CALMAC Study ID CPU0363.01

GROUP D

Custom Industrial, Agricultural, and Commercial (CIAC) 2020-21 Impact Evaluation

CALIFORNIA PUBLIC UTILITIES COMMISSION

6/1/2023

Information	Details
Project sponsor	Tom Ledyard
Project manager	Nick Beaman
Telephone number	+1 (510) 891-0446
Mailing address	155 Grand Ave. Suite 600, Oakland CA 94612
Email address	Tom.Ledyard@dnv.com; Nick.Beaman@dnv.com
Report location	https://pda.energydataweb.com/#!/ Search term: CIAC Impact Evaluation 2020-2021

LEGAL NOTICE

Table of contents

List of tables

List of figures

Glossary of key terms and acronyms[1]

Authority Having Jurisdiction (AHJ) – Refers to the organization, agency, or individual responsible for ensuring that the codes, standards, and regulations are followed within their jurisdiction, and they have the authority to enforce them, issue permits, and conduct inspections. AHJs may vary depending on the location and jurisdiction, and it is important to identify the specific AHJ for a particular project or activity to ensure compliance with applicable regulations.

California Database for Energy Efficiency Resources (DEER) – Refers to the Database for Energy Efficient Resources. 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) Program Administrators (PAs), private sector implementers, and the EE industry across the country to develop and design energy efficiency programs.[2]

California Energy Data and Reporting System (CEDARS) – Refers to the database that securely manages California Energy Efficiency Program data reported to the California Public Utilities Commission (CPUC) by Investor-Owned Utilities (IOUs), Regional Energy Networks (RENs), and certain Community Choice Aggregators (CCAs).[3]

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

Custom Project Review (CPR) – Refers to the process of selecting custom projects, submitted biweekly by the program administrators, for review of all forecasted savings parameters and documents of selected projects.

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

ED Tracking Data – Refers to the officially claimed electric and gas impacts as captured in the CEDARS (defined above) data and reporting system.

Effective Useful Life (EUL) – An estimate of the median number of years that the measures installed under the program are still in place and operable.

Free-ridership – Program participants who would have installed the program measure or equipment in the absence of the program.

Gross Realization Rate (GRR) – Refers to the ratio of achieved energy savings to predicted energy savings; as a multiplier on Unit Energy Savings, the GRR considers the likelihood that not all CPUC-approved projects undertaken by IOUs will come to fruition.

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

[1] Please refer to the Energy Efficiency Policy Manual for additional terms and definitions: https://www.cpuc.ca.gov/-/media/cpuc-website/files/legacyfiles/e/6442465683-eepolicymanualrevised-march-20-2020-b.pdf

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

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

International Performance Measurement and Verification Protocol (IPMVP)[4] – Refers to the protocol that facilities 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.

Industry Standard Practice (ISP) – Refers to the use of current market practice as a baseline. This is typically identified through a market research study to determine what current practice may be at the time of measure installation.

Lifecycle savings – Refers to 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 for a portion of its lifetime.

Measure – Refers to the specific customer actions that reduce or otherwise modify energy end use patterns. A measure is a product whose installation and operation at a customer's premises reduces the customer's on-site energy use, compared to what would have happened otherwise.

Measure Application Type (MAT) – Refers to the installation basis for each claim. 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.

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.

Net savings – Refers to the savings realized when free-ridership is accounted for. Savings are calculated by multiplying the 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. Net-to-gross ratios are used to estimate and describe the free-ridership that may be occurring within energy efficiency programs.

Normalized Metered Energy Consumption (NMEC) – Refers to high opportunity projects or programs (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 was often used to regress equipment operation for weather dependent data to estimate annual operation.

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),[5] Pacific Gas & Electric (PG&E), Southern California Edison (SCE), Southern California Gas (SCG), San Diego Gas & Electric (SDG&E)).

Peak Demand – Refers to the average demand impact, for installed or implemented measures, as would be applied to the electric grid. CPUC Resolution E-4952 approved the Database for Energy-Efficient Resources (DEER) for 2020. Additionally, this resolution revised the DEER Peak Period definition from 2:00 p.m. to 5:00 p.m. to 4:00 p.m. to 9:00 p.m. effective January 1, 2020. In accordance with the CPUC memo issued on 03/21/19, operationalizing the 2020 DEER Peak Period change, effective January 1, 2020, per CPUC Res E-4952 for custom projects shall follow the Statewide Custom Project Guidance Document, Version 1.4.

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

[5] 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.

Relative Precision – A ratio of the error bound divided by the value of the measurement itself. This provides the error on a relative basis that is 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 remain in place and operable had the program intervention not caused the replacement.

Strategic Energy Management (SEM) – Allows for continuous energy performance improvement by providing the processes and systems needed to incorporate energy considerations and energy management into daily operations.

Statewide – Energy efficiency programs or activities that are essentially similar in design and available in all CPUC regulated utility service areas in California.

EXECUTIVE SUMMARY

INTRODUCTION

This impact evaluation report presents findings of California Program Administrators' (PAs') 2020 and 2021 Custom Industrial, Agricultural, and Commercial (CIAC) programs. DNV independently determined how much electric demand and energy and natural gas energy were reduced by the CIAC program, which included Savings by Design (SBD) and Custom programs.

Savings by Design (SBD) is the 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.

Custom activity in this report refers to **Large Commercial and Industrial (C&I) and Agricultural project activity** involving complex equipment and systems requiring site-specific savings calculations.

Overall goals

1. Develop first year and lifecycle-evaluated net and gross savings for the Custom and SBD programs at a high level of precision.
   a. Lifecycle savings refer to the savings associated with the lifetime of an energy efficient technology or measure undertaken by a program participant. Calculating this can help determine the amount of reduced savings a measure might receive in its lifetime.
   b. Gross savings are changes in energy consumption that result directly from program-related actions taken by participants in an energy efficiency program, regardless of why they participated.
   c. Net savings are changes in energy use attributable to a particular energy efficiency program and consider savings from participants who would not have purchased energy efficient technologies without the influence of the program.
2. Develop meaningful and actionable recommendations to improve program performance in delivering energy efficiency savings.

Evaluation objectives

1. Quantify the first year and lifecycle gross kWh, peak (highest demand) kW, and therm savings by sampling domain (e.g., subject area, PA).
2. Calculate the ratio of evaluated savings to the savings claimed by the Program Administrator, referred to as the gross realization rate (GRR), by sampling domain. GRR is calculated by comparing the actual energy savings evaluated (or realized) over a given period to the estimated energy savings that were predicted before the implementation of the energy efficiency measures.
3. Provide analysis of the drivers of the GRR.
4. Recommend how GRRs can be improved.
5. Quantify the ratio between the program's evaluated gross and net savings, referred to as the net-to-gross ratio (NTGR), by sampling domain.
6. Share the factors that characterize free-ridership, and as required, provide recommendations on how the NTGR might be improved. Note that free-ridership occurs when participants would have installed the same equipment or technologies in the absence of the program. We refer to such participants as free-riders because they receive benefits from programs for actions they would have taken in absence of the program.
7. Identify gaps in the planned evaluation, measurement, and verification (EM&V) activities for custom programs and share what emerging evaluation issues should be addressed going forward.
8. Provide actionable recommendations to address gaps and improve programs and projects in the future.

METHODOLOGY

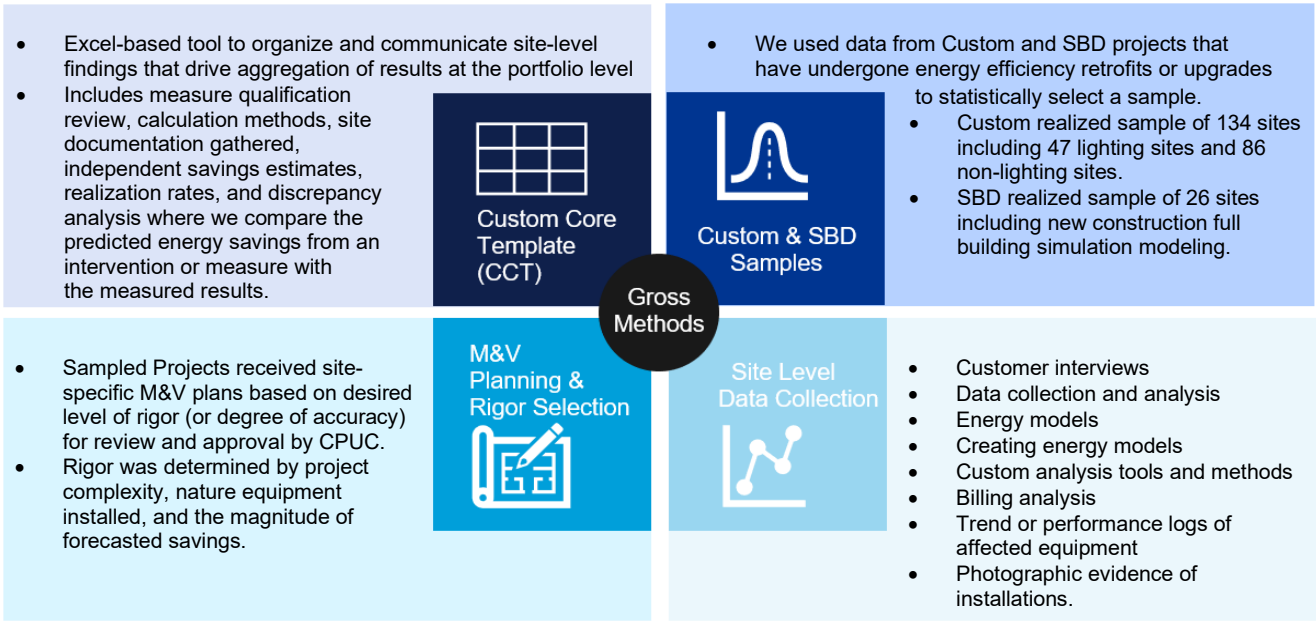
DNV estimated the accuracy of gross and net savings the PAs claimed for Custom and SBD projects installed in program years (PYs) 2020 and 2021. Our gross and net savings calculation methods are described in the final study workplan[6] and summarized below. This study adhered to International Performance Measurement and Verification Protocol (IPMVP)[7] and the California Evaluation Protocol[8] throughout its execution. **Figure ES-1** shows the overall evaluation process.

Figure ES-1. CIAC gross and net savings methods PY2020-21

GROSS SAVINGS METHODS

Key elements of our evaluation method include the following steps in sequence: 1) a site-specific evaluation via the use of a custom core template,[9] 2) sample design, 3) extensive measurement and verification (M&V) planning, and 4) site-level data collection for sampled sites from each area of interest.

Figure ES-2. CIAC gross savings methods PY2020-2021



6 GROUP D Evaluation, Measurement, & Verification of Program Year 2020/21 Commercial, Industrial, and Agriculture Custom Projects Work Plan, California Public Utilities Commission, May 20, 2022.

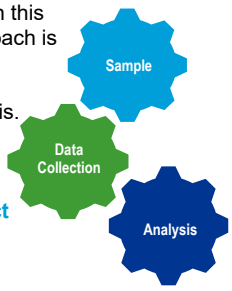
7 IPMVP is a protocol that facilitates a common approach to measuring and verifying energy efficiency investments. IPMVP incorporates M&V best practices in a non-prescriptive framework that allows it to be applied flexibly based on a measure's application and the information available.

8 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.

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

NET SAVINGS METHODS

A net-to-gross assessment estimates the portion of gross energy savings attributable to the financial incentives or activities (e.g., audits, technical assistance) of an energy efficiency program. The **net-to-gross approach** used in this study is consistent with approaches used in previous Custom project attribution research in California. This approach is summarized below:



1. **DNV planned 112 Custom** and **31 SBD participant survey completions** to inform the net-to-gross analysis.

Key **net-to-gross data collection** includes self-reported information on:

- Two program attribution indices that measured the **relative strength of program and non-program project drivers** on decision-making
- **One program attribution index that measured the likelihood of the participating customer installing program qualified equipment** in the absence of the program

EVALUATED PROGRAM SAVINGS CLAIMS

This evaluation focuses on the energy savings forecasted by the PAs in the final program database. The savings in the CIAC study represent **21% of the total portfolio (excluding Codes and Standards) electric** lifecycle energy savings in program years 2020 and 2021 and **49% of the total portfolio (excluding Codes and Standards) gas** lifecycle energy savings in program years 2020 and 2021.

Custom projects within the CIAC study in program years 2020 and 2021 report first-year savings of 187,339 MWh and 31,745 thousand therms and lifecycle savings of 1,380,755 MWh and 442,749 thousand therms.

SBD projects within the CIAC study in program years 2020 and 2021 report first-year savings of 26,754 MWh and 1,216 thousand therms and lifecycle savings of 398,217 MWh and 18,210 thousand therms.

Table ES-1 presents the CIAC study population and savings reported by subject area and year.

Table ES-1. CIAC study population and savings claims program years 2020 and 2021

Year	Number of projects*	First-year savings			Lifecycle savings		
		MWh	MW	Therms (thousand)	MWh	MW	Therms (thousand)
Electric							
Custom	2,122	187,330	20.7	N/A	1,380,677	169.9	N/A
SBD	107	26,754	6.5	N/A	398,217	97.7	N/A
Total	2,229	214,084	27.2	N/A	1,778,894	267.7	N/A
Natural gas							
Custom	99	N/A	N/A	31,745	N/A	N/A	442,749
SBD	75	N/A	N/A	1,216	N/A	N/A	18,210
Total	174	N/A	N/A	32,961	N/A	N/A	460,959

**Number of projects represents those with positive savings*

RESULTS

Gross Savings Results

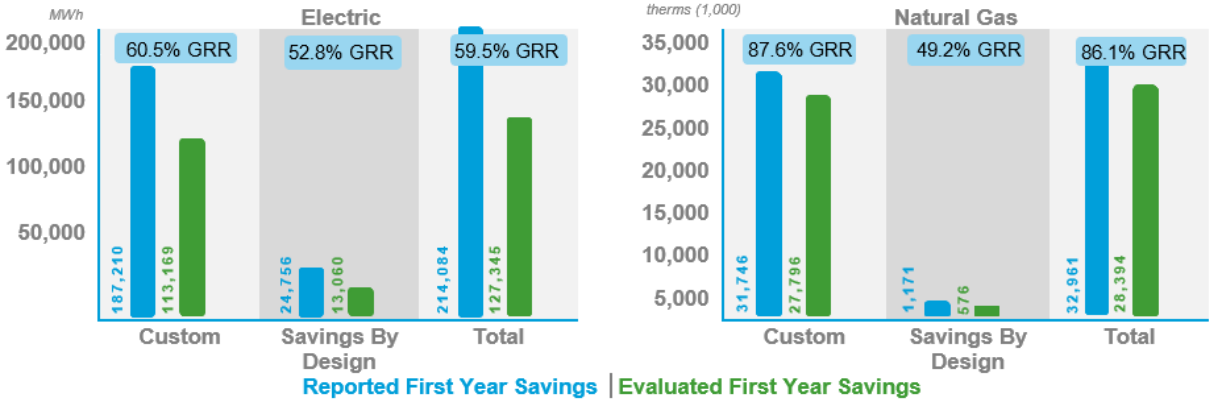
As shown in **Figure ES-3**, the CIAC study (**combined SBD and Custom** subject areas) verified first-year gross electric savings of 127,345 MWh with a gross realization rate (GRR) of 59.5% and statewide evaluated lifecycle electric savings of 858,837 MWh and a GRR of 48.3%. This study also verified first-year gross gas savings of 28,392 thousand therms with a GRR of 86.1% and statewide evaluated lifecycle gas savings of 408,945 thousand therms and a GRR of 88.7%. Statewide refers to all PAs and represents the overall results for California.

Custom projects within the CIAC study in program years 2020 and 2021 had an evaluated first-year gross savings of 113,169 MWh and 27,796 thousand therms with statewide GRRs of 60% and 88%, respectively.

One very large Custom Gas project represented 95% of evaluated first-year gas savings. Absent this site, the evaluated overall first-year gross savings is 2,551 thousand therms with a statewide GRR of 36%.

SBD projects within the CIAC study in program years 2020 and 2021 had an evaluated first-year gross savings of 13,060 MWh and 576 thousand therms with statewide GRRs of 53% and 49%, respectively.

Figure ES-3. First-year gross savings results*



Note: *the subject area totals do not include 2,118 MWh and 44 thousand therms in reported first-year savings or 1,115 MWh and 21 thousand therms in first year evaluated savings that were in non-sampled categories. These are included in the total savings estimates for each.*

The programs evaluated in the CIAC study had a statewide first-year MWh GRR of 59% with a relative precision[10] of ±12.1% and statewide first-year demand MW GRR of 55% with a relative precision of ±14.6%. These evaluated relative precisions are aligned with our target precision of ±10%. The first-year MWh realization rate, across all PAs, was driven downward by four primary factors:

- **Ineligible projects**
- **Differing calculation methods**
- **Differences in evaluated operating conditions**
- **The application of inappropriate baselines or Industry Standard Practices (ISPs)**

A detailed investigation of all these discrepancies is found in Chapters 4 and 5 of the report.

The lifecycle statewide electric energy GRR for all programs evaluated in the CIAC study was 48% with a relative precision of ±11.2%. The lifecycle demand MW GRR is 41% with a relative precision of ±14.2%.

- **The reduction in lifecycle energy GRR as compared to the first year GRR is primarily driven by the lower evaluated effective useful life[11] (EUL) and remaining useful life (RUL) as compared to forecasted EUL/RUL.**

10 Relative precision is a ratio of the error bound divided by the value of the measurement itself. This provides the error on a relative basis that is frequently used to show uncertainty as a fraction of quantity.

11 Effective Useful Life or (EUL) represents the measure life of the installed equipment.

Table ES-2. Electric first year and lifecycle-evaluated gross energy savings by program administrator[12]

Program Administrator	First-year savings				Lifecycle savings			
	Forecasted	Gross	GRR	RP%*	Forecasted	Gross	GRR	RP%*
Energy (MWh)								
MCE	1,421	499	35.1%	±43.4%	12,309	3,823	31.1%	±31.3%
PG&E	160,675	104,891	65.3%	±13.2%	1,286,571	630,822	49.0%	±14.6%
SCE	22,193	12,252	55.2%	±19.7%	200,636	167,465	83.5%	±13.0%
SDG&E	27,676	8,588	31.0%	±76.2%	250,338	42,875	17.1%	±40.9%
Non-sampled	2,118	1,115	52.6%	±0.0%	29,040	13,852	47.1%	±20.3%
Statewide	214,084	127,345	59.5%	±12.1%	1,778,894	858,837	48.3%	±11.2%
Demand (MW)								
MCE	0.1	0.03	34.0%	±57.3%	0.8	0.2	29.5%	±33.3%
PG&E	21.0	12.1	57.6%	±16.9%	195.7	86.2	44.1%	±17.6%
SCE	2.4	1.5	63.0%	±17.3%	29.5	15.3	51.7%	±11.9%
SDG&E	3.4	1.2	35.4%	±62.4%	37.3	6.7	17.9%	±43.9%
Non-sampled	0.3	0.2	49.4%	±25.8%	4.4	2.1	47.1%	±26.6%
Statewide	27.2	15.0	55.1%	±14.6%	267.7	110.4	41.3%	±14.2%

** Relative precision at the 90% confidence level.*

Table ES-2 presents the electric first year and lifecycle-evaluated gross energy savings by PA.

MCE had a first-year MWh GRR of 35% with a relative precision of ±43.4% and a lifecycle MWh GRR of 31% at ±31.3%.

- MCE's savings comprised lighting projects only, **which found evaluated operating conditions to be the primary driver of the GRR**.

PG&E had a first-year MWh GRR of 65% with a relative precision of ±13.2% and a lifecycle MWh GRR of 49% at ±14.6%.

- PG&E's GRRs were largely impacted by **differences in evaluated operating conditions and calculation methods.**

SCE had a first year MWh GRR of 55% with a relative precision of ±19.7% and a lifecycle MWh GRR of 83% at ±13.0%.

- SCE's first year GRR is primarily driven by **inappropriate baseline selection, ineligible projects, and operating condition discrepancies.**

SDG&E had a first year MWh GRR of 31% with a relative precision of ±76.2% and a lifecycle MWh GRR of 17.1% at ±40.9%.

- **SDG&E's first year GRR is largely impacted by differences in operating conditions, ineligible projects, and inappropriate baselines.** Lifecycle savings are also presented above. **Differences in lifecycle evaluated savings and GRRs for electricity are mainly driven by the evaluator's applied EUL and RULs determined to be appropriate for each project**.

Table ES-3. Natural gas first year and lifecycle-evaluated gross savings by PA

Program Administrator	First year savings				Lifecycle savings			
	Forecasted therms (1,000)	Gross therms (1,000)	GRR	RP%*	Forecasted therms (1,000)	Gross therms (1,000)	GRR	RP%*
PG&E	30,251	26,810	88.6%	±4.7%	442,359	402,156	±90.9%	±5.1%
SCG	1,639	950	58.0%	±13.4%	11,914	2,199	±18.5%	±10.9%
SDG&E	984	613	62.3%	±9.2%	5,948	4,273	±71.8%	±23.3%
Non-sampled	44	21	47.9%	±12.8%	634	299	±47.2%	±13.5%
Statewide	32,918	28,394	86.3%	±4.5%	460,855	408,928	±88.7%	±5.0%

** Relative precision at the 90% confidence level.*

12 Electric savings and gas first-year and lifecycle savings by program administrator are presented in the tables below. Note that a small subset of program activity (<1%) not included in the sample is represented in the "non-sampled" line. The results calculated from the sample at the program/measure level were applied to this subset of activity to determine total impacts. Note that the forecasted and gross results in this table do not include 2 sites identified as outliers due to excessively high lifetimes in forecasted lifecycle MW and were removed from the sample frame.

Below is a high-level summary of the natural gas first year and lifecycle results:

- **The statewide CIAC natural gas GRR across all PAs was 86%, which is a little bit below the 0.9 default forecasted GRR adjustments for the CIAC study.**
- **The primary driver of this higher gas GRR is attributable to a large PG&E gas project that contributed 75% of the total statewide PA forecasted gas savings.**
- **This large gas project had slightly more evaluated savings than the forecasted value.**

As shown in **Table ES-3**, PG&E had a first year therm GRR of 89% with a relative precision of ±4.7%. With the large project removed, PG&E had a first year therm GRR of 22.4% with a relative precision of ±43.8%. SCG had a first year therm GRR of 58% with a relative precision of ±13.4%. SDG&E had a first year therm GRR of 62% with a relative precision of ±9.2%.

Net Savings Results

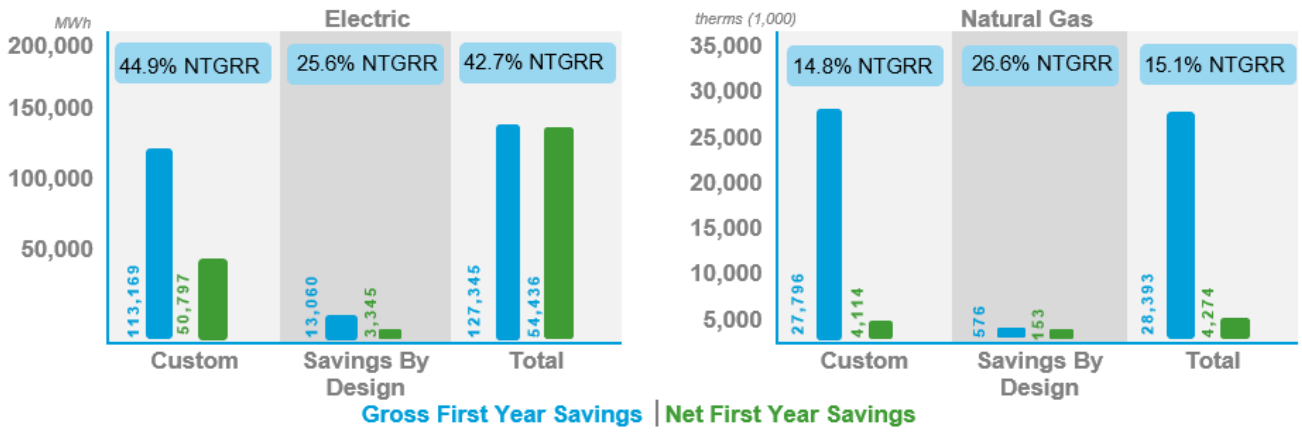
The CIAC study (**combined SBD and Custom** subject areas) had an evaluated first year net electric savings of 54,436 MWh with a statewide NTGRR of 43%. These subject areas also had evaluated first year net gas savings of 4,274 thousand therms with an NTGRR of 15.1%, driven by the large natural gas project.

Custom projects within the CIAC study in program years 2020 and 2021 had evaluated first year net savings of 50,797 MWh and 4,115 thousand therms with NTGRs of 44.9% and 14.8%, respectively.

Absent the very large custom site noted above, the evaluated overall first year net savings is 670 thousand therms with a NTGR of 27%.

SBD projects within CIAC in program years 2020 and 2021 had evaluated first year net savings of 3,345 MWh and 153 thousand therms with NTGRs of 26% and 27%, respectively.

Figure ES-4. Gross and net first year savings



Note: *the subject area totals do not include 1,114 MWh and 21 thousand therms in gross first year savings or 294 MWh and 6 thousand therms in net first year savings that were in non-sampled categories. These are included in the total savings estimates for each.*

CIAC had an overall first year electric energy NTGR of 43% with a relative precision of ±10.4%, with a lifecycle NTGR of 36% with a relative precision of ±11.6%. These NTGRs were driven by several factors:

- **Inadequate screening of projects where the decision to implement the energy efficiency measures had already been made before the program intervention.**

- **Inadequate screening of projects being driven by non-program factors such as corporate policies, normal equipment replacement/maintenance practices, and regulatory compliance.**
- **Lack of better identification of energy efficiency projects for which program incentives serve as the "tipping point" for moving the projects toward implementation.**
- **For SBD projects, key factors driving the lower NTGRs included low incentive levels and the significant presence of program participants such as universities that were already pursuing energy efficiency due to organizational initiatives.**

Table ES-4 shows the first year and lifecycle electric net savings broken down by program administrator.

Table ES-4. Electric first year and lifecycle-evaluated net savings by program administrator

Program Administrator	First year net savings			Lifecycle net savings		
	MWh	NTGR	RP%*	MWh	NTGR	RP%*
Energy (MWh)						
MCE	255	51.0%	±11.6%	1,961	51.3%	±13.7%
PG&E	49,251	47.0%	±11.3%	248,661	39.4%	±14.5%
SCE	2,906	23.7%	±12.4%	48,506	29.0%	±3.3%
SDG&E	1,730	20.1%	±61.4%	5,741	13.4%	±44.3%
Non-sampled	294	26.4%	±13.8%	3,211	23.2%	±14.4%
Statewide	54,436	42.7%	±10.4%	308,080	35.9%	±11.6%
Demand (MW)						
MCE	0.0	52.0%	±11.3%	0.1	52.3%	±13.8%
PG&E	4.9	40.8%	±11.6%	30.2	35.0%	±11.7%
SCE	0.2	11.9%	±17.5%	1.6	10.7%	±17.9%
SDG&E	0.2	18.8%	±71.2%	0.6	9.6%	±59.3%
Non-sampled	0.0	23.1%	±22.8%	0.4	20.9%	±22.8%
Statewide	5.4	36.0%	±11.0%	33.0	29.9%	±10.7%

** Relative precision at the 90% confidence level.*

Overall demand had a first year NTGR of 36% with a relative precision of ±11.0%, with a lifecycle NTGR of 30% with a relative precision of ±10.7%. PA-specific findings included:

- Projects implemented in the MCE and PG&E service territories had NTGRs above the statewide average NTGR, and those implemented in the SCE and SDG&E service territories were below this statewide average.
- Because the PG&E projects accounted for most of the statewide sampled energy and demand savings, they had the impact of pulling the statewide average NTGR closer to the PG&E average NTGR.

Table ES-5 shows the first year and lifecycle natural gas net savings broken down by program administrator. The first year NTGR for projects evaluated in the CIAC study was 15% with a relative precision of ±5.3% and a lifecycle NTGR of 14% with a relative precision of ±2.5%. The biggest single driver of these lower NTGRs was the presence of a single very large PG&E natural gas project with a low NTGR and which, as noted, accounted for 75% of the statewide natural gas portfolio. Removing this single project would increase the statewide first year NTGR from 15% to 26%.

Table ES-5. Natural gas first year and lifecycle-evaluated net savings by program administrator

Program administrator	First year savings			Lifecycle savings		
	1,000 therms	NTGR	RP%*	1,000 therms	NTGR	RP%*
MCE	(1.2)	50.7%	-±12.4%	(8.9)	51.1%	-±15.2%
PG&E	3,832.3	14.3%	±5.8%	55,436.6	13.8%	±2.4%
SCG	325.1	34.2%	±0.9%	411.2	18.7%	±0.2%
SDG&E	111.8	18.2%	±23.0%	1,234.6	28.9%	±38.2%
Non-sampled	5.8	27.2%	±31.5%	86.4	28.9%	±29.9%
Statewide	4,273.8	15.1%	±5.3%	57,159.9	14.0%	±2.5%

** Relative precision at the 90% confidence level.*

CONCLUSIONS, FINDINGS, & RECOMMENDATIONS

The key findings and recommendations presented below were developed from all impact evaluation activities. Extensive overarching findings and recommendations are presented in Chapter 4 (Results) and Chapter 5 (Findings and Recommendations) of this report.

The statewide lifecycle electric GRR in this study is 48.3%, which is slightly lower than that observed in 2015 (50%) and roughly the same as 2019 (47%). The statewide lifecycle gas GRR in this study is 89%, which is significantly higher than that observed in 2015 (54%) and 2019 (40%), primarily because of a large project that represented 75% of the total statewide custom gas savings, which had slightly more evaluated savings compared to the forecasted value.

Attribution of savings to program activities remains a challenging area. The overall lifecycle NTGR for electric savings is 36% while the overall lifecycle NTGR for gas is 14%, though without a particularly large gas site in the custom population this ratio improves to 26% but is far below the historic trend of 50%. Findings in this study suggest that participants often decide to pursue a project before engaging with their PA. In addition, many participating projects had significant non-program drivers such as corporate policies, regulatory compliance requirements, or other pre-established initiatives that increased free-ridership.

At a summary level, key conclusions and findings and recommendations are presented next, as well as an overview of recruitment practices and success for this study.[13]

Conclusion 1. CIAC projects are inherently complex, so GRRs tend to have more variation given differences in engineering approaches for various measures at various sites, and access to available data. Overall, both the electric and gas GRRs presented for this study have not improved significantly compared to previous cycles.

Conclusion 2. For some projects, provided documentation was extremely helpful for the evaluation efforts. Often PAs would collect pre- and post- trend data or short-term metered data to support engineering inputs and assumptions. Pre- and post- inspections would be paired with memos and photographic evidence to support baseline and installed conditions.

Conclusion 3. Several projects involving the installation of controls to add to the efficiency of underlying equipment such as boilers or cooling systems reverted to pre-existing conditions prior to the evaluation. This was likely driven by COVID-19-enforced protocols requiring practices such as increased ventilation or outdoor air requirements, but settings were never returned to the recommended settings after those requirements were lifted. Education practices for control-based measures are critical to ensure the persistence of energy saving projects.

Conclusion 4. Numerous SBD projects were expected to yield negative energy or demand savings from the savings calculation models, but the PAs reported these as zero impacts. In certain cases, the PAs failed to report the negative impacts that would have resulted from the implementation of specific measures.

Conclusion 5. A major theme is the general decline in the combined 2020/21 NTGRs compared to the 2019 NTG results. This decline occurred across programs, and, with one exception, across PAs. The one bright spot within the 2020/21 results was a slight increase in lifecycle electric NTGRs, from 34% in 2020 to 39% in 2021, which was offset by a decline in lifecycle gas GRR, from 35% in 2020 to 14% in 2021. Key contributors to these lower NTGRs were too many projects that either had already been approved before the program intervention or that had been driven by pre-established or compulsory practices such as corporate policy, compliance with normal maintenance/replacement policies, and regulatory requirements.

13 In support of Recommendation #3: CPUC, "Fuel Substitution Technical Guide," 10/31/2019, https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/building-decarb/fuel-substitution-technical-guide-v11.docx

FINDINGS & RECOMMENDATIONS

Findings 1. Project documentation received from the PAs in response to data requests was, at times, incomplete or unclear in describing the project and savings estimates that are shown in the tracking data. In some cases, the PAs have chosen to provide extracts of project documentation that was hard to follow, while customers or vendors, when asked, have provided much more thorough project documentation, which should have originally been provided by the PAs. In some instances, the analysis files that were provided were password protected, contained hard-coded inputs rather than intact algorithms, or did not equate to what was filed in tracking.

Recommendation 1. The PAs should be diligent in gathering all relevant project files at the time of documentation requests. PAs should provide the missing requested files. Particular attention should be paid to project applications and appropriate extension letters or other relevant CPUC policy-abiding documents, building permits, and unlocked versions of final calculation models and spreadsheets. PAs should focus on clearly documenting baseline conditions and any changes that may have occurred due to as-built conditions compared to those used in initial savings estimates. Final calculation models should always match tracking reported savings, and if not, it should be clearly documented why.

Findings 2. This evaluation cycle observed 41 zero savings projects. Some of these were for engineering reasons, which is considered an operational discrepancy, but the majority (28) are due to CPUC custom rule violations, specifically pertaining to missing project extensions if a project was not completed within the specified timeframe after approval, or for the installation of ineligible measures.

Recommendation 2. Ensure all reported claims follow CPUC policy guidelines. PAs should pay specific attention to the ineligible measures list such as paying custom incentives for deemed measures. They should also ensure projects are installed and claimed within the specified period in the customer agreement. If there are delays, ensure project extensions are signed and submitted. Deemed measures with deemed rebates should also be reported as deemed and paid deemed rebates. This will reduce the number of projects evaluated as ineligible and ensure persistence of program savings.

Findings 3. A number of projects were discovered to have on-site solar generation, cogeneration, or had a portion of fuel delivered by non-IOU suppliers; however, energy savings were not adjusted to account for any of these impacts. One customer in particular purchased just about all their fuel from a non-IOU supplier, but the PA credited 100% of the savings. This project was deemed ineligible in the evaluation as the PA was not responsible for any impacts to the grid.

Recommendation 3. If a site has solar generation, cogeneration, or uses non-IOU delivered fuels, the PAs should account for each when determining site savings estimates to ensure savings are only credited for the periods and portions of fuel that the customer is purchasing from the PA.

Findings 4. The evaluators noted several projects where sources used for baseline information were sourced from older and/or inaccurate information, including ISP studies that were no longer relevant, such as those for HVAC cow barn fans. There were also similar projects using pre-existing conditions at the time of scoping but never revisited the baseline at the time of project approval. These projects were scoped in 2015 but installed in 2020 using the 2015 baseline data, which greatly reduced the accuracy of PA-reported savings.

Recommendation 4. The PAs should ensure appropriate baseline and ISPs are used at the time of project approval. If project implementation is delayed by more than 24 months, then baseline measurements and prevailing CPUC policies should be revisited to ensure savings estimates reflect appropriate baseline operating conditions, market practices, and CPUC policies.

Findings 5. The evaluated sample contained several controls-based projects where equipment settings reverted to the baseline conditions. For example, during the COVID-19 period, some buildings were required to increase ventilation, building schedules, or outdoor air requirements, but these settings were never re-set to project levels when requirements were lifted. These projects resulted in zero savings as equipment was still operating at pre-existing conditions.

Recommendation 5. The PAs should ensure proper education of equipment and control is conducted. This will maximize the persistence of savings and reduce the chance of equipment and control sequences being reverted at or below baseline conditions.

Finding 6. For most sampled SBD projects, there was no documentation provided by the PAs to support the approval of building permits. Evaluators had to spend additional resources to identify permit dates to ascertain the applicable code[14] that would apply to the evaluated project.

Recommendation 6. The PAs should include permit drawings that clearly indicate the date the permit was applied and the AHJ approving the permit within project documentation to DNV.

Finding 7. The current SBD program design uses Title 24 as a reference baseline. The evaluation sample included a federal defense building to which International Building Codes were applicable, not Title 24. The reported savings were incorrectly modeled using Title 24 as the baseline.

Recommendation 7. The PAs should screen projects going through the SBD program for applicable baselines and include projects only when the building uses Title 24 or other relevant industry standards (e.g., healthcare and data center industry standard practices) to determine reference baselines for comparisons.

Finding 8. The evaluation of SBD projects that were implemented in 2020 and 2021 included numerous buildings that were part of larger campuses and did not have separate metering for their electricity and natural gas consumptions, making it impossible for evaluators to calibrate the as-built simulation models with the facility's energy usage.

Recommendation 8. The PAs should consider submetering for SBD whole building projects involving individual buildings on larger campuses that are not utility metered.

[14] Code, in reference to SBD projects, refers to Title 24. Title 24 is a set of building energy efficiency standards developed by the California Energy Commission (CEC) designed to ensure new and existing building achieve energy efficiency.

1 INTRODUCTION AND STUDY BACKGROUND

This report presents DNV's evaluation results for California Program Administrators' (PA) Commercial Industrial and Agricultural Custom (CIAC) program that includes Custom and Savings by Design (SBD) subject areas for program years (PY) 2020 and PY2021. This evaluation effort is guided by the CIAC final workplan dated May 20, 2022.[15] The two subject areas we evaluated are defined as:

- **SBD** – the statewide Non-Residential New Construction (NRNC) program administered by the California PAs
- **Custom** – non-residential energy efficiency projects or measures other than Strategic Energy Management (SEM) and Normalized Metered Energy Consumption (NMEC)

We will evaluate SEM and NMEC projects separately from CIAC projects. The SEM evaluation is under a different timeline, and that report will be delivered to the CPUC and stakeholders in April 2024. NMEC was initially scoped as part of the CIAC study. However, following a thorough review of the PAs' NMEC savings data and other program information, DNV, the CPUC, and PAs decided not to evaluate the NMEC program until tracking savings reconciliations were performed to ensure proper evaluation of the claims. We expect the reconciled savings claims from the PAs soon, and plan to finalize the NMEC sample frame for PY2020 and 2021.

1.1 Background

The CIAC study's overall purpose was to evaluate energy and demand savings for CIAC projects installed in PY2020-21. This impact evaluation quantified evaluated gross and net first year and lifecycle electric and gas energy savings and peak demand reduction. The study presents recommendations for improving program delivery quality control, appropriate maintenance, and submission of project documentation and savings claims. This evaluation also assessed the PAs' project-specific documentation of calculation methods, baselines, and savings parameters used to estimate forecasted savings.

1.2 Evaluation objectives

The six primary objectives of this study were to:

1. Develop first year and lifecycle evaluated net and gross savings for the Custom and SBD savings claims at a high level of precision.
2. Determine reasons for differences between evaluated (ex-post) and forecasted (ex-ante) savings, and as necessary, assess how to improve the ratio of evaluated savings to forecasted savings (realization rates). Identify issues with respect to reported savings estimation methods, inputs, and program procedures, and make recommendations to improve savings estimates and realization rates of the evaluated programs.
3. Provide results and data that will assist with updating reported workpapers/measure packages and the California Database for Energy Efficiency Resources (DEER) values.
4. Estimate the proportion of the program-installed measures and actions that would have been implemented absent program participation (free-ridership), determine the factors that characterize free-ridership, and as necessary, provide recommendations on how free-ridership can be reduced.
5. Provide timely feedback to the California Public Utilities Commission (CPUC), PAs, and other stakeholders on the evaluation research study to facilitate timely program improvements and support future program design efforts.
6. Provide meaningful and actionable recommendations to improve program performance in delivering energy efficiency savings.

[15] GROUP D Evaluation, Measurement, & Verification of Program Year 2020/21 Commercial, Industrial, and Agriculture Custom Projects Work Plan, California Public Utilities Commission, May 20, 2022., CPUC Energy Evaluation Public Comment (energydataweb.com)

1.3 CPUC policies and guidance

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

- *CPUC Energy Efficiency Policy and Procedures Manual Version 6*
- *Statewide Custom Project Guidance Document v. 1.4*
- *Utility Statewide Custom Policy and Procedures Manuals*
- *2020 Savings by Design Participant Handbook*, policies and procedures for participation in the statewide SBD program
- *Savings By Design Baseline Guidance Document*
- *PA-specific program policy and procedures manuals*
- *Energy Efficiency Industry Standard Practice (ISP) Guidance v. 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 for Third-Party Programs*
- *Industry Standard-Practice (ISP) studies completed before or in 2020 as applicable*
- *Title 20 and 24 requirements in place when projects were permitted*
- *CPUC policy papers and state-government memos addressing topics such as the savings for sites using non-Investor-Owned Utilities (IOU) fuel sources*
- *CPUC resolution E5115 adopting minimum evidence requirements to support 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 affecting preponderance-of-evidence requirements for accelerated-replacement projects and definition of small-business customers*
- *New construction permit requirements for the PAs as specified in SB-1414*
- *Fuel Substitution Technical Guidance for Energy Efficiency V2.0*
- *CPUC D.19-08-009 Fuel Substitution Decision*[16]
- *Project Ineligibility Table from the 2020-2021 CIAC Workplan*
- *Evaluation Guidance Questions and Responses from the 2020-2021 CIAC Workplan*

[16] 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.

2 METHODOLOGY

Most of the methodology for this evaluation is described in the published final workplan.[17] 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 International Performance Measurement and Verification Protocol (IPMVP) and the California Evaluation Protocol throughout its execution.

To better answer the evaluation objectives listed in Section 1.2, DNV collected information on 160 gross sample points and 159 net sample points.[18] The gross site evaluation was based on 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 3 of this report.

2.1 Sample designs

This section presents the gross and net sample designs.

2.1.1 Gross and net savings sample design overview

A sample design and data collection memo were delivered to the CPUC, and PAs provided details on the proposed sample design to evaluate gross and net savings.[19] We obtained project tracking data for all Commercial and Industrial (C&I) programs that included non-deemed project savings claims. The sample design for Wave 1 used final Energy Division (ED) tracking data for PY2020 and draft data from the SQL database outflow from the California Energy Data and Reporting System (CEDARS) for the first three-quarters of PY2021. This approach expedited the study by estimating the total sample needed to adequately represent PY2020 and PY2021 before the final PY2021 claims were available. The populations presented in this report are based on the claims from the final ED tracking data for both program years. We finalized the population after performing data cleaning to remove placeholder claims, mis-assigned claims, claims associated with a prior year installation (consistent with CPUC precedent), and assignment of claims to other program evaluations.

The sample design aggregated activity to a project level and did not include claims with negative savings that are generally either bulk adjustments for prior year claims or interactive effects from positive savings for the other fuel, e.g., heating penalty when retrofitting to LED lighting. Both positive and negative savings were included in the overall gross realization rates (GRRs). DNV identified three projects as outliers due to unreasonable forecasted lifecycle demand savings, one of which was sampled and received zero savings for baseline reasons. To avoid the inflation of program level estimates due to the extremity of the outliers, DNV removed the two unsampled projects from the sample frame. The sample design used error ratios available from three previous cycles of California C&I evaluations to determine the sample size for most key dimensions. The sample design used forecasted savings calculated by removing the default GRRs [20] that had been applied by the system in calculating the savings reported in the ED tracking data. The sample design stratified by MMBTU savings provides a consistent unit of measure for projects that can have both electric and gas savings. We summarize the final approved sample design parameters in Table 2-1 for the Custom and SBD subject areas.

[17] Group D Evaluation, Measurement & Verification of Program Year 2020/21 Commercial, Industrial, and Agriculture Custom Projects Work Plan, May 20. 2022, DNV

[18] A sample point is defined as an individual project installed at a specific site.

[19] Sample Design and Data Collection Memo – Final CIAC Program Years 2020/2021, May 20, 2022, https://pda.energydataweb.com/api/downloads/2629/Copy%20of%20PA%20Comment%20Review%20-%20CIAC%20Workplan%20and%20Sampling%20Memo%20-%205-20-2022.xlsx

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

Table 2-1. CIAC gross and net sample design assumptions and approach

Parameter	Description (PY2020-PY2021)
Population	Tracking data set for program year, aggregated at the application (project ID) level Wave 1: PY2020 final, PY2021 Q1-3 preliminary Wave 2: PY2020 and PY2021 final Any combinations of sampling strata that did not contain at least 1% of program savings were not included in the sample frame Three projects were identified as outliers due to unreasonable forecasted lifecycle demand savings. One was sampled but the remaining two were removed from the sample frame to avoid the inflation of program level estimates due to the extremity of the outliers.
Explicit sampling strata	Program year, project type, PA, size (claimed savings), measure group (Custom only)
Implicit sampling strata[21]	Custom only: Custom Project Review (CPR) status, third-party program or not Custom lighting only: Business name, businesses that represented over 0.5% of program savings
Gross sample allocation	200 projects for the combined period, allocated for best overall precision
Net-to-gross ratio (NTGR) sample allocation	NTGR surveys attempted for all projects in the gross impact sample (embedded) with supplemental participants added for desired quota (200)
Sample design approach	Stratified ratio estimation
Target parameters	GRR, NTGR
Analysis domains	Program type, PA, fuel, measure type (lighting only, all other), CPR status (when application counts support more granularity)
Error ratios	By PA and fuel based on historical Custom and Industrial results from three prior California evaluation cycles
Projected precision at 90% confidence (worst case)	CIAC combined PY2020-21: • Gross MMBTU savings by energy unit: ±10% • NTGR by energy unit: ±8% • Net by energy unit: ±15%
Savings size stratification	Custom: varied by domain from 1-4 strata (PA, program, year, and measure type) SBD: varied by domain from 1-3 strata (PA, program, year, and measure type)
Contingencies taken and back-up sample	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 nonresponse rates. All gross impact primary samples included plus additional ones as needed. Remaining sites pre-sorted into random selection sequence for each non-census-attempt sampling cell to produce additional back-up cases as needed.

The final electric and gas population and sample frame electric and gas savings are summarized in Table 2-2 by PA and subject area. This table shows the savings not included in the sample frame by virtue of falling into a sample stratum that did not contain at least 1% of program savings. In this table and all the results tables, the savings activity is set off as its own row. Accordingly, the sample frame includes all activity otherwise shown. Projects in the "not in sample frame" group received statewide results from the program and measure group.

[21] Implicit stratification means that a systematic sample will be selected in a way that distributes the selections across these categories approximately in proportion to their savings but without explicit sampling targets.

Table 2-2. Population savings summary by PA and subject area

Group	First year			Lifecycle		
	Forecasted savings (MWh)	Forecasted savings (MW)	Forecasted savings (million therms)	Forecasted savings (MWh)	Forecasted savings (MW)	Forecasted savings (million therms)
Subject area						
Custom	187,210	20.7	31.7	1,380,039	169.8	442.8
SBD	24,756	6.2	1.2	369,815	93.5	17.6
Not in Sample Frame	2,118	0.3	0.0	29,040	4.4	0.6
Total	**214,084**	**27.2**	**33.0**	**1,778,894**	**267.7**	**461.0**
Program administrator						
MCE	1,421	0.1	N/A	12,309	0.8	N/A
PG&E	160,675	21.0	30.3	1,286,571	195.7	442.4
SCE	22,193	2.4	N/A	200,636	29.5	N/A
SCG	N/A	N/A	1.6	N/A	N/A	11.9
SDG&E	27,676	3.4	1.0	250,338	37.3	5.9
Not in Sample Frame	2,118	0.3	0.0	29,040	4.4	0.6
Total	**214,084**	**27.2**	**32.9**[22]	**1,778,894**	**267.7**	**460.9**[13]

2.1.2 Gross sample completions and response rates

The following tables show the population counts, sample design quotas, and final sample achieved for key analysis dimensions. Table 2-3 shows Custom and SBD sample design counts and final sample achieved by PA, measure type, and year. Overall, 87% of electric and 89% of gas projects in the primary sample design were recruited. This level of success provided final precisions near those presented in the table for first year electric and gas overall. The electric sample design targeted ±4.8% relative precision for first year energy impacts overall and the final achieved relative precision for electric overall is ±12.2%. The gas sample design (as shown) targeted ±3.4% relative precision first year energy impacts and the final achieved relative precision for gas overall is ±4.4%[23].

We sought to gather sufficient information to estimate electric and gas impacts for all recruited sites. However, a small group of sites did not have sufficient information available to meet the threshold for inclusion in this impact evaluation. The final sample presented in this table and the results in this report are based on those sample points where we were able to successfully include telephone verification and analysis using new current post installation data acquired, Energy Management Systems (EMS) trends/screenshots from the customers or consumption data, and/or photographic evidence directly provided by the customer.

[22] The sum of forecasted therms savings by PA does not equal the sum by subject area, as gas savings for electric PAs due to interactive effects for the installation of electric systems are not included, as electric PAs were not sampled to receive a gas GRR.

[23] Natural gas achieved relative precision is heavily influenced by one project that represented 96% of forecasted first year gas savings. Further discussion is provided below in Section 4.

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

Dimension	Electric				Natural gas			
	Population (N)	Sample design quota	Final sample (n)	% Complete	Population (N)	Sample design quota	Final sample (n)	% Complete
Program Administrator								
MCE	78	5	5	100%	-	-	-	N/A
PGE	1,837	83	71	86%	104	46	41	89%
SCE	104	22	19	82%	4	-	-	N/A
SCG	-	-	-	N/A	18	9	8	89%
SDG&E	74	9	8	89%	48	9	8	89%
Statewide	**2,093**	**119**	**103**	**87%**	**174**	**64**	**57**	**89%**
Measure type								
Lighting only	1,792	50	47	94%	4	-	-	N/A
Other	301	69	56	81%	170	64	57	89%
Total	**2,093**	**119**	**103**	**87%**	**174**	**64**	**57**	**89%**
Year								
2020	1,397	78	64	82%	96	26	28	108%
2021	696	41	39	95%	78	38	29	76%
Total	**2,093**	**119**	**103**	**87%**	**174**	**64**	**57**	**89%**

2.1.3 Net sample completions and response rates

We targeted NTG data collection to all sites in the gross sample. Table 2-4 shows the sample design quotas and precisions targeted (the same as the gross sample design). Additional surveys with participants outside of those included in the gross evaluation sample were performed in our effort to fill all sample quotas. One hundred fifty-nine customers were used in the NTG results. Of the 159 surveyed projects, 79 of those were also part of the final gross sample (i.e., embedded). Of the 79 embedded projects, 60 had attributable savings associated with them (i.e., non-zero saver projects).

Table 2-4. Overall net sample response rate by fuel and key analysis dimensions

Dimension	Electric				Natural gas			
	Population (N)	Sample design quota	Final sample (n)	% Complete	Population (N)	Sample design quota	Final sample (n)	% Complete
Program Administrator								
MCE	78	5	9	180%	-	-	-	N/A
PGE	1,837	83	83	100%	104	46	35	76%
SCE	104	22	13	59%	4	-	0	N/A
SCG	-	-	0	N/A	18	9	7	78%
SDG&E	74	9	6	67%	48	9	6	67%
Statewide	**2,093**	**119**	**111**	**93%**	**174**	**64**	**48**	**75%**
Measure type								
Lighting only	1,792	50	52	104%	4	-	0	N/A
Other	301	69	59	86%	170	64	48	75%
Total	**2,093**	**119**	**111**	**93%**	**174**	**64**	**48**	**75%**
Year								
2020	1,397	78	74	95%	96	26	26	100%
2021	696	41	37	90%	78	38	22	54%
Total	**2,093**	**119**	**111**	**93%**	**174**	**64**	**48**	**72%**

2.2 Gross savings methods

2.2.1 Overall methods overview

This section describes the approach to evaluating gross savings across SBD and Custom programs. Our gross savings approach sought to maintain consistency with previous evaluation study methodologies. However, due to less time available to complete this study compared to the previous evaluation cycle and lingering pandemic concerns, this effort relied more on phone surveys to confirm facility- and measure-level operation along with other virtual data collection techniques than in previous studies. Figure 2-1 below shows three core aspects of the methods used across Custom and SBD, followed by a more detailed discussion of the methods used in our evaluation.

Figure 2-1. Custom and SBD evaluation approach, PY2021

During the evaluation process, we determined **appropriate baselines** based on preponderance of evidence on equipment viability and 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 why variances were found 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 q**uality control**, senior engineers worked with lead engineers for review, verification, and approval stages before site-specific report submission.

Custom Core Template (CCT) and M&V Plans

We created an 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 source for reference material engineers used to create M&V plans and document data collected in developing estimates of impacts. Critically, the CCT guided and captured the determination of whether measures were eligible or ineligible. We determined project eligibility in the CCT based on CPUC guidelines before developing full-fledged customized M&V plans. The determination of eligibility required an assessment of compliance with the CPUC decisions, rulings, and policies such as the Statewide custom program requirements and program-specific requirements.[24] We reviewed sites determined as ineligible with the CPUC and PAs as appropriate before removing their savings from the evaluation.

The CCT stored claim information downloaded from the tracking database organized M&V activities, 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 consistently developed and systematically followed best practices for pre-implementation review/evaluation. It also facilitated data sharing between DNV's CPR[25] team and the larger DNV team when a CPR site was selected for evaluation. 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 maintain and store all available information on a given project in a single, easily accessible location. These plans served as the roadmap to determining the evaluated estimate of savings for a site. Engineers followed each M&V plan to document site visits, data collection, and methodology for estimating savings (and to

[24] 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.

[25] 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.

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 switching, 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 if 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, what data was requested and received, etc.,). Senior engineers reviewed each plan to maintain quality standards of typical M&V procedures and policy requirements. We assessed M&V rigor as a key part of M&V planning.

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. The PAs assisted these efforts in various ways, including providing accurate customer contact information, providing introductory correspondence, and/or contacting the participant to encourage them to participate in evaluation activities (when requested by the evaluation team), including both NTG and gross surveys and verifications. Recruitment efforts were made by reaching out to the participants at different times of day and 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. Within the sample, there were projects with multiple measures installed. To provide an efficient yet thorough examination of measures, we focused our evaluation tasks on the largest measures and extrapolated findings to the un-evaluated measures. Data collected for projects varied from site to site, including:

- Customer verification of installed equipment, including pictures and video, when possible, for confirmation.
- Customer reported EMS/trend log data on current operational conditions including but not limited to load, hours of use, process temperatures, and seasonal variations. This information is collected for current conditions as well as historical changes since measure installation.
- Power measurements of equipment that are taken over a representative range of operating conditions and a period long enough to establish normal operational parameters with a high degree of certainty.
- Trend data from onsite monitoring systems or building management systems that show equipment operation.
- Production data if equipment operation is directly related to production.

Measure analysis

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

After completing the program file review and conducting the site interview or virtual audit with the customer, the evaluation engineers finalized M&V plans based on the updated information from the site and developed the final analysis approach, which is discussed further below 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 current data provided by the customer, the engineers determined the viability of repurposing PA-provided analysis templates or creating new custom evaluation analysis templates. The final M&V plan documents the engineering approach determined to be best suited based on measure-specific requirements to accurately determine savings. Inputs and assumptions were clearly documented 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 discrepancy adjustment factors are summarized in Table 2-5.

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 2-5, and further detailed in the following sections.

Table 2-5. Savings discrepancy adjustment 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 attributed to the number of units assumed 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 ISP, code, 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 that 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.

2.2.2 Custom specific analysis methods

This section includes a discussion of Custom-specific methods not covered in Section 2.2.1, broken out by non-lighting and lighting measures.

2.2.2.1 Non-lighting

Custom non-lighting projects, by nature, are unique and therefore warrant tailored approaches to estimate energy and demand savings. However, based on our experience with evaluating Custom non-lighting projects in California since 2006, there are certain measure groups that are more conducive to a templated analysis approach. During the development of the M&V plan, we determined the viability of repurposing the PA-provided analysis templates for use as the evaluated model with current information provided by the participant. If the previously used approach was determined to not be a viable method or if we identified a more accurate savings approach, alternative approaches were used or developed. These instances 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 as follows:

- 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 8760 spreadsheet tool

When required, a typical meteorological year (TMY) CZ2010 dataset based on the specific California climate zone location was used for temperature sensitive calculations. Energy savings were either calculated by the hour in an 8760 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. The following demand definitions were used to calculate peak demand reduction:

- The peak demand impacts of 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. (5 hours) over a three-day "heat wave" that occurs on consecutive days in June through September.
- The first day of that heat wave is determined for each climate zone and marks the start date for the peak demand period.
- Consistent with Title 24 and CZ2010, a 2009 calendar year was used to determine which days are weekends and holidays.

An example of this approach is an evaluated HVAC retro-commissioning (RCx) project in this study. This project involved schedule optimization, economizer optimization, supply air temperature reset for AC units, and discharge air temperature reset for heating units. To determine savings, the implementor used a tool to model savings, which used one of two methods: IPMVP Option A, a simple data option that interpolates trend values at different outdoor air temperature (OAT) points based on two OATs vs. trend data points; or IPMVP Option B, a trend data option that develops regressions based on a series of actual trends vs. OAT for the same data period. When using Option B, we applied these regressions to CZ2010 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 part of the data collection efforts, the evaluator was able to collect up to one full year of recent trend data to inform the current operation of the impacted equipment. The evaluator followed Option B as the evaluation methodology to develop regressions to OAT using provided trend data and applying those regressions to local CZ2010 weather data to accurately determine energy savings for the impacted equipment.

Similar details can be observed in each site-specific CCT, which is provided as a deliverable 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.

2.2.2.2 Lighting

We evaluated lighting-only sites via telephone surveys with each site contact. The evaluation team gathered information with site contacts on five items: 1) Confirm measure installation and measure quantities, (2) Obtain self-reported lighting operating hours, (3) Gauge the condition and functionality of the lighting equipment removed to determine if the lighting installed was accelerated replacement or normal replacement, (4) Obtain information about the lighting equipment removed, and (5) Obtain information about lighting controls.

Each lighting-only project had a savings calculator called a Modified Lighting Calculator (MLC).[26] Parameters of PA-provided project-specific MLCs were adjusted by the evaluation engineers based on information in the project documentation and reported from each customer contact. Below we list the general approach for site-level evaluation of lighting projects.

1. We verified that the facility type and location from the project documentation agree with the savings calculator inputs. These factors determine the DEER hours of use (HOU), coincident demand factor (CDF), and HVAC interactive effects (IE) parameters for the savings calculation.

[26] Most sampled projects had Modified Lighting Calculator (MLC) or Easy Lighting Calculator (eLC) files. Three projects calculated savings with SCE's Type B TLED Calculator, and five horticultural projects used the GrowGreen Calculator.

2. We compared measure quantities and type (long fluorescents vs. high-intensity discharge and indoor vs. outdoor) as reflected in documentation invoices, photographs, or project feasibility studies, with quantities and measure types as input into the savings calculator and updated them based upon survey responses.
3. We verified that the measures installed were eligible.
4. We estimated HOU and CDF using self-reported lighting hours of operation and used adjustment factors developed from previous evaluations for consistency.[27,28]
5. We confirmed and revised accelerated replacement (AR)/normal replacement (NR) categorization as necessary based upon respondent reports on whether the lighting project was necessary because lights were already failing or not providing adequate lighting, or if the project had low program influence using the preponderance of evidence standard.
6. We verified model wattage inputs for the existing measure, ISP measure, and new LED measure were correct and reflected measure information on Design Lighting Consortium (DLC) as reflected in the equipment spec sheets from the project documentation.
7. We used CIS billing data to confirm lighting calculator inputs and verify savings and incentive capping.[29]
8. We applied the effective useful life (EUL) and remaining useful life (RUL) inputs to lifecycle savings.

An example of this approach (provided in more detail below) is for an industrial facility where the vendor used the MLC to determine savings. The inputs, including quantity and technology provided within the MLC, matched the scope of work and equipment level information such as wattage was verified based on product spec sheets and DLC screenshots. After confirming all project inputs, the evaluator adjusted the PA-provided MLC and modified the inputs based on information gathered from the customer, including HOUs.

A storage facility replaced T5s, T8s, and T12s with Type B TLEDs, a technology that had no deemed path of participation in 2020. The PA claimed the project as MAT=AR. The evaluation engineer reviewed project documentation including the technical review document that followed the project development from first customer contact and walk-through to installation and incentive pay as well as photographs, invoices, equipment spec sheets, e-mails detailing the communications between the PA and the customer, the Easy Lighting Calculator (eLC) lighting model used by the implementer to estimate savings, the revised calculation proposed by the technical reviewer to address eLC shortcomings, and all materials submitted during CPR review. A customer survey verified the quantities installed, the type of equipment removed, the current operation schedule of the new lights, and asked questions about the likelihood that the customer would have installed the same measure at the same time in the absence of the program. Based on customer responses and the documentation provided, the evaluation engineer determined that MAT=AR is correct. The evaluator verified that the building type and climate zone inputs to the eLC were correct. The evaluator used the customer-reported lighting operation schedule to develop an adjusted, self-reported HOU, which superseded the custom HOU that had been used in the original eLC model. The evaluator calculated an updated EUL based on the rated life of 50,000 hours and the evaluation HOU, whereas the PA had used 20,000 hours and a custom HOU developed at installation time. For lifecycle savings, the PA had not claimed savings in the second baseline. The evaluator used the updated EUL, the unit savings from the updated eLC for the second baseline, and an RUL estimated as 1/3 of the remaining life of the measure removed for the evaluated HOU, in the calculation of lifecycle savings.

[27] 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

[28] Since these 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%.

[29] Since some of the important parameters that influence the savings calculation (HOU, CDF) are DEER-based, in some cases the resulting lighting savings might exceed monthly energy usage for the site. If this occurs, the lighting models apply a cap to the savings, and to the custom incentive paid.

Similar details can be obtained by reviewing each individual lighting-only CCT. The example above is complicated because the project was relatively large and had multiple lighting technologies replaced. Most other lighting projects required only one, or a small handful of parameter adjustments.

2.2.3 SBD specific analysis methods

This section includes a discussion of SBD specific methods. DNV's gross evaluation approach for SBD specifically involved leveraging pre-existing building simulation models provided by the PAs and the analysis of gross savings (kWh, kW, and therms) based on project-specific data that was collected for current conditions as well as historical changes since project installation. Data collected for SBD projects typically included EMS trends, chiller logs, equipment nameplate data, system operation sequences and operating schedules, and a careful description of the current operating conditions. Evaluation engineers interviewed the customers and building operating staff to collect relevant equipment operating parameters. As part of the SBD data collection, we also obtained the new construction building's permit date from the authority having jurisdiction (AHJ) to verify the version of the Title 24 code standards that would apply to the project. In cases where there was a mismatch, we revised the baseline to the applicable Title 24 code and re-calculated the savings.

The SBD program requires participants to use one of two design approaches to identify and quantify energy-efficient design improvements:

- The performance-based whole building approach: The whole building projects within the non-residential new construction group are very diverse. The size of the projects, the types of installed EEMs, and the energy savings of the projects are highly variable across the population. The whole building approach utilizes building energy simulation models to forecast project-level estimates.
- The prescriptive systems approach: provides individual system estimates for EEMs installed in building systems such as lighting, HVAC, and building shell.

The following two sections provide evaluation methods broken out by whole building and system approaches.

2.2.3.1 Whole building approach

For all SBD projects that utilized a whole building approach, we re-ran the PA-provided building simulation models as provided to verify that the modeled results from the performance runs are consistent with tracking savings. The compliance runs were also executed to verify that the project had a minimum of three EEMs, falling under at least two of the following systems: lighting, envelope, and mechanical, and will reduce energy use by more than 10%, compared to the applicable Title 24 code to be eligible for SBD incentive.

DNV's SBD team used enhanced rigor to estimate evaluated gross (typically IPMVP Option D) and net savings for whole building projects. We used the data collected per the section above to inform and calibrate the building model to as-built operating conditions. Due to the multiple, interactive measures typically included in whole building projects, SBD models were calibrated using whole building utility billing data, monthly, and/or AMI where feasible, obtained from the program administrators. Final evaluated savings (energy and peak demand) are reported as the difference between the baseline and as-built performance runs.

An example of this is a whole building measure installed under the SBD program at a new 250,000-square-foot acute care space for a hospital. The project included the installation of HVAC, lighting, and envelope measures and claimed 20% energy savings compared to the 2013 Title 24 baseline. To determine reported savings, the PA used EnergyPro v6.8.0.4, which uses the 2013 Title 24 code as a baseline. Since the evaluated site was a healthcare facility, a variety of tasks and special safety requirements dictated requirements that deviate from Title 24 Part 6. Specific rules for the modeling of the standard envelope, lighting, and mechanical systems in healthcare facilities were developed in the 2016 SBD Healthcare

Baseline Study. DNV evaluators determined that the PA savings analysis was appropriately modeled and used it as a basis to determine evaluated savings. The evaluation team utilized IPMVP Option D to evaluate this project, with data collection from the customer on as-built lighting, mechanical and architectural plans, and trend data collection from the facility's BMS. Based on the data that was collected, evaluators updated the as-built lighting power densities (LPD), boiler efficiencies, chilled water pump capacity, condenser water and hot water pump capacity and full load flow, and facility operating schedules and set points in the PA-provided EnergyPro model. The as-built model was then calibrated to sub-metered data provided by the facility. The difference between the baseline and as-built models in the performance run under EnergyPro was determined to be the evaluated savings associated with this project.

2.2.3.2 Systems approach

The systems approach evaluates systems that use energy (such as lighting, HVAC, etc.) on an individual basis. A typical systems approach project uses a simplified modeling tool like a spreadsheet-based analysis or SimCalc,[30] to calculate energy savings by comparing proposed equipment to Title 24 equipment of the same type. Like custom-specific analysis methodologies described in Section 2.2.2, we determined the viability of repurposing the PA-provided analysis templates for use as the evaluated model with current information provided by the participant. If the previously used approach was determined to not be a viable method or if we identified a more accurate savings approach, alternative approaches were used or developed.

An example of this systems approach was a project installed under the SBD program at a new single-story office building that involved an energy-efficient interior lighting measure with an installed LPD that was 16% better compared to the 2016 Title 24 baseline LPD. To determine reported savings, the PA used SimCalc 2016, which uses the 2016 Title 24 code as a baseline. The parameters input to the SimCalc model were the proposed LPD, building type, conditioned area of the building, and the applicable California Climate Zone (CZ). The building type provided in SimCalc determines the DEER-based operating profiles and schedules to be used for the savings analysis. DNV evaluators determined that the PA savings analysis was appropriately modeled and used it as a basis to determine evaluated savings. The evaluation team completed an in-depth data collection from the participant, obtained as-built lighting plans, and verified that the facility operating hours are consistent with DEER operating hours for the building type specified. Equipment-level information such as wattage was verified based on product specification sheets and DLC screenshots. The evaluators then re-calculated the as-built LPD based on lighting plans provided by the participant and updated the PA-provided SimCalc model as appropriate to estimate the evaluated savings.

2.3 Net savings methods

This section describes how DNV collected net savings information from program participants and estimated the NTGRs.

2.3.1 NTG data collection

As discussed previously, we completed NTG surveys or in-depth interviews both with participants who completed separate data collection as part of the gross savings analysis (embedded projects) and participants who did not (non-embedded projects). The embedded and non-embedded sites required separate expansion approaches, as detailed in Section 3.1.1.

We assigned different levels of net savings analysis rigor based on both the size of the project (as measured by the value of project incentives) and the program (Custom vs. SBD). We administered the Standard/Enhanced Rigor in-depth interview guides to decision makers with Custom projects that had received at least $250,000 in incentives and administered Standard/Enhanced Rigor in-depth interviews to all SBD participants. Decision makers with Custom projects that received less than $250,000 in incentives received a Basic Rigor survey. The Basic Rigor survey contained most of the same

[30] SimCalc is a California utility-specific tool that is based on a DOE-2 engine and incorporates the Title 24 standards with associated Alternative Calculation Methods (ACM) rulesets to estimate savings associated with systems approach SBD projects.

questions as the Standard/Enhanced Rigor interview guides. The questions that appeared in the Standard/Enhanced Rigor interview guides but not in the Basic Rigor survey were primarily follow-up questions designed to better understand why respondents assigned certain influence scores to program- and non-program project drivers.

2.3.2 NTGR estimation approach and scoring

DNV used the following three scores to calculate the NTGR:

- **Program attribution index 1 (PAI-1):** This score reflected the influence of various program (e.g., incentives, recommendations, training, or other program intervention) and non-program factors that might have driven the customer's decision to implement the energy-efficient measure. The interviewers asked the project decision makers to rate the relative importance of each program or nonprogram factor using a 0-to-10 rating scale, where 0 meant "Not at all important" and 10 meant "Extremely important." We calculated the PAI-1 score based on the highest rating for a program influence divided by the sum of the highest rating for a program influence plus the highest rating for a nonprogram influence.
- **Program attribution index 2 (PAI-2):** This score captured the perceived importance of the program factors relative to nonprogram factors in the decision to implement the energy-efficient measure. The interviewers asked the project decision-makers if they had 10 points to award in total, how many points would they give to the importance of the program factors, and how many would they give to the non-program factors? The PAI-2 score was normally the proportion of the 10 points that the respondents gave for the program factors. However, if the respondents had said, in response to an earlier question, that they had already decided to implement the energy-efficient measures before they learned about the program, we cut this PAI-2 factor in half.
- **Program attribution index 3 (PAI-3):** This score captured what the project decision makers said was the likelihood that they would have installed the same efficiency 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.

We calculated the NTGR as the average of these three program attribution index scores.

The details of gross and net evaluation methodologies, M&V activities, development of data collection instrument, data collection approach, assessment of baseline, evaluation rigor levels, reliability, bias, uncertainty, data sources, and constraints are discussed in the "Evaluation Methodology" section of the PY2020-2021 CIAC Work Plan.[31]

[31] CPUC, "Evaluation, Measurement, & Verification of Program Year 2020/21 Commercial, Industrial, and Agriculture Custom Projects Work Plan," 4/1/22, https://pda.energydataweb.com/api/view/2609/CPUC%20Group%20D%20PY2020-2021%20CIAC%20Workplan_DRAFT_2022_04_01_PDF%20Clean.pdf

3 RESULTS

In this section, we present our findings related to gross and net savings by key reporting dimensions. This section also includes a discussion of 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 decisions to implement efficiency measures.

3.1 Gross electric savings and realization rates

Figure 3-1 compares the weighted forecasted and evaluated first year electric energy savings for all custom and SBD sites in the final sample. The colors of the markets on each plot show Custom versus SBD sites. 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. The largest sites fall primarily along the dashed line, suggesting these forecasted estimates were fairly accurate. The scatterplot following this one focuses on the dispersion of sites on the lower left quartile of this graphic.

Figure 3-1. Weighted Custom and SBD first year electric energy savings scatterplot (all sites)

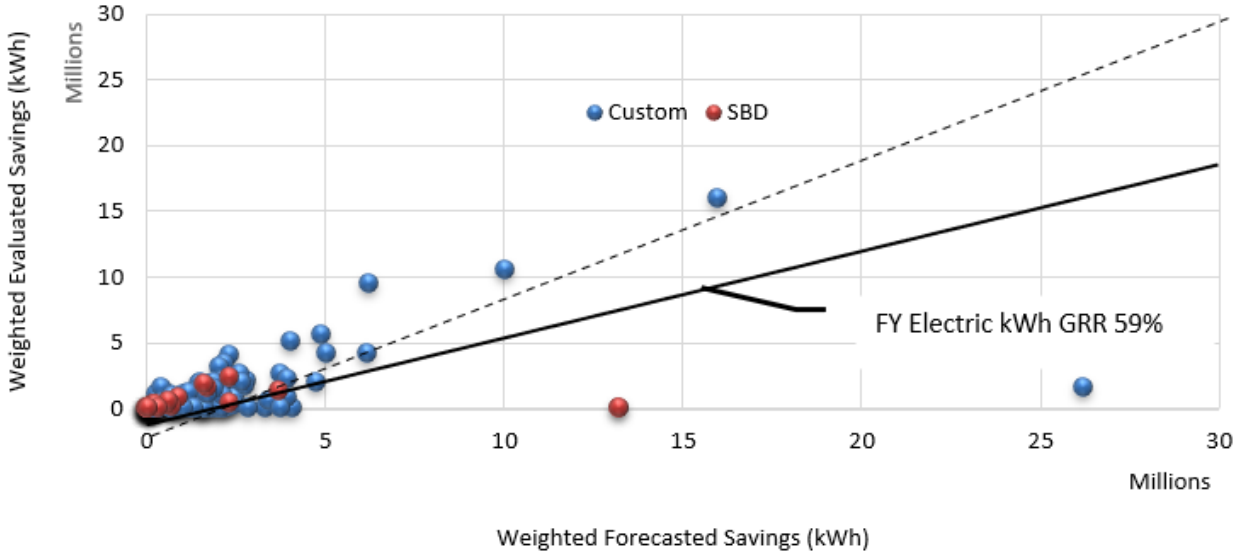
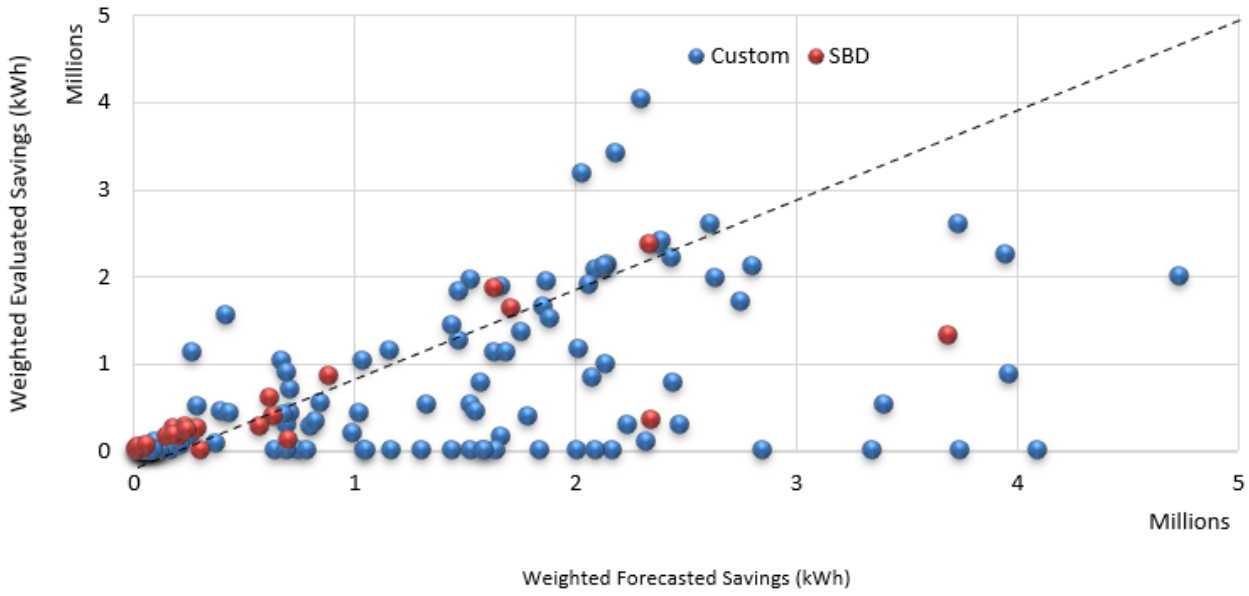


Figure 3-2 refocuses the scatterplot above on sites with forecasted values of less than 5 million kWh. In this view, you can see the number of ineligible projects and any with zero savings along the x-axis. In addition, it becomes clearer that many sites fall below the dashed line, indicating evaluated savings less than forecasted estimates. The combined impact of these sites influenced a final first year electric GRR of 59.5%.

Figure 3-2. Weighted Custom and SBD first year electric energy savings scatterplot (up to 5M kWh)



A series of tables that present various reporting dimensions follow. The first one, Table 3-2, and all other electric and gas gross results tables are laid out similarly. The first series of result columns are first year energy (top half) and demand (bottom half) savings with the second group of columns showing energy and demand for lifecycle savings. Subject areas include Custom and SBD project types. Non-sampled projects are projects in domains that represented <1% of program savings and we did not include them in the sample frame to ensure efficient use of evaluation funds. These projects received GRRs and NTGRs from the Statewide results of the WP group and measure group (as discussed in Section 3.1.1). We presented all results at the 90% confidence interval.

3.1.1 Expansion methods and results

This section presents the methodology that DNV used to expand the sample results to the population to calculate program-level estimates of gross realization and the net-to-gross realization rates (NTGRRs). To develop an optimal sample design given the complex nature of the evaluation, during the sample design, we elected to evaluate domains that accounted for more than 1% of overall program savings. The domains in the final sample design accounted for approximately 99% of program savings. For the domains that were not sampled, the statewide results were applied.[32]

Stratified ratio estimation was used to calculate separate ratios for each domain of analysis which included: implementation PA, program year, program, and measure group (lighting only and all other measures). The gross realization rate was calculated as the weighted evaluated ex-post savings divided by the weighted tracking forecasted gross savings. For the NTGR for embedded sites for which both gross and net analyses were conducted, the denominator in the ratio expansion was the evaluated ex-post gross savings for the domain. This embedded approach for the net expansion was used to leverage the additional information that was collected in the gross analysis to calculate the net savings. For sites that were not sampled as part of the gross analysis, the denominator for the ratio expansion was the tracking ex-ante gross savings. Table 3-1 presents the statewide realization rates that we applied to the non-sampled domains, which represent less than 1% of the PY20-21 claimed savings.[33]

[32] Statewide results applied to non-sampled measure were calculated at the program/measure level.
[33] Detailed results including lifecycle results, precisions, and error bounds are included in XXX appendix

Table 3-1. Non-sampled projects applied results

PA	Group	Program year	Measure group	Gross RR FY kWh	Gross RR FY kW	Gross RR FY therms	NTGR FY kWh	NTGR FY kW	NTGR FY therms
MCE	Custom	2020	Other	48.9%	49.9%	88.0%	39.4%	37.6%	15.1%
RCEA	Custom	2021	Lighting only	74.4%	65.3%	91.0%	49.6%	41.8%	40.4%
SDGE	SBD	2021	Other	52.8%	49.3%	49.2%	25.6%	22.2%	26.6%
SCG	SBD	2021	Other	52.8%	49.3%	49.2%	25.6%	22.2%	26.6%

After the estimation of project-level electric and/or gas impacts, we developed sampling weights to expand the sample results to the population. The sampling weights reflect the sample stratification and population counts and completed sample counts.

3.1.2 Gross savings results by subject area

Table 3-2 summarizes the first year and lifecycle-forecasted savings, evaluated savings, GRR, and relative precision at the statewide level and for each subject area. The statewide CIAC first year MWh GRR is 59%, with a relative precision of ±12.1%. The Custom subject area within CIAC, representing most forecasted savings (approximately 85%), had a first year MWh GRR of 60% with a relative precision of ±13.5%. The SBD subject area, representing approximately 11% of forecasted savings, had a first year MWh GRR of 53% with a relative precision of ±20.8%. The statewide CIAC lifecycle MWh GRR is 48% with a relative precision of ±11.2%. Custom and SBD lifecycle MWh GRRs are both 48%, with relative precisions of ±13.3% and ±20.6%, respectively.

The statewide, CIAC first year MW GRR is 55%, with a relative precision of ±14.6%. The Custom subject area within CIAC had a first year MW GRR of 57% with a relative precision of ±17.2%. The SBD subject area had a first year MW GRR of 49% with a relative precision of ±27.4%. The statewide CIAC lifecycle MW GRR is 41% with a relative precision of ±14.2%. Custom and SBD lifecycle MW GRRs are 38% and 48%, with relative precisions of ±15.6% and ±27.0%, respectively.

Statewide and subject area GRRs were largely influenced by ineligible projects. Ineligible projects include projects that violate CPUC policy guidance, statewide custom program rules, program rules established by their representative administrator, and the installation of ineligible measures. Changes in operating conditions also had a considerable influence on GRRs across all subject areas. These include updated baseline conditions, HOUs, efficiencies, etc. We have provided additional details of these discrepancies below in Section 3.1.6. The reduction in lifecycle GRR as compared to the first year GRR is primarily driven by the lower evaluated EUL/RULs as compared to forecasted EUL/RUL.

Table 3-2. Statewide gross electric energy and demand savings results by subject area (2020-2021)

Subject area	First year				Lifecycle			
	Forecasted savings [a]	Evaluated savings	GRR	Relative precision	Forecasted savings [a]	Evaluated savings	GRR	Relative precision
Energy (MWh)								
Custom	187,210	113,169	60.5%	±13.5%	1,380,039	667,321	48.4%	±13.3%
SBD	24,756	13,060	52.8%	±20.8%	369,815	177,664	48.0%	±20.6%
Total evaluated projects	**211,966**	**126,230**	**59.5%**	**±12.3%**	**1,749,854**	**844,985**	**48.3%**	**±11.4%**
Non-sampled projects	2,118	1,115	52.6%	±19.7%	29,040	13,852	47.1%	±20.3%
Total	**214,084**	**127,345**	**59.5%**	**±12.1%**	**1,778,894**	**858,837**	**48.3%**	**±11.2%**

Subject area	First year				Lifecycle			
	Forecasted savings [a]	Evaluated savings	GRR	Relative precision	Forecasted savings [a]	Evaluated savings	GRR	Relative precision
				Demand (MW)				
Custom	20.7	11.8	56.9%	±17.2%	169.8	64.0	37.7%	±15.6%
SBD	6.2	3.1	49.3%	±27.4%	93.5	44.4	47.5%	±27.0%
Total evaluated projects	**26.9**	**14.8**	**55.2%**	**±14.8%**	**263.3**	**108.4**	**41.2%**	**±14.4%**
Non-sampled projects	0.3	0.2	49.4%	±25.8%	4.4	2.1	47.1%	±26.6%
Total	**27.2**	**15.0**	**55.1%**	**±14.6%**	**267.7**	**110.4**	**41.3%**	**±14.2%**

[a] Forecasted savings represent engineering estimates and do not include the realization rate that has been applied in savings presented in ED Tracking data.

There are observed differences in GRR for program areas between annual and lifetime results. This difference was driven by the evaluator-applied EUL and RULs determined to be appropriate for each project. In general, a higher GRR for lifecycle savings compared to annual reflects an average increase in EUL or RUL, while a lower GRR for lifecycle reflects a decrease in evaluated EUL or RUL. We observed the same trends for demand.

3.1.3 Gross savings results by PA

Table 3-3 summarizes the first year and lifecycle forecasted savings, evaluated savings, GRR, and relative precision at the PA level. We presented all results at the 90% confidence interval.

MCE, representing approximately 0.7% of forecasted first year MWh, had a first year MWh GRR of 35% with a relative precision of ±43.4% and lifecycle MWh GRR of 31% at ±31.3%. MCE's savings comprised lighting projects only, which found evaluated operating conditions to be the primary driver of the GRR.

PG&E, representing approximately 73% of forecasted FY MWh savings, had a first year MWh GRR of 65% with a relative precision of ±13.2% and lifecycle MWh GRR of 49% ±14.6%. PG&E's GRRs were largely impacted by differences in evaluated operating conditions and calculation methods. PGE&E's decrease in lifecycle GRR as compared to the first year GRR was caused by projects that have lower evaluated EUL and RUL compared to the forecasted value. Fifteen projects, representing 16% of unweighted evaluated first year savings, had first year GRRs of 100% or greater while having lifecycle GRRs of 100% or lower.

SCE, representing approximately 10% of forecasted MWh savings, had a first year MWh GRR of 55% with a relative precision of ±19.7% and lifecycle MWh GRR of 83% ±13.0%. SCE's first year GRR is primarily driven by inappropriate baseline selection, ineligible projects, and operating condition discrepancies. SCE's increase in lifecycle GRR as compared to the first year GRR was caused by four lighting projects that have higher evaluated EUL and RUL compared to the forecasted value, in some cases three to four times the forecasted value.

SDG&E, representing approximately 13% of forecasted MWh savings, had a first year MWh GRR of 31% with a relative precision of ±76.2% and lifecycle MWh GRR of 17% ±40.9%. SDG&E's first year GRR is largely impacted by differences in operating conditions, ineligible projects, and inappropriate baselines.

MCE had a first year MW GRR of 34% with a relative precision of ±57.3% and lifecycle MW GRR of 30% ±33.3%.

PG&E had a first year MW GRR of 58% with a relative precision of ±16.9% and a lifecycle MW GRR of 44% ±17.6%.

SCE had a first year MW GRR of 63% with a relative precision of ±17.3% and a lifecycle MW GRR of 52% ±11.9%. The difference between the first year GRR and lifecycle GRR was driven by one project with a first year GRR of 186% and a

lifecycle GRR of 30%. This project represents 56% of unweighted evaluated first year MWs for SCE and 74% unweighted evaluated of lifecycle MWs.

SDG&E had a first year MW GRR of 35% with a relative precision of ±62.4% and a lifecycle MW GRR of 18% at ±43.9%. SDG&E's decrease lifecycle GRR as compared to the first year GRR was caused by two large projects that had lower evaluated EUL and RUL compared to the forecasted value. These two projects had first year GRRs of 100% and 202% and lifecycle GRRs of 33% and 61%, respectively. These projects represented 73% of first year unweighted evaluated MWs and 62% of lifecycle unweighted evaluated MWs for SDG&E.

As described above for different program areas, we also observed differences in GRR for PG&E, SCE, and SDG&E between annual and lifetime results. These differences were mainly driven by the evaluator-applied EUL and RULs determined to be appropriate for each project. On average, we found that EULs for SCE projects increased compared to applicant reported estimates. PAs such as PG&E or SDG&E saw the opposite impact, where an average reduction in EULs reduced the lifecycle GRR compares to annual results. We observed the same trends for demand.

Table 3-3. Statewide gross electric energy and demand savings results by PA (2020-2021)

Subject area	First year				Lifecycle			
	Forecasted savings [a]	Evaluated savings	GRR	Relative precision	Forecasted savings [a]	Evaluated savings	GRR	Relative precision
Energy (MWh)								
MCE	1,421	499	35.1%	±43.4%	12,309	3,823	31.1%	±31.3%
PG&E	160,675	104,891	65.3%	±13.2%	1,286,571	630,822	49.0%	±14.6%
SCE	22,193	12,252	55.2%	±19.7%	200,636	167,465	83.5%	±13.0%
SDG&E	27,676	8,588	31.0%	±76.2%	250,338	42,875	17.1%	±40.9%
Statewide	**211,966**	**126,230**	**59.5%**	**±12.3%**	**1,749,854**	**844,985**	**48.3%**	**±11.4%**
Non-sampled Projects	2,118	1,115	52.6%	±0.0%	29,040	13,852	47.1%	±20.3%
Total	**214,084**	**127,345**	**59.5%**	**±12.1%**	**1,778,894**	**858,837**	**48.3%**	**±11.2%**
Demand (MW)								
MCE	0.1	0.03	34.0%	±57.3%	0.8	0.2	29.5%	±33.3%
PG&E	21.0	12.1	57.6%	±16.9%	195.7	86.2	44.1%	±17.6%
SCE	2.4	1.5	63.0%	±17.3%	29.5	15.3	51.7%	±11.9%
SDG&E	3.4	1.2	35.4%	±62.4%	37.3	6.7	17.9%	±43.9%
Statewide	**26.9**	**14.8**	**55.2%**	**±14.8%**	**263.3**	**108.4**	**41.2%**	**±14.4%**
Non-sampled Projects	0.3	0.2	49.4%	±25.8%	4.4	2.1	47.1%	±26.6%
Total	**27.2**	**15.0**	**55.1%**	**±14.6%**	**267.7**	**110.4**	**41.3%**	**±14.2%**

[a] Forecasted savings represent engineering estimates and do not include the realization rate that has been applied in savings presented in ED Tracking data

3.1.4 Gross savings results by measure type

Table 3-4 summarizes the statewide first year and lifecycle forecasted electric energy savings, evaluated savings, GRR, and relative precision by measure type. We presented all results at the 90% confidence interval. Lighting, representing approximately 37% of forecasted first year MWh, had a first year MWh GRR of 74% with a relative precision of ±19.8%. Non-lighting measures, representing approximately 59% of forecasted MWh savings, had a first year MWh GRR of 50% with

a relative precision of ±14.8%. Lighting and non-lighting measures had lifecycle MWh GRRs of 76% and 36%, with relative precisions of ±14.3% and ±17.4%, respectively.

Lighting measures had a first year MW GRR of 65% with a relative precision of ±26.9%. Non-lighting measures had a first year MW GRR of 50% with a relative precision of ±16.6%. Lighting and non-lighting measures had lifecycle MW GRRs of 47% and 39%, with relative precisions of ±21.4% and ±18.1%, respectively. The reduction in the first year and lifecycle MW compared to MWh for lighting projects was the result of three main contributing factors; (1) EUL/RUL reduction between forecasted and evaluated savings, (2) a reduction in CDF between forecasted and evaluated savings, and (3) changes to the HOU based on customer information. The first two contributed to a lower MW GRR, and the last contributed to a higher MWh GRR.

Table 3-4. Statewide gross electric energy and demand savings results by measure (2020-2021)

Measure type	First year				Lifecycle			
	Forecasted savings [a]	Evaluated savings	GRR	Relative precision	Forecasted savings [a]	Evaluated savings	GRR	Relative precision
Energy (MWh)								
Lighting	82,057	61,030	74.4%	±19.8%	528,022	403,222	76.4%	±14.3%
Non-lighting	129,909	65,200	50.2%	±14.8%	1,221,832	441,763	36.2%	±17.4%
Total evaluated projects	**211,966**	**126,230**	**59.5%**	**±12.3%**	**1,749,854**	**844,985**	**48.3%**	**±11.4%**
Non-sampled projects	2,118	1,115	52.6%	±0.0%	29,040	13,852	47.1%	±20.3%
Total	**214,084**	**127,345**	**59.5%**	**±12.1%**	**1,778,894**	**858,837**	**48.3%**	**±11.2%**
Demand (MW)								
Lighting	9.4	6.2	65.3%	±26.9%	63.9	30.2	47.2%	±21.4%
Non-lighting	17.5	8.7	49.7%	±16.6%	199.4	78.2	39.2%	±18.1%
Total evaluated projects	**26.9**	**14.8**	**55.2%**	**±14.8%**	**263.3**	**108.4**	**41.2%**	**±14.4%**
Non-sampled projects	0.3	0.2	49.4%	±25.8%	4.4	2.1	47.1%	±26.6%
Total	**27.2**	**15.0**	**55.1%**	**±14.6%**	**267.7**	**110.4**	**41.3%**	**±14.2%**

[a] Forecasted savings represent engineering estimates and do not include the realization rate that has been applied in savings presented in ED Tracking data.

3.1.5 Gross savings results by year

Table 3-5 summarizes the first year and lifecycle forecasted savings, evaluated savings, GRR, and relative precision by PY. We presented all results at the 90% confidence interval. PY2020, representing approximately 59% of forecasted first year MWh, had a first year MWh GRR of 56% with a relative precision of ±16.1%. PY2021, representing approximately 37% of forecasted MWh savings, had a first year MWh GRR of 65% with a relative precision of ±18.9%. PY2020 and PY2021 had lifecycle MWh GRRs of 47% and 50%, with relative precisions of ±13.8% and ±19.6%, respectively.

PY2020 had a first year MW GRR of 50% with a relative precision of ±21.9%. PY2021 had a first year MW GRR of 64% with a relative precision of ±18.6%. PY2020 and PY2021 had lifecycle MW GRRs of 32% and 57%, with relative precisions of ±20.4% and ±20.3%, respectively.

Table 3-5. Statewide gross electric energy and demand savings results by program year (2020-2021)

Program year	First year				Lifecycle			
	Forecasted savings [a]	Evaluated savings	GRR	Relative precision	Forecasted savings [a]	Evaluated savings	GRR	Relative precision
Energy (MWh)								
PY2020	129,913	72,182	55.6%	±16.2%	1,092,364	505,641	46.3%	±14.3%
PY2021	82,053	53,363	65.0%	±18.9%	657,490	331,260	50.4%	±19.6%
Total evaluated projects	**211,966**	**125,546**	**59.2%**	**±12.3%**	**1,749,854**	**836,901**	**47.8%**	**±11.6%**
Non-sampled projects	2,118	1,114	52.6%	±0.0%	29,040	13,847	47.1%	±20.3%
Total	**214,084**	**126,660**	**59.2%**	**±12.2%**	**1,778,894**	**850,748**	**47.8%**	**±11.4%**
Demand (MW)								
2020	16.8	8.4	50.1%	±21.9%	164.2	51.9	31.6%	±20.4%
2021	10.1	6.4	63.5%	±18.6%	99.1	56.5	57.0%	±20.3%
Total evaluated projects	**26.9**	**14.8**	**55.2%**	**±14.8%**	**263.3**	**108.4**	**41.2%**	**±14.4%**
Non-sampled projects	0.3	0.2	49.4%	±25.8%	4.4	2.1	47.1%	±26.6%
Total	**27.2**	**15.0**	**55.1%**	**±14.6%**	**267.7**	**110.4**	**41.3%**	**±14.2%**

[a] Forecasted savings represent engineering estimates and do not include the realization rate that has been applied in savings presented in ED Tracking data.

3.1.6 Discrepancy analysis

This section presents an analysis of the discrepancies that account for differences between forecasted and evaluated savings estimates for the sampled projects. Note that this analysis is based on discrepancies associated with first year gross savings. Table 3-6 provides a summary of the discrepancy factors that may have impacted a project.

Table 3-6. Savings discrepancy adjustment factors

Discrepancy 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 attributed to the number of units assumed 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 ISP, code, 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 that 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.

When gross evaluated impacts for a project were found to be different than the forecasted savings, DNV recorded the associated discrepancy factors and ranked them from most to least impactful. For some projects, there was only one discrepancy factor. For example, an ineligible project (due to a policy violation or ineligible measure) would be recorded as a single discrepancy. If there were multiple factors (e.g., evaluated parameters were different from the operating parameters and adjustments to baseline conditions occurred), the discrepancies were ranked from most to least impactful, and their associated impact was recorded as a percentage of savings increased or reduced to accurately report on the impact on each discrepancy. Discrepancy factors were classified into seven categories as presented above.

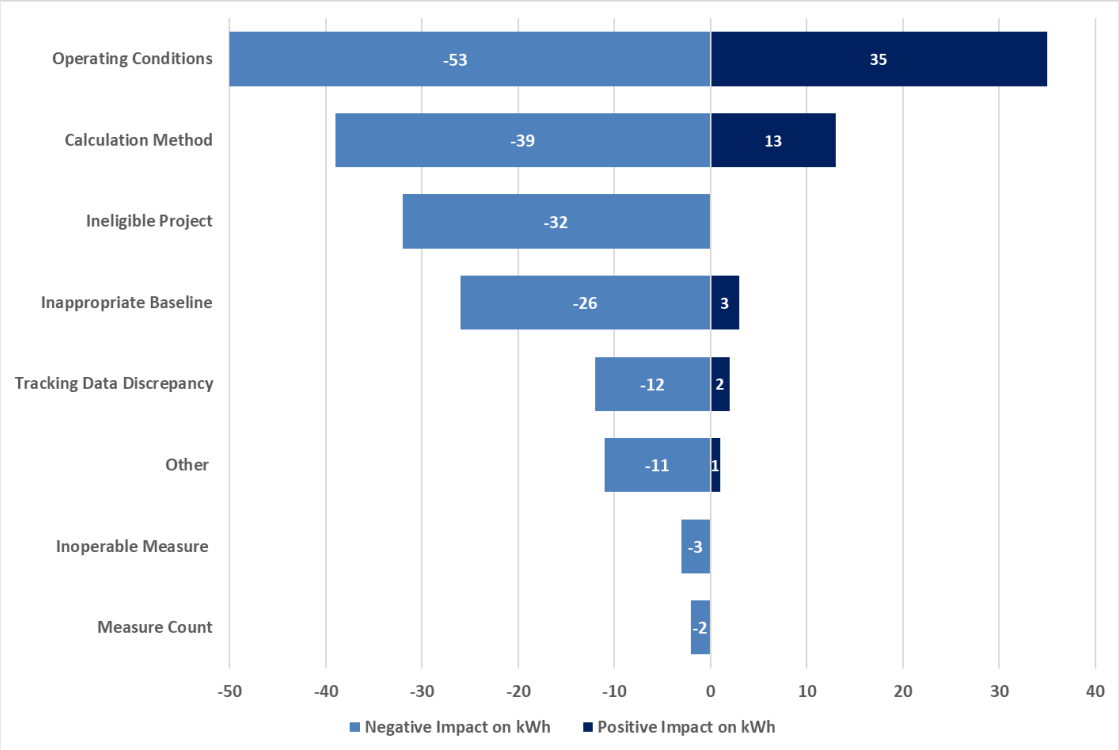
Figure 3-3. shows the number of instances a given discrepancy occurred in the electric sample. The following discrepancies were most impactful in both frequency and the degree of impact on first year gross savings:

- The **Calculation method discrepancy** used to estimate evaluated savings differed from those used to estimate forecasted savings. This method can include differences between forecasted and evaluated load estimates, weather normalization, savings normalization, peak demand calculation methods, and modelled equipment design. Generally, we were able to repurpose the PA-provided analysis template with current information provided by the participant, unless the provided model was not determined to be a viable method or if we determined a more accurate savings approach. There were 39 projects where evaluated savings were negatively impacted by differing calculation methods, and 13 projects where savings were positively impacted. Examples of evaluated savings methods included: using an 8760 model rather than single algorithms when appropriate; assessing correlations to production data for industrial customers or local weather station data for weather-dependent measures; performing a grid impact assessment when on-site generation was present; use of billing analysis to support evaluated savings; use of pre-and-post- collected trend data and spot measurements to inform savings; running whole-building SBD project simulations using the non-compliance mode to estimate savings and compliance mode to demonstrate project eligibility; and different engineering calculation approaches based on post-implementation data availability.
  - An example of a project that reported this discrepancy is for a RCx claim. The evaluators used a different model to determine energy savings using pre- and post-trend data collected from the customer to develop weekly usage profiles and extrapolated to a full year where the differences in consumption were equal to savings. The evaluator also included non-IOU fuel generation impacts to reduce overall savings impact on the grid.
- **Operating conditions** for primary equipment or action were often verified as different from that when equipment or action was initially implemented. Changes in HOUs, observed load, different control settings, or equipment efficiency were often the primary drivers in adjusting evaluated savings. Fifty-three projects were noted as having differing operating conditions that negatively impacted evaluated savings, while 35 projects were noted as having differing operating conditions that positively impacted evaluated savings.
  - An example of a project that reported this discrepancy is for another RCx claim. The evaluator collected recent trend data from the customer to confirm the operation of the impacted units where analysis led to the determination that equipment has been reverted to pre-existing operating conditions, which reduced overall savings.
- **Inappropriate baseline** selection or inappropriate use of baseline conditions was also a driver of deviation in evaluated savings from forecasted savings. Evaluated savings for twenty-five projects were lower because the evaluators corrected the baseline used in the PAs' savings forecasts whereas savings for three projects were higher because of the corrected baseline. Adjustments in baselines were largely attributed to non-compliance with CPUC baseline policy and guidance on ISP and a lack of documentation and data supporting the pre-existing condition. Other adjustments included the use of ISP for normal replacement projects that incorrectly implemented the pre-existing conditions as a baseline.

  - An example of a project that reported this discrepancy is for a process pumping project where three 400 HP pumps were replaced with three 700 HP variable frequency drive (VFD) pumps, and the applicant reported the project as accelerated replacement. After further discussion, the evaluators determined the pump replacement was driven by anticipated increases in load, and pre-existing pumps could not meet the anticipated load. This led the evaluators to assign this project as a major renovation and update the baseline respective of design horsepower and efficiency needed to achieve the anticipated load.

- **Ineligible projects** resulted only in a downward adjustment as these projects were assigned zero savings. Installation date violations occurred frequently among all PAs. Often, projects were installed outside of the allotted timeframe (one year for Custom, 4 years for SBD, and 3 years for 3P/Local Government). Unless extensions were filed and provided to the evaluation team, these projects were ineligible. Ineligible measures also fall under the "ineligible project" criteria. VFDs with less than 100 HP capacity were often installed in HVAC applications and paid custom incentives although this measure is designated as ineligible in the statewide customized offerings.[34] Thirty-three projects were evaluated as ineligible and assigned zero savings. We flagged all potentially ineligible projects for each respective PA to confirm the status or provide an explanation from already submitted documentation to support a change in the zero-saver assessment and request missing documentation before assigning zero savings to the project.
  - Before finalizing projects that were deemed ineligible, we reached out to the PAs to ensure that information used to base our project determination on was accurate. In many instances, PAs provided clarification on the information provided through formal data requests or supplementary information that provided insight into the project.

Figure 3-3. Summary of first year kWh discrepancy factors observed for CIAC sample points (project counts)



[34] PGE, "2019 Statewide Customized Offering Procedures Manual for Business," https://www.pge.com/pge_global/common/pdfs/save-energy-money/facility-improvements/custom-retrofit/Customized-Policy-Procedure-Manual_2019.pdf

Table 3-7 further examines the impact of the discrepancies discussed above by showing the influence of each on the evaluation adjustments to the tracking estimates. The realization rate in each row is the cumulative realization rate of all adjustments made to that point (i.e., the ineligible product realization rate includes both the tracking data adjustment and the ineligible project adjustment). Explored in this way, the combined impacts of ineligible projects and inappropriate baselines are clear drivers of the final electric realization rate, eroding the initial forecasted savings of the evaluated sample of 214,084 MWh by 30,071 MWh and 35,394 MWh, respectively.

Table 3-7. Discrepancy impacts on first year electric savings and GRR (2020-2021)

Discrepancy	First year savings (MWh)	Savings change (MWh)	Realization rate
Forecasted savings	214,084		
Tracking data	211,827	-2,257	99%
Ineligible project	181,992	-29,835	85%
Measure count	179,959	-2,033	84%
Inappropriate baseline	144,842	-35,117	68%
Inoperable measure	140,393	-4,448	66%
Operating conditions	134,896	-5,497	63%
Calculation methods	125,761	-9,136	59%
Other	127,345	1,584	59%
Precision at 90% confidence			±12.1%

3.1.7 Comparison to previous evaluation findings

Table 3-8 compares the 2020/2021 estimates of electric lifecycle GRR by PA and statewide to prior evaluations. As observed in the 2019 report, the tendency for GRRs to fluctuate somewhat between evaluated years continues. Some observations from this comparison included the following:

- The SCE GRR is substantially higher than in previous years. This is driven by four lighting projects with incorrect claimed EULs, as noted above.
- The PG&E GRR has been within four points of one another (0.48-0.52) over the last three published evaluations.
- MCE's GRR reduced from 78% to 31%, however, PY2020/2021 is based on a limited number of project reviews with a relative precision of ±43.4%.
- SDG&E's GRR reduced from 41% in 2019 to 17% in PY2020/2021 and is largely impacted by differences in operating conditions, ineligible projects, and inappropriate baselines.
- The statewide overall 2020/2021 GRR was 0.50 and remained largely unchanged from the historic average.

Table 3-8. Statewide electric energy lifecycle GRR results by program year and program administrator

Program Administrator[35]	2015	2019	2020,2021
MCE	n/a	78%	31%
PG&E	52%	48%	49%
SCE	46%	47%	83%
SDG&E	52%	41%	17%
Statewide	**50%**	**47%**	**48%**

[35] For values from 2015 and 2019, source: 2019 Custom Industrial, Agricultural, and Commercial (CIAC) Impact Evaluation (Group D–D11.04), SBW Consulting, February 12, 2022, page 58. https://pda.energydataweb.com/api/view/2583/GroupD-CIAC%202019%20Ex%20Post%20Evaluation%20PDF%20Final%202.pdf

3.2 Gross natural gas savings and realization rates

Figure 3-4 compares the weighted forecasted and evaluated first year gas energy savings for all Custom and SBD sites in the final sample. Like the electric scatter plots presented earlier, the colors of the markets on each plot show Custom versus SBD sites, and the diagonal dashed line indicates where each sample point would have been plotted had the forecasted estimates been 100% accurate. This plot has all sites clustered in the lower left corner and a single large site that represented the vast majority (96% of unweighted evaluated savings) of program savings in the upper right. This site had a realization rate of just over 100% and drove nearly all the gas GRR overall. The scatterplot following this one focuses on dispersion of sites on the lower left quartile of this graphic.

Figure 3-4. Weighted Custom and SBD first year gas energy savings scatterplot (all sites)

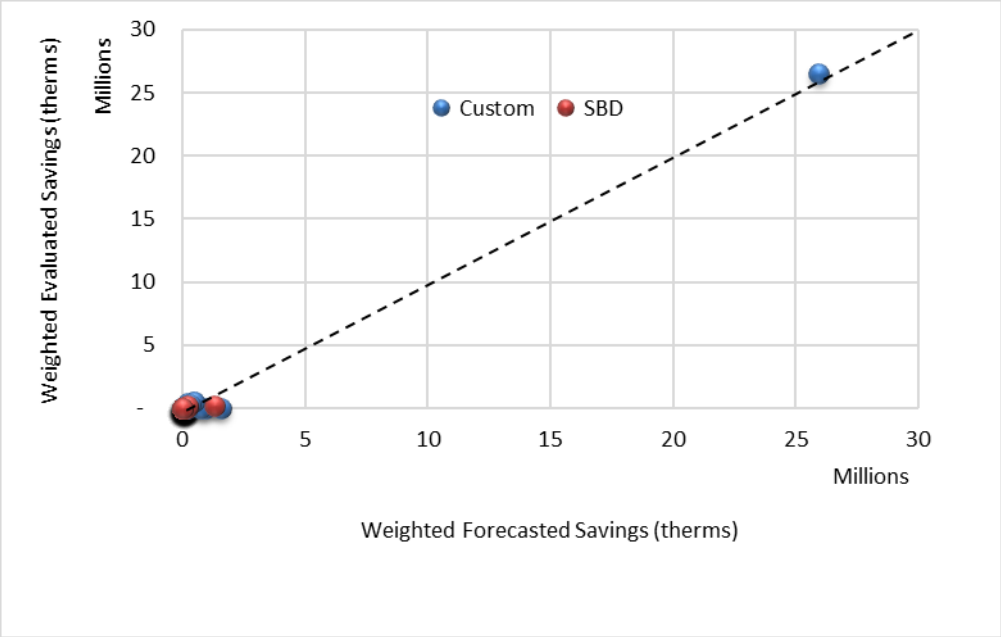
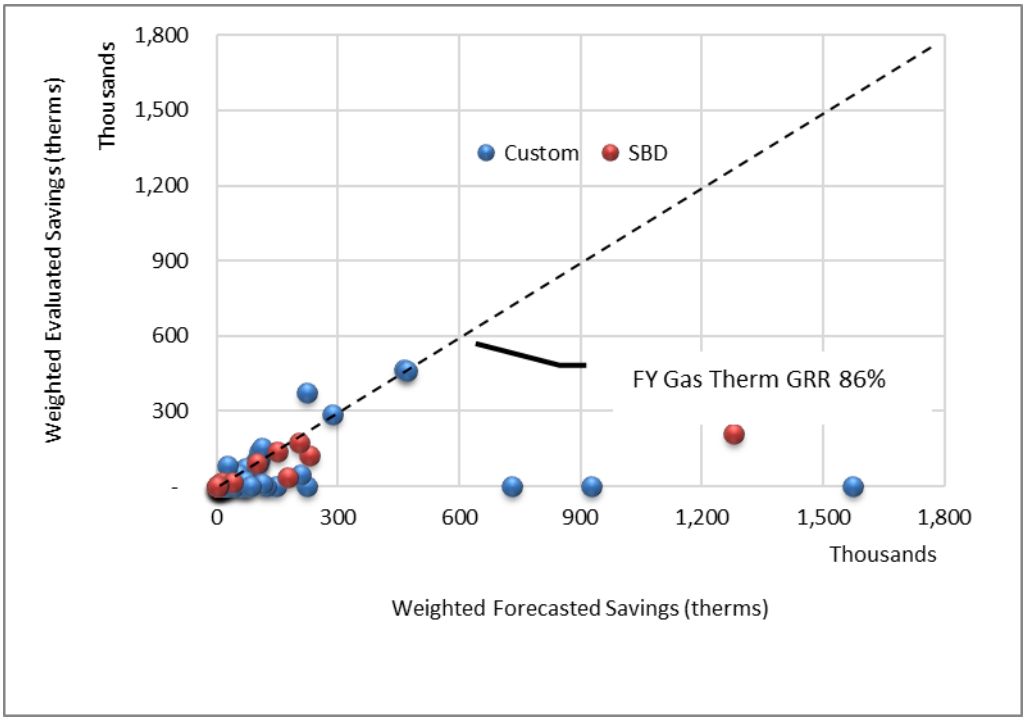


Figure 3-5 refocuses the scatterplot above on sites with forecasted values of less than 1.8 million therms. In this view, the number of ineligible projects and any with zero savings can be clearly seen along the x-axis. Many sites fall below the dashed line, each having a negative impact on the overall realization rate. In this context, the influence of the large site shown in Figure 3-4 is clear. Despite many sites with negative realization rate influence, the single large site drove an overall realization rate of 87%. Results without this large site are included in this section to show program performance absent this project.

Figure 3-5. Weighted Custom and SBD first year gas energy savings scatterplot (up to 1.8M therms)



3.2.1 Gross savings results by subject area

Table 3-9 summarizes natural gas first year and lifecycle forecasted savings, evaluated savings, GRR, and relative precision at the statewide level and for each subject area. We presented all results in million therms at the 90% confidence interval. Statewide, the first year therms GRR was 86%, with a relative precision of ±4.5%. The Custom subject area, representing most forecasted savings (approximately 95%), had a first year therms GRR of 88% with a relative precision of ±4.6%. The SBD subject area, representing approximately 5% of forecasted savings, had a first year therms GRR of 49% with a relative precision of ±12.1%. The statewide lifecycle therms GRR is 89% with a relative precision of ±5.0%. Custom and SBD lifecycle therms GRRs are 90% and 48%, with relative precisions of ±5.1% and ±13.3%, respectively.

We evaluated one large project, representing approximately 25.9 million in claimed therms and 96% of evaluated sampled therms. Due to the impact this project has had on overall GRRs and relative precision, we presented the natural gas savings tables with and without this project included. “Without large project” indicates the project was removed from our sample frame and is provided for informational purposes to provide an additional perspective. To emphasize, we do not recommend the use of these results without the large project for reporting purposes. The purpose is to demonstrate the impact of this one project on statewide and PA-specific savings and facilitate performance comparison with prior evaluations.

Statewide and subject area GRRs were largely influenced by ineligible projects. Ineligible projects include those that violate CPUC policy, statewide custom program rules, program rules established by their representative PA, and the installation of ineligible measures. Changes in operating conditions also had a considerable influence on GRRs across all subject areas. These include updated HOUs, efficiencies, measure persistence, etc. We provided additional detail in Section 3.2.4.

Table 3-9. Statewide gross natural gas energy savings results by subject area (2020-2021) with large project

Subject area	First year				Lifecycle			
	Forecasted savings [a] (million therms)	Evaluated savings (million therms)	GRR	Relative precision	Forecasted savings [a] (million therms)	Evaluated savings (million therms)	GRR	Relative precision
Custom	31.7	27.8	87.6%	±4.6%	442.8	400.3	90.4%	±5.1%
SBD	1.2	0.6	49.2%	±12.1%	17.6	8.3	47.5%	±13.3%
Total evaluated projects	**32.9**	**28.4**	**86.2%**	**±4.5%**	**460.3**	**408.6**	**88.8%**	**±5.0%**
Non-sampled projects	0.04	0.02	47.9%	±13.2%	0.6	0.3	47.2%	±13.5%
Total	**33.0**	**28.4**	**86.1%**	**±4.5%**	**461.0**	**408.9**	**88.7%**	**±5.0%**

[a] Forecasted savings represent engineering estimates and do not include the realization rate that has been applied in savings presented in ED Tracking data.

Table 3-10 presents the natural gas savings with the large project removed from the sample frame. The total statewide GRR is 38% at a relative precision of ±14.7%. The Custom first year GRR is 36% with a relative precision of ±18.5%. The total statewide lifecycle GRR is 30% with a relative precision of ±42.5%.

Table 3-10. Statewide gross natural gas energy savings results by subject area (2020-2021) without large project

Subject area	First year				Lifecycle			
	Forecasted savings [a] (million therms)	Evaluated savings (million therms)	GRR	Relative precision	Forecasted savings [a] (million therms)	Evaluated savings (million therms)	GRR	Relative precision
Custom	5.8	2.0	33.6%	±22.6%	53.9	12.4	23.0%	±74.4%
SBD	1.2	0.6	49.2%	±12.1%	17.6	8.3	47.5%	±13.3%
Total evaluated Projects	**7.0**	**2.6**	**36.3%**	**±17.5%**	**72.1**	**21.0**	**29.2%**	**±44.4%**

3.2.2 Gross savings results by PA

Table 3-11 summarizes natural gas first year and lifecycle forecasted savings, evaluated savings, GRR, and relative precision at the PA level. We presented all results at the 90% confidence interval. PG&E, representing approximately 90% of forecasted therm savings, had a first year GRR of 89% with a relative precision of ±4.7%.

SCG, representing approximately 5% of forecasted therm savings, had a first year GRR of 58% with a relative precision of ±13.4%. SCG's lifecycle GRR is largely driven by differences in EUL/RUL. One project in particular drove the lower GRR with a lifecycle GRR of 13% which had a claimed EUL of 7 years and an evaluated EUL of 1 year. Additionally, the 19% GRR is in line with the PY2019 evaluation findings, which reported an evaluation lifecycle GRR of 14%.

SDG&E, representing approximately 3% of forecasted therm savings, had a first year GRR of 62% with a relative precision of ±9.2%. PG&E, SCG, and SDG&E had lifecycle therm GRRs of 91%, 19%, and 72% with relative precisions of ±5.1%, ±10.9%, and ±23.3%, respectively.

Table 3-11. Gross natural gas energy savings results by Program Administrator (2020-2021) with large project

Program Administrator	First year				Lifecycle			
	Forecasted savings [a] (million therms)	Evaluated savings (million therms)	GRR	Relative precision	Forecasted savings [a] (million therms)	Evaluated savings (million therms)	GRR	Relative precision
PG&E	30.3	26.8	88.6%	±4.7%	442.4	402.2	90.9%	±5.1%
SCG	1.6	1.0	58.0%	±13.4%	11.9	2.2	18.5%	±10.9%
SDG&E	1.0	0.6	62.3%	±9.2%	5.9	4.3	71.8%	±23.3%
Total evaluated projects	**32.9**	**28.4**	**86.2%**	**±4.5%**	**460.2**	**408.6**	**88.8%**	**±5.0%**
Non-sampled projects	0.04	0.02	47.9%	±12.8%	0.6	0.3	47.2%	±13.5%
Total	**32.9**	**28.4**	**86.3%**	**±4.5%**	**460.9**	**408.9**	**88.7%**	**±5.0%**

[a] Forecasted savings represent engineering estimates and do not include the realization rate that has been applied in savings presented in ED Tracking data.

The large project was claimed through PG&E's natural gas program. With this project removed, the first year GRR for PG&E is 22% with a relative precision of ±43.8%. The lifecycle GRR for PG&E is 27% with a relative precision of ±64.8% Table 3-12 presents results by PA with the large project removed.

Table 3-12. Gross natural gas energy savings results by Program Administrator (2020-2021) without large project

Program Administrator	First year				Lifecycle			
	Forecasted savings [a] (million therms)	Evaluated savings (million therms)	GRR	Relative precision	Forecasted savings [a] (million therms)	Evaluated savings (million therms)	GRR	Relative precision
PG&E	4.3	1.0	22.4%	±43.8%	53.5	14.2	26.6%	±64.8%
SCG	1.6	1.0	58.0%	±13.4%	11.9	2.2	18.5%	±10.9%
SDG&E	1.0	0.6	62.3%	±9.2%	5.9	4.3	71.8%	±23.3%
Total evaluated projects	**7.0**	**2.5**	**36.2%**	**±17.5%**	**72.0**	**21.0**	**29.2%**	**±44.4%**

[a] Forecasted savings represent engineering estimates and do not include the realization rate that has been applied in savings presented in ED Tracking data.

3.2.3 Gross savings results by year

Table 3-13 summarizes natural gas first year and lifecycle forecasted savings, evaluated savings, GRR, and relative precision by program year. All results are presented at the 90% confidence interval. PY2020, representing approximately 14% of forecasted first year therms, had a first year GRR of 18% with a relative precision of ±44.9%. PY2021, representing approximately 84% of forecasted therm savings, had a first year GRR of 97% with a relative precision of ±4.4%. PY2020 and PY2021 had lifecycle therm GRRs of 21% and 97%, with relative precisions of ±83.5% and ±4.6%, respectively.

Table 3-13. Statewide gross natural gas energy savings results by program year (2020-2021) with large project

Program year	First year				Lifecycle			
	Forecasted savings [a] (million therms)	Evaluated savings (million therms)	GRR	Relative precision	Forecasted savings [a] (million therms)	Evaluated savings (million therms)	GRR	Relative precision
2020	4.6	0.8	18.2%	±44.9%	52.0	11.0	21.1%	±83.5%
2021	28.3	27.5	97.2%	±4.4%	408.3	397.7	97.4%	±4.6%
Total evaluated projects	**32.9**	**28.4**	**86.2%**	**±4.5%**	**460.3**	**408.6**	**88.8%**	**±5.0%**
Non-sampled projects	0.0	0.0	47.9%	±12.8%	0.6	0.3	47.2%	±13.5%
Total	**33.0**	**28.4**	**86.1%**	**±4.5%**	**461.0**	**408.9**	**88.7%**	**±5.0%**

[a] Forecasted savings represent engineering estimates and do not include the realization rate that has been applied in savings presented in ED Tracking data.

The large project was claimed in the 2021 program year. With this project removed, the GRR for first year savings in 2021 was 70% with a relative precision of ±14.3%. The lifecycle GRR for program year 2021 was 50% with a relative precision of ±15.3%. Table 3-14 presents results by program year with the large project removed.

Table 3-14. Statewide gross natural gas energy savings results by program year (2020-2021) without large project

Program year	First year				Lifecycle			
	Forecasted savings [a] (million therms)	Evaluated savings (million therms)	GRR	Relative precision	Forecasted savings [a] (million therms)	Evaluated savings (million therms)	GRR	Relative precision
2020	4.6	0.8	18.2%	±44.9%	52.0	11.0	21.1%	±83.5%
2021	2.4	1.7	70.3%	±14.3%	19.4	9.7	50.2%	±15.3%
Total evaluated projects	**7.0**	**2.5**	**35.9%**	**±17.5%**	**72.1**	**21.0**	**29.2%**	**±44.4%**

[a] Forecasted savings represent engineering estimates and do not include the realization rate that has been applied in savings presented in ED Tracking data.

3.2.4 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 in Table 3-7.

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

As shown in Figure 3-6 below, the following discrepancies were most impactful in both frequency and magnitude on first year gross savings:

- **Calculation methods** – There were 12 projects where evaluated savings were negatively impacted by differing calculation methods, and 17 projects where savings were positively impacted. An example of a project that reported this discrepancy is for a retrofit add on claim for an insulation claim. The evaluator could not determine the inputs used to simulate heat loss for bare and insulated applications using 3EPlus. Instead, the evaluator re-simulated heat loss for all unique applications for bare and insulated pipes and fittings.
- **Operating conditions** – Twenty-four projects were noted as having differing operating conditions that negatively impacted evaluated savings, while 32 projects were noted as having differing operating conditions that positively impacted evaluated savings. An example of a project that reported this discrepancy is for a new construction project where simulations were run using local CZ weather data; heating occupied and unoccupied setpoints changed, and operating hours were adjusted.
- **Inappropriate baselines** – Four projects were noted to have inappropriate baselines applied that negatively impacted savings, and seven projects were noted as having inappropriate baselines that positively impacted savings. An example of a project that reported this discrepancy is a multi-effect evaporator project where the evaluated conducted a mini-ISP by contacting three vendors and determined that the installed equipment was equal to standard practice.
- **Ineligible projects** – Nineteen projects were noted as ineligible, resulting in zero savings being applied. We flagged all potentially ineligible projects for each respective PA to confirm the status and request missing documentation before assigning zero savings to the project. Before finalizing projects that were deemed ineligible, we reached out to the PAs to ensure that the information used to base our project determination was accurate. In many instances, PAs provided clarification on information provided through formal data requests or supplementary information that provided insight.

Figure 3-6. Summary of discrepancy factors observed (gas)

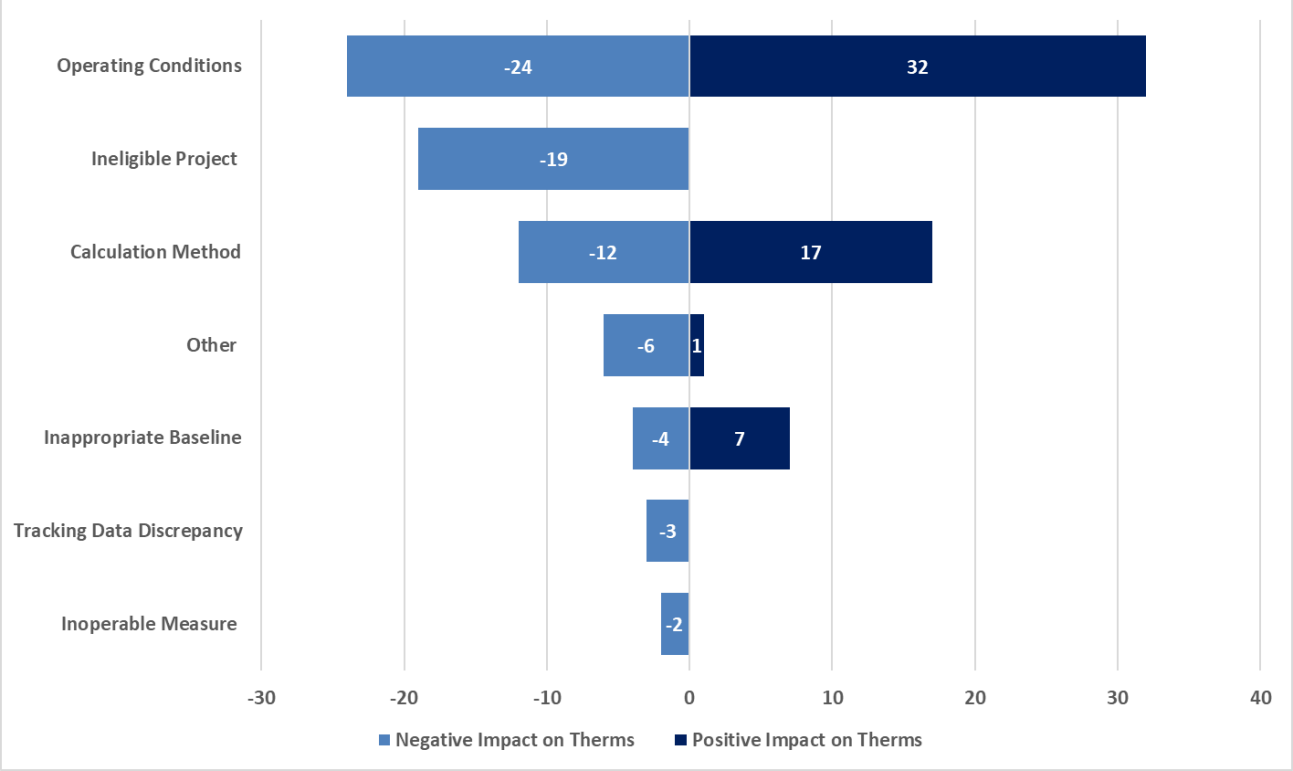


Table 3-15 further examines the impact of the discrepancies discussed above by showing the influence of each on the evaluated savings from the tracking estimate. The realization rate in each row is the cumulative realization rate of all adjustments made to that point (i.e., the ineligible product realization rate includes both the tracking data adjustment and the ineligible product adjustment). Explored in this way, the combined impacts of inappropriate baselines, calculation methods, and ineligible projects are clear drivers of the final gas realization rate, eroding the initial forecasted savings of 33.0 million therms by 1.7, 1.7, and 1.2 million therms, respectively.

Table 3-15. Discrepancy impacts on first year gas savings and GRR (2020-2021)

Discrepancy	First Year Savings (x1,000 therms)	Savings Change (x1,000 therms)	Realization rate
Tracking savings	32,961		
Tracking data	32,815	-146	100%
Ineligible project	31,763	-1,052	96%
Measure count	31,763	0	96%
Inappropriate baseline	30,257	-1,506	92%
Inoperable measure	30,561	304	93%
Operating conditions	29,882	-678	91%
Calculation methods	28,386	-1,496	86%
Other	28,393	7	86%
	Precision at 90% confidence		±4.5%

The large project was claimed in the 2021 program year. Table 3-16 shows the discrepancy impacts with this project removed.

Table 3-16. Discrepancy impacts on first year gas savings and GRR (2020-2021) without large project

Discrepancy	First year savings (x1,000 therms)	Savings change (x1,000 therms)	Realization rate
Tracking savings	7,037		
Tracking data	6,893	-144	98%
Ineligible project	5,860	-1,033	83%
Measure count	5,860	0	83%
Inappropriate baseline	4,381	-1,479	62%
Inoperable measure	4,680	298	67%
Operating conditions	4,014	-666	57%
Calculation methods	2,545	-1,469	36%
Other	2,551	6	36%
	Precision at 90% confidence		±17.5%

3.2.5 Comparison to previous evaluation findings

Table 3-17 compares the 2020/2021 estimates of gas lifecycle GRR by PA and statewide. We found a lot of fluctuation in gas realization rates across the PAs. Some observations from this comparison include:

- The PG&E realization rate was very high in this study compared to previous studies due to a large gas site with a high realization rate. The lifecycle gas GRR absent this site was 27%. Without the largest site, PG&E's LC GRRs show a steady decline from 52% in 2015 to 28% in 20-21.
- The SCG GRR in this study was higher than last year's but lower than that in 2015.
- The SDG&E GRR in this study at 72% was the highest observed in the last few studies.
- The statewide 2020/2021 GRR with the large project removed was 30%. This value was lower than previous years, which have ranged from 54% to 40%.

Table 3-17. Statewide gas energy lifecycle GRR results by program year and program administrator

Program Administrator[36]	2015	2019	2020/2021 (Including large project)	2020/2021 (excluding large project)
PG&E	52%	46%	91%	27%
SCG	56%	14%	19%	19%
SDG&E	52%	52%	72%	72%
Statewide	**54%**	**40%**	**89%**	**29%**

3.3 Net savings results and ratios

3.3.1 Net electric savings results and ratios

This section presents the net electric savings results and NTGR ratios broken out by program, program administrator, measure type, and year. A major theme is the general decline in NTGRs compared to earlier evaluated results. For example, the 2020/2021 combined NTGR for electric lifetime energy savings of 36% was lower than the 47% equivalent NTG for 2019 and the 54% equivalent NTG for 2015. This decline occurred across programs, and, with one exception, across PAs. The one bright spot was an increase in first year electric NTGRs from 34% in 2020 to 39% in 2021.

Key contributors to these lower NTGRs were too many projects which either had already been approved before the program intervention, or which had been driven by pre-established or compulsory practices such as corporate policy, compliance with normal maintenance/replacement policies, or regulatory requirements. For the SBD program in particular, small incentives, and a lack of participant diversity (e.g., repeat participants such as universities that were already motivated by corporate policies) were negatively impacting NTGRs.[37]

3.3.1.1 Net results by subject area

Table 3-18 shows net electric energy and demand savings results broken out by program. The table also shows that Custom had an overall FY NTGR of 45% for energy savings with a relative precision of ±11.1%, with a lifecycle NTGR of 40% and a relative precision of ±13.5%. As this has been the case in previous evaluations, the Custom program NTGRs were higher than those for the SBD program. Interview responses from the SBD participants indicated that the lower NTGRs in that program were driven by low incentives and high participation by customers such as universities that already had policies driving green building practices. However, because the SBD program only accounted for a small share of overall net

[36] For values from 2015 through 2019, source: 2019 Custom Industrial, Agricultural, and Commercial (CIAC) Impact Evaluation (Group D–D11.04), SBW Consulting, February 12, 2022, page 58.

[37] About half the SBD projects had incentives of $30,000 or less and over a third of the projects had incentives of less than $10,000. While we did not have data on the costs of these new buildings, it is reasonable to assume that such incentive levels would represent a small percentage of total building costs.

savings, its lower NTGRs did not significantly impact the overall CIAC NTGRs. While the lifecycle energy NTGRs were all lower than the first year energy NTGRs, the lifecycle demand NTGRs were mostly higher than the first year demand NTGRs, likely driven by similar patterns in the GRR discussed earlier.

Table 3-18. Net electric energy and demand savings results by program

Program	First year			Lifecycle		
	Net savings	NTGR	Relative precision	Net savings	NTGR	Relative precision
			Energy (MWh)			
Custom	50,797	44.9%	±11.1%	264,009	39.6%	±13.5%
SBD	3,345	25.6%	±15.1%	40,861	23.0%	±14.8%
Total	**54,141**	**42.9%**	**±10.5%**	**304,870**	**36.1%**	**±11.8%**
Non-sampled projects	294	26.4%	±13.8%	3,211	23.2%	±14.4%
Total	**54,436**	**42.7%**	**±10.4%**	**308,080**	**35.9%**	**±11.6%**
			Demand (MW)			
Custom	4.7	39.8%	±12.2%	23.4	36.6%	±12.1%
SBD	0.7	22.2%	±23.4%	9.2	20.6%	±23.4%
Total	5.4	36.1%	±11.1%	32.6	30.1%	±10.9%
Non-sampled projects	0.0	23.1%	±22.8%	0.4	20.9%	±22.8%
Total	**5.4**	**36.0%**	**±11.0%**	**33.0**	**29.9%**	**±10.7%**

3.3.1.2 Net results by PA

Table 3-19 breaks out the NTGRs by PA. It shows that the projects implemented in the MCE and PG&E service territories had NTGRs above the statewide average NTGR, and those implemented in the SCE and SDG&E service territories were below this statewide average. Because the PG&E projects accounted for most of the statewide sampled energy and demand savings, they had the impact of pulling the statewide average NTGR closer to the PG&E average NTGR.

The higher electric savings NTGR for MCE may be partially driven by the PA being relatively new to energy efficiency program administration and therefore having more untapped project opportunities relative to its size. When asked about the importance of previous program participation on their decision to implement the program-incentivized measure at the time that they did, the MCE participants were much less likely (average rating of 4.1 on a 0-10 importance scale) than participants from other PAs (average rating of 6.0 on a 0-10 scale) to consider this factor important. This suggests a lower incidence of repeat program participation among the MCE participants.

A substantial proportion of the MCE projects were also lighting retrofits, and lighting projects had higher average NTGRs than non-lighting electric projects, as discussed in the next section. Finally, MCE project decision makers were much less likely (average rating of 3.4 on a 0-10 scale) than participants from other PAs (average rating of 5.7 on a 0-10 scale) to cite corporate policies or guidelines as a key factor.

In analyzing why average PG&E NTGRs were higher than the average NTGRs for SCE, SCG, and SDG&E, it is difficult to pinpoint specific aspects of program delivery that might account for this difference. PG&E decision makers gave higher average importance ratings than SCE, SCG, and SDG&E decision makers for all the program drivers, but, with one

exception, these differences were not large (the average PG&E importance ratings were 4%-11% higher than the average importance ratings for SCE, SCG, and SDG&E). The one exception was in assessing the importance of project recommendations from a program vendor. PG&E decision makers gave an average importance rating of 5.2 for the program vendor recommendations which was 54% higher than the average importance rating of 3.3 from SCE, SCG, and SDG&E decision makers.

A closer examination of the SDG&E NTGRs revealed that drivers of the lower scores included a couple of Custom projects where the decision to implement the project had been reported as occurring before program intervention and four SBD projects where the average PAI-2 score (the proportion of 10 points that respondents attributed to program factors vs non-program factors) was only 2.5. The SDG&E decision makers were also more likely to cite corporate policies (7.0 average importance rating) or a recommendation from an auditor or design engineer (7.1) as drivers for their projects than decision makers from the other PAs (average importance ratings of 5.0 and 5.4 respectively). The SDG&E decision makers were also *less* likely to cite the availability of program rebates (6.1 average importance rating) or program technical assistance (4.5) as drivers for their projects than decision makers from the other PAs (average importance ratings of 7.5 and 5.9 respectively).

Table 3-19. Net electric energy and demand savings results by Program Administrator (2020-2021)

Program administrator	First year			Lifecycle		
	Net savings	NTGR	Relative precision	Net savings	NTGR	Relative precision
			Energy (MWh)			
MCE	255	51.0%	±11.6%	1,961	51.3%	±13.7%
PG&E	49,251	47.0%	±11.3%	248,661	39.4%	±14.5%
SCE	2,906	23.7%	±12.4%	48,506	29.0%	±3.3%
SDG&E	1,730	20.1%	±61.4%	5,741	13.4%	±44.3%
State-wide	54,141	42.9%	±10.5%	304,870	36.1%	±11.8%
Non-sampled projects	294	26.4%	±13.8%	3,211	23.2%	±14.4%
Total	**54,436**	**42.7%**	**±10.4%**	**308,080**	**35.9%**	**±11.6%**
			Demand (MW)			
MCE	0.02	52.0%	±11.3%	0.1	52.3%	±13.8%
PG&E	4.9	40.8%	±11.6%	30.2	35.0%	±11.7%
SCE	0.2	11.9%	±17.5%	1.6	10.7%	±17.9%
SDG&E	0.2	18.8%	±71.2%	0.6	9.6%	±59.3%
State-wide	5.4	36.1%	±11.1%	32.6	30.1%	±10.9%
Non-sampled projects	0.04	23.1%	±22.8%	0.4	20.9%	±22.8%
Total	**5.4**	**36.0%**	**±11.0%**	**33.0**	**29.9%**	**±10.7%**

3.3.1.3 Net results by measure type

Table 3-20 presents disaggregated net savings results by measure type. It shows that the lighting measures had higher energy savings NTGRs (49.6% for first year and 43.1% for lifecycle) than non-lighting measures (36.6% for first year and 29.6% for lifecycle).

Table 3-20. Statewide net electric energy and demand savings results by measure (2020-2021)

Measure	First year			Lifecycle		
	Net savings	NTGR	Relative precision	Net savings	NTGR	Relative precision
			Energy (MWh)			
Lighting	30,250	49.6%	±17.8%	173,945	43.1%	±20.1%
Non-lighting	23,891	36.6%	±7.6%	130,925	29.6%	±6.7%
Total	54,141	42.9%	±10.5%	304,870	36.1%	±11.8%
Non-sampled projects	294	26.4%	±13.8%	3,211	23.2%	±14.4%
Total	**54,436**	**42.7%**	**±10.4%**	**308,080**	**35.9%**	**±11.6%**
			Demand (MW)			
Lighting	2.6	41.8%	±20.7%	11.8	39.2%	±23.0%
Non-lighting	2.8	32.1%	±9.5%	20.8	26.5%	±10.0%
Total	5.4	36.1%	±11.1%	32.6	30.1%	±10.5%
Non-sampled projects	0.0	23.1%	±22.8%	0.4	20.9%	±22.8%
Total	**5.4**	**36.0%**	**±11.0%**	**33.0**	**29.9%**	**±10.7%**

3.3.1.4 Net results by year

Table 3-21 shows the net savings results broken down by program year. On average, the NTGRs for projects implemented in 2021 were higher than those implemented in 2020. The relative precision of the net savings of the 2021 projects was also much lower (or better) than the relative precision of the net savings of the 2020 projects. While several factors can influence precision estimates, since the net savings in 2021 were lower than in 2020, this suggests that the better precision results for the 2021 projects may have been due to their having less NTGR variability than their 2020 counterparts.

Table 3-21. Statewide net electric energy and demand savings results by program year (2020-2021)

Program year	First year			Lifecycle		
	Net savings	NTGR	Relative precision	Net savings	NTGR	Relative precision
			Energy (MWh)			
2020	29,068	39.9%	±18.8%	174,494	34.0%	±20.1%
2021	25,074	47.0%	±6.1%	130,376	39.4%	±6.7%
Total	54,141	42.9%	±10.5%	304,870	36.1%	±11.8%
Non-sampled projects	294	26.4%	±13.8%	3,211	23.2%	±14.4%
Total	**54,436**	**42.7%**	**±10.4%**	**308,080**	**35.9%**	**±11.6%**
			Demand (MW)			
2020	2.7	32.5%	±20.3%	12.4	23.8%	±23.0%
2021	2.6	40.9%	±8.2%	20.2	35.8%	±10.6%
Total	**5.4**	**36.1%**	**±11.1%**	**32.6**	**30.1%**	**±10.9%**

Program year	First year			Lifecycle		
	Net savings	NTGR	Relative precision	Net savings	NTGR	Relative precision
Non-sampled projects	0.0	23.1%	±22.8%	0.4	20.9%	±22.8%
Total	**5.4**	**36.0%**	**±11.0%**	**33.0**	**29.9%**	**±10.7%**

3.3.1.5 Comparison to previous evaluation findings

A comparison of the 2020-2021 electric energy lifecycle NTGR results to evaluated results from previous years (Table 3-22) shows that apart from the MCE projects, PA NTGRs have declined since 2019 with SCE and SDG&E projects experiencing the largest drops. However, it is important to note that Statewide NTGRs actually increased between 2020 and 2021.

Table 3-22. Statewide electric energy lifecycle NTGR results by program year and program administrator

Program administrator[38]	2015	2019	2020	2021
MCE	n/a	40%	51%	No projects in sample
PG&E	53%	46%	38%	41%
SCE	57%	51%	31%	23%
SDG&E	50%	49%	13%	No projects in sample
Statewide	**54%**	**47%**	**34%**	**39%**

3.3.2 Net gas savings results and ratios

This section presents the net gas savings results and NTGR ratios broken out by program, program administrator, and program year. The downward trend in electric savings NTGRs across the program and PA mentioned above held true also for the gas savings NTGRs for many of the same reasons. However, the gas NTGRs were also negatively impacted by a very large gas project with a low NTGR bringing down the overall net gas NTGRs significantly. To show the impact of this very large project, we present the net gas savings both with this project included and with it removed.

3.3.2.1 Net results by program

Table 3-23 breaks out the net natural gas results by program with the large savings project noted above. In contrast to the electric net savings where the Custom NTGRs were higher than the SBD NTGRs, for the gas net savings, the SBD NTGRs were higher than the Custom NTGRs. This result is primarily due to the previously mentioned low NTGR for one very large Custom gas project. The differences between first year and lifecycle NTGRs were much smaller for the natural gas measures than they were for the electric measures.

Table 3-23. Statewide net natural gas energy savings and NTGR results by program (2020-2021) with large project

Program	First year			Lifecycle		
	Net savings (million therms)	NTGR	Relative precision	Net savings (million therms)	NTGR	Relative precision
Custom	4.1	14.8%	±5.3%	54.8	13.7%	±2.2%
SBD	0.2	26.6%	±30.5%	2.4	28.5%	±29.8%
Total	**4.3**	**15.0%**	**±5.2%**	**57.2**	**14.0%**	**±2.5%**

[38] For values from 2015 through 2019, source: 2019 Custom Industrial, Agricultural, and Commercial (CIAC) Impact Evaluation (Group D–D11.04), SBW Consulting, February 12, 2022, page 58.

Program	First year			Lifecycle		
	Net savings (million therms)	NTGR	Relative precision	Net savings (million therms)	NTGR	Relative precision
Non-sampled projects	0.01	27.2%	±31.5%	0.1	28.9%	±29.9%
Total	**4.3**	**15.1%**	**±5.2%**	**57.2**	**14.0%**	**±2.5%**

Table 3-24 breaks out the net natural gas results by program without the large savings project noted above. Overall, Custom's NTGR increased from 15% to 26% with the removal of the large project, with relative precisions of ±5.3% and ±7.8%, respectively. Lifecycle NTGRs increased from 14% to 26%, with relative precisions of ±2.2% and ±27.1%, respectively.

Table 3-24. Statewide net natural gas energy savings and NTGR results by program (2020-2021) without large project

Program	First year			Lifecycle		
	Net savings (million therms)	NTGR	Relative precision	Net savings (million therms)	NTGR	Relative precision
Custom	0.5	26.2%	±7.8%	3.3	26.3%	±27.1%
SBD	0.2	26.6%	±30.3%	2.4	28.5%	±29.8%
Total	0.7	26.3%	±9.2%	5.6	27.2%	±20.1%
Non-sampled projects	0.01	26.6%	±31.3%	0.1	28.6%	±29.6%
Total	**0.7**	**26.3%**	**±9.2%**	**5.7**	**27.2%**	**±19.8%**

3.3.2.2 Net results by PA

Table 3-25 presents the net natural gas energy savings results broken down by PA with the large project included. It shows that PG&E accounted for most of the net savings across the state. Because the previously mentioned very large gas project with the low NTGR occurred in the PG&E service territory, this project significantly reduced the average NTGR for both PG&E and the state.

Table 3-25. Net natural gas energy savings results by PA (2020-2021) with large project

Program Administrator	First year			Lifecycle		
	Net savings (million therms)	NTGR	Relative precision	Net savings (million therms)	NTGR	Relative precision
MCE	(0.001)	50.7%	-±12.4%	(0.001)	51.1%	-±15.2%
PG&E	3.8	14.3%	±5.8%	55.4	13.8%	±2.4%
SCG	0.3	34.2%	±0.9%	0.4	18.7%	±0.2%
SDG&E	0.1	18.2%	±23.0%	1.2	28.9%	±38.2%
Statewide	4.3	15.0%	±5.3%	57.1	14.0%	±2.5%
Non-sampled projects	0.01	27.2%	±31.5%	0.1	28.9%	±29.9%
Total	**4.3**	**15.1%**	**±5.3%**	**57.2**	**14.0%**	**±2.5%**

Table 3-26 presents the net natural gas energy savings results broken down by PA without the large project. PG&E's first year NTGR increased from 14% to 24% with the removal of the large project, with relative precisions of ±5.8% and ±24.4%, respectively. PG&E's lifecycle NTGR increased from 14% to 28% with the removal of the large project, with relative precisions of ±2.4% and ±25.8%, respectively.

Table 3-26. Net natural gas energy savings results by Program Administrator (2020-2021) without large project

Program Administrator	First year			Lifecycle		
	Net savings (million therms)	NTGR	Relative precision	Net savings (million therms)	NTGR	Relative precision
MCE	(0.001)	50.7%	±12.4%	(0.001)	51.1%	±15.2%
PG&E	0.2	23.6%	±24.4%	4.0	28.0%	±25.8%
SCG	0.3	34.2%	±0.9%	0.4	18.7%	±0.2%
SDG&E	0.1	18.2%	±23.0%	1.2	28.9%	±38.2%
State-wide	0.7	26.3%	±9.2%	5.6	27.2%	±20.1%
Non-sampled projects	0.01	26.6%	±31.3%	0.1	28.6%	±29.6%
Total	**0.7**	**26.3%**	**±9.2%**	**5.7**	**27.2%**	**±19.8%**

3.3.2.3 Net results by year

Table 3-27 breaks out the net energy savings results by program year with the large project included. It shows that all the natural gas net savings occurred in 2021.

Table 3-27. Statewide net natural gas energy savings results by program year (2020-2021) with large project included

Program year	First year			Lifecycle		
	Net savings (million therms)	NTGR	Relative precision	Net savings (million therms)	NTGR	Relative precision
2020	(0.1)	40.4%	-±26.7%	1.9	35.3%	±45.1%
2021	4.4	15.3%	±5.1%	55.1	13.7%	±2.0%
Total	4.3	15.0%	±5.3%	57.1	14.0%	±2.5%
Non-sampled projects	0.01	27.2%	±31.5%	0.1	28.9%	±29.9%
Total	**4.3**	**15.1%**	**±5.3%**	**57.2**	**14.0%**	**±2.5%**

Table 3-28 shows the statewide net natural gas energy savings results by program year without the large project. The 2021 NTG improved from 15% to 28% with the removal of this project, with relative precisions of ±5.1% and ±24.2% respectively.

Table 3-28. Statewide net natural gas energy savings results by program year (2020-2021) without large project

Program year	First year			Lifecycle		
	Net savings (million therms)	NTGR	Relative precision	Net savings (million therms)	NTGR	Relative precision
2020	(0.1)	40.4%	-±26.7%	1.9	35.3%	±45.1%
2021	0.8	27.7%	±6.9%	3.7	24.2%	±19.5%
Total	0.7	26.3%	±9.2%	5.6	27.2%	±20.1%
Non-sampled projects	0.0	26.6%	±31.3%	0.1	28.6%	±29.6%
Total	**0.7**	**26.3%**	**±9.2%**	**5.7**	**27.2%**	**±19.8%**

Comparison to previous evaluation findings

Table 3-29 and Table 3-30 compare the 2020/2021 estimates of gas lifecycle NTGRs by PA and statewide with gas lifecycle NTGRs from the 2015 and 2019 evaluations with the first table showing the NTGRs with the large PG&E project included and the second table showing it with the project removed. The tables show that even with the large PG&E project removed, the 2020/2021 gas NTGRs showed a significant drop from previously evaluated results. A closer examination of survey responses from the SCG decision makers shows that they rated the importance of previous experience with the energy efficient measure much more highly (average 7.6 rating) than the other PAs (average 6.5 rating). Other factors that could be driving the lower NTGRs are the general ones discussed in section 3.3.4 such as many projects with low NTGRs being driven by pre-established or compulsory practices such as corporate policies, compliance with normal maintenance/ replacement policies, or industry standard practices. In addition, the maturing of the energy efficiency markets could be a driver since 2020/2021 project decision-makers were more likely than their 2019 and 2015 counterparts to cite previous experience either with the energy efficient technologies or the energy efficiency programs as project drivers.

Table 3-29. Statewide gas energy lifecycle NTGR results by program year and PA with large project included

Program Administrator[17]	2015	2019	2020, 2021
PG&E	0.53	0.48	0.14
SCG	0.57	0.44	0.19
SDG&E	0.50	0.51	0.29
Statewide	**0.54**	**0.48**	**0.14**

Table 3-30. Statewide gas energy lifecycle NTGR results by program year and PA without large project

Program Administrator[17]	2015	2019	2020, 2021
PG&E	0.53	0.48	0.28
SCG	0.57	0.44	0.19
SDG&E	0.50	0.51	0.29
Statewide	**0.54**	**0.48**	**0.27**

3.3.3 Sensitivity analysis

As described in the NTG methodology section, DNV based the NTGRs in this report on the average of three factors: Program attribution index 1 (PAI-1), Program attribution index 2 (PAI-2), and Program attribution index 3 (PAI-3). However, the team also explored whether the NTGRs might change if these factors were weighted differently. Table 3-31 shows that the average NTGR resulting from the current approach did not change with any of the various weighting schemes.

Table 3-31. Results of NTG sensitivity analysis[39]

NTGR weighting scheme	NTGR results
Equal weights to PAI-1, PAI-2, and PAI-3 (current approach)	46%
50% weight to PAI-1, 25% weights to PAI-2 and PAI-3	46%
Removal of PAI-1, 50% weights to PAI-2 and PAI-3	46%
50% weight to PAI-2, 25% weights to PAI-1 and PAI-3	46%
50% weight to PAI-3, 25% weights to PAI-1 and PAI-2	46%

3.3.4 Key factors influencing NTGRs

The interviewers asked the project decision makers to rate the relative importance of various program or nonprogram factors using a 0-to-10 rating scale, where 0 meant "Not at all important" and 10 meant "Extremely important." Table 3-32 compares the average rating and distribution of ratings for key program and non-program factors. It shows that project decision makers considered the program rebates the most important factor overall. However, the next most important factors — the desire to improve product quality, the age or quality of the previous equipment, and previous experience with this type of energy efficiency measure — were all non-program project drivers.

Table 3-32. Ratings for the importance of factors on decisions to implement the program measures

Program factor	Sample size[40]	Average rating[1]	Percentage of respondents		
			Low (0 to 3)	Medium (4 to 7)	High (8 to 10)
Program factors					
Program "rebate"	157	7.62	8%	27%	66%
Program-provided technical assistance or feasibility studies	153	5.63	26%	32%	43%
Recommendation from program vendor	129	5.48	32%	33%	34%
Recommendations from PA staff	156	4.39	36%	37%	28%
Top non-program factors					
Improved product quality	130	7.71	18%	21%	61%
Age or condition of the old equipment	132	7.40	12%	40%	49%
Previous experience with this type of measure	150	6.44	17%	33%	47%

[1] On the 11-point scale, 0 was "Not at all important(?)" and 10 was "Highly important(?)."

Table 3-33 compares projects with NTGRs in the top quartile to projects with NTGRs in the bottom quartile as to how frequently they rated various program factors highly (ratings of 8-10 on a 0-10 scale). It shows that the 2020-21 project decision makers in the top quartile were much more likely than those in the bottom quartile to value the program rebates and program-provided technical assistance. However, there was little difference between the top quartile and bottom quartile respondents as to how they valued the PA staff recommendations or the program marketing materials (neither group valued these program factors very highly).

The table also compares the 2020-21 responses to those in 2019 and 2015. The 2020-21 top quartile respondents were much more likely than the 2019 top quartile respondents to value the program rebates, but the 2020-21 responses were very

[39] While this analysis applied various weighting schemes to the site-specific NTGRs as described in the table, the original site-specific NTGRs used in this analysis are unweighted values and the average is a statewide average covering both program years 2020 and 2021.

[40] This is the number of respondents who gave a numerical rating, and it excludes those who gave responses such as "Don't know", those who refused to respond, or cases where the questions were not applicable (most commonly for SBD participants).

similar to those of the 2015 top quartile respondents. In all three years, the top quartile respondents were much more likely to value the program-provided technical assistance than respondents in the bottom quartile. In the lowest quartile, the 2020-2021 respondents were much less likely than those from 2015 and 2019 to value the program rebate. This could be related to the trend, discussed below, of the 2020-2021 respondents in the lowest quartile being more likely to cite compulsory practices such as corporate policies as project drivers, since such practices would make the rebates less influential.

Table 3-33. 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		
	2015	2019	2020-21	2015	2019	2020-21
Sample size[2]	52	84	47	52	82	46
Program "rebate"	100%	52%	87%	50%	74%	32%
Program-provided technical assistance or feasibility studies	65%	44%	47%	40%	27%	22%
Recommendations from PA staff	16%	13%	25%	41%	0%	26%
Program marketing materials	16%	25%	22%	14%	16%	23%

[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.

Table 3-34 shows that the 2020-21 project decision makers in the top NTGR quartile very rarely (only 2% of respondents) reported having decided to go ahead with the project before beginning discussions with the PA programs. In contrast, almost a third (32%) of the 2020-21 project decision makers in the bottom NTGR quartile had already decided to go ahead with the project before interacting with the PA programs. Project decision makers in the top quartile were also much more likely (81% of respondents) than those in the bottom quartile (56%) to mention that the project payback or ROI considerations were important project drivers. This aligns with the finding above that project decision makers in the top quartile were much more likely (87% of respondents) than those in the bottom quartile (32%) to say the program rebates were important project drivers.

The table also shows that 2020-2021 project decision makers in the bottom quartile were much more likely than those in the top quartile to have their energy efficiency projects driven by pre-established or compulsory practices such as corporate policy, compliance with normal maintenance/ replacement policies, or industry standard practices. Increasing concerns about global climate change as well as previous experience with the EEMs could be driving some of these corporate policies. Over half (52%) of the 2020-2021 project decision makers in the bottom quartile also had previous experience with the rebated energy-efficient equipment which is further evidence of well-established company energy efficiency practices.

The 2020-2021 project decision makers in the bottom quartile were much more likely (54%) than those in the top quartile (38%) to cite regulatory compliance as an important factor. The bottom quartile decision makers were also much more likely (93%) than those in the top quartile (43%) to say that the age or condition of the legacy equipment was an important driver of their energy efficiency projects.

Table 3-34. 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		
	2015	2019	2020-21	2015	2019	2020-21
Sample size[2]	52	84	47	52	85	46
Previous program experience	37%	15%	47%	52%	32%	44%
Made decisions before discussion with program	4%	12%	2%	88%	36%	32%
Standard practices	26%	0%	28%	56%	0%	57%
Corporate policy	33%	33%	32%	59%	36%	59%
Compliance with normal maintenance/ replacement policies	15%	20%	32%	38%	19%	67%
Improved product quality	0%	0%	61%	0%	4%	80%
Regulatory compliance	0%	29%	38%	0%	21%	54%
Importance of age/condition of old equipment	35%	30%	41%	40%	48%	93%
Previous experience with energy efficiency	Not asked	24%	53%	Not asked	38%	52%
Vendor recommendation	Not asked	14%	36%	Not asked	58%	26%
Recommendation of a designer or consulting engineer	Not asked	21%	38%	Not asked	11%	31%
An acceptable ROI or payback	Not asked	71%	81%	Not asked	85%	56%

[1] 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.

An analysis of the relationship between MAT and NTGRs revealed some interesting results.[41] The NTGRs were lowest (0.33 or less) for the Normal Replacement or New Construction MATs. Projects with Behavioral, RCx, or Operational (BRO) measures were somewhat higher than these (average 0.43 NTGR). Projects with the Accelerated Replacement (AR) MAT had the highest average NTGRs (0.51). While not conclusive, the evidence seemed to indicate that when program influence documentation is not required (e.g., the NR scenario), the NTGRs tend to suffer.

3.4 Measure application type (MAT) discussion

Table 3-35 compares forecasted and evaluated first year and life cycle savings by the measure application type. We also provided unweighted gross realization rates for kWh and therm savings. As discussed above in Sections 3.1.6 and 3.2.4, the application of inappropriate baselines resulted in an overall reduction in evaluated savings as compared to forecasted savings. This was particularly evident in BRO measures. EUL and RUL are directly correlated to the MAT, or baseline, assigned to a project. The first year unweighted GRR for AOE measures was 54% while the unweighted LC GRR was 23%. This suggests that the default one-third of host equipment EUL was likely assigned incorrectly. BRO-RCx measures had an unweighted first year GRR of 60% for kWh and 83% for therms. The lifecycle GRRs for BRO-RCx were 56% and 65% for kWh and therms, respectively. The difference between the first year and lifecycle savings was the least for the New Construction MAT. And the Normal replacement MAT also showed a significant difference between the first year and lifecycle GRRs — a decline from 50% to 35%. Overall, the GRR for kWh dropped from 58% for first year to a lifecycle GRR of 36%.

[41] While the average NTGRs in the tables in Section 3.3 are based on weighted averages, this particular analysis used unweighted averages.

Table 3-35. Measure Application Type (MAT) comparison for first year and lifecycle savings

MAT	Evaluated kWh	Forecasted kWh	Evaluated Therm	Forecasted Therm	Evaluated GRR (unweighted) kWh	Evaluated GRR (unweighted) Therm
First year savings						
AOE (Add-on Equipment)	13,289,939	24,518,595	276,208	888,161	54%	31%
AR (Accelerated Replacement)	7,780,688	7,798,193	-12,470	1,563,355	100%	-1%
BRO-Bhv	1,418	328,239	0	0	0%	N/A
BRO-Op	1,113,612	891,877	0	0	125%	N/A
BRO-RCx	7,749,629	12,307,391	460,626	534,598	63%	86%
NC (New Construction)	6,025,358	15,394,161	26,796,060	26,853,284	39%	100%
NR (Normal Replacement)	1,616,045	3,225,059	-2,315	285,361	50%	-1%
Overall	**37,576,689**	**64,463,515**	**27,518,109**	**30,124,758**	**58%**	**91%**
Lifecycle savings						
AOE (Add-on Equipment)	58,380,123	255,302,861	1,481,114	5,252,064	23%	28%
AR (Accelerated Replacement)	28,606,803	47,717,594	-12,180	23,546,140	60%	0%
BRO-Bhv	4,254	2,581,424	0	0	0%	N/A
BRO-Op	3,340,836	9,025,812	0	0	37%	N/A
BRO-RCx	23,262,645	41,569,593	1,381,878	2,017,655	56%	68%
NC (New Construction)	70,173,974	220,946,280	401,577,592	402,798,012	32%	100%
NR (Normal Replacement)	21,606,476	61,574,412	2,718	4,320,021	35%	0%
Overall	**205,375,110**	**638,717,976**	**404,431,122**	**437,933,891**	**32%**	**92%**

3.5 Effective useful life and remaining useful life discussion

Table 3-36 provides a comparison of EUL and RUL by PA for the evaluated measures. The values presented are weighted averages based on forecasted EUL and RUL and evaluated EUL and RUL at the project level. We evaluated the two highest savings claims for each project, presented below as Measure 1 and Measure 2. When no EUL or RUL was claimed by a specific PA for a measure, it is denoted by "N/A" in the table below. Overall, the forecasted EULs were higher than those determined by DNV, showing a decrease from 10.3 years to 9.7 years for Measure 1 and an increase from 10.6 years to 10.7 years for Measure 2. RULs for Measure 1 were largely the same, with the forecast average of 2.5 years and evaluated of 2.3 years. Measure 2 RULs also showed a decrease, with the forecasted RUL of 2.9 years decreasing to 2.8 years. Please note that the below table presents weighted results, while Table 3-35 presents unweighted results. Caution should be applied when comparing results across sections.

Table 3-36. EUL and RUL comparison by PA (weighted average)

PA	Measure 1				Measure 2			
	Forecasted (Years)		Evaluated (Years)		Forecasted (Years)		Evaluated (Years)	
PA	**EUL**	**RUL**	**EUL**	**RUL**	**EUL**	**RUL**	**EUL**	**RUL**
PG&E	10.4	2.6	9.7	2.4	11.1	3.3	11.0	3.2
SCE	8.0	0.9	9.4	1.3	7.2	0.0	7.8	0.0
SCG	10.2	0.0	9.6	0.1	11.7	0.0	11.7	0.0
SDG&E	10.2	0.4	8.9	0.4	6.4	0.0	8.3	0.0
MCE	12.0	4.0	12.0	3.0	N/A	N/A	N/A	N/A
Average	**10.3**	**2.5**	**9.7**	**2.3**	**10.6**	**2.9**	**10.7**	**2.8**

The differences in EUL and RUL can largely be attributed to the differences in MAT, as noted in Section 3.4 above. This difference in EUL and RUL is a key factor in the lower evaluated lifecycle savings as compared to the forecasted lifecycle savings, resulting in a lifecycle gross realization rate of less than the first year gross realization rate. Lifecycle savings refers to the savings associated with the lifetime of an efficiency measure undertaken by a program participant. Equipment replaced early in its useful life (e.g., Accelerated Replacement) might receive reduced savings for a portion of its lifetime. For example, SCE's evaluated Measure 1 EUL and RUL are 17% and 53% higher than their forecasted equivalents. In one case, for SCG, we found that the equipment installed was no longer functioning after 1 year of installation. This reduced the EUL of the project from 7 years to 1 year.

As noted above in Sections 3.1 and 3.2, there are notable differences between annual and lifecycle GRRs between program areas and PAs. This difference is likely attributed to the impact of EUL and RUL adjustments between the applicant and evaluated estimates. SCE, for example, showed an increase in GRR between annual and lifecycle estimates, which can be attributed to the average increase in EUL and RUL between forecasted and evaluated estimates as shown in Table 3-4.

4 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 year evaluations.

At a summary level, the recommendations are to:

- Better align forecasted and evaluated savings by:
  - Applying appropriate CPUC policy and statewide custom rules to screen eligible projects
  - Utilizing appropriate calculation methods
  - Applying as-built building operating conditions
  - Using appropriate baselines or Industry Standard Practices (ISPs) to improve the savings estimation
  - Performing better quality control of the projects
  - Improving adjustments to project savings based on post-installation inspections and M&V
- Improve project documentation and tracking data to increase consistency between project files and tracking data and minimize errors in project claims.
- Reduce a substantial increase in free-ridership by testing program features, improving and extending project screening to all custom projects, and changing procedures to increase program-induced savings.

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

- Gross impact findings and recommendations by the following research areas:
  - Custom
  - Savings by Design (SBD)
- Net impact findings and recommendations

The conclusions and recommendations below are not in any order of importance.

4.1 Gross savings conclusions and recommendations

4.1.1 Custom

We have provided conclusions and recommendations based on three categories: Custom non-lighting, Custom lighting, and SBD.

4.1.1.1 Non-Lighting

The below conclusions and recommendations are specific to non-lighting projects, although many apply to lighting and SBD projects as well.

1. **Impacts of on-site generation or non-IOU delivered fuels:** In several projects with on-site generation of power, the PA did not consider the impacts of photo-voltaic (PV) on-site generation appropriately while estimating the savings. In some cases, the customer was only using PA grid power for three months in a year, but full annual savings credit was claimed, and incentives were paid accordingly to the customer. Similar situations were found for projects where non-IOU fuels were delivered, where the PA did not adjust reported savings to only claim savings for grid impacts. In some cases, non-IOU delivered fuels accounted for over 90% of building usage.

- **The PAs should consider the impact of the on-site generation and only claim savings for periods the customer is purchasing power from the PA**: PAs should calculate incentive payment to the customer based on the grid impact of energy savings.

2. **Incorrect or outdated baseline information:** Many sources used for baseline information were based on old and/or inaccurate information, including ISP studies that were no longer relevant. Measures that fell into this category included HVAC fans for cow barns, for example. This lack of an appropriate, informed ISP required us to conduct "mini-ISPs," where we reached out to multiple equipment vendors to determine an appropriate baseline at the time of installation. We also found instances where ISPs were decided using hypothetical situations such as the transfer of used equipment from other locations or scenarios in which equipment would be modified or repaired perpetually to increase production output. We point out that the CPUC resolution E-4818 has removed repair indefinitely as the baseline category and this category is rolled in the accelerated replacement (AR) measure type. Using repairs and retrofits as justification for capacity expansion projects is not appropriate as doing so is considered accelerated replacement. Further, used equipment or retrofitted equipment has not been authorized as a baseline by the CPUC for capacity expansion or new construction as technical, economic, and functional performance equivalence for such actions cannot be reasonably estimated.

   - **PAs should ensure appropriate baselines and ISPs are being used at the time of project approval:** Prior to approving normal replacement and capacity expansion projects, the PAs should ensure that the current standard practice is identified and applied. If available ISP studies are used, the PAs should ensure that those are less than five years old at the time of project application and approval. Older ISP studies should be reassessed for continued applicability or replaced with updated standard practice. If a project is delayed, the PA should revisit the ISP before granting project extensions to ensure the continued applicability of standard practice. This is also critical when a project using pre-existing conditions as the baseline is delayed because the baseline should be represented by the operation of the equipment prior to implementation. The delayed project may no longer reflect the initially used pre-existing conditions or measurements. The CPUC should consider requiring re-baselining projects if they are delayed 24 months past the initial approval similar to the NMEC projects that require re-baselining for projects delayed by more than 18 months.

3. **PAs should ensure that contract extensions are granted annually as required in the customer agreement:** CPUC requires that project savings be claimed in the year of installation unless savings measurement and true-up requirements are likely to delay the savings claim to a year different from the year the project was installed. Numerous projects were found to have been installed past the approved installation date without contract extensions and/or lacked continuing measurement requirements in the customer agreement. This resulted in projects being zeroed out based on the CPUC guidance rule violations. Informal grant of extensions via emails, often sent years after the initially approved installation date and without adjustment of the baseline conditions, was commonly seen.

   - **PAs should ensure that projects are installed on the approved installation date and savings are claimed within the approved installation year; if projects cannot be installed, provide written extensions to be filed annually:** PAs should formalize the extension process to ensure that proper procedures are followed when extensions are granted. Further, all measurement and savings true-up requirements should be formally specified in the customer agreement.
   - **PAs should screen projects for eligible measures:** We found many instances where measures ineligible per the statewide custom program manual were installed, such as VFDs less than 100 HP installed on HVAC fans.

4. **Equipment found to be operating at pre-existing conditions:** There were many instances of projects, especially those classified as BRO-RCx where equipment was found to be operating at pre-installation conditions. Many of these projects reverted during the periods of COVID-19 operation for reasons such as increased air ventilation requirements, building schedules, minimum outdoor air requirements, etc., but were never re-programmed to settings as implemented to save energy, resulting in heavy reductions in evaluated savings or even zero savings in some cases.

   – **PAs should ensure proper education on equipment and controls is provided to the customer, especially for BRO-RCx based measures:** This will maximize the persistence of savings and reduce the chance of equipment and control sequences being changed drastically or reverted to pre-installation conditions.

5. **Inappropriate assignment of incentives for deemed/custom projects:** For many projects, the evaluation team found that deemed measures were part of a custom project package. In many instances, the deemed measures were paid custom incentives or claimed custom-calculated savings.

   – **The PAs should ensure that a deemed rebate is paid when available, and deemed savings are claimed for deemed measures bundled with a custom project.**

6. **As-built conditions not used to update savings models:** The PAs should ensure that savings calculations are based on post-installation equipment-use schedules and reflect any changes to operating parameters (such as flow rates, temperatures and set points, system pressures, production rates, and power measurements). The PAs should always include a quality control check on engineering inputs such as equipment operating hours, operational parameters and production levels, and ensure that data used to derive operating profiles is adequately representative of typical operating conditions.

   – **PAs should use post-installation parameters and operating conditions to estimate savings relative to baseline conditions.**

7. **Short-term or limited data was used to inform annual savings:** There were several instances where PAs used short-term metered data (1 week), or spot measurements from limited parameters to extrapolate savings. This methodology is not accurate in determining savings as limited data does not inform on potential changes in load from the installation of energy-efficient equipment/practice.

   – **PAs should conduct a longer-term pre- and post- installation M&V that represents a typical operation to develop accurate savings estimates. The PAs should also normalize for production fluctuations (and other variables like weather where applicable) between pre- and post-installation periods.**

8. **Benefits or penalties for other fuels were not documented:** There were some projects where benefits or penalties may have occurred for the other fuel but were not captured as part of the claim. This was especially the case if the other fuel provider was a non-IOU.

   – **PAs should capture all associated impacts to the grid including benefits or penalties for the other fuel, if applicable, even if the other fuel supplied is a non-IOU.**

9. **Agricultural pump projects do not normalize to changes in flow**: We evaluated numerous agricultural pump projects which consider the efficiency improvements between pre- and post-implementation pump tests to determine savings. Considering the significant changes to demand that rainfall will have for a State burdened by droughts, the PAs do not normalize the use of parameters such as flow, leading to a less accurate determination of savings.

   – **PAs should normalize pre- and post- implementation pump use to flow to consider the changes in demand between each period.**

4.1.1.2 Lighting

1. Each lighting-only sampled project provided a savings calculator: Modified Lighting Calculator (MLC), Easy Lighting Calculator (eLC), SCE's Type B TLED Calculator, or GrowGreen Calculator for horticultural projects. All calculators are required to use DEER inputs: hours of use (HOU), coincident demand factor (CDF), and interactive effects (IE.) **DEER inputs were developed at business type/climate zone level using historic lighting logger data, whereas LED installations are often limited to specific use areas: grocery, warehouse, hallway, common areas, indoor parking garage, and research labs.** Claimed savings for LED installations in spaces that operate 24/7 are always underestimated because the DEER tables have no 24/7 choice.
   - **PAs should use area-specific categories to DEER tables to facilitate correct accounting of savings when installations do not fit the "average business type-specific" criteria.** When DEER HOUs are not available, the PAs can conduct a study to develop HOUs, per D.12.05.015.
2. **PA documentation folders were complete and accurate:** calculators were present, DLC screenshots were provided for the LEDs installed; invoices matched quantities and technologies in the calculators. Only three out of 50 sampled projects required additional data requests.
   - **We recommend the PAs continue to work with implementers and customers to collect complete documentation.**
3. **The PAs classified each project as accelerated replacement (AR) – projects in which the existing lights were still viable, normal replacement (NR) projects in which the existing lights were at the end of their natural life, or new construction (NC)**. AR projects claim significantly higher savings than NR or NC projects. Information collected during customer telephone surveys led to changing the Measure Application Type from AR to NR for seven out of 37 projects.
   - **We recommend the PAs require implementers to provide photos of existing (viable) equipment and demonstrate equipment viability as required in E-5115.**
4. **Most LED measures installed were eligible according to Custom Project Guidance documents:** Only a few projects installed Type A TLEDs without LED drivers which were considered ineligible because they do not meet the "permanent measure" criterion of the statewide custom program and policies manual (they can be easily removed and replaced with T8s).
   - **We recommend that the PAs review technical documentation and calculators to ensure all measures are eligible. This is especially important whenever third parties/community aggregators provide measure installation.**
5. Four of the survey respondents indicated that all lighting measures were no longer in operation: one removed all lighting because the lighting quality was not as expected; one building burned down; one horticultural customer changed crops; another horticultural customer closed the business.
   - **PAs can reduce inoperative installations by verifying customer satisfaction and lighting measure persistence for a sample of projects in each program year.** Additionally, a better understanding of customer requirements before installation may reduce the frequency of inoperative installations.

6. **Claimed Effective Useful Life (EUL) values were generally accurate,** with only three projects using a generic rated life of 20,000 hours instead of the actual 50,000 hours for the installed LED measure to cap EUL.
   - **PAs should use DEER EULs when available or the rated life of the installed measure from the DLC data and include screenshots as supporting evidence.**
7. **Claimed Remaining Useful Life (RUL) for AR projects was calculated as 1/3 of the claimed EUL.** In many cases, this was consistent with the MLC Report tab found in pre-2021 versions of the MLC. The correct RUL is 1/3 of the EUL for the measure removed.
   - **The PAs should review the claimed RUL for any projects that still use older versions of the MLC, or other legacy calculators.** The Reporting tab in the most recent MLC v13.1.1 provides the correct EUL/RULs, so this should not be an issue for projects that use MLC v13.1.1.
8. **The GrowGreen calculator (horticultural projects) uses standard practice baseline efficacy values based on a very limited number of high intensity discharge (HID) lighting fixtures.** These few fixtures do not correctly account for products that are available for purchase on the California market and that are already commonly used by growers.
   - **The PAs should consider additional research be conducted to 1) show the appropriate lighting technology mix for growing cannabis in California, and 2) find the appropriate baseline efficacy values associated with this technology mix.** The survey data collected by *Cannabis Business Times* annually provide a saturation of various technologies installed every calendar year since 2016.
9. **The GrowGreen calculator has embedded assumptions for the unit cost of energy ($/kWh, $/kW, and $/Therm).** These were not trued up using actual rates at the facility.
   - **Since project cost savings are directly tied to program influence and the customer decision making for each project, horticultural projects should always update the embedded values with the correct rate for each customer.**
10. **To facilitate customer participation and reduce paperwork, custom projects allow the installation of deemed measures along with custom measures;** the PA must claim deemed savings and pay deemed rebates for the deemed portion of such projects. The 2020-2021 lighting-only sample included several projects in which the PA submitted one custom claim (one Claim ID) for the installation of multiple deemed and custom measures. Custom documentation covered all (deemed and custom) measures installed. This complicated evaluation activities.
    - **We recommend claiming the deemed portion of a custom project under a separate deemed claim.** PA accounting for deemed claims is much simpler than for custom claims, and the PA tracking systems automatically apply the appropriate deemed savings and incentives to each measure. Having separate Claim IDs for deemed and custom measures in a custom project also simplifies evaluation efforts.

4.1.2 Savings by Design (SBD)

1. **Non-reporting of negative energy or demand savings**: We came across many instances within the SBD sample where the PAs zeroed out negative energy or demand impacts that were estimated by the PAs' savings calculation models, resulting from the project before entering them into the tracking database. In some cases, the negative impacts that would have existed from the installation of certain measures were not reported; for example, the installation of an energy-efficient electric service water heater in lieu of a Title 24 code baseline natural gas fired water heater would result in natural gas savings, but also additional electricity consumption on the grid, which was not reported as an impact resulting from the measure.
   - **We recommend the PAs estimate and report energy or demand penalties from projects when applicable.**

2. **Absence of permit drawings and permit dates in PA documentation:** For most sampled SBD projects, there was no documentation provided by the PAs on AHJ providing building permits, application and approval dates of the building permit, and permit drawings associated with mechanical, architectural, and lighting plans. Evaluators had to spend additional resources trying to identify the AHJ and associated permit dates to ascertain the Title 24 code that would apply to the evaluated project.

   – **We recommend that the PAs include permit drawings that clearly indicate the date the permit was applied and the AHJ approving the permit within project documentation to the evaluation team.**

3. **Savings claimed for Variable Refrigerant Flow (VRF) measures under Whole Building projects**: Incentives for VRF measures are available through mid/upstream offerings for some building types under California's statewide energy efficiency programs. Based on CPUC's Baseline Guidance Document version 1, to avoid double-counting of savings, VRF HVAC systems shall be modelled as a minimally compliant heat pump in both the Baseline Case and the Proposed Case, for both the SBD Eligibility Simulation and SBD Performance Simulation. We identified two projects within the SBD sample that failed to comply with the CPUC baseline guidance for modelling VRF systems.

   – **We recommend that PAs follow modelling guidelines specified by CPUC and not include savings from measures that might have already been claimed through mid/upstream offerings like VRF systems.**

4. **Inclusion of incorrect occupancy groups under the SBD program to use Title 24 baselines**: The current SBD program design utilizes California Building Energy Efficiency Standards (Title 24, Part 6) as a reference baseline for comparison. The provisions of Title 24 Part 6 apply to all buildings that are of occupancy groups defined under Chapter 3 of Title 24, Part 2. The evaluation sample included a federal defense building with International Building Codes that applied to the facility and not Title 24. The reported savings were modelled incorrectly using Title 24 as the baseline.

   – **We recommend that the PAs screen projects going through the SBD program for applicable baselines and include projects only when the building uses Title 24 or other relevant industry standards (e.g., healthcare and data center industry standard practices) to determine reference baselines for comparisons. Additionally, if relevant industry standards are the applicable baselines, the modelling software utilized to estimate savings must be able to override Title 24 baseline parameters appropriately.**

5. **Use of non-California Energy Commission (CEC)-approved software for estimating reported savings**: For every published version of Title 24, the CEC approves a list of energy analysis computer programs that include all Alternative Calculation Methods approved for the Building Energy Efficiency Standards in accordance with the California Code of Regulations: Title 24, Part 1, Article 1, Section 10-109. We identified five projects in the SBD sample that utilized a software not approved by CEC, eQUEST, which was used to model the performance runs and estimate reported savings from the project. It is resource-intensive and an inappropriate use of ratepayer funds to build a performance model using a software that does not have built-in Title 24/SBD modules and requires the modeler to accurately incorporate the Title 24 interpretations into the baseline model. It is also resource and time-intensive for evaluation teams to review the non-CEC-approved baseline models for accuracy.

   – **We recommend that the PAs use CEC-approved software with built-in Title 24/SBD modules for estimating reported savings from whole building SBD projects.**

6. **Incomplete updates made to building simulation models per CPR recommendations**: We identified two projects in the SBD sample at the same campus that had CPR recommendations to make the chilled water systems energy neutral or modelled as minimally compliant units in both the baseline and the proposed cases. The project design team updated the chiller efficiencies in both cases to account for the same; however, they did not update part load efficiency curves or chiller capacities to make the chiller consumptions energy neutral.

   – **We recommend that PAs work with project design teams to fully and accurately implement CPR recommendations.**

7. **We were unable to replicate the PA-reported savings for IES VE projects under 2016 Title 24:** For five projects in the SBD sample, IES VE calculated the PA-reported savings utilizing the Title 24 modules that were available in the historical versions of the software. We were unable to replicate the PA savings as the 2016 module of Title 24 was not supported anymore by the software vendor.

   – **We recommend that the PAs work with vendors to provide software support at least until when evaluation happens, which could be 3 or 4 years after project implementation to make them evaluable.**

8. **Facilities that are part of larger campuses not sub-metered:** The evaluation of SBD projects that were implemented in 2020 and 2021 included numerous buildings that were part of larger campuses and did not have separate metering for their electricity and natural gas consumptions, making it impossible for evaluators to calibrate the as-built simulation models with the facility's energy usage.

   – **We recommend that the PAs to consider submetering for SBD whole building projects involving individual buildings on larger campuses that are not utility metered.**

4.2 Net savings conclusions and recommendations

4.2.1 Custom

Project decision makers should see improved NTGRs if they implement better project decision making screening processes: Mandatory corporate policies, regulatory compliance requirements, and standard maintenance and market practices are key drivers of projects with high free-ridership. Project decision-makers in the bottom NTGR quartile were much more likely than those in the top NTGR quartile to have their energy efficiency projects driven by these types of pre-established or compulsory practices. Another key contributor to free-ridership is the frequent failure of the PAs and implementers to engage with customers before decisions are made to install energy-efficient equipment. Project decision makers in the bottom NTGR quartile were much more likely than those in the top NTGR quartile to report that the decision to install their energy-efficient measures was made before they began discussions with the PAs regarding incentive or technical assistance availability.

– **The PAs should engage with customers early in the decision-making process and improve project screening practices to ensure that the decisions to go forward with the project were not already made, and/or where mandatory corporate policies or regulatory compliance are not driving project implementation.**
– **Better identification of projects for which incentives serve as the "tipping point" should improve NTGRs in the future:** Project decision makers in the highest NTGR quartile were much more likely than those in the lowest NTGR quartile to mention the importance of the program incentives and payback/ROI considerations. Eighty-seven percent of the respondents in the upper NTGR quartile said the program incentives were an important program driver compared to only 32% of the lower NTGR quartile respondents. Similarly, 81% of the upper NTGR quartile respondents cited an acceptable ROI or payback as an important driver compared to only 56% of those in the

bottom NTGR quartile. Part of this difference could be related to the trend discussed above: that low NTGR projects are more likely to be driven by pre-established or compulsory energy efficiency practices. If projects must go forward due to corporate policies or regulatory requirements, then the projects' payback periods or ROI calculations become less important.

- **The PAs should pursue more projects where incentives are critical in driving the decision to select energy-efficient equipment over less efficient alternatives.**

9. **The Custom programs should continue to emphasize feasibility studies and technical assistance:** Project decision makers in the highest NTGR quartile were much more likely (53% of respondents) to say that feasibility studies and technical assistance were important project factors than project decision makers in the lowest NTGR quartile (26%).

   - **PAs should continue the support of feasibility studies and technical assistance, which are key factors in influencing the decision to implement energy efficiency projects.**

4.2.2 SBD

10. **Diversify the program participation pool**: Many SBD program participants were universities that had been repeat program participants with corporate policies already driving building practices.

4.3 Overall conclusions and recommendations

The below conclusions and recommendations focus on qualitative items, such as project documentation and recruitment for all research areas. We provided these recommendations with the intent to inform PAs on items that impact evaluation timelines and outreach efforts, in the anticipation that PAs streamline evaluation requests and fulfilments in future years.

1. **Lack of PA documentation to identify the scope of some projects:** Project documentation received from the PAs in response to data requests was often not complete or clear in describing the project and the savings estimates shown in the tracking data. In some cases, the PAs have chosen to provide extracts of project documentation that was hard to follow, while customers or vendors, when asked, have provided much more thorough project documentation, which the PAs should have provided originally. This documentation included files and savings calculations. In other cases, PAs provided the same set of documentation when requested to provide missing documentation. For some SBD whole building projects, there was notable missing documentation needed to support inputs and assumptions for the model. The missing information included as-built mechanical drawings equipment specifications, cut sheets, and lighting plans.

   - **PAs should provide all relevant project files for each associated claim including native as-built calculations that match final tracking numbers, project applications, associated customer agreement extensions to support CPUC policy requirements, and a clear detailed project scope and documentation.** This will allow evaluators to see a clear trail from the project documentation to the tracking savings estimates and provide a much more efficient pathway to evaluate projects.

2. **Discrepancy between the tracking data and the reported savings in the PA documentation:** In a number of cases, it was difficult to trace savings from the project documentation through to the tracking system, and in some cases, it was not possible to reconcile the savings estimates, or as-built calculations did not match final tracked savings.

   - **The PAs should thoroughly document project files and associated calculations that align with the tracking data before sending files to the evaluators**. If there are notable discrepancies, the PAs should point them out in the files.

3. **Incorrectly applied MATs. We found instances of incorrectly applied MATs, such as RCx projects, which were documented as NR:** These projects did use the correct EULs but did not have proper MATs applied, which should be flagged during project file review or engineering QC.
   - **PAs should apply appropriate MATs to each claim.**
4. **Absence of final energy model for review:** Several projects used simulation models such as eQuest or Energy-Pro or IES to develop ex ante savings. For some of these projects, the models that were provided as part of the documentation request could not be rerun to get the same savings estimates that were included in the project files or the tracking data. This suggests that the PAs did not deliver a final version of the model to the evaluation team as part of the data response.
   - **The PAs should provide the final as-built version of the energy model and should clearly identify the version of the simulation tool so that the model can be simulated with the appropriate version of the modelling tool to exactly generate the same results as the tracking data.** The PAs should even go a step further to re-run the model on their own to ensure that the as-built model generates savings that are in line with the tracking claim, and if there is a discrepancy to identify it when providing project files to evaluators.
5. **Hardcoded or locked ex-ante analysis spreadsheets:** In several projects, PAs only provided hardcoded savings analysis in PDF or Excel format or provided password protected files where it was unclear to determine how savings were calculated and where inputs and assumptions were being derived. Without the native unlocked analysis spreadsheets, it was difficult to verify the ex-ante savings estimate, and in some cases, forced the evaluator to create a custom savings model which may have not been necessary if the applicant-provided model was accessible and deemed viable for use in the evaluation.
   - **PAs should provide native unlocked analysis files which clearly document calculations, inputs, and assumptions that match tracking reported savings as part of the evaluation data requests.** This will ensure the ex-ante savings can be verified and replicated readily.
6. **Incentive and cost discrepancy:** Paid incentives for several projects were found to be over the capped percentage of the reported project costs. In some cases, the source of the incremental cost was not provided for review.
   - **PAs should provide supporting documentation of incremental and installed costs and ensure the appropriate incentive cap is used.** PAs should document the source of the cost for the evaluator's review.
7. **Incorrect or missing customer contact information:** Many projects did not have accurate customer contact information, and in some cases, was missing entirely. Accurate customer contact information is crucial to gross and net recruitment. DNV recruiters often had to review project documentation to obtain new contact information.
   - **PAs ought to regularly update customer contact logs through customer outreach prior to sending them to the evaluator.** Updating contact logs will help expedite the recruitment process, which will allow for longer data collection periods during the evaluation. We can provide a standardized template so that the PAs can complete all fields.

5 APPENDICES

5.1 Appendix A: Detailed gross savings findings

Below, we have provided result tables that disaggregate results by key dimensions. Forecasted savings presented in this section are engineering estimates that do not include the realization rates that were applied for the savings reported in the ED tracking data. Relative precision (RP) is reported at the 10% confidence level.

5.1.1 Electric

5.1.1.1 Custom projects

Table A-1. Gross electric energy savings results among Custom projects (2020-2021)

Group	First year				Lifecycle			
	Forecasted savings (MWh)	Evaluated savings (MWh)	GRR	RP	Forecasted savings (MWh)	Evaluated savings (MWh)	GRR	RP
Year								
2020	117,308	67,920	58%	±17.1%	904,472	445,868	49%	±15.3%
2021	69,902	44,566	64%	±22.2%	475,567	213,370	45%	±27.5%
Measure								
Lighting	82,057	61,030	74%	±19.8%	528,022	403,222	76%	±14.3%
Non-Lighting	105,153	51,456	49%	±18.0%	852,016	256,015	30%	±27.0%
PA								
MCE	1,421	499	35%	±43.4%	12,309	3,823	31%	±31.3%
PG&E	144,856	94,577	65%	±14.3%	1,051,254	497,556	47%	±17.0%
SCE	19,030	8,964	47%	±27.0%	152,715	124,202	81%	±17.2%
SCR	21,903	8,445	39%	±77.4%	163,761	33,657	21%	±67.3%
SDG&E	187,210	112,486	60%	±13.5%	1,380,039	659,238	48%	±13.7%
Total	**1,421**	**499**	**35%**	**±43.4%**	**12,309**	**3,823**	**31%**	**±31.3%**

Table A-2. Gross electric demand savings results among Custom projects (2020-2021)

Group	First year				Lifecycle			
	Forecasted savings (MW)	Evaluated savings (MW)	GRR	RP	Forecasted savings (MW)	Evaluated savings (MW)	GRR	RP
Year								
2020	13.5	7.4	55%	±23.7%	115.3	37.0	32%	±21.7%
2021	7.2	4.3	60%	±23.1%	54.5	26.1	48%	±23.8%
Measure								
Lighting	9.4	6.2	65%	±26.9%	63.9	30.2	47%	±21.4%
Non-Lighting	11.2	5.6	50%	±20.8%	105.9	33.0	31%	±23.8%
PA								
MCE	0.1	0.0	34%	±57.3%	0.8	0.2	30%	±33.3%
PG&E	16.7	9.8	59%	±19.1%	130.5	52.9	41%	±18.0%
SCE	1.8	0.8	47%	±30.7%	20.5	5.1	25%	±35.2%
SCR	2.1	1.1	54%	±65.4%	18.0	4.8	27%	±64.9%
SDG&E	20.7	11.8	57%	±17.2%	169.8	63.1	37%	±16.1%
Total	**0.1**	**0.0**	**34%**	**±57.3%**	**0.8**	**0.2**	**30%**	**±33.3%**

5.1.2 SBD projects

Table A-3. Gross electric energy savings results among SBD projects (2020-2021)

Group	First year				Lifecycle			
	Forecasted savings (MWh)	Evaluated savings (MWh)	GRR	RP	Forecasted savings (MWh)	Evaluated savings (MWh)	GRR	RP
Year								
2020	12,604	4,263	34%	±42.7%	187,892	59,773	32%	±40.1%
2021	12,151	8,798	72%	±22.9%	181,923	117,890	65%	±23.5%
Measure								

Group	First year				Lifecycle			
	Forecasted savings (MWh)	Evaluated savings (MWh)	GRR	RP	Forecasted savings (MWh)	Evaluated savings (MWh)	GRR	RP
Lighting	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Non-Lighting	24,756	13,060	53%	±20.8%	369,815	177,664	48%	±20.6%
PA								
MCE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PG&E	15,819	9,719	61%	±27.8%	235,317	133,266	57%	±27.3%
SCE	3,163	3,200	101%	±0.3%	47,921	42,255	88%	±2.8%
SDG&E	24,756	13,060	53%	±20.8%	369,815	177,664	48%	±20.6%
Total	**15,819**	**9,719**	**61%**	**±27.8%**	**235,317**	**133,266**	**57%**	**±27.3%**

Table A-4. Gross electric demand savings results among SBD projects (2020-2021)

Group	First year				Lifecycle			
	Forecasted savings (MW)	Evaluated savings (MW)	GRR	RP	Forecasted savings (MW)	Evaluated savings (MW)	GRR	RP
Year								
2020	3.3	1.0	29%	±54.0%	48.9	13.9	29%	±51.1%
2021	3.0	2.1	71%	±31.5%	44.6	30.4	68%	±31.6%
Measure								
Lighting	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Non-Lighting	6.2	3.1	49%	±27.4%	93.5	44.4	47%	±27.0%
PA								
MCE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PG&E	4.4	2.4	54%	±35.4%	65.1	33.3	51%	±35.7%
SCE	0.6	0.6	110%	±5.1%	9.1	10.1	112%	±1.6%

Group	First year				Lifecycle			
	Forecasted savings (MW)	Evaluated savings (MW)	GRR	RP	Forecasted savings (MW)	Evaluated savings (MW)	GRR	RP
SDG&E	6.2	3.1	49%	±27.4%	93.5	44.4	47%	±27.0%
Total	**4.4**	**2.4**	**54%**	**±35.4%**	**65.1**	**33.3**	**51%**	**±35.7%**

5.1.3 Natural gas

5.1.3.1 Custom projects

Table A-5. Gross natural gas energy savings results among Custom projects (2020-2021)

Group	First year				Lifecycle			
	Forecasted savings (million therm)	Evaluated savings (million therm)	GRR	RP	Forecasted savings (million therm)	Evaluated savings (million therm)	GRR	RP
Year								
2020	4.0	0.8	20%	±39.2%	42.6	8.8	21%	±102.9%
2021	27.8	27.1	98%	±4.5%	400.1	392.2	98%	±4.6%
Measure								
Lighting	(0.3)	(0.3)	91%	-±23.6%	(1.8)	5.5	-311%	±163.6%
Non-lighting	32.1	28.2	88%	±4.4%	444.5	395.6	89%	±4.6%
PA								
MCE	(0.0)	(0.0)	35%	-±43.3%	(0.1)	(0.0)	31%	-±31.0%
PG&E	29.2	26.4	91%	±4.7%	426.0	396.2	93%	±5.1%
SCG	1.6	1.0	58%	±13.4%	11.9	2.2	18%	±10.9%
SDG&E	0.9	0.5	58%	±9.1%	4.8	2.7	56%	±27.1%
Total	**31.7**	**27.9**	**88%**	**±4.5%**	**442.8**	**401.1**	**91%**	**±5.1%**

5.1.3.2 SBD projects

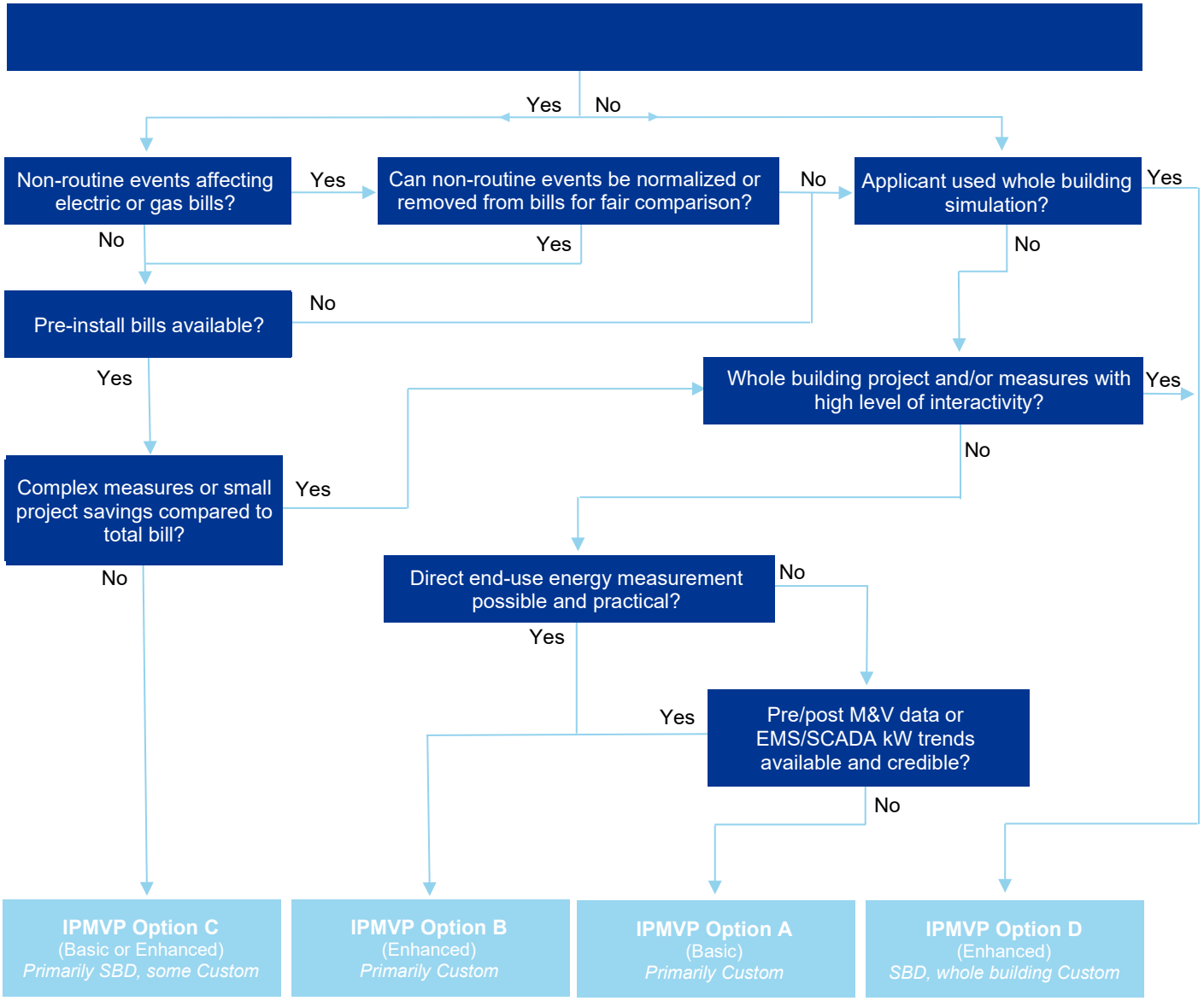
Table A-6. Gross natural gas energy savings results among SBD projects (2020-2021)

Group	First year				Lifecycle			
	Forecasted savings (million therm)	Evaluated savings (million therm)	GRR	RP	Forecasted savings (million therm)	Evaluated savings (million therm)	GRR	RP
Year								
2020	0.6	0.2	28%	±16.4%	9.4	2.9	31%	±23.5%
2021	0.5	0.4	73%	±15.9%	8.1	5.4	67%	±16.1%
Measure								
Lighting	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Non-lighting	1.2	0.6	49%	±12.1%	17.6	8.3	47%	±13.3%
PA								
MCE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PG&E	1.1	0.5	45%	±12.9%	16.4	6.7	41%	±13.1%
SCG	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SDG&E	0.1	0.1	109%	±34.5%	1.2	1.6	138%	±42.8%
Total	**1.2**	**0.6**	**49%**	**±12.1%**	**17.6**	**8.3**	**47%**	**±13.3%**

5.2 Appendix B: Site-level M&V rigor decision tree

The diversity of projects among the SBD and custom samples required careful consideration of the most defensible and cost-effective M&V methods for each sampled project given study conditions. The following figure presents the criteria used to guide project-level rigor.

Figure B-1. Criteria used to guide project-level rigor



5.3 Appendix C: Comment matrix

Table C-1. Project-specific comments

Comment #:	Entity:	DNV Site ID:	QUESTION or COMMENT:	Evaluator Response:
1	PG&E	PGE-20012	PG&E intends to clarify the following: 1) The Measure Application Type (MAT) for this project is AR, not NR; therefore, savings for the RUL period should remain eligible. Additional savings would be associated with the second baseline, which could be determined by applicable ISP study expected to be in compliance with the CPUC ISP Guidance 3.1. 2) Given the complexities and uncertainties in determining 2nd baseline, PG&E chose the most conservative and fastest approach by claiming no savings from the 2nd baseline. With regard to the evaluators' comments on ISP studies, the following provides PG&E's clarifications worth noting for future reference: a) PG&E conducted an ISP study during the pre-installation phase in collaboration with the CPUC EAR team; and concluded that the market-based ISP study, while with good initial intent, wasn't applicable to the specific customer. It's unfortunate that it's interpreted by some as an inconclusive ISP study. b) While the evaluators claimed that they conducted an ISP study on multi-effect evaporators, by speaking to 3 vendors (Rdgevaporators, Swenson, and Crystal Process Equipment), it's unclear what and how data was obtained and analyzed to support the conclusion that "three-effect evaporators have been a standard practice for the last several years," as their full compliance with the CPUC's ISP Guidance 3.1 is questionable. In addition, we're unconvinced that the evaluators truly understood the appropriateness of equating the number of effects to the efficiency level. Our field experience and in-depth communications with the stakeholders suggest that the number of effects alone does not necessarily dictate the efficiency levels. We also noticed that the evaluators did not discuss or present such a discussion about the evaporation system's MVR component, which is the primary design feature that improves the energy efficiency over the existing design.	The project was first scoped in 2013 and the applicant claimed 6.67 years RUL. The project was installed in 7/16/2020 - around 7 years after the project was first scoped with a 6.67 years RUL. The pre-existing equipment was 49 years old (older than the EUL of 20 years assumed by applicant). During the evaluation we found that the new evaporator has increased built-in capacity (a case of capacity expansion) and therefore, cannot be claimed as AR. Moreover, the CPR review had found the project to be NR for the lack of POE -- "CPUC Staff do not find any preponderance of evidence that measure 1 is a Program Induced Early replacement. This measure remains a normal replacement or replace on burnout measure type and should use ISP as baseline." The evaluator's ISP assessment determined the third effect evaporator as ISP, hence this project remains a zero saver as the project installed a system that is in-line with the ISP. Furthermore, the CPR process relies on documentation provided by the PA, including responses provided by the PA on questions asked by the CPR reviewers. The CPR team rarely talks to the customer directly about the project as the ex post team does routinely. While CPR dispositions help in ensuring documentation expectations and policy compliance, ex post evaluations may acquire additional and/or different information that can lead to a different conclusion as compared to the one reached by the CPR team. PGE 20012 was proposed as an accelerated replacement project and processed as such by the CPR team despite concerns it expressed about the capacity expansion nature of the project. The AR MAT was not found feasible by ex post evaluators despite the implementer's claim that no production increase had taken place after measure installation. The implementer/PA did not provide any evidence that the existing equipment was also capable of producing about 50 percent more as the installed equipment is capable of doing but has not done so yet.

Comment #:	Entity:	DNV Site ID:	QUESTION or COMMENT:	Evaluator Response:
1	PG&E	PGE-20012	c) The fact that the evaluators acknowledged "Even though all the vendors pointed out that the standard practice could vary based on the facility, no vendor has sold a three-effect evaporator to food processing companies in the 2019-2020 time frame" is telling that their unpublished ISP study effort has discounted if not ignored the critical value of understanding the customer's uniqueness, which is expected if the current ISP Guidance 3.1 was followed. It's clear to PG&E that the evaluators' claim should be considered inconclusive at best, if applicable. With any of these clarifications considered, we respectfully request that the proposed zero-out for this project be rescinded, and the CPR-approved savings be instated	The criterion of technical equivalence is not met and the measure has been determined as capacity expansion which requires establishing standard practice baseline and ensuring that the installed measure exceeds standard practice. The evaluators found that evaporators sold during the timeframe of project implementation had commonly exceeded the efficiency level of the installed measure. Therefore, the installed measure is not exceeding standard practice and has been disallowed. PG&E's argument that a savings credit should be granted up to the RUL period is not policy compliant in that the capacity expansion baseline projects cannot use the AR MAT framework. Further, the assumption that the installed measure qualifies for paying to-code incentives is contradicted by the level of incentive paid for the project which is no different than for measures that exceed code. The AB 802 framework does not apply to industrial process improvement projects. Evaluators do not agree with the argument that projects that have some impact on the grid/system, should be credited with savings even if such projects are ineligible. Custom program evaluations have always credited policy-compliant savings, not any savings that could occur on the grid. We also wish to stress that zero saver projects have been found in all evaluations conducted since the 06-08 cycle. Ineligible projects are identified only after they are sampled and reviewed. Because such projects are randomly selected from claims, they are representative of the population and cannot be separated from the evaluated sample. Doing so will be inconsistent with the statistical methods employed in program evaluations. Evaluators suggest that PG&E continue to use the early opinion process, rigorously implement the show-stopper guidance, and refine the internal review processes as evaluation results become available.
2	PG&E	PGE-20026	PG&E finds the basis for the Commission Staff evaluator determination of ineligibility is based upon an incomplete understanding of PG&E program rules. The project is allowed two years to complete, and a 1-year "reminder" is used to reduce the risk that the project progress will not be tracked properly by PMs. A TEEger exception approval is needed only to extend the project into the third year. PG&E requests that Commission Staff evaluator to revise the findings for this project to "eligible" and to reinstate the savings the project achieved	The program application clearly states the project is to be completed within an year of the application approval. Additionally, PG&E was not able to provide any supporting documentation that allowed the project completion to be extended more than a year from the approval of the project application. This is a clear violation of the program rules. Hence, this project still remains ineligible and was given zero evaluated savings.

Comment #:	Entity:	DNV Site ID:	QUESTION or COMMENT:	Evaluator Response:
3	PG&E	PGE-21476	We believe this Custom project is eligible for the following reasons: PG&E disagrees that the project should be classified as AR nor NR, the project documentation shows in file: PRJ - 02947512 Project Documentation Summary.docx (previously provided and included with our response package for convenience) that the project was classified as BRO/RCx from Program rules. The following statement can be found in the documentation package: "RUL/EUL - RUL is not known as useful life may be considered as long as the pump is producing an acceptable flow and/or pressure of water. Under its current designation as a BRO/RCx EUL is considered to be 3 years. (It is probably better to think of EUL for a pump in terms of hours per operation as this can vary greatly from year to year, especially in an agricultural environment.)" PG&E also disagrees that the Net-To-Gross ratio (NTGR) of a project has any effect on the Measure Application Type (MAT) assigned to the project. Per E-4818 Accelerated Replacement Measure Application Type is based on (1) the continued viability of the existing equipment and (2) the program influence on the decision to retire the system early. This project has demonstrated both criteria for this MAT. The assigned NTGR of the project affects the savings that can be claimed, but not the measure application type. If the NTGR were relevant to edibility of the existing conditions baseline, all programs with less than 0.5 NTG ratio would be entirely ineligible. Finally, P&GE double-checked the project's eligibility to be treated as hard-to-reach and confirmed that it is. In the map below, the red areas are qualified HTR zones and the project is located at the red dot/blue arrow. PG&E requests that Commission Staff revise the savings to include this project as eligible.	PG&E claimed the NR MAT for this project, not the BRO MAT. Evaluation uses the claims data, not notes in the project documentation. The use of NR MAT requires establishing that the project exceeded standard practice which has not been demonstrated. The evaluator assessed that the project qualifies to assign the AR MAT subject to meeting the preponderance of evidence requirements that include the equipment viability and program influence. The latter has not been proved per the results of the NTG survey. Therefore, the project has not been assigned savings. No change is necessary in the zero saver determination.

Comment #:	Entity:	DNV Site ID:	QUESTION or COMMENT:	Evaluator Response:
4	PG&E	PGE-21663	PG&E does not agree with Commission Staff's determination of this project as a zero saver because this project is part of a group of projects including CPR 536 hydrogen plant that have been under review for several years for both gross savings analysis and influence review as part of the RP2 pilot program. This group of projects were each subject to CPR review not just in the typical sense, but also before payment in 2021. It strains the credibility of this collaborative process to suggest that somehow this project was accidentally approved, or approved without the agreement of Commission Staff evaluators being aware of PG&E's involvement with the project. PG&E developed the project and subjected it to numerous reviews in collaboration with multiple generations of Commission Staff evaluation teams. PG&E cannot say with certainty, but evidence suggests that the missing TEEger exception document was either not required under applicable program guidelines at the time, or it was deleted after the 5-year documentation retention policy. PG&E did authorize the exception request for the larger of the three customer projects (CPR 536 hydrogen plant) that was moving through the Custom preview pipeline simultaneously. How can only one of the interconnected projects be extended without the others? PG&E requests Commission Staff to reconsider the eligibility of this project and reinstate the vast energy savings it legitimately provides to the California IOU grid.	Evaluators did not find any exception request in the CPR documentation for this project or a disposition with approval to claim savings in year different from the year of installation. Each project should meet the requirements laid out in the EE policy manual to be eligible. For this project, we did not see any evidence that supports delayed M&V that would justify claiming savings in a program year different from the year of installation. We sent an email requesting some supporting information regarding the delayed M&V from PG&E on Feb 17th, 2023 but we never received any response. No change is necessary to the zero-saver determination.
5	PG&E	PGE-20595	PG&E believes there are a few items to consider and that the entire project should not be declared a zero-saver project. Regarding the COVID impact to building operation, PG&E submitted a memo (see "PA Proposal For Reporting COVID Affected Projects_v4_2020.pdf") to the CPUC which was adopted and approved by Pete Skala of the CPUC (see "P Skala Response to PAs COVID Proposal for custom projects.pdf"). This proposal allowed Implementers and PA's to use pre-COVID baselines and to close out projects during a the period of COVID impacts by reasonably verifying the measures had been installed. PG&E believes the verification process followed this CPUC approved memo appropriately. The memo states that the project can be closed out if the measures can be confirmed to have been installed without penalizing the customer for COVID impacted operation (e.g. needing to keep the units on 24/7 for COVID safety).	The letter of Energy Division PG&E cites was meant to allow savings claims to be made using reasonable evidence. That authorization is not applicable to this ex post evaluation since CPUC guidelines require that we evaluate projects based on as found conditions. During our interview with the customer, we confirmed that the building is not occupied and the HVAC equipment is not running. Additionally, the measure was programmed into the EMS for the AC/HV unit but never implemented due to the entire building needing to be kept in occupied mode 24 hours per day, 7 days per week. The customer confirmed that the proposed control setpoints were never implemented. No change is necessary to the zero-saver determination.

Comment #:	Entity:	DNV Site ID:	QUESTION or COMMENT:	Evaluator Response:
5	PG&E	PGE-20595	Regarding the Tenant Improvement (TI) renovation and AHU's being replaced, PG&E had a call with the customer. It was confirmed that the AC units were not removed as part of the TI. The TI did, however, remove the heating units and convert the system from dual duct to single duct VAV with reheat. Based on this, PG&E agrees that EEM's 3-5 should be zero'd out as they are directly impacted by and dependent upon the removal of the heating units and the conversion to single duct VAV. However, per the customer the scheduling and economizer controls (EEM-1 and 2) were not touched by the TI. We checked with the customer to verify the evaluators findings on the building schedule. The customer provided us with this screenshot below on 4/6/2023 to show the current schedule of the AC units. As can be seen, the schedule is Monday through Friday 6am to 6pm. The original project used a schedule of Monday through Friday 6am to 7pm. This means that the original project claimed savings (EEM-1) are conservative as they had an extra hour of operation in the "proposed" case	
6	PG&E	PGE-20005	In the Free Rider form from June 18, 2015, on question 4, the PG&E Account Rep Clyde Shaffer wrote that the customer has not decided to implement the measure at that time and that the initial discussions with the customer started in January of 2015. Please see: PRJ - 00039182 2015 freeridership-CONF.pdf (previously provided in the documentation package). Even though this Free Rider screening record from 2015 is no longer officially required by PG&E, back in 2015 it was part of the typical project development process, especially for PG&E Account Reps when addressing influence and showstoppers. Also in 2015, it was customary for PG&E Account Reps to obtain a Custom Application signature at their initial customer meetings instead of at the final stage of project development as it is done today. However, the application signature did not represent a commitment from the customer on the project, but only the beginning of an official working relationship between the customer and PG&E, and thus serves as evidence of influence. In many instances this is a starting point for Calculation Assistance service contracts with 3rd parties. Evidence of this can also be found in the latest exception form.	The free rider form dated 6/18/15 detailed a discussion with the customer that happened in January 2015 does not provide sufficient evidence of influence. Per CPUC policy, there needs to be clear and explicit influence clearly documented in the project documentation. Therefore, this project still remains a zero saver with lack of influence.

Comment #:	Entity:	DNV Site ID:	QUESTION or COMMENT:	Evaluator Response:
6	PG&E	PGE-20005	The calculations were not finalized until July 13, 2015 and "approved for installation" at the end of October of 2015. Additionally in the email trend PRJ - 00039182 Foods Measure change and savings true up-CONF.pdf on page 5 we can see that further conversations and activity including logging took place after the application signature date.	
7	PG&E	PGE-20005	There is an email from the customer from 7/27/15 where the customer agrees with a proposed revision by PG&E Engineer Donald Fantz. Please see: PRJ - 00039182 Re project whey revision-CONF.pdf. Although the influence/communication documentation is limited, considering that both the PG&E Account Rep and the PG&E Engineer from that time are currently retired and PG&E IT Policy of 3-year email retention, this is the best PG&E was able to collect in good faith from that time.	Project influence needs to be clear and documented. See previous comment for PRJ-00039182.
8	PG&E	PGE-20005	PG&E agrees that the nature of the project did not allow for a wide selection of equipment because these types of heat exchangers are typically custom made for the needs of each customer. However, technical influence is evident in the many site visits, PRE M&V work, revisions and calculation assistance offered and put into practice by the customer, all were acceptable evidence of influence in PY2015/2016 and today. Regarding the extensions, on June 14, 2017 there is another extension for the project which was approved by Collen Breitenstein, 2017 EE Program Manager, however, at that time the Exception Form and TEEGer Process was not implemented yet, the approval notice is given by email and can be seen in file: PRJ - 00039182 Extension for Project-CONF.pdf (within the Customer Communication zip Folder) previously provided in the package. This extension allows for the project to remain eligible from 2017 to 2018. Program rules allow projects to expire after 2 years: 1-year initial approval (2015), 1 year PM informal extension (2016).	Thank you for the clarification. However, due to the lack of evidence of program influence, this project will not be credited savings. The concern outlined by PG&E in comment #8 is no longer relevant.

Comment #:	Entity:	DNV Site ID:	QUESTION or COMMENT:	Evaluator Response:
9	PG&E	PGE-20005	PG&E finds this statement factually incurred for two reasons: 1) The referred extension document can be seen in file: PRJ - 00039182 Exception Approved-CONF (2).pdf and it says: "The requested extension is to accommodate the M&V work that may take 8-12 Weeks." PG&E understands that M&V work includes the M&V logging period, additional time for installing loggers, a time for connecting trending capabilities, coordination between Customer and PG&E team, a time for uninstalling the loggers and a time for translation of the data. That can be seen in the email below in file: PRJ - 00039182 RE_ POST M&V Plan - Revision Email 2-CONF.pdf, page 2. 2) Additionally, we can see 6 weeks of total trend data in the project package, not 3 weeks. Please see picture below: (the 4th file includes three weeks of data as opposed to the first three files which only contain one week of logged data). About a comment in the calculations about some of the M&V data not being readable or usable for calculation, this was an fortuitus minor event not an intentional action by the customer who actually collected 6 weeks of data, as requested. Since the reviewers participated in the M&V calls, PA agreed to move forward in agreement with reviewers and Policy team as the project had a hard deadline for payment. If we consider an approaching end of the year deadline to comply with Program rules which did not allow any additional extensions, and the stability of the operations at the plant verified by the initial logged data and comments from the customer (from calls and summarized on M&V collaboration emails), and all the additional work needed before and after the actual logging time, PG&E concludes that the M&V period was reasonable, well-coordinated and sufficient to justify the project savings.	Thank you for the clarification. However, due to the lack of evidence of program influence, this project will not be credited savings. The concern outlined by PG&E in comment #9 is no longer relevant.
10	PG&E	PGE-20005	PG&E does not agree that the calculations are not transparent, but agrees that this calculator may not be reproducible, since it was custom made for the project, however the calculator has been successfully adapted to smaller size customers in the past. The final calculations can be seen in file: PRJ - 00039182 POST Calc_ATS Reviewer Comments_Final-CONF.xlsx, there is also a Pre-install version of the calculator file in the package: PRJ - 00039182 whey CRI project 2015_151001-CONF.xlsx	Thank you for the clarification. However, due to the lack of evidence of program influence, this project will not be credited savings. The concern outlined by PG&E in comment #10 is no longer relevant.

Comment #:	Entity:	DNV Site ID:	QUESTION or COMMENT:	Evaluator Response:
10	PG&E	PGE-20005	The calculator is a custom spreadsheet that was allowed and commonly used for industrial refrigeration projects in 2015. This calculator is infrequently used today. This calculator has been adapted to represent the customer's specific refrigeration system which includes 23 large compressors and 18 condensers. The calculator uses FRICK performance data as proxy for the existing compressors, and it was updated using logged data from the M&V at pre and post stages. All the data points can be traced back to their source trend data and all the FRICK performance data has been provided as well in the package, this methodology was accepted in 2015 since it is still considered a simple way to model a large and complex refrigeration system, which maybe too difficult to model with a bin analysis or eQuest model. All the cells are open, and all the formulas are visible and unlocked. The calculator contains several comments from the reviewer to add guidance to the review steps.	
11	PG&E	PGE-20005	PG&E Agrees with this comment. The additional equipment are the shell and tube heat exchangers.	Thanks for the acknowledgment
12	PG&E	PGE-20005	PGE agrees with these statements. No gas savings were claimed for this reason and because PG&E does not provide gas service to this customer.	Thanks for the acknowledgment
13	PG&E	PGE-20027	PG&E does not agree with the Title 24 code requirements assessment for the following reasons which were previously discussed in the Project Documentation package. 1. CHW Supply Temp Reset is found in Section 140.4(k)4 but is only required if the chilled water plant does not have variable flow pumping (see Exception 1 under this section of the code). The chilled water plant does have variable flow pumping so this measure is NOT required by code. Therefore, implementing this measure exceeds the T24 code requirement. 2. Condenser water pump VFD is not required by T24 code. Only chilled water pump variable flow is required (see Section 140.4(k)6). In fact, condenser water pumps serving just water-cooled chillers is specifically called out as not being required by the code in this very section (see Exception 2 to Section 140.4(k)6). Therefore, we find that both of these measures actually exceed the T24 code requirements that were triggered by the installation of the new chiller.	The evaluator agrees Title 24 does not require VFD on all pumping, including condenser pumps which is not accurate. CWP savings should be reinstated. CHWP VFDs are present on current system and therefore CHW reset measure is eligible and should also be reinstated.

Comment #:	Entity:	DNV Site ID:	QUESTION or COMMENT:	Evaluator Response:
13	PG&E	PGE-20027	Summary: Commission Staff evaluator incorrectly applied Title 24 to reduce the savings for two measures that are actually better than standard practice (Title 24) for this facility. Title 24 specifically lists these measures as "Exceptions" not required to be implemented by code. PG&E requests that the CIAC evaluation team correct their findings and reinstate savings for this project.	
14	PG&E	PGE-20568	We believe this Custom project is eligible for the following reasons: 1. According to the SW Custom Guidance Document, determination of “permanence” (or “persistence”) of a measure as part of a Custom program is at the IOU’s discretion. In practice PG&E relies upon DEER guidance to determine the appropriate EUL values. This measure will persist in the exact same manner as the deemed platform measure SWLG009-1. The SWLG009 measure is currently on its fourth revision and remains an eligible deemed statewide measure with a EUL of 5 years. a. Effective useful life (EUL) is an estimate of the median number of years that a measure installed through a program remains in place and operable. b. The workpaper uses an EUL of 5 years for all permutations. If impermanence of the measure is acceptable in the Measure Package for the deemed measure, why is it not acceptable for a Custom program that relies upon the same body of evidence? 2. PG&E approved the project with knowledge of the prior EM&V studies on this technology and the previously approved workpapers. We trusted that the CPUC evaluation teams evaluated the measure permanence as reflected in the DEER EUL. PG&E approved the project with confidence in the CPUC EM&V review process dispositions and workpapers. If we should not trust in these EM&V studies, please advise us what we should have done instead. Excerpt from the SW Custom Guidance Document Page 43. Persistence: Measure life is a function of equipment life and measure persistence. Equipment life is the number of years that a measure is installed and will operate until failure. Measure persistence takes into account business turnover, early retirement of installed equipment, and other reasons measures might be removed or discontinued. [emphasis added]	The SW custom manual requires that installed measures are permanent. This requirement has existed since publication of EE Policy Manual V 2.0. Staff guidance of this requirement is that installation of a measure should not be easily reversible to qualify as a permanent measure. A screw-in bulb or pin-based bulbs that do not require any other modification for installation are considered reversible; therefore, not eligible for custom programs. Savings persistence and EUL are not relevant for this perspective otherwise screw-in bulbs would also qualify for custom programs but they do not. This measure is likely acceptable as a deemed measure which is not permitted to offer custom incentives when packaged together with other custom measures in a custom project. No change is necessary to the zero-saver determination.

Comment #:	Entity:	DNV Site ID:	QUESTION or COMMENT:	Evaluator Response:
14	PG&E	PGE-20568	The measure life assigned to the deemed workpaper is based on the evaluation of the technology from previous EM&V studies. This EUL should be applied to the TLED technology consistently. Principles of public evaluations require that Commission Staff evaluator apply consistent EUL values based on technology from previous EM&V studies, therefore PG&E requests the evaluation team to reinstate the eligibility of this project and correct the life cycle savings for this project and any other projects that were “zeroed” due to claimed impermanence of the measure.	
15	PG&E	PGE-21286	We believe this Custom project is eligible for the following reasons: 1. The 100hp threshold is not a CPUC guideline as stated in the Evaluator Assessment, rather it is the maximum horsepower eligible for the deemed measure H148 (under 100hp fans are eligible for the VFD deemed rebate). However, this measure is to install VFD's on the exhaust fans in order to reduce the lab air change rates (ACH) which provides savings at both the exhaust fan as well as the supply fan. The deemed rebate does not take this into account and only applies the savings to the exhaust fan energy usage. PG&E, therefore, does not believe that the deemed measure is applicable considering the full scope of this measure. 2. The rebate catalog in 2016 (timeframe when this project was originally approved) specifically states that Universities are excluded from the deemed HVAC Fan VFD rebate. See attached rebate catalog also represented in the figure, below. Therefore, even if the deemed measure captured the full scope of the project, the project could not be processed as deemed because the customer was not eligible. When a customer is not eligible for a deemed measure, that means the customer can pursue the measure through the Custom program, provided the Custom program requirements are fulfilled. PG&E requests that the commission staff evaluator revise the findings and conclusions for this project and reinstate this project’s savings. PG&E requests that the evaluation team look through their records and identify any other projects in the evaluation sample that may have been incorrectly characterized as ineligible due to a misapplication of deemed program rules to Custom projects.	According to the 2015 SW Custom Program Manual, VFDs installed on HVAC fans driven by motors with less than 100 HP capacity are ineligible. The statewide manual does not exempte labs from this requirement. Further, the agreement signed in 2015 required measure installation within a year. No extensions of the installation period were granted annually until 2018 when the agreement was already invalid. For these reasons, this project remains a zero saver. Evaluators are concerned about savings claims from dated projects that merely extend the project completion deadline repeatedly without updating the baseline conditions and/or applying then current CPUC and program policies.

16	PG&E	PGE-21301	PG&E does not agree with the Evaluator's recommendation to disqualify this project or "render it ineligible" through the CIAC evaluations based on "the lack of approved extensions between 2017 and 2020." The evaluator's understanding of the circumstances around the events for this project and the program rules for TEEger exception process is not entirely complete or accurate. Custom projects can have a 1-year extension after the first year (after the approval date) without going through the formal exception process. Program staff in our Application Management and Program Management (AMPM) team can grant extensions without further review or approvals when they have knowledge that the project is still planning to be installed. After 2 years from the approved for installation date formal extensions through our TEEger process are required to prevent Energy Insight from prematurely auto-withdrawing the project. This date is mischaracterized as an "installation deadline" rather than as a risk-management tool that, in part, helps to prevent zombie projects. This project was still in the implementation phase when it was unintentionally auto-withdrawn from Energy Insight and this triggered the PG&E account rep to submit the first extension request to both reopen and extend the project. PG&E performed a review of the project to determine if the measure is still valid and verify that there were no other reasons to disqualify the project and reinstated it in November 2020 after a formal TEEger request. That auto-withdrawal situation over the brief gap of time between June-Nov 2020 does not render the project ineligible. Timeline of Events: • Signed Application Uploaded: Oct. 2017 • RCx Investigation (Project Development) & Project Technical Review: Oct. 2017 – June 2018 • Project Approved for Installation: 06/11/2018. • Project Auto-Withdrawn by Energy Insight: 06/12/2020. • 1st Project Exception (Un-Withdraw Project & Extend) Requested: 08/27/2020. • 1st Project Exception (Un-Withdraw & Extend) Approved: 11/24/2020. • Project Stage Rolled Back from Withdrawn to Approved for Installation: 11/30/2020. • 2nd Project Extension Approved: 8/5/2021. • Project Closed & Paid: 9/27/2021. PG&E requests that Commission Staff evaluator revise the findings for this project to reflect that it remains eligible and restore the projects' savings. Also, we would like the evaluation team to take a second look at their review process for timeliness and confirm that all projects that were characterized as ineligible due to lack of risk-management	Lack of sequential extensions before the expiration of the due date renders this project ineligible. We note that typical customer agreement in PG&E's custom programs requires extension requests to be initiated 30 days prior to the expiration of an approved installation date. We suggest that PG&E align its risk management process with provisions in the customer agreement. Evaluators are concerned about repeated project extensions without updating baseline data and applying then current CPUC and program policies. We suggest that PG&E include a description of its project extension practices in response to data requests on program manuals or comments on evaluation work plans.

Comment #:	Entity:	DNV Site ID:	QUESTION or COMMENT:	Evaluator Response:
			follow-up (TEEger review) are using the correct date. It is the “approved for installation date” that is the start of the 1 or 2-year countdown (4 years for Savings by Design whole-building projects) and it the TEEger exception is required after the second year.	
17	PG&E	PGE-20035	Departed Load customers who pay PPP on their departed load are eligible for EE incentives, capped based on the departing load on which they pay PPP charges. There is no requirement to be purchasing energy from the IOU as long as they are paying into PPP fund. In Decision (D.) 10-02-003, the CPUC stated that “because savings from direct access customers are included in IOU energy savings goals, such customers are eligible for energy efficiency incentive payments from IOUs. IOU energy efficiency incentive payments to direct access customers are capped based on the departing load on which they pay public purpose charges.” (D. 10-02-003, p. 2). While it is not a requirement for departed load customers to participate in EE programs, PG&E has determined that grid impacts of EE projects at the Customer site are equivalent to projects at sites that are directly connected to the grid due to the fact that the power plant that serves the Customer maintains a constant load. Therefore, any energy saved at the site will result in additional energy available on the grid. As with projects at sites directly connected to the PG&E grid, this excess energy is available for purchase by PG&E which saves customer costs by avoiding the requirement to purchase energy from more expensive resources. Based on the CPUC Decision the evaluators conclusion on eligibility appears to be in contradiction to CPUC policy. PG&E requests that Commission Staff revise the characterization of this project to eligible and reinstate the savings it has achieved.	It is correct in accordance with the 2019 Statewide Customized Offering Procedures Manual for Business, customer paying departing load fees for which the utility collects PPP surcharges are eligible for incentives. This customer is an "over the fence" customer as energy transported is not through the IOU grid. From the early opinion document titled "EO Request Direct Access with PPP_CPUC staff response", to qualify for EE incentives, the applicant must be a PG&E customer paying PPP. This entity is not a PGE customer as their fuel is purchased from a wholesaler and are disconnected from PG&E's grid. Please see the early opinion document for more information.

Comment #:	Entity:	DNV Site ID:	QUESTION or COMMENT:	Evaluator Response:
18	PG&E	PGE-20008	Different from the evaluator's analysis, PG&E's post-collection data supported a small amount of savings at the HXs. The evaluator's claim that "normalized post steam production data was found to be greater than the normalized pre period" suggests an NMEC approach in their analysis, which is concerning with regard to its accuracy, given that this project only delivered ~4.5% site level savings. Additionally reduced post COVID occupancy has substantially reduced persons, lighting levels, and appliance loads that produced much less internal heat. PG&E requests that the analysis approach be consistent with ASHRAE Guide 14 and IPMVP statistical requirements, taking into the usage changes associated with occupancy reduction as established in the COVID memos (P Skala Response to PAs COVID Proposal for custom projects.pdf and PA Proposal For Reporting COVID Affected Projects_v4_2020.pdf).	As documented in the CCT, the applicant's baseline used data reported from 2015 which is outdated, and reported increased steam production compared to the recent years prior to the project (2018-2020). For comparison, 2015 reported 14,078 Mlbs of steam while 2018-2020 showed an average of 12,280 mlbs. Using 2018-2020 data would have been a more appropriate baseline to document savings. This was something that was confirmed with the customer. CPUC guidelines require the projects to be evaluated based on as found conditions consistent with the PY2019 CIAC evaluation and previous CPUC custom evaluations. Additionally, this project was evaluated in fall 2022 with no COVID impact. Even when just considering steam production in 2022 however which is post covid, the steam production is still greater than the baseline period after normalizing to HDD. This indicates there are no savings associated with the project as the facility is using more steam than the baseline period. Therefore, this remains a zero saver.
19	PG&E	PGE-20040	This project was a New Construction project and regulations allow only the use of fine bubble diffuser systems. There were no other technologies presented that would meet the regulatory requirements, making a fine bubble diffuser system the standard practice technology by default as described in the ISP Guidance Document. However, there is more than one type of fine bubble diffuser system available on the market. A less efficient and less expensive fine bubble diffuser system available on the market was used as the standard practice baseline compared to a more efficient, and more expensive fine bubble diffuser system used as the measure case. Both fine bubble diffuser systems (baseline and measure case) would meet the customers and regulatory requirements. This was discussed in the ISP assessment provided in the project package. According to the June 5, 2017 HDR study; “PRJ - 01148125 Existing equipment comparison-CONFIDENTIAL”, (provided in the project package) a hybrid of the existing system paired with a smaller fine bubble diffuser system would have satisfied the regulatory requirements, and been the less expensive and less efficient option. PG&E requests that the CS revise the site report and reinstate savings for this project.	This ISP by BASE Energy compares 2006 common practice technologies with 2016. In 2006 the common practice was coarse bubble diffuser whereas fine-bubble diffuser was standard practice in 2016, which was the technology the customer installed. In the document, "PRJ-01148125 Existing equipment comparison-CONF.pdf" two alternative options were presented, existing mech. aeration and fine bubble aeration. The BASE ISP study clearly states that as early as 2016 fine bubble diffuser became standard practice and ultra-fine bubble aeration system is the energy efficient option. There is no hybrid option that could qualify as an ISP where the ISP study has clearly established fine bubble as ISP. CPUC policy requires that standard practice and proposed measure meet functional, technical and economic requirements of the customer. Hence, this project remains a zero saver.

20	PG&E	PGE-20552	PG&E recommends that the project savings be zeroed-out for the PY 2020-2021 claim because PG&E finds that the project savings were not eligible due to late submission of documents of a 2019 project. We submit this response because we do not agree with CS evaluator's stated reasons for being ineligible and to illustrate the appropriate treatment of deadlines for similar projects. The program direct-install implementers use a prepayment structure where the implementer pays (or floats) an incentive payment directly to the lighting contractor that is fungible upon installation. When complete the implementer then requests payment from PG&E pending post-install project review. The prepayment structure is vital to Direct Install programs as well as small/medium-sized customers because it reduces the time that it takes to get energy efficient equipment installed, reduces the project cost to the customer (co-payment amount), and reduces the time it takes contractors to get paid for their work. All of these features make the program approachable to both customers and contractors performing these small jobs, a market that would otherwise go without the energy efficiency benefits that the program delivers. However, the implementer submitted the project late. The project was installed on 5/29/2019, but the project files were not completely submitted to PG&E for post-install review until 3/17/2020, approximately two months after the PY 2019-2020 claim was submitted. Custom measure code CLA48 (LED T8 Type A lamps) was an eligible measure through the custom and custom-lite (direct-install and downstream) program channels up until 11:59 pm on 3/29/2020 and winding down with the introduction of deemed measure code LT538 (LED T8 Type A lamps) which was effective starting 1/1/2020, but did not officially launch as a deemed measure until 12:00 am on 3/30/2020, so PG&E's CRM tool (Energy Insight) was not able to automatically flag this project and the project subsequently did not get sampled for internal technical review nor CMPA ex-ante review. Furthermore, implementers were instructed to use deemed values in new custom project submissions starting on 12/16/2019, as well as using new 145 lumen/watt minimum LED efficacy; the efficacy of the project's installed LED lamps (128 lumen/watt) do not meet the efficacy that was effective beginning on 12/16/2019. PG&E resolves that the energy savings would have been eligible for PY2019-2020 if project documents were submitted to PG&E in 2019, and due to the end of year changes to CLA48 in 2019 and the late submission of the project, this project should not have been eligible for the PY2020-2021 claim. PG&E will notify the program	This project installed Type A TLEDs in existing T8 ballasts, which was a deemed measure effective 1/1/2020 (Disposition for Workpaper SWLG009-01 dated August 13, 2019.) Under custom rules a custom project cannot claim only deemed measures. The evaluator welcomes PG&E's acknowledgement that the project savings should remain zeroed-out. Regarding PG&E's request that the evaluator review other projects for eligibility: 1. PG&E is correct that there is a 60-day "eligibility window" for measures. Specifically, D.15-10-028 states (p102): "To address concerns about market certainty while we consider the potential for additional process changes, we will allow any similar projects with a signed project agreement or project application that occurs within 60 days of the staff disposition that modifies the ex ante value, to utilize the prior ex ante savings estimate for those qualifying projects. In other words, projects with signed agreements or applications that occur within 60 days will be "grandfathered" and allowed to utilize prior ex ante savings estimates." The 60-day period starts on the date of the ED Decision, or the date when the measure becomes effective, *whichever comes first*. 2. For SWLG009-01 the Decision is dated August 13, 2019, and states Type A TLEDs will become a deemed measure effective January 1, 2020. The date of the Decision (August 13, 2019) pre-dates the effective date (January 1, 2020), meaning the 60-day "window of eligibility" closed October 12, 2019. Any projects with agreement date after October 12, 2019 would have to acknowledge SWLG009-01, unless the Type A TLED measures were installed in 2019, i.e. before the effective date of the Workpaper. The Modified Lighting Calculator MLC v.12, dated December 20, 2019, no longer included measure CLA48. 3. Based on the data uploaded by the PAs to CEDARS: All 2020-2021 evaluated CIAC Lighting-Only projects have reported installation dates from 2020 or 2021. All but one evaluated project (not from PG&E) have reported agreement dates from 2020 or 2021. There does not appear to be cause for concern that any lighting projects claiming Type A TLEDs may have been unduly zeroed out based on the "eligibility window" stipulated by D.15-20-028.

Comment #:	Entity:	DNV Site ID:	QUESTION or COMMENT:	Evaluator Response:
			implementer of the findings and develop a remediation plan so that this does not happen in the future. However, based on the small savings and incentive ($114) that was erroneously paid out, PG&E does not find it financially sound to pursue recourse claw-back of the incentive. It would be much more costly Supporting evidence of above statements are provided below: 1. PRJ - 02326830 Application - CONF.pdf – Evidence of customer signature (3/28/2019) and beginning of project pipeline. 2. PRJ - 02326830 Project Proposal - CONF.pdf – Evidence of continued engagement (5/29/2019) with customer. 3. PRJ - 02326830 Invoices - CONF.pdf – Evidence of installation date (5/29/2019). 4. PRJ - 02326830 EI Project Page - CONF.pdf – Evidence of late project submission (3/17/2020) and PG&E payment date 3/20/2020. 5. PRJ - 02326830 Newsletter EE_Update_12-06-2019.pdf (newly supplemented document) – Archived newsletter from PG&E informing implementers of 2019 end-of-year changes to CLA48, including using deemed values and updated LED efficacy as of 12/16/2019. 6. PRJ - 02326830 LT538 Replace CLA48 - PGEwiki.pdf (newly supplemented document) – Archived communication of announcement of 3/30/2020 launch date of LT538, replacing CLA48. 7. Deemed Measure Code LT538 effective dates (for Assembly Building Type and CZ01) listed in Energy Insight: 8. Custom Measure Code CLA48 effective dates listed in Energy Insight: PG&E requests the evaluation team to review other sample project and identify any other projects or measures that were incorrectly characterized as “not eligible” due to a misunderstanding of this 60-day window of continued eligibility, which was approved by Commission Staff Custom Project Review team for other projects in a similar predicament, i.e., caught at the end of the eligibility window.	

21	PG&E	PGE-21324	This project was selected for Custom Project Review (CPR) and rigorously reviewed by the CPUC ex-ante review team. In fact, the CPR evaluation team reviewed all aspects of project eligibility including the calculation and M&V method. The CPR disposition, “PGE_19_C_C_261_P–J - 01992991_HVAC_Disposition.xlsx” accepted the calculation method including the specifications of the measure case filters. The CPR team did not disqualify the project and in fact they approved it with two exceptions related only to data transfer to the bi-monthly list. It is true that the face velocity for HVAC systems varies to meet the demand of the space being served which results in a variable pressure drop across the filter depending on face velocity, and the project savings calculation approach does account for this effect, as follows. The face velocity is estimated based on the performance graphs in the manufacture specification graphs provided in the project package. The curves are shown in the post-installation review documents and calculations files (below) that were submitted as part of the CIAC evaluation. 1. PRJ - 01992991 Post Phase 4 Calcs.xlsx 2. PRJ - 01992991 Post Phase 3 Calcs.xlsx 3. PRJ - 01992991 Post AC 1 and 2 Calcs.xlsx See the “Post Savings” calculations tab. Below is a screenshot showing the FPM vs static pressure from the manufacturer specifications. These values can be found in the specifications for the existing and proposed filters which were already included in the CIAC project package in the following files: 1. PRJ - 01992991 AmAir AstroCel I Filter.pdf 2. PRJ - 01992991 AmAir CE Carbon Filter.pdf 3. PRJ - 01992991 AmAir Perfect Pleat Filter.pdf 4. PRJ - 01992991 AmAir Varicel VXL Filter.pdf 5. Camfil Hi-Flo ES Filter.pdf 6. Camfil Durafil ES2 Filter.pdf 7. Camfil Dual 9 Air Filter.pdf . Consistent with the approved M&V approach, the achieved more efficient filter operation was demonstrated through pictures of the existing and proposed system operation as required for low rigor projects with less than $25,000 incentive. The photos are located in the following zip archive that was in the CIAC project file, “CPR261 Post WorkOrders-CONFIDENTIAL.zip.” This file contains the before and after photos of pressure measurements for the air filters. These can be used to estimate face velocities based on the manufacturer’s specifications provided in the project package.	For new technologies such as this, the PA is required to collect sufficient data to accurately represent baseline conditions and post period operation. To calculate the savings accurately there are several parameters that must be monitored and taken into account. The readings at the pressure gauge across the filter are dependent on several other parameters such as the system airflow rate, dust loading, and age and condition of the air filter. The pressure readings in the "CPR261 Post WorkOrders-CONFIDENTIAL.zip" represent only one snapshot of base and post operating condition and were reported without documenting those other parameters. Therefore, the documented differential pressure does not represent the like-for-like comparison of the filters’ operation; hence, could not be used -as is- for accurate savings calculations. As the filters compared here are used in variable air volume systems, they are likely to offer dissimilar differential pressure drops at different conditions. Furthermore, their pressure drop profiles change at different stages of their service lives. If the EMS trends for the pressure drop are not available, it is incumbent on the PA to document the differential pressure, face velocity, airflow rates at different points of both filters service lives to develop the pressure drop characteristics of both filter systems. Such characteristics curves, when compared side-by-side, shows energy efficiencies at different stages of filter service lives and other non-energy benefits the proposed filters may provide. The onus is on the PAs to collect adequate baseline and performance period data that account for major uncertainties and include an M&V plan to update savings to reduce those uncertainties. Given the lack of relevant data that address major uncertainties associated the savings claims, we still deem this measure as not having a basis to make a claim for energy efficiency improvement; therefore, it is ineligible. Evaluators recommend that PG&E consider filing a workpaper and providing a deemed rebate if site-specific savings assessment is likely to be more rigorous in relation to the magnitude of savings.

			SW Custom Project Guidance Document v1.4, states on page 43: Measurement and Verification (M&V), as distinguished from Evaluation, Measurement & Verification, M&V refers specifically to the process of quantifying measure- or project-level energy and cost savings resulting from improvements in energy-consuming systems. The effort required and rigor achieved from M&V should be commensurate with the project capital investment and savings risk.91 91 U.S. Department of Energy, Federal Energy Management Program, November 2015, M&V Guidelines: Measurement and Verification for Performance - Based Contracts, Version 4.0, p. 2-1. The M&V Guidelines: Measurement and Verification for Federal Energy Projects also states: The use of stipulations is a practical, cost-effective way to reduce M&V costs and allocate risks. Stipulations used appropriately do not jeopardize the savings guarantee, the customer's ability to pay for the project, or the overall value of the project to the customer. [] Risk is minimized and optimally allocated through carefully crafted M&V requirements, including diligent estimation of any stipulated values. US DOE, M&V Guidelines Version 4., page 3.1. [Sentence omitted for clarity] The CPUC EM&V process is used to evaluate, monitor, measure, and verify performance or other aspects of energy efficiency programs or their market environment in order to determine accurate impacts on the IOU grid. The CPUC's Energy Division has management and contracting responsibility for estimating savings impacts for purposes of calculating savings claims. All documents were provided the evaluation team and CPUC Energy Division ex ante M&V process was followed. Expecting a different M&V approach than the CPUC ED ex-ante team approved for the project does not follow the best practice of evaluation and unfairly burdens the project development team with new requirements long after it is too late to do anything about them. The ex-post evaluation team simply zeroed-out the savings instead of doing the monitoring to true-up the savings claim. Zero savings is not a more accurate estimate of the grid impacts produced by this project. If the evaluation team had visited the site or employed a virtual site visit approach, they could have easily improved upon the savings estimate and verified that the measure case filters were still installed, which would have been over 2 years after installation. The ex-post team could have taken photos of the pressures for each air handler as the PA implementer had done in the POST for this project. Since	

Comment #:	Entity:	DNV Site ID:	QUESTION or COMMENT:	Evaluator Response:
			there would have been post-install data over a representative period of time, the ex-post team could have collected this data to simply cross-check the parameters used in the calculations provided in the CIAC documentation project package. Consistent with past ex-post evaluation studies of Custom programs, those data would have been required, and if collected, those data would have given a more accurate estimate of energy savings for the evaluation to true-up the savings claim. According to the best practice of evaluation studies, the point in time when Commission Staff has the ability to revise the M&V plan was during the ex-ante (CPR) process. PG&E requests that Commission Staff evaluation team revise the disposition for this project based upon prior Commission Staff Custom Project Review approval and PG&E's comments to the savings actually achieved and approved by the CPR review team.	
22	PG&E	PGE-20114	After reviewing Commission Staff evaluator findings, PG&E finds this project should be eligible as a custom project for the following reasons: 1. The project pre-review was completed by CIT on 9-5-2019 and selected for Custom Project Review (CPR) on 9-24-2019. 2. CS completed ex-ante review (CPR) on 12-3-2019 issuing a favorable disposition in PGE_19_T_I_285_ICASE1009_CompAir (see attached) concluding that the Project is approved with exception. The disposition comment (exception) is: The EUL for this project should be the lesser of the measure EUL or the host equipment RUL. The measure EUL is specified as 15 years. Although DEER does not specify an EUL for compressed air systems, we believe an EUL of 15 years is appropriate based on a review of industry-specified EULs for compressed air systems. This would put the host equipment RUL at 5 years (1/3 host equipment EUL). Please update the measure EUL accordingly or suggest a more accurate measure EUL. 3. A message was sent to the implementer on 12-3-2019 stating the project is approved with exception and asking for the measure EUL to be updated accordingly or suggest a more accurate measure EUL.	We were not provided an updated EI page that showed the implementer was told about the CPR approval, and PG&E did not provide any evidence that the customer was approved to order equipment. The documentation we were provided showed an "approved for installation date" of 01/03/2020 for approval. Regardless, this project is still a zero saver due to the other response indicated in the final site report: "The customer confirmed that their facility was not going to be able to meet the compressed air demands for 2020, and they were in the middle of evaluating the need for an additional 250 HP compressor. AOE requires that the existing equipment meet the requirements of the facility, which this project would not."

Comment #:	Entity:	DNV Site ID:	QUESTION or COMMENT:	Evaluator Response:
22	PG&E	PGE-20114	4. The equipment was ordered/purchased on 12-19-2019 which is after the implementer was told the project was approved by Commission Staff. (see "chatter" screen shot from EI showing the date posted. Disposition file included: PGE_19_T_I_285_ICASE 1009_CompAir_Disposition.xlsx). 5. Invoice date (screen shot): 6. Since the equipment was purchased after the project was approved by CS, the project savings should be eligible. PG&E requests Commission Staff evaluation team to revise their findings and reinstate the achieved project savings.	
23	PG&E	PGE-20614	This project was previously reviewed by PG&E Engineers and Commission Staff (CS) determined was "approved without exception" after selection from the bi-monthly list. We believe this project should be eligible as a custom project for the following reason(s): CIAC Commission Staff review findings, in a nutshell, state that the project is ineligible either because it's claimed to be mischaracterized as an Add-One Equipment, or because it would have zero savings as a Normal Replacement type of project. Since the project was "approved without exception" by Commission Staff ex-ante (CPR) evaluators on 6/17/2020, (Disposition "PGE_20_T_I_518_PRJ - 02367952_CompAir_ Disposition.xlsx" attached for convenience, previously provided) whatever findings made during the ex-post evaluation cannot reverse a prior evaluation determination of eligibility. Multiple engineers reviewed the project during the project development phase and none of those engineers identified the issues in the ex-ante evaluation findings as issues that would warrant a negative determination of project eligibility. According to longstanding evaluation rules, shortcomings found by the ex-post evaluation team may not contradict the ex-ante review findings. This was part of the agreement between the IOUs and CPUC when all parties agreed to the terms of the ex-ante review process. The same agreement also stipulated the approved projects should be granted a "1.0" gross realization rate. A change in the measure application type or a finding of insufficient EUL are all aspects of evaluation of the technical merits and eligibility of the project that are immutable once Commission Staff have released their findings. PG&E requests that CS revise the CIAC ex-post evaluation findings to reflect the fact that this project followed Custom program rules and the project's savings impact on the grid are real and remain as claimable savings.	The CPR review uses the documentation provided by the PA at the time of review. The documentation provided to the CPR team indicated that the AOE would improve the efficiency, and that the individually controlled compressors was not optimal, but it did not indicate that the existing system wasn't meeting their load and that the customer was looking into purchasing additional compressors to meet this load. If this had been made clear to the CPR team, they would have determined that this project was ineligible for savings. The CPR review process has stopped approving claimable savings for a long time now which was the basis for allowing the PAs to claim a 1.0 GRR. Unfortunately, the fact that CPRs do not recommend claimable ex ante savings has not been reflected yet in a Commission decision to lower the default GRR for CPR-reviewed projects in line with the default GRR for custom projects. It has been a long-established practice for ex post evaluations to change the findings of CPR reviews when new and additional information is available. PG&E had raised this point during the webinar on the 20-21 workplan and staff had answered that question as stated above.

Comment #:	Entity:	DNV Site ID:	QUESTION or COMMENT:	Evaluator Response:
24	PG&E	PGE-21292	An exception titled "8 IRCx Projects Exception Approved.pdf" (previously provided, included here for convenience) was approved August 2020 to extend this projects deadline to June 2021. This project is identified as IRCx 120 in the exception file. The exception justifications to extend the deadline is as follows: "IRCx 120: Customer wanted to close IRCx 129 first and then work on IRCx 120. The IRCx 129 was closed in Dec 2018. IRCx 120 could not receive funding in 2019. The project received the funding last month. The Purchase Order (PO) is being issued to a contractor." PG&E looked for the root cause of the confusion associated with the review and approval timeline for this project. This project started in 2017 and the pre-installation tech review was complete in 2017. The project then was dormant because the program ran out of incentive funds. The program contract was extended allowing the implementer to revive the project. The project went back into project development stage in 2019, and without a review of the tech review findings, it proceeded to approved for install in Sept. 2019. The new project with a new identifier (IRCx 120) was first approved for an extension in 2019 project with 2020 completion deadline. Due to unknown causes the project was not ready to claim in 2020, and so the project manager granted an extension to 2021. June 10, 2021 was first time the project required an exception that was granted. The cause of the confused dates and completion deadlines is that our CRM system (Energy Insight) had a bug that did not appropriately blank-out the prior tech review completion deadline when the stages were rolled-back. Changing stages messed-up the internal logic and prevented us from identifying the need for a Tech Review. RCx projects suffer from eligibility due to slight changes. The project was impacted by COVID-19 pandemic. The CIAC evaluator comments focus on "why was it sitting since 2017" and then extended. The project deadlines are primarily a risk-management process that, in this case, did not work as expected, so any rule violations were a symptom of the confused dates and internal workflow logic. PG&E requests that the CS evaluation team revise the project findings to be eligible and reinstate the savings.	Project documentation did not show annual approval for extension. Also, it is unclear what the baseline conditions were prior to installation of the measure. The calculations and data for the baseline conditions are based on 2016 data, which is 4 years before the project close out. This project still remains a zero saver due to lack documentation for supporting the installation extension.

Comment #:	Entity:	DNV Site ID:	QUESTION or COMMENT:	Evaluator Response:
25	SDG&E	SDG-60095	Project “SDG-60095” was considered a controls project since the detention facility had strict requirements that all doors must close and lock shut. The major challenge at the detention facility was over pressurizing rooms. If a room was over pressured the door between the rooms could remain open which would not allow the door to close, and lock shut. If a door would not shut and lock, an inmate could potentially escape from that room. The VFD’s on the supply fans and return fans were used to control the differential pressure in the rooms to ensure the doors would always close and lock shut. To implement the energy efficient measure, a generic thermostat response was not adequate and required significant additional controls. For this reason, this project did not qualify for a HVAC DEEM measure and therefore qualified for the EEBI calculated incentive method. The statement in the custom guide is to emphasize “if a project qualifies for a DEEM measure it must use the DEEM savings”, since this project did not qualify for a DEEM measure, it is eligible for the Custom approach.	According to 2019 Statewide Customized Retrofit Procedures Manual measure eligibility rules, VFDs on HVAC fan motors less than 100HP are not eligible for incentive. Therefore, this project remains ineligible and will not receive any evaluation savings credit. Exceptions to this requirement should be clearly listed in the statewide manual. We note that demonstrating claimable custom savings for small savers could be perceived as an intensive effort. Please refer to the Table1-5 of the following manual for list of ineligible measures. https://www.pge.com/pge_global/common/pdfs/save-energy-money/facility-improvements/custom-retrofit/Customized-Policy-Procedure-Manual_2019.pdf
26	SDG&E	SDG-60035	Project "SDG-60035" is a Whole Building, SBD project that was contracted in Nov 2019. The Savings By Design Participant Handbook outlines eligibility of projects based on a uniform “statewide” criteria of the building code, Title-24, Part-6. This uniform approach compares all submitted energy saving New Construction projects using the same “standard” without regard to the many differing rules of each local jurisdiction within the state. Energy modeling software used for this comparison is EnergyPro, which applies the statewide Title-24 ruleset using the DOE-2.1e calculation engine. All energy saving New Construction projects approved for the SBD program are compared, approved, reconciled, and have incentives paid using the output (UTIL-1) of EnergyPro. Very few energy saving New Construction projects have been approved using other Title-24 based software with the UTIL-1 output. There is no requirement in the SBD program to enforce a variable set of standard baselines based on a specific locality or “enforceable building code”, as this would introduce various results and inequitable comparisons for similar projects. This eligibility criteria is “parallel to”, but not “part of” the permitting process; as we are regulated by the CPUC, not the CEC.	Savings By Design Program Policies clearly says the program to use California Energy Efficiency standard (Title 24,Part 6) as reference baseline for comparison. The program also allows to use industry standard as baseline where appropriate. This is a federal building and only international code can be used as baseline for this project which is neither Title-24 nor industry standard practice. Therefore, this project still remains ineligible per SBD rules and no savings will be credited for this project.

Comment #:	Entity:	DNV Site ID:	QUESTION or COMMENT:	Evaluator Response:
26	SDG&E	SDG-60035	Section 2.1 in the SBD Participant Handbook states "SBD uses the uses a CPUC-modified version of most current version of the California Building Energy Efficiency Standards (Title 24, Part 6) as a reference baseline for comparison ... ; and when appropriate, uses other industry standards to determine reference baselines for comparisons." That being said, the evaluators comment of "Inappropriate baseline – This is a federal building with international codes as applicable baseline and not Title 24. This facility does not qualify under SBD's program elig	
27	SCG	SCG-40008	SoCalGas believes that there are no material gaps in the extension documents. These documents were provided in the initial data request and including project 40008 would positively impact SoCalGas' NTGR percentage. SoCalGas believes that this zero-saver project should be considered as acceptable, and the corresponding changes should be applied. The extension documentation package can be resubmitted to DNV to be considered and reviewed if needed.	This extension package was already reviewed and does not change the fact that the project is still in violation of the installation timeline eligibility criteria. This project remains ineligible and is a zero saver
28	SDG&E	SDG-60045	The forecasted 10,298 kWh savings were the estimated savings prior to project installation. After Post M&V package submitted in 2021 per M&V plan "10954908 MV Plan" the savings should be 18,130 kWh. SDG&E follows decisions D.04-09-060 and D.05-04-051, in which savings must be claimed in the year which a measure is installed. Evaluator may have used the early forecasted savings, but SDG&E Recommends using (forecasted) post-M&V savings result of 18,130 kWh, and review comments #5, 6, and 7 of this worksheet to re-calculate the evaluated savings for Project SDG-60045.	Gross realization rate is calculated by comparing evaluated savings to PA reported tracking savings. As SDG&E reported 10,298 kWh for this project in the tracking data, this number will be used as the denominator for calculating the gross realization rate (GRR) of this project. Therefore, the evaluators have calculated the GRR accurately. No change is warranted.
29	SDG&E	SDG-60045	SDG&E recommends the baseline model created by the evaluators shouldn't be used to calculate forecasted savings. Based on the M&V plan, SDG&E gave the contractor 3 months for commissioning after the controls were installed in 2019. The final date after commissioning was 01/13/2020. Evaluator used 2019 utility data to develop the baseline model, which covered the installation and commissioning months, so the baseline model for adjusting the savings is not valid. SDG&E recommends the evaluator does not use the 2019 data, but instead uses the M&V data. Please review the Post M&V package submitted in 2021, according to the M&V plan submitted as "10954908 MV plan." As noted in Comment #4, SDG&E had claimed 10,298 kWh, but the M&V savings showed 18,130 kWh and recommends that evaluators re-calculate to the M&V savings.	The evaluators have confirmed the baseline, installation, and post periods with the site contact. The evaluators removed 14 months -starting from the installation date- provided by the site contact to account for installation time, and an additional time to account for the time during which COVID regulations were in place. As evaluators, we deem the billing analysis model used for evaluation as appropriate since the site contact confirmed that no other projects occurred at the facility that could have impacted the facility's energy consumption, and also the reported project savings represented a considerable percentage of the annual energy consumption at the facility. Additionally, its a multi-measure project. Therefore, the billing analysis is more appropriate as it takes into account all interactive effects between the measures.

Comment #:	Entity:	DNV Site ID:	QUESTION or COMMENT:	Evaluator Response:
30	SDG&E	SDG-60045	Evaluator used 03/2021 to 01/2022 billing data for post-installation M&V model. As this billing period is 1 year post-installation, has the evaluator verified if any electricity consumption changed on site due to load, operation and occupancy changes during the 03/2021 to 01/2022 timeframe that could have resulted in billing increases?	As this is a third party independent evaluation, the 3rd party evaluator confirmed with the site contact that the facility's operation during this period was representative of the typical facility operation.
31	SDG&E	SDG-60045	SDG&E recommends CZ 2010 weather should be used for weather normalization for 2019 projects, not the CZ 2022 data. The CZ 2022 data was not available during the install of this project. Therefore, SDG&E recommends that CZ 2010 weather data be used, not CZ 2022 (which is consistent with Ex Ante guidance at the time). Weather corrected billing analysis had been done for both baseline and post M&V period in file “10954908 Burger Lounge GSE LLC Post M&V."	The evaluators will make the necessary revision and adjustments to ensure that CZ2010 is used for this project's evaluation
32	SDG&E	SDG-60040	SDG&E recommends to continue the use of RUL=7 and not RUL=4. Footnote 4 references a "vendor maintenance contract" of 4 years, not the life of any specific system/s. An RUL=4 is not valid, per the Audit Report by Lincus,Inc (screenshot below), the customer is required to maintain equipment and systems indefinitely, so they obtained a service contract. It is reasonable to expect equipment to last longer than a service contract term. MAT must be AR due to the facility requirement to maintain indefinitely. This program clearly influenced the customer to upgrade the system early to newer technology; therefore it is not NR.	The measure event type was changed from AR to NR based on CPUC policy which states that if the NTG ratio is less than 0.5 at the site-level, then AR may not be used, NR must be used. The most recent evaluator calculations are "DNV Evaluation Analysis - SDG-60040_FINAL Analysis_v2.xlsx".
33	SDG&E	SDG-60015	The tracking data discrepancy is a result of reporting timelines not aligning with post-installation M&V timelines. SDG&E follows decisions D.04-09-060 and D.05-04-051, in which savings must be claimed in the year which a measure is installed. In this case, installation occurred in 2020, however, post-M&V savings were not finalized until 2021. As a result, SDG&E had to report estimated savings values in 2020. Currently, there is no true-up mechanism for custom claims, and so the CIAC evaluation serves as the true-up. SDG&E welcomes further discussion on CPUC reporting requirements, particularly for custom projects that have extended post-installation timelines, as the data discrepancies can cause confusion for evaluators.	Thank you for the clarification. GRRs are based on claimed data as submitted to CEDARS. As such, no change to this project is warranted. We agree that further discussion is welcome.
34	SDG&E	SDG-60015	Evaluators calculated savings of 61,669 kWh divided by the SDGE post M&V data of 65,058 kWh (reported/claimed) which gives a GRR of 0.95. The evaluators incorrectly used the customer's estimated savings (in the application prior to installation) of 101,141 kWh to get an invalid GRR of 0.61.	Evaluated RR is based on evaluated savings divided by tracked savings, not the post M&V savings. hence, the GRR of 61%. We attributed the 37% difference to tracking data discrepancy (101,141 vs 65,058).

Comment #:	Entity:	DNV Site ID:	QUESTION or COMMENT:	Evaluator Response:
35	SDG&E	SDG-60047	SDG&E 's HOPPS RCx program has a three-year monitoring period and reports incremental savings claims each year. Evaluators verified that the customer's current operating conditions are different than the post-installation calculated conditions. However, the submitted project claim reflects the first-year claim only. Revised operating conditions will be captured in the year 2 and 3 evaluation periods. The HOPPs program reports the post installation 3 year evaluations separately, at the conclusion of each year. This project is a 3 year HOPPs project for which only year 1 has been completed and reported. This project is not complete, but still has 2 more years of IOU evaluation. Therefore, SDG&E believes that it is more appropriate for the evaluators to evaluate the year 1 claim using year 1 data rather than a future year's data for the evaluation.	Per the 2020/2021 CIAC Evaluation Workplan, for multi-year projects that have not had savings claimed in a previous year, savings are evaluated per the 2020 and 2021 work plan protocol. Workplan: https://pda.energydataweb.com/#!/documents/2629/view
36	SCE	SCE-30025	SCE's Response on Measure 1 – SCE disagrees with the assessment of this measure. At the IR stage, it was determined that the higher efficient fans were installed and rated at 1.5 HP. Although the installed fans have a slightly higher HP compared to the existing fans, this measure is still eligible for EE savings. The quantity of fans were reduced by more than half, decreasing from 208 to 100 fans. Installing less fans caused higher efficiency, more air ventilation, and a reduction of about 28% in power draw. In addition, the measure package SWPR001-01 covers ventilation fans up to 48 inches whereas, the installed fans in this project is a 50 inch fan. Therefore the project is not covered under the deemed must go deemed policy and should be allowed. SCE's Response on Measure 2: SCE disagrees with the assessment on Measure 2. The 2019 Statewide Customized Offering Procedures Manual for Business, on page 17 states " Variable Frequency Drives (VFDs) on HVAC fans < 100 HP" and falls under ineligible measures category. This statement was made was to avoid any overlapping with the deemed measure package SWHC018-01. In addition, the Measure Case in the measure package states "The measure case is defined as the installation of a variable speed drive (VSD) and associated controls on an existing constant speed HVAC supply or return fan." which is not the same as installing VFD on circulation fans in dairy farms, thus this measure package rules and 019 Statewide Customized Offering Procedures Manual for Business requirements does not apply to this installation.	M1: DNV is in agreement. The evaluated SCE GRR and NTG will be applied. M2: According to 2019 Statewide Customized Retrofit Procedures Manual measure eligibility rules, VFDs on HVAC fan motors less than 100HP are not eligible for incentive. Therefore, this project remains ineligible and will not receive any evaluation savings credit. Exceptions to this requirement should be clearly listed in the statewide manual. Please refer to the Table 1-5 of the following manual for list of ineligible measures. https://www.pge.com/pge_global/common/pdfs/save-energy-money/facility-improvements/custom-retrofit/Customized-Policy-Procedure-Manual_2019.pdf

Comment #:	Entity:	DNV Site ID:	QUESTION or COMMENT:	Evaluator Response:
37	SCE	SCE-30032	SCE's Response on Measure 1 – SCE disagrees with the assessment of this measure. For savings calculations, the baseline thrust and fan thrust efficiency values were taken from Workpaper PGE3PAGR117 R8 - Ag Ventilation Fans which were approved by CPUC at the time in the stated workpaper. In addition, Section 2.1.2. Installed case thrust and fan efficiencies were taken from the fan specification sheet. Baseline and installed case fan efficiencies were compared to the workpaper and specification sheets and were confirmed.	Thank you for your comments: Measure 1: Since the ISP for this study was not clearly defined, DNV performed an ISP study for a similar barn fan project where we reached out to the vendor for that project and performed market research to understand market trends. Through this work we found the alternative option to install smaller, standard efficiency fans to meet facility requirements – so a larger quantity of smaller fans to meet air flow requirements. ISP in this case does not need to be dictated by the size of fan, but the feasibility of the options to meet facility requirements. We have chosen ISP fans which are represented by the lower quartile of efficiency from BESS lab data. No change is warranted.
37	SCE	SCE-30032	SCE's Response on Measure 2: SCE disagrees with the assessment on Measure 2. The 2019 Statewide Customized Offering Procedures Manual for Business, on page 17 states " Variable Frequency Drives (VFDs) on HVAC fans < 100 HP" and falls under ineligible measures category. This statement was made was to avoid any overlapping with the deemed measure package SWHC018-01. In addition, the Measure Case in the measure package states "The measure case is defined as the installation of a variable speed drive (VSD) and associated controls on an existing constant speed HVAC supply or return fan." which is not the same as installing VFD on circulation fans in dairy farms, thus this measure package rules and 019 Statewide Customized Offering Procedures Manual for Business requirements does not apply to this installation.	Measure 2: Per the 2019 Statewide Customer Offering Procedures Manual, VFDs on HVAC fans of less than 100 HP are ineligible.

Comment #:	Entity:	DNV Site ID:	QUESTION or COMMENT:	Evaluator Response:
38	SCE	SCE-30084	SCE Response to Measure 1 - In the submitted IR calculations workbook ('Post Calcs' tab), the baseline energy consumption was normalized with respect to flow to reflect post-install flow rates (obtained from pump tests conducted in Oct 2020). Furthermore, baseline power (hp) (Cell: AF9) is calculated by dividing baseline hydraulic power and most recent Overall Plant Efficiency (OPE) from the 2020 pump test results (Cells U9: U15). Please note that only pumps #2, 3, and 5 were overhauled between the 2015 and 2020 pump tests. Pump#1 and 4 were not overhauled and to calculate baseline energy consumption, more efficient OPE from 2015/2020 tests were chosen for pump#4 to be conservative. Please note that the CCT comment is listed under Measure 2 (pump #3 overhaul) which was already declined in the IR Tech Review Form and in iEnergy. As for its relevancy in Measure 1 (pump #4 VFD), IR calculations workbook does show the 2015 baseline being adjusted using the post-install operating efficiency and post-install flow rate as describe above. SCE Response to Measure 2 - The post-install approved project scope only includes pump #4 VFD (measure 1). The calculated post-install annual energy consumption of the entire pumping system does not account for pump #3 consumption as pump #3 was not operational during the post M&V period. Refer to post M&V data ("Post Install M&V Data" tab of IR Calculations Workbook) for more details. Therefore, any savings obtained from the pump #3 overhaul is not captured in the post-install energy consumption. Thus SCE disagrees with the evaluator's statement that the applicant bundled the pump #4 VFD (measure 1) and the pump #3 efficiency improvement measure (measure 2) as one.	While it is true that the IR calculations workbook does not include metered pump kW data for pump #3 in the post-install usage kWh, the baseline efficiency calculation still includes the 2015 (pre-overhaul) pump efficiency. This resulted in a lower overall baseline efficiency, resulting in higher estimated savings. The applicant submitted analysis did not capture the post install consumption by excluding the post-install metered kWh, but still includes the impacts associated with pump #3 overhaul by including the 2015 efficiency.

Comment #:	Entity:	DNV Site ID:	QUESTION or COMMENT:	Evaluator Response:
39	SCE	SCE-30129	SCE Response to Measure - This project has three identical sites/toaster equipment and the total IR approved savings per site is 6,546.6 kWh and 0.87 kW (total project saving is 19,639.8 kWh and 2.61 kW). Please note that the submitted savings were increased during the post-install review, hence IR approved calculations and review document the final values. Therefore, the 8% difference due to a tracking error does not seem correct. The difference appears to stem from the CPUC evaluator not including readings of less than 1 in the daily kWh averaging calculation whereas IR approved analysis did include all values. SCE believes that all readings must be included in the averages because the savings analysis calculated daily kWh averages which were multiplied by the number of days per year to calculate annual consumption (similar to the baseline calculations).	The most recent post installation savings analysis (CONFIDENTIAL - Site Summary.xlsx) included in project documentation shows savings of 5,992.04 kWh and 0.711 kW per site. Evaluators were not able to verify how the tracked savings per site of 6,546.6 kWh and 0.87 kW was estimated. Evaluators attributed this discrepancy to tracking error. Regarding the M&V analysis discrepancy, the metered data has zero consumption values on the day of Thanksgiving and Christmas. Because evaluators used verified annual operating days which excludes 2 holidays, evaluators filtered for removed the data points with zero readings when estimating average daily kWh. Should all readings be included in the average, the baseline operating days should be 365.25.

Table C-2. Overarching comments

Comment #:	Entity:	Table/Figure/Section Number	QUESTION or COMMENT:	Evaluator Response:
1	SCG	Table ES-3	SoCalGas believes that the study did not provide the data to understand the large disparity between the first year and the lifecycle gross realization rate (GRR) as shown in table ES-3, i.e., first year gross realization rate is 58% and lifecycle gross realization rate is 18.5%. Although first year and lifecycle GRR rates can be different, the difference between the first year and lifecycle is substantial, therefore, we would like to have additional information on how these ratios are significantly different.	The intent of the executive summary is to provide a high level narrative of findings, conclusions and recommendations. SCG's lifecycle GRR is largely driven by differences in EUL/RUL. One project in particular drove the lower GRR (SCG-40003) with a LC GRR of 13% which had a claimed EUL of 7 years and an evaluated EUL of 1 year. Additional, the 19% GRR is in line with the PY2019 evaluation findings, which reported an evaluation lifecycle GRR of 14%. This explanation will be added to the final report and will be reflected in the main body.
2	SCG	Table ES-5	SoCalGas believes that the study did not provide the data to understand the large disparity between the first year and the lifecycle net to gross ratio (NTGR) in table ES-5, i.e., first year net to gross rate is 34.2% and the lifecycle net to gross rate is 18.7%. SoCalGas would like to understand the difference between the algorithms used to obtain the NTGR for first year and lifecycle. This would help SoCalGas in future CIAC programs and their NTGR results.	Similar to comment #1, the intent of the executive summary is to provide a high level narrative of findings, conclusions and recommendations. Furthermore, the NTG ratio is also being driven by differences in EUL/RUL. This explanation will be added to the final report and will be reflected in the main body.

Comment #:	Entity:	Table/Figure/Section Number	QUESTION or COMMENT:	Evaluator Response:
3	SCG	Section 2.1.3	SoCalGas was made aware that the surveys being conducted for this evaluation began around September 2022 and ran through the latter part of Q4 of 2022. Due to the significance of the information obtained from these surveys, and the potential impacts that these surveys may have on NTGR results (i.e. received surveys not being submitted by respondents), SoCalGas suggests that these surveys should be conducted earlier in the year. By conducting the surveys earlier in the year, the responses can be complete before running into the latter part of Q4 during the holiday season.	The evaluation timeline is largely driven by the availability of program data, which is typically finalized in June of the proceeding year. Additionally, timely response by the PAs to the evaluator's data requests will strengthen our ability to field surveys earlier with the possibility of sharing results.
4	SCG	Page 24	SoCalGas believes that twenty total projects were uploaded to CEDARS for PY 2020 – 2021. The total population size (N) of eighteen was in the DNV report of which, eight were chosen as sample (n). SoCalGas would like for DNV to consider the twenty projects that were uploaded to CEDARS as the total population. If DNV believes that the number is still eighteen, SoCalGas would like to know the reason for the variance.	The disparity between projects is due to the removal of NMEC projects, which will be evaluated separately via an NMEC impact evaluation, scheduled to come out in late fall of 2023.
5	SCG	General Comment	SoCalGas suggests DNV to upload all the IOU zero savers list with corresponding CCTs at the same time. SoCalGas communication with DNV shows four zero savers in late March 2023, and the draft impact evaluation report indicates six zero saver projects. Having the zero saver lists sent to IOUs at one time would help streamline the process and avoid commenting multiple times.	Thank you for the feedback. DNV will take this into consideration when executing the PY2022 project level reviews.
6	SDG&E	Finding 4 - ES-9	The SBD New Construction projects have building permits issued setting baselines at the time the project was approved for incentives. Since we cannot control construction timelines, we are required to use the approved baseline (same version of EnergyPro) as of the date initial "notice to proceed" was issued to the customer, in reconciling the post savings claims at project close out. If the baselines change from when the project was approved for savings versus installation, that can potentially have negative affects on the incentives to customers as the incentives are related to the forecasted savings and program influence.	New construction projects can have delays, sometimes considerable, between the time project was approved for incentives and when the project is actually being installed. In some of these cases, a new code cycle would be applicable based on the permit document issued by AHJ. If the building code changes before the permit is issued, then the project should revise savings and incentives based on the new applicable code, which in turn will change the incentive and forecasted savings. Not adjusting the baseline using the permit date could result into overpayment of incentives, risk to ratepayer funds, and a disconnect between the building compliance approval and claimed savings.

Comment #:	Entity:	Table/Figure/Section Number	QUESTION or COMMENT:	Evaluator Response:
7	SDG&E	Webinar Presentation / Slide 44	Finding states "Corporate policies, compliance with normal maintenance/ replacement policies, or regulatory compliance obligations are driving many EE projects that the programs are claiming savings for." Resolution E-4818 pg. 39 states that "Sustainability policies or energy policies have been shown to be highly indicative of energy efficiency and integrated demand side management measure uptake. As such, we promote the adoption of these policies and withdraw from the guidance document the example of using a sustainability policy as evidence against program influence." The wording in the resolution has guidance which directly allows corporate sustainability policies to not impact the influence of the projects. SDG&E recommends that the evaluation team review projects that were impacted by these types of corporate policies and ensure proper application of this guidance in program evaluation results. SDG&E also recommends that the ex-post team reviews ex-ante and implementation language as found in Resolution E-4818 that allows these policies to not impact program influence.	The NTG battery asks the respondent to score corporate policies, not sustainability policies. That score is treated as a non-program factor; however, it is meant to refer to a broader range of corporate policies (e.g., standardized equipment requirements) and not necessarily sustainability policies. In the follow up question on the standard/enhanced guide (which was not scored) the battery did used the term 'sustainable' once to gain insights into the nature of such policies. The large majority of respondents received the basic rigor guide which does not ask any follow up questions to gain insights into sustainability policies. It is also important to note that the NTGRs are determined by multiple program and non-program factors and the PA1 multiplier uses the "max" of the program and nonprogram factors. This means that changing a single factor (e.g. corporate policy") is unlikely to change NTGR significantly.
8	SDG&E	Appendix E and F / Overarching	SDG&E is unclear as to how the sample weight for each project was determined. For example, Project SDG-60007 has a sample weight of 13.0 for a forecasted savings value of 15,971 therms, whereas Project SDG- 60032 has a sample weight of 6.1 with a forecasted savings value of 70,001 therms. The CIAC evaluation describes the weighting methodology as follows: "We have provided sampling weights for each project. The sampling weights reflect the number of customers in the population that a sample customer represents for given strata. The sampling weights also incorporate sample and population characteristics not used for explicit stratification." SDG&E does not fully understand the methodology in place for determining sample weighting. However, in principle, SDG&E recommends that the sample weight should reflect project and forecasted savings. Since the	The population was segmented by program (Custom, SBD, NMEC), program year, measure type (lighting only /other), and program year. The weights in each cell are the ratio of the number of accounts in the population to the number of points in the sample. The weights for SDG&E range from 5.4 to 13 in the 3 distinct sample cells.

Comment #:	Entity:	Table/Figure/Section Number	QUESTION or COMMENT:	Evaluator Response:
			sample weighting methodology can significantly impact the results, SDG&E recommends that reviewers supply a more detailed description for review by stakeholders.	
9	SDG&E	Overarching	SDG&E has previously submitted comments for zero saver projects SDG-60035 and SDG-60095 to the Non-DEER Resources EM&V Database.	See Project Specific Comments Responses

Comment #:	Entity:	Table/Figure/Section Number	QUESTION or COMMENT:	Evaluator Response:
10	PG&E	Overarching	Projects declared ineligible for policy or program rule reasons should be excluded from gross realization rate (GRR) calculations, or the final report should clearly state that the GRRs cannot be applied to future ex ante claims for individual projects. On page 17 of the draft report, the evaluators note "GRRs were largely influenced by ineligible projects…that violate CPUC policy guidance, statewide custom program rules, Public program rules established by their representative administrator, and the installation of ineligible measures." PG&E understands that it is within the scope of the evaluation to assess project policy conformance. However, including projects disqualified for reasons due to policy or program rules and assigning them zero ex post savings biases GRRs downward. PG&E suggests calculating GRR by including only projects whose savings calculations have been assessed by ex post evaluators, or adding to the final study report an explanation that the GRR shown cannot be applied to future ex ante savings claims. When evaluators declare a project ineligible due to policy or program rules, they are not assessing the quality of the ex ante savings calculations—and including those projects in the GRR calculation with an ex post value of zero biases the GRR downward. For example, a project declared ineligible because it was installed too late may still have savings that affect the grid. PG&E respectfully suggests that as an alternative method, GRR calculations should exclude projects disqualified for policy/program rule reasons from both the numerator and the denominator. This would ensure that GRR represents the relationship between PAs' ex ante savings estimates and evaluators' calculations of savings. PG&E encourages the evaluation team to recalculate GRRs following this method. If the evaluation team cannot recalculate GRRs, PG&E suggests that the final study report include a note explaining that the GRRs are intended to represent the ratio of total claimed to evaluated savings for PY 2020-2021, including disqualified projects, and that the GRR shown in the report cannot be applied to future	DNV includes zero savers found in the sample drawn from ex ante claims while calculating ex post GRR because they represent those projects in the sample frame that are also ineligible. This is standard statistical method used in all custom program evaluations since the 06-08 cycle. The report provides correctly calculated GRR that applies to ex ante claims. DNV notes that ex post savings are credited only for policy-compliant projects.

Comment #:	Entity:	Table/Figure/Section Number	QUESTION or COMMENT:	Evaluator Response:
			individual ex ante claims because they do not represent the relationship between PAs' ex ante gross savings estimates and evaluated gross savings values.	

Comment #:	Entity:	Table/Figure/Section Number	QUESTION or COMMENT:	Evaluator Response:
11	PG&E	Overarching	The final study report should include a description of requirements ex post evaluators applied to standard practice assessments, and ensure the requirements align with policies in effect during the evaluated program years. PG&E requests that in the final report, the evaluation team include a description of the requirements it applied to reviews of Standard Practice (SP) assessments. SP assessments do not appear to follow the same level of rigor as ex-ante SP guidance, and may not reflect the market at the time projects were developed. In addition, PG&E notes that projects with SP measures were assigned zero ex post savings, but according to CPUC policy that was in effect at during program years 2020-2021, those projects should receive first baseline savings. For example, evaluators deemed Project PGE-20012 a zero-saver due a re-evaluation of the ISP for the customer. During project development PG&E had worked with the Ex-ante Custom Project Review team to perform a SP study for the customer in compliance with CPUC's ISP Guidance Document v3.1. Following the guidance document, it was determined that the customer was unique and a market based study was not applicable to this customer. It is not clear if the evaluation team followed the same rigor when they contacted three vendors and determined a different ISP for this customer type, while admitting that the vendors stated that standard practice in this market varies by facility. Additionally, the evaluation team zeroed out all savings rather than applying to-code, first baseline savings for this Accelerated Replacement project.	Thank you for your feedback. In absence of a market based ISP, DNV conducted a informal ISP study for the installed measure per CPUC's ISP guidance document version 3.1 in order to assess the standard practice of the measure. The study found that measures better than the installed measure were being sold around the time when the project agreement was signed, and the installed measure was not being sold in the market place. Because the installed measure did not exceed standard practice and the 2019/20 custom program manual requires installed equipment to exceed standard practice, no savings were assigned to the installed measure for not complying with the policy/program requirements. Regarding PGE-20012, please refer to the Project Specific Comments worksheet for additional detail on our response.

Comment #:	Entity:	Table/Figure/Section Number	QUESTION or COMMENT:	Evaluator Response:
12	PG&E	Overarching	Issues that could disqualify smaller projects should be investigated with the same rigor as those in larger projects, to avoid biasing realization rates downward. The evaluation team noted in the webinar presentation of the draft report that a lower level of rigor was applied to assessments of smaller-saving projects. This is concerning to PG&E given the fact that aggregated evaluation results are generalized across multiple projects, large and small. Of particular concern is projects that are zeroed out after only a low rigor of review, as described below. PG&E requests that the savings for any of the smaller projects treated with lower rigor be subjected to greater rigor, and if this causes savings to be revised, to include all eligible savings for those projects and to revise the findings in the final report, accordingly. Applying a lower level of rigor to smaller-saving or lower-incentive projects during ex ante review—when the purpose is to determine whether an individual project may move forward with the ex ante savings values it plans to claim—is appropriate and follows Commission policy articulated in E-4818. However, ex post evaluation seeks to identify broad findings generalizable across custom projects, and a different approach must be used. This is particularly true for an evaluation that uses a stratified sampling approach, such as the 2020-2021 CIAC impact evaluation, because the multiplication of results by stratum weights causes the aggregate savings of smaller projects to be roughly equivalent to the aggregate savings of projects in the larger project strata that apparently treated with greater rigor. In other words, if a smaller project is too quickly determined to have no or much-lower-than-claimed realized savings, those results are generalized to other projects, and may feed into calculations used to summarize overall findings. For example, both projects PGE-21330 and PGE-20114 were deemed a zero saver because the evaluation found that the equipment was purchased prior to project approval, however, the finding was incorrect because the evaluators had not looked into all the	Thank you for the comment and opportunity to clarify our approach. Per the PY2020/2021 workplan, the DNV team used a combination of approaches to field the various survey instruments depending on the complexity, incentive and uncertainty of a project. This follows the precedents of past CIAC impact evaluation studies. Most standard rigor surveys were conducted by the site engineers during a telephone interview or by professionals trained in administering NTG questions. Enhanced rigor interviews, for the largest and most complex projects, involved interviews of several entities involved in the project. These may have included primary decision-makers, CFOs, vendor representatives, utility account executives, program staff, and other decision influencers, as well as a review of market data to help establish an appropriate baseline. This level of effort is not appropriate for lower rigor, less complex projects. The level of rigor for the gross analysis did not vary depending on project type, complexity and uncertainty. For the basic rigor surveys, the NTG questions used for scoring were the same as those used in the standard/enhanced rigor interviews with the exception that the latter interviews had more follow-up and consistency check questions. Regarding project PGE-20114, please see the Project Specific Comments worksheet for additional information. PY2020/2021 Workplan: https://pda.energydataweb.com/#!/documents/2609/view

Comment #:	Entity:	Table/Figure/Section Number	QUESTION or COMMENT:	Evaluator Response:
			documentation before making this determination. PG&E pointed to previously provided documentation that showed the date of the CPR approvals, and invoice dates after the CPR disposition. With time for review of this evaluation limited, there may be more projects incorrectly determined to be zero savers.	

Comment #:	Entity:	Table/Figure/Section Number	QUESTION or COMMENT:	Evaluator Response:
13	PG&E	Overarching	Policy interpretation should align between ex ante custom project review team feedback and ex post evaluation findings. PG&E respectfully requests the final evaluation report be updated to avoid applying policy in a manner different from the Ex-Ante Custom Project Review (CPR) team. The evaluation includes 13 electricity sample projects and 12 natural gas sample projects where the ex-post evaluation team overturned a policy position taken by the CPR team. For the ex post evaluation process to reverse ex ante guidance introduces confusion and inefficiency, and undermines the ex ante process. Both the CPR and ex post evaluation processes are overseen by Energy Division staff and conducted by Energy Division-contracted third party evaluators, so it is reasonable that they would align. It is unclear if evaluators reviewed CPR dispositions to see if the guidance was followed. For example, evaluators deemed a CPR project ineligible and counted its savings as zero in the analysis due to lack of sufficient monitored data on pre-existing face velocity and pressure drop for HVAC filters. However, the project had been approved by the CPR team with a CPUC approved M&V method which was followed in the post-installation verification of the project.	All available CPR dispositions for evaluated projects were taken into consideration during the evaluation. Per Comment #23 in the "Project Specific Comments" worksheet, the CPR (i.e. ex-ante) review process has stopped approving claimable savings for a long time now which was the basis for allowing the PAs to claim a 1.0 GRR. Unfortunately, the fact that CPRs do not recommend claimable ex ante savings has not been reflected yet in a Commission decision to lower the default GRR for CPR-reviewed projects in line with the default GRR for custom projects. It has been a long-established practice for ex post evaluations to change the findings of CPR reviews when new and additional information is available, often from talking with customers which the CPR team mostly does not do. Regarding the filter project, please refer to our response to comment #21 in the Project Specific Comments worksheets.

Comment #:	Entity:	Table/Figure/Section Number	QUESTION or COMMENT:	Evaluator Response:
14	PG&E	Overarching	The final study report should clarify understanding of PG&E's of installation deadline extension request process. Multiple projects were assessed as "Zero-Savers" due to a lack of documentation of approved installation-deadline extension requests. However, this is inconsistent with the purpose of PG&E's installation deadline, which is to encourage customers to follow through with installation to the best of their ability, and to stay in contact with the program if the installation is delayed for any reason. PG&E has a formal process for extending this deadline that has been evolving in recent years as PG&E has worked to improve project tracking. If a customer is not responding to PG&E's requests for updates, or not following through with commitments, then PG&E will deny an extension request and close out the application. The goals of the evaluation as stated on page ES-1 of the CIAC 2020-21 Impact Evaluation Report are to "1. Develop first year and lifecycle-evaluated net and gross savings…", and "2. Develop meaningful and actionable recommendations to improve program performance". While PG&E would understand a recommendation to improve its extension request process, PG&E emphasizes that neither installation deadlines nor lack of formal approval of an installation deadline extension render the savings of a project invalid.	Thank you for the comment. Per staff guidance, all extensions must be executed according to the program policy and customer agreement provisions, documented and provided to the evaluator at the time of evaluation. In instances where extensions were not provided, the evaluator attempted to reconcile the extension timeline with the PA. If sufficient evidence was not provided, the evaluated determination was upheld and the project received no attributable savings. DNV notes that repeated extensions granted over a long period without taking into consideration changes to the baseline conditions and CPUC policies over that time poses a risk to the appropriateness of claimed savings.

Comment #:	Entity:	Table/Figure/Section Number	QUESTION or COMMENT:	Evaluator Response:
15	PG&E	Overarching	PG&E urges Energy Division staff and the CPUC's evaluators to build more time into future evaluation cycles for two-way communication between the evaluation team and PAs—in order to permit clarification of issues and produce an evaluation of the highest quality and greatest usefulness possible. PG&E proposes that future evaluation cycles include more opportunities for collaboration between evaluator and PA engineers before the report is published. PG&E appreciates that the evaluators offered to share some Custom Core Template (CCT) files for PA review after the webinar for this study. However, PG&E suggests that PA review of these files would be more useful prior to publication of the draft report; if the review is followed by discussions during which PAs can explain details of projects they believe the evaluation team may not have understood; and if PAs have time to review all CCT files for their projects. PG&E requested information about projects assessed as zero-savers during multiple PCG meetings about prior to the draft study report's release, but the zero-saver projects were not identified until the draft report was released for comments, cutting short time for PAs to review and comment on discrepancies, and in some cases correct errors. PG&E also suggests that future evaluations incorporate more site visits. The evaluators note on page 7 of the draft report that time constrains led them to rely heavily on virtual data collection techniques and phone surveys. In future evaluation cycles, PG&E urges the evaluation team to return to conducting more site visits. Site visits permit evaluation staff to verify the as-installed condition of projects first-hand. They also reduce burden on customers to provide detailed data years after their projects were installed, and when key staff who were involved in project implementation may no longer be available.	Thank you for the feedback. Evaluation timelines are largely driven by the availability of final program tracking data through CEDARS, which is often finalized in June of the proceeding year. Additionally, fulfillment of evaluation data requests has taken considerable time in the past. DNV is currently planning the evaluation activities for PY2022, the workplan will document planned on-site evaluation activities. Staff Response: Thank you for your feedback. We will consider this request going forward. We are best able to consider changes to process during workplan development and review. Please provide this input to the draft 2022 workplan which will be posted to the PDA in the coming months.

Comment #:	Entity:	Table/Figure/Section Number	QUESTION or COMMENT:	Evaluator Response:
16	PG&E	Overarching	Request to include Impact Evaluation Standard Reporting (IESR) tables in the final report. The draft report does not include IESR tables, which are a standard component of CPUC-led ex post impact evaluations. Standard impact evaluation reporting guidelines, including the requirements for these tables, are outlined in a 2015 Energy Division memo available on the CPUC's Public Documents Area (PDA) website.2 PG&E suggests adding these tables to Appendix A, or elsewhere in the report, to conform to CPUC impact evaluation reporting guidelines.	These will be provided as part of the final report.
17	PG&E	Appendix E, p.13	Appendix E, project PGE-21107 (PRJ - 02703076) shows a gross realization rate of 38 percent for kWh, however; a recalculation of the GRR using the forecasted and evaluated savings from that table shows that the GRR should be 142 percent.	There is a typo in the appendix as evaluated savings should be 2,190 not 2,1890.
18	PG&E	Appendix E	Appendix E shows 8 projects that received a savings haircut greater than 75%. However, the evaluators did not reach out to PG&E regarding these projects to provide the site-specific CCT or provide PG&E with an opportunity to review and comment. While this lack of outreach may have been due to evaluation timing constraints, PG&E urges the Energy Division and its evaluators to build more time into the next evaluation cycle for two-way communication with PAs.	Thank you for the feedback. Evaluation timelines are largely driven by the availability of final program tracking data through CEDARS, which is often finalized in June of the proceeding year. Additionally, fulfillment of evaluation data requests has taken considerable time in the past.
19	PG&E	Appendix F, p.22	Appendix F project PGE-20013 (PRJ - 00933452) shows forecasted savings of 965 therms but PG&E's tracking data shows that the ex-ante savings should be 1,930 therms.	CEDARS tracking data shows savings of 965 as reported.
20	PG&E	Appendix F, p.22	Project PGE-20007 was determined to be a zero-saver because of operating conditions and tracking data discrepancy, however; PG&E's ex-ante savings appears to agree with the forecasted savings value included in the table.	The reported therms savings are correct. The noted tracking data discrepancy is associated with the electric reported savings.

Comment #:	Entity:	Table/Figure/Section Number	QUESTION or COMMENT:	Evaluator Response:
21	PG&E	Appendix F, p.23	For project PGE - 20049, PG&E used the CPUC-approved READi Tool v2.5.1 to calculate ex ante savings. The project was determined to be a zero-saver after evaluators recalculated savings using a different method. If a project uses a CPU approved savings calculation tool, does so within guidelines for use of the tool, and does not make errors, it is not appropriate for ex post evaluators to recalculate savings using a different method unless they are conducting an explicit assessment of the tool itself, and results will not be generalized to assess the performance of the PA. It is also incorrect to characterize the reason for discrepancy as "calculation method."	A point of clarification. Only the gas savings for this project were zeroed out. Electric savings achieved a GRR of 43%. The evaluation can use existing methods or can use a new method to evaluate savings if that is deemed appropriate for the measure. In this instance, a TMY3 based 8760 analysis, using normalized cooling loads and verified inputs was used to develop a more accurate representation of savings.
22	PG&E	Overarching	The draft report does not include IESR tables, which are a standard component of CPUC-led ex post impact evaluations. Standard impact evaluation reporting guidelines, including the requirements for these tables, are outlined in a 2015 Energy Division memo available on the CPUC's Public Documents Area (PDA) website. PG&E suggests adding these tables to Appendix A, or elsewhere in the report, to conform to CPUC impact evaluation reporting guidelines.	The IESR tables will be included in the final report.
23	PG&E	Appendix E/F	PG&E has provided a write-up of its responses to zero-saver projects to the evaluation team. Responses are provided in a separate document because for some projects, images and links to relevant files are included.	See Project Specific Comments worksheet

Comment #:	Entity:	Table/Figure/Section Number	QUESTION or COMMENT:	Evaluator Response:
24	Willdan	Overarching	Willdan appreciates the opportunity to comment and contribute to the Custom Industrial, Agricultural, and Commercial (CIAC) 2020 – 2021 Impact Evaluation. Existing corporate/sustainability policies are referenced as evidence against program influence. The draft evaluation notes on page ES-7: “Inadequate screening of projects being driven by nonprogram factors such as corporate policies, normal equipment replacement/maintenance practices, and regulatory compliance.” The draft additionally notes: “For SBD projects, key factors driving the lower NTGRs included low incentive levels and the significant presence of program participants such as universities that were already pursuing energy efficiency due to organizational sustainability initiatives.” Resolution E-4818, page 391 states “Sustainability policies or energy policies have been shown to be highly indicative of energy efficiency and integrated demand side management measure uptake. As such, we promote the adoption of these policies and withdraw from the guidance document the example of using a sustainability policy as evidence against program influence.” The wording in Resolution E-4818 provides guidance that should exclude existing corporate/sustainability policy from being used as evidence against influence. Willdan recommends a review of projects where corporate/sustainability policies were referenced as evidence against influence. Where appropriate, Willdan recommends updates to both study results and trailing language.	See comment #7 above.

5.4 Appendix D: Project ineligibility criteria

Table D-1. Summary of project eligibility criteria and exceptions

Eligibility criteria	Description	Exceptions/discussion
Measure installation before evaluated program year	Ineligible. Remove from the sample frame	Custom projects other than those from the NMEC, HOPPS, or other programs for which extended measurements were required and carried into the program year, will be considered ineligible if the installation did not occur in the program year being evaluated.
Installed prior to project approval	A measure that was 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.
Equipment ordered prior to project approval	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.
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 providing an install time limit extension, then the project is eligible.
Like-for-like equipment	If installed equipment has the same or lower efficiency than the existing equipment, the measure is ineligible.	No exceptions.
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.
Deemed Claims	Not eligible as custom savings claims	Deemed savings claims associated with a custom project for customer convenience. Deemed savings and deemed incentives have been paid.

Eligibility criteria	Description	Exceptions/discussion
PPP Charges	If the customer does not pay PPP charges for the sampled fuel, the project is ineligible.	No exceptions.
Permits	If there is no documentation of permit closure, per SB-1414, for measures that require the PA to obtain proof of permit closure, then the claim is ineligible. SB-1414.	No exceptions.
Rulebook violations	If the installed measures are not allowed per the rules, such as LED products not listed in the statewide Qualified Products List, then the measure is ineligible.	Deemed measures that are typically not eligible but are included with the custom project will be allowed and the savings will be passed through.
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.
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.
Participant declines to participate in evaluation	A participant declines to participate in the 20/21 evaluation. Savings will be zeroed out as D.10.04.029 requires participants to fulfill EM&V obligations. Substitute samples will not be drawn.	No exceptions.

5.5 Appendix E: Electric project discrepancies

The table below presents project-level results, including the project sample weight, measure type, forecasted and evaluated first year savings, GRR, and the primary reason for the adjustment to the forecasted savings (i.e., reason for discrepancy). Please note that each project may have included multiple claims. This table provides a high-level summary that captures the most impactful reasons for savings adjustments.

We have provided sampling weights for each project. The sampling weights reflect the number of customers in the population that a sample customer represents for given strata. The sampling weights also incorporate sample and population characteristics not used for explicit stratification.

Table E-1. Project discrepancies resulting in adjusted gross electric savings and GRR (2020-2021)

DNV Project ID	Sampling weight	Measure type	First year (kWh)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
MCE-10017	15.4	Lighting indoor LED fixture	12,890	4,653	36%	**Operating conditions** – Evaluators updated lighting operating hours and coincident demand factor based on customer self-report operating hours.
MCE-10028	15.4	Lighting indoor LED fixture	7,054	820	12%	**Inappropriate baseline** – MAT was changed from AR to NR since customer reported that they would have installed same equipment at the same time. **Operating conditions** – Evaluators updated the coincident demand factor based on site collected customer operation data.
MCE-10040	15.4	Lighting indoor LED fixture	3,118	-	0%	**Inoperable measure** – The customer removed all equipment.
MCE-10060	15.4	Lighting indoor LED fixture	2,559	2,610	102%	**Calculation method** – The forecasted savings only claimed direct savings. The evaluation uses total (direct + indirect) savings from the MLC.
MCE-10077	15.4	Lighting indoor LED fixture	3,376	2,104	62%	**Operating conditions** – Updated DEER HOU based on customer- reported operation of lighting.
PGE-20005	1.5	Refrigeration other	2,226,238	-	0%	**Ineligible project** – Project is not eligible due to violation of eligibility rules due to granted extensions. Extensions were not properly filed and/or included for review.
PGE-20007	3.6	Non-resource	55,352	51,743	93%	**Operating conditions-**The evaluator updated the boiler capacity, hours of operation and hot water setpoint based on the as-found data. **Tracking data discrepancy**-There was a difference between forecasted savings and PA-provided model savings.
PGE-20022	3.6	Whole building NRNC	648,922	656,801	101%	**Operating conditions** - Evaluator made minor updates to cooling and heating temperature set points based on data provided from the customer's BMS system resulting in a slight increase in evaluated savings

DNV Project ID	Sampling weight	Measure type	First year (kWh)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
PGE-20027	3.3	HVAC pump VFD	312,477	282,233	90%	**The project was initially ineligible. Savings were reinstated for the project by the magnitude according to the PA GRR.**
PGE-20036	1.7	Process other	881,172	1,100,045	125%	**Calculation method** – The forecasted savings model normalized the new reclaim B&J pumps accurately with post-M&V flow but did not do the same for the Goulds pumps. A new load profile for the baseline was established by using most recent post-installation flow data (BPD) and amperage data to determine what the baseline kW would be based upon pre-installation flow.
PGE-20040	1.7	Process wastewater aerator	953,287	-	0%	**Ineligible project** – The participant reported that they were required to meet the new effluent regulations as of January 2019 and the installed diffusers were the only way to meet those requirements.
PGE-20046	8.3	Process cooling	292,083	266,753	91%	**Operating conditions** – The evaluation team received updated CHWST setpoints, per a BMS screenshot from the customer.
PGE-20048	1.5	Process compressed air other	3,153,989	1,331,405	42%	**Calculation method** – Evaluators gathered proposed hourly trend data of the impacted compressors from 10/01/2022 to 12/31/2022 and found that the low-pressure compressors operate at a higher average discharge pressure as compared to the forecasted savings model. Additionally, the verified total CFM is higher when compared to the applicant model.
PGE-20054	136.7	Lighting outdoor LED fixture	11,153	14,411	129%	**Operating conditions** – Adjusted HOU and CDF based on customer reported operation.
PGE-20066	8.6	Lighting indoor LED fixture	392,694	274,410	70%	**Ineligible project** – Customer installed multiple measures and claimed all under one custom claim ID. Type A TLEDs and T8 ballasts are not "permanent" under Custom Manual rules and are therefore ineligible.
PGE-20082	1.7	HVAC pump system optimization	1,237,000	1,140,492	92%	**Calculation method** – The evaluation team used a monthly billing analysis as compared to the forecasted savings model which used an eQuest model. This difference in approach resulted in a lower evaluated savings as compared to the forecasted.

DNV Project ID	Sampling weight	Measure type	First year (kWh)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
PGE-20104	1.7	RCx HVAC	1,210,465	700,125	58%	**Operating conditions** – In the evaluation case, we observed that the chillers were not staged and that they had a higher operating kW, which was different compared to the baseline operation
PGE-20114	1.7	Process compressed air controls	916,051	-	0%	**Ineligible project** – Existing equipment did not meet the load requirements (as required for add-on equipment [AOE]). Equipment ordered before project approval.
PGE-20116	3.3	RCx HVAC	840,050	635,555	76%	**Calculation method** – The variation in energy savings is due to the change in calculation methodology adopted by the evaluator using as-found data. In forecasted analysis, the post-case plant efficiency model grossly under predicts the plant kW/ton. The forecasted savings model post-trend data used to model the efficiency curve did not include any chiller kW data in overall plant kW. This resulted in an underprediction of the post case efficiency and inflated the project savings drastically.
PGE-20117	1.5	RCx HVAC	2,628,491	1,498,244	57%	**Operating conditions** – The evaluator updated the savings analysis using an extended range of baseline and post-retrofit data. This resulted in the average fan speed between the forecasted and evaluated models differing.
PGE-20120	136.7	Lighting indoor LED fixture	45,332	30,231	67%	**Operating conditions** – The evaluated savings updated the HOU and CDF for lighting based on the customer's self-reported operation.
PGE-20146	8.6	Lighting indoor LED fixture	213,843	335,828	157%	**Operating conditions** – Updated the hours of use based on the adjusted self-report operation of the lights.
PGE-20148	8.6	Lighting indoor LED fixture	229,274	358,956	157%	**Operating conditions** – Increased HOU and CDF based on the customer reported operation of the lights. The customer reported that the lights operate 24/7 and only close for Christmas and half of Thanksgiving. The calculated HOU is significantly higher than the DEER HOU.
PGE-20197	8.6	Lighting indoor LED fixture	225,180	223,482	99%	**Calculation method** – Fixtures are in the garden center, which is connected to the indoor areas, but is

DNV Project ID	Sampling weight	Measure type	First year (kWh)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
						outside. Hours are consistent with the indoor lighting but have no interactive effects.
PGE-20206	8.6	Lighting indoor LED fixture	223,830	222,912	100%	**Calculation method** – Removed the interactive effects for measure installed in the garden center only.
PGE-20218	8.6	Lighting indoor LED fixture	171,814	118,583	69%	**Operating conditions** – Updated the hours of use based on the self-report operation of the lights.
PGE-20246	136.7	Lighting indoor LED	776	476	61%	**Operating conditions** – Changed DEER HOU=2,320, CDF=0.56 with evaluation HOU=1,422 and CDF=0.162, based on the operation of the lighting.
PGE-20251	30.9	Lighting outdoor LED fixture	70,303	-	0%	**Ineligible project** – The project does not have supporting documentation, so it is treated as a zero saver.
PGE-20306	30.9	Lighting outdoor LED fixture	72,459	9,587	13%	**Inappropriate baseline** – MAT was changed from AR to NR since customer reported that the pre-existing equipment was not functional. **Operating conditions** – Evaluators updated the coincident demand factor and reported hours of use based on site collected customer operation data.
PGE-20374	30.9	Lighting outdoor LED fixture	67,625	67,625	100%	There are no reported discrepancies.
PGE-20375	136.7	Lighting indoor LED fixture	2,708	626	23%	**Inappropriate baseline** – MAT was changed from AR to NR as the equipment would have been replaced absent the program.
PGE-20469	8.6	Lighting outdoor LED fixture	175,115	16,781	10%	**Inappropriate baseline** – MAT was changed from AR to NR as the equipment would have been replaced absent the program. **Operating conditions** – Evaluators updated the reported HOU based on collected site information.
PGE-20493	30.9	Lighting indoor LED fixture	69,486	69,486	100%	There are no reported discrepancies.
PGE-20552	136.7	Lighting indoor LED	473	-	0%	**Ineligible project** – The project involved the installation of only Type A TLEDs and did not replace the ballast, so this is a deemed measure. Since no other custom measures were installed as part of this project, ED guidance is that the measure installed does

DNV Project ID	Sampling weight	Measure type	First year (kWh)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
						not qualify for custom incentives and evaluation savings should be set to zero.
PGE-20568	136.7	Lighting indoor LED	124	-	0%	**Ineligible project** – The project involved the installation of only Type A TLEDs and did not replace the ballast, so this is a deemed measure. Since no other custom measures were installed as part of this project, ED guidance is that the measure installed does not qualify for custom incentives and evaluation savings should be set to zero.
PGE-20614	1.5	Process compressed air controls	2,729,306	-	0%	**Ineligible project** – This project is a zero saver as pre-existing equipment was not meeting capacity needs, and the installed project brought it up to code requirements.
PGE-20633	30.9	Lighting outdoor LED fixture	67,145	27,333	41%	**Inappropriate baseline** – MAT was changed from AR to NR since the customer reported that the pre-existing equipment was no longer meeting their requirements.
PGE-20642	8.6	Lighting outdoor LED fixture	187,584	40,392	22%	**Inappropriate baseline** – MAT was changed from AR to NR since the customer reported that the pre-existing equipment was no longer meeting their requirements.
PGE-20648	8.3	Lighting indoor LED downlight	31,294	135,677	434%	**Operating conditions** – Evaluators updated the coincident demand factor and reported hours of use based on site collected customer operation data. **Other** – The evaluator adjusted technology and wattage to ensure the MLC was consistent with the DLC screenshots and invoices.
PGE-20649	8.3	Lighting indoor LED downlight	31,092	20,352	65%	**Operating conditions** – Evaluators updated the coincident demand factor and reported hours of use based on site collected customer operation data. **Other** – The evaluator adjusted technology and wattage to ensure the MLC was consistent with the DLC screenshots and invoices.
PGE-20673	30.9	Lighting indoor LED fixture	74,457	130,838	176%	**Operating conditions** – Evaluators updated the coincident demand factor and reported hours of use based on site collected customer operation data.

DNV Project ID	Sampling weight	Measure type	First year (kWh)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
PGE-20698	30.9	Lighting indoor LED fixture	79,131	25,340	32%	**Operating conditions** – Evaluators updated the coincident demand factor and reported hours of use based on site collected customer operation data.
PGE-20703	8.3	Process fan	241,027	-	0%	**Ineligible measure** – The equipment was purchased and installed prior to project approval, which violates CPUC rulebook eligibility.
PGE-20931	8.6	Lighting outdoor LED fixture	184,705	142,478	77%	**Calculation method** – The claimed savings match up with the first baseline savings in the MLC but not the overall savings. The evaluators updated savings to match the provided MLC. **Inappropriate baseline** – The evaluators updated the baseline wattage based on the monthly consumption on the meter as outdoor lighting with the only load on the meter.
PGE-21107	8.3	Refrigeration case LED lighting	15,390	2,190	14%	**Other** – The evaluators included the HVAC interactive effects associated with the measure implementation. The PA model includes these impacts, but they were not tracked within the final claim The evaluator savings also only consider savings from standard technology to installed technology as this project was reclassified to NR based on an NTGR of less than 0.5, failing to show influence of the program.
PGE-21249	8.6	Lighting indoor LED fixture	165,708	81,433	49%	**Inappropriate baseline** – MAT was changed from AR to NR as the equipment would have been replaced absent the program. **Operating conditions** – Evaluators updated the reported coincident demand factor based on collected site information.
PGE-21283	3.2	HVAC other	129,757	481,932	371%	**Operating conditions** – The evaluators updated the EnergyPro model based on recent trend data which reflects changes to the SAT and, included changes in operation based on increased process loads.
PGE-21290	3.2	Process computing operations data center air flow management	123,381	138,528	112%	**Calculation method** – The evaluator normalized the data to account for differences in server demand between pre- and post-conditions. **Operating conditions** – The evaluator updated the

DNV Project ID	Sampling weight	Measure type	First year (kWh)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
						IOU model using recent trend data provided by the customer which reflects a difference in demand.
PGE-21300	2.5	Lighting indoor LED fixture	1,584,873	347,705	22%	**Calculation method** – The evaluator used a different calculation as the PA-provided calculator does not accurately estimate savings for cannabis grow lighting projects. The provided tool uses baseline assumptions that are not supported and do not follow CPUC resolution E-4939 for baseline development processes. The evaluator developed a more appropriate baseline using survey data collected by the Cannabis Business Times to establish a standard practice for each growth stage.
PGE-21303	2.5	Lighting indoor LED fixture	620,054	181,346	29%	**Calculation method** – The evaluators discounted savings based on the sites' cogent operation, which was not included in the applicant reported calculations. **Inappropriate baseline** – The PAs incorrectly used existing fixture wattages as the baseline when the project is normal replacement and should use an ISP-reported baseline. The evaluator updated the baseline to reflect standard conditions.
PGE-21313	2.5	Whole building NRNC	346,928	334,100	96%	**Operating conditions** – Evaluator made minor updates to cooling and heating temperature set points based on data provided from customer's BMS system resulting in a slight increase in evaluated savings. **Tracking data discrepancy** – There was an additional minor discrepancy due to the PA-provided model providing different savings than forecasted when run using the same version of EnergyPro used by the PA (v6.8.0.5).
PGE-21319	3.2	HVAC controls other	50,414	-	0%	**Ineligible project** – This measure is ineligible since the installation date is past the 1-year countdown from the PA approval date without extension which violated the CPUC rulebook for eligibility.
PGE-21323	1.0	HVAC economizer water side	4,036,868	5,047,512	125%	**Operating conditions** – The evaluator savings analysis is based on updated trend data which indicated an increase in load.

DNV Project ID	Sampling weight	Measure type	First year (kWh)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
PGE-21324	3.2	HVAC replacement system: packaged AC	231,249	-	0%	**Operating conditions** – The application information was found to be unsupported and indefensible. Given the lack of documentation, trend data, and the uncertainty in the savings calculations, the evaluators determined that without EMS data for the pre-existing and installed filters, any savings would be inaccurate.
PGE-21329	2.5	Whole building NRNC	673,005	640,817	95%	**Operating conditions** – The evaluator updated the facility operation schedule, temperature setpoint and fan power input based on the customer-provided information.
PGE-21330	3.2	Process computing operations data center air flow management	648,037	-	0%	**Ineligible measure** – The equipment was purchased and installed prior to project approval, which violates CPUC rulebook eligibility.
PGE-21331	29.0	Lighting indoor LED fixture	117,187	18,038	15%	**Inappropriate baseline** – The baseline technology and efficiency were changed to the industrial standard practice baseline in the evaluated analysis. **Operating conditions** – The evaluator updated conditioned space area based on site collected information.
PGE-21343	3.2	Process cooling	219,845	132,839	60%	**Calculation method** – The evaluators applied on-site generation to the reported measure to make sure the savings accounted for the IOU fuel generation. The evaluators updated the input parameters with trend data and spec sheets. **Tracking data discrepancy** – The evaluator included demand savings that were missed in the forecasted estimations.
PGE-21344	45.0	Lighting indoor LED fixture	51,625	2,319	4%	**Inappropriate baseline** – MAT was changed from AR to NR, due to customer confirmed the pre-existing equipment no longer satisfied the need and this project would be done regardless of program incentive. **Operating conditions** – The evaluator updated the hour of operation and coincident demand factor based on site-collected customer operation data.

DNV Project ID	Sampling weight	Measure type	First year (kWh)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
PGE-21348	2.5	Lighting indoor LED fixture	733,909	-	0%	**Operating conditions** – The evaluator updated the hours of operation based on the customer provided information. **Calculation method** – The baseline technology and efficiency were changed to the industrial standard practice baseline. And the HVAC interaction was not calculated properly in the forecasted estimations. The forecasted analysis did not correctly estimate the incremental costs or EUL for this project and used wrong unit cost of energy to estimate the payback time. After updating the cost and rate information, the evaluated payback time for this project is negative and does not qualify for the program.
PGE-21351	3.2	Process fan	317,475	130,332	41%	**Operating conditions** – The evaluator updated the average fan speeds based on the trend data.
PGE-21354	3.2	Process computing operations data center air flow management	664,040	309,717	47%	**Inappropriate baseline** – The forecasted analysis double counted savings through both measures. The evaluator updated the baseline and removed the overlapping savings.
PGE-21359	2.5	Lighting indoor LED fixture	1,099,132	685,377	62%	**Operating conditions** – The evaluator updated conditioned space area based on site-collected information. **Calculation method** – The baseline technology and efficiency were changed to the industrial standard practice baseline. And the HVAC interaction was not calculated properly in the forecasted estimations. The forecasted analysis did not correctly estimate the incremental costs or EUL for this project and used wrong unit cost of energy to estimate the payback time. The evaluator recalculated the payback time and the lifetime savings.
PGE-21360	87.3	Lighting outdoor LED fixture	16,843	14,414	86%	**Calculation method** – The evaluator updated the baseline fixture wattage.
PGE-21381	3.2	Process pumping	15,762	1,418	9%	**Calculation method** – Based on CPUC guidance, evaluators updated the energy savings calculation methods based on pump productivity levels instead of

DNV Project ID	Sampling weight	Measure type	First year (kWh)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
						a ratio of overall pump efficiency (OPE) values used in the PA model. **Operating conditions** – The evaluator updated the post-performance using this information based on a most recent pump performance test. **Tracking data discrepancy** – The forecasted savings was higher than 30% of the product of the three-year billing average but not capped at this threshold correctly.
PGE-21389	2.5	Lighting indoor LED fixture	267,331	409,533	153%	**Operating conditions** – The evaluator updated HOUs for the lighting based on customer reported information. And the evaluated EUL and RUL were both updated, due to the higher HOU.
PGE-21390	29.0	Lighting indoor LED fixture	213,865	327,627	153%	**Operating conditions** – The evaluator updated the HOUs for the lighting based on customer reported information. And the evaluated EUL and RUL were both updated, due to the higher HOU.
PGE-21392	87.3	Lighting indoor LED fixture	15,175	6,042	40%	**Operating conditions** – The evaluator updated the HOUs for the lighting based on customer reported information. And the evaluated EUL and RUL were both updated, due to the higher HOU.
PGE-21423	45.0	Lighting indoor LED fixture	52,768	52,768	100%	**Calculation method** – The evaluator updated RUL due to the second baseline adjustments.
PGE-21470	87.3	Lighting indoor LED fixture	1,170	50	4%	**Calculation method** – The forecasted savings did not match up to the MLC provided in the documentation. **Inappropriate baseline** – MAT was changed from AR to NR, due to customer confirmed the pre-existing equipment no longer satisfied the need and this project would be done regardless of program incentive. **Operating conditions** – The evaluator updated the hour of operation and coincident demand factor based on site collected customer operation data.
PGE-21472	3.2	Process pumping	10,704	13,567	127%	**Calculation method** – Evaluator developed a new model to estimate the savings, which normalizes the water flow rate by incorporating pre/post flow rate ratio in the post energy consumption equation. The annual

DNV Project ID	Sampling weight	Measure type	First year (kWh)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
						hours of operation were also updated from the energy use report provided by the customer, as the impacted pump is on a separate meter.
PGE-21476	3.2	Process pumping	30,653	0	0%	**Tracking data discrepancy** – The forecasted savings were not appropriately capped using the 30% adjustment factor prescribed in the APEP pump initiative guidelines. **Calculation methods** – Based on CPUC guidance, evaluators updated the energy savings calculation methods based on pump productivity levels instead of a ratio of OPE values that were used in the PA model. **Operating conditions** – The evaluator updated the annual pump operating hours based on as-found data provided by the site contact. The evaluator originally classified the project as AR as the pump had 1 more year of remaining life. However, the NTGR for this site was calculated to be less than 0.5 for this AR measure, indicating the project would have been completed absent program influence. Therefore, the measure was reclassified as NR using ISP as baseline. ISP for this measure is equal to the installed equipment, therefore there are no savings for this project.
PGE-21487	3.2	Process pumping	14,744	15,501	105%	**Calculation method** – Evaluator developed a new model to estimate the savings, which normalizes the water flow rate by incorporating pre/post flow rate ratio in the post energy consumption equation. The annual hours of operation were also updated from the energy use report provided by the customer, as the impacted pump is on a separate meter.
PGE-21492	45.0	Lighting outdoor LED fixture	53,005	53,465	101%	**Calculation method** – The forecasted savings did not match up to the MLC provided in the documentation.
PGE-21621	87.3	Lighting indoor LED fixture	3,322	5,780	174%	**Operating conditions** – The evaluator updated the hour of operation and coincident demand factor based on site-collected customer operation data.

DNV Project ID	Sampling weight	Measure type	First year (kWh)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
PGE-21653	3.2	Process cooling	19,245	-	0%	**Ineligible project** – Based on the interview with the customer, the evaluator updated MAT from AR to NR. The as-built equipment efficiency is lower than the updated NR baseline, so it is an ineligible measure.
PGE-21669	2.5	Lighting indoor LED fixture	337,338	215,580	64%	**Calculation method** – The forecasted analysis did not correctly estimate the incremental costs or EUL for this project and used wrong unit cost of energy to estimate the payback time. The evaluator recalculated the payback time and the lifetime savings. **Inappropriate baseline** – The baseline technology and efficiency were changed to the industrial standard practice baseline. And the HVAC interaction was not calculated properly in the forecasted estimations. **Measure count** – The evaluator updated the fixture quantity based on the customer provided information. **Operating conditions** – The evaluator updated the indoor space area and the hours of operation.
SCE-30002	4.5	Lighting indoor other	3,498	3,504	100%	**Calculation method** – The evaluator re-calculated the savings using a DEER-based spreadsheet calculator since the forecasted energy model cannot be opened.
SCE-30008	4.5	Whole building NRNC	39,362	40,787	104%	**Operating conditions** – Based on the as-built drawing and the customer interview, the evaluator added lighting control and updated the HVAC unit quantity and efficiency in the model. **Tracking data discrepancy** – The forecasted tracked savings did not match savings from the forecasted energy model or the forecasted report.
SCE-30017	7.5	Lighting indoor LED fixture	12,588	12,179	97%	**Calculation method** – Evaluator built an eLC 3.1 model that estimated energy savings for the highest saving measure to be 97% of the forecasted energy savings.
SCE-30025	6.7	Process other	138,027	16,042	12%	**Ineligible project** – This measure was deemed to be ineligible since the impacted fans were less than 100HP and violated program eligibility rules. **Program savings were reinstated for EEM1 and we applied based on the PA GRR.**

DNV Project ID	Sampling weight	Measure type	First year (kWh)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
SCE-30027	2.0	HVAC economizer	940,102	758,417	81%	**Operating conditions** – The evaluator updated the hours of operation based on the collected trend data.
SCE-30029	6.7	RCx HVAC	140,970	139,763	99%	**Tracking data discrepancy** – The forecasted tracked savings did not match the savings from the forecasted energy model or the forecasted report.
SCE-30032	6.7	Process fan	197,376	39,081	20%	**Calculation method** – The forecasted fan power did not match the spec sheet and the evaluator updated it properly. **Inappropriate baseline** – The evaluator changed the baseline to ISP. **Ineligible project** – The VFD measure is ineligible because it was installed to a fan less than 100HP.
SCE-30051	7.5	Lighting indoor LED fixture	649,953	752,882	116%	**Operating conditions** – Survey-based lighting hours of use were different compared to what was used to forecast savings.
SCE-30069	2.0	RCx HVAC	1,422,037	-	0%	**Ineligible project** – This project was installed outside the 3-year window and is not eligible.
SCE-30072	2.0	Process pumping replacement	927,418	0	0%	**Inappropriate baseline** – Per CPUC guidance E-4939 Attachment A: The customer did not explore alternatives to establish equivalent functional, technical and economic requirements. Quotes for alternative 72% efficiency (second baseline) were not obtained nor specific product model equivalence demonstrated. The participant had only one feasible option that they implemented. Because this project has the normal replacement baseline, the sole implemented solution is the baseline and no savings can be credited.
SCE-30080	6.0	HVAC rooftop AC system	102,872	100,900	98%	**Calculation method** – The evaluator re-calculated the savings using a DEER-based spreadsheet calculator since the forecasted energy model cannot be opened.
SCE-30082	7.2	RCx process	181,411	-	0%	**Other** – The evaluator assessed that VFD control of service pressure for district pumping systems of this type is standard practice. The site contact confirmed that this has also historically been standard practice for the site and systems of this type.

DNV Project ID	Sampling weight	Measure type	First year (kWh)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
SCE-30083	7.2	Ag pump overhaul	96,489	124,361	129%	**Calculation method** – Based on CPUC guidance, evaluators updated the energy savings calculation methods based on pump productivity levels instead of a ratio of OPE values that were used in the PA model.
SCE-30084	7.2	Process pumping VFD	365,478	276,100	76%	**Tracking data discrepancy** – Forecasted savings for Measure 1 included savings for both measures that were evaluated at this site.
SCE-30086	8.0	Lighting indoor LED fixture	144,516	144,516	100%	There are no reported discrepancies.
SCE-30088	8.0	Lighting indoor LED fixture	53,919	53,919	100%	There are no reported discrepancies.
SCE-30114	7.2	Pool pump	114,569	47,258	41%	**Operating conditions** – For the post-case, the total pool circulation flow was not split 50/50 between the two pumps as described in the original project scope and the PA model. Instead, the site continues to operate the pumping system in the original configuration where one pump handles 100% of the circulation flow and the other serves as backup. **Calculation method** – Evaluators used VFD efficiency to adjust the post-case pumping demand during occupied condition
SCE-30129	7.2	Food service	6,547	5,452	83%	**Calculation method** – The PA's post-installation savings document did not correctly calculate the average daily kWh consumed by the installed equipment. **Tracking data discrepancy** – Forecasted savings did not match with post installation verified savings.
SDG-60011	5.4	Whole building NRNC	56,590	-	0%	**Ineligible project** – The one measure installed violates the SBD rulebook which requires at least three measures for two end-uses under whole building approach. The SBD review workbook for the project suggests that the energy-efficient measures other than cool roof were contracted before applying for SBD.
SDG-60015	6.1	Process pumping overhaul	101,141	61,669	61%	**Tracking data discrepancy** – Forecasted savings does not match post-installation M&V estimated savings.

DNV Project ID	Sampling weight	Measure type	First year (kWh)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
						Operating conditions – Evaluator used as found supervisory control and data acquisition (SCADA) data from customer to update the PA's savings calculation model.
SDG-60017	6.1	RCx other	13,245	-	0%	**Tracking data discrepancy** – Incremental savings for this RCx project were misreported in tracking data and confirmed to be zero with PA. As-found consumption during post-installation period increased after RCx implementation.
SDG-60023	5.4	HVAC rooftop AC system	44,306	43,571	98%	**Calculation method** — measure case LPD was updated in the SimCalc model based on as-built lighting plans provided by the site contact.
SDG-60040	6.1	Process wastewater other	3,910,118	245,569	6%	**Operating conditions** – Evaluators updated savings calculations based on a new 1-year of post-case data, resulting in a slight update to evaluated savings. The evaluator originally classified the project as AR, However, the NTGR for this site was calculated to be less than 0.5 for this AR measure, indicating the project would have been completed absent program influence. Therefore, the measure was reclassified as NR using ISP as baseline.
SDG-60045	6.1	HVAC controls EMS	10,298	6,627	64%	**Calculation method** – The evaluators used a site-level billing analysis to estimate evaluated savings from the project, compared to PA's savings assumptions of 13% and 12% of baseline use for summer and winter, respectively.
SDG-60047	6.1	RCx other	251,096	166,828	66%	**Operating conditions** – Evaluators updated AHU operating schedules and supply fan reset parameters based on as-found data.
SDG-60095	6.1	HVAC fan VFD	557,936	-	0%	**Ineligible project** – This measure was deemed to be ineligible since the impacted fans were less than 100HP and violated program eligibility rules.

5.6 Appendix F: Natural gas project discrepancies

Table F-1. Project discrepancies resulting in adjusted gross natural gas savings and GRR (2020-2021)

DNV Project ID	Sample weight	Measure type	First year (therm)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
PGE-20007	3.6	Non-resource	11	-	0%	**Operating conditions** – The evaluator updated the boiler capacity, hours of operation and hot water setpoint based on the as-found data. **Tracking data discrepancy** – There was a difference between forecasted savings and PA-provided model savings.
PGE-20008	8.3	Process boiler other	8,966	-13,737	-150%	**Operating conditions** – The difference in savings is due to the increased production of steam in the normalized post period compared to the normalized pre period.
PGE-20012	1.0	Process other	1,573,087	-	0%	**Inappropriate baseline** – Evaluators conducted a mini-ISP study on multi-effect evaporators. Evaluators spoke to 3 vendors and concluded that three-effect evaporators have been a standard practice for the last several years, and that the vendors have been selling more efficient multi-effect evaporators. The evaluators concluded that the three-effect evaporator installed by the customer is indeed a standard practice and does not save energy compared to ISP.
PGE-20013	3.6	Non-resource	965	-	0%	**Ineligible measure** – The forecasted savings were derived from a model with VRF system but according to 2018 PGE rulebook, the model can only be used for incentive rate calculation. The savings should be calculated without VRF system and using the same HVAC system as the baseline (Packaged VAV).
PGE-20026	3.3	HVAC replacement system: packaged AC	36,693	-	0%	**Ineligible measure** – The program application states that the project must be completed within a year of application approval. No supporting documentation that shows extension approval was provided.
PGE-20031	3.3	RCx process	31,621	33,042	104%	**Calculation method** – The evaluator updated the savings method using an 8760 model and used the power ratio vs. speed relationship from part load performance data of VAV fan systems to calculate the fan speeds and corresponding CFM, which differs from the applicant's approach. **Operating conditions** – The evaluator updated the operating schedule of the equipment based on collected data.
PGE-20035	8.3	Process heat recovery	17,718	-	0%	**Ineligible measure** – The customer was confirmed to be a departing load customer who is paying PPP charges. We found out that the customer is purchasing all their natural gas used for the process measure from another alternative supplier. The evaluator also verified the same through billing history for the last couple of years.
PGE-20042	3.6	Non-resource	355,414	58,945	17%	**Calculation method** – Evaluators used CBECC-COM, a CEC-approved simulation software to estimate evaluated savings. Forecasted savings were

DNV Project ID	Sample weight	Measure type	First year (therm)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
						estimated using eQUEST, which is not a CEC-approved software for estimating savings under SBD. eQUEST does not have a provision to include all Title 24 code requirements by default and requires the modeler to accurately incorporate the Title 24 interpretations into the baseline model. **Operating conditions** – The evaluator updated the chiller and boiler capacity, temperature setpoint, HVAC schedule, and other input parameters in the model, based on the as-found data.
PGE-20049	8.3	RCx HVAC	881	-	0%	**Calculation method** – PA used READi Tool (V2.5.1 - DEER2005) and building square footage for calculating the energy savings associated with the measure. Evaluator developed TMY3 data based 8760 analysis approach using normalized cooling loads, chiller efficiency, and chilled water supply temperature. The variation in energy savings (kWh and peak kW) is due to the 8760 analysis methodology adopted by the evaluator when compared with the PA method. The project documentation (utility energy assessment studies, invoice, BMS logic) did not indicate any modification to the air-side equipment as part of the measure implementation.
PGE-20056	1.0	Process other	221,597	-	0%	**Other** – Since the cost documentation provided by the customer is invalid because the EULs of the existing mills and the additional mills that would have been shipped from their Las Vegas plant to scale to the new design capacity are mismatched, the evaluator conducted research to acquire cost documentation of standard like equipment. The evaluator found pricing information on highly similar equipment to that which had been retrofitted at the site (same manufacturer, feed type and production type, similar process stages, production capacity) has been on the market for the past 20 years. According to the specifications, it can meet the post-case functional requirement at a lower cost than the baseline costs that were established by the customer. The claim that the total post-case system costs are higher than the baseline is dubious.
PGE-20067	8.3	Process other	11,695	11,675	100%	**Calculation method** – The evaluators re-ran the 3E plus model using information provided and collected.
PGE-20093	3.6	Whole building NRNC	48,947	9,478	19%	**Calculation method** – Evaluators used CBECC-COM, a CEC-approved simulation software to estimate evaluated savings. Forecasted savings were estimated using eQUEST, which is not a CEC-approved software for estimating savings under SBD. eQUEST does not have a provision to include all Title 24 code requirements by default and requires the modeler to accurately incorporate the Title 24 interpretations into the baseline model. **Operating conditions** – Evaluator added outside air reset schedule on chilled water loop, hot water loop, and AHU-2 per updated control drawings provided by the site contact. As-found schedules and thermostat setpoints were also added in evaluator model.

DNV Project ID	Sample weight	Measure type	First year (therm)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
PGE-20252	3.3	RCx HVAC	30,999	34,277	111%	**Operating conditions** – The primary discrepancy is due to discrediting the savings for the AHUs as they are currently operating at pre-existing conditions (24/7 in an occupied schedule).
PGE-20376	1.7	RCx HVAC	63,326	83,525	132%	**Operating conditions** – The PA-provided model was updated with recent trend data which showed a difference in assumed operation.
PGE-20595	3.3	RCx HVAC	18,885	-	0%	**Operating conditions** – Based on information gathered from the customer, the evaluators determined the EMS controls were installed but never properly commissioned due to COVID-19 space requirements. The equipment is still operating at pre-existing conditions to date, and the impacted AHUs are planned to be replaced as part of a major renovation.
PGE-21286	3.2	HVAC replacement system: packaged ac	6,444	-	0%	**Ineligible measure** – The project involves the installation of ineligible measures per the Statewide custom manual: VFDs on HVAC fans less than 100 HP.
PGE-21289	2.5	Whole building NRNC	80,884	67,717	84%	**Calculation method** – The evaluator updated LPD, boiler efficiency, pump size, and flow in the forecast model, based on the post verification report and customer provided data. **Operating conditions** – The evaluator updated cooling and heating temperature setpoint in the forecast model, based on collected EMS screenshot.
PGE-21292	3.2	RCx process	7,096	-	0%	**Ineligible measure** – This measure is ineligible since the installation date is past the 1-year countdown from the PA approval date without sufficient extensions which violated the CPUC rulebook for eligibility.
PGE-21293	2.5	Non-resource	2,272	197	9%	**Calculation method** – The evaluator updated the weather file with CZ2010 data and the correct peak period profile to estimate kW savings. And updated the supply fan size based on the as-found conditions. **Operating conditions** – The evaluator updated occupied and unoccupied heating setpoints, based on BMS screenshots.
PGE-21295	2.5	Whole building NRNC	2,579	1,247	48%	**Calculation method** – The forecasted model baseline LPD values were higher than the code and overestimated the savings. Evaluators adjusted the baseline LPD by the ratio of Title 24 wattage to modelled wattage. The evaluator also updated the weather profile to CZ2010 data. **Operating conditions** – Based on the as-found data from customer, the evaluator updated the temperature setpoint and the occupied and unoccupied schedule.
PGE-21296	2.5	Whole building NRNC	39,310	36,069	92%	**Calculation method** – The evaluator updated the weather profile to CZ2010 data.

DNV Project ID	Sample weight	Measure type	First year (therm)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
						Operating conditions – Based on the as-found data from customer, the evaluator updated the temperature setpoint and the occupied and unoccupied schedule.
PGE-21298	2.5	Whole building NRNC	3,112	3,463	111%	**Calculation method** – The evaluator adjusted roof R-value based on the as-built drawing. **Operating conditions** – The evaluator updated occupied cooling setpoint according to the EMS snapshot.
PGE-21299	3.2	RCx HVAC	143,942	143,942	100%	**Operating conditions** – The evaluator adjusted the model with collected trend data, which showed the AHUs operating at higher speeds than assumed.
PGE-21301	3.2	RCx HVAC	20,252	-	0%	**Ineligible measure** – This measure is ineligible since the installation date is past the 1-year countdown from the PA approval date without sufficient extensions which violated the CPUC rulebook for eligibility.
PGE-21310	2.5	Whole building NRNC	58,905	54,322	92%	**Calculation method** – Evaluators used CBECC-COM, a CEC-approved simulation software to estimate evaluated savings. Forecasted savings were estimated using eQUEST, which is not a CEC-approved software for estimating savings under SBD. eQUEST does not have a provision to include all Title 24 code requirements by default and requires the modeler to accurately incorporate the Title 24 interpretations into the baseline model. **Operating conditions** – The evaluator updated boiler temperature reset, chiller capacity, space temperature setpoint and the operation schedule in the model, based on the as-found data.
PGE-21311	2.5	Whole building NRNC	16,096	5,404	34%	**Calculation method** – Evaluators used CBECC-COM, a CEC-approved simulation software to estimate evaluated savings. Forecasted savings were estimated using eQUEST, which is not a CEC-approved software for estimating savings under SBD. eQUEST does not have a provision to include all Title 24 code requirements by default and requires the modeler to accurately incorporate the Title 24 interpretations into the baseline model. **Operating conditions** – The evaluator updated space temperature setpoint and the operation schedule in the model, based on the as-found data.
PGE-21312	1.0	Process other	25,923,258	26,519,166	102%	**Operating conditions** – The evaluators updated the savings model with collected trend data which showed a difference in operation.
PGE-21315	2.5	Whole building NRNC	1,509	1,305	86%	**Inappropriate baseline** – Evaluator used EnergyPro v7.2.7.1, which was slightly newer than PA version v7.2.6.0. **Operating conditions** - Evaluator updated heating setpoints in the evaluated model based on as-found data
PGE-21316	3.2	RCx HVAC	22,036	22,036	100%	**Calculation method** - The PA-provided model did not reduce savings due to on-site generation which represented about 20% of the campus energy consumption.

DNV Project ID	Sample weight	Measure type	First year (therm)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
						The evaluators updated the model to account for these impacts, so savings reflect the impact on the grid performed by the PA.
PGE-21321	2.5	Whole building NRNC	45	45	100%	**Calculation method** – Added economizer to the HVAC system and removed the program unrelated savings in the model. **Operating conditions** – Updated the space temperature setpoint and the supply fan airflow, based on the as-found data.
PGE-21328	2.5	Whole building NRNC	4,997	6,982	140%	**Calculation method** – Evaluators used CBECC-COM, a CEC-approved simulation software to estimate evaluated savings. Forecasted savings were estimated using eQUEST, which is not a CEC-approved software for estimating savings under SBD. eQUEST does not have a provision to include all Title 24 code requirements by default and requires the modeler to accurately incorporate the Title 24 interpretations into the baseline model. **Operating conditions** – The evaluator updated space temperature setpoint and the operation schedule in the model, based on the as-found data.
PGE-21337	2.5	Whole building NRNC	90,366	47,604	53%	**Operating conditions** – The evaluator updated cooling and heating temperature setpoints during the occupied and unoccupied periods, following EMS snapshot of the building provided by the site contact.
PGE-21353	3.2	Pipe insulation hot application	16,752	17,290	103%	**Calculation method** – The evaluators updated heat loss for bare and insulated components in the 3E plus model for all unique applications. The evaluators also re-ran the 3E plus model using information provided and collected.
PGE-21361	3.2	Pipe insulation hot application	10,101	9,526	94%	**Calculation method** – The evaluators updated heat loss for bare and insulated components in the 3E plus model for all unique applications.
PGE-21658	3.2	RCx process	69,054	115,501	167%	**Operating conditions** - The applicant submitted baseline regression models were based on 2016 trend data, and do not accurately reflect the pre-project conditions. The evaluators updated baseline trends based on 2018-2019 trend data, which showed a difference in operation. Collected post-implementation trend data also showed an increase in supply fan speed compared to what was assumed.
PGE-21661	3.2	Process fan	4,547	-	0%	**Ineligible measure** – The project involves the installation of ineligible measures per the Statewide custom manual: VFDs on HVAC fans less than 100 HP. **Operating conditions** – The evaluator updated the model with collected trend data, which showed an increase in operation for the existing pumps.
PGE-21663	3.2	Process other	287,688	-	0%	**Operating conditions** – The evaluator updated the model using collected trend data, which showed an increase in hp.
PGE-21680	3.2	RCx HVAC	22,017	6,863	31%	**Calculation method** – The evaluator updated the model using site trends to develop regressions, compared to the applicant approach which used 2 points of trend data to interpolate savings at various bins.

DNV Project ID	Sample weight	Measure type	First year (therm)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
						Operating conditions – The evaluator updated the model with provided trend data which reflected a difference in operation compared to what was assumed.
PGE-21681	3.2	RCx HVAC	17,249	13,815	80%	**Calculation method** – The evaluator updated the model with a full year of trend data compared to the PA provided model which, modelled savings using one month of data. **Operating conditions** – The measures were installed but adjusted due to state COVID-19 protocols. The provided trend data indicated the operating schedule is still 24 hours which indicates the optimization measure is not operating, therefore zero savings were applied for that measure. The economizer optimization significantly increased as hours were found to be longer than reported.
PGE-21684	3.2	RCx HVAC	34,577	4,053	12%	**Inoperable measure** – Evaluators identified that the pre- and post-project boiler lock-out temperatures were the same, and hence there were no savings associated with this project.
PGE-21686	3.2	Process boiler	1,446	-	0%	**Inoperable measure** – The boiler is no longer in operation since July 1, 2022. The evaluator updated the EUL and lifetime savings based on this.
SCG-40002	1.5	Pipe insulation hot application	28,949	-	0%	**Ineligible measure** – The project claimed an installation date of 5/19/2020 but documentation was provided that showed the installation date was 7/24/2019.
SCG-40003	1.5	Process boiler other	68,894	62,880	91%	**Calculation method** – The forecasted calculator used 2020 annual gas usage (1,309,409 therms) for both the pre-case and post-install case. The evaluator revised the calculator to use the 2019 pre-installation annual gas usage for the pre-case and post install case. The 2020 annual gas usage would have included the savings realized from the measure, effectively double counting the months that the measure was operable. The baseline blowdown amount is based on the incorrect boiler efficiencies which were corrected in the applicant's post M&V calculator. The evaluator recalculated the baseline blowdown amount using the correct boiler efficiencies.
SCG-40005	1.5	Process heating	17,991	-	0%	**Ineligible measure** – The application was originally submitted under the 2014 custom program. The tracking data has the project installation date of 10/10/2019, however, the measures were installed on 3/1/2017. SCG has confirmed that the install date was 3/1/2017 therefore this project is ineligible under the PY2020 program year.
SCG-40007	1.5	Process heating insulation	56,330	-	0%	**Ineligible measure** – The installation date of 12/31/2019 from the project documentation falls outside of the eligibility window because the application was filed in 2015. There is no supporting documentation provided showing that any delay in the implementation of this measure was approved.
SCG-40008	1.5	Process boiler steam traps	486,702	-	0%	**Ineligible measure** – This project was assessed to be a zero-saver due to the lack of justification for the gaps in application extension documents.

DNV Project ID	Sample weight	Measure type	First year (therm)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
SCG-40011	1.5	HVAC controls other	16,524	-	0%	**Ineligible measure** – The equipment invoice shows a purchase order reference date that pre-dates the project approval date. The available invoice is dated 05/25/20 but references a purchase order dated 08/30/2019. There is also no documentation showing the installation date. The project was approved not until 5/11/20 according to the Conditional Incentive Reservation (CIR). The evaluator interviewed the customer, but the customer did not know the installation date or the equipment purchase date.
SCG-40018	3.0	Food service	1,899	-	0%	**Ineligible measure** – The new unit was installed and had been running without issues since 11/7/2016 as confirmed by the customer during a phone call conducted on 9/6/2022. Documentation shows that the incentive was paid on 5/27/2021. Project timelines and screenshots from documentation to further support ineligibility were also documented.
SCG-40020	3.0	Water heating controls	37,761	51,614	137%	**Calculation method** – Evaluator reran SSAT model with project-specific inputs along with verified operating hours (6636) of boiler from 1 year's consumption data.
SDG-60007	13.0	RCx other	15,971	3,573	22%	**Tracking data discrepancy** – The Year 2 savings for this multi-year whole-building RCx project was incorrectly reported by a significant margin (>12,000 therm).
SDG-60020	5.4	Lighting outdoor led fixture	568	773	136%	**Calculation method** – Evaluator used DEER water heater calculator v5.1 to estimate natural gas and electric impacts. The forecasted measure level therm savings for the DHW measure was hard coded into the SimCalc model with no penalties provided for the electricity consumption.
SDG-60028	5.4	Whole building NRNC	120	120	100%	**Operating conditions** – Evaluator updated the heating setpoints at the facility according to BMS screenshots and site inspection photos. Evaluators also updated the facility schedules resulting in different evaluated savings compared to forecasted values.
SDG-60032	6.1	Process other	70,001	68,484	98%	**Operating conditions** – Evaluator used post-install trend data on the AHUs to estimate evaluated savings, while the PA model calculated post- CFM values by regressing baseline CFM with outdoor air temperature.
SDG-60035	5.4	Whole building NRNC	129	-	0%	**Inappropriate baseline** – This is a federal building with international codes as applicable baseline and not Title 24. This facility does not qualify under SBD's program eligibility criteria.
SDG-60037	6.1	HVAC ventilation other	42,767	42,767	100%	There are no reported discrepancies.
SDG-60060	6.1	HVAC controls EMS	4,010	11,973	299%	**Calculation method** – The evaluators performed a weather-normalized billing analysis to estimate savings from the project, whereas the PA forecast model assumed fixed-percentage savings for the measure.

DNV Project ID	Sample weight	Measure type	First year (therm)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
SDG-60074	6.1	Water heating boiler	2,558	2,602	102%	**Calculation method** – The evaluated savings are slightly higher since the PA calculation extrapolated to 96% thermal efficiency whereas the nameplate photos obtained from the site chief engineer by evaluators confirm that the thermal efficiency of the new unit is 96.2%.

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	11,079	3,823	0.35	0.0%	0.35
MCE	Non-sampled Projects	555	191	0.34	0.0%	0.34
MCE	**Total**	**11,695**	**4,014**	**0.34**	**0.0%**	**0.34**
PGE	Custom Lighting	448,924	304,712	0.68	0.0%	0.68
PGE	Custom Non Lighting	543,440	214,436	0.39	23.2%	0.35
PGE	SBD Non-Lighting	184,723	111,674	0.60	34.0%	0.56
PGE	**Total**	**1,177,095**	**630,822**	**0.54**	**16.0%**	**0.52**
RCEA	Non-sampled Projects	20	17	0.85	100.0%	
RCEA	**Total**	**20**	**17**	**0.85**	**100.0%**	
SCE	Custom Lighting	19,295	94,687	4.91	6.0%	5.11
SCE	Custom Non Lighting	119,263	30,523	0.26	0.5%	0.25
SCE	SBD Non-Lighting	43,546	42,255	0.97	31.6%	1.06
SCE	**Total**	**182,104**	**167,465**	**0.92**	**8.5%**	**0.93**
SCG	Custom Non Lighting	0	0			
SCG	Non-sampled Projects	0	0			
SCG	**Total**	**0**	**0**			
SDGE	Custom Non Lighting	148,961	40,733	0.27	0.0%	0.27
SDGE	Non-sampled Projects	26,165	13,644	0.52	99.7%	0.48
SDGE	SBD Non-Lighting	82,093	2,142	0.03	0.0%	0.03
SDGE	**Total**	**257,219**	**56,519**	**0.22**	**10.1%**	**0.19**
	Statewide	***1,628,134***	***858,837***	***0.53***	***14.2%***	***0.51***

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	10,633	2,142	0.20	0.0%	0.96	0.56	0.96	0.56
MCE	Non-sampled Projects	532	85	0.16	0.0%	0.96	0.44	0.96	0.44
MCE	**Total**	**11,225**	**2,227**	**0.20**	**0.0%**	**0.96**	**0.55**	**0.96**	**0.55**
PGE	Custom Lighting	406,368	167,693	0.41	0.0%	0.91	0.55	0.91	0.55
PGE	Custom Non Lighting	341,185	119,041	0.35	16.0%	0.63	0.56	0.69	0.57
PGE	SBD Non-Lighting	132,607	49,005	0.37	31.4%	0.72	0.44	0.75	0.44
PGE	**Total**	**880,168**	**335,739**	**0.38**	**11.0%**	**0.75**	**0.53**	**0.79**	**0.54**
RCEA	Non-sampled Projects	13	9	0.71	100.0%	0.65	0.55		
RCEA	**Total**	**13**	**9**	**0.71**	**100.0%**	**0.65**	**0.55**		
SCE	Custom Lighting	12,714	44,766	3.52	12.2%	0.66	0.47	0.66	0.46
SCE	Custom Non Lighting	78,942	16,732	0.21	0.6%	0.66	0.55	0.66	0.55
SCE	SBD Non-Lighting	23,950	10,313	0.43	31.6%	0.55	0.24	0.55	0.24
SCE	**Total**	**115,607**	**71,811**	**0.62**	**8.3%**	**0.63**	**0.43**	**0.64**	**0.43**
SCG	Custom Non Lighting	0	0						
SCG	Non-sampled Projects	0	0						
SCG	**Total**	**0**	**0**						
SDGE	Custom Non Lighting	102,576	19,980	0.19	0.0%	0.69	0.49	0.69	0.49
SDGE	Non-sampled Projects	20,877	4,177	0.20	99.8%	0.80	0.31	0.65	0.31
SDGE	SBD Non-Lighting	55,991	512	0.01	0.0%	0.68	0.24	0.68	0.24
SDGE	**Total**	**179,444**	**24,669**	**0.14**	**11.6%**	**0.70**	**0.44**	**0.69**	**0.48**
	Statewide	***1,186,457***	***434,454***	***0.37***	***10.7%***	***0.73***	***0.51***	***0.76***	***0.51***

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	0.7	0.2	0.33	0.0%	0.33
MCE	Non-sampled Projects	0.1	0.0	0.36	0.0%	0.36
MCE	**Total**	**3.6**	**0.3**	**0.08**	**0.0%**	**0.08**
PGE	Custom Lighting	56.4	28.7	0.51	0.0%	0.51
PGE	Custom Non Lighting	69.5	28.7	0.41	17.8%	0.35
PGE	SBD Non-Lighting	53.5	28.8	0.54	30.1%	0.47
PGE	**Total**	**851.2**	**86.2**	**0.10**	**3.3%**	**0.08**
RCEA	Non-sampled Projects	0.0	0.0	0.52	100.0%	
RCEA	**Total**	**0.0**	**0.0**	**0.52**	**100.0%**	
SCE	Custom Lighting	1.0	1.2	1.18	0.0%	1.18
SCE	Custom Non Lighting	17.8	3.9	0.22	0.5%	0.22
SCE	SBD Non-Lighting	8.3	10.1	1.23	29.2%	1.29
SCE	**Total**	**27.0**	**15.3**	**0.56**	**9.3%**	**0.51**
SCG	Custom Non Lighting	0.0	0.0			
SCG	Non-sampled Projects	0.0	0.0			
SCG	**Total**	**0.0**	**0.0**			
SDGE	Custom Non Lighting	16.5	5.7	0.35	0.0%	0.35
SDGE	Non-sampled Projects	3.9	2.0	0.51	99.7%	0.47
SDGE	SBD Non-Lighting	17.9	1.0	0.05	0.0%	0.05
SDGE	**Total**	**38.3**	**8.7**	**0.23**	**10.3%**	**0.19**
	Statewide	***920.2***	***110.4***	***0.12***	***3.8%***	***0.10***

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	0.7	0.1	0.20	0.0%	0.96	0.57	0.96	0.57
MCE	Non-sampled Projects	0.1	0.0	0.16	0.0%	0.96	0.43	0.96	0.43
MCE	**Total**	**3.4**	**0.2**	**0.04**	**0.0%**	**0.96**	**0.55**	**0.96**	**0.55**
PGE	Custom Lighting	50.3	13.6	0.27	0.0%	0.89	0.47	0.89	0.47
PGE	Custom Non Lighting	43.9	15.7	0.36	10.8%	0.63	0.55	0.69	0.55
PGE	SBD Non-Lighting	41.2	12.1	0.29	26.8%	0.77	0.42	0.81	0.43
PGE	**Total**	**780.3**	**41.4**	**0.05**	**2.0%**	**0.92**	**0.48**	**0.93**	**0.48**
RCEA	Non-sampled Projects	0.0	0.0	0.38	100.0%	0.65	0.47		
RCEA	**Total**	**0.0**	**0.0**	**0.38**	**100.0%**	**0.65**	**0.47**		
SCE	Custom Lighting	0.7	0.8	1.18	17.7%	0.65	0.65	0.65	0.65
SCE	Custom Non Lighting	12.0	2.5	0.21	0.6%	0.67	0.65	0.67	0.65
SCE	SBD Non-Lighting	4.5	2.9	0.64	29.2%	0.55	0.28	0.55	0.29
SCE	**Total**	**17.2**	**6.2**	**0.36**	**8.8%**	**0.64**	**0.41**	**0.64**	**0.43**
SCG	Custom Non Lighting	0.0	0.0						
SCG	Non-sampled Projects	0.0	0.0						
SCG	**Total**	**0.0**	**0.0**						
SDGE	Custom Non Lighting	10.9	2.9	0.27	0.0%	0.66	0.51	0.66	0.51
SDGE	Non-sampled Projects	3.1	0.6	0.18	99.8%	0.79	0.27	0.65	0.27
SDGE	SBD Non-Lighting	12.1	0.2	0.02	0.0%	0.67	0.23	0.67	0.23
SDGE	**Total**	**26.1**	**3.7**	**0.14**	**11.9%**	**0.68**	**0.43**	**0.67**	**0.47**
	Statewide	***827.1***	***51.5***	***0.06***	***2.5%***	***0.90***	***0.47***	***0.91***	***0.48***

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	-50	-17	0.34	0.0%	0.34
MCE	Non-sampled Projects	-7	-7	0.99	0.0%	0.99
MCE	**Total**	**-58**	**-24**	**0.42**	**0.0%**	**0.42**
PGE	Custom Lighting	-1,539	5,508	-3.58	0.0%	-3.58
PGE	Custom Non Lighting	425,864	391,009	0.92	1.2%	0.92
PGE	SBD Non-Lighting	13,478	5,638	0.42	10.7%	0.38
PGE	**Total**	**437,802**	**402,156**	**0.92**	**1.4%**	**0.92**
RCEA	Non-sampled Projects	0	1	-3.46	100.0%	
RCEA	**Total**	**0**	**1**	**-3.46**	**100.0%**	
SCE	Custom Lighting	0	0			
SCE	Custom Non Lighting	131	131	1.00	0.0%	1.00
SCE	SBD Non-Lighting	13	35	2.76	0.0%	2.76
SCE	**Total**	**144**	**166**	**1.16**	**0.0%**	**1.16**
SCG	Custom Non Lighting	10,807	2,199	0.20	3.0%	0.19
SCG	Non-sampled Projects	3	1	0.53	100.0%	
SCG	**Total**	**10,810**	**2,201**	**0.20**	**3.0%**	**0.19**
SDGE	Custom Non Lighting	4,469	2,680	0.60	0.0%	0.60
SDGE	Non-sampled Projects	590	303	0.51	100.0%	
SDGE	SBD Non-Lighting	1,051	1,593	1.52	0.0%	1.52
SDGE	**Total**	**6,110**	**4,577**	**0.75**	**9.7%**	**0.77**
	Statewide	***454,807***	***409,076***	***0.90***	***1.6%***	***0.90***

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	-48	-10	0.20	0.0%	0.96	0.56	0.96	0.56
MCE	Non-sampled Projects	-6	-1	0.21	0.0%	0.96	0.20	0.96	0.20
MCE	**Total**	**-55**	**-11**	**0.20**	**0.0%**	**0.96**	**0.46**	**0.96**	**0.46**
PGE	Custom Lighting	-1,457	2,197	-1.51	0.0%	0.95	0.40	0.95	0.40
PGE	Custom Non Lighting	92,292	76,310	0.83	1.2%	0.22	0.20	0.22	0.20
PGE	SBD Non-Lighting	10,742	2,311	0.22	9.5%	0.80	0.41	0.81	0.41
PGE	**Total**	**101,577**	**80,818**	**0.80**	**2.1%**	**0.23**	**0.20**	**0.23**	**0.20**
RCEA	Non-sampled Projects	0	0	-2.41	100.0%	0.65	0.45		
RCEA	**Total**	**0**	**0**	**-2.41**	**100.0%**	**0.65**	**0.45**		
SCE	Custom Lighting	0	0						
SCE	Custom Non Lighting	81	81	1.00	0.0%	0.62	0.62	0.62	0.62
SCE	SBD Non-Lighting	7	11	1.64	0.0%	0.55	0.33	0.55	0.33
SCE	**Total**	**88**	**92**	**1.05**	**0.0%**	**0.61**	**0.55**	**0.61**	**0.55**
SCG	Custom Non Lighting	6,106	1,000	0.16	5.6%	0.56	0.45	0.55	0.46
SCG	Non-sampled Projects	2	0	0.19	100.0%	0.90	0.32		
SCG	**Total**	**6,108**	**1,000**	**0.16**	**5.6%**	**0.57**	**0.45**	**0.55**	**0.46**
SDGE	Custom Non Lighting	3,460	1,866	0.54	0.0%	0.77	0.70	0.77	0.70
SDGE	Non-sampled Projects	460	96	0.21	100.0%	0.78	0.32		
SDGE	SBD Non-Lighting	651	746	1.15	0.0%	0.62	0.47	0.62	0.47
SDGE	**Total**	**4,570**	**2,708**	**0.59**	**10.1%**	**0.75**	**0.59**	**0.74**	**0.61**
	Statewide	***112,288***	***84,608***	***0.75***	***2.6%***	***0.25***	***0.21***	***0.24***	***0.21***

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	1,279	499	0.39	0.0%	0.39
MCE	Non-sampled Projects	103	57	0.55	0.0%	0.55
MCE	**Total**	**1,388**	**556**	**0.40**	**0.0%**	**0.40**
PGE	Custom Lighting	70,394	57,116	0.81	0.0%	0.81
PGE	Custom Non Lighting	63,962	39,611	0.62	26.4%	0.58
PGE	SBD Non-Lighting	12,433	8,164	0.66	33.9%	0.61
PGE	**Total**	**146,792**	**104,891**	**0.71**	**14.4%**	**0.71**
RCEA	Non-sampled Projects	5	4	0.83	100.0%	
RCEA	**Total**	**5**	**4**	**0.83**	**100.0%**	
SCE	Custom Lighting	2,818	3,415	1.21	3.4%	1.22
SCE	Custom Non Lighting	14,548	5,637	0.39	1.4%	0.38
SCE	SBD Non-Lighting	2,873	3,200	1.11	31.5%	1.13
SCE	**Total**	**20,239**	**12,252**	**0.61**	**6.0%**	**0.58**
SCG	Custom Non Lighting	0	0			
SCG	Non-sampled Projects	0	0			
SCG	**Total**	**0**	**0**			
SDGE	Custom Non Lighting	20,065	8,447	0.42	0.0%	0.42
SDGE	Non-sampled Projects	1,840	1,054	0.57	99.7%	0.53
SDGE	SBD Non-Lighting	5,474	141	0.03	0.0%	0.03
SDGE	**Total**	**27,379**	**9,642**	**0.35**	**6.7%**	**0.34**
	Statewide	***195,803***	***127,345***	***0.65***	***12.3%***	***0.64***

Net First Year 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	1,228	280	0.23	0.0%	0.96	0.56	0.96	0.56
MCE	Non-sampled Projects	99	25	0.25	0.0%	0.96	0.44	0.96	0.44
MCE	**Total**	**1,332**	**305**	**0.23**	**0.0%**	**0.96**	**0.55**	**0.96**	**0.55**
PGE	Custom Lighting	65,299	31,987	0.49	0.0%	0.93	0.56	0.93	0.56
PGE	Custom Non Lighting	41,223	22,488	0.55	22.2%	0.64	0.57	0.68	0.59
PGE	SBD Non-Lighting	8,917	3,582	0.40	31.5%	0.72	0.44	0.74	0.44
PGE	**Total**	**115,442**	**58,058**	**0.50**	**10.4%**	**0.79**	**0.55**	**0.82**	**0.56**
RCEA	Non-sampled Projects	3	2	0.69	100.0%	0.65	0.55		
RCEA	**Total**	**3**	**2**	**0.69**	**100.0%**	**0.65**	**0.55**		
SCE	Custom Lighting	1,846	1,690	0.92	18.5%	0.66	0.49	0.66	0.46
SCE	Custom Non Lighting	9,754	3,042	0.31	1.6%	0.67	0.54	0.67	0.54
SCE	SBD Non-Lighting	1,580	788	0.50	31.5%	0.55	0.25	0.55	0.24
SCE	**Total**	**13,181**	**5,520**	**0.42**	**7.5%**	**0.65**	**0.45**	**0.66**	**0.46**
SCG	Custom Non Lighting	0	0						
SCG	Non-sampled Projects	0	0						
SCG	**Total**	**0**	**0**						
SDGE	Custom Non Lighting	15,660	4,143	0.26	0.0%	0.78	0.49	0.78	0.49
SDGE	Non-sampled Projects	1,471	323	0.22	99.7%	0.80	0.31	0.65	0.31
SDGE	SBD Non-Lighting	3,734	34	0.01	0.0%	0.68	0.24	0.68	0.24
SDGE	**Total**	**20,865**	**4,500**	**0.22**	**7.0%**	**0.76**	**0.47**	**0.76**	**0.49**
	Statewide	***150,823***	***68,384***	***0.45***	***9.6%***	***0.77***	***0.54***	***0.80***	***0.55***

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	0.1	0.0	0.38	0.0%	0.38
MCE	Non-sampled Projects	0.0	0.0	0.56	0.0%	0.56
MCE	**Total**	**0.1**	**0.0**	**0.40**	**0.0%**	**0.40**
PGE	Custom Lighting	8.3	5.9	0.71	0.0%	0.71
PGE	Custom Non Lighting	7.3	4.1	0.56	18.1%	0.53
PGE	SBD Non-Lighting	3.6	2.0	0.57	30.3%	0.50
PGE	**Total**	**19.2**	**12.1**	**0.63**	**12.6%**	**0.62**
RCEA	Non-sampled Projects	0.0	0.0	0.73	100.0%	
RCEA	**Total**	**0.0**	**0.0**	**0.73**	**100.0%**	
SCE	Custom Lighting	0.2	0.2	1.06	0.0%	1.06
SCE	Custom Non Lighting	1.5	0.6	0.44	2.1%	0.43
SCE	SBD Non-Lighting	0.5	0.6	1.21	28.9%	1.26
SCE	**Total**	**2.2**	**1.5**	**0.68**	**8.6%**	**0.65**
SCG	Custom Non Lighting	0.0	0.0			
SCG	Non-sampled Projects	0.0	0.0			
SCG	**Total**	**0.0**	**0.0**			
SDGE	Custom Non Lighting	2.0	1.1	0.58	0.0%	0.58
SDGE	Non-sampled Projects	0.3	0.1	0.53	99.7%	0.49
SDGE	SBD Non-Lighting	1.2	0.1	0.06	0.0%	0.06
SDGE	**Total**	**3.4**	**1.4**	**0.40**	**7.9%**	**0.38**
	Statewide	***25.0***	***15.0***	***0.60***	***11.5%***	***0.58***

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	0.1	0.0	0.22	0.0%	0.96	0.57	0.96	0.57
MCE	Non-sampled Projects	0.0	0.0	0.25	0.0%	0.96	0.43	0.96	0.43
MCE	**Total**	**0.1**	**0.0**	**0.23**	**0.0%**	**0.96**	**0.54**	**0.96**	**0.54**
PGE	Custom Lighting	7.6	2.9	0.38	0.0%	0.92	0.49	0.92	0.49
PGE	Custom Non Lighting	4.8	2.4	0.50	13.6%	0.65	0.57	0.68	0.58
PGE	SBD Non-Lighting	2.8	0.9	0.31	27.1%	0.77	0.42	0.80	0.43
PGE	**Total**	**15.1**	**6.1**	**0.41**	**9.2%**	**0.79**	**0.51**	**0.82**	**0.51**
RCEA	Non-sampled Projects	0.0	0.0	0.52	100.0%	0.65	0.47		
RCEA	**Total**	**0.0**	**0.0**	**0.52**	**100.0%**	**0.65**	**0.47**		
SCE	Custom Lighting	0.1	0.1	1.06	37.1%	0.65	0.65	0.65	0.65
SCE	Custom Non Lighting	1.0	0.4	0.41	2.3%	0.69	0.64	0.68	0.64
SCE	SBD Non-Lighting	0.3	0.2	0.62	28.9%	0.55	0.28	0.55	0.29
SCE	**Total**	**1.4**	**0.7**	**0.51**	**10.8%**	**0.65**	**0.49**	**0.66**	**0.50**
SCG	Custom Non Lighting	0.0	0.0						
SCG	Non-sampled Projects	0.0	0.0						
SCG	**Total**	**0.0**	**0.0**						
SDGE	Custom Non Lighting	1.4	0.6	0.41	0.0%	0.72	0.51	0.72	0.51
SDGE	Non-sampled Projects	0.2	0.0	0.18	99.8%	0.79	0.27	0.65	0.27
SDGE	SBD Non-Lighting	0.8	0.0	0.02	0.0%	0.67	0.23	0.67	0.23
SDGE	**Total**	**2.4**	**0.6**	**0.26**	**8.9%**	**0.71**	**0.47**	**0.71**	**0.50**
	Statewide	***19.1***	***7.5***	***0.39***	***9.2%***	***0.77***	***0.50***	***0.79***	***0.51***

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	-6	-2	0.39	0.0%	0.39
MCE	Non-sampled Projects	-1	-1	0.97	0.0%	0.97
MCE	**Total**	**-7**	**-3**	**0.49**	**0.0%**	**0.49**
PGE	Custom Lighting	-269	-275	1.02	0.0%	1.02
PGE	Custom Non Lighting	29,244	26,673	0.91	1.5%	0.91
PGE	SBD Non-Lighting	898	412	0.46	10.7%	0.42
PGE	**Total**	**29,874**	**26,810**	**0.90**	**1.8%**	**0.90**
RCEA	Non-sampled Projects	0	0	1.01	100.0%	
RCEA	**Total**	**0**	**0**	**1.01**	**100.0%**	
SCE	Custom Lighting	0	0			
SCE	Custom Non Lighting	44	44	1.00	0.0%	1.00
SCE	SBD Non-Lighting	1	1	0.89	0.0%	0.89
SCE	**Total**	**45**	**45**	**1.00**	**0.0%**	**1.00**
SCG	Custom Non Lighting	1,490	950	0.64	4.3%	0.60
SCG	Non-sampled Projects	0	0	0.55	100.0%	
SCG	**Total**	**1,490**	**950**	**0.64**	**4.4%**	**0.60**
SDGE	Custom Non Lighting	861	529	0.61	0.0%	0.61
SDGE	Non-sampled Projects	42	22	0.53	100.0%	
SDGE	SBD Non-Lighting	70	84	1.20	0.0%	1.20
SDGE	**Total**	**973**	**635**	**0.65**	**4.3%**	**0.66**
	Statewide	***32,374***	***28,437***	***0.88***	***2.0%***	***0.88***

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	-6	-1	0.22	0.0%	0.96	0.56	0.96	0.56
MCE	Non-sampled Projects	-1	0	0.20	0.0%	0.96	0.20	0.96	0.20
MCE	**Total**	**-7**	**-2**	**0.22**	**0.0%**	**0.96**	**0.43**	**0.96**	**0.43**
PGE	Custom Lighting	-255	-125	0.49	0.0%	0.95	0.45	0.95	0.45
PGE	Custom Non Lighting	6,714	5,320	0.79	2.3%	0.23	0.20	0.23	0.20
PGE	SBD Non-Lighting	716	169	0.24	9.5%	0.80	0.41	0.81	0.41
PGE	**Total**	**7,174**	**5,365**	**0.75**	**3.1%**	**0.24**	**0.20**	**0.24**	**0.20**
RCEA	Non-sampled Projects	0	0	0.71	100.0%	0.65	0.45		
RCEA	**Total**	**0**	**0**	**0.71**	**100.0%**	**0.65**	**0.45**		
SCE	Custom Lighting	0	0						
SCE	Custom Non Lighting	27	27	1.00	0.0%	0.62	0.62	0.62	0.62
SCE	SBD Non-Lighting	0	0	0.53	0.0%	0.55	0.33	0.55	0.33
SCE	**Total**	**27**	**27**	**0.99**	**0.0%**	**0.61**	**0.61**	**0.61**	**0.61**
SCG	Custom Non Lighting	852	436	0.51	8.0%	0.57	0.46	0.55	0.46
SCG	Non-sampled Projects	0	0	0.19	100.0%	0.90	0.32		
SCG	**Total**	**852**	**436**	**0.51**	**8.0%**	**0.57**	**0.46**	**0.55**	**0.46**
SDGE	Custom Non Lighting	774	347	0.45	0.0%	0.90	0.66	0.90	0.66
SDGE	Non-sampled Projects	33	7	0.22	100.0%	0.78	0.32		
SDGE	SBD Non-Lighting	43	39	0.91	0.0%	0.62	0.47	0.62	0.47
SDGE	**Total**	**850**	**394**	**0.46**	**3.9%**	**0.87**	**0.62**	**0.88**	**0.63**
	Statewide	***8,897***	***6,221***	***0.70***	***3.6%***	***0.27***	***0.22***	***0.27***	***0.22***

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 First Year	Ex-Post Annualized
MCE	Custom Lightg -Zeroed	0	100.0%	100.0%	12.0	0.0	0.0	0.0
MCE	Custom Lighting	0	100.0%	100.0%	12.0	734.3	95.9	61.2
MCE	Non-sampled Projects	0	100.0%	100.0%	12.0	566.7	168.2	47.2
PGE	Custom Lightg -Zeroed	0	100.0%	100.0%	12.0	0.0	0.0	0.0
PGE	Custom Lighting	0	84.2%	84.2%	11.8	3.9	0.7	0.3
PGE	Custom Non Lighting	0	8.9%	8.9%	11.7	1.9	0.3	0.2
PGE	SBD Non-Lighting	0	0.0%	0.0%	14.8	7.6	0.6	0.5
PGE	Custom Non Lighting	1	7.2%		7.8	3.8	0.7	0.5
PGE	SBD Non-Lighting	1	0.0%		14.9	9.6	0.7	0.6
RCEA	Non-sampled Projects	1	100.0%		12.0	17,092.2	4,161.7	1,424.4
SCE	Custom Lighting	0	37.6%	37.6%	7.8	31.7	1.1	3.5
SCE	Custom Non Lighting	0	15.0%	15.0%	6.0	1.6	0.3	0.3
SCE	SBD Non-Lighting	0	0.0%	0.0%	15.1	14.6	1.0	1.0
SCE	Custom Lighting	1	0.0%		12.0	18.9	1.0	1.6
SCE	Custom Non Lighting	1	0.0%		3.0	1.9	0.6	0.6
SCE	SBD Non-Lighting	1	0.0%		15.2	10.7	1.0	0.7
SCG	Custom Non Lighting	0	0.0%	0.0%	11.4	0.0	0.0	0.0
SCG	Custom Non Lighting	1	100.0%		15.0	0.0	0.0	0.0
SCG	Non-sampled Projects	1	0.0%		15.8	0.0	0.0	0.0
SDGE	Custom Non Lighting	0	2.1%	2.1%	6.2	433,325.8	89,856.6	47,680.7
SDGE	Non-sampled Projects	0	0.0%	0.0%	14.0	12,817.4	1,075.0	978.9
SDGE	SBD Non-Lighting	0	0.0%	0.0%	12.6	45,584.6	3,000.6	3,039.9
SDGE	Non-sampled Projects	1	0.0%		12.5	438,897.8	33,902.9	30,872.8

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 Lightg -Zeroed	0	100.0%	100.0%	12.0	0.0	0.0	0.0
MCE	Custom Lighting	0	100.0%	100.0%	12.0	-3.3	-0.4	-0.3
MCE	Non-sampled Projects	0	100.0%	100.0%	12.0	-19.6	-3.6	-1.6
PGE	Custom Lightg -Zeroed	0	100.0%	100.0%	12.0	0.0	0.0	0.0
PGE	Custom Lighting	0	84.2%	84.2%	11.8	0.1	0.0	0.0
PGE	Custom Non Lighting	0	8.9%	8.9%	11.7	4.9	0.3	0.3
PGE	SBD Non-Lighting	0	0.0%	0.0%	14.8	0.5	0.0	0.0
PGE	Custom Non Lighting	1	7.2%		7.8	0.3	0.0	0.0
PGE	SBD Non-Lighting	1	0.0%		14.9	0.2	0.0	0.0
RCEA	Non-sampled Projects	1	100.0%		12.0	1,030.9	-75.3	85.9
SCE	Custom Lighting	0	37.6%	37.6%	7.8	0.0	0.0	0.0
SCE	Custom Non Lighting	0	15.0%	15.0%	6.0	0.0	0.0	0.0
SCE	SBD Non-Lighting	0	0.0%	0.0%	15.1	0.0	0.0	0.0
SCE	Custom Lighting	1	0.0%		12.0	0.0	0.0	0.0
SCE	Custom Non Lighting	1	0.0%		3.0	0.0	0.0	0.0
SCE	SBD Non-Lighting	1	0.0%		15.2	0.0	0.0	0.0
SCG	Custom Non Lighting	0	0.0%	0.0%	11.4	102,749.2	45,090.5	22,278.5
SCG	Custom Non Lighting	1	100.0%		15.0	247,133.7	93,608.6	16,475.6
SCG	Non-sampled Projects	1	0.0%		15.8	232.4	14.6	14.1
SDGE	Custom Non Lighting	0	2.1%	2.1%	6.2	28,511.5	5,625.2	5,359.5
SDGE	Non-sampled Projects	0	0.0%	0.0%	14.0	0.0	0.0	0.0
SDGE	SBD Non-Lighting	0	0.0%	0.0%	12.6	33,900.1	1,785.7	2,260.3
SDGE	Non-sampled Projects	1	0.0%		12.5	9,785.2	720.8	695.7

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 First Year	Ex-Post Annualized
MCE	Custom Lightg -Zeroed	0	100.0%	100.0%	12.0	0.0	0.0	0.0
MCE	Custom Lighting	0	100.0%	100.0%	12.0	411.4	53.7	34.3
MCE	Non-sampled Projects	0	100.0%	100.0%	12.0	251.7	74.7	21.0
PGE	Custom Lightg -Zeroed	0	100.0%	100.0%	12.0	0.0	0.0	0.0
PGE	Custom Lighting	0	84.2%	84.2%	11.8	2.2	0.4	0.2
PGE	Custom Non Lighting	0	8.9%	8.9%	11.7	1.1	0.2	0.1
PGE	SBD Non-Lighting	0	0.0%	0.0%	14.8	3.3	0.2	0.2
PGE	Custom Non Lighting	1	7.2%		7.8	2.0	0.4	0.3
PGE	SBD Non-Lighting	1	0.0%		14.9	4.2	0.3	0.3
RCEA	Non-sampled Projects	1	100.0%		12.0	9,326.6	2,270.9	777.2
SCE	Custom Lighting	0	26.2%	26.2%	8.1	17.0	0.5	1.9
SCE	Custom Non Lighting	0	15.0%	15.0%	6.0	0.9	0.2	0.1
SCE	SBD Non-Lighting	0	0.0%	0.0%	15.1	3.5	0.2	0.2
SCE	Custom Lighting	1	80.7%		7.4	4.8	0.6	0.6
SCE	Custom Non Lighting	1	0.0%		3.0	1.1	0.4	0.4
SCE	SBD Non-Lighting	1	0.0%		15.2	2.8	0.3	0.2
SCG	Custom Non Lighting	0	0.0%	0.0%	11.4	0.0	0.0	0.0
SCG	Custom Non Lighting	1	100.0%		15.0	0.0	0.0	0.0
SCG	Non-sampled Projects	1	0.0%		15.8	0.0	0.0	0.0
SDGE	Custom Non Lighting	0	2.1%	2.1%	6.2	212,552.8	44,076.0	23,388.1
SDGE	Non-sampled Projects	0	0.0%	0.0%	14.0	3,923.4	329.1	299.6
SDGE	SBD Non-Lighting	0	0.0%	0.0%	12.6	10,899.2	717.4	726.8
SDGE	Non-sampled Projects	1	0.0%		12.5	134,346.4	10,377.6	9,450.2

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 Lightg -Zeroed	0	100.0%	100.0%	12.0	0.0	0.0	0.0
MCE	Custom Lighting	0	100.0%	100.0%	12.0	-1.9	-0.2	-0.2
MCE	Non-sampled Projects	0	100.0%	100.0%	12.0	-3.9	-0.7	-0.3
PGE	Custom Lightg -Zeroed	0	100.0%	100.0%	12.0	0.0	0.0	0.0
PGE	Custom Lighting	0	84.2%	84.2%	11.8	0.0	0.0	0.0
PGE	Custom Non Lighting	0	8.9%	8.9%	11.7	1.0	0.1	0.1
PGE	SBD Non-Lighting	0	0.0%	0.0%	14.8	0.2	0.0	0.0
PGE	Custom Non Lighting	1	7.2%		7.8	0.1	0.0	0.0
PGE	SBD Non-Lighting	1	0.0%		14.9	0.1	0.0	0.0
RCEA	Non-sampled Projects	1	100.0%		12.0	467.5	-34.2	39.0
SCE	Custom Lighting	0	26.2%	26.2%	8.1	0.0	0.0	0.0
SCE	Custom Non Lighting	0	15.0%	15.0%	6.0	0.0	0.0	0.0
SCE	SBD Non-Lighting	0	0.0%	0.0%	15.1	0.0	0.0	0.0
SCE	Custom Lighting	1	80.7%		7.4	0.0	0.0	0.0
SCE	Custom Non Lighting	1	0.0%		3.0	0.0	0.0	0.0
SCE	SBD Non-Lighting	1	0.0%		15.2	0.0	0.0	0.0
SCG	Custom Non Lighting	0	0.0%	0.0%	11.4	46,989.3	20,828.0	9,920.8
SCG	Custom Non Lighting	1	100.0%		15.0	107,039.9	40,544.3	7,136.0
SCG	Non-sampled Projects	1	0.0%		15.8	73.5	4.6	4.5
SDGE	Custom Non Lighting	0	2.1%	2.1%	6.2	19,854.7	3,696.7	4,161.4
SDGE	Non-sampled Projects	0	0.0%	0.0%	14.0	0.0	0.0	0.0
SDGE	SBD Non-Lighting	0	0.0%	0.0%	12.6	15,862.4	835.5	1,057.6
SDGE	Non-sampled Projects	1	0.0%		12.5	3,094.8	228.0	220.0

About DNV

DNV is a global quality assurance and risk management company. Driven by our purpose of safeguarding life, property, and the environment, we enable our customers to advance the safety and sustainability of their business. We provide classification, technical assurance, software and independent expert advisory services to the maritime, oil & gas, power and renewables industries. We also provide certification, supply chain and data management services to customers across a wide range of industries. Operating in more than 100 countries, our experts are dedicated to helping customers make the world safer, smarter, and greener.