Group A Deemed Savings PY2023 Claims Review

Prepared for:

California Public Utilities Commission

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Abbreviations and Acronyms

ASH – Anti-Sweat Heater (used in refrigeration controls)

ATR – All Things Reporting (CPUC's internal database of individual savings claims)

BAY – BayREN (Bay Area Regional Energy Network)

CA eTRM – California Electronic Technical Reference Manual

CCA – Community Choice Aggregator

CEDARS – California Energy Data and Reporting System

CPUC – California Public Utilities Commission

CZ – Climate Zone

EUL – Expected Useful Life

GRR – Gross Realization Rate

GWh – Gigawatt-hour

HPWH – Heat Pump Water Heater

HVAC – Heating, Ventilation, and Air Conditioning

IOU – Investor-Owned Utility

kWh – Kilowatt-hour

LED – Light Emitting Diode

MMTherms – Million Therms

MW – Megawatt

NTG – Net-to-Gross

NTGR – Net-to-Gross Ratio

PA – Program Administrator

PY – Program Year

REN – Regional Energy Network

RUL – Remaining Useful Life

SCG – Southern California Gas Company

SDGE – San Diego Gas & Electric

SJCE – San José Clean Energy

TCR – Tri-County Regional Energy Network

TLED – Tubular Light Emitting Diode

TSB – Total System Benefit

VFD – Variable Frequency Drive

Glossary of Key Terms

Accelerated Replacement - A measure installed before the end of the existing equipment's useful life.

Deemed Savings - Pre-calculated energy savings values assigned to specific energy efficiency measures.

Embedded Water Savings - The water purification and pumping energy saved by implementing energy efficient measures that save water in addition to energy.

Hard-to-Reach (HTR) - Customer segments that may require additional effort to engage in energy efficiency programs

Measure Group - A collection of similar measures grouped for evaluation purposes.

Workpaper - A document that defines the assumptions and calculations used to estimate deemed savings for a measure.

Executive Summary

Introduction

Energy efficiency programs save energy by encouraging customers to install efficient technologies (appliances, HVAC, etc.) that use less energy. Additionally, although fuel substitution programs increase electricity use, they save natural gas and reduce total energy consumption by replacing gas technologies with electric technologies. The CPUC sets energy savings targets that Program Administrators (PAs) meet by administering programs that install these technologies.[1] The CPUC then evaluates the performance of these programs.

For evaluation purposes, the CPUC has grouped programs into three evaluation groups: Group A (pre-approved "typical" and aggregated meter-based savings estimates), Group B (Codes and Standards programs and programs without savings targets), and Group D (custom calculated and site-level meter-based savings). The scope of this review covers all Group A "typical" savings claims. For Group A claims, rather than measure savings from each and every technology installation (also known as a "measure"), the CPUC approves and relies on "typical savings" estimates, also called "deemed savings." PAs then calculate gross program energy savings (GWh, MW, and therms), by multiplying the CPUC-estimated savings per measure times the number of measure installations, and determine "net" energy savings by estimating what portion of those savings were due to the influence of the program instead of other factors. The PAs report gross and net savings to the CPUC.

In prior Group A evaluation cycles, evaluators identified the technologies and/or programs that accounted for the largest measurement uncertainty of the portfolio and conducted in depth research activities to reduce that uncertainty. Given the high rigor of recent evaluations, the need to look across the entire savings portfolio, and timing limitations, this evaluation reviewed the PAs' Program Year (PY) 2023 reported savings and compared them to the CPUC's approved savings estimate for each technology to determine any discrepancies or variance. For any instances in which there were discrepancies, the evaluation team adjusted estimates and re-calculated total savings.

Key Findings and Results

The team conducted an in-depth review of claims with discrepancies and found that the difference in values could be explained by legitimate reasons for the vast majority of the claims. Only around 1% of the total claims contained errors that required an adjustment to the parameters. These in turn represented less than 0.5% of total deemed savings for PY2023.

Key findings include:

- There were 68 programs that claimed Group A savings in PY2023, encompassing 63 measure groups (some measures were offered in more than one program). Twenty-one

[1] PAs that administered programs in PY2023 include the California Investor-Owned Utilities (IOUs) Pacific Gas & Electric, Southern California Edison, Southern California Gas, and San Diego Gas & Electric; the Community Choice Aggregators (CCAs) Ava Community Energy, East Bay Community Energy, Lancaster Choice Energy, Marin Clean Energy, Peninsula Clean Energy, Redwood Coast Energy Authority, San Jose Clean Energy, and Sonoma Clean Power; and the Regional Energy Networks (RENs) Inland Regional Energy Network, Bay Area Regional Energy Network, Southern California Regional Energy Network, and Tri-County Regional Energy Network.

of the 63 measure groups accounted for more than 85% of total energy savings. The study team focused their review specifically on these 21 measure groups to direct study resources to areas of greatest potential impact.

- **Energy efficiency, non-fuel substitution technologies saved 425 GWh in lifecycle net savings** and in aggregate the PAs' reported lifecycle net savings were near 100% aligned with CPUC estimates. These savings were overwhelmingly from IOU programs.
- **Energy efficiency, non-fuel substitution technologies saved 265 million therms in lifecycle net savings** and in aggregate the PAs' reported lifecycle net savings were near 100% aligned with CPUC estimates. These savings were overwhelmingly from IOU programs.
- **Fuel substitution technologies increased electricity usage by an estimated 440 GWh**, compared to PA-reported savings of 441 GWh (99.5% alignment in aggregate), and these values were overwhelmingly from IOU programs.
- **Fuel substitution technologies saved 59 million therms** and the PAs' reported lifecycle net savings were almost 100% aligned in aggregate with CPUC estimates, and these savings were overwhelmingly from IOU programs.

At the PA level:

- **High IOU accuracy.** The four IOUs' reported savings were almost entirely in 100 percent alignment with CPUC estimates, with SoCalGas at 99.9%.
- **Non-IOU PA room to improve.** The non-IOU PAs had more variation, ranging from variances of 83%-123% for GWh and 9% to 102% for therms.
- **Nine programs out of 68 with PY2023 claims had the largest discrepancies.** Five out of these nine programs with the most reported savings variance were non-IOU programs, with variances ranging from 28% to 90%, while the reported savings from the remaining four IOU programs had variances ranging from 62% to 112%.

Recommendations for PAs

- **Ensure accurate technical savings parameters.** The deemed savings for some technologies vary by certain parameters such as building type or location. The PAs should confirm, and the CPUC should verify that the claims accurately reflect appropriate parameters (building type, geographic location, etc.).
- **Document intentional differences between claims and deemed values.** The PAs should confirm, and the CPUC should verify, that the PAs adequately document instances in which the CPUC allows for deviations specific to "typical parameters" for certain technologies (i.e. technology installations for "hard-to-reach" customers may see different estimates, and the PA should indicate that the customer is hard-to-reach).
- **Account for water savings separately from energy savings.** For technologies that save both energy and water (faucet aerators, low-flow showerheads, food service appliances etc.), the PAs should calculate the water savings separately from the energy savings and ensure they are being reported in their respective categories.

1. Introduction

Energy efficiency programs save energy by encouraging customers to install efficient technologies (appliances, HVAC, etc.) that use less energy. Additionally, although fuel substitution programs increase electricity use, they save natural gas and reduce total energy consumption by replacing gas technologies with electric technologies. The California Public Utilities Commission (CPUC) sets energy savings targets that Program Administrators (PAs) meet by administering programs that install these technologies. The CPUC then evaluates the performance of these programs.

For evaluation purposes, the CPUC has grouped programs into three evaluation groups: Group A (pre-approved deemed and aggregated meter-based savings estimates), Group B (Codes and Standards programs and programs without savings targets), and Group D (custom calculated and site-level meter-based savings). The scope of this review covers all Group A deemed savings claims. For Group A claims, rather than determining measure savings from each and every technology installation (also known as a "measure"), the CPUC approves and relies on "deemed savings" estimates that represent a typical installation. PAs then calculate program energy savings (GWh, MW, and therms), by multiplying the deemed savings per measure times the number of measure installations and report those savings to the CPUC.

In Program Year (PY) 2023, the 10 PAs in California reported a total of 1.06 million individual savings claims for deemed measures in Group A, across 167 programs and 63 measure groups, delivering $307.6 million in Total System Benefits (TSB).[2] In prior Group A evaluation cycles, evaluators identified the technologies and/or programs that accounted for the largest measurement uncertainty of the portfolio and conducted deep dive research activities to reduce that uncertainty. Given the high rigor of recent evaluations, the need to look across the entire savings portfolio, and timing limitations, this evaluation reviewed a majority of the PAs' Program Year (PY) 2023 reported savings and compared them to the CPUC's approved savings estimate for each technology, to identify and correct inaccurate claims and detect technical or administrative risks within the portfolio. For any instances in which there were discrepancies, estimates were adjusted and total savings re-calculated. The goal was to ensure that data is reported as accurately as possible, while managing portfolio risk in the time available.

This report contains the results of Guidehouse Inc. (Guidehouse) and Quantum Energy Analytics (Quantum's) (hereafter referred to as the study team's) review of PA savings claims for deemed measures in PY2023.

1.1 Background

Table 1 summarizes the lifecycle net savings claimed by PAs for Group A programs in PY2023. The table shows savings for Residential, Commercial, Industrial, and Public Sector deemed measures grouped into two categories: non-fuel substitution measures, which are like-for-like replacements, and fuel substitution measures, which switch the predominant fuel type of the

[2] Total System Benefit (TSB) is "an expression, in dollar value, of the lifecycle energy, capacity, and GHG benefits of a utility's energy efficiency program portfolio." (California Public Utilities Commission, "CPUC Better Aligns Energy Efficiency Programs to Reduce GHG Emissions, Support Equity, and Increase Grid Stability." Available at: https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M385/K242/385242131.PDF)

measure from gas to electric. An example is swapping out a gas clothes dryer with an all-electric one.

Table 1. Lifecycle Net Savings for Deemed Claims in PY2023

Measure Category	Count of Claims	Claimed MW	Claimed GWh	Claimed MMTherms
Non-Fuel Substitution Measures	1,034,924	118.80	425.37	264.88
Fuel Substitution Measures	26,836	-	(441.98)	59.74
All		118.79	(16.61)	324.62

A primary goal of this research was to focus reviews on measure groups responsible for the vast majority of claimed energy savings. While the Group A programs collectively included over 1 million claims, 21 of the 63 measure groups accounted for more than 85% of total energy savings. Among non-fuel substitution measures, 11 groups represented 86% of claimed electric (kWh) savings, and eight groups represented 86% of claimed natural gas savings. More dramatically, among fuel substitution measures, only two groups accounted for 98% of fuel substitution natural gas savings and the associated increase in electric load. Fuel substitution measures also accounted for a disproportionate amount of gas savings relative to the number of claims. The study team focused their review specifically on these 21 groups to direct study resources to areas of greatest potential impact. The reviewed measure groups collectively represented at least 85% of total energy savings and 93% of claims. Future research may explore if these measure groups sufficiently address broader energy efficiency opportunities across California.

1.2 Objectives

The objectives of this study included the following:

- Review claims representing at least 90% of deemed Group A savings to identify errors in reporting savings parameters, savings parameters that can be updated per recent evaluations, and any reporting error patterns that can be systematically addressed going forward.
- Update the All Things Reporting (ATR) Database[3] to add ex-post savings for PY2023 deemed measures based on this analysis.
- Report findings and recommendations for PY2023 deemed measures to address any systematic reporting issues identified through the study, and to inform CPUC processes and policy.

[3] The ATR Database is a CPUC internal database of every individual savings claim in California across all programs and measure groups. When claims are evaluated, any incorrect parameters are fixed and the corrected value is added to the ATR Database. This recordkeeping process supports CPUC's oversight of programs by tracking the accuracy of claims.

1.3 Organization of Report

This report consists of the following sections:

- Section 2 describes the study methodology.
- Section 3 presents the key findings.
- Section 4 presents the results of the study in table form.
- Section 5 provides recommendations for PAs.

2. Methodology

The study methodology consisted of the following steps:

1. Generate aggregated savings claims dataset and prioritize measure groups for review
2. Review savings claims to identify discrepancies with ex-ante workpapers
3. Conduct in-depth review of savings claims with differences between claimed parameters and workpaper values
4. Incorporate recent evaluation results for select measure groups, as applicable

The following subsections describe each of these steps in detail.

2.1 Step 1: Aggregate Savings Claims and Prioritize Measure Groups

The study team prioritized which measure groups to review, in order to focus study resources on the most impactful measures.

First, the study team aggregated the individual savings claims into a manageable number of data points for further review. The California Energy Data and Reporting System (CEDARS) database includes each individual claim from PA programs with millions of records. The first step in the review of savings claims was to aggregate those claims to unique combinations of fields: PA, MeasureDetailID (unique identifier for a measure package permutation), statewide claim flag, residential flag, and fuel substitution flag. Over one million individual deemed claims were aggregated to just under 14,000 unique combinations of these fields, which is referred to as the aggregated savings claims dataset.

Next, the study team conducted further aggregation to identify which measure groups were responsible for the largest proportion of the claimed energy savings. The study team analyzed the aggregated savings claims dataset to identify the top measure groups for PY2023 in terms of savings. Measure groups are defined by the Measure ID that identifies each measure group and its version in the California Electronic Technical Reference Manual (CA eTRM).[4,5] The team aggregated savings claims for kWh, kW and Therms at the measure group level.

Finally, the study team chose a subset of the measures for review. The study team targeted measures that would collectively cover at least 85% of Group A energy savings in aggregate. This subset ultimately consisted of 21 of the 63 measure groups. This resulted in each of the selected measure groups representing at least 3% of the total savings individually (hereafter referred to as “prioritized measure groups”). Measure groups representing the bottom 15% of savings (hereafter referred to as “non-prioritized measure groups”) were passed through without review.

Table 2, Table 3, and Table 4 show prioritized measure groups based on electric, gas, and fuel substitution savings. Some measure groups appear in multiple tables because they save electricity and gas. For example, refrigeration case doors save electricity by improving efficiency of the refrigerated case and save gas, resulting in lower heating needs for the building. Notably,

[4] www.caetrm.com

[5] For example, Measure ID SWHC050-02 is for residential ductless heat pumps, version 02 which was effective from July 22, 2021 through November 7, 2023, while Measure ID SWHC050-03 is the version effective from November 8, 2023 through December 31, 2023.

electric savings are primarily driven by food service and refrigeration measures, representing 40.5% of electric savings, as well as HVAC duct sealing and high efficiency unitary systems, representing an additional 25.4% of electric savings. Gas savings are dominated by one measure group, tankless water heaters, which represent 57% of gas savings. Future evaluation research may examine the measure groups that contribute most significantly to overall Group A savings in more depth.

Table 2. Prioritized Electric Measures

Measure Group	% of kWh Savings
HVAC Duct Sealing	14.5%
Food Service	12.8%
HVAC High Efficiency Unitary	10.9%
Lighting Indoor LED TLED	9.6%
Refrigeration Door Closer	8.1%
Refrigeration Controls – Anti-Sweat Heater	7.9%
Refrigeration Case Doors	7.6%
HVAC Controls – Smart Thermostat	4.4%
Refrigeration Freezer	4.1%
Process Fan Variable Frequency Drive	3.7%
HVAC Boiler (Electric)	2.9%
Water Heating Faucet Aerator	2.6%
Total	**89.1%**

Table 3. Prioritized Gas Measures

Measure Group	% of Therm Savings
Water Heating Tankless Water Heater	57.5%
Food Service	7.6%
Water Heating Storage Water Heater	3.8%
Water Heating Showerhead	3.7%
Process Greenhouse Heat Curtain	3.5%
HVAC Boiler (Gas)	3.5%
Tank Insulation Hot Application	3.3%
Water Heating Faucet Aerator	3.3%
Water Heating Boiler	2.9%
Pipe Insulation Hot Application	2.5%
Process Boiler	2.2%
HVAC Duct Sealing	1.3%
HVAC Furnace	0.9%
Refrigeration Case Doors	0.9%
Total	**97.0%**

Table 4. Prioritized Fuel Substitution Measures

Measure Group	% of Therm Savings
Water Heating Heat Pump Water Heater – Fuel Substitution	71.6%
HVAC High Efficiency Unitary – Fuel Substitution	26.6%
Total	**98.2%**

2.2 Step 2: Review Savings Claims to Identify Discrepancies with Workpapers

The study team proceeded with a claims review for measures within prioritized groups (i.e., "prioritized measures"). The first step was to verify each field in the aggregated savings claims dataset for the prioritized measures applied the correct value in its respective workpaper (that is, the deemed value in the CA eTRM measure description or measure database). The study team then joined the eTRM parameters for each MeasureDetailID to the unique combination from the aggregated savings claims dataset, facilitating a side-by-side review of claimed vs. eTRM parameters. Using this data set, we conducted the following checks:

- That the SourceDescription field from the claim matches the eTRM version description
- That the claim installation year falls within the eligibility period of the measure package version
- Compare the following fields between the claim data and the workpaper:
  - kWh net-to-gross ratio (NTGR)
  - kW NTGR

  - Therm NTGR
  - NTGR ID
  - Effective useful life (EUL)
  - Remaining useful life (RUL)
  - Per-unit kWh
  - Per-unit kW
  - Per-unit Therms
  - Per-unit embedded water kWh
  - Measure Installation Type – this is an indicator of fuel substitution
- For weather-sensitive measures, the study team verified the correct climate zone (CZ) was used by comparing the following:
  - Site zip code from tracking database, mapped to CZ
  - CZ field from tracking database
  - Correct CZ found within MeasureDetailID
  - CZ located within the service territory of the PA

Through this review, the study team flagged any discrepancy between the aggregated savings claims dataset and the measure workpaper for further review in Step 3.

2.3 Step 3: In-Depth Review of Savings Claims

Not every discrepancy between the aggregated savings claims dataset and the measure workpaper is, in fact, an error, since other considerations may override default values in the measure workpapers. The study team established protocols for evaluating and addressing discrepancies to determine whether they are justified or should be corrected, and if the latter, what the correct value should be. Table 5 lists the protocols the study team used for evaluating discrepancies, to ensure consistent application of review.

Table 5. Protocols for In-Depth Review of Claims with Discrepancies

Value	Discrepancy	Protocol
Measure ID	Workpaper number in MeasureDetailID does not match measure description.	Review claim parameters to identify the correct measure.
Measure Impact Type	Measure Impact Type indicates a non-fuel substitution measure, but claimed MeasureDetailID indicates Fuel Substitution.	Review claim parameters to determine whether the measure is a fuel substitution measure and update the fields to match the measure type.
Measure Version	Claim installation date does not fall within eligible date range of measure version.	Update parameters to match measure version in effect at time of installation.
Climate Zone	Listed climate zone is not consistent with installation zip code or PA service territory	Update climate zone to match known information and update per-unit savings accordingly
Per-Unit Savings (kWh, kW, therms, and embedded water-energy savings)	Claimed per-unit savings are different from deemed measure per-unit savings.	If the claim was made by a Statewide Program, verify that there are multiple entries for the claim that assign a share of the per-unit savings to different IOUs for each installation and verify that the sum of the per-unit savings for each IOU adds up to the total deemed per-unit savings. If the claim was not made by a Statewide program, review and update the per-unit savings.
Effective Useful Life (EUL) and Remaining Useful Life (RUL)	EUL and/or RUL are different from deemed values	Update the EUL and/or RUL.
Net-to-Gross (NTGR) Values	NTGR value is different from deemed value	Determine if the measure was a Direct Install measure at a hard-to-reach (HTR) or educational facility, which may claim a NTGR value of 0.85 instead of the deemed value. If the measure was installed at a HTR facility or school as indicated in the NTGR ID, or if the program plan has a stated primary goal of targeting HTR customers, and the claim has a NTGR of 0.85, do not change it. If the study team cannot verify that the measure was installed in a HTR facility or school, update the NTGR to match the deemed value.

2.4 Step 4: Review of Recent Water Heater Evaluation

Storage water heaters, instantaneous water heaters, and boilers represent a large proportion (63%) of the claimed deemed Therm savings in 2023. Because of the significant contribution of these measures, the study team consulted two recent evaluations, the PY2022 Statewide

Midstream Commercial Water Heating Program Impact Evaluation,[6] and the PY2021 Residential Energy Efficiency Program Evaluation,[7] which included residential water heaters. The study team reviewed the ex-ante savings claims for measures covered by these evaluations to determine applicability of the evaluation findings (for example, the realization rate or evaluated net to gross ratio) to the appropriate PY2023 claims. Upon review, the study team did not apply any of the evaluation findings to the PY2023 claims for reasons described further in section 3.3.

[6] Opinion Dynamics, "PY2022 Statewide Midstream Commercial Water Heating Program Evaluation." Available at https://pda.energydataweb.com/api/view/4021/PY2022%20SW%20Midstream%20Commercial%20Water%20Heating%20Program%20Impact%20Evaluation%20Report_DRAFT.pdf

[7] Quantum Energy Analytics, "Final Impact Evaluation: Residential Energy Efficiency, Program Year 2021." Available at https://www.calmac.org/publications/___CPUC_REEP_2021_Evaluation_Final_wApps.pdf

3. Key Findings

The PY2023 claims database includes over one million individual deemed savings claims within the prioritized and non-prioritized measure groups in this study. Of these, the prioritization exercise reviewed 93% of these claims, which represent over 85% of Group A PY2023 savings. The initial review found that approximately 14% of the total Group A claims contained one or more parameter values that did not match the parameters in the assigned measure workpaper. The study team conducted an in-depth review of claims with discrepancies and found the vast majority could be explained by legitimate reasons. Only about 12,000 claims, or around 1% of the total claims, contained errors that required an adjustment to the parameters. These in turn represented less than 0.5% of total deemed savings, resulting in overall realization rates of approximately 100% (when estimated to the nearest whole percent). Table 6 summarizes the most significant reasons for discrepancies in order of impact. Discrepancies requiring changes are listed first, followed by discrepancies that did not result in changes.

Table 6. Summary of Findings

Value Category	Nature of the Discrepancy	Approximate # of Claims Affected	Impact on Results as Percent of Group A Lifecycle Net Savings	
			kWh	Therms
Discrepancies that Required Correction				
Workpaper Version	Claim parameters corresponded to the incorrect version of the measure workpaper	6,000	0.12%	-0.07%
Net-to-Gross Ratio	Incorrect NTGR was used and did not match an allowed customer-specific value	7	-0.11%	0.00%
EUL or RUL	EUL or RUL did not match workpaper value	3,000	0.08%	0.06%
Measure Description (MeasureID and Measure Impact Type)	Measure ID or Measure Impact Type did not match description	7	-0.02%	0.00%
Climate Zone Designation	Midstream program using savings value for a different climate zone than the one documented in the building location field	2,000	-0.01%	0.00%
Embedded Water Savings	Per-unit savings incorrectly entered into embedded water savings field (or vice versa)	400	0.00%	0.00%
Discrepancies that Did Not Require Correction				
Statewide Program Savings Allocation	Statewide program claims allocate a percent of the per-unit savings for each installation to each of the IOUs, rather than using the total per-unit savings value in the workpaper	92,000	None – we verified the correct allocation	
Installation Date	Installation date was not consistent with the program year in which measure savings were claimed	33,000	None – measure savings may be claimed when the incentive is paid, regardless of when the measure was installed.	
Net-to-Gross Ratio	Net-to-gross ratio (NTGR) used an allowed customer-specific value instead of the default workpaper value	10,900	None – customer-specific value overrides the workpaper default value	
Building Type	Building type field did not match building type in MeasureDetailID	Minimal	None – in these instances, the BuildingTypeID could indicate a type of space within an overall building type (e.g. an office within a college or university)	

3.1 Discrepancies that Required Correction

The following subsections describe the categories of discrepancies that required correction by the study team.

3.1.1 Workpaper Version

Many measures have different savings parameters depending on the version of the workpaper. The study team found discrepancies affecting a relatively significant number of claims that caused notable impact on the overall Group A savings.

The year portion of InstallationDate from the claim was compared to the date range from the MeasureDetailID to confirm that installation fell within the eligible date range of the measure package.

- If the installation year did not fall within the eligible date range of the measure package, the study team found the measure package version in effect for the year of installation and compared parameters.

The claimed parameters (per-unit savings, NTGR values) were compared to the version of the workpaper.

- If the correct measure package had identical parameters as the version referenced, no changes were made.
- If the two had different parameters, the study team updated the parameters to match the measure version that was in effect for the year of installation for the claim. For some claims this resulted in significant savings changes due to factors such as changes in measure baseline across versions.
- In some cases, the measure package version in the variable Source_Description also did not match the first 10 characters from the MeasureDetailID. In most cases where there was no match, the review found a different version of the same measure package and the study team updated the Source_Description variable to reflect the same version as the MeasureDetailID. For some claims this resulted in substantial savings changes due to version differences as noted above.

Table 7. Electric Savings Adjustment Due to Workpaper Version Discrepancies

PA	Number of Claims Affected	Total Reported kWh Savings of Affected Claims	Average Reported kWh Savings per Affected Claim	Average kWh Adjustment per Affected Claim	kWh Adjustment as Percent of Reported Lifecycle Net Savings per Affected Claim
Non-Fuel Substitution Measures					
BAY	5,039	790,040	157	181	116%
MCE	321	495,025	1,542	0	0%
RCEA	80	43,441	543	-11	-2%
SJCE	49	547,178	11,167	-7,774	-70%
TCR	4	16,892	4,223	-3,428	-81%
Fuel Substitution Measures					
BAY	595	-10,776,938	-18,113	2,332	-13%
MCE	1	-7,442	-7,442	0	0%
RCEA	7	-481,481	-68,783	28,391	-41%
SCR	1	-154,350	-154,350	50,400	-33%
TCR	1	-69,825	-69,825	-69,825	100%

Table 8. Gas Savings Adjustment Due to Workpaper Version Discrepancies

PA	Number of Claims Affected	Total Reported Therm Savings of Affected Claims	Average Reported Therm Savings per Affected Claim	Average Therm Adjustment per Affected Claim	Therm Adjustment as Percent of Reported Lifecycle Net Savings per Affected Claim
Non-Fuel Substitution Measures					
BAY	5,039	153,295	30	0	2%
MCE	321	170,071	530	-1	0%
RCEA	80	1,421	18	-10	-56%
SJCE	49	10,036	205	-239	-117%
TCR	4	1,087	272	-92	-34%
Fuel Substitution Measures					
BAY	595	958,342	1,611	-280	-17%
MCE	1	1,812	1,812	0	0%
RCEA	7	84,866	12,124	-5,927	-49%
SJCE	1	20,475	20,475	-6,064	-30%
TCR	1	9,083	9,083	9,083	100%

3.1.2 Net-to-Gross Ratio (NTGR)

Some NTGR discrepancies resulted in corrections. Although only a small number of individual claims were affected, the magnitude of the savings per claim was large enough to have a small but observable impact on the overall Group A savings. The study team compared the claim NTGR_ID and NTGR values to the NTGR_ID and NTGR values for the permutation indicated by MeasureDetailID. For discrepancies that did not match the measure permutation values, and could not otherwise be justified, the study team corrected the NTGR_ID and value to match the measure permutation parameters. This mainly affected a single program.

Table 9. Electric Savings Adjustment Due to Net-to-Gross Ratio Discrepancies

PA	Number of Claims Affected	Total Reported kWh Savings of Affected Claims	Average Reported kWh Savings per Affected Claim	Average kWh Adjustment per Affected Claim	kWh Adjustment as Percent of Reported Lifecycle Net Savings per Affected Claim
MCE	2	82,737	41,369	-25,745	-62%
PGE	3	1,100,484	366,828	-139,744	-38%
RCEA	1	8,149	8,149	627	8%

Table 10. Gas Savings Adjustment Due to Net-to-Gross Ratio Discrepancies

PA	Number of Claims Affected	Total Reported Therm Savings of Affected Claims	Average Reported Therm Savings per Affected Claim	Average Therm Adjustment per Affected Claim	Therm Adjustment as Percent of Reported Lifecycle Net Savings per Affected Claim
MCE	2	-686	-343	247	-72%
PGE	3	-37,422	-12,474	4,752	-38%
RCEA	1	-169	-169	-13	8%

3.1.3 Expected Useful Life (EUL) and Remaining Useful Life (RUL)

There were several claims with incorrect EUL or RUL values. They were corrected to match the measure permutation parameters. This affects the lifecycle net savings because the annual savings are calculated over a different number of years. Similarly to the NTGR adjustments, savings adjustments from EUL and RUL corrections were primarily driven by a small number of claims that each had a large savings value per claim.

Table 11. Electric Savings Adjustment Due to EUL and RUL Discrepancies

PA	Number of Claims Affected	Total Reported kWh Savings of Affected Claims	Average Reported kWh Savings per Affected Claim	Average kWh Adjustment per Affected Claim	kWh Adjustment as Percent of Reported Lifecycle Net Savings per Affected Claim
BAY (EUL)	3,125	596,069	191	-13	-7%
PGE (EUL)	3	0	0	0	0
PGE (RUL)	4	203,721	50,930	98,506	193%

Table 12. Gas Savings Adjustment Due to EUL and RUL Discrepancies

PA	Number of Claims Affected	Total Reported Therm Savings of Affected Claims	Average Reported Therm Savings per Affected Claim	Average Therm Adjustment per Affected Claim	Therm Adjustment as Percent of Reported Lifecycle Net Savings per Affected Claim
BAY (EUL)	3,125	328,618	105	-5	-4%
PGE (EUL)	3	309,236	103,079	66,916	65%
PGE (RUL)	4	-2,101	-525	-1,016	193%

3.1.4 Measure Description

Discrepancies between measure ID and measure characteristics affected only a small number of claims but had a large impact on those claims. Seven claims had a MeasureDetailID corresponding to programmable thermostats (SWHC039-05) but the measure package version (Source_Description) and claim parameters corresponded to SWCR005-03 (a commercial refrigeration measure). The claim review found they were from a residential program and the parameters were corrected to reflect the programmable thermostat measure. This correction had a significant impact on the program in which these measures were claimed, but a small effect on the overall study savings.

Additionally, the study team found two claims for which MeasureImplementationType contained “FuelSub” but MeasureDetailID referenced a non-fuel substitution measure package. The MeasureImplementationType field for these claims was updated to indicate the claims were not fuel substitution installations.

Table 13. Electric Savings Adjustment Due to Measure ID Discrepancies

PA	Number of Claims Affected	Total Reported kWh Savings of Affected Claims	Average Reported kWh Savings per Affected Claim	Average kWh Adjustment per Affected Claim	kWh Adjustment as Percent of Reported Lifecycle Net Savings per Affected Claim
SJCE	7	96,637	13,805	-13,456	-97%

Table 14. Gas Savings Adjustment Due to Measure ID Discrepancies

PA	Number of Claims Affected	Total Reported Therm Savings of Affected Claims	Average Reported Therm Savings per Affected Claim	Average Therm Adjustment per Affected Claim	Therm Adjustment as Percent of Reported Lifecycle Net Savings per Affected Claim
SJCE	7	-4	-1	38	-6,246%

3.1.5 Climate Zone Designation

Discrepancies in climate zone caused minor differences in the analysis because the climate zone only affects the per-unit savings for weather-dependent measures. For these measures, the study team used a formula to analyze individual claims to determine if the correct climate zone was specified, and whether savings were consistent with the climate zone, using the following criteria:

- Mapped Site Zip to climate zone and compared to Building_Location CZ
- Compared Building_Location CZ to the CZ component from MeasureDetailID
- Compared Building_Location CZ lists for each PA to the PA service territories

Most claims passed these tests, except one Midstream program that used CZ09 permutations for close to 2,000 claims with zip codes and Building_Location fields different than CZ09. Complete site address and customer contacts were not available, but zip codes indicated a high likelihood they were end-user addresses rather than those of contractors or distributors. After consultation with the CPUC Energy Division (ED), the study team found MeasureDetailID permutations corresponded to each CZ and substituted corresponding per-unit parameters into the claims.

Table 15. Electric Savings Adjustment Due to Climate Zone Designation Discrepancies

PA	Number of Claims Affected	Total Reported kWh Savings of Affected Claims	Average Reported kWh Savings per Affected Claim	Average kWh Adjustment per Affected Claim	kWh Adjustment as Percent of Reported Savings per Affected Claim
SCG	1,961	1,025,570	523	-30	-6%

Table 16. Gas Savings Adjustment Due to Climate Zone Designation Discrepancies

PA	Number of Claims Affected	Total Reported Therm Savings of Affected Claims	Average Reported Therm Savings per Affected Claim	Average Therm Adjustment per Affected Claim	Therm Adjustment as Percent of Reported Savings per Affected Claim
SCG	1,961	46,710	24	4	19%

3.1.6 Embedded Water Savings

Discrepancies in embedded water savings were another source of differences in savings, which caused significant adjustments to individual claims, but had a minimal impact on the overall Group A savings due to the small number of affected claims and the relatively low savings per affected claim. The study team found the following discrepancies in the per-unit embedded kWh water savings for some measures:

- Gas measures (zero per-unit kWh and positive per-unit Therms) where the per-unit kWh field was set equal to the positive per-unit embedded water value, and the per-unit water value was also claimed as positive.
- Combined electric and gas measures where the per-unit kWh field was set equal to the sum of per-unit kWh and embedded water kWh value set to zero.
- Combined electric and gas measures where the per-unit kWh field was set to zero, and only the embedded water kWh value was nonzero.
- Accelerated replacement measures with embedded water for which the first or second baseline per-unit kWh or per-unit embedded water kWh did not match the eTRM measure package.

All per-unit savings were corrected (electric, gas, embedded water kWh) to match permutation parameters.

Table 17. Electric Savings Adjustment Due to Embedded Water Savings Discrepancies

PA	Number of Claims Affected	Total Reported kWh Savings of Affected Claims	Average Reported kWh Savings per Affected Claim	Average kWh Adjustment per Affected Claim	kWh Adjustment as Percent of Reported Lifecycle Net Savings per Affected Claim
BAY	352	0	0	22	-
MCE	13	9,048	696	577	83%
PGE	6	0	0	82	-
RCEA	14	4,444	317	1	0%
SJCE	24	1,968	82	-26	-32%
TCR	4	1,137	284	0	0%

Table 18. Gas Savings Adjustment Due to Embedded Water Savings Discrepancies

PA	Number of Claims Affected	Total Reported Therm Savings of Affected Claims	Average Reported Therm Savings per Affected Claim	Average Therm Adjustment per Affected Claim	Therm Adjustment as Percent of Reported Lifecycle Net Savings per Affected Claim
BAY	352	7,317	21	-1	-4%
MCE	13	721,802	55,523	-279	-1%
PGE	6	485	81	0	0%
RCEA	14	2,152	154	0	0%
SJCE	24	703	29	2	6%
TCR	4	1,006	251	0	0%

3.2 Discrepancies that Did Not Require Correction

3.2.1 Statewide Program Savings Allocation

Claim per-unit savings (both first- and second baseline)[8], should match corresponding parameters from the measure permutation.[9] However, Statewide Program claims allocate a percent of the per-unit savings for each installation to each of the IOUs, based on a pre-determined allocation rule.

- For the vast majority of Statewide Program claims, the study team verified per-unit savings across IOUs added up to the per-unit savings from the measure permutation.
- The exception was a Statewide Program that installed some fuel substitution measures. After "allocation" to the three electric IOUs the program reported positive fuel substitution equivalent kWh for all three IOUs, with negative per-unit kWh and zero per-unit Therm savings. In addition to the sum of Therm per-unit savings across IOUs (zero in this case) not matching the total from the permutation, the discrepancy to eTRM was obvious because the positive kWh equivalent savings are incompatible with negative per-unit kWh and zero per-unit Therm inputs. We corrected the per-unit saving Therms at claim level in such a way that, when paired with the negative per-unit kWh savings, they would match the positive fuel substitution equivalent kWh savings. For this program the lead PA had reported the correct total kWh and Therm savings for each claim, but the CEDARS "allocation" algorithm, using the program's zero Therms percentages for each IOU, caused the per-unit Therms to be zeroed out. Our correction simply restored the per-unit Therms to the values they should have had. The overall fuel substitution equivalent kWh remained unchanged, and no correction to the total claim savings was necessary.

3.2.2 Installation Date

CPUC policy generally allows for savings to be claimed in the year that the incentive is paid. For example, claims with incentives paid in 2023 may be claimed in PY2023. There may be some lag between the installation and the incentive payment. Since the measure version is based on the installation date, the study team reviewed the installation date of claims for reasonableness. Claims with a long interval between installation date and the claim program year may indicate an incorrect installation date which could require a change to the measure version. Given potential ambiguity in the policy that could allow for such an interval the CPUC will work to clarify guidance on allowable installation dates for claims. The CPUC will also work to clarify which date from the claim (application, approval, installation, or paid) determines which measure package should be associated with the claim.

The study team found the following discrepancies between the claim year and installation date:

[8] "First-baseline" and "Second-baseline" are applicable to accelerated replacement measures—measures that involve replacing equipment before the end of its useful life—which calculate savings compared to an existing equipment baseline for some portion of the years in its life and savings compared to a code baseline for the other portion of its lifetime, corresponding when the equipment needed to be replaced anyway.

[9] For each CPUC-approved deemed measure, "permutations" establish savings for each building type, location (climate zone), program implementation type, and other categories. Each such "permutation" has a unique identification (ID) code, and every PA is required to identify the unique measure permutation ID that corresponds to a given measure installation. As measure standards change and measure studies completed, the CPUC-approved savings are revised and updated. CPUC guidance on the use of the approved deemed measure "permutations" also evolve over time.

- Just over 24,000 claims have installation dates prior to 2023. About 19,000 of these have installation dates in Q4, 2022, and the remaining 5,000 have installation dates before Q4, 2022 (some in 2021). Collectively these add up to 2.2% of first year net kWh and 1.5% of first year net Therms of the PY2023 deemed portfolio. All had incentive payments in calendar year 2023. The study team recommends that CPUC provide guidance on the time limit within which it is appropriate for incentives to be paid, and savings to be claimed, after a significant interval (several months or even multiple years) has passed.
- Just over 9,000 claims have installation dates in 2023 (2,400 from Q1-Q3 2023, 6,660 from Q4, 2023) and have incentive payment dates in 2024. Collectively, these add up to 28.9% of first year net kWh and 1.8% of first year net Therms of the PY2023 deemed portfolio. It is likely that claims with incentive payment dates in 2024 may be more appropriately assigned to PY2024 instead of PY2023. The CPUC plans to further clarify its policy to determine if these savings should be removed from PY2023.

3.2.3 Situation-Specific Net-to-Gross Values

The acceptable situation-specific NTGR values that can override workpaper values are for Direct Install measures at hard-to-reach or education facilities, which can claim a NTGR of 0.85. If the NTGR_ID or NTGR value from the claim did not match the NTGR_ID or value from the measure permutation:

- For NTGR values of 0.85: the study team reviewed the claimed NTGR_ID for letter combinations “HTR” (i.e., Hard to Reach) or “K-12School-ComCollege” (indicating an educational facility). If HTR status or educational facility type was not confirmed by NTGR_ID, we further examined the HTRFlag and Building Type from the claim. We confirmed claims that used a NTGR value of 0.85 instead of the workpaper value were either HTR or educational facilities.
- There were 905 claims that used NTGR_ID=Com-Default>2yrs for measure packages that referred to industrial installations. The NTGR=0.6 value for Ind-Default>2yrs is the same as for Com-Default>2yrs, so the study team did not change the claimed NTGR_ID or NTGR value.

3.2.4 Building Type

Building_Type was compared to the component from MeasureDetailID, while allowing for legitimate component values of Res, Com, Ind or All. The study team found a small number of claims for which Building_Type was set equal to university or community college, but the MeasureDetailID component indicated Office, Hospital or Restaurant. These are legitimate spaces found on a college campus, so the study team did not correct the MeasureDetailID.

3.3 Findings from Review of Water Heater Evaluations

The study team examined recent evaluation results for storage water heaters, instantaneous water heaters, and boilers, as these measures represent a large proportion (63%) of the claimed deemed therm savings in PY2023. The study team reviewed two recent water heater evaluations to determine whether the evaluation findings should be applied as part of the claims review. The evaluation team found that prior evaluation findings reflected 2022 program circumstances in 2022 but were not sufficiently relevant to 2023 program year (PY2023) activity. The evaluation team therefore chose **not** to apply their results to PY2023 claims.

The following sections examine each evaluation in detail, describing the study team's rationale for not applying the evaluation results to PY2023 water heating claims.

3.3.1 PY2022 Statewide Midstream Commercial Water Heating Program Impact Evaluation[10]

The PY2022 Statewide Midstream Commercial Water Heating program targeted distributors and contractors with rebates to contractors, who theoretically pass on the savings to the customer. It included several commercial water heating measures, including tankless water heaters (TWHs), one of the largest measures included in this evaluation in therm savings. As discussed below, while the PY2022 evaluation provided insights into reasons for reduced realization rates, these findings were not directly transferable to PY2023 because of unique characteristics of the participant and measure mix in PY2022 that may not be present in PY2023. Therefore, the study team recommends passing through the ex-ante values rather than using PY2022 results as proxies.

Factors that influenced the recommendation to not apply these evaluation results to PY2023 claims are described below.

Gross Savings

Table 19 presents realization rates for measures in the program.

Table 19. Realization Rates for PY2022 Statewide Midstream Commercial Water Heating Program

Measure	Claimed Therm Savings	Evaluated Therm Savings	Gross Therm Realization Rate
Small Instant Tankless Water Heaters	1,871,344	1,205,781	64%
Large Instant Tankless Water Heaters	544,451	558,971	103%
Large Domestic Hot Water Boilers	488,521	457,606	94%
Large Storage Water Heaters	272,719	292,438	107%
Heat Pump Water Heaters (HPWH)	603	603	100%*

*Although commercial HPWHs were included in the program, the study did not evaluate this measure because the savings were a vanishingly small proportion of the total program savings—less than 0.1%. A 100% realization rate indicates the study passed through claimed savings for this measure.

[10] Opinion Dynamics, "PY2022 Statewide Midstream Commercial Water Heating Program Evaluation." Available at https://pda.energydataweb.com/api/view/4021/PY2022%20SW%20Midstream%20Commercial%20Water%20Heating%20Program%20Impact%20Evaluation%20Report_DRAFT.pdf

Four of the five measures in the program have realization rates at or close to 100%. Based on sample sizes it is highly likely the gross realization rates (GRRs) are not statistically different from 100% at the 90% confidence level, so the study team does not recommend applying these values in the PY2023 study, but instead will continue to use the claims values in PY2023 data.

The exception to this was the Small Instant TWHs, which accounted for most of the therm savings and also had a realization rate substantially less than 100%. However, the study team does not recommend applying the new value.

Overall, for Small Instant TWHs, the evaluation GRR was highly dependent on numbers of new construction and multifamily participants in the population,[11] with the approach the 2022 evaluation team took to modify savings based on these characteristics. Because this program year may not be representative of PY2023 with respect to these two issues, along with uncertainty how savings were adjusted, we do not recommend using the GRR for the Small Instant TWH.

NTGRs and Net Savings

The study team also does not recommend changing the NTGR for any measures to align with the PY2022 evaluation due to uncertainties in the PY2022 NTGR evaluation approach. The PY2022 Statewide Midstream Commercial Water Heating Program incentivized distributors with the intent of passing the rebate to the customer.[12] The net savings approach involved interviewing contractors and distributors, then scoring the program's influence based on stocking, upselling, and price practices. Based on its implementation plan[13], part of the program's objectives is to increase available stock of high efficiency equipment, influence participants to integrate high efficiency solutions, and increase rebate opportunities for customers on high efficiency equipment. Therefore, the evaluator's NTG methodology aligns with assessing the program's influence based on these goals. The overall NTG derived from the method used is 0.52, lower than the ex-ante value of 0.60.

Because the resulting NTG ratio is so similar to the ex-ante value, we recommend using the ex-ante result as there is too much uncertainty in the evaluation result to warrant overriding the ex-ante value. It is difficult to estimate a confidence interval for this result given the nature of the algorithm, but based on its construct and sample sizes, it is very unlikely 0.52 is statistically significantly different than the 0.60 ex-ante value at the 90% confidence level.

3.3.2 PY2021 Residential Energy Efficiency Program Evaluation[14]

The study team also reviewed a PY2021 study to determine if any of the results could be applied to residential water heaters, and did not find any compelling evidence to justify changing the PY2023 values. Based on the findings described below the study team decided not to

[11] The evaluation report attributed this low rate to "changes in the evaluation measure package, which eliminated the storage water heater baseline assumption and applied multifamily-specific measure packages instead of commercial measure packages."

[12] https://www.socalgas.com/midstream-water-heating-program

[13] The program implementation plan can be downloaded here: https://cedars.cpuc.ca.gov/programs/list/

[14] Quantum Energy Analytics, "Final Impact Evaluation: Residential Energy Efficiency, Program Year 2021." Available at https://www.calmac.org/publications/___CPUC_REEP_2021_Evaluation_Final_wApps.pdf

change the PY2023 study values for residential tankless water heaters to match the results from the PY2021 evaluation or the evaluation NTGR values for the purposes of this claims review.

The Residential Energy Efficiency Program in 2021 offered a wide range of measures such as tankless water heaters, duct sealing, water heating controls, smart thermostats, clothes dryers, storage water heaters, and other measures. Tankless water heaters were the largest single measure group in the program, which accounted for 82% of the program's lifecycle net ex-ante savings that year. The program had three sub-programs, targeting single-family customers, multifamily customers, and new construction builders. The evaluation goals included calculating gross ex-post therm savings for the tankless water heater measure. The evaluation did not include a NTG study since a comprehensive NTG analysis was conducted on the tankless water heater measure in 2019, with over 700 participant interviews.[15]

Gross Savings

The study evaluated single-family new construction and single-family retrofit water heaters. Overall, therm realization rates were at or close to 100% (100% for the single-family retrofit program and 103% for the new construction builder program), with derivations in claimed and evaluated savings due to the following:

- Based on surveys, the evaluators found the temperature setpoints closer to 120 degrees instead of the ex-ante value of 135 degrees.
- Slight alterations in savings were due to miscategorized efficiencies in tracking data. Evaluators referred to program documents and builder information to verify the correct installed efficiencies.
- No baseline changes were made in ex-post results but the evaluator did report survey responses for the single-family retrofit program indicated 69% of customers would have installed a tankless water heater in the absence of the program. The evaluators found 36% of homes in the new construction program would not have passed compliance if a minimally efficient tankless water heater was installed, and 13 of 15 surveyed builders would still have purchased a tankless water heater in the absence of the program. The evaluators recommend a further market study to determine if a tankless water heater baseline is becoming more commonplace than the current storage water heater baseline.

Based on these findings, and since the gross realization rates are so close to 100%, the study team decided not to change the PY2023 study values for residential tankless water heaters to match the results from the PY2021 evaluation. The study team also decided not to use the PY2021 evaluation NTGR values because they were derived from the 2019 NTG analysis, and too much time has passed for the study team to be confident that the 2019 values are applicable to PY2023 programs.

[15] NMR Group, Inc. "Impact Evaluation of Water Heating Measures – Residential Sector – Program Year 2019." Available at https://www.calmac.org/publications/CPUC_Group_A_Report_Water_Heating_PY_2019_Final_CALMAC.pdf

4. Results

This section presents the quantitative results of the claims review. We report the adjusted values for GWh and therms due to corrections that the study team made to the value of the measures' parameters based on findings in the previous section. We also present the realization rate.[16] Overall, realization rates were very close to 100% (within 0.5% for Group A as a whole), suggesting that the PAs are accurately submitting the majority of claims.

Table 20 and Table 21 present GWh and MMTherms results for Group A measures.

Table 20. Lifecycle Net Electric Savings and Realization Rates by Type of Measure

Measure Category	Claimed GWh	Adjusted GWh	Claims Review RR
Non-Fuel Substitution Measures	425.37	425.63	100.06%
Fuel Substitution Measures	(441.98)	(440.42)	99.65%

Table 21. Lifecycle Net Gas Savings and Realization Rates by Type of Measure

Measure Category	Claimed MMTherms	Adjusted MMTherms	Claims Review RR
Non-Fuel Substitution Measures	264.88	265.07	100.07%
Fuel Substitution Measures	59.74	59.68	99.89%
All	**324.62**	**324.75**	**100.04%**

Some individual PAs had rates different from 100%, which could indicate systematic errors. Table 22 shows results for each PA. Overall, non-IOU PAs had realization rates further from 100% than the IOUs, suggesting non-IOU PAs may need additional assistance reporting savings from programs. However, all of the instances of abnormally high or low realization rates occurred for PAs with relatively small savings claims, so these did not significantly affect Group A savings overall.

[16] Realization rate is calculated as the total savings after adjustment, divided by the total savings before adjustment. If adjusted savings are higher than the savings before adjustment, the realization rate is greater than 100%. If the adjusted savings are lower than the savings before adjustment, the realization rate is less than 100%. A realization rate of 100% means the analysis found no adjustments to the savings were needed.

Table 22. Lifecycle Net Savings and Realization Rates by Program Administrator

PA	Claimed GWh*	Reviewed GWh*	Claims Review RR	Claimed MMTherms	Reviewed MMTherms	Claims Review RR
BAY	3.13	4.01	128.2%	6.84	6.66	97.4%
MCE	0.67	0.62	93.4%	1.10	1.09	99.7%
PGE	119.22	119.20	100.0%	85.29	85.56	100.3%
RCEA	0.69	0.69	100.0%	0.41	0.37	89.7%
SCE	155.01	155.01	100.0%	25.94	25.99	100.2%
SCG	60.85	60.79	99.9%	174.58	174.59	100.0%
SCR	0.16	0.16	100.0%	1.07	1.07	99.4%
SDGE	73.92	73.92	100.0%	29.04	29.06	100.1%
SJCE	11.63	11.16	95.9%	0.01	0.00	9.1%
TCR	0.09	0.07	83.9%	0.34	0.35	102.6%
All	**425.37**	**425.63**	**100.1%**	**324.62**	**324.74**	**100.0%**

* The savings values for GWh are for non-fuel substitution measures only.

Table 23 and Table 24 identify specific programs for which electric and or gas realization rates, respectively, were less than 90% or greater than 110%. Major discrepancies were limited to a relatively small number of programs, most of which were administered by the RENs or CCAs identified in the previous table.

Table 23. Lifecycle Electric Net Savings and Realization Rates by Program

PA Program ID	Claimed MWh*	Reviewed MWh*	Claims Review RR	Main Drivers of Discrepancies
MCE02a	89.60	46.44	51.8%	NTGR, embedded water
PGE_Com_SmallBiz	4.63	5.13	110.6%	Embedded water
PGE_Ind_001b	1,100.48	681.25	61.9%	NTGR
RCEA02	(1,891.96)	(1,679.38)	88.8%	Workpaper version
SCG3702	(467.24)	(526.76)	112.7%	MeasureDetailID CZ
SJCE02	131.67	36.85	28.0%	Measure ID, embedded water

* The savings values for MWh are for non-fuel substitution measures only.

Table 24. Lifecycle Gas Net Savings and Realization Rates by Program

PA Program ID	Claimed kTherms	Reviewed kTherms	Claims Review RR	Main Drivers of Discrepancies
PGE_Ind_001b	(37.42)	(23.17)	61.9%	NTGR
RCEA02	343.23	300.06	87.4%	Workpaper version
SJCE01	9.56	(2.17)	-22.7%	Workpaper version
SJCE02	3.01	3.32	110.2%	Measure ID, embedded water

Table 25 and Table 26 present results by measure group for electricity and gas, respectively. When considered at the level of the measure group, there were no measure groups that had significant discrepancies between claimed and adjusted savings.

Table 25. Lifecycle Net Electric Savings and Realization Rates by Measure Group

Measure Group	Claimed GWh	Adjusted GWh	Claims Review RR
HVAC Duct Sealing	61.8	61.8	100.0%
Food Service	54.5	54.5	100.0%
HVAC High Efficiency Unitary	46.4	47.2	101.7%
Lighting Indoor Led TLED	40.8	41.1	100.8%
Refrigeration Door Closer	34.5	34.4	99.7%
Refrigeration Controls ASH	33.7	33.7	100.0%
Refrigeration Case Doors	32.2	32.2	100.0%
HVAC Controls Smart Thermostat	18.8	18.7	99.6%
Refrigeration Freezer	17.5	17.1	**97.6%**
Process Fan VFD	15.5	15.5	100.0%
HVAC Boiler	12.2	12.2	100.0%
Water Heating Showerhead	12.2	12.2	99.8%
Water Heating Faucet Aerator	10.9	10.8	99.4%
All others	34.5	34.3	99.4%
Total	**425.4**	**425.6**	**100.1%**

Table 26. Lifecycle Net Gas Savings and Realization Rates by Measure Group

Measure Group	Claimed MMTherms	Adjusted MMTherms	Claims Review RR
Non-Fuel Substitution	**266.1**	**266.2**	**100.1%**
Water Heating Tankless Water Heater	152.2	152.2	100.0%
Food Service	20.1	20.1	100.0%
Water Heating Storage Water Heater	10.2	10.2	100.0%
Water Heating Showerhead	9.9	9.9	100.0%
Process Greenhouse Heat Curtain	9.2	9.2	100.0%
HVAC Boiler	9.2	9.2	100.0%
Tank Insulation Hot Application	8.8	8.8	100.0%
Water Heating Faucet Aerator	8.7	8.7	100.0%
Water Heating Boiler	7.8	7.8	100.0%
Pipe Insulation Hot Application	6.7	6.9	103.0%
Process Boiler	5.9	5.9	100.0%
HVAC Duct Sealing	3.5	3.5	100.0%
HVAC Furnace	2.5	2.5	100.0%
Refrigeration Case Doors	2.4	2.4	100.0%
All other non-fuel substitution measures	9.0	8.9	99.6%
Fuel Substitution	**58.7**	**58.6**	**99.9%**
HVAC High Efficiency Unitary - Fuel Substitution	15.8	15.8	99.7%
Water Heating HPWH - Fuel Substitution	42.8	42.9	100.0%
Total	**324.6**	**324.7**	**100.0%**

5. Recommendations

Based on the 2023 claims review, the study team has developed the following recommendations to support the PAs in aligning claims with deemed measure parameters and address the most significant discrepancies found in the claims review.

1. The majority of the discrepancies can be resolved by using the measure permutation designation to correctly align the eTRM parameters with the claim values. These values include the workpaper version and measure description, building type, and climate zone (for climate-dependent measures), which determine measure per-unit savings, as well as related factors like EUL and RUL. The recommended method is:

    - Start a claim by identifying the MeasureDetailID permutation that represents the best match to the actual measure installation. Follow CPUC policy guidelines surrounding the appropriate package for the claim date.
    - Use the eTRM parameters from that permutation as a starting point to build the claim (permutations can be exported from eTRM specifically for this purpose).
    - For measures with embedded water savings, be sure to enter embedded water savings in the correct field (Unit_kWh_IOU_Water_1st_baseline, Unit_kWh_IOU_Water_2nd_baseline). Do not substitute (or add them to) the "usual" per-unit electric savings (Unit_kWh_First_Baseline, Unit_kWh_Second_Baseline).

2. For NTGR values that intentionally do not align with the eTRM parameters for a given claim, the study team proposes the following method:

    - When substituting NTGR=0.85 for HTR or education customers, the NTG_ID should contain "HTR" or "K-12School-ComCollege." The 0.85 value is only allowed for Direct Install deemed permutations.
    - For non-HTR claims, use the NTGR_ID that matches the MeasureDetailID. For example: industrial customers should get NTGR_ID that contain "Ind", not "Com."

3. Most errors occurred in CCA and REN administered programs. CCAs and RENs should review the above recommendations and send the CPUC confirmation that the errors and corrections are clear or request support to ensure claims submissions do not contain these errors going forward.

Appendix A. Response to Comments

EM&V Impact Study Recommendations

Study Title: Group A Deemed Savings PY2023 Claims Review

Study Manager: CPUC

Table A-1. Response to Comments

Comment #	Commenter	Location	Topic	Question/Comment	Evaluator Response
1	Western States Council of Sheet Metal, Air, Rail, and Transportation Workers (WSC)	Full Report	Scope of Report	The Group A Deemed Savings PY2023 Claims Review is a thorough and likely technically correct review of the past reported performance of energy savings goals, however, upon closer inspection, there is a significant lack of actual performance data included in this review. The reported findings from the programs that were included in the study showing a near 100% rate of alignment with estimated energy savings is highly misleading to the general public considering that no actual performance measurements were taken or included in the review. Instead, they relied solely on the self reported data from the installers and manufacturers of the equipment using factory tested results. This is highly problematic as outlined in the studies included below, one in particular showed that “nearly 30% of the energy efficiency of newly installed air conditioning units can be lost as a result of design and installation errors.” The reviewers admittedly did not rely on any available data, such as equipment nameplates, permitting, or Mechanical Acceptance Testing reports, to validate the reported installations. This information was not required by the programs, ignored, or not investigated despite the well-documented lack of compliance and enforcement of California’s Energy and Mechanical Codes.	Thank you for your comment. This further in-depth review is out of scope for this study. The objective of the study was to review claims and identify reporting errors. The study scope did not include performance measurements or validation of reported installations.

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