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Final Report

Nonresidential Downstream Lighting Impact Evaluation Report

Prepared for
California Public Utilities Commission

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Executive Summary

This report documents the activities undertaken by the Nonresidential Downstream Lighting Impact Evaluation of the 2010-2012 Investor-Owned-Utilities' (IOU) energy efficiency programs. The primary goal of this impact evaluation, discussed in this report, is to verify and validate the net and gross energy savings claims reported by IOU energy efficiency programs for nonresidential downstream lighting measures.[1]

For the 2010-12 portfolio of IOU programs, Nonresidential Downstream Lighting was comprised of 42 different measure groups, which in aggregate represented 23% and 28% of the overall ex-ante gross kWh and kW savings portfolio, respectively, for the IOU energy efficiency programs. Among these 42 measure groups, the following seven measures were evaluated, which comprised over 80% of the ex-ante gross kWh savings and approximately 90% of the kW savings among all Nonresidential Downstream Lighting measures, at the statewide level. Six of these were high impact measure (HIM) groups that comprised over 1% of IOU portfolio kW or kWh savings, plus one additional strategic measure of interest (CFLs with reflectors):

- Indoor CFL – Basic,
- Indoor CFL – Reflectors,
- Indoor Controls - Occupancy Sensor,
- Indoor HID,
- Indoor High Bay Fluorescent,
- Indoor Linear Fluorescent, and
- Indoor Linear Fluorescent Delamping.

The primary research objective for this evaluation was to determine net and gross *ex-post* impacts associated with each measure and program group (where programs were classified as either custom, deemed, direct install, local government partnership or third party). Specific researchable issues included:

[1] The estimation of spillover was not a goal of this impact evaluation.

- Confirm installations (verification). This included on-site verification of measure installation to confirm the installations reported by the IOUs.
- Estimate baseline (both pre-retrofit and standard practice) and replacement (post-retrofit) equipment wattages, operating hours, and use shapes to support the estimate of energy savings values and 8760 impact load shapes.
- Estimate participant free-ridership to support the development of net-to-gross ratios and net savings values.
- Estimate remaining useful life values for selected measures, to support dual baseline estimates of lifecycle energy savings.
- Based on the above, estimate first year and lifetime gross and net ex-post impacts (kWh, and kW) at the measure level. Using these measure level results, develop gross and net realization rates (ratio between *ex-post* and *ex-ante* savings) that can be applied to the participant population by measure and program group, such that population estimates of net and gross savings can be estimated for both first year and lifecycle savings.

1.1 Key Findings

Two distinct evaluation activities were performed, as summarized below.

Gross Energy Savings Analysis. The primary objective of this activity was to develop gross and net realization rates (ratio between *ex-post* and *ex-ante* savings) that can be applied to the participant population for each of the seven measures by program group for those segments evaluated, such that population estimates of net and gross savings can be estimated for both first year and lifecycle savings. For each site in the analysis, ex-post savings were evaluated by separately establishing a number of impact parameters including installation rates; pre- and post-installation operating hours; installed, replaced, and industry standard practice wattages; effective useful life; and remaining useful life. These parameters were estimated based on performing on-site audits on 727 nonresidential sites that encompassed 1,643 measures. Of these on-sites, 579 included the installation of 4,650 lighting loggers to support the estimation of hours of operation.

Net-To-Gross Analysis. The objective of this analysis was to develop net-to-gross ratios (NTGR) for each of the seven measures by program group. The approach for estimating NTGRs was based on a self-report methodology utilizing 2,443 participant survey phone responses. This methodology was based on the large nonresidential free ridership approach developed by the NTGR Working Group and documented in Appendix C, Methodological Framework for Using

the Self-Report Approach to Estimating Net-to-Gross Ratios for Nonresidential Customers[2]. The methodology estimated three separate measurements of free ridership from different inquiry routes and then averaged the values to derive the final free ridership estimate at the measure level.

Table 1-1 through Table 1-4 present the overall results for this study. Shown are the net and gross ex-ante and ex-post values, along with NTGRs and realization rates, for the first year and lifecycle MW and GWh savings. Results are presented by HIM and IOU. These savings represent all nonresidential downstream lighting measures that were evaluated as part of this study. Approximately 89% of the gross first year MW ex-ante savings and 81% of the gross first year GWh ex-ante savings across all nonresidential downstream lighting measures were explicitly evaluated in this study, and had ex-post results. Overall 36% and 42% of the first year net ex-ante MW and GWh savings, respectively, were realized through the evaluation. Furthermore, 43% and 48% of the lifecycle net ex-ante MW and GWh savings, respectively, were realized.

Appendix G of the report present a detailed analysis identifying which specific parameters in the impact algorithm lead to the realization rates differing from one. This analysis required examining multiple parameters and comparing ex-ante and ex-post results to understand the differences in each parameter, and how that affected the overall net and gross realization rates.

[2] This document can also be found at : http://www.energydataweb.com/cpucFiles/pdaDocs/910/Nonresidential%20NTGR%20Methods%202010-12%20101612.docx

Table 1-1: Aggregate First Year MW Savings and Realization Rates by HIM and IOU for Evaluated Population

HIM	IOU	Ex-Ante Gross First Year MW Savings	Ex-Post Gross First Year MW Savings	First Year MW GRR	Ex-Post NTGR	Ex-Ante Net First Year MW Savings	Ex-Post Net First Year MW Savings	First Year MW NRR
CFL Basic	PG&E	7.6	2.3	0.30	0.60	5.8	1.3	23%
	SCE	5.2	1.7	0.32	0.70	4.4	1.2	26%
	SDG&E	1.1	0.7	0.64	0.62	0.9	0.4	48%
	Total	**14**	**4.6**	**0.33**	**0.64**	**11**	**2.9**	**27%**
CFL Reflector	PG&E	2.0	2.3	1.18	0.61	1.5	1.4	94%
	SCE	5.9	3.6	0.61	0.69	5.0	2.5	50%
	SDG&E	0.7	0.4	0.50	0.62	0.6	0.2	37%
	Total	**8.6**	**6.3**	**0.73**	**0.66**	**7.1**	**4.1**	**59%**
High Bay	PG&E	39	17	0.43	0.60	30	10	33%
	SCE	61	36	0.58	0.62	48	22	46%
	SDG&E	3.8	1.3	0.34	0.55	3.0	0.7	24%
	Total	**104**	**54**	**0.52**	**0.61**	**81**	**33**	**41%**
HID	PG&E	5.8	2.3	0.40	0.60	4.1	1.4	34%
	SCE	1.5	1.9	1.28	0.60	1.1	1.1	105%
	SDG&E	0.9	0.8	0.86	0.55	0.6	0.4	66%
	Total	**8.2**	**5.0**	**0.61**	**0.60**	**5.8**	**3.0**	**51%**
Delamping	PG&E	17	8.6	0.51	0.62	13	5.3	42%
	SCE	39	21	0.55	0.65	32	14	44%
	SDG&E	1.9	0.7	0.38	0.55	1.4	0.4	27%
	Total	**58**	**31**	**0.53**	**0.64**	**46**	**20**	**43%**
Linear Fluorescent	PG&E	67	27	0.40	0.59	50	16	31%
	SCE	64	31	0.48	0.62	49	19	38%
	SDG&E	19	9.1	0.48	0.60	14	5.4	39%
	Total	**150**	**67**	**0.44**	**0.60**	**113**	**40**	**35%**
Occupancy Sensor	PG&E	13	6.7	0.52	0.60	11	4.0	38%
	SCE	62	16	0.26	0.62	52	10	20%
	SDG&E	2.0	1.4	0.70	0.55	1.7	0.8	46%
	Total	**77**	**25**	**0.32**	**0.61**	**64**	**15**	**23%**
Total	**PG&E**	151	66	0.43	0.60	115	39	34%
	SCE	239	112	0.47	0.63	192	70	37%
	SDG&E	30	14	0.49	0.59	22	8.4	38%
	Total	**420**	**192**	**0.46**	**0.61**	**329**	**118**	**36%**

Table 1-2: Aggregate First Year GWh Savings and Realization Rates by HIM and IOU for Evaluated Population

HIM	IOU	Ex-Ante Gross First Year GWh Savings	Ex-Post Gross First Year GWh Savings	First Year MW GRR	Ex-Post NTGR	Ex-Ante Net First Year GWh Savings	Ex-Post Net First Year GWh Savings	First Year GWh NRR
CFL Basic	PG&E	48	13	0.28	0.60	36	8.2	23%
	SCE	26	7.5	0.29	0.69	22	5.2	24%
	SDG&E	5.9	4.2	0.71	0.62	4.9	2.6	53%
	Total	**80**	**25**	**0.32**	**0.63**	**63**	**16**	**25%**
CFL Reflector	PG&E	10	13	1.30	0.61	7.7	8.0	103%
	SCE	30	17	0.56	0.68	25	11	45%
	SDG&E	3.6	1.7	0.46	0.61	3.0	1.0	34%
	Total	**43**	**31**	**0.72**	**0.65**	**36**	**20**	**57%**
High Bay	PG&E	167	88	0.53	0.60	129	53	41%
	SCE	261	164	0.63	0.61	205	101	49%
	SDG&E	15	6.3	0.41	0.55	12	3.5	29%
	Total	**443**	**259**	**0.58**	**0.61**	**346**	**157**	**45%**
HID	PG&E	40	18	0.44	0.62	28	11	39%
	SCE	9.3	9.9	1.07	0.58	6.6	5.8	87%
	SDG&E	4.1	5.4	1.33	0.56	2.9	3.0	103%
	Total	**54**	**33**	**0.61**	**0.60**	**38**	**20**	**52%**
Delamping	PG&E	74	32	0.44	0.63	56	20	36%
	SCE	175	100	0.57	0.65	144	65	45%
	SDG&E	8.4	5.5	0.66	0.55	6.5	3.0	46%
	Total	**257**	**138**	**0.54**	**0.64**	**206**	**88**	**43%**
Linear Fluorescent	PG&E	308	133	0.43	0.59	227	78	34%
	SCE	296	172	0.58	0.59	228	102	45%
	SDG&E	94	48	0.51	0.58	68	28	41%
	Total	**698**	**353**	**0.51**	**0.59**	**523**	**208**	**40%**
Occupancy Sensor	PG&E	63	29	0.46	0.60	52	17	34%
	SCE	131	72	0.56	0.61	107	44	41%
	SDG&E	9.6	8.5	0.89	0.55	8.1	4.7	58%
	Total	**204**	**110**	**0.54**	**0.60**	**167**	**66**	**40%**
Total	**PG&E**	710	326	0.46	0.60	536	196	36%
	SCE	928	543	0.59	0.62	737	334	45%
	SDG&E	141	80	0.56	0.58	105	46	44%
	Total	**1,780**	**949**	**0.53**	**0.61**	**1,379**	**576**	**42%**

Table 1-3: Aggregate Lifecycle MW Savings and Realization Rates by HIM and IOU for Evaluated Population

HIM	IOU	Ex-Ante Gross Lifecycle MW Savings	Ex-Post Gross Lifecycle MW Savings	Lifecycle MW GRR	Ex-Post NTGR	Ex-Ante Net Lifecycle MW Savings	Ex-Post Net Lifecycle MW Savings	Lifecycle MW NRR
CFL Basic	PG&E	30	17	0.58	0.59	23	10	45%
	SCE	14	12	0.83	0.70	12	8.0	68%
	SDG&E	2.8	3.6	1.28	0.63	2.3	2.2	97%
	Total	**46**	**32**	**0.70**	**0.63**	**37**	**21**	**56%**
CFL Reflector	PG&E	5.5	7.5	1.35	0.61	4.3	4.5	106%
	SCE	16	15	0.91	0.69	13	10	75%
	SDG&E	1.8	1.5	0.83	0.62	1.5	0.9	62%
	Total	**23**	**23**	**1.01**	**0.66**	**19**	**16**	**81%**
High Bay	PG&E	383	152	0.40	0.60	296	91	31%
	SCE	552	404	0.73	0.62	433	250	58%
	SDG&E	49	8.7	0.18	0.55	38	4.8	13%
	Total	**984**	**564**	**0.57**	**0.61**	**767**	**345**	**45%**
HID	PG&E	83	45	0.54	0.61	58	27	47%
	SCE	15	67	4.57	0.61	11	41	387%
	SDG&E	13	3.2	0.25	0.56	9.5	1.8	19%
	Total	**111**	**116**	**1.04**	**0.61**	**79**	**70**	**89%**
Delamping	PG&E	175	106	0.61	0.62	131	66	50%
	SCE	281	290	1.03	0.65	232	187	81%
	SDG&E	23	8.4	0.36	0.55	18	4.6	26%
	Total	**479**	**404**	**0.84**	**0.64**	**381**	**258**	**68%**
Linear Fluorescent	PG&E	833	325	0.39	0.59	610	191	31%
	SCE	638	374	0.59	0.62	480	231	48%
	SDG&E	227	109	0.48	0.60	163	65	40%
	Total	**1,698**	**808**	**0.48**	**0.60**	**1,253**	**487**	**39%**
Occupancy Sensor	PG&E	103	53	0.52	0.60	84	32	38%
	SCE	498	131	0.26	0.62	417	81	20%
	SDG&E	30	11	0.37	0.55	25	6.2	25%
	Total	**631**	**195**	**0.31**	**0.61**	**527**	**119**	**23%**
Total	**PG&E**	1,612	705	0.44	0.60	1,207	422	35%
	SCE	2,014	1,292	0.64	0.63	1,598	808	51%
	SDG&E	346	146	0.42	0.59	257	86	33%
	Total	**3,973**	**2,143**	**0.54**	**0.61**	**3,062**	**1,316**	**43%**

Table 1-4: Aggregate Lifecycle GWh Savings and Realization Rates by HIM and IOU for Evaluated Lighting Population

HIM	IOU	Ex-Ante Gross Lifecycle GWh Savings	Ex-Post Gross Lifecycle GWh Savings	Lifecycle MW GRR	Ex-Post NTGR	Ex-Ante Net Lifecycle GWh Savings	Ex-Post Net Lifecycle GWh Savings	Lifecycle GWh NRR
CFL Basic	PG&E	206	130	0.63	0.60	156	78	50%
	SCE	70	52	0.75	0.69	59	36	61%
	SDG&E	15	20	1.36	0.63	12	13	103%
	Total	**291**	**202**	**0.70**	**0.62**	**228**	**126**	**55%**
CFL Reflector	PG&E	31	42	1.38	0.60	24	26	107%
	SCE	80	71	0.89	0.68	68	48	72%
	SDG&E	8.9	6.8	0.76	0.62	7.4	4.2	57%
	Total	**120**	**120**	**1.01**	**0.65**	**99**	**78**	**79%**
High Bay	PG&E	1,629	803	0.49	0.60	1,259	483	38%
	SCE	2,348	1,854	0.79	0.61	1,840	1,131	61%
	SDG&E	194	38	0.20	0.55	151	21	14%
	Total	**4,171**	**2,695**	**0.65**	**0.61**	**3,250**	**1,635**	**50%**
HID	PG&E	592	290	0.49	0.62	414	181	44%
	SCE	105	340	3.24	0.60	73	203	278%
	SDG&E	61	21	0.35	0.57	44	12	27%
	Total	**758**	**651**	**0.86**	**0.61**	**531**	**396**	**75%**
Delamping	PG&E	774	389	0.50	0.63	581	244	42%
	SCE	1,286	1,384	1.08	0.65	1,067	901	84%
	SDG&E	102	61	0.60	0.55	80	34	43%
	Total	**2,161**	**1,834**	**0.85**	**0.64**	**1,728**	**1,179**	**68%**
Linear Fluorescent	PG&E	3,863	1,572	0.41	0.59	2,823	928	33%
	SCE	3,075	1,939	0.63	0.60	2,279	1,158	51%
	SDG&E	1,162	544	0.47	0.58	821	318	39%
	Total	**8,101**	**4,055**	**0.50**	**0.59**	**5,923**	**2,404**	**41%**
Occupancy Sensor	PG&E	507	227	0.45	0.60	413	137	33%
	SCE	1,044	563	0.54	0.61	860	346	40%
	SDG&E	141	67	0.47	0.55	118	37	31%
	Total	**1,692**	**857**	**0.51**	**0.61**	**1,391**	**519**	**37%**
Total	**PG&E**	7,602	3,453	0.45	0.60	5,671	2,075	37%
	SCE	8,008	6,204	0.77	0.62	6,246	3,824	61%
	SDG&E	1,684	758	0.45	0.58	1,233	438	36%
	Total	**17,294**	**10,415**	**0.60**	**0.61**	**13,149**	**6,338**	**48%**

1.2 Key Recommendations

This section presents recommendations related to the findings developed for this evaluation. Section 6 of the report explains each of these recommendations in more detail. These recommendations are directed at each of the parameters that comprise the energy savings calculations, along with recommendations and issues that are specific to a measure. Also recommendations are provided regarding the IOU work papers for deemed measures, and for the documentation and data delivery of calculated participant applications.

Installation Rates

- For deemed measures, apply installation rates to ex ante claims by measure and by gross program group.
- For calculated measures, ensure that post-retrofit inspections are being performed such that installations can be confirmed.

Operating Hours

- For deemed measures, utilize the 2006-08 and 2010-12 lighting logger data to update default ex-ante lighting operating hours for DEER building types and space types and to establish lighting operating hours for new building and space types that are not currently covered in DEER.
- When developing ex-ante estimates of operating hours for calculated projects, customer-specific monitored data should be used whenever available. If, however, self-reported operating hours are used, then ex-ante estimates should correspond to the lighting system's operation and not the facility's business hours.

Dual Baseline

- Use a dual baseline for all linear fluorescent, delamping, high bay fluorescent and HID measures for program-induced early retirement, which classifies a customer as ER or ROB.
- For calculated measures, if program-induced early retirement is assumed, a dual baseline must be utilized, and each participant should be identified as either early replacement (ER) or replace on burnout (ROB), using the criteria provided in the CPUC draft guidance document "Project Basis (RET, ROB, etc), EUL/RUL Definitions, & Preponderance of Evidence" dated 1/29/14
- For deemed measures assuming program-induced early retirement and utilizing a dual baseline, an "average" case needs to be developed, where the RUL and post-RUL period UES values are developed as a combined value of the ER and ROB cases. When

combining the ER and ROB values together, the results of this evaluation can be used to estimate the percentage of installations that are ER.

- When classifying customers as early replacement versus replace on burnout, customers replacing T12's should always be considered replace on burnout.
- Lower wattage ceramic metal halides that are replacing incandescent, CFL and halogen lamps should be considered to be replace on burnout.

RUL

- Continue to use a default RUL that is estimated as one-third of the EUL, as directed by the CPUC decision D.12.05.015.

EUL

- Continue to use the DEER algorithm for EUL, but use updated operating hours to estimate these values.

Net-to-Gross Ratios

- Update the NTGRs developed in this study, and apply them by delivery mechanism (using either the Net or Gross Program Group results).
- Further research should also be done to consider a framework for NTGRs that can be applied to measures that have a dual baseline, where separate NTGRs are developed for the RUL and post-RUL periods.

Baseline/Industry Standard Practice Wattages

- For linear fluorescent, high bay fluorescent and delamping measures, consider utilizing the Industry Standard Practice wattages developed in this report based on the Commercial Market Share Tracking data for baseline wattage values for measures with dual baselines, adjusting for post-2012 code and market practice changes.
- Industry standard practice wattages should exclude the 700 series T-8 fixtures for future unit energy savings values corresponding to time periods when these fixtures are no longer expected to be readily available.
- For HID measures, the baseline wattage for ROB installations and for the post-RUL period for ER installations should be a pulse start metal halide.

Pre and Post-Installation Wattages and Measures Development Practices

- For linear fluorescent and high bay fluorescent measures, separate measure names should be utilized for high output versus standard output linear fluorescent lamps.
- Because delamping is almost always done in conjunction with a linear fluorescent retrofit, a consistent use of a single measure name should be applied to this joint action.
- For occupancy sensors:
  - Ensure there is a measure that allows for low controlled wattages (below 75 Watt, if not less).
  - Consider reducing the ex-ante assumed controlled wattage by 10-15%.
  - Stress with program implementers and vendors the importance of accurately identifying the controlled wattage, and consider providing some information to help them estimate this value.

Work Paper Recommendations

- All program tracking data records should be assigned to the correct work paper ID and should be using parameter values from the most recent approved version.
- The link between tracking data and ex-ante assumptions should go through a more thorough QC process to ensure the correct reference is being made.

Calculated Program Application/Documentation Recommendations

Although it may be the case that the following documentation standards are required by calculated programs, it was not the case that this level of documentation was provided to the evaluation team. Therefore, the following recommendations apply to both the collection of this information and the desired format/process for delivering this information to the evaluation team.

- Provide detailed, organized and internally consistent data documentation for each claim, such that the evaluator can easily trace the program participation information to the final tracking system savings estimates.
- Provide detailed calculation workbooks that explicitly identify where measures are being installed.
- Utilize pre-installation inspections to inventory installed baseline technologies and wattages.
- Develop a final report folder for each claim that includes all program information – project application/approval documents, invoices, calculation workbooks, signed project completion/rebate information, etc. – such that all the data points are properly stored and easily accessible for retrieval.

- Ensure that detailed calculation workbooks are provided with the project documentation data upon fulfilling a data request.
- As a general guideline, all lighting calculation workbooks should be compiled in an unlocked spreadsheet format.

2

Introduction and Overview of Study

This report documents the activities undertaken by the Nonresidential Downstream Lighting Impact Evaluation of the 2010-2012 investor-owned utilities' (IOU) energy efficiency programs. The primary goal of this impact evaluation, discussed in this report, is to verify and validate the net and gross energy savings claims reported by IOU energy efficiency programs for nonresidential downstream lighting measures[1]. An additional goal for this evaluation, not discussed in this report, is to provide data and results to support future updates of the Database for Energy Efficiency Resources (DEER).

This report presents the findings and results from this evaluation, which includes a presentation of the goals and objectives of the evaluation, the researchable issues, information on the nonresidential lighting programs and measure groups evaluated, data sources used, the approach for sampling, the methods to determine gross and net impacts, and the resulting ex post net and gross energy and demand impacts.

2.1 Evaluation Research Objectives

The primary research issues for this evaluation center around determining net and gross *ex post* impacts associated with each measure. Specific researchable issues are briefly listed below.

- Confirm installations (verification). This will include on-site verification of measure installation to confirm the installations reported by the IOUs.
- Estimate baseline (both pre-retrofit and standard practice) and replacement (post-retrofit) equipment wattages, operating hours, and use shapes to support the estimate of energy savings values and 8760 impact load shapes.
- Estimate participant free-ridership to support the development of net-to-gross ratios and net savings values.
- Estimate remaining useful life values for selected measures, to support dual baseline estimates of lifecycle energy savings.

[1] The estimation of spillover was not a goal of this impact evaluation.

- Based on the above, estimate first year and lifetime gross and net ex post impacts (kWh, and kW) at the measure level. Using these measure level results, develop gross and net realization rates (ratio between *ex post* and *ex ante* savings) that can be applied to the participant population by measure and program or program group, such that population estimates of net and gross savings can be estimated for both first year and lifecycle savings.
- Utilize the above results, and the primary data collected to support these efforts, to assist with updating DEER values (not presented in this report).

2.2 Overview of Measures Evaluated

For the 2010-12 portfolio of IOU programs, energy savings from downstream lighting measures represented 23% of the overall ex ante gross kWh savings portfolio for the investor-owned utility's (IOU) energy efficiency programs, showing an obvious need for these measures to be evaluated. Table 2-1 summarizes the total kW and kWh savings claim by IOU and statewide for 2010-12. Shown are the absolute savings and the savings expressed as a percentage of each IOU's total portfolio (as well as the statewide totals, and percentage of the statewide savings).[2]

Table 2-1: Summary of 2010-12 Nonresidential Downstream Lighting Gross Ex Ante Savings

	Total Savings		Savings as a % of Portfolio	
IOU	**GWh**	**MW**	**kWh**	**kW**
PG&E	905	174	22%	24%
SCE	1,087	264	24%	32%
SDG&E	194	35	25%	27%
Statewide	2,185	472	23%	28%

Nonresidential downstream lighting is comprised of 42 different measure groups. There are six high impact measure (HIM) groups that comprise over 1% of IOU portfolio kW or kWh savings, plus one additional strategic measure of interest (CFLs with reflectors), all of which will be the focus of this evaluation.

[2] It is important to note that all savings expressed in terms of a percentage of the portfolio do not include savings from Codes and Standards, as these savings were not reported in the IOU tracking data.

- Indoor CFL – Basic
- Indoor CFL - Reflectors
- Indoor Controls - Occupancy Sensor
- Indoor HID
- Indoor High Bay Fluorescent
- Indoor Linear Fluorescent
- Indoor Linear Fluorescent Delamping

These seven measure groups comprise 83% of the ex ante gross kWh savings and 91% of the kW savings among all nonresidential downstream lighting measures, at the statewide level.

Table 2-2: Summary of 2010-12 Gross Ex Ante Savings by HIM and IOU

HIM	IOU	Total Savings		Savings as a % of Nonresidential Downstream Lighting		Savings as a % of Portfolio	
		GWh	MW	kWh	kW	kWh	kW
CFL Basic	PG&E	48	8	5%	4%	1%	1%
	SCE	30	6	3%	2%	0.7%	0.7%
	SDG&E	6	1	3%	3%	0.8%	0.9%
	Statewide	84	15	4%	3%	0.9%	0.9%
CFL Reflector	PG&E	10	2	1%	1%	0.3%	0.3%
	SCE	30	6	3%	2%	0.7%	0.7%
	SDG&E	4	1	2%	2%	0.5%	0.6%
	Statewide	44	9	2%	2%	0.5%	0.5%
Linear Fluorescent	PG&E	308	67	34%	39%	8%	9%
	SCE	296	64	27%	24%	7%	8%
	SDG&E	97	19	50%	56%	12%	15%
	Statewide	701	150	32%	32%	7%	9%
High Bay Fluorescent	PG&E	167	39	18%	22%	4%	5%
	SCE	265	62	24%	24%	6%	7%
	SDG&E	15	4	8%	11%	2%	3%
	Statewide	447	105	20%	22%	5%	6%
Delamping	PG&E	74	17	8%	10%	2%	2%
	SCE	177	40	16%	15%	4%	5%
	SDG&E	9	2	5%	6%	1%	2%
	Statewide	260	59	12%	12%	3%	3%

Table 2-2 (Cont'd): Summary of 2010-12 Gross Ex Ante Savings by HIM and IOU

HIM	IOU	Total Savings		Savings as a % of Nonresidential Downstream Lighting		Savings as a % of Portfolio	
		GWh	MW	kWh	kW	kWh	kW
HIDs	PG&E	42	6	5%	3%	1%	0.8%
	SCE	11	2	1.0%	0.6%	0.2%	0.2%
	SDG&E	4	1	2%	3%	0.5%	0.7%
	Statewide	57	9	3%	2%	0.6%	0.5%
Occupancy Sensors	PG&E	65	13	7%	7%	2%	2%
	SCE	140	68	13%	26%	3%	8%
	SDG&E	10	2	5%	6%	1%	2%
	Statewide	215	83	10%	18%	2%	5%
TOTAL	**PG&E**	**714**	**152**	**79%**	**87%**	**18%**	**21%**
	SCE	**949**	**247**	**87%**	**94%**	**21%**	**30%**
	SDG&E	**145**	**30**	**75%**	**87%**	**18%**	**23%**
	Statewide	**1808**	**429**	**83%**	**91%**	**19%**	**25%**

2.3 Overview of Program Groups Studied

During the 2010-12 program cycle, there were 118 different programs (or program elements) that offered one or more of the 42 nonresidential downstream lighting measure groups. A primary objective of this evaluation was to develop results at the measure and program or program group level. In particular, net-to-gross ratios (NTGRs) are likely to vary across program delivery mechanism. Therefore, the evaluation was designed to develop results at the measure group and program or program group level, particularly for NTGRs. Fortunately, it was significantly less costly to develop NTRGs than gross savings estimates, as the NTG analysis conducted relied on phone survey data rather than on-site visits and monitoring. Because of this, NTRGs were developed at a finer level of program aggregation than gross savings values.

Two sets of program groupings were developed for this evaluation. A set of "Gross Program Groups" were developed for the purposes of developing gross ex post energy savings values by measure group and program type. A second, more detailed, set of "Net Program Groups" were developed for the purposes of developing net to gross ratios by program type. The Gross Program Groups are a subset of the Net Program Groups.

The following tables summarize how the individual programs that offer nonresidential downstream lighting were grouped into the Gross and Net Program Groups, for each IOU. Shown are the groupings for the gross analysis and the net-to-gross analysis. Also shown is the

distribution of 2010-12 gross ex ante kWh and kW savings claims for all nonresidential downstream lighting across all programs. It is important to note that not every program group offers all of the measure groups being evaluated. Furthermore, some program groups may offer a measure group, but current participation may be very low for that measure. Therefore, not all measure groups were selected for sampling for each of these program groups. This will be discussed in more detail in the Sample Design section of this report in Section 3.

Table 2-3: Gross and Net Program Groupings for PGE's Programs

Gross Program Group	Net Program Group	IOUPrgID	IOU Program Name	% kwh	% kw
Core/Statewide Custom	PGE Core/Statewide Custom[3]	PGE21031	Ag Calculated Incentives	2%	1%
		PGE21011	Com Calculated Incentives	7%	5%
		PGE21021	Ind Calculated Incentives	0.7%	0.5%
		PGE21042	Savings By Design	0.0%	0.0%
Core/Statewide Deemed	PGE Deemed Commercial	PGE21012	Commercial Programs - Deemed	23%	27%
	PGE Deemed Ind	PGE21022	Industrial Programs - Deemed	4%	5%
	PGE Deemed Ag	PGE21032	Agricultural Programs - Deemed	3%	3%
Local Government Partnership/ Direct Install	PGE DI Ecology	PGE2130	Ambag Energy Watch	0.0%	0.0%
		PGE2142	San Mateo County Energy Watch	0.9%	0.7%
		PGE2146	Silicon Valley Energy Watch	1%	1%
	PGE DI RHA	PGE2131	City of San Joaquin Energy Watch	0.1%	0.2%
		PGE2133	Fresno County Energy Watch	5%	5%
		PGE2135	Madera County Energy Watch	0.4%	0.5%
	PGE DI Staples	PGE2134	Kern County Energy Watch	2%	2%
		PGE2141	San Luis Obispo County Energy Watch	0.5%	0.5%
		PGE2143	Santa Barbara County Energy Watch	0.5%	0.5%
	PGE DI Staples/RHA	PGE2144	Sierra Nevada Energy Watch	2%	2%
	PGE DI Synergy	PGE2140	San Joaquin County Energy Watch	0.4%	0.4%
	PGE DI TEAA	PGE2137	Mendocino County Energy Watch	0.1%	0.1%
		PGE2138	Napa County Energy Watch	0.3%	0.2%
		PGE2145	Sonoma County Energy Watch	0.6%	0.4%
	PGE Energy Fitness	PGE2194	Energy Fitness Program	7%	10%
	PGE LGP East Bay	PGE2132	East Bay Energy Watch	9%	7%
	PGE LGP LGEAR	PGE2125	LGEAR	0.0%	0.0%
	PGE LGP Marin	PGE2136	Marin County Energy Watch	0.6%	0.7%
	PGE LGP Redwood	PGE2139	Redwood Coast Energy Watch	0.6%	0.7%
	PGE LGP SF	PGE2147	San Francisco Energy Watch	6%	6%

[3] Originally, four separate net program groups were created for the Core/Statewide Custom segment: Calculated Commercial, Calculated Industrial, Calculated Agriculture and Nonresidential New Construction. However, participation was not sufficient enough to obtain a large enough sample such that reliable results could be developed for each segment. Therefore, these four segments were combined into a single segment for both the net and gross program groups.

Table 2-3 (Cont'd): Gross and Net Program Groupings for PGE's Programs

Gross Program Group	Net Program Group	IOUPrgID	IOU Program Name	% kwh	% kw
Local Government Partnership/ Direct Install, (Continued)	PGE RightLights	PGE2196	Rightlights	6%	6%
	PGE SW Partnership	PGE21261	California Community Colleges	0.3%	0.3%
		PGE21262	UC/CSU	0.0%	0.0%
		PGE21263	State of California	0.5%	0.6%
		PGE21264	Dept. of Corrections & Rehabilitation	0.0%	0.0%
Third/Local Party Implementer	PGE 3P	PGE2183	Comprehensive Retail Energy Management	0.1%	0.1%
		PGE2185	EnergySmart Grocer	0.5%	0.4%
		PGE2189	Cool Controls Plus	0.1%	0.1%
		PGE2190	LodgingSavers	1%	0.5%
		PGE2193	School Energy Efficiency	0.9%	0.3%
		PGE2195	Energy Savers	1%	1%
		PGE2197	SCCR Program	0.0%	0.0%
		PGE2199	Energy-Efficient Parking Garage	0.6%	0.4%
		PGE2200	Retail Furniture Store Energy Efficiency Program	1%	1%
		PGE2201	California High Performance Lighting Program	1%	1.0%
		PGE2202	LED Accelerator	0.9%	1%
		PGE2205	Casino Green	0.6%	0.2%
		PGE2206	Healthcare Energy Efficiency Program	0.0%	0.0%
		PGE2212	California Preschool Energy Efficiency Program	0.5%	0.0%
		PGE2213	K-12 Private Schools and Colleges Audit Retrofit	0.4%	0.2%
		PGE2214	Energy Efficiency Program for Entertainment Centers	0.0%	0.0%
		PGE2223	Heavy Industry Energy Efficiency Program	0.5%	0.5%
		PGE2227	Cement Production & Distribution Energy Efficiency	0.0%	0.0%
		PGE2230	Dairy Energy Efficiency Program	0.1%	0.1%
		PGE2231	Industrial Refrigeration Performance Plus	0.0%	0.0%
		PGE2232	Light Exchange Program	0.1%	0.0%
		PGE2233	Wine Industry Efficiency Solutions	0.3%	0.3%
		PGE2234	Comprehensive Food Process Pgm	0.0%	0.0%
		PGE2235	Dairy Industry Resource Advantage Pgm	0.3%	0.3%

Table 2-4: Gross and Net Program Groupings for SCE's Programs

Gross Program Group	Net Program Group	IOUPrgID	IOU Program Name	% kwh	% kw
Core/Statewide Custom	SCE Core/Statewide Custom	SCE-SW-002B	Commercial Energy Efficiency Program	8%	5%
		SCE-SW-003B	Industrial Energy Efficiency Program	2%	1%
		SCE-SW-004B	Agriculture Energy Efficiency Program	0.3%	0.1%
		SCE-SW-005A	New Construction Program	3%	2%
Core/Statewide Deemed	SCE Deemed Ag	SCE-SW-004C	Agriculture Energy Efficiency Program	0.6%	0.5%
	SCE Deemed Com	SCE-SW-002C	Commercial Energy Efficiency Program	35%	40%
	SCE Deemed Ind	SCE-SW-003C	Industrial Energy Efficiency Program	11%	13%
Direct Install	SCE Direct Install	SCE-SW-002D	Commercial Energy Efficiency Program	27%	29%
Local Government Partnership	SCE LGP ELP	SCE-L-004A	Energy Leader Partnership Program	0.0%	0.0%
		SCE-L-004B	Energy Leader Partnership Program	0.1%	0.1%
		SCE-L-004C	Energy Leader Partnership Program	0.0%	0.0%
		SCE-L-004E	Energy Leader Partnership Program	0.1%	0.0%
		SCE-L-004F	Energy Leader Partnership Program	0.0%	0.0%
		SCE-L-004G	Energy Leader Partnership Program	0.0%	0.0%
		SCE-L-004H	Energy Leader Partnership Program	0.4%	0.1%
		SCE-L-004I	Energy Leader Partnership Program	0.0%	0.0%
		SCE-L-004J	Energy Leader Partnership Program	0.0%	0.0%
		SCE-L-004L	Energy Leader Partnership Program	0.0%	0.0%
		SCE-L-004M	Energy Leader Partnership Program	0.1%	0.1%
		SCE-L-004N	Energy Leader Partnership Program	0.5%	0.5%
		SCE-L-004O	Energy Leader Partnership Program	0.3%	0.1%
		SCE-L-004P	Energy Leader Partnership Program	0.0%	0.1%
		SCE-L-004Q	Energy Leader Partnership Program	0.2%	0.1%
		SCE-L-004R	Energy Leader Partnership Program	0.0%	0.0%
		SCE-L-004S	Energy Leader Partnership Program	0.2%	0.1%
		SCE-L-004U	Energy Leader Partnership Program	0.1%	0.0%

Table 2-4 (Cont'd): Gross and Net Program Groupings for SCE's Programs

Gross Program Group	Net Program Group	IOUPrgID	IOU Program Name	% kwh	% kw
Local Government Partnership (Continued)	SCE LGP ELP (Continued)	SCE-L-004V	Energy Leader Partnership Program	0.0%	0.0%
		SCE-L-004W	Energy Leader Partnership Program	0.0%	0.0%
	SCE LGP Institutional	SCE-L-005A	Institutional and Government Core	0.0%	0.0%
		SCE-L-005B	Institutional and Government Core	0.0%	0.0%
		SCE-L-005C	Institutional and Government Core	0.0%	0.0%
		SCE-L-005D	Institutional and Government Core	0.0%	0.0%
		SCE-L-005E	Institutional and Government Core	0.0%	0.0%
		SCE-L-005F	Institutional and Government Core	0.0%	0.0%
		SCE-L-005G	Institutional and Government Core	0.0%	0.0%
Third/Local Party Implementer	SCE 3P	SCE-TP-006	Healthcare EE Program	0.5%	0.4%
		SCE-TP-010	Data Center Energy Efficiency	0.2%	0.1%
		SCE-TP-012	Lodging EE Program	0.4%	0.3%
		SCE-TP-013	Food & Kindred Products	0.3%	0.2%
		SCE-TP-014	Primary and Fabricated Metals	0.4%	0.2%
		SCE-TP-015	Industrial Gasses	0.1%	0.1%
		SCE-TP-016	Nonmetallic Minerals and Products	0.3%	0.2%
		SCE-TP-017	Comprehensive Chemical Products	0.1%	0.1%
		SCE-TP-025	Retail Energy Action Program	0.7%	0.6%
		SCE-TP-026	Commercial Utility Building Efficiency	0.0%	0.0%
		SCE-TP-033	Automatic Energy Review for Schools	0.0%	0.0%
		SCE-TP-036	Energy Efficiency for Entertainment Centers	0.1%	0.1%
		SCE-TP-037	Private Schools and Colleges Program	0.6%	0.7%
		SCE-TP-0608	Coin Operated Laundry Program	0.1%	0.0%
	SCE 3P Mgmt Affiliates	SCE-TP-031	Management Affiliates Program	0.7%	0.8%
	SCE 3P Preschool	SCE-TP-038	California Preschools Program	0.5%	0.6%
	SCE 3P Schools	SCE-TP-024	Public Pre-, Elementary and High Schools	0.0%	0.0%

Table 2-5: Gross and Net Program Groupings for SDG&E's Programs

Gross Program Group	Net Program Group	IOUPrgID	IOU Program Name	% kwh	% kwh
Core/Statewide Custom	SDGE Core/Statewide Custom	SDGE3105	SW-ComA - Calculated	8%	5%
		SDGE3109	SW-IndA - Calculated	0.3%	0.2%
		SDGE3118	SW-NCNR - NRNC Savings By Design	3%	3%
Core/Statewide Deemed	SDGE Deemed COM	SDGE3106	SW-ComB - Deemed	41%	39%
	SDGE Deemed IND_AG	SDGE3101	SW-AgB - Deemed	0.6%	0.7%
		SDGE3110	SW-IndB - Deemed	3%	5%
Direct Install	SDGE Direct Install	SDGE3174	SW-ComE - Direct Install	17%	22%
Third/Local Party Implementer	SDGE BID	SDGE3117	Local03 - Local Nonresidential (BID)	27%	24%
	SDGE MEC	SDGE3167	3P-NRes09 - Mobile Energy Clinic (MEC)	0.8%	0.9%

2.4 Overview of Impact Evaluation Approach

A primary objective of this evaluation was to develop gross and net ex-post kW and kWh savings estimated for the seven nonresidential downstream lighting HIMs listed above. This impact evaluation utilized a gross realization rate (GRR) approach, where site-specific gross ex-post impacts were estimated for a sample of participants. These site-specific gross ex-post impacts were then compared to the ex-ante impact from the tracking data to develop a ratio of ex-post to ex-ante gross savings, which is the GRR, or the percentage of ex-ante savings realized in the ex-post evaluation. A set of GRRs were developed for specific participant segments, which could then be applied to the entire population of participants to create a population estimate of ex-post gross savings.

A separate NTG analysis was then performed using a self-report analysis based on participant phone survey data. This analysis resulted in a number of NTGRs that could then be applied to the population's gross savings values in order to estimated net savings.

Section 4, Appendix G and Appendix H discuss in detail the approaches that were used to develop site-specific ex-post net and gross kW and kWh savings values, and the corresponding segment-specific GRRs and NTGRs that could be applied back to the population of participants.

The development of the site-specific ex-post gross savings values was based on on-site data collection, which is discussed in more detail in Section 3 and Appendix G. The on-site visits collected data that supported a number of parameters that were used in the following algorithm

to estimate site-specific ex-post gross savings. This algorithm was based on developing hourly impacts to create an impact load profile. From this profile, impacts could be aggregated to develop an annual ex-post gross kWh savings value, or averaged over a set of specific hours to develop an ex-post gross kW savings value. The general algorithm applied to estimate energy savings for a specific hour is:

$$\text{Impact\_Hour\_i} = \text{Measure\_Qty} \times \left[\begin{array}{l} (\text{Baseline\_Wattage} \times \text{Percent\_On\_Pre\_Hour\_i}) \\ -(\text{Post\_Wattage} \times \text{Percent\_On\_Post\_Hour\_i}) \end{array} \right]$$

Where,

Measure_Qty = the quantity of measures found to be installed and operable based on an on-site visit.

Baseline_Wattage = the wattage associated with the measures that were replaced or with measures corresponding to the industry standard practice for the type of retrofit. As discussed below, some measures employed a dual baseline over the life of the measure, while others were based solely on industry standard practice.

Post_Wattage = the wattage associated with the measures that were installed.

Percent_On_Pre = the percentage of time the baseline equipment is on during a specific hour i, which is obtained from adjusted self-reported operating hours gathered on site.

Percent_On_Post = the percentage of time the installed equipment is on during a specific hour i, which is obtained from either logger data usage or adjusted self-reported operating hours gathered on site. The Percent_On_Pre and Percent_On_Post are assumed to be equal for all measures, except occupancy sensors.

One final parameter that is utilized to estimate annual energy and demand impacts is the HVAC interactive effects. The Database for Energy Efficient Resources (DEER) provides a set of factors that were used to incorporate the kWh and kW HVAC interactive effects associated with the installed measures. The kWh factors are multiplied by the annual kWh impact for a given participant, and the kW factors are multiplied by the kW demand impact. Different factors are applied to a given measure and participant based on if the measure was a CFL or not, the participant's IOU, the climate zone where the participant is located, the building type of the participant, and if the participant's facility is new or existing.

For many measures evaluated under this study, baseline wattages are estimated differently for customers that replaced their equipment on burnout or as a result of a natural replacement, as opposed to those that were influenced by the program to make an early replacement. When a

measure is considered an early replacement (ER), the lifecycle savings will be examined over two distinct time periods. The first time period is associated with the replaced equipment's remaining useful life (RUL), which is the period over which the accelerated program adoption was considered to have been made. The second or post-RUL period, continues from the end of the RUL through the measure's effective useful life (EUL). Different baseline wattages are used for each period. This methodology is referred to as a dual baseline approach, and is discussed in more detail in Section 4 and Appendix G.

The remainder of this report will discuss the following:

- Section 3 discusses the data sources that were utilized to estimate each of the individual parameters that comprise the impact load shapes, the sample design and resulting data used in the evaluation.
- Section 4 discusses the overall impact evaluation approach in more detail, including the methods used for estimating each individual impact parameter, including the installation rate, the various wattage values, the pre and post operating hours, the RUL, and the NTGRs.
- Section 5 presents the final study results, including the gross and net realization rates at various levels of segmentation.

There are also a number of appendices that accompany this report, as follows:

- Appendix A presents the participant telephone survey instrument.
- Appendix B presents the on-site survey instrument.
- Appendix C presents the responses to the phone survey questions.
- Appendix D presents the net-to-gross analysis framework developed by the NTGR Working Group.
- Appendix E presents the lighting logger field installation procedures.
- Appendix F presents the logger data validation process.
- Appendix G presents the detailed approach used to conduct the gross impact analysis.
- Appendix H presents the detailed approach used to conduct the net-to-gross analysis.
- Appendix I presents the method used to adjust the self-reported operating schedules.

3

Data Sources, Sample Design, and Data Collection

3.1 Data Sources

A number data sources were utilized to support the development of each impact parameter in order to develop site-specific estimates of gross ex-post kW and kWh savings values for this study, which are discussed below.

3.1.1 On-Site Data Collection

On-site visits collected data to support a number of parameters used in the impact algorithm. Verification data was collected to support installation rates as well as storage rates. Equipment manufacturer and model numbers were collected in order to perform lookups that provided information on the wattage of installed and replaced equipment to support the estimate of pre- and post-retrofit wattages. Furthermore, for some on sites, spot watt measurements were taken to estimate post-installation wattage. Self-report data was also gathered on the wattage of pre-existing equipment when actual equipment replaced was not on site, to help support the estimate of pre-retrofit wattages. Finally, self-report data was gathered on lighting equipment usage schedules to aid in the development of pre- and post-retrofit load shapes. The use of this data to develop installation rates is discussed in Section 4.2, the development of wattage values is discussed in Section 4.5, and the development of operating schedules using self-report data is discussed in Section 4.4.

3.1.2 Time of Use Lighting Loggers

As part of the on-site visit, a sample of installed lighting equipment was monitored to gather time-of-use data to support the development of operating hours. Lighting loggers using optical sensors were the predominant type used for this study. When lighting was not accessible for optical sensors, logging was done at the electrical panel where the circuit amperage was collected over time. The development of lighting usage load shapes using logger data is discussed in detail in Section 4.4.

3.1.3 Participant Phone Survey

A phone survey was conducted to recruit customers for the on-site visit, as well as collect data useful for the net-to-gross (NTG) analysis and various other components of the evaluation. The

NTG analysis is discussed in detail in Section 4.6. One other key use of the phone survey data was to identify if customer installations were early replacement (ER) or replacement on burnout (ROB), which is discussed in detail in Section 4.3.

3.1.4 2006-08 Logger Data

Logger data from the 2006-08 CPUC Small Commercial Contract Group evaluation were utilized to adjust customer self-reported operating schedules for CFL and linear fluorescent measures. The use of this data to adjust the self-reported operating schedules is discussed in detail in Section 4.4.

3.1.5 Commercial Market Share Tracking Study Data

The Commercial Market Share Tracking study provided information on lighting equipment installations that occurred outside of the CPUC programs. This information was utilized to develop estimates of industry standard practices for lighting retrofits, which is discussed in detail in Section 4.5.

3.2 Sample Design

There were two primary data collection activities, which were on-site visits (including lighting logger installations in the majority of visits) and participant phone surveys. Both sample designs are discussed below.

3.2.1 On-Site Sample Design

As mentioned above, the on-site visits collected data to support a number of the impact parameters including the installation rates, pre and post wattages and pre and post operating hours. The on-site sample was designed to develop statistically significant results at the measure level for one or more combinations of IOU and Gross Program Groups. Appendix G discusses the sample design in greater detail, but the resulting design focused on developing gross ex-post savings results for 48 combinations of measure, IOU and Gross Program Group. Sample sizes were developed to achieve general ranges of statistical precision which ranged from 90/15 (defined as estimating annual operating hours such that the 90% confidence interval was within 15% of the mean) to 90/40. Sample sizes needed to meet the relative precision targets were based on estimates of coefficients of variation obtained from the 2006-08 Small Commercial Contract Evaluation.

The sample design was developed early on in the evaluation cycle when only 2010 participation data was available. Therefore, there was some uncertainty in the levels of participation that would occur, and if there would even be enough participants to support the desired sample size. The sample design was revisited on a quarterly basis as new tracking data became available and

sample sizes were adjusted accordingly. This also involved adding new segments as new programs were introduced (such as SDG&E's direct installation program).

Table 3-1 below summarizes the final sample design. Table 3-2 presents each segment's percent contribution towards 2010-12 total nonresidential downstream lighting kWh savings by IOU. For each IOU, the 7 evaluated HIMs represent 79%, 87% and 75% of kWh savings, respectively. Table 3-3 summarizes the number of unique sites within 2010-12 total nonresidential downstream lighting. Sample sizes are shown by HIM, IOU and Gross Program Group.

Table 3-1: On-site Sample Design by HIM and Gross Program Group

Gross Program Group	CFL Basic	CFL Reflector	Linear Fluorescent	Delamp	High Bay Fluorescent	Occupancy Sensors	HIDs	Total
PG&E Deemed	-	15	20	20	30	25	15	125
PG&E Custom	-	-	20	-	-	-	-	20
PG&E 3P	15	-	20	15	15	15	-	80
PG&E LGP/DI	35	15	30	20	20	15	35	170
PG&E TOTAL	**50**	**30**	**90**	**55**	**65**	**55**	**50**	**395**
SCE DI	35	35	30	30	20	25	-	175
SCE Deemed	-	15	20	30	30	35	15	145
SCE Custom	-	-	20	-	-	-	-	20
SCE 3P	-	-	20	20	-	-	-	40
SCE LGP	-	-	20	-	-	-	-	20
SCE Total	**35**	**50**	**110**	**80**	**50**	**60**	**15**	**400**
SDGE DI	15	15	20	-	-	-	-	50
SDGE Deemed	15	15	20	20	20	25	15	130
SDGE Custom	-	-	20	-	-	-	-	20
SDGE 3P/LGP	15	-	20	-	-	-	-	35
SDG&E Total	**45**	**30**	**80**	**20**	**20**	**25**	**15**	**235**
Statewide	**130**	**110**	**280**	**155**	**135**	**140**	**80**	**1,030**

Table 3-2: Percent 2010-12 Total Nonresidential Downstream Lighting kWh Savings by IOU

Gross Program Group	CFL Basic	CFL Reflector	Linear Fluorescent	Delamp	High Bay Fluorescent	Occupancy Sensors	HIDs	Total
PG&E Deemed	< 1 %	< 1 %	5%	2%	15%	6%	< 1 %	29%
PG&E Custom	< 1 %	0%	5%	0%	0%	< 1 %	< 1 %	6%
PG&E 3P	1%	< 1 %	3%	1%	< 1 %	< 1 %	< 1 %	7%
PG&E LGP/DI	4%	< 1 %	22%	5%	2%	< 1 %	4%	38%
PG&E TOTAL	**5%**	**1%**	**34%**	**8%**	**18%**	**7%**	**5%**	**79%**

Table 3-2 (Cont'd): Percent 2010-12 Total Nonresidential Downstream Lighting kWh Savings by IOU

Gross Program Group	CFL Basic	CFL Reflector	Linear Fluorescent	Delamp	High Bay Fluorescent	Occupancy Sensors	HIDs	Total
SCE DI	2%	2%	12%	7%	1%	1%	0%	26%
SCE Deemed	< 1 %	< 1 %	5%	6%	23%	10%	< 1 %	44%
SCE Custom	0%	0%	6%	< 1 %	0%	< 1 %	< 1 %	7%
SCE 3P	< 1 %	< 1 %	3%	3%	< 1 %	< 1 %	< 1 %	8%
SCE LGP	< 1 %	< 1 %	2%	< 1 %	< 1 %	< 1 %	< 1 %	2%
SCE Total	**3%**	**3%**	**27%**	**16%**	**24%**	**13%**	**< 1 %**	**87%**
SDGE DI	1%	< 1 %	13%	< 1 %	0%	< 1 %	< 1 %	16%
SDGE Deemed	< 1 %	< 1 %	13%	4%	8%	5%	1%	33%
SDGE Custom	< 1 %	0%	1%	0%	0%	0%	< 1 %	2%
SDGE 3P/LGP	< 1 %	0%	22%	0%	0%	0%	< 1 %	23%
SDG&E Total	**3%**	**2%**	**50%**	**5%**	**8%**	**5%**	**2%**	**75%**

Table 3-3: Number of Unique 2010-12 Nonresidential Downstream Lighting Sites by IOU

Gross Program Group	CFL Basic	CFL Reflector	Linear Fluorescent	Delamp	High Bay Fluorescent	Occupancy Sensors	HIDs	Total
PG&E Deemed	9	178	3,195	1,421	2,333	2,746	72	9,954
PG&E Custom	3	-	586	-	-	121	18	728
PG&E 3P	789	13	1,665	949	243	390	378	4,427
PG&E LGP/DI	7,018	1,068	10,817	4,761	1,066	2,037	841	27,608
PG&E TOTAL	**7,819**	**1,259**	**16,263**	**7,131**	**3,642**	**5,294**	**1,309**	**42,717**
SCE DI	25,969	10,744	46,721	16,202	1,737	30,015	-	131,388
SCE Deemed	69	445	6,386	3,475	4,635	5,460	86	20,556
SCE Custom	-	-	669	5	-	127	25	826
SCE 3P	541	16	1,389	1,112	46	736	24	3,864
SCE LGP	109	116	720	350	43	403	10	1,751
SCE Total	**26,688**	**11,321**	**55,885**	**21,144**	**6,461**	**36,741**	**145**	**158,385**
SDGE DI	2,347	847	5,108	315	-	1,071	6	9,694
SDGE Deemed	118	107	1,949	790	466	905	97	4,432
SDGE Custom	2	-	41	-	-	-	2	45
SDGE 3P/LGP	1,057	-	253	-	-	-	1	1,311
SDG&E Total	**3,524**	**954**	**7,351**	**1,105**	**466**	**1,976**	**106**	**15,482**

One further objective of the sample design was that the above sample sizes would include 60 participants that were identified as large calculated projects. These customers were defined as participants that installed calculated (not deemed) lighting measures that were at least 250,000

kWh in size. As will be shown later, we were unable to sample 60 large calculated sites as their population was very limited. This was also true of other segments, as discussed later.

Section 3.3.3 below discusses the data collection content for the on-sites, but to summarize, the on-sites attempted to collect verification data, pre- and post-wattage data, and pre and post self-report operating schedules. Lighting loggers were also installed in a majority of the sites. The 2006-08 Small Commercial evaluation developed a set of adjustment factors that were used to adjust self-reported usage schedules to more accurately reflect actual usage, and develop use shapes. Therefore, this evaluation relied on those adjustment factors to develop pre- and post-retrofit use shapes whenever possible, rather than install new lighting logger samples. Linear fluorescent, delamping and basic CFL measures were the primary focus of the 2006-08 lighting logger study. Therefore, we only installed loggers for these measures within market segments that were not reliably estimated in 2006-08. All CFLs with reflectors, high bay fluorescent lighting, HIDs, and measures controlled by occupancy sensors were monitored. Furthermore, the 2006-08 Small Commercial Lighting Logger sample focused more on medium and small customers. As a result, larger basic CFL, linear fluorescent and delamping projects were not well represented in the 2006-08 sample and were therefore monitored as part of this study. A threshold for project size of 100,000 kWh of ex ante savings was used, such that any customers with installations above that size were monitored (less than 5% of the 2006-08 projects in the logger sample were above this size, compared to approximately one third of 2010-12 projects that exceeded this size).

3.2.2 Participant Phone Survey Sample Design

One of the key objectives of the phone survey was to support the NTG analysis. Participants were asked a detailed battery of questions to support the NTG algorithm. As discussed, a primary goal of the NTG analysis was to provide results at the IOU and Net Program Group level. Precision targets for NTGRs were set at the Net Program Group level, not at the Measure Group and Net Program Group level. These precision targets and corresponding sample sizes were developed as part of the research plan when only 2010 participation data was available. As a result, many segment-specific targets were not reached because fewer than expected customers participated, so a census was attempted for these segments. For analysis purposes, a number of segments needed to be collapsed for reporting purposes due to low sample sizes. Appendix H discusses the participant phone survey sample design in more detail. Table 3-4 through Table 3-6 below summarize the initial sample design for the participant phone survey.

Table 3-4: Net-to-Gross Sample Design by Net Program Group – PG&E

IOU Net Program Group	Unique Sites	Total Savings		Savings as a % of Non-res Downstream Lighting		Sample Size
	n	GWh	MW	kWh	kW	
PGE Calculated Ag	108	14	2	1%	0%	60
PGE Calculated Com	2,171	63	9	3%	2%	130
PGE Calculated Ind	55	7	1	0%	0%	40
PGE NRNC	99	5	1	0%	0%	40
PGE Deemed	11,254	276	63	13%	13%	260
PGE LGP East Bay	3,218	79	12	4%	2%	130
PGE LGP LGEAR	2,118	12	2	1%	1%	40
PGE LGP Marin	537	6	1	0%	0%	40
PGE LGP Redwood	718	6	1	0%	0%	40
PGE LGP SF	2,791	54	11	2%	2%	130
PGE 3P Other	5,478	102	14	5%	3%	130
PGE Energy Fitness	8,051	64	17	3%	4%	60
PGE RightLights	3,899	56	11	3%	2%	60
PGE SW Partnership	233	30	6	1%	1%	40
PGE DI Ecology	1,587	34	5	2%	1%	60
PGE DI RHA	3,410	47	10	2%	2%	60
PGE DI Staples	4,343	23	4	1%	1%	60
PGE DI Staples and RHA*	1,914	15	3	1%	1%	
PGE DI Synergy	762	4	1	0%	0%	40
PGE DI TEAA	792	8	1	0%	0%	40
PG&E Total	**53,538**	**905**	**174**	**41%**	**37%**	**1,460**

* Note that this segment (PGE2144) was originally planned to be split and reallocated to PGE DI Staples and PGE DI RHA based on the vendor performing the retrofit, so no sample size was prescribed for this segment. However, this information was not available for the majority of the tracking system records, so it was left as its own segment.

Table 3-5: Net-to-Gross Sample Design by Net Program Group – SCE

IOU Net Program Group	Unique Sites	Total Savings		Savings as a % of Nonres Downstream Lighting		Sample Size
	n	GWh	MW	kWh	kW	
SCE Calculated Com	1,705	87	12	4%	3%	130
SCE Calculated Ind_Ag	137	28	4	1%	1%	130
SCE NRNC	243	31	5	1%	1%	130
SCE Deemed Ag	214	6	1	0%	0%	40
SCE Deemed Com	17,321	379	107	17%	23%	130
SCE Deemed Ind	4,985	116	33	5%	7%	130
SCE Direct Install	149,474	293	76	13%	16%	130
SCE LGP ELP	2,908	22	3	1%	1%	40
SCE LGP Institutional	293	25	4	1%	1%	60
SCE 3P	979	41	8	2%	2%	40
SCE 3P Mgmt Affiliates	270	7	2	0%	0%	40
SCE 3P Preschool	1,056	6	2	0%	0%	40
SCE 3P Schools	1,935	46	7	2%	1%	40
SCE Total	**181,520**	**1,087**	**264**	**50%**	**56%**	**1,080**

Table 3-6: Net-to-Gross Sample Design by Net Program Group – SDG&E

IOU Net Program Group	Unique Sites	Total Savings		Savings as a % of Nonres Downstream Lighting		Sample Size
	n	GWh	MW	kWh	kW	
SDGE BID	585	52	8	2%	2%	130
SDGE Calculated	426	16	2	1%	0%	60
SDGE NRNC	48	6	1	0%	0%	40
SDGE Deemed COM	4,939	79	13	4%	3%	130
SDGE Deemed IND_AG	472	7	2	0%	0%	40
SDGE Direct Install	10,474	32	8	1%	2%	130
SDGE MEC	1,040	2	0	0%	0%	40
SDGE Total	**17,984**	**194**	**35**	**9%**	**7%**	**570**
Grand Total (All 3 IOUs)	**253,042**	**2,185**	**472**	**100%**	**100%**	**3,110**

3.3 Data Collection

This section presents the achieved data collection for the on-site and participant phone surveys. Also presented are details on the on-site data collection activity.

3.3.1 On-Site Survey Completes

Table 3-7 and Table 3-8 below summarize the resulting on-site data collection activity conducted for this evaluation. Table 3-7 summarizes the number of sites visited that provided data for the evaluation and supported the development of installation rates, wattage estimates, and operating schedules. Totals are shown for both unique sites and the total number of site-HIM combinations that were visited. On average, more than two HIMs per site were evaluated. As mentioned above, not all sites included the installation of lighting loggers. Table 3-8 summarizes the number of sites for which lighting loggers were installed for the use of developing operating profiles. Over 80% of all HIMs that were evaluated on site were monitored. Sample sizes are shown by HIM, IOU and Gross Program Group. Not shown in the table is the number of Large Custom sites that were visited. As mentioned above, the target was to conduct 60 on-site surveys. A total of 47 Large Custom sites were visited, resulting in a total of 74 site level HIMs being evaluated, 71 of which were monitored.

Table 3-7: Number of On-sites Used in the Evaluation by HIM and Gross Program Group

Gross Program Group	CFL Basic	CFL Reflector	Linear	Delamp	High Bay	Occ Sensors	HIDs	Total	Unique
PG&E Deemed	1	12	44	25	42	39	4	**167**	**92**
PG&E Custom	1	1	18	5	-	5	1	**31**	**20**
PG&E 3P	25	1	38	25	24	16	-	**129**	**58**
PG&E LGP/DI	62	32	92	61	31	33	3	**314**	**116**
PG&E TOTAL	**89**	**46**	**190**	**116**	**96**	**92**	**8**	**637**	**277**
SCE DI	69	39	102	26	19	76	-	**331**	**115**
SCE Deemed	-	16	57	42	43	53	6	**217**	**110**
SCE Custom	-	-	16	3	-	1	2	**22**	**18**
SCE 3P	17	-	40	14	-	15	-	**86**	**44**
SCE LGP	2	5	24	9	2	8	-	**50**	**26**
SCE Total	**88**	**60**	**235**	**93**	**64**	**153**	**8**	**701**	**305**
SDGE DI	32	23	53	2	-	9	-	**119**	**54**
SDGE Deemed	10	9	54	23	23	33	3	**155**	**73**
SDGE Custom	2	1	2	1	-	-	1	**7**	**5**
SDGE 3P/LGP	10	-	10	1	2	2	-	**25**	**19**
SDG&E Total	**54**	**33**	**118**	**27**	**25**	**44**	**4**	**305**	**145**
SW DI	101	62	155	28	19	85	-	**450**	**169**
SW Deemed	11	37	155	90	108	125	13	**539**	**275**
SW Custom	3	2	36	9	-	6	4	**60**	**43**
SW 3P	52	1	88	40	26	33	-	**240**	**121**
SW LGP	64	37	116	70	33	41	3	**364**	**142**
Statewide Total	**231**	**139**	**543**	**236**	**185**	**289**	**20**	**1,643**	**727**

Table 3-8: Number of On-sites with Lighting Loggers Installed by HIM and Gross Program Group

Gross Program Group	CFL Basic	CFL Reflector	Linear	Delamp	High Bay	Occ Sensors	HIDs	Total	Unique
PG&E Deemed	-	11	35	20	41	38	3	**148**	**80**
PG&E Custom	1	1	15	5	-	5	1	**28**	**17**
PG&E 3P	20	1	34	22	24	16	-	**117**	**52**
PG&E LGP/DI	51	27	74	50	30	33	5	**270**	**99**
PG&E TOTAL	**72**	**40**	**157**	**97**	**94**	**91**	**9**	**560**	**240**
SCE DI	55	34	79	18	18	66	-	**270**	**86**
SCE Deemed	-	14	41	29	40	49	6	**179**	**91**
SCE Custom	-	-	13	3	-	1	2	**19**	**15**
SCE 3P	17	-	36	14	-	13	-	**80**	**39**
SCE LGP	1	5	18	6	2	7	-	**39**	**20**
SCE Total	**73**	**53**	**184**	**69**	**60**	**136**	**8**	**583**	**245**
SDGE DI	12	14	27	1	-	8	-	**62**	**27**
SDGE Deemed	7	6	36	15	22	31	3	**120**	**54**
SDGE Custom	1	1	2	1	-	-	1	**6**	**4**
SDGE 3P/LGP	6	-	10	1	2	1	-	**20**	**15**
SDG&E Total	**26**	**21**	**74**	**18**	**24**	**40**	**4**	**207**	**94**
SW DI	67	48	106	19	18	74	-	**332**	**113**
SW Deemed	7	31	112	64	103	118	12	**447**	**225**
SW Custom	2	2	30	9	-	6	4	**53**	**36**
SW 3P	43	1	80	37	26	30	-	**217**	**106**
SW LGP	52	32	92	56	32	40	5	**309**	**119**
Statewide Total	**171**	**114**	**415**	**184**	**178**	**267**	**21**	**1,350**	**579**

Overall, 1,643 site-level HIMs were evaluated, compared to the target of 1,030. The large majority of target sample sizes at the HIM and Gross Program Group level were exceeded. For the sample sizes that were not met, it was due to having insufficient levels of participation to meet the targets. These tended to be in one of the CFL or HID HIMs or among participants in the Custom Gross Program Groups.

For the sample of sites where lighting loggers were installed, surveyors attempted to log every activity area where the measures of interest were installed. Activity areas are defined as areas at the premise that have different operating schedules. Time-of-use lighting loggers were installed at the premise for up to twelve months to gather data, and seven months on average. On average, eight loggers per site were installed. For some sites, when fixtures were not accessible or when it was not efficient or accurate to use TOU data logging (e.g. high bay fixtures controlled by

integrated occupancy sensors), electric panel logging was performed. For sites that were not monitored, self-report data was obtained on the operating schedules.

Table 3-9 summarizes the number of lighting loggers installed for the use of developing operating profiles. Lighting logger counts are shown for each IOU by HIM and Gross Program Group. Note that occupancy sensors are not actually monitored, it is the equipment associated with the occupancy sensor that is monitored. Generally, the occupancy sensors are controlling rebated measures. Therefore, most of the 1,096 loggers listed in the table for occupancy sensors are also being counted towards the HIM being controlled. In total, 4,650 loggers were installed that represented 5,655 HIMs.

Table 3-9: Number of Lighting Loggers Installed by HIM and Gross Program Group

Gross Program Group	CFL Basic	CFL Reflector	Linear	Delamp	High Bay	Occ Sensors	HIDs	Total
PG&E Deemed	1	29	243	49	150	224	11	**707**
PG&E Custom	1	-	126	10	-	26	-	**163**
PG&E 3P	49	6	205	57	86	75	-	**487**
PG&E LGP/DI	121	44	504	150	77	91	6	**997**
PG&E TOTAL	**172**	**79**	**1,078**	**266**	**313**	**416**	**17**	**2,354**
SCE DI	81	55	379	73	41	157	-	**786**
SCE Deemed	-	63	326	73	187	275	29	**953**
SCE Custom	-	-	104	-	-	10	4	**118**
SCE 3P	37	-	309	45	-	69	-	**460**
SCE LGP	1	10	124	10	7	21	-	**173**
SCE Total	**119**	**128**	**1,242**	**201**	**235**	**532**	**33**	**2,490**
SDGE DI	19	28	131	-	-	10	-	**188**
SDGE Deemed	16	18	272	10	70	136	6	**528**
SDGE Custom	1	2	6	1	-	-	4	**14**
SDGE 3P/LGP	6	-	64	-	7	2	-	**81**
SDG&E Total	**42**	**48**	**473**	**11**	**77**	**148**	**10**	**811**
Statewide	**333**	**255**	**2,793**	**478**	**625**	**1,096**	**60**	**5,655**

3.3.2 Participant Phone Survey Completes

Table 3-10 and Table 3-11 present the phone surveys completed by HIM, IOU and Net Program Group. Although the sample was not designed to develop NTGRs at the measure level, they will be reported where available.

A total of 2,443 participants were interviewed. As shown above, the targeted number of completes was 3,110, which was based on having unlimited sample to meet the Net Program Group targets. Recall that these sample size targets were developed in 2010, prior to knowing what the final number of participants would be. As shown, many of the net program groups did not have sufficient populations to meet the desired sample sizes. As a result, some of the Net Program Groups needed to be combined. Specifically, the industrial, commercial, agricultural custom programs and new construction program were combined into a single group.

Table 3-10: Participant Phone Survey Completes by Net Program Group – PG&E

Net Program Group	CFL Basic	CFL Reflector	Linear	Delamp	High Bay	Occ Sensors	HIDs	Total
PGE Core/Statewide Custom	0	0	38	0	0	7	0	**45**
PGE Deemed Ag	0	3	7	1	5	3	0	**19**
PGE Deemed Com	0	11	47	21	57	49	4	**189**
PGE Deemed Ind	0	1	8	6	26	9	0	**50**
PGE LGP East Bay	7	0	66	24	0	9	34	**140**
PGE LGP LGEAR	7	3	16	10	3	5	0	**44**
PGE LGP Marin	16	0	19	0	0	0	4	**39**
PGE LGP Redwood	22	0	14	0	0	4	0	**40**
PGE LGP SF	22	0	69	0	2	7	0	**100**
PGE 3P Other	19	0	52	25	22	13	4	**135**
PGE Energy Fitness	5	0	9	21	16	4	3	**58**
PGE RightLights	50	0	93	0	0	5	8	**156**
PGE SW Partnership	0	1	4	0	0	0	0	**5**
PGE DI Ecology	15	0	32	0	1	5	4	**57**
PGE DI RHA	8	6	26	19	3	1	0	**63**
PGE DI Staples	18	5	19	7	9	1	1	**60**
PGE DI Staples and RHA	3	3	6	3	2	1	0	**18**
PGE DI Synergy	5	2	19	5	0	4	0	**35**
PGE DI TEAA	11	0	15	10	1	1	4	**42**
PG&E Total	**208**	**35**	**559**	**152**	**147**	**128**	**66**	**1,295**

Table 3-11: Participant Phone Survey Completes by Net Program Group – SCE and SDG&E

Net Program Group	CFL Basic	CFL Reflector	Linear	Delamp	High Bay	Occ Sensors	HIDs	Total
SCE								
SCE Core/Statewide Custom	0	0	42	0	2	8	3	**55**
SCE Deemed Ag	0	1	4	7	15	1	0	**28**
SCE Deemed Com	0	10	31	22	35	31	7	**136**
SCE Deemed Ind	0	2	48	26	43	17	0	**136**
SCE Direct Install	24	33	81	27	13	16	0	**194**
SCE LGP ELP	0	4	39	10	0	7	3	**63**
SCE LGP Institutional	0	0	10	3	1	4	0	**18**
SCE 3P	4	0	29	14	0	8	1	**56**
SCE 3P Mgmt Affiliates	0	0	6	3	0	2	0	**11**
SCE 3P Preschool	7	0	14	17	0	8	0	**46**
SCE 3P Schools	0	0	3	7	0	2	0	**12**
SCE Total	**35**	**50**	**307**	**136**	**109**	**104**	**14**	**755**
SDG&E								
SDGE Core/Statewide Custom	2	0	9	0	0	2	0	**13**
SDGE BID	0	0	40	0	0	1	0	**41**
SDGE Deemed COM	8	2	50	14	16	21	2	**113**
SDGE Deemed IND_AG	2	0	12	3	4	5	1	**27**
SDGE Direct Install	24	17	86	2	0	3	0	**132**
SDGE MEC	67	0	0	0	0	0	0	**67**
SDGE Total	**103**	**19**	**197**	**19**	**20**	**32**	**3**	**393**
Grand Total	**346**	**104**	**1,063**	**307**	**276**	**264**	**83**	**2,443**

3.3.3 On-Site Data Collection Content

The data collected at each site included both visual observations and, for most sites, measurements. At each site, the following information was gathered (although monitoring did not occur for every site):

- ***Site Information.*** This data included basic information about the business and the building itself. The field auditors recorded business type, total floor area, conditioned floor area, floor area by space use type, business hours, and also verified the cooling

system type and heating fuel type reported by the phone survey. The conditioning state (unconditioned, heated, cooled, etc.) of each space use area was also noted.

- ***Customer Reported Equipment Operating Schedule.*** In addition to business hours, the field auditors asked the customers about equipment operation schedules for each specific lighting circuit with rebated fixtures. These schedules were recorded as the percent "on" time in each hour of every weekday. Seasonal schedule variations were also recorded. Customers that installed occupancy sensors were also asked about their operating schedules prior to the retrofit.
- ***Lighting Fixture-Lamp Data.*** Detailed information was collected for every rebated fixture and lamp. The primary collection method was visual verification, however the auditors also asked for any documentation on-site for the rebated lighting. The information recorded included lamp manufacturer and model number, lamp quantity, lamp length and diameter (if linear fluorescent), and ballast manufacturer and model number. It also included contextual data not directly affecting fixture power such as lighting application, mounting type, reflector, floor-to-fixture height, and control type. To gather baseline fixture-lamp information the surveyor used four approaches for each measure on-site. In each case the auditor tried to gather the same information as described above. The first was to locate fixtures that were not retrofitted but in the same area or type of area and matched the baseline fixture description. The second approach was to look for spare baseline lamps and ballasts in storage and maintenance areas. The third was to review any documentation regarding the previously installed lamps and fixtures. The forth approach was to gather the contacts' or maintenance staffs' best recollection of the baseline fixture-lamp information. It is also important to note that for many calculated measures, baseline wattage information is documented in the application.
- ***Lighting Inventory.*** The final component of the field observations was the lighting inventory. This task required the field auditors to identify the rebated/targeted equipment that corresponded to each lighting schedule gathered, or in the case of when loggers were installed, the inventory corresponding to the installed lighting loggers. As many loggers were used as needed to represent the different activity areas and schedules. The information contained in the lighting inventory provided the "load" portion of determining the 8,760 load shape for the circuit. When combined with all of the other lighting circuits at the site, the load could be aggregated at both the site and activity area level.
- ***Time-of-Use Data Logging.*** This critical measurement involved leaving data loggers in place over some period to capture the typical usage of each defined lighting circuit. The field auditors attempted to install at least one data logger on every circuit feeding fixtures affected by the retrofit; often, a "backup" logger was also installed in case the primary logger failed. The information provided by the logger data provides the "shape"

portion of determining the 8,760 load shape for this circuit. When combined with all of the other lighting circuits at the site, the shape can be aggregated at both the site and activity area level. Two types of TOU loggers were used for this study, a lumens logger with a photocell and a current logger with a built in current transducer. Detailed information about the loggers and installation procedures are contained in Appendix E.

- ***Electric Panel Data Logging.*** When fixtures were not accessible or when it was not efficient or accurate to use TOU data logging (e.g. high bay fixtures controlled by integrated occupancy sensors), electric panel logging was performed. This method involved the installation of loggers in electric panels to capture circuit amp levels in five minute intervals. When combined with the circuit spot measurements, the data provided actual kW consumption and circuit load shapes. Detailed information about the panel metering loggers, tools, installation, and safety procedures are contained in Appendix E.
- ***Spot Measurements.*** When loggers were installed in electrical panels, spot measurements were performed on each rebated lighting circuit to measure the circuits full load wattage, amperage, voltage, and power factor. The spot measurements served three purposes. The first was to confirm the number of rebated fixtures believed to be on the circuit from a visual verification. The second was to determine the type of logger to install given the measurements taken. The third was to provide a real time measurement of circuit and fixture input wattage, amperage, voltage, and power factor to use as desired for analysis. Detailed procedures and equipment information for the spot measurements are contained in Appendix E.

Additional details on the data used for this evaluation are provided in Appendix G, Section 3 Data Collection. Included are more detailed dispositions of the on-site and phone survey data collected; a discussion on the logger data validation procedures; a more detailed discussion of the 2006-08 Small Commercial and CMST data used; and detailed tables on the sample sizes used to support the operating hour and wattage analyses.

4

Methodology

This section provides an overview of the methods used to estimate the gross and net savings values and corresponding realization rates. The approach used to estimate each individual parameter in the savings algorithm is discussed. More detailed discussions of the methods are provided in Appendix G and Appendix H.

Final realization rates for kW and kWh savings are presented in Section 5.

4.1 Overview of Gross Impact Evaluation Approach

As mentioned, one of the primary objectives of this evaluation is to develop gross ex-post kW and kWh savings estimated for seven non-residential downstream lighting high impact measures (HIMs)

- Indoor CFL – Basic
- Indoor CFL - Reflectors
- Indoor Controls - Occupancy Sensor
- Indoor HID
- Indoor High Bay Fluorescent
- Indoor Linear Fluorescent
- Indoor Linear Fluorescent Delamping

For this evaluation a gross realization rate (GRR) approach was utilized, where site-specific gross ex-post impacts were estimated for a sample of participants. These site-specific gross ex-post impacts were then compared to the ex-ante impact from the tracking data to develop a ratio of ex-post to ex-ante gross savings, which is the GRR, or the percentage of ex-ante savings realized in the ex-post evaluation. As will be discussed in more detail, a set of GRRs were developed for specific participant segments, which could then be applied to the entire population of participants to create a population estimate of ex-post gross savings.

The general approach that was used to estimate site-specific ex-post gross savings values was based on developing hourly impacts to create an impact load profile. From this profile, impacts

could be aggregated to develop an annual ex-post gross kWh savings value, or averaged over a set of specific hours to develop an ex-post gross kW savings value. The general algorithm applied to estimate energy savings for a specific hour is:

$$\text{Impact\_Hour\_i} = \text{Measure\_Qty} \times \left[\begin{array}{l} (\text{Baseline\_Wattage} \times \text{Percent\_On\_Pre\_Hour\_i}) \\ -(\text{Post\_Wattage} \times \text{Percent\_On\_Post\_Hour\_i}) \end{array} \right]$$

Where,

Measure_Qty = the quantity of measures found to be installed and operable based on an on-site visit.

Baseline_Wattage = the wattage associated with the measures that were replaced or with measures corresponding to the industry standard practice for the type of retrofit. As discussed in detail below, some measures employed a dual baseline over the life of the measure, while others were based solely on industry standard practice.

Post_Wattage = the wattage associated with the measures that were installed.

Percent_On_Pre = the percentage of time the baseline equipment is on during a specific hour i, which is obtained from adjusted self-reported operating hours gathered on site.

Percent_On_Post = the percentage of time the installed equipment is on during a specific hour i, which is obtained from either logger data usage or adjusted self-reported operating hours gathered on site. The Percent_On_Pre and Percent_On_Post are assumed to be equal for all measures, except occupancy sensors.

One final parameter that is utilized to estimate annual energy and demand impacts is the HVAC interactive effects. The Database for Energy Efficient Resources (DEER) provides a set of factors that were used to incorporate the kWh and kW HVAC interactive effects associated with the installed measures. The kWh factors are multiplied by the annual kWh impact for a given participant, and the kW factors are multiplied by the kW demand impact. Different factors are applied to a given measure and participant based on if the measure was a CFL or not, the participant's IOU, the climate zone where the participant is located, the building type of the participant, and if the participant's facility is new or existing.

For many measures evaluated under this study, impacts are estimated differently for customers that replaced their equipment on burnout or as a result of a natural replacement, as opposed to those that were influenced by the program to make an early replacement. For customers that performed a replacement on burnout (ROB) or were natural replacement (NR), the baseline

equipment for estimating impacts for the effective life of the project (EUL) is considered to be industry standard practice. This is because the customer would have installed equipment in the absence of the program; therefore the existing equipment does not provide the appropriate baseline for estimating impacts.

When a measure is considered an early replacement (ER), the lifecycle savings will be examined over two distinct time periods. The first time period is associated with the replaced equipment's remaining useful life (RUL), which is the period over which the accelerated program adoption was considered to have been made. During the RUL time period, the baseline equipment for estimating impacts is the equipment that was replaced. However, for the post-RUL period through the measures' EUL, the baseline equipment for estimating impacts again will be considered to be industry standard practice, because at the end of the RUL the customer would have had to replace their equipment. This methodology is also referred to as the dual baseline approach, as there are two different baselines that are applied to customers who are considered to be ER.

The dual baseline approach will be applied to all measures except for basic CFLs, CFLs with reflectors and occupancy sensors. Because CFLs typically replace incandescent lamps which have a very small EUL, it is assumed that they are always ROB. Occupancy sensors installed under the program are typically installed as part of a lighting retrofit. When estimating savings for a lighting retrofit along with occupancy sensors, the impact associated with the occupancy sensors is considered to be the incremental measure whose savings is based on the installed equipment. Therefore, the wattage affected by the occupancy sensor is the post-retrofit wattage for the occupancy sensor's full EUL and no dual baseline would apply.

The determination of which installations require a dual baseline, and the development of the RUL and various baseline wattages, are discussed in more detail below.

The savings algorithm presented above varied depending on the measure installed, as well as the circumstances of the installation (e.g., if the installation was early replacement or a replacement on burnout). Below we discuss the methods used to estimate each individual impact parameter, including the installation rate, the various wattage values, the pre and post operating hours and the RUL. In Appendix G, measure and situation-specific (early replacement or replacement on burnout) equations are provided, as well as a more detailed description of how each parameter is being evaluated.

4.2 Installation Rate Analysis

Although the installation rate is not directly used in the impact algorithm, it is implicit in the gross realization rate. If the measure quantity found on site is less than the amount claimed in

the tracking data, then the gross realization rate will be reduced accordingly. The installation rate is defined as the percentage of equipment found to be installed and operable. The installation rate is estimated for each site based on data gathered during the on-site visit. As part of these on-site visits, an objective of the auditor was to attempt to identify all equipment rebated/incented, along with a disposition of that equipment.

The key measure count that is identified on site is the number of measures that are currently installed and in working condition (operable). The installation rate is calculated directly from this measurement:

$$\text{Installation Rate} = \frac{\text{Quantity of measures installed and operable from on-site visit}}{\text{Quantity of measures reported installed in tracking system}}$$

In addition to identifying the amount of equipment that was installed and operable, the auditor also identified the amount of equipment that was placed in storage, sent to another location, or had either failed or been removed for other reasons. Although the installation rate is defined as the percent found to be in place and operable, an analysis was also conducted to determine the percent of rebated/incented measures that were actually received by a participant (received rate). This would include those in place and operable, burned out or replaced, placed in storage, or placed at another facility.

Table 4-1 through Table 4-7 present the installation rates, received rates, storage rates, failure/removal rates, and the percentage of equipment at another location, for each HIM by Gross Program Group. Also shown are the sample sizes and resulting relative precisions measured at the 90% confidence interval.

Table 4-1: Disposition of Lighting Verification by Gross Program Group for CFL Basic

Gross Program Group	Sites	Installation Rate	Relative Precision	Received Rate	Storage Rate	Other Location	Failure/ Removal Rate
PG&E Deemed	1	0%		0%	0.0%	0.0%	0.0%
PG&E Custom	1	100%		100%	0.0%	0.0%	0.0%
PG&E 3P	25	75%	8%	84%	5.8%	1.8%	0.9%
PG&E LGP/DI	62	86%	4%	88%	0.5%	0.0%	0.7%
PG&E Total	**89**	**85%**	**3%**	**87%**	**1.3%**	**0.3%**	**0.7%**
SCE DI	69	63%	12%	74%	0.9%	1.1%	9.0%
SCE Deemed							
SCE Custom							
SCE 3P	17	83%	9%	84%	1.2%	0.0%	0.0%
SCE LGP	2	100%	0%	100%	0.0%	0.0%	0.0%
SCE Total	**88**	**65%**	**9%**	**75%**	**0.9%**	**1.0%**	**8.2%**
SDGE DI	32	94%	4%	96%	1.4%	0.0%	0.5%
SDGE Deemed	10	94%	8%	96%	1.3%	1.3%	0.0%
SDGE Custom	2	100%	0%	100%	0.0%	0.0%	0.0%
SDGE 3P/LGP	10	26%	75%	29%	5.3%	0.0%	0.0%
SDG&E Total	**54**	**80%**	**8%**	**82%**	**1.7%**	**0.1%**	**0.1%**
SW DI	101	66%	9%	76%	1.0%	1.0%	8.2%
SW Deemed	11	87%	14%	89%	1.2%	1.2%	0.0%
SW Custom	3	100%	0%	100%	0.0%	0.0%	0.0%
SW 3P	52	64%	9%	70%	4.9%	1.0%	0.5%
SW LGP	64	87%	4%	88%	0.5%	0.0%	0.7%
Statewide	**231**	**77%**	**3%**	**82%**	**1.3%**	**0.5%**	**3.3%**

Table 4-2: Disposition of Lighting Verification by Gross Program Group for CFL Reflectors

Gross Program Group	Sites	Installation Rate	Relative Precision	Received Rate	Storage Rate	Other Location	Failure/ Removal Rate
PG&E Deemed	12	88%	10%	91%	0.3%	2.6%	0.2%
PG&E Custom	1	100%		100%	0.0%	0.0%	0.0%
PG&E 3P	1	95%		99%	3.8%	0.0%	0.0%
PG&E LGP/DI	32	78%	8%	82%	3.5%	0.0%	0.0%
PG&E Total	**46**	**84%**	**5%**	**87%**	**2.3%**	**0.9%**	**0.1%**
SCE DI	39	88%	6%	96%	0.4%	0.6%	6.9%
SCE Deemed	16	95%	7%	98%	0.1%	1.9%	0.0%
SCE Custom							
SCE 3P							
SCE LGP	5	100%	0%	100%	0.0%	0.0%	0.0%
SCE Total	**60**	**89%**	**4%**	**97%**	**0.4%**	**0.7%**	**6.0%**
SDGE DI	23	90%	7%	93%	2.4%	0.3%	0.0%
SDGE Deemed	9	87%	9%	89%	1.1%	0.8%	0.4%
SDGE Custom	1	100%		100%	0.0%	0.0%	0.0%
SDGE 3P/LGP							
SDG&E Total	**33**	**92%**	**4%**	**93%**	**1.2%**	**0.4%**	**0.2%**
SW DI	62	89%	5%	96%	0.5%	0.6%	6.5%
SW Deemed	37	90%	5%	93%	0.4%	2.1%	0.2%
SW Custom	2	100%	0%	100%	0.0%	0.0%	0.0%
SW 3P	1	95%		99%	3.8%	0.0%	0.0%
SW LGP	37	80%	7%	83%	3.2%	0.0%	0.0%
Statewide	**139**	**88%**	**3%**	**93%**	**1.1%**	**0.7%**	**3.5%**

Table 4-3: Disposition of Lighting Verification by Gross Program Group for Linear Fluorescents

Gross Program Group	Sites	Installation Rate	Relative Precision	Received Rate	Storage Rate	Other Location	Failure/ Removal Rate
PG&E Deemed	44	94%	2%	94%	0.0%	0.0%	0.0%
PG&E Custom	18	94%	3%	94%	0.0%	0.0%	0.0%
PG&E 3P	38	91%	3%	91%	0.2%	0.2%	0.0%
PG&E LGP/DI	92	93%	2%	94%	0.2%	0.0%	1.0%
PG&E Total	**190**	**93%**	**1%**	**94%**	**0.1%**	**0.0%**	**0.7%**
SCE DI	102	98%	1%	98%	0.2%	0.2%	0.2%
SCE Deemed	57	69%	5%	70%	0.1%	0.2%	0.1%
SCE Custom	16	89%	5%	89%	0.0%	0.0%	0.0%
SCE 3P	40	95%	2%	95%	0.0%	0.0%	0.0%
SCE LGP	24	97%	2%	97%	0.2%	0.0%	0.0%
SCE Total	**235**	**91%**	**1%**	**92%**	**0.1%**	**0.1%**	**0.1%**
SDGE DI	53	93%	2%	94%	0.1%	0.0%	0.1%
SDGE Deemed	54	94%	1%	95%	0.2%	0.4%	0.2%
SDGE Custom	2	100%	0%	100%	0.0%	0.0%	0.0%
SDGE 3P/LGP	10	74%	9%	76%	0.7%	0.0%	0.6%
SDG&E Total	**118**	**86%**	**2%**	**87%**	**0.4%**	**0.1%**	**0.3%**
SW DI	155	97%	1%	98%	0.2%	0.2%	0.2%
SW Deemed	155	85%	2%	85%	0.1%	0.2%	0.1%
SW Custom	36	92%	3%	92%	0.0%	0.0%	0.0%
SW 3P	88	86%	2%	86%	0.3%	0.0%	0.3%
SW LGP	116	93%	1%	94%	0.2%	0.0%	0.9%
Statewide	**543**	**91%**	**1%**	**92%**	**0.2%**	**0.1%**	**0.4%**

Table 4-4: Disposition of Lighting Verification by Gross Program Group for Delamping

Gross Program Group	Sites	Installation Rate	Relative Precision	Received Rate	Other Location	Failure/ Removal Rate
PG&E Deemed	25	64%	13%	64%	0.0%	0.0%
PG&E Custom	5	77%	18%	77%	0.0%	0.0%
PG&E 3P	25	83%	7%	84%	0.1%	0.0%
PG&E LGP/DI	61	89%	4%	90%	0.1%	0.0%
PG&E Total	**116**	**83%**	**3%**	**83%**	**0.1%**	**0.0%**
SCE DI	26	94%	6%	94%	0.0%	0.0%
SCE Deemed	42	90%	3%	91%	0.0%	0.0%
SCE Custom	3	100%	0%	100%	0.0%	0.0%
SCE 3P	14	95%	3%	100%	0.0%	0.0%
SCE LGP	9	99%	1%	99%	0.0%	0.0%
SCE Total	**93**	**93%**	**2%**	**94%**	**0.0%**	**0.0%**
SDGE DI	2	5%	2,718%	5%	0.0%	0.0%
SDGE Deemed	23	86%	6%	86%	0.0%	0.0%
SDGE Custom	1	100%		100%	0.0%	0.0%
SDGE 3P/LGP	1	100%		100%	0.0%	0.0%
SDG&E Total	**27**	**84%**	**7%**	**84%**	**0.0%**	**0.0%**
SW DI	28	91%	6%	91%	0.0%	0.0%
SW Deemed	90	84%	3%	84%	0.0%	0.0%
SW Custom	9	93%	6%	93%	0.0%	0.0%
SW 3P	40	91%	3%	94%	0.0%	0.0%
SW LGP	70	90%	3%	90%	0.1%	0.0%
Statewide	**236**	**88%**	**2%**	**89%**	**0.0%**	**0.0%**

Table 4-5: Disposition of Lighting Verification by Gross Program Group for High Bay

Gross Program Group	Sites	Installation Rate	Relative Precision	Received Rate	Storage Rate	Other Location	Failure/ Removal Rate
PG&E Deemed	42	94%	4%	94%	0.1%	0.0%	0.4%
PG&E Custom							
PG&E 3P	24	96%	3%	99%	0.0%	0.0%	2.6%
PG&E LGP/DI	31	98%	2%	98%	0.4%	0.4%	0.0%
PG&E Total	**96**	**95%**	**2%**	**96%**	**0.2%**	**0.1%**	**0.4%**
SCE DI	19	100%	0%	100%	0.0%	0.0%	0.0%
SCE Deemed	43	99%	1%	99%	0.3%	0.0%	0.1%
SCE Custom							
SCE 3P							
SCE LGP	2	75%	149%	75%	0.0%	0.0%	0.0%
SCE Total	**64**	**99%**	**1%**	**99%**	**0.3%**	**0.0%**	**0.1%**
SDGE DI							
SDGE Deemed	23	100%	0%	100%	0.1%	0.0%	0.0%
SDGE Custom							
SDGE 3P/LGP	2	5%	1,929%	5%	0.0%	0.0%	0.0%
SDG&E Total	**25**	**91%**	**6%**	**91%**	**0.0%**	**0.0%**	**0.0%**
SW DI	19	100%	0%	100%	0.0%	0.0%	0.0%
SW Deemed	108	97%	1%	98%	0.2%	0.0%	0.2%
SW Custom							
SW 3P	26	82%	10%	84%	0.0%	0.0%	2.2%
SW LGP	33	97%	3%	98%	0.4%	0.4%	0.0%
Statewide	**185**	**97%**	**1%**	**97%**	**0.2%**	**0.1%**	**0.2%**

Table 4-6: Disposition of Lighting Verification by Gross Program Group for Occupancy Sensors

Gross Program Group	Sites	Installation Rate	Relative Precision	Received Rate	Storage Rate	Other Location	Failure/ Removal Rate
PG&E Deemed	39	95%	1%	97%	0.5%	0.5%	0.8%
PG&E Custom	5	86%	16%	86%	0.0%	0.0%	0.0%
PG&E 3P	16	99%	2%	100%	0.1%	0.0%	1.2%
PG&E LGP/DI	33	84%	8%	84%	0.0%	0.0%	0.0%
PG&E Total	**92**	**94%**	**2%**	**95%**	**0.4%**	**0.4%**	**0.7%**
SCE DI	76	94%	4%	98%	1.9%	0.0%	2.3%
SCE Deemed	53	89%	4%	96%	0.0%	0.0%	6.5%
SCE Custom	1	100%		100%	0.0%	0.0%	0.0%
SCE 3P	15	69%	20%	69%	0.0%	0.0%	0.0%
SCE LGP	8	97%	5%	100%	0.0%	3.3%	0.0%
SCE Total	**153**	**89%**	**3%**	**95%**	**0.2%**	**0.1%**	**5.4%**
SDGE DI	9	100%	0%	100%	0.0%	0.0%	0.0%
SDGE Deemed	33	93%	2%	95%	1.2%	0.2%	0.1%
SDGE Custom							
SDGE 3P/LGP	2	97%	10%	97%	0.0%	0.0%	0.0%
SDG&E Total	**44**	**95%**	**2%**	**96%**	**0.9%**	**0.1%**	**0.1%**
SW DI	85	94%	4%	98%	1.8%	0.0%	2.2%
SW Deemed	125	91%	2%	96%	0.2%	0.2%	4.5%
SW Custom	6	92%	10%	92%	0.0%	0.0%	0.0%
SW 3P	33	86%	7%	86%	0.0%	0.0%	0.4%
SW LGP	41	89%	6%	91%	0.0%	1.4%	0.0%
Statewide	**289**	**91%**	**2%**	**95%**	**0.3%**	**0.2%**	**3.6%**

Table 4-7: Disposition of Lighting Verification by Gross Program Group for HID

Gross Program Group	Sites	Installation Rate	Relative Precision	Received Rate	Storage Rate	Other Location	Failure/ Removal Rate
PG&E Deemed	4	98%	3%	100%	0.0%	2.2%	0.0%
PG&E Custom	1	100%		100%	0.0%	0.0%	0.0%
PG&E 3P							
PG&E LGP/DI	3	100%	0%	100%	0.0%	0.0%	0.0%
PG&E Total	**8**	**99%**	**1%**	**100%**	**0.0%**	**1.0%**	**0.0%**
SCE DI							
SCE Deemed	6	98%	1%	98%	0.0%	0.0%	0.0%
SCE Custom	2	100%	0%	100%	0.0%	0.0%	0.0%
SCE 3P							
SCE LGP							
SCE Total	**8**	**99%**	**1%**	**99%**	**0.0%**	**0.0%**	**0.0%**
SDGE DI							
SDGE Deemed	3	100%	0%	100%	0.0%	0.0%	0.0%
SDGE Custom	1	100%		100%	0.0%	0.0%	0.0%
SDGE 3P/LGP							
SDG&E Total	**4**	**100%**	**0%**	**100%**	**0.0%**	**0.0%**	**0.0%**
SW DI							
SW Deemed	13	99%	1%	99%	0.0%	0.7%	0.0%
SW Custom	4	100%	0%	100%	0.0%	0.0%	0.0%
SW 3P							
SW LGP	3	100%	0%	100%	0.0%	0.0%	0.0%
Statewide	**20**	**99%**	**1%**	**100%**	**0.0%**	**0.4%**	**0.0%**

For the most part, installation rates are similar across program groups within a measure. There are a handful of relatively high or low values, which are usually the result of small sample sizes that have one participant where the installation rate was very low and drove the overall result. The HIM-Gross Program Group segments with relatively low installation rates are:

CFL_Basic – SDGE 3P/LGP: This segment has only a 26% installation rate. Although there are 10 participant sites, this result is driven by one site that accounts for 57% of the weight and had a zero installation rate.

CFL Basic – SCE DI: Although the 63% installation rate is not extremely low, it is low relative to the other segments. This result is based on a sample size of 69 sites and is being driven by 3 sites that accounted for approximately one quarter of the weight for this segment. The on-site auditors found no CFLs at two of these sites, and only one CFL at the third.

Linear Fluorescents – SCE Deemed: Although the 69% rate is not extremely low, it is low relative to the other segments. This result is based on a sample size of 57 sites (114 site-measures) and is being driven by 1 site that accounted for 15% of the weight for this segment. The on-site auditor found that the building that contained the rebated measures was demolished in 2012 before the on-site was performed, so the install rate was set to zero.

Linear Fluorescents – SDGE 3P/LGP: Again, this 74% rate is not extremely low, but it is low relative to the other segments. This result is based on a sample size of 10 and is being driven by 3 sites that account for approximately 50% of the weight for this segment. These sites had relatively low (non-zero) installation rates.

High Bay – SDGE 3P/LGP: This segment had an install rate of 5%, but was comprised of only two sites, one of which had a zero installation rate and comprised 96% of the segment weight. The zero installation rate was due to the participant removing all of the lamps because they were too dim.

Delamping – PGE Deemed: Again, this 64% rate is not extremely low, but it is low relative to the other segments. This segment consists of 25 participants, and is being driven by one participant who claimed 160 fixtures delamped but none were found onsite.

Delamping – PGE Custom: This segment had a 77% install rate, but had only 5 participants. Again this is being driven by one site where that had 9 measures claiming 1060 delamped units with zero delamped fixtures found for these measures.

Delamping – SDGE Direct Install: This segment had only a 5% installation rate, but consisted of only 2 participants, one of which represents 90% of the segment's weight and had a zero installation rate.

Relative precisions at the statewide HIM level are in the 90/5 range or better. Even at the HIM-IOU level, all estimates have relative precisions at the 90/10 level or better. Finally, for the key HIM-Gross Program Group segments that were targeted for the sample design and ended up with at least 15 observations, the relative precisions are all at the 90/10 level or better, except for two out of the 39 segments (one at 90/13 and one at 90/20).

Appendix G also presents the installation rates for each IOU by HIM, Gross Program Group, and type of application, in which sites are classified as those that have measures that are deemed, small/medium calculated, or large calculated (where large calculated sites have project level savings of 250,000 kWh or more). In general, the small/medium calculated applications result in the highest installation rates, and the large calculated applications have the lowest rates. This is typically the case both across IOU as well as across HIM.

4.3 RUL Analysis

As discussed above, the dual baseline approach will be applied to all measures except for basic CFLs, CFLs with reflectors and occupancy sensors. In order to estimate a site-specific impact for a participant, it must first be determined if the installation was ROB/NR or ER. If it is determined that the installation was ER, the RUL is estimated as one third of the EUL, following the DEER methodology. For the measures being evaluated, the EUL is defined as:

EUL = Minimum of either $\frac{Ballast\ Service\ Life\ (hours)}{Annual\ Hours\ of\ Use}$ or 15 years.

Where,

Ballast Service Life = 45,000 for T12s with magnetic ballasts; 70,000 for T8s and electronic ballasts; and 70,000 for HIDs

Annual Hours of Use = the site-specific estimate of post-retrofit annual hours of operation obtained from either logger data usage or adjusted self-reported operating hours gathered on site.

Then, as mentioned above, for ER installations, the replaced equipment will be used to determine baseline wattage during the RUL period and industry standard practice will be used to determine baseline wattage for the post-RUL period. For ROB/NR installations, industry standard practice will be used to determine baseline wattage for the full EUL period.

Below, the approach for determining if a customer is ROB/NR or ER is discussed in detail.

ROB/NR/ER Algorithm

In order to classify an installation as being ER, there must be "a preponderance of evidence that an energy efficiency program activity induced or accelerated equipment replacement. Early retirement measures must provide justification that the existing equipment being replaced would have continued to function and perform its original design intent for a period of time in absence of the replacement."[1]

Therefore, to determine if an installation is ER we first determined if the equipment was replaced on burnout, or was approaching the end of its useful life. If the equipment would not have been able to function as intended for at least a year, the installation is classified as an ROB. If not, we then examine if the program influenced an accelerated replacement, or if the customer was likely to have replaced the equipment at roughly the same time in the absence of the program. If the

[1] From CPUC guidance document "Project Basis (RET, ROB, etc.), EUL/RUL Definitions, & Preponderance of Evidence" dated 1/29/14.

customer was likely to have replaced the equipment at roughly the same time in the absence of the program, they are considered NR. If not, then the customer will be classified as ER.

Appendix G describes in detail how the participant phone survey data were used to determine if the equipment would have been able to function as intended for at least a year or not, and if the customer was likely to have replaced the equipment at roughly the same time in the absence of the program.

Table 4-8 through Table 4-11 present the percentage of participants classified as ER and the Average RUL for each HIM, by IOU and Gross Program Group. Also shown are the sample size and relative precisions corresponding to each value. Overall, 58% of the measures subjected to the dual baseline were considered to be ER. At the IOU level, we see very similar results for PG&E and SCE, but higher rates of early replacement for SDG&E. By measure, across IOU we see results similar to that mentioned above with the three linear measures being relatively similar and the HID measures being more likely to be ROB.

Also shown are the average RUL for participants classified as ER. Recall that the RUL is defined as one third of the EUL, and the EUL is capped at 15. Therefore, for many fluorescent measures, their EUL is 15, resulting in an RUL of 5. For HIDs, a significant portion of the equipment that was replaced included CFLs and halogen lamps, which have EULs of 8 years or less. Because the RUL is based on the remaining life of the replaced equipment, HIDs will therefore have a lower RUL (as shown below) as the average EUL of the replaced equipment is lower than all the linear fluorescent technologies. Overall, the average RUL is just below 5 years.

Appendix G also presents the distribution of all of the criteria used to classify customers into ROB, NR or ER. The most common reason for being classified as ROB is due to the age exceeding the EUL. This is true for the large majority of those classified as ROB.

Table 4-8: Percent Early Replacement and Average RUL by Gross Program Group for Linear Early Replacers

Gross Program Group	n	Percent Early Replacement	Relative Precision	Average RUL	Relative Precision
PG&E Deemed	26	34%	30%	4.8	2%
PG&E Custom	33	40%	31%	4.9	3%
PG&E 3P	39	74%	19%	3.3	8%
PG&E LGP/DI	188	56%	10%	4.8	1%
PG&E Total	**286**	**52%**	**8%**	**4.7**	**2%**
SCE DI	157	63%	8%	4.8	1%
SCE Deemed	55	48%	17%	4.5	4%
SCE Custom	20	53%	27%	4.9	2%
SCE 3P	41	45%	21%	4.6	3%
SCE LGP	35	66%	40%	4.7	4%
SCE Total	**308**	**56%**	**7%**	**4.8**	**1%**
SDGE DI	107	80%	10%	4.7	2%
SDGE Deemed	50	63%	15%	4.6	3%
SDGE Custom	3	100%	0%	3.6	75%
SDGE 3P/LGP	19	61%	13%	4.7	7%
SDG&E Total	**179**	**72%**	**6%**	**4.6**	**2%**
SW DI	264	69%	7%	4.8	1%
SW Deemed	131	49%	11%	4.6	2%
SW Custom	56	46%	17%	4.8	3%
SW 3P	99	57%	10%	4.5	4%
SW LGP	223	57%	9%	4.8	1%
Statewide	**773**	**58%**	**4%**	**4.7**	**1%**

Table 4-9: Percent Early Replacement and Average RUL by Gross Program Group for High Bay Early Replacers

Gross Program Group	n	Percent Early Replacement	Relative Precision	Average RUL	Relative Precision
PG&E Deemed	18	40%	27%	4.7	6%
PG&E Custom					
PG&E 3P	18	64%	38%	4.9	2%
PG&E LGP/DI	18	49%	23%	5.0	0%
PG&E Total	**54**	**49%**	**16%**	**4.8**	**3%**
SCE DI	13	68%	26%	4.9	3%
SCE Deemed	17	31%	42%	5.0	0%
SCE Custom					
SCE 3P					
SCE LGP	3	100%	0%	4.3	16%
SCE Total	**33**	**43%**	**32%**	**5.0**	**1%**
SDGE DI					
SDGE Deemed	18	78%	11%	5.0	0%
SDGE Custom					
SDGE 3P/LGP	2	100%	0%	4.9	33%
SDG&E Total	**20**	**80%**	**10%**	**5.0**	**1%**
SW DI	13	68%	26%	4.9	3%
SW Deemed	53	43%	21%	4.9	2%
SW Custom					
SW 3P	20	67%	31%	4.9	2%
SW LGP	21	53%	21%	5.0	1%
Statewide	**107**	**51%**	**14%**	**4.9**	**2%**

Table 4-10: Percent Early Replacement and Average RUL by Gross Program Group for HID Early Replacers

Gross Program Group	n	Percent Early Replacement	Relative Precision	Average RUL	Relative Precision
PG&E Deemed	1	20%	768%	3.8	
PG&E Custom					
PG&E 3P					
PG&E LGP/DI	1	33%	98%	5.0	
PG&E Total	**2**	**22%**	**82%**	**5.0**	**22%**
SCE DI					
SCE Deemed					
SCE Custom	2	100%	0%	2.8	263%
SCE 3P					
SCE LGP					
SCE Total	**2**	**25%**	**90%**	**2.8**	**263%**
SDGE DI					
SDGE Deemed	1	33%	32%	3.0	
SDGE Custom	1	100%		1.4	
SDGE 3P/LGP					
SDG&E Total	**2**	**50%**	**17%**	**2.4**	**203%**
SW DI					
SW Deemed	2	14%	91%	3.1	24%
SW Custom	3	75%	43%	2.4	100%
SW 3P					
SW LGP	1	33%	98%	5.0	
Statewide	**6**	**29%**	**38%**	**3.2**	**38%**

Table 4-11: Percent Early Replacement and Average RUL by Gross Program Group for Delamping Early Replacers

Gross Program Group	n	Percent Early Replacement	Relative Precision	Average RUL	Relative Precision
PG&E Deemed	12	36%	63%	4.7	7%
PG&E Custom	19	63%	35%	4.9	1%
PG&E 3P	27	82%	16%	4.8	3%
PG&E LGP/DI	70	60%	16%	4.9	2%
PG&E Total	**128**	**60%**	**12%**	**4.9**	**1%**
SCE DI	23	85%	14%	4.7	3%
SCE Deemed	28	48%	24%	4.6	5%
SCE Custom	4	67%	62%	5.0	0%
SCE 3P	11	69%	19%	5.0	0%
SCE LGP	7	70%	43%	5.0	0%
SCE Total	**73**	**62%**	**11%**	**4.7**	**2%**
SDGE DI	2	100%	0%	5.0	0%
SDGE Deemed	17	71%	12%	4.4	7%
SDGE Custom	1	100%		2.7	
SDGE 3P/LGP					
SDG&E Total	**20**	**71%**	**13%**	**4.2**	**8%**
SW DI	25	86%	13%	4.7	3%
SW Deemed	57	50%	17%	4.5	3%
SW Custom	24	65%	21%	4.6	6%
SW 3P	38	76%	12%	4.9	2%
SW LGP	77	61%	15%	4.9	2%
Statewide	**221**	**62%**	**7%**	**4.7**	**1%**

Across HIM at the statewide, the percentage of ER is relatively similar for the three linear fluorescent measures (51% to 62%), but much lower for HIDs (29%). This is primarily due to the fact that many HID participants are replacing CFLs and Halogen lamps which have lower EULs, and therefore are more likely to have the age of their replaced equipment be at or above the measure's EUL (which would classify them as an ROB).

Across program types, direct install has the highest rate of ER (70%) followed by third party programs (62%). This is not unexpected as these programs often times go door to door, especially the DI programs, and offer high incentive rates, as opposed to deemed program participants which may be more likely to have been in the market for their equipment and have the lowest rate of ER at 47%. Note that PG&E's LGP program contains a number of direct

installation programs managed by various program implementers, which may be causing the percentage of ER to be higher. Chapter two of the main body of the report provides a full mapping of all programs into the various IOU-Gross Program Groups.

Although the DEER methodology was used to estimate the RUL, an analysis was also conducted that estimated an approximate RUL by subtracting the customer's self-reported equipment age from the equipment's EUL. Because age was asked in 5 year bins, mid-points were used to estimate the RUL. Table 4-12 presents this estimated RUL by HIM and compares it to the DEER value. Overall, the values seem to compare fairly well, with linear fluorescents matching almost exactly and high bay fluorescents within 10% of each other. Delamping values differ by about a year. The two year difference among HIDs is being driven by one customer that holds a significant portion of the weight and an EUL minus self-reported age of 12 years, driving up that value. We feel these results provide a good validation for the DEER methodology.

Table 4-12: Comparison of DEER RUL to EUL minus Self-Reported Age by HIM for ER Participants

Gross Program Group	EUL – Self-Reported Age	DEER RUL
Linear Fluorescent	4.8	4.7
Delamping	3.5	4.7
High Bay Fluorescent	4.5	4.9
HIDs	6.7	4.1

4.4 Operating Hour Analysis

One of the primary inputs into the gross savings calculations are the pre- and post-retrofit 8760 load shapes, or percent on, for lighting equipment. Post-retrofit load shapes were based on a combination of logger data and self-report data, whereas pre-retrofit load shapes were based solely on self-report data. All self-report results were further adjusted using results from the logger analysis from this study as well as the 2006-08 Small Commercial Evaluation. This analysis is discussed in greater detail in Appendix G.3.7 and G.6.

4.4.1 Development of 8760 Post-Retrofit Percent-On Load Shapes using Logger Data

The objective of this analysis was to develop 8760 hourly load shapes of the percentage of the hour that the lights are on (percent on) for the post-retrofit equipment. The goal is to develop load shapes for each site and for each specific measure monitored at the activity area (or space type) level. In later steps of the analysis, these site-measure-activity area-specific load shapes would be merged onto measure quantity and wattage data that corresponded to that specific

measure in that specific activity area for that site. That would then allow us to develop estimates of ex-post savings for that site-measure-activity area combination. Ultimately, all the individual estimates of savings at this fine level of segmentation could be aggregated up to develop a site-specific estimate of savings.

The results of this step are 8760 post-retrofit percent-on load shapes, developed at the site, measure, and activity area level.

4.4.2 Development of 8760 Post-Retrofit Percent-On Load Shapes using Adjusted Self-Report Schedules

Lighting loggers were installed in a majority, but not all of the sites. As part of the 2006-08 Small Commercial evaluation, a set of adjustment factors were developed that can be used to adjust self-reported usage schedules to more accurately reflect actual usage, and develop load shapes. The methodology for developing and applying these self-report adjustment factors is described in the IEPEC conference paper "Is the Customer Always Right? A Cost-Effective Method for Estimating Lighting Usage in Commercial Buildings", provided in Appendix I.

This evaluation utilized this same approach, but incorporated both the 2006-08 and any relevant 2010-12 logger data collected for this study, to develop adjustment factors to apply to self-reported post-retrofit use shapes for sites that did not have loggers installed. Linear fluorescent, delamping and basic CFL measures were the primary focus of the 2006-08 lighting logger study. Therefore, for these measures, we typically did not install lighting loggers, but instead collected detailed self-report schedules that could be adjusted using the approach documented in Appendix I.

By applying this approach to the self-report usage schedules, 8,760 load shapes could be developed at the measure and activity area level. This is consistent with the same fine level of segmentation as described in the previous section for the post-retrofit logger data.

4.4.3 Final 8760 Post-Retrofit Percent-On Load Shapes

As mentioned, both the logger data and adjusted self-report schedules were capable of developing 8760 post-retrofit percent-on load shapes at the site, measure, and activity area level. For the purpose of presenting results for this report, these site-measure-activity area level load shapes were aggregated to various levels of segmentation. This allows results to be compared across different levels of segmentation, such as HIM and Gross Program Group. To perform this aggregation, each site-space type profile is weighted to represent the number of lamps/fixtures being represented in the population. Table 4-13 through Table 4-19 provide the average annual operating hours and coincident peak factors for the on-site sample by HIM and Gross Program Group.

Table 4-13: Post-Retrofit Annual Hours of Operation and Coincident Factors by Gross Program Group for CFL Basic

Gross Program Group	Sites	Annual Op Hours	Relative Precision	Coincident Factors	Relative Precision
PG&E Deemed					
PG&E Custom	1	5,191		66%	
PG&E 3P	23	2,537	15%	64%	16%
PG&E LGP/DI	55	1,158	15%	17%	18%
PG&E Total	**79**	**1,543**	**13%**	**27%**	**15%**
SCE DI	64	1,303	13%	27%	15%
SCE Deemed					
SCE Custom					
SCE 3P	16	2,482	20%	48%	25%
SCE LGP	2	467	6%	7%	131%
SCE Total	**82**	**1,413**	**12%**	**29%**	**13%**
SDGE DI	29	2,064	17%	38%	22%
SDGE Deemed	8	2,863	16%	39%	33%
SDGE Custom	2	1,140	104%	0%	2628%
SDGE 3P/LGP	6	4,004	33%	72%	49%
SDG&E Total	**45**	**1,895**	**15%**	**23%**	**31%**
SW DI	93	1,407	11%	28%	12%
SW Deemed	8	2,863	16%	39%	33%
SW Custom	3	1,789	104%	11%	242%
SW 3P	45	2,785	11%	61%	12%
SW LGP	57	1,151	15%	17%	18%
Statewide	**206**	**1,565**	**8%**	**27%**	**10%**

Table 4-14: Post-Retrofit Annual Hours of Operation and Coincident Factors by Gross Program Group for CFL Reflectors

Gross Program Group	Sites	Annual Op Hours	Relative Precision	Coincident Factors	Relative Precision
PG&E Deemed	10	5,004	20%	90%	10%
PG&E Custom	1	7,472		85%	
PG&E 3P	1	4,432		54%	
PG&E LGP/DI	30	2,869	16%	47%	17%
PG&E Total	**42**	**4,193**	**12%**	**69%**	**10%**
SCE DI	36	2,593	14%	56%	13%
SCE Deemed	15	1,320	35%	20%	50%
SCE Custom					
SCE 3P					
SCE LGP	5	1,907	33%	34%	41%
SCE Total	**56**	**2,404**	**12%**	**51%**	**12%**
SDGE DI	20	2,224	21%	47%	25%
SDGE Deemed	9	4,408	40%	62%	32%
SDGE Custom	1	7,271		80%	
SDGE 3P/LGP					
SDG&E Total	**30**	**3,632**	**22%**	**57%**	**18%**
SW DI	56	2,572	11%	56%	11%
SW Deemed	34	3,824	16%	65%	14%
SW Custom	2	7,457	5%	85%	11%
SW 3P	1	4,432		54%	
SW LGP	35	2,804	14%	46%	16%
Statewide	**128**	**3,107**	**8%**	**57%**	**7%**

Table 4-15: Post-Retrofit Annual Hours of Operation and Coincident Factors by Gross Program Group for Linear Fluorescents

Gross Program Group	Sites	Annual Op Hours	Relative Precision	Coincident Factors	Relative Precision
PG&E Deemed	41	2,537	10%	51%	10%
PG&E Custom	18	4,869	10%	77%	7%
PG&E 3P	37	2,801	15%	42%	13%
PG&E LGP/DI	91	2,626	6%	58%	5%
PG&E Total	**187**	**2,973**	**5%**	**57%**	**4%**
SCE DI	101	2,182	7%	51%	6%
SCE Deemed	56	3,968	7%	61%	6%
SCE Custom	16	5,653	12%	88%	6%
SCE 3P	38	2,215	12%	37%	11%
SCE LGP	24	3,482	10%	60%	7%
SCE Total	**235**	**3,377**	**4%**	**58%**	**3%**
SDGE DI	53	2,637	8%	62%	7%
SDGE Deemed	52	3,010	9%	52%	7%
SDGE Custom	2	2,971	77%	34%	76%
SDGE 3P/LGP	9	5,724	13%	82%	9%
SDG&E Total	**116**	**4,020**	**6%**	**66%**	**4%**
SW DI	154	2,245	5%	52%	5%
SW Deemed	149	3,463	5%	57%	4%
SW Custom	36	5,262	8%	82%	4%
SW 3P	84	3,687	8%	55%	6%
SW LGP	115	2,768	5%	58%	4%
Statewide	**538**	**3,331**	**3%**	**59%**	**2%**

Table 4-16: Post-Retrofit Annual Hours of Operation and Coincident Factors by Gross Program Group for Delamping

Gross Program Group	Sites	Annual Op Hours	Relative Precision	Coincident Factors	Relative Precision
PG&E Deemed	23	2,639	16%	52%	14%
PG&E Custom	5	3,847	13%	70%	17%
PG&E 3P	25	2,365	13%	50%	14%
PG&E LGP/DI	57	1,925	7%	42%	8%
PG&E Total	**110**	**2,204**	**6%**	**46%**	**6%**
SCE DI	26	2,813	18%	63%	13%
SCE Deemed	39	2,570	8%	54%	9%
SCE Custom	3	2,804	8%	68%	8%
SCE 3P	14	2,514	15%	47%	14%
SCE LGP	9	2,485	11%	61%	13%
SCE Total	**91**	**2,667**	**5%**	**58%**	**5%**
SDGE DI	2	2,316	0%	55%	0%
SDGE Deemed	23	3,133	18%	44%	14%
SDGE Custom	1	8,760		100%	
SDGE 3P/LGP	1	7,651		89%	
SDG&E Total	**27**	**3,591**	**17%**	**49%**	**14%**
SW DI	28	2,812	18%	63%	13%
SW Deemed	85	2,661	7%	52%	6%
SW Custom	9	3,028	11%	69%	6%
SW 3P	40	2,518	9%	48%	8%
SW LGP	66	1,948	7%	43%	8%
Statewide	**228**	**2,555**	**4%**	**54%**	**4%**

Table 4-17: Post-Retrofit Annual Hours of Operation and Coincident Factors by Gross Program Group for High Bay

Gross Program Group	Sites	Annual Op Hours	Relative Precision	Coincident Factors	Relative Precision
PG&E Deemed	40	3,821	10%	67%	7%
PG&E Custom					
PG&E 3P	24	3,988	16%	54%	15%
PG&E LGP/DI	31	2,340	11%	50%	15%
PG&E Total	**95**	**3,479**	**7%**	**62%**	**6%**
SCE DI	19	2,477	20%	56%	21%
SCE Deemed	42	3,243	11%	65%	7%
SCE Custom					
SCE 3P					
SCE LGP	1	3,431		58%	
SCE Total	**62**	**3,186**	**9%**	**64%**	**7%**
SDGE DI					
SDGE Deemed	23	2,351	13%	42%	16%
SDGE Custom					
SDGE 3P/LGP	1	3,792		45%	
SDG&E Total	**24**	**2,514**	**16%**	**42%**	**16%**
SW DI	19	2,477	20%	56%	21%
SW Deemed	105	3,372	7%	65%	5%
SW Custom					
SW 3P	25	3,965	16%	53%	15%
SW LGP	32	2,400	11%	51%	14%
Statewide	**181**	**3,263**	**5%**	**63%**	**4%**

Table 4-18: Post-Retrofit Annual Hours of Operation and Coincident Factors by Gross Program Group for Occupancy Sensors

Gross Program Group	Sites	Annual Op Hours	Relative Precision	Coincident Factors	Relative Precision
PG&E Deemed	39	1,465	16%	28%	19%
PG&E Custom	5	3,088	20%	59%	21%
PG&E 3P	16	1,746	7%	26%	15%
PG&E LGP/DI	31	1,320	19%	31%	20%
PG&E Total	**91**	**1,667**	**10%**	**32%**	**11%**
SCE DI	71	1,197	14%	30%	19%
SCE Deemed	52	2,145	10%	50%	9%
SCE Custom	1	3,600		67%	
SCE 3P	14	1,639	19%	43%	19%
SCE LGP	8	2,637	31%	61%	24%
SCE Total	**146**	**2,108**	**7%**	**48%**	**6%**
SDGE DI	9	798	101%	16%	101%
SDGE Deemed	33	1,459	12%	27%	15%
SDGE Custom					
SDGE 3P/LGP	2	3,140	18%	67%	12%
SDG&E Total	**44**	**1,802**	**11%**	**35%**	**13%**
SW DI	80	1,185	14%	29%	18%
SW Deemed	124	1,827	7%	40%	8%
SW Custom	6	3,372	13%	63%	13%
SW 3P	32	1,960	10%	40%	13%
SW LGP	39	2,078	15%	48%	13%
Statewide	**281**	**1,927**	**5%**	**41%**	**5%**

Table 4-19: Post-Retrofit Annual Hours of Operation and Coincident Factors by Gross Program Group for HID

Gross Program Group	Sites	Annual Op Hours	Relative Precision	Coincident Factors	Relative Precision
PG&E Deemed	4	3,698	30%	99%	3%
PG&E Custom	1	8,760		100%	
PG&E 3P					
PG&E LGP/DI	3	1,146	200%	19%	239%
PG&E Total	**8**	**3,508**	**48%**	**72%**	**37%**
SCE DI					
SCE Deemed	6	4,603	8%	99%	3%
SCE Custom	2	3,840	37%	11%	643%
SCE 3P					
SCE LGP					
SCE Total	**8**	**4,362**	**9%**	**71%**	**43%**
SDGE DI					
SDGE Deemed	3	7,575	10%	99%	3%
SDGE Custom	1	5,655		32%	
SDGE 3P/LGP					
SDG&E Total	**4**	**7,243**	**13%**	**87%**	**26%**
SW DI					
SW Deemed	13	5,134	15%	99%	1%
SW Custom	4	5,345	37%	36%	110%
SW 3P					
SW LGP	3	1,146	200%	19%	239%
Statewide	**20**	**4,662**	**17%**	**75%**	**19%**

4.4.4 Development of 8760 Pre-Retrofit Percent-On Load Shapes using Adjusted Self-Report Schedules

For all measures, except occupancy senors, it is assumed that the pre-retrofit usage is equal to the post-retrofit usage. The 2006-08 Small Commercial Evaluation had a pre-post monitoring study, where it was found that there was no discernible difference between the pre- and post-retrofit usage for linear fluorescent and CFL measures (about a 1% difference was found, but it was not statistically significantly different from zero at the 90% confidence level[2]). Therefore, it was determined that the pre-retrofit load shape would utilize the post-retrofit load shape for linear fluorescent, HID and CFL measures.

2 2006-08 Small Commercial Contract Group Direct Impact Evaluation, Appendix G.7.2, page G-62.

However, for the occupancy sensor measures, the savings is generated from a change in operation, making it necessary to have a separate estimate of pre-retrofit usage. Similarly, for measures that are installed in conjunction with an occupancy sensor, the measures are assumed to have an impact that corresponds to the same operating conditions as the previous equipment. Therefore the pre-retrofit operating hours are used for both the pre- and post-retrofit period for measures that are installed in conjunction with an occupancy sensor.

Therefore, for occupancy sensors and measures installed in conjunction with occupancy sensors, pre-retrofit load shapes must be estimated. As part of the on-site survey, detailed self-report schedules are also gathered for the pre-retrofit period. These self-report schedules are adjusted in the same manner as described above to develop 8,760 load shapes at the site, measure and activity area level.

Again, for the purpose of presenting results for this report, these site-measure-activity area level load shapes were aggregated to various levels of segmentation. This allows results to be compared across different levels of segmentation, such as Gross Program Group. To perform this aggregation, each site-space type profile is weighted to represent the number of lamps/fixtures being represented in the population.

Table 4-20 provides the average pre-retrofit annual operating hours and coincident peak factors for the on-site sample of occupancy sensor participants by Gross Program Group.

Table 4-20: Pre-Retrofit Annual Hours of Operation and Coincident Factors by Gross Program Group for Occupancy Sensors

Gross Program Group	Sites	Annual Op Hours	Relative Precision	Coincident Factors	Relative Precision
PG&E Deemed	39	2,080	15%	40%	17%
PG&E Custom	5	5,259	24%	69%	20%
PG&E 3P	16	4,606	9%	73%	7%
PG&E LGP/DI	31	2,200	12%	47%	16%
PG&E Total	**91**	**2,733**	**10%**	**47%**	**10%**
SCE DI	71	2,038	10%	45%	12%
SCE Deemed	52	3,019	7%	66%	6%
SCE Custom	1	4,551	0%	87%	0%
SCE 3P	14	2,704	10%	60%	13%
SCE LGP	8	3,688	24%	72%	17%
SCE Total	**146**	**3,005**	**5%**	**64%**	**4%**
SDGE DI	9	1,251	68%	25%	65%
SDGE Deemed	33	2,712	13%	45%	13%
SDGE Custom					
SDGE 3P/LGP	2	3,444	20%	74%	7%
SDG&E Total	**44**	**2,823**	**11%**	**51%**	**10%**
SW DI	80	2,015	10%	45%	12%
SW Deemed	124	2,638	6%	54%	6%
SW Custom	6	4,867	17%	79%	13%
SW 3P	32	3,656	8%	68%	6%
SW LGP	39	3,057	11%	61%	10%
Statewide	**281**	**2,894**	**4%**	**57%**	**4%**

Table 4-21 presents the average pre-retrofit and post-retrofit annual operating hours and coincident peak factors for the on-site sample of occupancy sensors by Gross Program Group, which indicates on average how much the occupancy sensors are reducing usage.

Table 4-21: Pre- and Post-Retrofit Annual Hours of Operation and Coincident Factors by Gross Program Group for Occupancy Sensors

Gross Program Group	Sites	Pre-Retrofit Annual Op Hours	Post-Retrofit Annual Op Hours	Percent Change in Annual Op Hours	Pre-Retrofit Coincident Factors	Post-Retrofit Coincident Factors	Percent Change in Peak Demand
PG&E Deemed	39	2,080	1,465	30%	40%	28%	29%
PG&E Custom	5	5,259	3,088	41%	69%	59%	14%
PG&E 3P	16	4,606	1,746	62%	73%	26%	64%
PG&E LGP/DI	31	2,200	1,320	40%	47%	31%	33%
PG&E Total	**91**	**2,733**	**1,667**	**39%**	**47%**	**32%**	**33%**
SCE DI	71	2,038	1,197	41%	45%	30%	35%
SCE Deemed	52	3,019	2,145	29%	66%	50%	23%
SCE Custom	1	4,551	3,600	21%	87%	67%	23%
SCE 3P	14	2,704	1,639	39%	60%	43%	29%
SCE LGP	8	3,688	2,637	28%	72%	61%	16%
SCE Total	**146**	**3,005**	**2,108**	**30%**	**64%**	**48%**	**24%**
SDGE DI	9	1,251	798	36%	25%	16%	34%
SDGE Deemed	33	2,712	1,459	46%	45%	27%	41%
SDGE Custom							
SDGE 3P/LGP	2	3,444	3,140	9%	74%	67%	9%
SDG&E Total	**44**	**2,823**	**1,802**	**36%**	**51%**	**35%**	**31%**
SW DI	80	2,015	1,185	41%	45%	29%	35%
SW Deemed	124	2,638	1,827	31%	54%	40%	26%
SW Custom	6	4,867	3,372	31%	79%	63%	19%
SW 3P	32	3,656	1,960	46%	68%	40%	41%
SW LGP	39	3,057	2,078	32%	61%	48%	21%
Statewide	**281**	**2,894**	**1,927**	**33%**	**57%**	**41%**	**27%**

4.5 Pre-Retrofit, Post-Retrofit and Industry Standard Practice Wattage Analysis

Another set of key inputs into the gross savings calculations are the pre, post and industry standard practice wattage values. Various approaches and data sources were utilized to develop these wattage values, which are discussed in detail in Appendix G and summarized below. In general, the following wattage values were developed:

- Post-Retrofit Wattages - based on spot watt and make and model information gathered on site
- Pre-Retrofit Wattages - based on self-report data and other information gathered on site

- Industry Standard Practice Baseline Wattages – based on data gathered for the Commercial Market Share Tracking (CMST) study

4.5.1 Post-Retrofit Wattages

Post-retrofit wattages were primarily based on make and model information gathered on site. For some measures, like basic CFLs, the on-site auditor was able to gather the wattage directly from the lamp. For high bay sites where fixtures were not accessible or when it was not as efficient or accurate to use time-of-use data logging, electric panel logging was performed. When this was the case, spot watt measurements were taken and used to estimate post-retrofit wattages instead of the make and model information. In the limited cases where it was not possible to gather make and model information, or perform spot watt measurements, we attempted to use the IOU measure name, which often times would specify the wattage of the measure being installed. If this was not available, average wattage values were used from the sample that had populated values.

4.5.2 Pre-Retrofit Wattages

Pre-retrofit wattages were developed using a variety of sources including participant application information, visual inspection on site and self-report information from the participant gathered on site. For calculated measures, baseline wattage information was frequently documented in the participant's application. This information would be considered the most reliable information because it was gathered while the replaced equipment was still in place. If this was not available, pre-retrofit wattage information was gathered on site by the auditor. Four different approaches were attempted to gather pre-retrofit wattage for each measure on site. In each case the auditor tried to gather the same information as described above for the post-retrofit wattages. The first was to locate fixtures that were not retrofitted but in the same area or type of area and matched the baseline fixture description. The second approach was to look for spare baseline lamps and ballasts in storage and maintenance areas. The third was to review any documentation regarding the previously installed lamps and fixtures. The fourth approach was to gather the contacts' or maintenance staffs' best recollection of the baseline fixture-lamp information. Finally, if pre-retrofit wattage information was not available, average wattage values were used, similar to what was done for the post-wattage values.

4.5.3 Industry Standard Practice Wattages

Industry standard practice (ISP) baselines are only used for linear fluorescent, high bay fluorescent, delamping and HID measures. For HID measures, customers that are ROB use pre-retrofit wattage for the full EUL because there is no reliable estimate for ISP developed for the 2010-12 period. For customers that are classified as ER, the post-RUL period utilizes a pulse start metal halides as the ISP, which is consistent with Title 20, beginning in 2013. For participants that installed pulse start metal halides under the program, their ISP baseline is set

equal to their post-retrofit wattage. As a result, these measures have zero savings in the post-RUL period.

For linear fluorescent measures (including high bay and delamping), the ISP baselines are developed using data collected for the Commercial Market Share Tracking (CMST) Study on linear fluorescent installations performed during 2009-12. Using the CMST, average wattages are developed by lamp length, the number of lamps per fixture, and if the fixture was installed in a high bay application or not (defined as greater than 12 feet in height). For example, an average wattage would be developed for all 3-lamp, 4-foot fixtures that were not high bay applications. This would serve as the ISP baseline wattage for all installed non-high bay linear fluorescent measures that were 3-lamp, 4-foot fixtures. Note that this ISP baseline wattage would be comprised of various efficiencies of linear fluorescent measures including T8 and T5 fixtures.

Two different averages were taken, one which excluded T12 fixtures and one which excluded both T12 and 700 series T8 fixtures. T12 fixtures are excluded in both because T12 lamps began being phased out in 2012 and the CMST found that only 1% of all installations included T12s. Therefore, T12s were not considered to be industry standard practice. Although 700 series T8 fixtures are also being phased out, the CMST found that a significant portion of the installations during 2010-12 (approximately a third) included 700 series T8s. For customers that are classified as ROB, their ISP baseline is used for the full EUL, which would take affect when their installation was made (i.e., between 2010-12). For these participants, their ISP baseline should include 700 series T8s. For customers classified as ER, their ISP baseline is used in the post-RUL period, which typically would begin approximately 5 years after their installation (i.e., between 2015-17). By this time, 700 series T8s would not be available; therefore, for these participants, their ISP baseline should exclude 700 series T8s.

Because not all possible combinations of configuration were well represented in the CMST, ratios of ISP wattage to pre-retrofit wattage were developed by HIM, IOU and Gross Program Group. These ratios could then be applied to the pre-retrofit wattage for any configuration within that given HIM, IOU and Gross Program Group to estimate the industry standard practice wattage.

4.5.4 Summary of Pre-Retrofit, Post-Retrofit, and ISP Wattages

For each participant in the on-site sample, pre-retrofit, post-retrofit and ISP wattages were developed, when applicable. For example, CFL measures did not require ISP wattages. Linear fluorescent customer's that were considered ROB did not require pre-retrofit wattages since they utilized the ISP baseline wattages for the full EUL. For occupancy sensors, only post-wattage values are necessary as the equipment only affects the post-retrofit measures. For delamping, the

post-retrofit wattage is zero. In some cases these wattages were collected specific to the site, and in other cases average values or wattage ratios were applied as discussed above.

Table 4-22 through Table 4-28 present these average wattage values for the on-site sample for each HIM by Gross Program Group

Table 4-22: Summary of Wattage Values by IOU and Gross Program Group for CFL Basic

IOU	Gross Program Group	n	Post-Retrofit Wattage	Pre-Retrofit Wattage	ROB ISP Wattage	Post-RUL ISP Wattage
PGE	Deemed					
PGE	Custom	3	59	208	-	-
PGE	3P	68	22	79	-	-
PGE	LGP/DI	146	28	99	-	-
PGE	**Total**	**218**	**28**	**100**	**-**	**-**
SCE	DI	79	22	85	-	-
SCE	Deemed					
SCE	Custom					
SCE	3P	22	22	82	-	-
SCE	LGP	2	18	60	-	-
SCE	**Total**	**103**	**22**	**84**	**-**	**-**
SDGE	DI	33	19	130	-	-
SDGE	Deemed	10	16	55	-	-
SDGE	Custom	2	23	151	-	-
SDGE	3P	15	24	98	-	-
SDGE	**Total**	**60**	**21**	**130**	**-**	**-**
Statewide	**DI**	**112**	**22**	**91**	**-**	**-**
Statewide	**Deemed**	**11**	**16**	**55**	**-**	**-**
Statewide	**Custom**	**5**	**29**	**160**	**-**	**-**
Statewide	**3P**	**105**	**22**	**83**	**-**	**-**
Statewide	**LGP**	**148**	**28**	**98**	**-**	**-**
Statewide	**Total**	**381**	**25**	**100**	**-**	**-**

Table 4-23: Summary of Wattage Values by IOU and Gross Program Group for CFL Reflector

IOU	Gross Program Group	n	Post-Retrofit Wattage	Pre-Retrofit Wattage	ROB ISP Wattage	Post-RUL ISP Wattage
PGE	Deemed	12	19	74	-	-
PGE	Custom	1	32	130	-	-
PGE	3P	13	16	91	-	-
PGE	LGP/DI	61	21	87	-	-
PGE	**Total**	**87**	**21**	**85**	**-**	**-**
SCE	DI	44	17	68	-	-
SCE	Deemed	16	36	98	-	-
SCE	Custom					
SCE	3P					
SCE	LGP	6	22	77	-	-
SCE	**Total**	**66**	**20**	**72**	**-**	**-**
SDGE	DI	25	20	83	-	-
SDGE	Deemed	9	18	37	-	-
SDGE	Custom	1	42	96	-	-
SDGE	3P					
SDGE	**Total**	**35**	**20**	**57**	**-**	**-**
Statewide	**DI**	**69**	**17**	**69**	**-**	**-**
Statewide	**Deemed**	**37**	**24**	**75**	**-**	**-**
Statewide	**Custom**	**2**	**33**	**128**	**-**	**-**
Statewide	**3P**	**13**	**16**	**91**	**-**	**-**
Statewide	**LGP**	**67**	**21**	**87**	**-**	**-**
Statewide	**Total**	**188**	**20**	**75**	**-**	**-**

Table 4-24: Summary of Wattage Values by IOU and Gross Program Group for Delamping

IOU	Gross Program Group	n	Post-Retrofit Wattage	Pre-Retrofit Wattage	ROB ISP Wattage	Post-RUL ISP Wattage
PGE	Deemed	33	-	62	55	55
PGE	Custom	30	-	51	46	46
PGE	3P	33	-	78	60	60
PGE	LGP/DI	116	-	84	73	73
PGE	**Total**	**212**	**-**	**78**	**68**	**67**
SCE	DI	27	-	95	88	88
SCE	Deemed	58	-	80	69	69
SCE	Custom	6	-	65	65	65
SCE	3P	16	-	66	66	66
SCE	LGP	10	-	65	65	65
SCE	**Total**	**117**	**-**	**76**	**71**	**71**
SDGE	DI	2	-	42	42	42
SDGE	Deemed	24	-	41	41	41
SDGE	Custom	1	-	56	56	56
SDGE	3P	1	-	74	60	60
SDGE	**Total**	**28**	**-**	**42**	**42**	**42**
Statewide	**DI**	**29**	**-**	**95**	**88**	**88**
Statewide	**Deemed**	**115**	**-**	**72**	**63**	**63**
Statewide	**Custom**	**37**	**-**	**63**	**62**	**62**
Statewide	**3P**	**50**	**-**	**68**	**65**	**65**
Statewide	**LGP**	**126**	**-**	**83**	**73**	**73**
Statewide	**Total**	**357**	**-**	**75**	**69**	**69**

Table 4-25: Summary of Wattage Values by IOU and Gross Program Group for Occupancy Sensor

IOU	Gross Program Group	n	Post-Retrofit Wattage	Pre-Retrofit Wattage	ROB ISP Wattage	Post-RUL ISP Wattage
PGE	Deemed	52	87	-	-	-
PGE	Custom	7	219	-	-	-
PGE	3P	17	203	-	-	-
PGE	LGP/DI	62	156	-	-	-
PGE	**Total**	**138**	**119**	**-**	**-**	**-**
SCE	DI	84	122	-	-	-
SCE	Deemed	61	175	-	-	-
SCE	Custom	1	274	-	-	-
SCE	3P	15	423	-	-	-
SCE	LGP	9	643	-	-	-
SCE	**Total**	**170**	**216**	**-**	**-**	**-**
SDGE	DI	9	44	-	-	-
SDGE	Deemed	41	119	-	-	-
SDGE	Custom					
SDGE	3P	2	62	-	-	-
SDGE	**Total**	**52**	**104**	**-**	**-**	**-**
Statewide	**DI**	**93**	**120**	**-**	**-**	**-**
Statewide	**Deemed**	**154**	**137**	**-**	**-**	**-**
Statewide	**Custom**	**8**	**249**	**-**	**-**	**-**
Statewide	**3P**	**34**	**262**	**-**	**-**	**-**
Statewide	**LGP**	**71**	**437**	**-**	**-**	**-**
Statewide	**Total**	**360**	**172**	**-**	**-**	**-**

Table 4-26: Summary of Wattage Values by IOU and Gross Program Group for High Bay Lighting

IOU	Gross Program Group	n	Post-Retrofit Wattage	Pre-Retrofit Wattage	ROB ISP Wattage	Post-RUL ISP Wattage
PGE	Deemed	45	201	387	333	333
PGE	Custom					
PGE	3P	28	211	396	341	340
PGE	LGP/DI	37	178	378	325	325
PGE	**Total**	**110**	**196**	**385**	**332**	**331**
SCE	DI	19	203	355	225	225
SCE	Deemed	54	164	344	302	301
SCE	Custom					
SCE	3P					
SCE	LGP	3	56	115	99	99
SCE	**Total**	**76**	**166**	**343**	**295**	**294**
SDGE	DI					
SDGE	Deemed	23	199	398	343	342
SDGE	Custom					
SDGE	3P	2	197	400	344	344
SDGE	**Total**	**25**	**199**	**399**	**343**	**343**
Statewide	**DI**	**19**	**203**	**355**	**225**	**225**
Statewide	**Deemed**	**122**	**174**	**356**	**311**	**310**
Statewide	**Custom**					
Statewide	**3P**	**30**	**209**	**396**	**341**	**341**
Statewide	**LGP**	**40**	**172**	**364**	**313**	**313**
Statewide	**Total**	**211**	**176**	**358**	**307**	**307**

Table 4-27: Summary of Wattage Values by IOU and Gross Program Group for HID

IOU	Gross Program Group	n	Post-Retrofit Wattage	Pre-Retrofit Wattage	ROB ISP Wattage	Post-RUL ISP Wattage
PGE	Deemed	5	27	66	-	-
PGE	Custom	1	39	109	-	-
PGE	3P					
PGE	LGP/DI	3	69	193	-	-
PGE	**Total**	**9**	**43**	**114**	**-**	**-**
SCE	DI					
SCE	Deemed	6	21	79	-	-
SCE	Custom	2	974	1,038	-	-
SCE	3P					
SCE	LGP					
SCE	**Total**	**8**	**322**	**382**	**-**	**-**
SDGE	DI					
SDGE	Deemed	3	39	72	-	-
SDGE	Custom	1	175	324	-	-
SDGE	3P					
SDGE	**Total**	**4**	**62**	**116**	**-**	**-**
Statewide	**DI**					
Statewide	**Deemed**	**14**	**28**	**73**	**-**	**-**
Statewide	**Custom**	**4**	**606**	**687**	**-**	**-**
Statewide	**3P**					
Statewide	**LGP**	**3**	**69**	**193**	**-**	**-**
Statewide	**Total**	**21**	**156**	**218**	**-**	**-**

Table 4-28: Summary of Wattage Values by IOU and Gross Program Group for Linear Fluorescent

IOU	Gross Program Group	n	Post-Retrofit Wattage	Pre-Retrofit Wattage	ROB ISP Wattage	Post-RUL ISP Wattage
PGE	Deemed	76	61	77	71	71
PGE	Custom	82	64	87	84	84
PGE	3P	53	56	95	81	80
PGE	LGP/DI	338	60	97	83	84
PGE	**Total**	**549**	**61**	**90**	**80**	**80**
SCE	DI	251	78	95	89	89
SCE	Deemed	114	65	79	72	72
SCE	Custom	38	78	136	120	119
SCE	3P	91	64	103	97	96
SCE	LGP	53	47	65	65	65
SCE	**Total**	**547**	**69**	**92**	**85**	**85**
SDGE	DI	134	66	91	84	83
SDGE	Deemed	79	58	72	72	72
SDGE	Custom	3	71	279	251	251
SDGE	3P	31	64	114	95	95
SDGE	**Total**	**247**	**62**	**93**	**84**	**84**
Statewide	**DI**	**385**	**76**	**94**	**89**	**88**
Statewide	**Deemed**	**269**	**63**	**78**	**72**	**72**
Statewide	**Custom**	**123**	**71**	**113**	**104**	**103**
Statewide	**3P**	**175**	**62**	**105**	**92**	**92**
Statewide	**LGP**	**391**	**58**	**91**	**80**	**81**
Statewide	**Total**	**1,343**	**65**	**91**	**83**	**83**

4.6 Overview of Net-to-Gross Analysis

The approach for estimating net-to-gross ratios (NTGRs) was based on the large non-residential free ridership approach developed by the Net-to-Gross Ratio (NTGR) Working Group and documented in Appendix C, Methodological Framework for Using the Self-Report Approach to Estimating Net-to-Gross Ratios for Non-residential Customers. The NTGR is calculated as the average of three program attribution indices (PAI) known as PAI-1, PAI-2, and PAI-3. Each of these scores represents the highest response or the average of several responses given to one or more questions about the decision to install a program measure. The participant phone survey was the basis for the inputs to each score.

- **Program attribution index 1 (PAI–1)** is a score that reflects the influence of the most important of various program-related elements in the customer's decision to select a

given program measure. The PAI-1 score is calculated as the highest program influence factor divided by the sum of the highest program influence factor and the highest non-program influence factor. Some example non-program factors are: previous experience with the measure, recommendation from an engineer, standard practice, corporate policy, compliance with rules or regulations, organizational maintenance or equipment replacement policies and "other – specify." Payback is treated as a program influence factor if the rebate/incentives played a major role in meeting payback criteria, but is treated as a non-program influence factor if it did not play a major role in meeting payback criteria.

- **Program attribution index 2 (PAI–2)** is a score that captures the perceived importance of program factors (including rebate/incentives, recommendation, and training) relative to non-program factors in the decision to implement the specific measure that was eventually adopted or installed. This score is determined by asking respondents to assign importance values to the program and most important non-program influences so that the two total 10. The program influence score is adjusted (i.e., divided by 2) if respondents had made the decision to install the measure before learning about the program. The final score is divided by 10 to be put into decimal form, thus making it consistent with PAI-1.
- **Program attribution index 3 (PAI–3)** is a score that captures the likelihood of various actions the customer might have taken at the given time and in the future if the program had not been available (the counterfactual). This score is calculated as 10 minus the likelihood that the respondent would have installed the same measure in the absence of the program. The final score is divided by 10 to put into decimal form, thus making it consistent with PAI-1 and PAI-2.

The NTGR is estimated as an average of these three scores. If one of the scores is not available (generally due to respondents giving a "don't know" or "refusal" response), then the NTGR is estimated as the average of the two available score. If two or more scores were missing, results are discarded from the calculation.

Table 4-29 through Table 4-36 present NTGRs for each HIM by Net Program Group, and include the sample size, the NTGR and the corresponding relative precision for results weighted by ex post kWh and kW, respectively. Table 4-36 presents the statewide level results. There is not a tremendous amount of variation across programs and measures, and the majority of NTGR values are within 20% of the overall statewide average. Most of the values outside of this range correspond to segments with low sample sizes. Overall, the achieved relative precisions met or beat the target level of precisions in the sample design. The only exception was for the SDG&E Core/Statewide Custom segment, where participation was limited and the desired sample sizes could not be achieved.

Table 4-29: CFL Basic NTGRs by Net Program Group

Net Program Group	n	NTGR kWh	Relative Precision	NTGR kW	Relative Precision
PG&E					
PGE 3P	19	0.62	5%	0.63	5%
PGE DI Ecology	15	0.68	9%	0.69	8%
PGE DI RHA	8	0.67	5%	0.67	5%
PGE DI Staples	18	0.64	8%	0.63	8%
PGE DI Staples/RHA **	3	0.62	18%	0.61	19%
PGE DI Synergy	5	0.54	41%	0.52	42%
PGE DI TEAA	11	0.63	14%	0.60	16%
PGE Energy Fitness	5	0.87	13%	0.82	21%
PGE LGP East Bay	7	0.58	14%	0.56	15%
PGE LGP LGEAR	7	0.57	25%	0.55	26%
PGE LGP Marin	16	0.63	15%	0.63	15%
PGE LGP Redwood	22	0.59	8%	0.59	8%
PGE LGP SF	22	0.47	10%	0.44	10%
PGE RightLights	50	0.62	4%	0.61	5%
PG&E Total	**208**	**0.61**	**3%**	**0.59**	**3%**
SCE					
SCE 3P	4	0.54	18%	0.54	18%
SCE 3P Preschool	7	0.71	9%	0.71	9%
SCE Direct Install	24	0.59	9%	0.61	9%
SCE Total	**35**	**0.60**	**7%**	**0.61**	**7%**
SDG&E					
SDGE Core/Statewide Custom	2	0.26	132%	0.26	130%
SDGE Deemed COM	8	0.57	23%	0.66	7%
SDGE Deemed IND_AG	2	0.65	16%	0.66	14%
SDGE Direct Install	24	0.61	7%	0.61	8%
SDGE MEC	67	0.62	5%	0.62	5%
SDGE Total	**103**	**0.56**	**5%**	**0.54**	**6%**
Grand Total	**346**	**0.60**	**2%**	**0.59**	**2%**

Table 4-30: CFL Reflector NTGRs by Net Program Group

Net Program Group	n	NTGR kWh	Relative Precision	NTGR kW	Relative Precision
PG&E					
PGE DI RHA	6	0.59	17%	0.58	17%
PGE DI Staples	5	0.56	8%	0.57	7%
PGE DI Staples/RHA **	3	0.74	17%	0.74	16%
PGE DI Synergy	2	0.59	101%	0.59	101%
PGE Deemed Ag	3	0.59	19%	0.60	15%
PGE Deemed Com	11	0.43	20%	0.45	17%
PGE Deemed Ind	1	0.47		0.47	
PGE LGP LGEAR	3	0.50	42%	0.50	42%
PGE SW Partnership	1	0.30		0.30	
PG&E Total	**35**	**0.56**	**5%**	**0.57**	**5%**
SCE					
SCE Deemed Ag	1	0.62			
SCE Deemed Com	10	0.60	12%	0.54	10%
SCE Deemed Ind	2	0.67	18%	0.67	16%
SCE Direct Install	33	0.65	4%	0.64	4%
SCE LGP ELP	4	0.69	30%	0.69	29%
SCE Total	**50**	**0.64**	**3%**	**0.64**	**3%**
SDG&E					
SDGE Core/Statewide Custom	2	0.54	66%	0.54	64%
SDGE Direct Install	17	0.63	8%	0.62	8%
SDGE Total	**19**	**0.61**	**7%**	**0.60**	**7%**
Grand Total	**104**	**0.61**	**3%**	**0.61**	**3%**

Table 4-31: Linear Fluorescent NTGRs by Net Program Group

Net Program Group	n	NTGR kWh	Relative Precision	NTGR kW	Relative Precision
PG&E					
PGE 3P	52	0.66	3%	0.65	4%
PGE Core/Statewide Custom	38	0.46	9%	0.44	10%
PGE DI Ecology	32	0.54	12%	0.52	13%
PGE DI RHA	26	0.73	5%	0.73	5%
PGE DI Staples	19	0.63	7%	0.62	9%
PGE DI Staples/RHA **	6	0.72	10%	0.72	10%
PGE DI Synergy	19	0.69	9%	0.69	9%
PGE DI TEAA	15	0.51	9%	0.49	9%
PGE Deemed Ag	7	0.71	8%	0.72	7%
PGE Deemed Com	47	0.59	7%	0.58	7%
PGE Deemed Ind	8	0.53	21%	0.52	20%
PGE Energy Fitness	9	0.62	6%	0.62	6%
PGE LGP East Bay	66	0.63	5%	0.63	5%
PGE LGP LGEAR	16	0.60	10%	0.60	9%
PGE LGP Marin	19	0.58	8%	0.58	8%
PGE LGP Redwood	14	0.63	11%	0.63	11%
PGE LGP SF	69	0.64	4%	0.64	4%
PGE RightLights	93	0.64	4%	0.63	4%
PGE SW Partnership	4	0.54	15%	0.52	18%
PG&E Total	**559**	**0.59**	**2%**	**0.59**	**2%**
SCE					
SCE 3P	29	0.49	12%	0.49	12%
SCE 3P Mgmt Affiliates	6	0.66	10%	0.65	10%
SCE 3P Preschool	14	0.57	15%	0.58	14%
SCE 3P Schools	3	0.71	23%	0.69	20%
SCE Core/Statewide Custom	42	0.56	7%	0.58	7%
SCE Deemed Ag	4	0.44	34%	0.44	34%
SCE Deemed Com	31	0.56	10%	0.56	9%
SCE Deemed Ind	48	0.64	5%	0.64	5%
SCE Direct Install	81	0.65	4%	0.65	4%
SCE LGP ELP	39	0.51	9%	0.51	9%
SCE LGP Institutional	10	0.65	11%	0.66	10%
SCE Total	**307**	**0.59**	**3%**	**0.60**	**2%**
SDG&E					
SDGE BID	40	0.57	6%	0.60	5%
SDGE Core/Statewide Custom	9	0.65	18%	0.64	20%
SDGE Deemed COM	50	0.54	6%	0.54	6%
SDGE Deemed IND_AG	12	0.53	10%	0.53	9%
SDGE Direct Install	86	0.63	4%	0.63	4%
SDGE Total	**197**	**0.58**	**3%**	**0.60**	**3%**
Grand Total	**1,063**	**0.59**	**1%**	**0.60**	**1%**

Table 4-32: Delamping NTGRs by Net Program Group

Net Program Group	n	NTGR kWh	Relative Precision	NTGR kW	Relative Precision
PG&E					
PGE 3P	25	0.52	11%	0.47	15%
PGE DI RHA	19	0.54	14%	0.54	14%
PGE DI Staples	7	0.64	13%	0.65	11%
PGE DI Staples/RHA **	3	0.66	21%	0.67	17%
PGE DI Synergy	5	0.68	16%	0.68	17%
PGE DI TEAA	10	0.58	10%	0.56	8%
PGE Deemed Ag	1	0.76		0.76	
PGE Deemed Com	21	0.62	7%	0.60	8%
PGE Deemed Ind	6	0.54	25%	0.53	27%
PGE Energy Fitness	21	0.64	7%	0.65	6%
PGE LGP East Bay	24	0.64	7%	0.65	6%
PGE LGP LGEAR	10	0.62	9%	0.61	10%
PG&E Total	**152**	**0.61**	**3%**	**0.60**	**3%**
SCE					
SCE 3P	14	0.60	10%	0.66	9%
SCE 3P Mgmt Affiliates	3	0.46	83%	0.46	84%
SCE 3P Preschool	17	0.75	7%	0.75	7%
SCE 3P Schools	7	0.67	19%	0.49	31%
SCE Deemed Ag	7	0.60	15%	0.60	15%
SCE Deemed Com	22	0.59	9%	0.59	8%
SCE Deemed Ind	26	0.64	8%	0.62	9%
SCE Direct Install	27	0.73	5%	0.73	5%
SCE LGP ELP	10	0.69	6%	0.69	6%
SCE LGP Institutional	3	0.48	28%	0.50	26%
SCE Total	**136**	**0.66**	**3%**	**0.65**	**3%**
SDG&E					
SDGE Deemed COM	14	0.64	13%	0.50	12%
SDGE Deemed IND_AG	3	0.55	27%	0.55	27%
SDGE Direct Install	2	0.74	69%	0.74	69%
SDGE Total	**19**	**0.65**	**10%**	**0.56**	**11%**
Grand Total	**307**	**0.65**	**2%**	**0.63**	**2%**

Table 4-33: High Bay NTGRs by Net Program Group

Net Program Group	n	NTGR kWh	Relative Precision	NTGR kW	Relative Precision
PG&E					
PGE 3P	22	0.65	9%	0.64	9%
PGE DI Ecology	1	0.21		0.21	
PGE DI RHA	3	0.77	25%	0.76	27%
PGE DI Staples	9	0.67	9%	0.68	10%
PGE DI Staples/RHA **	2	0.56	272%	0.39	168%
PGE DI TEAA	1	0.65		0.65	
PGE Deemed Ag	5	0.57	12%	0.57	12%
PGE Deemed Com	57	0.65	4%	0.65	4%
PGE Deemed Ind	26	0.50	12%	0.51	12%
PGE Energy Fitness	16	0.62	6%	0.62	5%
PGE LGP LGEAR	3	0.59	51%	0.59	51%
PGE LGP SF	2	0.49	180%	0.46	150%
PG&E Total	**147**	**0.61**	**3%**	**0.61**	**3%**
SCE					
SCE Core/Statewide Custom	2	0.29	112%	0.30	100%
SCE Deemed Ag	15	0.66	6%	0.67	6%
SCE Deemed Com	35	0.62	7%	0.63	7%
SCE Deemed Ind	43	0.63	6%	0.63	6%
SCE Direct Install	13	0.82	8%	0.85	8%
SCE LGP Institutional	1	0.73		0.73	
SCE Total	**109**	**0.62**	**4%**	**0.64**	**4%**
SDG&E					
SDGE Deemed COM	16	0.67	10%	0.67	10%
SDGE Deemed IND_AG	4	0.64	32%	0.65	32%
SDGE Total	**20**	**0.67**	**9%**	**0.67**	**9%**
Grand Total	**276**	**0.62**	**3%**	**0.63**	**2%**

Table 4-34: Occupancy Sensor NTGRs by Net Program Group

Net Program Group	n	NTGR kWh	Relative Precision	NTGR kW	Relative Precision
PG&E					
PGE 3P	13	0.50	7%	0.50	7%
PGE Core/Statewide Custom	7	0.59	30%	0.51	19%
PGE DI Ecology	5	0.44	24%	0.44	24%
PGE DI RHA	1	0.67		0.67	
PGE DI Staples	1	0.26		0.26	
PGE DI Staples/RHA **	1	0.76			
PGE DI Synergy	4	0.66	17%	0.66	17%
PGE DI TEAA	1	0.55		0.55	
PGE Deemed Ag	3	0.61	18%	0.61	16%
PGE Deemed Com	49	0.60	8%	0.60	9%
PGE Deemed Ind	9	0.61	9%	0.60	11%
PGE Energy Fitness	4	0.78	13%	0.76	17%
PGE LGP East Bay	9	0.56	19%	0.55	19%
PGE LGP LGEAR	5	0.40	31%	0.41	32%
PGE LGP Redwood	4	0.73	17%	0.74	17%
PGE LGP SF	7	0.60	13%	0.60	13%
PGE RightLights	5	0.63	10%	0.63	10%
PG&E Total	**128**	**0.59**	**5%**	**0.58**	**5%**
SCE					
SCE 3P	8	0.62	18%	0.67	19%
SCE 3P Mgmt Affiliates	2	0.53	99%	0.53	99%
SCE 3P Preschool	8	0.76	15%	0.69	22%
SCE 3P Schools	2	0.54	60%	0.53	
SCE Core/Statewide Custom	8	0.30	48%	0.41	47%
SCE Deemed Ag	1	0.83		0.83	
SCE Deemed Com	31	0.60	8%	0.65	6%
SCE Deemed Ind	17	0.60	9%	0.63	8%
SCE Direct Install	16	0.69	5%	0.70	5%
SCE LGP ELP	7	0.20	58%	0.21	41%
SCE LGP Institutional	4	0.42	21%	0.45	28%
SCE Total	**104**	**0.59**	**5%**	**0.62**	**4%**
SDG&E					
SDGE BID	1	0.62		0.62	
SDGE Core/Statewide Custom	2	0.59	192%	0.70	
SDGE Deemed COM	21	0.63	7%	0.64	6%
SDGE Deemed IND_AG	5	0.63	17%	0.67	9%
SDGE Direct Install	3	0.79	24%	0.80	20%
SDGE Total	**32**	**0.63**	**6%**	**0.65**	**5%**
Grand Total	**264**	**0.59**	**3%**	**0.61**	**3%**

Table 4-35: HID NTGRs by Net Program Group

Net Program Group	n	NTGR kWh	Relative Precision	NTGR kW	Relative Precision
PG&E					
PGE 3P	4	0.50	45%	0.50	45%
PGE DI Ecology	4	0.60	18%	0.65	15%
PGE DI Staples	1	0.28		0.28	
PGE DI TEAA	4	0.50	9%	0.50	14%
PGE Deemed Com	4	0.61	20%	0.60	22%
PGE Energy Fitness	3	0.69	19%	0.69	17%
PGE LGP East Bay	34	0.68	7%	0.68	7%
PGE LGP Marin	4	0.70	5%	0.70	5%
PGE RightLights	8	0.58	20%	0.60	16%
PG&E Total	**66**	**0.63**	**6%**	**0.62**	**5%**
SCE					
SCE 3P	1	0.68		0.68	
SCE Core/Statewide Custom	3	0.35	4%	0.36	4%
SCE Deemed Com	7	0.55	29%	0.45	39%
SCE LGP ELP	3	0.36	9%	0.35	10%
SCE Total	**14**	**0.50**	**19%**	**0.44**	**23%**
SDG&E					
SDGE Deemed COM	2	0.20	132%	0.20	205%
SDGE Deemed IND_AG	1	0.65		0.65	
SDGE Total	**3**	**0.20**	**58%**	**0.21**	**78%**
Grand Total	**83**	**0.53**	**8%**	**0.51**	**8%**

Table 4-36: Total NTGRs by Net Program Group

Net Program Group	n	NTGR kWh	Relative Precision	NTGR kW	Relative Precision
PG&E					
PGE 3P	135	0.61	3%	0.59	4%
PGE Core/Statewide Custom	45	0.48	9%	0.44	9%
PGE DI Ecology	57	0.57	8%	0.56	8%
PGE DI RHA	63	0.70	4%	0.70	4%
PGE DI Staples	60	0.61	4%	0.61	4%
PGE DI Staples/RHA **	18	0.68	8%	0.67	8%
PGE DI Synergy	35	0.64	7%	0.65	7%
PGE DI TEAA	42	0.55	5%	0.54	5%
PGE Deemed Ag	19	0.59	5%	0.60	5%
PGE Deemed Com	189	0.62	3%	0.62	3%
PGE Deemed Ind	50	0.51	8%	0.52	8%
PGE Energy Fitness	58	0.64	3%	0.64	3%
PGE LGP East Bay	140	0.65	3%	0.65	3%
PGE LGP LGEAR	44	0.58	6%	0.58	6%
PGE LGP Marin	39	0.60	6%	0.60	6%
PGE LGP Redwood	40	0.64	6%	0.65	6%
PGE LGP SF	100	0.57	4%	0.55	5%
PGE RightLights	156	0.63	3%	0.63	3%
PGE SW Partnership	5	0.54	10%	0.52	11%
PG&E Total	**1,295**	**0.60**	**1%**	**0.60**	**1%**
SCE					
SCE 3P	56	0.52	8%	0.58	7%
SCE 3P Mgmt Affiliates	11	0.57	14%	0.55	13%
SCE 3P Preschool	46	0.69	6%	0.69	6%
SCE 3P Schools	12	0.66	11%	0.53	10%
SCE Core/Statewide Custom	55	0.50	8%	0.53	8%
SCE Deemed Ag	28	0.63	6%	0.64	7%
SCE Deemed Com	136	0.60	4%	0.61	4%
SCE Deemed Ind	136	0.63	3%	0.63	3%
SCE Direct Install	194	0.69	2%	0.70	2%
SCE LGP ELP	63	0.53	8%	0.47	10%
SCE LGP Institutional	18	0.62	9%	0.63	9%
SCE Total	**755**	**0.61**	**2%**	**0.62**	**2%**
SDG&E					
SDGE BID	41	0.57	6%	0.60	5%
SDGE Core/Statewide Custom	13	0.61	16%	0.57	19%
SDGE Deemed COM	113	0.55	6%	0.55	5%
SDGE Deemed IND_AG	27	0.59	7%	0.60	6%
SDGE Direct Install	132	0.64	3%	0.64	3%
SDGE MEC	67	0.62	60%	0.62	5%
SDGE Total	**393**	**0.58**	**2%**	**0.59**	**2%**
Grand Total	**2,443**	**0.61**	**1%**	**0.61**	**1%**

Comparing NTGRs by HIM, there is little variation at the statewide and IOU levels. The HIM level NTGRs weighted by kWh savings range from 0.59 to 0.65 at the statewide level, with the exception of HIDs, which are at 0.53. Across IOUs, there is also little variation overall with IOU level NTGRs of 0.60 for PG&E, 0.61 for SCE and 0.58 for SDG&E.

The most significant variation occurs across gross program groups. But even with this comparison, there is not that much variation. Of the 36 Net Program Groups, only nine have NTGRs that differ from their IOU average by more than 10%. There does appear to be some correlation among NTGRs across the program types. For example, the Core/Statewide Custom programs tend to have lower NTGRs and the Direct Install programs tend to have higher NTGRs. Deemed programs tend to have NTGRs very close to the overall statewide average. The LGP and 3P programs have a bit more variation across program, some with higher and some with lower than average NTGRs.

Results were also compared across participants whose measures were installed under a deemed application versus a calculated application. Calculated applications were further disaggregated by project size, with large projects being defined as 250,000 kWh or more. As expected, deemed participants had the largest NTGRs (0.62 at the statewide level), and large calculated projects the smallest NTGRs (0.51 at the statewide level, and small/medium calculated projects at 0.55). Detailed results are presented in Appendix H.

Finally, NTGRs were compared across participants whose installations were identified as being ROB versus ER. This was only done for measures subject to the dual baseline, which include linear fluorescents, high bay fluorescents, delamping and HIDs. Results were not statistically significantly different among ROB and ER participant at the statewide level. Detailed results are presented in Appendix H.

For developing ex post net savings values, NTGRs will be applied by Net Program Group. Sample sizes by HIM and Net Program Group were not sufficient to develop reliable estimates of NTGRs for many of the HIM-Net Program Group combinations, as can be seen in the tables above. Table 4-37 compares the ex-ante and ex-post NTGRs by Net Program Group. Overall, at the statewide and IOU levels, the ex-ante NTGRs are more than a quarter larger than the ex-post values.

Table 4-37: Comparison of Ex-Ante and Ex-Post NTGRs by Net Program Group, Weighted by kWh and kW Savings

Net Program Group	N	Ex-Ante NTGR kWh	Ex-Post NTGR kWh	Ex-Ante NTGR kW	Ex-Post NTGR kW
PG&E					
PGE Core/SW Custom	45	0.71	0.48	0.70	0.44
PGE Deemed Ag	19	0.80	0.59	0.80	0.60
PGE Deemed Com	189	0.79	0.62	0.79	0.62
PGE Deemed Ind	50	0.78	0.51	0.79	0.52
PGE LGP East Bay	140	0.70	0.65	0.70	0.65
PGE LGP LGEAR	44	0.73	0.58	0.74	0.58
PGE LGP Marin	39	0.70	0.60	0.70	0.60
PGE LGP Redwood	40	0.70	0.64	0.70	0.65
PGE LGP SF	100	0.70	0.57	0.70	0.55
PGE 3P Other	135	0.78	0.61	0.78	0.59
PGE Energy Fitness	58	0.77	0.64	0.77	0.64
PGE RightLights	156	0.78	0.63	0.78	0.63
PGE SW Partnership	5	0.64	0.54	0.64	0.52
PGE DI Ecology	57	0.79	0.57	0.78	0.56
PGE DI RHA	63	0.78	0.70	0.78	0.70
PGE DI Staples	60	0.70	0.61	0.70	0.61
PGE DI Staples and RHA	18	0.71	0.68	0.70	0.67
PGE DI Synergy	35	0.70	0.64	0.70	0.65
PGE DI TEAA	42	0.79	0.55	0.79	0.54
PG&E Total	**1,295**	**0.76**	**0.60**	**0.76**	**0.60**
SCE					
SCE Core/ SW Custom	55	0.66	0.50	0.66	0.53
SCE Deemed Ag	28	0.79	0.63	0.78	0.64
SCE Deemed Com	136	0.79	0.60	0.79	0.61
SCE Deemed Ind	136	0.79	0.63	0.78	0.63
SCE Direct Install	194	0.85	0.69	0.85	0.70
SCE LGP ELP	63	0.77	0.53	0.80	0.47
SCE LGP Institutional	18	0.69	0.62	0.69	0.63
SCE 3P	56	0.73	0.52	0.77	0.58
SCE 3P Mgmt Affiliates	11	0.80	0.57	0.82	0.55
SCE 3P Preschool	46	0.85	0.69	0.85	0.69
SCE 3P Schools	12	0.85	0.66	0.85	0.53
SCE Total	**755**	**0.79**	**0.61**	**0.80**	**0.62**
SDG&E					
SDGE Core/ SW Custom	13	0.67	0.61	0.68	0.57
SDGE BID	41	0.64	0.57	0.64	0.60
SDGE Deemed COM	113	0.79	0.55	0.79	0.55
SDGE Deemed IND_AG	27	0.79	0.59	0.79	0.60
SDGE Direct Install	132	0.82	0.64	0.82	0.64
SDGE MEC	67	0.85	0.62	0.85	0.62
SDGE Total	**393**	**0.75**	**0.58**	**0.75**	**0.59**
Grand Total	**2,443**	**0.78**	**0.61**	**0.78**	**0.61**

5

Results

This section presents the final results for the Nonresidential Downstream Lighting Impact Evaluation. Presented are the gross and net realization rates for first year and lifecycle kW and kWh savings. A comparison is also made between the results of this study and the 2006-08 Small Commercial Impact Evaluation for a few key measures.

5.1 Development of Gross and Net Realization Rates

5.1.1 Gross First Year Realization Rates

Once all the individual parameter estimates are developed for each participant in the on-site sample, and the customer is classified as either ROB or ER, the equations presented in Section 4 can be applied to develop site-specific and measure-specific estimates of gross energy savings.

Gross realization rates can then be estimated for kWh and kW savings by looking at the ratio of the evaluated gross savings to the ex-ante gross savings. Specifically, the Gross Realization Rate (GRR) for HIM-IOU-Gross Program Group segment j is estimated as:

$$Gross\_Realization\_Rate_j = \frac{\sum_{i=1}^{n} Gross\_Ex\_Post\_Impact_{i,j}}{\sum_{i=1}^{n} Gross\_Ex\_Ante\_Impact_{i,j}}$$

Where,

> $Gross\_Ex\_Post\_Impact_{i,j}$ is the site-specific gross ex-post impact estimate for customer i, in the on-site sample, who is in HIM-IOU-Gross Program Group segment j.
>
> $Gross\_Ex\_Ante\_Impact_{i,j}$ is the site-specific gross ex-ante impact estimate for customer i, in the on-site sample, who is in HIM-IOU-Gross Program Group segment j.

Table 5-1 and Table 5-2 present the kWh and kW gross realization rates, respectively, by HIM, IOU and Gross Program Group. The results presented do not incorporate any of the Large Calculated sites. These sites were sampled separately as a census, and separate results are presented for the Large Calculated sites in Table 5-10 below.

It is important to note that realization rates are only developed for the HIM, IOU and Gross Program Group segments that were explicitly sampled as part of the data collection plan. While on-site, if other measures were found at the facility that were not part of the sample design, data was still collected on those measures to support other analysis efforts, such as updating DEER impact parameters. However, the sample that was obtained on measures that were not part of the original sample design was not of sufficient size to produce statistically significant results.

Table 5-1: Gross kWh Realization Rates by HIM, IOU and Gross Program Group – Not Including Large Calculated

Gross Program Group	CFL Basic	CFL Reflector	High Bay	HID	Delamp	Linear	Occ Sensors	Total
PG&E Deemed		166%	55%	*95%*	48%	49%	41%	**56%**
PG&E Custom						85%		**85%**
PG&E 3P	50%		59%		36%	49%	52%	**53%**
PG&E LGP/DI	21%	84%	35%	37%	44%	33%	106%	**36%**
PG&E Total	**35%**	**132%**	**54%**	**45%**	**43%**	**48%**	**45%**	**50%**
SCE DI	29%	64%	69%		52%	28%	69%	**47%**
SCE Deemed		24%	63%	*153%*	64%	133%	55%	**78%**
SCE Custom						90%		**90%**
SCE 3P					55%	58%		**57%**
SCE LGP						59%		**59%**
SCE Total	**29%**	**32%**	**63%**	***153%***	**61%**	**86%**	**56%**	**74%**
SDGE DI	99%	62%				45%		**52%**
SDGE Deemed	48%	32%	41%	*196%*	66%	57%	89%	**70%**
SDGE 3P/LGP	46%					71%		**71%**
SDG&E Total	**68%**	**44%**	**41%**	***196%***	**66%**	**60%**	**89%**	**68%**
SW DI	**54%**	**63%**	**69%**		**52%**	**37%**	**69%**	**49%**
SW Deemed	**48%**	**53%**	**55%**	**162%**	**61%**	**80%**	**56%**	**69%**
SW Custom						**88%**		**88%**
SW 3P	**50%**		**59%**		**43%**	**63%**	**52%**	**57%**
SW LGP	**21%**	**84%**	**35%**	**37%**	**44%**	**34%**	**106%**	**37%**
Statewide Total	**38%**	**58%**	**55%**	**129%**	**55%**	**63%**	**57%**	**63%**

* Italics indicate segment level results that are supported by small samples sizes of six or less.

Table 5-2: Gross kW Realization Rates by HIM, IOU and Gross Program Group – Not Including Large Calculated

Gross Program Group	CFL Basic	CFL Reflector	High Bay	HID	Delamp	Linear	Occ Sensors	Total
PG&E Deemed		152%	45%	*104%*	58%	48%	46%	**51%**
PG&E Custom						59%		**59%**
PG&E 3P	98%		42%		68%	59%	58%	**54%**
PG&E LGP/DI	16%	75%	31%	28%	45%	33%	165%	**34%**
PG&E Total	**49%**	**120%**	**42%**	**39%**	**53%**	**43%**	**51%**	**46%**
SCE DI	32%	72%	69%		54%	30%	21%	**43%**
SCE Deemed		15%	58%	*158%*	59%	92%	27%	**64%**
SCE Custom						61%		**61%**
SCE 3P					44%	42%		**43%**
SCE LGP						49%		**49%**
SCE Total	**32%**	**27%**	**58%**	***158%***	**56%**	**61%**	**27%**	**60%**
SDGE DI	92%	67%				47%		**52%**
SDGE Deemed	38%	33%	34%	*113%*	38%	42%	70%	**49%**
SDGE 3P/LGP	38%					85%		**85%**
SDG&E Total	**61%**	**48%**	**34%**	***113%***	**38%**	**57%**	**70%**	**54%**
SW DI	**54%**	**70%**	**69%**		**54%**	**39%**	**21%**	**46%**
SW Deemed	**38%**	**44%**	**48%**	**141%**	**55%**	**60%**	**39%**	**57%**
SW Custom						**60%**		**60%**
SW 3P	**95%**		**42%**		**53%**	**66%**	**58%**	**58%**
SW LGP	**16%**	**75%**	**31%**	**28%**	**45%**	**34%**	**165%**	**34%**
Statewide Total	**49%**	**52%**	**47%**	**108%**	**53%**	**53%**	**40%**	**54%**

* Italics indicate segment level results that are supported by small samples sizes of six or less.

Table 5-3 through Table 5-9 present separate results for each HIM, by IOU and Gross Program Group, which include the sample size, the kWh realization rate, the relative precision for the kWh realization rate, the kW realization rate, and the relative precision for the kW realization rate. Again, these tables do not include the Large Calculated sample.

Table 5-3: Gross kWh and kW Realization Rates for CFL Basic by IOU and Gross Program Group, with Relative Precisions – Not Including Large Calculated

Gross Program Group	n	GRR kWh	Relative Precision	GRR kW	Relative Precision
PG&E Deemed					
PG&E Custom					
PG&E 3P	32	50%	38%	98%	40%
PG&E LGP/DI	100	21%	40%	16%	34%
PG&E Total	**132**	**35%**	**29%**	**49%**	**33%**
SCE DI	79	29%	35%	32%	38%
SCE Deemed					
SCE Custom					
SCE 3P					
SCE LGP					
SCE Total	**79**	**29%**	**35%**	**32%**	**38%**
SDGE DI	33	99%	17%	92%	24%
SDGE Deemed	10	48%	60%	38%	75%
SDGE Custom					
SDGE 3P/LGP	14	46%	78%	38%	85%
SDG&E Total	**57**	**68%**	**24%**	**61%**	**27%**
SW DI	**112**	**54%**	**16%**	**54%**	**21%**
SW Deemed	**10**	**48%**	**60%**	**38%**	**75%**
SW Custom					
SW 3P	**46**	**50%**	**37%**	**95%**	**39%**
SW LGP	**100**	**21%**	**40%**	**16%**	**34%**
Statewide Total	**268**	**38%**	**22%**	**49%**	**26%**

Table 5-4: Gross kWh and kW Realization Rates for CFL Reflector by IOU and Gross Program Group, with Relative Precisions – Not Including Large Calculated

Gross Program Group	n	GRR kWh	Relative Precision	GRR kW	Relative Precision
PG&E Deemed	12	166%	72%	152%	50%
PG&E Custom					
PG&E 3P					
PG&E LGP/DI	28	84%	25%	75%	38%
PG&E Total	**40**	**132%**	**54%**	**120%**	**39%**
SCE DI	44	64%	32%	72%	30%
SCE Deemed	16	24%	84%	15%	137%
SCE Custom					
SCE 3P					
SCE LGP					
SCE Total	**60**	**32%**	**51%**	**27%**	**62%**
SDGE DI	25	62%	23%	67%	26%
SDGE Deemed	9	32%	44%	33%	42%
SDGE Custom					
SDGE 3P/LGP					
SDG&E Total	**34**	**44%**	**23%**	**48%**	**23%**
SW DI	**69**	**63%**	**24%**	**70%**	**23%**
SW Deemed	**37**	**53%**	**52%**	**44%**	**48%**
SW Custom					
SW 3P					
SW LGP	**28**	**84%**	**25%**	**75%**	**38%**
Statewide Total	**134**	**58%**	**34%**	**52%**	**30%**

Table 5-5: Gross kWh and kW Realization Rates for High Bay Lighting by IOU and Gross Program Group, with Relative Precisions – Not Including Large Calculated

Gross Program Group	n	GRR kWh	Relative Precision	GRR kW	Relative Precision
PG&E Deemed	45	55%	14%	45%	15%
PG&E Custom					
PG&E 3P	28	59%	41%	42%	36%
PG&E LGP/DI	23	35%	24%	31%	21%
PG&E Total	**96**	**54%**	**16%**	**42%**	**14%**
SCE DI	19	69%	47%	69%	57%
SCE Deemed	54	63%	19%	58%	15%
SCE Custom					
SCE 3P					
SCE LGP					
SCE Total	**73**	**63%**	**19%**	**58%**	**14%**
SDGE DI					
SDGE Deemed	24	41%	25%	34%	43%
SDGE Custom					
SDGE 3P/LGP					
SDG&E Total	**24**	**41%**	**25%**	**34%**	**43%**
SW DI	**19**	**69%**	**47%**	**69%**	**57%**
SW Deemed	**123**	**55%**	**11%**	**48%**	**11%**
SW Custom					
SW 3P	**28**	**59%**	**41%**	**42%**	**36%**
SW LGP	**23**	**35%**	**24%**	**31%**	**21%**
Statewide Total	**193**	**55%**	**11%**	**47%**	**10%**

Table 5-6: Gross kWh and kW Realization Rates for HID by IOU and Gross Program Group, with Relative Precisions – Not Including Large Calculated

Gross Program Group	n	GRR kWh	Relative Precision	GRR kW	Relative Precision
PG&E Deemed	5	95%	26%	104%	11%
PG&E Custom					
PG&E 3P					
PG&E LGP/DI	26	37%	51%	28%	53%
PG&E Total	**31**	**45%**	**37%**	**39%**	**34%**
SCE DI					
SCE Deemed	6	153%	55%	158%	48%
SCE Custom					
SCE 3P					
SCE LGP					
SCE Total	**6**	**153%**	**55%**	**158%**	**48%**
SDGE DI					
SDGE Deemed	3	196%	5%	113%	3%
SDGE Custom					
SDGE 3P/LGP					
SDG&E Total	**3**	**196%**	**5%**	**113%**	**3%**
SW DI					
SW Deemed	**14**	**162%**	**35%**	**141%**	**35%**
SW Custom					
SW 3P					
SW LGP	**26**	**37%**	**51%**	**28%**	**53%**
Statewide Total	**40**	**129%**	**33%**	**108%**	**32%**

Table 5-7: Gross kWh and kW Realization Rates for Delamping by IOU and Gross Program Group, with Relative Precisions – Not Including Large Calculated

Gross Program Group	n	GRR kWh	Relative Precision	GRR kW	Relative Precision
PG&E Deemed	33	48%	49%	58%	61%
PG&E Custom					
PG&E 3P	28	36%	28%	68%	44%
PG&E LGP/DI	54	44%	27%	45%	24%
PG&E Total	**115**	**43%**	**22%**	**53%**	**25%**
SCE DI	38	52%	32%	54%	30%
SCE Deemed	58	64%	24%	59%	31%
SCE Custom					
SCE 3P	23	55%	27%	44%	36%
SCE LGP					
SCE Total	**119**	**61%**	**19%**	**56%**	**24%**
SDGE DI					
SDGE Deemed	24	66%	51%	38%	41%
SDGE Custom					
SDGE 3P/LGP					
SDG&E Total	**24**	**66%**	**51%**	**38%**	**41%**
SW DI	**38**	**52%**	**32%**	**54%**	**30%**
SW Deemed	**115**	**61%**	**20%**	**55%**	**25%**
SW Custom					
SW 3P	**51**	**43%**	**19%**	**53%**	**29%**
SW LGP	**54**	**44%**	**27%**	**45%**	**24%**
Statewide Total	**258**	**55%**	**14%**	**53%**	**17%**

Table 5-8: Gross kWh and kW Realization Rates for Linear Fluorescent by IOU and Gross Program Group, with Relative Precisions – Not Including Large Calculated

Gross Program Group	n	GRR kWh	Relative Precision	GRR kW	Relative Precision
PG&E Deemed	76	49%	28%	48%	30%
PG&E Custom	14	85%	77%	59%	71%
PG&E 3P	44	49%	67%	59%	80%
PG&E LGP/DI	127	33%	66%	33%	59%
PG&E Total	**261**	**48%**	**37%**	**43%**	**34%**
SCE DI	240	28%	13%	30%	13%
SCE Deemed	114	133%	61%	92%	53%
SCE Custom	10	90%	57%	61%	68%
SCE 3P	73	58%	15%	42%	25%
SCE LGP	43	59%	41%	49%	39%
SCE Total	**480**	**86%**	**34%**	**61%**	**34%**
SDGE DI	134	45%	24%	47%	18%
SDGE Deemed	78	57%	28%	42%	30%
SDGE Custom					
SDGE 3P/LGP	7	71%	27%	85%	19%
SDG&E Total	**219**	**60%**	**17%**	**57%**	**14%**
SW DI	**374**	**37%**	**17%**	**39%**	**13%**
SW Deemed	**268**	**80%**	**35%**	**60%**	**29%**
SW Custom	**24**	**88%**	**46%**	**60%**	**51%**
SW 3P	**124**	**63%**	**20%**	**66%**	**19%**
SW LGP	**170**	**34%**	**61%**	**34%**	**55%**
Statewide Total	**960**	**63%**	**19%**	**53%**	**17%**

Table 5-9: Gross kWh and kW Realization Rates for Occupancy Sensors by IOU and Gross Program Group, with Relative Precisions – Not Including Large Calculated

Gross Program Group	n	GRR kWh	Relative Precision	GRR kW	Relative Precision
PG&E Deemed	52	41%	42%	46%	46%
PG&E Custom					
PG&E 3P	16	52%	58%	58%	73%
PG&E LGP/DI	30	106%	65%	165%	64%
PG&E Total	**98**	**45%**	**33%**	**51%**	**37%**
SCE DI	84	69%	38%	21%	45%
SCE Deemed	61	55%	31%	27%	52%
SCE Custom					
SCE 3P					
SCE LGP					
SCE Total	**145**	**56%**	**28%**	**27%**	**48%**
SDGE DI					
SDGE Deemed	41	89%	22%	70%	21%
SDGE Custom					
SDGE 3P/LGP					
SDG&E Total	**41**	**89%**	**22%**	**70%**	**21%**
SW DI	**84**	**69%**	**38%**	**21%**	**45%**
SW Deemed	**154**	**56%**	**18%**	**39%**	**26%**
SW Custom					
SW 3P	**16**	**52%**	**58%**	**58%**	**73%**
SW LGP	**30**	**106%**	**65%**	**165%**	**64%**
Statewide Total	**284**	**57%**	**17%**	**40%**	**24%**

Table 5-10 presents the sample size, the kWh realization rate, the relative precision for the kWh realization rate, the kW realization rate, and the relative precision for the kW realization rate by IOU, for the Large Calculated Sites.

Table 5-10: Gross kWh and kW Realization Rates for Large Calculated Sites by IOU with Relative Precisions

IOU	n	GRR kWh	Relative Precision	GRR kW	Relative Precision
PG&E	46	53%	46%	44%	65%
SCE	15	46%	32%	47%	28%
SDG&E	5	43%	33%	39%	78%
Statewide	**66**	**49%**	**27%**	**45%**	**34%**

As shown above in Table 5-3 through Table 5-10, the GRRs can vary significantly from one segment to another. It is important to note, however, that all results except one are statistically significant at the 90% confidence interval.[1] It can be expected to have a lot of variation in the GRRs across segment because the GRR incorporates so many random variables, including installation rates, operating hours, coincidence factors, installed wattages, replaced wattages, and industry standard wattage. Many of the measures have a dual baseline, so whether the installation is ROB or ER creates additional variation. To understand why the GRR differs from one, means understanding why each individual parameter estimated differs between ex-ante and ex-post. The ex-post values are based on observed data, with a number of segments having sample sizes less than 30 points. Although these parameter level estimates are statistically significant, these results are likely to vary from segment to segment due to the sampling error inherent in the randomly selected sample. Furthermore, even within a segment, the ex-ante parameter level values can vary significantly due to differences in work paper assumptions for deemed measures, or for site-specific reasons for calculated measures.

The objective of this study was to develop GRRs that could be used to estimate IOU level net and gross savings across all nonresidential downstream lighting that are statistically significant. The ex-post saving values across all HIMs for an IOU produced GRRs with relative precision that ranged from 9% to 16% at the overall IOU level at 90% confidence. The relative precision for the IOU-HIM level kW and kWh GRRs for linear measures (linear fluorescents, delamping and high bay) are mostly in the range of 15 to 25% at 90% confidence, with a few values in the 30-40% range and a few more in the 40-50% range. For occupancy sensors, the relative precisions are in the 20-35% range with one exception at 48%. There is more variation among the CFL and HID measures, where the relative precisions are mostly in the 20-40% range, with a few values in the 50-60% range.

[1] Only the SCE Deemed CFL Reflector kW GRR is not statistically significant, with a relative precision of 137%. The absolute or margin of error for this segment, however, is only 20%, which is actually smaller than many other segments. But because the GRR is only 15% for this segment, the relative error is large at 137%.

For large calculated measures, the objective was to develop statewide level kW and kWh GRRs, which resulted in relative precisions of 34% and 27%, respectively.

An additional objective was to develop GRRs at the HIM, IOU and Gross Program Group level that were considered to still be statistically significant, but not at the same high level of precision as statewide results. As mentioned, all but one of these values was statistically significant at the 90% confidence level. The majority (about 60%) of the kW and kWh GRRs had relative precisions measured at the 90% confidence level that were in the range of 10-40% at the HIM, IOU and Gross Program Group level.

Appendix G provides a detailed analysis identifying which specific parameters in the impact algorithm lead to the realization rates differing from one. This analysis requires examining multiple parameters and comparing ex-ante and ex-post results to understand the differences in each parameter, and how that affected the overall GRR. To do this, it is necessary to know what the underlying parameter values are for every customer and measure evaluated. However, this was not always possible for every ex-ante parameter. Some work papers were not detailed enough to allow us to identify the customer-specific value associated with a given installation, and some calculated applications were not complete enough to provide this information. In this exercise, it was not considered necessary to completely explain the differences in ex-ante and ex-post values 100% of the time, but rather to have a more general understanding of what was the cause of the GRRs differing from one.

Below, is a summary of that analysis, highlighting these results for each HIM at the statewide level. Table 5-11 also provides these values.

CFL Basic – Statewide

At the statewide level for CFL Basic measures, the kWh GRR is 38%. The overall installation rate is 77%. Ex-post operating hours are only about half of the ex-ante value. Delta watts, however, are in line with ex-ante values. The kW GRR has a value of 49%, due to the ex-post coincidence factors being about 35% lower than ex-ante.

CFL Reflector – Statewide

At the statewide level for CFL Reflector measures, the kWh GRR is 58%. The overall installation rate is 88%. Ex-post operating hours are about a quarter lower than the ex-ante value. Delta watts are about 15% lower than ex-ante values. The kW GRR has a value of 52%, due to the ex-post coincidence factors being about a third lower than ex-ante.

HID – Statewide

At the statewide level for HID measures, the kWh GRR is 129%. The overall installation rate is 99%. Ex-post operating hours are about 30% higher than the ex-ante value. Delta watts are in line with ex-ante values. The kW GRR has a value of 108%, due to the ex-post coincidence factors being about 10% higher than ex-ante.

Linear Fluorescents – Statewide

At the statewide level for Linear Fluorescent measures, the kWh GRR is 63%. The overall installation rate is 92%. Ex-post operating hours are about 20-25% lower than the ex-ante value. Delta watts are about 10-15% lower than ex-ante values. The kW GRR has a value of 53%, due to the ex-post coincidence factors being about 35% lower than ex-ante.

Delamping – Statewide

At the statewide level for Delamping measures, the kWh GRR is 55%. The overall installation rate is 89%. Ex-post operating hours are about 25-30% lower than the ex-ante value. Delta watts are about 15-20% lower than ex-ante values. The kW GRR has a value of 53%, due to the ex-post coincidence factors also being about 25-30% lower than ex-ante.

High Bay Fluorescents – Statewide

At the statewide level for High Bay Fluorescents measures, the kWh GRR is 53%. The overall installation rate is 98%. Ex-post operating hours are about 10% lower than the ex-ante value. Delta watts are about 40% lower than ex-ante values. The kW GRR has a value of 46%, due to the ex-post coincidence factors being about 20% lower than ex-ante.

Occupancy Sensors – Statewide

At the statewide level for Occupancy Sensors measures, the kWh GRR is 57%. The overall installation rate is 92%. The reduction in ex-post operating hours is about 10-15% lower than ex-ante, and the controlled wattage is about 30% lower than ex-ante. The kW GRR is 40%, due to the reduction in the ex-post coincidence factor being about 40% lower than ex-ante.

Large Calculated – Statewide

At the statewide level for Large Calculated, the kWh GRR is 49%. Its installation rate is 93%. Ex-post operating hours are about 30% lower than ex-ante, and delta wattages are about a quarter lower than ex-ante. The kW GRR is 45%, due to ex-post coincidence factors that are about 35% lower than ex-ante.

Table 5-11: Comparison of Ex-Ante and Ex-post parameters and resulting Gross Realization Rates for 7 HIMs and Large Calculated Sites at the Statewide Level

HIM	kWh GRR	kW GRR	Installation Rate	Operating Hours	Delta Watts	CF
CFL Basic	0.38	0.49	0.77	45% - 55%	95% - 105%	60% - 70%
CFL Reflector	0.58	0.52	0.88	70% - 80%	80% - 90%	60% - 70%
High Bay	0.55	0.47	0.98	85% - 95%	55% - 65%	75% - 85%
HID	1.29	1.08	0.99	125% - 135%	95% - 105%	105% - 115%
Linear	0.63	0.53	0.92	75% - 80%	85% - 90%	60% - 70%
Delamp	0.55	0.53	0.89	70% - 75%	80% - 85%	70% - 75%
Occ Sensor*	0.57	0.40	0.92	85% - 90%	65% - 75%	55% - 65%
Large Calculated	0.49	0.45	0.93	65% - 75%	70% - 80%	60% - 70%

* For occupancy sensors, the ranges in the operating hour column represent the PTO and those in the delta watts column are controlled wattages.

5.1.2 Lifecycle Gross Realization Rates

Because many measures have a dual baseline, the gross realization rates associated with the first year savings will differ from the gross realization rates associated with lifecycle savings. To estimate lifecycle savings, annual gross savings were estimated for each year through the measure's EUL and aggregated. No net present valuation was made, just a straight aggregation. For measures classified as ROB, the lifecycle savings will equal the first year savings times the EUL. For measures classified as ER, the lifecycle savings will equal the annual RUL period savings times the RUL plus the annual post-RUL savings times the EUL minus the RUL:

*ROB Lifecycle savings = EUL * First Year Savings*

*ER Lifecycle savings = RUL * RUL Period Savings + (EUL-RUL) * Post-RUL Savings*

Gross lifecycle realization rates can then be estimated by looking at the ratio of the evaluated gross lifecycle savings to the ex-ante gross lifecycle savings. Table 5-12 and Table 5-13 present the kWh and kW gross lifecycle realization rates, respectively, by HIM, IOU, and Gross Program Group. Again, Large Calculated sites are not included and are presented separately.

Table 5-12: Gross Lifecycle kWh Realization Rates by HIM, IOU and Gross Program Group – Not Including Large Calculated

Gross Program Group	CFL Basic	CFL Reflector	High Bay	HID	Delamp	Linear	Occ Sensors	Total
PG&E Deemed		141%	56%	*277%*	66%	75%	41%	**60%**
PG&E Custom						54%		**54%**
PG&E 3P	78%		53%		31%	59%	52%	**52%**
PG&E LGP/DI	63%	131%	17%	36%	49%	33%	106%	**35%**
PG&E Total	**71%**	**138%**	**49%**	**48%**	**49%**	**45%**	**45%**	**48%**
SCE DI	75%	96%	54%		81%	45%	69%	**62%**
SCE Deemed		65%	80%	*712%*	155%	154%	55%	**131%**
SCE Custom						62%		**62%**
SCE 3P					113%	91%		**98%**
SCE LGP						100%		**100%**
SCE Total	**75%**	**71%**	**79%**	***712%***	**133%**	**85%**	**56%**	**111%**
SDGE DI	226%	116%				62%		**69%**
SDGE Deemed	64%	40%	20%	*40%*	60%	67%	47%	**38%**
SDGE 3P/LGP	52%					50%		**50%**
SDG&E Total	**126%**	**70%**	**20%**	***40%***	**60%**	**58%**	**47%**	**42%**
SW DI	**125%**	**101%**	**54%**		**81%**	**55%**	**69%**	**64%**
SW Deemed	**64%**	**76%**	**54%**	**266%**	**102%**	**94%**	**48%**	**79%**
SW Custom						**59%**		**59%**
SW 3P	**77%**		**53%**		**55%**	**59%**	**52%**	**57%**
SW LGP	**63%**	**131%**	**17%**	**36%**	**49%**	**35%**	**106%**	**35%**
Statewide Total	**78%**	**85%**	**52%**	**164%**	**80%**	**60%**	**49%**	**66%**

* Italics indicate segment level results that are supported by small samples sizes of six or less.

Table 5-13: Gross Lifecycle kW Realization Rates by HIM, IOU and Gross Program Group – Not Including Large Calculated

Gross Program Group	CFL Basic	CFL Reflector	High Bay	HID	Delamp	Linear	Occ Sensors	Total
PG&E Deemed		134%	46%	*307%*	81%	74%	46%	**55%**
PG&E Custom						40%		**40%**
PG&E 3P	138%		37%		72%	67%	58%	**48%**
PG&E LGP/DI	49%	136%	16%	27%	51%	33%	165%	**33%**
PG&E Total	**87%**	**135%**	**38%**	**41%**	**63%**	**42%**	**51%**	**44%**
SCE DI	83%	108%	52%		85%	50%	21%	**56%**
SCE Deemed		28%	74%	*739%*	143%	110%	27%	**108%**
SCE Custom						46%		**46%**
SCE 3P					88%	66%		**73%**
SCE LGP						86%		**86%**
SCE Total	**83%**	**46%**	**73%**	***739%***	**121%**	**63%**	**27%**	**90%**
SDGE DI	216%	125%				65%		**71%**
SDGE Deemed	66%	42%	18%	*24%*	36%	52%	37%	**30%**
SDGE 3P/LGP	32%					65%		**64%**
SDG&E Total	**125%**	**79%**	**18%**	***24%***	**36%**	**59%**	**37%**	**38%**
SW DI	**128%**	**112%**	**52%**		**85%**	**59%**	**21%**	**61%**
SW Deemed	**66%**	**50%**	**48%**	**248%**	**93%**	**74%**	**34%**	**67%**
SW Custom						**44%**		**44%**
SW 3P	**133%**		**37%**		**81%**	**65%**	**58%**	**57%**
SW LGP	**49%**	**136%**	**16%**	**27%**	**51%**	**35%**	**165%**	**33%**
Statewide Total	**92%**	**69%**	**44%**	**142%**	**81%**	**54%**	**35%**	**58%**

* Italics indicate segment level results that are supported by small samples sizes of six or less.

Table 5-14 through Table 5-20 present separate results for each HIM, by IOU and Gross Program Group, which include the sample size, the kWh gross lifecycle realization rate, the relative precision for the kWh realization rate, the kW gross lifecycle realization rate, and the relative precision for the kW realization rate. Furthermore, the first year gross realization rates are also presented for kWh and kW so a comparison can be made between first year and lifecycle realization rates. Large Calculated sites are not included in these results.

Table 5-14: Comparison of Gross First Year and Lifecycle kWh and kW Realization Rates for CFL Basic by IOU and Gross Program Group, with Relative Precisions – Not Including Large Calculated

Gross Program Group	n	Gross Realization Rates - kWh			Gross Realization Rates – kW		
		First Year	Lifecycle	RP - Lifecycle	First Year	Lifecycle	RP - Lifecycle
PG&E Deemed							
PG&E Custom							
PG&E 3P	32	50%	78%	29%	98%	138%	38%
PG&E LGP/DI	100	21%	63%	19%	16%	49%	20%
PG&E Total	**132**	**35%**	**71%**	**18%**	**49%**	**87%**	**27%**
SCE DI	79	29%	75%	32%	32%	83%	32%
SCE Deemed							
SCE Custom							
SCE 3P							
SCE LGP							
SCE Total	**79**	**29%**	**75%**	**32%**	**32%**	**83%**	**32%**
SDGE DI	33	99%	226%	21%	92%	216%	30%
SDGE Deemed	10	48%	64%	38%	38%	66%	56%
SDGE Custom							
SDGE 3P/LGP	14	46%	52%	66%	38%	32%	78%
SDG&E Total	**57**	**68%**	**126%**	**18%**	**61%**	**125%**	**26%**
SW DI	**112**	**54%**	**125%**	**18%**	**54%**	**128%**	**22%**
SW Deemed	**10**	**48%**	**64%**	**38%**	**38%**	**66%**	**56%**
SW Custom							
SW 3P	**46**	**50%**	**77%**	**28%**	**95%**	**133%**	**37%**
SW LGP	**100**	**21%**	**63%**	**19%**	**16%**	**49%**	**20%**
Statewide Total	**268**	**38%**	**78%**	**13%**	**49%**	**92%**	**20%**

Table 5-15: Comparison of Gross First Year and Lifecycle kWh and kW Realization Rates for CFL Reflector by IOU and Gross Program Group, with Relative Precisions – Not Including Large Calculated

Gross Program Group	n	Gross Realization Rates - kWh			Gross Realization Rates – kW		
		First Year	Lifecycle	RP - Lifecycle	First Year	Lifecycle	RP - Lifecycle
PG&E Deemed	12	166%	141%	62%	152%	134%	49%
PG&E Custom							
PG&E 3P							
PG&E LGP/DI	28	84%	131%	23%	75%	136%	32%
PG&E Total	**40**	**132%**	**138%**	**41%**	**120%**	**135%**	**33%**
SCE DI	44	64%	96%	22%	72%	108%	21%
SCE Deemed	16	24%	65%	24%	15%	28%	127%
SCE Custom							
SCE 3P							
SCE LGP							
SCE Total	**60**	**32%**	**71%**	**18%**	**27%**	**46%**	**63%**
SDGE DI	25	62%	116%	14%	67%	125%	29%
SDGE Deemed	9	32%	40%	21%	33%	42%	21%
SDGE Custom							
SDGE 3P/LGP							
SDG&E Total	**34**	**44%**	**70%**	**12%**	**48%**	**79%**	**21%**
SW DI	**69**	**63%**	**101%**	**16%**	**70%**	**112%**	**17%**
SW Deemed	**37**	**53%**	**76%**	**26%**	**44%**	**50%**	**58%**
SW Custom							
SW 3P							
SW LGP	**28**	**84%**	**131%**	**23%**	**75%**	**136%**	**32%**
Statewide Total	**134**	**58%**	**85%**	**17%**	**52%**	**69%**	**31%**

Table 5-16: Comparison of Gross First Year and Lifecycle kWh and kW Realization Rates for High Bay Lighting by IOU and Gross Program Group, with Relative Precisions – Not Including Large Calculated

Gross Program Group	n	Gross Realization Rates - kWh			Gross Realization Rates – kW		
		First Year	Lifecycle	RP - Lifecycle	First Year	Lifecycle	RP - Lifecycle
PG&E Deemed	45	55%	56%	17%	45%	46%	23%
PG&E Custom							
PG&E 3P	28	59%	53%	38%	42%	37%	32%
PG&E LGP/DI	23	35%	17%	25%	31%	16%	27%
PG&E Total	**96**	**54%**	**49%**	**16%**	**42%**	**38%**	**18%**
SCE DI	19	69%	54%	45%	69%	52%	54%
SCE Deemed	54	63%	80%	18%	58%	74%	21%
SCE Custom							
SCE 3P							
SCE LGP							
SCE Total	**73**	**63%**	**79%**	**18%**	**58%**	**73%**	**21%**
SDGE DI							
SDGE Deemed	24	41%	20%	49%	34%	18%	68%
SDGE Custom							
SDGE 3P/LGP							
SDG&E Total	**24**	**41%**	**20%**	**49%**	**34%**	**18%**	**68%**
SW DI	**19**	**69%**	**54%**	**45%**	**69%**	**52%**	**54%**
SW Deemed	**123**	**55%**	**54%**	**13%**	**48%**	**48%**	**16%**
SW Custom							
SW 3P	**28**	**59%**	**53%**	**38%**	**42%**	**37%**	**32%**
SW LGP	**23**	**35%**	**17%**	**25%**	**31%**	**16%**	**27%**
Statewide Total	**193**	**55%**	**52%**	**12%**	**47%**	**44%**	**14%**

Table 5-17: Comparison of Gross First Year and Lifecycle kWh and kW Realization Rates for HID by IOU and Gross Program Group, with Relative Precisions – Not Including Large Calculated

Gross Program Group	n	Gross Realization Rates - kWh			Gross Realization Rates – kW		
		First Year	Lifecycle	RP - Lifecycle	First Year	Lifecycle	RP - Lifecycle
PG&E Deemed	5	95%	277%	36%	104%	307%	49%
PG&E Custom							
PG&E 3P							
PG&E LGP/DI	26	37%	36%	54%	28%	27%	57%
PG&E Total	**31**	**45%**	**48%**	**40%**	**39%**	**41%**	**40%**
SCE DI							
SCE Deemed	6	153%	712%	54%	158%	739%	47%
SCE Custom							
SCE 3P							
SCE LGP							
SCE Total	**6**	**153%**	**712%**	**54%**	**158%**	**739%**	**47%**
SDGE DI							
SDGE Deemed	3	196%	40%	1%	113%	24%	11%
SDGE Custom							
SDGE 3P/LGP							
SDG&E Total	**3**	**196%**	**40%**	**1%**	**113%**	**24%**	**11%**
SW DI							
SW Deemed	**14**	**162%**	**266%**	**46%**	**141%**	**248%**	**41%**
SW Custom							
SW 3P							
SW LGP	**26**	**37%**	**36%**	**54%**	**28%**	**27%**	**57%**
Statewide Total	**40**	**129%**	**164%**	**42%**	**108%**	**142%**	**38%**

Table 5-18: Comparison of Gross First Year and Lifecycle kWh and kW Realization Rates for Delamping by IOU and Gross Program Group, with Relative Precisions – Not Including Large Calculated

Gross Program Group	n	Gross Realization Rates - kWh			Gross Realization Rates – kW		
		First Year	Lifecycle	RP - Lifecycle	First Year	Lifecycle	RP - Lifecycle
PG&E Deemed	33	48%	66%	48%	58%	81%	61%
PG&E Custom							
PG&E 3P	28	36%	31%	36%	68%	72%	45%
PG&E LGP/DI	54	44%	49%	27%	45%	51%	26%
PG&E Total	**115**	**43%**	**49%**	**23%**	**53%**	**63%**	**26%**
SCE DI	38	52%	81%	28%	54%	85%	30%
SCE Deemed	58	64%	155%	23%	59%	143%	30%
SCE Custom							
SCE 3P	23	55%	113%	32%	44%	88%	46%
SCE LGP							
SCE Total	**119**	**61%**	**133%**	**18%**	**56%**	**121%**	**23%**
SDGE DI							
SDGE Deemed	24	66%	60%	30%	38%	36%	21%
SDGE Custom							
SDGE 3P/LGP							
SDG&E Total	**24**	**66%**	**60%**	**30%**	**38%**	**36%**	**21%**
SW DI	**38**	**52%**	**81%**	**28%**	**54%**	**85%**	**30%**
SW Deemed	**115**	**61%**	**102%**	**18%**	**55%**	**93%**	**24%**
SW Custom							
SW 3P	**51**	**43%**	**55%**	**24%**	**53%**	**81%**	**33%**
SW LGP	**54**	**44%**	**49%**	**27%**	**45%**	**51%**	**26%**
Statewide Total	**258**	**55%**	**80%**	**13%**	**53%**	**81%**	**16%**

Table 5-19: Comparison of Gross First Year and Lifecycle kWh and kW Realization Rates for Linear Fluorescent by IOU and Gross Program Group, with Relative Precisions – Not Including Large Calculated

Gross Program Group	n	Gross Realization Rates - kWh			Gross Realization Rates – kW		
		First Year	Lifecycle	RP - Lifecycle	First Year	Lifecycle	RP - Lifecycle
PG&E Deemed	76	49%	75%	33%	48%	74%	35%
PG&E Custom	14	85%	54%	59%	59%	40%	55%
PG&E 3P	44	49%	59%	74%	59%	67%	79%
PG&E LGP/DI	127	33%	33%	63%	33%	33%	55%
PG&E Total	**261**	**48%**	**45%**	**33%**	**43%**	**42%**	**31%**
SCE DI	240	28%	45%	14%	30%	50%	15%
SCE Deemed	114	133%	154%	60%	92%	110%	51%
SCE Custom	10	90%	62%	45%	61%	46%	63%
SCE 3P	73	58%	91%	19%	42%	66%	25%
SCE LGP	43	59%	100%	40%	49%	86%	39%
SCE Total	**480**	**86%**	**85%**	**29%**	**61%**	**63%**	**31%**
SDGE DI	134	45%	62%	21%	47%	65%	15%
SDGE Deemed	78	57%	67%	19%	42%	52%	24%
SDGE Custom							
SDGE 3P/LGP	7	71%	50%	33%	85%	65%	22%
SDG&E Total	**219**	**60%**	**58%**	**17%**	**57%**	**59%**	**13%**
SW DI	**374**	**37%**	**55%**	**14%**	**39%**	**59%**	**11%**
SW Deemed	**268**	**80%**	**94%**	**31%**	**60%**	**74%**	**25%**
SW Custom	**24**	**88%**	**59%**	**36%**	**60%**	**44%**	**46%**
SW 3P	**124**	**63%**	**59%**	**23%**	**66%**	**65%**	**19%**
SW LGP	**170**	**34%**	**35%**	**57%**	**34%**	**35%**	**51%**
Statewide Total	**960**	**63%**	**60%**	**16%**	**53%**	**54%**	**16%**

Table 5-20: Comparison of Gross First Year and Lifecycle kWh and kW Realization Rates for Occupancy Sensors by IOU and Gross Program Group, with Relative Precisions – Not Including Large Calculated

Gross Program Group	n	Gross Realization Rates - kWh			Gross Realization Rates – kW		
		First Year	Lifecycle	RP - Lifecycle	First Year	Lifecycle	RP - Lifecycle
PG&E Deemed	52	41%	41%	42%	46%	46%	46%
PG&E Custom							
PG&E 3P	16	52%	52%	58%	58%	58%	73%
PG&E LGP/DI	30	106%	106%	65%	165%	165%	64%
PG&E Total	**98**	**45%**	**45%**	**33%**	**51%**	**51%**	**37%**
SCE DI	84	69%	69%	38%	21%	21%	45%
SCE Deemed	61	55%	55%	31%	27%	27%	52%
SCE Custom							
SCE 3P							
SCE LGP							
SCE Total	**145**	**56%**	**56%**	**28%**	**27%**	**27%**	**48%**
SDGE DI							
SDGE Deemed	41	89%	47%	22%	70%	37%	21%
SDGE Custom							
SDGE 3P/LGP							
SDG&E Total	**41**	**89%**	**47%**	**22%**	**70%**	**37%**	**21%**
SW DI	**84**	**69%**	**69%**	**38%**	**21%**	**21%**	**45%**
SW Deemed	**154**	**56%**	**48%**	**18%**	**39%**	**34%**	**26%**
SW Custom							
SW 3P	**16**	**52%**	**52%**	**58%**	**58%**	**58%**	**73%**
SW LGP	**30**	**106%**	**106%**	**65%**	**165%**	**165%**	**64%**
Statewide Total	**284**	**57%**	**49%**	**17%**	**40%**	**35%**	**24%**

Table 5-21 presents the sample size, the kWh realization rate, the relative precision for the kWh realization rate, the kW realization rate, and the relative precision for the kW realization rate for each IOU for the Large Calculated sites. Furthermore, the first year gross realization rates are also presented for kWh and kW so a comparison can be made between first year and lifecycle realization rates.

Table 5-21: Comparison of Gross First Year and Lifecycle kWh and kW Realization Rates for Large Calculated Sites by IOU with Relative Precisions

IOU	n	Gross Realization Rates - kWh			Gross Realization Rates - kW		
		First Year	Lifecycle	RP - Lifecycle	First Year	Lifecycle	RP - Lifecycle
PG&E	46	53%	39%	35%	44%	34%	51%
SCE	15	46%	28%	37%	47%	39%	28%
SDG&E	5	43%	26%	39%	39%	26%	67%
Statewide	**66**	**49%**	**32%**	**25%**	**45%**	**35%**	**28%**

There are a few reasons why first year and lifecycle GRRs may differ. First of all, the ex-post and ex-ante EULs may be different. Generally, this is due to differences in the operating hours. When ex-post operating hours are lower than ex-ante (as is typically the case), the EUL will generally increase, particularly for CFL measures. This explains why we see the lifecycle GRRs for CFL basic measures being roughly twice as large as the first year GRRs (recall from above that the ex-post operating hours were about half that of ex-ante). Also, the lifecycle GRRs for CFL reflector measures are about a third to a half larger than the first year GRRs, as operating hours tend to be a quarter to a third lower.

However, occupancy sensors have a fixed EUL of 8 years and are not affected by the hours of operation of the lighting equipment they control. This is why the lifecycle and first year GRRs are identical in all cases, except for SDG&E Deemed. The lower lifecycle GRRs for SDG&E Deemed are due to the ex-ante EUL estimate being 15 years, instead of 8 (which explains why the lifecycle GRR is just over half that of the first year).

For linear fluorescent, delamping and high bay measures, the EUL will often times max out at 15 years, so lower operating hours will not increase the EUL beyond its 15 year maximum. However, another factor that affects the lifecycle GRRs for these measures is the dual baseline. For measures with a dual baseline, the post-RUL impacts are typically much lower than the impact during the RUL period. Therefore, if the ex-post RUL is less than the ex-ante RUL, then the lifecycle GRRs will also decrease relative to the first year GRR. Also, if the percentage of installations being classified as ER is higher for ex-post than ex-ante, the lifecycle GRR will again decrease relative to the first year GRR (because a customer classified as ER will typically exhibit a large decrease in impact after the RUL period, whereas a customer classified as ROB will have a constant impact over the entire EUL period). Finally, when both the ex-post and ex-ante classify an installation as ER, the relative differences in post-RUL wattage between ex-post and ex-ante can cause the lifecycle GRR to increase or decrease relative to the first year.

For linear fluorescents and high bay lighting, the first year and lifecycle GRRs are relatively similar overall, but can vary more significantly at the segment level. Overall, many of the above

factors cancel each other out, but at the segment level any combination of effects may drive the lifecycle GRR up or down relative to the first year GRR. However, the lifecycle GRRs for delamping tend to be higher than first year, due to a couple of factors. First, the ex-post EULs are slightly larger than ex-ante, overall. Second, the post-RUL ex-post delta wattage is larger than ex-ante, overall.

Finally, the HID measures are also affected by the dual baseline. For these measures overall, the average ex-post EUL is more than 50% larger than the ex-ante value, and is the primary reason for higher lifecycle GRRs relative to first year. The fact that about a quarter of these installations are classified as ER is causing the lifecycle GRR to decrease relative to the first year, which is why the lifecycle GRRs are only 25-30% larger than first year GRRs, overall, and not 50% larger.

5.1.3 Net First Year Realization Rates

The gross realization rates presented above were based on the on-site sample, however NTGRs were developed for the larger participant phone survey sample. Net realization rates (NRR) are calculated as the ratio of the evaluated ex-post net savings to the ex-ante net savings. Ex-post net savings are calculated by first multiplying the segment-specific NTGR by the ex-post gross savings for each participant in the on-site sample. The segment-specific NTGR corresponds to the Net Program Group under which the customer participated. Net ex-post and net ex-ante savings are then aggregated across all participants within a HIM-IOU-Gross Program Group segment, only for participants in the on-site sample. The NRR for a given HIM-IOU-Gross Program Group segment is the ratio of the total net ex-post savings divided by the total net ex-ante savings for that segment.

For customer i in the on-site sample, in Net Program Group segment j, the net ex-post savings is estimated as:

$$Net\_Ex\_Post\_Impact_{i,j} = NTGR_{j} \times Gross\_Ex\_Post\_Impact_{i,j}$$

Where,

$NTGR_{j}$ is the segment-specific NTGR for Net Program Group segment j.

$Gross\_Ex\_Post\_Impact_{i,j}$ is the site-specific gross ex-post impact estimate for customer i in the on-site sample, who is in Net Program Group segment j.

Then, the NRR for HIM-IOU-Gross Program Group segment k is estimated as:

$$Net\_Realization\_Rate_k = \frac{\sum_{i=1}^{n} Net\_Ex\_Post\_Impact_{i,k}}{\sum_{i=1}^{n} Net\_Ex\_Ante\_Impact_{i,k}}$$

Where,

Net_Ex_Post_Impact$_{i,k}$ is the site-specific net ex-post impact estimate for customer i, in the on-site sample, who is in HIM-IOU-Gross Program Group segment k.

Net_Ex_Ante_Impact$_{i,k}$ is the site-specific net ex-ante impact estimate for customer i, in the on-site sample, who is in HIM-IOU-Gross Program Group segment k.

Net realization rates are calculated separately for kWh and kW. For developing ex-post net savings values, NTGRs are applied by Net Program Group. Table 5-22 compares the ex-ante and ex-post NTGRs by Net Program Group. Overall, at the statewide and IOU levels, the ex-post NTGRs are about 20% less than the ex-ante values. Appendix H provides a detailed description of how the NTGR values are developed.

Table 5-22: Comparison of Ex-ante and Ex-post NTGRs by Net Program Group, Weighted by kWh and kW Savings

Net Program Group	N	Ex-Ante NTGR kWh	Ex-Post NTGR kWh	Ex-Ante NTGR kW	Ex-Post NTGR kW
PG&E					
PGE Core/SW Custom	45	0.71	0.48	0.70	0.44
PGE Deemed Ag	19	0.80	0.59	0.80	0.60
PGE Deemed Com	189	0.79	0.62	0.79	0.62
PGE Deemed Ind	50	0.78	0.51	0.79	0.52
PGE LGP East Bay	140	0.70	0.65	0.70	0.65
PGE LGP LGEAR	44	0.73	0.58	0.74	0.58
PGE LGP Marin	39	0.70	0.60	0.70	0.60
PGE LGP Redwood	40	0.70	0.64	0.70	0.65
PGE LGP SF	100	0.70	0.57	0.70	0.55
PGE 3P Other	135	0.78	0.61	0.78	0.59
PGE Energy Fitness	58	0.77	0.64	0.77	0.64
PGE RightLights	156	0.78	0.63	0.78	0.63
PGE SW Partnership	5	0.64	0.54	0.64	0.52
PGE DI Ecology	57	0.79	0.57	0.78	0.56
PGE DI RHA	63	0.78	0.70	0.78	0.70
PGE DI Staples	60	0.70	0.61	0.70	0.61
PGE DI Staples and RHA	18	0.71	0.68	0.70	0.67
PGE DI Synergy	35	0.70	0.64	0.70	0.65
PGE DI TEAA	42	0.79	0.55	0.79	0.54
PG&E Total	**1,295**	**0.76**	**0.60**	**0.76**	**0.60**
SCE					
SCE Core/ SW Custom	55	0.66	0.50	0.66	0.53
SCE Deemed Ag	28	0.79	0.63	0.78	0.64
SCE Deemed Com	136	0.79	0.60	0.79	0.61
SCE Deemed Ind	136	0.79	0.63	0.78	0.63
SCE Direct Install	194	0.85	0.69	0.85	0.70
SCE LGP ELP	63	0.77	0.53	0.80	0.47
SCE LGP Institutional	18	0.69	0.62	0.69	0.63
SCE 3P	56	0.73	0.52	0.77	0.58
SCE 3P Mgmt Affiliates	11	0.80	0.57	0.82	0.55
SCE 3P Preschool	46	0.85	0.69	0.85	0.69
SCE 3P Schools	12	0.85	0.66	0.85	0.53
SCE Total	**755**	**0.79**	**0.61**	**0.80**	**0.62**
SDG&E					
SDGE Core/ SW Custom	13	0.67	0.61	0.68	0.57
SDGE BID	41	0.64	0.57	0.64	0.60
SDGE Deemed COM	113	0.79	0.55	0.79	0.55
SDGE Deemed IND_AG	27	0.79	0.59	0.79	0.60
SDGE Direct Install	132	0.82	0.64	0.82	0.64
SDGE MEC	67	0.85	0.62	0.85	0.62
SDGE Total	**393**	**0.75**	**0.58**	**0.75**	**0.59**
Grand Total	**2,443**	**0.78**	**0.61**	**0.78**	**0.61**

Table 5-23 and Table 5-24 present the kWh and kW net realization rates, respectively, by HIM, IOU and Gross Program Group. Again, Large Calculated sites are not included in these results, but are presented separately below.

Table 5-23: Net kWh Realization Rates by HIM, IOU and Gross Program Group – Not Including Large Calculated

Gross Program Group	CFL Basic	CFL Reflector	High Bay	HID	Delamp	Linear	Occ Sensors	Total
PG&E Deemed		127%	41%	*77%*	37%	38%	29%	**42%**
PG&E Custom						58%		**58%**
PG&E 3P	38%		47%		28%	39%	38%	**41%**
PG&E LGP/DI	17%	75%	30%	34%	38%	28%	85%	**31%**
PG&E Total	**28%**	**107%**	**42%**	**40%**	**35%**	**36%**	**32%**	**39%**
SCE DI	24%	52%	56%		42%	23%	56%	**38%**
SCE Deemed		18%	50%	*119%*	51%	103%	40%	**60%**
SCE Custom						70%		**70%**
SCE 3P					42%	41%		**41%**
SCE LGP						40%		**40%**
SCE Total	**24%**	**25%**	**50%**	***119%***	**48%**	**65%**	**41%**	**57%**
SDGE DI	74%	47%				36%		**41%**
SDGE Deemed	33%	22%	29%	*139%*	46%	41%	58%	**49%**
SDGE 3P/LGP	33%					64%		**63%**
SDG&E Total	**49%**	**32%**	**29%**	***139%***	**46%**	**48%**	**58%**	**50%**
SW DI	**42%**	**50%**	**56%**		**42%**	**30%**	**56%**	**39%**
SW Deemed	**33%**	**40%**	**42%**	**122%**	**47%**	**61%**	**40%**	**52%**
SW Custom						**65%**		**65%**
SW 3P	**38%**		**47%**		**34%**	**51%**	**38%**	**45%**
SW LGP	**17%**	**75%**	**30%**	**34%**	**38%**	**28%**	**85%**	**31%**
Statewide Total	**30%**	**45%**	**42%**	**101%**	**43%**	**49%**	**41%**	**48%**

* Italics indicate segment level results that are supported by small samples sizes of six or less.

Table 5-24: Net kW Realization Rates by HIM, IOU and Gross Program Group – Not Including Large Calculated

Gross Program Group	CFL Basic	CFL Reflector	High Bay	HID	Delamp	Linear	Occ Sensors	Total
PG&E Deemed		115%	34%	*83%*	44%	37%	33%	**38%**
PG&E Custom						38%		**38%**
PG&E 3P	71%		32%		52%	45%	41%	**41%**
PG&E LGP/DI	13%	68%	26%	25%	39%	28%	133%	**29%**
PG&E Total	**38%**	**97%**	**33%**	**34%**	**42%**	**33%**	**36%**	**36%**
SCE DI	26%	59%	56%		44%	25%	17%	**35%**
SCE Deemed		11%	46%	*125%*	47%	72%	20%	**50%**
SCE Custom						50%		**50%**
SCE 3P					33%	31%		**32%**
SCE LGP						31%		**31%**
SCE Total	**26%**	**22%**	**46%**	***125%***	**44%**	**48%**	**20%**	**47%**
SDGE DI	69%	50%				37%		**41%**
SDGE Deemed	25%	22%	24%	*80%*	27%	30%	46%	**35%**
SDGE 3P/LGP	28%					80%		**78%**
SDG&E Total	**44%**	**35%**	**24%**	***80%***	**27%**	**46%**	**46%**	**40%**
SW DI	**42%**	**56%**	**56%**		**44%**	**32%**	**17%**	**37%**
SW Deemed	**25%**	**33%**	**37%**	**109%**	**43%**	**46%**	**28%**	**43%**
SW Custom						**46%**		**46%**
SW 3P	**69%**		**32%**		**40%**	**54%**	**41%**	**45%**
SW LGP	**13%**	**68%**	**26%**	**25%**	**39%**	**28%**	**133%**	**29%**
Statewide Total	**37%**	**41%**	**36%**	**86%**	**42%**	**41%**	**28%**	**41%**

* Italics indicate segment level results that are supported by small samples sizes of six or less.

Table 5-25 through Table 5-31 present separate results for each HIM, by IOU and Gross Program Group, which include the sample size, the kWh NRRs, the relative precision for the kWh NRRs, the kW NRRs, and the relative precision for the kW NRR. Large Calculated sites are not included in these results.

Table 5-25: Net kWh and kW Realization Rates for CFL Basic by IOU and Gross Program Group, with Relative Precisions – Not Including Large Calculated

Gross Program Group	n	NRR kWh	Relative Precision	NRR kW	Relative Precision
PG&E Deemed					
PG&E Custom					
PG&E 3P	32	38%	37%	71%	40%
PG&E LGP/DI	100	17%	38%	13%	33%
PG&E Total	**132**	**28%**	**28%**	**38%**	**33%**
SCE DI	79	24%	35%	26%	38%
SCE Deemed					
SCE Custom					
SCE 3P					
SCE LGP					
SCE Total	**79**	**24%**	**35%**	**26%**	**38%**
SDGE DI	33	74%	17%	69%	24%
SDGE Deemed	10	33%	60%	25%	75%
SDGE Custom					
SDGE 3P/LGP	14	33%	78%	28%	85%
SDG&E Total	**57**	**49%**	**22%**	**44%**	**26%**
SW DI	**112**	**42%**	**17%**	**42%**	**21%**
SW Deemed	**10**	**33%**	**60%**	**25%**	**75%**
SW Custom					
SW 3P	**46**	**38%**	**35%**	**69%**	**39%**
SW LGP	**100**	**17%**	**38%**	**13%**	**33%**
Statewide Total	**268**	**30%**	**20%**	**37%**	**25%**

Table 5-26: Net kWh and kW Realization Rates for CFL Reflector by IOU and Gross Program Group, with Relative Precisions – Not Including Large Calculated

Gross Program Group	n	NRR kWh	Relative Precision	NRR kW	Relative Precision
PG&E Deemed	12	127%	72%	115%	50%
PG&E Custom					
PG&E 3P					
PG&E LGP/DI	28	75%	26%	68%	39%
PG&E Total	**40**	**107%**	**54%**	**97%**	**39%**
SCE DI	44	52%	32%	59%	30%
SCE Deemed	16	18%	83%	11%	137%
SCE Custom					
SCE 3P					
SCE LGP					
SCE Total	**60**	**25%**	**48%**	**22%**	**58%**
SDGE DI	25	47%	23%	50%	26%
SDGE Deemed	9	22%	44%	22%	42%
SDGE Custom					
SDGE 3P/LGP					
SDG&E Total	**34**	**32%**	**22%**	**35%**	**22%**
SW DI	**69**	**50%**	**25%**	**56%**	**23%**
SW Deemed	**37**	**40%**	**52%**	**33%**	**48%**
SW Custom					
SW 3P					
SW LGP	**28**	**75%**	**26%**	**68%**	**39%**
Statewide Total	**134**	**45%**	**34%**	**41%**	**29%**

Table 5-27: Net kWh and kW Realization Rates for High Bay Lighting by IOU and Gross Program Group, with Relative Precisions – Not Including Large Calculated

Gross Program Group	n	NRR kWh	Relative Precision	NRR kW	Relative Precision
PG&E Deemed	45	41%	13%	34%	16%
PG&E Custom					
PG&E 3P	28	47%	44%	32%	38%
PG&E LGP/DI	23	30%	25%	26%	22%
PG&E Total	**96**	**42%**	**16%**	**33%**	**15%**
SCE DI	19	56%	47%	56%	57%
SCE Deemed	54	50%	20%	46%	15%
SCE Custom					
SCE 3P					
SCE LGP					
SCE Total	**73**	**50%**	**19%**	**46%**	**14%**
SDGE DI					
SDGE Deemed	24	29%	26%	24%	44%
SDGE Custom					
SDGE 3P/LGP					
SDG&E Total	**24**	**29%**	**26%**	**24%**	**44%**
SW DI	**19**	**56%**	**47%**	**56%**	**57%**
SW Deemed	**123**	**42%**	**12%**	**37%**	**11%**
SW Custom					
SW 3P	**28**	**47%**	**44%**	**32%**	**38%**
SW LGP	**23**	**30%**	**25%**	**26%**	**22%**
Statewide Total	**193**	**42%**	**11%**	**36%**	**10%**

Table 5-28: Net kWh and kW Realization Rates for HID by IOU and Gross Program Group, with Relative Precisions – Not Including Large Calculated

Gross Program Group	n	NRR kWh	Relative Precision	NRR kW	Relative Precision
PG&E Deemed	5	77%	26%	83%	11%
PG&E Custom					
PG&E 3P					
PG&E LGP/DI	26	34%	51%	25%	53%
PG&E Total	**31**	**40%**	**38%**	**34%**	**35%**
SCE DI					
SCE Deemed	6	119%	55%	125%	48%
SCE Custom					
SCE 3P					
SCE LGP					
SCE Total	**6**	**119%**	**55%**	**125%**	**48%**
SDGE DI					
SDGE Deemed	3	139%	5%	80%	3%
SDGE Custom					
SDGE 3P/LGP					
SDG&E Total	**3**	**139%**	**5%**	**80%**	**3%**
SW DI					
SW Deemed	**14**	**122%**	**36%**	**109%**	**35%**
SW Custom					
SW 3P					
SW LGP	**26**	**34%**	**51%**	**25%**	**53%**
Statewide Total	**40**	**101%**	**33%**	**86%**	**33%**

Table 5-29: Net kWh and kW Realization Rates for Delamping by IOU and Gross Program Group, with Relative Precisions – Not Including Large Calculated

Gross Program Group	n	NRR kWh	Relative Precision	NRR kW	Relative Precision
PG&E Deemed	33	37%	45%	44%	56%
PG&E Custom					
PG&E 3P	28	28%	28%	52%	44%
PG&E LGP/DI	54	38%	26%	39%	23%
PG&E Total	**115**	**35%**	**20%**	**42%**	**23%**
SCE DI	38	42%	32%	44%	30%
SCE Deemed	58	51%	23%	47%	31%
SCE Custom					
SCE 3P	23	42%	25%	33%	37%
SCE LGP					
SCE Total	**119**	**48%**	**18%**	**44%**	**23%**
SDGE DI					
SDGE Deemed	24	46%	51%	27%	41%
SDGE Custom					
SDGE 3P/LGP					
SDG&E Total	**24**	**46%**	**51%**	**27%**	**41%**
SW DI	**38**	**42%**	**32%**	**44%**	**30%**
SW Deemed	**115**	**47%**	**19%**	**43%**	**25%**
SW Custom					
SW 3P	**51**	**34%**	**19%**	**40%**	**29%**
SW LGP	**54**	**38%**	**26%**	**39%**	**23%**
Statewide Total	**258**	**43%**	**13%**	**42%**	**16%**

Table 5-30: Net kWh and kW Realization Rates for Linear Fluorescent by IOU and Gross Program Group, with Relative Precisions – Not Including Large Calculated

Gross Program Group	n	NRR kWh	Relative Precision	NRR kW	Relative Precision
PG&E Deemed	76	38%	29%	37%	30%
PG&E Custom	14	58%	67%	38%	64%
PG&E 3P	44	39%	67%	45%	80%
PG&E LGP/DI	127	28%	68%	28%	60%
PG&E Total	**261**	**36%**	**35%**	**33%**	**34%**
SCE DI	240	23%	13%	25%	13%
SCE Deemed	114	103%	60%	72%	53%
SCE Custom	10	70%	57%	50%	68%
SCE 3P	73	41%	13%	31%	27%
SCE LGP	43	40%	45%	31%	45%
SCE Total	**480**	**65%**	**34%**	**48%**	**33%**
SDGE DI	134	36%	24%	37%	18%
SDGE Deemed	78	41%	28%	30%	30%
SDGE Custom					
SDGE 3P/LGP	7	64%	27%	80%	19%
SDG&E Total	**219**	**48%**	**17%**	**46%**	**13%**
SW DI	**374**	**30%**	**16%**	**32%**	**12%**
SW Deemed	**268**	**61%**	**35%**	**46%**	**29%**
SW Custom	**24**	**65%**	**44%**	**46%**	**51%**
SW 3P	**124**	**51%**	**20%**	**54%**	**19%**
SW LGP	**170**	**28%**	**63%**	**28%**	**57%**
Statewide Total	**960**	**49%**	**18%**	**41%**	**17%**

Table 5-31: Net kWh and kW Realization Rates for Occupancy Sensors by IOU and Gross Program Group, with Relative Precisions – Not Including Large Calculated

Gross Program Group	n	NRR kWh	Relative Precision	NRR kW	Relative Precision
PG&E Deemed	52	29%	41%	33%	47%
PG&E Custom					
PG&E 3P	16	38%	58%	41%	73%
PG&E LGP/DI	30	85%	67%	133%	66%
PG&E Total	**98**	**32%**	**32%**	**36%**	**38%**
SCE DI	84	56%	38%	17%	45%
SCE Deemed	61	40%	30%	20%	52%
SCE Custom					
SCE 3P					
SCE LGP					
SCE Total	**145**	**41%**	**28%**	**20%**	**47%**
SDGE DI					
SDGE Deemed	41	58%	22%	46%	21%
SDGE Custom					
SDGE 3P/LGP					
SDG&E Total	**41**	**58%**	**22%**	**46%**	**21%**
SW DI	**84**	**56%**	**38%**	**17%**	**45%**
SW Deemed	**154**	**40%**	**18%**	**28%**	**27%**
SW Custom					
SW 3P	**16**	**38%**	**58%**	**41%**	**73%**
SW LGP	**30**	**85%**	**67%**	**133%**	**66%**
Statewide Total	**284**	**41%**	**17%**	**28%**	**24%**

Table 5-32 presents the sample size, the kWh NRRs, the relative precision for the kWh NRRs, the kW NRRs, and the relative precision for the kW NRR for each IOU for the Large Calculated sites.

Table 5-32: Net kWh and kW Realization Rates for Large Calculated Sites by IOU with Relative Precisions

IOU	n	NRR kWh	Relative Precision	NRR kW	Relative Precision
PG&E	46	42%	47%	36%	67%
SCE	15	37%	33%	41%	29%
SDG&E	5	37%	31%	36%	78%
Statewide	**66**	**40%**	**27%**	**38%**	**35%**

The NRRs differ from one for the same reasons as the GRRs, plus the NRRs are also affected by differences between the ex-post and ex-ante NTGRs. For the most part, the ex-post NTGRs are less than the ex-ante NTGRs, which explains why the NRRs are lower than the GRRs. As mentioned above, at the statewide and IOU levels, the ex-post NTGRs are about 20% less than the ex-ante values.

5.1.4 Lifecycle Net Realization Rates

Net lifecycle realization rates can be estimated in a similar way as gross lifecycle realization rates, by looking at the ratio of the evaluated ex-post net lifecycle savings to the ex-ante net lifecycle savings. The approach is identical to that for the gross lifecycle realization rates, but using net savings instead of gross.

Table 5-33 and Table 5-34 present the kWh and kW net lifecycle realization rates, respectively, by HIM, IOU, and Gross Program Group. Again, Large Calculated sites are not included and results are presented separately below.

Table 5-33: Net Lifecycle kWh Realization Rates by HIM, IOU and Gross Program Group – Not Including Large Calculated

Gross Program Group	CFL Basic	CFL Reflector	High Bay	HID	Delamp	Linear	Occ Sensors	Total
PG&E Deemed		108%	42%	*224%*	51%	58%	29%	**45%**
PG&E Custom						37%		**37%**
PG&E 3P	59%		42%		24%	46%	38%	**40%**
PG&E LGP/DI	52%	120%	15%	33%	43%	27%	85%	**30%**
PG&E Total	**56%**	**112%**	**38%**	**43%**	**40%**	**35%**	**32%**	**38%**
SCE DI	61%	78%	44%		66%	37%	56%	**50%**
SCE Deemed		49%	63%	*553%*	123%	119%	40%	**101%**
SCE Custom						49%		**49%**
SCE 3P					86%	64%		**71%**
SCE LGP						68%		**68%**
SCE Total	**61%**	**56%**	**62%**	***553%***	**104%**	**66%**	**41%**	**86%**
SDGE DI	170%	87%				50%		**55%**
SDGE Deemed	44%	27%	14%	*29%*	42%	48%	31%	**27%**
SDGE 3P/LGP	38%					45%		**45%**
SDG&E Total	**94%**	**52%**	**14%**	***29%***	**42%**	**47%**	**31%**	**32%**
SW DI	**97%**	**80%**	**44%**		**66%**	**44%**	**56%**	**52%**
SW Deemed	**44%**	**58%**	**42%**	**205%**	**78%**	**71%**	**34%**	**59%**
SW Custom						**44%**		**44%**
SW 3P	**58%**		**42%**		**43%**	**49%**	**38%**	**46%**
SW LGP	**52%**	**120%**	**15%**	**33%**	**43%**	**29%**	**85%**	**30%**
Statewide Total	**62%**	**66%**	**40%**	**132%**	**63%**	**47%**	**35%**	**51%**

* Italics indicate segment level results that are supported by small samples sizes of six or less.

Table 5-34: Net Lifecycle kW Realization Rates by HIM, IOU and Gross Program Group – Not Including Large Calculated

Gross Program Group	CFL Basic	CFL Reflector	High Bay	HID	Delamp	Linear	Occ Sensors	Total
PG&E Deemed		101%	35%	*245%*	61%	57%	33%	**42%**
PG&E Custom						26%		**26%**
PG&E 3P	100%		28%		55%	50%	41%	**37%**
PG&E LGP/DI	40%	126%	14%	25%	45%	28%	133%	**28%**
PG&E Total	**67%**	**109%**	**29%**	**36%**	**51%**	**32%**	**36%**	**34%**
SCE DI	68%	88%	42%		70%	41%	17%	**46%**
SCE Deemed		21%	59%	*585%*	115%	87%	20%	**84%**
SCE Custom						38%		**38%**
SCE 3P					67%	49%		**55%**
SCE LGP						54%		**54%**
SCE Total	**68%**	**36%**	**58%**	***585%***	**95%**	**51%**	**20%**	**71%**
SDGE DI	161%	94%				52%		**57%**
SDGE Deemed	45%	29%	13%	*17%*	25%	37%	24%	**21%**
SDGE 3P/LGP	23%					60%		**60%**
SDG&E Total	**93%**	**59%**	**13%**	***17%***	**25%**	**48%**	**24%**	**28%**
SW DI	**100%**	**90%**	**42%**		**70%**	**47%**	**17%**	**49%**
SW Deemed	**45%**	**37%**	**38%**	**195%**	**72%**	**56%**	**24%**	**51%**
SW Custom						**33%**		**33%**
SW 3P	**96%**		**28%**		**62%**	**55%**	**41%**	**46%**
SW LGP	**40%**	**126%**	**14%**	**25%**	**45%**	**29%**	**133%**	**28%**
Statewide Total	**71%**	**54%**	**35%**	**117%**	**64%**	**43%**	**25%**	**45%**

* Italics indicate segment level results that are supported by small samples sizes of six or less.

Table 5-35 through Table 5-41 present separate tables for each HIM, by IOU and Gross Program Group, which include the sample size, the kWh net lifecycle realization rate, the relative precision for the kWh realization rate, the kW net lifecycle realization rate, and the relative precision for the kW realization rate. Furthermore, the first year net realization rates are also presented for kWh and kW so a comparison can be made between first year and lifecycle realization rates.

Table 5-35: Comparison of Net First Year and Lifecycle kWh and kW Realization Rates for CFL Basic by IOU and Gross Program Group, with Relative Precisions – Not Including Large Calculated

Gross Program Group	n	Net Realization Rates - kWh			Net Realization Rates – kW		
		First Year	Lifecycle	RP - Lifecycle	First Year	Lifecycle	RP - Lifecycle
PG&E Deemed							
PG&E Custom							
PG&E 3P	32	38%	59%	28%	100%	71%	38%
PG&E LGP/DI	100	17%	52%	20%	40%	13%	22%
PG&E Total	**132**	**28%**	**56%**	**18%**	**67%**	**38%**	**26%**
SCE DI	79	24%	61%	32%	68%	26%	32%
SCE Deemed							
SCE Custom							
SCE 3P							
SCE LGP							
SCE Total	**79**	**24%**	**61%**	**32%**	**68%**	**26%**	**32%**
SDGE DI	33	74%	170%	21%	161%	69%	30%
SDGE Deemed	10	33%	44%	38%	45%	25%	56%
SDGE Custom							
SDGE 3P/LGP	14	33%	38%	66%	23%	28%	78%
SDG&E Total	**57**	**49%**	**94%**	**18%**	**93%**	**44%**	**25%**
SW DI	**112**	**42%**	**97%**	**18%**	**100%**	**42%**	**22%**
SW Deemed	**10**	**33%**	**44%**	**38%**	**45%**	**25%**	**56%**
SW Custom							
SW 3P	**46**	**38%**	**58%**	**27%**	**96%**	**69%**	**37%**
SW LGP	**100**	**17%**	**52%**	**20%**	**40%**	**13%**	**22%**
Statewide Total	**268**	**30%**	**62%**	**13%**	**71%**	**37%**	**19%**

Table 5-36: Comparison of Net First Year and Lifecycle kWh and kW Realization Rates for CFL Reflector by IOU and Gross Program Group, with Relative Precisions – Not Including Large Calculated

Gross Program Group	n	Net Realization Rates - kWh			Net Realization Rates – kW		
		First Year	Lifecycle	RP - Lifecycle	First Year	Lifecycle	RP - Lifecycle
PG&E Deemed	12	127%	108%	63%	101%	115%	50%
PG&E Custom							
PG&E 3P							
PG&E LGP/DI	28	75%	120%	24%	126%	68%	33%
PG&E Total	**40**	**107%**	**112%**	**41%**	**109%**	**97%**	**33%**
SCE DI	44	52%	78%	22%	88%	59%	21%
SCE Deemed	16	18%	49%	22%	21%	11%	127%
SCE Custom							
SCE 3P							
SCE LGP							
SCE Total	**60**	**25%**	**56%**	**17%**	**36%**	**22%**	**58%**
SDGE DI	25	47%	87%	14%	94%	50%	29%
SDGE Deemed	9	22%	27%	21%	29%	22%	21%
SDGE Custom							
SDGE 3P/LGP							
SDG&E Total	**34**	**32%**	**52%**	**12%**	**59%**	**35%**	**22%**
SW DI	**69**	**50%**	**80%**	**16%**	**90%**	**56%**	**17%**
SW Deemed	**37**	**40%**	**58%**	**26%**	**37%**	**33%**	**58%**
SW Custom							
SW 3P							
SW LGP	**28**	**75%**	**120%**	**24%**	**126%**	**68%**	**33%**
Statewide Total	**134**	**45%**	**66%**	**17%**	**54%**	**41%**	**30%**

Table 5-37: Comparison of Net First Year and Lifecycle kWh and kW Realization Rates for High Bay Lighting by IOU and Gross Program Group, with Relative Precisions – Not Including Large Calculated

Gross Program Group	n	Net Realization Rates - kWh			Net Realization Rates – kW		
		First Year	Lifecycle	RP - Lifecycle	First Year	Lifecycle	RP - Lifecycle
PG&E Deemed	45	41%	42%	16%	35%	34%	24%
PG&E Custom							
PG&E 3P	28	47%	42%	40%	28%	32%	34%
PG&E LGP/DI	23	30%	15%	26%	14%	26%	29%
PG&E Total	**96**	**42%**	**38%**	**17%**	**29%**	**33%**	**18%**
SCE DI	19	56%	44%	45%	42%	56%	54%
SCE Deemed	54	50%	63%	19%	59%	46%	21%
SCE Custom							
SCE 3P							
SCE LGP							
SCE Total	**73**	**50%**	**62%**	**18%**	**58%**	**46%**	**20%**
SDGE DI							
SDGE Deemed	24	29%	14%	50%	13%	24%	68%
SDGE Custom							
SDGE 3P/LGP							
SDG&E Total	**24**	**29%**	**14%**	**50%**	**13%**	**24%**	**68%**
SW DI	**19**	**56%**	**44%**	**45%**	**42%**	**56%**	**54%**
SW Deemed	**123**	**42%**	**42%**	**13%**	**38%**	**37%**	**16%**
SW Custom							
SW 3P	**28**	**47%**	**42%**	**40%**	**28%**	**32%**	**34%**
SW LGP	**23**	**30%**	**15%**	**26%**	**14%**	**26%**	**29%**
Statewide Total	**193**	**42%**	**40%**	**12%**	**35%**	**36%**	**14%**

Table 5-38: Comparison of Net First Year and Lifecycle kWh and kW Realization Rates for HID by IOU and Gross Program Group, with Relative Precisions – Not Including Large Calculated

Gross Program Group	n	Net Realization Rates - kWh			Net Realization Rates – kW		
		First Year	Lifecycle	RP - Lifecycle	First Year	Lifecycle	RP - Lifecycle
PG&E Deemed	5	77%	224%	36%	245%	83%	49%
PG&E Custom							
PG&E 3P							
PG&E LGP/DI	26	34%	33%	55%	25%	25%	57%
PG&E Total	**31**	**40%**	**43%**	**41%**	**36%**	**34%**	**41%**
SCE DI							
SCE Deemed	6	119%	553%	54%	585%	125%	47%
SCE Custom							
SCE 3P							
SCE LGP							
SCE Total	**6**	**119%**	**553%**	**54%**	**585%**	**125%**	**47%**
SDGE DI							
SDGE Deemed	3	139%	29%	1%	17%	80%	12%
SDGE Custom							
SDGE 3P/LGP							
SDG&E Total	**3**	**139%**	**29%**	**1%**	**17%**	**80%**	**12%**
SW DI							
SW Deemed	**14**	**122%**	**205%**	**47%**	**195%**	**109%**	**41%**
SW Custom							
SW 3P							
SW LGP	**26**	**34%**	**33%**	**55%**	**25%**	**25%**	**57%**
Statewide Total	**40**	**101%**	**132%**	**42%**	**117%**	**86%**	**38%**

Table 5-39: Comparison of Net First Year and Lifecycle kWh and kW Realization Rates for Delamping by IOU and Gross Program Group, with Relative Precisions – Not Including Large Calculated

Gross Program Group	n	Net Realization Rates - kWh			Net Realization Rates – kW		
		First Year	Lifecycle	RP - Lifecycle	First Year	Lifecycle	RP - Lifecycle
PG&E Deemed	33	37%	51%	44%	61%	44%	57%
PG&E Custom							
PG&E 3P	28	28%	24%	37%	55%	52%	45%
PG&E LGP/DI	54	38%	43%	26%	45%	39%	25%
PG&E Total	**115**	**35%**	**40%**	**21%**	**51%**	**42%**	**24%**
SCE DI	38	42%	66%	28%	70%	44%	30%
SCE Deemed	58	51%	123%	23%	115%	47%	30%
SCE Custom							
SCE 3P	23	42%	86%	32%	67%	33%	48%
SCE LGP							
SCE Total	**119**	**48%**	**104%**	**18%**	**95%**	**44%**	**22%**
SDGE DI							
SDGE Deemed	24	46%	42%	30%	25%	27%	21%
SDGE Custom							
SDGE 3P/LGP							
SDG&E Total	**24**	**46%**	**42%**	**30%**	**25%**	**27%**	**21%**
SW DI	**38**	**42%**	**66%**	**28%**	**70%**	**44%**	**30%**
SW Deemed	**115**	**47%**	**78%**	**18%**	**72%**	**43%**	**23%**
SW Custom							
SW 3P	**51**	**34%**	**43%**	**24%**	**62%**	**40%**	**34%**
SW LGP	**54**	**38%**	**43%**	**26%**	**45%**	**39%**	**25%**
Statewide Total	**258**	**43%**	**63%**	**13%**	**64%**	**42%**	**16%**

Table 5-40: Comparison of Net First Year and Lifecycle kWh and kW Realization Rates for Linear Fluorescent by IOU and Gross Program Group, with Relative Precisions – Not Including Large Calculated

Gross Program Group	n	Net Realization Rates - kWh			Net Realization Rates – kW		
		First Year	Lifecycle	RP - Lifecycle	First Year	Lifecycle	RP - Lifecycle
PG&E Deemed	76	38%	58%	34%	57%	37%	36%
PG&E Custom	14	58%	37%	50%	26%	38%	49%
PG&E 3P	44	39%	46%	74%	50%	45%	79%
PG&E LGP/DI	127	28%	27%	64%	28%	28%	56%
PG&E Total	**261**	**36%**	**35%**	**33%**	**32%**	**33%**	**32%**
SCE DI	240	23%	37%	14%	41%	25%	15%
SCE Deemed	114	103%	119%	60%	87%	72%	51%
SCE Custom	10	70%	49%	45%	38%	50%	63%
SCE 3P	73	41%	64%	16%	49%	31%	27%
SCE LGP	43	40%	68%	45%	54%	31%	46%
SCE Total	**480**	**65%**	**66%**	**29%**	**51%**	**48%**	**29%**
SDGE DI	134	36%	50%	21%	52%	37%	15%
SDGE Deemed	78	41%	48%	19%	37%	30%	24%
SDGE Custom							
SDGE 3P/LGP	7	64%	45%	33%	60%	80%	22%
SDG&E Total	**219**	**48%**	**47%**	**17%**	**48%**	**46%**	**13%**
SW DI	**374**	**30%**	**44%**	**14%**	**47%**	**32%**	**11%**
SW Deemed	**268**	**61%**	**71%**	**31%**	**56%**	**46%**	**26%**
SW Custom	**24**	**65%**	**44%**	**34%**	**33%**	**46%**	**47%**
SW 3P	**124**	**51%**	**49%**	**23%**	**55%**	**54%**	**19%**
SW LGP	**170**	**28%**	**29%**	**59%**	**29%**	**28%**	**53%**
Statewide Total	**960**	**49%**	**47%**	**16%**	**43%**	**41%**	**16%**

Table 5-41: Comparison of Net First Year and Lifecycle kWh and kW Realization Rates for Occupancy Sensors by IOU and Gross Program Group, with Relative Precisions – Not Including Large Calculated

Gross Program Group	n	Net Realization Rates - kWh			Net Realization Rates – kW		
		First Year	Lifecycle	RP - Lifecycle	First Year	Lifecycle	RP - Lifecycle
PG&E Deemed	52	29%	29%	41%	33%	33%	47%
PG&E Custom							
PG&E 3P	16	38%	38%	58%	41%	41%	73%
PG&E LGP/DI	30	85%	85%	67%	133%	133%	66%
PG&E Total	**98**	**32%**	**32%**	**32%**	**36%**	**36%**	**38%**
SCE DI	84	56%	56%	38%	17%	17%	45%
SCE Deemed	61	40%	40%	30%	20%	20%	52%
SCE Custom							
SCE 3P							
SCE LGP							
SCE Total	**145**	**41%**	**41%**	**28%**	**20%**	**20%**	**47%**
SDGE DI							
SDGE Deemed	41	58%	31%	22%	24%	46%	21%
SDGE Custom							
SDGE 3P/LGP							
SDG&E Total	**41**	**58%**	**31%**	**22%**	**24%**	**46%**	**21%**
SW DI	**84**	**56%**	**56%**	**38%**	**17%**	**17%**	**45%**
SW Deemed	**154**	**40%**	**34%**	**18%**	**24%**	**28%**	**27%**
SW Custom							
SW 3P	**16**	**38%**	**38%**	**58%**	**41%**	**41%**	**73%**
SW LGP	**30**	**85%**	**85%**	**67%**	**133%**	**133%**	**66%**
Statewide Total	**284**	**41%**	**35%**	**17%**	**25%**	**28%**	**24%**

Table 5-42 presents the sample size, the net kWh realization rate, the relative precision for the kWh realization rate, the net kW realization rate, and the relative precision for the kW realization rate for each IOU, for the Large Calculated sites. Furthermore, the first year net realization rates are also presented for kWh and kW so a comparison can be made between first year and lifecycle realization rates.

Table 5-42: Comparison of Net First Year and Lifecycle kWh and kW Realization Rates for Large Calculated Sites by IOU with Relative Precisions

IOU	n	Net Realization Rates - kWh			Net Realization Rates - kW		
		First Year	Lifecycle	RP - Lifecycle	First Year	Lifecycle	RP - Lifecycle
PG&E	46	42%	32%	35%	36%	27%	54%
SCE	15	37%	23%	38%	41%	34%	29%
SDG&E	5	37%	22%	46%	36%	24%	67%
Statewide	**66**	**40%**	**27%**	**26%**	**38%**	**30%**	**29%**

First year and lifecycle NRRs differ for the same reasons as described above for the first year and lifecycle GRRs. Furthermore, the lifecycle NRRs differ from lifecycle GRRs due to differences between the ex-post and ex-ante NTGRs. Overall, the ex-post NTGRs are about 20% less than the ex-ante NTGRs, which explains why the lifecycle NRRs are lower than the lifecycle GRRs.

5.2 Aggregate Ex-post Results

Using the GRRs and NRRs developed above, estimates were developed for first year and lifecycle, net and gross kW and kWh savings for the evaluated population. Table 5-43 to

Table 5-58 present these first year and lifecycle, net and gross kW and kWh savings by both gross and net program group (separate tables are presented by IOU and statewide). Although the GRRs do not vary by net program group, the NTGRs do, so results are presented at that finer level of aggregation.

Note that the evaluated population corresponds to the participants that installed measures that have a GRR specifically estimated and presented above. Approximately 89% of the gross first year kW ex-ante savings and 81% of the gross first year kWh ex-ante savings were among segments that were evaluated.

Table 5-43: Aggregate First Year Gross kW and kWh Savings and Realization Rates by Net Program Group for Evaluated Population in PG&E

Gross Program Group	Net Program Group	kW			kWh		
		Ex-Ante First Year Savings	Ex-Post First Year Savings	First Year GRR	Ex-Ante First Year Savings	Ex-Post First Year Savings	First Year GRR
PG&E							
PG&E Custom	PGE Core/Statewide Custom	9,465	4,877	0.52	49,511,753	33,631,649	0.68
	Total Custom	**9,465**	**4,877**	**0.52**	**49,511,753**	**33,631,649**	**0.68**
PG&E Deemed	PGE Deemed Ag	5,597	3,488	0.62	27,826,710	19,617,251	0.70
	PGE Deemed Com	44,735	21,738	0.49	194,074,192	99,702,693	0.51
	PGE Deemed Ind	9,417	4,383	0.47	37,749,100	19,724,276	0.52
	Total Deemed	**59,749**	**29,610**	**0.50**	**259,650,002**	**139,044,220**	**0.54**
PG&E Local Govt Partner/DI	PGE DI Ecology	4,038	1,375	0.34	23,192,671	8,193,333	0.35
	PGE DI RHA	10,200	3,516	0.34	44,798,281	15,635,060	0.35
	PGE DI Staples	4,169	1,595	0.38	21,196,037	8,783,857	0.41
	PGE DI Staples/RHA **	2,778	914	0.33	12,412,027	4,262,733	0.34
	PGE DI Synergy	636	249	0.39	3,101,970	1,174,539	0.38
	PGE DI TEAA	1,194	453	0.38	4,978,264	2,054,513	0.41
	PGE Energy Fitness	16,013	5,657	0.35	61,256,839	21,943,467	0.36
	PGE LGP East Bay	10,885	3,820	0.35	61,352,313	22,945,634	0.37
	PGE LGP LGEAR	2,312	831	0.36	9,775,317	3,526,206	0.36
	PGE LGP Marin	1,029	335	0.32	4,510,003	1,488,909	0.33
	PGE LGP Redwood	1,110	399	0.36	4,566,678	1,570,992	0.34
	PGE LGP SF	4,643	1,464	0.32	26,681,321	8,035,188	0.30
	PGE RightLights	10,009	3,375	0.34	45,775,103	15,878,324	0.35
	PGE SW Partnership	4,524	1,996	0.44	20,081,339	10,140,658	0.50
	Total LGP/DI	**73,542**	**25,978**	**0.35**	**343,678,162**	**125,633,412**	**0.37**
PG&E 3rd Party	PGE 3P	8,435	5,125	0.61	57,525,749	28,117,061	0.49
	Total 3rd Party	**8,435**	**5,125**	**0.61**	**57,525,749**	**28,117,061**	**0.49**
PG&E Total		**151,192**	**65,591**	**0.43**	**710,365,666**	**326,426,341**	**0.46**

Table 5-44: Aggregate First Year Gross kW and kWh Savings and Realization Rates by Net Program Group for Evaluated Population in SCE

Gross Program Group	Net Program Group	kW			kWh		
		Ex-Ante First Year Savings	Ex-Post First Year Savings	First Year GRR	Ex-Ante First Year Savings	Ex-Post First Year Savings	First Year GRR
SCE							
SCE Custom	SCE Core/Statewide Custom	12,581	6,596	0.52	76,596,647	46,375,909	0.61
	Total Custom	**12,581**	**6,596**	**0.52**	**76,596,647**	**46,375,909**	**0.61**
SCE Deemed	SCE Deemed Ag	1,344	596	0.44	6,234,549	3,339,733	0.54
	SCE Deemed Com	104,049	50,757	0.49	355,774,407	247,258,729	0.69
	SCE Deemed Ind	32,947	18,609	0.56	115,074,553	79,380,722	0.69
	Total Deemed	**138,340**	**69,962**	**0.51**	**477,083,509**	**329,979,184**	**0.69**
SCE DI	SCE Direct Install	73,823	28,739	0.39	279,379,545	116,219,371	0.42
	Total DI	**73,823**	**28,739**	**0.39**	**279,379,545**	**116,219,371**	**0.42**
SCE Local Govt Partner	SCE LGP ELP	1,381	678	0.49	6,531,503	3,685,863	0.56
	SCE LGP Institutional	2,907	1,385	0.48	12,525,445	5,910,038	0.47
	Total LGP	**4,288**	**2,063**	**0.48**	**19,056,947**	**9,595,901**	**0.50**
SCE 3rd Party	SCE 3P	4,093	1,846	0.45	25,976,191	13,268,069	0.51
	SCE 3P Mgmt Affiliates	1,081	465	0.43	3,992,040	2,277,317	0.57
	SCE 3P Preschool	1,327	573	0.43	4,551,435	2,564,350	0.56
	SCE 3P Schools	3,414	1,482	0.43	41,310,180	23,041,232	0.56
	Total 3rd Party	**9,916**	**4,366**	**0.44**	**75,829,846**	**41,150,968**	**0.54**
SCE Total		**238,948**	**111,726**	**0.47**	**927,946,494**	**543,321,332**	**0.59**

Table 5-45: Aggregate First Year Gross kW and kWh Savings and Realization Rates by Net Program Group for Evaluated Population in SDG&E

Gross Program Group	Net Program Group	kW			kWh		
		Ex-Ante First Year Savings	Ex-Post First Year Savings	First Year GRR	Ex-Ante First Year Savings	Ex-Post First Year Savings	First Year GRR
SDG&E							
SDG&E Custom	SDG&E Core/Statewide	344	135	0.39	1,905,142	818,889	0.43
	Total Custom	**344**	**135**	**0.39**	**1,905,142**	**818,889**	**0.43**
SDG&E Deemed	SDG&E Deemed Com	12,447	5,751	0.46	56,928,277	36,679,636	0.64
	SDG&E Deemed Ind/Ag	1,994	852	0.43	7,110,569	3,881,933	0.55
	Total Deemed	**14,441**	**6,603**	**0.46**	**64,038,846**	**40,561,569**	**0.63**
SDG&E DI	SDG&E Direct Install	7,206	3,695	0.51	30,428,052	15,500,138	0.51
	Total DI	**7,206**	**3,695**	**0.51**	**30,428,052**	**15,500,138**	**0.51**
SDG&E LGP/ 3rd Party	SDG&E BID	7,241	3,806	0.53	43,332,843	22,021,232	0.51
	SDG&E MEC	294	111	0.38	1,526,873	695,266	0.46
	Total LGP/3rd Party	**7,535**	**3,917**	**0.52**	**44,859,716**	**22,716,498**	**0.51**
SDG&E Total		**29,525**	**14,350**	**0.49**	**141,231,757**	**79,597,094**	**0.56**

Table 5-46: Aggregate First Year Gross kW and kWh Savings and Realization Rates by Net Program Group for Evaluated Population Statewide

Gross Program Group	Net Program Group	kW			kWh		
		Ex-Ante First Year Savings	Ex-Post First Year Savings	First Year GRR	Ex-Ante First Year Savings	Ex-Post First Year Savings	First Year GRR
Statewide							
Statewide	Total Custom	22,390	11,608	0.52	128,013,542	80,826,447	0.63
	Total Deemed	212,530	106,175	0.50	800,772,357	509,584,973	0.64
	Total DI	81,029	32,434	0.40	309,807,597	131,719,509	0.43
	Total LGP	77,830	28,041	0.36	362,735,109	135,229,312	0.37
	Total 3rd Party	25,886	13,408	0.52	178,215,311	91,984,527	0.52
Statewide Total		**419,664**	**191,667**	**0.46**	**1,779,543,917**	**949,344,767**	**0.53**

Table 5-47: Aggregate Lifecycle Gross kW and kWh Savings and Realization Rates by Net Program Group for Evaluated Population in PG&E

Gross Program Group	Net Program Group	kW			kWh		
		Ex-Ante Lifecycle Savings	Ex-Post Lifecycle Savings	Life-cycle GRR	Ex-Ante Lifecycle Savings	Ex-Post Lifecycle Savings	Life-cycle GRR
PG&E							
PG&E Custom	PGE Core/Statewide Custom	138,361	51,312	0.37	712,382,562	329,682,887	0.46
	Total Custom	**138,361**	**51,312**	**0.37**	**712,382,562**	**329,682,887**	**0.46**
PG&E Deemed	PGE Deemed Ag	45,161	25,114	0.56	225,341,125	142,652,181	0.63
	PGE Deemed Com	389,767	231,250	0.59	1,685,933,765	1,036,545,232	0.61
	PGE Deemed Ind	83,584	43,152	0.52	335,024,003	192,400,599	0.57
	Total Deemed	**518,512**	**299,517**	**0.58**	**2,246,298,892**	**1,371,598,012**	**0.61**
PG&E Local Govt Partner/DI	PGE DI Ecology	52,270	18,575	0.36	289,334,920	108,430,955	0.37
	PGE DI RHA	97,578	32,231	0.33	423,281,861	138,721,318	0.33
	PGE DI Staples	39,271	14,678	0.37	196,209,109	73,688,404	0.38
	PGE DI Staples/RHA **	31,882	10,752	0.34	139,290,945	47,222,867	0.34
	PGE DI Synergy	7,741	3,411	0.44	36,570,706	15,449,553	0.42
	PGE DI TEAA	13,107	4,954	0.38	53,354,955	21,618,878	0.41
	PGE Energy Fitness	152,158	53,109	0.35	572,904,218	198,833,162	0.35
	PGE LGP East Bay	160,480	57,696	0.36	906,023,327	335,846,128	0.37
	PGE LGP LGEAR	24,005	9,640	0.40	102,158,239	40,674,839	0.40
	PGE LGP Marin	14,465	4,854	0.34	62,003,913	21,580,793	0.35
	PGE LGP Redwood	13,931	5,290	0.38	55,490,769	20,592,706	0.37
	PGE LGP SF	58,191	20,807	0.36	315,863,448	122,922,500	0.39
	PGE RightLights	144,873	49,250	0.34	650,440,073	226,513,808	0.35
	PGE SW Partnership	65,074	22,497	0.35	284,739,157	110,958,248	0.39
	Total LGP/DI	**875,025**	**307,743**	**0.35**	**4,087,665,641**	**1,483,054,161**	**0.36**
PG&E 3rd Party	PGE 3P	80,551	46,921	0.58	555,465,943	268,733,164	0.48
	Total 3rd Party	**80,551**	**46,921**	**0.58**	**555,465,943**	**268,733,164**	**0.48**
PG&E Total		**1,612,449**	**705,493**	**0.44**	**7,601,813,039**	**3,453,068,225**	**0.45**

Table 5-48: Aggregate Lifecycle Gross kW and kWh Savings and Realization Rates by Net Program Group for Evaluated Population in SCE

Gross Program Group	Net Program Group	kW			kWh		
		Ex-Ante Lifecycle Savings	Ex-Post Lifecycle Savings	Lifecycle GRR	Ex-Ante Lifecycle Savings	Ex-Post Lifecycle Savings	Life-cycle GRR
SCE							
SCE Custom	SCE Core/Statewide Custom	181,313	75,243	0.41	1,081,418,161	433,926,741	0.40
	Total Custom	**181,313**	**75,243**	**0.41**	**1,081,418,161**	**433,926,741**	**0.40**
SCE Deemed	SCE Deemed Ag	8,612	6,494	0.75	39,381,995	35,814,656	0.91
	SCE Deemed Com	844,960	580,678	0.69	2,913,053,224	2,839,679,407	0.97
	SCE Deemed Ind	264,572	213,521	0.81	932,977,496	889,184,059	0.95
	Total Deemed	**1,118,144**	**800,694**	**0.72**	**3,885,412,715**	**3,764,678,122**	**0.97**
SCE DI	SCE Direct Install	550,498	315,053	0.57	2,019,484,455	1,236,521,750	0.61
	Total DI	**550,498**	**315,053**	**0.57**	**2,019,484,455**	**1,236,521,750**	**0.61**
SCE Local Govt Partner	SCE LGP ELP	15,687	11,838	0.75	76,515,359	63,245,931	0.83
	SCE LGP Institutional	40,621	17,481	0.43	174,741,442	59,991,080	0.34
	Total LGP	**56,308**	**29,320**	**0.52**	**251,256,801**	**123,237,011**	**0.49**
SCE 3rd Party	SCE 3P	51,467	26,357	0.51	326,938,892	172,946,950	0.53
	SCE 3P Mgmt Affiliates	10,916	8,072	0.74	41,871,953	41,046,623	0.98
	SCE 3P Preschool	10,758	8,322	0.77	36,817,509	37,614,868	1.02
	SCE 3P Schools	34,618	29,112	0.84	365,216,068	393,865,133	1.08
	Total 3rd Party	**107,760**	**71,863**	**0.67**	**770,844,422**	**645,473,574**	**0.84**
SCE Total		**2,014,023**	**1,292,172**	**0.64**	**8,008,416,554**	**6,203,837,197**	**0.77**

Table 5-49: Aggregate Lifecycle Gross kW and kWh Savings and Realization Rates by Net Program Group for Evaluated Population in SDG&E

Gross Program Group	Net Program Group	kW			kWh		
		Ex-Ante Lifecycle Savings	Ex-Post Lifecycle Savings	Lifecycle GRR	Ex-Ante Lifecycle Savings	Ex-Post Lifecycle Savings	Life-cycle GRR
SDG&E							
SDG&E Custom	SDG&E Core/Statewide	5,154	1,319	0.26	28,577,129	7,458,210	0.26
	Total Custom	**5,154**	**1,319**	**0.26**	**28,577,129**	**7,458,210**	**0.26**
SDG&E Deemed	SDG&E Deemed Com	151,481	55,258	0.36	687,315,386	336,969,218	0.49
	SDG&E Deemed Ind/Ag	21,871	7,914	0.36	74,979,521	34,904,193	0.47
	Total Deemed	**173,352**	**63,172**	**0.36**	**762,294,907**	**371,873,411**	**0.49**
SDG&E DI	SDG&E Direct Install	59,055	41,091	0.70	242,515,806	164,843,936	0.68
	Total DI	**59,055**	**41,091**	**0.70**	**242,515,806**	**164,843,936**	**0.68**
SDG&E LGP/ 3rd Party	SDG&E BID	108,094	39,854	0.37	646,631,280	212,121,030	0.33
	SDG&E MEC	725	233	0.32	3,771,375	1,957,177	0.52
	Total LGP/3rd Party	**108,819**	**40,087**	**0.37**	**650,402,655**	**214,078,207**	**0.33**
SDG&E Total		**346,380**	**145,668**	**0.42**	**1,683,790,498**	**758,253,764**	**0.45**

Table 5-50: Aggregate Lifecycle Gross kW and kWh Savings and Realization Rates by Net Program Group for Evaluated Population Statewide

Gross Program Group	Net Program Group	kW			kWh		
		Ex-Ante Lifecycle Savings	Ex-Post Lifecycle Savings	Lifecycle GRR	Ex-Ante Lifecycle Savings	Ex-Post Lifecycle Savings	Lifecycle GRR
Statewide							
Statewide	Total Custom	324,828	127,873	0.39	1,822,377,853	771,067,838	0.42
	Total Deemed	1,810,008	1,163,382	0.64	6,894,006,515	5,508,149,545	0.80
	Total DI	609,552	356,144	0.58	2,262,000,261	1,401,365,686	0.62
	Total LGP	931,333	337,063	0.36	4,338,922,442	1,606,291,172	0.37
	Total 3rd Party	297,130	158,871	0.53	1,976,713,020	1,128,284,945	0.57
Statewide Total		**3,972,851**	**2,143,333**	**0.54**	**17,294,020,090**	**10,415,159,186**	**0.60**

Table 5-51: Aggregate First Year Net kW and kWh Savings and Realization Rates by Net Program Group for Evaluated Population in PG&E

Gross Program Group	Net Program Group	kW			kWh		
		Ex-Ante First Year Savings	Ex-Post First Year Savings	First Year NRR	Ex-Ante First Year Savings	Ex-Post First Year Savings	First Year NRR
PG&E							
PG&E Custom	PGE Core/Statewide Custom	6,301	2,146	0.34	32,719,423	15,994,840	0.49
	Total Custom	**6,301**	**2,146**	**0.34**	**32,719,423**	**15,994,840**	**0.49**
PG&E Deemed	PGE Deemed Ag	4,438	2,095	0.47	22,041,243	11,651,293	0.53
	PGE Deemed Com	35,395	13,390	0.38	153,786,719	61,999,502	0.40
	PGE Deemed Ind	7,402	2,297	0.31	29,671,121	10,143,022	0.34
	Total Deemed	**47,235**	**17,782**	**0.38**	**205,499,083**	**83,793,817**	**0.41**
PG&E Local Govt Partner/DI	PGE DI Ecology	3,177	770	0.24	18,275,725	4,655,885	0.25
	PGE DI RHA	7,902	2,449	0.31	34,731,677	10,932,425	0.31
	PGE DI Staples	2,922	966	0.33	14,846,939	5,341,843	0.36
	PGE DI Staples/RHA **	1,981	612	0.31	8,815,329	2,909,923	0.33
	PGE DI Synergy	445	162	0.36	2,171,379	755,450	0.35
	PGE DI TEAA	940	244	0.26	3,910,951	1,138,566	0.29
	PGE Energy Fitness	12,399	3,611	0.29	47,445,120	13,999,929	0.30
	PGE LGP East Bay	7,607	2,467	0.32	42,864,106	14,987,026	0.35
	PGE LGP LGEAR	1,713	483	0.28	7,167,745	2,056,611	0.29
	PGE LGP Marin	721	200	0.28	3,157,002	893,307	0.28
	PGE LGP Redwood	777	258	0.33	3,196,915	1,006,335	0.31
	PGE LGP SF	3,261	812	0.25	18,720,473	4,580,721	0.24
	PGE RightLights	7,822	2,133	0.27	35,810,002	10,077,220	0.28
	PGE SW Partnership	2,933	1,044	0.36	13,047,462	5,466,060	0.42
	Total LGP/DI	**54,599**	**16,212**	**0.30**	**254,160,823**	**78,801,301**	**0.31**
PG&E 3rd Party	PGE 3P	6,429	3,013	0.47	44,111,672	17,036,755	0.39
	Total 3rd Party	**6,429**	**3,013**	**0.47**	**44,111,672**	**17,036,755**	**0.39**
PG&E Total		**114,565**	**39,153**	**0.34**	**536,491,001**	**195,626,713**	**0.36**

Table 5-52: Aggregate First Year Net kW and kWh Savings and Realization Rates by Net Program Group for Evaluated Population in SCE

Gross Program Group	Net Program Group	kW			kWh		
		Ex-Ante First Year Savings	Ex-Post First Year Savings	First Year NRR	Ex-Ante First Year Savings	Ex-Post First Year Savings	First Year NRR
SCE							
SCE Custom	SCE Core/Statewide Custom	8,052	3,473	0.43	49,021,854	23,197,633	0.47
	Total Custom	**8,052**	**3,473**	**0.43**	**49,021,854**	**23,197,633**	**0.47**
SCE Deemed	SCE Deemed Ag	1,065	379	0.36	4,940,042	2,098,043	0.42
	SCE Deemed Com	83,661	30,903	0.37	282,208,106	148,003,191	0.52
	SCE Deemed Ind	25,967	11,712	0.45	90,633,001	50,054,126	0.55
	Total Deemed	**110,693**	**42,994**	**0.39**	**377,781,149**	**200,155,360**	**0.53**
SCE DI	SCE Direct Install	62,749	20,010	0.32	237,472,613	80,322,732	0.34
	Total DI	**62,749**	**20,010**	**0.32**	**237,472,613**	**80,322,732**	**0.34**
SCE Local Govt Partner	SCE LGP ELP	1,012	318	0.31	4,698,436	1,955,707	0.42
	SCE LGP Institutional	1,880	868	0.46	8,103,182	3,670,277	0.45
	Total LGP	**2,893**	**1,187**	**0.41**	**12,801,618**	**5,625,984**	**0.44**
SCE 3rd Party	SCE 3P	2,831	1,068	0.38	17,958,295	6,928,989	0.39
	SCE 3P Mgmt Affiliates	852	254	0.30	3,099,708	1,297,329	0.42
	SCE 3P Preschool	1,128	396	0.35	3,868,720	1,762,099	0.46
	SCE 3P Schools	2,902	786	0.27	35,113,653	15,176,317	0.43
	Total 3rd Party	**7,713**	**2,503**	**0.32**	**60,040,375**	**25,164,734**	**0.42**
SCE Total		**192,100**	**70,167**	**0.37**	**737,117,609**	**334,466,443**	**0.45**

Table 5-53: Aggregate First Year Net kW and kWh Savings and Realization Rates by Net Program Group for Evaluated Population in SDG&E

Gross Program Group	Net Program Group	kW			kWh		
		Ex-Ante First Year Savings	Ex-Post First Year Savings	First Year GRR	Ex-Ante First Year Savings	Ex-Post First Year Savings	First Year NRR
SDG&E							
SDG&E Custom	SDG&E Core/Statewide	220	77	0.35	1,219,291	496,510	0.41
	Total Custom	**220**	**77**	**0.35**	**1,219,291**	**496,510**	**0.41**
SDG&E Deemed	SDG&E Deemed Com	9,803	3,142	0.32	44,896,914	20,134,862	0.45
	SDG&E Deemed Ind/Ag	1,576	510	0.32	5,622,693	2,272,316	0.40
	Total Deemed	**11,379**	**3,652**	**0.32**	**50,519,607**	**22,407,178**	**0.44**
SDG&E DI	SDG&E Direct Install	5,818	2,352	0.40	24,613,504	9,898,788	0.40
	Total DI	**5,818**	**2,352**	**0.40**	**24,613,504**	**9,898,788**	**0.40**
SDG&E LGP/ 3rd Party	SDG&E BID	4,634	2,267	0.49	27,733,020	12,628,972	0.46
	SDG&E MEC	250	69	0.28	1,297,842	428,510	0.33
	Total LGP/3rd Party	**4,884**	**2,336**	**0.48**	**29,030,862**	**13,057,483**	**0.45**
SDG&E Total		**22,301**	**8,416**	**0.38**	**105,383,263**	**45,859,959**	**0.44**

Table 5-54: Aggregate First Year Net kW and kWh Savings and Realization Rates by Net Program Group for Evaluated Population Statewide

Gross Program Group	Net Program Group	kW			kWh		
		Ex-Ante First Year Savings	Ex-Post First Year Savings	First Year NRR	Ex-Ante First Year Savings	Ex-Post First Year Savings	First Year NRR
Statewide							
Statewide	Total Custom	14,573	5,696	0.39	82,960,568	39,688,984	0.48
	Total Deemed	169,307	64,428	0.38	633,799,839	306,356,355	0.48
	Total DI	68,568	22,362	0.33	262,086,117	90,221,520	0.34
	Total LGP	57,492	17,398	0.30	266,962,441	84,427,284	0.32
	Total 3rd Party	19,026	7,852	0.41	133,182,909	55,258,971	0.41
Statewide Total		**328,965**	**117,736**	**0.36**	**1,378,991,874**	**575,953,115**	**0.42**

Table 5-55: Aggregate Lifecycle Net kW and kWh Savings and Realization Rates by Net Program Group for Evaluated Population in PG&E

Gross Program Group	Net Program Group	kW			kWh		
		Ex-Ante Lifecycle Savings	Ex-Post Lifecycle Savings	Life-cycle NRR	Ex-Ante Lifecycle Savings	Ex-Post Lifecycle Savings	Life-cycle NRR
PG&E							
PG&E Custom	PGE Core/Statewide Custom	92,112	22,580	0.25	471,072,767	156,793,532	0.33
	Total Custom	**92,112**	**22,580**	**0.25**	**471,072,767**	**156,793,532**	**0.33**
PG&E Deemed	PGE Deemed Ag	35,688	15,080	0.42	177,915,288	84,725,553	0.48
	PGE Deemed Com	307,945	142,441	0.46	1,333,969,784	644,569,230	0.48
	PGE Deemed Ind	65,640	22,616	0.34	263,099,738	98,940,185	0.38
	Total Deemed	**409,273**	**180,137**	**0.44**	**1,774,984,811**	**828,234,968**	**0.47**
PG&E Local Govt Partner/DI	PGE DI Ecology	40,953	10,406	0.25	226,844,130	61,616,206	0.27
	PGE DI RHA	75,433	22,448	0.30	327,539,675	96,997,419	0.30
	PGE DI Staples	27,518	8,893	0.32	137,401,709	44,813,103	0.33
	PGE DI Staples/RHA **	22,608	7,200	0.32	98,456,218	32,236,344	0.33
	PGE DI Synergy	5,419	2,220	0.41	25,599,494	9,936,975	0.39
	PGE DI TEAA	10,295	2,666	0.26	41,809,975	11,980,706	0.29
	PGE Energy Fitness	117,659	33,900	0.29	443,221,080	126,855,536	0.29
	PGE LGP East Bay	112,145	37,254	0.33	632,985,479	219,359,150	0.35
	PGE LGP LGEAR	17,630	5,603	0.32	74,196,928	23,723,039	0.32
	PGE LGP Marin	10,125	2,907	0.29	43,402,739	12,947,921	0.30
	PGE LGP Redwood	9,752	3,423	0.35	38,845,505	13,191,130	0.34
	PGE LGP SF	40,867	11,543	0.28	221,660,304	70,075,970	0.32
	PGE RightLights	113,093	31,127	0.28	507,951,940	143,757,578	0.28
	PGE SW Partnership	42,017	11,770	0.28	184,209,139	59,809,177	0.32
	Total LGP/DI	**645,514**	**191,360**	**0.30**	**3,004,124,316**	**927,300,253**	**0.31**
PG&E 3rd Party	PGE 3P	60,408	27,586	0.46	421,108,834	162,831,421	0.39
	Total 3rd Party	**60,408**	**27,586**	**0.46**	**421,108,834**	**162,831,421**	**0.39**
PG&E Total		**1,207,307**	**421,663**	**0.35**	**5,671,290,727**	**2,075,160,174**	**0.37**

Table 5-56: Aggregate Lifecycle Net kW and kWh Savings and Realization Rates by Net Program Group for Evaluated Population in SCE

Gross Program Group	Net Program Group	kW			kWh		
		Ex-Ante Lifecycle Savings	Ex-Post Lifecycle Savings	Life-cycle NRR	Ex-Ante Lifecycle Savings	Ex-Post Lifecycle Savings	Life-cycle NRR
SCE							
SCE Custom	SCE Core/Statewide Custom	116,041	39,615	0.34	692,107,623	217,053,934	0.31
	Total Custom	**116,041**	**39,615**	**0.34**	**692,107,623**	**217,053,934**	**0.31**
SCE Deemed	SCE Deemed Ag	6,785	4,134	0.61	31,009,618	22,499,018	0.73
	SCE Deemed Com	679,313	353,543	0.52	2,310,626,049	1,699,764,511	0.74
	SCE Deemed Ind	208,701	134,380	0.64	735,304,358	560,681,861	0.76
	Total Deemed	**894,799**	**492,057**	**0.55**	**3,076,940,026**	**2,282,945,389**	**0.74**
SCE DI	SCE Direct Install	467,923	219,360	0.47	1,716,561,787	854,597,681	0.50
	Total DI	**467,923**	**219,360**	**0.47**	**1,716,561,787**	**854,597,681**	**0.50**
SCE Local Govt Partner	SCE LGP ELP	11,149	5,554	0.50	53,428,296	33,558,083	0.63
	SCE LGP Institutional	26,166	10,963	0.42	112,545,886	37,255,916	0.33
	Total LGP	**37,316**	**16,516**	**0.44**	**165,974,182**	**70,813,998**	**0.43**
SCE 3rd Party	SCE 3P	34,717	15,248	0.44	220,815,346	90,318,160	0.41
	SCE 3P Mgmt Affiliates	8,362	4,413	0.53	31,476,395	23,383,201	0.74
	SCE 3P Preschool	9,145	5,745	0.63	31,294,883	25,847,146	0.83
	SCE 3P Schools	29,426	15,436	0.52	310,433,658	259,422,850	0.84
	Total 3rd Party	**81,649**	**40,842**	**0.50**	**594,020,281**	**398,971,357**	**0.67**
SCE Total		**1,597,728**	**808,390**	**0.51**	**6,245,603,899**	**3,824,382,359**	**0.61**

Table 5-57: Aggregate Lifecycle Net kW and kWh Savings and Realization Rates by Net Program Group for Evaluated Population in SDG&E

Gross Program Group	Net Program Group	kW			kWh		
		Ex-Ante Lifecycle Savings	Ex-Post Lifecycle Savings	Lifecycle NRR	Ex-Ante Lifecycle Savings	Ex-Post Lifecycle Savings	Life-cycle NRR
SDG&E							
SDG&E Custom	SDG&E Core/Statewide	3,298	752	0.23	18,289,363	4,522,074	0.25
	Total Custom	**3,298**	**752**	**0.23**	**18,289,363**	**4,522,074**	**0.25**
SDG&E Deemed	SDG&E Deemed Com	119,451	30,190	0.25	542,734,064	184,975,357	0.34
	SDG&E Deemed Ind/Ag	17,311	4,740	0.27	59,320,090	20,431,405	0.34
	Total Deemed	**136,762**	**34,930**	**0.26**	**602,054,153**	**205,406,762**	**0.34**
SDG&E DI	SDG&E Direct Install	47,485	26,153	0.55	195,127,245	105,273,591	0.54
	Total DI	**47,485**	**26,153**	**0.55**	**195,127,245**	**105,273,591**	**0.54**
SDG&E LGP/ 3rd Party	SDG&E BID	69,180	23,736	0.34	413,844,019	121,649,445	0.29
	SDG&E MEC	616	144	0.23	3,205,669	1,206,258	0.38
	Total LGP/3rd Party	**69,797**	**23,879**	**0.34**	**417,049,688**	**122,855,703**	**0.29**
SDG&E Total		**257,342**	**85,714**	**0.33**	**1,232,520,450**	**438,058,130**	**0.36**

Table 5-58: Aggregate Lifecycle Net kW and kWh Savings and Realization Rates by Net Program Group for Evaluated Population Statewide

Gross Program Group	Net Program Group	kW			kWh		
		Ex-Ante Lifecycle Savings	Ex-Post Lifecycle Savings	Lifecycle NRR	Ex-Ante Lifecycle Savings	Ex-Post Lifecycle Savings	Life-cycle NRR
Statewide							
Statewide	Total Custom	211,451	62,947	0.30	1,181,469,753	378,369,540	0.32
	Total Deemed	1,440,834	707,124	0.49	5,453,978,990	3,316,587,119	0.61
	Total DI	515,408	245,513	0.48	1,911,689,032	959,871,272	0.50
	Total LGP	682,830	207,877	0.30	3,170,098,498	998,114,251	0.31
	Total 3rd Party	211,855	92,307	0.44	1,432,178,803	684,658,480	0.48
Statewide Total		**3,062,377**	**1,315,767**	**0.43**	**13,149,415,076**	**6,337,600,664**	**0.48**

5.3 Comparison with 2006-08 Small Commercial Impact Evaluation

Table 5-59 presents a comparison of key evaluation results between this and the 2006-08 Small Commercial Impact Evaluation. The 2006-08 evaluation only studied CFL, high bay and linear fluorescent measures. For the most part, the installation rates and first year gross realization rates (GRR) compare well. CFL installation rates increased from 70% to 77%, while high bay and linear fluorescent measures changed by only 2-3%. The first year GRRs were also very close for high bay and linear fluorescent measures, differing by only 1% and 4% respectively. The CFL basic GRR, however, increased from 0.21 to 0.38. The NTGRs for CFLs was very similar, differing by only 1%, while the NTGRs dropped significantly for high bay and linear fluorescent measures by about 14 to 17 percentage points.

It is important to note that this evaluation was conducted at the Gross Program Group level, and that GRRs did vary across program group. However, the 2006-08 evaluation was conducted at the measure level, so comparisons could not be made at the program level.

Table 5-59: Comparison between 2006-08 and 2010-12 First Year Impact Evaluation Results for CFL, High Bay and Linear Fluorescent Measures

HIM	Installation Rate		GRR		NTGR	
	2006-08	2010-12	2006-08	2010-12	2006-08	2010-12
CFL Basic	70%	77%	0.21	0.38	0.61	0.60
High Bay Fluorescent	94%	97%	0.64	0.63	0.73	0.59
Linear Fluorescent	93%	91%	0.59	0.55	0.79	0.62

6

Recommendations

This section presents recommendations related to the findings developed for this evaluation. Below, we provide global recommendations that are typically associated with each of the parameters that comprise the energy savings calculations, and highlight recommendations and issues that are specific to a measure. Also, recommendations may differ between deemed and calculated measures, so those differences are also noted. Finally we provide recommendations on measure development practices, for IOU workpapers, and on the documentation provided from the participant applications.

6.1 Installation Rates

Deemed Measures

For deemed measures, apply installation rates to ex ante claims by measure and by gross program group. Installation rates are a function of installed and operable measures and exclude the percentage in storage, failed and/or removed. They varied by measure, but were found to be less than 100% for all measures studied. To develop ex ante claims, the ex ante savings values should be adjusted by installation rates. Because installation rates vary by measure and delivery mechanism, separate installation rates should be applied by measure and by gross program group (or some combination of deemed, direct installation, third party and LGP program groupings). Appendix G.5 provides an analysis that informs this recommendation.

Calculated Measures

For calculated measures, ensure that post-retrofit inspections are being performed such that installations can be confirmed. Installation rates varied by measure, but were found to be less than 100% for most measures that were studied. While a majority of the calculated measure documentation provided evidence of a post-inspection report that detailed installation information, some did not. Post-installation inspections provide more accurate estimates of what was actually installed.

For example, installation rates varied across programs for CFL basic and reflector measures and, at the statewide level, were the lowest at 77% and 88%, respectively. Therefore, it is particularly important that the ex ante savings values be adjusted for installation rates for these measures. For calculated projects (particularly large installations), the IOUs may want to consider

recommending or requiring that applications include photos of installed CFLs as a way of documenting that installations were performed. Appendix G.5 provides an analysis that informs this recommendation.

6.2 Operating Hours

Deemed Measures

Utilize the 2006-08 and 2010-12 lighting logger data to update default ex-ante lighting operating hours for DEER building types and space types and to establish lighting operating hours for new building and space types that are not currently covered in DEER. This evaluation found that monitored ex-post operating hours continue to be lower than ex-ante default operating hours used in calculating ex-ante savings. A similar result was also reported in the evaluation of the 06-08 cycle lighting programs conducted as part of the Small Commercial Contract Group contract. Extensive datasets now exist on monitored hours obtained from approximately 7,000 lighting loggers deployed in the 06-08 cycle and 4,650 lighting loggers deployed in this evaluation. We recommend that these datasets should be combined to update default ex-ante lighting operating hours for DEER building types and space types and to establish lighting operating hours for new building and space types that are not currently covered in DEER. An expeditious implementation of this recommendation and revision of the IOUs' ex-ante savings estimates incorporating updated lighting operating hours would likely improve the GRR by reflecting the best available current information. Appendix G.3.7 and G.6 provide information and analyses that inform this recommendation.

Calculated Measures

When developing ex-ante estimates of operating hours for calculated projects, customer-specific monitored data should be used whenever available. If, however, self-reported operating hours are used, then ex-ante estimates should correspond to the lighting system's operation and not the facility's business hours. Monitored data is generally accepted as the most reliable way of estimating hours of use, and therefore should be used whenever available. However, this is not always a cost-effective or practical means of estimating operating hours, particularly for smaller projects. When it is the case that a self-report estimate is used to calculate ex-ante operating hours, it is important that those estimates reflect the lighting schedule, and ideally done at the activity area level, and that business hours are not used. It is typically the case the not all lights are operating during open business hours. For example, the average coincidence factor for this study was 59% for linear fluorescents. Using business hours would assume that 100% of the lights are on during that open time period (and 0% during the closed time period, which also is not always the case). An approach consistent with the manner that this study used to develop self-report operating hours should be used, where a project is

broken out into activity areas, and a separate lighting schedule is developed for each activity area. Appendix G.6 provides an analysis that informs this recommendation.

6.3 Dual Baseline

Use a dual baseline for all linear fluorescent, delamping, high bay fluorescent and HID measures for program-induced early retirement, which classifies a customer as ER or ROB. This evaluation found that programs that assume a program-induced early retirement and utilize a dual baseline had a split between the ex post classification of early replacement (ER) or replace on burnout (ROB), as opposed to being all ER. For calculated measures, if program-induced early retirement is assumed, a dual baseline must be utilized, and each participant should be identified as either early replacement (ER) or replace on burnout (ROB), using the criteria provided in the CPUC draft guidance document "Project Basis (RET, ROB, etc), EUL/RUL Definitions, & Preponderance of Evidence" dated 1/29/14. However, for deemed measures, it may not be feasible or practical to gather enough evidence to determine if each customer should be classified as ER or ROB. Therefore, for deemed measures assuming program-induced early retirement and utilizing a dual baseline, an "average" case needs to be developed, where the RUL and post-RUL period UES values are developed as a combined value of the ER and ROB cases. When combining the ER and ROB values together, the results of this evaluation can be used to estimate the percentage of installations that are ER. Appendix G.4, G.7 and G.8 provide information and analyses that inform this recommendation.

Linear Fluorescents

When classifying customers as early replacement versus replace on burnout, customers replacing T12's should always be considered replace on burnout. Because T12 lamps have been phased out, the EUL for T12 fixtures is based on the lamp life, not the ballast life. As a result, the DEER RUL for these measures is typically around one year and for many building types less than one. Since measures with an RUL of one year or less are classified as ROB, installations replacing T12 fixtures should be classified as ROB. Appendix G.8 provides an analysis that informs this recommendation.

HID Measures:

Lower wattage ceramic metal halides that are replacing incandescent, CFL and halogen lamps should be considered to be replace on burnout. This evaluation found that a number of the HIDs being installed were lower wattage ceramic metal halides, which replaced incandescent, CFL and halogen lamps. Because these measures are replacing lamps that typically have lower EULs, their RUL is likely to be close to or less than one year. Therefore, these installations should be classified as ROB. Appendix G.8 provides an analysis that informs this recommendation.

6.4 RUL

Continue to use a default RUL that is estimated as one-third of the EUL, as directed by the CPUC decision D.12.05.015. This study compared the default RUL to the measure's RUL — calculated as its EUL minus the customer-reported age of the equipment — and found the calculated RUL was a close match with the CPUC-default RUL. Appendix G.8 provides an analysis that informs this recommendation.

6.5 EUL

Continue to use the DEER algorithm for EUL, but use updated operating hours to estimate these values. The EUL is estimated as a function of operating hours, and is inversely proportional to this value. Because this study found that ex post operating hours were typically much lower than ex ante values, the ex post EULs were larger for some measures (but not always because if the ex ante value is already at its maximum, then lower operating hours will not increase the EUL). Therefore, EUL estimates should be revised based on revised operating hours as discussed above. Appendix G.8 provides an analysis that informs this recommendation.

6.6 Net-to-Gross Ratios

Update the NTGRs developed in this study, and apply them by Net Program Group. For the most part, the ex post net-to-gross ratios (NTRGs) were found to be significantly lower than ex ante values. NTGRs vary by program, and should be applied by Net Program Group. Appendix H provides an analysis that informs this recommendation. **Further research should also be done to consider a framework for NTGRs that can be applied to measures that have a dual baseline, where separate NTGRs are developed for the RUL and post-RUL periods.**

6.7 Baseline/Industry Standard Practice Wattages

Linear Fluorescent, High Bay Fluorescent and Delamping Measures

Consider utilizing the Industry Standard Practice wattages developed in this report based on the Commercial Market Share Tracking data for baseline wattage values for measures with dual baselines, adjusting for post-2012 code and market practice changes. Industry standard practice (ISP) wattages were developed for measures that had dual baselines, and were applied to the post-RUL period for installations classified as early replacement, and applied to the full EUL period for installations classified as replacement on burnout. Appendix G.3.9, G.7 and G.8 provide information and analyses that inform this recommendation.

Industry standard practice wattages should exclude the 700 series T-8 fixtures for future unit energy savings values corresponding to time periods where these fixtures are no longer expected to be readily available. Beginning July 14, 2014, 700 series T-8 fixtures are no longer allowed to be manufactured. Therefore, when developing baseline wattages for installations classified as replacement on burnout, as discussed above, industry standard practice wattages should exclude the 700 series T-8 fixtures at some point in the future to allow for a reasonable amount of time to pass for these lamps to no longer be readily available. Appendix G.3.9, G.7 and G.8 provide information and analyses that inform this recommendation.

HID Measures

The baseline wattage for ROB installations and for the post-RUL period for ER installations should be a pulse start metal halide. For this evaluation, installations classified as replacement on burnout utilized a baseline wattage equivalent to the existing equipment wattage because a reliable estimate for industry standard wattages during the 2010-12 period was not available. However, after the 2012 period, pulse start metal halides are considered to be industry standard practice, which is consistent with Title 20 and the baseline prescribed by the CPUC's May 30, 2014 Workpaper Disposition for Lighting Retrofits. It is also for these reasons that the pulse start metal halide was used as the baseline for the post-RUL period for early replacement installations in this evaluation. Therefore, going forward, future ex ante estimates should also use the pulse start metal halide as the baseline for ROB installations. Appendix G.3.9, G.7 and G.8 provide information and analyses that inform this recommendation.

6.8 Pre and Post-Installation Wattages and Measures Development Practices

Linear Fluorescent and High Bay Measures

Separate measure names should be utilized for high output versus standard output linear fluorescent lamps. There were many instances of linear fluorescent measures being installed that had high output lamps, but the measure description did not indicate this. Furthermore, the ex-ante post-installation wattage assumption for these measures assumed standard wattage lamps rather than high output wattage. Therefore, the ex-ante delta wattage was overstated. There are measure names that correspond to the installation of high output lamps, but they are not always being utilized. Regardless of if the installation is high bay or not, if a high output lamp is being installed it should correspond to a measure name that assumes a high output lamp wattage for the installed equipment. Appendix G.7 provides an analysis that informs this recommendation.

Occupancy Sensors

A separate measure should be available for programs installing occupancy sensor associated with low controlled wattage, less than 75 Watts (or an even lower threshold).

Some consideration should also be given to reducing ex ante controlled wattage assumptions by 10-15%. Finally, the importance of accurately identifying the controlled wattage and assigning installations to the correct measure name with the corresponding wattage range should be stressed with program implementers/vendors, and some consideration should be given to providing information to help implementers/vendors more accurately estimate controlled wattage. The evaluation found that the ex-post controlled wattage was about 30% lower than ex ante. There are multiple measure names for occupancy sensors, which differ by the range of wattage controlled by the sensor. For example, one measure may be associated with controlled wattages less than 150 watts, and another associated with controlled wattage of 150 or more. At least half of the 30% difference between ex-post and ex-ante controlled wattages can be attributed to misclassification of the measure name (e.g., the actual claimed wattage was less than 150 watts, but the installation was classified as controlling 150 watts or more). For those installations that were properly classified, ex-post wattages were still found to be 10-15% lower than ex ante. Having more measures names with more (and tighter) wattage ranges can help improve the differences between ex ante and ex post wattage within that range. However, with more range categories, it also becomes more likely for installations to be misclassified into the incorrect wattage range. So increasing the number of measures to include more discrete ranges might not necessarily result in more accurate ex-ante results. The number of wattage ranges currently used varies from program to program, but what is most important is to ensure that there is a measure name associated with low wattage installations. The evaluation found a number of occupancy sensors that controlled a small number of CFLs, and were often times associated with an ex-ante wattage assumption that was well above what was actually being controlled. Appendix G.7 informs this recommendation. Based on all of the above, we have three recommendations.

- Ensure there is a measure that allows for low controlled wattages.
- Consider reducing the ex-ante assumed controlled wattage by 10-15%.
- Stress with program implementers and vendors the importance of accurately identifying the controlled wattage, and consider providing some information to help them estimate this value.

Delamping

Because delamping is almost always done in conjunction with a linear fluorescent retrofit, a consistent use of a single measure name should be applied to this joint action. If delamping were to occur in the absence of a retrofit, then a separate measure could be developed just for delamping without a retrofit. But otherwise, a single delamping plus retrofit measure name should be used.

6.9 Work Paper Recommendations

All program tracking data records should be assigned to the correct workpaper ID and should be using parameter values from the most recent approved version. This evaluation found that program tracking data records did not always reference the correct workpaper ID, and that tracking data records were using values from older versions of a workpaper. **The link between tracking data and ex ante assumptions should go through a more thorough QC process to ensure the correct reference is being made.**

6.10 Program Application/Documentation Recommendations

Provide detailed, organized and internally consistent data documentation for each claim, such that the evaluator can easily trace the program participation information to the final tracking system savings estimates. While not always the case, project documentation received from the IOUs in response to initial data requests was sometimes incomplete. On occasion, when more data was re-requested, the same incomplete project data was provided again. Program participation documents were generally adequate and provided reliable customer information and high level project data. These data included site contact information, installation dates, rebate totals, etc. Deficiencies were most often observed in the specific savings calculations for projects. These calculation workbooks are the most important piece of documentation and confirmation of tracking system savings claims.

Develop a final report folder for each claim that includes all program information – project application/approval documents, invoices, calculation workbooks, signed project completion/rebate information, etc. – such that all the data points are properly stored and easily accessible for retrieval. In line with the recommendation made above, this would ensure that all relevant information is available for review even before the data request is made and enable an accurate analysis of claimed savings once the data request is fulfilled. Deficiencies in program information should also be noted within the final report folder such that any subsequent data requests can be informed by what data is actually available. If the evaluator is aware that certain data points are not available for review, this may eliminate the need to re-request data altogether.

Ensure that detailed calculation workbooks are provided with the project documentation data upon fulfilling a data request. Workbooks were generally provided, although not always, that detailed each of the parameters that constituted the energy and demand savings. The level of specificity within these workbooks, however, varied from program to program (as well as within program). Some workbooks detailed the quantities installed, delta wattages, and operating hours at the activity area level while others provided an aggregated site level total. At the very least, this provided all the inputs that were necessary to evaluate the ex-ante assumptions. Many other applications failed to provide complete information regarding the parameter estimates that

constituted the demand and energy savings. These included scanned .pdf's that provided missing inputs or invoices that only detailed quantities installed and nothing more. It was often difficult to discern what was being installed, where it was being installed, what baseline assumptions were being used for wattages, etc.

As a general guideline, all lighting calculation workbooks should be compiled in an unlocked spreadsheet format. Generally, calculation spreadsheets were provided. However, many project calculations were delivered as scanned documents which made it difficult to discern what inputs were being applied to parameter estimates. Live spreadsheets that detailed each input were far more informative and provided a much more accurate and transparent means by which the ex-ante assumptions could be evaluated.