficiency program, as required by code, regulation, or law, or as expected to occur as standard practice (SP). The Standard Practice Baseline activity or installation must meet the anticipated functional, technical, and economic needs of the customer, building, or process and provide a level of service comparable to that provided by the energy efficiency (EE) measure. Savings claims shall be generated based on equipment choices that operate at a level of service comparable to that provided by the EE measure. If there is not a viable and comparable baseline solution that offers a comparable level of service as the EE measure, the energy use of the baseline solution must be adjusted to provide a level of service comparable to that provided by the EE measure.

Statewide – Energy efficiency programs or activities that are essentially similar in design and available in all CPUC regulated utility service areas in California, administered by a CPUC-specified PA.

Total System Benefit – Is an expression, in dollars, of the lifecycle energy, ancillary services, generation capacity, transmission and distribution capacity, and GHG benefits of energy efficiency activities, on an annual basis.

1 EXECUTIVE SUMMARY

1.1 Introduction

This evaluation report presents the findings and impacts of the California Program Administrators' (PAs') 2024 Custom Industrial, Agricultural, and Commercial (CIAC) programs. DNV independently determined to what extent site-specific custom projects in the CIAC programs realized their forecasted electric peak demand, electric energy, and natural gas savings (i.e., non-deemed[5] savings claims). In this report, "custom activity" refers to large commercial and industrial (C&I) and agricultural projects involving complex equipment and systems that require site-specific verifications and savings calculations. New to the 2024 Program Year (PY) evaluation is the inclusion of the total system benefit (TSB) as a standard measure for evaluating the time-dependent advantages of energy efficiency.

Overall goals

1. Develop first-year and lifecycle net and gross savings for the Custom program with a targeted precision of better than ±10% at 90% confidence.
    a. Gross savings are changes in the energy consumption of program participants that result directly from the installed energy efficiency measures (EEM), regardless of why customers participated.
    b. Net savings are changes in energy use attributable to a particular energy efficiency program—that is, energy savings that a participant would not have realized without the influence of the program.
    c. Lifecycle savings are the savings that occur over the lifetime of an energy-efficient technology or measure installed by a program participant.
2. Estimate the TSB achieved from 2024 Custom activity. TSB captures, in dollars, the lifecycle avoided costs of energy efficiency activities, expressed on an annual basis. It represents the total benefits—or "avoided costs"—that an energy efficiency measure provides to California's electric system.
3. Develop meaningful and actionable recommendations to improve program delivery of energy efficiency savings.

Evaluation objectives

1. Quantify the Custom Program TSB overall and by PA with comparisons to PA-claimed values.
2. Calculate the ratio of evaluated savings to the savings forecasted by PAs, referred to as the gross realization rate (GRR), by sampling domain. GRR is calculated by comparing the energy savings evaluated (or realized) in the 2024 program year to the energy savings predicted before the implementation of the energy efficiency measures.
3. Analyze the factors driving the GRR.
4. Recommend ways for the PAs to improve GRRs.
5. Quantify the ratio of the program's evaluated net and gross savings,[6] referred to as the net-to-gross ratio (NTGR), by sampling domains.

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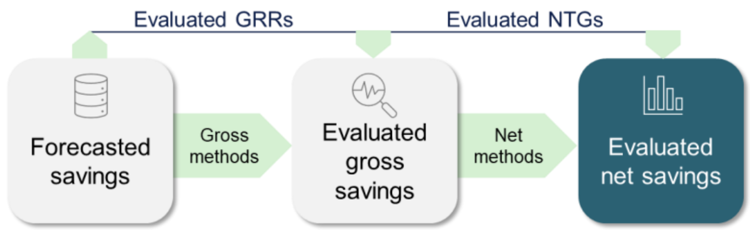
5 Non-deemed savings refer to energy savings that are not predefined or pre-approved by regulators or PAs.
6 This factor represents net program load impacts divided by gross program load impacts. Evaluators apply it to gross program load impacts to convert them into net program load impacts.

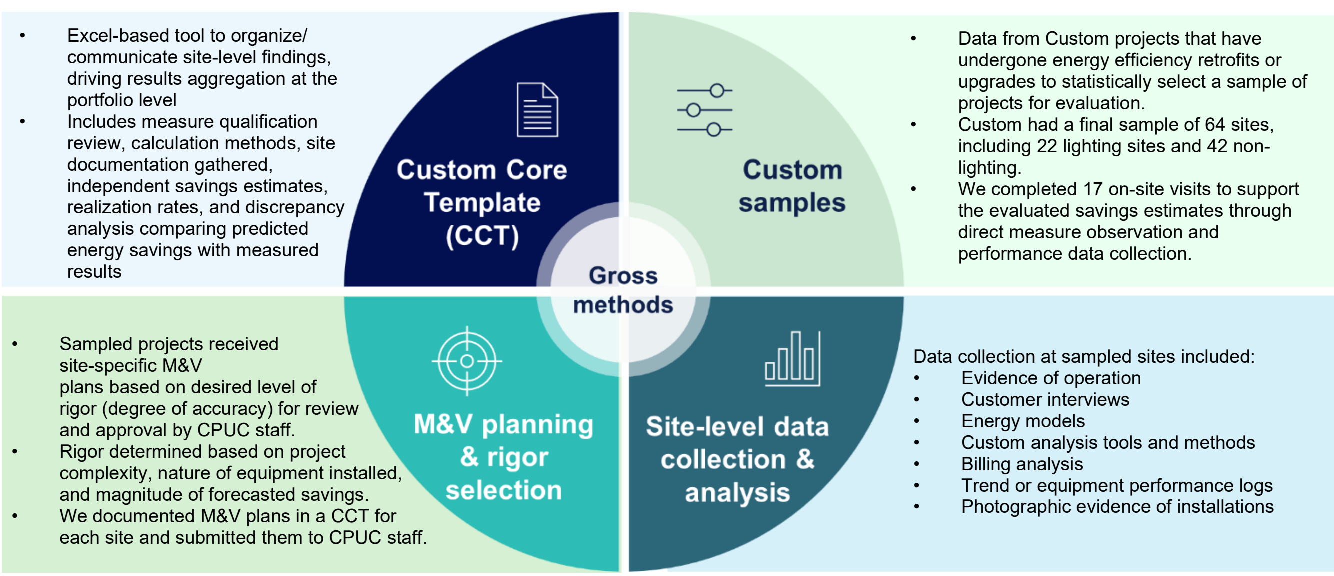
1.2 Methodology overview

DNV evaluated gross and net savings that the PAs forecasted for Custom projects installed in program year (PY) 2024, including residual Savings by Design[7] (SBD) projects. We present results for electric and gas by PA in this executive summary but offer further breakouts by measure group and projects with and without On Bill Financing (OBF) in the body of the report. Our gross and net savings calculation methods are described in the final study work plan[8] and summarized below. This study adhered to International Performance Measurement and Verification Protocol (IPMVP)[9] and the California Evaluation Protocol.[10]



Gross methods

DNV's evaluation of gross savings included the following steps, in sequence: 1) sample design, 2) a site-specific evaluation via use of a Custom Core Template,[11] 3) extensive measurement and verification (M&V) planning, and 4) site-level data collection and analysis for sampled sites from each area of interest. These are illustrated in the figure below.



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[7] SBD is a discontinued non-residential new construction program. SBD savings are estimated via either a "Systems" or "Whole Building" approach. The Whole Building approach requires a program-approved energy simulation tool to estimate energy savings, while a typical Systems approach project can use simplified modeling.

[8] GROUP D Evaluation, Measurement, & Verification of Program Year 2023 Commercial, Industrial, and Agriculture Custom Projects Work Plan, California Public Utilities Commission, September 30, 2024.

[9] IPMVP is a protocol that facilitates a common approach to measuring and verifying energy efficiency investments. IPMVP incorporates M&V best practices in a non-prescriptive framework that allows it to be applied flexibly based on a measure's application and the information available.

[10] The California Evaluation Protocol (CEP) is a set of guidelines and procedures developed by the California Public Utilities Commission (CPUC) for conducting evaluations of energy efficiency programs.

[11] DNV created an Excel-based Custom Core Template (CCT) to organize and communicate evaluation information for each claimed project in the sample. We used this spreadsheet to ensure a uniform and systematic approach to determining and communicating gross savings methods, calculations, and results.

DNV evaluated program TSB results by updating the existing project-level calculations with evaluated savings estimates, necessary input changes, and net-to-gross (NTG) results. DNV applied the sample design weights to expand the site-level results to produce a program TSB estimate.

Net methods

The NTG assessment estimated the portion of gross energy savings attributable to the financial incentives or activities (e.g., audits, technical assistance) of an energy efficiency program. The **NTG approach** used in this study and summarized below is consistent with approaches used in previous custom project attribution research in California.

DNV completed 60 participant NTG surveys. We used these surveys to collect the information needed to calculate three component scores which made up the NTGRs for each project.

- Two program attribution scores measured the **relative strength of program and non-program influences** on decision-making.
  - For the first program attribution score, the study asked program participants to rate the relative importance of a list of program influences as well as a list of non-program influences on their decision to implement the energy efficiency measures. The study based the attribution score on the highest rating for a program influence divided by the sum of the highest rating for a program influence and the highest rating for a non-program influence.
  - For the second program attribution score, the study asked program participants to divide 10 points between their collective program influences and their collective non-program influences.
- A third program attribution score measured the likelihood that the participating customer would have installed program-qualified equipment in the absence of the program.

The study calculated NTG ratios as the average of these three program attribution scores.

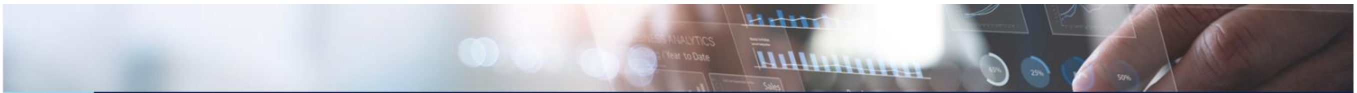
1.3 Evaluated program savings claims

This evaluation focused on the energy savings forecasted by the PAs. The forecasted savings[12] in the CIAC study included **28,881 MWh first-year electric** savings and **209,099 MWh** lifecycle energy savings in PY2024. Total forecasted **first-year gas savings were 2,145 thousand therms** and total **forecasted lifecycle gas savings were 15,586 thousand therms**. Of the 158 projects in the population, DNV sampled 64 projects to inform the gross evaluation and 60 projects to inform the net evaluation. Of the 60 NTG surveys, 35 were nested in the gross sample.

Table 1-1. PY2024 forecasted electric and gas savings

Group		First-year			Lifecycle		
	Number of projects	Forecasted savings (MWh)	Forecasted savings (MW)	Forecasted savings (thousand therms)	Forecasted savings (MWh)	Forecasted savings (MW)	Forecasted savings (thousand therms)
Electric only	94	28,881	3.07	N.A.	209,099	23.74	N.A.
Natural gas	64	N.A.	N.A.	2,145	N.A.	N.A.	15,586
Overall	158	28,881	3.07	2,145	209,099	23.74	15,586

[12] Note that a small subset of program activity from very small projects totalling less than 1% of the population are not included in the result tables below.



1.4 Results

TSB results

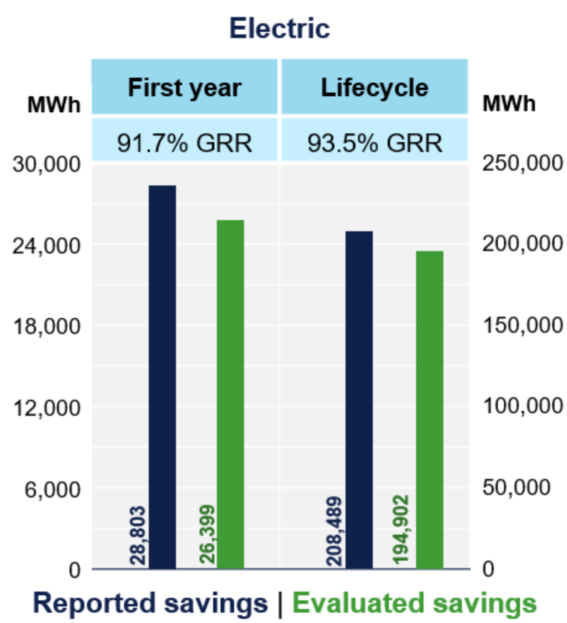
The following table presents the TSB results by PA and statewide. DNV estimates $16.6 million in TSB compared to the forecasted estimate of $21.5 million. The team used revisions to gross and net savings per site to update the tracking values. "Statewide" refers to all PAs and represents the overall results for California.

PA	Total System Benefit (TSB)			
	Forecasted TSB ($)	Evaluated TSB ($)	TSB RR	Relative precision
MCE	$63,727	49,722.16	78%	±24%
PG&E	$9,357,114	7,705,095.29	82%	±7%
SCE	$2,049,228	2,272,165.87	111%	±12%
SoCalREN	$123,914	60,974.41	49%	±28%
SoCalGas	$4,979,594	1,094,798.28	22%	±69%
SDG&E	$4,901,283	5,457,603.47	111%	±1%
Statewide	$21,474,861	$16,640,359	77%	±6%

Gross savings results

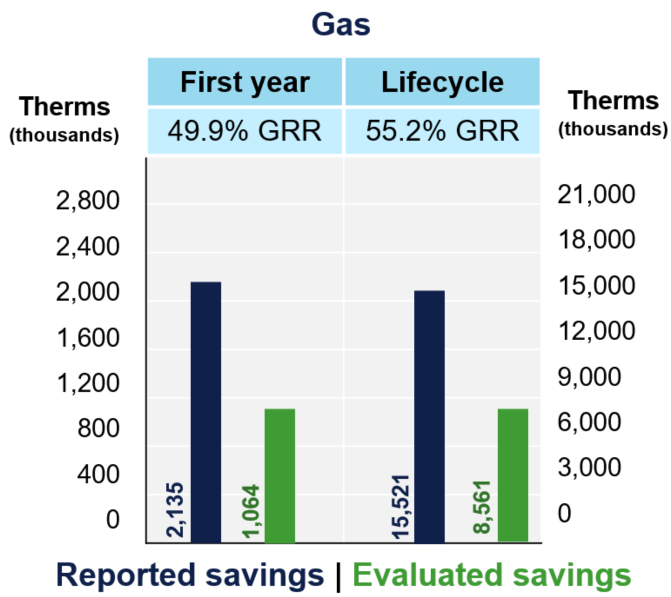
The following graphics show the overall evaluated statewide electric and gas results and GRRs.

- The 91.7% electric first-year realization rate[13] for PY2024 extends a trend of increasingly higher realization rates since 2022 (PY2022 was 38% PY2023 was 75.4%).
- Changes in operating conditions[14], with an overall adjustment of -6%, had the greatest impact on the GRR.



[13] Realization rate is the ratio of achieved energy savings to forecasted energy savings. A realization rate of 100% means the evaluated savings match exactly those forecasted, while lower or higher realization rates means forecasted savings were over- or under-forecasted, respectively.

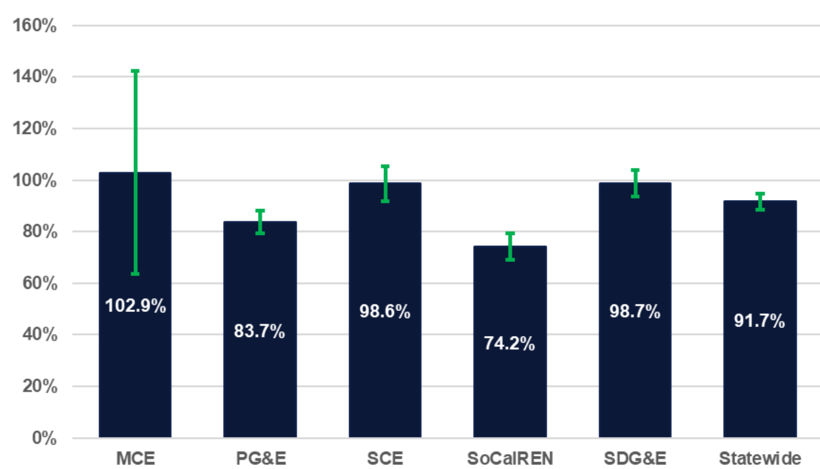
[14] Changes in HOU, observed load, control settings, or equipment efficiency were often the primary drivers in adjusting evaluated savings. Sixteen projects had differing operating conditions that negatively impacted evaluated savings, while 9 projects had differing operating conditions that positively impacted evaluated savings, with a net impact of -6%. As an example, for on project, evaluated savings were lower than claimed because the evaluation incorporated two additional years of production data beyond the original three-year model, improving accuracy and reducing estimated savings.



- The 55% gas lifecycle realization rate for PY2024 is lower than PY2023 (86%) but higher than PY2022 (19%). The lower gas realization rate was driven primarily by two large projects that together represented 63% of all claimed savings.
  - One project was found to be non-operational (resulting in zero savings), and;
  - Another project was found to have differing operating conditions, resulting in a realization rate of 40%.

Figure 1-1 presents the electric first-year evaluated energy gross realization rates and absolute precisions (green bars), both statewide and by PA. Result tables in the body of the report have first year and lifecycle electric energy and demand savings by PA and statewide with attendant realization rates and precisions for each. A discussion of the drivers of PA electric realization rates follows.

Figure 1-1. Electric first-year evaluated gross energy GRR by PA and statewide[15]



* Bands show absolute precision at the 90% confidence level.

- **PG&E** (44% of statewide savings). First-year GRR 84% ±5%; lifecycle GRR 77% ±4%. Of the 19 sampled projects with electric savings, 11 projects had savings greater than forecasted (ranging from 100% to 231%), and eight projects had savings that were less than 100% of what was forecasted. This included one zero-saver site at which installed VFDs were deemed not operational because they were not programmed or commissioned as designed.

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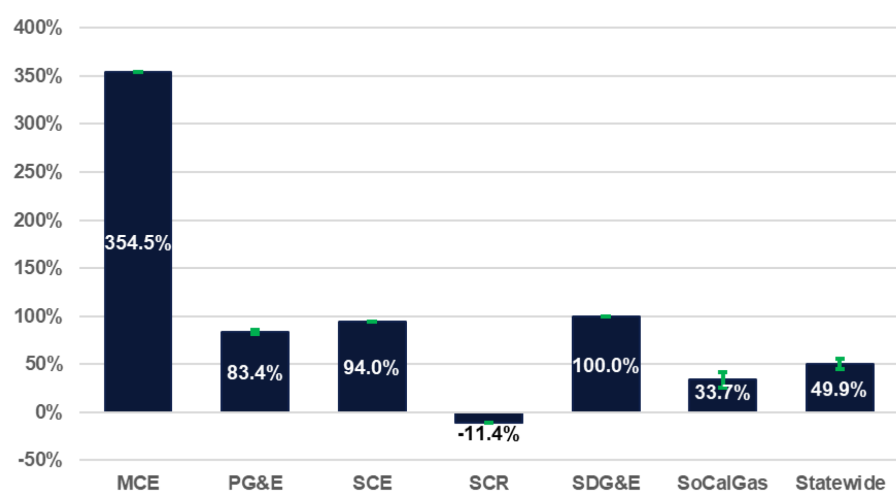
[15] Electric savings and gas first-year and lifecycle savings by PA are presented in the tables below. Note that a small subset of program activity (<1%) was not included in the sample. The results calculated from the sample at the program/measure level were applied to this subset of activity to determine total impacts.

- **SCE** (32% of statewide savings). First-year GRR 99% ±7%; lifecycle GRR 112% ±6%. Of the 20 sampled projects for SCE, 13 projects had first-year electric energy GRRs ranging from 100% to 186%. Three of the 13 projects had upwards adjustments due to observed operating conditions. One of these projects (a wastewater controls measure) had a first year and lifecycle GRR of 186% due to changes in the energy savings model based on observed conditions.
- **SDG&E** (21% of statewide savings). First-year GRR 99% ±5%; lifecycle GRR 96% ±4%. Of the 13 SDG&E projects sampled, nine were evaluated to have savings of 100% or greater, ranging from 100% to 109%. Four projects were found to have realization rates less than 100%. Three of the four projects were whole-building projects that adjusted the savings downward due to differences adjustment in the lighting power density (LPD).
- **MCE** and **SoCalREN** (3% of statewide savings combined). First-year GRRs 103% and 74%, respectively. MCE was predominantly lighting projects, SoCalREN mostly non-lighting.
  - **MCE** (3 sampled). First-year GRR 65–223%. Lifecycle GRR higher due to RUL correction. MCE incorrectly calculated the RUL as one third the EUL of the EE measure. The RUL should be calculated as one third the EUL of the baseline measure.
  - **SoCalREN** (4 sampled). First-year GRR 14–101%. The three Southern California Regional Energy Network projects were adjusted downward due to the difference in evaluated operating conditions, while one project was adjusted upward due to differences in calculation methods. One project in particular had a first year GRR of 14% due to changes in operating parameters for a Variable Air Volume (VAV) measure based on site M&V findings.

Figure 1-2 presents the gas first-year evaluated therm gross realization rates and absolute precisions (green bars) statewide and by PA. Result tables in the body of the report have first year and lifecycle Therm savings by PA and statewide with attendant realization rates and precisions for each. A discussion of the drivers of PA gas realization rates follows.

Figure 1-2. Natural gas first-year evaluated gross savings by PA and statewide



* Bands show absolute precision at the 90% confidence level.

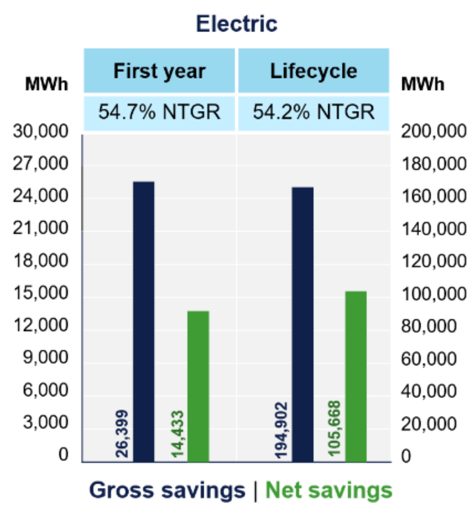
Below we discuss the drivers of each PA's natural gas realization rate, except for those PAs with impacts due only to interactive effects (MCE, SCE).

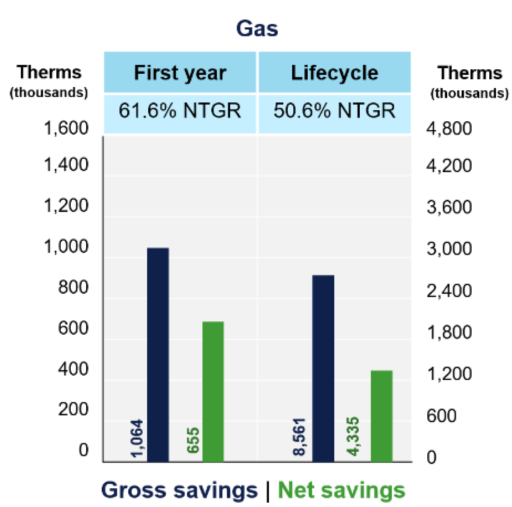
- **PG&E** (32% of forecasted statewide therm savings). First-year GRR 83% (±3% precision), lifecycle GRR 88% (±1% precision). Of the 12 PG&E projects that claimed positive first-year gas savings, 8 projects where adjusted due to difference in operating conditions and 3 were adjusted due to difference in calculation methods. One project was found to be an ineligible measure due to its effective useful life (EUL) being shorter than its simple payback period[16]. PAs must document a case-by-case exception analysis consistent with Statewide Guidance, including review of cost-effectiveness, measure cost reasonableness, program influence, and the relative magnitude of the payback-to-EUL gap. For another project that had a first year GRR of 53%, the evaluation team found the measured post installation gas use exceeded projections while the baseline was lower than assumed, resulting in lower calculated gas savings than projected.

- **SDG&E** (2% of forecasted savings). First-year GRR 63% (±40%), lifecycle GRR 91% (±5%). Of the four sampled SDG&E projects that claimed first-year gas savings, three were HOPPS projects, two of which claimed negative gas savings as adjustments to previously overstated savings.
- **SoCalGas** (66% of forecasted savings). First-year GRR 34% (±24%), lifecycle GRR 20% (±67%). SoCalGas had two very large projects in the sample that represented 63% of all gas CIAC savings that contributed to lower-than-forecasted savings.
  - In one project, a geothermal heating system was installed but achieved zero energy savings during the reporting period. The greenhouse it served was destroyed by a severe windstorm in fall 2024. Because no heating load exists and no fossil fuel use has been avoided, the project achieved zero energy savings during the reporting period.
  - The second project upgraded a Steam Methane Reforming (SMR) catalyst optimization process to improve performance and reduce natural gas use. Evaluated savings were lower than claimed due to smaller efficiency gains, lower average hydrogen production, and higher post-installation gas use at certain production levels.
- **SoCalREN** (<1% of forecasted savings). First-year GRR -11% (±0%), lifecycle GRR -9,381% (±0%). Of the three SoCalREN projects claiming first-year gas savings, two were adjusted for operating conditions and one for calculation methods. Two projects showed negative savings, while one showed positive savings with a 35% first-year and lifecycle GRR. One project had a first year GRR of 35% decreased the overall evaluated savings. The evaluation team adjusted the savings model to better reflect actual operating conditions. The negative GRR reflects total net negative evaluated savings divided by total net positive claimed savings across the sample.

Net savings results

Evaluated PY2024 first-year net electric savings were 14,433 MWh with a statewide NTGR of 55%. Though down slightly, we regard this result as stable relative to the PY2023 and PY2022 results of 59% and 61%, respectively.





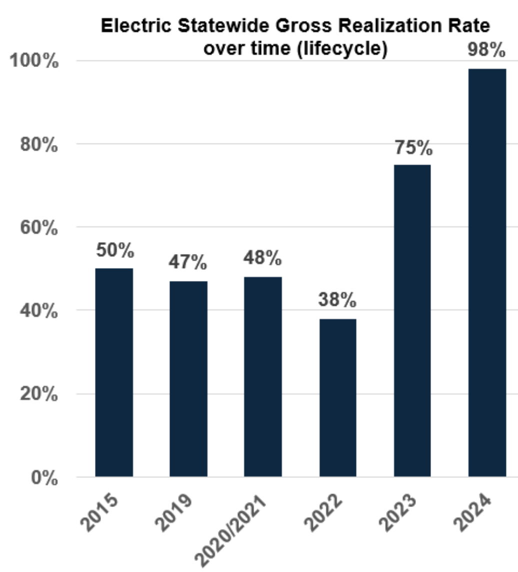
[16] Program rules require EUL to exceed simple payback. No documented exception was approved by the Program Administrator.

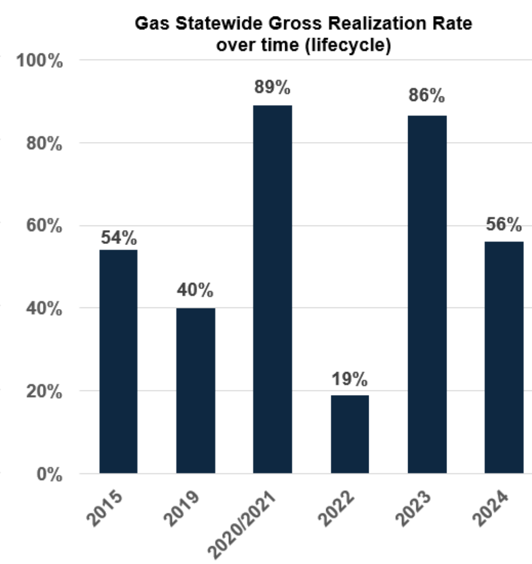
This offers some certainty and confidence around the understanding of programs' effectiveness in influencing participants. There were no single projects of significant size that drove the statewide PY2024 electric NTG ratio. The unweighted average of electric NTG results is 55% with a median of 57%, indicating a normal distribution of results around the evaluated weighted estimate (55%).

The statewide first-year net gas savings evaluated are 689 thousand therms with an NTGR of 62%. This estimate is largely in the middle of the PY2023 estimate of 40% and the PY2022 result of 76%. The unweighted average of all projects with NTGR is 50%. One very large project—which represented 51% of all program gas savings—had a very high NTGR (83%). This single project contributed significantly to increasing the statewide savings-weighted estimate NTGR of 62%.

1.5 Conclusions and recommendations

PA efforts to improve program eligibility adherence, the application of measure application types (MATs), documentation of baseline extensions, and baseline selection have resulted in a much improved (and nearly 100%) electric GRR in PY2024. Overall, the evaluation found that the electric lifetime GRR improved year-over-year, continuing the trend of improved performance that began in 2023. Gas lifetime GRR decreased substantially from PY2024, due to the influence of low realization rates at two very large sites representing 63% of all program gas savings.





The figures to the right show statewide electric (left) and gas (right) lifecycle GRRs since the 2015 program year evaluation. The 98% statewide lifecycle electric GRR observed in PY2024 is substantially above all previous studies, which ranged from 38% to 75%. Key drivers such as baseline adjustments and the presence of zero-savers that drove lower realization rates in previous evaluation cycles continued to diminish in PY2024. For example, PY2024 had only one MAT baseline reclassification compared to seven in PY2023 and 20 in PY2022.

The statewide gas lifecycle GRR for PY2024 was 56%, compared to 86% in PY2023 and 19% in PY2022. The low lifecycle GRR in 2022 was due to 2 sites representing 72% of total claimed PY savings. These projects had low realization rates due to inappropriate baselines and calculation methods. The low realization rate in PY 2024 is similarly due to two projects representing 63% of total PY savings claimed. One was found to be non-operational (no savings) and another had a low realization rate due to differing operating conditions. The impact of these one or two large sites in these PYs drove the low lifecycle GRRs experienced in them.

Conclusion 1: Operating conditions continue to be the primary driver of changes in gross realization rates. In PY2024, our evaluation adjusted 38 projects due to changes in operating conditions, resulting in an overall decrease in first-year electric energy savings of 6% and a decrease in first year gas savings of 34%. Comparably, in PY2023, 30 electric projects and 17 gas projects saw changes in operating conditions, driving an overall 3% increase in first-year electric GRRs and an 8% decrease in first-year gas GRRs. Operating condition savings changes are characterized by differences in how measures are being actually operated versus planned or designed at the time of the program. These changes can move savings up or down and can include changes in hours, setpoints, and accompanying efficiency changes that are largely out of the PAs control.

Conclusion 2: The use of MATs has become increasingly consistent over recent program years. In PY2024, only one MAT was overturned. In contrast, the PY2023 evaluation identified seven instances of incorrect MAT designations the PY2022 evaluation found 20 occurrences. This improvement is important because the MAT determines how the project's baseline is defined; that is, what would have happened without the program. For example, it reflects whether equipment failed and had to be replaced, was upgraded early, or was installed as part of new construction. Getting this classification right ensures that energy savings are calculated accurately and consistently.

Recommendation 1: PAs should maintain the strengthened MAT determination practices demonstrated in PY2024, when only one MAT was overturned. PAs should continue applying MAT definitions in the Statewide Custom Project Guidance Document v1.4 to ensure appropriate baseline designation. In addition, PAs should sustain robust pre- and post-installation reviews, leverage the California Technical Forum (Cal TF) and applicable custom workpapers, and continue coordinating with CPUC staff and stakeholders to preserve consistency and minimize future MAT reclassifications.

Conclusion 3: The incidence of zero- or negative-saver projects continues to decrease. In PY2024, the evaluation found six projects (out of 65) with zero or negative savings while the PY2023 evaluation identified six zero-saver projects (out of 68) and PY2022 found 16 of 72 projects with no or negative savings. Ineligible measures[17] have historically been the largest driver of a project receiving zero savings. Across PY2020/2021 through PY2024, the number of ineligible projects declined steadily from 51 to 16, then to 2, and finally to just 1. This suggests program improvements in measure screening, installation quality, and verification practices.

Recommendation 2: PAs should continue adhering to statewide guidance and sustaining program improvements that have contributed to the decline in zero- and negative-saver projects. Given that PY2024 zero-savers were primarily driven by inoperable measures and operating conditions, rather than ineligible measures, PAs should emphasize strengthened pre-installation inspections, post-installation verification, and functional performance checks to confirm that measures are installed, operational, and aligned with design specifications.

PAs should also continue robust measure eligibility screening to maintain the low incidence of ineligible measures. Enhanced quality control procedures and continuing to train contractors and third-party implementers on CPUC eligibility requirements can further minimize avoidable savings losses due to measure ineligibility.

Conclusion 4: A subset of lighting projects continues to claim a remaining useful life (RUL) of four years, which does not align with statewide guidance requiring RUL to reflect the remaining life of the removed equipment. In cases where RUL is not appropriately derived from the expected useful life (EUL) of the baseline equipment, savings may be overstated, and baseline assumptions may be inconsistently applied.

Recommendation 3: PAs should ensure that claimed RUL values are calculated in accordance with statewide guidance—generally as one-third of the measure life (EUL) of the removed equipment, unless site-specific documentation with clearly

[17] Measures approval by the PA not consistent with CPUC policies, guidance, and rulebook eligibility

stated justification supports an alternative value. PAs should verify that RUL inputs are transparently documented in project files and consistent with applicable workpapers or DEER assumptions.

Conclusion 5: The PAs are improving their baseline selection. The PY2024 evaluation found no inconsistencies in baseline selection for either electric or gas projects. This is a departure from observations in previous studies in which some projects used baseline information based on old and/or inaccurate data. The PY2022 evaluation found 14 instances for electric projects and one instance for gas projects with inappropriate baselines, while the PY2023 evaluation found 5 instances for electric projects and 2 instances for gas projects requiring adjustments based on project-specific findings. This indicates that the PAs are continuing to improve the accuracy and appropriateness of baseline selection.

Recommendation 4: PAs should continue ensuring projects use appropriate baselines and standard practices (SPs) at the time of project approval. If SP studies are used, they should be less than five years old in accordance with the Energy Efficiency Industry Standard Practice (ISP) Guidance v3.1; older studies should be reassessed or replaced.

Conclusion 7: Improvements in project extension documentation have reduced instances of ineligible projects. The PY2022 evaluation found 14 electric and two gas zero-saving projects due to missing or incomplete contract extensions; the PY2023 evaluation found only one. The PY2024 evaluation found no instances where extensions should have been filed but were not, indicating that projects are consistently installed within approved timelines and extensions are properly documented.

Recommendation 6: PAs should continue to ensure that projects are installed before the approved installation deadline date and that savings are claimed within the approved installation year. Written extensions should be provided in advance if projects cannot meet approved timelines, and documentation such as dated purchase orders or invoices should be reviewed to confirm that equipment has not yet been ordered. PAs should maintain and reinforce formalized extension procedures to ensure all projects comply with customer agreements, building on the successful practices demonstrated in PY2024.

Conclusion 8: Better screening of high free-ridership projects would significantly improve overall NTGRs. About a quarter of the projects in PY2024 NTG sample had NTGRs of less than 35% due to free-ridership. Better screening out these high free-ridership projects would improve the overall NTGR significantly. A common theme in these high free-ridership projects was that the project decision-makers did not, on average, value the Custom Program incentives very highly. Since financial incentives are some of the primary levers of program influence, if project decision-makers do not value them, they are unlikely to give the Custom Program much credit for influencing their energy efficiency projects.

Recommendation 7: Program Administrators should require program implementers to ask participants to rate the importance of project payback or return on investment using a Likert scale as part of their screening questions. High ratings suggest that incentives may influence the decision, while low ratings suggest that the project is likely driven by non-economic factors and may have higher free-ridership. More effective screening would increase NTGRs and allow PAs to direct limited incentive funds to projects where incentives are more likely to serve as the financial tipping point.

2 INTRODUCTION

This report presents the evaluation results for the California Program Administrators' (PAs') Custom Industrial, Agricultural, and Commercial (CIAC) programs for program year 2024 (PY2024). The CIAC final work plan, dated September 30, 2025, guided this evaluation effort.[18]

2.1 Background

The CIAC study's overall purpose was to evaluate the Total System Benefit (TSB), energy and demand savings for CIAC projects installed in PY2024. This impact evaluation quantified gross and net first-year and lifecycle energy savings and peak demand reduction, for both electricity and gas. The study presents recommendations for improving program delivery quality control, maintaining clear and complete project documentation, and submitting appropriate savings claims consistent with project documentation. This evaluation also assessed the PAs' project-specific documentation of the calculation methods, baselines, measure performance/characteristics, and savings parameters used to forecast savings.

2.2 Evaluation objectives

This study encompassed the following primary research questions:

1. What are the first-year and lifecycle gross kWh, peak kW, and therm savings by sampling domain (PA, fuel, etc.)?
2. What is the overall total system benefit (TSB), and how does that compare to forecasted TSB claims by PA?
3. What are the evaluated gross realization rates (GRRs)? What factors are driving GRRs, and, as necessary, how can realization rates be improved? What is the corresponding GRR by sampling domain?
4. What is the corresponding net-to-gross ratio (NTGR) by sampling domain? Determine the factors that characterize free-ridership, and as required, provide recommendations on how the NTGR might be improved.
5. What factors contributed to the difference between forecasted and evaluated savings in terms of energy impacts?
6. What assumptions or assumed parameter values should be adjusted based on evaluation findings, and how?
7. What gaps are there, if any, in the planned EM&V activities for custom programs? What emerging evaluation issues should be addressed going forward?
8. What are the actionable recommendations to address gaps and improve programs and projects in the future?

2.3 CPUC policies and guidance

When designing and implementing this evaluation, DNV considered the codes and regulations that were in effect at the time of project approval and the following CPUC policies and guidance:

- CPUC Energy Efficiency Policy and Procedures Manual, Version 6
- Statewide Custom Project Guidance Document, Version 1.4
- Utility Statewide Custom Policy and Procedures Manuals
- 2020 Savings by Design Participant Handbook, which provides policies and procedures for participation in the statewide Savings by Design program
- Savings by Design Baseline Guidance Document
- PA-specific program policy and procedure manuals
- Energy Efficiency Industry Standard Practice (ISP) Guidance, Version 3.1
- 2016 Savings by Design Healthcare Baseline Procedures
- Assigned Commissioner and ALJ Ruling Regarding High Opportunity Energy Efficiency Programs or Projects ALJ Ruling on Certain Measurement and Verification Issues, including Third-Party Programs

[18] https://pda.energydataweb.com/#!/documents/4223/view

- Title 20 and 24 requirements in place when projects were permitted
- CPUC policy papers and state-government memos that address topics such as the savings for sites using non-Investor-Owned Utilities (IOU) fuel sources
- CPUC resolution E5115, which adopts minimum evidence requirements for Custom projects' Accelerated Replacement measure type
- CPUC resolution E-4867 approving the DEER updates for 2020
- CPUC resolution E-4952 revising DEER update for 2020
- CPUC resolution E-4818 affecting assignment of project baselines
- Dispositions of reviews of custom projects by CPUC staff
- CPUC resolution E-4939, which affects the preponderance-of-evidence requirements for Accelerated Replacement projects and the definition of small-business customers
- New construction permit requirements for the PAs as specified in SB-1414
- Fuel Substitution Technical Guidance for Energy Efficiency, Version 2.0
- CPUC D.19-08-009 Fuel Substitution Decision[19]
- Project Ineligibility Table from the 2020-2021 CIAC Work Plan
- Evaluation Guidance Questions and Responses from the 2020-2021 CIAC Work Plan
- Assigned Commissioner and Administrative Law Judge's Ruling Regarding High Opportunity Energy Efficiency Programs (HOPPs) Or Projects, Rulemaking 13-11-005 (Filed November 14, 2013)
- Assembly Bill (AB) 802
- Other CPUC decisions and guidance documents as appropriate

[19] D.19-08-009 adopted the fuel substitution test and ordered the creation of this fuel substitution guidance document. D.19-08-009 provides direction on the fuel substitution test, fuel substitution measure eligibility, and utility credits for savings claims.

3 METHODOLOGY

The published final work plan describes most of the methodology for this evaluation. This section documents the final methods DNV used, including the planned sample design, achieved sample sizes, gross savings, measurement and verification (M&V) activities, net savings approach, and final expansion procedures. The evaluation followed the International Performance Measurement and Verification Protocol (IPMVP) and the California Evaluation Protocol.

To better fulfill the evaluation objectives listed in Section 2.2, DNV collected information on 65 gross sample points and 61 net sample points. The gross site evaluation was based on on-site verification, phone interviews, virtual data collection, and extensive analysis. The net evaluation used an interview-based approach to determine net-to-gross (NTG) scores. Both gross and net evaluation results are presented in Section 4 of this report.

3.1 Sample design

DNV delivered a sample design and data collection memo[20] to the CPUC staff and PAs detailing the proposed sample design to evaluate gross and net savings, sample domains, target completes, and target precisions. In July 2025, DNV obtained final project tracking data for all commercial and industrial (C&I) programs that included non-deemed project savings claims from CEDARS. The populations presented in this report are based on the claims from the final ED tracking data for PY2024 (January 1, 2024 through December 31, 2024). We finalized the population after performing data cleaning to remove placeholder claims, mis-assigned claims, and assignment of claims to other program evaluations.

The overall gross realization rates (GRRs) included both positive and negative savings. The sample design used error ratios available from previous cycles of California C&I evaluations to determine the required sample size for key domains of interest to meet the precision requirements. The sample design used forecasted savings calculated by removing the default GRRs[21] that had been applied by the system in calculating the savings reported in the ED tracking data. The sample design stratified the population by MMBtu savings to provide a consistent unit of measure, accounting for projects that can have both electric and gas savings.

3.1.1 Gross and net savings sample design overview

Table 3-1 summarizes the key assumptions for the sample allocations. Estimated precisions are shown in subsequent sections. In contrast to previous evaluation cycles, which used separate gross and net-to-gross ratio (NTGR) samples, both the gross and NTGR samples for the PY2024 evaluation include the same sampled projects. The limited population for PY2024 and the increased error ratio assumption for the gross analysis sufficiently align the gross and net error ratios to use a single sample for both analyses.

Table 3-1. CIAC sample design assumptions and approach

Parameter	Description (PY2023)
Population	Tracking data set for program year, aggregated at the application (Project ID) level
Explicit sampling strata	Fuel type, PA, size (MMBtu), and measure group PY2024 program data
Gross sample allocation	65 projects, allocated for optimal overall precision to achieve 90/10 results by fuel type and 90/10 overall (MMBtu)
NTGR sample allocation	Separate sample allocation, starting by attempting NTGR surveys for all projects in the gross impact sample. 65 total projects (65 embedded with the gross sample, non-embedded as needed).

[20] https://pda.energydataweb.com/api/downloads/4223/CIAC%20PY2024%20Evaluation%20Sample%20Design%20Memo%20-%20Draft%20-%209-30-2025.pdf

[21] CPUC, "Default Custom Measure Gross Realization Rates,": D1107030 Attachments A-B (ca.gov)

Parameter	Description (PY2023)
Sample design approach	Model-based statistical sample with stratified ratio estimation
Target parameters	GRR, NTGR
Analysis domains	• PA • Fuel • Measure Group (Lighting vs. Non-Lighting) • Funding (OBF vs non OBF) • Third Party (3P) vs. non-3P[22] • Hard-to-Reach (HTR)[23]
Error ratios	By PA and fuel based on historical custom and industrial results from three prior CA evaluation cycles
Projected precision at 90% confidence (based on current error ratio assumptions)	• CIAC PY2024 • Gross MMBtu savings by energy unit (electric): ±10% • Gross MMBtu savings by energy unit (gas): ±3% • NTGR by energy unit: ±10% • Net by fuel type: ±10%
Savings size stratification	Custom – up to 3 levels based on savings, depending on the number of samples in the cell
Contingency and back-up sample[24]	• Gross impact sample: 50% initial over-sample for primary sample to account for projected ineligible and nonresponse rates. • NTGR sample: 3x initial oversample for primary sample to account for projected ineligible and nonresponse rates. All gross impact primary samples included plus additional as needed. Remaining projects pre-sorted into random selection sequence for each non-census-attempt sampling cell to produce additional back-up cases as needed.

3.1.2 Gross sample completions and response rates

Table 3-2 shows the population counts, sample design quotas, and final sample achieved for key analysis dimensions. Overall, the DNV team recruited 97% of gross projects and 94% of net surveys in the primary sample design. For each of the four projects not recruited, the customer either was initially unresponsive or became unresponsive during the evaluation process. We made multiple attempts (a minimum of three), in addition to outreach from the respective PA and, in some cases, from CPUC staff.

Table 3-2. Overall gross sample response rate by fuel and key analysis dimensions

Dimension	Sampled design[25]		Gross		Net	
	Population (N)[26]	Sample design quota	Final sample (n)	% complete	Final sample (n)	% complete
PA						
PGE	45	20	22	105%	17	80%
MCE	6	4	3	75%	3	75%

[22] Analysis of 3P vs. non-3P will be contingent on sufficient population in either domain.
[23] Analysis of HTR projects will be contingent on sufficient participation from customers identified as Hard-to-Reach (HTR).
[24] Backup sample estimates will be contingent on sufficient population.
[25] Please note – the final population and sample was adjusted to remove 2 BayREN projects and 2 PG&E projects as they were incorrectly including in the initial population.
[26] The population presented in Table 3-2 represents total unique project IDs. These counts may differ from the sample design memo, where counts represent unique site IDs. Additionally, these totals include statewide projects and projects that did not claim savings.

Dimension	Sampled design[25]		Gross		Net	
	Population (N)[26]	Sample design quota	Final sample (n)	% complete	Final sample (n)	% complete
SCE	68	22	20	91%	19	86%
SoCalGas	22	2	2	100%	2	100%
SDGE	56	13	13	100%	18	138%
SoCalREN	6	4	4	100%	3	75%
Statewide	**203**	**65**	**64**	**97%**	**61**	**94%**
Measure type						
Lighting only	67	21	22	105%	29	138%
Other	136	44	42	89%	32	70%
Total	**203**	**65**	**64**	**97%**	**61**	**94%**
Finance type						
OBF	84	34	32	94%	34	100%
Other	119	31	32	100%	27	87%
Total	**203**	**65**	**64**	**97%**	**61**	**94%**

The DNV team recruited gross and net participants separately; as such, the total number of final sample counts for gross will not always align with the final sample counts for net.

3.1.3 Expansion methods

This section presents the methodology used to expand the sample results to the population to calculate program-level estimates of gross realization and the NTGRs.

This evaluation used stratified ratio estimation to calculate separate ratios for each domain of analysis, which were implementation PA, program, finance type (On-Bill Finance (OBF) vs non-OBF), and measure group (lighting only and all other measures). DNV calculated the GRR as the weighted evaluated savings divided by the weighted tracking forecasted savings. For NTGR calculations for embedded sites, the denominator in the ratio expansion was the evaluated gross savings for the domain rather than the tracking savings. We used this embedded approach for the net expansion to leverage the additional information collected in the gross analysis. After establishing the final recruited sample and estimating the project-level electric and/or gas impacts, DNV developed sampling weights to expand the sample results to the population. The sampling weights reflect the achieved sample post-stratification, which is the ratio of the completed sample counts divided by the population counts within each analysis cell.

3.2 Gross savings methods

3.2.1 Overall methods overview

This section describes the approach to evaluating gross savings. DNV sought to keep our gross savings approach consistent with previous evaluation study methodologies. Our efforts relied on on-site verification, virtual verification, and phone surveys to confirm facility- and measure-level operation, along with other virtual data collection techniques. Figure 3-1 shows three core aspects of the methods used across our evaluation, followed by a more detailed discussion of our methods.

Figure 3-1. Custom evaluation approach

During the evaluation process, we determined appropriate baselines based on preponderance of evidence of program influence, relevant building code, program rules, CPUC policy requirements, and industry standards. When necessary, we performed a "mini ISP" study to support evaluated baselines.

Through discrepancy analysis, we assessed the reasons for variances between the forecasted and evaluated savings for each sampled project. The site-level discrepancy assessment shows the primary drivers of the realization rates.

To ensure quality control, senior engineers worked with lead engineers for review, verification, and approval stages before site-specific report submission.

3.2.1.1 Custom Core Template and M&V plans

DNV leveraged the previously created Excel-based Custom Core Template (CCT) to organize and communicate evaluation information for each claimed project in the sample. The CCT served as the final site-specific evaluated savings deliverable and was the common reference source that engineers used to create M&V plans and document data collected for impact estimates. Critically, the CCT guided the determination of whether measures were eligible or ineligible. Before developing full-fledged customized M&V plans, DNV determined project eligibility in the CCT based on CPUC guidelines. Determining eligibility required an assessment of compliance with CPUC decisions, rulings, and policies, such as the statewide Custom program requirements and program-specific requirements.[27] As appropriate, we reviewed the sites determined to be ineligible with CPUC staff and PAs before removing their savings from the evaluation.

The CCT stored claim information downloaded from the tracking database, savings calculation methodologies, supplemental data, energy model references, site visit documentation, and realization rate determination in a common format shareable as site-level deliverables. The CCT ensured we followed CPUC guidelines and developed and systematically followed best practices for pre-implementation review/evaluation. It also facilitated data sharing between DNV's Custom Project Review (CPR)[28] team and the larger DNV team when the evaluation included a CPR site. We assigned projects and their accompanying CCTs to lead engineers based on subject area, measure category, and team member experience and specialty. We assigned a senior engineer to each sample project to ensure quality throughout the CCT-driven process.

We embedded site-level M&V plans in the CCT to store all available information on a given project in a single accessible location. These plans served as the roadmap for estimating a site's evaluated savings. Engineers followed each M&V plan to document site visits, data collection, and methodology for estimating savings (and to ensure realization rates). The M&V plans allowed DNV engineers to validate key project information preliminarily determined from project files, such as baseline, eligibility, fuel substitution, non-IOU fuel source, data availability, and engineering methods. The M&V plan included a section to document applicant-reported engineering methods to determine whether the provided templates could be repurposed for evaluation, or whether the evaluators required a custom analysis template. The M&V template also fully documented the engineer's site-level activities and data gathering (e.g., which facility representatives were interviewed or what data was requested and received). Senior engineers reviewed each plan to maintain the quality standards of typical M&V procedures and policy requirements. Through a review of project documentation, we assessed M&V rigor as key to M&V planning, taking into consideration forecasted savings, end-use type, and project complexity.

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[27] The Statewide Custom Project Guidance Document (https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/demand-side-management/energy-efficiency/custom-projects-review-guidance-documents), program-specific manuals, Statewide custom program and policy manual, various CPUC decisions and resolutions, CPUC EE Policy Manual, CPUC guidance, CPR directives, are some of the resources DNV intends to use to determine project eligibility.

[28] Custom Project Review (CPR) refers to the process of selecting projects for further review of eligibility, baseline, program influence, and savings approaches used for projects submitted in a given program year.

3.2.1.2 Recruitment and data collection

We recruited sampled customers to schedule a site contact interview and to inform any modifications needed to the M&V plan before more formal data collection. For a selection of customers, we conducted on-site verification. The PAs supported these efforts in various ways, including providing accurate customer contact information, providing introductory correspondence, and/or contacting participants to encourage them to participate in evaluation activities, including both NTG and gross surveys and verifications.

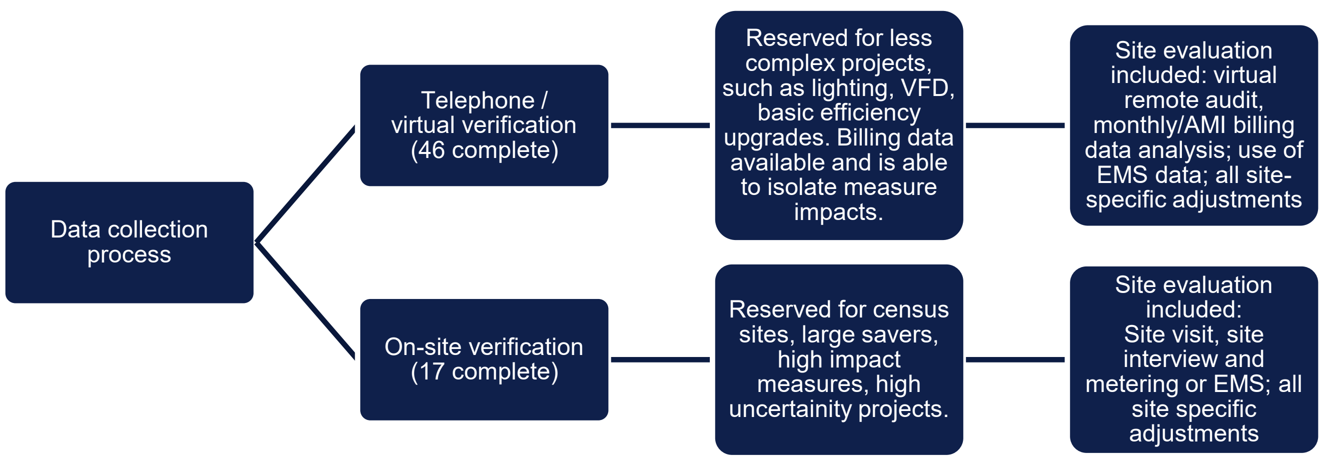
Data collection

Data collected for projects varied, but could include:

- On-site verification of installed equipment
- Customer verification of installed equipment, including pictures and video, when possible, for confirmation
- Customer-reported Energy Management System (EMS)/trend log data on current operational conditions, including but not limited to load, hours of use (HOU), process temperatures, and seasonal variations (this information is collected for current conditions as well as historical changes since measure installation)
- Trend data from onsite monitoring systems or building management systems that showed equipment operation
- Production data if equipment operation is directly related to production

Figure 3-2 provides an overview of the data collection process and highlights the key differences between processes across sites.

Figure 3-2. Data collection process



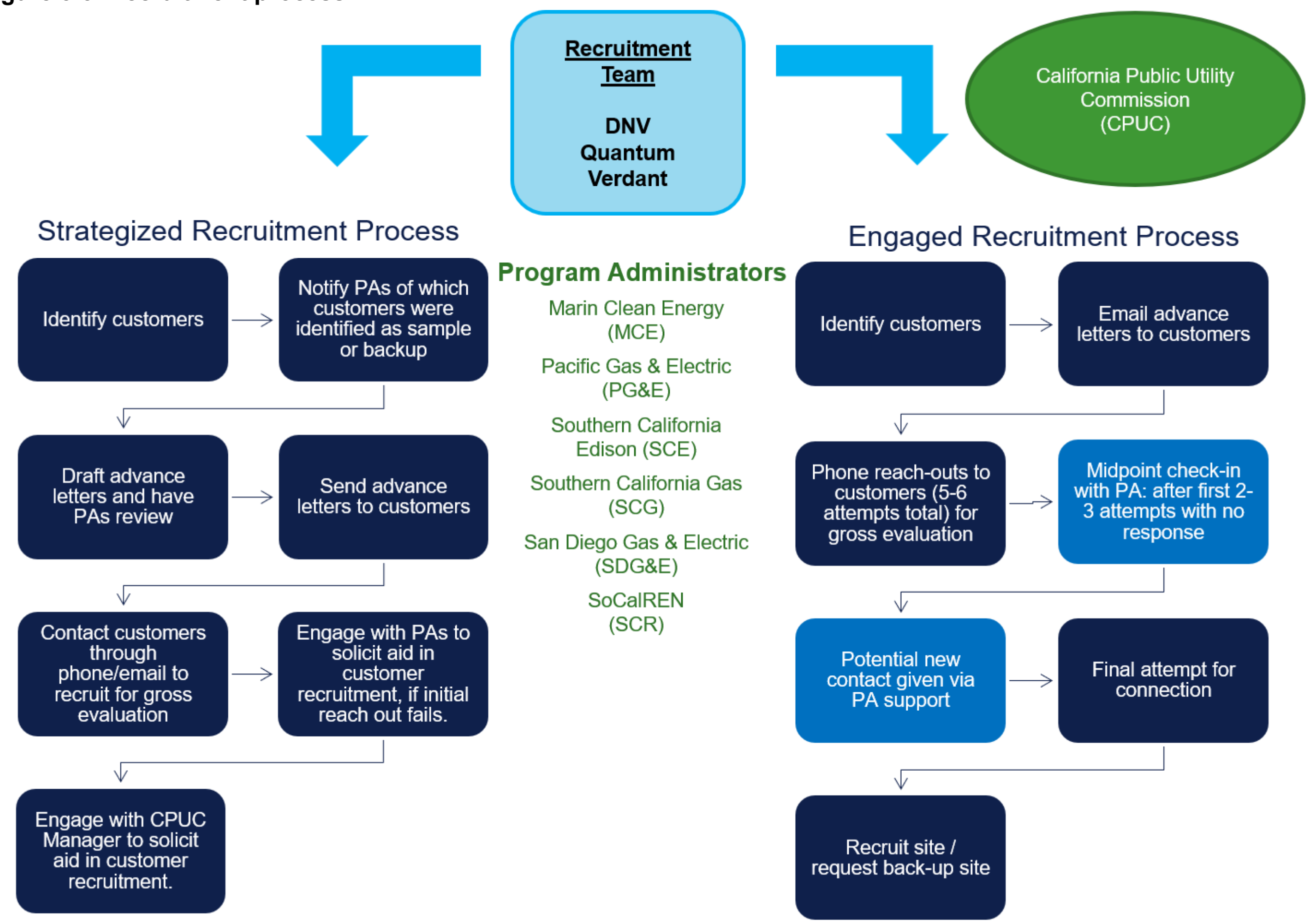
Gross recruitment

Recruitment efforts started with an introductory email sent to prospective participants. Following initial contact, the DNV team attempted to reach the participants by phone at different times of day and on different days of the week to maximize contact success. We used each M&V plan to guide site contact interviews to collect updated parameters for the savings calculations. The sample contained projects with multiple measures installed.

Recruitment efforts were completed from September 2025 through January 2026. These efforts engaged one lead recruiter and two active recruiters at DNV, with support from two subcontractors, Quantum and Verdant. Most of the sites recruited were within the expected number of attempts (ranging from one to five), with an initial email that included a site description and a customer notification letter. Though our team made many successful attempts on our own, we also had the support of the PAs and CPUC staff when needed. If not for both parties' efficient email replies with updated information, quick phone calls, and suggestions of different outreach methods and patterns, we may not have been so successful. Our collaborative efforts made this recruitment process efficient and smooth from start to finish.

Figure 3-3 provides a comprehensive overview of the recruitment process and illustrates the challenges encountered.

Figure 3-3. Recruitment process



Of the 65 gross sample points, we successfully recruited 64. Three sampled projects were replaced with backup projects as the customer was unresponsive to recruitment efforts. Two projects were dropped and not replaced with backups, as no acceptable backup existed.

Net recruitment

In PY2024, 203 sites participated in the CIAC program, but this evaluation set the net recruitment goal at 65 sites to achieve 90/10 precision targets. To meet this goal, we used several experienced recruiters and began contacting backup sites early in the process. Additionally, we made up to eight attempts to complete surveys, exceeding the CPUC's requirement of three attempts. The outreach team was mindful of the January 2025 wildfires in Southern California and temporarily paused data collection attempts at sites in affected areas until the situation improved. Also, the sample size enabled us to perform a meaningful comparison of NTGRs between HTR and non-HTR sites, which we could not do in the PY2020-2021, PY2022, and PY2023 CIAC impact evaluations due to the small sample sizes.

3.2.2 Measure analysis

As part of each site-specific evaluation, we collected facility- and measure-specific information from participants, including consumption data, photographic evidence of installed equipment or controls, trend data if available, equipment functional tests, and any other supplemental information to confirm current operation and load. When PA-provided data was available to complement the analysis, we considered including it. All sample points used current post-installation data from customers, consumption data, and/or photographic evidence directly from customers or from on-site verification efforts.

After completing the program file review and conducting the site interview or virtual audit with the customer, DNV engineers finalized M&V plans based on the updated information from the site and developed the final analysis approach, which Section 3.2.2.1 discusses further for Custom and SBD individually. This finalized M&V plan within the CCT reflected limitations and achievements in executing the planned site-level tasks. The CCT also identified any discrepancies or significant changes found throughout the evaluation process.

After reviewing the current data provided by the customer, DNV determined the viability of repurposing PA-provided analysis templates or creating new custom evaluation analysis templates. The final M&V plan describes the engineering approach we chose, based on measure-specific requirements, to accurately determine savings. DNV clearly documented inputs and assumptions based on trend data, spot measurements, or other information gathered from the customer, including photographs of building management system (BMS) settings. We assigned the adjustments made to savings estimates in the process described above to various categories to understand program savings drivers. These categories of adjustment factors include tracking data adjustments, ineligible projects, measure count changes, the application of an inappropriate baseline, discovery of inoperable measures, changes in operating conditions, and savings changes due to calculation methods.

The diversity of Custom projects warrants careful consideration when selecting the most defensible and cost-effective M&V for each sampled project. We assessed several key criteria to assign project-level rigor, as illustrated in Table 3-3 and further detailed in the following sections.

Table 3-3. Savings discrepancy factors

Adjustment factor	Description
Tracking data	Differences attributed to incorrect adjustments or unexplained changes to savings that occurred between completion of the analysis and entry into the PA tracking system.
Ineligible project	Circumstances around measure approval by the PA are not consistent with CPUC policies, guidance, and rulebook eligibility.
Measure count	Differences are attributed to the number of units used in the project calculations and the number of units operating at the time of evaluation.
Inappropriate baseline	Represents a difference in evaluated and reported baseline, including a different standard practice, or pre-existing baseline.
Inoperable measure	The measure is no longer operating at the time of evaluation, whether it has been decommissioned or removed from site.
Operating conditions	Evaluator M&V or collected trend data informs different operating parameters, including hours of use, setpoints, efficiency, etc.
Calculation methods	Differences attributed to changes in calculation methodology between methods used for forecasting savings and evaluation analysis. The evaluator only changed analysis methodology when necessary to accurately calculate savings such as employing an 8760 model.
Other	Differences that cannot be attributed to other categories due to their unique nature.

3.2.2.1 Custom-specific analysis methods

This section includes a discussion of Custom-specific methods not covered in Section 3.2.1, broken out by non-lighting and lighting measures.

Non-lighting

Custom non-lighting projects, by nature, are unique and thus warrant tailored approaches to estimate energy and demand savings. However, based on our experience with evaluating Custom non-lighting projects in California since 2006, certain measure groups are more conducive to a templated analysis approach. In developing the M&V plan, we determined the viability of repurposing the PA-provided analysis templates for the evaluated model using current information provided by the participant. If we determined that the previously used approach was not a viable method or if we identified a more accurate savings approach, we used or developed alternative approaches. These alternatives generally relied on previously developed and automated M&V tools that leverage high-frequency trend data. Some of the key features for these in-house tools/savings approaches are:

- Reliable analysis with built-in engineering guidance regarding appropriate assumptions and applications
- Traceable calculations including relevant citations
- Automatic vetting of input and output parameters for improved quality control
- Automated 8,760 spreadsheet tool

When required, we used a typical meteorological year (TMY) climate zone (CZ) 2010 (CZ2022) dataset based on the specific California climate zone location for temperature-sensitive calculations. We calculated energy savings either by the hour in an 8,760 model or allocated to each hour in the year to estimate demand and annual savings impacts. Each analysis provided estimates for annual savings and demand, as specified in the DEER 2020 update. We used the following demand definitions to calculate peak demand reduction:

- The peak demand impacts of energy efficient measures (EEMs) are represented by the average kWh reduction over a 15-hour window.
- The 15-hour window is from 4 p.m. to 9 p.m. (five hours) over a three-day “heat wave” that occurs on consecutive days in June through September.
- The first day of the heat wave is determined for each climate zone and marks the start date for the peak demand period.
- Consistent with Title 24 and CZ2022, a 2009 calendar year was used to determine which days are weekends and holidays.

The following provides an example of estimating energy savings for an HVAC retro-commissioning (RCx) project in this study. This project involved schedule optimization and a discharge static pressure reset on air handling units. To quantify the savings, the PAs used a custom tool to model savings, which used actual trends to develop regressions against outdoor air temperature (OAT) for the same data period. Aligning with the IPVP Option B approach, the DNV evaluator gathered the most recent trend data and developed regressions against OAT for the same period, applying these regressions to CZ2022 weather bins to estimate energy savings at each bin. When developing the site-specific M&V plan, the DNV evaluator determined the PA approach to be a viable and accurate option and used it as a basis for determining evaluated savings. As a part of the data collection efforts, the evaluator was able to collect up to six months of recent trend data, providing valuable insights into the current operation of the impacted equipment. The evaluator adhered to Option B as the chosen evaluation methodology, employing provided trend data to develop regressions against OAT and applying these regressions to local CZ2022 weather data to accurately determine energy savings for the impacted equipment.

Similar details can be observed in each site-specific CCT, which are provided as deliverables within this report. These CCTs detail the specific analysis methods used for each project, including a high-level discussion of algorithms, inputs, assumptions, and calibration methods where applicable.

Lighting

DNV evaluated lighting-only projects via telephone surveys with each site contact, followed by on-site visits. We conducted five primary activities for each project: 1) Confirm measure installation and measure quantities, 2) Obtain self-reported lighting operating hours, 3) Establish the condition and functionality of the lighting equipment removed to determine if the lighting project was accelerated replacement or normal replacement of existing lights, 4) Obtain information about the lighting equipment removed, and 5) Obtain information about lighting controls.

PAs submitted a savings calculator for each project, with most projects using the Modified Lighting Calculator (MLC), and just a handful of projects using the GrowGreen calculator.[29] Project engineers reviewed the information submitted with the project documentation and the customer survey and on-site responses, and where necessary, adjusted the input parameters of the PA-submitted savings calculators. Below, we list the general approach for lighting-only project evaluation.

1. We verified that the savings calculator inputs reflect the facility type and location from the project documentation and confirmed those during the telephone surveys and the on-site visits. Facility type determines the DEER HOU and coincident demand factor (CDF), while facility location determines HVAC interactive effects (IE) parameters for the savings calculation.
2. We compared measure quantities and types (linear fluorescents vs. high-intensity discharge, and interior vs. exterior) as reflected in documentation invoices, photographs, or project feasibility studies, with quantities and measure types as inputs into the savings calculator. During on-site visits, we verified that the LEDs present at each site matched the documented quantities. We updated quantity inputs to the savings calculators when needed.
3. We reviewed equipment spec sheets and verified that the lighting installed was Design Lighting Consortium (DLC)-listed or otherwise eligible for custom installations. We compared the documented manufacturer and model information with the lighting calculator inputs to verify that wattage inputs for the existing in-situ measure, the standard practice baseline measure, and the new LED measure were correct and reflected measure information from the DLC directory.
4. Based on the lighting schedule from the survey—confirmed or adjusted during the on-site visit—and using adjustment factors developed from previous evaluations for consistency, we estimated the lighting HOU and coincident demand factors (CDF) for each site.[30] We compared these with the DEER-based HOU and CDF for the building type/climate zone for each site and substituted the evaluation HOU/CDF in the PA-provided calculator where appropriate.[31]
5. Using existing and LED measure life information in conjunction with the evaluated HOU, we estimated the EUL and Remaining Useful Life (RUL) of lighting measures and compared them with the PA- claimed EUL and RUL. We substituted evaluation-based EUL and RUL values if the PA-claimed values were incorrect (for example: RUL=4 instead of RUL=5 for a project replacing HIDs) or when the rated measure life, in conjunction with the evaluation- or DEER-based HOU, required the EUL/RUL to be capped (example: HOU=5,000 hours and LED rated life of 50,000 hours cap the EUL to 10 years.)

Based on customer statements regarding the lighting equipment condition prior to the project—whether they were viable and providing adequate lighting, or whether they were failing or not providing sufficient lighting, or if the customer had otherwise decided that new lighting was necessary—we confirmed or revised the measure application type (MAT) of accelerated replacement (AR)/normal replacement (NR) categorization as needed. Since all PA-submitted calculators had used accelerated

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[29] The GrowGreen calculator is used for lighting installations at horticultural sites, including cannabis.

[30] Group D Evaluation, *2019 Custom Industrial, Agricultural and Commercial (CIAC) Impact Evaluation*, February 1, 2022, SBW https://pda.energydataweb.com/api/view/2583/GroupD-CIAC%202019%20Ex%20Post%20Evaluation%20PDF%20Final%202.pdf

[31] Since the adjustment factors have a standard deviation of 25%, we only replaced the DEER HOU and CDF if the evaluated values were different by more than 25%. Only interior lighting parameters are adjusted, since no adjustment factors exist for exterior lighting.

replacement conditions as inputs, we edited the MAT only when the evaluation determined that a project was, in fact, a normal replacement.

An example of this approach is a lighting installation at a hospital. The equipment information provided in the invoices and spec sheets and DLC screenshots—quantities, wattage, lighting output—matched the inputs from the PA-provided MLC. The site visit confirmed the quantities installed and verified that the new LEDs were still in operation. DNV obtained facility operation information during the on-site and determined that the interior lights were on 24/7. HOU=8,760 and CDF=1.0 are much higher than the DEER HOU and CDF for this building type. The evaluator edited the MLC by overwriting the DEER HOU and CDF with 24/7 operation. The high HOU caused caps in EUL and RUL. The change in HOU/CDF is the only source of discrepancy between claimed and evaluated first-year savings. EUL and RUL caps also affect evaluated lifecycle savings estimates.

Two additional projects had a similar situation, with parking structure lights always switched on. Those projects received adjustments similar to the hospitals.

A community center that houses offices, classrooms, a gym, and a kitchen replaced interior and exterior lighting with LEDs. Following MLC guidance, the PA modeled the project as an assembly building (ASM), for which DEER HOU is 1,100 hours/year. The evaluation confirmed lighting quantities and the type of equipment removed. The onsite visit established that the community center is open from early morning until evening. Even with lighting controls in place, the actual HOU and CDF are much higher than the DEER HOU and CDF for the ASM building type. DNV edited the MLC by overwriting the DEER HOU and CDF with evaluation-based HOU and CDF.

A grocery store-anchored shopping area replaced exterior pole and sconce HIDs with LEDs. The customer survey verified the quantities installed, the type of equipment removed, and the operation schedule of the lights. The onsite visit confirmed quantities installed and confirmed dusk-to-dawn operation of the new LED lighting. The evaluation determined that the PA-submitted MLC already captured all the measure-specific information correctly. However, the MLC estimate for the baseline annual lighting usage—with the HIDs in place—exceeds (is 115% of) the annual usage of the site. By comparison, the CEUS average lighting baseline for retail sites is 5%, and this value is displayed in the MLC Utility Usage tab just below the total site usage. As submitted by the PA, the MLC caps the claimable savings to 98%—just enough to ensure that the “equivalent monthly savings” do not exceed the monthly site usage. The MLC “capped savings” estimate suggests that the LED installation would drop the site’s annual usage by 81%. Billing data indicate that the site’s usage dropped post-installation by approximately 50%. DNV applied an additional 65% cap in the MLC Utility usage tab to bring the MLC estimate in line with the observed drop in usage. This adjustment is conservative because the customer survey revealed replacements of HVAC units on an as-needed basis, so the usage drop post-installation cannot be attributed to the lighting project alone.

The custom evaluation found some unusual situations in PY2024. One PA continues to claim accelerated replacement lighting projects with RUL consistent with the LED equipment installed (RUL=4 years). RUL should be estimated as one-third of the rated life of the equipment removed, meaning most lighting projects have RUL=5 years. The MLC usually reports RUL in the Executive Summary Reporting tab, but the MLCs submitted for the sampled projects had blank RUL. DNV corrected the RUL for each of the sampled projects, but the PA submitted other (non-sampled) lighting projects with RUL=4 years.

Another PA installed a lighting-only project at an outdoor space with light poles connected to multiple meters. To comply with the CEDARS requirements that savings be connected with specific meters, this project was claimed in “pieces,” one per meter, with savings for each “project piece” matching the fraction of total usage corresponding to that meter. Unaware of this, the Group D sampling strategy selected only certain “project pieces” for evaluation. DNV assessed the lighting project in its entirety, confirmed with the documentation that the other “pieces” belonged together, and informed the expansion analysis of the need to apply the evaluation results to all project “pieces,” whether sampled or not.

Each individual lighting-only CCT discusses the source of discrepancies between evaluated and claimed savings.

Overall, in PY2024, the lighting-only projects present relatively limited discrepancies between evaluated and claimed savings:

Twenty of the 22 lighting-only projects sampled in PY2024 were claimed as accelerated replacement. The evaluation confirmed accelerated replacement. Adjusting an accelerated replacement project to a normal replacement project is a source of major savings adjustments in previous evaluation cycles; this was not observed in PY2024.

3.3 Net savings methods

DNV's net evaluated savings plan was built on prior experience with custom project attribution research in California. Our team continued to use the 2015 NTG survey instruments it used in the previous evaluation (PY2023), with some deletions of questions and changes in question wording based on discussions with CPUC staff. These changes were designed to both reduce respondent fatigue by removing duplicative or previously unused questions and tailor the remaining questions to help better understand how the CIAC programs did or did not influence energy efficiency projects. A better understanding of the levers of program influence and their relative effectiveness allows the DNV team to make more informed recommendations as to how CIAC program attribution could be improved in the future.

3.3.1 NTG data collection

The DNV team employed a variety of methods to administer the different survey instruments. For the largest savers and most complex projects, we conducted enhanced rigor interviews with several entities involved in the project. These included primary decision-makers, CFOs, vendor representatives, utility account executives, program staff, and other decision influencers, along with a review of market data to establish an appropriate baseline.

We used project size, as measured by program incentives, to categorize projects into basic rigor, standard rigor, or enhanced rigor categories. The study assigned projects to rigor categories based on the following criteria:

- **Enhanced rigor**: Projects in the top 10% based on incentive amount, including those with important measures or high complexity (e.g., a mix of measure application types). While project size and complexity are often correlated, this is not always the case.
- **Standard rigor**: The next quartile of projects in terms of incentive amounts after those in the enhanced rigor category.
- **Basic rigor**: All remaining projects that did not qualify for the enhanced rigor or standard rigor categories.

However, after this initial assignment, the DNV team had the discretion to reassign projects to another rigor category. For example, in the current evaluation, we reassigned the project, the largest project in the basic rigor category, to the standard rigor category.

The gross and net savings teams collaborated to shorten the time between completing the gross savings analysis and the net savings analysis. This is crucial because if projects claiming AR have evaluated NTGRs at or below 0.5, the gross savings invalidate the AR MAT and establish a different baseline for their analysis.

Our sampling approach aimed to complete NTG surveys/interviews with the entire population of embedded projects. Previous evaluations showed that DNV staff achieved a much higher survey/interview completion rate than the CATI firm. Therefore, in the current round, we completed NTG surveys/interviews with the approximately 46 embedded projects and 13 net-only projects. The original net sample design targeted 71 participants. Due to difficulties obtaining survey responses, we completed and used 61 in the NTG analysis.

DNV's data collection approach varied based on the NTG rigor assigned to each project:

- **Basic rigor**: Participants in this group received NTG surveys containing all the key questions used for NTG scoring in the standard/enhanced rigor interview guides, but with fewer follow-up questions for qualitative elaboration and generally shorter, simpler question batteries.

- **Standard rigor**: Participants in this group underwent in-depth interviews with more complex and comprehensive question batteries than the basic rigor surveys. Additionally, two different evaluators reviewed almost all standard rigor evaluations.
- **Enhanced rigor**: Participants in this group received in-depth interviews nearly identical to those for standard rigor participants. However, due to their greater size, enhanced rigor projects have often required NTG interviews with multiple project decision-makers. Enhanced rigor also included a similar quality control approach as described above for standard rigor.

As previously mentioned, DNV revised the survey instruments to both reduce the respondent fatigue and improve our understanding as to what levers of program intervention—e.g., financial assistance vs. technical assistance—were more influential in moving energy efficiency projects forward. In addition, based on feedback from the PAs in an earlier NTG study, we added a question that allowed the interview respondents to self-rate their level of recall of the project being evaluated. The following is a summary of some of the changes we made in the NTG interview guides for PY2024:

- **Added question about project recall:** Based on PA recommendations, we asked the project decision-makers to self-rate their level of recall of the evaluated project using a five-point Likert scale.
- **Removed project background questions that were duplicative, time-consuming, or of limited value:** In collaboration with CPUC staff we eliminated some project background questions that had greatly lengthened previous interviews without contributing much to our understanding of how the program influenced the specific projects. One example of a question that we removed from the interview guides was: "Could you describe your project development decision-making structure?" In past interviews this question could lead to lengthy responses about general decision-making structures and processes which were only tangentially related to the project being evaluated and which reduced the amount of time that the interviewee would be willing to stay on the phone for more relevant project-specific questions. We also eliminated some project background questions that covered baseline or MAT scenarios, since the gross savings interviews were already covering these topics.
- **In the standard/enhanced rigor interview guides we added some follow-up questions for instances where program activities had received low influence ratings:** In past standard/enhanced rigor interview guides we had only asked follow-up questions seeking more information if the project decision-makers had given a high influence rating for program activities such as paying financial incentives or providing technical assistance. However, the CPUC staff and DNV were also interested in learning more about scenarios where the project decision-makers had given the program activities low influence ratings, and so we added follow-up questions for these responses also.
- **In the standard/enhanced rigor interview guides we removed follow-up questions that were time consuming or of limited value:** One example of a question that we eliminated was: "How do you identify standard practices in your industry?" Both the CPUC staff and DNV determined that many project decision-makers might not know how to answer this question, and those that did might consume too much of the limited interview time responding to a question that was very tangential to the key questions about how the energy efficiency program influenced the project in question.
- **Added questions about which categories of program influence were more important:** In past evaluations, the interviewers asked project decision-makers to allocate a total of 10 points between program-related project drivers and non-program related drivers. Their responses to this question formed the basis of the NTG scoring factor PAI-2. For the NTG interview guides used for the PY2024 evaluation, DNV and the CPUC staff decided to add a few questions to better understand which levers of program influence were more important than others. The new follow-up questions asked the project decision-makers to allocate 10 points between three categories of possible program influence: 1) technical expertise, 2) functional support for more efficient operations and greater productivity, and 3) financial assistance.
- **Removed questions about justifications for counterfactual scenarios:** To reduce respondent fatigue, the CPUC staff and DNV decided to eliminate a couple of follow-up questions to the counterfactual question N6: "Now I would like you to think one last time about what action you would have taken if the program had not been available. Supposing that you had not installed the program qualifying equipment, which of the following alternatives would you have been MOST likely

to do …?" In prior evaluations, once the project decision-maker had selected a counterfactual scenario from a list of options in question N6, the NTG guide had asked them the follow-up questions: 1) "Did you research, analyze, or evaluate the technical and financial aspects of the alternative action of (insert question N6 response) you would have likely taken?" and 2) "Why do you think you would have taken that action?" DNV and CPUC staff decided to eliminate these follow-up questions to reduce the length of the NTG interviews and also because while the N6 question was useful for better understanding counterfactual scenarios for the projects, it was not used in the NTG scoring.

- **Eliminated most of the firmographic questions:** In past evaluations, the NTG interview guides had asked a long series of firmographic questions. DNV and the CPUC staff decided to remove most of these questions to reduce the length of the interview (the questions came at the end of a long interview when the project decision-makers were likely fatigued). In addition, much firmographic information was available elsewhere (e.g., in the CEDARs database and project documents) and furthermore the evaluators had used this firmographic information very sparingly in the past.

3.3.2 NTGR estimation approach and scoring

DNV used three scores to calculate the NTGR:

- **Program attribution index 1 (PAI-1):** This score reflects the influence of the most important program and program-related elements in the customer's decision to select the specific program measure. It also includes program influence through vendor recommendations. The final PAI-1 score is based on the highest rating for a program influence factor divided by the sum of the highest rating for a program influence factor and the highest rating for a non-program influence factor. As part of the NTGR re-alignment, we updated the scoring approach to account for the addition of the N6 battery of questions, which asks respondents about what alternative actions they would have taken if they had not participated in the program. The scoring from the N6 battery is based on the following question, "On a 0-to-10 scale of likelihood, how likely it is that you would have implemented the [ALTERNATIVE ACTION] if you had not installed the program qualifying equipment?"
- **Program attribution index 2 (PAI-2):** This score captures the perceived importance of the program (whether rebate, recommendation, training, or other program intervention) relative to non-program factors in the decision to implement the specific measure that was eventually adopted or installed. The survey instrument asked respondents to assign importance values to both program and non-program influences so that the two totalled 10. The DNV team adjusted the PAI-2 score (i.e., divided by 2) if respondents had already decided to install the specific program-qualifying measure before learning about the program.
- **Program attribution index 3 (PAI-3):** This score captures the likelihood that the customer would have selected the exact same equipment if the program had not been available (the counterfactual). We calculated the PAI-3 score as 10 minus the likelihood of installing the same equipment.

The average of these three program attribution index scores produced the NTGR. For the PY2024 evaluation we did not change the calculation methods for these three factors. However, as discussed above, we did add some follow-up question to the PAI-2 battery of questions to better understand which levers of program influence (e.g., financial incentives vs. technical assistance) were more influential in moving projects forward.

3.4 Total system benefit approach

The CPUC adopted TSB as the new goal metric for energy efficiency programs starting in PY2024. TSB assigns a dollar value to the lifecycle energy, capacity, and greenhouse gas benefits of a program, encouraging "high value" load reduction and longer-duration energy savings while being fuel agnostic. The approach DNV used is internally consistent with that used to produce the program wide energy savings estimates described earlier. The two steps to estimating statewide TSB estimates included:

- Calculating TSB savings for each site by updating the forecasted estimate of project level TSB impacts with the evaluated savings estimates, MAT or EUL changes based on evaluation observations, and net to gross results.
- Like the energy savings results, the site level TSB results were expanded using impact sample design weights to produce a statewide TSB estimate.

4 RESULTS

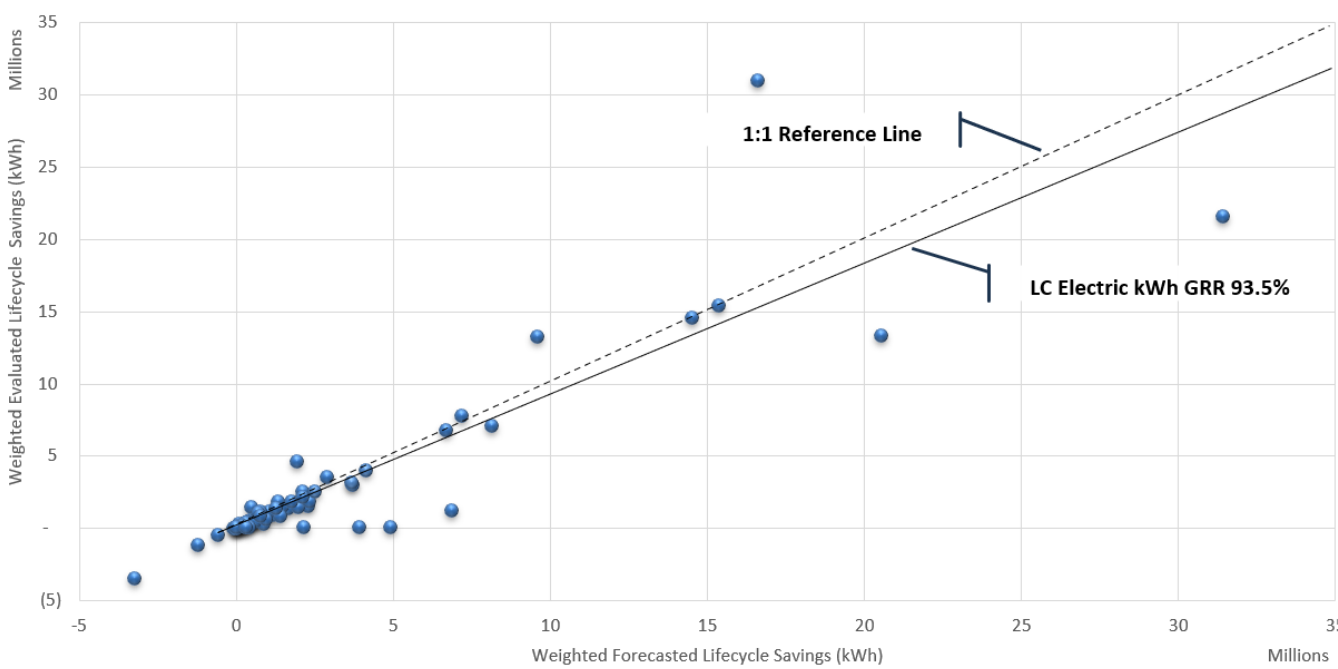
In this section, we present our findings related to gross and net savings by key reporting dimensions. This section also includes the impact of baseline changes, reasons for differences in gross savings, and a comparison of findings to those from previous impact evaluations. Below, we have included our examination of the reliability, sensitivity, and drivers of the NTGR, which measures the program's influence on participants' decisions to implement efficiency measures.

4.1 Gross electric savings and realization rates

This section provides gross electric savings and realization rates results. Figure 4-1 compares the weighted forecasted and evaluated lifecycle electric energy savings for all sites in the final sample. The diagonal dashed line indicates where each sample point would have been plotted had the forecasted estimates been 100% accurate. The points below the dashed line represent sites with evaluated savings less than the forecasted estimate, while those above the line are instances where evaluated savings were larger than the forecasted estimates. This view shows that many sites cluster along or near the 1:1 reference line, indicating generally accurate forecasting of lifecycle savings. While a subset of sites (36) fell below the 1:1 line and reduced overall performance, the portfolio achieved an overall LC Electric kWh gross realization rate (GRR) of 93.5%. Although far fewer than last year, the sites below the 1:1 line includes three with zero savings.

Note there are also three projects with negative savings. These are HOPPS projects that claimed negative first-year and lifecycle kWh. These projects were in their final year of implementation, and the negative savings represent a true up from claimed savings in prior years that were not realized.

Figure 4-1. Weighted lifecycle electric gross energy savings scatterplot (all sites)



4.1.1 Gross savings results by finance type

Table 4-1 summarizes the first-year and lifecycle forecasted savings, evaluated savings, GRR, and relative precision for projects that received and did not receive On-Bill Financing (OBF). Statewide, the PAs achieved 26,399 MWh of gross first-year energy savings and 2,888 kW of gross first-year demand savings, with 92% and 94% GRRs, respectively. Statewide lifecycle savings behaved similarly, producing 194,902 MWh in lifecycle energy savings, with an 93% GRR.

OBF projects performed well, with an 89% first-year GRR, while the non-OBF GRR was higher at 95%. In PY2023, OBF projects had a first-year GRR of 115%. Those projects were limited to lighting-only projects, which follow a largely prescriptive approach, requiring little correction. In PY2024, OBF projects accounted for approximately 76 of the 158 (48%) projects that claimed savings. Of the 76 OBF projects, 49 were lighting and 27 were non-lighting. Custom non-lighting projects used on-site data collection, such as BMS or billing data, to update usage and savings, resulting in lower realization rates when comparing PY2023 to PY2024.

Table 4-1. Statewide gross electric energy and demand savings results by finance type

Subject area/ finance type	First-year				Lifecycle			
	Forecasted savings	Evaluated savings	GRR	Relative precision*	Forecasted savings	Evaluated savings	GRR	Relative precision*
Energy (MWh)								
Non-OBF	12,220	11,650	95.3%	±3.5%	94,283	89,909	95.4%	±3.5%
OBF	16,583	14,748	88.9%	±5.5%	114,207	104,993	91.9%	±4.9%
Statewide	28,803	26,399	91.7%	±3.4%	208,489	194,902	93.5%	±3.1%
Demand (kW)								
Non-OBF	1,643.4	1,694.0	103.1%	5.1%	14,429.9	15,496.9	107.4%	13.7%
OBF	1,415.7	1,194.5	84.4%	8.5%	9,227.0	9,554.0	103.5%	6.7%
Statewide	3,059.2	2,888.5	94.4%	4.6%	23,656.9	25,050.9	105.9%	8.9%

*Relative precision at the 90% confidence interval

4.1.2 Gross savings results by PA

Table 4-2 summarizes the first-year and lifecycle energy and demand forecasted savings, evaluated savings, GRR, and relative precision at the PA level. We present all results at the 90% confidence interval. A discussion of the drivers of the electric energy realization rates by PA follows the table.

Table 4-2. Statewide gross electric energy and demand savings results by PA with outlier

PA	First-year				Lifecycle			
	Forecasted savings	Evaluated savings	GRR	Relative precision*	Forecasted savings	Evaluated savings	GRR	Relative precision*
Energy (MWh)								
MCE	335	345	102.9%	±38.3%	1,511	1,993	131.9%	±39.0%
PG&E	12,745	10,666	83.7%	±5.2%	87,606	67,496	77.0%	±4.3%
SCE	9,153	9,024	98.6%	±6.9%	77,466	86,465	111.6%	±5.8%
SoCalREN	498	370	74.2%	±7.1%	2,988	1,517	50.8%	±23.0%
SDG&E	6,071	5,994	98.7%	±5.3%	38,918	37,431	96.2%	±3.8%
Statewide	28,803	26,399	91.7%	±3.4%	208,489	194,902	93.5%	±3.1%
Demand (kW)								
MCE	30	52	172.9%	±37.1%	143	304	213.0%	±34.8%
PG&E	1,273	1,065	83.6%	±10.3%	8,782	8,965	102.1%	±23.7%
SCE	960	1,006	104.8%	±7.0%	8,368	9,894	118.2%	±6.1%
SoCalREN	40	44	109.6%	±1.4%	245	147	60.0%	±18.4%
SDG&E	756	721	95.4%	±2.4%	6,119	5,742	93.8%	±1.5%
Statewide	3,059	2,889	94.4%	±4.6%	23,657	25,051	105.9%	±8.9%

*Relative precision at the 90% confidence interval

First-year electric energy gross realization rates by PA ranged from 103% to 74%, with a statewide GRR of 94%. Drivers of the various PA first-year rates are summarized below.

- **PG&E**, representing approximately 44% of statewide forecasted first-year electric energy savings, had a first-year electric energy GRR of 84%, with a relative precision of ±5%, and a lifecycle electric energy GRR of 77% ±4%. Of the 19 sampled projects with electric savings, 11 projects had savings greater than forecasted (ranging from 100% to 231%), and eight projects had savings that were less than 100% of what was forecasted. This included one zero-saver site which the evaluation found that the installed VFDs were not programmed or commissioned to modulate the CAH fan speed. Therefore, the claimed measure was not operational.
- **SCE**, representing approximately 32% of statewide forecasted first-year electric energy savings, had a first-year electric energy GRR of 99%, with a relative precision of ±7%, and a lifecycle electric energy GRR of 112% ±6%. Of the 20 sampled projects for SCE, 13 projects had first-year electric energy GRRs ranging from 100% to 174%. Three of the 13 projects had upwards adjustments due to operating conditions. Seven of the sampled projects had savings adjustments that resulted in GRRs of less than 100%. This included two projects installed at wastewater facilities that received zero savings, one that found that the facilities operational practices increased electric power needs, and the other in which the control system was taken out of operation shortly after commissioning.
- **SDG&E**, representing approximately 21% of statewide forecasted electric energy first-year savings, had a first-year electric energy GRR of 99%, with a relative precision of ±5%, and a lifecycle electric energy GRR of 96% ±4%. Of the thirteen SDG&E projects sampled, nine were evaluated to have savings of 100% or greater, ranging from 100% to 109%. Four projects were found to have realization rates of less than 100%. Three of the four projects were whole building projects that adjusted the savings downward due to differences adjustment in the lighting power density (LPD). The fourth project was adjusted downward due to differences in the calculation methods.
- **MCE** and **SoCalREN**, collectively representing approximately 3% of statewide forecasted first-year MWh, had first-year energy GRRs of 103% and 74%, respectively. For MCE, all but one site were lighting projects. Comparatively, SoCalREN only had one lighting-only site.

– For the three MCE projects sampled, first-year electric kWh GRRs ranged from 65% to 223%. The lifecycle kWh GRR for MCE is higher than the first-year GRR, as the RUL was corrected to reflect 1/3 equipment life for the removed lamps.
– For the four SoCalREN projects sampled, first-year electric kWh GRRs ranged from 14% to 101%. Three projects were adjusted downward due to the difference in evaluated operating conditions, while one project was adjusted upward due to differences in calculation methods.

The bullets below describe drivers of the 2024 electric lifecycle GRRs by PA.

- **PG&E**, representing approximately 42% of statewide forecasted lifecycle electric energy savings, had an electric energy GRR of 77%. Seven projects were found to have lifecycle GRRs of less than or equal to 68%, with a weighted average of 19%. One project which had a first-year GRR of 100% and a lifecycle GRR of 68% contributed to the difference between PG&E's first-year GRR (84%) and lifecycle GRR (77%).
- **SCE**, representing approximately 37% of statewide forecasted lifecycle electric energy savings, had an electric energy GRR of 112%. Three projects had a lifecycle GRR of greater than 100%. One project found that the evaluated savings are higher than the reported savings due to a correction in both the operational data and the savings normalization methodology. Another project was evaluated using interval data to calculate savings. For the third project, the evaluation used an updated measure efficiency based on updated trend data.
- **SDG&E**, representing approximately 19% of statewide forecasted lifecycle electric energy savings, had an electric energy GRR of 96%. These results are in line with PY2023 (94% GRR). Four projects were found to have realization rates of less than 100%. Three of the four projects were whole-building projects that adjusted the savings downward due to differences in the lighting power density (LPD). The fourth project was adjusted downward due to differences in the calculation methods.
- **MCE** and **SoCalREN**, collectively representing less than 3% of statewide forecasted lifecycle electric energy savings, had an electric energy GRRs of 132% and 51%, respectively. The lifecycle GRRs are being driven by adjustments to the PA-claimed EUL and RUL of lighting measures. The evaluation adjusted EUL and RUL values if the PA-claimed values were incorrect (for example: RUL=4 instead of RUL=5 for a project replacing HIDs) or when the rated measure life, in conjunction with the evaluation- or DEER-based HOU, required the EUL/RUL to be capped (for example: HOU=5,000 hours combined with an LED rated life of 50,000 hours caps the EUL at 10 years).

4.1.3 Gross savings results by measure type

Table 4-3 summarizes the statewide first-year and lifecycle forecasted electric energy savings, evaluated savings, GRR, and relative precision for "Lighting Only" and "Other" projects. As the name suggests, "Lighting Only" means a Project ID includes only lighting claims. "Other" means a project includes HVAC, process, or whole-building measures. These projects may include lighting measures, but do not only include lighting measures. As mentioned above, lighting-only projects performed well, with a first-year electric energy GRR of 98% (compared to 89% in PY2023) and demand gross realization rate of 113% (compared to 78% in PY2023). Lifecycle energy lighting and other gross realization rates are 75% and 101%, respectively.

Three projects representing approximately 11% of total claimed lifecycle kWh contributed to the lifecycle energy GRR being lower than the first-year energy GRR (98% compared to 74%). All three projects had EULs and/or RULs capped based on on-site findings.

For the "Other" category, one project representing approximately 5% of forecasted lifecycle savings and 10% of evaluated lifecycle contributed to the difference in first-year and lifecycle GRRs (89% versus 100%). This project had a first-year GRR of 96% and a lifecycle GRR of 137% due to adjustments in the operating conditions found during the evaluation.

Table 4-3. Statewide gross electric energy and demand savings results by measure type

Measure type	First-year				Lifecycle			
	Forecasted savings	Evaluated savings	GRR	Relative precision*	Forecasted savings	Evaluated savings	GRR	Relative precision*
Energy (MWh)								
Lighting only	7,472	7,309	97.8%	±3.1%	58,937	44,243	75.1%	±2.5%
Other	21,331	19,090	89.5%	±4.6%	149,552	150,659	100.7%	±3.9%
Statewide	28,803	26,399	91.7%	±3.4%	208,489	194,902	93.5%	±3.1%
Demand (KW)								
Lighting only	280	316	112.7%	±6.1%	2,247	2,259	100.5%	±4.8%
Other	2,779	2,573	92.6%	±5.1%	21,410	22,792	106.5%	±9.7%
Statewide	3,059	2,889	94.4%	±4.6%	23,657	25,051	105.9%	±8.9%

*Relative precision at the 90% confidence interval

4.1.4 Discrepancy analysis

This section presents an analysis of the savings adjustments that account for differences between forecasted and evaluated electric savings estimates for the sampled projects. Note that this analysis is based on adjustments associated with first-year gross savings. Table 4-4 describes the factors that may have impacted a project.

Table 4-4. Savings adjustment factors

Discrepancy factor	Description
Tracking data	Differences attributed to incorrect adjustments or unexplained changes to savings between completion of the forecasted savings analysis and claimed savings entered into the PA tracking system
Ineligible measure	Measure approval by the PA is not consistent with CPUC policies, guidance, and rulebook eligibility
Measure count	Differences attributed to the number of units used to forecast savings not consistent with the number of units operating at the time of evaluation
Inappropriate baseline	Represents a difference in evaluated and reported baselines, including a different standard practice, code, or pre-existing baseline
Inoperable measure	Measure no longer operating at the time of evaluation, whether decommissioned or removed from site
Operating conditions	Evaluator M&V or collected trend data informs different operating parameters, including hours of use, setpoints, efficiency, etc.
Calculation methods	Differences attributed to changes in the calculation methodology between the forecasted savings and evaluated savings analysis. The evaluator only changed analysis methodology when necessary to accurately calculate savings, such as employing an 8,760 model.)

When DNV revised gross evaluated impacts for a project from forecasted savings, we recorded and ranked the associated adjustment factors. Some projects had only one discrepancy factor. For example, we would categorize an ineligible project (due to a policy violation or ineligible measure) as having a single discrepancy. If there were multiple factors (e.g., evaluated parameters were different from the operating parameters and adjustments were made to baseline conditions), we ranked the discrepancies from most to least impactful and recorded their associated impact as a percentage of savings increased or reduced to accurately report on the impact of each discrepancy. We classified discrepancy factors into seven categories, as presented in Table 4-5, which shows the number of instances a given discrepancy occurred and its impact on overall GRRs in the electric sample.

Table 4-5. Key drivers of electric GRR

Discrepancy category	Negative impact		Positive impact		Overall	
	# instances	Impact on GRR	Impact on GRR	# instances	Impact on GRR	# instances
Tracking data discrepancy	1	<-1%	<1%	1	<-1%	2
Ineligible measure	0	0%	0%	0	0%	0
Measure count	3	<-1%	0%	0	<-1%	3
Inappropriate baseline	0	0%	0%	0	0%	0
Inoperable measure	2	-5%	0%	0	-5%	2
Operating conditions	16	-12%	8%	9	-3%	25
Calculation method	3	-1.6%	3%	7	1.1%	10
Other	0	0%	0%	0	0%	0
Total	**25**	**-19%**	**11%**	**17**	**-8.3%**	**42**

The following discrepancies were both the most frequent and had the largest impact on first-year gross savings:

- **Operating conditions** for primary equipment, which the DNV team often verified as different from the operating conditions at the time of initial implementation. Changes in HOU, observed load, control settings, or equipment efficiency were often the primary drivers in adjusting evaluated savings. Sixteen projects had differing operating conditions that negatively impacted evaluated savings, while 9 projects had differing operating conditions that positively impacted evaluated savings, with a net impact of -3%.
  - One project, which was an agricultural pump system overhaul (250 to 499 HP), was found to have a project-level GRR of 70% for first-year electric savings. The claimed savings were based on a model that used 3 years of production data. The evaluator was able to obtain an additional 2 years of production data, which resulted in a lower evaluated savings.
  - Another example is a project that installed an ammonia-based aeration control (ABAC) system at a wastewater treatment facility to enhance the existing dissolved oxygen (DO) control strategy and improve blower energy performance in the secondary treatment process. The system was designed to provide additional blower turndown capability by adjusting aeration in response to ammonia levels, supplementing the facility's existing DO-based controls. The evaluation found that the control system was installed and operating consistently with its intended design, including periodic resetting of DO levels. However, operational practices at the facility—specifically operating blowers at higher airflow rates to mitigate algae growth in the aeration basins—resulted in higher blower flow and power (kW) than assumed in the original savings analysis. Because the ex-post analysis was based on metered blower power data reflecting actual operating conditions, the evaluated results show no realized electric energy savings from the project during the reporting period, resulting in a realization rate of 0% for first-year and lifecycle electric energy savings.
  - Another example is a wastewater treatment project that resulted in a GRR of greater than 100%. This project involved the installation of chemically enhanced primary sedimentation (CEPS) on two primary clarifiers (Unit 1 and Unit 2S) at a wastewater reclamation plant. The measure is designed to reduce biological oxygen demand (BOD) and increase solids removal through chemical treatment in the primary treatment stage, thereby decreasing the downstream oxygen demand and reducing the need for mechanical aeration from secondary treatment blowers. The interactive effects (IR) calculation model was used to estimate savings by modeling both baseline and installed conditions. The model applied identical wastewater volume assumptions and aeration airflow relationships in both cases, relying on standard wastewater engineering equations to estimate required blower airflow (SCFM) and corresponding power

(kW) based on wastewater characteristics and required BOD and ammonia removal. However, baseline blower kW was not metered; only post-installation (installed-case) blower kW data were available.

The evaluation found that the modeled installed blower kW did not align well with the metered installed kW. To improve accuracy, the evaluator calibrated the installed-case model to better match observed annual blower energy use, achieving agreement within approximately 8% of annual metered kWh. Calibration was performed by adjusting selected engineering parameters within the oxygen transfer equations—specifically the fouling factor (F) and Standard Oxygen Transfer Efficiency (SOTE). The fouling factor was adjusted from 0.65 to 0.55, and SOTE was adjusted from 20.7% to 15% for one unit and from 25.5% to 16.5% for a second unit, resulting in a GRR of 186%.

- **Inoperable measures** were the second most impactful discrepancy. DNV found a total of two projects had missing or inoperable measures at the time of evaluation, resulting in an overall reduction of 7% to the first-year electric GRR.
  - For one project, as confirmed with the site-contact, the site removed Aeration-Based Ammonia Control (ABAC) and Internal Mixed Liquor (IML) controls shortly after installation, putting back into operation a pre-existing dissolved oxygen (DO) control. The installed ABAC system cut down oxygen in the wastewater system so much that the bacteria in the tank died, leaving sewage improperly treated. After observing the TSS (Total Suspended Solids) levels, the site analyzed effluent under a microscope to find significantly reduced live cells. The site contact indicated that after reverting the ABAC controls to pre-existing DO operation, the IML system is no longer in operation. This project had a first-year electric energy realization rate of 0%.
  - Another project, implemented at a data center, involved retrofitting constant-speed Computer Air Handling (CAH) units on the first floor with variable frequency drives (VFDs) to reduce fan energy use by modulating airflow in response to cooling demand. Based on a review of 12 months of post-installation trend data, the evaluation found no evidence of fan speed modulation. The CAH units operated at consistent fan speeds, indicating that the VFDs were not commissioned or configured to actively control fan operation as intended. In addition, the evaluation confirmed that the information technology (IT) load previously served by the affected area has since been relocated from the building. Given the absence of demonstrated fan speed control and the change in facility load conditions, the evaluation did not approve energy savings for this measure, resulting in a 0% GRR for electric savings.

4.1.5 Comparison to previous evaluation findings

Table 4-6 compares the 2024 estimates of electric lifecycle GRR by PA and statewide to prior evaluations. There is substantial variability across PAs and years, particularly in 2020/2021 which saw SCE with an 83% lifecycle GRR and SDG&E with 17%. SDG&E shows the most dramatic swing over time, improving from 17% (2020/2021) to 94–96% (2023–2024). This study of PY2024 shows notably high achievement rates, with MCE (132%) and SCE (112%) exceeding 100% and a statewide GRR estimate of 94%.

Table 4-6. Statewide electric lifecycle GRR results by program year and PA

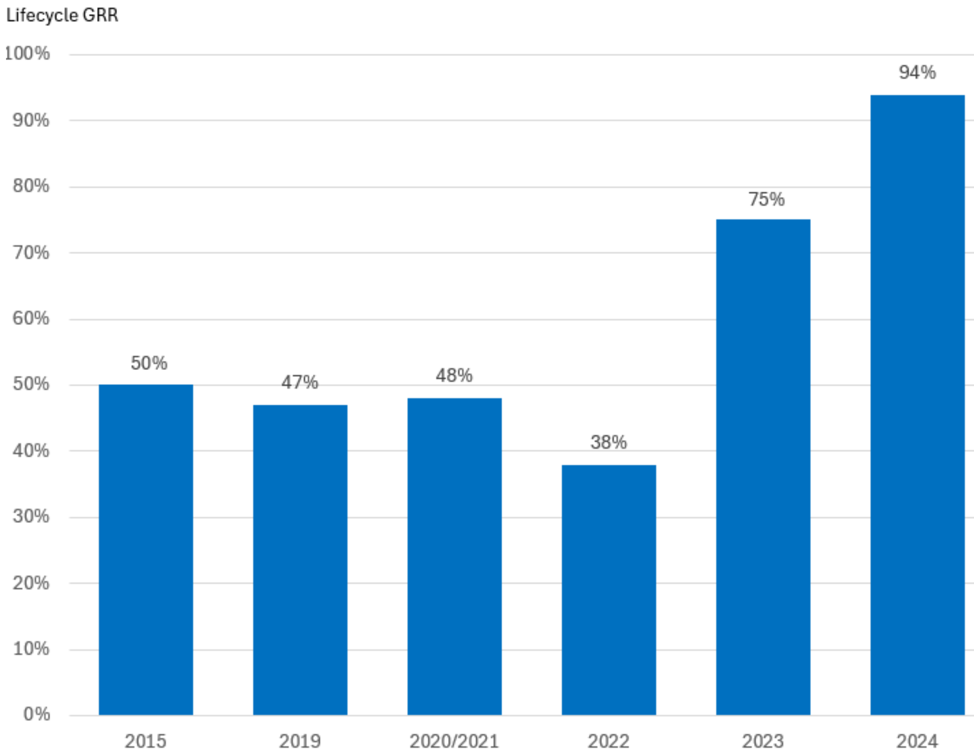
Program Year	MCE	PG&E	SCE	SDG&E	Statewide
2015	N.A.	52%	46%	52%	50%
2019	78%	48%	47%	41%	47%
2020/2021	31%	49%	83%	17%	48%
2022	31%	39%	N.A.	35%	38%
2023	36%	63%	87%	94%	75%
2024	132%	77%	112%	96%	94%

Figure 4-2 graphically shows the statewide lifecycle GRRs since 2015 presented in the table above. The statewide gross realization rate remained relatively stable between 2015 and 2022, fluctuating between 38% and 50% with a notable dip in

2022. However, the rate increased significantly in 2023 and 2024, reaching 75% and 94% respectively, indicating a strong upward trend in recent years.

Key drivers of lower realization rates observed in earlier evaluation cycles appear to have diminished in this cycle. For example, the PY2022 study found that ineligible measures and baseline adjustments were the primary factors lowering GRRs, with 28 such discrepancies identified; in contrast, the PY2023 evaluation found only six occurrences, while the PY2024 evaluation found no occurrence of ineligible measures. Reductions in ineligible measures have had an outsized impact on realization rates because these cases result in sites with zero savings.

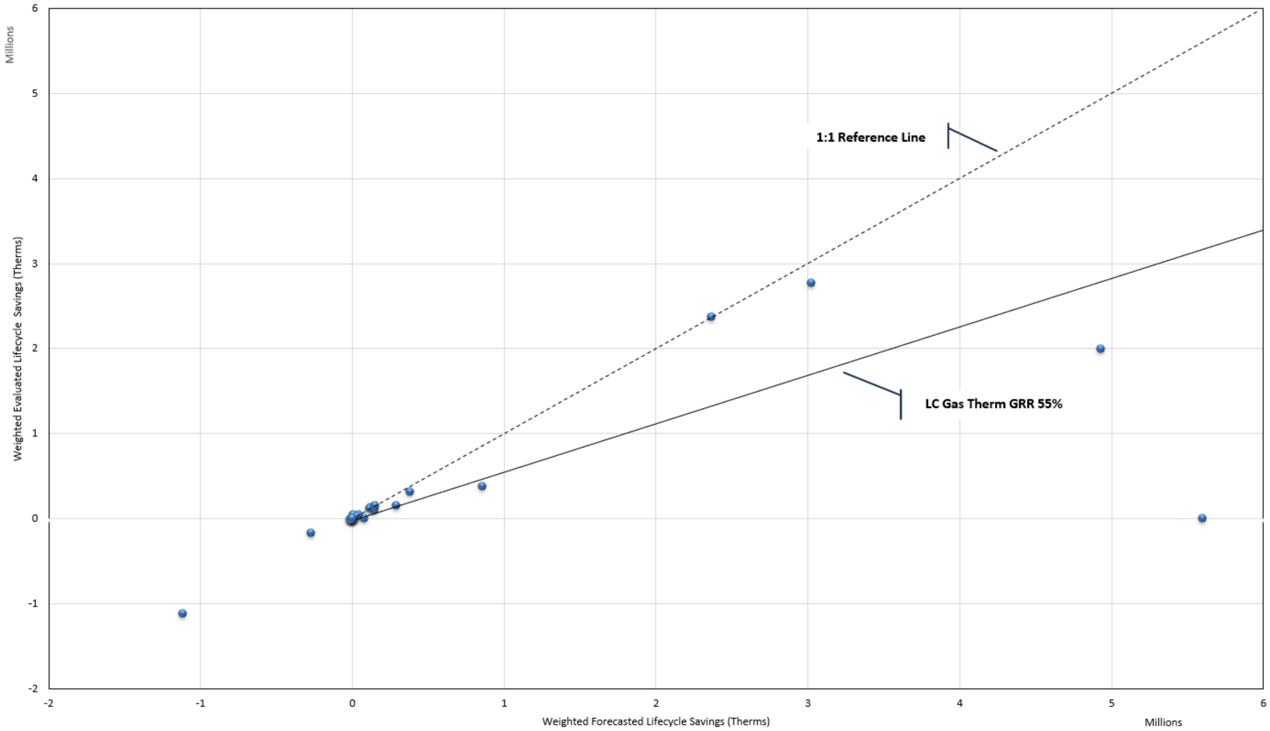
Figure 4-2. Statewide electric energy lifecycle GRR results by program year



4.2 Gross natural gas savings and realization rates

This section provides gross gas savings and realization rates results. Figure 4-3 compares the weighted forecasted and evaluated lifecycle gas energy savings for all sites in the final sample. As with the electric results, the diagonal dashed line represents the 1:1 reference line, indicating where projects would fall if forecasted savings were perfectly realized. Points below the dashed line reflect sites where evaluated savings were lower than forecasted, while points above indicate evaluated savings exceeded forecasts. In this case, several large underperforming projects, including one with zero savings and one with very low savings, pull the trend line well below the 1:1 reference, resulting in an LC gas therm gross realization rate (GRR) of 55%. These two projects are discussed further below. Although many projects cluster near the reference line, a small number of significant shortfalls materially reduced overall portfolio performance.

Figure 4-3. Weighted lifecycle gas gross energy savings scatterplot (all sites)



4.2.1 Gross savings results by subject area

Table 4-7 summarizes natural gas first-year and lifecycle forecasted savings, evaluated savings, GRR, and relative precision at the statewide level and for each subject area. Statewide, the PAs achieved 1.1 million therms of gross first-year savings with a 50% GRR. Statewide lifecycle savings performance was similar, producing 8.6 million therms in lifecycle energy savings, with a 55% GRR.

Non-OBF projects had a first-year GRR of 47% with a relative precision of 12.4%. Of the 17 non-OBF sampled projects that claimed first-year gas savings, two projects in particular contributed to the low realization rate. One project involved the installation of a geothermal heating system. While the geothermal system itself is operational, the greenhouse it was designed to serve was destroyed by a severe windstorm in Fall 2024 and has not been rebuilt. As a result, the space remains unoccupied and has no heating demand. Consequently, the geothermal system has not displaced any natural gas consumption and has not delivered useful thermal energy to a conditioned space during the evaluation period. Because no heating load exists and no fossil fuel use has been avoided, the project achieved zero realized energy savings during the reporting period.

The second project involved an upgraded catalyst configuration in the Steam Methane Reforming (SMR) process to improve High-Temperature Shift Reactor (HTSR) performance and reduce natural gas use by lowering the steam-to-carbon ratio. Evaluated savings were lower than claimed due to smaller observed efficiency gains, lower average hydrogen production, the use of changepoint regression modeling, and higher post-installation gas use at production levels below 80 MMSCFD.

Because these projects accounted for 63% of total PY2024 claimed gas savings, the unweighted combined GRR of 33% significantly reduced the overall statewide GRR.

Table 4-7. Statewide gross natural gas energy savings results by subject area

Subject area/ finance type	First-year				Lifecycle			
	Forecasted savings (thousand therms)	Evaluated savings (thousand therms)	GRR	Relative precision*	Forecasted savings (thousand therms)	Evaluated savings (thousand therms)	GRR	Relative precision*
Non-OBF	1,930.0	916.4	47.5%	±12.4%	14,935.7	8,043.0	53.9%	±12.5%
OBF	205.2	148.2	72.2%	±10.6%	585.5	517.6	88.4%	±8.9%
Statewide	2,135.2	1,064.6	49.9%	±10.8%	15,521.2	8,560.6	55.2%	±11.8%

*Relative precision at the 90% confidence interval

4.2.2 Gross savings results by PA

Table 4-8 summarizes natural gas first-year and lifecycle forecasted savings, evaluated savings, GRR, and relative precision by PA. We present all results at the 90% confidence interval. The following bullets present the key drivers of the first-year gas realization rates by PA.

- **PG&E**, representing approximately 32% of total forecasted positive statewide first-year therm savings, had a first-year GRR of 83%, with a relative precision of ±3%. Of the 12 PG&E projects that claimed positive first-year gas savings, 8 projects were adjusted due to difference in operating conditions, 3 were adjusted due to difference in calculation methods. One project was found to be an ineligible measure. This project included the installation of a condensate recovery system at a chemical manufacturing facility. Although the measure was designed to reduce natural gas consumption by returning hot condensate to the boiler plant, its EUL was shorter than its simple payback period. Because program rules require EUL to exceed simple payback, and no documented exception was approved by the PA, the project did not meet eligibility requirements and was assigned zero savings.
- **SDG&E**, representing approximately 2% of forecasted positive statewide first-year therm savings, had a first-year GRR of 63%, with a relative precision of ±40%, and a lifecycle GRR of 91% with a relative precision of ±5%. Of the four sampled SDG&E projects that claimed first-year gas savings, three were HOPPS projects, two of which claimed negative gas savings.
- **SoCalGas**, representing approximately 66% of forecasted positive statewide first-year therm savings, had a first-year GRR of 34%, with a relative precision of ±24%. As noted above, SoCalGas had two projects that contributed to the lower than forecasted savings. One project involved the installation of a geothermal heating system. While the geothermal system itself is operational, the greenhouse it was designed to serve was destroyed by a severe windstorm in Fall 2024 and has not been rebuilt. As a result, the space remains unoccupied and has no heating demand. Consequently, the geothermal system has not displaced any natural gas consumption and has not delivered useful thermal energy to a conditioned space during the evaluation period. Because no heating load exists and no fossil fuel use has been avoided, the project achieved zero realized energy savings during the reporting period.

  The second project involved an upgraded catalyst configuration in the Steam Methane Reforming (SMR) process to improve High-Temperature Shift Reactor (HTSR) performance and reduce natural gas use by lowering the steam-to-carbon ratio from 2.87 to 2.77. Evaluated savings were lower than claimed due to smaller observed efficiency gains (13 vs. 30 Therms/MMSCF), lower average hydrogen production (90.9 vs. 101.1 MMSCFD), the use of changepoint regression modeling, and higher post-installation gas use at production levels below 80 MMSCFD.

- **MCE** and **SCE** claimed negative therm savings. These claims represent increases in gas usage attributable to the installation of high-efficiency lighting, which can increase heating loads.
- **SoCalREN** represented less than 1% of overall claimed gas savings. Of the three SoCalREN projects that claimed first-year gas savings, two were adjusted due to differences in operating conditions, and one was adjusted due to differences in calculation methods. Two of these projects claimed negative gas savings (attributable to the installation of high-

efficiency lighting, which can increase heating loads), while the third project claimed positive gas savings. The project that claimed positive gas savings had a first-year and lifecycle GRR of 35%. The negative GRR in the table below is reflective of the total net negative evaluated savings for all sampled projects, divided by the total net positive savings of the claimed savings.

The bullets below describe drivers of the 2024 gas lifecycle GRRs by PA.

- **PG&E**'s PY2024 lifecycle GRR of 88% was higher than PY2023 (79%) which was higher than PY2022's (−10%) but approaching the previous cycle of 91% (PY2020/2021) and much higher than the lifecycle GRRs of PY2019 (46%) and PY2015 (52%). Lighting projects drove the PY2022 negative realization rate, and gas usage can increase when energy efficient lighting measures require more facility heating.
- The **SoCalGas** lifecycle GRR in PY2024 of 20% was largely driven by two very large projects (discussed above in Section 4.2.2), one receiving a GRR of 40% and the other receiving now savings. This compares to a lifecycle GRR of 85% in PY2023 and PY2022's GRR of 94%.
- **SDG&E**'s PY2024 GRR was 91% compared to the PY2023 GRR of 110%. Of the four sampled SDG&E projects that claimed lifecycle gas savings, three were HOPPS projects, three of which claimed negative gas savings.
- **MCE** and **SoCalREN** had minimal gas claims and are not represented in the figure below.

The **statewide** lifecycle GRR for PY2024 was 55%, compared to PY2023's GRR of 86% and PY2022's GRR of 19%. The PY2022 value was also lower than previous years and was largely influenced by two projects. The PY2020/2021 evaluated GRR of 89% included a large savings project that accounted for over 90% of all gas savings.

Table 4-8. Gross natural gas energy savings results by PA

	First-year				Lifecycle			
PA	Forecasted savings (million therms)	Evaluated savings (million therms)	GRR	Relative precision*	Forecasted savings (million therms)	Evaluated savings (million therms)	GRR	Relative precision*
MCE	-0.4	-1.4	354.5%	±0.0%	-2.2	-8.8	403.5%	±0.0%
PG&E	683.2	569.5	83.4%	±2.8%	7,104.6	6,217.1	87.5%	±0.7%
SCE	-1.6	-1.5	94.0%	±0.0%	-13.5	-2.8	20.5%	±0.0%
SoCalREN	0.5	-0.1	-11.4%	±0.0%	0.0	-1.4	-9,380.6%	±0.0%
SDG&E	28.1	17.7	63.0%	±40.5%	939.4	858.8	91.4%	±5.5%
SoCalGas	1,425.5	480.3	33.7%	±23.6%	7,492.9	1,497.5	20.0%	±67.0%
Statewide	2,135.2	1,064.6	49.9%	±10.8%	15,521.2	8,560.6	55.2%	±11.8%

*Relative precision at the 90% confidence interval

4.2.3 Discrepancy analysis

This section presents DNV's analysis of the discrepancies that account for differences between forecasted and evaluated savings estimates for the sampled natural gas projects. Note that this analysis is based on discrepancies associated with first-year gross gas savings and has been categorized based on the factors described above in Table 4-4.

When DNV found gross evaluated impacts for a project were different than the forecasted savings, we recorded and ranked the associated discrepancy factors. Some projects had only one discrepancy factor. For example, we would categorize an ineligible project (due to a policy violation or ineligible measure) as having a single discrepancy. If there were multiple factors (e.g., evaluated parameters were different than the operating parameters and adjustments were made to baseline conditions), we ranked the discrepancies from most impactful to least impactful and recorded their associated impacts as percentages of savings increased or reduced. We classified discrepancy factors for natural gas into seven categories: tracking data, ineligible measures, measure counts, inappropriate baseline, ineligible measures, operating conditions, and calculation methods. Table

4-9 shows the number of instances a given discrepancy occurred, and its impact on overall gross realization rates in the electric sample. We noted a total of 20 discrepancy instances, with 14 causing a negative impact (−50.7% total) and 6 contributing to a positive impact (+0.6% total), leading to an overall net impact of −50.2% on the GRR.

Table 4-9. Key drivers behind natural gas GRR

Discrepancy category	Negative impact		Positive impact		Overall	
	# instances	Impact on GRR	Impact on GRR	# instances	Impact on GRR	# instances
Tracking data discrepancy	0	0%	0%	0	0%	0
Ineligible measure	1	<-1%	0%	0	<-1%	1
Measure count	1	0%	0%	0	0.0%	1
Inappropriate baseline	0	0%	0%	0	0.0%	0
Inoperable measure	1	-13%	0%	0	-13%	1
Operating conditions	9	-37%	0%	4	-34%	13
Calculation method	2	<-1%	<1%	2	-1%	4
Other	0	0%	0%	0	0%	0
Total	**14**	**-50.7%**	**0.6%**	**6**	**-50.2%**	**20**

The following discrepancies were both the most frequent and had the largest impact on first-year gross savings.

- Nine projects had **operating condition** changes that negatively impacted evaluated savings (−35%), while four projects were positively impacted.
  - One project involved upgrading the catalyst configuration within the facility's chemical process to improve efficiency and reduce natural gas consumption. Specifically, the project optimizes the Steam Methane Reforming (SMR) process by enhancing the performance of the High-Temperature Shift Reactor (HTSR). Located downstream of the primary reformer, the HTSR increases hydrogen yield by converting carbon monoxide and steam into hydrogen and carbon dioxide through the water-gas shift reaction. The measure reduced the steam-to-carbon ratio from 2.87 to 2.77, consistent with industry best practices. Lowering this ratio decreases the amount of steam generated and, in turn, reduces the natural gas required for steam production, resulting in fuel savings.

    Differences between claimed and evaluated savings are attributable to several factors. The observed efficiency improvement was 13 Therms per MMSCF, compared to the 30 Therms per MMSCF assumed in the tracking calculations, and the actual daily average hydrogen production rate was 90.9 MMSCFD, lower than the 101.1 MMSCFD assumed. Additionally, the evaluation applied changepoint linear regression models rather than the polynomial regression used in tracking calculations, and post-installation data indicate that at hydrogen production levels below approximately 80 MMSCFD, natural gas usage in the post-case exceeded pre-case levels, further reducing net savings. Overall, evaluated savings were lower than originally claimed due to more conservative performance improvements, lower production levels, and differences in modelling methodology. This project represented 51% of all claimed gas savings in PY2024 and received a Gross Realization Rate (GRR) of 40%.
  - Another example of changes in operating conditions impacting the final project GRRs was a project that implemented optimal Start/Stop control multiple air handling units (AHUs) by reducing or turning off supply fan speeds during unoccupied hours. Evaluated savings differ from the applicant's estimate due to discrepancies between reported and observed fan operation in both the baseline and post-installation periods. During the post-installation period, trend data indicate that both occupied and unoccupied supply fan speeds were higher than reported. Occupied fan speeds

averaged 52% for one AHE and 48% for the other, while unoccupied speeds remained at approximately 18% for both units. This contrasts with the applicant's assumption that fans would shut off completely during unoccupied hours.

In the baseline period, as-found data from January through August 2024 show average fan speeds of approximately 48% during both occupied and unoccupied hours. This is lower than the greater-than-60% baseline fan speed reported by the applicant, which was based on data from August through October 2023.

The combination of lower-than-reported baseline fan speeds and higher-than-reported post-installation fan speeds reduced the differential in fan power between baseline and post conditions. As a result, evaluated fan and associated cooling load energy savings were lower than originally estimated, leading to reduced overall measure kWh savings.

- Although **inoperable measures** only had a single occurrence, it resulted in a reduction in overall first-year gas savings of 13%. This new construction geothermal heating project was designed to deepen an existing well from 650 to 1,000 feet to supply hot water for greenhouse heating and eliminate boiler-based fossil fuel consumption. However, the system was never commissioned because the greenhouse structure was destroyed by a severe windstorm in Fall 2024 prior to operation. Consequently, no heat was delivered, no fossil fuel use was displaced, and no energy savings were realized during the evaluation period. While the owner has expressed intent to rebuild and utilize the geothermal system in the future, there is no defined timeline or assurance of reconstruction. Due to the lack of operational performance data, the project is classified as a zero saver with zero verified energy savings to date.

4.2.4 Comparison to previous evaluation findings

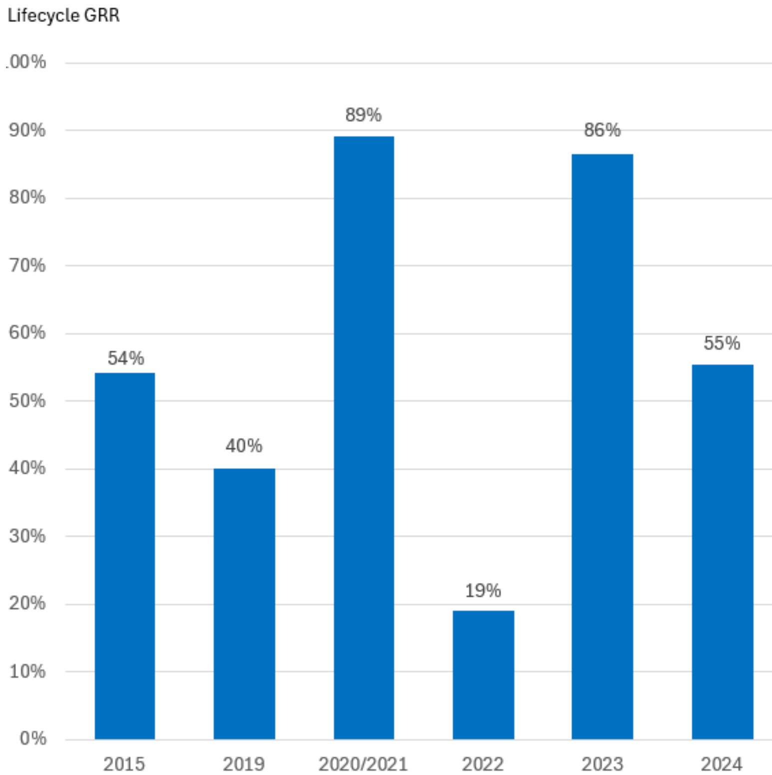
Figure 4-4 compares the PY2024 estimates of gas lifecycle GRR by PA and statewide to prior evaluations. Similar to previous evaluation years, we found considerable fluctuations in gas realization rates across the PAs. There is substantial variability across PAs and years, particularly in PY2022 which saw PG&E with a -10% lifecycle GRR (due to two very large projects with negative savings) and SoCalGas with a 94% lifecycle GRR. PY2023 experienced very solid lifecycle GRRs (79%-110%), while this study of PY2024 shows GRRs spreading again (34% to 83%) with a statewide estimate of 55%.

Table 4-10. Statewide gas lifecycle GRR results by program year and PA

Program Year	PG&E	SDG&E	SoCalGas	Statewide
2015	52%	52%	56%	54%
2019	46%	52%	14%	40%
2020/2021	91%	72%	19%	89%
2022	-10%	234%	94%	19%
2023	79%	110%	85%	86%
2024	83%	63%	34%	55%

Figure 4-2 graphically shows the statewide lifecycle GRRs since 2015 presented in the table above. The statewide gross realization rate has fluctuated over the years between 38% and 89% with a notable dip in 2022 of 19%. The Gas lifecycle GRRs have been very sensitive to the performance of very large sites in the program year evaluated. For example, the PY2022 study had two sampled projects that represented 72% of all statewide claimed therms that drove the low GRR while PY2023 had one site that representing 55% of statewide claimed savings that performed well and drove the statewide lifecycle GRR of 86%.

Figure 4-4. Statewide gas energy lifecycle GRR results by program year

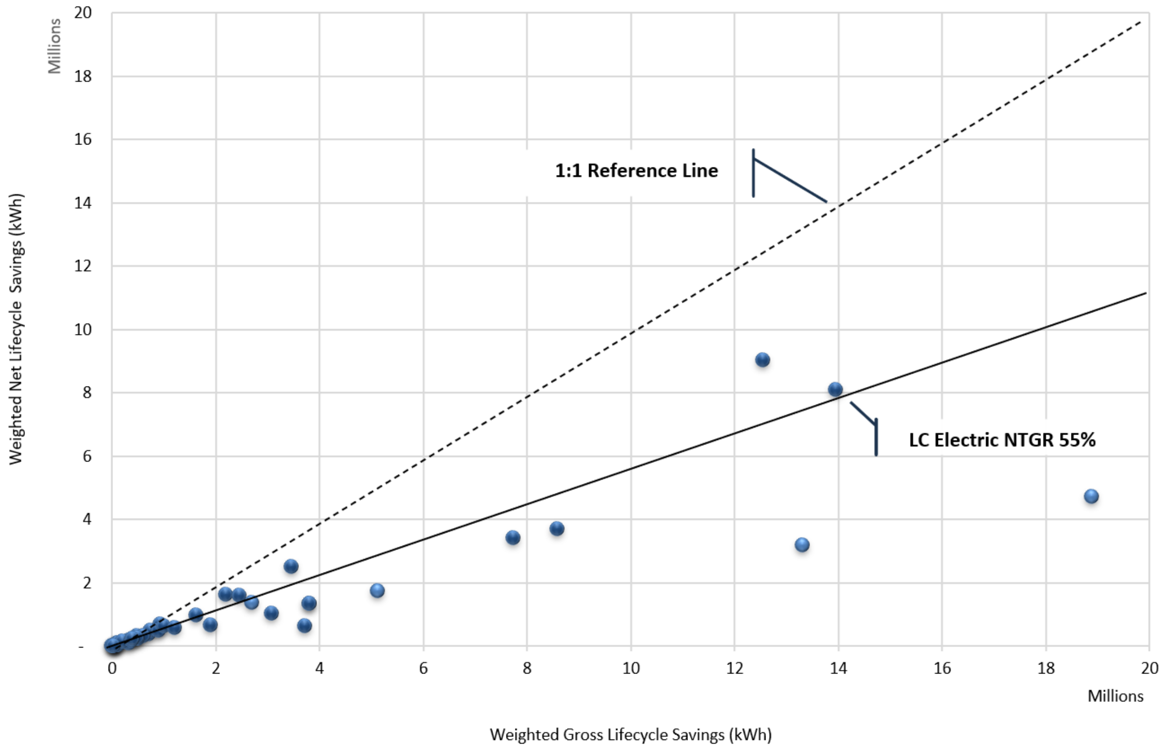


4.3 Net savings results and ratios

4.3.1 Net electric savings results

This section presents the net electric savings estimates and the NTGRs for the PY2024 program as well as a time series of historical lifecycle NTGRs. Figure 4-5 plots the projects for which DNV was able to estimate net electric energy savings with the gross energy savings of these projects along the x-axis and their net energy savings along the y-axis. The dashed reference line shows what would happen if all the projects had NTGRs of 1.0, with gross energy savings and net energy savings being equal. The solid line shows the 55% NTGR for statewide electric energy that the evaluators estimated (discussed in more detail below). The scatterplot shows that of the four very large projects in the lower right quadrant, two projects are well below this statewide average line, and the two others are just barely above it.

Figure 4-5. Weighted lifecycle electric net energy savings scatterplot (all sites)



4.3.1.1 Net results by PAs

Table 4-11 shows the electric net savings and NTGRs by PA for both the first-year and lifecycle time periods. The PAs with the largest volume of electric savings—PG&E and SCE—also had the highest NTGRs, and these NTGRs helped raise the first-year statewide average NTGR to 54.7% with a relative precision of ±9.3%, and the lifecycle statewide average NTGR to 54.2% with a relative precision of 7.2%. The electric savings NTGRs for the lifecycle period were very similar to those for the first-year period, not only at the statewide level but also for most of the PAs. The NTGRs for electric demand were slightly lower than those for electric energy for both the first-year and lifecycle time periods.

Table 4-11. Electric first-year and lifecycle-evaluated net savings by PA

PA	First-year net savings			Lifecycle net savings		
	MWh	NTGR	RP%*	MWh	NTGR	RP%*
Energy (MWh)						
MCE	165	48%	±13%	964	48%	±14%
PG&E	6,077	57%	±16%	39,198	58%	±15%
SCE	5,193	58%	±8%	49,646	57%	±6%
SoCalREN	140	38%	±3%	598	39%	±6%
SDG&E	2,926	49%	±22%	16,127	43%	±19%
Statewide	14,433	55%	±9%	105,668	54%	±7%
Demand (kW)						
MCE	27	52%	17%	162	53%	18%
PG&E	538	50%	33%	4,697	52%	35%
SCE	564	56%	5%	5,641	57%	6%
SoCalREN	18	42%	3%	73	50%	3%
SDG&E	290	40%	19%	2,083	36%	15%
Statewide	1,416	49%	14%	12,496	50%	13%

*Relative precision at the 90% confidence interval.

Table note: The domain (program) NTGRs were calculated with a blend of embedded and non-embedded sample. These NTGRs were applied to the evaluated gross savings totals to derive the values in this table. Due to this expansion process, the total of the domain estimates may not equal the overall savings.

4.3.1.2 Net results by measure type

Table 4-12 shows the breakdown of net savings estimates, NTGRs, and relative precisions for the NTGRs by measure type. As has been the case in previous years, the first-year electric NTGRs for the lighting projects (66.5% with a relative precision of ±6.3%) were higher than those for the non-lighting projects (49.7% with a relative precision of ±14.0%). Furthermore, in PY2024 the differences between the first-year energy lighting and non-lighting NTGRs (67% vs. 50% after rounding) were larger than they had been in the PY2023 CIAC evaluation (67% vs. 55%).

One possible reason why lighting projects have higher NTGRs than non-lighting projects is that some non-program project drivers such as the desire to improve product quality, which can drive down program attribution, are more prevalent in non-lighting projects than in lighting projects. Another possible explanation is that lighting projects usually have less sense of urgency for implementation than non-lighting projects because equipment failure is usually not a project driver (legacy lighting systems usually provide adequate foot candles to meet code requirements). Because C&I customers have less urgency to retrofit their lighting systems on their own accord, they are probably more likely to credit the energy efficiency program incentives for accelerating these lighting retrofits.

Table 4-12. Statewide net electric energy and demand savings results by measure

Measure	First-year			Lifecycle		
	Net savings	NTGR	Relative precision*	Net savings	NTGR	Relative precision*
Energy (MWh)						
Lighting	4,861	66.5%	±6.3%	29,189	66.0%	±5.6%
Non-lighting	9,493	49.7%	±14.0%	75,668	50.2%	±10.1%
Statewide	14,433	54.7%	±9.3%	105,668	54.2%	±7.2%
Demand (kW)						
Lighting	176	55.8%	±7.4%	1,334	59.0%	±7.8%
Non-lighting	1,239	48.2%	±16.1%	11,140	48.9%	±14.6%
Statewide	1,416	49.0%	±14.0%	12,496	49.9%	±12.9%

*Relative precision at the 90% confidence interval.
Table note: The domain (program) NTGRs were calculated with a blend of embedded and non-embedded sample. These NTGRs were applied to the evaluated gross savings totals to derive the values in this table. Due to this expansion process, the total of the domain estimates may not equal the overall savings.

4.3.1.3 Comparison to previous evaluation findings

Table 4-13 shows the statewide electric energy lifecycle NTGRs over the last seven evaluations that used the current NTG method. The table shows that after a large increase in the statewide NTGR from 39% in PY2021 to 56% in PY2022, the statewide NTGRs have been very stable, tightly clustered in the 54%-56% NTGR range over the PY2022-PY2024 period. However, over this time series, the NTGRs for individual PAs have had much more variability (except for MCE, which has historically had mostly lighting projects).

Table 4-13. Statewide electric energy lifecycle NTGR results by program year and PA

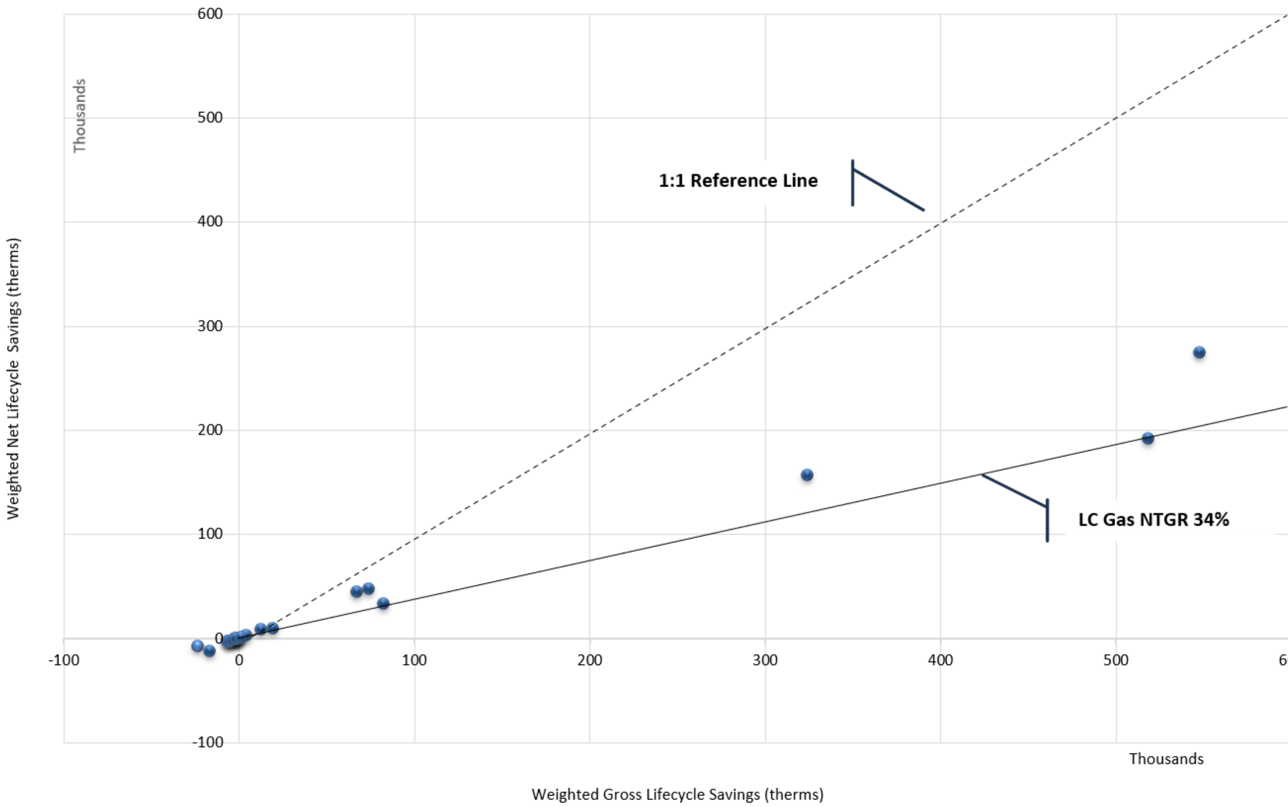
PA[32]	2015	2019	2020	2021	2022	2023	2024
MCE	N/A	40%	51%	N/A	55%	53%	48%
PG&E	53%	46%	38%	41%	56%	42%	58%
SCE	57%	51%	31%	23%	N/A	66%	57%
SDG&E	50%	49%	13%	N/A	50%	26%	43%
Statewide	**54%**	**47%**	**34%**	**39%**	**56%**	**55%**	**54%**

32 For values from 2015 through 2019, source: 2019 Custom Industrial, Agricultural, and Commercial (CIAC) Impact Evaluation (Group D–D11.04), SBW Consulting, February 12, 2023, page 58.

4.3.2 Net gas savings results

This section presents the net natural gas savings estimates and the NTGRs for the PY2024 program as well as a time series of historical lifecycle NTGRs. Figure 4-6 plots the projects for which the evaluation team was able to estimate net natural gas lifecycle savings with the gross savings of these projects along the x-axis and their net savings along the y-axis. The dashed reference line shows what would happen if all the projects had NTGRs of 1.0 with gross savings and net savings being equal. The solid line shows the NTGR for statewide lifecycle gas that the evaluators estimated (discussed in more detail below). The scatterplot shows that of the three very large projects in the lower right quadrant; two projects were above the statewide average line and the third was right on the line.

Figure 4-6. Weighted lifecycle gas net energy savings scatterplot (all sites)



4.3.2.1 Net results by PA

Table 4-14 shows the natural gas net savings and NTGRs by PA for both the first-year and lifecycle time periods. The first-year statewide NTGR was 61.6% with a relative precision of ±25.8%, and the lifecycle NTGR was 50.6% with a relative precision of ±32.6%. As has been the case in past years, the vast majority (99%) of the statewide gas net savings came from just two PAs (SDG&E with 60% of the statewide gas net savings and PG&E with 39%). Because SDG&E alone accounted for over half the statewide gas net savings, the PA's higher first-year NTGR (82.1%) had the impact of more than offsetting PG&E's lower first-year NTGR (44.9%) to achieve the statewide first-year NTGR of 61.6%. The negative net gas savings estimates for some PAs are due to gas interactive effects resulting from lighting projects.

Table 4-14. Net natural gas energy savings results by PA

PA	First-year			Lifecycle		
	Net savings (thousand therms)	NTGR	Relative precision*	Net savings (thousand therms)	NTGR	Relative precision*
MCE	-0.0010	70.0%	±0.0%	0.0	70.0%	±0.0%
PG&E	0.2559	44.9%	±54.3%	2.9	45.8%	±48.5%
SCE[33]	-0.0003	23.0%	±0.0%	0.0	23.0%	±0.0%
SoCalREN	0.0000	63.3%	±0.0%	0.0	63.3%	±0.0%
SoCalGas	0.0065	36.9%	±1464.5%	0.3	31.0%	±112.3%
SDG&E	0.3943	82.1%	±1.9%	1.2	81.9%	±2.4%
Statewide	0.6555	61.6%	±25.8%	4.3	50.6%	±32.6%

*Relative precision at the 90% confidence interval.
Table note: The domain (PA) NTGRs were calculated with a blend of embedded and non-embedded sample. These NTGRs were applied to the evaluated gross savings totals to derive the values in this table. Due to this expansion process, the total of the domain estimates may not equal the overall savings.

4.3.2.2 Comparison to previous evaluation findings

Table 4-15 shows the statewide natural gas lifecycle NTGRs over the last six evaluations that used the current NTG method. **It also shows the time series of NTGRs for the three PAs that together accounted for nearly all the statewide gas net energy savings.**

Both the time series for the statewide NTGRs and the time series for the NTGRs of individual PAs show a lot of variability over the years, especially when we compare it to the lifecycle NTGRs for the electric projects (which have been in the narrow 54%-56% NTGR range over the last three evaluations). The most plausible explanations for the greater variability in NTGRs for gas projects over the time series are a combination of: 1) smaller samples of projects compared to the electric projects and, 2) some very large gas projects whose savings weights have greatly influenced the statewide NTGR averages, especially when these very large projects were parts of small samples of projects. The PY2024 pool of gas projects did not have any extraordinarily large projects, but in past years there have been very large projects which have driven the statewide NTGRs. When the very large project had a low NTGR, then the statewide NTGR ended up being low. When the very large project had a high NTGR than the statewide NTGR ended up being higher.

Table 4-15. Statewide gas energy lifecycle NTGR results by program year and PA

PA	2015	2019	2020, 2021	2022	2023	2024
PG&E	0.53	0.48	0.14	0.45	0.45	0.46
SoCalGas	0.57	0.44	0.19	0.78	0.24	0.37
SDG&E	0.50	0.51	0.29	0.60	0.23	0.82
Statewide	**0.54**	**0.48**	**0.14**	**0.75**	**0.34**	**0.62**

4.3.3 Updated NTG approach comparison

In late 2025, DNV began a CPUC-authorized accelerated NTG pilot program. As part of this pilot program, the team completed NTG interviews with decision-makers for CIAC projects completed in the same year (PY2025). This was a much quicker turnaround from project completion to NTG interview than our typical evaluation cycle. This quicker evaluation cycle was designed to reach project decision-makers when they had a stronger recall of the project details.

[33] As stated in the gross realization rate analysis Table 4-8, DNV recommends that SCE apply the gross gas realization rate to the ex ante savings to calculate the ex post gross savings. The non-Savings by Design site with positive therm savings was evaluated in the net to gross analysis so the net to gross ratio is appropriate to determine final net savings for SCE.

Although the evaluation team has so far only completed a small sample of 9 NTG interviews under the pilot program, the preliminary results are encouraging. For example, 8 of the 9 interviewees (89%) self-reported their level of project recall as either “very good” or “excellent.” This was a much higher percentage than the PY2024 interviewees had reported. In addition, the unweighted NTGR for these 9 accelerated NTG interviews was higher (61%) than the NTGR for the PY2024 participants (55% for first-year electric energy). However, it is important to note that because the accelerated NTG sample is very small and unweighted, it is prudent not to draw too many conclusions by comparing its NTGR to the PY2024 NTGR which is based on a much larger (60 sites) sample that is weighted to the full participant population.

4.3.4 Key factors influencing NTGRs

4.3.4.1 Program-wide comparisons

The evaluation team asked the project decision-makers about the relative importance of both program-related and non-program-related project drivers using a 0-10 importance scale. Table 4-16 compares the average importance ratings of both the program and non-program factors and also shows the distribution of these importance ratings. The table shows that by far the strongest project drivers were the desire of the project decision-makers to improve the quality of the products that they make (average importance rating of 7.90) and the availability of the program incentives (average importance rating of 7.68). The receipt of technical assistance or feasibility studies from the programs was the third most important project driver (average importance rating of 5.72).

One interesting trend is that except for the financial incentives—which both the PY2024 and PY2023 CIAC participants awarded with a 7.7 average importance rating—all the other program-related project drivers declined in importance from PY2023 to PY2024. The average importance rating of the technical assistance declined from 6.7 in PY2023 to 5.7 in PY2024. The average importance rating of recommendations from program vendors declined from 5.9 in PY2023 to 4.6 in PY2024. Finally, the average importance rating of recommendations from program staff declined from 5.5 in PY2023 to 4.9 in PY2024. It is possible that the recent increase in the number of California custom programs that third-party contractors are implementing is contributing to these downward trends in the importance of non-financial program drivers.

Table 4-16. Ratings for the importance of factors on measures

Program factor	Sample size[34]	Average rating	Percentage of respondents		
			Low (0 to 3)	Medium (4 to 7)	High (8 to 10)
Program factors					
Program “rebate”	57	7.7	7%	30%	63%
Program-provided technical assistance or feasibility studies	39	5.7	28%	31%	41%
Recommendation from program vendor	40	4.6	40%	28%	33%
Recommendations from program staff	39	4.9	38%	38%	23%
Top non-program factors					
Improved product quality	50	7.9	18%	6%	76%
Previous experience with this type of measure	51	4.8	45%	12%	43%
Recommendation from auditor/consulting engineer	38	3.6	55%	11%	34%

Table note: On the 11-point scale, 0 was “Not at all important” and 10 was “Highly important

[34] This is the number of respondents who gave a numerical rating. It excludes those who gave responses such as “Don’t know,” those who refused to respond, and cases where the questions were not applicable. Since the evaluation team asked the project decision-makers for the importance ratings at the EE measure level, to report these ratings at the project level we averaged the measure-level ratings.

4.3.4.2 NTG quartile comparisons

In this subsection we compare the relative importance of the program and non-program project drivers for PY2024 projects which were in the top quartile of NTGRs vs. those in the bottom NTGR quartile. Table 4-17 compares project decision-makers from the top and bottom NTGR quartiles as to how frequently they rated various program-related project drivers as highly important (e.g., ratings of 8-10 on a 0-10 importance scale). The table shows that nearly three quarters (73%) of the PY2024 project decision-makers considered the program rebates to be highly important. This continues the trend of top quartile project decision-makers greatly valuing the program incentives that has continued over the last four years. The table also shows that the project decision-makers in the top NTG quartile valued other program services less highly with only 40 percent saying that recommendations from program staff were important and only a third saying that the program's technical assistance was very important. It is important to note that some respondents did not provide importance ratings for the staff recommendations or the technical assistance because they had not received these services. We removed these non-responses due to non-applicability from the Table 4-17 calculations.

Comparing the importance ratings of the project decision-makers from the top PY2024 NTGR quartile to the ratings of decision-makers from the bottom PY2024 NTGR quartile shows that the decision-makers in the top quartile were much more likely than those in the bottom quartile to value either the program rebates or the program staff recommendations. For example, while 73% of the decision-makers in the top quartile rated the program rebates as highly important, only 21% of them in the lower quartile did. In addition, the decision-makers in the top quartile were almost four times as likely as those in the bottom quartile (40% vs. 11%) to identify recommendations from program staff as very important drivers. However, the frequency with which project decision-makers rated the program technical assistance to be highly important did not vary much between the top quartile and bottom quartile decision-makers (33% vs. 27% respectively).

Table 4-17. Percentage highly rating importance of program factors, by evaluation year and NTGR group[1]

NTGR factor	Highest quartile of NTGRs					Lowest quartile of NTGRs				
	2019	2020-2021	2022	2023	2024	2019	2020-2021	2022	2023	2024
Sample size[2]	84	47	17	15	15	82	46	17	14	14
Program "rebate"	52%	87%	100%	79%	73%	74%	32%	10%	21%	21%
Program-provided technical assistance or feasibility studies	44%	47%	30%	45%	33%	27%	22%	40%	20%	27%
Recommendations from program staff	13%	25%	33%	44%	40%	0%	26%	8%	33%	11%

[1] Percentages represent the share of interviewees rating the factor between 8 and 10 on a 0-10 scale where 0 is "Not at all important(?)" and 10 is "Highly important(?)." Quartiles are established based on the number of projects and the value of the NTGR associated with the project.
[2] Sample sizes vary by row depending mostly on the number of respondents who gave "not applicable" responses (e.g., they never received program technical assistance, etc.).

Table 4-18 shows that for the projects in the top NTG quartile the non-program project drivers were not that important. Of the eight non-program factors that the table lists, none received high importance ratings from a majority of top quartile project decision-makers. Furthermore, five of the eight non-program factors received high importance ratings from 20% or fewer of the project decision-makers.

Table 4-18 also shows the percentage of project decision-makers who said that their companies or organizations had decided to implement the energy-efficient measures before they began discussions with the programs. For the second straight evaluation no project decision-makers in the top NTGR quartile said that they had made this decision before program involvement while nearly half (43%) of the bottom quartile decision-makers said they had made this decision before program involvement.

Comparing the percentages of project decision-makers from the top and bottom NTGR quartiles who rated various non-program factors to be highly important reveals several non-program factors for which the two groups of decision-makers had large differences in the frequency of their importance ratings including:

- *Standard practices:* Only 20% of the top quartile project decision-makers rated this non-program factor highly important vs. 67% of the bottom quartile decision-makers.
- *Compliance with normal O&M practices:* Just 20% of the top quartile project decision-makers rated this non-program factor highly important vs. 78% of the bottom quartile decision-makers.
- *Improved product quality:* Only half the top quartile project decision-makers rated this non-program factor highly important vs. 89% of the bottom quartile decision-makers.
- *Previous experience with the EE measures:* Just 10% of the top quartile project decision-makers rated this non-program factor highly important vs. 77% of the bottom quartile decision-makers.
- *Recommendation of a non-program-affiliated designer or consulting engineer:* Only 20% of the top quartile project decision-makers rated this non-program factor highly important vs. 62% of the bottom quartile decision-makers.

The project decision-makers in the bottom NTGR quartile were also more likely than those in the top NTGR quartile to say that an acceptable ROI or payback was highly important (75% vs. 50%) or the age/condition of old equipment was highly important (63% vs 43%). However, due to the small sample sizes in both quartiles, these differences were not statistically significant.

Table 4-18. Percentage highly rating importance of non-program factors, by evaluation year and NTGR group[1]

NTGR factor	Highest quartile of NTGRs					Lowest quartile of NTGRs				
	2019	2020-21	2022	2023	2024	2019	2020-21	2022	2023	2024
Sample size[2]	84	47	17	15	15	85	46	17	14	14
Made decisions before discussion with program	12%	2%	12%	0%	0%	36%	32%	88%	43%	43%
Standard practices	0%	28%	13%	38%	20%	0%	57%	50%	36%	67%
Compliance with normal maintenance/ replacement policies	20%	32%	50%	36%	20%	19%	67%	73%	44%	78%
Improved product quality	0%	61%	83%	77%	50%	4%	80%	94%	73%	89%
Regulatory compliance	29%	38%	50%	20%	20%	21%	54%	20%	42%	22%
Importance of age/condition of old equipment	30%	41%	31%	27%	43%	48%	93%	67%	56%	63%
Previous experience with energy efficiency measure	24%	53%	54%	55%	10%	38%	52%	31%	45%	77%
Recommendation of a non-program-affiliated designer or consulting engineer	21%	38%	33%	50%	20%	11%	31%	70%	50%	62%
An acceptable ROI or payback	71%	81%	82%	85%	50%	85%	56%	19%	57%	75%

Table note: Percentages represent the share of interviewees rating the factor between 8 and 10 on 0-10 scale where 0 is “Not at all important(?)” and 10 is “Highly important(?).” Quartiles are established based on the number of projects and the value of the NTGR associated with the project.
[2] Sample sizes vary by row.

4.4 Measure application type discussion

Table 4-21 compares forecasted and evaluated first-year and lifecycle savings by measure application type (MAT), including unweighted gross realization rates for kWh and therm savings. As discussed in Sections 4.1 and 4.2, the application of inappropriate baselines has historically contributed to reductions in evaluated savings relative to forecasted savings, particularly for AR measures. The PY2023 evaluation identified seven instances of Normal Replacement (NR) projects that were overturned to Accelerated Replacement (AR) and one AR project overturned to NR, resulting in a reduction of 32% of first-year electric savings and 3% of first-year gas savings. The PY2022 evaluation similarly identified 20 occurrences of inappropriate baseline applications (due to incorrect MAT designation), which reduced first-year electric savings by 68% and first-year gas savings by 55%.

In contrast, the PY2024 evaluation found substantially fewer MAT-related discrepancies, and overall savings realization was stronger across most application types. Overall first-year electric savings achieved a 94% GRR and lifecycle electric savings also realized at 94%. AR measures achieved an 85% first-year electric GRR (60% lifecycle), indicating some continued downward adjustments but far less severe impacts than observed in earlier cycles. NR electric savings realized at 100%, indicating strong alignment between forecasted and evaluated savings for these projects. AOE measures exceeded forecasts, with 154% first-year and 199% lifecycle electric realization rates. Gas results varied more significantly by MAT, with particularly low realization for BRO-RCx and NC measures, though the overall lifecycle gas GRR reached 50%. As noted above, gas savings were largely driven by two large projects that represented 66% of total claimed gas savings. These projects had an unweighted average GRR of 33%. Taken together, the reduced frequency of MAT adjustments and generally higher realization rates suggest that the PAs have continued improving their baseline selection practices and documentation of the preponderance of evidence (POE) required to support AR designations.

Table 4-19. MAT comparison for first-year and lifecycle savings (unweighted)

MAT	Electric			Natural gas		
	Forecasted kWh	Evaluated kWh	GRR (%)	Forecasted therm	Evaluated therm	GRR (%)
First-year savings						
AOE (Add-on Equipment)	2,508,729	3,869,193	154%	391,295	367,228	94%
AR (Accelerated Replacement)[1]	7,418,061	6,301,790	85%	(57,814)	(59,362)	103%
BRO-RCx	6,275,973	5,422,613	86%	1,054,974	332,915	32%
NC (New Construction)	1,588,208	980,078	62%	266,654	20	0%
NR (Normal Replacement)	1,281,853	1,281,853	100%	57,314	25,553	45%
Overall	**19,072,825**	**17,855,528**	**94%**	**1,712,424**	**666,355**	**39%**
Lifecycle savings						
AOE (Add-on Equipment)	23,497,666	46,769,208	199%	5,591,700	5,253,564	94%
AR (Accelerated Replacement)	57,249,638	34,404,445	60%	(289,153)	(190,698)	66%
BRO-RCx	35,449,725	32,714,226	92%	3,237,676	1,071,499	33%
NC (New Construction)	17,674,138	11,479,439	65%	3,733,177	305	0%
NR (Normal Replacement)	15,382,239	15,382,239	100%	859,710	383,295	45%
Overall	**149,253,406**	**140,749,556**	**94%**	**13,133,110**	**6,517,964**	**50%**

[1] The evaluated therm is a large negative number compared to the forecasted therm and therefore, the RR represents increased therm consumption and not savings.
U.D. = undefined because the forecasted savings were zero.

4.5 Effective useful life and remaining useful life discussion

Table 4-19 provides a comparison of forecasted and evaluated EUL and RUL by PA for the evaluated measures. Differences between forecasted and evaluated values are largely attributable to MAT designations, as discussed in Section 3.2.2.1. In PY2024, the average evaluated EUL and RUL for Measure 1 were slightly lower than forecasted values (9.0 years vs. 9.4 years for EUL and 4.6 years vs. 4.9 years for RUL), while Measure 2 values were largely consistent with forecasts (9.2 years evaluated vs. 9.1 years forecasted EUL and 4.9 years evaluated vs. 4.9 years forecasted RUL).

These differences in EUL and RUL contribute to lower evaluated lifecycle savings relative to forecasted lifecycle savings, resulting in lifecycle gross realization rates that are typically lower than first-year gross realization rates. Lifecycle savings represent the savings associated with the full lifetime of an efficiency measure. Equipment replaced early in its useful life (e.g., Accelerated Replacement) may receive reduced savings for a portion of its lifetime due to remaining useful life adjustments. For example, if a project had a forecasted EUL of 12 years and an evaluated EUL of 8 years, the reduced EUL would lower lifecycle savings when comparing forecasted to evaluated kWh savings.

Across PAs, most evaluated EUL and RUL values were relatively close to forecasted values, though some notable differences occurred. For example, MCE and PG&E showed modest reductions in evaluated EUL for Measure 1, while SDG&E's evaluated EUL was slightly higher than forecasted. SoCalGas exhibited a larger reduction in evaluated EUL for Measure 1 (3.0 years compared to a forecasted 8.5 years), reflecting measure-specific adjustments. Overall, the relatively small differences between forecasted and evaluated EUL and RUL in PY2024 suggest improved alignment between forecasted and evaluated lifecycle savings compared to earlier evaluation cycles, which is evident in the Statewide results when comparing the first-year GRR to lifecycle GRR for both gas and electric.

Table 4-20. EUL and RUL comparison by PA (weighted average)

	Measure 1				Measure 2			
	Forecasted		Evaluated		Forecasted		Evaluated	
PA	EUL	RUL	EUL	RUL	EUL	RUL	EUL	RUL
SCE	11.2	5.0	11.1	4.8	11.1	5.0	11.1	5.0
MCE	12.0	4.0	9.9	5.0	12.0	4.0	12.0	5.0
PGE	7.6	5.0	6.9	4.5	5.3	5.0	5.1	4.5
SDGE	8.2	5.0	8.4	3.9	7.1	5.0	7.3	5.0
SoCalGas	8.5	N/A	3.0	N/A	N/A	N/A	N/A	N/A
SoCalREN	10.8	5.0	5.2	5.0	12.0	5.7	12.0	4.3
Average	**9.4**	**4.9**	**9.0**	**4.6**	**9.1**	**4.9**	**9.2**	**4.9**

4.6 Total system benefit results

The following table presents the TSB results by PA and statewide. DNV estimates $16.6 million in TSB savings compared to the forecasted estimate of $21.5 million. The team used revisions to gross and net savings per site to update the tracking values. "Statewide" refers to all PAs and represents the overall results for California.

Table 4-21. Total system benefit - net results

PA	Total System Benefit (TSB)			
	Forecasted TSB ($)	Evaluated TSB ($)	TSB RR	Relative precision*
MCE	$63,727	$ 49,722	78%	±24%
PG&E	$9,357,114	$7,705,095	82%	±7%
SCE	$2,049,228	$2,272,166	111%	±12%
SoCalREN	$123,914	$60,974	49%	±28%
SoCalGas	$4,979,594	$1,094,798	22%	±69%
SDG&E	$4,901,283	$5,457,604	111%	±1%
Statewide	$21,474,861	$$16,640,359	77%	±6%

*Relative precision at the 90% confidence interval.

5 CONCLUSIONS AND RECOMMENDATIONS

This section presents conclusions and recommendations at a statewide level applicable to all PAs. Many of the conclusions and recommendations presented below are similar to those made in prior evaluation studies.

The detailed conclusions and recommendations of this evaluation are organized into the following sections:

- Overall conclusions and recommendations
- Gross impact findings and recommendations by the following research areas:
  - Custom – Non-Lighting
  - Custom - Lighting
- Net impact findings and recommendations

5.1 Overall conclusions and recommendations

PA efforts to improve program eligibility adherence, application of MATS, documentation of baseline extensions, and baseline selection have resulted in a much improved (and nearly 100%) electric GRR in PY2024. Overall, the evaluation found that the electric lifetime GRR improved year-over-year, continuing the trend of improved performance that began in 2023. Gas lifetime GRR went down substantially from last year, due to the influence of low realization rates at two very large sites representing 63% of all program gas savings.

The following conclusions and recommendations rest upon all impact evaluation activities and results. They represent the most impactful recommendations based on our assessment as evaluators.

Conclusion 1: Operating conditions continue to be the primary driver of changes in gross realization rates. In PY2024, 38 projects were adjusted due to changes in operating conditions, resulting in an overall decrease in first-year electric energy savings of 6% and a decrease in first-year gas savings of 34%. Comparably, in PY2023, 30 electric projects saw changes in operating conditions, as did 17 gas projects, driving an overall 3% increase of first-year electric GRRs and an 8% decrease of first-year gas GRRs. PY2022 had 22 changed electric projects and six changed gas projects, resulting in a reduction of the overall first-year electric GRR by 7% and a 1% reduction for first-year gas GRRs. Changes to operating conditions include updated trend data or onsite data collection that informs different operating parameters (hours of use, setpoints, efficiency, etc.), which are largely outside the control of PAs or implementers.

Conclusion 2: The application of Measure Application Types (MATs) has become increasingly consistent over recent program years. In PY2024, only one MAT was overturned (from BRO RCx to AOE), representing a significant improvement compared to prior evaluations. In contrast, the PY2023 evaluation identified seven instances where Normal Replacement (NR) projects were overturned to Accelerated Replacement (AR) and one AR project was overturned to NR. The PY2022 evaluation found 20 occurrences of inappropriate baseline applications due to incorrect MAT designation, resulting in a 22% reduction in first-year electric savings and a 15% reduction in first-year gas savings. The substantial decline in MAT reclassifications suggests that PAs have strengthened baseline determination practices and improved their documentation of preponderance of evidence (POE) to support MAT designations.

Recommendation 1: PAs should maintain the strengthened MAT determination practices demonstrated in PY2024, when only one MAT was overturned. PAs should continue applying MAT definitions in the Statewide Custom Project Guidance Document v1.4 to ensure appropriate baseline designation. In addition, PAs should sustain robust pre- and post-installation reviews, leverage the California Technical Forum (Cal TF) and applicable custom workpapers (when available), and continue coordination with CPUC staff and stakeholders to preserve consistency and minimize future MAT reclassifications.

Conclusion 3: The incidence of zero-saver projects continues to decrease. The incidence of zero- or negative-saver projects continues to decline and has shifted in underlying cause. In PY2024, six projects were found to have zero or negative savings; three due to inoperable measures, two driven by operating conditions, and only one attributable to an ineligible measure. This represents continued improvement compared to prior years. The PY2023 evaluation identified six zero-saver projects (out of 68), while PY2022 found 16 of 72 projects with no or negative savings, largely driven by ineligible measures (14 occurrences). The declining role of ineligible measures and the continued reduction in zero-saver incidence suggest improvements in measure screening, installation quality, and project verification practices.

Recommendation 2: PAs should continue adhering to statewide guidance and sustaining program improvements that have contributed to the decline in zero- and negative-saver projects. Given that PY2024 zero-savers were primarily driven by inoperable measures and operating conditions, rather than ineligible measures, PAs should emphasize strengthened pre-installation inspections, post-installation verification, and functional performance checks to confirm measures are installed, operational, and aligned with design specifications.

PAs should also continue robust measure eligibility screening to maintain the reduced incidence of ineligible measures. Enhanced quality control procedures, contractor training focused on installation accuracy and commissioning, and continued education of third-party implementers on CPUC eligibility requirements can further minimize avoidable savings losses prior to claim submission.

Conclusion 4: A subset of lighting projects continues to claim a remaining useful life (RUL) of four years, which does not align with statewide guidance requiring RUL to reflect the remaining life of the removed equipment. In cases where RUL is not appropriately derived from the EUL of the baseline equipment, savings may be overstated and baseline assumptions may be inconsistently applied.

Recommendation 3: PAs should strengthen quality control procedures to ensure that claimed RUL values are calculated in accordance with statewide guidance—generally as one-third of the measure life (EUL) of the removed equipment, unless site-specific documentation supports an alternative value. PAs should verify that RUL inputs are transparently documented in project files and consistent with applicable workpapers or DEER assumptions. Where deviations from the standard one-third convention are proposed, implementers should provide clear technical justification prior to claim approval.

Conclusion 5: The PAs are improving their baseline selection. The PY2024 evaluation found no inconsistencies in baseline selection for either electric or gas projects. Consistent with the PY2020/2021 and PY2022 evaluations, some projects previously used baseline information based on old and/or inaccurate data. The PY2022 evaluation found 14 instances for electric projects and one instance for gas projects with inappropriate baselines, while the PY2023 evaluation found 5 instances for electric projects and 2 instances for gas projects requiring adjustments based on project-specific findings. Given these trends and similar sample sizes across years, this indicates that the PAs are continuing to improve the accuracy and appropriateness of baseline selection.

Recommendation 4: PAs should continue to ensure projects use appropriate baselines and standard practices (SPs) at the time of project approval. If available SP studies are used, the PAs should verify that the studies are less than five years old at the time of project application and approval. Per the Energy Efficiency Industry Standard Practice (ISP) Guidance document version 3.1, market studies should be less than five years old. If an SP is older than five years, the PA should reassess it for continued applicability or replace it with an updated standard practice. The PY2024 evaluation found no inconsistencies in baseline selection for either electric or gas projects, indicating that current PA processes are effectively supporting accurate baseline use; however, continued diligence is recommended to maintain these improvements.

Conclusion 6: The DEER HOU and CDF parameters referenced in the MLC for interior lighting were generally consistent with prototypical DEER values. Among the 21 lighting-only projects, six included interior lighting. For three of these sites, evaluated HOU and CDF were within 25% of DEER values—an improvement relative to PY2022 and PY2023 (three out of 15 sites and eight out of 18 sites, respectively). For the remaining three sites, evaluation-adjusted HOU or CDF exceeded DEER values by more than 25%, with two adjustments in the 40% range and one exceeding 100%. The evaluation also identified continuous 24/7 operation at one hospital (interior lighting) and in two parking garages (exterior/parking lighting), indicating operational practices that diverge from standard assumptions.

Recommendation 5: PAs should continue to monitor and verify HOU and CDF assumptions for interior lighting, particularly in healthcare and parking garage settings where atypical operational patterns may occur. For projects with potential deviations from DEER assumptions, PAs should require site-specific operational data or metering to ensure accurate savings estimates. Additionally, guidance should be provided to project implementers about identifying and documenting continuous-operation lighting to prevent overestimation of savings.

Conclusion 7: Improvements in project extension documentation have reduced instances of ineligible projects. The PY2022 evaluation found 14 electric and 2 gas projects with zero savings due to missing or incomplete contract extensions, and the PY2023 evaluation found only 1 such instance. The PY2024 evaluation found no instances where extensions should have been filed but were not, indicating that projects are consistently being installed within approved timelines and extensions are properly documented.

Recommendation 6: PAs should continue to ensure that projects are installed before the approved installation date and that savings are claimed within the approved installation year. Written extensions should be provided in advance if projects cannot meet approved timelines, and documentation such as dated purchase orders or invoices should be reviewed to confirm that equipment has not yet been ordered. PAs should maintain and reinforce formalized extension procedures to ensure all projects comply with customer agreements, building on the successful practices demonstrated in PY2024.

5.2 Gross savings conclusions and recommendations

In this section we provide conclusions and recommendations for two categories of projects, non-lighting and lighting. When a conclusion is in reference to a specific PA, the PA and the project ID (PID) are provided. These conclusions and recommendations represent either systemic issues that are applicable to multiple PAs and projects, or findings directly related to projects that represent a large portion of the overall portfolio savings.

5.2.1 Non-lighting

Conclusion 8. (PA: SCE; PID WISE-18-000029) One project installed an ammonia-based aeration control (ABAC) system at a wastewater treatment facility to enhance the existing dissolved oxygen (DO) control strategy and improve blower energy performance in the secondary treatment process. The system was designed to provide additional blower turndown capability by adjusting aeration in response to ammonia levels, supplementing the facility’s existing DO-based controls.

The evaluation found that the control system was installed and operated consistent with its intended design, including periodic resetting of DO levels. However, operational practices at the facility—specifically operating blowers at higher airflow rates to mitigate algae growth in the aeration basins—resulted in higher blower flow and power (kW) than assumed in the original savings analysis.

Because the ex-post analysis was based on metered blower power data reflecting actual operating conditions, the evaluated results show no realized electric energy savings from the project during the reporting period.

Recommendation 7. The utility should strengthen project screening, savings estimation, and post-installation engagement practices for advanced process control measures to ensure projected savings are achievable under actual operating conditions.

Specifically, the utility could:

- **Incorporate operational risk assessment into savings estimates.** Confirm that facility operating practices (e.g., algae mitigation strategies, minimum airflow requirements, duct pressure setpoints) are consistent with the control sequence assumptions used to calculate savings.
- **Require documented operational commitment.** Prior to incentive payment, obtain written confirmation that the customer intends to operate the system in a manner aligned with the proposed energy-saving strategy, or adjust savings assumptions accordingly.
- **Conduct post-installation optimization support.** Provide or facilitate technical assistance to help the customer tune control setpoints and integrate the new system with existing SCADA logic to maximize achievable turndown.
- **Refine savings algorithms for similar projects.** Update calculation methodologies to reflect observed operational constraints and variability in blower turndown for wastewater applications.
- **Consider performance-based structures for advanced controls.** Where feasible, tie a portion of incentives to measured performance to better align projected and realized savings.

These steps would reduce the likelihood of overestimated savings and improve realization rates for future advanced aeration control projects.

Conclusion 9 (PA: SCE; PID: EE_CALC_5885558). For another wastewater treatment project, the evaluation determined that the installed ammonia-based aeration control (ABAC) system serving the secondary aeration basin was removed from service within several weeks of commissioning. Facility staff reported that the system was unresponsive and resulted in blower operation at higher electric demand (kW) levels relative to baseline conditions. The control vendor did not provide follow-up technical support to address these performance issues. At the time of evaluation, the facility had not developed plans to restore the ABAC system to operation.

Recommendation 8. For similar projects, the utility should ensure that control vendors provide commissioning assistance, post-installation tuning, and defined troubleshooting support to address operational issues that arise shortly after installation (i.e., some form of warrantee on their services and products). In addition, the utility should confirm that customers have an operational plan and internal capacity to maintain and operate the control system as intended.

Conclusion 10 (PA: PG&E; PID: PRJ – 03772742). Another project, implemented at a data center, involved retrofitting constant-speed Computer Air Handling (CAH) units on the first floor with variable frequency drives (VFDs) to reduce fan energy use by modulating airflow in response to cooling demand. Based on a review of 12 months of post-installation trend data, the evaluation found no evidence of fan speed modulation. The CAH units operated at consistent fan speeds, indicating that the VFDs were not commissioned or configured to actively control fan operation as intended. In addition, the evaluation confirmed that the information technology (IT) load previously served by the affected area has since been relocated from the building. Given the absence of demonstrated fan speed control and the change in facility load conditions, the evaluation did not approve energy savings for this measure, resulting in a 0% GRR for electric savings.

Recommendation 9. The PA should strengthen commissioning verification and post-installation validation requirements for VFD retrofit projects. Specifically, the utility should require documented evidence of functional testing and trend data demonstrating active fan speed modulation under varying load conditions prior to final incentive approval.

Conclusion 11 (PA: SCE; PID: WISE-19-000088) A wastewater treatment project with a GRR of greater than 100%. This project involved the installation of chemically enhanced primary sedimentation (CEPS) on two primary clarifiers (Unit 1 and Unit 2S) at a wastewater reclamation plant. The measure is designed to reduce biological oxygen demand (BOD) and increase solids removal through chemical treatment in the primary treatment stage, thereby decreasing the downstream oxygen demand and reducing the need for mechanical aeration from secondary treatment blowers. The interactive effects (IR) calculation model was used to estimate savings by modeling both baseline and installed conditions. The model applied identical wastewater volume assumptions and aeration airflow relationships in both cases, relying on standard wastewater engineering equations to estimate required blower airflow (SCFM) and corresponding power (kW) based on wastewater characteristics and required BOD and ammonia removal. However, baseline blower kW was not metered; only post-installation (installed-case) blower kW data were available.

The evaluation found that the modeled installed blower kW did not align well with the metered installed kW. To improve accuracy, the evaluator calibrated the installed-case model to better match observed annual blower energy use, achieving agreement within approximately 8% of annual metered kWh. Calibration was performed by adjusting selected engineering parameters within the oxygen transfer equations—specifically the fouling factor (F) and Standard Oxygen Transfer Efficiency (SOTE). The fouling factor was adjusted from 0.65 to 0.55, and SOTE was adjusted from 20.7% to 15% for Unit 1 and from 25.5% to 16.5% for Unit 2S. This resulted in a GRR of 186%.

These parameters were selected for adjustment because, relative to other correction factors (e.g., alpha and beta), they are more directly influenced by aeration equipment condition and performance and appeared less constrained by wastewater characteristics. While calibration improved alignment between modeled and metered installed energy use, the absence of baseline metering introduces uncertainty in the estimated savings attributable to the CEPS measure.

Recommendation 10. For future CEPS or similar wastewater process optimization projects, the PA should require baseline blower airflow and power metering prior to implementation, where feasible, to reduce uncertainty associated with modeled baseline conditions. Savings methodologies should also require clear documentation and site-specific justification for key oxygen transfer parameters—particularly fouling factors and SOTE values—when they materially influence savings estimates.

Conclusion 12 (PA: SoCalGas; PID: 12165254) One project involved upgrading the catalyst configuration within the facility's chemical process to improve efficiency and reduce natural gas consumption. Specifically, the project optimizes the Steam Methane Reforming (SMR) process by enhancing the performance of the High-Temperature Shift Reactor (HTSR). The HTSR, located downstream of the primary reformer, increases hydrogen yield by converting carbon monoxide and steam into hydrogen and carbon dioxide through the water-gas shift reaction.

The measure reduced the steam-to-carbon ratio from 2.87 to 2.77, consistent with industry best practices. Lowering this ratio decreases the amount of steam generated and, in turn, reduces the natural gas required for steam production, resulting in fuel savings.

Differences between claimed and evaluated savings are attributable to several factors:

- The observed efficiency improvement was 13 Therms per MMSCF, compared to the 30 Therms per MMSCF assumed in the tracking calculations.
- The actual daily average hydrogen production rate was 90.9 MMSCFD, lower than the 101.1 MMSCFD assumed in tracking.
- The evaluation applied changepoint linear regression models rather than the polynomial regression used in tracking calculations.
- Post-installation data indicate that at hydrogen production levels below approximately 80 MMSCFD, natural gas usage in the post-case exceeded pre-case levels, further reducing net savings.

As this project represented 51% of total PY2024 claimed gas savings, the resulting project GRR of 40% had a large impact on the overall statewide GRR.

Recommendation 11. PAs should require that projected savings for BRO-RCx process optimization measures be supported by empirically validated operating data and modeling approaches that reflect expected production conditions. Specifically, tracking assumptions related to efficiency improvements (e.g., Therms per MMSCF) and hydrogen production rates should be based on recent historical operating data and aligned with demonstrated achievable performance.

In addition, modeling methodologies used for claimed savings estimates should be documented and justified, and where feasible, sensitivity analyses should be conducted to assess savings variability across production ranges. Given that post-installation data indicate increased gas usage at lower production levels (below approximately 80 MMSCFD), savings estimates should explicitly account for part-load or reduced-throughput operation to avoid overestimation.

Conclusion 13 (PA: SoCalGas; PID 13596750). One new construction project installed a geothermal hot water system intended to meet the heating demands of a greenhouse. While the geothermal system itself is operational, the greenhouse it was designed to serve was destroyed by a severe windstorm in Fall 2024 and has not been rebuilt. As a result, the space remains unoccupied and has no heating demand. Consequently, the geothermal system has not displaced any natural gas consumption and has not delivered useful thermal energy to a conditioned space during the evaluation period.

Because no heating load exists and no fossil fuel use has been avoided, the project achieved zero realized energy savings during the reporting period.

Recommendation 12:

12 a.) To the PA – If the customer rebuilds the greenhouse and places the geothermal system into service to meet an active heating load, the PA should resubmit the project in PY2026 as a zero-savings claim, given that savings and incentives have already been claimed in a prior program year. The resubmission should document verified system installation status, operational readiness, and confirmation of active heating demand. Any future savings should be evaluated prospectively based on verified system operation and documented fuel displacement, consistent with CPUC guidance. It should be noted that projects of this nature will be reviewed on a case-by-case basis.

12 b.) To the CPUC – Although the measure installation is complete and the absence of savings is attributable to the lack of heating load rather than deficiencies in design or implementation, we recommend that the CPUC require the project to be resubmitted to CPR upon any future filing. CPR review would ensure independent verification of operational status, confirmation of active load, and documented fuel displacement prior to recognizing any savings.

Conclusion 14 (PA: PG&E; PID: PRJ – 04823192). A project implementing optimal Start/Stop controls across multiple air handling units (AHUs) experienced lower-than-expected gross realization rates (GRRs) due to differences between assumed and observed operating conditions. The measure strategy reduced or turned down supply fan speeds during unoccupied hours. However, evaluated savings differed from the applicant's estimate because both baseline and post-installation fan operations varied from reported values. Post-installation trend data indicate that occupied fan speeds averaged 52% for one AHU and 48% for the other, while unoccupied speeds remained at approximately 18% for both units. This contrasts with the applicant's assumption that fans would shut off completely during unoccupied hours.

Baseline data from January through August 2024 show average fan speeds of approximately 48% during both occupied and unoccupied hours, which is lower than the greater-than-60% baseline speed reported by the applicant based on August through October 2023 data.

The combination of lower-than-reported baseline fan speeds and higher-than-reported post-installation fan speeds reduced the differential in fan power between baseline and post conditions. Consequently, evaluated fan and associated cooling load savings were lower than originally estimated, resulting in reduced overall measure kWh savings and GRRs.

Recommendation 13: PAs should require that savings estimates for control-based measures be supported by representative baseline and post-installation trend data covering comparable operating periods. Baseline assumptions should reflect typical, sustained operating conditions rather than limited or seasonally atypical data.

Additionally, claimed savings calculations should account for realistic post-installation fan turndown limits and control sequences, particularly during unoccupied periods. Incorporating pre-installation trend verification and post-installation commissioning data review will improve the accuracy of projected savings and reduce the likelihood of material GRR adjustments during evaluation.

Conclusion 15 (PA:PG&E; PID: PRJ-03858374). One project was determined to be ineligible under program rules, resulting in zero verified savings and reducing overall portfolio performance.

This Add-On Equipment (AOE) measure proposed installation of a condensate recovery system at five steam use points within a 24/7 chemical manufacturing facility that currently discharge condensate to drain. Steam is produced by three onsite boilers and distributed to nine use points, of which only four presently return condensate. The proposed system would capture and return hot condensate from the remaining five locations to the boiler plant, thereby reducing natural gas consumption by decreasing cold make-up water requirements and associated heating load.

However, the project's EUL was shorter than its simple payback period. Section 2.3.1 of the Statewide Guidance requires that a custom project's EUL exceed its simple payback period unless a documented, case-by-case exception is reviewed and approved by the Program Administrator (PA). The Program Implementation Plan (PIP) similarly states that custom project EUL must be greater than simple payback. No documentation was provided indicating that the PA conducted or approved a case-by-case exception analysis. Accordingly, the project does not meet established eligibility requirements and was assigned zero verified savings.

Recommendation 14: PAs should implement a formal eligibility screening process to confirm that EUL exceeds simple payback prior to project approval and incentive commitment. For projects that do not meet this criterion, the PA must document a case-by-case exception analysis consistent with Statewide Guidance, including review of cost-effectiveness, measure cost reasonableness, program influence, and the relative magnitude of the payback-to-EUL gap. Projects lacking documented approval should not proceed to incentive payment or savings claim.

5.2.2 Lighting

Conclusion 16 (PA: MCE; PID P-2024.06.21-62835): For one project, review of the Modified Lighting Calculator (MLC) identified internal inconsistencies in the submitted baseline energy data. Specifically, the baseline lighting consumption reported in the model exceeded total site energy usage, which is not feasible.

To address this issue, the evaluator applied the observed pre- to post-installation reduction in apparent usage and reduced the capping value in the *Utility Usage* tab by 65%. This adjustment lowered claimable energy savings under the first baseline scenario. However, it did not reduce claimable demand (kW) savings or affect claimable savings under the second baseline scenario.

Additionally, the MLC *Utility Usage* tab includes limited capping functionality for claimable savings. As structured, this approach may allow modeled savings to exceed reasonable site-level constraints, increasing the risk of savings overestimation if baseline inputs are not thoroughly vetted and reconciled with total facility energy consumption.

Recommendation 15: PAs should review MLC inputs to ensure that custom models are reasonable. If the baseline usage of existing lamps is (1) higher than the site's annual usage, or (2) significantly above the CEUS lighting percentage shown in the Utility Usage tab, the implementer should either adjust the inputs or provide documentation justifying the modeled estimates.

Conclusion 17 (PA: Multiple; PID: N/A): The DEER HOU and CDF parameters referenced in the MLC for interior lighting were generally consistent with prototypical DEER values. Among the 21 lighting-only projects, six included interior lighting. For three of these sites, evaluated HOU and CDF were within 25% of DEER values—an improvement relative to PY2022 and PY2023 (three out of 15 sites and eight out of 18 sites, respectively). For the remaining three sites, evaluation-adjusted HOU or CDF exceeded DEER values by more than 25%, with two adjustments in the 40% range and one exceeding

100%. The evaluation also identified continuous 24/7 operation at one hospital (interior lighting) and in two parking garages (exterior/parking lighting), indicating operational practices that diverge from standard assumptions.

Recommendation 16: PAs should continue to monitor and verify HOU and CDF assumptions for interior lighting, particularly in healthcare and parking garage settings where atypical operational patterns may occur. For projects with potential deviations from DEER assumptions, PAs should require site-specific operational data or metering to ensure accurate savings estimates. Additionally, guidance should be provided to project implementers on identifying and documenting continuous-operation lighting to prevent overestimation of savings.

Conclusion 18 (PA: Multiple; PID: EE_CALC_5916840): Custom lighting projects continue to install LEDs in spaces with 24/7 operation, which the MLC does not currently support.

Recommendation 17: To the DEER/MLC teams. Consider expanding DEER options to include a limited set of business or space types with 24/7 operation, such as: hospital, hallway, parking garage, and airport. This would allow these spaces to select appropriate HOU/CDF values from the outset, reducing reliance on evaluation-based adjustments.

Conclusion 19 (PA: MCE; PID: Multiple): Documentation provided in response to the data request (DR) did not include evidence of Public Purpose Program (PPP) payment for the reviewed MCE projects. The only reference to PPP within the submitted materials appears in the standard TEAA customer agreement language related to self-generation, which generically states that customers must be net power purchasers and remit PPP charges. However, no project-specific documentation (e.g., customer utility bills) was included to substantiate active PPP payment.

For one project that underwent CPR review, the CPR file did contain a copy of a customer utility bill confirming electric PPP payment. This indicates that the Program Administrator (PA) has access to the necessary documentation but did not consistently include it in standard project files.

This documentation gap appears to be systemic across MCE projects reviewed to date. While projects have not been disqualified on the basis of missing PPP documentation thus far, the absence of consistent and verifiable evidence of PPP payment represents a compliance risk which may result in projects being deemed ineligible in the future.

Recommendation 18: PAs should submit consistent inclusion of project-specific documentation demonstrating Public Purpose Program (PPP) payment within the standard project file. At a minimum, this should include a recent customer utility bill or equivalent documentation clearly showing active electric PPP charges for the service account associated with the project.

The PAs should implement a standardized documentation checklist to ensure PPP verification is obtained and retained prior to project approval and incentive payment. This requirement should apply uniformly to all projects, regardless of whether they undergo CPR review.

To address the apparent systemic nature of this issue for MCE projects, the PA should also conduct a targeted internal review of previously approved projects to confirm PPP eligibility documentation is available and accessible. Establishing consistent documentation practices will reduce compliance risk and strengthen eligibility verification in future evaluations.

5.3 Net savings conclusions and recommendations

Conclusion 20: Better screening out of high free-ridership projects would significantly improve overall NTGRs. About a quarter of the projects in PY2024 NTG sample had NTGRs of less than 35%. If the PAs had been better able to screen out these high free-ridership projects, the overall NTGR would have been significantly higher.

One common theme among the high free-ridership projects was that many were cases where the company or organization had already decided to move forward with the EE project before becoming involved with the custom EE program. For example, nearly half (43%) of the decision-makers for projects with NTGRs in the bottom quartile said that their company or organization had already decided to implement the EE measures before they began discussing them with the EE programs. In contrast, none of the decision-makers for projects in the top NTGR quartile said their company/organization had already decided to go forward with the EE measures before program involvement.

One net savings recommendation from the PY2022 CIAC evaluation was to “improve project screening practices to ensure that the decisions to go forward with the project were not already made.” The custom programs made great progress in screening out these “greenlit” projects from PY2022 to PY2023. Over this period, the percentage of decision-makers for projects in the bottom NTGR quartile who said their projects had been approved before program involvement had declined from 88% to 43%. However, progress in this area has stagnated with the percentage of greenlit projects in PY2024 being 43%, the same as it was in PY2023.

Another common theme for these high free-ridership projects was that the project decision-makers did not, on average, value the custom program incentives very highly. For example, while 73% of the decision-makers in the quartile of projects with the highest NTGRs rated the program rebates as highly important, only 21% of those in the bottom NTGR quartile did. Since financial incentives are some of the primary levers of program influence, if project decision-makers do not value these, they are unlikely to give the custom programs much credit for influencing their EE projects.

Recommendation 19: Based on the evidence cited in Conclusion 19, we recommend that the custom program staff adopt screening questions to filter out projects with high free ridership risk. One screener would involve, when considering whether to incentivize a prospective EE project, asking the project decision-makers how important the availability of program incentives would be for their project moving forward (using a 0-10 point Likert scale). As we noted in the PY2023 CIAC evaluation, if the project decision-makers give a relatively high importance rating, then that is a promising sign that the program and its incentives will be influential. Conversely, if they give a relatively low importance rating, then this is a warning sign that the projects are being driven by non-economic factors and therefore the program incentives are less likely to be influential. More effective screening out of these high free-ridership projects would not only increase overall NTGRs but would also allow the PAs to reallocate limited incentive dollars to projects where the incentives will serve as the crucial financial “tipping points” for helping the EE projects move forward.

In answering this screening question, it is possible that a few project decision-makers might try to “game” the system by cynically claiming that the incentives were more important than they actually were just to receive the incentives. However, our long evaluation experience indicates that this is a risk worth taking and that most interviewees are relatively transparent in their assessment of program impacts on their project decision-making. As noted, only 21% of the project decision-makers in the bottom NTGR quartile said that the program rebates were highly important for their projects and one would expect this percentage to be much higher if gaming practices were more prevalent.[35]

Besides this recommendation to use a project screener for the importance of program rebates, we also repeat a recommendation we had made in the PY2023 CIAC evaluation report to better screen out projects that companies or organizations had already approved before program involvement. In the PY2023 report we had pointed out PG&E’s RP 2.1 NTG screening tool which uses a series of “showstopper” screeners which PG&E staff are required to ask the project decision-maker about before approving a large project for CIAC incentives. These screeners include:

[35] A possible argument might be that it is less risky for project decision-makers to say that the program rebates were not influential in the ex-post NTG interviews (e.g., vs. a project screening exercise) since they already received these rebates and there is no danger of the program clawing back these rebates. While this is a fair point, in our experience evaluation gaming strategies are more common with interviewees who have participated in many evaluations and therefore have learned about the implications of their responses to NTG questions for future program design and delivery. For example, our evaluations of California upstream lighting programs in past years did raise questions about whether certain lighting manufacturers who had participated in these programs for many years, and who knew the implications of their interview responses for future program design and delivery, might be “gaming” their responses. However, most CIAC NTG interviewees are unlikely to have this extensive experience with evaluation programs or know how their NTG interview responses might impact future EE program activities.

- “[Whether] the customer purchased the efficient measure before being contacted by PA staff or program implementers (PI) for this specific project, under the condition that no additional stakeholders on behalf of PA had communicated information that swayed the customer in seeking PA program support or funding.”
- “[Whether] the customer already decided on selecting a technology/equipment to install prior to any PA or PI engagement.”
- “[Whether] the customer already installed the equipment before PA pre-install approval or no exception was obtained appropriately.”

We had noted that if the responses from the project decision-maker to any of these screeners were affirmative, PG&E staff was encouraged to avoid funding these projects. The evaluation team continues to encourages broader use of these types of screeners by all the PAs and program implementers.

Conclusion 21: The CIAC programs are funding too many projects for which the participating companies/organizations are already familiar with the EE measures and their benefits. Evidence to support this claim includes:

- *Standard practices:* Two thirds of decision-makers for projects in the bottom NTGR quartile said that standard practices in their organizations were highly important project drivers compared to only 20% of the top NTGR quartile decision-makers.
- *Compliance with normal O&M practices:* Seventy-eight percent of decision-makers for projects in the bottom NTGR quartile said that compliance with normal O&M or equipment replacement policies were highly important project drivers compared to only 20% of the top NTGR quartile decision-makers.
- *Familiarity with the EE equipment:* Seventy-seven percent of decision-makers for projects in the bottom NTGR quartile said that familiarity with the EE equipment was an important project driver compared to only 10% of the top NTGR quartile decision-makers.

Many custom programs like incentivizing EE projects for a given customer that are identical to ones the customer had implemented previously. The programs like these “repeat projects” because they get to claim the project energy savings without having to spend much time selling the customer on the project, because the customer has already seen the proof of concept for the project and has noticed the resulting reductions in their energy bills.

However, the ease of selling these repeat projects is exactly why custom programs should minimize the amount of incentive dollars that they spend on them. For example, if a customer has had a successful lighting retrofit in one of their buildings and has witnessed the large energy savings that it produced, they are likely to replicate the lighting retrofit project in another building without the need for too much outside encouragement. If a custom program chooses to incentivize this second lighting retrofit, the customer may give the program some credit for influencing this project (e.g., accelerating the timing of the project), but the amount of program attribution will be inherently limited because the customer already knows about the energy savings benefits of the lighting retrofits.

DNV’s evaluation of custom programs in California and other jurisdictions has revealed that energy efficient projects that are parts of routine O&M practices carry even higher risks of free ridership than repeat projects. For example, our evaluations have found that many industrial companies replace faulty steam traps and clean heat exchangers on an annual basis. Since these companies have been doing these routine maintenance projects for several years, they have compiled extensive cost, performance, and energy savings data to demonstrate the cost effectiveness of these projects. Because the cost effectiveness of these O&M projects is so certain, often the companies will automatically fund these projects years in advance. When custom EE projects later come along and offer these companies financial incentives for the energy savings benefits of replacing the steam traps or cleaning the heat exchangers, the companies will often take the program incentives. However, when program evaluators later interview the representatives of these companies, the company reps will give the programs little attribution because these O&M activities have been ordered and funded well before the program became involved.

Recommendation 20: To minimize custom program funding of repeat projects, DNV recommends that custom programs should analyze their historical project funding activities to determine whether a new project they are considering for funding might be a repeat project. When the custom program is reviewing the list of EE projects that it is considering for program incentives, it should move the repeat projects lower down the priority list to reduce the risk of free ridership.

To minimize custom program funding of O&M projects, program implementers should ask the project decision-makers whether the proposed EE project is already something that they implement as part of their standard O&M practices. If the project decision-maker answers in the affirmative, then the custom program should either walk away from the project altogether or, at minimum, move these O&M projects towards the bottom of the program's project funding priority list.

APPENDIX A. PROJECT INELIGIBILITY CRITERIA

Table A-1. Project ineligibility criteria

Ineligibility criteria	Evaluation practice	Exceptions/discussion	Source
Tracking data shows measure installation before the program year being evaluated	Remove from the sample frame	Custom projects other than those from the NMEC, HOPPs, or Strategic Energy Management (SEM) programs for which extended measurements are required and carried into multiple program years, will be considered ineligible if the installation did not occur in the program year being evaluated. Custom project installations that occurred in Q4 of the program year immediately preceding the program year being evaluated will remain in the sample frame subject to the evaluation practice described next.	Energy Efficiency Policy Manual;[36] PG&E Resource Savings Rulebook[37]
Measure installed in Q4 of the program year immediately preceding the program year being evaluated did not require measurements to true up savings	Measure ineligible for evaluation	When measurements are required to true up savings claims the M&V requirements must be specified and described in the customer agreement to allow the measure savings to be claimed in a different program year.	Statewide Custom Project Guidance Document Version 1.4[38]
Measure installed prior to project approval	A measure installed prior to project approval is ineligible.	Some programs such as PG&E's Advanced Pumping Efficiency Program (APEP) allow application for incentive after the project is complete and requires submission of pre- and post-test results, savings calculations, and paid invoices. Some DI projects that are identified and implemented rapidly might not have documentation to support sequential approval and installation.	Statewide P&P manual[39]

[36] https://www.cpuc.ca.gov/-/media/cpuc-website/files/legacyfiles/e/6442465683-eepolicymanualrevised-march-20-2020-b.pdf
[37] https://www.pge.com/assets/pge/docs/about/doing-business-with-pge/PGE-Resource-Savings-Rulebook.pdf
[38] https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/demand-side-management/energy-efficiency/custom-projects-review-guidance-documents
[39] https://www.sdge.com/sites/default/files/2021Customized%20PolicyProcedureManualVERSION1.pdf

Ineligibility criteria	Evaluation practice	Exceptions/discussion	Source
Equipment ordered prior to project approval without the PA authorization	If equipment was ordered prior to project approval, the project is ineligible.	If there is documentation by the PA or implementor dated prior to equipment ordering that allowed equipment ordering prior to project approval, then the project is eligible.	Statewide P&P manual[40]
Installation time limit exceeded	If the measure was not installed within the allowed installation time specified as program requirement and/or customer agreement for installation, the project is ineligible.	If there is documentation by the PA for authorizing installation time extension(s) in a timely manner, then the project is eligible.	Statewide P&P manual[41]
Non-regressive efficiency	If installed equipment has the same or lower efficiency than the existing equipment, the measure is ineligible.	(1) The proposed equipment exceeds standard practice or code, and (2) there is clear evidence that without support, the efficiency level would fall to the standard practice or code minimum.	D. 12-05-015[42]
Fuel substitution test failure	If the project included fuel substitution and required a fuel substitution test (three-prong test prior to August 1, 2019, and two-prong test starting August 1, 2019) and failed required test, then ineligible.	If the test result was not provided, the evaluator will attempt to complete the test to confirm compliance.	Statewide Custom Project Guidance Document Version 1.4[43]
Deemed claims and non-permanent measures	Not eligible as custom savings claims	Deemed savings may be claimed with a custom project for customer convenience provided deemed incentives have been paid. Deemed measures for which custom incentives are paid shall be considered ineligible.	Statewide Custom Project Guidance Document Version 1.4[44]

40 https://www.sdge.com/sites/default/files/2021Customized%20PolicyProcedureManualVERSION1.pdf
41 https://www.sdge.com/sites/default/files/2021Customized%20PolicyProcedureManualVERSION1.pdf
42 https://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/166830.PDF
43 https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/demand-side-management/energy-efficiency/custom-projects-review-guidance-documents
44 https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/demand-side-management/energy-efficiency/custom-projects-review-guidance-documents

Ineligibility criteria	Evaluation practice	Exceptions/discussion	Source
Non-PPP Charge paying customers	If the customer does not pay PPP charges for the sampled fuel, or savings are for fuel not sourced from a California IOU or the project is installed by a departing load customer, the project is ineligible.	No exceptions.	Statewide Custom Project Guidance Document Version 1.4[45]
Lack of Required Permits	If there is no documentation of permit closure, per SB-1414, for measure that require the PA to obtain proof of permit closure, then the claim is ineligible. SB-1414.	No exceptions	SB-1414[46]
Code Year Inconsistent with the Permit Date	If the baseline code year used is inconsistent with the permit date, project savings will be calculated using the applicable code year based on the permit date.	No exceptions	Statewide Custom Project Guidance Document Version 1.4;[47] Statewide P&P manual;[48] E-4818[49]

[45] https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/demand-side-management/energy-efficiency/custom-projects-review-guidance-documents
[46] http://www.leginfo.ca.gov/pub/09-10/bill/sen/sb_1401-1450/sb_1414_bill_20100427_amended_sen_v96.html
[47] https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/demand-side-management/energy-efficiency/custom-projects-review-guidance-documents
[48] https://www.sdge.com/sites/default/files/2021Customized%20PolicyProcedureManualVERSION1.pdf
[49] https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M179/K264/179264220.PDF

Ineligibility criteria	Evaluation practice	Exceptions/discussion	Source
Rulebook and Program Rule violations	If the installed measures are not allowed per program rules, such as LED products not listed in the statewide Qualified Products List, = or no permanent measure, then the measure is ineligible.	If a deemed measure for which there is a PA program offering, claims deemed savings but uses a custom incentive, the measure is considered ineligible and will receive zero savings. If the entire claim consists of one or more ineligible deemed measures, savings will be set to zero only for the identified ineligible deemed measure, not the entire claim. If a deemed measure for which there is a PA program offering claims custom savings but uses a deemed incentive, the savings will be corrected in evaluations to the appropriate CPUC approved measure package deemed value.	Statewide Custom Project Guidance Document Version 1.4;[50] Statewide P&P manual[51]
SBD whole building project without required measures	SBD whole building project that does not have at least three measures applicable to two of the end uses of lighting, envelop and mechanical systems are ineligible.	No exceptions	SavingsByDesign Participant Handbook[52]
SBD whole building projects without required minimum savings	SBD whole building projects that do not have savings that exceed code baseline by 10% or more are ineligible.	No exceptions	SavingsByDesign Participant Handbook[53]
Participant declines to participate in evaluation	A participant declines two times to participate in the CPUC EM&V studies. Savings will be zeroed out as D.10.04.029 requires participants to fulfil EM&V obligations. Substitute samples will not be drawn.	No exceptions	D.10.04.029

[50] https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/demand-side-management/energy-efficiency/custom-projects-review-guidance-documents
[51] https://www.sdge.com/sites/default/files/2021Customized%20PolicyProcedureManualVERSION1.pdf
[52] https://www.sdge.com/sites/default/files/documents/2020%20SBD%20Handbook_12262019.pdf
[53] https://www.sdge.com/sites/default/files/documents/2020%20SBD%20Handbook_12262019.pdf

APPENDIX B. IESR HIGH LEVEL SAVINGS TABLES

Table B-1. Gross lifecycle savings (MWh)

PA	Standard report group	Ex ante gross	Ex post gross	GRR	% Ex ante gross pass through	Eval GRR
MCE	CUSTOM - Lighting	1,511	1,993	1.32	0.0%	1.32
MCE	**Total**	**1,511**	**1,993**	**1.32**	**0.0%**	**1.32**
PGE	CUSTOM - Lighting	32,812	31,838	0.97	0.0%	0.97
PGE	CUSTOM-Other	54,794	35,658	0.65	0.0%	0.65
PGE	**Total**	**87,606**	**67,496**	**0.77**	**0.0%**	**0.77**
SCE	CUSTOM - Lighting	19,080	18,157	0.95	0.0%	0.95
SCE	CUSTOM-Other	58,386	68,308	1.16	0.0%	1.16
SCE	**Total**	**77,466**	**86,465**	**1.12**	**0.0%**	**1.12**
SoCalREN	CUSTOM - Lighting	643	526	0.82	0.0%	0.82
SoCalREN	CUSTOM-Other	2,345	991	0.42	0.0%	0.42
SoCalREN	**Total**	**2,988**	**1,527**	**0.51**	**0.0%**	**0.51**
SDGE	CUSTOM - Lighting	8,634	8,289	0.96	0.0%	0.96
SDGE	CUSTOM-Other	30,224	30,224	1.00	0.0%	1.00
SDGE	**Total**	**38,858**	**35,198**	**0.96**	**0.0%**	**0.96**
	Statewide	**208,489**	**194,902**	***0.93***	***0.0%***	***0.93***

Table B-2. Net lifecycle savings (MWh)

PA	Standard report group	Ex ante net	Ex post net	NRR	% Ex ante net pass through	Ex ante NTG	Ex post NTG	Eval ex ante NTG	Eval ex post NTG
MCE	CUSTOM - Lighting	1,511	1,993	1.17	0.0%	0.60	0.53	0.60	0.53
MCE	**Total**	**1,511**	**1,993**	**1.17**	**0.0%**	**0.60**	**0.53**	**0.60**	**0.53**
PGE	CUSTOM - Lighting	35,947	19,130	0.53	0.0%	0.79	0.61	0.79	0.61
PGE	CUSTOM-Other	19,949	18,116	0.91	0.0%	0.48	0.50	0.48	0.50
PGE	**Total**	**55,895**	**37,245**	**0.67**	**0.0%**	**0.64**	**0.55**	**0.64**	**0.55**
SCE	CUSTOM - Lighting	6,897	2,517	0.36	0.0%	0.86	0.34	0.86	0.34
SoCalGas	CUSTOM - Lighting	0							
SCE	CUSTOM-Other	30,933	43,528	1.41	0.0%	0.47	0.57	0.47	0.57
SCE	**Total**	**37,830**	**46,044**	**1.22**	**0.0%**	**0.51**	**0.55**	**0.51**	**0.55**
SoCalGas	CUSTOM-Other	0							
SoCalGas	**Total**	**0**							
SoCalREN	CUSTOM - Lighting	631	380	0.60	0.0%	0.86	0.63	0.86	0.63
SoCalREN	CUSTOM-Other	1,353	244	0.18	0.0%	0.60	0.26	0.60	0.26
SoCalREN	**Total**	**1,983**	**625**	**0.31**	**0.0%**	**0.66**	**0.40**	**0.66**	**0.40**
SDGE	CUSTOM - Lighting	5,712	5,034	0.88	0.0%	0.51	0.62	0.51	0.62
SDGE	CUSTOM-Other	24,539	9,442	0.38	0.0%	0.89	0.35	0.89	0.35
SDGE	**Total**	**30,251**	**14,476**	**0.48**	**0.0%**	**0.78**	**0.41**	**0.78**	**0.41**
	Statewide	***126,833***	***99,410***	***0.78***	***0.0%***	***0.62***	***0.53***	***0.62***	***0.53***

Table B-3. Gross lifecycle savings (MW)

PA	Standard report group	Ex ante gross	Ex post gross	GRR	% Ex ante gross pass through	Eval GRR
MCE	CUSTOM - Lighting	0.1	0.2	2.13	0.0%	2.13
MCE	**Total**	**0.1**	**0.2**	**2.13**	**0.0%**	**2.13**
PGE	CUSTOM - Lighting	1.4	1.3	0.94	0.0%	0.94
PGE	CUSTOM-Other	7.8	8.2	1.05	0.0%	1.05
PGE	**Total**	**9.2**	**9.6**	**1.04**	**0.0%**	**1.04**
SCE	CUSTOM - Lighting	0.3	0.2	0.71	0.0%	0.71
SoCalGas	CUSTOM - Lighting	0.0	0.0			
SCE	CUSTOM-Other	9.6	11.2	1.17	0.0%	1.17
SCE	**Total**	**9.9**	**11.4**	**1.15**	**0.0%**	**1.15**
SoCalGas	CUSTOM-Other	0.0	0.0			
SoCalGas	**Total**	**0.0**	**0.0**			
SoCalREN	CUSTOM - Lighting	0.1	0.1	1.25	0.0%	1.25
SoCalREN	CUSTOM-Other	0.2	0.1	0.31	0.0%	0.31
SoCalREN	**Total**	**0.2**	**0.2**	**0.62**	**0.0%**	**0.62**
SDGE	CUSTOM - Lighting	2.5	0.8	0.32	0.0%	0.32
SDGE	CUSTOM-Other	3.8	3.9	1.02	0.0%	1.02
SDGE	**Total**	**6.3**	**4.7**	**0.75**	**0.0%**	**0.75**
	Statewide	***25.7***	***26.0***	***1.01***	***0.0%***	***1.01***

Table B-4. Net lifecycle savings (MW)

PA	Standard report group	Ex ante net	Ex post net	NRR	% Ex ante net pass through	Ex ante NTG	Ex post NTG	Eval ex ante NTG	Eval ex post NTG
MCE	CUSTOM - Lighting	0.1	0.1	1.89	0.0%	0.60	0.53	0.60	0.53
MCE	**Total**	**0.1**	**0.1**	**1.89**	**0.0%**	**0.60**	**0.53**	**0.60**	**0.53**
PGE	CUSTOM - Lighting	0.7	0.8	1.14	0.0%	0.50	0.61	0.50	0.61
PGE	CUSTOM-Other	4.0	4.1	1.04	0.0%	0.51	0.50	0.51	0.50
PGE	**Total**	**4.7**	**5.0**	**1.06**	**0.0%**	**0.51**	**0.52**	**0.51**	**0.52**
SCE	CUSTOM - Lighting	0.2	0.1	0.39	0.0%	0.63	0.34	0.63	0.34
SoCalGas	CUSTOM - Lighting	0.0							
SCE	CUSTOM-Other	5.1	6.4	1.25	0.0%	0.53	0.57	0.53	0.57
SCE	**Total**	**5.3**	**6.5**	**1.22**	**0.0%**	**0.54**	**0.57**	**0.54**	**0.57**
SoCalGas	CUSTOM-Other	0.0							
SoCalGas	**Total**	**0.0**							
SoCalREN	CUSTOM - Lighting	0.1	0.1	0.89	0.0%	0.89	0.63	0.89	0.63
SoCalREN	CUSTOM-Other	0.1	0.0	0.13	0.0%	0.60	0.26	0.60	0.26
SoCalREN	**Total**	**0.2**	**0.1**	**0.45**	**0.0%**	**0.70**	**0.51**	**0.70**	**0.51**
SDGE	CUSTOM - Lighting	1.2	0.5	0.40	0.0%	0.50	0.62	0.50	0.62
SDGE	CUSTOM-Other	3.5	1.4	0.39	0.0%	0.91	0.35	0.91	0.35
SDGE	**Total**	**4.7**	**1.9**	**0.39**	**0.0%**	**0.75**	**0.39**	**0.75**	**0.39**
	Statewide	***14.9***	***13.5***	***0.90***	***0.0%***	***0.58***	***0.52***	***0.58***	***0.52***

Table B-5. Gross lifecycle savings (MTherms)

PA	Standard report group	Ex ante gross	Ex post gross	GRR	% Ex ante gross pass through	Eval GRR
MCE	CUSTOM - Lighting	-1	-2	4.04	0.0%	4.04
MCE	**Total**	**-1**	**-2**	**4.04**	**0.0%**	**4.04**
PGE	CUSTOM - Lighting	-275	-173	0.63	0.0%	0.63
PGE	CUSTOM-Other	7,795	6,753	0.87	0.0%	0.87
PGE	**Total**	**7,520**	**6,581**	**0.88**	**0.0%**	**0.88**
SCE	CUSTOM - Lighting	-5	-3	0.58	0.0%	0.58
SoCalGas	CUSTOM - Lighting	-4	-4	1.00	0.0%	1.00
SCE	CUSTOM-Other	871	0	0.00	0.0%	0.00
SCE	**Total**	**866**	**-3**	**0.00**	**0.0%**	**0.00**
SoCalGas	CUSTOM-Other	7,698	1,542	0.20	0.0%	0.20
SoCalGas	**Total**	**7,694**	**1,538**	**0.20**	**0.0%**	**0.20**
SoCalREN	CUSTOM - Lighting	-3	-2	0.81	0.0%	0.81
SoCalREN	CUSTOM-Other	3	0	0.16	0.0%	0.16
SoCalREN	**Total**	**0**	**-2**	**-133.13**	**0.0%**	**-133.13**
SDGE	CUSTOM - Lighting	-1	-2	1.39	0.0%	1.39
SDGE	CUSTOM-Other	1,072	980	0.91	0.0%	0.91
SDGE	**Total**	**1,071**	**979**	**0.91**	**0.0%**	**0.91**
	Statewide	***17,151***	***9,090***	***0.53***	***0.0%***	***0.53***

Table B-6. Net lifecycle savings (MTherms)

PA	Standard report group	Ex ante net	Ex post net	NRR	% Ex ante net pass through	Ex ante NTG	Ex post NTG	Eval ex ante NTG	Eval ex post NTG
MCE	CUSTOM - Lighting	0	-1	3.58	0.0%	0.60	0.53	0.60	0.53
MCE	**Total**	**0**	**-1**	**3.58**	**0.0%**	**0.60**	**0.53**	**0.60**	**0.53**
PGE	CUSTOM - Lighting	-249	-106	0.43	0.0%	0.90	0.61	0.90	0.61
PGE	CUSTOM-Other	4,067	3,404	0.84	0.0%	0.52	0.50	0.52	0.50
PGE	**Total**	**3,819**	**3,298**	**0.86**	**0.0%**	**0.51**	**0.50**	**0.51**	**0.50**
SCE	CUSTOM - Lighting	-3	-1	0.33	0.0%	0.60	0.34	0.60	0.34
SoCalGas	CUSTOM - Lighting	-2			0.0%	0.55		0.55	
SCE	CUSTOM-Other	807	0	0.00	0.0%	0.93		0.93	
SCE	**Total**	**804**	**-1**	**0.00**	**0.0%**	**0.93**	**0.34**	**0.93**	**0.34**
SoCalGas	CUSTOM-Other	3,885			0.0%	0.50		0.50	
SoCalGas	**Total**	**3,883**			**0.0%**	**0.50**		**0.50**	
SoCalREN	CUSTOM - Lighting	-3	-2	0.56	0.0%	0.91	0.63	0.91	0.63
SoCalREN	CUSTOM-Other	2	0	0.08	0.0%	0.50	0.26	0.50	0.26
SoCalREN	**Total**	**-1**	**-1**	**1.15**	**0.0%**	**-84.08**	**0.73**	**-84.08**	**0.73**
SDGE	CUSTOM - Lighting	-1	-1	1.57	0.0%	0.55	0.62	0.55	0.62
SDGE	CUSTOM-Other	1,470	342	0.23	0.0%	1.37	0.35	1.37	0.35
SDGE	**Total**	**1,469**	**341**	**0.23**	**0.0%**	**1.37**	**0.35**	**1.37**	**0.35**
	Statewide	***9,973***	***3,635***	***0.36***	***0.0%***	***0.58***	***0.40***	***0.58***	***0.40***

Table B-7. Gross first-year savings (MWh)

PA	Standard report group	Ex ante gross	Ex post gross	GRR	% Ex ante gross pass through	Eval GRR
MCE	CUSTOM - Lighting	335	345	1.03	0.0%	1.03
MCE	**Total**	335	345	**1.03**	**0.0%**	**1.03**
PGE	CUSTOM - Lighting	3,146	3,019	0.96	0.0%	0.96
PGE	CUSTOM-Other	9,599	7,647	0.80	0.0%	0.80
PGE	**Total**	**12,745**	**10,666**	**0.84**	**0.0%**	**0.84**
SCE	CUSTOM - Lighting	2,359	2,113	0.90	0.0%	0.90
SCE	CUSTOM-Other	6,795	6,911	1.02	0.0%	1.02
SCE	**Total**	**9,153**	**9,024**	**0.98**	**0.0%**	**0.98**
SoCalREN	CUSTOM - Lighting	130	116	0.83	0.0%	0.83
SoCalREN	CUSTOM-Other	369	383	0.72	0.0%	0.72
SoCalREN	**Total**	**498**	**370**	**0.74**	**0.0%**	**0.74**
SDGE	CUSTOM - Lighting	1,349	1,322	0.98	0.0%	0.98
SDGE	CUSTOM-Other	4,722	4,675	0.99	0.0%	0.99
SDGE	**Total**	**6,071**	**5994.012426**	**0.98**	**0.0%**	**0.98**
	Statewide	**28,803**	**26,399**	***0.92***	***0.0%***	***0.92***

Table B-8. Net first-year savings (MWh)

PA	Standard report group	Ex ante net	Ex post net	% Ex ante net pass through	Ex ante NTG	Ex post NTG	Eval ex ante NTG	Eval ex post NTG
MCE	CUSTOM - Lighting	198	164	0.0%	0.60	0.50	0.60	0.50
MCE	**Total**	**198**	164	**0.0%**	**0.60**	0.50	**0.60**	0.50
PGE	CUSTOM - Lighting	4,059	2,046	0.0%	0.81	0.68	0.81	0.84
PGE	CUSTOM-Other	3,777	3,687	0.0%	0.49	0.48	0.49	0.98
PGE	**Total**	**7,836**	**5,732**	**0.0%**	**0.62**	**0.50**	**0.62**	**0.50**
SCE	CUSTOM - Lighting	1,288	1,448	0.0%	0.86	0.69	0.86	0.69
SCE	CUSTOM-Other	3,516	3,775	0.0%	0.48	0.55	0.48	0.55
SCE	**Total**	**4,804**	**5,223**	**0.0%**	**0.54**	**0.58**	**0.54**	**0.58**
SoCalREN	CUSTOM - Lighting	111	61	0.0%	0.86	0.63	0.86	0.86
SoCalREN	CUSTOM-Other	221	79	0.0%	0.60	0.30	0.60	0.60
SoCalREN	**Total**	**332**	**140**	**0.0%**	**0.67**	**0.39**	**0.67**	**0.67**
SDGE	CUSTOM - Lighting	684	824	0.0%	0.51	0.62	0.51	0.62
SDGE	CUSTOM-Other	4,437	2,224	0.0%	0.94	0.48	0.94	0.48
SDGE	**Total**	**5,122**	**3,048**	**0.0%**	**0.84**	**0.50**	**0.84**	**0.50**
	Statewide	***18,292***	***14,307***	***0.0%***	***0.64***	***0.54***	***0.64***	***0.54***

Table B-9. Gross first-year savings (MW)

PA	Standard report group	Ex ante gross	Ex post gross	GRR	% Ex ante gross pass through	Eval GRR
MCE	CUSTOM - Lighting	0.0	0.0	1.73	0.0%	1.73
MCE	**Total**	**0.0**	**0.0**	**1.73**	**0.0%**	**1.73**
PGE	CUSTOM - Lighting	0.6	0.6	1.07	0.0%	1.07
PGE	CUSTOM-Other	0.7	0.4	0.81	0.0%	0.81
PGE	**Total**	**1.3**	**1.1**	**0.84**	**0.0%**	**0.93**
SCE	CUSTOM - Lighting	0.3	0.3	0.98	0.0%	1.22
SCE	CUSTOM-Other	0.7	0.7	1.03	0.0%	1.03
SCE	**Total**	**1.1**	**1.1**	**1.04**	**0.0%**	**1.04**
SoCalREN	CUSTOM - Lighting	0.0	0.0	1.25	0.0%	1.25
SoCalREN	CUSTOM-Other	0.0	0.0	1.02	0.0%	1.02
SoCalREN	**Total**	**0.0**	**0.0**	**1.10**	**0.0%**	**1.10**
SDGE	CUSTOM - Lighting	0.2	0.1	0.50	0.0%	0.50
SDGE	CUSTOM-Other	0.5	0.5	1.01	0.0%	1.01
SDGE	**Total**	**0.8**	**0.6**	**0.85**	**0.0%**	**0.85**
	Statewide	***3.2***	***2.9***	***0.92***	***0.0%***	***0.92***

Table B-10. Net first-year savings (MW)

PA	Standard report group	Ex ante net	Ex post net	NRR	% Ex ante net pass through	Ex ante NTG	Ex post NTG	Eval ex ante NTG	Eval ex post NTG
MCE	CUSTOM - Lighting	0.0	0.0	1.38	0.0%	0.60	0.48	0.60	0.48
MCE	**Total**	**0.0**	**0.0**	**1.38**	**0.0%**	**0.60**	**0.48**	**0.60**	**0.48**
PGE	CUSTOM - Lighting	0.1	0.1	1.31	0.0%	0.51	0.68	0.51	0.68
PGE	CUSTOM-Other	0.6	0.5	0.79	0.0%	0.50	0.48	0.50	0.48
PGE	**Total**	**0.7**	**0.6**	**0.84**	**0.0%**	**0.50**	**0.50**	**0.50**	**0.50**
SCE	CUSTOM - Lighting	0.0	0.0	1.33	0.0%	0.63	0.69	0.63	0.69
SoCalGas	CUSTOM - Lighting	0.0							
SCE	CUSTOM-Other	0.5	0.6	1.09	0.0%	0.52	0.55	0.52	0.55
SCE	**Total**	**0.6**	**0.6**	**1.10**	**0.0%**	**0.52**	**0.55**	**0.52**	**0.55**
SoCalGas	CUSTOM-Other	0.0							
SoCalGas	**Total**	**0.0**							
SoCalREN	CUSTOM - Lighting	0.0	0.0	0.89	0.0%	0.89	0.63	0.89	0.63
SoCalREN	CUSTOM-Other	0.0	0.0	0.49	0.0%	0.60	0.29	0.60	0.29
SoCalREN	**Total**	**0.0**	**0.0**	**0.67**	**0.0%**	**0.70**	**0.43**	**0.70**	**0.43**
SDGE	CUSTOM - Lighting	0.1	0.1	0.63	0.0%	0.50	0.62	0.50	0.62
SDGE	CUSTOM-Other	0.5	0.3	0.47	0.0%	1.02	0.48	1.02	0.48
SDGE	**Total**	**0.7**	**0.3**	**0.50**	**0.0%**	**0.85**	**0.50**	**0.85**	**0.50**
	Statewide	***1.9***	***1.5***	***0.80***	***0.0%***	***0.60***	***0.52***	***0.60***	***0.52***

Table B-11. Gross first-year savings (MTherms)

PA	Standard report group	Ex ante gross	Ex post gross	GRR	% Ex ante gross pass through	Eval GRR
MCE	CUSTOM - Lighting	0	0	3.55	0.0%	3.55
MCE	**Total**	**0**	**0**	**3.55**	**0.0%**	**3.55**
PGE	CUSTOM - Lighting	4	-55	1.00	0.0%	1.00
PGE	CUSTOM-Other	783	664	0.85	0.0%	0.85
PGE	**Total**	**727**	**609**	**0.84**	**0.0%**	**0.84**
SCE	CUSTOM - Lighting	-1	-2	1.72	0.0%	1.72
SoCalGas	CUSTOM - Lighting	-1	-1	1.00	0.0%	1.00
SCE	CUSTOM-Other	73	0	0.00	0.0%	0.00
SCE	**Total**	**72**	**-2**	**-0.02**	**0.0%**	**-0.02**
SoCalGas	CUSTOM-Other	1,449	489	0.34	0.0%	0.34
SoCalGas	**Total**	**1,448**	**488**	**0.34**	**0.0%**	**0.34**
SoCalREN	CUSTOM - Lighting	0	0	-0.81	0.0%	-0.81
SoCalREN	CUSTOM-Other	1	0	0.20	0.0%	0.20
SoCalREN	**Total**	**0**	**0**	**-0.26**	**0.0%**	**-0.10**
SDGE	CUSTOM - Lighting	0	0	1.09	0.0%	1.09
SDGE	CUSTOM-Other	28	17	0.63	0.0%	0.63
SDGE	**Total**	**28**	**17**	**0.63**	**0.0%**	**0.63**
	Statewide	***2,135***	***1,046***	***0.49***	***0.0%***	***0.49***

Table B-12. Net first-year savings (MTherms)

PA	Standard report group	Ex ante net	Ex post net	NRR	% Ex ante net pass through	Ex ante NTG	Ex post NTG	Eval ex ante NTG	Eval ex post NTG
MCE	CUSTOM - Lighting	0	0	4.14	0.0%	0.60	0.70	0.60	0.70
MCE	**Total**	**0**	**0**	**4.14**	**0.0%**	**0.60**	**0.70**	**0.60**	**0.70**
PGE	CUSTOM - Lighting	-50	-39	0.78	0.0%	0.90	0.70	0.90	0.70
PGE	CUSTOM-Other	407	313	0.77	0.0%	0.52	0.47	0.52	0.47
PGE	**Total**	**357**	**274**	**0.77**	**0.0%**	**0.49**	**0.45**	**0.49**	**0.45**
SCE	CUSTOM - Lighting	-1	0	0.66	0.0%	0.60	0.23	0.60	0.23
SCE	CUSTOM-Other	68			0.0%	0.93		0.93	
SCE	**Total**	**67**	**0**	**-0.01**	**0.0%**	**0.93**	**0.23**	**0.93**	**0.23**
SoCalGas	CUSTOM - Lighting	0			0.0%	0.55		0.55	
SoCalGas	CUSTOM-Other	728	401	0.55	0.0%	0.50	0.82	0.50	0.82
SoCalGas	**Total**	**728**	**401**	**0.55**	**0.0%**	**0.50**	**0.82**	**0.50**	**0.82**
SoCalREN	CUSTOM - Lighting	0	0	0.57	0.0%	0.91	0.63	0.91	0.63
SoCalREN	CUSTOM-Other	1			0.0%	0.50		0.50	
SoCalREN	**Total**	**0**	**0**	**-7.31**	**0.0%**	**0.07**	**2.04**	**0.07**	**2.04**
SDGE	CUSTOM - Lighting	0			0.0%	0.55		0.55	
SDGE	CUSTOM-Other	183	10	0.05	0.0%	4.32	0.37	4.32	0.37
SDGE	**Total**	**182**	**10**	**0.05**	**0.0%**	**4.35**	**0.37**	**4.35**	**0.37**
	Statewide	***1,334***	***685***	***0.51***	***0.0%***	***0.58***	***0.61***	***0.58***	***0.61***

APPENDIX C. IESR PER UNIT SAVINGS TABLES

Table C-1. Per unit (quantity) gross energy savings (kWh)

PA	Standard report group	Pass through	% ER ex ante	% ER ex post	Average EUL (yr)	Ex post lifecycle	Ex post annualized
MCE	CUSTOM - Lighting	0	0.0%	0.0%	12.0	4,340.2	361.7
PGE	CUSTOM - Lighting	0	0.0%	0.0%	12.0	5.9	0.5
PGE	CUSTOM-Other	0	0.0%	0.0%	7.3	3.5	0.6
SCE	CUSTOM - Lighting	0	0.0%	0.0%	11.3	19.6	1.7
SCE	CUSTOM-Other	0	0.0%	0.0%	10.9	26.8	2.8
SoCalGas	CUSTOM - Lighting	0	0.0%	0.0%	11.3	0.0	0.0
SoCalGas	CUSTOM-Other	0	0.0%	0.0%	10.1	0.0	0.0
SoCalREN	CUSTOM - Lighting	0	0.0%	0.0%	12.0	60,033.7	5,002.8
SoCalREN	CUSTOM-Other	0	0.0%	0.0%	11.0	158,780.6	25,956.8
SDGE	CUSTOM - Lighting	0	0.0%	0.0%	11.3	21.5	1.8
SDGE	CUSTOM-Other	0	0.0%	0.0%	10.9	9.5	1.6

Table C-2. Per unit (quantity) gross energy savings (therms)

PA	Standard report group	Pass through	% ER ex ante	% ER ex post	Average EUL (yr)	Ex post lifecycle	Ex post first-year	Ex post annualized
MCE	CUSTOM - Lighting	0	0.0%	0.0%	12.0	-5.1	-0.8	-0.4
PGE	CUSTOM - Lighting	0	0.0%	0.0%	12.0	0.0	0.0	0.0
PGE	CUSTOM-Other	0	0.0%	0.0%	7.3	0.7	0.1	0.1
SCE	CUSTOM - Lighting	0	0.0%	0.0%	11.3	0.0	0.0	0.0
SCE	CUSTOM-Other	0	0.0%	0.0%	10.9	0.0	0.0	0.0
SoCalGas	CUSTOM - Lighting	0	0.0%	0.0%	11.3	0.0	0.0	0.0
SoCalGas	CUSTOM-Other	0	0.0%	0.0%	10.1	0.7	0.2	0.1
SoCalREN	CUSTOM - Lighting	0	0.0%	0.0%	12.0	-244.3	-42.3	-20.4
SoCalREN	CUSTOM-Other	0	0.0%	0.0%	11.0	81.2	48.6	27.1
SDGE	CUSTOM - Lighting	0	0.0%	0.0%	11.3	0.0	0.0	0.0
SDGE	CUSTOM-Other	0	0.0%	0.0%	10.9	0.3	0.0	0.0

Table C-3. Per unit (quantity) net energy savings (kWh)

PA	Standard report group	Pass through	% ER ex ante	% ER ex post	Average EUL (yr)	Ex post lifecycle	Ex post annualized
MCE	CUSTOM - Lighting	0	0.0%	0.0%	12.0	2,308.6	192.4
PGE	CUSTOM - Lighting	0	0.0%	0.0%	12.0	3.6	0.3
PGE	CUSTOM-Other	0	0.0%	0.0%	7.3	1.8	0.3
SCE	CUSTOM - Lighting	0	0.0%	0.0%	11.3	6.7	0.6
SCE	CUSTOM-Other	0	0.0%	0.0%	10.9	15.3	1.6
SoCalGas	CUSTOM - Lighting	0	0.0%	0.0%	11.3		
SoCalGas	CUSTOM-Other	0	0.0%	0.0%	10.1		0.0
SoCalREN	CUSTOM - Lighting	0	0.0%	0.0%	12.0	38,021.4	3,168.4
SoCalREN	CUSTOM-Other	0	0.0%	0.0%	11.0	40,716.6	6,656.2
SDGE	CUSTOM - Lighting	0	0.0%	0.0%	11.3	13.4	1.1
SDGE	CUSTOM-Other	0	0.0%	0.0%	10.9	3.3	0.6

Table C-4. Per unit (quantity) net energy savings (therms)

PA	Standard report group	Pass through	% ER ex ante	% ER ex post	Average EUL (yr)	Ex post lifecycle	Ex post first-year	Ex post annualized
MCE	CUSTOM - Lighting	0	0.0%	0.0%	12.0	-2.7	-0.6	-0.2
PGE	CUSTOM - Lighting	0	0.0%	0.0%	12.0	0.0	0.0	0.0
PGE	CUSTOM-Other	0	0.0%	0.0%	7.3	0.3	0.0	0.0
SCE	CUSTOM - Lighting	0	0.0%	0.0%	11.3	0.0	0.0	0.0
SCE	CUSTOM-Other	0	0.0%	0.0%	10.9	0.0		0.0
SoCalGas	CUSTOM - Lighting	0	0.0%	0.0%	11.3			
SoCalGas	CUSTOM-Other	0	0.0%	0.0%	10.1		0.2	0.0
SoCalREN	CUSTOM - Lighting	0	0.0%	0.0%	12.0	-154.7	-26.8	-12.9
SoCalREN	CUSTOM-Other	0	0.0%	0.0%	11.0	20.8		6.9
SDGE	CUSTOM - Lighting	0	0.0%	0.0%	11.3	0.0		0.0
SDGE	CUSTOM-Other	0	0.0%	0.0%	10.9	0.1	0.0	0.0

APPENDIX D. ELECTRIC PROJECT DISCREPANCIES

Table D-1 below provides project level results, including sampling weights, forecasted and evaluated savings, GRRs, and the primary discrepancy category.

Table D-1. Discrepancy details for PY2023 CIAC electric projects

DNV Project ID	Sampling weight	First-year (kWh) Forecasted	Evaluated	GRR	Primary discrepancy category
10958650	1	26,746	26,746	100%	No discrepancy found.
10997072	16	-11,393	-11,393	100%	No discrepancy found.
10973269	1	-400,865	-400,865	100%	No discrepancy found.
10978709	4.6667	-4,648	-4,648	100%	No discrepancy found.
11026888	3	32,586	31,470	97%	Measure Count
11032322	1.6667	126,158	126,158	100%	No discrepancy found.
11032335	1.6667	184,090	156,849	85%	Measure Count
11032336	1.6667	207,487	197,580	95%	Measure Count
11220566	4.6667	134,554	130,447	97%	Calculation Method
11227560	3.5	11,176	11,176	100%	No discrepancy found.
11227562	3.5	17,243	17,243	100%	No discrepancy found.
11427257	1	283,030	283,030	100%	No discrepancy found.
11427259	4.6667	309,350	337,914	109%	Operating Conditions
EE_CALC_5885558	1.1667	233,636	0	0%	Inoperable Measure
EE_CALC_5900042	1.1667	184,441	256,257	139%	Operating Conditions
EE_CALC_5916840	1.6667	154,893	266,574	172%	Operating Conditions
EE_CALC_5916889	1.1667	381,184	250,197	66%	Calculation Method

DNV Project ID	Sampling weight	First-year (kWh) Forecasted	Evaluated	GRR	Primary discrepancy category
EE_CALC_5921712	6.75	8,906	8,906	100%	No discrepancy found.
EE_CALC_5921716	1.6667	125,504	125,504	100%	No discrepancy found.
EE_CALC_5921731	2.6667	49,474	49,474	100%	No discrepancy found.
EE_CALC_5921734	2.6667	53,288	53,287	100%	No discrepancy found.
EE_CALC_5921746	6.75	11,737	11,738	100%	No discrepancy found.
EE_CALC_5926398	2.6667	41,898	41,898	100%	No discrepancy found.
EE_CALC_5929812	1.6667	96,120	96,120	100%	No discrepancy found.
EE_CALC_6709577	6.75	13,333	13,333	100%	No discrepancy found.
EE_CALC_6709582	6.75	10,584	10,584	100%	No discrepancy found.
EE_CALC_6731221	1	195,130	0	0%	Operating Conditions
EE_CALC_6735115	1	706,360	0	0%	Operating Conditions
P-2024.04.16-52248	1.6667	14,762	27,629	187%	Operating Conditions
P-2024.04.16-52249	1.6667	61,767	137,724	223%	Operating Conditions
P-2024.06.21-62835	1.6667	226,030	146,060	65%	Operating Conditions
PRJ - 02085104	1	-228,439	-250,491	110%	Operating Conditions
PRJ - 02738586	1.75	152,795	152,080	100%	No discrepancy found.
PRJ - 02860006	2.5	685,397	468,021	68%	Operating Conditions
PRJ - 03237490	2	323,383	128,975	40%	Operating Conditions
PRJ - 03622414	1	3,713,419	3,713,419	100%	No discrepancy found.

DNV Project ID	Sampling weight	First-year (kWh) Forecasted	Evaluated	GRR	Primary discrepancy category
PRJ - 03772742	2	493,741	0	0%	Inoperable Measure
PRJ - 03792212	1	786,253	596,110	76%	Calculation Method
PRJ - 04047126	2	193,508	150,759	78%	Operating Conditions
PRJ - 04237428	1.75	6,208	-14,445	-233%	Operating Conditions
PRJ - 04281924	2.5	376,680	376,680	100%	No discrepancy found.
PRJ - 04303342	1	2,307,429	2,298,096	100%	No discrepancy found.
PRJ - 04326990	1.75	409,608	480,888	117%	Calculation Method
PRJ - 04362490	1	98,533	98,533	100%	No discrepancy found.
PRJ - 04378448	1.75	139,280	192,990	139%	Operating Conditions
PRJ - 04473180	0	14,355	5,607	39%	Calculation Method
PRJ - 04682262	2	216,217	291,342	135%	Calculation Method
PRJ - 04775910	1	291,704	347,125	119%	Operating Conditions
PRJ - 04823192	1	1,244,976	989,836	80%	Operating Conditions
PRJ - 02674596	2	65,860	152,190	231%	Operating Conditions
SCR-2024-PUBL-0066T00001Bsvv1QAB	2	14,710	9,923	67%	Operating Conditions
SCR-2024-PUBL-0066T00001CZFcPQAX	1	115,578	95,792	83%	Operating Conditions
SCR-2024-PUBL-006Pk000007JTGnIAO	1	108,363	15,606	14%	Operating Conditions
SCR-2024-PUBL-006Pk00000BGypuIAD	2	52,961	53,743	101%	Calculation Method
WISE-17-000022	1	920,191	878,837	96%	Operating Conditions

DNV Project ID	Sampling weight	First-year (kWh) Forecasted	Evaluated	GRR	Primary discrepancy category
WISE-18-000029	1.1667	352,490	0	0%	Operating Conditions
WISE-18-000036	1.1667	217,072	54,315	25%	Operating Conditions
WISE-19-000052	1	1,281,853	1,281,853	100%	No discrepancy found.
WISE-19-000088	1	1,300,001	2,412,583	186%	Operating Conditions

APPENDIX E. GAS PROJECT DISCREPANCIES

Table E-1 below provides project level results, including sampling weights, forecasted and evaluated savings, GRRs, and the primary discrepancy category.

Table E-1. Discrepancy details for PY2023 CIAC gas projects

DNV Project ID	Sampling weight	First-year (Therm)			Primary discrepancy category
		Forecasted	Evaluated	GRR	
10997072	16	569	569	100%	No discrepancy found.
10973269	1	-372,472	-372,472	100%	No discrepancy found.
10978709	4.6667	-927	-927	100%	No discrepancy found.
11026888	3	21	20	97%	Measure Count
12165254	1.5	1,094,893	442,847	40%	Operating Conditions
13596750	1.5	266,633	0	0%	Inoperable Measure
EE_CALC_5916840	1.6667	-874	-1,505	172%	Operating Conditions
P-2024.04.16-52249	1.6667	-388	-1,374	355%	Operating Conditions
PRJ - 02085104	1	215,815	198,053	92%	Operating Conditions
PRJ - 02738586	1.75	1,219	-697	-57%	Operating Conditions
PRJ - 03101280	1	157,756	157,755	100%	No discrepancy found.
PRJ - 03622414	1	-54,068	-54,069	100%	No discrepancy found.
PRJ - 03792212	1	48,403	33,853	70%	Calculation Method
PRJ - 03858374	1	5,547	0	0%	Ineligible Measure
PRJ - 03927590	1	57,314	25,553	45%	Operating Conditions
PRJ - 04237428	1.75	72,550	58,910	81%	Operating Conditions
PRJ - 04281924	2.5	-1,847	-1,847	100%	No discrepancy found.

DNV Project ID	Sampling weight	First-year (Therm) Forecasted	Evaluated	GRR	Primary discrepancy category
PRJ - 04303342	1	89,512	86,180	96%	Operating Conditions
PRJ - 04326990	1.75	23,089	24,548	106%	Calculation Method
PRJ - 04362490	1	-260	-260	100%	No discrepancy found.
PRJ - 04378448	1.75	1,315	8,823	671%	Operating Conditions
PRJ - 04473180	0	802	12	1%	Calculation Method
PRJ - 04775910	1	11,517	11,517	100%	No discrepancy found.
PRJ - 04823192	1	95,807	50,921	53%	Operating Conditions
SCR-2024-PUBL-0066T00001CZFcPQAX	1	-376	-308	82%	Operating Conditions
SCR-2024-PUBL-006Pk000007JTGnIAO	1	1,015	360	35%	Operating Conditions
SCR-2024-PUBL-006Pk00000BGypuIAD	2	-141	-109	77%	Calculation Method