




2018 NONRESIDENTIAL ESPI DEEMED LIGHTING IMPACT EVALUATION

Final Report

Submitted to:
California Public Utilities Commission

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 EXECUTIVE SUMMARY

1.1 OVERVIEW

This study evaluates energy efficient light emitting diode (LED) tubes and fixtures, a subset of lighting technologies offered by the 2018 investor-owned utility (IOU) commercial energy efficiency programs for which the levels of energy savings are highly uncertain. This executive summary discusses the specific lighting technologies studied, the general approach to developing savings, and the resulting evaluated savings values and key findings.

Overall, the evaluation team found few differences in how savings were claimed by IOUs compared to the savings *actually* being realized. We found one difference in how some IOU programs were claiming and accounting for savings, however. While not a pervasive issue, in terms of overall number of customers or total claimed savings affected, the program accounting error did under-estimate some IOU program claimed savings. Aside from this accounting issue, the evaluation team found the following:

- LED tubes and fixtures were predominantly replacing fluorescent tubes as claimed by the IOUs and the *claimed* number of fixtures and bulbs were confirmed when the evaluation visited program participants to verify installations.
- The evaluation team found some differences in the claimed hours of use (HOU) or the total hours throughout the year when the lights were switched "ON", but these differences varied by customer sector. The evaluated HOU for retail establishments, for example, were generally higher than the HOU claimed for these establishments.
- The evaluation team also found programs were fairly influential in a customer's decision to install rebated LED bulbs.

Future evaluation efforts should continue to monitor the annual operation of LED technologies, especially in high usage areas like retail space, hallways and lobbies. These areas can operate for much longer periods of time than claimed HOU and can have potentially significant impacts on realized energy and demand savings moving forward. Further research should continue to track the typical baseline and efficiency of the equipment replaced with program-rebated LED indoor and outdoor technologies. The claimed efficiency levels of rebated technologies should also continue to be tracked, to ensure equipment is program eligible. Furthermore, if an IOU program is claiming savings from a certain perspective – i.e., what a given fixture or efficiency of a given fixture is claiming – they should accurately report those claimed savings.

1.2 ENERGY EFFICIENCY TECHNOLOGIES STUDIED

This evaluation focused on six LED technologies which the IOUs offered through their commercial rebate programs:

- Indoor LED Fixture – These are typically 4-foot lighting fixtures found in offices or a gym and include changing out the entire fixture and surrounding casing.
- Indoor LED Tubes – This only includes changing out an old inefficient light tube for an efficient LED tube.
- Outdoor LED Fixture – These are the lights found outdoors, like in parking lots and parking garages.
- Indoor LED Light Bulbs – These are the classic light bulbs you would find in a desk lamp.
- Indoor LED Reflector Light Bulbs – These are often referred to as "flood lights."
- Indoor LED Decorative Light Bulbs – These are often installed in fixtures like chandeliers or accent lighting.

The technologies studied represent roughly 5.9% of the total kilowatt hour (kWh) energy savings reported by all IOU program technologies statewide, over the life of the technologies – referred to as lifecycle savings. Table 1-1 presents the distribution of reported kWh energy savings across the six studied technologies for each IOU along with the statewide total.

TABLE 1-1: PERCENTAGE OF 2018 REPORTED GROSS KWH SAVINGS BY PORTFOLIO AND LIGHTING TECHNOLOGY FOR COMMERCIAL PROGRAMS

	Percent of Portfolio Lifecycle kWh Savings			
2018 Lighting Technology	**Statewide**	**PG&E**	**SCE**	**SDG&E**
Indoor LED Fixture	**2.7%**	6.5%	1.1%	1.0%
Indoor LED Tubes	**1.9%**		2.1%	4.6%
Outdoor LED Fixture	**0.8%**	2.0%	0.1%	0.1%
Indoor LED Light Bulbs	**0.1%**	0.3%		0.1%
Indoor LED Reflector Light Bulbs	**0.3%**	0.6%	0.1%	0.5%
Indoor LED Decorative Light Bulbs	**0.1%**	0.1%	0.0%	0.2%
TOTAL	**5.9%**	**9.4%**	**3.4%**	**6.4%**

1.3 APPROACH

The study's objective is to evaluate IOU savings claims for the six lighting technologies and to conduct research that develops revised estimates of savings. This study examines each of the parameters that make up the energy (in kWh) and demand (in kW) savings provided over the lifetime of these technologies, as follows:

- Installed measure counts – the number of rebated units that were installed and operable.
- Annual hours of use (HOU).
- Delta wattage – The change in power measured in watts, which represents the efficiency of the installed technology relative to the pre-existing equipment.
- Effective useful life (EUL) – the number of years that the energy efficient equipment will operate into the future. This is critical to estimating lifecycle savings.

Various techniques were used to study each parameter. For some technologies, customers were visited on site to collect information to support the energy savings calculations. In some instances, monitoring equipment was installed on the new lighting systems to measure the number of hours the lights are "ON." Another key on-site activity collected information on the model numbers of the light bulbs or fixtures installed so that wattage values and the efficacy of the equipment could be determined from manufacturer specifications.

The evaluation compared the savings reported by the programs for each parameter to evaluation results developed using the data collected on-site. The ratio of the evaluated savings to reported savings is referred to as the "realization rate," or the rate at which *reported* savings are realized through the evaluation.

The evaluation also examines how successful the IOU programs were at influencing customers to install energy efficient technologies that would not have been installed without the programs. Customers who would have installed the same energy efficient equipment in the absence of the program are referred to as "free riders," because they receive incentives for actions they would have undertaken without the program's existence. The evaluation examines both the total amount of savings derived among all participants, referred to as "gross savings," and the savings that is generated "net" of free riders, referred to as "net savings." The ratio between the net and gross levels of savings is referred to as the net-to-gross ratio.

To estimate the net-to-gross ratio, a representative sample of participants were contacted and asked several questions regarding the program's influence on their decision to install the energy efficient equipment. The survey examined various factors including what the customer would likely have done in the absence of the program. The net-to-gross ratio is a value between zero and 100%. The higher the ratio the better, meaning the program had a higher influence on the installation of that energy efficient technology.

The following table presents which technologies had on-site and telephone surveys performed, and whether evaluated gross and net savings values were calculated or if the IOU reported values were used (as indicated by the "used reported" notation).

TABLE 1-2: DATA COLLECTION AND ANALYSES CONDUCTED BY TECHNOLOGY

2018 Lighting Technology	Data Source		Evaluation Update	
	New Phone Surveys	New On-sites	NTG	Gross
Indoor LED Fixture		X	Used Reported	X
Indoor LED Tubes		X	Used Reported	X
Outdoor LED Fixture		X	Used Reported	X
Indoor LED Light Bulbs	X		X	Used Reported
Indoor LED Reflector Light Bulbs	X		X	Used Reported
Indoor LED Decorative Light Bulbs	X		X	Used Reported

1.4 RESULTS

The results of this evaluation are provided in Table 1-3 through Table 1-5 below. Shown for each technology are the evaluated and reported net lifecycle savings values (MWh), the realization rates and the corresponding net-to-gross ratio, if applicable.

TABLE 1-3: PG&E LIFECYCLE NET MWH REALIZATION RATES FOR EVALUATED TECHNOLOGIES

2018 Lighting Technology	Life Cycle Net MWh Savings			Net-to-Gross Ratio (Evaluated)
	Reported	Evaluated	Net Realization Rate (Evaluated/Reported)	
Indoor LED Fixture	221,179.6	281,280.8	**127%**	-
Indoor LED Tubes				
Outdoor LED Fixture	76,280.3	74,014.0	**97%**	-
Indoor LED Light Bulbs	13,758.1	9,619.6	**70%**	0.62
Indoor LED Reflector Light Bulbs	25,919.5	23,951.8	**92%**	0.73
Indoor LED Decorative Light Bulbs	2,649.5	3,654.6	**138%**	0.88

TABLE 1-4: SCE LIFECYCLE NET MWH REALIZATION RATES FOR EVALUATED TECHNOLOGIES

2018 Lighting Technology	Life Cycle Net MWh Savings			Net-to-Gross Ratio (Evaluated)
	Reported	Evaluated	Net Realization Rate (Evaluated/Reported)	
Indoor LED Fixture	51,087.6	70,778.8	**139%**	-
Indoor LED Tubes	96,476.1	102,211.0	**106%**	-
Outdoor LED Fixture	5,919.0	5,919.0	**100%**	-
Indoor LED Light Bulbs				
Indoor LED Reflector Light Bulbs	5,099.8	4,003.3	**78%**	0.70
Indoor LED Decorative Light Bulbs	440.8	416.8	**95%**	0.70

TABLE 1-5: SDG&E LIFECYCLE NET MWH REALIZATION RATES FOR EVALUATED TECHNOLOGIES

2018 Lighting Technology	Life Cycle Net MWh Savings			Net-to-Gross Ratio (Evaluated)
	Reported	Evaluated	Net Realization Rate (Evaluated/Reported)	
Indoor LED Fixture	25,445.6	28,645.2	**113%**	-
Indoor LED Tubes	106,916.6	103,548.0	**97%**	-
Outdoor LED Fixture	3,296.7	3,296.7	**100%**	-
Indoor LED Light Bulbs	1,066.7	1,354.1	**127%**	0.79
Indoor LED Reflector Light Bulbs	14,590.6	9,484.6	**65%**	0.57
Indoor LED Decorative Light Bulbs	4,291.7	5,028.0	**117%**	0.73

1.5 KEY EVALUATION FINDINGS

The realization rates, which compare the evaluated and reported savings values, vary significantly across each technology and program administrator. Differences between the evaluated and reported savings values are due to differences in the underlying parameters that comprise the energy and demand savings. Variations are primarily driven by the following:

- **Overall, the evaluation team found higher operating hours – especially within specific sectors like retail establishments – than were claimed.** Higher evaluated operating hours lead to more significant energy savings.
- **Indoor LED tubes and fixtures were primarily replacing fluorescent tubes and fixtures.** LED tubes replaced fluorescent tubes directly. The existing fixture and wiring remained intact. LED fixture panels and retrofit kits replaced entire lighting systems, including the casing and wiring.
- **The evaluation found indoor LED technologies and baseline technologies that were very similar to reported technologies.** The efficacies of LED technologies were generally high. Efficacy in this regard is defined as the light output of the measure per watt (lumens/watt). The higher the lumens per watt, the more efficient the bulb is in producing light output per unit of power. The evaluation team found efficacies of indoor LED bulbs and fixtures at roughly 125 lumens/watt, on average.
- **The evaluation team found that lighting technologies were installed and operating properly.** The evaluation team did not have to make significant adjustments based on improper installations.
- **The evaluation team found discrepancies in the program tracking data that had a negative impact on the reported savings values for some measures.** For some indoor LED technologies, the claimed savings were far less than evaluated savings because the IOU claimed savings were misreported in the program tracking data.
- **The evaluation team found that the programs were fairly influential in the customers' decision to install LED bulbs.** Free ridership levels were below 30% for most technologies for each IOU. There was only one segment (SDG&E reflector bulbs) with a high level of free ridership (43%), primarily driven by two very large installations where the customers claimed they would have still installed the bulbs in the absence of the program.

1.6 RECOMMENDATIONS

- Future evaluation efforts should continue to monitor the annual operation of indoor LED fixture and tube technologies and claimed HOU should be updated to reflect the higher usage of installations in areas like hallways, lobbies and retail sales space.
- Future evaluations should continue to monitor the age and condition of existing fixtures like fluorescent technologies. LED tube lamps are designed to replace the fluorescent tube lamp, but the existing fixture remains. Understanding the age and condition of that existing fixture, would provide more information regarding how long the whole fixture will last before needing to be replaced.
- Program Administrators should continue to carefully track program claims, to make sure claimed savings reflect how the actual claims should be accounted for.
- All workpaper documentation (documents, savings calculation workbooks and supporting documents) should be posted on the CPUC's Workpaper archive website. Furthermore, discrepancies in claimed savings should be identified and rectified prior to the commencement of evaluation work.

1.7 CONTACT INFORMATION

The ED Project Manager for this study was Mr. Coby Rudolph. Mr. Brian McAuley of Itron, Inc. served as the manager of the impact evaluation.

TABLE 1-6: CONTACT INFORMATION

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2 INTRODUCTION AND OVERVIEW OF STUDY

This report documents the activities and results of the 2018 Nonresidential Deemed Lighting Impact Evaluation of the California Investor Owned Utilities (IOU) energy efficiency programs. The overall goal of this study is to perform an impact evaluation on specific nonresidential deemed lighting technologies that were identified in the Efficiency Savings and Performance Incentive[1] (ESPI) decision for program year (PY) 2018. The ESPI mechanism was adopted on September 5, 2013 in D.13-09-023 and provides monetary incentives to IOUs for performance in resource and non-resource program activities.

This evaluation focuses on energy efficiency (EE) resource program savings – measured in net ex post lifecycle energy and demand savings – realized by IOU programs in PY2018. The evaluation team collected and analyzed new primary data to develop net ex post lifecycle savings and to satisfy impact evaluation requirements for lighting technologies on the PY2018 Uncertain List. This report details the goals and objectives of the impact evaluation to meet those requirements. Likewise, the report discusses the researchable issues, information on the technologies evaluated as well as the data sources used, the approach for sampling, the verification analysis and the methods used to determine ex post net lifecycle energy impacts. Finally, the report presents the results and findings from the analysis that can then be used to update the Net-to-Gross Ratios (NTGRs) and gross/net first year and lifecycle savings for the measures detailed in the ESPI decision.

2.1 ANALYSIS OF MEASURE UNCERTAINTY

The objective of this study is to perform a measure or measure-parameter impact evaluation – utilizing new primary evaluation data – to update claimed gross or net savings estimates and inform future savings values for lighting technologies identified in the PY2018 ESPI decision. Attachment A of the ESPI decision provides an overview of the measure groups (i.e., Food Service equipment, Indoor LED Fixtures), the energy resource (i.e., electric, gas) and the parameters that have been identified as potentially requiring ex post verification. These parameters include installation/verification rates, Unit Energy Savings (UES), NTGRs, gross and net energy savings values, effective useful life (EUL) and impact load shapes. The measure groups and parameters detailed in Attachment A were selected for ex post verification based on several criteria:

- Ex ante savings for the measure are substantially uncertain
- Ex ante savings for the measure represent a significant proportion of program administrator (PA) portfolio savings
- Ex ante savings claims for the measure are expected to increase substantially

[1] http://www.cpuc.ca.gov/general.aspx?id=4137

The final 2018 ESPI Uncertain List identifies several lighting measures that are subject to some level of ex post evaluation for PY2018. Table 2-1 below summarizes the source of uncertainty surrounding the claimed energy and demand impacts for each measure and details which parameters were studied for ex post evaluation. All measures presented below were also included on the PY2017 uncertain list. Furthermore, all measures listed below will remain on the PY2019 list. The remainder of the report discusses these parameters and how they were studied, in more detail.

TABLE 2-1: OVERVIEW OF PY2017-2018 MEASURE UNCERTAINTY

2018 ESPI Measure	Measure Type	% of PY2018 Portfolio LC KWh Savings (SW)	2017 ESPI Measure	Uncertain Parameters Studied in 2018
Indoor LED Fixture	High/Non-Highbay	2.7%	X	Gross Realization Rate (GRR), EUL
Indoor LED Tube Lamps	T-LED	1.9%	X	
LED Lamp	A-Lamps	0.2%	X	NTG Ratio
	Specialty Lamps		X	
LED Reflector Lamps	MR-16 and Reflector Lamps	0.3%	X	NTG Ratio
Outdoor LED Fixture	Non-Street Light	0.8%	X	Gross Realization Rate (GRR), EUL

As evident above, indoor LED fixture and T-LED technologies represent a significant proportion of portfolio level lifecycle savings at the statewide level (4.6 percent combined), followed by outdoor LED fixtures (0.8 percent). Indoor lamp and reflector lamp technologies represent a combined 0.5 percent of total claimed lifecycle (LC) kWh savings at the statewide level (SW).

Changes in the composition of the underlying program participant population can have a significant effect on the realized savings claims for these measures across program years. For example, program participants installing LED fixture measures in PY2017 may have been replacing more inefficient baseline technologies compared to program participants installing the same measures in PY2018. Furthermore, a given program may be targeting different commercial sectors in PY2017 compared to PY2018 and changes to program delivery methods can impact the realized savings of a measure from one program year to the next. While these measures represent a significant percentage of PA portfolio level savings and the baseline and installed composition of the measure continues to evolve and remain uncertain, claimed impacts for these measures will remain uncertain and ex post evaluation will be required to true up claimed savings.

2.2 RESEARCH OBJECTIVES

Rather than develop a full, comprehensive analysis on all uncertain measures, this evaluation focuses on evaluating specific parameters within the savings algorithms for some measures while implementing a more comprehensive analysis on others. Several research objectives have been targeted in order to develop net and gross ex post impacts for the measures detailed above. The following tasks have been performed, either by collecting new primary data from participant phone surveys or on-site verification to develop ex post net lifecycle savings. A more detailed description of the impact methodologies follows in Section 5, but the tasks are summarized below:

- Confirm installations (verification). This includes on-site verification of measure installations that represent a significant percentage of ex ante claimed savings.
- Estimate baseline (both pre-retrofit and code based) and replacement (post-retrofit) equipment wattages, operating hours and use shapes to support the estimate of gross ex post impacts and 8,760 impact load shapes.
- Estimate participant free-ridership to support the development of net-to-gross ratios and net savings values.
- Update EUL estimates based on ex post operating hours.
- Estimate first year and lifecycle gross and net ex post impacts (kWh, kW).
- Develop gross and net realization rates (GRRs and NRRs) and NTG ratios – both first year and lifecycle.

2.3 STUDIED MEASURES

Table 2-2 presents the deemed lighting measure contribution to each PA's 2018 portfolio lifecycle gross claimed energy savings (as well as the statewide contribution). Also shown are each measure's lifecycle gross energy savings as a percentage of all ESPI nonresidential lighting measure savings.

TABLE 2-2: PERCENTAGE OF 2018 EX ANTE GROSS KWH SAVINGS BY PORTFOLIO AND DEEMED ESPI LIGHTING

2018 ESPI Uncertain Measure	Percent of Portfolio Lifecycle kWh Savings				Percent of Lifecycle kWh Savings Among All Deemed ESPI Lighting Measures			
	SW	PG&E	SCE	SDG&E	SW	PG&E	SCE	SDG&E
Indoor LED High/Non-Highbay	**2.7%**	6.5%	1.1%	1.0%	**45.9%**	68.7%	31.3%	15.9%
Indoor T-LED Lamps	**1.9%**		2.1%	4.6%	**32.0%**		62.7%	70.8%
Outdoor LED Fixture	**0.8%**	2.0%	0.1%	0.1%	**13.1%**	21.4%	3.1%	1.7%
Indoor LED A-Lamps	**0.1%**	0.3%		0.1%	**1.9%**	3.1%		0.8%
Indoor LED Reflector Lamps	**0.3%**	0.6%	0.1%	0.5%	**5.8%**	6.0%	2.7%	7.6%
Indoor LED Specialty Lamps	**0.1%**	0.1%	0.0%	0.2%	**1.3%**	0.8%	0.3%	3.2%
TOTAL	**5.9%**	**9.4%**	**3.4%**	**6.4%**	***100%***	***100%***	***100%***	***100%***

As shown in Table 2-2, each of these uncertain measures contributes varying levels of claimed lifecycle gross portfolio savings. Overall, they represent roughly 5.9 percent of total claimed kWh savings at the statewide level. LED fixture and T-LED savings represent roughly 91 percent of that total. LED A-lamp, accent and reflector lamp measures represent the remaining 9 percent, at the statewide level.

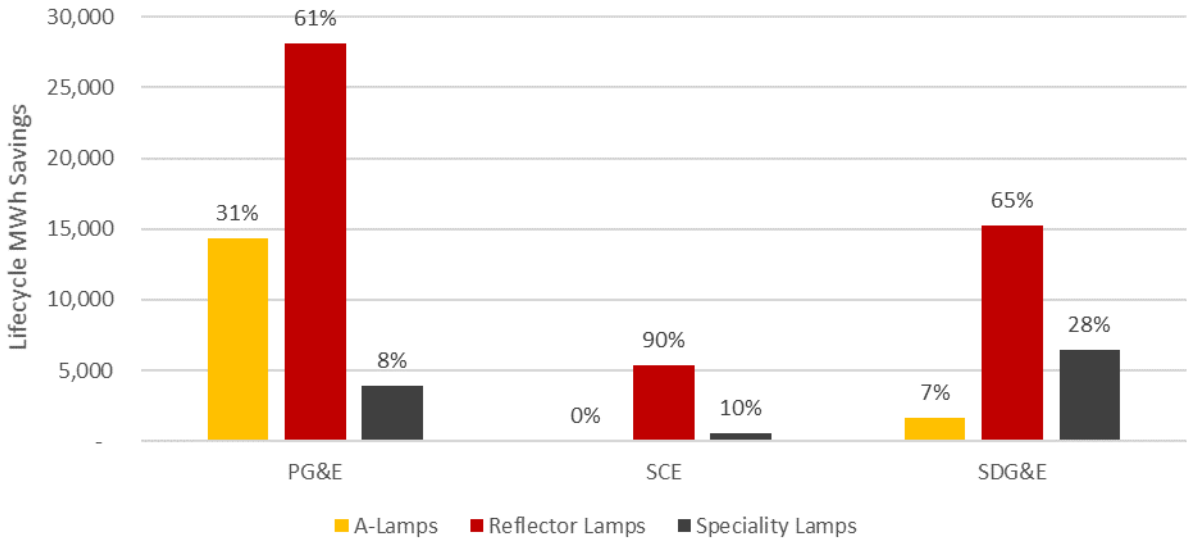
The six measures listed are aggregate measures that are comprised of seven deemed measure groups and over 350 unique measure names.[2] The evaluation team mapped each of the measure groups and measure names that were represented in the tracking data to these deemed ESPI uncertain measures. The evaluation team also referenced work papers for some measures where the measure name was too generalized, to more accurately map it to a specific measure category.

2.3.1 Indoor LED Lamps

As presented above in Table 2-2, LED A-lamp, specialty and reflector lamp measures represent roughly 0.5 percent of statewide lifecycle portfolio energy savings and 9 percent of the statewide kWh savings for all the deemed ESPI lighting measures. This measure category, however, represents several different technology types and applications. Indoor LED lamps, for example, include the A-lamp type, reflector lamp types (BR, MR-16 and PAR) and specialty bulbs like candelabras and accent globes. Figure 2-1 presents the distribution of lifecycle MWh savings for each technology type for each PA.

[2] Appendix E provides a detailed mapping of how each ESPI measure was mapped to a specific measure name found in the 2018 program tracking data.

FIGURE 2-1: DISTRIBUTION OF PY2018 LIFECYCLE MWH SAVINGS FOR INDOOR LED LAMPS BY PA

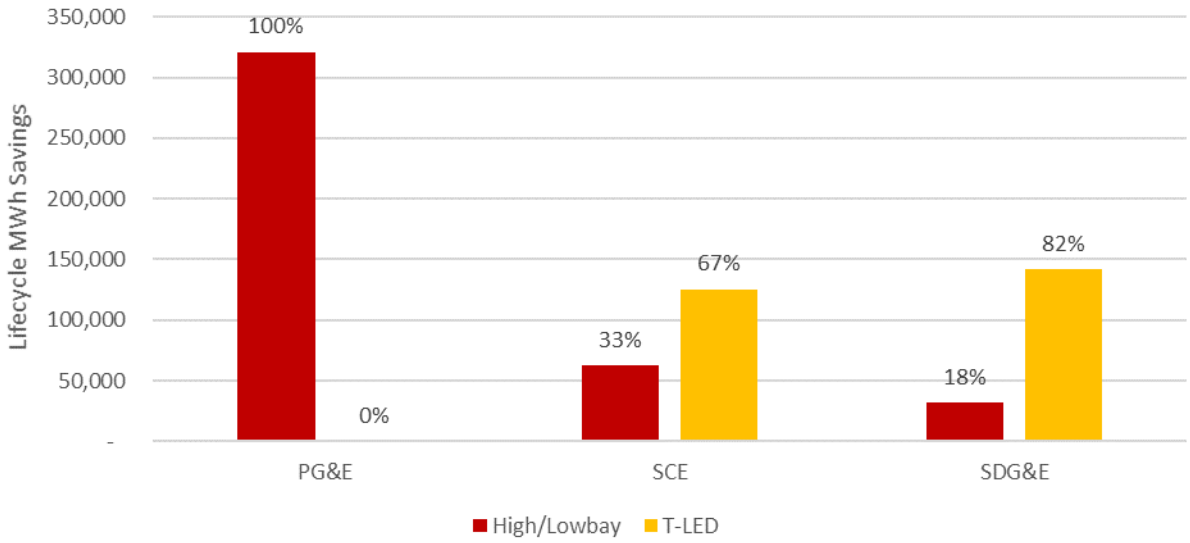


LED reflector lamps represent the most significant percentage of claimed lifecycle MWh savings for each PA, followed by LED A-lamps and specialty bulbs. Overall, the number of claims and contributing claimed savings for indoor LED lamp measures have dropped significantly in PY2018 compared to PY2017. Claimed lifecycle kWh savings for indoor lamp measures has decreased by 74 percent in PG&E, 92 percent in SCE and 43 percent in SDG&E. No claimed savings were reported for the A-lamp measures for SCE in PY2018.

2.3.2 Indoor T-LEDs and Fixtures

As presented in Table 2-2, LED indoor fixture and T-LED measures represent roughly 4.6 percent of statewide lifecycle portfolio energy savings and 78 percent of the statewide kWh savings for all the deemed ESPI lighting measures. The indoor LED fixture measure group also represents several different technology types and applications. LED downlights are represented in the LED fixture measure group because they include not only a lamp replacement, but a fixture/housing replacement as well. Non-downlight fixtures can also be installed in a high-bay application or in a low-bay setting. These measures range in light output and baseline/measure case wattages and have different applications and technology considerations – troffers, panel fixtures, integrated retrofit kits, etc. T-LED lamps are also rebated per lamp and are installed directly into existing linear fluorescent (LF) fixtures and are designed to operate with existing electronic ballasts. Figure 2-2 presents the distribution of lifecycle MWh savings for each indoor measure by PA.

FIGURE 2-2: DISTRIBUTION OF PY2018 LIFECYCLE MWH SAVINGS FOR INDOOR LED FIXTURES BY PA

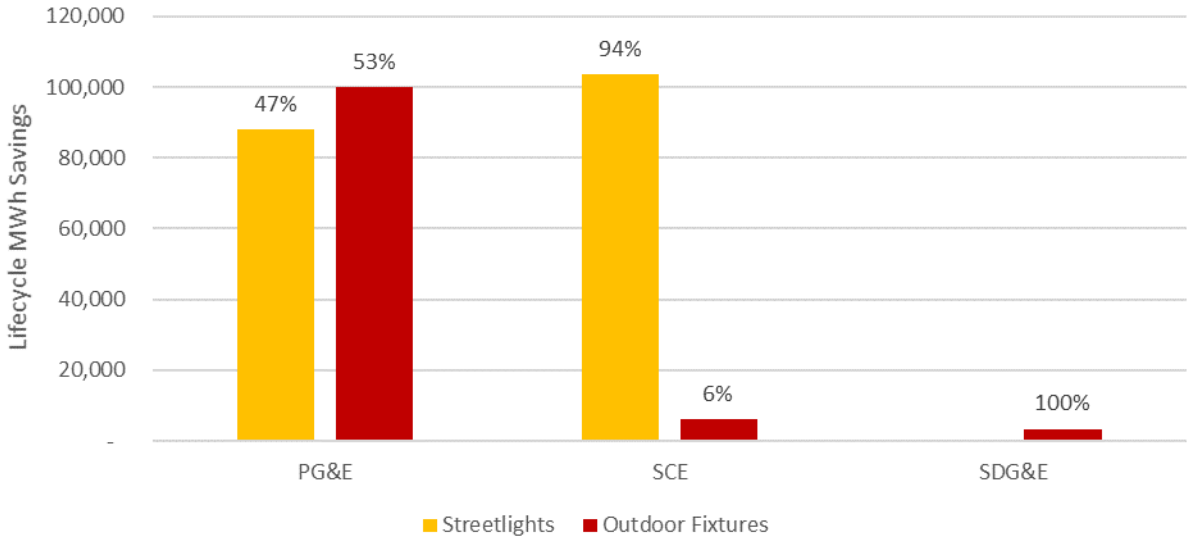


Linear T-LED lamps represent the most significant share of claimed lifecycle savings for SCE and SDG&E and only high-bay and low-bay fixtures were rebated in PY2018 for PG&E. There is also significant heterogeneity in the technology types representing high-bay and low-bay measures. Some measures are whole fixture replacements with different baseline considerations (i.e., 6L high light output (HLO) T8 systems versus pulse start metal halide (PSMH) or high-pressure sodium (HPS)). Some measures are specifically detailed as high-bay lighting in the program tracking data, while others don't have that application designation. T-LED lamps are direct replacements for existing LF T8 tubes and the existing wiring and ballast are maintained. However, the impacts for T-LEDs are predicated on the configuration, the number of lamps per fixture and the ballast factor.

2.3.3 Outdoor LED Fixtures

As presented in Table 2-2, LED outdoor fixture measures represent roughly 0.8 percent of statewide lifecycle portfolio energy savings and 13 percent of the statewide kWh savings for all the deemed ESPI lighting measures. For exterior LED fixtures, streetlights serve a much different purpose than parking lots or walkway lighting. Streetlights, however, are not on the 2018 ESPI uncertainty list, but their lifecycle energy savings contribution (by PA) is presented alongside other outdoor LED measures in Figure 2-3 for comparative purposes.

FIGURE 2-3: DISTRIBUTION OF LIFECYCLE MWH SAVINGS FOR OUTDOOR LED FIXTURES BY PA



2.4 OVERVIEW OF IMPACT EVALUATION METHODOLOGY

The evaluation team utilized a gross realization rate (GRR) approach to develop gross and net ex post kW and kWh savings for the PY2018 ESPI measures detailed above. For each of the deemed ESPI measures, site-specific gross ex post impacts were estimated from a sample of program participants. The evaluation team then compared those impacts to the claimed savings for each site-measure to develop a ratio of evaluated to claimed gross savings. The evaluation team developed GRRs for specific participant segments and these rates were applied to the population of participants in order to develop program population estimates of ex post gross savings.

The general approach the evaluation team utilized to estimate ex post gross impacts is based on developing hourly impacts to generate an impact load profile:

$$\text{Impact\_Hour\_i} = \begin{bmatrix}(\text{Baseline\_Wattage} \times \text{Percent\_On\_Pre\_Hour\_i}) \\ -(\text{Post\_Wattage} \times \text{Percent\_On\_Post\_Hour\_i})\end{bmatrix}$$

The hourly (i) impacts for each measure were aggregated to develop an annual or 8,760 load shape and summed to develop ex post gross kWh (energy) savings estimates. These hourly impacts were also averaged across specific hours to develop an ex post gross kW (demand) savings estimate. A more detailed discussion of the impact evaluation methodology can be found in Section 5.

A net-to-gross (NTG) analysis was also performed using a self-report analysis based on participant phone survey data. NTGRs were applied back to the ex ante gross impacts in order to estimate net savings for

the population of program participants. The approach for estimating NTGRs for these customers uses a standardized Self-Report Approach (SRA) that is based on the results of self-report telephone surveys with program participants and is discussed in detail in Appendix A.

This SRA methodology provides a standard framework, including decision rules, for integrating findings from both quantitative and qualitative information in the calculation of the NTGR in a systematic and consistent manner. The method uses a 0 to 10 scoring system for key questions used to estimate the NTGR, rather than using fixed categories that are assigned weights. Respondents are asked to jointly consider and rate the importance of the many likely events or factors that may have influenced their energy efficiency decision making for the project in question, rather than focusing narrowly on only their rating of the program's importance. This question structure more accurately reflects the complex nature of real-world decision making and helps to ensure that all non-program influences are considered when assessing the unique contribution of the program to the energy efficiency project's implementation.

The current Nonresidential NTG framework is designed mainly for Downstream programs, which are focused on delivering incentives directly to end-use customers. Some programs are positioned higher up in the supply chain, so they work through vendors (e.g., distributors, contractors, and design professionals) to deliver incentives to customers. Such programs are classified as Midstream.

The current downstream-centric framework relies primarily on findings from end-use customer surveys for determining NTGRs, which is appropriate, given the customer-focused program delivery approach. The method does allow for vendor input into the NTGR but only in cases where the customer rates the vendor higher than any other program or non-program element in their decision making.

The Midstream approach applies to programs delivered through vendors that meaningfully change how they stock, promote and price program-qualified energy efficient equipment as a result of their participation in the program. There are multiple Midstream program delivery approaches, some for which the program intervention(s) is "invisible" to the end-use customer, and others where the end-use customer is fully aware of the program intervention(s). The design of the program, and the availability of customer data determines the specific NTG approach to be used:

- Programs that work through vendors, where customer contact data is collected, and where it is believed the end-user is either unaware or aware of the program (Midstream A).
- Programs that work entirely with vendors, customer contact data is not collected, and where it is believed the end-user may not be aware of the program (Midstream B).

The remainder of this report will include the following:

- Section 3 discusses the data sources that were utilized to estimate each of the individual measure parameters.
- Section 4 discusses the sample design for measures subject to ex post evaluation.
- Section 5 discusses the development of each of the gross impact parameters – installation rates, pre-and post-retrofit wattages, operating hours and effective useful life (EUL).
- Section 6 discusses the results of the phone interviews and the net-to-gross (NTG) analysis.
- Section 7 presents the final study results including a discussion of the gross and net realization rates and the total population level ex post energy and demand savings.
- Section 8 presents the conclusions and recommendations.
- Appendix AA presents the standardized high-level savings for both gross and net first year and lifecycle.
- Appendix AB presents the standardized per unit savings for both gross and net first year and lifecycle.
- Appendix AC presents the summary of recommendations for the Response to Recommendations (RTR).
- Appendix A presents supporting material for the net-to-gross methodology.
- Appendix B presents the participant and vendor telephone survey instruments.
- Appendix C presents the on-site survey instrument.
- Appendix D presents the method used to adjust the self-reported operating schedules.
- Appendix E presents the phone survey banners.
- Appendix F presents the ESPI measure mapping from measure name in the tracking data.
- Appendix G presents the evaluators responses to public comment.

3 DATA SOURCES

The evaluation team utilized a variety of data sources to support the development of site-specific gross realization rates (GRRs) and net-to-gross ratios (NTGRs) for the ESPI uncertain measures in this study. These data sources were leveraged from new primary data collection which included phone surveys and on-site verification. Table 3-1 presents the data sources and ex post impact evaluation updates for each of the measures discussed in Section 2.

TABLE 3-1: DATA SOURCES AND EX POST UPDATE FOR PY2018 ESPI MEASURES

	Data Source		Evaluation Update	
2018 ESPI Measure	New Phone Surveys	New On-sites	NTG	Gross
Indoor LED High/Non-Highbay Fixture		X	Pass Through	X
Indoor T-LED Lamps		X	Pass Through	X
Outdoor LED Fixture		X	Pass Through	X
Indoor LED A-Lamps	X		X	Pass Through
Indoor LED Reflector Lamps	X		X	Pass Through
Indoor LED Specialty Lamps	X		X	Pass Through

The evaluation team has no existing primary on-site data for LED fixture measures – indoor high/non-highbay, T-LED and outdoor fixtures – and the claimed savings for these measures have increased substantially over the past few program years and new technologies have become eligible for rebates through energy efficiency (EE) programs. The claimed savings for indoor LED lamp technologies, conversely, continue to decrease as a percentage of the portfolio of savings as these technologies continue to become more standard practice and potentially stricter efficacy standards reduce the realized energy and demand savings for these technologies. Given budgetary considerations, accelerated reporting timelines and results garnered from the previous PY2017 impact evaluation, for PY2018:

- New on-site primary research was conducted for the indoor fixture, TLED and outdoor measures and no new NTG research has been conducted – claimed NTG ratios will be passed through. In PY2017, the evaluation team conducted new NTG research on these measures and passed through gross savings.
- New NTG research was conducted on indoor LED lamp technologies and gross savings have been passed through. In PY2017, the evaluation updated gross impacts for these measures and passed through the NTG.

3.1 PROGRAM TRACKING DATA

Prior to the commencement of the data collection and sample planning, the evaluation team reviewed the program tracking data for PY2018 participants. These data were uploaded by each of the IOUs to a centralized server. The evaluation team analyzed, cleaned, re-categorized, reformatted and merged these separate datasets into one program tracking database. We reviewed the measure groups within that database that were identified on the 2018 ESPI uncertain list to gain insight into the number of program participants receiving rebates for PY2018 and the claimed savings associated with those measure installations. These data informed the data summaries presented in Section 2 along with the sampling plan (Section 4) for ex post evaluation.

3.2 ON-SITE VERIFICATION AUDITS

The evaluation team conducted on-site audits for indoor LED fixtures, T-LEDs and outdoor fixtures. The purpose of these audits was to collect site-specific information that could be used to support the parameter estimates that are used in the impact algorithm. On-site surveyors verified if measures that were rebated were installed and operable. When rebated quantities were not consistent with the quantities found on site, the surveyors also quantified and detailed the reason for that inconsistency – the number of rebated measures that had been removed, had burned out or had been placed in storage.

Surveyors also collected equipment manufacturer and model numbers so that the evaluation team could perform equipment lookups. These lookups provided information regarding the wattage, light output and service life of the installed equipment to support the development of post-retrofit wattages and effective useful life (EUL). Surveyors also attempted to collect information on the baseline equipment that had been replaced. They investigated non-rebated areas and/or storage areas to determine the wattage of the pre-existing equipment. For T-LED measures, along with the make and model of the lamp, the evaluation team collected the ballast make and model. The actual wattage draw of the fixture is predicated on the configuration and whether the ballast has a low, normal or high ballast factor. These data were combined with the lamp lookups to develop pre-retrofit and post-retrofit fixture wattages.

The evaluation team also collected information on how the lighting fixtures were controlled and if baseline and retrofit operating conditions were the same. The auditors reported whether a fixture was being controlled by a switch, an occupancy sensor, a time clock, electric panel or photocell. The evaluation team also installed monitoring equipment on rebated fixtures, where possible, to develop time-of-use data and annual operating hours. Finally, self-report data were collected on lighting

equipment usage schedules and business hours – in combination with the actual metered data – to aid in the development of pre- AND post-retrofit load shapes.

3.2.1 On-site Data Used to Support Pre- and Post-Retrofit Wattages

The evaluation team collected detailed information regarding the rebated measures found on site. This information included a full inventory of the fixture/lamp type, the nominal lamp wattage, ballast information and fixture configurations. The evaluation team also collected lamp/fixture/ballast manufacturer and model numbers and performed lookups – based on specification sheets – to develop post-retrofit input fixture/lamp wattages and to collect the efficacy of the program rebated measures. Table 3-2 presents the data collection summaries from the PY2018 on-site verification work conducted by the evaluation team. The total unique site-measures found on site are presented for each make and model lookup performed for each configuration found on-site. Also presented is the count of baseline equipment reported on site by either the site contact or the auditor at the time of the inspection.[1]

TABLE 3-2: T-LED AND FIXTURE POST-RETROFIT MODEL LOOKUPS AND PRE-RETROFIT OBSERVATIONS (PY2018)

LED Type	Configuration	n Site Measures	Measure Case		Baseline
			Lamp/Fixture Lookups	Ballast Lookups	Baseline Equipment Reported
T-LED	4 ft – 2 lamp	35	30	26	35
	4 ft – 3 lamp	9	7	5	9
	4 ft – 4 lamp	16	12	9	16
	4 ft – 6 lamp	2	2	1	2
	All	**62**	**51**	**41**	**62**
Indoor High/Lowbay fixture	1x4	4	4	-	3
	2x2	14	7	-	12
	2x4	40	27	-	30
	Other	43	13	-	25
	All	**101**	**50**	**-**	**57**
Outdoor Fixtures	**All**	**53**	**27**	**-**	**22**

[1] Section 5 details how these data were used in the analysis, but the baseline equipment in the analysis includes linear fluorescents (LFs), metal halide (MH), high pressure sodium (HPS), etc.

3.2.2 Existing On-site Data Used to Support Pre- and Post-Retrofit Operating Hours

The evaluation team utilized logger data collected throughout the 2013-2014 evaluation periods to develop ex post operating hour estimates for indoor LED measures. Those evaluations involved the installation of monitoring equipment on rebated indoor highbay and lowbay linear fluorescent technologies and installed in a variety of building and area types. These logger data were collected and compared against the self-reported operating schedules that were garnered from the on-site contact as well as against the business hours of the business/facility. The evaluation team analyzed the logger data, self-reported schedules and business hours in variety of ways:

- Actual hourly logger data were compared to hourly self-reported operating schedules during the open hours of the business/facility by day type (weekend vs. weekday).
- Actual hourly logger data were analyzed for each business hour during the week and summarized by business period:
  - Open period: All hours of the day for which the business is open.
  - Opening and Closing Shoulders: The two hours before opening and two hours after closing.
  - Closed Period: All hours for which the business was closed and not in one of the shoulder periods.
- The self-reported comparisons and business hour analysis were also done at the control level – measures controlled by a switch versus measures controlled by an occupancy sensor.

Section 5 and Appendix D discuss the methodology in more detail and discuss how the evaluation team tested the approach. Table 3-3 below presents the number of sites and loggers that were used in the adjustment factor and business hour rate development analysis. These summaries detail the control type of the linear fluorescent fixtures being monitored along with the facility and activity area of measure installation.

TABLE 3-3: LOGGED DATA USED FOR ADJUSTMENT FACTORS AND BUSINESS HOUR RATES (2013-2014)

Building Type	Activity Area	Occupancy Sensors		Switch	
		Total Sites	Total Loggers	Total Sites	Total Loggers
Assembly	Classroom			17	42
	Dining			7	10
	Hallway/Lobby			14	25
	Kitchen/Break Room			15	16
	Office			23	38
	Other Miscellaneous	1	1	21	57
	Restrooms	2	3	8	16
	Storage	1	1	9	13
	Total Assembly	**3**	**5**	**36**	**213**
Education – Primary School	Classroom	1	6	34	132
	Hallway/Lobby			16	23
	Kitchen/Break Room			19	25
	Office	1	1	23	41
	Other Miscellaneous	1	3	17	38
	Restrooms	3	3	17	28
	Storage			7	12
	Total Education – Primary School	**4**	**13**	**41**	**299**
Manufacturing – Light Assembly	Comm/Ind Work	5	16	45	110
	Conference Room			11	13
	Hallway/Lobby			24	31
	Kitchen/Break Room			17	26
	Office	4	7	41	118
	Other Miscellaneous	5	8	19	38
	Restrooms	2	4	17	25
	Storage	4	7	27	55
	Total Manufacturing	**18**	**42**	**83**	**395**
Office – Large	Kitchen/Break Room			6	8
	Office			6	29
	Other Miscellaneous	1	5	7	36
	Total Office – Large	**1**	**5**	**8**	**73**
Office – Small	Comm/Ind Work			8	12
	Hallway/Lobby			15	26
	Kitchen/Break Room			10	14
	Office			24	65
	Other Miscellaneous	2	4	11	19
	Restrooms			6	6
	Storage			8	11
	Total Office – Small	**2**	**4**	**30**	**151**
Restaurant	Dining			7	10
	Kitchen/Break Room			10	20
	Other Miscellaneous	3	4	8	14
	Total Restaurant	**3**	**4**	**12**	**44**

TABLE 3-3: LOGGED DATA USED FOR ADJUSTMENT FACTORS AND BUSINESS HOUR RATES (2013-2014) (CONTINUED)

Building Type	Activity Area	Occupancy Sensors		Switch	
		Total Sites	Total Loggers	Total Sites	Total Loggers
Retail – Large	Auto Repair Shop			12	25
	Hallway/Lobby			6	9
	Kitchen/Break Room			6	6
	Office			15	51
	Other Miscellaneous	8	15	10	22
	Restrooms	1	1	6	8
	Retail Sales			19	31
	Storage	8	15	15	36
	Total Retail – Large	**13**	**31**	**38**	**185**
Retail – Small	Auto Repair Shop	8	11	21	45
	Comm/Ind Work	2	2	11	21
	Hallway/Lobby			16	21
	Kitchen/Break Room			9	9
	Office			29	47
	Other Miscellaneous	5	7	14	27
	Retail Sales			24	49
	Storage	1	1	21	34
	Total Retail – Small	**15**	**21**	**81**	**245**
Warehouse	Conference Room			9	11
	Hallway/Lobby			13	23
	Kitchen/Break Room			10	14
	Office			24	56
	Other Miscellaneous	8	19	13	27
	Restrooms	1	2	9	11
	Storage	11	32	27	58
	Total Warehouse	**19**	**53**	**39**	**196**
All Building Types		**83**	**186**	**400**	**1,524**

Overall, measures installed on a switch represent the most significant logger data that were used in the analysis – 1,524 loggers representing 400 sites. Measures controlled by an occupancy sensor were monitored with 186 loggers installed across 83 sites. Across all building types, controls were more prevalent in storage areas while the distribution of loggers on switches was predicated on the building type and activity area of installation.

As detailed above, the evaluation team utilized adjusted self-report data and business hours from 2013-2014 to develop pre- and post-retrofit hours of use for indoor T-LED and fixtures *not* monitored as part of this PY2018 evaluation. On-site auditors verified installation of rebated LED technologies at a variety of business types. Furthermore, technologies were installed in different activity areas within those facilities and monitoring equipment was installed, where possible, on equipment to capture hours of use

(HOU). Table 3-4 presents the number of sites – by building type and activity area – the evaluation team analyzed for each LED technology along with the number of rebated lamp and fixtures that were installed and operable at the time of the on-site verification and the total number of loggers installed.

TABLE 3-4: INDOOR LED MEASURE INSTALLATION BY BUILDING TYPE AND ACTIVITY AREA (PY2018)

Building Type	Activity Area	Total Sites	Total Lamps	Total Fixtures	Total Loggers Installed
Education – Primary School	Auditorium/Gym	2	72	72	2
	Classroom	4	1,077	1,077	5
	Kitchen/Break Room	2	40	40	5
	Office	2	38	38	5
	Other	4	112	112	8
	Restrooms	2	54	54	3
	Storage	2	12	12	1
	Total Education Primary School	**6**	**1,405**	**1,405**	**29**
Grocery	Other	4	163	63	6
	Outdoor	1	10	3	1
	Retail	5	287	170	6
	Storage	3	22	22	4
	Total Grocery	**7**	**482**	**258**	**17**
Manufacturing – Light Industrial	Comm/Ind Work	5	326	164	4
	Conference Room	3	24	12	-
	Hallway/Lobby	4	155	71	3
	Kitchen/Break Room	4	57	25	1
	Office	5	244	148	4
	Other	2	19	9	-
	Restrooms	2	36	16	2
	Storage	3	335	119	1
	Total Manufacturing – Light Industrial	**7**	**1,196**	**564**	**15**
Office - Large	Conference Room	2	16	4	1
	Hallway/Lobby	5	108	81	4
	Office	5	123	68	4
	Other	3	16	3	1
	Restrooms	4	33	28	4
	Services	2	60	52	3
	Storage	2	269	179	4
	Total Office – Large	**6**	**625**	**415**	**21**

TABLE 3-4: INDOOR LED MEASURE INSTALLATION BY BUILDING TYPE AND ACTIVITY AREA (PY2018) (CONTINUED)

Building Type	Activity Area	Total Sites	Total Lamps	Total Fixtures	Total Loggers Installed
Office-Small	Comm/Ind Work	5	105	46	3
	Conference Room	10	121	75	3
	Copy Room	4	15	7	3
	Hallway/Lobby	14	229	180	8
	Kitchen/Break Room	10	119	67	4
	Office	17	1,120	866	23
	Other	11	224	136	5
	Restroom	5	20	8	5
	Services	4	69	44	5
	Storage	4	30	12	2
	Total Office – Small	**22**	**2,052**	**1,441**	**61**
Other	Auditorium/Gym	2	87	87	-
	Total Other	**2**	**87**	**87**	**-**
Restaurant	Dining	3	41	28	5
	Kitchen/Break Room	5	81	49	7
	Other	1	2	1	1
	Outdoor	1	26	13	-
	Restrooms	3	7	6	2
	Storage	2	26	15	2
	Total Restaurant	**7**	**183**	**112**	**17**
Retail-Large	Auditorium/Gym	2	156	156	4
	Auto Repair Workshop	2	286	79	3
	Hallway/Lobby	4	53	51	2
	Kitchen/Break Room	4	11	11	2
	Office	5	118	118	2
	Other	5	178	178	1
	Recreation	2	77	77	1
	Restrooms	3	38	38	-
	Retail	5	401	401	3
	Storage	4	58	25	2
	Total Retail – Large	**9**	**1,376**	**1,134**	**20**

TABLE 3-4: INDOOR LED MEASURE INSTALLATION BY BUILDING TYPE AND ACTIVITY AREA (PY2018) (CONTINUED)

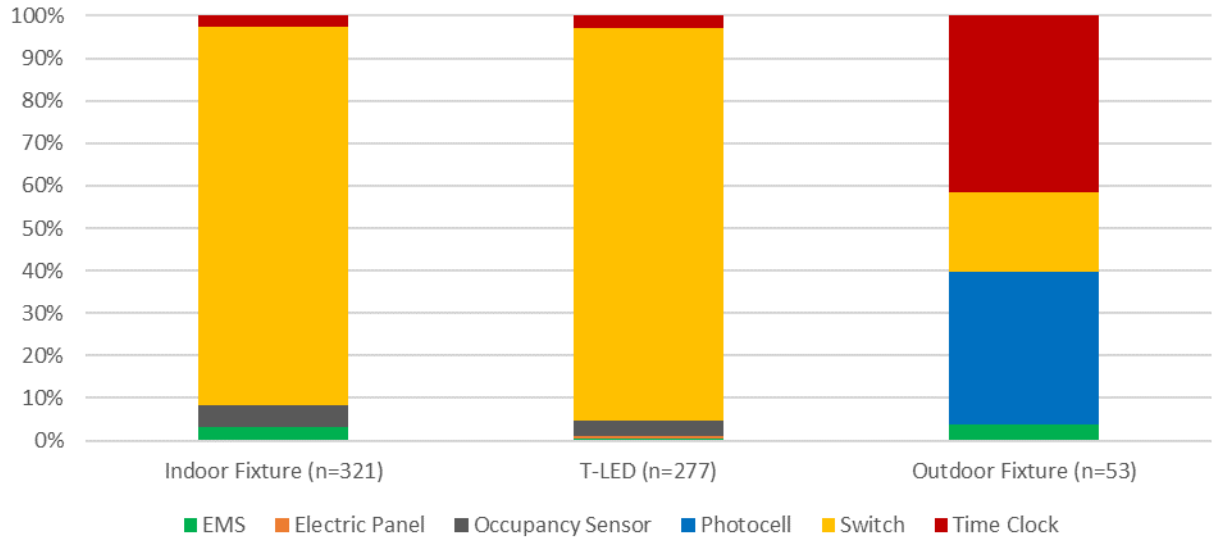
Building Type	Activity Area	Total Sites	Total Lamps	Total Fixtures	Total Loggers Installed
Retail-Small	Auto Repair Workshop	8	321	137	10
	Comm/Ind Work	2	54	24	3
	Hallway/Lobby	7	63	38	7
	Kitchen/Break Room	10	57	26	6
	Office	19	394	144	19
	Other	11	143	69	13
	Outdoor	1	10	10	-
	Recreation	5	210	56	7
	Restrooms	11	33	18	11
	Retail	21	857	672	27
	Storage	16	536	271	17
	Total Retail – Small	**42**	**2,678**	**1,463**	**120**

The activity area and schedule for each installation has a significant impact on the overall operating hours and coincidence demand factors. For example, an LED fixture installed in the retail space of a clothing store will generally have higher annual operating hours and a differing load shape than an identical fixture installed in the storage area of the same store. The sample of verified indoor fixtures were most prominently installed in retail establishments (51 total) and offices (28).

It's also important to note the potential differences in total lamps verified and total fixtures. An LED retrofit kit replacing an entire LF 4-lamp fixture is considered one lamp *and* one fixture in the table above. There could be multiple lamps encased within the fixture, but for the purposes of these summaries, fixtures and lamps are considered equal. However, for T-LED measures, those that represent a lamp for lamp replacement, the total number of lamps and fixtures will generally not equal one another (4 T-LED lamps may replace 4 fluorescent tubes in one 4-lamp fixture).

The operating hour analysis also included the control type of the post-retrofit equipment. The adjustment factors were developed differently for measures that were installed with an occupancy sensor compared to those that were installed on a switch. Furthermore, rebated measures were also installed on circuits connected directly to timeclocks, electric panels and energy management systems (EMS). Figure 3-1 presents the distribution of control type associated with each of the rebated measures evaluated throughout PY2018.

FIGURE 3-1: DISTRIBUTION OF CONTROL TYPE BY LED TECHNOLOGY (PY2018)



Most indoor LED measures were controlled directly by switches with a small percentage being controlled by time clocks, EMS or occupancy sensors. For outdoor measures, control types are more distributed, with photocells making up roughly 35 percent, followed by time clocks and switches.

3.3 NEW PARTICIPANT PHONE SURVEYS

As detailed in Table 3-1, the evaluation team also conducted phone interviews with participants who had installed program rebated interior LED lamp measures – A-lamps, decorative lamps and reflectors. These surveys detailed building owner and operator responses from downstream programs and programs positioned higher up in the supply chain that work through vendors (e.g., distributors, contractors, and design professionals) to support the NTG analysis. In addition to interviewing participants, distributors were also interviewed for measures offered through a midstream program, so a different approach to estimating the NTGR was performed which relied on surveying distributors involved with the program. A detailed description of the self-report attribution and NTG analysis can be found in Section 6 and the overall participant phone survey results are presented in Appendix D but, overall, the surveys were administered to:

- Identify the facility type and activity area of measure installation
- Identify the equipment that was replaced along with the age and condition of that equipment prior to the retrofit

- Estimate net-of-free ridership ratios for each project evaluated through an analysis of surveys and/or professional in-depth interviews
- Extrapolate net-of-free ridership estimates for the entire population sample frame from the sample of projects

3.4 IOU WORKPAPERS AND DEER

The evaluation also reviewed the workpapers, the DEER database and any relevant lighting dispositions that impacted the PY2018 measures studied in this evaluation. Furthermore, we conducted a comparative analysis using ex ante parameter estimates from IOU workpapers, data received directly from the IOUs and from data downloaded from DEER. These ex ante estimates were compared against the gross ex post impacts developed using new primary data collection for each of the measure-parameters to better understand which parameters are driving the gross realization rates for each of the T-LED and indoor/outdoor LED fixture measures installed through downstream and midstream programs.

4 SAMPLE DESIGN

This section of the report presents the population of PY2018 nonresidential ESPI measures subject to evaluation and describes the sampling approach the evaluation team utilized to satisfy the impact evaluation objectives detailed in Section 2. The sampling strategy was designed to provide statistically significant impact results for PY2018 program participants while maintaining evaluation delivery timelines and project budgets. The sample design was developed prior to the commencement of data collection activities and was based on several factors:

- Budgetary considerations and reporting timelines
- Availability of existing primary data
- An understanding of existing primary data limitations
- The magnitude and distribution of ex ante lifecycle energy savings by ESPI measure
- An understanding of the underlying program delivery mechanisms for each ESPI measure
- Sampling requirements needed to develop population-level impacts with a high level of statistical precision

The on-site sample frame for indoor and outdoor LED fixtures and the phone survey sample frame for indoor LED lamp technologies were designed to develop statistically significant gross realization rates (GRR) or NTG parameter estimates while adhering to evaluation reporting deadlines and project budgets. The sample frames include all types of indoor and outdoor LED measures receiving rebates in PY2018 through a downstream or midstream program delivery mechanism. The evaluation team utilized a stratified random sampling approach to produce ex post NTG ratios and GRRs for the evaluated population.

The stratification scheme was designed to develop ex post NTG ratios and GRRs with 10 percent relative precision at the 90 percent confidence interval (90/10). In order to develop estimates at that level of precision, the evaluation team set sampling targets based on coefficients of variation[1] (COV) developed from previous nonresidential lighting NTG and gross studies conducted for California IOUs using the self-report framework. Impact evaluations from 2013-2015 reveal a COV of 0.3 to 0.4 for ex post NTG estimates from rebated lighting measures installed throughout those program years and a 0.5 and 0.7 COV for ex post GRR estimates. Table 4-1 presents how the relationship between sample size and coefficients of variation (COV) affect resulting precision estimates at the 90 percent confidence interval. With a COV of 0.4, the evaluator could achieve a 10 percent relative precision at the 90 percent confidence

[1] The coefficient of variation is the standard deviation of a parameter divided by its mean.

interval with 50 sample points. As the variability in the individual NTG estimates increases relative to the mean, much larger sample sizes are required to obtain a similar level of precision.

TABLE 4-1: SAMPLE SIZE REQUIREMENTS AND COEFFICIENT OF VARIATION AT THE 90% CONFIDENCE INTERVAL

		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Sample Size	5	0.09	0.18	0.27	0.36	0.45	0.54	0.63	0.72	0.81	0.90
	10	0.06	0.11	0.17	0.23	0.29	0.34	0.40	0.46	0.52	0.57
	20	0.04	0.08	0.12	0.15	0.19	0.23	0.27	0.31	0.35	0.39
	30	0.03	0.06	0.09	0.12	0.15	0.19	0.22	0.25	0.28	0.31
	50	0.02	0.05	0.07	0.09	0.12	0.14	0.17	0.19	0.21	0.24
	100	0.02	0.03	0.05	0.07	0.08	0.10	0.12	0.13	0.15	0.17
	150	0.01	0.03	0.04	0.05	0.07	0.08	0.09	0.11	0.12	0.14
	300	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10

4.1 T-LED AND LED FIXTURE ON-SITE SAMPLE DESIGN (PY2018)

For T-LEDs and indoor and outdoor LED fixture measures, the evaluation team conducted on-site verification visits for nonresidential downstream and midstream lighting program participants in PY2018 to support the parameters used in the impact algorithm for specific measures.

- Verification data was collected on site to support installation rates as well as storage rates.
- Equipment manufacturer and model numbers were collected to perform lookups that provide information on the wattage and lumens of installed and replaced equipment to support the estimate of pre- and post-retrofit wattages. For some on-site surveys, 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 is not on site, to help support the estimate of pre-retrofit wattages. The lookups also provide information on manufacturer lamp/fixture life to update the EUL of the measure.
- Lighting loggers were installed and self-report data was gathered on lighting equipment usage schedules to aid in the development of operating hours and pre- and post-retrofit load shapes.

Figure 4-1 presents the distribution of lifecycle MWh savings for LED fixture and T-LED measures. For PG&E, most lifecycle MWh savings (76 percent) are associated with indoor LED highbay and lowbay fixtures, followed by outdoor fixtures (24 percent). T-LED measures were not rebated in PY2018. For both SCE and SDG&E, TLED measures comprise the most significant percentage of savings at 65 percent and 80 percent, respectively. Indoor high and low-bay fixtures also represent a significant share.

FIGURE 4-1: DISTRIBUTION OF CLAIMED LIFECYCLE MWH SAVINGS FOR EVALUATED T-LED AND FIXTURE MEASURES BY PA (PY2018)

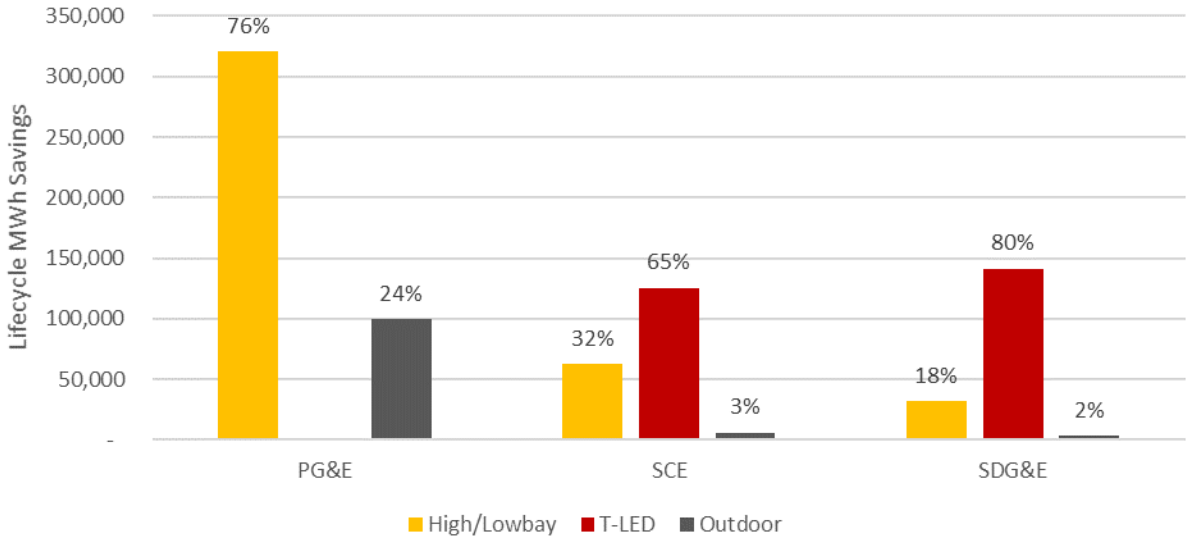


Table 4-2 presents the on-site sample design for deemed indoor and outdoor LED fixture measures along with the number of nonresidential deemed participants, the ex ante lifecycle MWh savings, the percentage of lifecycle savings, sample targets and the precision objectives (by PA). Overall, the evaluation team expected to complete 150 on-site verifications across the three PAs and sample targets were set:

- to develop gross realization rates with a high level of precision measured at the 90 percent confidence interval
- based on the distribution of ex ante lifecycle savings associated with each measure category (by PA)
- based on the practicality of being able to complete the number of on-sites given the number of sites in the population and budgetary considerations

Measures representing a less significant percentage of a given PA's savings will be "passed through". Note that, because many of these measures have not been evaluated in the past, we assumed a coefficient of variation (COV) in the range of 0.5 to 0.7 based on experience with similar measures. Therefore, relative precision values are shown as an expected range corresponding to this range in expected COV.

TABLE 4-2: PY2018 SAMPLE DESIGN FOR T-LED AND LED FIXTURES

PA	LED Type	N Sites	Lifecycle Gross Savings		Sample n	90% CI
			MWh	%		
PG&E	Indoor LED Fixture	1,786	320,989	76%	50	90/10-90/20
	Indoor LED Tube Lamps					
	Outdoor	1,534	99,887	24%	25	90/15-90/25
	All	**3,320**	**420,876**	**100%**	**75**	90/10-90/15
SCE	Indoor LED Fixture	513	62,642	32%	15	90/20-90/30
	Indoor LED Tube Lamps	9,050	125,526	65%	25	90/15-90/25
	Outdoor	182	6,167	3%	Pass Through	-
	All	**9,745**	**194,335**	**100%**	**40**	90/10-90/20
SDG&E	Indoor LED Fixture	166	31,705	18%	10	90/25-90/40
	Indoor LED Tube Lamps	2,622	141,506	80%	25	90/15-90/25
	Outdoor	124	3,444	2%	Pass Through	-
	All	**2,912**	**176,655**	**100%**	**35**	90/15-90/20

N is not indicative of total number of participating sites. One site may have installed multiple measures.

Table 4-3 presents the achieved sample design for each measure. Overall, the evaluation team met or exceeded on-site quotas (by site) for the T-LED measures and the outdoor fixtures. The evaluation team fell short of on-site quotas for indoor LED fixtures in PG&E and SCE. However, we did complete far more site-measures than the initial quotas. Many commercial businesses will install multiple measures at their facility. Our team verified each of the rebated measures installed. Also presented in how much claimed population-level lifecycle MWh savings are represented in the sample completes.

TABLE 4-3: ACHIEVED PY2018 SAMPLE DESIGN FOR T-LED AND LED FIXTURES

PA	LED Type	Lifecycle Gross Savings		Sample n	Achieved n	Achieved Site Measure n	% of Population LC Savings Represented in Sample
		MWh	%				
PG&E	Indoor LED Fixture	320,989	76%	50	44	76	1.8%
	Indoor LED Tube Lamps			-	-	-	-
	Outdoor	99,887	24%	25	33	53	1.9%
	All	**420,876**	**100%**	**75**	**77**	**129**	
SCE	Indoor LED Fixture	62,642	32%	15	11	12	1.5%
	Indoor LED Tube Lamps	125,526	65%	25	31	31	0.2%
	Outdoor	6,167	3%	-	-		-
	All	**194,335**	**100%**	**40**	**42**	43	
SDG&E	Indoor LED Fixture	31,705	18%	10	11	13	1.0%
	Indoor LED Tube Lamps	141,506	80%	25	31	31	0.5%
	Outdoor	3,444	2%	-	-		-
	All	**176,655**	**100%**	**35**	**42**	44	

4.2 INDOOR LED LAMP PHONE SURVEY SAMPLE DESIGN (PY2018)

For downstream and midstream LED lamp measures, the evaluation team conducted phone surveys, as described above, to confirm the measure installation and estimate free-ridership and net-to-gross ratios. The evaluation team carefully reviewed the program tracking data to confirm the measures were deemed, installed in nonresidential facilities, and were delivered through downstream or midstream delivery channels. The three lamp measures include:

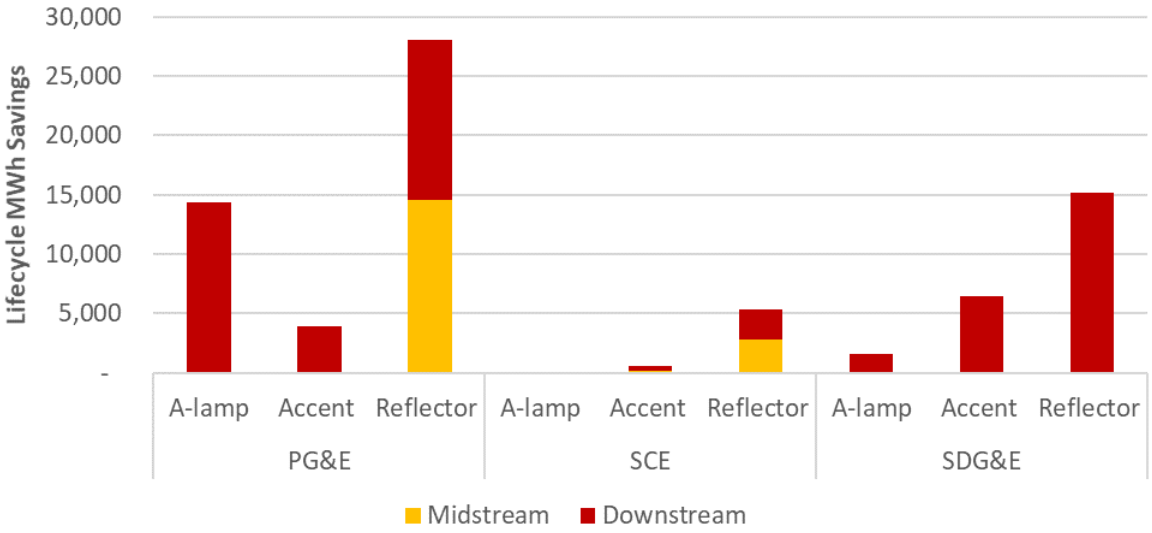
- LED A-Lamp – omni-directional bulbs
- LED Accent lamp – decorative globe and candelabra bulbs
- LED Reflector lamp – MR-16, BR, PAR directional lamps

In PY2018, the PA's rebated LED lamp measures through downstream programs, but they also incentivized equipment through a midstream point of purchase program which provides rebates directly through a distributor delivery channel. The participating distributor signs an agreement with the utility, and they provide point of purchase incentives to customers. The distributor notifies the customer that they are receiving an incentive on behalf of the utility, but the distributor submits the required information to the utility for payment and verification. The specific midstream programs are summarized below:

- PG&E – Commercial Deemed Incentive Program (PGE21012)
  - Qualifying LED reflector lamps
- SCE – Midstream Point of Purchase Program MPOP (SCE-13-SW-002H)
  - Qualifying LED reflector and accent lamps and fixture technologies include LED T8 tubes, high/low bays and downlight fixtures

The evaluation of Net-to-Gross Ratios for midstream nonresidential LED measures uses a hybrid approach that relies on a combination of findings from interviews with end-use customers and lighting distributors. The NTG evaluation for downstream customers utilized findings from end-use customer phone interviews, exclusively. Figure 4-2 presents the distribution of lifecycle MWh savings for each indoor LED lamp measure by IOU and program delivery channel. The evaluation team did not have end-use customer contact information for the PG&E program, so the midstream NTG analysis was limited to the SCE MPOP.

FIGURE 4-2: DISTRIBUTION OF CLAIMED LIFECYCLE MWH SAVINGS FOR EVALUATED LED LAMPS BY DELIVERY CHANNEL AND PA (PY2018)



In PY2018, PG&E delivered rebated LED A-Lamps and accent lamps exclusively through downstream channels and reflector lamps were split between downstream and midstream. SCE did not rebate A-lamp measures in PY2018, and savings were split between downstream and midstream for the other two lighting technologies. SDG&E only rebated lamp measures through downstream channels. Table 4-4 presents the phone survey sample design for deemed LED lamp measures along with the number of nonresidential deemed participants, the ex ante lifecycle MWh savings, the percentage of lifecycle savings, sample targets and the precision objectives (by PA).

Overall, the evaluation team expected to complete 180 downstream self-report customer phone surveys across the three PAs and sample targets were set:

- to develop net-to-gross ratios with a high level of precision measured at the 90 percent confidence interval
- based on the distribution of ex ante lifecycle savings associated with each measure category (by PA)
- based on the practicality of being able to complete the number of phone surveys given the number of sites in the population

The evaluation team also reviewed the midstream program implementation plans, participation data and conducted interviews with program managers, end-use customers and market actors to better understand the nature of the delivery mechanism and to determine program influence. The evaluation team did not develop a dedicated sample design strategy for midstream program participants. Rather we attempted to survey all end-use customers and conduct interviews with all participating vendors.

TABLE 4-4: PY2018 SAMPLE DESIGN FOR LED LAMPS BY PROGRAM DELIVERY

PA	LED Fixture Type	Midstream (1=yes)	N Sites	Lifecycle MWH Savings	% of LC MWH Savings	Sample n	90% CI
PG&E	A-Lamp	0	613	14,349	31%	35	90/10
	Accent Lamp	0	143	3,910	8%	15	90/15
	Reflector Lamp	0	648	13,511	29%	35	90/10
		1	234	14,578	31%	-	-
	All		**1,638**	**46,347**	**100%**	**85**	**90/10**
SCE	Accent Lamp	0	174	413	7%	-	-
	Reflector Lamp	0	466	2,529	43%	20	90/10
	Accent/Reflector Lamp	1	51	2,987	50%		-
	All		**691**	**5,930**	**100%**	**20***	**90/10-15***
SDG&E	A-Lamp	0	337	1,621	7%	15	90/15
	Accent Lamp	0	219	6,439	28%	25	90/10
	Reflector Lamp	0	684	15,233	65%	35	90/10
	All		**1,240**	**23,292**	**100%**	**75**	**90/10**

* The total number of completes and associated precision estimates are based the downstream reflector measures only. At the commencement of the sampling plan, expected completes for the midstream programs was unknown.

Table 4-5 presents the achieved sample design for indoor LED lamps. The evaluation team completed 175 downstream NTG interviews, twelve interviews with SCE MPOP participants and conducted 10 vendor interviews from the program.

TABLE 4-5: ACHIEVED PY2018 SAMPLE DESIGN FOR LED LAMPS BY PROGRAM DELIVERY

PA	LED Fixture Type	Midstream (1=yes)	Lifecycle MWH Savings	% of LC MWH Savings	Sample n	Achieved n	% of Population LC Savings Represented in Sample
PG&E	A-Lamp	0	14,349	31%	35	38	5%
	Accent Lamp	0	3,910	8%	15	10	3%
	Reflector Lamp	0	13,511	29%	35	33	6%
		1	14,578	31%	-	-	
	All		**46,347**	**100%**	**85**	**81**	
SCE	Accent Lamp	0	413	7%		-	
	Reflector Lamp	0	2,529	43%	20	20	4%
	Accent/Reflector Lamp	1	2,987	50%	-	12/10*	59%
	All		**5,930**	**100%**	**20**	**32**	
SDG&E	A-Lamp	0	1,621	7%	15	14	5%
	Accent Lamp	0	6,439	28%	25	25	10%
	Reflector Lamp	0	15,233	65%	35	34	5%
	All		**23,292**	**100%**	**75**	**73**	

* The evaluation team completed 12 midstream program participant interviews and 10 vendor interviews.

5 GROSS IMPACT PARAMETER ANALYSIS

This section of the report details the parameter and gross impact analysis for each of the evaluated LED measures presented throughout this report – T-LEDs and indoor/outdoor LED fixtures. Each of these parameters represents an input into the savings algorithm for these measures and includes, along with the installation rate and measure EULs – operating hours, coincidence factors (CF), post-retrofit wattages and baseline wattages. As discussed in Section 2, the evaluation team developed site-specific ex post impacts at different levels of aggregation. These impacts were then compared to the ex ante claimed savings to create a gross realization rate – the gross savings realized as a result of the ex post evaluation. Below is a discussion of those parameter estimates along with summaries from the on-site data collection.

5.1 GROSS IMPACT METHODOLOGY

As discussed in Section 2, the evaluation team estimated site-specific gross realization rates by developing hourly impacts and impact load profiles. These profiles were then aggregated to develop an annual ex post gross energy savings value (kWh) or, averaged over specific coincident peak hours, to develop ex post gross demand savings (kW). The evaluation team then compared those impacts to the ex ante impacts claimed in the program tracking data to develop a ratio of ex post to ex ante gross savings. The general approach the evaluation team utilized to estimate ex post gross impacts is based on developing hourly impacts to generate an impact load profile.

$$\text{Impact\_Hour\_i} = \begin{bmatrix} (\text{BaselineWattage} \times \text{Percent\_On\_Pre\_Hour\_i}) \\ -(\text{PostWattage} \times \text{Percent\_On\_Post\_Hour\_i}) \end{bmatrix}$$

From this profile, the impacts for each measure were aggregated to develop an annual ex post gross kWh savings estimate and – averaged over specific hours – to develop an ex post gross kW savings estimate.

The evaluation team conducted no new primary research on accelerated replacement. As a result, the ex post analysis utilized each program's claim of replacement on burnout (ROB) or early retirement (ER). All indoor and outdoor fixture measures were rebated as ROB, so these measures were considered under a single baseline methodology. T-LED measures, however, were considered ER, although, due to the nature of this measure, a dual baseline approach was not necessary. Because T-LEDs are installed within a pre-existing fixture and utilize that fixture's ballast, it is assumed that when the pre-existing ballast fails, so does the entire fixture. Therefore, the T-LEDs effective useful life (EUL) should be equivalent to the pre-existing ballast's remaining useful life (RUL), or one third of the ballast's EUL (per DEER). However, the evaluation team deviated from this methodology and developed the EUL for T-LEDs as one third the EUL of the T-LED.

It is also important to note that no research has been done to estimate operating hours during the pre-installation period. Therefore, it is assumed that the pre and post operating hours are equivalent.

Below is a brief description of how the evaluation team developed first year and lifecycle ex post impacts for these measures. The individual parameter estimates are discussed in more detail thereafter.

First Year Impact

$$FirstYearImpact = Quantity\ x\ (PercentOn\ x\ (BaselineWattage\ \ -PostWattage)\ x\ ie)$$

Quantity = the quantity of measures found installed and operable on site at the time of the on-site audit. The installation rate analysis is discussed below in Section 5.2.1.

PercentOn = the percentage of time the equipment is "ON" throughout the year for energy savings or the percentage of time the equipment is "ON" throughout the peak demand period for demand savings. Operating hours and coincident diversity factors (CDF) were created from logger and adjusted self-report data. The operating hour analysis is presented below in Section 5.2.2.

BaselineWattage = the wattage associated with the replaced measure. For T-LED measures, these estimates were developed using baseline equipment found on-site, including fixture configurations and ballast make and model numbers. For outdoor and indoor fixtures, estimates were developed using workpaper assumptions and any relevant lighting dispositions. For indoor fixtures replacing linear fluorescent systems, the evaluation team compared the baseline watts per lumen (WPL) from the T-LED measures to confirm the ex ante assumption was being applied appropriately. These approaches, along with the wattage analysis, are discussed below in Section 5.2.3.

PostWattage = the wattage associated with the installed measure. Post-retrofit wattages, collected on site and through make and model lookups, were used in conjunction with baseline wattage estimates to develop delta wattage estimates. Where post-retrofit equipment could not be verified with make and model lookups (i.e., the fixture was installed at a height not assessible to the on-site surveyor), several other approaches were used to develop post-retrofit wattages (i.e., developing average fixture wattages from the on-site sample or workpaper assumptions and any relevant lighting dispositions). These approaches, along with the wattage analysis, are discussed below in Section 5.2.3.

IE = 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 rebated measures. The kWh factors are multiplied by the annual kWh impact for a given measure, and the kW factors are multiplied by the kW demand impact. Different factors are applied to a given measure and participant based on the measure type, 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.

Lifecycle Impact

$$Lifecycle\ Impact = FirstYearImpact\ x\ EUL$$

FirstYearImpact = the energy or demand savings associated with the installed measure as discussed above.

EUL = the effective useful life of the measure. The EUL is calculated as the lamp/fixture life divided by the post-retrofit hours of operation. The post-retrofit hours of operation were estimated (as discussed above) as the percent "ON" throughout the year. The lamp/fixture life was developed based on make and model lookups and other approaches. For T-LED measures, this time period represents the EUL of the T-LED divided by 3, per DEER. The EUL analysis is discussed in Section 5.2.4.

5.2 GROSS IMPACTS

As discussed above, the evaluation team employed a gross realization rate approach for this evaluation. This means that site-specific savings estimates were developed using the individual parameter estimates developed for each site-measure. Below is a discussion of those parameter estimates along with summaries from the on-site sample. Note that these summaries are weighted averages across the on-site sample and the parameter level estimates were not used to calculate the ex post impacts and gross realization rates. The GRRs are based on site-specific estimates of ex post savings.

5.2.1 Installation Rates

The installation rate is defined as the percentage of equipment found to be installed and operable. The evaluation team estimated the installation rate for each site-measure based on data gathered during on-site verification. The auditor collected information to ascertain the quantity of rebated measures installed and operable along with a total disposition for the rebated measure. In PY2018, program LED technologies were rebated in two ways:

- By fixture or lamp
  - For measures where the rebated unit basis is fixture or lamp, claimed savings estimates are developed based on unit energy savings (UES) of each lamp or fixture. The claimed savings are a product of the UES and the total number of fixtures or lamps rebated.

- By kilolumen
  - Some measures were rebated, and total claimed savings were estimated, not by the total number of fixtures/lamps installed, but by the total kilolumens (or light output) installed. The unit of savings is not the demand or energy savings per lamp or fixture. Rather, the unit of savings is the demand or energy savings per claimed kilolumen installed.

An example of this differentiation is a customer installing *one* fixture at a retail establishment. If the unit basis for the *one* rebated LED fixture was *fixture*, then the program tracking data would classify that claim as such and the evaluation team would conduct an on-site audit and verify the installation of the 1 fixture. If the unit basis was *kilolumen*, the IOU would make a claim based on a minimum efficacy (i.e., a 40-watt LED fixture with a minimum efficacy of 125 lumens per watts or 5,000 lumens). The program tracking data would classify that claim as such and the evaluation team would conduct an on-site audit and verify 5 kilolumens installed (1 kilolumen equal 1,000 lumens). The make and model lookups serve to verify the light output of the claimed measure.

As a result, the forthcoming installation rate analysis presents results for each method. For rebated lamp and fixture measures, the installation rate is determined by identifying the quantity of rebated measures currently installed and in working condition (operable) during the on-site audit. The installation rate is calculated directly from this measurement:

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

For rebated kilolumen measures, the installation rate is determined by 1) identifying the quantity of rebated measures currently installed and in working condition (operable) during the on-site audit, 2) conducting make and model lookups on those installations to determine the efficacy and light output. The kilolumen installation rate is calculated directly from this measurement:

$$\text{LED kilolumen Installation Rate} = \frac{\text{Total kilolumens installed and operable from on-site visit}}{\text{Total kilolumens reported installed in tracking system}}$$

Figure 5-1 and Figure 5-2 present each of the site-measure installation rates evaluated as part of the PY2018 impact evaluation. Each site-measure represents an observation and the vertical axis provides the total claimed fixtures or lamps rebated, while the horizontal axis provides the total quantity of fixtures or lamps installed and operable at the time of the on-site visit. The black line is provided to represent a 100 percent installation rate. If an observation falls directly on the black line, then the on-site surveyors were able to confirm that all rebated lamps or fixtures were installed and operable at the time of the on-site visit. If an observation is above the black line, then the evaluation team found fewer installed and operable measures than claimed. Conversely, a site-measure with an installation rate greater than 100 percent would fall below the black line.

FIGURE 5-1: INSTALLATION RATES FOR REBATED LED FIXTURES BY SITE-MEASURE

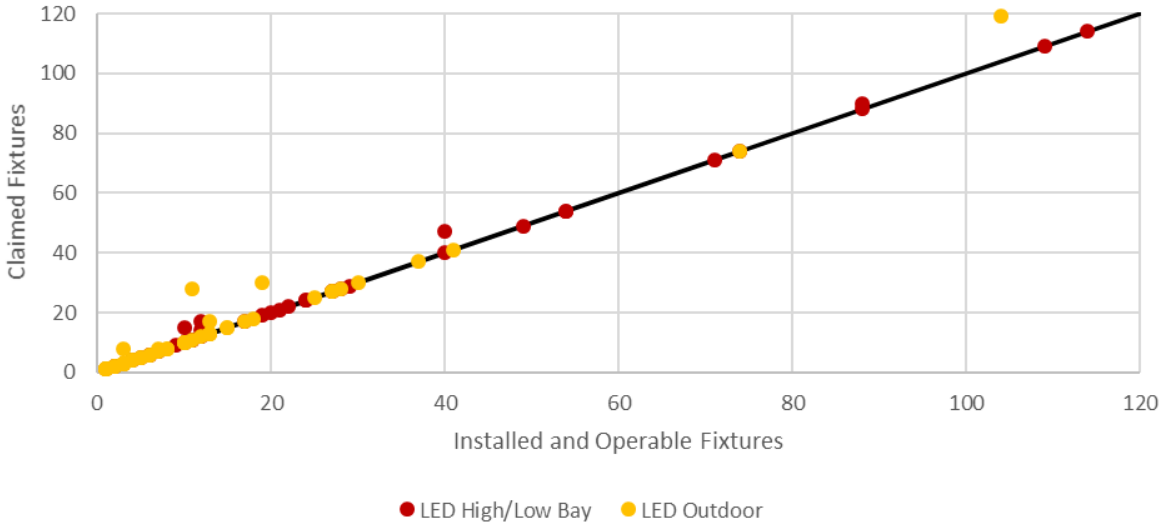
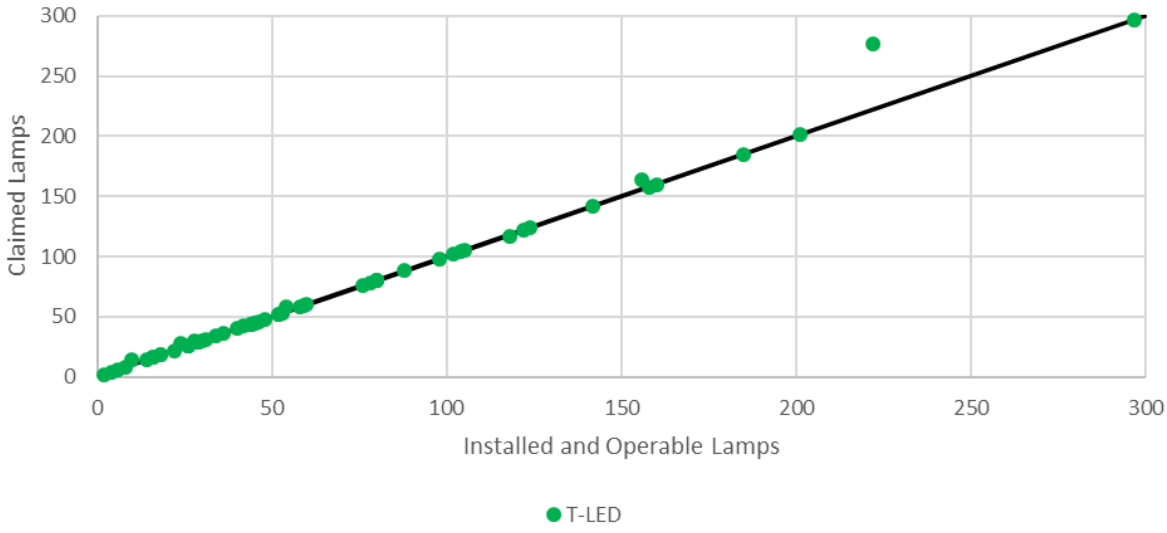


FIGURE 5-2: INSTALLATION RATES FOR REBATED T-LED LAMPS BY SITE-MEASURE



This analysis reveals that installation rates are close to 100 percent for each of the evaluated LED technologies. A few fixture and lamp site-measures are positioned above the black line where installation rates are less than 100 percent. While the installation rate is defined as the percent of equipment found to be in place and operable at the time of the on-site audit, the evaluation team conducted a parallel analysis to better understand why the installation rates would be less than 100 percent. This analysis includes additional verification data collected by the auditor from the on-site contact to identify the percent of rebated measures that were *received* by the program participant (received rate) and the percent of equipment that was:

- Failed and in place – The number of measures that were currently installed but were not in working condition (failed).
- Failed and replaced – The number of measures that had been installed, but then had failed and were replaced with a different technology.
- Removed and not replaced – The number of measures that had been installed but had been removed (either due to failure or other reasons) and were not replaced.
- In storage – The number of measures that were found in storage and had not yet been installed.

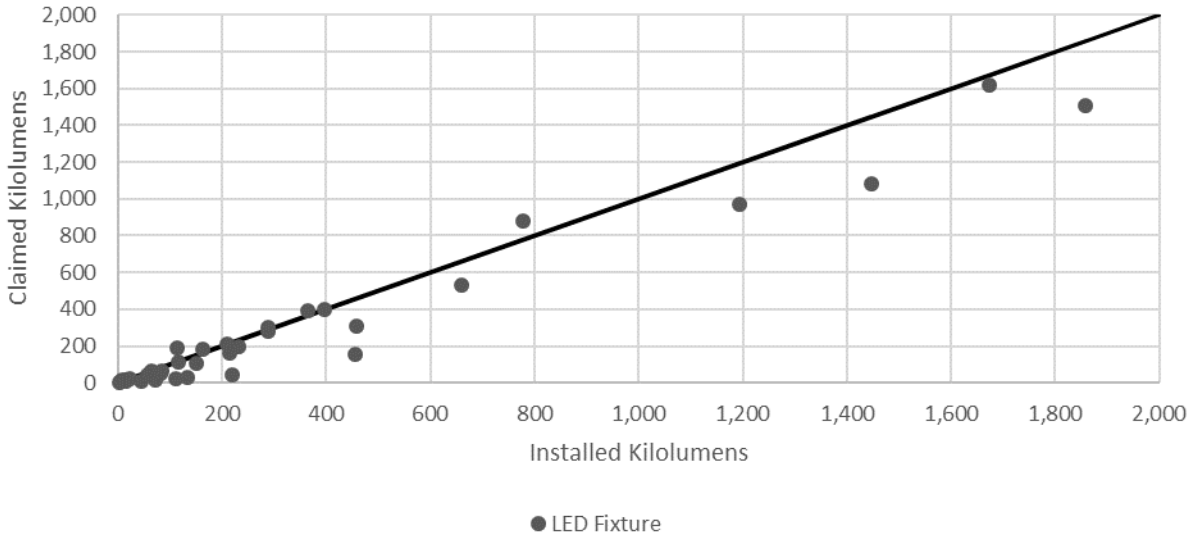
Table 5-1 presents the installation rates, received rates, storage rates and failure/removal rates for each measure type. Also shown are the sample sizes ("n") which correspond to the number of unique site-measures evaluated throughout PY2018.

TABLE 5-1: LIGHTING DISPOSITION AND INSTALLATION RATES FOR LED MEASURES (PY2018)

LED Type	Unit Basis	n	Received Rate	Failure Rate	Storage Rate	Removal Rate	Install Rate	Install Rate RP
High/Lowbay	Fixture	43	99%	0%	0%	0%	99%	1%
Outdoor	Fixture	53	95%	0%	0%	0%	95%	3%
T-LED	Lamp	62	98%	0%	0%	0%	97%	2%

For measures where the unit basis was kilolumen, the evaluation team collected make and model information from the installed equipment and verified the manufacturer rated light output (in lumens) for each installation. We then summed the total lumens installed and compared those findings with those claimed in the program tracking data. Potential differences in what was claimed and what was found is predicated on 1) inconsistencies in the number of fixtures installed versus claimed *and/or* 2) inconsistencies in the claimed efficacy or light output per fixture compared to what the make and model lookups revealed. Figure 5-3 presents the results for each site-measure verified as part of this impact evaluation. Again, an observation above the black line means that fewer installed kilolumens were found on site than were claimed.

FIGURE 5-3: KILOLUMEN INSTALLATION RATE FOR REBATED LED FIXTURE MEASURES



There is far more variability in the kilolumen installation rates compared to the lamp and fixture installation rates. There are few instances in which the claimed total lumens are greater than the evaluated total. Conversely, there are far more instances where the claimed kilolumens were less than what were verified by the evaluation team. There are a few factors which help to explain why each of the observations above don't fall on the black line (100 percent installation rate):

- The evaluation team found fewer installed and operable fixtures than what were claimed.
  - All else being equal, this would reduce the installed kilolumen rate
- The evaluation team found more efficient equipment installed than what was claimed
  - All else being equal, this would increase the installed kilolumen rate
- Programs incorrectly reported the unit basis of claimed savings
  - All else being equal, this could dramatically increase the installed kilolumen rate. If a program installed 5 – 4,000 lumen fixtures, they should report the number of units installed as 20 (5 fixtures X 4 kilolumens) if the unit basis and the UES is based on kilolumens. However, if they incorrectly report the number of fixtures installed instead (5 in this example), they are under-reporting their claimed savings by a factor of 4.

The evaluation team found evidence of all three conditions. However, the third case had the most dramatic influence. Table 5-2 presents the ratio of installed kilolumens to claimed kilolumens by program administrator.

TABLE 5-2: RATIO OF TOTAL INSTALLED KILOLUMENS TO CLAIMED KILOLUMENS (BY PA)

PA	Unit Basis	n	Average Installed Kilolumens	Average Claimed Kilolumens	Ratio	Relative Precision
PG&E	Kilolumen	39	1,276	1,394	1.09	2%
SCE	Kilolumen	9	1,269	1,571	1.24	4%
SDG&E	Kilolumen	10	174	266	1.53	36%
All	**Kilolumen**	**58**	**1,167**	**1,316**	**1.13**	**2%**

The evaluation team found no examples of incorrect reporting for PG&E measures with a unit basis equal to kilolumen – and the ratio is 1.09. For SCE and SDG&E, however, the evaluation team found evidence of units being incorrectly reported in the tracking data. Of the 9 SCE measures, six were incorrectly reported and of the 10 SDG&E measures, two were incorrectly reported.

5.2.2 Operating Hour Analysis Methodology

Section 3 presented the total number of sites and loggers used in the development of adjusted self-reported usage schedules and business hour rates (by control type) along with an inventory of site and ex post fixture counts – by LED technology, building type, activity area – from the 2013-2014 impact evaluations.

For measures not directly monitored in this evaluation, the evaluation team conducted an adjusted self-report and business hour analysis.[1] The evaluation team installed monitoring equipment on a variety of rebated LED measure installations throughout those program years and analyzed the logger profiles to develop hours of use (HOU) estimates and load shape profiles. These loggers were installed:

- on multiple indoor linear fluorescent technologies (i.e., highbay and lowbay fixtures)
- across multiple program years (2013-2014)
- within a variety of facility and space types (i.e., retail space of a retail establishment or the break room of an office)
- on lighting equipment connected through different controls (i.e., switch or wall/ceiling mount occupancy sensors)

[1] Appendix D provides a detailed description of the adjusted self-report methodology.

Along with the logger installations, on-site auditors also asked the on-site contact to estimate lighting usage for each activity area within their building for each hour in the day throughout a typical work week. Since different activity areas within a building generally have different lighting schedules, the site contact was asked to estimate the operating schedule for each of the activity areas where rebated measures were installed. On-site auditors also collected weekly business operating schedules from the site contact. Furthermore, the on-site auditors collected the open and close time for each day of the week for any seasonal operations or holiday schedules that deviated from the facility's normal operating schedules.

For those customers that were monitored, the evaluation team compared the participant's actual lighting usage to both their self-reported lighting usage and their business operating hours. These comparisons were made at the technology, building type, activity area and control level. Furthermore, rather than simply comparing annual operating hours, comparisons were made for four different use periods – relative to self-reported business hours:

- The Open period was defined as all hours of the day for which the business was open.
- The Opening and Closing shoulders were defined as the two hours before opening and after closing, respectively.
- The Closed period was defined as all hours for which the business was closed, and not in one of the two shoulder periods.

Finally, these comparisons were made at the day type level as well – weekday versus weekend. Figure 5-4 presents an example of these three usage profiles from a private office along with the four usage periods.

FIGURE 5-4: EXAMPLE DAILY LOAD PROFILE FOR A LINEAR FLUORESCENT FIXTURE INSTALLED IN AN OFFICE

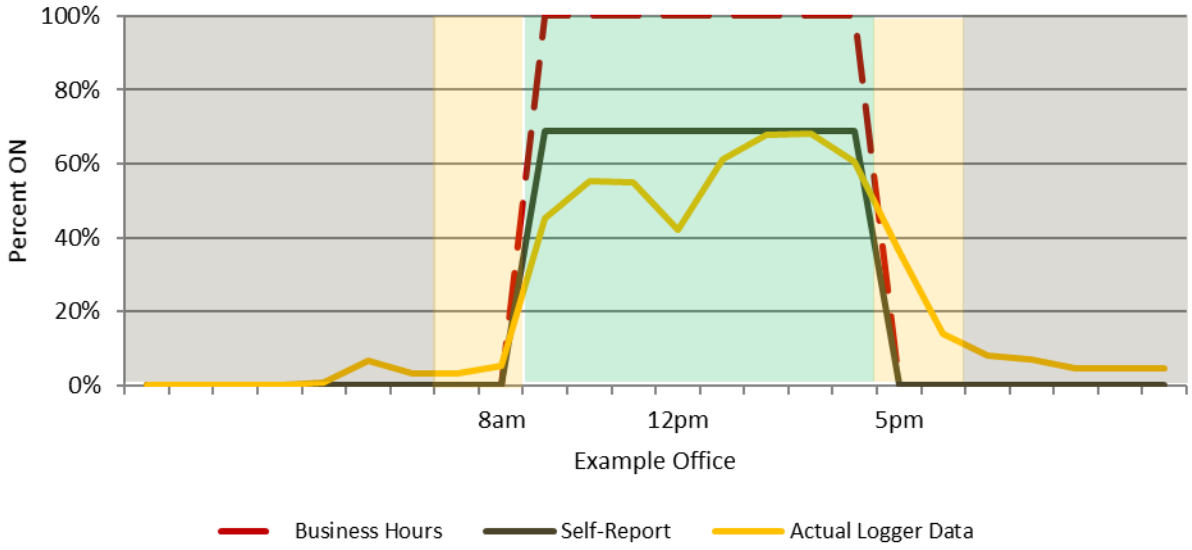


Figure 5-4 reveals a few important distinctions that, ultimately, represent the motivation behind this analysis:

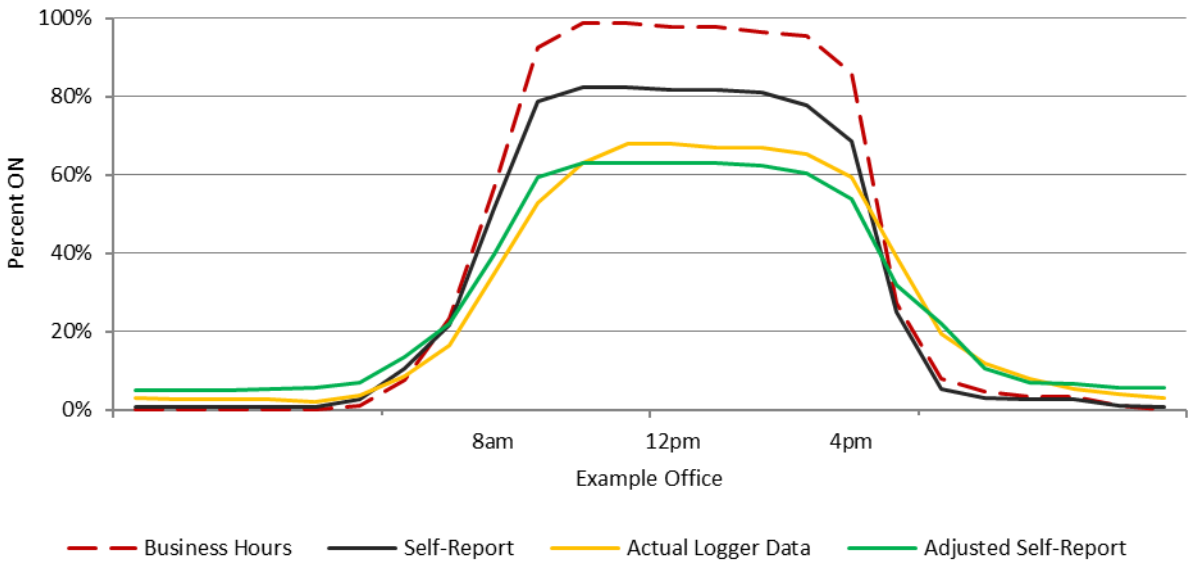
- Business hours alone are not a reliable proxy to develop use shapes and lighting load impacts.
- Customer self-reported lighting usage, which was garnered from the on-site contact, is roughly 30 percent less than the business hours throughout the open period (highlighted in green).
- Actual lighting usage, garnered from monitoring data, is less than both business hour and self-report estimates and there is significant hourly variability throughout that time frame.
- Business hours and self-reports – in this case – do not account for any lighting usage throughout shoulder periods (highlighted in yellow) and non-shoulder closed periods (highlighted in gray).

However, the intent of this analysis was not to accurately predict lighting usage at a single site, but rather for a large sample of similar technologies, building types and space types. In order to aggregate these adjustments and usage rates, logger data was compared to the business hours of the facility and each self-reported schedule at the facility. As mentioned above, for each hour in each day, four usage periods were generated for each facility – Open, Open Shoulder, Closed Shoulder and Closed. The actual and self-reported usage rates were then calculated for each logger by use period within the site and each logger was aggregated to a site-activity area level by measure. This aggregation only occurred when there was more than one logger installed in similar space types. The aggregation from individual loggers to activity areas was done based on the number of lamps that each logger was monitoring.

For the open period, the evaluation team developed a ratio of actual logger to self-report by technology, building type, activity area, usage period, day type and control type. Then these ratios, or adjustment factors, were developed such that they could be applied to a self-report schedule by building type and activity area, for the open period where lighting loggers were not deployed. However, for the closed and shoulder periods, rather than develop and apply adjustment factors, the evaluation team developed average usage values from the logger sample and these usage values were used directly for those time periods. The reason why adjustment factors were not developed and applied to these periods is that the self-reported usage during these periods was often claimed to be zero. A zero value cannot be adjusted by a multiplicative factor, so a constant factor was used. Again, this constant factor was the actual average usage found in the logger sample for those time periods and was applied by technology, building type, activity area, day type and control type.

By applying the adjustment factors to the open time period, and the usage values to the closed and shoulder time periods, the evaluation team developed proxy load shapes at several levels of disaggregation. Since not all technology, building type and activity area combinations were well represented, adjustment factors and usage rates were also developed at the technology-building type level as well as at the technology level alone. Figure 5-5 presents an example of average daily profiles from all 4 streams of data from the sample of offices monitored throughout the evaluation periods.

FIGURE 5-5: AGGREGRATED DAILY LOAD PROFILE FOR LINEAR FLUORESCENTS INSTALLED IN AN OFFICE



In this example, the hourly self-reported profiles were compared against the actual hourly logger data throughout the open hours for each office and were aggregated. Average hourly usage rates were also developed during the shoulder and closed period – based on facility business hours. The resulting adjusted load profile (in green) is very similar to the actual logger profile (in yellow).

Table 5-3 presents the average annual operating hours and CDFs for the sites studied as part of this evaluation. Also shown are the number of site-measures evaluated along with the relative precision for each estimate, measured at the 90 percent confidence interval. Again, these summaries are weighted averages across the on-site sample. These parameter level estimates are provided for illustrative purposes only and were not used to calculate the ex post impacts and gross realization rates. The GRRs are based on site-specific operating hours and CDFs.

TABLE 5-3: T-LED AND FIXTURE POST-RETROFIT ANNUAL HOURS OF OPERATION AND COINCIDENCE FACTORS BY BUILDING TYPE (PY2018)

Building Type	n Sites	Annual Operating Hours	RP	Coincidence Factor	RP
Education - Primary School	6	2,072	10%	0.43	10%
Grocery	7	5,312	9%	0.85	14%
Manufacturing - Light Industrial	7	2,585	12%	0.66	14%
Office - Large	6	2,860	22%	0.61	15%
Office - Small	22	2,584	11%	0.66	8%
Other	2	2,320	32%	0.44	63%
Restaurant	7	4,136	15%	0.64	29%
Retail - Large	9	4,290	15%	0.81	12%
Retail - Small	42	3,360	7%	0.78	5%
All Building Types	**115**	**3,068**	**5%**	**0.69**	**4%**
Outdoor	33	4,059	1%		

Overall, the evaluation team used monitored data and adjusted self-report data from a total of 115 evaluated indoor sites and 33 outdoor sites to develop annual operating hour and CDF estimates for LED T-LED and fixture measures. These estimates were garnered from a wide variety of business types – retail and offices, restaurants, grocery, etc. The operating hour estimates for each building type were most influenced by the distribution of measure installation by activity area. As presented in Section 3 (Table 3-4), for example, program rebated LED installations were verified in the retail sales space for 25 of the 51 retail establishments with almost half of the total fixture installations verified within that activity area.

5.2.3 Pre- and Post-Wattage Analysis Methodology

Another key set of parameters in the impact algorithm are the pre- and post-wattages. The evaluation team utilized on-site verification data and several other data sources to support development of wattage estimates for each indoor LED measure. The make and model database of rebated and installed LED technologies served as the backbone for this analysis along with workpaper and lighting disposition review.

Table 5-4 presents the total number of site-measures evaluated in PY2018. Each observation below was analyzed to develop the site-specific pre- and post-retrofit wattages and to update delta wattage estimates in the impact algorithm. Also included is the total number confirmed lamp/fixture wattage and ballast lookups conducted, along with whether baseline equipment was found on-site or reported by the site contact at the time of the audit.

TABLE 5-4: T-LED AND FIXTURE POST-RETROFIT MODEL LOOKUPS AND PRE-RETROFIT OBSERVATIONS (PY2018)

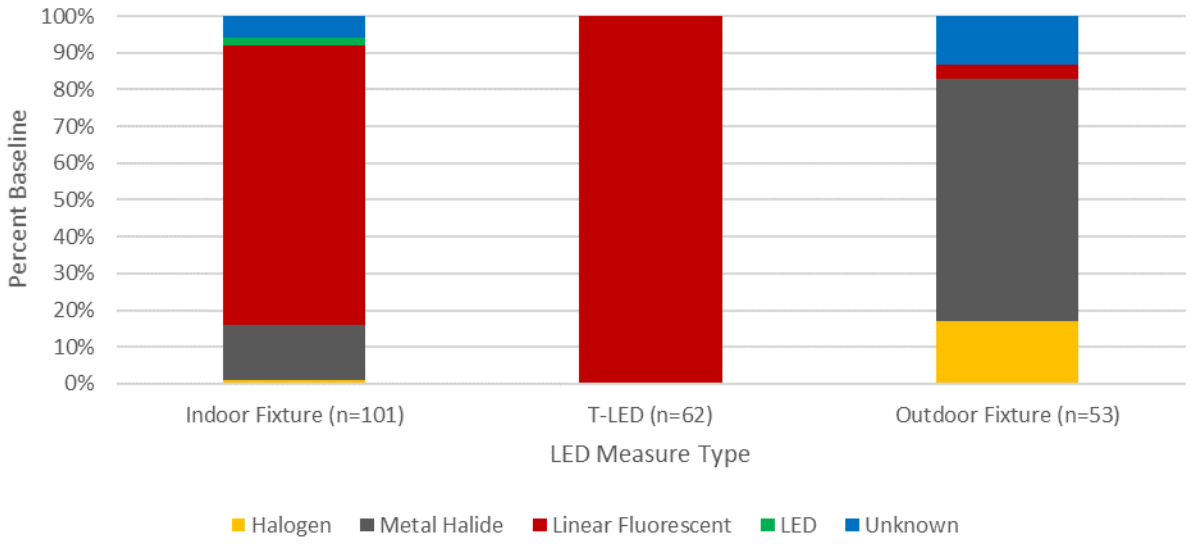
LED Type	Configuration	n Site Measures	Measure Case		Baseline
			Lamp/Fixture Lookups	Ballast Lookups	Baseline Equipment Reported
T-LED	4 ft – 2 lamp	35	30	26	35
	4 ft – 3 lamp	9	7	5	9
	4 ft – 4 lamp	16	12	9	16
	4 ft – 6 lamp	2	2	1	2
	All	**62**	**51**	**41**	**62**
Indoor High/Lowbay Fixture	1x4	4	4	-	3
	2x2	14	7	-	12
	2x4	40	27	-	30
	Other	43	13	-	25
	All	**101**	**50**	**-**	**57**
Outdoor Fixtures	**All**	**53**	**27**	**-**	**22**

Overall, the evaluation team conducted analyses on 63 T-LED measures, 101 indoor fixture measures and 53 outdoor fixtures. These data are also presented at the configuration level as well. T-LED measures are rebated on a lamp per unit basis, but they are installed in existing linear fluorescent fixtures that house multiple lamps per fixture. Furthermore, the existing linear fluorescent ballast remains installed within the fixture and surveyors collect the ballast information to aid in development of pre- and post-retrofit wattages. These fixture wattages are based on the configuration of the fixture as well as the ballast factor. Indoor high/lowbay fixture retrofit kits are presented along with the dimensions of the equipment (1-ft x 4-ft or 2-ft x 4-ft). Fixtures labeled “other” represent all other high

and lowbay fixture types. These technologies, along with outdoor fixtures, are complete fixture replacements, so even if the existing baseline technology were linear fluorescent, the ballast and any existing wiring has been replaced with the installation of the new fixture.

Figure 5-6 presents the baseline technology distribution for each of the LED measures evaluated. These technologies have been binned for presentation purposes. Halogen technologies include incandescent fixtures and metal halides (MH) include Mercury Vapor (MV) and high-pressure sodium (HPS) technologies.

FIGURE 5-6: DISTRIBUTION OF BASELINE TECHNOLOGY FOR T-LED AND FIXTURE MEASURES



T-LED measures were all replacing existing linear fluorescent (LF) lamps so the baseline distribution is 100 percent LF. Most indoor fixtures were replacing LF fixtures as well, with a smaller percentage of highbay technologies replacing metal halides. Most outdoor LED technologies were replacing metal halides, followed by halogens.

The evaluation team also collected the fixture light output – measured in lumens – for each of the installed LED retrofits from make and model information, along with ballast factors and fixture configurations for T-LED measures. We collected nominal lamp wattages, input fixture wattages and the rated light output for each lamp and fixture. LED technologies have matured over the past several years, both in terms of quality and efficacy. Efficacy in this regard is defined as the light output of the measure per watt (lumens/watt). The higher the lumens per watt, the more efficient the lamp is in producing light output per unit of power. The evaluation team combined the post-retrofit fixture wattages with the light output for each measure. Figure 5-7 presents these results for indoor and outdoor fixtures and Figure 5-8 presents the results for T-LED fixtures.

FIGURE 5-7: FIXTURE LUMENS AND POST-RETROFIT WATTAGE FOR LED FIXTURES (BY SITE - MEASURE)

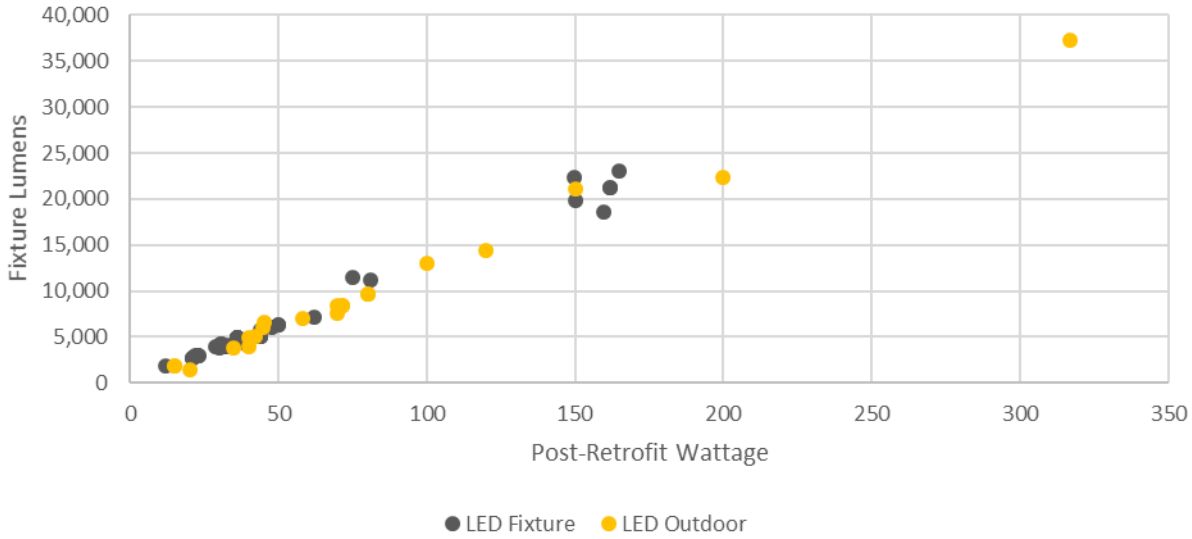
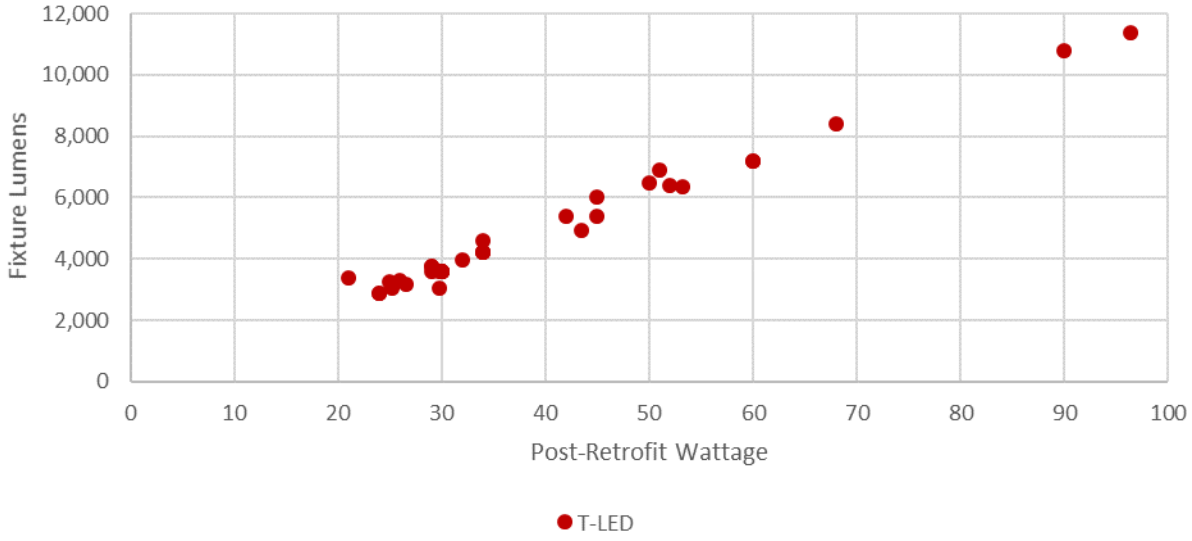


FIGURE 5-8: FIXTURE LUMENS AND POST-RETROFIT WATTAGE FOR T-LED FIXTURES (BY SITE - MEASURE)

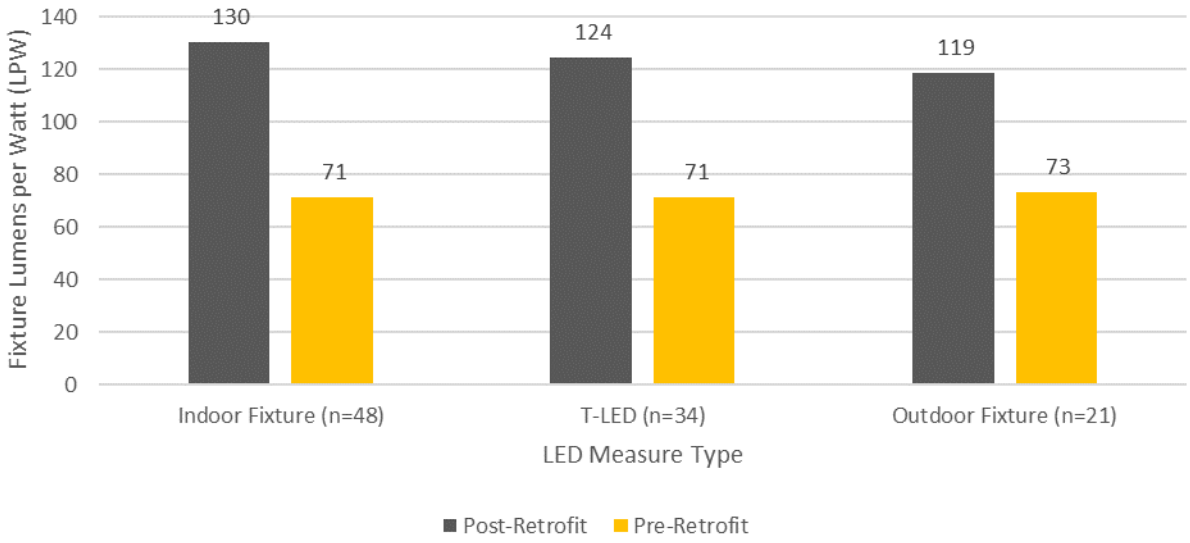


Most verified indoor and outdoor fixtures were less than 100 watts, with a few indoor fixtures in the 150 to 250-watt range and one outdoor measure verified above 300 watts. For T-LED measures, the post-retrofit wattages ranged from as low as 21 watts to as high as 96 watts. The spread in post-retrofit fixtures wattages for T-LEDs is predicated on the lamp configuration of the fixture as well as the ballast factor. Observations on the lower range represent 4 ft – 2 lamp fixtures and fixture wattages generally increase with more lamps per fixture. The 90 watts fixture in Figure 5-8 is a 4 ft – 6 lamp fixture and the

96-watt fixture is a 4 ft – 4 lamp configuration. The higher wattage associated with this site-measure is a result of the fixture having a ballast with a high ballast factor.

The evaluation team also developed average efficacy or LPW estimates for each of the LED measures. The post-retrofit lumens were compared to both the post-retrofit wattage and the baseline wattage estimates for each measure. These figures represent observations where the evaluation team successfully conducted a make-model lookup to confirm the rated lumens of the measure. Figure 5-9 presents those results.

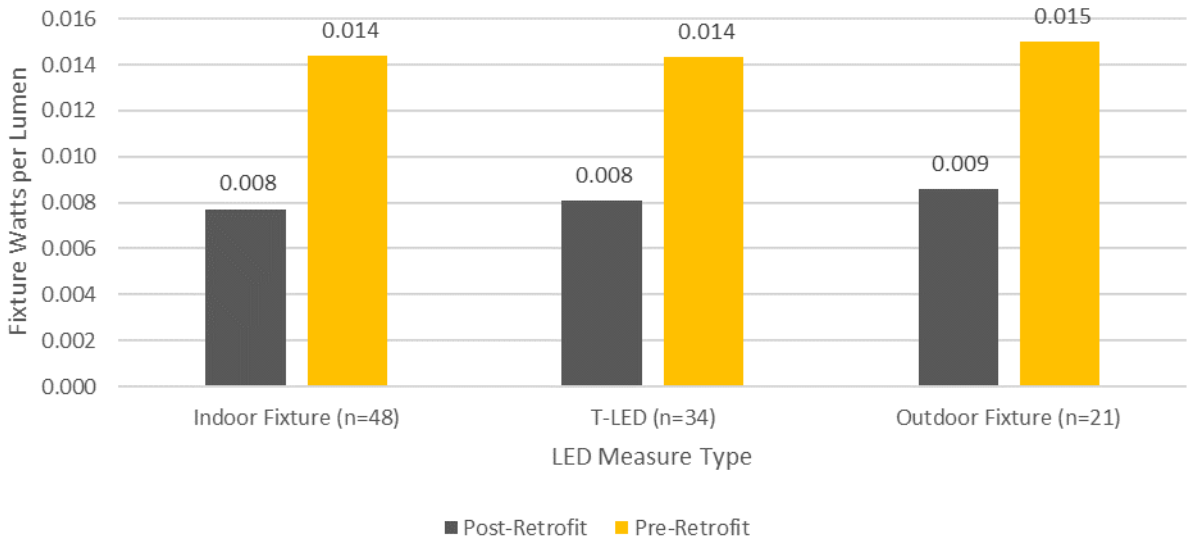
FIGURE 5-9: PRE- AND POST-RETROFIT FIXTURE LUMENS PER WATT (LPW) FOR T-LED AND FIXTURE MEASURES



The average LPW estimates for indoor LED fixtures was roughly 130 LPW. For T-LEDs, it was less, at roughly 124 LPW in the post-retrofit and 71 LPW in the base case. Outdoor fixtures have a lower efficacy than indoor fixtures. We also developed summaries representing the inverse – the total watts per lumen. These results are presented in Figure 5-10.

The average post-retrofit watts per lumen for indoor measures is 0.008, with a less efficient baseline of 0.014 watts per lumen. In this case, the installation of a 5,000 lumen fixture could translate over to savings of roughly 35 watts – a baseline of 75 watts and measure case of 40 watts.

FIGURE 5-10: PRE- AND POST-RETROFIT FIXTURE WATTS PER LUMEN FOR T-LED AND FIXTURE MEASURES



The average pre- and post-retrofit wattages for measures analyzed as part of this evaluation are presented below in Table 5-5. Again, the number of sampled site-measures are included – by configuration and overall – along with the relative precision for each wattage measurement. Overall, delta wattages average roughly 32 watts for T-LED fixtures, 34 watts for high/lowbay technologies and 40 watts for outdoor fixtures.

TABLE 5-5: PRE- AND POST-RETROFIT FIXTURE WATTAGES FOR T-LED AND FIXTURE MEASURES

LED Type	Configuration	n Site Measures	Pre-Retrofit		Post-Retrofit	
			Wattage	Relative Precision	Wattage	Relative Precision
T-LED	4 ft – 2 lamp	35	63	10%	31	3%
	4 ft – 3 lamp	9	70	6%	45	2%
	4 ft – 4 lamp	16	106	4%	63	6%
	4 ft – 6 lamp	2	146	0%	90	0%
	All	**62**	**75**	**7%**	**43**	**7%**
Indoor High/Lowbay Fixture	1 x 4	4	43	18%	21	23%
	2 x 2	14	41	6%	22	6%
	2 x 4	40	67	4%	34	4%
	Other	43	170	13%	128	13%
	All	**101**	**88**	**12%**	**54**	**16%**
Outdoor Fixtures	**All**	**53**	**152**	**18%**	**114**	**22%**

5.3 EUL ANALYSIS

In order to develop lifecycle savings for each measure, the EUL was calculated. The EUL is a function of the service life of the measure divided by the ex post annual operating hours. The EUL is defined as:

EUL = Minimum of either $\frac{Service\ Life\ (hours)}{Annual\ Hours\ of\ Use}$ or 12 years for exterior fixtures or 15 years for indoor.

Where:

Service Life = the rated service life of the measure.

Annual Hours of Use = the site-specific estimate of post-retrofit annual hours of use (HOU) as outlined in Table 5-3.

Table 5-6 presents the average service life for T-LED and indoor/outdoor fixtures along with the ex post EUL for each measure type. The EUL is a function of the life of the technology along with the ex post operating hours.

TABLE 5-6: SERVICE LIFE AND POST-RETROFIT EUL FOR T-LED AND FIXTURE MEASURES

LED Type	n Site Measures	Service Life	Service Life RP	EUL	EUL RP
T-LED	62	50,796	1%	4.7*	3%
Indoor High/Lowbay Fixture	101	83,045	5%	14.3	2%
Outdoor Fixtures	53	55,608	9%	12.0	0%

*The T-LED EUL is the EUL of the lamps divided by 3 and is capped at 5 years.

6 NET-TO-GROSS ANALYSIS

The phone surveys that were conducted for this evaluation served not only to verify the installation of sampled measures and recruit for the on-site verification, but also to acquire information about the influence of the program on the purchase and installation of the measure. The questions asked of interviewees were designed to gather information that allowed the evaluation team to estimate participant free-ridership to support the development of net-to-gross ratios (NTGRs) and net savings values. A standard battery of Net-to-Gross (NTG) questions was asked of all phone survey respondents who purchased and installed different indoor LED lamp technologies. Below we discuss the methodology used to develop the NTGR and the results of that analysis.

6.1 BACKGROUND

The net impact methodology involves a two-step process:

- First, a net-of-free-ridership ratio is estimated for each project evaluated through analysis of surveys and/or professional in-depth interviews.
- Second, a net-of-free ridership estimate is developed for the population by extrapolating from the sample to the entire population sample frame.

Over the last several evaluation cycles, Net-to-Gross (NTG) analysis for Nonresidential programs has used a standardized Self-Report Approach (SRA)[1] that is based on the results of self-report telephone surveys with program participants and has been used with minor modifications since the 2006-2008 evaluation cycle. This 2018 evaluation continues use of this standard SRA framework with two types of updates, developed through a collaborative process by team members from both the Group A and Group D evaluations:

1. **An alternative scoring structure to replace the current PAI-1 score.** This is designed to address problems identified in previous evaluation cycles.
2. **Expansion of the framework to address Midstream programs**. The expanded framework incorporates a Vendor score and combines it with the Participating Customer score if certain conditions are met.

[1] This SRA framework was originally developed by the statewide Nonresidential NTG working group during 2008.

The Nonresidential NTG methodology that has been used since the 2006-2008 evaluation cycle was developed to address the unique needs of nonresidential customer projects developed through energy efficiency programs offered by the four California IOUs and third-party implementers. This method relies exclusively on the standardized Self-Report Approach (SRA) to estimate project and domain-level net-to-gross ratios (NTGRs), since other available approaches and research designs are generally not feasible. The SRA in this evaluation is implemented in accordance with the relevant EM&V guidelines including the California Energy Efficiency Evaluation Protocols (April 2006).

This SRA methodology provides a standard framework, including decision rules, for integrating findings from both quantitative and qualitative information in the calculation of the NTGR in a systematic and consistent manner. The method uses a 0 to 10 scoring system for key questions used to estimate the NTGR, rather than using fixed categories that are assigned weights. Respondents are asked to jointly consider and rate the importance of the many likely events or factors that may have influenced their energy efficiency decision making for the project in question, rather than focusing narrowly on only their rating of the program's importance. This question structure more accurately reflects the complex nature of real-world decision making and helps to ensure that all non-program influences are considered when assessing the unique contribution of the program to the energy efficiency project's implementation.

6.2 NTG QUESTIONS AND SCORING ALGORITHM

6.2.1 Approach Used in Previous Evaluations

Under this SRA methodology, the NTGR has been calculated as an average of three scores. 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.

- **Score PAI-1** reflects the influence of the most important of various program and non-program elements in the customer's decision to select the specific program measure at this time. Program influence through vendor recommendations is also incorporated in this score. PAI-1 is based on the highest program element score divided by the sum of the maximum of the program and non-program element scores. Note that in the 2017 evaluation, the PAI-1 score was excluded from the NTG ratio. This change was made based on specific recommendations from the 2013-2015 Program Performance Assessment[2] and on concerns raised during the 2017 evaluation with respect to the PAI-1 analysis.

[2] https://pda.energydataweb.com/api/view/1975/2013-2015%20Program%20Performance%20Assessment%20Of%20The%20Nonresidential%20Downstream%20Programs%20-%20Final.pdf

- **Score PAI-2** captures the perceived importance of the program (whether incentive, recommendation, audit, or other program intervention) 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 both the program and most important non-program influences so that the two values total 10. The program influence score is reduced by half if respondents say they had already made their decision to install the specific program qualifying measure before they learned their project was eligible for program rebates.
- **Score PAI-3** captures the likelihood of various actions the customer might have taken at the time or project decision making, and in the future, if the program had not been available (the counterfactual). This score also accounts for deferred free ridership by incorporating the likelihood that the customer would have installed program-qualifying measures at a later date, if the program had not been available.

When there are missing data or 'don't knows' to critical elements of each score, one of two options is used. The most common approach, in cases where it is one of several other elements that are considered in the algorithm, is to simply exclude the missing element from consideration.

Excluding the 2017 evaluation, the resulting self-reported NTGR, in most cases, has been simply the average of all three scores, divided by 10. The one exception to this is when the respondent indicates a 10 in 10 probability of installing the same equipment at the same time in the absence of the program, in which case the NTGR is based on the average of the PAI-2 and PAI-3 scores only.

6.2.2 Issues with Current PAI-1 Score

The problems identified in the 2017 Small Commercial evaluation and underlying analysis are discussed below. These problems led to a change in methodology for the 2018 evaluation to replace the PAI-1 score with a new score specification.

Issue 1: Lack of variation in PAI-1 scores. Overall, the evaluation team found the average PAI-1 score to be 4.9, with over 80 percent of the individual scores within 0.5 of that mean (i.e., between 4.4 and 5.4). This is likely due to respondents rating at least one program and one non-program factor very high. The team found that respondents rated at least one program factor a 9 or 10 nearly three-fourths of the time (72 percent), and at least one non-program factor a 9 or 10 over three-fourths of the time (80 percent). Furthermore, two-thirds of the time (66 percent), the respondent's highest rated program and non-program factors were rated equally. Respondents are likely to score at least one program and one non-program influence very highly, leading most PAI-1 scores to cluster near 4.9 (pulling NTGRs towards 0.5).

Issue 2: Similarity in concept between PAI-1 and PAI-2 scores. The PAI-1 and PAI-2 scores are based on a similar concept of program influence and are based on self-reported influence scores for individual program and non-program elements. In addition, to provide for greater consistency in responses during the survey, the introduction to the N41/N42 questions, which PAI-2 is based on, consisted of a read-through of the highest-scored program and non-program elements from the previous question (which is used to calculate PAI-1). While both scores are intended to represent different ways of characterizing program influence, there is a high degree of similarity between them. Including both scores in the NTGR calculation amounts to assigning a two-thirds weight to similar program influence metrics and reduces the importance of the PAI-3 "no program" score in the overall calculation.

Issue 3: Weak correspondence between the PAI-1 score and the "no program" behaviors cited by participants. Perhaps the most telling indication of program influence is the self-reported action that participants say they would have taken had the program not existed. Respondents were asked what they would have been most likely to do if the program had not been available. Two common responses were "done nothing and keep existing equipment as is", and "done the same thing I would have done as I did through the program". One would expect relatively high PAI scores for the "done nothing" and relatively low PAI scores for the "done the same thing" responses. As shown in the table below, PAI-1 had the lowest score for the "done nothing" response, significantly less than PAI-3 (5.12 versus 8.11), and PAI-1 had the smallest difference in scores between the "done the same thing" and "done nothing" responses (only a 0.49 difference compared to 5.67 for PAI-3).

TABLE 6-1: COMPARISON OF PAI-1 SCORES WITH NO-PROGRAM BEHAVIORS

Stated Action in Absence of the Program	PAI-1	PAI-2	PAI-3
Done nothing, keep existing equipment as is	5.12	6.48	8.11
Done the same thing I would have done as I did through the program	4.63	5.43	2.44

*Results from http://www.calmac.org/publications/2017_Nonresidential_ESPI_Deemed_Lighting_Impact_Evaluation_-_Final_Report.pdf

6.2.3 Alternative to Current PAI-1 Structure

The evaluation team examined several alternative specifications to replace the PAI_1 score and then calculated the resulting NTGR using each alternative by averaging it with the PAI_2 and PAI_3 scores.[3] The evaluation team's preferred alternative approach uses the participant phone survey question N6 value and assigns a PAI score based on the following responses to this question. Note that this approach is also referred to as PAI-1 alternative 3 = Assign value based on No Program actions (survey question N6):[4]

Question N6 - Now I would like you to think one last time about what action you would have taken if the program had not been available. Which of the following alternatives would you have been most likely to do?

- If N6 = 2,4 then NTGR = 1
  - 2 Install standard efficiency equipment or whatever required by code
  - 4 Done nothing (keep existing equipment as is)
- If N6=5 then NTGR = 0
  - 5 Done the same thing I would have done as I did through the program
- If N6=1, then NTGR = 1.00 minus the % share they would have installed
  - 1 Install/Delamped fewer units
- If N6=3, then NTGR =0.75
  - 3 Installed equipment more efficient than code but less efficient than what you installed through the program
- IF N6=6, NTGR=missing (This is a repair and the efficiency of the action ultimately taken is unknown, therefore this response is excluded from the analysis.)
  - 6 Repair/rewind or overhaul the existing equipment
- If N6=77, the response is reviewed and a judgment made regarding the likely NTGR level, frequently a 0 or 1
  - 77 Something else (specify what _____)

The overall NTGR using this approach is the average of PAI-2, PAI-3, and PAI-N6. This alternative NTGR specification has been used in this evaluation to calculate the NTGR at the project-level, except for those projects that merit use of the Midstream approach discussed below.

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[3] See Appendix A for a memo detailing the updates considered to the NTG framework. This memo includes a detailed description of the alternative score specifications considered, including PAI-1 alternative 3.

[4] The numbers immediately below each bullet point indicate specific response categories to question N6.

6.3 NTG APPROACH FOR MIDSTREAM PROGRAMS

The current Nonresidential NTG framework is designed mainly for Downstream programs, which are focused on delivering incentives directly to end-use customers. Some programs are positioned higher up in the supply chain, so that they work through vendors (e.g., distributors, contractors, and design professionals) to deliver incentives to customers. Such programs are classified as Midstream.

The current Downstream-centric framework relies primarily on findings from end-use customer surveys for determining NTGRs, which is appropriate, given the customer-focused program delivery approach. The method does allow for vendor input into the NTGR but only in cases where the customer rates the vendor higher than any other program or non-program element in their decision making. The vendor is interviewed, and their input is incorporated into the final NTG ratio.

The Midstream approach, as described, applies to programs delivered through vendors that meaningfully change how they stock, promote and price program-qualified energy efficient equipment as a result of their participation in the program. There are multiple Midstream program delivery approaches, some for which the program intervention(s) is "invisible" to the end-use customer, and others where the end-use customer is fully aware of the program intervention(s). The design of the program, and the availability of customer data determines the specific NTG approach to be used:

- Programs that work through vendors, where customer contact data is collected, and where it is believed the end-user is either unaware or aware of the program (Midstream A).
- Programs that work entirely with vendors, customer contact data is not collected, and where it is believed the end-user may not be aware of the program (Midstream B).

6.3.1 Midstream NTG Protocol

To assess impacts from Midstream A programs, evaluators need to survey end-use customers and their associated equipment vendors. As with Downstream programs, customers are queried regarding the importance of various program and non-program factors that influenced their decision, the relative importance of the program, and the likely actions they would have taken absent the program. In addition, for Midstream A and Midstream B programs, evaluators need to determine if the Vendor changed their practices in a way that ultimately influenced the customer's buying decision. Assessing the influence of the program on vendors involves conducting in-depth interviews with participating vendors and asking them how the program influenced their stocking, pricing and promotion practices, and alternatively, how they would behave in the absence of the program.

NTGR Estimation Methodology

For Midstream A programs where customer contact data is collected, surveys are conducted of both participating customers and participating vendors. Customer and Vendor-based estimates of program influence are developed and combined into a single NTGR metric. For Midstream B programs that work exclusively with vendors and customer information is not collected, telephone or web surveys with end-use customers are not feasible. Another approach is in-store intercept surveys that allow for direct questioning of customers at the point-of-sale. However, if in-store or telephone/web surveys are not feasible, then the NTGR must rely solely on the results of the Vendor survey and associated NTGR algorithm.

For the **Customer** component, the standard NTG framework is used, participating customer surveys are conducted, and the customer-based NTGR is calculated.

Vendor Component

The **Vendor** component of this Midstream methodology uses three indicators of free ridership, the Program Importance Score, the Relative Program Influence Score (similar to PAI-2), and the No-Program Score (similar to PAI-3).

The **Program Importance** score is based on the Vendor's rating of the importance of the program as a whole (considering various program factors) in their decision to recommend the program-qualifying measure to distributors/customers.

The **Relative Program Influence** Score is based on the Vendor's rating of the Program's relative importance (versus non-program factors in influencing their decision to recommend the program-qualifying measure to distributors/customers

The **No-Program** Score is based on the Vendor's response to a counterfactual question regarding their likelihood to recommend the program-qualifying measure if the program had not been available.

The Vendor-based NTGR is simply the average of these three scores divided by 10. Once this has been computed, the project-level NTGR is determined from a combination of findings from the participating customer (if available) and participating vendor surveys. The triangulation approach, combining customer and vendor input, is used.[5] The algorithm uses the customer's input to guide the assessment, with input by the vendor if certain conditions are met.

[5] The detailed version of this algorithm is provided in Appendix A.

6.4 NTG RESULTS

Table 6-2 and Table 6-3 present the ex post NTGR scores by sample strata that were developed for the evaluated sampling domains using the above methodology, for downstream and midstream programs, respectively. As mentioned in Section 4.2, the midstream NTG analysis was limited to the SCE MPOP, so NTGRs for PG&E midstream LED lamps were passed through and are not represented in any of the NTGRs presented below.

Also presented are the ex ante NTG values as well as the average PAI2, PAI3 and PAI N6 scores for each segment. These data are weighted by ex ante lifecycle kWh, as an ex post gross analysis was not conducted for these measures.

TABLE 6-2: EX ANTE AND EX POST NET-TO-GROSS RATIOS AND NTG SCORES FOR THE DOWNSTREAM DELIVERY APPROACH BY MEASURE TYPE

PA	Measure Type	Responses	Applications	NTG			PAI Score		
		n	n	Ex Ante	Ex Post	Relative Precision	PAI2	PAI3	PAI N6
PG&E	A Lamps	38	38	0.91	0.62	12%	5.0	7.2	6.3
	Accent Lamps	10	11	0.63	0.88	11%	8.5	8.6	9.4
	Reflectors	33	33	0.87	0.73	11%	6.6	7.6	7.8
	Subtotal	**81**	**82**	**0.86**	**0.71**	**9%**	**6.3**	**7.5**	**7.4**
SCE	Reflectors	**20**	**21**	**0.91**	**0.70**	**19%**	**7.0**	**6.5**	**8.5**
SDG&E	A Lamps	14	16	0.61	0.79	6%	7.5	6.5	9.9
	Accent Lamps	25	25	0.62	0.73	25%	7.0	7.1	8.7
	Reflectors	35	36	0.91	0.57	39%	5.1	6.2	5.4
	Subtotal	**74**	**77**	**0.81**	**0.63**	**25%**	**5.8**	**6.5**	**6.7**

TABLE 6-3: EX ANTE AND EX POST NET-TO-GROSS RATIOS AND NTG SCORES FOR SCE'S MIDSTREAM APPROACH BY MEASURE TYPE

PA	Responses		NTG			PAI Score			Vendor NTG Scores		
	Participants	Distributors	Ex Ante	Ex Post	Relative Precision	PAI 2	PAI 3	PAI N6	Score 1	Score 2	Score 3
SCE	12	10	0.77	0.70	6%	4.8	6.0	9.7	9.0	6.9	5.0

Table 6-4 illustrates how these values can be used in the future for DEER if a single statewide number were to be used for a measure. Ideally, results would be applied consistently statewide and vary by program delivery mechanism. Results are shown below by delivery approach when the data could support an estimate at that level.

TABLE 6-4: RECOMMENDED STATEWIDE DEER NTG VALUES BASED ON EVALUATED RESULTS

Measure Type	Deemed Downstream	Deemed Midstream
A Lamps	0.64	0.70
Accent Lamps	0.79	0.70
Reflectors	0.68	0.70

6.4.1 PG&E Indoor LED Lamps, Downstream Delivery

- The ex post NTG ratios for both A-Lamps (0.62 ex post vs. 0.91 ex ante) and Reflectors (0.73 ex post vs. 0.87 ex ante) indicate a medium level of program influence and are less than ex ante values. In contrast, the ex post value of 0.88 for Accent lamps significantly exceeds the ex ante value of 0.63.
- For Accent Lamps, the PAI-2, PAI-3 and PAI-N6 scores of 8.5, 8.6 and 9.4 were consistently high and in-line with the NTGR of 0.88. A-Lamp and Reflector score values were more moderate, and generally in-line with one another, except for the PAI-2 value for A-lamps, which was somewhat less than the other scores. These scores and the resulting NTG ratios suggest a medium-high level of program influence for these two measures.
- These Indoor LED lamp NTGR values for PG&E are generally in-line with the other IOUs.

6.4.2 SCE Indoor LED Lamps, Downstream Delivery

- SCE Reflectors exhibited medium-high program influence based on an NTGR of 0.70. PAI-2, PAI-3 and PAI-N6 score values varied somewhat, with weighted average values ranging from 6.5 (PAI-3) to 8.5 (PAI-N6).

6.4.3 SCE Indoor LED Lamps, Midstream Delivery

- Interestingly, the NTGR for the midstream delivery is the same as that for the downstream reflector measure of 0.70. It is important to note that this result is weighted almost entirely based on the distributor responses; whereas the downstream result is based solely on the participants.

6.4.4 SDG&E Indoor LED Lamps, Downstream Delivery

- The ex post NTG ratios for A-Lamps and Accent lamps suggest high program influence and exceed the ex ante values. All three scores for both measures are mostly high, with average values ranging from 6.5 to nearly 10 (the maximum possible value).
- However, for LED Reflectors, the ex post NTG ratio of 0.57 suggests a more moderate level of program influence, but still falls well short of the ex ante value of 0.91. The PAI-2, PAI-3 and PAI-N6 scores of 5.1, 6.2 and 5.4 are consistent with the reported moderate level of program influence.

7 EVALUATION RESULTS

This section of the report presents the gross and net realization rates the evaluation team developed for the 2018 deemed ESPI lighting measures discussed throughout the report. The evaluation team studied a subset of the measures within the PY2018 population of nonresidential deemed measures. Table 7-1 presents the six ESPI measures subject to ex post evaluation for PY2018 along with the measure types ultimately evaluated.

TABLE 7-1: DATA SOURCES AND EX POST UPDATE FOR PY2018 ESPI MEASURES

2018 ESPI Measure	Data Source		Evaluation Update	
	New Phone Surveys	New On-sites	NTG	Gross
Indoor LED High/Non-Highbay		X	Pass Through	X
Indoor T-LED Lamps		X	Pass Through	X
Outdoor LED Fixture		X	Pass Through	X
Indoor LED A-Lamps	X		X	Pass Through
Indoor LED Reflector Lamps	X		X	Pass Through
Indoor LED Specialty Lamps	X		X	Pass Through

7.1 GROSS FIRST YEAR REALIZATION RATES

The evaluation team estimated gross realization rates (GRR) by examining the ratio of the aggregate evaluated gross savings to the aggregated ex ante gross savings. The evaluation team utilized the following algorithm to develop GRRs:

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

Where:

$Gross\_Ex\_Post\_Impact_{i,m}$ = the gross ex post impact estimate for $claim_i$ of $measure_m$ in the population.

$Gross\_Ex\_Ante\_Impact_{i,m}$ = the gross ex ante impact estimate $claim_i$ of $measure_m$ in the population.

Table 7-2 through Table 7-4 below present the population level first year gross MWh and MW realization rates for evaluated deemed ESPI lighting measures along with the aggregate ex ante and ex post first year MWh and MW savings for each IOU. Realization rates that are *italicized* signifies the ex ante savings were passed through.

TABLE 7-2: PG&E FIRST YEAR GROSS MWH AND MW REALIZATION RATES FOR EVALUATED MEASURES

2018 ESPI Measure	Measure Type	First Year Gross MWh Savings				First Year Gross MW Savings			
		Ex Ante	Ex Post	GRR	Sample RP	Ex Ante	Ex Post	GRR	Sample RP
LED Fixture	High/Non-Highbay	26,680.5	30,972.9	**116%**	40%	5.9	7.0	**118%**	**31%**
	Outdoor	8,323.9	8,076.6	**97%**	60%	-	-	-	-
LED Lamp	A-Lamps	1,454.4	1,454.4	***100%***	-	0.3	0.3	***100%***	-
	Reflector Lamps	3,265.2	3,265.2	***100%***	-	0.8	0.8	***100%***	-
	Specialty Lamps	515.9	515.9	***100%***	-	0.1	0.1	***100%***	-
LED T-LED	Linear Lamp								

TABLE 7-3: SCE FIRST YEAR GROSS MWH AND MW REALIZATION RATES FOR EVALUATED MEASURES

2018 ESPI Measure	Measure Type	First Year Gross MWh Savings				First Year Gross MW Savings			
		Ex Ante	Ex Post	GRR	Sample RP	Ex Ante	Ex Post	GRR	Sample RP
LED Fixture	High/Non-Highbay	4,230.5	5,659.8	**134%**	3%	1.3	1.1	**84%**	4%
	Outdoor	513.9	513.9	***100%***	-	-	-		-
LED Lamp	A-Lamps	-	-		-	-	-		-
	Reflector Lamps	602.3	602.3	***100%***	-	0.1	0.1	***100%***	-
	Specialty Lamps	85.3	85.3	***100%***	-	0.0	0.0	***100%***	-
LED T-LED	Linear Lamp	25,113.2	31,051.0	**124%**	18%	7.4	7.9	**106%**	16%

TABLE 7-4: SDG&E FIRST YEAR GROSS MWH AND MW REALIZATION RATES FOR EVALUATED MEASURES

2018 ESPI Measure	Measure Type	First Year Gross MWh Savings				First Year Gross MW Savings			
		Ex Ante	Ex Post	GRR	Sample RP	Ex Ante	Ex Post	GRR	Sample RP
LED Fixture	High/Non-Highbay	2,079.2	2,600.4	**125%**	26%	0.5	0.7	**133%**	18%
	Outdoor	287.0	287.0	***100%***	-	-	-		-
LED Lamp	A-Lamps	191.0	191.0	***100%***	-	0.0	0.0	***100%***	-
	Reflector Lamps	1,781.2	1,781.2	***100%***	-	0.4	0.4	***100%***	-
	Specialty Lamps	1,050.6	1,050.6	***100%***	-	0.2	0.2	***100%***	-
LED T-LED	Linear Lamp	28,553.2	30,376.5	**106%**	22%	7.4	7.4	**100%**	11%

7.2 GROSS LIFECYCLE REALIZATION RATES

Table 7-5 through Table 7-7 present the population level gross lifecycle MWh and MW realization rates for the evaluated deemed ESPI lighting measures along with the aggregate ex ante and ex post lifecycle MWh and MW savings.

TABLE 7-5: PG&E LIFECYCLE GROSS MWH AND MW REALIZATION RATES FOR EVALUATED MEASURES

2018 ESPI Measure	Measure Type	Lifecycle Gross MWh Savings				Lifecycle Gross MW Savings			
		Ex Ante	Ex Post	GRR	Sample RP	Ex Ante	Ex Post	GRR	Sample RP
LED Fixture	High/Non-Highbay	320,989.3	407,695.3	**127%**	32%	72.3	91.9	**127%**	30%
	Outdoor	99,887.1	96,919.3	**97%**	60%	-	-		-
LED Lamp	A-Lamps	14,348.5	14,348.5	***100%***	-	2.9	2.9	***100%***	-
	Reflector Lamps	28,088.7	28,088.7	***100%***	-	6.6	6.6	***100%***	-
	Specialty Lamps	3,909.6	3,909.6	***100%***	-	0.8	0.8	***100%***	-
LED T-LED	Linear Lamp								

TABLE 7-6: SCE LIFECYCLE GROSS MWH AND MW REALIZATION RATES FOR EVALUATED MEASURES

2018 ESPI Measure	Measure Type	Lifecycle Gross MWh Savings				Lifecycle Gross MW Savings			
		Ex Ante	Ex Post	GRR	Sample RP	Ex Ante	Ex Post	GRR	Sample RP
LED Fixture	High/Non-Highbay	62,641.8	87,700.8	**140%**	15%	20.1	17.9	**89%**	13%
	Outdoor	6,167.3	6,167.3	***100%***	-	-	-		-
LED Lamp	A-Lamps								
	Reflector Lamps	5,339.3	5,339.3	***100%***	-	1.3	1.3	***100%***	-
	Specialty Lamps	590.6	590.6	***100%***	-	0.2	0.2	***100%***	-
LED T-LED	Linear Lamp	125,526.1	132,987.8	**106%**	14%	37.2	35.4	**95%**	17%

TABLE 7-7: SDG&E LIFECYCLE GROSS MWH AND MW REALIZATION RATES FOR EVALUATED MEASURES

2018 ESPI Measure	Measure Type	Lifecycle Gross MWh Savings				Lifecycle Gross MW Savings			
		Ex Ante	Ex Post	GRR	Sample RP	Ex Ante	Ex Post	GRR	Sample RP
LED Fixture	High/Non-Highbay	31,705.5	35,716.0	**113%**	18%	7.7	9.3	**122%**	17%
	Outdoor	3,443.5	3,443.5	***100%***	-	-	-		-
LED Lamp	A-Lamps	1,620.8	1,620.8	***100%***		0.3	0.3	***100%***	
	Reflector Lamps	15,232.7	15,232.7	***100%***	-	3.7	3.7	***100%***	-
	Specialty Lamps	6,438.6	6,438.6	***100%***	-	1.5	1.5	***100%***	-
LED T-LED	Linear Lamp	141,506.0	137,047.6	**97%**	23%	36.6	33.9	**93%**	11%

7.3 NET FIRST YEAR REALIZATION RATES

The evaluation team estimated the net ex post impacts in a similar manner as the gross impacts, however, the NTG ratios were multiplied by the gross impacts. The resulting net realization rates (NRR) represent the ratio of aggregated evaluated net savings to the aggregated ex ante net savings. The evaluation team utilized the following formula to develop customer specific NRRs:

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

Where:

$Net\_Ex\_Post\_Impact_{i,m}$ = the net ex post impact estimate for $claim_i$ of $measure_m$ in the population

$Net\_Ex\_Ante\_Impact_{i,m}$ = the net ex ante impact estimate for $claim_i$ of $measure_m$ in the population

Table 7-8 presents the ex ante and ex post NTG ratios for the evaluated indoor LED lamp measures.

TABLE 7-8: EX ANTE AND EX POST NET-TO-GROSS RATIOS AND PAI SCORES FOR INDOOR LED LAMPS BY PA

PA	Measure Type	Midstream	Sites	NTG kWh			NTG Components		
			n	Ex Ante	Ex Post	RP	PAI-2	PAI-3	PAI N6
PG&E	A-Lamps	0	38	0.91	0.62	12%	5.0	7.2	6.3
	Reflector Lamps	0	33	0.87	0.73	11%	6.6	7.6	7.8
	Specialty Lamps	0	10	0.63	0.88	11%	8.5	8.6	9.4
SCE	Reflector Lamps	0	20	0.91	0.70	19%	7.0	6.5	8.5
	Reflector/Specialty Lamps	1	12/10*	0.77	0.70	6%	4.8	6.0	9.7
SDG&E	A-Lamps	0	14	0.61	0.79	6%	7.5	6.5	9.9
	Reflector Lamps	0	35	0.91	0.57	39%	5.1	6.2	5.4
	Specialty Lamps	0	25	0.62	0.73	25%	7.0	7.1	8.7

*The evaluation team conducted 12 participant interviews and 10 vendor surveys (Section 5).

While the gross savings were passed through for these measures (i.e., GRR = 100 percent), the net first year savings were updated with the NTG ratios developed from the phone survey. If the ex post NTG was less than the ex ante claim, the NRR is less than 100 percent, and vice versa.

Table 7-9 through Table 7-11 below presents the population level first year MWh and MW net realization rates for the evaluated deemed ESPI lighting measures along with the aggregate ex ante and ex post first year net MWh and MW savings. The net realization rate is impacted by the difference in ex ante and ex post gross savings along with the differences between the ex ante and ex post NTG ratios.

TABLE 7-9: PG&E FIRST YEAR NET MWH AND MW REALIZATION RATES FOR EVALUATED MEASURES

2018 ESPI Measure	Measure Type	First Year Net MWh Savings			First Year Net MW Savings		
		Ex Ante	Ex Post	NRR	Ex Ante	Ex Post	NRR
LED Fixture	High/Non-Highbay	18,431.4	21,416.8	**116%**	4.1	4.8	**118%**
	Outdoor	6,356.7	6,167.8	**97%**	-	-	
LED Lamp	A-Lamps	1,394.4	975.1	**70%**	0.3	0.2	**70%**
	Reflector Lamps	3,015.5	2,763.9	**92%**	0.7	0.6	**92%**
	Specialty Lamps	349.9	482.2	**138%**	0.1	0.1	**136%**
LED T-LED	Linear Lamp						

TABLE 7-10: SCE FIRST YEAR NET MWH AND MW REALIZATION RATES FOR EVALUATED MEASURES

2018 ESPI Measure	Measure Type	First Year Net MWh Savings			First Year Net MW Savings		
		Ex Ante	Ex Post	NRR	Ex Ante	Ex Post	NRR
LED Fixture	High/Non-Highbay	3,486.6	4,603.2	**132%**	1.1	0.9	**82%**
	Outdoor	493.2	493.2	***100%***	-	-	
LED Lamp	A-Lamps	-	-		-	-	
	Reflector Lamps	576.0	451.7	**78%**	0.1	0.1	**79%**
	Specialty Lamps	65.4	60.0	**92%**	0.0	0.0	**94%**
LED T-LED	Linear Lamp	19,301.2	23,864.7	**124%**	5.7	6.0	**106%**

TABLE 7-11: SDG&E FIRST YEAR NET MWH AND MW REALIZATION RATES FOR EVALUATED MEASURES

2018 ESPI Measure	Measure Type	First Year Net MWh Savings			First Year Net MW Savings		
		Ex Ante	Ex Post	NRR	Ex Ante	Ex Post	NRR
LED Fixture	High/Non-Highbay	1,680.3	2,098.3	**125%**	0.4	0.5	**133%**
	Outdoor	274.7	274.7	***100%***	-	-	
LED Lamp	A-Lamps	125.9	159.6	**127%**	0.0	0.0	**128%**
	Reflector Lamps	1,706.2	1,109.0	**65%**	0.4	0.3	**63%**
	Specialty Lamps	694.8	820.5	**118%**	0.2	0.2	**123%**
LED T-LED	Linear Lamp	21,572.6	22,950.2	**106%**	5.6	5.6	**100%**

7.4 NET LIFECYCLE REALIZATION RATES

Table 7-12 through Table 7-14 presents the population lifecycle MWh and MW net realization rates for the evaluated deemed ESPI lighting measures along with the aggregate ex ante and ex post lifecycle net MWh and MW savings.

TABLE 7-12: PG&E LIFECYCLE NET MWH AND MW REALIZATION RATES FOR EVALUATED MEASURES

2018 ESPI Measure	Measure Type	Lifecycle Net MWh Savings			Lifecycle Net MW Savings		
		Ex Ante	Ex Post	NRR	Ex Ante	Ex Post	NRR
LED Fixture	High/Non-Highbay	221,179.6	281,280.8	**127%**	50.1	63.8	**127%**
	Outdoor	76,280.3	74,014.0	**97%**	-	-	
LED Lamp	A-Lamps	13,758.1	9,619.6	**70%**	2.8	1.9	**70%**
	Reflector Lamps	25,919.5	23,951.8	**92%**	6.1	5.6	**92%**
	Specialty Lamps	2,649.5	3,654.6	**138%**	0.5	0.7	**136%**
LED T-LED	Linear Lamp						

TABLE 7-13: SCE LIFECYCLE NET MWH AND MW REALIZATION RATES FOR EVALUATED MEASURES

2018 ESPI Measure	Measure Type	Lifecycle Net MWh Savings			Lifecycle Net MW Savings		
		Ex Ante	Ex Post	NRR	Ex Ante	Ex Post	NRR
LED Fixture	High/Non-Highbay	51,087.6	70,778.8	**139%**	16.4	14.4	**88%**
	Outdoor	5,919.0	5,919.0	***100%***	-	-	
LED Lamp	A-Lamps	-	-		-	-	
	Reflector Lamps	5,099.8	4,003.3	**78%**	1.3	1.0	**79%**
	Specialty Lamps	440.8	416.8	**95%**	0.1	0.1	**97%**
LED T-LED	Linear Lamp	96,476.1	102,211.0	**106%**	28.6	27.3	**95%**

TABLE 7-14: SDG&E LIFECYCLE NET MWH AND MW REALIZATION RATES FOR EVALUATED MEASURES

2018 ESPI Measure	Measure Type	Lifecycle Net MWh Savings			Lifecycle Net MW Savings		
		Ex Ante	Ex Post	NRR	Ex Ante	Ex Post	NRR
LED Fixture	High/Non-Highbay	25,445.6	28,645.2	**113%**	6.1	7.5	**122%**
	Outdoor	3,296.7	3,296.7	***100%***	-	-	
LED Lamp	A-Lamps	1,066.7	1,354.1	**127%**	0.2	0.3	**128%**
	Reflector Lamps	14,590.6	9,484.6	**65%**	3.6	2.2	**63%**
	Specialty Lamps	4,291.7	5,028.0	**117%**	1.0	1.2	**122%**
LED T-LED	Linear Lamp	106,916.6	103,548.0	**97%**	27.6	25.6	**93%**

8 CONCLUSIONS AND RECOMMENDATIONS

This section of the report provides conclusions and recommendations related to the findings that were developed from this evaluation.

Conclusion 1a [Section 5]: The evaluation team found the ex post operating hours for certain commercial sectors – like retail and grocery - were significantly higher than ex ante assumptions. While there were measurable differences between ex ante and ex post operating hours for each technology type, T-LEDs and retrofit kits were generally installed in high usage areas like lobbies and retail space that can operate for a significant number of hours per day and week.

Conclusion 1b [Section 5]: The evaluation team found claims and associated energy/demand savings using a building type designation and claimed HOU that don't correspond to the actual activity level within a facility. The evaluation team verified installations at fitness centers, grocery stores and retail establishments that operate 24-hours a day and had much greater reported HOU than claimed.

Recommendation 1: The ex ante/DEER team should consider utilizing the monitoring data, along with the business hour and self-reported operating schedules collected as part of this evaluation, to support the development of updated operating hour estimates for LED Fixtures and T-LEDs. Furthermore, businesses that operate 24 hours a day should be considered a unique case and claimed operating hours should be updated to reflect higher activity within these facilities.

Conclusion 2a [Section 5]: The PA's assumed a replacement on burnout baseline for LED Fixture measures. However, we found that T-LEDs and retrofit kits were predominantly replacing linear fluorescent systems – T-LEDs were installed in fixtures with existing wiring and ballasts. Therefore, it's likely there is significant stock of LF systems still out there with well-functioning ballasts, so an opportunity for accelerated replacement may exist for LED Fixture retrofits.

Conclusion 2b [Section 5]: LED tube lamps have an average service life of roughly 50,000. However, they are being installed in fixtures with existing ballasts that may have much shorter remaining useful lives.

Recommendation 2: Future studies should consider an accelerated replacement path for LED Fixture retrofits. As industry standard practice moves towards LEDs for replacement on burnout of linear fixtures, accelerated replacement may be the more cost-effective path for this measure. Furthermore, The PA's should track the age and condition of linear fluorescent ballasts where T-LED lamps are being installed.

Conclusion 3 [Section 3 and Section 5]: A not insignificant percentage of program participants installing LED fixture measures self-reported metal halide (MH), mercury vapor (MV) and high-pressure sodium (HPS) as the baseline technology replaced as part of the retrofit – especially for outdoor LED fixture measures.

Recommendation 3: Further research should be conducted to continue to track the typical baseline and efficiency of equipment replaced with program rebated LED indoor and outdoor technologies. Furthermore, future studies and programs should consider a framework to recognize the age of the existing equipment and the likelihood that a program participant would have either 1) deferred installation and maintained or continually repaired their existing system or 2) installed equipment that was no more efficient than code at the time they did, in the absence of the program.

Conclusion 4 [Over-arching]: When comparing ex ante parameter estimates to ex post results, not all documentation could be found detailing the specific parameters comprised of the ex ante claimed savings values. This caused unnecessary coordination with the PAs to find missing workpapers.

Recommendation 4: All workpaper documentation (workbook calculations and supporting documents) should be posted on the workpaper project archive (WPA) at www.deeresources.info.

Conclusion 5 [Over-arching]: The evaluation team sometimes found that the expected parameter values used in the ex ante savings claims were not based on the reported ex ante IDs.

Recommendation 5: Ex ante IDs should match with parameters used in the *actual* reported ex ante savings.

Conclusion 6 [Over-arching]: In general, lighting measures exhibited medium program influence levels. NTGR values vary somewhat by measure type and PA and range from a low of 0.57 (SDG&E Reflectors) to a high of 0.88 (PG&E Accent Lamps). Values by PA show less variation and range from 0.63 (SDG&E) to 0.71 (PG&E). In nearly all cases, ex post NTGR values are less than ex ante values. For SCE Indoor Lamps, it is interesting to note that the NTGR of 0.70 for the midstream delivery is the same as that for the downstream reflector measure, despite being based on two fundamentally different data sources. The midstream result is almost entirely based on distributor survey results, while the downstream result is based solely on participant survey results. This was because the Midstream program did not collect contact information for most of the end user program participants. As a result, it was difficult to identify a sufficient sample of participants to triangulate responses against the distributor responses. Therefore, the NTG analysis for the midstream program relied primarily on distributor responses.

Recommendation 6: The Midstream NTG framework generally calls for values that are based on a combination of customer and distributor survey results. With the transition to 3P programs that are predominantly Midstream, it is increasingly important that the PA's collect both customer and distributor contact information to support this process.

Conclusion 7 [Section 5]: The evaluation team found evidence of some programs incorrectly reporting the unit basis of claimed savings for measures rebated by the total lumens installed, rather than the total number of fixtures or lamps installed. When savings are incorrectly reported, claimed savings are underestimated.

Recommendation 7: PA's should carefully review claims data for projects rebated with a unit basis of kilolumens to confirm that the claimed units installed represent the total kilolumens installed rather than the total fixtures installed.

APPENDIX AA STANDARDIZED HIGH LEVEL SAVINGS

Gross Lifecycle Savings (MWh)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Eval GRR
PGE	PGE_LED_ACCENT	3,910	3,910	1.00	100.0%	
PGE	PGE_LED_A-LAMP	14,349	14,349	1.00	100.0%	
PGE	PGE_LED_HIGH_LOWBAY	320,989	407,695	1.27	9.5%	1.30
PGE	PGE_LED_OUTDOOR_FIXTURE	99,887	96,919	0.97	0.0%	0.97
PGE	PGE_LED_REFLECTOR	28,089	28,089	1.00	100.0%	
PGE	**Total**	**467,223**	**550,962**	**1.18**	**16.5%**	**1.21**
SCE	SCE_LED_ACCENT	591	591	1.00	100.0%	
SCE	SCE_LED_A-LAMP	0	0			
SCE	SCE_LED_HIGH_LOWBAY	62,642	87,701	1.40	1.0%	1.40
SCE	SCE_LED_OUTDOOR_FIXTURE	6,167	6,167	1.00	100.0%	
SCE	SCE_LED_REFLECTOR	5,339	5,339	1.00	100.0%	
SCE	SCE_LED_TLED	125,526	132,988	1.06	0.0%	1.06
SCE	**Total**	**200,265**	**232,786**	**1.16**	**6.4%**	**1.17**
SDGE	SDGE_LED_ACCENT	6,439	6,439	1.00	100.0%	
SDGE	SDGE_LED_A-LAMP	1,621	1,621	1.00	100.0%	
SDGE	SDGE_LED_HIGH_LOWBAY	31,705	35,716	1.13	3.0%	1.13
SDGE	SDGE_LED_OUTDOOR_FIXTURE	3,444	3,444	1.00	100.0%	
SDGE	SDGE_LED_REFLECTOR	15,233	15,233	1.00	100.0%	
SDGE	SDGE_LED_TLED	141,506	137,048	0.97	0.0%	0.97
SDGE	**Total**	**199,947**	**199,499**	**1.00**	**13.8%**	**1.00**
	Statewide	***867,436***	***983,247***	***1.13***	***13.5%***	***1.15***

Net Lifecycle Savings (MWh)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Eval Ex-Ante NTG	Eval Ex-Post NTG
PGE	PGE_LED_ACCENT	2,649	3,655	1.38	0.0%	0.68	0.93	0.68	0.93
PGE	PGE_LED_A-LAMP	13,758	9,620	0.70	0.0%	0.96	0.67	0.96	0.67
PGE	PGE_LED_HIGH_LOWBAY	221,180	281,281	1.27	100.0%	0.69	0.69		
PGE	PGE_LED_OUTDOOR_FIXTURE	76,280	74,014	0.97	100.0%	0.76	0.76		
PGE	PGE_LED_REFLECTOR	25,919	23,952	0.92	51.8%	0.92	0.85	0.92	0.78
PGE	**Total**	**339,787**	**392,521**	**1.16**	**91.5%**	**0.73**	**0.71**	**0.91**	**0.75**
SCE	SCE_LED_ACCENT	441	417	0.95	64.5%	0.75	0.71	0.88	0.75
SCE	SCE_LED_A-LAMP	0	0						
SCE	SCE_LED_HIGH_LOWBAY	51,088	70,779	1.39	100.0%	0.82	0.81		
SCE	SCE_LED_OUTDOOR_FIXTURE	5,919	5,919	1.00	100.0%	0.96	0.96		
SCE	SCE_LED_REFLECTOR	5,100	4,003	0.78	0.0%	0.96	0.75	0.96	0.75
SCE	SCE_LED_TLED	96,476	102,211	1.06	100.0%	0.77	0.77		
SCE	**Total**	**159,023**	**183,329**	**1.15**	**96.7%**	**0.79**	**0.79**	**0.95**	**0.75**
SDGE	SDGE_LED_ACCENT	4,292	5,028	1.17	0.0%	0.67	0.78	0.67	0.78
SDGE	SDGE_LED_A-LAMP	1,067	1,354	1.27	0.0%	0.66	0.84	0.66	0.84
SDGE	SDGE_LED_HIGH_LOWBAY	25,446	28,645	1.13	100.0%	0.80	0.80		
SDGE	SDGE_LED_OUTDOOR_FIXTURE	3,297	3,297	1.00	100.0%	0.96	0.96		
SDGE	SDGE_LED_REFLECTOR	14,591	9,485	0.65	0.0%	0.96	0.62	0.96	0.62
SDGE	SDGE_LED_TLED	106,917	103,548	0.97	100.0%	0.76	0.76		
SDGE	**Total**	**155,608**	**151,357**	**0.97**	**87.2%**	**0.78**	**0.76**	**0.86**	**0.68**
	Statewide	***654,418***	***727,206***	***1.11***	***91.7%***	***0.75***	***0.74***	***0.89***	***0.72***

Gross Lifecycle Savings (MW)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Eval GRR
PGE	PGE_LED_ACCENT	0.8	0.8	1.00	100.0%	
PGE	PGE_LED_A-LAMP	2.9	2.9	1.00	100.0%	
PGE	PGE_LED_HIGH_LOWBAY	72.3	91.9	1.27	8.9%	1.30
PGE	PGE_LED_OUTDOOR_FIXTURE	0.0	0.0			
PGE	PGE_LED_REFLECTOR	6.6	6.6	1.00	100.0%	
PGE	**Total**	**82.5**	**102.2**	**1.24**	**20.2%**	**1.30**
SCE	SCE_LED_ACCENT	0.2	0.2	1.00	100.0%	
SCE	SCE_LED_A-LAMP	0.0	0.0			
SCE	SCE_LED_HIGH_LOWBAY	20.1	17.9	0.89	0.8%	0.89
SCE	SCE_LED_OUTDOOR_FIXTURE	0.0	0.0			
SCE	SCE_LED_REFLECTOR	1.3	1.3	1.00	100.0%	
SCE	SCE_LED_TLED	37.2	35.4	0.95	0.0%	0.95
SCE	**Total**	**58.7**	**54.8**	**0.93**	**2.8%**	**0.93**
SDGE	SDGE_LED_ACCENT	1.5	1.5	1.00	100.0%	
SDGE	SDGE_LED_A-LAMP	0.3	0.3	1.00	100.0%	
SDGE	SDGE_LED_HIGH_LOWBAY	7.7	9.3	1.22	3.1%	1.23
SDGE	SDGE_LED_OUTDOOR_FIXTURE	0.0	0.0			
SDGE	SDGE_LED_REFLECTOR	3.7	3.7	1.00	100.0%	
SDGE	SDGE_LED_TLED	36.6	33.9	0.93	0.0%	0.93
SDGE	**Total**	**49.8**	**48.8**	**0.98**	**11.6%**	**0.98**
	Statewide	***191.0***	***205.7***	***1.08***	***12.6%***	***1.09***

Net Lifecycle Savings (MW)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Eval Ex-Ante NTG	Eval Ex-Post NTG
PGE	PGE_LED_ACCENT	0.5	0.7	1.36	0.0%	0.68	0.93	0.68	0.93
PGE	PGE_LED_A-LAMP	2.8	1.9	0.70	0.0%	0.96	0.67	0.96	0.67
PGE	PGE_LED_HIGH_LOWBAY	50.1	63.8	1.27	100.0%	0.69	0.69		
PGE	PGE_LED_OUTDOOR_FIXTURE	0.0	0.0						
PGE	PGE_LED_REFLECTOR	6.1	5.6	0.92	52.3%	0.92	0.85	0.93	0.78
PGE	**Total**	**59.5**	**72.1**	**1.21**	**89.6%**	**0.72**	**0.71**	**0.91**	**0.75**
SCE	SCE_LED_ACCENT	0.1	0.1	0.97	70.7%	0.73	0.71	0.85	0.75
SCE	SCE_LED_A-LAMP	0.0	0.0						
SCE	SCE_LED_HIGH_LOWBAY	16.4	14.4	0.88	100.0%	0.82	0.81		
SCE	SCE_LED_OUTDOOR_FIXTURE	0.0	0.0						
SCE	SCE_LED_REFLECTOR	1.3	1.0	0.79	0.0%	0.95	0.76	0.95	0.76
SCE	SCE_LED_TLED	28.6	27.3	0.95	100.0%	0.77	0.77		
SCE	**Total**	**46.4**	**42.8**	**0.92**	**97.2%**	**0.79**	**0.78**	**0.95**	**0.76**
SDGE	SDGE_LED_ACCENT	1.0	1.2	1.22	0.0%	0.67	0.81	0.67	0.81
SDGE	SDGE_LED_A-LAMP	0.2	0.3	1.28	0.0%	0.66	0.84	0.66	0.84
SDGE	SDGE_LED_HIGH_LOWBAY	6.1	7.5	1.22	100.0%	0.80	0.80		
SDGE	SDGE_LED_OUTDOOR_FIXTURE	0.0	0.0						
SDGE	SDGE_LED_REFLECTOR	3.6	2.2	0.63	0.0%	0.96	0.60	0.96	0.60
SDGE	SDGE_LED_TLED	27.6	25.6	0.93	100.0%	0.76	0.76		
SDGE	**Total**	**38.5**	**36.8**	**0.96**	**87.7%**	**0.77**	**0.76**	**0.86**	**0.67**
	Statewide	***144.4***	***151.7***	***1.05***	***91.5%***	***0.76***	***0.74***	***0.90***	***0.72***

Gross Lifecycle Savings (MTherms)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Eval GRR
PGE	PGE_LED_ACCENT	-22	-22	1.00	100.0%	
PGE	PGE_LED_A-LAMP	-79	-79	1.00	100.0%	
PGE	PGE_LED_HIGH_LOWBAY	-2,487	-3,154	1.27	10.1%	1.30
PGE	PGE_LED_OUTDOOR_FIXTURE	0	0			
PGE	PGE_LED_REFLECTOR	-177	-177	1.00	100.0%	
PGE	**Total**	**-2,764**	**-3,431**	**1.24**	**19.1%**	**1.30**
SCE	SCE_LED_ACCENT	-1	-1	1.00	100.0%	
SCE	SCE_LED_A-LAMP	0	0			
SCE	SCE_LED_HIGH_LOWBAY	-25	-32	1.30	4.0%	1.31
SCE	SCE_LED_OUTDOOR_FIXTURE	0	0			
SCE	SCE_LED_REFLECTOR	-12	-12	1.00	100.0%	
SCE	SCE_LED_TLED	-378	-400	1.06	0.0%	1.06
SCE	**Total**	**-415**	**-445**	**1.07**	**3.3%**	**1.07**
SDGE	SDGE_LED_ACCENT	-23	-23	1.00	100.0%	
SDGE	SDGE_LED_A-LAMP	-5	-5	1.00	100.0%	
SDGE	SDGE_LED_HIGH_LOWBAY	-281	-317	1.13	1.2%	1.13
SDGE	SDGE_LED_OUTDOOR_FIXTURE	0	0			
SDGE	SDGE_LED_REFLECTOR	-48	-48	1.00	100.0%	
SDGE	SDGE_LED_TLED	-1,457	-1,411	0.97	0.0%	0.97
SDGE	**Total**	**-1,814**	**-1,804**	**0.99**	**4.4%**	**0.99**
	Statewide	***-4,993***	***-5,680***	***1.14***	***12.5%***	***1.16***

Net Lifecycle Savings (MTherms)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Eval Ex-Ante NTG	Eval Ex-Post NTG
PGE	PGE_LED_ACCENT	-15	-20	1.37	0.0%	0.68	0.93	0.68	0.93
PGE	PGE_LED_A-LAMP	-76	-53	0.70	0.0%	0.96	0.67	0.96	0.67
PGE	PGE_LED_HIGH_LOWBAY	-1,692	-2,148	1.27	100.0%	0.68	0.68		
PGE	PGE_LED_OUTDOOR_FIXTURE	0	0						
PGE	PGE_LED_REFLECTOR	-163	-151	0.93	53.5%	0.92	0.86	0.93	0.78
PGE	**Total**	**-1,945**	**-2,372**	**1.22**	**91.5%**	**0.70**	**0.69**	**0.91**	**0.75**
SCE	SCE_LED_ACCENT	-1	-1	0.94	71.8%	0.73	0.69	0.93	0.75
SCE	SCE_LED_A-LAMP	0	0						
SCE	SCE_LED_HIGH_LOWBAY	-24	-31	1.30	100.0%	0.95	0.95		
SCE	SCE_LED_OUTDOOR_FIXTURE	0	0						
SCE	SCE_LED_REFLECTOR	-11	-9	0.79	0.0%	0.96	0.75	0.96	0.75
SCE	SCE_LED_TLED	-294	-312	1.06	100.0%	0.78	0.78		
SCE	**Total**	**-330**	**-352**	**1.07**	**96.5%**	**0.79**	**0.79**	**0.95**	**0.75**
SDGE	SDGE_LED_ACCENT	-16	-18	1.17	0.0%	0.67	0.78	0.67	0.78
SDGE	SDGE_LED_A-LAMP	-3	-4	1.28	0.0%	0.65	0.84	0.65	0.84
SDGE	SDGE_LED_HIGH_LOWBAY	-223	-252	1.13	100.0%	0.80	0.79		
SDGE	SDGE_LED_OUTDOOR_FIXTURE	0	0						
SDGE	SDGE_LED_REFLECTOR	-46	-30	0.65	0.0%	0.96	0.62	0.96	0.62
SDGE	SDGE_LED_TLED	-1,100	-1,066	0.97	100.0%	0.76	0.76		
SDGE	**Total**	**-1,389**	**-1,370**	**0.99**	**95.3%**	**0.77**	**0.76**	**0.85**	**0.69**
	Statewide	***-3,664***	***-4,094***	***1.12***	***93.4%***	***0.73***	***0.72***	***0.90***	***0.73***

Gross First Year Savings (MWh)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Eval GRR
PGE	PGE_LED_ACCENT	516	516	1.00	100.0%	
PGE	PGE_LED_A-LAMP	1,454	1,454	1.00	100.0%	
PGE	PGE_LED_HIGH_LOWBAY	26,681	30,973	1.16	10.3%	1.18
PGE	PGE_LED_OUTDOOR_FIXTURE	8,324	8,077	0.97	0.0%	0.97
PGE	PGE_LED_REFLECTOR	3,265	3,265	1.00	100.0%	
PGE	**Total**	**40,240**	**44,285**	**1.10**	**19.9%**	**1.13**
SCE	SCE_LED_ACCENT	85	85	1.00	100.0%	
SCE	SCE_LED_A-LAMP	0	0			
SCE	SCE_LED_HIGH_LOWBAY	4,230	5,660	1.34	1.5%	1.34
SCE	SCE_LED_OUTDOOR_FIXTURE	514	514	1.00	100.0%	
SCE	SCE_LED_REFLECTOR	602	602	1.00	100.0%	
SCE	SCE_LED_TLED	25,113	31,051	1.24	0.0%	1.24
SCE	**Total**	**30,545**	**37,912**	**1.24**	**4.1%**	**1.25**
SDGE	SDGE_LED_ACCENT	1,051	1,051	1.00	100.0%	
SDGE	SDGE_LED_A-LAMP	191	191	1.00	100.0%	
SDGE	SDGE_LED_HIGH_LOWBAY	2,079	2,600	1.25	4.9%	1.26
SDGE	SDGE_LED_OUTDOOR_FIXTURE	287	287	1.00	100.0%	
SDGE	SDGE_LED_REFLECTOR	1,781	1,781	1.00	100.0%	
SDGE	SDGE_LED_TLED	28,553	30,377	1.06	0.0%	1.06
SDGE	**Total**	**33,942**	**36,287**	**1.07**	**10.1%**	**1.08**
	Statewide	***104,728***	***118,484***	***1.13***	***12.1%***	***1.15***

Net First Year Savings (MWh)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Eval Ex-Ante NTG	Eval Ex-Post NTG
PGE	PGE_LED_ACCENT	350	482	1.38	0.0%	0.68	0.93	0.68	0.93
PGE	PGE_LED_A-LAMP	1,394	975	0.70	0.0%	0.96	0.67	0.96	0.67
PGE	PGE_LED_HIGH_LOWBAY	18,431	21,417	1.16	100.0%	0.69	0.69		
PGE	PGE_LED_OUTDOOR_FIXTURE	6,357	6,168	0.97	100.0%	0.76	0.76		
PGE	PGE_LED_REFLECTOR	3,016	2,764	0.92	47.4%	0.92	0.85	0.93	0.78
PGE	**Total**	**29,548**	**31,806**	**1.08**	**88.7%**	**0.73**	**0.72**	**0.90**	**0.76**
SCE	SCE_LED_ACCENT	65	60	0.92	56.0%	0.77	0.70	0.92	0.75
SCE	SCE_LED_A-LAMP	0	0						
SCE	SCE_LED_HIGH_LOWBAY	3,487	4,603	1.32	100.0%	0.82	0.81		
SCE	SCE_LED_OUTDOOR_FIXTURE	493	493	1.00	100.0%	0.96	0.96		
SCE	SCE_LED_REFLECTOR	576	452	0.78	0.0%	0.96	0.75	0.96	0.75
SCE	SCE_LED_TLED	19,301	23,865	1.24	100.0%	0.77	0.77		
SCE	**Total**	**23,922**	**29,473**	**1.23**	**97.5%**	**0.78**	**0.78**	**0.95**	**0.75**
SDGE	SDGE_LED_ACCENT	695	820	1.18	0.0%	0.66	0.78	0.66	0.78
SDGE	SDGE_LED_A-LAMP	126	160	1.27	0.0%	0.66	0.84	0.66	0.84
SDGE	SDGE_LED_HIGH_LOWBAY	1,680	2,098	1.25	100.0%	0.81	0.81		
SDGE	SDGE_LED_OUTDOOR_FIXTURE	275	275	1.00	100.0%	0.96	0.96		
SDGE	SDGE_LED_REFLECTOR	1,706	1,109	0.65	0.0%	0.96	0.62	0.96	0.62
SDGE	SDGE_LED_TLED	21,573	22,950	1.06	100.0%	0.76	0.76		
SDGE	**Total**	**26,055**	**27,412**	**1.05**	**90.3%**	**0.77**	**0.76**	**0.84**	**0.69**
	Statewide	***79,525***	***88,691***	***1.12***	***91.9%***	***0.76***	***0.75***	***0.88***	***0.73***

Gross First Year Savings (MW)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Eval GRR
PGE	PGE_LED_ACCENT	0.1	0.1	1.00	100.0%	
PGE	PGE_LED_A-LAMP	0.3	0.3	1.00	100.0%	
PGE	PGE_LED_HIGH_LOWBAY	5.9	7.0	1.18	9.8%	1.20
PGE	PGE_LED_OUTDOOR_FIXTURE	0.0	0.0			
PGE	PGE_LED_REFLECTOR	0.8	0.8	1.00	100.0%	
PGE	**Total**	**7.1**	**8.1**	**1.15**	**24.7%**	**1.20**
SCE	SCE_LED_ACCENT	0.0	0.0	1.00	100.0%	
SCE	SCE_LED_A-LAMP	0.0	0.0			
SCE	SCE_LED_HIGH_LOWBAY	1.3	1.1	0.84	1.1%	0.83
SCE	SCE_LED_OUTDOOR_FIXTURE	0.0	0.0			
SCE	SCE_LED_REFLECTOR	0.1	0.1	1.00	100.0%	
SCE	SCE_LED_TLED	7.4	7.9	1.06	0.0%	1.06
SCE	**Total**	**8.9**	**9.1**	**1.02**	**2.0%**	**1.02**
SDGE	SDGE_LED_ACCENT	0.2	0.2	1.00	100.0%	
SDGE	SDGE_LED_A-LAMP	0.0	0.0	1.00	100.0%	
SDGE	SDGE_LED_HIGH_LOWBAY	0.5	0.7	1.33	5.1%	1.35
SDGE	SDGE_LED_OUTDOOR_FIXTURE	0.0	0.0			
SDGE	SDGE_LED_REFLECTOR	0.4	0.4	1.00	100.0%	
SDGE	SDGE_LED_TLED	7.4	7.4	1.00	0.0%	1.00
SDGE	**Total**	**8.6**	**8.8**	**1.02**	**8.3%**	**1.03**
	Statewide	***24.6***	***26.0***	***1.06***	***10.7%***	***1.07***

Net First Year Savings (MW)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Eval Ex-Ante NTG	Eval Ex-Post NTG
PGE	PGE_LED_ACCENT	0.1	0.1	1.36	0.0%	0.68	0.93	0.68	0.93
PGE	PGE_LED_A-LAMP	0.3	0.2	0.70	0.0%	0.96	0.67	0.96	0.67
PGE	PGE_LED_HIGH_LOWBAY	4.1	4.8	1.18	100.0%	0.70	0.70		
PGE	PGE_LED_OUTDOOR_FIXTURE	0.0	0.0						
PGE	PGE_LED_REFLECTOR	0.7	0.6	0.92	48.0%	0.92	0.85	0.93	0.78
PGE	**Total**	**5.2**	**5.8**	**1.12**	**85.9%**	**0.73**	**0.71**	**0.91**	**0.76**
SCE	SCE_LED_ACCENT	0.0	0.0	0.94	63.4%	0.75	0.70	0.89	0.75
SCE	SCE_LED_A-LAMP	0.0	0.0						
SCE	SCE_LED_HIGH_LOWBAY	1.1	0.9	0.82	100.0%	0.82	0.81		
SCE	SCE_LED_OUTDOOR_FIXTURE	0.0	0.0						
SCE	SCE_LED_REFLECTOR	0.1	0.1	0.79	0.0%	0.95	0.76	0.95	0.76
SCE	SCE_LED_TLED	5.7	6.0	1.06	100.0%	0.77	0.77		
SCE	**Total**	**7.0**	**7.1**	**1.01**	**98.0%**	**0.78**	**0.77**	**0.95**	**0.76**
SDGE	SDGE_LED_ACCENT	0.2	0.2	1.23	0.0%	0.66	0.81	0.66	0.81
SDGE	SDGE_LED_A-LAMP	0.0	0.0	1.28	0.0%	0.66	0.84	0.66	0.84
SDGE	SDGE_LED_HIGH_LOWBAY	0.4	0.5	1.33	100.0%	0.81	0.81		
SDGE	SDGE_LED_OUTDOOR_FIXTURE	0.0	0.0						
SDGE	SDGE_LED_REFLECTOR	0.4	0.3	0.63	0.0%	0.96	0.60	0.96	0.60
SDGE	SDGE_LED_TLED	5.6	5.6	1.00	100.0%	0.76	0.76		
SDGE	**Total**	**6.6**	**6.6**	**1.01**	**91.2%**	**0.77**	**0.75**	**0.84**	**0.69**
	Statewide	***18.7***	***19.5***	***1.04***	***92.3%***	***0.76***	***0.75***	***0.88***	***0.73***

Gross First Year Savings (MTherms)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Eval GRR
PGE	PGE_LED_ACCENT	-3	-3	1.00	100.0%	
PGE	PGE_LED_A-LAMP	-8	-8	1.00	100.0%	
PGE	PGE_LED_HIGH_LOWBAY	-209	-243	1.16	11.0%	1.18
PGE	PGE_LED_OUTDOOR_FIXTURE	0	0			
PGE	PGE_LED_REFLECTOR	-21	-21	1.00	100.0%	
PGE	**Total**	**-242**	**-275**	**1.14**	**22.9%**	**1.18**
SCE	SCE_LED_ACCENT	0	0	1.00	100.0%	
SCE	SCE_LED_A-LAMP	0	0			
SCE	SCE_LED_HIGH_LOWBAY	-2	-3	1.23	4.6%	1.24
SCE	SCE_LED_OUTDOOR_FIXTURE	0	0			
SCE	SCE_LED_REFLECTOR	-2	-2	1.00	100.0%	
SCE	SCE_LED_TLED	-76	-94	1.24	0.0%	1.24
SCE	**Total**	**-79**	**-98**	**1.23**	**2.3%**	**1.24**
SDGE	SDGE_LED_ACCENT	-4	-4	1.00	100.0%	
SDGE	SDGE_LED_A-LAMP	-1	-1	1.00	100.0%	
SDGE	SDGE_LED_HIGH_LOWBAY	-18	-22	1.26	2.1%	1.26
SDGE	SDGE_LED_OUTDOOR_FIXTURE	0	0			
SDGE	SDGE_LED_REFLECTOR	-6	-6	1.00	100.0%	
SDGE	SDGE_LED_TLED	-294	-313	1.06	0.0%	1.06
SDGE	**Total**	**-323**	**-346**	**1.07**	**3.4%**	**1.07**
	Statewide	***-644***	***-719***	***1.12***	***10.6%***	***1.13***

Net First Year Savings (MTherms)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Eval Ex-Ante NTG	Eval Ex-Post NTG
PGE	PGE_LED_ACCENT	-2	-3	1.37	0.0%	0.68	0.93	0.68	0.93
PGE	PGE_LED_A-LAMP	-8	-6	0.70	0.0%	0.96	0.67	0.96	0.67
PGE	PGE_LED_HIGH_LOWBAY	-143	-166	1.16	100.0%	0.68	0.68		
PGE	PGE_LED_OUTDOOR_FIXTURE	0	0						
PGE	PGE_LED_REFLECTOR	-19	-18	0.92	47.8%	0.92	0.85	0.93	0.78
PGE	**Total**	**-172**	**-192**	**1.11**	**88.2%**	**0.71**	**0.70**	**0.91**	**0.76**
SCE	SCE_LED_ACCENT	0	0	0.94	69.6%	0.73	0.68	0.94	0.75
SCE	SCE_LED_A-LAMP	0	0						
SCE	SCE_LED_HIGH_LOWBAY	-2	-2	1.23	100.0%	0.95	0.95		
SCE	SCE_LED_OUTDOOR_FIXTURE	0	0						
SCE	SCE_LED_REFLECTOR	-1	-1	0.78	0.0%	0.96	0.75	0.96	0.75
SCE	SCE_LED_TLED	-59	-73	1.24	100.0%	0.78	0.78		
SCE	**Total**	**-63**	**-77**	**1.22**	**97.6%**	**0.79**	**0.78**	**0.96**	**0.75**
SDGE	SDGE_LED_ACCENT	-3	-3	1.18	0.0%	0.66	0.78	0.66	0.78
SDGE	SDGE_LED_A-LAMP	0	-1	1.28	0.0%	0.65	0.84	0.65	0.84
SDGE	SDGE_LED_HIGH_LOWBAY	-14	-18	1.26	100.0%	0.80	0.80		
SDGE	SDGE_LED_OUTDOOR_FIXTURE	0	0						
SDGE	SDGE_LED_REFLECTOR	-6	-4	0.65	0.0%	0.96	0.62	0.96	0.62
SDGE	SDGE_LED_TLED	-222	-237	1.06	100.0%	0.76	0.76		
SDGE	**Total**	**-245**	**-262**	**1.07**	**96.4%**	**0.76**	**0.76**	**0.82**	**0.70**
	Statewide	***-480***	***-530***	***1.10***	***93.6%***	***0.75***	***0.74***	***0.88***	***0.74***

APPENDIX AB STANDARDIZED PER UNIT SAVINGS

Per Unit (Quantity) Gross Energy Savings (kWh)

PA	Standard Report Group	Pass Through	% ER Ex-Ante	% ER Ex-Post	Average EUL (yr)	Ex-Post Lifecycle	Ex-Post First Year	Ex-Post Annualized
PGE	PGE_LED_HIGH_LOWBAY	0	0.0%	0.0%	13.8	493.2	36.9	40.6
PGE	PGE_LED_OUTDOOR_FIXTURE	0	0.0%	0.0%	12.0	2,243.4	186.9	186.9
PGE	PGE_LED_ACCENT	1	0.0%		8.2	250.7	33.1	33.1
PGE	PGE_LED_A-LAMP	1	0.0%		10.4	252.8	25.6	25.6
PGE	PGE_LED_HIGH_LOWBAY	1	0.0%		11.7	664.5	60.0	60.0
PGE	PGE_LED_REFLECTOR	1	0.0%		9.1	564.1	65.6	65.6
SCE	SCE_LED_HIGH_LOWBAY	0	0.0%	0.0%	15.7	399.3	25.7	26.8
SCE	SCE_LED_TLED	0	0.0%	0.0%	5.0	125.9	29.4	25.2
SCE	SCE_LED_ACCENT	1	0.0%		8.0	248.5	35.9	35.9
SCE	SCE_LED_A-LAMP	1	0.0%		11.8	0.0	0.0	0.0
SCE	SCE_LED_HIGH_LOWBAY	1	0.0%		10.8	231.9	22.1	22.1
SCE	SCE_LED_OUTDOOR_FIXTURE	1	0.0%		12.0	1,023.8	85.3	85.3
SCE	SCE_LED_REFLECTOR	1	0.0%		10.1	494.6	55.8	55.8
SDGE	SDGE_LED_HIGH_LOWBAY	0	0.0%	0.0%	15.9	442.3	31.8	28.4
SDGE	SDGE_LED_TLED	0	100.0%	100.0%	14.9	173.8	38.5	11.7
SDGE	SDGE_LED_ACCENT	1	0.0%		7.4	400.4	65.3	65.3
SDGE	SDGE_LED_A-LAMP	1	0.0%		9.7	300.0	35.4	35.4
SDGE	SDGE_LED_HIGH_LOWBAY	1	0.0%		8.8	679.1	74.3	74.3
SDGE	SDGE_LED_OUTDOOR_FIXTURE	1	0.0%		12.0	1,115.9	93.0	93.0
SDGE	SDGE_LED_REFLECTOR	1	0.0%		9.3	699.7	81.8	81.8

Per Unit (Quantity) Gross Energy Savings (Therms)

PA	Standard Report Group	Pass Through	% ER Ex-Ante	% ER Ex-Post	Average EUL (yr)	Ex-Post Lifecycle	Ex-Post First Year	Ex-Post Annualized
PGE	PGE_LED_HIGH_LOWBAY	0	0.0%	0.0%	13.8	-3.8	-0.3	-0.3
PGE	PGE_LED_OUTDOOR_FIXTURE	0	0.0%	0.0%	12.0	0.0	0.0	0.0
PGE	PGE_LED_ACCENT	1	0.0%		8.2	-1.4	-0.2	-0.2
PGE	PGE_LED_A-LAMP	1	0.0%		10.4	-1.4	-0.1	-0.1
PGE	PGE_LED_HIGH_LOWBAY	1	0.0%		11.7	-5.5	-0.5	-0.5
PGE	PGE_LED_REFLECTOR	1	0.0%		9.1	-3.5	-0.4	-0.4
SCE	SCE_LED_HIGH_LOWBAY	0	0.0%	0.0%	15.7	-0.1	0.0	0.0
SCE	SCE_LED_TLED	0	0.0%	0.0%	5.0	-0.4	-0.1	-0.1
SCE	SCE_LED_ACCENT	1	0.0%		8.0	-0.5	-0.1	-0.1
SCE	SCE_LED_A-LAMP	1	0.0%		11.8	0.0	0.0	0.0
SCE	SCE_LED_HIGH_LOWBAY	1	0.0%		10.8	-0.3	0.0	0.0
SCE	SCE_LED_OUTDOOR_FIXTURE	1	0.0%		12.0	0.0	0.0	0.0
SCE	SCE_LED_REFLECTOR	1	0.0%		10.1	-1.1	-0.1	-0.1
SDGE	SDGE_LED_HIGH_LOWBAY	0	0.0%	0.0%	15.9	-4.0	-0.3	-0.3
SDGE	SDGE_LED_TLED	0	100.0%	100.0%	14.9	-1.8	-0.4	-0.1
SDGE	SDGE_LED_ACCENT	1	0.0%		7.4	-1.5	-0.3	-0.3
SDGE	SDGE_LED_A-LAMP	1	0.0%		9.7	-0.9	-0.1	-0.1
SDGE	SDGE_LED_HIGH_LOWBAY	1	0.0%		8.8	-2.5	-0.3	-0.3
SDGE	SDGE_LED_OUTDOOR_FIXTURE	1	0.0%		12.0	0.0	0.0	0.0
SDGE	SDGE_LED_REFLECTOR	1	0.0%		9.3	-2.2	-0.3	-0.3

Per Unit (Quantity) Net Energy Savings (kWh)

PA	Standard Report Group	Pass Through	% ER Ex-Ante	% ER Ex-Post	Average EUL (yr)	Ex-Post Lifecycle	Ex-Post First Year	Ex-Post Annualized
PGE	PGE_LED_ACCENT	0	0.0%	0.0%	8.2	234.3	30.9	30.9
PGE	PGE_LED_A-LAMP	0	0.0%	0.0%	10.4	169.5	17.2	17.2
PGE	PGE_LED_REFLECTOR	0	0.0%	0.0%	8.7	434.3	55.1	55.1
PGE	PGE_LED_HIGH_LOWBAY	1	0.0%		13.7	347.0	26.4	28.9
PGE	PGE_LED_OUTDOOR_FIXTURE	1	0.0%		12.0	1,713.2	142.8	142.8
PGE	PGE_LED_REFLECTOR	1	0.0%		9.4	525.4	55.9	55.9
SCE	SCE_LED_ACCENT	0	0.0%	0.0%	6.8	147.2	26.0	26.0
SCE	SCE_LED_REFLECTOR	0	0.0%	0.0%	10.1	370.9	41.8	41.8
SCE	SCE_LED_ACCENT	1	0.0%		8.8	192.5	24.8	24.8
SCE	SCE_LED_A-LAMP	1	0.0%		11.8	0.0	0.0	0.0
SCE	SCE_LED_HIGH_LOWBAY	1	0.0%		15.6	320.5	20.8	21.8
SCE	SCE_LED_OUTDOOR_FIXTURE	1	0.0%		12.0	982.6	81.9	81.9
SCE	SCE_LED_TLED	1	0.0%		5.0	96.7	22.6	19.4
SDGE	SDGE_LED_ACCENT	0	0.0%	0.0%	7.4	312.6	51.0	51.0
SDGE	SDGE_LED_A-LAMP	0	0.0%	0.0%	9.7	250.7	29.5	29.5
SDGE	SDGE_LED_REFLECTOR	0	0.0%	0.0%	9.3	435.7	50.9	50.9
SDGE	SDGE_LED_HIGH_LOWBAY	1	0.0%		15.8	358.1	26.2	23.6
SDGE	SDGE_LED_OUTDOOR_FIXTURE	1	0.0%		12.0	1,068.3	89.0	89.0
SDGE	SDGE_LED_TLED	1	100.0%		14.9	131.3	29.1	8.8

Per Unit (Quantity) Net Energy Savings (Therms)

PA	Standard Report Group	Pass Through	% ER Ex-Ante	% ER Ex-Post	Average EUL (yr)	Ex-Post Lifecycle	Ex-Post First Year	Ex-Post Annualized
PGE	PGE_LED_ACCENT	0	0.0%	0.0%	8.2	-1.3	-0.2	-0.2
PGE	PGE_LED_A-LAMP	0	0.0%	0.0%	10.4	-0.9	-0.1	-0.1
PGE	PGE_LED_REFLECTOR	0	0.0%	0.0%	8.7	-2.6	-0.4	-0.4
PGE	PGE_LED_HIGH_LOWBAY	1	0.0%		13.7	-2.6	-0.2	-0.2
PGE	PGE_LED_OUTDOOR_FIXTURE	1	0.0%		12.0	0.0	0.0	0.0
PGE	PGE_LED_REFLECTOR	1	0.0%		9.4	-3.4	-0.4	-0.4
SCE	SCE_LED_ACCENT	0	0.0%	0.0%	6.8	-0.2	0.0	0.0
SCE	SCE_LED_REFLECTOR	0	0.0%	0.0%	10.1	-0.8	-0.1	-0.1
SCE	SCE_LED_ACCENT	1	0.0%		8.8	-0.4	-0.1	-0.1
SCE	SCE_LED_A-LAMP	1	0.0%		11.8	0.0	0.0	0.0
SCE	SCE_LED_HIGH_LOWBAY	1	0.0%		15.6	-0.1	0.0	0.0
SCE	SCE_LED_OUTDOOR_FIXTURE	1	0.0%		12.0	0.0	0.0	0.0
SCE	SCE_LED_TLED	1	0.0%		5.0	-0.3	-0.1	-0.1
SDGE	SDGE_LED_ACCENT	0	0.0%	0.0%	7.4	-1.1	-0.2	-0.2
SDGE	SDGE_LED_A-LAMP	0	0.0%	0.0%	9.7	-0.8	-0.1	-0.1
SDGE	SDGE_LED_REFLECTOR	0	0.0%	0.0%	9.3	-1.4	-0.2	-0.2
SDGE	SDGE_LED_HIGH_LOWBAY	1	0.0%		15.8	-3.1	-0.2	-0.2
SDGE	SDGE_LED_OUTDOOR_FIXTURE	1	0.0%		12.0	0.0	0.0	0.0
SDGE	SDGE_LED_TLED	1	100.0%		14.9	-1.4	-0.3	-0.1

APPENDIX AC RESPONSE TO RECOMMENDATIONS

EM&V Impact Study Recommendations
Study Title: 2018 Nonresidential ESPI Deemed Lighting Impact Evaluation
Study Manager: CPUC

ID		Section	Conclusion	Recommendation	Disposition (Accepted, Rejected, or Other)	Disposition Notes (e.g. Description of specific program change or Reason for rejection or Under further review)
1a	CPUC	5	The evaluation team found the ex post operating hours for certain commercial sectors – like retail and grocery - were significantly higher than ex ante assumptions. While there were measurable differences between ex ante and ex post operating hours for each technology type, T-LEDs and retrofit kits were generally installed in high usage areas like lobbies and retail space that can operate for a significant number of hours per day and week.	The ex ante/DEER team should consider utilizing the monitoring data, along with the business hour and self-reported operating schedules collected as part of this evaluation, to support the development of updated operating hour estimates for LED Fixtures and T-LEDs. Furthermore, businesses that operate 24 hours a day should be considered a unique case and claimed operating hours should be updated to reflect higher activity within these facilities.		
1b	CPUC	5	The evaluation team found claims and associated energy/demand savings using a building type designation and claimed HOU that don't correspond to the actual activity level within a facility. The evaluation team verified installations at fitness centers, grocery stores and retail establishments that operate 24-hours a day and had much greater reported HOU than claimed.			

ID		Section	Conclusion	Recommendation	Disposition (Accepted, Rejected, or Other)	Disposition Notes (e.g. Description of specific program change or Reason for rejection or Under further review)
2a	CPUC	5	The PA's assumed a replacement on burnout baseline for LED Fixture measures. However, we found that T-LEDs and retrofit kits were predominantly replacing linear fluorescent systems – T-LEDs were installed in fixtures with existing wiring and ballasts. Therefore, it's likely there is significant stock of LF systems still out there with well-functioning ballasts, so an opportunity for accelerated replacement may exist for LED Fixture retrofits.	Future studies should consider an accelerated replacement path for LED Fixture retrofits. As industry standard practice moves towards LEDs for replacement on burnout of linear fixtures, accelerated replacement may be the more cost-effective path for this measure. Furthermore, The PA's should track the age and condition of linear fluorescent ballasts where T-LED lamps are being installed.		
2b		5	LED lamps have an average service life of roughly 50,000. However, they are being installed in fixtures with existing ballasts.			
3	CPUC	5	A not insignificant percentage of program participants installing LED fixture measures self-reported metal halide (MH), mercury vapor (MV) and high-pressure sodium (HPS) as the baseline technology replaced as part of the retrofit – especially for outdoor LED fixture measures.	Further research should be conducted to continue to track the typical baseline and efficiency of equipment replaced with program rebated LED indoor and outdoor technologies. Furthermore, future studies and programs should consider a framework to recognize the age of the existing equipment and the likelihood that a program participant would have either 1) deferred installation and maintained or continually repaired their existing system or 2) installed equipment that was no more efficient than code at the time they did, in the absence of the program.		

ID		Section	Conclusion	Recommendation	Disposition (Accepted, Rejected, or Other)	Disposition Notes (e.g. Description of specific program change or Reason for rejection or Under further review)
4	PG&E, SCE, SDG&E	Over-arching	When comparing ex ante parameter estimates to ex post results, not all documentation could be found detailing the specific parameters comprised of the ex ante claimed savings values. This caused unnecessary coordination with the PAs to find missing workpapers.	All workpaper documentation (workbook calculations and supporting documents) should be posted on the workpaper project archive (WPA) at www.deeresources.info.		
5	PG&E, SCE, SDG&E	Over-arching	The evaluation team sometimes found that the expected parameter values used in the ex ante savings claims were not based on the reported ex ante IDs.	Ex ante IDs should match with parameters used in the actual reported ex ante savings.		
6	PG&E, SCE, SDG&E	Over-arching	In general, lighting measures exhibited medium program influence levels. NTGR values vary somewhat by measure type and PA and range from a low of 0.57 (SDG&E Reflectors) to a high of 0.88 (PG&E Accent Lamps). Values by PA show less variation and range from 0.63 (SDG&E) to 0.71 (PG&E). In nearly all cases, ex post NTGR values are less than ex ante values. For SCE Indoor Lamps, it is interesting to note that the NTGR of 0.70 for the midstream delivery is the same as that for the downstream reflector measure, despite being based on two fundamentally different data sources. The midstream result is almost entirely based on distributor survey results, while the downstream result is based solely on participant survey results. This was because the Midstream program did not collect contact information for most of the end user program participants. As a result, it was difficult to identify a sufficient sample of participants to triangulate responses against the distributor responses. Therefore, the NTG analysis for the midstream program relied primarily on distributor responses.	The Midstream NTG framework generally calls for values that are based on a combination of customer and distributor survey results. With the transition to 3P programs that are predominantly Midstream, it is increasingly important that the PA's collect both customer and distributor contact information to support this process.		

ID		Section	Conclusion	Recommendation	Disposition (Accepted, Rejected, or Other)	Disposition Notes (e.g. Description of specific program change or Reason for rejection or Under further review)
7	PG&E, SCE, SDG&E	Section 5	The evaluation team found evidence of some programs incorrectly reporting the unit basis of claimed savings for measures rebated by the total lumens installed, rather than the total number of fixtures or lamps installed. When savings are incorrectly reported, claimed savings are underestimated.	PA's should carefully review claims data for projects rebated with a unit basis of kilolumens to confirm that the claimed units installed represent the total kilolumens installed rather than the total fixtures installed.		

APPENDIX A NET-TO-GROSS SUPPORTING MATERIALS

This appendix provides the following materials to support the NTG Analysis:

- A document describing the updates made to the current Nonresidential Net-to-Gross (NTG) framework for this 2018 evaluation cycle.
- A detailed description of the NTG algorithm for both downstream and midstream programs. Also included are the individual survey responses for each customer and vendor survey, along with the PAI and vendor scores, and the resulting NTGRs used to develop the ex-post NTGR values for the LED A Lamps, Accent Lamps and Reflectors.

UPDATES TO NONRESIDENTIAL NET-TO-GROSS FRAMEWORK FOR 2018 EVALUATION

This Appendix describes updates made to the current Nonresidential Net-to-Gross (NTG) framework for this 2018 evaluation cycle. This framework has been used with minor modifications since the 2006-2008 evaluation cycle. Team members from both the Group A and Group D evaluation teams coordinated to develop two changes that have been incorporated into the 2018 Small Commercial and Lighting evaluations:

1. **An alternative to the current PAI-1 score.** This is designed to address problems identified in previous evaluation cycles.
2. **Expansion of the framework to address Midstream programs.** The expanded framework incorporates a Vendor score and combines it with the Participating Customer score if certain conditions are met.

The updates apply to the following nonresidential programs and measures for the PY2018 evaluation cycle. The Group A and Group D evaluation teams will consider modifications to these updates as well as expansion to additional measures for the PY2019 evaluations.

TABLE A-1: AFFECTED PROGRAMS AND MEASURES

NTG Component	Program Type	Program Year	Program	Measure
PAI_1	Deemed	PY18 & 19	All Relevant Nonresidential Downstream Deemed Programs	Agricultural Irrigation
				Process Pumping VFD
				Refrigeration Case LED Lighting
				Water Heating Tankless Water Heater
				Lighting Indoor LED Reflector Lamp
				Lighting Indoor LED Lamp
		PY19		Lighting Indoor LED Fixture
				Lighting Indoor LED High Bay Fixture
				Lighting Outdoor LED Fixture
				Ozone Laundry
	Calculated	PY18 & 19	All Nonresidential Calculated Program-Measures	
Midstream	Deemed	PY18	SCE Midstream Point of Purchase	Lighting Indoor LED lamps and fixtures
			SCE IDEEA365	Process Pumping VFD
			PG&E and SCG Commercial Deemed Incentives	Tankless Water Heaters
		PY19	TBD	TBD
	Calculated	PY18 & 19	None	None

A.1 BACKGROUND

Over the last several evaluation cycles, Net-to-Gross (NTG) analysis for Nonresidential programs has used a Self-Report Approach (SRA) that is based on the results of self-report telephone surveys with program participants. The existing Nonresidential Net-to-Gross (NTG) framework was originally developed by the Nonresidential Working Group during the 2006-2008 evaluation cycle and was updated modestly during the 2010-2012 cycle. This approach was designed to fully comply with the California Energy Efficiency Evaluation: Protocols: Technical, Methodological, and Reporting Requirements for Evaluation Professionals[1] (Protocols) and the Guidelines for Estimating Net-To-Gross Ratios Using the Self-Report Approaches (Guidelines), as demonstrated in the Nonresidential NTGR Methods (Appendix D-1 to the full WO033 Custom Final Report).

Standardized Nonresidential NTG Algorithm Improvements

Current Algorithm and Rationale

The standardized Nonresidential NTG framework incorporates a 0 to 10 scoring system for key questions used to estimate the NTGR. It consists of a 3-score structure, with each score representing a different way of characterizing program influence:

- **Program attribution index 1 (PAI–1)** score that reflects the influence of the most important of various program and non-program-related elements in the customer's decision to select the specific program measure at the time they did. Program influence through vendor recommendations is also incorporated in this score.
- **Program attribution index 2 (PAI–2)** score that captures the perceived importance of the program (whether rebate, recommendation, training, or other program intervention) relative to non-program factors in the decision to implement the specific measure that was eventually adopted or installed. This score is determined by asking respondents to assign importance values to both the program and most important non-program influences so that the two total 10. The program influence score is reduced in half if respondents say they had already made their decision to install the specific program qualifying measure before they learned about the program.
- **Program attribution index 3 (PAI–3)** score that captures the likelihood of various actions the customer might have taken at the time they did, and in the future, if the program had not been available (the counterfactual).

1 The TecMarket Works Team. California Energy Efficiency Evaluation Protocols: Technical, Methodological, and Reporting Requirements for Evaluation Professionals. Directed by the CPUC's Energy Division, and with guidance from Joint Staff, April 2006.

The resulting self-reported NTGR in most cases is simply the average of the PAI-1, PAI-2, and PAI-3 values, divided by 10. The one exception to this is when the respondent indicates a 10 in 10 probability of installing the same equipment at the same time in the absence of the program, in which case the NTGR is based on the average of the PAI-2, and PAI-3 values only. The reasoning is that the customer has responded with absolute certainty that the program did not influence their decisionmaking through their responses to PAI-3, whereas responses to the PAI-1 score typically indicate some level of program influence despite efforts to check and resolve the consistency of their responses.

The rationale for using three separate scores (triangulation [2]), rather than relying on a single metric, is as follows. The objective of the NTGR analysis is to determine the fraction of the gross savings that occurred because of the program. One minus this score is interpreted as freeridership. Some questions are designed to measure the counterfactual by asking the participant several questions about what they would have done in the absence of the program. Other questions attempt to get at the direct influence of the rebate and other forms of assistance on the decision to install efficient equipment. As part of this set of questions, the respondent is prompted to consider other possible non-program influences that might have played a role in the decision. Still other questions attempt to establish the chronology of when the participant first heard about the program and their decision to install the efficient equipment. These three different types of questions are trying to measure three slightly different things with some being more difficult than others for the respondent to assess. For example, it is easier for the respondent to recall whether they found out about the availability of the rebate before or after they decided to buy the efficient equipment than it is to imagine what they would have done in the absence of the program or assess the influence of the rebate. Nevertheless, all three types of questions provide information about the influence of the program that decision makers should find both meaningful and useful.

One of the problems inherent in asking program participants if they would have installed the same equipment or adopted the same energy-saving practices without the program is that we are asking them to recall what has happened in the past. Worse than that is the fact that what we are really asking them, among other things, is report on a hypothetical situation, what they would have done in the absence of the program. In many cases, the respondent may simply not know and/or cannot know what would have happened in the absence of the program. Even if the customer has some idea of what would have happened, there is, of necessity, uncertainty about it. The situation just described is a circumstance ripe for invalid answers (low construct validity) and answers with low reliability, where reliability is defined as the likelihood that a respondent will give the same answer to the same question whenever or wherever it is asked. It is well known in the interview literature that the more factual and concrete the information the survey requests, the more accurate responses are likely to be. Where we are asking for motivations

[2] Triangulation, using a variety of research methods and data sources, is a strategy adopted ideally before the data are collected and reduces the risk of systematic biases. In some cases, the decision to use triangulation is adopted after the data are collected and found robust enough to support this approach.

and processes in hypothetical situations that occurred in the past, there is room for bias. Using a framework that combines scores based on three different concepts mutes the impact of such bias and increases the accuracy of the resulting NTGR for each project evaluated.

Changes Since the 2006-2008 Evaluation Cycle and Next Steps

The **PAI- 1** score has evolved since the original specification in 2008. The 2008 version called for the score to be based on the highest rating for a program element. Since most decisionmakers would choose to rate at least one program element highly, this often resulted in a PAI-1 score that was significantly higher than either the PAI-2 or PAI-3 scores, and in some cases, led to the elimination of PAI-1 due to it being an outlier. The score was revised in the 2010-2012 cycle to be based on the highest rating for a program influence divided by the sum of the highest-rating for a program influences plus the highest rating for a non-program influence, multiplied by 10. This revised normalized structure solved the problem with outlier results but led to a different issue due to the normalization process yielding mid-range values approximating 5 in nearly all cases, since most decisionmakers give a high score to at least one program element and one non-program element. This issue was flagged in the 2013-2015 Program Performance Assessment of the Nonresidential Downstream Programs, with a recommendation that PAI-1 be eliminated from the NTGR calculation until an alternative formulation could be developed.

The 2017 evaluation of Deemed measures continued use of this standard SRA framework with relatively minor modifications to NTG survey question batteries. Based on the 2013-2015 Program Performance Assessment recommendation, the PAI-1 score was eliminated from the NTG ratio computation. *The Nonresidential NTG Working Group was re-established, in part, to identify an alternative to the current PAI-1 scoring structure.*

Extend NTGR Framework to Accommodate Midstream Programs

The standardized Nonresidential NTG framework is primarily designed for Downstream programs. However, a small number of programs offered are classified as Midstream and, with the transition to predominantly third-party (3P) programs in 2020, they will become more predominant. *Thus, it is necessary to extend the standardized framework to accommodate Midstream programs.*

Dual Baseline NTGR Framework for Accelerated Replacement Projects

During the 2010-2012 evaluation cycle, the Nonresidential Net-to-Gross Working Group also identified the need to extend the standard NTG framework to accommodate early replacement dual baseline projects, based on a CPUC policy change to look at lifetime savings (D.11-07-030, July 15, 2011). This structure is intended to mirror the dual baseline framework adopted for Gross Savings at that time. The group identified some relatively modest changes to both the survey questions and the standard NTG algorithm for such projects, but the changes were not implemented at that time. During the 2017 and

2018 evaluations, the Net evaluation team for Deemed Measures considered modifying the NTG framework to incorporate a dual baseline NTG approach but decided to defer it to the 2019 evaluation cycle since there were very few measures in the 2018 cycle where the dual baseline approach applied.

The remainder of this memo will describe the proposed modifications to the current Nonresidential NTGR framework to address these two areas:

- the alternative to the current PAI-1 scoring structure
- the extension of the framework to accommodate Midstream programs

A.2 ALTERNATIVE TO CURRENT PAI-1 SCORING STRUCTURE

Issues with Current PAI-1 Score

As discussed previously, a number of issues with the PAI-1 score have emerged in previous evaluations. The observations below are specific to the 2017 Deemed evaluations where these problems resulted in a decision to exclude the PAI-1 score from the NTGR calculation.

The inclusion of the PAI-1 score biased the NTGR towards a value of 0.5. The PAI-1 score tended to converge to a value of around 5. Overall, the PAI-1 score averaged 4.9, with over 80 percent of the individual scores within 0.5 of that mean (i.e., between 4.4 and 5.4). This was likely due to respondents rating at least one program and one non-program factor very high. Respondents gave a 9 or 10 rating to at least one program factor 72 percent of the time, and at least one non-program factor 80 percent of the time. Furthermore, 66 percent of the time, the respondent's highest rated program and non-program factors were rated equally. Averaging in the PAI-1 score with PAI-2 and PAI-3 will therefore reduce the NTGR.

PAI-1 scores did not appear to be correlated with "no program" responses indicating free ridership. When PAI-1 scores were compared to other survey questions that would indicate a high likelihood for free ridership, they did not correlate well to these metrics. Specifically, we examined the relationship between PAI-1 and two survey questions that we felt were strong indications of free ridership:

N2: Did your organization make the decision to install this new equipment before, after, or at the same time as you became aware of the program rebate?

N6: Now I would like you to think one last time about what action you would have taken if the program had not been available. Which of the following alternatives would you have been MOST likely to do?

1	Install/Delamped fewer units
2	Install standard efficiency equipment or whatever required by code
3	Installed equipment more efficient than code but less efficient than what you installed through the program
4	Done nothing (keep existing equipment as is)
5	Done the same thing I would have done as I did through the program
6	Repair/rewind or overhaul the existing equipment
77	Something else (specify what _____)

The first question (N2) concerns the timing of the decision to install the measure relative to when they became aware of program rebates. For this question, higher levels of free ridership would be expected for those that already made the decision to install their new equipment before they became aware of the program rebate, and PAI-1 scores would be substantially lower for this response than the other two responses. Our expectation was to see significant increases in the PAI scores for the Same Time and After responses, compared to the Before response. This was the case for PAI-2 and PAI-3 scores, however, the PAI-1 scores changed by only 0.08 points.

Another telling indication of program influence is the self-reported action that participants say they would have taken had the program not existed in question N6. Respondents were asked what they would have been most likely to do if the program had not been available. Two common responses were "done nothing and keep existing equipment as is", and "done the same thing I would have done as I did through the program". One would expect relatively high PAI scores for the "done nothing" and relatively low PAI scores for the "done the same thing" responses. The PAI-2 and PAI-3 scores did meet this expectation, but the PAI-1 score differed by only 0.10 points.

Non-program factors may actually be program factors. What we may think is a non-program factor, may actually be a marketing message of the program. For example, better lighting quality may be considered a non-program factor. However, this may be something the program promotes. Therefore, it may be that the influence of better lighting quality on their decision may have been due to the program.

Similarity in concept between PAI-1 and PAI-2 scores. The PAI-1 and PAI-2 scores are based on a similar concept of program influence and are based on self-reported influence scores for individual program and non-program elements. While both scores are intended to represent different ways of characterizing program influence, there is a high degree of similarity between them. Including both scores in the NTGR calculation amounts to assigning a two-thirds weight to similar program influence metrics and reduces

the importance of the PAI-3 "no program" score in the overall calculation. It is possible that PAI-1 may represent another aspect of program influence that PAI-2 may not be capturing, but quantifying this is difficult to do, and it could be equally likely that instead they are capturing the same influence, accounting for double attribution of program influence. Additionally, removing PAI-1 will give a more consistent representation of program influence across respondents.

Alternatives to the PAI-1 Score

We examined a few different alternatives to the PAI_1 score and then calculated the resulting NTGR using each alternative by averaging it with the PAI_2 and PAI_3 scores. The alternatives we considered were as follows:

NTGR_2a – PAI-1 alternative 1 = ratio of average program element score to sum of average program plus non-program element scores. Average all the program element scores and divide by the average of all the program element scores plus the average of the non-program element scores. For example:

Program scores = 10, 8, 7, 6, 6 = average of 7.4
Nonprogram = 9, 9, 4, 4, 4 = average of 6.0
PAI_1 = 7.4/ (7.4+6.0) = 0.55

NTGR_2b – PAI-1 alternative 2 = Ratio of number of highly rated program factors to highly rated non-program factors
Identify the number of scores that rate an 8 or higher and set the PAI score equal to the ratio of the number of high program scores to high program and non-program scores. For example:

Program scores = 10, 8, 7, 6, 6 = 3 high scores
Nonprogram = 9, 9, 4, 4, 4 = 2 high scores
PAI_1 = 3/ (3+2) = 0.6
If you get no high scores, then NTG =0.5

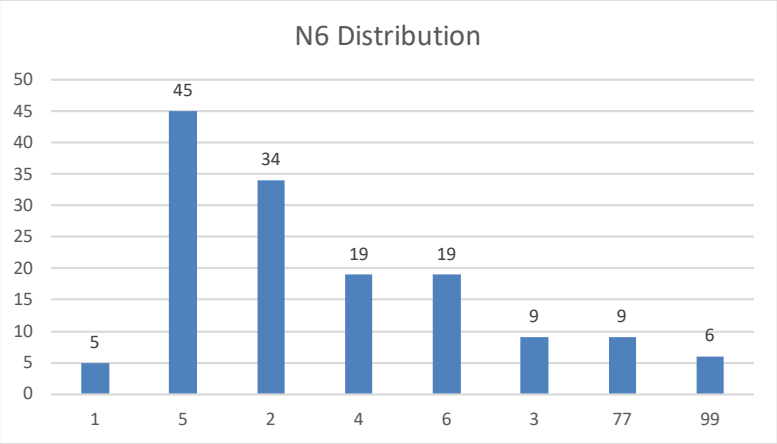
NTGR_2c – PAI-1 alternative 3 = Assign value based on No Program actions (N6). This Approach uses the N6 value and assigns a PAI score as follows.

- If N6 = 2,4 then NTGR = 1
  - 2 Install standard efficiency equipment or whatever required by code
  - 4 Done nothing (keep existing equipment as is)
- If N6=5 then NTGR = 0
  - 5 Done the same thing I would have done as I did through the program
- If N6=1, then NTGR = 1.00 minus the % share they would have installed
  - 1 Install/Delamped fewer units
- If N6=3, then NTGR =0.75
  - 3 Installed equipment more efficient than code but less efficient than what you installed through the program
- IF N6=6, NTGR=missing – this is an Accelerated Replacement and the efficiency of the action is unknown, therefore this response is excluded from the analysis
  - 6 Repair/rewind or overhaul the existing equipment
- If N6=77, the response is reviewed and a judgment made regarding the likely NTGR level, usually a 0, 0.5 or 1
  - 77 Something else (specify what _____)

The overall NTGR_2c is the average of PAI-2, PAI-3, and PAI-N6.

Figure A-1 below shares results from the 2017 Deemed evaluations for question N6. The response category with the largest share is category 5 (Done the same thing I would have done as I did through the program, 45 percent). Other categories that were commonly selected were 2 (Install standard efficiency equipment or whatever required by code, 34 percent), 4 (Done nothing, 19 percent and 6 (Repair/rewind or overhaul the existing equipment, 19 percent).

FIGURE A-1: DISTRIBUTION OF RESPONSES TO QUESTION N6 IN SMALL COMMERCIAL EVALUATION



NTGR_2d – PAI-1 alternative 4 = Preponderance of Evidence approach. If there is significant evidence of free ridership, the value is set to 0, if there is significant evidence of program influence, the value is set to 1, or else the PAI-1 alternative algorithm of choice is used to determine the NTGR. Here is the algorithm.

First calculate PAI_2 and PAI_3 and use question N6 shown earlier:

If PAI_2 >= 7 then NTG_2 = 1
Else if PAI_2<= 3 then NTG_2 = -1
Else NTG_2 = 0

If PAI_3 >= 7 then NTG_3 = 1
Else if PAI_3<= 3 then NTG_3 = -1
Else NTG_3 = 0

IF N6 = 2, 4 (and possibly more options) then NTG_6 = 1
Else if N6 = 5 (and possibly more options) then NTG_6 = -1
Else NTG_6 = 0

THEN:
If sum of NTG2,3,6 >=2, then NTGR = 1 (so in other words you have at least 2 indicators of being net, and no contradictions)
Else, if sum of NTG2,3,6 <= -2, then NTGR = 0, (so in other words you have at least 2 indicators of being a free rider, and no contradictions)
ELSE = NTGR = the standard calculation (the average of PAI2, PAI3 and the PAI-1 alternative algorithm of choice)

Comparison of Results Across Methods

The following two figures graphically illustrate the NTGR results across methods, based on the data collected in the 2017 Deemed evaluations.

Figure A-2 illustrates the distribution of NTGR values for each of the methods tested. Note that NTGR is based on the approach used in the 2017 Deemed evaluation and represents the average of the PAI-2 and PAI-3 scores. NTGR_wPAI1 is the historic 3 score framework, and NTGR_2a through NTGR_2d are the variants described above.

FIGURE A-2: DISTRIBUTION OF NTGRS ACROSS ALTERNATIVE METHODS

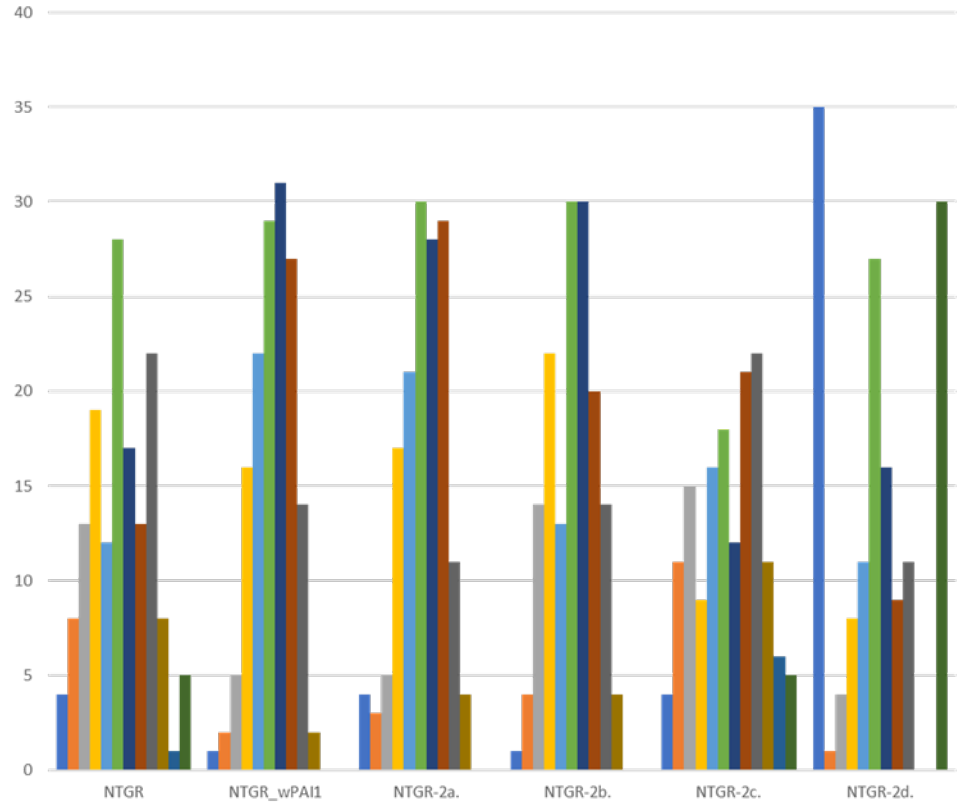
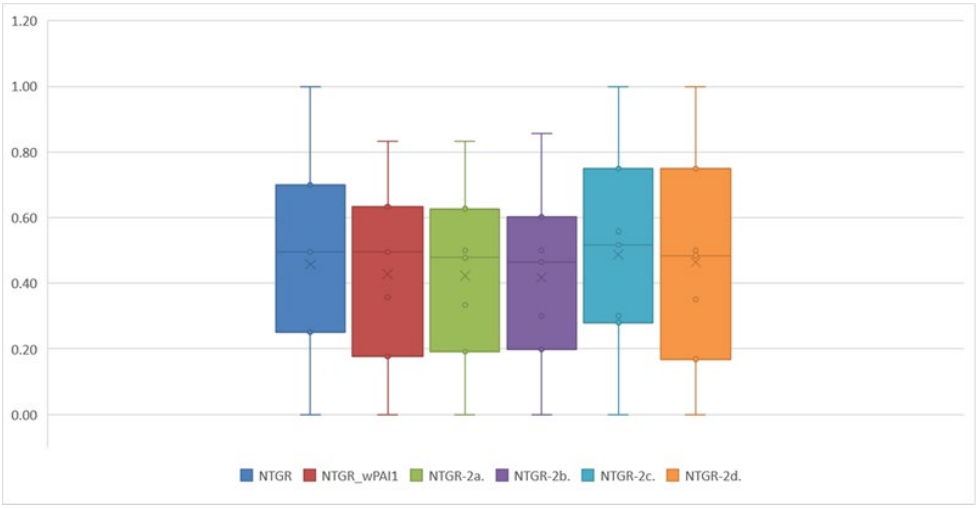


Figure A-3 below provides mean NTGR values and 90 percent confidence intervals across all six cases. The whiskers indicate the range of values analyzed.

FIGURE A-3: NTGR MEAN VALUES AND CONFIDENCE INTERVALS ACROSS ALTERNATIVE METHODS



The following observations can be made from these two figures:

- From Figure A-2:
  - NTGR_wPAI1 – note the clustering of NTGRs around the mid-range values of 0.4 to 0.7. This illustrates the issue with the PAI_1. In contrast, the NTGR case, which is based on PAI-2 and PAI-3 only, has a wider distribution of values.
  - NTGR_2a and NTGR_2b are still relatively narrowly distributed around the 0.5 value, while NTGR_2c and NTGR_2d show much wider variance. Similarly, NTGR_2a and NTGR_2b have relatively narrow standard deviations, while those for NTGR_2c and NTGR_2d are significantly wider.
  - NTGR_2c values are well-distributed and more homogeneous while NTGR_2d values tend toward the extreme 0 and 1 values in many instances.
- In Figure A-3, it is striking how relatively similar the mean NTGR values are, and likely reflects the contribution of the PAI-2 and PAI-3 scores (2/3 weight) in all cases.

Method Change 1

The core NTGR algorithm has been revised and the current PAI-1 score has been replaced with the N6-based score in NTGR_2c – PAI-1 alternative 3. This option leverages the counterfactual information from the survey more fully, with 2 of three scores derived from it. Further, as noted above, the NTGR_2c values have desirable qualities in that they are more normally distributed across each of the scoring intervals and have higher inter-item correlations.

The three PAI scores using the NTGR_2c approach all represent very different approaches and uses of survey information, whereas the other approaches still have the issue of the revised PAI-1 and PAI-2 scores utilizing similar information. We also feel there are some issues with the other alternate PAI_1 scores such as:

NTGR_2a – PAI-1 alternative 1 = ratio of average program element score to sum of average program plus non-program element scores. Consider the following example where an individual was highly influenced by a couple program factors, not at all influenced by the other program factors, and only moderately influenced by the non-program factors
Program scores = 10, 10, 0, 0, 0 = average of 4
Non-program scores = 4, 4, 4, 4, 4 = average of 4
PAI_1 = 4/(4+4) = 0.5

One could argue that the NTGR in this case should be very high because there was clear influence of the program by more than one factor, and no other factor seemed to be very influential. Yet the NTGR is 0.5, inconsistent with this observation. We do not like this alternative because of this issue, where low factor scores can offset high influential factors. A customer does not need all factors to be influential for the program to have influenced their decision.

NTGR_2b – PAI-1 alternative 2 = Ratio of number of highly rated program factors to highly rated non-program factors. This alternative tells us if there were multiple factors that influenced their decision, and how many influential program versus non program factors there are. But it does not tell us which of the influential factors were the most influential, and what may have really driven their decision. Even though a customer may rate two factors a 10 does not mean they were equally influential. The PAI-2 score does address this, however. So the PAI-2 score on its own is a more accurate representation of attribution than this approach.

NTGR_2d – PAI-1 alternative 4 = Preponderance of Evidence approach. If there is significant evidence of free ridership, the value is set to 0, if there is significant evidence of program influence, the value is set to 1, or else the PAI-1 alternative algorithm of choice is used to determine the NTGR. The issue with this approach is that is uses PAI-2 and PAI-3 in its construction, so it's obviously highly correlated with those values and does not provide as independent a result as, say, using the N6 questions in NTGR_2c.

Given the replacement of PAI-1, for projects that report a high level of vendor influence, it is necessary to incorporate vendor influence into one of the other scores. One option is to include it in PAI-3, and another alternative is to develop a fourth score that reflects vendor influence only.

A.3 EXTEND NTGR FRAMEWORK TO ACCOMMODATE MIDSTREAM PROGRAMS

The current Nonresidential NTG framework is designed mainly for Downstream programs, which are focused on delivering incentives directly to end-use customers. Some programs are positioned higher up in the supply chain, so that they work through vendors (e.g., distributors, contractors, and design professionals) to deliver incentives to customers. Such programs are classified as Midstream.

The current Downstream-centric framework relies primarily on findings from end-use customer surveys for determining NTGRs, which is appropriate, given the customer-focused program delivery approach. The method does allow for vendor input into the NTGR but only in cases where the customer rates the vendor higher than any other program or non-program element in their decisionmaking. The vendor is interviewed, and their input is incorporated into the PAI-1 score.

NTG Approach for Midstream Programs

The Midstream approach as described applies to programs delivered through vendors[3] that meaningfully change how they stock, promote and price program-qualified energy efficient equipment as a result of their participation in the program. There are multiple Midstream program delivery approaches, some for which the program intervention(s) is "invisible" to the end-use customer, and others where the end-use customer is fully aware of the program intervention(s). The design of the program, and the availability (vs. not) of customer data will determine the specific NTG approach to be used. Two such variants are:

- Programs that work through vendors, where customer contact data is collected, and where it is believed the end-user is either unaware or aware of the program (**Midstream A**).
- Programs that work entirely with vendors, customer contact data is not collected, and where it is believed the end-user may not be aware of the program (**Midstream B**).

Midstream Program Logic

Most Midstream programs transact directly with vendors and provide incentives in exchange for their promoting the program to their customers, developing projects, enrolling them in the program, and aiding them with program applications and paperwork. The approaches used typically work in the following manner:

- The programs work through participating vendors [usually distributors (including retailers) and contractors] to promote program-eligible energy efficient measures, develop projects and provide incentives to customers. Customers can either be contractors, installers, or end-users.
- Vendors provide instant incentives at the point-of-sale to reduce the upfront price to their customers by all or a portion of the incentive amount. If the customer of a distributor is a contractor or installer, they must pass down all or a portion of the incentive to ultimate purchasers (end-users) of the eligible measures.
- Vendors also aid their customers with program applications and paperwork.
- Periodically, vendors bundle applications together and submit them to the Program Administrator (PA) for reimbursement. As a result, transactions with the program are between the Vendor and the PA.

[3] "Vendors" in this discussion is being used broadly to refer to the entity that transacts with the program to deliver incentives and other program features to end-use customers. Vendors can include distributors, contractors or design professionals but they must have direct involvement with the program via a contract, application or other mechanism to obtain incentives from the program administrator and re-distribute them to the next level(s) down.

Having incentives available to buy down the cost of program measures to ultimate purchasers potentially motivates Vendors to change their behavior from "business as usual" in several ways. Knowing that they will receive an incentive for selling high efficiency units, and in some cases having received training and marketing support to encourage stocking and upselling, Vendors may choose to:

- Reduce prices of program-eligible units,
- Increase their stock of high efficiency units,
- Upsell high efficiency units to contractors and/or end-users,
- Offer training sessions or marketing campaigns aimed at engineers, architects, and contractors to increase awareness of these high efficiency units.

As a result of the program's actions:

- Contractors/customers may be more likely to purchase high efficiency units because they are in stock,
- Contractors/customers may be more likely to purchase high efficiency equipment because the distributor upsold these units,
- Contractors/customers may be more likely to purchase high efficiency units because the incremental cost is lower than it would have been without the incentive, and
- Design professionals and contractors may be more likely to specify or recommend high efficiency units because they are more aware or more familiar with these options.

The expected outcome is that a greater share of end-users will purchase high efficiency units. Ultimately, the overall market in a utility's service territory will become more efficient than it otherwise would have been, or it will achieve this efficiency sooner than if no intervention had occurred.

Midstream NTG Protocol

To assess impacts from Midstream A programs, evaluators need to continue to collect standard self-reported information from end-use customers regarding the importance of various program and non-program factors that influenced their decision, the relative importance of the program, and the likely actions they would have taken absent the program. In addition, for Midstream A and Midstream B programs, evaluators need to determine if the Vendor changed their practices in a way that ultimately influenced the customer's buying decision. Assessing the influence of the program on vendors involves conducting in-depth interviews with participating vendors and asking them how the program influenced their stocking, pricing and promotion practices, and alternatively, how they would behave in the absence of the program.

NTGR Estimation Methodology

For Midstream A programs where customer contact data is collected, surveys are conducted of both participating customers and participating vendors, Customer and Vendor-based estimates of free ridership are developed and are combined into a single NTGR metric. For Midstream B programs that work exclusively with vendors and customer information is not collected, telephone or web surveys with end-use customers are not feasible. However, in-store intercept surveys would allow for direct questioning of customers at the point-of-sale. If in-store or telephone/web surveys are not feasible, the NTGR is derived fully from the Vendor algorithm.

For the **Customer** component, the standard NTG framework is used, participating customer surveys are conducted, and the customer-based NTGR is calculated.

Vendor Component

The **Vendor** component of this methodology uses three indicators of free ridership, Program Importance Score, the Relative Program Influence Score (similar to PAI-2), and the No-Program Score (similar to PAI-3).

Vendor Surveys. During the in-depth interviews, the Vendor is asked which of the available sales strategies they used to promote program-qualified equipment:

*A3 Now, I'm going to ask you about the various strategies you might have used to sell program-qualifying **MEASURE**. Please indicate which ones you have used. [READ]*
___ *Upsell contractors to purchase program-qualified units*
___ *Upsell customers to purchase program-qualified units*
___ *Conduct training workshops for contractors*
___ *Increase marketing of program-qualified units*
___ *Reduce the prices of program-qualified units*
___ *Increase the stocking or assortment of program-qualified units*
___*Increase stock for emergency replacements*
___*Increase signage on sales floor*
___ *Discuss the benefits of program-qualified units with contractors*
___ *Discuss the benefits of program-qualified units with customers*
___ *Other (Please describe: _____)*

Next, the Vendor is asked to use a 0-to-10 importance scale to rate the importance of various program and non-program factors in their decision to recommend the program-qualifying measure to distributors/customers.

A4 Using this 0-to-10 scale, please rate the following in terms of their importance in your ***decision to recommend*** *MEASURE to contractors and your other customers*

Increased awareness of MEASURE benefits	*0 to 10 score (_____)*
Program-provided training of sales staff	*0 to 10 score (_____)*
Program promotional materials	*0 to 10 score (_____)*
Information from PROGRAM website	*0 to 10 score (_____)*
PROGRAM incentive	*0 to 10 score (_____)*
Reduced high-efficiency MEASURE prices from manufacturers	*0 to 10 score (_____)*
Availability of manufacturers' promotional rebates/spiffs	*0 to 10 score (_____)*
Information about the cost-effectiveness of more efficient units	*0 to 10 score (_____)*
Increased stocking of high-efficiency MEASURE	*0 to 10 score (_____)*
Past participation in PROGRAM	*0 to 10 score (_____)*

Next, Vendors are asked to rate the importance of the Program in influencing their decision to recommend the program-qualifying measure to distributors/customers, and a follow-up question regarding the relative importance of the Program in their decision. Finally, there is a counterfactual question regarding their likelihood to recommend the program-qualifying measure absent the program.

A5 Using this 0-to-10 scale where 0 is NOT AT ALL IMPORTANT and 10 is EXTREMELY IMPORTANT, how important was the PROGRAM, including incentives as well as program services and information, in influencing your decision to recommend that UTILITY's contractors/customers purchase the energy efficient MEASURE at this time?

Next, I would like you to rate the importance of the PROGRAM FACTORS as a group in your decision to implement these sales strategies as opposed to other NON-PROGRAM FACTORS as a group that might have influenced your decision.

> *Program factors include: [READ IN A MINIMUM OF TWO PROGRAM FACTORS, SELECTED BY CHOOSING THOSE THAT RECEIVED THE HIGHEST TWO SCORES AMONG ALL PROGRAM COMPONENTS IN THE PROGRAM COMPONENTS SECTION]*
>
> *Non-program factors include: [READ IN A MINIMUM OF TWO NON-PROGRAM FACTORS, SELECTED BY CHOOSING THOSE THAT RECEIVED THE HIGHEST TWO SCORES AMONG ALL NON-PROGRAM COMPONENTS IN THE PROGRAM COMPONENTS SECTION.]*

A5a. Now, if you were given 10 points to award in total, how many points would give to the importance of the program factors as a group and how many points would you give to the non-program factors as a group?

A6 And using a 0-to-10 likelihood scale where 0 is NOT AT ALL LIKELY and 10 is EXTREMELY LIKELY, if the PROGRAM, including incentives as well as program services and information, had not been available, what is the likelihood that you would have recommended this specific MEASURE to UTILITY's contractors /customers?

Vendor NTGR Algorithm. First the three separate scores are computed, then averaged to produce the Vendor NTGR. The three component scores are as follows:

- *Program Importance Score.* This score is based on the response to question A5 and is computed using the following equation:

  Program Importance Score = Program importance rating from A5.

- *Relative Program Influence Score.* Responses to question A5a are used to calculate this score as follows:

  Relative Program Influence Score = Program Points from A5a.

- *No-Program Score.* This represents the numeric score of the likelihood that the respondent would have recommended program-qualified equipment in the absence of the program. It is calculated from the response to question A6, using the following equation:

  No-Program FR Score = 10 minus No-Program Likelihood to Recommend

The Vendor-based NTGR is simply the average of these three scores divided by 10. Once this has been computed, the project-level NTGR is determined from a combination of findings from the participating customer and participating vendor surveys. The triangulation approach, combining customer and vendor input, is used. The algorithm uses the customer's input to guide the assessment, with input by the vendor if certain conditions are met. This Midstream scoring approach is shown below in Table A-2.

TABLE A-2: MIDSTREAM SCORING ALGORITHM

Scoring Criteria	Question Number	Decision Rule	Explanation
Criteria 1	N5aa	IF N5aa < 3 Then Use CUSTOMER NTGR only	Per decisionmaker, very low likelihood of installing same absent program. Vendor influence unimportant.
Criteria 2	N5aa	IF N5aa >7 Then Use CUSTOMER NTGR only	Per decisionmaker, very high likelihood of installing same at same time absent the program. Vendor influence unimportant.
Criteria 3	N5, N5b	If N5 < 3 and N6aa = 0 Then Use CUSTOMER NTGR only	Per decisionmaker, very low likelihood of installing same absent program. Vendor influence unimportant.
Criteria 4	N5, N5b	If N5 > 7and N6aa > 7, Then Use CUSTOMER NTGR only	Per decisionmaker, very high likelihood of installing same at same time absent program. Vendor influence unimportant.
Criteria 5	N6	If N6 = 2 and N6aa = Same Time, Then Use CUSTOMER NTGR only	Per decisionmaker, would have installed Standard efficiency at the same time absent the program
Criteria 6	N6	If N6 = 4 and N6aa = Same Time, Then Use CUSTOMER NTGR only	Per decisionmaker, would have Done Nothing at the same time absent the program. Vendor influence unimportant.
Criteria 7	N6	If N6 = 6 and N6aa = Same Time, Then Use CUSTOMER NTGR only	Per decisionmaker, would have Repaired/Rewound Existing equipment at the same time absent the program. Vendor influence unimportant.
Criteria 8	N6	If N6 = 5 and N6aa = Same Time, Then Use CUSTOMER NTGR only	Per decisionmaker, would have Done Same Thing at the same time absent the program. Vendor influence unimportant.
Criteria 9	V3, N3d, V4a	If V3 = Yes, N3d > 7 and V4a >7, and Criteria 1 through 8 not met, Vendor NTGR > 0.70, then use VENDOR NTGR only	Vendor recommended high efficiency, made customer aware of program, vendor was highly influential to the customer
Criteria 10	Multiple	If Criteria 1 through 9 not met, Average Customer and Vendor NTGRs	Moderate program influence and potential for vendor influence

Method Change 2

We have incorporated the Midstream NTG methodology as described for PY2018, and plan to use this method or refinements of it for future program years. This change allows for consideration of the vendor's assessment of the program's influence on the customer's decision to upgrade to program-qualifying equipment in cases where the program is working primarily through vendors.

DETAILED NTGR CALCULATION AND INDIVIDUAL RESPONSES

This appendix provides a detailed description of the NTG algorithm for both downstream and midstream programs, including every survey question used in the algorithm, and how each survey question is used to develop the NTGR.

Also provided are the individual survey responses for each customer and vendor survey, along with the PAI and vendor scores, and the resulting NTGRs used to develop the ex-post NTGR values for the LED A Lamp, Accent Lamp and Reflector measures.

CUSTOMER NET-TO-GROSS ALGORITHM

The customer NTGR algorithm is based on six survey questions asked of participants, as shown below.

N2	Did your organization make the decision to install this new equipment before or, after, or at the same time as you became aware of that rebates [IF NEEDED: to reduce the cost of the measure] were available through the PROGRAM?
1	Before
2	After
3	Same time

	If you were given 10 points to award in total, how many points would you give to the importance of the program and how many points would you give to these other non-program factors?
N41	How many of the ten points would you give to the importance of the PROGRAM in your decision?
#	Record 0 to 10 score (_____)

REPLACE	Was the installation of this measure....<%NTGMEASURE> ...a replacement of existing equipment or was it additional equipment you installed in your facility?
1	Replace/Modification/Retrofit
2	Add-on

N5	Using a likelihood scale from 0 to 10, where 0 is not at all likely and 10 is extremely likely, if THE PROGRAM had NOT BEEN AVAILABLE, what is the likelihood that you would have installed exactly the same program-qualifying energy efficient equipment that you did for this project regardless of when you would have installed it?
#	Record 0 to 10 score (_____)

N5aa	Using a likelihood scale from 0 to 10, where 0 is Not at all likely and 10 is Extremely likely, if THE PROGRAM had NOT BEEN AVAILABLE, what is the likelihood that you would have installed exactly the same energy efficient equipment at the same time as you did?
#	Record 0 to 10 score (_____)

N6	Now I would like you to think one last time about what action you would have taken if the program had not been available. Which of the following alternatives would you have been MOST likely to do?
1	Install/Delamped fewer units
2	Install standard efficiency equipment or whatever required by code
3	Installed equipment more efficient than code but less efficient than what you installed through the program
4	Done nothing (keep existing equipment as is)
5	Done the same thing I would have done as I did through the program
6	Repair/rewind or overhaul the existing equipment
77	Something else (specify what _____)

Three separate scores are calculated based on these questions, as follows:

PAI-2 Score:

The PAI-2 score utilizes the N2 and N41 questions, and is calculated as:

If N2 = after, then PAI-2 = N41/2

Else PAI-2 = N41

PAI-3 Score:

The PAI-3 score utilizes the REPLACE, N5 and N5aa questions, and is calculated as:

If REPLACE = 1, then PAI-3 = 10 – N5

Else PAI-3 = 10 – N5aa

PAI-N6 Score:

The third PAI score is based on Question N6, as follows:

- If N6 = 2,4 then PAI-N6 = 10
  - 2 Install standard efficiency equipment or whatever required by code
  - 4 Done nothing (keep existing equipment as is)
- If N6=5 then PAI-N6 = 0
  - 5 Done the same thing I would have done as I did through the program
- If N6=1, then PAI-N6 = 10* (1.00 minus the % share they would have installed)
  - 1 Install/Delamped fewer units
- If N6=3, then PAI-N6 =7.5
  - 3 Installed equipment more efficient than code but less efficient than what you installed through the program
- IF N6=6, PAI-N6=missing (This is a repair and the efficiency of the action ultimately taken is unknown, therefore this response is excluded from the analysis.)
  - 6 Repair/rewind or overhaul the existing equipment
- If N6=77, the response is reviewed and a judgment made regarding the likely PAI-N6 value, frequently a 0 or 10
  - 77 Something else (specify what _____)

Customer NTGR Calculation:

Finally, the NTGR is calculated as the average of these three scores, divided by 10:

NTGR = ((PAI-2 + PAI-3 + PAI-N6)/3)/10

Note that is only two PAI scores are available, then the NTGR equals the average of those two PAI scores divided by 10. Finally, if only one PAI score is available, then the NTGR is set to missing.

For downstream programs, only the customer NTGR is used. For midstream programs, a combination of customer and vendor NTGRs are used, as discussed below.

VENDOR NET-TO-GROSS ALGORITHM

The vendor NTGR algorithm is based on three survey questions asked of distributors, as shown below.

A5 Using this 0 to 10 scale where 0 is NOT AT ALL IMPORTANT and 10 is EXTREMELY IMPORTANT, how important was the PROGRAM, including incentives as well as program services and information, in influencing your decision to recommend that <%UTILITY's> contractors/distributors/customers purchase the energy efficiency MEASURE at this time?
Record 0 to 10 score (_____) A5A

A5a. Now, if you were given 10 points to award in total, how many points would give to the importance of the program factors as a group and how many points would you give to the non-program factors as a group?
Record 0 to 10 value (_____) A6

A6 And using a 0 to 10 likelihood scale where 0 is NOT AT ALL LIKELY and 10 is EXTREMELY LIKELY, if the PROGRAM, including incentives as well as program services and information, had not been available, what is the likelihood that you would have recommended this specific MEASURE to <%UTILITY's> contractors/distributors/customers?
Record 0 to 10 score (_____) A7

Three separate scores are calculated using these survey questions, as follows:

PIS - Program Importance Score:

This score is based on the response to question A5 and is computed using the following equation:

PIS = A5.

RPIS - Relative Program Importance Score:

Responses to question A5a are used to calculate this score as follows:

RPIS = A5a.

NPS – No-Program Score:

This represents the numeric score of the likelihood that the respondent would have recommended program-qualified equipment in the absence of the program. It is calculated from the response to question A6, using the following equation:

NPS = 10 – A6

Vendor NTGR Calculation:

Finally, the NTGR is calculated as the average of these three scores, divided by 10:

NTGR = ((PIS + RPIS + NPS)/3)/10

Note that is only two scores are available, then the NTGR equals the average of those two scores divided by 10. Finally, if only one score is available, then the NTGR is set to missing.

MIDSTREAM NET-TO-GROSS ALGORITHM

For midstream programs, the project-level NTGR is determined from a combination of findings from the customer and vendor NTGRs. The triangulation approach, combining customer and vendor input, is used. In cases where customer contact information is not available, the midstream program NTGR is based solely on the vendor NTGR. The algorithm uses the customer's input to guide the assessment, with input by the vendor if certain conditions are met, based on the following questions.

NN5aa	Would you like for me to change your score on the importance of the rebate that you gave a rating of <%N3B> and/or change your rating on the likelihood you would install the same equipment without the rebate which you gave a rating of <%N5> and/or we can change both if you wish?
1	No change
77	Record how they would rate rebate influence and how they would rate likelihood to install without the rebate

N5	Using a likelihood scale from 0 to 10, where 0 is not at all likely and 10 is extremely likely, if THE PROGRAM had NOT BEEN AVAILABLE, what is the likelihood that you would have installed exactly the same program-qualifying energy efficient equipment that you did for this project regardless of when you would have installed it?
#	Record 0 to 10 score (_____)

N6aa	Would you have [FILL IN RESPONSE TO N6 for N6 = 1,2, 3, 5] at the same time as you did under the program, within a yea
1	Same time
2	Within one year
3	At a later time

N6	Now I would like you to think one last time about what action you would have taken if the program had not been available. Which of the following alternatives would you have been MOST likely to do?
1	Install/Delamped fewer units
2	Install standard efficiency equipment or whatever required by code
3	Installed equipment more efficient than code but less efficient than what you installed through the program
4	Done nothing (keep existing equipment as is)
5	Done the same thing I would have done as I did through the program
6	Repair/rewind or overhaul the existing equipment
77	Something else (specify what _____)

N3d	Recommendation from an equipment vendor that sold you the equipment and/or installed it for you **[VENDOR_1]**
#	Record 0 to 10 score (_____)

V3	Did the contractor/vendor tell you about or recommend the program?
1	Yes
2	No

V4a	Using the same scale of 0 - 10 as before, how likely is it that your organization would have installed the new energy efficient equipment had the contractor/vendor not recommended it?
1	0-10 response

This Midstream scoring approach is shown below.

TABLE A-3: MIDSTREAM SCORING ALGORITHM

Scoring Criteria	Question Number	Decision Rule	Explanation
Criteria 1	N5aa	IF N5aa < 3 Then Use CUSTOMER NTGR only	Per decisionmaker, very low likelihood of installing same absent program. Vendor influence unimportant.
Criteria 2	N5aa	IF N5aa >7 Then Use CUSTOMER NTGR only	Per decisionmaker, very high likelihood of installing same at same time absent the program. Vendor influence unimportant.
Criteria 3	N5, N5b	If N5 < 3 and N6aa = 0 Then Use CUSTOMER NTGR only	Per decisionmaker, very low likelihood of installing same absent program. Vendor influence unimportant.
Criteria 4	N5, N5b	If N5 > 7and N6aa > 7, Then Use CUSTOMER NTGR only	Per decisionmaker, very high likelihood of installing same at same time absent program. Vendor influence unimportant.
Criteria 5	N6	If N6 = 2 and N6aa = Same Time, Then Use CUSTOMER NTGR only	Per decisionmaker, would have installed Standard efficiency at the same time absent the program
Criteria 6	N6	If N6 = 4 and N6aa = Same Time, Then Use CUSTOMER NTGR only	Per decisionmaker, would have Done Nothing at the same time absent the program. Vendor influence unimportant.
Criteria 7	N6	If N6 = 6 and N6aa = Same Time, Then Use CUSTOMER NTGR only	Per decisionmaker, would have Repaired/Rewound Existing equipment at the same time absent the program. Vendor influence unimportant.
Criteria 8	N6	If N6 = 5 and N6aa = Same Time, Then Use CUSTOMER NTGR only	Per decisionmaker, would have Done Same Thing at the same time absent the program. Vendor influence unimportant.
Criteria 9	V3, N3d, V4a	If V3 = Yes, N3d > 7 and V4a >7, and Criteria 1 through 8 not met, Vendor NTGR > 0.70, then use VENDOR NTGR only	Vendor recommended high efficiency, made customer aware of program, vendor was highly influential to the customer
Criteria 10	Multiple	If Criteria 1 through 9 not met, Average Customer and Vendor NTGRs	Moderate program influence and potential for vendor influence

INDIVIDUAL SURVEY RESPONSES, PAI AND VENDOR SCORES AND NTGRS

The following tables provide the survey responses for each customer and vendor survey, and along with the PAI and vendor scores, and resulting NTGR used to develop the ex-post NTGR values for LED A Lamp, Accent Lamp and Reflector measures.

TABLE A-4: PG&E INDIVIDUAL SURVEY RESPONSES, PAI SCORES AND NTGRS FOR DOWNSTREAM MEASURES – LED A LAMP

PA	Measure Group	n41	n2	PAI2	n5aa	Replace	n5	PAI3	n6	N6_77	n6_Pct	PAI-N6	NTGR
PGE	A Lamps	8	3	8	.	1	10	0	5	.	.	0	**0.27**
PGE	A Lamps	10	99	10	.	1	0	10	4	.	.	10	**1.00**
PGE	A Lamps	5	2	5	.	1	6	4	5	.	.	0	**0.30**
PGE	A Lamps	5	3	5	.	1	4	6	77	.	.	.	**0.55**
PGE	A Lamps	10	3	10	.	1	7	3	4	.	.	10	**0.77**
PGE	A Lamps	7	2	7	.	1	2	8	4	.	.	10	**0.83**
PGE	A Lamps	5	3	5	.	1	10	0	5	.	.	0	**0.17**
PGE	A Lamps	5	2	5	.	1	0	10	77	10	.	10	**0.83**
PGE	A Lamps	6	2	6	.	1	0	10	4	.	.	10	**0.87**
PGE	A Lamps	2	3	2	.	1	0	10	4	.	.	10	**0.73**
PGE	A Lamps	10	2	10	.	1	0	10	4	.	.	10	**1.00**
PGE	A Lamps	5	3	5	.	1	10	0	6	.	.	.	**0.25**
PGE	A Lamps	10	3	10	.	1	.	.	77	10	.	10	**1.00**
PGE	A Lamps	8	1	4.0	.	1	5	5	4	.	.	10	**0.63**
PGE	A Lamps	10	3	10	.	1	10	0	77	10	.	10	**0.67**
PGE	A Lamps	5	3	5	.	1	0	10	5	.	.	0	**0.50**
PGE	A Lamps	5	3	5	.	1	7	3	4	.	.	10	**0.60**
PGE	A Lamps	10	3	10	.	1	0	10	4	.	.	10	**1.00**
PGE	A Lamps	10	3	10	.	1	8	2	5	.	.	0	**0.40**
PGE	A Lamps	4	1	2.0	.	1	5	5	4	.	.	10	**0.57**
PGE	A Lamps	10	3	10	.	1	0	10	4	.	.	10	**1.00**
PGE	A Lamps	8	3	8	.	1	0	10	4	.	.	10	**0.93**

PA	Measure Group	n41	n2	PAI2	n5aa	Replace	n5	PAI3	n6	N6_77	n6_Pct	PAI-N6	NTGR
PGE	A Lamps	7	2	7	.	1	4	6	4	.	.	10	**0.77**
PGE	A Lamps	6	3	6	.	1	10	0	5	.	.	0	**0.20**
PGE	A Lamps	4	99	4	.	1	0	10	4	.	.	10	**0.80**
PGE	A Lamps	4	2	4	.	1	0	10	77	10	.	10	**0.80**
PGE	A Lamps	.	2	.	.	1	0	10	4	.	.	10	**1.00**
PGE	A Lamps	10	2	10	.	1	3	7	5	.	.	0	**0.57**
PGE	A Lamps	8	3	8	.	1	0	10	4	.	.	10	**0.93**
PGE	A Lamps	5	1	2.5	.	1	0	10	4	.	.	10	**0.75**
PGE	A Lamps	8	3	8	.	1	0	10	2	.	.	10	**0.93**
PGE	A Lamps	5	3	5	.	1	5	5	5	.	.	0	**0.33**
PGE	A Lamps	3	3	3	.	1	0	10	6	.	.	.	**0.65**
PGE	A Lamps	10	3	10	.	1	0	10	4	.	.	10	**1.00**
PGE	A Lamps	6	2	6	.	1	7	3	4	.	.	10	**0.63**
PGE	A Lamps	5	3	5	.	1	0	10	4	.	.	10	**0.83**
PGE	A Lamps	10	3	10	.	1	5	5	4	.	.	10	**0.83**
PGE	A Lamps	8	3	8	.	1	1	9	4	.	.	10	**0.90**

TABLE A-5: PG&E INDIVIDUAL SURVEY RESPONSES, PAI SCORES AND NTGRS FOR DOWNSTREAM MEASURES – ACCENT LAMP

PA	Measure Group	n41	n2	PAI2	n5aa	Replace	n5	PAI3	n6	N6_77	n6_Pct	PAI-N6	NTGR
PGE	Accent Lamps	7	3	7	.	1	7	3	5	.	.	0	**0.33**
PGE	Accent Lamps	7	2	7	.	1	0	10	4	.	.	10	**0.90**
PGE	Accent Lamps	10	99	10	.	1	9	1	77	10	.	10	**0.70**
PGE	Accent Lamps	7	3	7	.	1	1	9	6	.	.	.	**0.80**
PGE	Accent Lamps	10	1	5.0	.	1	0	10	4	.	.	10	**0.83**
PGE	Accent Lamps	7	3	7	.	1	3	7	4	.	.	10	**0.80**
PGE	Accent Lamps	10	3	10	.	1	0	10	2	.	.	10	**1.00**
PGE	Accent Lamps	8	2	8	.	1	.	.	2	.	.	10	**0.90**
PGE	Accent Lamps	10	3	10	.	1	0	10	4	.	.	10	**1.00**
PGE	Accent Lamps	7	2	7	.	1	2	8	2	.	.	10	**0.83**

TABLE A-6: PG&E INDIVIDUAL SURVEY RESPONSES, PAI SCORES AND NTGRS FOR DOWNSTREAM MEASURES – REFLECTORS

PA	Measure Group	n41	n2	PAI2	n5aa	Replace	n5	PAI3	n6	N6_77	n6_Pct	PAI-N6	NTGR
PGE	Reflectors	10	3	10	.	1	0	10	4	.	.	10	**1.00**
PGE	Reflectors	10	99	10	.	1	0	10	4	.	.	10	**1.00**
PGE	Reflectors	5	3	5	.	1	0	10	4	.	.	10	**0.83**
PGE	Reflectors	3	2	3	.	1	0	10	2	.	.	10	**0.77**
PGE	Reflectors	5	1	2.5	.	1	0	10	4	.	.	10	**0.75**
PGE	Reflectors	5	3	5	.	1	0	10	6	.	.	.	**0.75**
PGE	Reflectors	6	2	6	.	1	3	7	1	.	.	.	**0.65**
PGE	Reflectors	9	3	9	.	1	3	7	77	10	.	10	**0.87**
PGE	Reflectors	2	3	2	.	1	4	6	77	10	.	10	**0.60**
PGE	Reflectors	10	1	5.0	.	1	7	3	3	.	.	7.5	**0.52**
PGE	Reflectors	7	3	7	.	1	0	10	4	.	.	10	**0.90**
PGE	Reflectors	5	3	5	.	1	2	8	4	.	.	10	**0.77**

PA	Measure Group	n41	n2	PAI2	n5aa	Replace	n5	PAI3	n6	N6_77	n6_Pct	PAI-N6	NTGR
PGE	Reflectors	10	3	10	.	1	8	2	4	.	.	10	**0.73**
PGE	Reflectors	3	1	1.5	.	1	5	5	1	.	.	.	**0.33**
PGE	Reflectors	10	2	10	.	1	8	2	99	.	.	.	**0.60**
PGE	Reflectors	9	3	9	.	1	0	10	4	.	.	10	**0.97**
PGE	Reflectors	8	1	4.0	.	1	6	4	4	.	.	10	**0.60**
PGE	Reflectors	10	3	10	.	1	0	10	4	.	.	10	**1.00**
PGE	Reflectors	5	1	2.5	.	1	5	5	77	10	.	10	**0.58**
PGE	Reflectors	8	2	8	.	1	0	10	4	.	.	10	**0.93**
PGE	Reflectors	8	3	8	.	1	0	10	5	.	.	0	**0.60**
PGE	Reflectors	8	2	8	.	1	2	8	3	.	.	7.5	**0.78**
PGE	Reflectors	8	99	8	4	2	.	6	2	.	.	10	**0.80**
PGE	Reflectors	10	3	10	.	1	0	10	4	.	.	10	**1.00**
PGE	Reflectors	10	3	10	.	1	5	5	2	.	.	10	**0.83**
PGE	Reflectors	5	2	5	.	1	2	8	4	.	.	10	**0.77**
PGE	Reflectors	5	3	5	.	1	0	10	4	.	.	10	**0.83**
PGE	Reflectors	.	3	.	.	1	5	5	4	.	.	10	**0.75**
PGE	Reflectors	.	3	.	.	1	7	3	4	.	.	10	**0.65**
PGE	Reflectors	5	3	5	.	1	0	10	3	.	.	7.5	**0.75**
PGE	Reflectors	10	3	10	.	1	0	10	4	.	.	10	**1.00**
PGE	Reflectors	7	3	7	.	1	3	7	4	.	.	10	**0.80**
PGE	Reflectors	10	1	5.0	.	1	10	0	1	.	50	5	**0.33**

TABLE A-7: SCE INDIVIDUAL SURVEY RESPONSES, PAI SCORES AND NTGRS FOR DOWNSTREAM LED REFLECTORS

PA	Measure Group	n41	n2	PAI2	n5aa	Replace	n5	PAI3	n6	N6_77	n6_Pct	PAI-N6	NTGR
SCE	Reflectors	10	2	10	.	1	0	10	4	.	.	10	**1.00**
SCE	Reflectors	10	3	10	.	1	6	4	77	10	.	10	**0.80**
SCE	Reflectors	.	2	.	.	1	10	0	1	.	80	2	**0.10**
SCE	Reflectors	9	3	9	.	1	0	10	4	.	.	10	**0.97**
SCE	Reflectors	10	3	10	.	1	0	10	2	.	.	10	**1.00**
SCE	Reflectors	5	3	5	.	1	7	3	6	.	.	.	**0.40**
SCE	Reflectors	10	3	10	10	2	.	0	5	.	.	0	**0.33**
SCE	Reflectors	8	3	8	.	1	2	8	2	.	.	10	**0.87**
SCE	Reflectors	5	3	5	.	1	0	10	4	.	.	10	**0.83**
SCE	Reflectors	4	99	4	.	1	1	9	4	.	.	10	**0.77**
SCE	Reflectors	5	3	5	.	1	0	10	4	.	.	10	**0.83**
SCE	Reflectors	10	3	10	.	1	0	10	4	.	.	10	**1.00**
SCE	Reflectors	5	3	5	.	1	0	10	4	.	.	10	**0.83**
SCE	Reflectors	10	2	10	.	1	0	10	2	.	.	10	**1.00**
SCE	Reflectors	.	3	.	.	1	0	10	4	.	.	10	**1.00**
SCE	Reflectors	5	1	2.5	.	1	9	1	5	.	.	0	**0.12**
SCE	Reflectors	.	3	.	.	1	4	6	4	.	.	10	**0.80**
SCE	Reflectors	10	3	10	.	1	10	0	4	.	.	10	**0.67**
SCE	Reflectors	8	3	8	.	1	0	10	4	.	.	10	**0.93**
SCE	Reflectors	10	1	5.0	.	1	3	7	3	.	.	7.5	**0.65**

TABLE A-8: SCE MIDSTREAM POP PROGRAM - INDIVIDUAL SURVEY RESPONSES, VENDOR SCORES AND NTGRS FOR LED REFLECTORS

PA	Program	Measure Group	A5	PIS Score 1	A5a	RPIS Score 2	A6	NPS Score 3	NTGR
SCE	Midstream POP	Reflectors	10	10	5	5	5	5	**0.67**
SCE	Midstream POP	Reflectors	7	7	5	5	5	5	**0.57**
SCE	Midstream POP	Reflectors	10	10	7	7	7	3	**0.67**
SCE	Midstream POP	Reflectors	10	10	7	7	10	0	**0.57**
SCE	Midstream POP	Reflectors	7	7	6	6	7	3	**0.53**
SCE	Midstream POP	Reflectors	10	10	10	10	5	5	**0.83**
SCE	Midstream POP	Reflectors	10	10	8	8	4	6	**0.80**
SCE	Midstream POP	Reflectors	8	8	8	8	2	8	**0.80**
SCE	Midstream POP	Reflectors	8	8	7	7	3	7	**0.73**
SCE	Midstream POP	Reflectors	8	8	3	3	6	4	**0.50**

TABLE A-9: SCE MIDSTREAM POP PROGRAM - INDIVIDUAL SURVEY RESPONSES, PAI SCORES AND NTGRS FOR LED REFLECTORS

PA	Program	Measure Group	n41	n2	PAI2	Replace	n5	PAI3	n6	N6_77	PAI-N6	NTGR
SCE	Midstream POP	Reflectors	3	3	3.0	1	6	4	6	.	.	**0.58**
SCE	Midstream POP	Reflectors	0	1	.0	1	10	0	5	.	0	**0.00**
SCE	Midstream POP	Reflectors	0	3	.0	1	0	10	77	10	10	**0.80**
SCE	Midstream POP	Reflectors	0	3	.0	1	7	3	77	10	10	**0.43**
SCE	Midstream POP	Reflectors	7	3	7.0	1	3	7	77	10	10	**0.80**
SCE	Midstream POP	Reflectors	5	3	5.0	1	4	6	77	10	10	**0.75**
SCE	Midstream POP	Reflectors	5	3	5.0	1	4	6	6	.	.	**0.55**
SCE	Midstream POP	Reflectors	5	1	2.5	1	5	5	77	10	10	**0.58**
SCE	Midstream POP	Reflectors	5	3	5.0	1	4	6	6	.	.	**0.55**
SCE	Midstream POP	Reflectors	5	2	5.0	1	4	6	77	10	10	**0.63**
SCE	Midstream POP	Reflectors	8	2	8.0	1	4	6	77	10	10	**0.80**
SCE	Midstream POP	Reflectors	5	2	5.0	1	0	10	4	.	10	**0.83**

TABLE A-10: SDG&E INDIVIDUAL SURVEY RESPONSES, PAI SCORES AND NTGRS FOR DOWNSTREAM MEASURES – LED A LAMP

PA	Measure Group	n41	n2	PAI2	n5aa	Replace	n5	PAI3	n6	N6_77	n6_Pct	PAI-N6	NTGR
SDGE	A Lamps	8	3	8	.	1	6	4	3	.	.	7.5	**0.65**
SDGE	A Lamps	5	3	5	.	1	0	10	6	.	.	.	**0.75**
SDGE	A Lamps	8	3	8	.	1	0	10	4	.	.	10	**0.93**
SDGE	A Lamps	.	3	.	.	1	8	2	5	.	.	0	**0.10**
SDGE	A Lamps	5	3	5	.	1	0	10	6	.	.	.	**0.75**
SDGE	A Lamps	8	3	8	.	1	9	1	6	.	.	.	**0.45**
SDGE	A Lamps	.	2	.	.	1	3	7	4	.	.	10	**0.85**
SDGE	A Lamps	6	2	6	.	1	0	10	4	.	.	10	**0.87**
SDGE	A Lamps	10	2	10	.	1	3	7	77	10	.	10	**0.90**
SDGE	A Lamps	3	3	3	.	1	10	0	77	10	.	10	**0.43**
SDGE	A Lamps	5	3	5	.	1	0	10	4	.	.	10	**0.83**
SDGE	A Lamps	9	2	9	.	1	5	5	4	.	.	10	**0.80**
SDGE	A Lamps	.	3	.	.	1	0	10	4	.	.	10	**1.00**
SDGE	A Lamps	.	99	.	.	1	5	5	4	.	.	10	**0.75**

TABLE A-11: SDG&E INDIVIDUAL SURVEY RESPONSES, PAI SCORES AND NTGRS FOR DOWNSTREAM MEASURES – ACCENT LAMP

PA	Measure Group	n41	n2	PAI2	n5aa	Replace	n5	PAI3	n6	N6_77	n6_Pct	PAI-N6	NTGR
SDGE	Accent Lamps	7	3	7	.	1	0	10	4	.	.	10	**0.90**
SDGE	Accent Lamps	8	3	8	.	1	3	7	2	.	.	10	**0.83**
SDGE	Accent Lamps	8	3	8	.	1	0	10	4	.	.	10	**0.93**
SDGE	Accent Lamps	7	99	7	.	1	9	1	4	.	.	10	**0.60**
SDGE	Accent Lamps	8	3	8	.	1	0	10	4	.	.	10	**0.93**
SDGE	Accent Lamps	.	99	.	.	1	0	10	4	.	.	10	**1.00**
SDGE	Accent Lamps	.	3	.	.	1	0	10	4	.	.	10	**1.00**
SDGE	Accent Lamps	5	3	5	.	1	2	8	77	10	.	10	**0.77**
SDGE	Accent Lamps	5	1	2.5	.	1	8	2	4	.	.	10	**0.48**
SDGE	Accent Lamps	5	1	2.5	.	1	0	10	4	.	.	10	**0.75**
SDGE	Accent Lamps	7	3	7	.	1	0	10	4	.	.	10	**0.90**
SDGE	Accent Lamps	5	3	5	.	1	0	10	4	.	.	10	**0.83**
SDGE	Accent Lamps	6	3	6	.	1	4	6	4	.	.	10	**0.73**
SDGE	Accent Lamps	8	2	8	.	1	0	10	4	.	.	10	**0.93**
SDGE	Accent Lamps	10	3	10	.	1	0	10	4	.	.	10	**1.00**
SDGE	Accent Lamps	5	3	5	.	1	4	6	5	.	.	0	**0.37**
SDGE	Accent Lamps	10	3	10	.	1	2	8	4	.	.	10	**0.93**
SDGE	Accent Lamps	2	99	2	.	1	0	10	4	.	.	10	**0.73**
SDGE	Accent Lamps	10	3	10	.	1	0	10	4	.	.	10	**1.00**
SDGE	Accent Lamps	5	3	5	.	1	8	2	77	10	.	10	**0.57**
SDGE	Accent Lamps	5	2	5	.	1	5	5	5	.	.	0	**0.33**
SDGE	Accent Lamps	10	2	10	.	1	0	10	2	.	.	10	**1.00**
SDGE	Accent Lamps	.	99	.	.	1	10	0	5	.	.	0	-
SDGE	Accent Lamps	5	3	5	.	1	0	10	4	.	.	10	**0.83**
SDGE	Accent Lamps	5	3	5	.	1	2	8	2	.	.	10	**0.77**

TABLE A-12: SDG&E INDIVIDUAL SURVEY RESPONSES, PAI SCORES AND NTGRS FOR DOWNSTREAM MEASURES – REFLECTORS

PA	Measure Group	n41	n2	PAI2	n5aa	Replace	n5	PAI3	n6	N6_77	n6_Pct	PAI-N6	NTGR
SDGE	Reflectors	6	2	6	.	1	3	7	77	10	.	10	**0.77**
SDGE	Reflectors	9	3	9	.	1	0	10	4	.	.	10	**0.97**
SDGE	Reflectors	.	3	.	.	1	0	10	4	.	.	10	**1.00**
SDGE	Reflectors	10	2	10	.	1	6	4	1	.	5	9.5	**0.78**
SDGE	Reflectors	9	99	9	.	1	8	2	99	.	.	.	**0.55**
SDGE	Reflectors	10	2	10	0	1	0	10	4	.	.	10	**1.00**
SDGE	Reflectors	5	3	5	.	1	10	0	5	.	.	0	**0.17**
SDGE	Reflectors	7	2	7	.	1	0	10	4	.	.	10	**0.90**
SDGE	Reflectors	5	3	5	.	1	2	8	4	.	.	10	**0.77**
SDGE	Reflectors	10	3	10	.	1	0	10	4	.	.	10	**1.00**
SDGE	Reflectors	5	3	5	.	1	0	10	4	.	.	10	**0.83**
SDGE	Reflectors	6	3	6	.	1	7	3	2	.	.	10	**0.63**
SDGE	Reflectors	8	2	8	.	1	9	1	5	.	.	0	**0.30**
SDGE	Reflectors	5	3	5	.	1	10	0	5	.	.	0	**0.17**
SDGE	Reflectors	2	3	2	.	1	10	0	1	.	10	9	**0.37**
SDGE	Reflectors	7	3	7	.	1	0	10	4	.	.	10	**0.90**
SDGE	Reflectors	7	3	7	.	1	4	6	77	10	.	10	**0.77**
SDGE	Reflectors	0	3	-	.	1	0	10	4	.	.	10	**0.67**
SDGE	Reflectors	10	3	10	.	1	0	10	4	.	.	10	**1.00**
SDGE	Reflectors	5	3	5	.	1	0	10	4	.	.	10	**0.83**
SDGE	Reflectors	.	3	.	.	1	0	10	4	.	.	10	**1.00**
SDGE	Reflectors	10	2	10	.	1	8	2	77	10	.	10	**0.73**
SDGE	Reflectors	4	2	4	.	1	5	5	5	.	.	0	**0.30**
SDGE	Reflectors	5	3	5	.	1	0	10	4	.	.	10	**0.83**
SDGE	Reflectors	5	2	5	.	1	0	10	1	.	.	.	**0.75**
SDGE	Reflectors	7	3	7	.	1	2	8	4	.	.	10	**0.83**

PA	Measure Group	n41	n2	PAI2	n5aa	Replace	n5	PAI3	n6	N6_77	n6_Pct	PAI-N6	NTGR
SDGE	Reflectors	0	3	-	.	1	0	10	4	.	.	10	**0.67**
SDGE	Reflectors	2	1	1.0	.	1	8	2	5	.	.	0	**0.10**
SDGE	Reflectors	6	3	6	.	1	3	7	2	.	.	10	**0.77**
SDGE	Reflectors	5	3	5	.	1	5	5	6	.	.	.	**0.50**
SDGE	Reflectors	6	3	6	.	1	3	7	5	.	.	0	**0.43**
SDGE	Reflectors	7	1	3.5	.	1	7	3	5	.	.	0	**0.22**
SDGE	Reflectors	5	3	5	.	1	0	10	4	.	.	10	**0.83**
SDGE	Reflectors	8	3	8	.	1	0	10	4	.	.	10	**0.93**
SDGE	Reflectors	10	2	10	.	1	1	9	4	.	.	10	**0.97**

APPENDIX B NONRESIDENTIAL DOWNSTREAM LIGHTING TELEPHONE SURVEY INSTRUMENTS

- Participant Telephone Survey Instrument
- Vendor Telephone Survey Instrument

PARTICIPANT TELEPHONE SURVEY INSTRUMENT

Participant Survey for CPUC
PY2018 Downstream Lighting Evaluation

INTRODUCTION AND FINDING CORRECT RESPONDENT

OUTCOME 1

This is %n calling on behalf of the CPUC, from PACIFIC MARKET RESEARCH. THIS IS NOT A SALES CALL NOR A SERVICE CALL. May I please speak with ...<%CONTACT> ...<%OLDCONTACT> ... <%BUSINESS> ... the person at your organization that is most knowledgeable about your participation in <%UTILITY>'s <%PROGRAM> program. !___[IF NEEDED]...This is a fact-finding survey only, authorized by the California Public Utilities Commission.

1	Yes (go to next screen)	Continue
2	Make appointment	Make appt and record time
3	Busy/engaged	Record Response and T&T
4	No Answer	Record Response and T&T
5	Refused	Record Response and T&T
6	Disconnected	Record Response and T&T
7	Answering Machine - no message	Record Response and T&T
8	Duplicate	Record Response and T&T
9	DRNA	Record Response and T&T
10	Disability	Record Response and T&T
11-12	Language Barriers	Record Response and T&T
13	Answering Machine - left message	Record Response and T&T
14	NO SCREEN - Participant	Record Response and T&T
15	Hang up	Record Response and T&T
16	Residence	Record Response and T&T
17	Fax	Record Response and T&T
18	Quota full	Record Response and T&T

19	Wrong Address	Record Response and T&T
20	Home office	Record Response and T&T
21	Max attempts	Record Response and T&T
24	General callback	Record Response and T&T
25	Name/Number changed	Record Response and T&T

Thank & Terminate PBLOCK NO_ONE	Thank you for your time. For this study, we need to speak to someone about your organization's installation of energy efficient equipment that your organization installed through <%UTILITY>'s <%PROGRAM> program.	END

Q1B

[IF YOU ARE TRANSFERRED TO ANOTHER PERSON OTHER THAN THE BEST CONTACT]
Who would be the person most familiar about your organization's participation in <%UTILITY>'S <%PROGRAM> program?
[ENTER NEW CONTACT NAME AND MOVE ON]
[IF NEEDED] This is not a sales call.
[IF NEEDED] This is a fact-finding survey only, and responses will not be connected with your firm in any way. The California Public Utilities Commission wants to better understand how businesses think about and manage their energy consumption.

77	There is no one here who can help you	T&T
1	Continue Q1B until you find appropriate contact person, record as &NEW CONTACT NAME	Intro3:s

Intro3:S

[IF BEST CONTACT IS AVAILABLE]
Hello, my name is _____%n_____ and I am calling on behalf of the California Public Utilities Commission from PACIFIC MARKET RESEARCH. THIS IS NOT A SALES CALL.
We are interested in speaking with the person most knowledgeable about your organization's participation in ...
<%UTILITY>'s <%PROGRAM> program during 2018...I was told that would be you.
...Your organization participated in <%UTILITY>'s <%PROGRAM> by installing lighting equipment in 2018.
[Small Commercial/HVAC/ERS only no Lighting]
You should have received an email recently that explained the evaluation process and provided a letter from the CPUC validating this study.
Through this program, your organization installed....
<%CUSTOM_MEASURE> on <CUST_INSTALL_DATE>...<CUST_PAID_DATE>...
<%UNITS_1> ... <%MEASURE_1> on <MEASURE_1_DATE>
<%UNITS_2> ... <%MEASURE_2> on <MEASURE_2_DATE>
<%UNITS_3> ... <%MEASURE_3> on <MEASURE_3_DATE>
Are you the best person to speak to about your organization's participation in this program?

1	Yes	Person:s
2	No, there is someone else	Intro3:s
3	No and I don't know who to refer you to	Appoint

5	Property management company handles this	PMNAME
99	Don't know/refused	T&T

Ext Is there a phone extension or phone number you recommend we use when we call back?

77	Record Extension or Phone Number, &PHONE	Thank&Terminate
88	Refused	Thank&Terminate
99	Don't know	Thank&Terminate

PMNAME May I have the name and contact information of your property management company?

1	Yes - RECORD	Record Response and T&T
2	No	Thank&Terminate
88	Refused	Thank&Terminate
99	Don't Know	Thank&Terminate

Appoint [IF RECOMMENDED CONTACT IS NOT CURRENTLY AVAILABLE] When would be a good day and time for us to call back?

77	Record day of the week, time of day and date to call back, as &APPOINT	Record Response and T&T
88	Refused	Intro3(99)
99	Don't know	Intro3(99)

If Person(3)

Intro3(99)	Thank you for your time. We need to speak with the person at your organization that is most familiar with this facility's energy using equipment. Those are all of the questions I have for you today.	Abandoned User30

PBLOCKHi Who would be the person at this location who is most knowledgeable about this facility's energy using equipment? [Enter New Contact Name and move on.]

77	Record Name, as &CONTACT	May_I
88	Refused	Thank&Terminate
99	Don't know	Intro3(99)

May_I May I speak with him/her?

77	Yes	Intro3:s
88	No (not available right now@, set cb)	Abandoned Appointment

PERSON:s

According to our records, your organization participated in <%UTILITY>'s <%PROGRAM> program by installing energy saving equipment around ... <%DEEM_PAID_DATE1> <%CUST_PAID_DATE>
Through this program, your organization installed.... <%CUSTOM_MEASURE> on <CUST_INSTALL_DATE>...<CUST_PAID_DATE>...
<%UNITS_1> ... <%MEASURE_1> on <MEASURE_1_DATE>
<%UNITS_2> ... <%MEASURE_2> on <MEASURE_2_DATE>
<%UNITS_3> ... <%MEASURE_3> on <MEASURE_3_DATE>
Are you the person most knowledgeable about your organization's participation in ...<%UTILITY>'s <%PROGRAM> Program?

1	Yes	Continue
2	Yes, need to make appointment	Appoint
4	No, but I will give you a name	Thank&Terminate
99	No one knows about the energy using equipment	Thank&Terminate

DISPLAY

If you need to provide validation for this survey, provide the following contact name and number: Abhilasha Wadhwa, California Public Utilities Commission 916-823-4774 and the following website: **www.cpuc.ca.gov/eevalidation**
Before we start, I would like to inform you that for quality control purposes, this call may be monitored by my supervisor.

Today we're conducting a very important study on the energy needs and perceptions of organizations like yours. We are interested in how organizations like yours think about and manage their energy consumption.

Your input will allow the California Public Utilities Commission to build and maintain better energy savings programs for customers like you. And we would like to remind you, your responses will not be connected with your organization in any way.

SCREENER

VERIFY For verification purposes only, may I please have your name?

77	Get name	Scrn_Addr
88	Refused	Scrn_Addr
99	Don't know	Scrn_Addr

DISPLAY

For the sake of expediency, I will refer to ....<%UTILITY>'s <%PROGRAM> ...program as the PROGRAM.

Scrn_Addr

First, I'd like to ask you a few questions about your organization and facility. Our records show your organization is located at %ADDRESS in %CITY. Is that correct?
[CONTINUE IF ADDRESS REPORTED BY RESPONDENT IS SIMILAR ENOUGH]

1	Yes	Bus_Name
2	No	CORRECT
88	Refused	COMMENT
99	Don't Know	COMMENT

COMMENT We were attempting to reach <%UTILITY>'s customer at <%ADDRESS> and since you cannot confirm this address, those are all the questions that we have for you today, on behalf of the California Public Utilities Commission, thank you for your time.

CORRECT May I have your correct address?

%CORRECT	Corrected Address	COMPARE

COMPARE Are these addresses similar or totally different?
Computer Address - %ADDRESS
Corrected Address - &CORRECT

1	Similar	Bus_Name
2	Totally Different	COMMENT2

COMMENT2	We were attempting to reach the <%UTILITY> customer at <%ADDRESS> in <%CITY> and since that does not match your address, then we must have mis-dialed the telephone number. Those are all the questions that we have for you today, on behalf of the California Public Utilities Commission. Thank you for your time and cooperation.	Thank and Terminate

BUS_NAME Our records show your organization's name as: <%BUSINESS> <%CONTACT> <%OLDCONTACT>. Is that correct?

1	Yes	INCENT
2	No	Bus_Correct
88	Refused	COMMENT
99	Don't Know	COMMENT

BUS_CORRECT What is the correct name for your organization?

&BUS_CORRECT	Corrected Business	INCENT

INCENT What percentage of the cost of your rebated equipment was covered by the program?

77	RECORD RESPONSE	A1gg
101	REFUSED	FM050
102	DON'T KNOW	A1gg

IF INCENT <> 100 then ask; Else skip to FM050

A1gg What incentive amount did your organization receive from the program towards your energy efficient equipment installation?

77	RECORD VERBATIM	FM050
88	Refused	FM050
99999	Don't know	FM050

FM050 What is the main business ACTIVITY at this facility? [DO NOT READ] (SINGLE RESPONSE)

1	Offices (non-medical)	V1
2	Restaurant/Food Service	V1
3	Food Store (grocery/liquor/convenience)	V1
4	Agricultural (farms, greenhouses)	V1
5	Retail Stores	V1
6	Warehouse	V1
7	Health Care	V1
8	Education	V1
9	Lodging (hotel/rooms)	V1
10	Public Assembly (church, fitness, theatre, library, museum, convention)	V1
11	Services (hair, nail, massage, spa, gas, repair)	V1
12	Industrial (food processing plant, manufacturing)	V1
13	Laundry (Coin Operated, Commercial Laundry Facility, Dry Cleaner)	V1
14	Condo Assoc./Apartment Mgr (Garden Style, Mobile Home Park, High-rise, Townhouse)	V1
15	Public Service (fire/police/postal/military)	V1
77	OPEN\Record Other Service Shop	V1
88	Refused	V1
99	Don’t know	V1

ROLE OF CONTRACTORS

V1 Did you use a contractor/vendor to install any of the energy efficient measures that were purchased through the program?

1	Yes	V2
2	No	AP9
88	Refused	AP9
99	Don't Know	AP9

If V1 = 1 then ask; else skip to AP9

V2 How did you come into contact with the contractor/vendor?

1	They contacted you	V2b
2	You contacted them	V3
3	You had worked with them before	V2a

77	OTHER - Record	V3
88	Refused	V3
99	Don't Know	V3

Ask if V2 = 3; else skip to V2b

V2a In relation to this project, did the vendor/contractor approach you about your energy efficient equipment retrofit/installation?

1	Yes	V2b
2	No	V3
88	Refused	V3
99	Don't Know	V3

Ask if V2 = 1 or V2a = 1; else skip to V3

V2b On a scale of 0 - 10, with 0 being NOT AT ALL LIKELY and 10 is VERY LIKELY, how likely is it that your organization would have installed this new equipment had the contractor/vendor not contacted you?

1	0-10 response	V3
88	Refused	V3
99	Don't Know	V3

V3 Did the contractor/vendor tell you about or recommend the program?

1	Yes	V4
2	No	AP9
88	Refused	AP9
99	Don't Know	AP9

Ask if V3 = 1; else skip to AP9

V4 Prior to coming into contact with the contractor/vendor, did your organization have plans to replace/install this equipment?

1	Yes	V4a
2	No	V4a
88	Refused	V4a
99	Don't Know	V4a

V4a Using the same scale of 0 - 10 as before, how likely is it that your organization would have installed the new energy efficient equipment had the contractor/vendor not recommended it?

1	0-10 response	V4b
88	Refused	V4b
99	Don't Know	V4b

V4b Using the same scale, how likely is it that your organization would have installed the energy efficient equipment with the same level of efficiency if the contractor/vendor had not recommended to do so?

1	0-10 response	V40
88	Refused	V40

99	Don't Know	V40

On a scale of 0 - 10, with 0 being not at all important and 10 being very important, how important was the input from the contractor you worked with in deciding which specific equipment to install?

V40

1	0-10 response	AP9
88	Refused	AP9
99	Don't Know	AP9

PROGRAM AWARENESS

Next, I'd like to ask you about various energy efficiency programs and what influenced your program participation.

How did you FIRST learn about <%UTILITY>'s program? [DO NOT READ ANSWERS](SINGLE RESPONSE)

AP9

1	Bill insert	AP9a
2	Program literature	AP9a
3	Account representative	AP9a
4	Program approved vendor	AP9a
5	Program representative	AP9a
6	Utility or program website	AP9a
7	Trade publication	AP9a
8	Conference	AP9a
9	Newspaper article	AP9a
10	Word of mouth	AP9a
11	Previous experience with it	AP9a
12	Company used it at other locations	AP9a
13	Contractor	AP9a
14	Result of an audit	AP9a
15	Part of a larger expansion or remodeling effort	AP9a
77	Other (RECORD VERBATIM)	AP9a
88	Refused	A1b
99	Don’t know	A1b

If AP9 in (1-77) then ask; else skip to [MEASURE]

How ELSE did you learn about <%UTILITY>'s program? [DO NOT READ LIST, ACCEPT MULTIPLES]

AP9a

1	Bill insert	N33
2	Program literature	N33
3	Account representative	N33
4	Program approved vendor	N33
5	Program representative	N33
6	Utility or program website	N33
7	Trade publication	N33

8	Conference	N33
9	Newspaper article	N33
10	Word of mouth	N33
11	Previous experience with it	N33
12	Company used it at other locations	N33
13	Contractor	N33
14	Result of an audit	N33
15	Part of a larger expansion or remodeling effort	N33
66	No other sources	N33
77	Other (RECORD VERBATIM)	N33
88	Refused	N33
99	Don't know	N33

If AP9 = 3 or AP9A = 3 then ask; else skip to [MEASURE]

N33 You mentioned that you have a Utility or Program Administrator Account Rep.
Can you give me his or her name?
!!___Do you have his/her email address?
!___Do you have a phone number for him/her?
!___Do you have a cell phone number for him/her?\,

77	RECORD NAME, Phone, Email, etc.	A3A
88	Refused	A3A
99	Don't know	A3A

PROGRAM LIGHTING EQUIPMENT

Ask if LIGHTING = 1; else skip to NEXT BATTERY

Comment	One way that organizations like yours can reduce their energy use is to install more energy efficient lighting equipment. I would like to ask you about the lighting changes you made as part of your participation in <%UTILITY>'s program.	A3A

ASK IF LT_QTY_x > 0; ELSE SKIP TO A3a[A-C]

A3[A-C] According to our records, your organization installed <%LT_QTY_x> <%LT_MEAS_x> through <%UTILITY>'s program, is this correct?

1	Yes - Quantity is Correct	DEEMED_INST ALL_DATE_NU
2	Yes - Installed Different Quantity	A3_QTY
3	No, did not install	DISPLAY
88	Refused	DISPLAY
99	Don't know	DISPLAY

ASK A3a[A-C] if LT_QTY_x = 0

A3a[A-C] According to our records, your organization installed <%LT_MEAS_x> through <%UTILITY>'s program, is this correct?

1	Yes	A3_QTY
2	No, did not install	DISPLAY
88	Refused	DISPLAY
99	Don't know	DISPLAY

DISPLAY **IF A3[A-C](3 - 99), READ: "We must conduct this study with someone that knows about the installation of this measure." and ABANDON USER. Else continue with A3[A-C]_QTY**

A3[A-C]_QTY **Ask if A3[A-C] = 2 or A3a[A-C] = 1**
Approximately how many units of <%LT_MEAS_x> were installed under the %PROGRAM program?

77	Record #	DEEMED_INSTALL_DATE_NU
8888	Refused	A3_OTH
9999	Don't know	A3_OTH

A3[A-C]_OTH **IF A3_QTY IN (88, 99)**
Would you say that the number of <%LT_MEAS_x> installed are…

1	less than 10 units	DEEMED_INSTALL_DATE_NU
2	11 - 50 units	DEEMED_INSTALL_DATE_NU
3	50 - 100 units	DEEMED_INSTALL_DATE_NU
4	More than 100 units	DEEMED_INSTALL_DATE_NU
88	Refused	DEEMED_INSTALL_DATE_NU
99	Don't know	DEEMED_INSTALL_DATE_NU

DEEM_INSTALL_DATEx_NU **IF ^UNRECORDED(DEEM_INSTALL_DATEx)**
Our records indicate that your organization <installed> ...<%LT_MEAS_x> on <%DEEM_INSTALL_DATEx>. _____Is this correct?

1	Yes	LI18
2	No	DEEM_INSTALL_YEAR
88	Refused	DEEM_INSTALL_YEAR
99	Don't know	DEEM_INSTALL_YEAR

IF UNRECORDED(DEEM_INSTALL_DATEx) & ^UNRECORDED(DEEM_PAID_DATEx)

DISPLAY According to our records, your organization received a rebate for the installation> of ...<%LT_MEAS_x>... on <%DEEM_PAID_DATEx>.

IF DEEM_INSTALL_DATEx_NU in (2,88,99) | (UNRECORDED(DEEM_INSTALL_DATEx) & ^UNRECORDED(DEEM_PAID_DATEx))

DEEM_INSTALL_YEARx In what year did you install <%LT_MEAS_x>? (PROBE FOR BEST GUESS)

1	2016	DEEM_INSTALL_MONTHx
2	2017	DEEM_INSTALL_MONTHx
88	Refused	LI18
99	Don't know	LI18

IF DEEM_INSTALL_YEARx in (1-3)

DEEM_INSTALL_MONTHx And what month? {If they can not recall month, try to get the season.}

1	January	LI18
2	February	LI18
3	March	LI18
4	April	LI18
5	May	LI18
6	June	LI18
7	July	LI18
8	August	LI18
9	September	LI18
10	October	LI18
11	November	LI18
12	December	LI18
13	Fall	LI18
14	Winter	LI18
15	Spring	LI18
16	Summer	LI18
88	Refused	LI18
99	Don't know	LI18

If A3[A-C] is 1 or 2;
Ask only if CFLx = 1 and (LT_QTY_x > 1 | A3[A-C]_QTY > 1); else skip to LI181[A-C]

LI18[A-C] Of the CFLs you received through the program, what percentage do you estimate were placed into storage for later use?

77	Open Record	LI181
101	Refused	LI181
102	Don't know	LI181

Ask only if LEDx = 1 and (LT_QTY_x > 1 | A3[A-C]_QTY > 1); else skip to LI182[A-C]

LI181[A-C] Of the LEDs you received through the program, what percentage do you estimate were placed into storage for later use?

77	Open Record	LI182
101	Refused	LI182
102	Don't know	LI182

ASK ONLY IF LEDRLx = 1 and (LT_QTY_x > 1 | A3[A-C]_QTY > 1); else skip to LI183[A-C]

LI182[A-C] Of the LED Reflector Lamps you received through the program, what percentage do you estimate were placed into storage for later use?

77	Open Record	LI183
101	Refused	LI183
102	Don't know	LI183

ASK ONLY IF LEDOUTx = 1 and (LT_QTY_x > 1 | A3[A-C]_QTY > 1); else skip to LI184[A-C]

LI183[A-C] Of the LED Outdoor lighting you received through the program, what percentage do you estimate were placed into storage for later use?

77	Open Record	LI184
101	Refused	LI184
102	Don't know	LI184

ASK ONLY IF LEDINTx = 1 and (LT_QTY_x > 1 | A3[A-C]_QTY > 1); else skip to LI19[A-C]

LI184[A-C] Of the LED fixtures/lamps you received through the program, what percentage do you estimate were placed into storage for later use?

77	Open Record	LI185
101	Refused	LI185
102	Don't know	LI185

ASK ONLY IF LEDDOWNx = 1 and (LT_QTY_x > 1 | A3[A-C]_QTY > 1); else skip to LI19[A-C]

LI185[A-C] Of the LED Downlighting you received through the program, what percentage do you estimate were placed into storage for later use?

77	Open Record	LI19
101	Refused	LI19
102	Don't know	LI19

IF C5 <> 1 and (LT_QTY_x >1 | A3[A-C]_QTY > 1) ASK LI19[A-C]; else skip to LI190[A-C]

LI19[A-C] Were any of the program provided <%LT_MEAS_x> installed at another facility? If so, what percentage would you estimate?

77	Yes, #record percentage	LI190
101	Refused	LI190
102	Don't know	LI190

ASK ONLY IF LEDOUTx = 1

LI190[A-C] Where did you install the LED outdoor lighting that you received through the program? (ACCEPT MULTIPLE RESPONSES)

1	Parking lots	LI191
2	Garages	LI191
3	Walkways	LI191
4	Patios/Outdoor seating areas	LI191
5	Outside door	LI191
77	Other	LI191
88	Refused	LI191
99	Don't know	LI191

ASK ONLY IF LEDINTx = 1

LI191[A-C] Where did you install the LED fixtures/lamps that you received through the program? (ACCEPT MULTIPLE RESPONSES)

1	Open office	LI192
2	Private office	LI192
3	Hallway	LI192
4	Lobby	LI192
5	Stairwell	LI192
6	Kitchen/Break area	LI192
7	Restrooms	LI192
8	Dining	LI192
9	Retail space	LI192
10	Conference room	LI192
11	Warehouse	LI192
12	Storage	LI192
13	Outdoor	LI192
14	Guest rooms	LI192
15	Gymnasium	LI192
77	Other	LI192
88	Refused	LI192
99	Don't know	LI192

ASK ONLY IF LEDDOWNx = 1

LI192[A-C] Where did you install the LED downlighting that you received through the program? (ACCEPT MULTIPLE RESPONSES)

1	Open office	LI20
2	Private office	LI20

3	Hallway	LI20
4	Lobby	LI20
5	Stairwell	LI20
6	Kitchen/Break area	LI20
7	Restrooms	LI20
8	Dining	LI20
9	Retail space	LI20
10	Conference room	LI20
11	Warehouse	LI20
12	Storage	LI20
13	Outdoor	LI20
14	Guest rooms	LI20
77	Other	LI20
88	Refused	LI20
99	Don't know	LI20

LI20[A-C] What type of lighting was removed and replaced when you installed <%LT_MEAS_x> through the program? [MULTIPLE RESPONSE]

1	High performance T8 (1" diameter bulbs)	LI22
2	T8 fluorescent fixtures (1” diameter bulbs)	LI22
3	T10 fluorescent fixtures	LI22
4	T12 Fixtures (1.5” diameter bulbs)	LI22
5	Compact HID (High Density Discharge) Fixtures	LI21
6	Screw-in Modular CFLs	LI22
7	Hardwire CFL Fixtures	LI22
8	Incandescent	LI22
9	CFL Exit Signs	LI22
10	LED Exit Signs	LI22
11	Halogen bulbs	LI22
12	Reflectors	LI22
13	Electronic Ballast	LI22
14	Magnetic Ballast	LI22
15	Manual Switches	LI22
16	Lighting Controls, Time Clock	LI22
17	Lighting Controls, Occupancy Sensor	LI22
18	Lighting Controls, Bypass/Delay Timers	LI22
19	Lighting Controls, Photocell	LI22
20	Other Fluorescent	LI22
21	Fat/Thick Tubes	LI22
22	Skinny/Thin Tubes	LI22
23	T5 Fixtures (5/8” diameter)	LI22
24	Screw-in LEDs	LI22

25	Screw-in LEDs Reflector Lamps	LI22
26	LED Fixtures or Panels (e.g., replacement for linear fixtures)	LI22
66	DID NOT REMOVE ANYTHING-ADDITIONAL EQUIP ONLY	NTGCHECK1
77	Other (PLEASE SPECIFY)	LI22

ASK IF LI20[A-C] = 5; else skip to LI22[A-C]

LI21[A-C] Were the HID lamps you removed High Pressure Sodium, Metal Halide, Mercury Vapor or Incandescent?

1	High pressure sodium	LI22
2	Metal Halide	LI22
3	Mercury Vapor	LI22
4	Incandescent	LI22
88	Refused	LI22
99	Don't know	LI22

If LI20[A-C]^= 66 then ask; else skip to end of DEEMED Loop

LI22[A-C] Approximately how old was the equipment that were removed and replaced? Would you say…

1	Less than 5 years old	LI23
2	Between 5 and 10 years old	LI23
3	Between 10 and 15 years old	LI23
4	More than 15 years old	LI23
88	Refused	LI23
99	Don't know	LI23

LI23[A-C] How would you describe the removed equipment's condition? Would you say they were in…

1	Poor condition	LI24
2	Fair condition	LI24
3	Good condition	LI24
88	Refused	LI24
99	Don’t know	LI24

ASK IF LT_QTY_x > 1 | A3[A-C]_QTY > 1

LI24[A-C] Approximately what percentage of the lighting equipment that was removed and replaced was broken or not working prior to installing <%LT_MEAS_x>?

%	Percent	LI30
101	Refused	LI30
102	Don't know	LI30

ASK IF LIGHTING=1

LI30 Considering all of the lighting changes we just discussed, approximately what percentage of the facility’s lighting was affected by those changes?

%	Percent	HB1

101	Refused	HB1
102	Don't know	HB1

HIGH BAY

If LEDINTx = 1 ; else skip to DEL5

HB1 Thinking about all of the types of LED fixtures/lamps that were installed through the program, what is the highest height, in feet, above the area they light? [IN FEET] [PROBE FOR HEIGHT - 13 FEET OR HIGHER IS CONSIDERED HB AND WILL TRIGGER FOLLOW-UP QUESTIONS]

1	Record number of feet	HB2
88	Refused	HB2
99	Don't know	HB2

IF HB1 < 13 then ask; else skip to HB3

HB2 Just to double check, was any of the LED lighting installed through the program at a height of 13 or more feet above the area it is meant to light? This would qualify as HIGH BAY lighting.

1	Yes	HB3
2	No	DEL5
88	Refused	DEL5
99	Don't know	DEL5

ASKI IF (HB1 >> 12 & HB1 <> 88 & HB1 <> 99) | HB2(1)

HB3 What is the main kind of LED Fixture located at this height?

1	Linear LED (T-LED)	DEL5
2	Integrated LED Troffers	DEL5
3	Round LED High Bay (similar shape to an HID fixture)	DEL5
4	Panel LED	DEL5
77	OPEN\RECORD OTHER	DEL5
88	Refused	DEL5
99	Don't know	DEL5

DEL5 Is the amount of lighting better, worse, or the same than before your LED retrofit?

1	Better	NEXT SECTION (NTG BATTERY)
2	Worse	DEL11
3	Same	NEXT SECTION (NTG BATTERY)
88	Refused	DEL11
99	Don’t know	DEL11

If DEL5 in (2, 88, 99) then ask; else skip to NTG BATTERY

DEL11 Did you install additional lighting equipment to increase the amount of lighting in the LED retrofitted area(s)?

1	Yes	NEXT SECTION (NTG BATTERY)
2	No	
88	Refused	
99	Don't know	

NET TO GROSS BATTERY

DISPLAY For the sake of expediency, during this next battery we will be referring to the ..... program as THE PROGRAM and we will be referring to the installation of ...<%NTGMEASURE>... as THE MEASURE.

I

IF MULTIPLE = 1, THEN ASK. ELSE AA3

A1b. Our records show that your organization installed more than one MEASURE through the <%UTILITY>'s <%PROGRAM> Program. They are … <%QTY_1> <%MEASURE1>, <%QTY_2> <%MEASURE2>, <%QTY_3> <%MEASURE3>. Was there a single decision making process for the installation of this equipment, or was there a separate decision making process for each type of equipment?

1	Single decision making process	AA3
2	Separate decision making process for each type of equipment	AA3
88	Refused	AA3
99	Don't know	AA3

AA3 There are usually a number of reasons why an organization like yours decides to participate in energy efficiency programs like this one. In your own words, can you tell me why you decided to participate in this program?

1	To replace old or outdated equipment	AA3a
2	As part of a planned remodeling, build-out, or expansion	N2
3	To gain more control over how the equipment was used	N2
4	Maintenance downtime/associated expenses for old equipment were too high	AA3a
5	Had process problems and were seeking a solution	N2
6	To improve equipment performance	N2
7	To improve production as a result of the change in equipment	N2
8	To comply with codes set by regulatory agencies	N2
9	To improve visibility/plant safety	N2
10	To comply with company policies regarding regular equipment retrofits or remodeling	AA3a
11	To get a rebate from the program	N2
12	To protect the environment	N2

13	To reduce energy costs	N2
14	To reduce energy use/power outages	N2
15	To update to the latest technology	N2
16	To improve the comfort level of the facility	N2
77	RECORD VERBATIM	N2
88	Don't know	N2
99	Refused	N2

IF AA3=1, 4 or 10 THEN ASK. ELSE N2

AA3a Had the equipment that you replaced reached the end of its useful life?

1	Yes	N2
2	No	N2
88	Refused	N2
99	Don't know	N2

N2 Did your organization make the decision to install this new equipment before after, or at the same time as you became aware of that rebates [IF NEEDED: to reduce the cost of the measure] were available through the PROGRAM?

1	Before	N3a
2	After	N3a
3	Same time	N3a
88	Refused	N3a
99	Don't know	N3a

DISPLAY Next, I'm going to ask you to rate the importance of the program as well as other factors that might have influenced your decision to install this equipment through the program. Using a scale of 0 to 10 where 0 means not at all important and 10 means extremely important, how would you rate the importance of...

N3a The age or condition of the old equipment

#	Record 0 to 10 score (_____)	N3aa
88	Refused	N3b
99	Don't know	N3b

IF N3a > 5 and NTG_TYPE >= 2 THEN ASK

N3aa How, specifically, did this enter into your decision to install/delamp this equipment?

77	RECORD VERBATIM	N3b
88	Don't know	N3b
99	Refused	N3b

N3b Availability of the PROGRAM rebate [IF NEEDED: to reduce the cost of the measure]

#	Record 0 to 10 score (_____)	N3bb
88	Refused	N3c
99	Don't know	N3c

IF N3b > 7 AND NTG_TYPE >= 2, THEN ASK

N3bb Why do you give it this rating?

77	Record VERBATIM	N3D
88	Refused	N3D
99	Don't know	N3D

~~**IF A1B(1)|ID0(1) THEN ASK; ELSE SKIP TO N3d**~~

~~**N3c** Please rate the degree of importance of information provided through...A1B(1)|<ID0(1)/The Facility or System AUDIT/>~~

~~**#**~~	~~Record 0 to 10 score (_____)~~	~~N3cc~~
~~**88**~~	~~Refused~~	~~N3d~~
~~**99**~~	~~Don't know~~	~~N3d~~

~~**IF N3c > 7 and NTG_TYPE >= 2, THEN ASK**~~

~~**N3cc** Why do you give it this rating?~~

~~**77**~~	~~Record VERBATIM~~	~~N3d~~
~~**88**~~	~~Refused~~	~~N3d~~
~~**99**~~	~~Don't know~~	~~N3d~~

If V1 = 1 THEN ASK; ELSE SKIP TO N3e

N3d Recommendation from an equipment vendor that sold you the equipment and/or installed it for you **[VENDOR_1]**

#	Record 0 to 10 score (_____)	N3e
88	Refused	N3e
99	Don't know	N3e

N3e Your previous experience with similar types of energy efficient projects?

#	Record 0 to 10 score (_____)	N3f
88	Refused	N3f
99	Don't know	N3f

N3f Your previous experience with <%UTILITY>'s program or a similar utility program?

#	Record 0 to 10 score (_____)	N3g
88	Don't know	N3g
99	Refused	N3g

NTG_TYPE >= 2 THEN ASK, ELSE N3h

N3g	Information from the Program, Utility, or Program Administrator training course?	
#	Record 0 to 10 score (_____)	N3gg
88	Refused	N3h
99	Don't know	N3h

IF N3g > 5, THEN ASK

N3gg	What type of information was provided during the training?	
77	Record VERBATIM	N3ggg
88	Refused	N3h
99	Don't know	N3h

N3ggg	How, specifically, did this enter into your decision to install/delamp this equipment?	
77	RECORD VERBATIM	N3h
88	Don't know	N3h
99	Refused	N3h

N3h	Information from the Program, Utility, or Program Administrator Marketing materials?	
#	Record 0 to 10 score (_____)	N3hh
88	Refused	N3j
99	Don't know	N3j

IF N3h > 5 and NTG_TYPE >= 1, THEN ASK

N3hh	What type of information was provided that pertained to the PROJECT?	
77	Record VERBATIM	N3hhh
88	Refused	N3j
99	Don't know	N3j

IF N3hh = 77, THEN ASK

N3hhh	How, specifically, did this enter into your decision to install/delamp this energy efficient equipment?	
77	RECORD VERBATIM	N3j
88	Don't know	N3j
99	Refused	N3j

IF NTG_TYPE >= 1

N3j	Standard practice in your business/industry	
#	Record 0 to 10 score (_____)	N3k
88	Refused	N3k
99	Don't know	N3k

If AP9 = 3 or AP9a = 3 THEN ASK; ELSE SKIP TO N3m

N3l Endorsement or recommendation by your account rep?

#	Record 0 to 10 score (_____)	N3ll
88	Refused	N3m
99	Don't know	N3m

IF N3l > 5 & NTG_TYPE >= 2 THEN ASK

N3ll What did they recommend?

77	Record VERBATIM	N3lll
88	Refused	N3m
99	Don't know	N3m

IF N3LL(77)

N3lll How specifically did this enter into your decision to install this project using energy efficient equipment?

77	RECORD VERBATIM	N3m
88	Don't know	N3m
99	Refused	N3m

IF NTG_TYPE >= 2, ASK

N3m Corporate policy or guidelines

#	Record 0 to 10 score (_____)	N3mm
88	Refused	N3n
99	Don't know	N3n

IF N3m > 5, THEN ASK

N3mm How, specifically, did this enter into your decision to install/delamp this equipment?

77	RECORD VERBATIM	N3n
88	Don't know	N3n
99	Refused	N3n

N3n Payback or return on investment of installing this equipment

#	Record 0 to 10 score (_____)	N3o
88	Refused	N3o
99	Don't know	N3o

N3o Improved product quality

#	Record 0 to 10 score (_____)	N3oo
88	Refused	N3p
99	Don't know	N3p

IF N3o > 5, THEN ASK

N3oo How, specifically, did this enter into your decision to install/delamp this equipment?

77	RECORD VERBATIM	N3p
88	Don't know	N3p
99	Refused	N3p

IF FM050 = 12 AND NTG_TYPE >= 2, THEN ASK, ELSE SKIP TO N3r

N3p Compliance with state or federal regulations such as Title 24, air quality, OSHA, or FDA regulations

#	Record 0 to 10 score (_____)	N3pp
88	Refused	N3r
99	Don't know	N3r

IF N3p > 5, THEN ASK

N3pp How, specifically, did this enter into your decision to upgrade to energy efficient equipment?

77	RECORD VERBATIM	N3r
88	Don't know	N3r
99	Refused	N3r

ASK IF NTG_TYPE >= 1

N3r Compliance with your organization's normal remodeling or equipment replacement practices?

#	Record 0 to 10 score (_____)	N3rrr
88	Refused	N3s
99	Don't know	N3s

IF AA3(2|10)&N3R(6||10);

N3RRR According to your organization’s remodeling and equipment replacement policies, how often are you supposed to replace this type of equipment? [IF NEEDED: in terms of the number of years]

# yrs	Record Number of Years	N3rr
88	Refused	N3rr
99	Don't know	N3rr

IF N3r > 5, THEN ASK

N3rr How, specifically, did this enter into your decision to install/delamp this equipment?

77	RECORD VERBATIM	N3s.
88	Don't know	N3s.
99	Refused	N3s.

N3s	Were there any other factors we haven't discussed that were influential in your decision to install/delamp this MEASURE?	
1	Nothing else influential	CC1
77	Record verbatim	N3ss
88	Refused	CC1
99	Don't know	CC1

	ASK IF N3s = 77	
N3ss	Using the same zero to 10 scale, how would you rate the influence of this factor?	
#	Record 0 to 10 score (_____)	CC1
88	Refused	CC1
99	Don't know	CC1

	CONSISTENCY CHECKS ON N3p, N3q and N3r **If NTG_TYPE >=2** **IF AA3 = 8, AND N3p < 4, THEN ASK**	
CC1	You indicated earlier that compliance with codes or regulatory policies was one of the reasons you did the project. However, just now you scored the importance of compliance with state or federal regulations or standards such as Title 24, air quality, OSHA, or FDA regulations in your decision making fairly low, why is that?	
77	RECORD VERBATIM	CC1a
88	Don't know	CC1a
99	Refused	CC1a

	IF AA3 ^= 8, and N3p > 7, THEN ASK	
CC1a	You indicated earlier that compliance with codes or regulatory policies was not one of the primary reasons you did the project. However, just now you scored the importance of compliance with state or federal regulations or standards such as Title 24,air quality, OSHA, or FDA regulations in your decision making fairly high, why is that?	
77	RECORD VERBATIM	CC3
88	Don't know	CC3
99	Refused	CC3

	IF AA3 = 2 or 10, AND N3r < 4, THEN ASK	
NCC3	You indicated earlier that a regularly scheduled retrofit was one of the reasons you did the project. However, just now you scored the importance of compliance with your company's regularly scheduled retrofit or equipment replacement in your decision making fairly low, why is that?	
77	RECORD VERBATIM	NCC3a
88	Don't know	NCC3a
99	Refused	NCC3a

IF AA3 ^= 2 and AA3 ^= 9 and AA3^=10 AND N3r > 7 THEN ASK

NCC3a You indicated earlier that a regularly scheduled retrofit was NOT one of the reasons you did the project. However, just now you scored the importance of compliance with your company's regularly scheduled retrofit or equipment replacement in your decision making fairly high, why is that?

77	RECORD VERBATIM	**P1**
88	Don't know	**P1**
99	Refused	**P1**

PAYBACK BATTERY
If INCENT <> 100 AND NTG_TYPE >= 1, THEN ASK; ELSE SKIP TO P3

P1 What financial calculations does your company typically make before proceeding with the installation of energy efficient equipment like you installed through the program?

1	Payback	P2A
2	Return on investment	P2B
77	Record VERBATIM	P3
88	Don't know	P3
99	Refused	P3

If P1 = 1 THEN ASK; ELSE SKIP TO P2B

P2A What is your threshold in terms of the payback or return on investment your company uses before deciding to proceed with installing energy efficient equipment like you installed through the program? Is it…

1	0 to 6 months	P3
2	6 months to 1 year	P3
3	1 to 2 years	P3
4	2 to 3 years	P3
5	3 to 5 years	P3
6	Over 5 years	P3
88	Don't know	P3
99	Refused	P3

IF P1 = 2 THEN ASK

P2B What is your ROI?

1	Record ROI____;	P3

P3 Did the rebate move your energy efficient equipment project within this acceptable range?

1	Yes	P4
2	No	P3a
88	Don't know	P3a
99	Refused	P3a

If P3 = 1 THEN ASK; ELSE SKIP TO P3A

P4 On a scale of 0 to 10, with a zero meaning NOT AT ALL IMPORTANT and 10 meaning Very Important, how important in your decision was it that the project was in the acceptable range?

#	Record 0 to 10 score (_____)	P3a
88	Refused	P3a
99	Don't know	P3a

CONSISTENCY CHECKS ON N3b and P3

IF P3 = 1, AND N3b < 5, THEN ASK

P3a The rebate seemed to make the difference between meeting your financial criteria and not meeting them, but you are saying that the rebate didn't have much effect on your decision, why is that?

77	Record VERBATIM	P3e
88	Don't know	P3e
99	Refused	P3e

IF P3 = 2, AND N3b > 5, THEN ASK

P3e The rebate didn't cause the installation of energy efficient equipment to meet your company's financial criteria, but you said that the rebate had an impact on the decision to install this energy efficient equipment. Why did it have an impact?

77	Record VERBATIM	N33
88	Don't know	N33
99	Refused	N33

IF N3D(8||10) | N3E(8||10) | N3F(8||10) | N3J(8||10) | N3M(8||10) | N3N(8||10) | N3O(8||10) | N3P(8||10) | N3R(8||10);

DISPLAY Next, with regard to your decision to implement this energy efficient MEASURE *instead of either less energy efficient or standard efficiency equipment*, I would like you to rate the importance of the PROGRAM as opposed to other Non-program factors that may have influenced your decision such as...(SCAN BELOW AND READ TO THEM THOSE FACTORS THAT INFLUENCED THEIR DECISION)

(READ ITEMS WHERE THEY GAVE A RATING OF 8 or higher)

Program-related factors

<%N3B> Availability of the PROGRAM rebate ...@[%N3B>@

<%N3G> Information from the Program, Utility, or Program Administrator training course? ...@[%N3G>@

<%N3H> Information from the Program, Utility, or Program Administrator Marketing materials? ...@[%N3H>@

<%N3L> Endorsement or recommendation by your account rep? ...@[%N3L>@

Non-Program factors

<%N3D> Equipment Vendor recommendation ...@[%N3D>@

<%N3E> Previous experience with this measure ...@[%N3E>@

<%N3F> Previous experience with this program ...@[%N3F>@

<%N3J> Standard practice in your business/industry	...@[%N3J>@
<%N3M> Corporate policy or guidelines	...@[%N3M>@
<%N3N> Payback on investment.	...@[%N3N>@
<%N3O> To improve production as a result of lighting,	...@[%N3O>@
<%N3P> Compliance with state or federal regulations or standards such as Title 24, air quality, OSHA, or FDA regulations	...@[%N3P>@
<%N3R> Compliance with normal maintenance or retrocommissioning policies or your companies regularly scheduled retrofit or lighting replacement	...@[%N3R>@

DISPLAY

If you were given 10 points to award in total, how many points would you give to the importance of the program and how many points would you give to these other non-program factors?

N41

How many of the ten points would you give to the importance of the PROGRAM in your decision?

#	Record 0 to 10 score (_____)	N42
88	Refused	N42
99	Don't know	N42

N42

and how many points would you give to all of these other non-program factors?

#	Record 0 to 10 score (_____)	N41P
88	Refused	N41P
99	Don't know	N41P

If N41 <> 88 and N41 <> 99 and N42 <> 88 and N42 <> 99, compute N41 + N42. While N41+N42 <> 10, display:

__We want these two sets of numbers to equal 10.

<%N41> for Program influence and

<%N42> for Non Program factors

DISPLAY

Next, I would like for you to consider the importance of the PROGRAM in your decision to install your equipment *at the time you did* rather than waiting to install new equipment sometime in the future, regardless of the actual efficiency of the equipment you selected. Please rate the importance of the program on this timing decision as opposed to other non-program factors that may have influenced your decision.

If Needed - else skip…

If you were given 10 points to award in total, how many points would you give to the importance of the program and how many points would you give to these other non-program factors in your decision to install your equipment at the time you did rather than waiting to install new equipment sometime in the future.

N41P

How many of the ten points would you give to the importance of the PROGRAM in your decision TO INSTALL YOUR EQUIPMENT AT THE TIME YOU DID?

#	Record 0 to 10 score (_____)	N42P
88	Refused	N42P
99	Don't know	N42P

N42P and how many points would you give to all of these other non-program factors?

#	Record 0 to 10 score (_____)	REPLACE
88	Refused	REPLACE
99	Don't know	REPLACE

If N41P <> 88 and N41P <> 99 and N42P <> 88 and N42P <> 99, compute N41P + N42P. While N41P+N42P <> 10, display:

__We want these two sets of numbers to equal 10.

<%N41P> for Program influence and

<%N42P> for Non Program factors

REPLACE **ASK ALL**
Was the installation of this measure....<%NTGMEASURE> ...a replacement of existing equipment or was it additional equipment you installed in your facility?

1	Replace/Modification/Retrofit	DISPLAY
2	Add-on	DISPLAY
88	Refused	DISPLAY
99	Don't know	DISPLAY

DISPLAY Now I would like you to think about the action you would have taken with regard to the installation of this equipment if the program had not been available.

N5 **IF REPLACE(1) | ~~DELAMP == 1~~**
Using a likelihood scale from 0 to 10, where 0 is not at all likely and 10 is extremely likely, if THE PROGRAM had NOT BEEN AVAILABLE, what is the likelihood that you would have installed exactly the same program-qualifying energy efficient equipment that you did for this project regardless of when you would have installed it?

#	Record 0 to 10 score (_____)	N5a
88	Refused	N5B
99	Don't know	N5B

IF REPLACE(2) THEN ASK; ELSE SKIP TO N6

Using a likelihood scale from 0 to 10, where 0 is Not at all likely and 10 is Extremely likely, if THE PROGRAM had NOT BEEN AVAILABLE, what is the likelihood that you would have installed exactly the same energy efficient equipment at the same time as you did?

N5aa

#	Record 0 to 10 score (_____)	N6
88	Don't know	N6
99	Refused	N6

CONSISTENCY CHECKS

IF N3b > 7 and N5 > 7, THEN ASK

When you answered ...<%N3B> ... for the question about the influence of the rebate, I would interpret that to mean that the rebate was quite important to your decision to install. Then, when you answered ..<%N5>... for how likely you would be to install the same equipment **without** the rebate, it sounds like the rebate was not very important in your installation decision.

I want to check to see if I am misunderstanding your answers or if the questions may have been unclear. Will you explain in your own words, the role the rebate played in your decision to install this efficient equipment?

N5a

77	Record VERBATIM	NN5aa
88	Don't know	NN5aa
99	Refused	NN5aa

Would you like for me to change your score on the importance of the rebate that you gave a rating of <%N3B> and/or change your rating on the likelihood you would install the same equipment without the rebate which you gave a rating of <%N5> and/or we can change both if you wish?

NN5aa

1	No change	N5b
77	Record how they would rate rebate influence and how they would rate likelihood to install without the rebate	N5b
88	Don't know	N5b
99	Refused	N5b

ASK IF REPLACE(1)

Using the same scale as before, if the program had not been available, what is the likelihood that you would have done this project at the same time as you did?

N5b

#	Record 0 to 10 score (_____)	N5bb
88	Refused	N5bb
99	Don't know	N5bb

If N5b < 9 THEN ASK; ELSE SKIP TO N6

N5bb Why do you say that?

77	Record VERBATIM	N6
88	Don't know	N6
99	Refused	N6

ADDITIONAL BASELINE INPUT

N6 Now I would like you to think one last time about what action you would have taken if the program had not been available. Which of the following alternatives would you have been MOST likely to do?

1	Install/Delamped fewer units	N6aa
2	Install standard efficiency equipment or whatever required by code	N6aa
3	Installed equipment more efficient than code but less efficient than what you installed through the program	N6aa
4	Done nothing (keep existing equipment as is)	N6ba
5	Done the same thing I would have done as I did through the program	N6aa
6	Repair/rewind or overhaul the existing equipment	N7
77	Something else (specify what _____)	N6ca
88	Don't know	N6ca
99	Refused	N6ca

If N6 = 1,2,3,5 ASK, ELSE N6ba

N6aa Would you have [FILL IN RESPONSE TO N6 for N6 = 1,2, 3, 5] at the same time as you did under the program, within a year, or at a later time?

1	Same time	N7
2	Within one year	N7
3	At a later time	N6ab
88	Don't know	N7
99	Refused	N7

N6ab How many years later would it have been?

77	Record VERBATIM	N7
88	Don't know	N6ac
99	Refused	N7

N6ac Would it have been….

1	Less than one year	N7
2	About a year	N7
3	A couple of years	N7
4	A few years	N7
5	More than four years	N7
88	Don't know	N7
99	Refused	N7

If N6 = 4 THEN ASK, ELSE N6ca

N6ba How long would you have waited to replace your equipment?

1	Less than one year	N7
2	About a year	N7
3	A couple of years	N7
4	A few years	N7
5	More than four years	N7
88	Don't know	N7
99	Refused	N7

IF N6=77, 88, 99 THEN ASK, ELSE N7

N6ca Would you still have replaced your equipment at the same time as you did under the program, within a year, or at a later time?

1	Same time	N7
2	Within one year	N7
3	At a later time	N6cb
88	Don't know	N7
99	Refused	N7

N6cb How many years later would it have been?

77	Record VERBATIM	N6
88	Don't know	N6cc
99	Refused	N6

N6cc Would it have been….

1	Less than one year	N7
2	About a year	N7
3	A couple of years	N7
4	A few years	N7
5	More than four years	N7
88	Don't know	N7
99	Refused	N7

CONSISTENCY CHECK

Ask if N6 = (1, 2, 3, 4) and ((N5 > 8 and N5b > 8) OR N5aa > 8)

N7 In an earlier response, you said that if the program had not been available, there was a very high likelihood that you would have installed exactly the same equipment as you did through the program. However, just now you have indicated that you would not have installed the same equipment as you did without the benefit of the program. Can you explain to me why there is this difference?

77	Record VERBATIM	N6a
88	Don't know	N6a
99	Refused	N6a

Ask if N6(1);

N6a How many fewer units would you have installed/Delamped? (It is okay to take an answer such as ...HALF...or 10 percent fewer ... etc.)

77	RECORD VERBATIM	ER2
88	Refused	ER2
99	Refused	ER2

Ask if N6(3);

N6b Can you tell me what model or efficiency level you were considering as an alternative? (It is okay to take an answer such as … 10 percent more efficient than code or 10 percent less efficient than the program equipment)

77	RECORD VERBATIM	ER2
88	Don't know	ER2
99	Refused	ER2

Ask if N6(6);

N6c How long do you think the repaired equipment would have lasted before requiring replacement?

77	RECORD VERBATIM	ER2
88	Don't know	ER2
99	Refused	ER2

EARLY REPLACEMENT BATTERY

[IF N5b < 8 and A3 = 1, 4, 8, or 10 THEN ASK. ELSE SKIP TO PP1]

DISPLAY Earlier, when I asked you a question about why you decided to implement the project using high efficiency equipment, you gave reasons related to <A3> Now I would like to ask you some follow up questions regarding these responses you gave me. ER2

IF REPLACE(1) AND N6c IS UNRECORDED;

ER2 How many more years do you think your equipment would have gone before failing and required replacement?

77	___ Estimated Remaining Useful Life (in years)	ER6
88	Don't know	ER6
99	Refused	ER6

IF AA3 = 4, THEN ASK

ER6 How much downtime did you experience in the past year?

77	_____Downtime Estimate (in weeks)	ER9
88	Don't know	ER9
99	Refused	ER9

ER9 In your opinion, based on the economics of operating this equipment, for how many more years could you have kept this equipment functioning?

Yrs	___ Estimated Remaining Useful Life	ER15
88	Don't know	ER15
99	Refused	ER15

IF AA3 = 8, THEN ASK

ER15 Can you briefly describe the specific code/regulatory requirements that this project addressed?

77	RECORD VERBATIM	ER19
88	Don't know	ER19
99	Refused	ER19

IF AA3 = 10, THEN ASK

ER19 Can you briefly describe the specific company policies regarding regular/normal maintenance/replacement policy(ies) that were relevant to this project? Or briefly describe the specific company policies regarding regular equipment retrofits and remodeling?

77	RECORD VERBATIM	PP1
88	Don't know	PP1
99	Refused	PP1

PROCESS QUESTIONS - ASK ALL

PP1 What do you believe the PROGRAM'S primary strengths are?

77	Record VERBATIM	PP2
88	Don't know	PP2
99	Refused	PP2

PP2 What concerns do you have about the PROGRAM, if any? (IF NEEDED: What do you view as the primary features that need to be improved?)

77	Record VERBATIM	PP4
88	Don't know	PP4
99	Refused	PP4

PP4 On a scale of 0 - 10, where 0 is completely dissatisfied and 10 is completely satisfied, how would you rate your OVERALL satisfaction with the <%PROGRAM>?

#	Record 0 to 10 score (_____)	PP5
88	Refused	PP5
99	Don't know	PP5

IF PP4 < 4 THEN ASK; ELSE SKIP TO LT2

PP5 Why do you say that?

77	Record VERBATIM	LT2
88	Don't know	LT2
99	Refused	LT2

LONG TERM INFLUENCE

IF N3f > 4, THEN ASK, ELSE GO TO OPERATING HOURS SECTION

DISPLAY Now I'd like you to think about your organization's experiences with %UTILITY's energy efficiency programs and efforts over the longer term, for example, over the past 5, 10, or even 20 years.
In an earlier question, you indicated that your previous experience with utility energy efficiency programs was a factor that influenced your decision to implement this PROJECT. I would like to ask you a few questions about this experience. LT2

LT2 For how many years have you been participating in %UTILITY's energy efficiency programs?

# yrs	Record Number of Years	LT3
88	Refused	LT3
99	Don't know	LT3

LT3 During this time, how many times has your organization participated in these PROGRAM(s)?

1	7 to 10 times, or more	CA6
2	4 to 7 times	CA6
3	2 to 4 times	CA6
4	less than 2 times	CA6
88	Refused	LT6
99	Don't know	LT6

IF LT3(1||4);

CA6 What type of equipment did you install through this (these) program(s)? [READ RESPONSE CATEGORIES]

1	Indoor lighting	LT6
2	Cooling equipment	LT6
3	Natural gas equipment, such as water heater, furnace or appliances	LT6

4	Insulation or windows	LT6
5	Refrigeration	LT6
6	Industrial process equipment	LT6
7	Greenhouse heat curtains	LT6
8	Food service equipment	LT6
77	OPEN \SOMETHING OTHER (specify)	LT6
88	Refused	LT6
99	Don't Know	LT6

LT6 What factors led you to participate in these program(s)?

77	Record VERBATIM	LT7
88	Refused	LT7
99	Don't know	LT7

LT7 And exactly how did that experience help to convince you to install this energy efficient equipment?

77	Record VERBATIM	LT8
88	Refused	LT8
99	Don't know	LT8

LT8 **IF LT3 = 1 or 2, THEN ASK. ELSE GO TO OPERATING HOURS SECTION**
Have these programs had any long-term influence on your organization's energy efficiency related practices and policies that go beyond the immediate effect of incentives on individual projects? [DO NOT READ: Examples are causing them to add energy efficiency procurement policies, internal incentive or reward structures for improving energy efficiency, or adoption of energy management best practices.]

1	Yes	ALWAYS
2	No	ALWAYS
88	Refused	ALWAYS
99	Don't know	ALWAYS

OPERATING HOURS

DISPLAY The next few questions are to help us get a full understanding of your organization's operational hours.

ALWAYS Is your organization operation 24 hours a day, 7 days a week?

1	Yes	HOLIDAYS
2	No	HOLIDAYS
88	Refused	HOLIDAYS

HOLIDAYS	Dose your facility close for any holidays during the year? If so, which one(s)?	
1	New Year's Day - January 1	DAYS
2	Martin Luther King Jr. Day - (3rd Monday in January)	DAYS
3	President's Day - (3rd Monday in February)	DAYS
4	Memorial Day - (Last Monday in May)	DAYS
5	Independence Day - July 4th (Or Surrounding Monday/Friday if July 4 is a weekend)	DAYS
6	Labor Day - (First Monday in September)	DAYS
7	Thanksgiving - (4th Thursday in November)	DAYS
8	Day after Thanksgiving	DAYS
9	Christmas Eve - December 24	DAYS
10	Christmas Day - December 25	DAYS
66	NO HOLIDAY CLOSURES	DAYS
77	Other - Specify	DAYS
88	Refused	DAYS
99	Don't Know	DAYS

Ask if ALWAYS = 2; else skip to OS_REC;

DAYS	Is your facility closed any of the 7 days of the week? If so, which days are you CLOSED?	
1	Monday	MONDAY_OPEN
2	Tuesday	MONDAY_OPEN
3	Wednesday	MONDAY_OPEN
4	Thursday	MONDAY_OPEN
5	Friday	MONDAY_OPEN
6	Saturday	MONDAY_OPEN
7	Sunday	MONDAY_OPEN
66	Open EVERYDAY	MONDAY_OPEN
88	REFUSED	MONDAY_OPEN
99	DON'T KNOW	MONDAY_OPEN

Ask if ALWAYS(2)&^DAYS(1); else skip to TUESDAY_OPEN;

MONDAY_OPEN	What time do you open your facility on MONDAY?	
	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	MONDAY_CLOSE
88	REFUSED	MONDAY_CLOSE
99	DON'T KNOW	MONDAY_CLOSE

IF MONDAY_OPEN(1||64)

MONDAY_CLOSE What time do you close your facility on MONDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	TUESDAY_OPEN
88	REFUSED	TUESDAY_OPEN
99	DON'T KNOW	TUESDAY_OPEN

TUESDAY_OPEN **Ask if ALWAYS(2)&^DAYS(2); else skip to WEDNESDAY_OPEN;**
What time do you open your facility on TUESDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	TUESDAY_CLOSE
88	REFUSED	TUESDAY_CLOSE
99	DON'T KNOW	TUESDAY_CLOSE

TUESDAY_CLOSE **IF TUESDAY_OPEN(1||65)**
What time do you close your facility on TUESDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	WEDNESDAY_OPEN
88	REFUSED	WEDNESDAY_OPEN
99	DON'T KNOW	WEDNESDAY_OPEN

WEDNESDAY_OPEN **Ask if ALWAYS(2)&^DAYS(3); else skip to THURSDAY_OPEN;**
What time do you open your facility on WEDNESDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	WEDNESDAY_CLOSE
88	REFUSED	WEDNESDAY_CLOSE
99	DON'T KNOW	WEDNESDAY_CLOSE

WEDNESDAY_CLOSE **IF WEDNESDAY_OPEN(1||65)**
What time do you close your facility on WEDNESDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	THURSDAY_OPEN
88	REFUSED	THURSDAY_OPEN
99	DON'T KNOW	THURSDAY_OPEN

THURSDAY_OPEN **Ask if ALWAYS(2)&^DAYS(4); else skip to FRIDAY_OPEN;**
What time do you open your facility on THURSDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	THURSDAY_CLOSE
88	REFUSED	THURSDAY_CLOSE
99	DON'T KNOW	THURSDAY_CLOSE

IF THURSDAY_OPEN(1||65)

THURSDAY_CLOSE What time do you close your facility on THURSDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	FRIDAY_OPEN
88	REFUSED	FRIDAY_OPEN
99	DON'T KNOW	FRIDAY_OPEN

Ask if ALWAYS(2)&^DAYS(5); else skip to SATURDAY_OPEN;

FRIDAY_OPEN What time do you open your facility on FRIDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	FRIDAY_CLOSE
88	REFUSED	FRIDAY_CLOSE
99	DON'T KNOW	FRIDAY_CLOSE

IF FRIDAY_OPEN(1||65)

FRIDAY_CLOSE What time do you close your facility on FRIDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	SATURDAY_OPEN
88	REFUSED	SATURDAY_OPEN
99	DON'T KNOW	SATURDAY_OPEN

Ask if ALWAYS(2)&^DAYS(6); else skip to SUNDAY_OPEN;

SATURDAY_OPEN What time do you open your facility on SATURDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	SATURDAY_CLOSE
88	REFUSED	SATURDAY_CLOSE
99	DON'T KNOW	SATURDAY_CLOSE

IF SATURDAY_OPEN(1||65)

SATURDAY_CLOSE What time do you close your facility on SATURDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	SUNDAY_OPEN
88	REFUSED	SUNDAY_OPEN
99	DON'T KNOW	SUNDAY_OPEN

Ask if ALWAYS(2)&^DAYS(7); else skip to DIFF_SCHEDULE;

SUNDAY_OPEN What time do you open your facility on SUNDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	SUNDAY_CLOSE
88	REFUSED	SUNDAY_CLOSE
99	DON'T KNOW	SUNDAY_CLOSE

IF SUNDAY_OPEN(1||65)

SUNDAY_CLOSE What time do you close your facility on SUNDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	DIFF_SCHEDULE
88	REFUSED	DIFF_SCHEDULE
99	DON'T KNOW	DIFF_SCHEDULE

DIFF_SCHEDULE Some organizations have different schedules for certain times of the year. Does your organization maintain a different schedule for certain months of the year?

1	Yes	MONTHS
2	No	OS_REC
88	REFUSED	OS_REC
99	DON'T KNOW	OS_REC

Ask if DIFF_SCHEDULE = 1; Else skip to OS_REC;

MONTHS Which months of the year does the schedule vary from the times I just recorded?

1	January	ALT_DAYS
2	February	ALT_DAYS
3	March	ALT_DAYS
4	April	ALT_DAYS
5	May	ALT_DAYS
6	June	ALT_DAYS
7	July	ALT_DAYS
8	August	ALT_DAYS
9	September	ALT_DAYS
10	October	ALT_DAYS
11	November	ALT_DAYS
12	December	ALT_DAYS
88	REFUSED	ALT_DAYS
99	DON'T KNOW	ALT_DAYS

ALT_ALWAYS	Is your organization operation 24 hours a day, 7 days a week?	
1	Yes	HOLIDAYS
2	No	HOLIDAYS
88	Refused	HOLIDAYS

ALT_DAYS	**If ^ALT_ALWAYS(1) then ask; Else skip to OS_REC;** During this alternate schedule, is your facility closed any of the 7 days of the week? If so, which days are you CLOSED?	
1	Monday	ALT_MONDAY_OPEN
2	Tuesday	ALT_MONDAY_OPEN
3	Wednesday	ALT_MONDAY_OPEN
4	Thursday	ALT_MONDAY_OPEN
5	Friday	ALT_MONDAY_OPEN
6	Saturday	ALT_MONDAY_OPEN
7	Sunday	ALT_MONDAY_OPEN
66	Open EVERYDAY	ALT_MONDAY_OPEN
88	REFUSED	ALT_MONDAY_OPEN
99	DON'T KNOW	ALT_MONDAY_OPEN

ALT_MONDAY_OPEN	**Ask if DIFF_SCHEDULE(1)&^ALT_DAYS(1) ; else skip to ALT_TUESDAY_OPEN;** For the alternate schedule, what time do you open your facility on MONDAY?	
	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	ALT_MONDAY_CLOSE
88	REFUSED	ALT_MONDAY_CLOSE
99	DON'T KNOW	ALT_MONDAY_CLOSE

ALT_MONDAY_CLOSE	**IF ALT_MONDAY_OPEN(1||64)** What time do you close your facility on MONDAY?	
	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	ALT_TUESDAY_OPEN
88	REFUSED	ALT_TUESDAY_OPEN
99	DON'T KNOW	ALT_TUESDAY_OPEN

Ask if DIFF_SCHEDULE(1)&^ALT_DAYS(2) ; else skip to ALT_WEDNESDAY_OPEN;

ALT_TUESDAY_OPEN What time do you open your facility on TUESDAY during your alternate schedule?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	ALT_TUESDAY_CLOSE
88	REFUSED	ALT_TUESDAY_CLOSE
99	DON'T KNOW	ALT_TUESDAY_CLOSE

IF ALT_TUESDAY_OPEN(1||65)

ALT_TUESDAY_CLOSE What time do you close your facility on TUESDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	ALT_WEDNESDAY_OPEN
88	REFUSED	ALT_WEDNESDAY_OPEN
99	DON'T KNOW	ALT_WEDNESDAY_OPEN

Ask if DIFF_SCHEDULE(1)&^ALT_DAYS(3) ; else skip to ALT_THURSDAY_OPEN;

ALT_WEDNESDAY_OPEN What time do you open your facility on WEDNESDAY during your alternate schedule?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	ALT_WEDNESDAY_CLOSE
88	REFUSED	ALT_WEDNESDAY_CLOSE
99	DON'T KNOW	ALT_WEDNESDAY_CLOSE

IF ALT_WEDNESDAY_OPEN(1||65)

ALT_WEDNESDAY_CLOSE What time do you close your facility on WEDNESDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	ALT_THURSDAY_OPEN
88	REFUSED	ALT_THURSDAY_OPEN
99	DON'T KNOW	ALT_THURSDAY_OPEN

Ask if DIFF_SCHEDULE(1)&^ALT_DAYS(4) ; else skip to ALT_FRIDAY_OPEN;

ALT_THURSDAY_OPEN What time do you open your facility on THURSDAY during your alternate schedule?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	ALT_THURSDAY_CLOSE
88	REFUSED	ALT_THURSDAY_CLOSE
99	DON'T KNOW	ALT_THURSDAY_CLOSE

ALT_THURSDAY_OPEN(1||65)

ALT_THURSDAY_CLOSE

What time do you close your facility on THURSDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	ALT_FRIDAY_OPEN
88	REFUSED	ALT_FRIDAY_OPEN
99	DON'T KNOW	ALT_FRIDAY_OPEN

Ask if
DIFF_SCHEDULE(1)&^ALT_DAYS(5)
; else skip to ALT_SATURDAY_OPEN;

ALT_FRIDAY_OPEN

What time do you open your facility on FRIDAY during this alternate schedule?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	ALT_FRIDAY_CLOSE
88	REFUSED	ALT_FRIDAY_CLOSE
99	DON'T KNOW	ALT_FRIDAY_CLOSE

IF ALT_FRIDAY_OPEN(1||65)

ALT_FRIDAY_CLOSE

What time do you close your facility on FRIDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	ALT_SATURDAY_OPEN
88	REFUSED	ALT_SATURDAY_OPEN
99	DON'T KNOW	ALT_SATURDAY_OPEN

Ask if
DIFF_SCHEDULE(1)&^ALT_DAYS(6)
; else skip to ALT_SUNDAY_OPEN;

ALT_SATURDAY_OPEN

I recorded that during your alternate schedule you are also open on Saturday. What time do you open your facility on SATURDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	ALT_SATURDAY_CLOSE
88	REFUSED	ALT_SATURDAY_CLOSE
99	DON'T KNOW	ALT_SATURDAY_CLOSE

IF ALT_SATURDAY_OPEN(1||65)

ALT_SATURDAY_CLOSE

What time do you close your facility on SATURDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	ALT_SUNDAY_OPEN
88	REFUSED	ALT_SUNDAY_OPEN
99	DON'T KNOW	ALT_SUNDAY_OPEN

Ask if
DIFF_SCHEDULE(1)&^ALT_DAYS(7)
; else skip to OS_REC;

ALT_SUNDAY_OPEN

I recorded that during your alternate schedule you are also open on Sunday.

What time do you open your facility on SUNDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	ALT_SUNDAY_CLOSE
88	REFUSED	ALT_SUNDAY_CLOSE
99	DON'T KNOW	ALT_SUNDAY_CLOSE

IF ALT_SUNDAY_OPEN(1||65)

ALT_SUNDAY_CLOSE What time do you close your facility on SUNDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	CUSTOMER CHARACTERISTICS
88	REFUSED	CUSTOMER CHARACTERISTICS
99	DON'T KNOW	CUSTOMER CHARACTERISTICS

CUSTOMER CHARACTERISTICS

We're almost finished. Now, I'd like to ask you questions regarding your facility.

CC2a What is the total square footage at this facility?

77	RECORD Square feet	CC2c
88	Refused	CC3
99	Don't know	CC3

IF CC2a IN (88, 99)

CC3 Would you say that the floor area is ...?

1	less than 1,500 sq. ft.	CC2c
2	1,500 - 5,000 sq. ft.	CC2c
3	5,000 - 10,000 sq. ft.	CC2c
4	10,000 – 25,000 sq. ft.	CC2c
5	25,000 – 50,000 sq. ft.	CC2c
6	50,000 – 75,000 sq. ft.	CC2c
7	75,000 – 100,000 sq. ft.	CC2c
8	over 100,000 sq. ft. (ag area)	CC2c
88	Refused	CC2c
99	Don't know	CC2c

CC2c Is the entire floor area of this facility heated or cooled?

1	Yes	CC3a
2	No	CC2d
88	Refused	C0
99	Don't know	C0

CC2d What percentage of the floor area is heated or cooled?

77	Percent	CC3a
88	Refused	C0
99	Don't know	C0

If CC2d > 0 or CC2c = 1; else skip to C0

CC3a Is your space heated using electricity or gas or something else?

1	Electricity	C0
2	Gas	C0
3	Both electricity and gas	C0
4	Propane	C0
77	OPEN\Other-record	C0
88	Refused	C0
99	Don't know	C0

C0 About what percentage of your operating costs does energy account for?

1	Less than 1 percent	CC4
2	1-2 percent	CC4
3	3-5 percent	CC4
4	6-10 percent	CC4
5	11-15 percent	CC4
6	16-20 percent	CC4
7	21-50 percent	CC4
8	Over 51 percent	CC4
88	Refused	CC4
99	Don't Know	CC4

CC4 Does your organization own, lease, or manage the facility?

1	Own	C5
2	Lease/Rent	C5
3	Manage	C5
88	Refused	C5
99	Don't know	C5

C5 How many locations does your organization have. Is it....

1	This facility only	CC6
2	2 to 4 locations	CC6
3	5 to 10 locations	CC6
4	11 to 25 locations	CC6
5	more than 25 locations	CC6
88	Don't know	CC6
99	Refused	CC6

CC6 How active a role does your organization take in making purchase decisions related to energy using equipment at this facility? Would you say you are…

1	Very active – involved in all phases and have veto power	CC7
2	Somewhat active – we approve decisions and provide some input and review	CC7
3	Slightly active – we have a voice but it's not the dominant voice	CC7
4	Not active at all – we're part of a larger firm	CC7
5	Not active at all – our firm doesn't get involved in these issues	CC7
88	Refused	CC7
99	Don't know	CC7

CC7 Does your firm have a maintenance company that you use to maintain any of your building systems such as lighting, HVAC, refrigeration, or food service equipment?

1	Yes	CC12a
2	No	CC12a
88	Refused	CC12a
99	Don't Know	CC12a

CC12a In what year was this organization established at this location?

7777	Year	BC090
8888	Refused	CC12b
9999	Don't know	CC12b

If CC12a in (88, 99) then ask; else skip to BC090

CC12b Would you say it was…

1	After 2010	BC090
2	Between 2006 and 2010	BC090
3	Between 2000 and 2005	BC090
4	In the 1990s	BC090
5	In the 1980s	BC090
6	In the 1970s	BC090
7	In the 1960s or	BC090
8	Before 1960	BC090
88	Don't know	BC090
99	Refused	BC090

ADDITIONAL FACILITY CHARACTERISTICS

BC090 Has the square footage of the facility increased, decreased or remained the same since January 2017?

1	Increase in square footage	BC100
2	Decrease in square footage	BC110
3	Stayed the same	ONSITE RECRUITING
88	Refused	ONSITE RECRUITING
99	Don't know	ONSITE RECRUITING

If BC090 = 1 then ask; else skip to BC110

BC100 How many square feet were added?

77	Square feet	BC120
88	Refused	BC120
99	Don't know	BC120

If BC090 = 2 then ask; else skip to BC120

BC110 By how many square feet was the facility reduced?

77	Square feet	BC120
88	Refused	BC120
99	Don't know	BC120

If BC090 in (1, 2) then ask; else skip to CA15

BC120 In what year did this <%BC090> occur?

1	2016	Vendor_Name
2	2017	Vendor_Name
88	Refused	Vendor_Name
99	Don't know	Vendor_Name

Participant Survey for CPUC
PY2018 Downstream Lighting Evaluation

DISPLAY

LOG_REC

1		
2		
88		
99		

LOG_NAME

LOG_PHONE

LOG_ALT

LOG_PH_ALT

LOG_NOTE

66		
77		

COMMENT1

OS_NAME1

1		
77		
99		

OS_PHONE1

&OS_PHONE1		
88		
99		

OTHER

&OTHER		
88		
99		

OS_NAME2

&OS_NAME2		
88		
99		

OS_PHONE2

&OS_PHONE2		
88		
99		

HB_Lift

1		
2		
88		
99		

OS_Business

1		
2		
88		
99		

OS_Bus_Name

1		

VISIT_NOTES		
1		
77		

Vendor_Name	**Ask if V1(1)** Earlier you stated that you had a vendor/contractor that helped you with the installation of the lighting equipment that was installed through the <%UTILITY> Program. Could you provide me with their name and phone number?	
1	Cannot provide	END
77	Record Name, Phone Number, Email Address or any other information they can provide. More is better.	END
88	Refused	END
99	Don't know	END

END	Those are all the questions I have for you today. On behalf of the CPUC, I would like to thank you very much for your kind cooperation. Have a good day.	

VENDOR TELEPHONE SURVEY INSTRUMENT

Introduction

AA1 This is %n calling on behalf of the CPUC [California Public Utilities Commission] from <%SURVEY FIRM>> regarding your firm's involvement with the sales and/or installations of ...<%MEASURE>… through ...<%PROGRAM> ... between January 1, 2018 and December 31, 2018._____Our records indicate that ...<%CONTACT>... would be the person most knowledgeable about this. Are they available?

1 Yes AA7
2 No AA2

AA2 Who would be the person most knowledgeable about your firm's involvement with ...<%PROGRAM> during 2018?

1 Record name and start over

A1 <%UTILITY>... has indicated that your firm implements the <% PROGRAM NAME> and was involved in selling and/or installing energy-efficient...<%MEASURE> throughout their service territory during 2018. Is this correct?

1 Yes A2
2 No Thank and Terminate

[DO NOT READ: The following question will determine if we ask about influences on their recommendations. Please be sure to be thorough with this question. If they truly only installed this equipment, then a "No" is fine]

A2 According to <%UTILITY>, your firm promotes and sells ...<%MEASURE> through the <% PROGRAM NAME> [ADJUST TO PROGRAM DESCRIPTION]. Is that correct??

1 Yes A3
2 No A11

A3 Now, I'm going to ask you about the various strategies you might have used to sell program-qualified equipment. Please indicate which ones you have used. [READ]

___ Upsell contractors to purchase program-qualified units

___ Upsell customers to purchase program-qualified units

___ Conduct training workshops for contractors

___ Increase marketing of program-qualified units

___ Reduce the prices of program-qualified units

___ Increase the stocking or assortment of program-qualified units

___ Discuss the benefits of program-qualified units with contractors

___ Discuss the benefits of program-qualified units with customers

___ Other (Please describe: _____)

Next, I am going to ask you to rate the importance of the various PROGRAM and NON-PROGRAM factors in influencing your decision to recommend this MEASURE to distributors/ customers. Think of the degree of importance as being shown on a scale with equally spaced units from 0 to 10, where 0 means not at all important and 10 means very important, so that an importance rating of 8 shows twice as much influence as a rating of 4.

A4 Using this 0-to-10 scale, please rate the following in terms of their importance in your decision to recommend this MEASURE to ...<%CUSTOMER>.and other customers

Program incentive	Record 0 to 10 score (_____)
Information about the cost-effectiveness of more efficient units	Record 0 to 10 score (_____)
Program promotional materials	Record 0 to 10 score (_____)
Program-provided training of sales staff	Record 0 to 10 score (_____)

Next, I am going to ask you to rate the importance of the PROGRAM in general in influencing your decision to recommend this MEASURE to <%UTILITY's> contractors/distributors/customers.

A5 Using this 0 to 10 scale where 0 is NOT AT ALL IMPORTANT and 10 is EXTREMELY IMPORTANT, how important was the PROGRAM, including incentives as well as program services and information, in influencing your decision to recommend that <%UTILITY's> contractors/distributors/customers purchase the energy efficiency MEASURE at this time?

Record 0 to 10 score (_____) A5A

A5a. Now, if you were given 10 points to award in total, how many points would give to the importance of the program factors as a group and how many points would you give to the non-program factors as a group?

Record 0 to 10 value (_____) A6

A6 And using a 0 to10 likelihood scale where 0 is NOT AT ALL LIKELY and 10 is EXTREMELY LIKELY, if the PROGRAM, including incentives as well as program services and information, had not been available, what is the likelihood that you would have recommended this specific MEASURE to <%UTILITY's> contractors/distributors/customers?

Record 0 to 10 score (_____) A7

A7 Approximately, in what percent of sales situations did you recommend this MEASURE before you learned about the PROGRAM?

% Record PERCENTAGE A8

A8 And approximately in what percent of sales situations do you recommend this MEASURE now that you have worked with the PROGRAM?

% Record PERCENTAGE A8a

A8a In what most important other way has the PROGRAM influenced your recommendations regarding this MEASURE?

RECORD ANSWER HERE:

A8aa Using a 0 to 10 scale, how important was this influence on this recommendation?

Record 0 to 10 score (_____) A8b

A8b. Was there another way the PROGRAM influenced your recommendations regarding this MEASURE?

1 No other way A9a

77 **Record SECOND mention here:**

A8bb Using a 0 to 10 scale, how important was this influence on this recommendation?

Record 0 to 10 score (_____) A9a

A9a Using the same scale as before, how important was the TRAINING SEMINAR provided by <%UTILITY> in your recommendation?

Record 0 to 10 score (_____) A9b

A9b And how important was the information provided by the <%UTILITY> website?
Record 0 to 10 score (_____) A9c

A9c And how important was your firm's past participation in a rebate or audit program sponsored by <%UTILITY>?
Record 0 to 10 score (_____) A10

A10 Approximately, what percentage of your sales over the last 12 months of this...<%MEASURE_TYPE> installed in <%UTILITY>'s service territory are energy efficient models…that qualify for incentives from the program?
% Record PERCENTAGE A11

A11 On a 0 to 100 percent scale, in what percent of sales situations do you encourage your contractors/distributors/customers in <%UTILITY>'s territory to purchase program qualifying ...<%MEASURE_TYPE>...?
% Record PERCENTAGE A11a

IF A11 << 100;
A11a In what situations do you NOT encourage your contractors/distributors/customers to purchase energy efficient models if they qualify for a rebate? Why is that?
RECORD ANSWER HERE:

A12 Of those installations of ...<%MEASURE_TYPE>... in <%UTILITY>'s service territory that qualify for incentives, approximately what percentage do not receive the incentive?
RECORD ANSWER HERE:

IF A12 >> 0;
A13 Why do you think they do not receive the incentive?
RECORD ANSWER HERE:

A14 Do you also sell ...<%MEASURE_TYPE>.. in areas where contractors/distributors/customers do not have access to incentives for energy efficient models?

1 Yes A15
2 No A16

A15 About what percent of your sales of ...<%MEASURE_TYPE> ... are represented by these areas where incentives are not offered?

RECORD ANSWER HERE:

IF A15 >> 10 & A15 << 101;

A15a And approximately what percentage of your sales of this ...<%MEASURE_TYPE>..in these areas are the energy efficient models that would qualify for incentives in <%UTILITY>'s service territory?

RECORD ANSWER HERE:

A16 Have you changed your stocking practices as a result of the <%UTILITY> Program?\,

1 Yes A17

2 No A17

IF A14=1

A17 Do you promote energy efficient models equally in areas with and without incentives?

1 Yes END

2 No END

END Those are all the questions I have for you today. Thank you very much for your time.

END OF SURVEY

APPENDIX C PARTICIPANT ON-SITE SURVEY INSTRUMENT

CPUC 2018 Nonresidential
On-Site Verification Survey Form

General Site Information (from phone survey & IOU tracking database)

Itron SiteID			
Sample Strata		What to Do	
Evaluation		What to	

Corporate (Multi-Site) Name			
Business Name (Tracking			
Actual Business Name			
Service Address			
City		Zip Code	
CORRECTIONS TO SITE INFORMATION			
Revised Corp. (Multi-Site)			
Revised Business Name			
Revised Service Address			
Revised City		Revised Zip	

Site Contact Information

PS Completion Date:	_____	Length (min)	____	Respondent:	____ ____ ____ ____	Date of Install:	_____

	Contacted	Contact Name	Phone Number	Alternate Phone	Email Address
OS Primary	☐				
OS Back-up	☐				
OS Other	☐				

Note: Use the "Contacted" check box to indicate the actual contact(s) for the site visit.

Scheduling Notes/Special Instructions for On-site Visit: _____

_____

Survey Tracking Information

Survey Company:		Assigned Surveyor's Initials:	
Survey Travel Mileage:	miles	Total Travel Time	hrs
Survey Duration (24 hr clock)	Start:	Survey Duration (24 hr clock)	End:
Total Onsite Time	hrs	Total Time to Fill Out Survey Form	hrs

	Date:	• **Initials**
Field survey completed:	__ __ / __ __ / __ __	__ __ __

Survey received from surveyor:	__ __ / __ __ / __ __	__ __ __
Initial QC check completed:	__ __ / __ __ / __ __	__ __ __
Survey sent back to surveyor (*if needed*):	__ __ / __ __ / __ __	__ __ __
Received from surveyor (*if needed*):	__ __ / __ __ / __ __	__ __ __
Itron QC completed:	__ __ / __ __ / __ __	__ __ __
Data entry (DE) completed:	__ __ / __ __ / __ __	__ __ __
Logger extraction DE complete:	__ __ / __ __ / __ __	__ __ __
Follow-up Logger Extraction DE complete:	__ __ / __ __ / __ __	__ __ __

IOU Tracking Data Measure Summary Sheet

This is a summary of all of the measures implemented at this site as extracted from the IOU tracking database. All of the measures listed here should also be found on the measure-level verification forms.

Measure Category	Meas ID	Measure Code	IOU MeasureName	Unit Basis	Rebated # of Units	Reference Meas Code

Lighting Other Description

Measure Code	Revised MeasureName Description	Rebated # of Units

Phone Survey Self-Reported Measure Counts for Calculated kWh Measures

CATI Measure Category-RebatedUnits-UnitBasis	Self Report # of Units

Phone Survey High Bay Information

High Bay?	Max Fixture Height (ft)	Access to fixtures via lift or ladder?

Custom Measure Summary

Meas ID	Measure Name	Measure State	Activity Area	Unit Basis	Qty	Lamps per Fixture	Length	Type	Watts

Site & Business Characteristics

PRIMARY BUSINESS TYPE DESCRIPTION: *(do not leave blank)*	

Phone Survey	**Phone Survey Building Type:**	*FM050*
	Detailed Building Type:	*FM050a-j*

Recent Survey Area Changes: Give a brief description about any changes made to this site since January 2011 that significantly impacted energy usage.		
Percent of Site Lighting Retrofitted: What percent of the site lighting was retrofitted? Describe whether it was almost all of the lighting or just certain areas.		%

Fields in this table will be populated as much as possible with data from the phone survey. However, any fields that are blank should be completed during the on-site verification. Any fields that are incorrect should also be corrected.

Electric Utility	PGE SCE SDGE SMUD LADWP OT _____		
Gas Utility	PGE SCG SDGE AllElec/None Propane LBGO SWG OT _____		
Is this premise owner-occupied (**O**) or leased (**L**)?	*CC4*	Revised	O
How many full-time equivalent employees work at this premise?	*FM070*	Revised	
What is the total occupied floor area of this premise? (exclude prkg garage)	*CC2a / CC2b* ft^2	Revised	_____ ft^2
-- If the premise has an enclosed parking garage, what is the floor area?	_____ ft^2		
What percent of the total floor area is heated or cooled?	*CC2c / CC2d* %	Revised	_____
How many buildings are part of this premise?			
What year was the majority of the facility built?	*CC8*	Revised	
Cooling Type: **1**=No A/C **2**=Split-System **3**=PkgRooftop **4**=PTAC/PTHP **5**=EvapCool **6**=Chiller **7**=IndivAC/HP **8**=WLHP **OT**=Other		Revised	
Heating Fuel Type: **1**=Electric **2**=Gas **3**=Both **4**=Propane **5**=None **OT**=Other		Revised	
What kind of site is this? **P** = Part of a bldg **B** = Single building **SM** = Small multi-building **CM** = Campus (multi-bldg, subsampled bldgs) **OT** = Other _____			
For single, stand-alone buildings or partial buildings: Number of stories/floors			

Premise-Level Schedule Definitions

Standard Holidays *(check all that apply)* ☐ N/A

Indicate below which, if any, standard holidays that the business is closed or operation deviates drastically from normal/typical operations, and indicate on Form BUS_HRS what the holiday operation hours are.

Indicate any additional holidays in the comment block.

New Year's Eve	☐	July 4th Celebrated	☐
New Year's Day	☐	Labor Day	☐
New Year's Day Celebrated	☐	Columbus Day	☐
Martin Luther King Day	☐	Veterans' Day	☐
Presidents' Day	☐	Thanksgiving	☐
St. Patrick's Day	☐	Thanksgiving Friday	☐
Easter Sunday	☐	Christmas Eve	☐
Memorial Day	☐	Christmas Day	☐
Flag Day	☐	Christmas Day Celebrated	☐
July 4th	☐	Caesar Chavez Day	☐
Other (1) _____	☐	Other (2)_____	☐

Seasonal Operation Periods ☐ N/A

Define seasonal operation periods for significant periods of time where business hours and/or equipment operation differs significantly from normal or typical business hours and/or equipment operation. To indicate seasonal operation periods, provide a brief description of the period (e.g. "spring break", "winter break", "summer break", "extended holiday hours"), and list the beginning/ending months (1-12) and days for up to three time periods.

Typical Schedule			Seasonal Time Period					
1			2			3		
Description			Description			Description		
Begin Month/Day			Begin Month/Day			Begin Month/Day		
End Month/Day			End Month/Day			End Month/Day		
Begin Month/Day			Begin Month/Day			Begin Month/Day		
End Month/Day			End Month/Day			End Month/Day		
Begin Month/Day			Begin Month/Day			Begin Month/Day		
End Month/Day			End Month/Day			End Month/Day		

Holiday and Seasonal Operation Comments:

Business Schedule

Primary Business Hours

Define typical operation for <u>all</u> Day Types listed below and specify hours in military time (00 to 24). For partial (i.e. not full) operation days, also indicate the approximate % of full operation as Partial Op %.

Day Type	From Phone Survey	Corrected Business Hours	Closed All Day?	Open 24 hrs?	PartialOp%
Monday	from _____ to _____	from _____ to_____			
Tuesday	from _____ to _____	from _____ to_____			
Wednesday	from _____ to _____	from _____ to_____			
Thursday	from _____ to _____	from _____ to_____			
Friday	from _____ to _____	from _____ to_____			
Saturday	from _____ to _____	from _____ to_____			
Sunday	from _____ to _____	from _____ to_____			
Holidays	from _____ to _____	from _____ to_____			

Seasonal Operation Business Hours – Time Period 2

Day Type	From Phone Survey	Corrected Business Hours	Closed All Day?	Open 24 hrs?	PartialOp%
Monday	from _____ to _____	from _____ to_____			
Tuesday	from _____ to _____	from _____ to_____			
Wednesday	from _____ to _____	from _____ to_____			
Thursday	from _____ to _____	from _____ to_____			
Friday	from _____ to _____	from _____ to_____			
Saturday	from _____ to _____	from _____ to_____			
Sunday	from _____ to _____	from _____ to_____			
Holidays	from _____ to _____	from _____ to_____			

Seasonal Operation Business Hours – Time Period 3

Day Type	Business Hours	Closed All Day?	Open 24 hrs?	PartialOp%
Monday	from _____ to_____	Y N	Y N	
Tuesday	from _____ to_____	Y N	Y N	
Wednesday	from _____ to_____	Y N	Y N	
Thursday	from _____ to_____	Y N	Y N	
Friday	from _____ to_____	Y N	Y N	

Saturday	from _____ to_____	Y N	Y N	
Sunday	from _____ to_____	Y N	Y N	
Holidays	from _____ to_____	Y N	Y N	

Activity Area Definitions

Activity Area ID# Assignments *Identify an Area ID# for each distinct Activity Area type within the surveyed area. Indicate each area on the Site Plan sketch, Form PREM_SKETCH. Also consider lighting system controls and operation when defining these areas.*

Area ID#	Activity Area Code (AA Code)	Surveyor's Description of Area (include floor and Bldg identifiers if needed)	% of Total Premise Floor Area	Windows or Skylights	Conditioned Space Type Code	Total Qty of this Area Type On-site
1				W S		
2				W S		
3				W S		
4				W S		
5				W S		
6				W S		
7				W S		
8				W S		
9				W S		
10				W S		
11				W S		
12				W S		
13				W S		
14				W S		
15				W S		
16				W S		
17				W S		
18				W S		
19				W S		
20				W S		
21				W S		
22				W S		
23				W S		
24				W S		
25				W S		

Conditioned Space Type Codes
CH = Cooled & Heated **CL** = Only Cooled **HT** = Only Heated **ECH** = EvapCooled & Heated **ECL** = Only EvapCool
NU = HVAC present but not used **RF** = Refrigerated **UN** = Unconditioned **OU** = Outside **OT** = Other (describe in comments)

Premise/Site-Plan Sketch

This sketch should provide a high-level view of the premise and its surroundings as it is actually configured. Attach site plans and floor plans available from other sources. Sketch all buildings and the closest streets/roadways in both directions. Mark the orientation of True North. Use multiple sheets/drawings if necessary. Also indicate the "front"or primary entrance for each building. A site map or site plans can be used in place of this, as long as streets can be shown.

Hourly Operation Schedules

Use this form if equipment operation is independent of Business Hours as indicated on Form BUS_HRS. Use one block for each end use. Indicate the applicable daytypes for each day type schedule, and account for all day types including holidays. Specify the % of max. occupancy or equipment-on for all time periods, and be sure to accurately capture transition periods. Pay attention to lighting control type as a separate schedule is needed for different control types.

Hour	12-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12

Schedule #___ End Use:_____ LtgCtrlType:_____ Description_____

Applicable		% Equipment On											
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												

Schedule #___ End Use:_____ LtgCtrlType:_____ Description_____

Applicable		% Equipment On											
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												

Schedule #___ End Use:_____ LtgCtrlType:_____ Description_____

Applicable		**%** Equipment On											
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												

Hourly Operation Schedules

Use this form if equipment operation is independent of Business Hours as indicated on Form BUS_HRS. Use one block for each end use. Indicate the applicable daytypes for each day type schedule, and account for all day types including holidays. Specify the % of max. occupancy or equipment-on for all time periods, and be sure to accurately capture transition periods. Pay attention to lighting control type as a separate schedule is needed for different control types.

Hour	12-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12

Schedule #___ End Use:_____ LtgCtrlType:_____ Description_____

Applicable		% Equipment On											
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												

Schedule #___ End Use:_____ LtgCtrlType:_____ Description_____

Applicable		% Equipment On											
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												

Schedule #___ End Use:_____ LtgCtrlType:_____ Description_____

Applicable		% Equipment On											
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												

Hourly Operation Schedules

Use this form if equipment operation is independent of Business Hours as indicated on Form BUS_HRS. Use one block for each end use. Indicate the applicable daytypes for each day type schedule, and account for all day types including holidays. Specify the % of max. occupancy or equipment-on for all time periods, and be sure to accurately capture transition periods. Pay attention to lighting control type as a separate schedule is needed for different control types.

Hour	12-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12

Schedule #___ End Use:_____ LtgCtrlType:_____ Description_____

Applicable		% Equipment On											
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												

Schedule #___ End Use:_____ LtgCtrlType:_____ Description_____

Applicable		% Equipment On											
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												

Lighting Logger Installation Form

Installation Date		**Extraction Date**	
Installer's Initials		**Extraction Initials**	
Scheduled Extraction Date			

Installation

Logger Serial Number					
Primary or Backup Logger?	P B	P B	P B	P B	P B
Placement Area ID# (ref only)					
Lighting Tech Type (HIM)	**CF LF HID LED HB**	**CF LF HID LED HB**	**CF LF HID LED HB**	**CF LF HID LED HB**	**CF LF HID LED HB**
Logger Placement on Fixture	**I**(nt) **E**(xt) **O**(ther)	**I**(nt) **E**(xt) **O**(ther)	**I**(nt) **E**(xt) **O**(ther)	**I**(nt) **E**(xt) **O**(ther)	**I**(nt) **E**(xt) **O**(ther)
Placement Description Include building, floor, room #, etc. and be descriptive enough that it can be located for extraction.					
Schedule #					

Extraction

Logger Intact? See Legend Belo	**Y N L *P***	**Y N L *P***	**Y N L *P***	**Y N L *P***	**Y N L *P***
Logger Tested "OK" (On/Off)	**Y N** NA	**Y N** NA	**Y N** NA	**Y N** NA	**Y N** NA
% "ON" Time	%	%	%	%	%
Extraction Comments					
Logger Date&Time (HH:MM)					
Computer Date&Time (HH:MM)					
Alternate Extraction Date					

Logger Intact: "Y" – If logger is as originally installed, does not appear to be tampered with, and display indicates the logger is working **Logger Tested "OK"** – If Logger Intact was "Y" then is it properly logging the light ON/OFF, "Y" or "N"? If Logger Intact was "N" use "NA"

Lighting Logger Installation Form (continued)

Use this table to record information for installed measurement devices such as lighting loggers.

Installation

Logger Serial Number					
Primary or Backup Logger?	P B	P B	P B	P B	P B
Placement Area ID# (ref only)					
Lighting Tech Type (HIM)	**CF LF HID LED HB**	**CF LF HID LED HB**	**CF LF HID LED HB**	**CF LF HID LED HB**	**CF LF HID LED HB**
Logger Placement on Fixture	**I**(nt) **E**(xt) **O**(ther)	**I**(nt) **E**(xt) **O**(ther)	**I**(nt) **E**(xt) **O**(ther)	**I**(nt) **E**(xt) **O**(ther)	**I**(nt) **E**(xt) **O**(ther)
Placement Description Include building, floor, room #, etc. and be descriptive enough that it can be located for extraction.					
Schedule #					

Extraction

Logger Intact? (L=Lost/missing)	**Y N L *P***	**Y N L *P***	**Y N L *P***	**Y N L *P***	**Y N L *P***
Logger Tested "OK" (On/Off)	**Y N** NA	**Y N** NA	**Y N** NA	**Y N** NA	**Y N** NA
% "ON" Time	%	%	%	%	%
Extraction Comments					
Logger Date&Time (HH:MM)					
Computer Date&Time (HH:MM)					
Alternate Extraction Date					

Logger Intact: "Y" – If logger is as originally installed, does <u>not</u> appear to be tampered with, and display indicates the logger is working

Logger Tested "OK" – <u>If Logger Intact is "Y"</u> then is it properly logging the light ON/OFF, "Y" or "N"? <u>If Logger Intact is "N"</u> use "NA"

Lighting Logger Installation Form (continued)

Installation

Logger Serial Number					
Primary or Backup Logger?	P B	P B	P B	P B	P B
Placement Area ID# (ref only)					
Lighting Tech Type (HIM)	**CF LF HID LED HB**	**CF LF HID LED HB**	**CF LF HID LED HB**	**CF LF HID LED HB**	**CF LF HID LED HB**
Logger Placement on Fixture	**I**(nt) **E**(xt) **O**(ther)	**I**(nt) **E**(xt) **O**(ther)	**I**(nt) **E**(xt) **O**(ther)	**I**(nt) **E**(xt) **O**(ther)	**I**(nt) **E**(xt) **O**(ther)
Placement Description Include building, floor, room #, etc. and be descriptive enough that it can be located for extraction.					
Schedule #					

Extraction

Logger Intact? (L=Lost/missing)	**Y N L *P***	**Y N L *P***	**Y N L *P***	**Y N L *P***	**Y N L *P***
Logger Tested "OK" (On/Off)	**Y N** NA	**Y N** NA	**Y N** NA	**Y N** NA	**Y N** NA
% "ON" Time	%	%	%	%	%
Extraction Comments					
Logger Date&Time (HH:MM)					
Computer Date&Time (HH:MM)					
Alternate Extraction Date					

Logger Intact: "Y" – If logger is as originally installed, does <u>not</u> appear to be tampered with, and display indicates the logger is working

Logger Tested "OK" – <u>If Logger Intact is "Y"</u> then is it properly logging the light ON/OFF, "Y" or "N"? <u>If Logger Intact is "N"</u> use "NA"

Lighting Logger Installation Form (continued)

Installation

Logger Serial Number					
Primary or Backup Logger?	P B	P B	P B	P B	P B
Placement Area ID# (ref only)					
Lighting Tech Type (HIM)	**CF LF HID LED HB**	**CF LF HID LED HB**	**CF LF HID LED HB**	**CF LF HID LED HB**	**CF LF HID LED HB**
Logger Placement on Fixture	**I**(nt) **E**(xt) **O**(ther)	**I**(nt) **E**(xt) **O**(ther)	**I**(nt) **E**(xt) **O**(ther)	**I**(nt) **E**(xt) **O**(ther)	**I**(nt) **E**(xt) **O**(ther)
Placement Description Include building, floor, room #, etc. and be descriptive enough that it can be located for extraction.					
Schedule #					

Extraction

Logger Intact? (L=Lost/missing)	**Y N L *P***	**Y N L *P***	**Y N L *P***	**Y N L *P***	**Y N L *P***
Logger Tested "OK" (On/Off)	**Y N** NA	**Y N** NA	**Y N** NA	**Y N** NA	**Y N** NA
% "ON" Time	%	%	%	%	%
Extraction Comments					
Logger Date&Time (HH:MM)					
Computer Date&Time (HH:MM)					
Alternate Extraction Date					

Logger Intact: "Y" – If logger is as originally installed, does <u>not</u> appear to be tampered with, and display indicates the logger is working

Logger Tested "OK" – <u>If Logger Intact is "Y"</u> then is it properly logging the light ON/OFF, "Y" or "N"? <u>If Logger Intact is "N"</u> use "NA"

Indoor/Outdoor LED Lamp Lighting Measures

IOU Tracking Data	Measure Category	LED_MeasCategory	
	Engineering Estimation Method	LED_EngEstMethod	
	Measure Code	LED_OS_MeasCode	
	Measure Name	LED_OS_MeasName	
	Rebated #of Units	LED_IOUUnitQtyRebated	
	IOU Unit Basis	LED_IOUUnitBasis	
	Correct Unit Basis (only if incorrect above)		
	Can Rebated measures be clearly identified?	Y N	
Visual Verification Data	Inside or outside lighting?	**I O**	
	Total number of fixtures		
	Number of lamps per fixture		
	Total number of lamps		
	Ltg Application Type Code		
	Fixture Mount Type Code		
	Ltg Control Code		
	Multilevel: Fixture or Lamp switched?	**Y N**	
Verification Counts	**(A) Installed & Operational # of units (ex post quantity)**		
	-- Was subsampling or estimation used?	**Y N**	
	-- # of lamps burned out in partial operation fixtures		
	(B) # of Non-Operable (broken/entire fixture burned-out) Units in place		
	(C) # of Units in Storage/Spares		
	-- Utility rebate sticker observed on packages?	**Y N**	
Physical Inspection Data	*Lamps/fixtures are NOT accessible (Check box & explain in comments)*	☐	
	Number of units physically inspected		
	*If more than one type	**Primary**	***Secondary**
	Lamp Wattage		
	Make/Manufacturer		
	Model/Lamp Code		
	Lamp Shape/Features Code		
	Lamp Base Type Code:	**P M C I MO ADP GU24 OT**	**P M C I MO ADP GU24 OT**
	Installed and OP # of lamps		
Baseline System Summary Data (Observed or Self-Reported)	Is post-installation operation the same as pre-retrofit operation?	**Y N**	**B SC E**
	-- If pre-retrofit operation was different, specify Sched #		
	Lamp Type Code		**B SC E**
	Watts per lamp		**B SC E**
	Number of lamps per fixture		**B SC E**
	Observed versus Rebated # of Units is: E=Equal M=More L=Less OT (describe)	**E M L OT**	
If Disposition Not Equal: Site Contact/Self-Report Questions	Self-Reported # of rebated units onsite (probe for rebated under 10-12)		
	Others purchased since rebated units installed		
	(D) # of units located at Other Affiliated Sites		

Baseline Sources:

- **B** – Baseline equipment (includes physical inspection, documentation, or building/energy management system)
- **SC** – Site Contact
- **E** – Engineering estimate

Failed (and Replaced) Rebated Units (Indirect/Self-Report)	How long did units typically operate before failure (months)?	
	(E) # of rebated units that Failed, but replaced w/ incandescent	
	# of rebated units that Failed but were replaced in-kind (Ref)	
Removed Rebated Units (Indirect/Self-	**(F)** # of rebated units that were Removed and not replaced	
	-- When were the units removed? (month/year if possible)	
	-- Describe why units were removed **in comments**	
	(Sum A-F) Total # of units accounted for on-site	**(reqd)**
Total # of units (A-F) MORE than Rebated # of Units	# that were rebated by other programs/projects?	
	# that were obtained from OTHER means (explain in comments)?	
Total # of units (A-F) LESS than Rebated # of Units	# of rebated units, other site contact explanation (note in comments)	
	# of rebated units, unaccounted for	

LED – Activity Area Assignment Table

Measure Code:_____

Use this table to associate LED # of units to Activity Areas, equipment operation schedules, and lighting loggers. The values in the "Represented # of Units" column must add up to the total # of installed and operational units in the table above.

Area ID #	Sched #	Item #	Primary or Secondary Type	Control type Code	Repres. # of Units	% of Total Inst&Op. Units (Ref)	Primary Logger S/N	Ref. Logger	Back-up Logger S/N	Comments
			P S			%		☐		
			P S			%		☐		
			P S			%		☐		
			P S			%		☐		
			P S			%		☐		
			P S			%		☐		
			P S			%		☐		
			P S			%		☐		
			P S			%		☐		
			P S			%		☐		
			P S			%		☐		
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			P S			%		☐		
			P S			%		☐		
			P S			%		☐		

		%	<= Totals # of Installed & Operational Units check *(no data entry)*

Comments:_____
_____
_____
_____
_____
_____

Baseline Characterization

Please describe why these lights were changed to LEDs instead of any other lighting technology	

Approximate age of existing lighting system prior to retrofit (years)	
Condition of original fixtures prior to retrofit (**G**ood, **F**air, **P**oor)	**G F P**
What % of original fixtures were completely burned out?	
What % of original fixtures were partially burned out?	
On a scale of 1-10, Please rate the following topics on their level of influence for retrofitting the lighting	
Burned out fixtures	
Adequate lighting levels	
Major Renovation / Re-Modeling	
Safety of Occupants	
Productivity of Occupants	
Lowering energy consumption and energy bills	
Long lamp life	
Low maintenance	
Going green	
Utility Incentive	
Other (*describe in comments*)	
Considering all of the influential factors above, in the absence of an energy efficiency rebate program: How long would you have continued to operate the original fixtures before replacing	

Comments: _____

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Indoor/Outdoor LED Hardwired Fixture Lighting Measures

IOU Tracking Data		Measure Category	«OS_MeasGroup_1»	
		Measure Code	«OS_MeasCode_1»	
		Measure Name	«OS_MeasName_1»	
		Rebated #of Units	«OS_MeasQty_1»	
		IOU Unit Basis	*«OS_NormUnit_1»*	
		Correct Unit Basis (if incorrect above above)		
		Can Rebated measures be clearly identified?	Y N	
Visual Verification Data		Inside or outside lighting?	**I O**	
		Ceiling height in ft		
		Fixture height from floor in ft		
		Ltg Application Code		
		Fixture Mount type code		
		Total number of fixtures		
	If LED Linear Tubes or Track lighting fixtures	Fixture Replacement or Lamp Replacement	**FR LP**	
		PREDOMINANT # Lamps per Fixture		
		Total number of lamps		
		Lamp Shape/Features Code		
		If LED **bar, strip, string, or tape**: Provide length (ft)		
		If LED **panel/head**: Provide dimensions (length X width in ft)	Length ____ X ____ Width (ft)	
		If LED **linear fixture:** Fixture dimensions (length X width in ft) and Tube length (ft)	Length ____ X ____ Width (ft)	
		Multilevel: Fixture or Lamp switched?	**Y N**	
Verification Counts		**(A) Installed & Operational # of units (ex post quantity)**		
		-- Was sub sampling or estimation used?	**Y N**	
		-- # of lamps burned out in partial operation fixtures		
		(B) # of Non-Operable (broken/entire fixture burned-out) Units in place		
		(C) # of Rebated Units in Storage/Spares		
Physical Inspection Data[1]		*Check box if Fixtures are NOT accessible (explain in comments)*	☐	
		Number of units physically inspected		
		Fixture Wattage:		
		Fixture Make/Manufacturer		
		Fixture Model Number		
		Ballast Make/Manufacturer		
		Ballast Model Number		
Baseline System Summary		Is post-installation operation the same as pre-retrofit operation?	**Y N**	**B SC E**
		-- If pre-retrofit operation was different, specify Sched #		
		Control type Code		**B SC E**
		Lamp Type Code		**B SC E**
		(If LF Baseline) - Tube Length and Diameter (e.g. 4ft T12)		**B SC E**
		# Lamps/Fixture		**B SC E**
		Lamp Wattage		**B SC E**

[1] If the Unit Basis = Lamp: Provide Lamp information instead of Fixture info

	If **NOT** LF Baseline: Fixture Description (i.e. unique characteristics)		B SC E
Observed versus Rebated # of Units is: E=Equal M=More L=Less OT (describe)			E M L OT

Baseline Sources:

- **B** – Baseline equipment (includes physical inspection, documentation, or building/energy management system)
- **SC** – Site Contact

If Disposition Not Equal: **Site Contact/Self-Report**	Self-Reported # of rebated units onsite (probe for rebated under Others purchased since rebated units installed **(D)** # of units located at Other Affiliated Sites	
Failed (and Replaced) Rebated Units (Indirect/Self-Report)	How long did units typically operate before failure (months)? **(E)** # of rebated units that Failed, but were replaced w/different # of rebated units that Failed but were replaced in-kind (Ref)	
Removed Rebated Units (Indirect/Self-Report)	**(F)** # of rebated units that were Removed and not replaced -- Describe why units were removed **in comments**	
	(Sum A-F) Total # of units accounted for on-site	**(reqd)**
Total # of units (A-F) MORE than Rebated # of Units	# that were rebated by other programs/projects? # that were obtained from OTHER means (explain in	
Total # of units (A-F) LESS than Rebated # of Units	# of rebated units, other site contact explanation (note in # of rebated units, unaccounted for	

LED Fixture - Activity Area Assignment Table (AAAT) **Measure Code: _____**

*Use the AAAT below to associate lighting units to Activity Areas, equipment oper. Schedules, and lighting loggers. The values in the "Represented # of Units" column must add up to the **total # of Installed and Operational** units in the table above.*

- *If ONLY FIXTURE **DENT LL**: Only fill out **AAAT** below.*
- *If **DENT LL & (DENT CT or HOBO)**: Fill out **AAAT** with logger info **&** the **HIGHBAY** Form for Panel Metering*
- *If ONLY **PANEL METERING**: Check **N/A** box and only fill out **HIGHBAY** Form.*

***Circle all that apply:** (If Verify Only, circle 'NA', and fill out AAAT)*

Metering Type:	DENT LL DENT CT HOBO NA

N/A

Area ID #	Sched #	Item #	Control Type Code	Repres. # of Units	% of Total Inst&Op. Units (Ref)	Primary Logger S/N	Ref. Logger	Back-up Logger S/N	Comments
					%		☐		
					%		☐		
					%		☐		
					%		☐		
					%		☐		
					%		☐		
					%		☐		
					%		☐		
					%		☐		
					%		☐		
					%		☐		
					%		☐		
					%	<= Total # of Installed & Operational Units check *(no data entry)*			

Baseline Characterization

Please describe why these lights were changed to LEDs instead of any other lighting technology	

Approximate age of existing lighting system prior to retrofit (years)	
Condition of original fixtures prior to retrofit (**G**ood, **F**air, **P**oor)	**G F P**
What % of original fixtures were completely burned out?	
What % of original fixtures were partially burned out?	
On a scale of 1-10, Please rate the following topics on their level of influence for retrofitting the lighting	
Burned out fixtures	
Adequate lighting levels	
Major Renovation / Re-Modeling	
Safety of Occupants	
Productivity of Occupants	
Lowering energy consumption and energy bills	
Long lamp life	
Low maintenance	
Going green	
Utility Incentive	
Other (*describe in comments*)	
Considering all of the influential factors above, in the absence of an energy efficiency rebate program: How long would you have continued to operate the original fixtures before replacing	

General Comments

Item #	Form Name	Comments

Site Photo Log

Record site photo information here including the PhotoID (i.e. digital file name) and a brief description of the photo where needed. Site Photos should include the site entrance and entire building, rebated measures, and close-up photos of nameplates, lamp codes, and other make/model identification. Refer to the training manual for more on what photos to take. Photo/file naming conventions is SiteID_Item# or SiteID 00# (e.g. PGE_056789_1.jpg, PGE_056789 001.jpg).

Item #	Description/Comments/Measure Code *(no data entry)*
1	
2	
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APPENDIX D SELF-REPORT AND BUSINESS HOUR METHODOLOGY

Are the Lights Really ON? Leveraging a Cost Effective Approach to Estimate Lighting Usage in Nonresidential Buildings

David Gonzales, Itron, Inc., San Diego, CA

Brian McAuley, Itron, Inc., San Diego, CA

ABSTRACT

There are a number of methods by which lighting usage can be estimated within nonresidential buildings. These methods range from the inexpensive, but less accurate – utilizing a facility's business hour schedule – to the more efficient, but more costly – installing onsite monitoring equipment. The difficulty with the first approach is that it ignores the variability in a facility's lighting load shape throughout open hours and does not capture any usage during closed hours or shoulder hours, which generally refer to the hours just before opening and right after closing. The latter approach involves extensive on-site visits that involve the installation of monitoring equipment over a long period of time.

This paper will discuss the methods and findings that were developed from comparing business hours and customer self-reported lighting usage to actual monitored lighting data. These results will provide evaluators with two cost effective methods for obtaining accurate lighting usage estimates within nonresidential buildings. With the self-report method, a ratio (or adjustment factor) of actual logger to self-report usage has been developed for linear and non-linear technologies at the building type and activity area level throughout open business hours. With the second approach, a usage rate (based on actual logger data) has been developed for three periods outside of open hours – an open/closed shoulder rate and a closed rate.

Introduction

This paper discusses methods that evaluators can leverage which are cost effective alternatives to installing onsite monitoring equipment to estimate lighting usage in nonresidential buildings. The paper relies on the results that were garnered from three extensive evaluation studies that were conducted within California. The onsite data collection effort for these studies included the installation of over 3,200 loggers monitoring CFLs and LEDs at more than 900 sites and roughly 5,000 loggers monitoring linear fluorescents at almost 900 sites. Along with the installation of monitoring equipment, auditors also collected business hour schedules from the site contact, including seasonal and holiday hours as well as hourly self-reported estimates of lighting usage by activity area.

This paper will discuss the methods and findings that were developed from comparing business hours and self-reported lighting usage to actual monitored lighting usage. With the self-report method, a ratio (or adjustment factor) of actual logger to self-report usage has been developed for each technology, building type and activity area throughout open business hours. With the second approach, a usage rate (based on actual logger data) has been developed for three periods outside of open hours – an open/closed shoulder rate, which is defined as two hours prior to opening and two hours after close and a closed rate, which is defined as all closed hours not within the shoulder hours.

Background

This paper leverages a method for estimating lighting usage in nonresidential buildings that was first presented at the 2011 IEPEC conference, *"Is the Customer Always Right? Two Cost-Effective Methods for Determining Lighting Usage in Commercial Buildings"* and expands upon those findings by including additional logger data that were collected for three impact evaluations prepared by Itron, Inc. for the California Public Utilities Commission – *2006-2008 Small Commercial Contract Group Direct Impact Evaluation Report* (Sm Com),[1] *2010-2012 Nonresidential Downstream Lighting Impact Evaluation* (NRL)[2] and *2010-2012 LED Impact Evaluation* (LED).[3] The primary purpose of those studies was to evaluate the California investor owned utilities' energy efficiency claims for each of the program periods detailed above. Each of these evaluations involved an extensive statewide phone survey effort and on-site verification as well as time-of-use data collection for several high impact lighting measures, including CFLs, LEDs and linear technologies installed in nonresidential buildings.

Data Sources

The three main sources of on-site data that were used in this paper from the evaluations detailed above were participant business hours, participant self-reported lighting usage and lighting logger data. Participant business hours were collected as part of the initial phone survey and were confirmed by an auditor at the time of the on-site visit. In order to capture any variability in business hour operations throughout the year, the auditor not only collected the open and close time for each day of the week, but they also captured any seasonal operations and holiday schedules.

Self-reported lighting usage was gathered at the time of the on-site visit. Since different activity areas[4] within a building generally have different lighting usage schedules, the site contact was asked to estimate

[1] The Small Com Report can be found at www.CALMAC.org. Study ID: CPU0019.01.

[2] The NRL Report can be found at www.CALMAC.org. Study ID: CPU0078.01.

[3] The LED Report can be found at www.CALMAC.org. Study ID: CPU0101.01.

[4] Activity areas are defined as areas within the facility that have different occupancy and usage patterns. For example, the restroom(s) in a retail establishment may have a different usage pattern throughout business hours than the retail sales area.

the operating schedules for each of the activity areas where rebated measures were installed. The site contact was the individual who met with the surveyor onsite and, typically, was most knowledge about the facility's operations. These self-reported operating hours were collected as the percent of time "ON" per hour for each hour in each day of the week.

The time-of-use data were obtained through the installation of lighting loggers. A technical description of the lighting loggers and the installation/extraction procedures can be found in the NRL Report, Appendix G. Lighting loggers using optical sensors were the predominant type used for these studies, however, when lighting was not accessible, logging was done at the electrical panel where circuit amperage could be collected in order to develop lighting load shapes. As part of the on-site visit, surveyors attempted to log every representative activity area where rebated measures were installed. These loggers were generally in the field for anywhere from four weeks to one year.

Processing of Data

After the loggers were extracted, the data was processed into a percent "ON" per hour format such that the actual lighting usage for each activity area could be compared to the business and self-reported hours of operation. Figure 1 provides a site-specific example of those comparisons. The figure presents the average logger data collected for a typical weekday in the office area of an office building. The vertical axis represents the percent "ON" per hour for that day. The business hours have a value of one when the office building is open and a value of zero during closed hours. Likewise, the site contact self-reported that the lighting within the office area was "ON" eighty percent of the time throughout the open hours.

FIGURE 1: ACTUAL, SELF-REPORTED LIGHTING USAGE AND BUSINESS HOURS FOR A LOGGER MONITORING AN OFFICE

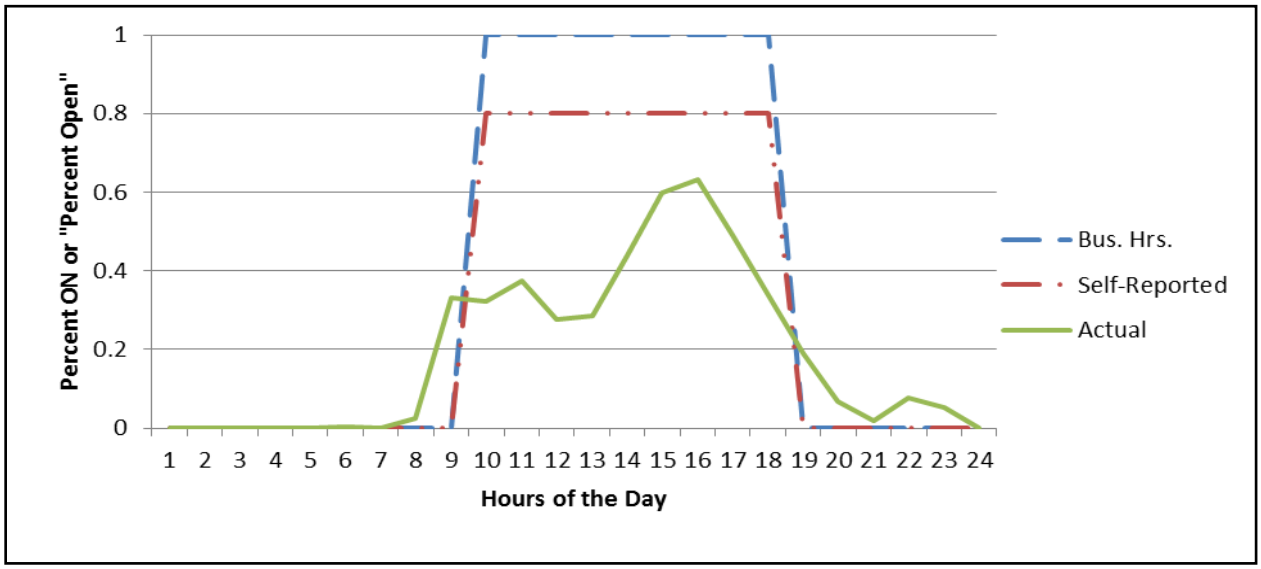


Figure 1 reveals a few important distinctions that, ultimately, represent the motivation behind this analysis. The first is that business hours may not be a reliable proxy to use in developing usage shapes and lighting load impacts. Customer self-reported lighting usage, which was garnered from the on-site visit, is 20 percent less than business hour estimates throughout the open period. The second is that actual lighting usage, which was garnered from monitoring data, is much less than both business hour and self-report estimates throughout open hours and there is significant hourly variability throughout that time frame. The third is that business hours and self-reports (in this case) do not account for any lighting usage throughout time periods prior to open or after close.

However, the intent of this analysis was not to accurately predict lighting usage at a single site, but rather for a large sample of similar technologies, building types and space types. In order to aggregate these adjustments and usage rates, logger data was compared to the business hours of the facility and each self-reported schedule at the facility. As mentioned above, for each hour in each day, four usage periods were generated for each facility – Open, Open Shoulder, Closed Shoulder and Closed. The actual and self-reported usage rates were then calculated for each logger by use period within the site and each logger was aggregated to a site-activity area level by measure. This aggregation only occurred when there was more than one logger installed in similar space types. The aggregation from individual loggers to activity areas was done based on the number of lamps that each logger was monitoring.

Results

Two sets of data were generated from the analysis detailed above – usage rates and adjustment factors. The results from the usage rates can be applied by knowing business operating hours, building type and activity areas and, in the case of the adjustment factors, by knowing the customer self-reported operating schedules which is typically gathered from on-site data collection.

Business Hour Rates

The business hour rates represent the actual average usage found in the logger sample for each use period by technology, building type and activity area. The usage rate represents a constant factor than can be applied to all hours within each use period and includes data from normal operation schedules as well as seasonal operations, where applicable. If a participant had more than one business operating schedule and logger data was collected during those times, the single hourly average usage rate for that logger (for each use period) was developed by weighting the number of days in the year represented in each schedule. Each individual logger was then weighted by the total number of lamps represented by the logger along with the total number of hours associated with each use period.

Table 1 and Table 2 present the results from that aggregation. Building type-activity area combinations for which at least six sites were monitored are included in these tables. The "Other" building type and "Other Miscellaneous" activity area represent all the unique building type or building type-space types where there were less than six sites represented in the sample.

Self-Report Adjustment Factors

The adjustment factor represents the actual monitored usage divided by the self-reported use. Again, these ratios were generated at the technology, building type and activity area level much like the business hour rates, but are applied only for the open period. The reason why adjustment factors were not developed for the shoulder and closed periods is that self-reported usage was often claimed to be zero during these periods. A zero value cannot be adjusted by a multiplicative factor, therefore a constant factor is more appropriate when analyzing the closed and shoulder periods.

Table 1 and Table 2 present the results associated with the adjustment factor analysis. The self-reported usage can then be multiplied by the adjustment factor to generate a proxy percent "ON" value throughout the open hours by technology, building type and activity area. Also presented are the averages by technology and building type alone.

TABLE 1: SELF-REPORTED ADJUSTMENT FACTORS – NON-LINEAR FLUORESCENT

Building Type	Activity Area	Number of Sites	Self-Reported Adjustment		Business Hour Usage Rates		
			Self-Reported Usage	Adjustment Factor	Open Shoulder	Closed Shoulder	Closed
Assembly	Classroom	8	9%	0.53	0.00	0.03	0.01
	Dining	15	57%	0.88	0.25	0.34	0.16
	HallwayLobby	67	69%	0.87	0.35	0.32	0.16
	Kitchen/Break Room	15	34%	0.58	0.14	0.15	0.06
	Office	28	67%	0.53	0.07	0.14	0.05
	OtherMisc	34	58%	0.85	0.18	0.23	0.10
	Recreation	16	39%	0.40	0.05	0.10	0.04
	Religious Worship	31	25%	0.64	0.04	0.09	0.03
	Restrooms	53	35%	0.84	0.18	0.23	0.11
	Storage	38	27%	0.88	0.11	0.11	0.05
	All	**119**	**50%**	**0.79**	**0.17**	**0.21**	**0.09**
Education – Primary/Secondary	OtherMisc	15	70%	0.68	0.04	0.14	0.04
	Restrooms	17	38%	0.97	0.06	0.09	0.03
	Storage	6	28%	0.34	0.02	0.04	0.02
	All	**26**	**60%**	**0.71**	**0.05**	**0.12**	**0.04**
Grocery	OtherMisc	7	70%	0.98	0.64	0.13	0.04
	Storage	6	36%	1.54	0.10	0.10	0.02
	All	**9**	**56%**	**1.13**	**0.43**	**0.12**	**0.04**
Health/Medical-Clinic	Comm/Ind Work	6	36%	0.12	0.00	0.01	0.00
	HallwayLobby	47	82%	0.79	0.29	0.36	0.15
	Kitchen/Break Room	8	43%	0.95	0.75	0.82	0.21
	Office	28	85%	0.49	0.11	0.19	0.03
	OtherMisc	12	55%	0.26	0.04	0.11	0.03
	Restrooms	32	15%	1.04	0.03	0.05	0.01
	Storage	13	9%	3.82	0.06	0.05	0.05
	All	**77**	**52%**	**0.42**	**0.24**	**0.30**	**0.10**
Lodging	Comm/Ind Work	13	28%	1.14	0.05	0.01	0.01
	Dining	10	70%	0.91	0.06	0.18	0.07
	Guest Rooms	93	34%	0.24	0.10	0.05	0.07
	HallwayLobby	55	81%	0.87	0.21	0.19	0.25
	Kitchen/Break Room	12	51%	0.67	0.40	0.27	0.13
	Office	13	81%	0.42	0.05	0.09	0.07
	OtherMisc	13	46%	1.18	0.02	0.06	0.09
	Restrooms	39	32%	0.22	0.16	0.15	0.09
	Storage	13	27%	0.70	0.43	0.22	0.14
	All	**109**	**38%**	**0.36**	**0.11**	**0.08**	**0.08**

Building Type	Activity Area	Number of Sites	Self-Reported Adjustment		Business Hour Usage Rates		
			Self-Reported Usage	Adjustment Factor	Open Shoulder	Closed Shoulder	Closed
Office – Large	HallwayLobby	21	86%	0.85	0.28	0.69	0.42
	Office	6	90%	0.69	0.34	0.44	0.25
	OtherMisc	8	41%	0.68	0.05	0.15	0.08
	Restrooms	11	30%	1.82	0.24	0.37	0.13
	All	**28**	**72%**	**0.87**	**0.26**	**0.53**	**0.31**
Office - Small	Conference Room	9	29%	0.87	0.06	0.11	0.01
	HallwayLobby	47	73%	0.76	0.29	0.33	0.15
	Kitchen/Break Room	12	44%	0.85	0.06	0.08	0.03
	Office	39	82%	0.76	0.07	0.25	0.03
	OtherMisc	13	50%	0.71	0.45	0.17	0.28
	Restrooms	90	19%	0.93	0.06	0.08	0.03
	Storage	22	33%	0.66	0.13	0.14	0.03
	All	**151**	**55%**	**0.77**	**0.16**	**0.20**	**0.08**
Other	OtherMisc	22	54%	0.83	0.24	0.24	0.37
	All	**22**	**54%**	**0.83**	**0.24**	**0.24**	**0.37**
Other Industrial	HallwayLobby	14	88%	0.82	0.13	0.21	0.04
	Office	11	81%	0.57	0.03	0.09	0.04
	OtherMisc	9	48%	0.74	0.19	0.19	0.09
	Restrooms	29	13%	1.32	0.08	0.04	0.01
	Storage	7	25%	0.49	0.06	0.06	0.02
	All	**49**	**63%**	**0.73**	**0.09**	**0.12**	**0.04**
Restaurant	Dining	101	87%	0.91	0.24	0.32	0.06
	HallwayLobby	43	82%	0.80	0.43	0.38	0.29
	Kitchen/Break Room	33	93%	0.90	0.49	0.33	0.11
	Office	16	35%	1.16	0.29	0.27	0.12
	OtherMisc	8	62%	0.92	0.39	0.23	0.12
	Restrooms	70	52%	0.98	0.31	0.31	0.14
	RetailSales	10	94%	0.80	0.40	0.52	0.31
	Storage	54	42%	1.11	0.28	0.19	0.09
	All	**170**	**82%**	**0.90**	**0.30**	**0.34**	**0.12**
Retail – Large	Office	4	97%	0.98	0.61	0.13	0.03
	OtherMisc	6	90%	0.96	0.39	0.51	0.27
	Restrooms	13	35%	1.35	0.25	0.26	0.13
	RetailSales	23	95%	1.02	0.20	0.10	0.02
	Storage	8	33%	0.25	0.07	0.05	0.06
	All	**39**	**95%**	**1.02**	**0.20**	**0.10**	**0.02**

Building Type	Activity Area	Number of Sites	Self-Reported Adjustment		Business Hour Usage Rates		
			Self-Reported Usage	Adjustment Factor	Open Shoulder	Closed Shoulder	Closed
Retail – Small	Auto Repair Workshop	6	80%	0.63	0.19	0.29	0.15
	Comm/Ind Work	9	80%	0.82	0.16	0.06	0.02
	HallwayLobby	23	85%	0.63	0.30	0.28	0.17
	Kitchen/Break Room	9	40%	0.62	0.12	0.13	0.09
	Office	28	64%	1.19	0.39	0.37	0.28
	OtherMisc	14	72%	0.58	0.15	0.19	0.02
	Restrooms	126	15%	1.16	0.05	0.06	0.03
	RetailSales	98	87%	0.98	0.31	0.19	0.09
	Services	9	96%	0.91	0.34	0.43	0.17
	All	**227**	**79%**	**0.96**	**0.27**	**0.19**	**0.10**
Warehouse	OtherMisc	11	83%	0.72	0.10	0.21	0.07
	Restrooms	15	6%	0.90	0.01	0.01	0.00
	All	**24**	**62%**	**0.73**	**0.08**	**0.17**	**0.06**

The results from the adjustment factor analysis for non-linear technologies (CFLs and LEDs) reveal that site contacts generally over-estimate lighting usage in their facilities for most building types. For example, the average overall self-reported lighting usage throughout open hours in office – small was 55 percent. However, the overall adjustment factor is 0.77, which reveals that actual usage, on average, was roughly 25 percent lower.[5] For retail – large, site contacts were generally accurate in predicting usage throughout open hours (1.02 adjustment factor). This was driven predominantly by an almost identical self-report to actual in retail sales areas.

The results from the usage rate analysis reveal that facilities experience measured lighting loads throughout closed hours. The most significant loads come during the two hours prior to opening and two hours after close (the shoulder periods). For example, the average usage for restaurants for each hour in the open and closed shoulder period was 0.30 and 0.34, respectively. Likewise, the usage rate throughout all other closed hours was 0.12 with the most significant load being generated in retail sales areas and hallways/lobbies.

[5] A 42 percent actual divided by the 55 percent self-report yields an adjustment factor of 0.77 throughout open hours.

TABLE 2: SELF-REPORTED ADJUSTMENT FACTORS – LINEAR FLUORESCENT

Building Type	Activity Area	Number of Sites	Self-Reported Adjustment		Business Hour Usage Rates		
			Self-Reported Usage	Adjustment Factor	Open Shoulder	Closed Shoulder	Closed
Assembly	Classroom	30	64%	0.47	0.05	0.12	0.02
	Conference Room	7	55%	0.55	0.14	0.27	0.06
	Dining	14	63%	0.64	0.27	0.11	0.06
	HallwayLobby	32	91%	0.42	0.17	0.33	0.13
	Kitchen/Break Room	31	43%	0.83	0.18	0.22	0.07
	Office	43	66%	0.57	0.26	0.20	0.06
	OtherMisc	28	91%	0.61	0.35	0.33	0.20
	Recreation	21	75%	0.63	0.11	0.26	0.06
	Religious Worship	8	30%	0.31	0.05	0.06	0.04
	Restrooms	23	47%	1.45	0.42	0.47	0.28
	Storage	24	45%	0.78	0.37	0.36	0.15
	All	**70**	**76%**	**0.57**	**0.21**	**0.26**	**0.11**
Education – Primary/Secondary	Classroom	48	76%	0.67	0.03	0.14	0.02
	HallwayLobby	24	78%	1.00	0.22	0.45	0.16
	Kitchen/Break Room	22	62%	0.98	0.22	0.26	0.07
	Office	32	76%	0.91	0.13	0.25	0.06
	OtherMisc	24	76%	0.74	0.11	0.37	0.06
	Restrooms	23	46%	1.24	0.10	0.22	0.04
	Storage	11	10%	1.49	0.02	0.12	0.02
	All	**59**	**74%**	**0.72**	**0.07**	**0.20**	**0.04**
Grocery	OtherMisc	6	84%	0.71	0.09	0.29	0.09
	RetailSales	14	95%	1.01	0.54	0.31	0.16
	Storage	7	73%	0.97	0.33	0.22	0.15
	All	**14**	**91%**	**0.96**	**0.45**	**0.30**	**0.15**
Health/Medical-Clinic	Comm/Ind Work	15	81%	0.79	0.06	0.30	0.04
	HallwayLobby	40	91%	0.89	0.24	0.46	0.18
	Kitchen/Break Room	19	68%	0.87	0.21	0.37	0.05
	Office	44	69%	0.83	0.17	0.29	0.06
	OtherMisc	17	77%	0.52	0.05	0.27	0.01
	Patient Rooms	10	28%	0.51	0.06	0.20	0.02
	Restrooms	15	22%	1.38	0.07	0.17	0.06
	Storage	18	32%	1.18	0.02	0.06	0.02
	All	**54**	**75%**	**0.73**	**0.15**	**0.32**	**0.08**
Laundry	OtherMisc	7	100%	0.93	0.54	0.52	0.34
	All	**7**	**100%**	**0.93**	**0.54**	**0.52**	**0.34**

Building Type	Activity Area	Number of Sites	Self-Reported Adjustment		Business Hour Usage Rates		
			Self-Reported Usage	Adjustment Factor	Open Shoulder	Closed Shoulder	Closed
Office - Large	Comm/Ind Work	6	88%	0.74	0.37	0.54	0.24
	Conference Room	13	33%	0.92	0.04	0.09	0.04
	HallwayLobby	16	94%	0.85	0.43	0.48	0.26
	Kitchen/Break Room	12	82%	0.93	0.36	0.52	0.23
	Office	22	90%	0.77	0.42	0.55	0.25
	OtherMisc	10	44%	1.00	0.32	0.38	0.27
	Storage	11	55%	0.99	0.10	0.12	0.11
	All	**26**	**82%**	**0.80**	**0.39**	**0.51**	**0.24**
Office - Small	Comm/Ind Work	17	79%	0.77	0.14	0.22	0.10
	Conference Room	22	58%	0.80	0.17	0.17	0.02
	Copy Room	11	80%	0.96	0.24	0.16	0.01
	HallwayLobby	52	89%	0.84	0.19	0.21	0.05
	Kitchen/Break Room	38	69%	0.84	0.17	0.23	0.04
	Office	92	82%	0.76	0.14	0.24	0.05
	OtherMisc	16	75%	0.81	0.36	0.22	0.15
	Restrooms	13	40%	0.84	0.05	0.14	0.05
	Storage	34	52%	0.84	0.13	0.10	0.04
	All	**105**	**78%**	**0.79**	**0.16**	**0.22**	**0.05**
Other	OtherMisc	12	40%	1.65	0.18	0.14	0.02
	All	**12**	**40%**	**1.65**	**0.18**	**0.14**	**0.02**
Other Industrial	Auto Repair Workshop	7	92%	0.99	0.47	0.07	0.06
	Comm/Ind Work	83	85%	0.85	0.28	0.32	0.14
	Conference Room	16	9%	0.81	0.00	0.02	0.01
	HallwayLobby	40	83%	0.76	0.33	0.36	0.23
	Kitchen/Break Room	25	56%	1.34	0.20	0.25	0.06
	Office	66	73%	0.90	0.12	0.18	0.05
	OtherMisc	20	66%	0.94	0.10	0.38	0.09
	Restrooms	23	14%	3.27	0.15	0.15	0.08
	RetailSales	6	84%	0.95	0.35	0.30	0.22
	Storage	53	74%	0.88	0.18	0.18	0.08
	All	**133**	**75%**	**0.90**	**0.23**	**0.27**	**0.11**
Restaurant	Dining	19	79%	0.82	0.15	0.20	0.04
	Kitchen/Break Room	21	91%	0.92	0.60	0.57	0.22
	OtherMisc	13	93%	0.90	0.26	0.26	0.03
	Storage	11	79%	0.89	0.52	0.30	0.05
	All	**29**	**85%**	**0.88**	**0.33**	**0.33**	**0.10**

Building Type	Activity Area	Number of Sites	Self-Reported Adjustment		Business Hour Usage Rates		
			Self-Reported Usage	Adjustment Factor	Open Shoulder	Closed Shoulder	Closed
Retail – Large	Auto Repair Workshop	7	78%	1.04	0.50	0.39	0.02
	Comm/Ind Work	6	97%	0.94	0.49	0.49	0.29
	Conference Room	7	18%	1.41	0.05	0.09	0.02
	HallwayLobby	11	96%	0.95	0.77	0.53	0.17
	Kitchen/Break Room	12	80%	0.95	0.47	0.45	0.29
	Office	25	80%	0.96	0.38	0.43	0.14
	OtherMisc	9	93%	0.73	0.58	0.39	0.21
	Restrooms	11	74%	1.28	0.59	0.70	0.44
	RetailSales	32	97%	0.99	0.61	0.58	0.41
	Storage	35	94%	0.61	0.52	0.48	0.31
	All	**51**	**94%**	**0.82**	**0.56**	**0.51**	**0.31**
Retail – Small	Auto Repair Workshop	45	85%	0.88	0.13	0.29	0.03
	Comm/Ind Work	38	94%	0.91	0.25	0.30	0.09
	HallwayLobby	39	84%	0.95	0.15	0.19	0.05
	Kitchen/Break Room	33	81%	0.79	0.17	0.16	0.04
	Office	84	82%	0.84	0.10	0.16	0.01
	OtherMisc	23	84%	0.89	0.17	0.13	0.03
	Restrooms	19	24%	0.91	0.05	0.12	0.02
	RetailSales	104	96%	0.96	0.15	0.15	0.04
	Services	15	93%	0.91	0.27	0.33	0.09
	Storage	75	68%	1.03	0.16	0.22	0.06
	All	**208**	**88%**	**0.93**	**0.16**	**0.20**	**0.04**
Warehouse	Comm/Ind Work	14	91%	0.76	0.24	0.14	0.06
	Conference Room	12	30%	1.04	0.02	0.05	0.01
	HallwayLobby	20	70%	0.73	0.26	0.10	0.04
	Kitchen/Break Room	17	57%	0.90	0.19	0.17	0.05
	Office	44	85%	0.69	0.18	0.13	0.06
	OtherMisc	22	45%	0.76	0.05	0.08	0.02
	Restrooms	17	23%	1.52	0.13	0.13	0.04
	Storage	58	71%	0.83	0.21	0.20	0.06
	All	**87**	**73%**	**0.78**	**0.19**	**0.16**	**0.05**

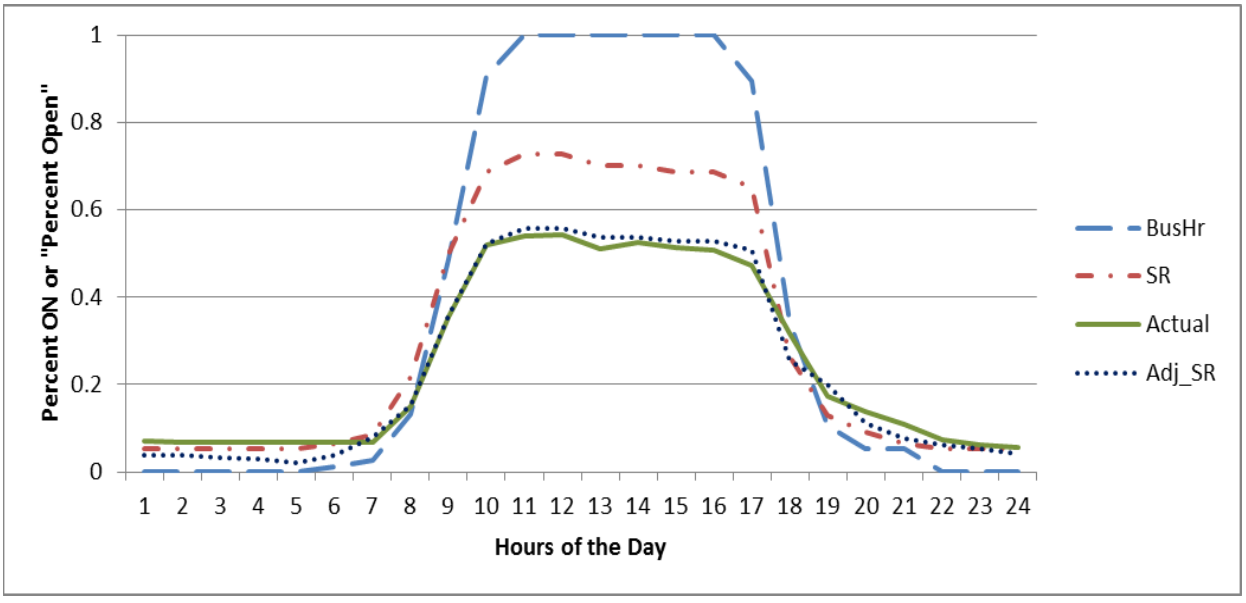
The results from the adjustment factor analysis for linear technologies yield similar results to the non-linear lighting analysis for some building types and different results for others. The similarities and differences result from both the self-reported lighting usage as well as the accuracy of the self-report. For example, the self-reported usage for non-linear and linear technologies throughout open hours were 79 percent and 88 percent, respectively. However, the adjustment factors for each technology (0.96 and 0.93) reveal that sit contacts over-estimated usage by a similar margin.

The results from the business factor analysis for linear technologies also reveal that facilities experience measured lighting loads throughout closed hours. For some building types like retail – large and office – large, those loads are quite substantial.

Application of Results

By applying the adjustment factors to the open time period and the usage rates to the closed and shoulder time periods, 8,760 load shapes can be developed at the measure and activity area level for each building type. As mentioned above, these estimation techniques are meant to be applied to a large sample of sites and are not meant to accurately predict usage at a single site. For the adjustment factors and usage rates, since business hours can vary considerably from one site to another, they are applied to each site in the sample individually and then aggregated together. Figure 2 provides an example of this for a non-linear technology (CFL or LED) installed in an office area of an office building. An adjustment factor of 0.76 was multiplied by the self-reported usage during open hours (from Table 1) and business rates (from Table 1) were applied to the closed and shoulder period for each site. These individual site profiles were then aggregated together to create a population-wide estimate of usage.

FIGURE 2: POPULATION BUSINESS HOURS, SELF-REPORT, ACTUAL USAGE AND SELF-REPORT ADJUSTMENT/ USAGE RATE



Conclusion

These results will provide evaluators with two cost effective methods for obtaining accurate lighting usage estimates within nonresidential buildings. Evaluators can apply these methods by using data collected throughout the on-site verification process. These data include the facility's business hour schedule and the self-reported lighting schedule for each activity area of measure installation. Likewise, evaluators can properly weight the activity area lighting load shapes to the site level by confirming the number of measure installations (by activity area). Evaluators can then apply the adjustment factors to the self-reported usage data collected on-site and apply the usage rates to the business operating hours to develop more reliable estimates of lighting load shapes. Furthermore, since these results are developed at the technology, building type, activity area and use period level, evaluators can better understand lighting operation nuances at a much more disaggregated level than by relying simply on annual operating hour estimates.

References

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Itron, Inc., 2014b. LED Impact Evaluation Report. Prepared for the California Public Utilities Commission, Energy Division.

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APPENDIX E PHONE SURVEY BANNERS

	DOWNSTREAM ALL	DOWNSTREAM PGE_LED_A-LAMP	DOWNSTREAM PGE_LED_ACCENT	DOWNSTREAM PGE_LED_REFLECTOR	DOWNSTREAM SCE_LED_REFLECTOR	DOWNSTREAM SDGE_LED_A-LAMP	DOWNSTREAM SDGE_LED_ACCENT	DOWNSTREAM SDGE_LED_REFLECTOR	MIDSTREAM SCE
<FM050> What is the main business activity at this facility?									
Offices (non-medical)	6.95	0.44	6.44	5.18	29.98	0.00	2.67	18.78	0.00
Restaurant/Food Service	10.43	0.36	0.00	1.26	19.61	5.70	42.35	1.35	10.81
Food Store (grocery/liquor/convenience)	0.53	0.53	0.00	0.00	0.00	4.98	0.00	1.27	0.00
Retail Stores	13.64	2.40	0.00	48.44	3.37	0.00	0.84	4.28	2.04
Health Care	0.70	0.00	0.00	0.00	13.20	0.90	1.42	0.00	0.00
Education	0.37	0.00	0.00	0.00	0.00	0.00	0.00	1.78	1.03
Lodging (hotel/rooms)	20.44	84.26	0.00	0.00	0.00	0.00	0.00	0.00	63.18
Public Assembly (church, fitness, theatre, library, museum, convention)	5.36	5.14	7.12	0.00	1.61	52.66	5.71	5.80	5.00
Services (hair, nail, massage, spa, gas, repair)	0.69	0.29	0.00	0.54	8.35	1.83	0.35	0.60	0.00
Industrial (food processing plant, manufacturing)	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.00
Condo Assoc./Apartment Mgr (Garden Style, Mobile Home Park, High-rise, Townhouse)	0.29	0.00	0.00	0.00	0.00	10.97	0.00	0.00	0.00
Agricultural (farms, greenhouses)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.94
Other	40.53	6.58	86.44	44.59	23.87	22.96	46.65	65.79	15.00
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	12
<CC2A> What is the total square footage at this facility?									
Less Than 1500 sq ft.	2.27	0.67	0.00	2.73	9.42	3.59	3.39	1.68	2.04
Between 1500 and 5000 sq ft.	16.19	2.69	35.96	33.49	12.45	32.22	20.02	2.81	1.31
Between 5000 and 10,000 sq ft.	11.24	1.29	2.73	30.73	17.74	4.28	2.19	10.58	20.94
Between 10,000 and 25,000 sq ft.	12.36	2.15	4.28	12.94	12.88	0.00	16.30	22.32	12.40
Between 25,000 and 50,000 sq ft.	2.93	0.33	7.12	1.98	0.00	0.25	2.51	7.50	9.11
Between 50,000 and 75,000 sq ft.	0.37	0.00	0.00	0.00	0.00	0.00	0.00	1.78	0.00
Between 75,000 and 100,000 sq ft.	4.30	0.00	5.69	0.00	0.00	0.00	19.19	0.00	0.00
Over 100,000 sq ft. (Ag area)	50.35	92.87	44.21	18.13	47.50	59.67	36.39	53.33	54.20
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	*12*
<CC3> Would you say that the floor area is...?									
Less than 1,500 sq. ft.	0.44	0.00	0.00	11.34	3.39	1.52	0.00	0.00	0.00
1,500 - 5,000 sq. ft.	3.94	1.72	0.00	60.75	4.35	9.55	4.77	1.31	0.00
5,000 - 10,000 sq. ft.	6.43	0.11	0.00	27.92	70.48	0.00	18.79	1.95	0.00
10,000 - 25,000 sq. ft.	32.63	56.46	6.73	0.00	0.00	0.00	27.77	0.00	0.00
25,000 - 50,000 sq. ft.	19.26	38.33	0.00	0.00	0.00	0.00	0.00	2.10	77.93
50,000 - 75,000 sq. ft.	0.38	0.00	0.00	0.00	0.00	0.00	0.00	1.72	0.00
Over 100,000 sq. ft. (Ag area)	20.02	0.00	0.00	0.00	0.00	0.00	0.61	91.47	0.00
REFUSED	0.23	0.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DON'T KNOW	16.67	2.90	93.27	0.00	21.78	88.93	48.06	1.44	22.07
n	*51*	*13*	*2*	*6*	*8*	*4*	*10*	*8*	3
<CC2C> Is the entire floor area of this facility heated or cooled?									
Yes	67.43	48.92	53.64	65.58	53.18	89.07	67.74	92.24	85.07
No	32.33	50.64	46.36	34.42	46.82	10.52	32.26	7.14	14.93
REFUSED	0.17	0.44	0.00	0.00	0.00	0.00	0.00	0.29	0.00
DON'T KNOW	0.08	0.00	0.00	0.00	0.00	0.41	0.00	0.34	0.00
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	*12*

	DOWNSTREAM ALL	DOWNSTREAM PGE_LED_A-LAMP	DOWNSTREAM PGE_LED_ACCENT	DOWNSTREAM PGE_LED_REFLECTOR	DOWNSTREAM SCE_LED_REFLECTOR	DOWNSTREAM SDGE_LED_A-LAMP	DOWNSTREAM SDGE_LED_ACCENT	DOWNSTREAM SDGE_LED_REFLECTOR	MIDSTREAM SCE
<CC2D> What percentage of the floor area is heated or cooled at this facility?									
Less Than 15 percent	69.10	94.03	90.69	31.31	54.18	58.01	66.65	81.15	0.00
15-30 percent	11.12	4.62	0.00	24.24	3.39	18.58	9.81	13.82	0.00
30-45 percent	0.61	0.20	0.00	0.39	0.00	23.41	0.00	5.03	19.70
45-60 percent	2.18	1.16	0.00	0.00	42.43	0.00	0.00	0.00	0.00
60-80 percent	13.23	0.00	9.31	44.06	0.00	0.00	5.87	0.00	0.00
80-100 percent	3.77	0.00	0.00	0.00	0.00	0.00	17.67	0.00	19.90
DON'T KNOW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	60.40
n	*69*	*15*	*4*	*12*	*8*	*5*	*13*	*12*	3
<CC3A> Is your space heated using electricity or gas or something else?									
Electricity	32.79	12.47	64.45	44.43	42.44	97.86	33.90	19.58	52.03
Gas	18.38	9.32	19.74	33.43	35.96	2.15	24.65	1.54	47.98
Both electricity and gas	47.91	77.13	14.52	21.19	21.61	0.00	39.73	78.68	0.00
Propane	0.36	0.66	0.00	0.95	0.00	0.00	0.00	0.00	0.00
Other	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
DON'T KNOW	0.51	0.42	1.29	0.00	0.00	0.00	1.72	0.00	0.00
n	*139*	*30*	*8*	*28*	*14*	*11*	*21*	*27*	*11*
<C0> About what percentage of your operating costs does energy account for?									
Less than 1 percent	1.22	1.72	2.94	1.51	5.33	2.46	0.35	0.18	0.00
1-2 percent	33.25	82.10	3.48	35.00	12.67	0.00	16.73	3.30	0.00
3-5 percent	10.03	2.40	7.12	21.35	13.62	0.00	7.19	9.78	44.28
6-10 percent	4.46	0.05	5.69	3.83	13.71	0.25	11.84	1.85	0.00
11-15 percent	2.03	0.00	42.04	2.34	0.00	0.00	0.00	0.00	0.00
16-20 percent	9.66	1.50	1.34	11.26	1.59	2.14	29.29	0.61	10.37
21-50 percent	4.82	0.37	34.41	0.00	0.00	0.00	0.19	16.75	0.00
Over 50 percent	1.42	1.37	0.00	2.72	5.44	0.00	0.00	1.27	0.00
REFUSED	0.18	0.44	0.00	0.00	0.00	0.00	0.35	0.00	0.00
DON'T KNOW	32.93	10.06	2.98	22.01	47.65	95.15	34.05	66.27	45.36
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	*12*
<CC4> Does your organization own, lease, or manage the facility?									
Own	60.87	93.15	22.80	28.38	16.28	78.56	54.35	78.33	65.34
Lease/Rent	36.11	6.42	35.96	71.62	83.72	21.03	44.09	16.20	34.66
Manage	1.14	0.00	0.00	0.00	0.00	0.00	0.00	5.48	0.00
REFUSED	0.18	0.44	0.00	0.00	0.00	0.00	0.35	0.00	0.00
DON'T KNOW	1.70	0.00	41.24	0.00	0.00	0.41	1.20	0.00	0.00
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	*12*
<C5> How many locations does your organization have. Is it....?									
This facility only	59.60	14.46	50.13	76.82	49.99	71.61	63.60	89.03	68.18
2 to 4 locations	23.98	48.60	8.63	10.30	4.83	15.18	35.27	6.16	0.44
5 to 10 locations	3.66	0.38	0.00	12.87	0.00	1.83	0.78	0.91	14.87
11 to 25 locations	9.71	36.12	0.00	0.00	10.12	10.97	0.00	1.78	1.03
more than 25 locations	1.31	0.00	0.00	0.00	35.07	0.00	0.00	1.53	15.48
REFUSED	1.74	0.44	41.24	0.00	0.00	0.41	0.35	0.59	0.00
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	12

	DOWNSTREAM ALL	DOWNSTREAM PGE_LED_A-LAMP	DOWNSTREAM PGE_LED_ACCENT	DOWNSTREAM PGE_LED_REFLECTOR	DOWNSTREAM SCE_LED_REFLECTOR	DOWNSTREAM SDGE_LED_A-LAMP	DOWNSTREAM SDGE_LED_ACCENT	DOWNSTREAM SDGE_LED_REFLECTOR	MIDSTREAM SCE
<CC6> How active a role does your organization take in making purchase decisions related to energy using equipment at this facility? Would you say you are...									
Very active - involved in all phases and have veto power	82.66	56.03	100.00	95.96	77.39	94.59	81.26	95.72	97.96
Somewhat active - we approve decisions and provide some input and review	14.10	38.34	0.00	2.82	1.59	2.14	17.19	1.57	2.04
Slightly active - we have a voice but it's not the dominant voice	1.66	1.42	0.00	1.22	17.65	2.86	0.00	2.12	0.00
Not active at all - our firm doesn't get involved in these issues	0.35	0.00	0.00	0.00	3.37	0.00	1.20	0.00	0.00
REFUSED	0.32	0.44	0.00	0.00	0.00	0.41	0.35	0.59	0.00
DON'T KNOW	0.92	3.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	*12*
<CC7> Does your firm have a maintenance company that you use to maintain any of your building systems such as lighting, HVAC, refrigeration, or food service equipment?									
Yes	30.65	1.23	12.81	29.42	37.94	28.95	65.60	32.69	58.03
No	67.02	93.70	87.19	70.08	59.21	70.64	30.96	66.56	31.60
REFUSED	0.44	0.96	0.00	0.00	0.00	0.41	0.35	0.59	0.00
DON'T KNOW	1.89	4.12	0.00	0.50	2.84	0.00	3.08	0.15	10.37
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	*12*
<CC12A> In what year was this organization established at this location?									
After 2010	34.86	81.26	40.88	9.02	15.87	5.68	37.92	13.47	75.71
Between 2006 and 2010	4.46	4.18	41.24	1.82	17.28	11.92	0.00	3.67	0.00
Between 2000 and 2005	10.30	0.81	5.69	18.03	11.57	13.49	5.66	17.18	2.89
In the 1990s	4.86	0.60	0.00	10.50	19.22	0.90	0.00	7.50	10.37
In the 1980s	7.72	1.81	2.98	16.90	12.60	0.00	10.30	2.27	0.00
In the 1970s	3.55	0.81	0.00	3.88	22.63	0.00	5.72	2.55	0.00
In the 1960s or	10.67	1.51	7.12	16.52	0.00	67.59	19.75	0.00	5.12
Before 1960	19.96	4.45	1.34	22.29	0.00	0.00	12.69	50.98	5.91
DON'T KNOW	1.23	4.22	0.00	0.00	0.00	0.41	0.35	0.59	0.00
REFUSED	2.39	0.34	0.75	1.05	0.84	0.00	7.60	1.78	0.00
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	12
<CC12B> Would you say it was...									
Between 2000 and 2005	7.10	0.00	0.00	0.00	0.00	0.00	15.12	0.00	0.00
In the 1990s	12.57	0.00	100.00	10.90	0.00	0.00	23.59	0.00	0.00
In the 1970s	6.90	0.00	0.00	40.97	0.00	0.00	0.00	29.13	0.00
Before 1960	34.39	7.52	0.00	0.00	0.00	0.00	56.84	39.47	0.00
DON'T KNOW	4.06	0.00	0.00	0.00	100.00	0.00	0.00	24.93	0.00
REFUSED	34.97	92.48	0.00	48.13	0.00	100.00	4.46	6.47	0.00
n	*18*	*3*	*1*	*3*	*1*	*1*	*5*	*4*	*0*
<BC090> Has the square footage of the facility increased, decreased or remained the same since January 2016?									
Increase in square footage	2.41	0.22	5.69	8.34	1.53	2.46	0.00	0.00	1.03
Decrease in square footage	9.24	0.00	0.00	0.00	0.00	0.00	0.00	44.21	0.00
Stayed the same	86.83	95.56	94.31	91.66	98.47	97.13	98.44	55.05	98.97
REFUSED	1.27	4.22	0.00	0.00	0.00	0.41	0.35	0.74	0.00
DON'T KNOW	0.26	0.00	0.00	0.00	0.00	0.00	1.20	0.00	0.00
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	*12*

	DOWNSTREAM ALL	DOWNSTREAM PGE_LED_A-LAMP	DOWNSTREAM PGE_LED_ACCENT	DOWNSTREAM PGE_LED_REFLECTOR	DOWNSTREAM SCE_LED_REFLECTOR	DOWNSTREAM SDGE_LED_A-LAMP	DOWNSTREAM SDGE_LED_ACCENT	DOWNSTREAM SDGE_LED_REFLECTOR	MIDSTREAM SCE
<BC100> How many square feet were added?									
1000	87.79	0.00	0.00	100.00	0.00	100.00	0.00	0.00	0.00
1500	9.98	0.00	100.00	0.00	100.00	0.00	0.00	0.00	0.00
2000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
DON'T KNOW	2.23	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
n	*5*	*1*	*1*	*1*	*1*	*1*	*0*	*0*	*1*
<BC120> In what year did this <BC090> occur?									
2016	2.25	0.00	100.00	0.00	0.00	100.00	0.00	0.00	0.00
2017	97.29	0.00	0.00	100.00	100.00	0.00	0.00	100.00	100.00
DON'T KNOW	0.46	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
n	*7*	*1*	*1*	*1*	*1*	*1*	*0*	*2*	*1*
<V1> Did you use a contractor/vendor to install any of the the energy efficient measures that were purchased through the program?									
Yes	59.09	12.64	52.31	72.56	57.62	74.68	87.78	67.20	59.51
No	39.63	87.14	44.71	27.44	39.01	25.32	9.07	31.11	40.05
DON'T KNOW	1.28	0.22	2.98	0.00	3.37	0.00	3.15	1.69	0.44
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	*12*
<V2> How did you come into contact with the contractor/vendor?									
They contacted you	55.14	50.93	4.10	81.39	100.00	13.31	64.86	17.02	81.13
You contacted them	34.00	30.71	5.62	18.61	0.00	0.55	21.86	82.76	17.42
You had worked with them before	2.84	4.11	79.40	0.00	0.00	0.94	0.52	0.00	0.00
Other	1.62	14.26	10.88	0.00	0.00	14.70	0.00	0.23	1.45
DON'T KNOW	6.40	0.00	0.00	0.00	0.00	70.51	12.76	0.00	0.00
n	*110*	*24*	*6*	*25*	*12*	*8*	*16*	*19*	*6*
<V2A> In relation to this project, did the vendor/contractor approach you about your energy efficient equipment retrofit/installation?									
Yes	6.92	0.00	0.00	0.00	0.00	100.00	100.00	0.00	0.00
No	73.30	31.96	82.85	0.00	0.00	0.00	0.00	0.00	0.00
DON'T KNOW	19.78	68.04	17.15	0.00	0.00	0.00	0.00	0.00	0.00
n	*7*	*3*	*2*	*0*	*0*	*1*	*1*	*0*	*0*
<V2B> On a scale of 0 - 10, with 0 being NOT AT ALL LIKELY and 10 is VERY LIKELY, how likely is it that your organization would have installed this new equipment had the contractor/vendor not contacted you?									
0 NOT AT ALL LIKELY	53.66	44.14	37.50	55.44	67.19	69.95	51.23	50.88	2.13
1	0.75	15.73	0.00	0.00	0.00	0.00	0.00	0.00	87.49
2	1.76	3.34	0.00	0.00	0.00	20.13	0.78	15.56	0.00
3	1.96	0.00	0.00	2.16	0.00	0.00	1.08	8.18	0.00
4	16.44	0.00	62.50	21.86	0.00	0.00	17.61	0.00	0.00
5	16.30	19.85	0.00	6.10	10.90	0.00	28.51	19.38	6.15
6	0.14	0.00	0.00	0.15	0.00	0.00	0.00	1.04	4.23
7	4.95	6.81	0.00	9.76	0.00	0.00	0.80	0.00	0.00
8	1.47	1.54	0.00	2.66	4.36	0.00	0.00	0.00	0.00
10 VERY LIKELY	2.37	4.55	0.00	1.87	17.56	9.92	0.00	4.97	0.00
DON'T KNOW	0.19	4.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
n	*86*	*17*	*2*	*22*	*12*	*5*	*14*	*14*	4

	DOWNSTREAM ALL	DOWNSTREAM PGE_LED_A-LAMP	DOWNSTREAM PGE_LED_ACCENT	DOWNSTREAM PGE_LED_REFLECTOR	DOWNSTREAM SCE_LED_REFLECTOR	DOWNSTREAM SDGE_LED_A-LAMP	DOWNSTREAM SDGE_LED_ACCENT	DOWNSTREAM SDGE_LED_REFLECTOR	MIDSTREAM SCE
<V3> Did the contractor/vendor tell you about or recommend the program?									
Yes	67.97	49.38	94.38	77.59	88.41	28.08	87.24	33.93	82.58
No	27.55	50.62	5.62	21.18	9.45	71.92	0.00	66.07	17.42
DON'T KNOW	4.48	0.00	0.00	1.24	2.14	0.00	12.76	0.00	0.00
n	*110*	*24*	*6*	*25*	*12*	*8*	*16*	*19*	*6*
<V4> Prior to coming into contact with the contractor/vendor, did your organization have plans to replace/install this equipment?									
Yes	39.14	11.70	11.53	39.54	24.78	1.96	39.66	63.48	10.20
No	58.45	88.30	88.47	60.46	75.22	98.04	54.43	36.52	89.80
DON'T KNOW	2.41	0.00	0.00	0.00	0.00	0.00	5.91	0.00	0.00
n	*86*	*13*	*5*	*21*	*10*	*6*	*15*	*16*	*5*
<V4A> Using the same scale of 0 - 10 as before, how likely is it that your organization would have installed the new energy efficient equipment had the contractor/vendor not recommended it?									
0 NOT AT ALL LIKELY	34.60	28.93	71.33	25.84	70.57	35.49	38.39	24.68	8.00
1	2.33	30.32	0.00	0.75	0.00	0.00	0.00	7.80	85.95
2	0.76	3.45	0.00	0.00	0.00	10.21	0.00	4.10	0.00
3	3.32	16.22	2.72	4.26	0.00	52.33	0.81	0.67	0.00
4	6.53	0.00	0.00	0.00	0.00	0.00	16.04	0.00	0.00
5	17.81	3.73	0.00	39.89	1.64	1.96	5.91	12.21	0.00
6	0.24	0.00	0.00	0.00	0.00	0.00	0.60	0.00	0.00
7	7.89	0.00	0.00	22.93	0.00	0.00	0.00	0.00	0.00
8	0.22	0.00	0.00	0.16	0.00	0.00	0.00	1.36	0.00
9	5.38	0.00	0.00	0.00	0.00	0.00	13.20	0.00	0.00
10 VERY LIKELY	20.60	11.70	25.95	6.17	24.78	0.00	25.06	49.17	6.05
DON'T KNOW	0.32	5.66	0.00	0.00	3.00	0.00	0.00	0.00	0.00
n	*86*	*13*	*5*	*21*	*10*	*6*	*15*	*16*	5
<V4B> Using the same scale, how likely is it that your organization would have installed the energy efficient equipment with the same level of efficiency if the contractor/vendor had not recommended to do so?									
0 NOT AT ALL LIKELY	45.55	26.46	85.76	52.04	79.97	87.83	37.54	30.56	2.09
1	2.01	46.54	0.00	0.75	0.00	0.00	0.00	0.00	85.95
2	2.47	3.45	0.00	4.98	0.00	10.21	0.00	4.10	0.00
3	5.57	0.00	2.72	0.00	0.00	0.00	13.20	0.67	0.00
4	7.89	0.00	0.00	22.93	0.00	0.00	0.00	0.00	1.76
5	14.93	0.00	0.00	0.33	6.57	0.00	32.41	11.64	4.16
6	6.86	0.00	0.00	0.00	0.00	0.00	16.85	0.00	0.00
7	0.49	0.00	11.53	0.00	0.00	0.00	0.00	0.00	0.00
8	0.06	0.00	0.00	0.16	0.00	0.00	0.00	0.00	0.00
10 VERY LIKELY	7.61	17.90	0.00	18.82	0.00	0.00	0.00	3.85	6.05
DON'T KNOW	6.56	5.66	0.00	0.00	13.47	1.96	0.00	49.17	0.00
n	*86*	*13*	*5*	*21*	*10*	*6*	*15*	*16*	5

	DOWNSTREAM ALL	DOWNSTREAM PGE_LED_A-LAMP	DOWNSTREAM PGE_LED_ACCENT	DOWNSTREAM PGE_LED_REFLECTOR	DOWNSTREAM SCE_LED_REFLECTOR	DOWNSTREAM SDGE_LED_A-LAMP	DOWNSTREAM SDGE_LED_ACCENT	DOWNSTREAM SDGE_LED_REFLECTOR	MIDSTREAM SCE
<V40> On a scale of 0 - 10, with 0 being not at all important and 10 being very important, how important was the input from the contractor you worked with in deciding which specific equipment to install?									
0 Not at all important	1.28	25.22	1.63	0.00	7.33	0.00	0.00	0.00	0.00
3	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.83	0.00
5	0.99	0.00	0.00	0.00	0.00	0.00	0.00	8.32	0.00
6	7.95	0.00	0.00	23.09	0.00	0.00	0.00	0.00	0.00
7	4.64	0.00	11.53	4.05	0.00	0.00	6.75	0.00	0.00
8	14.40	0.00	0.00	0.98	4.93	0.00	28.91	17.78	2.09
9	3.25	0.00	2.72	6.75	0.00	0.00	1.99	0.00	85.95
10 VERY IMPORTANT	65.77	74.78	84.13	63.16	62.31	96.64	62.35	73.07	11.96
DON'T KNOW	1.64	0.00	0.00	1.97	25.44	3.36	0.00	0.00	0.00
n	*86*	*13*	*5*	*21*	*10*	*6*	*15*	*16*	5
<AP9> How did you FIRST learn about <UTILITY>'s program?									
Bill insert	4.59	0.30	0.00	17.57	0.00	0.00	0.00	0.00	0.00
Program literature	0.82	0.00	0.00	3.20	0.00	0.00	0.00	0.00	0.00
Account representative	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.03
Program approved vendor	0.10	0.00	0.00	0.00	0.00	0.00	0.51	0.00	0.00
Program representative	0.10	0.00	2.73	0.00	0.00	0.00	0.00	0.00	5.12
Utility or program website	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trade publication	0.14	0.00	0.00	0.00	0.00	0.00	0.71	0.00	0.00
Conference	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Newspaper article	0.01	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Word of mouth	2.83	0.05	9.17	9.31	2.55	0.00	0.00	0.10	0.00
Previous experience with it	11.65	46.41	0.00	0.00	0.00	0.00	0.00	0.21	0.00
Company used it at other locations	0.02	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00
Contractor	1.54	0.37	0.00	2.28	20.19	2.92	0.73	0.21	0.00
Result of an audit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Part of a larger expansion or remodeling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No other sources	73.64	52.86	49.60	66.66	58.85	94.90	86.26	99.49	93.86
Other	4.36	0.00	41.98	0.00	14.98	2.18	11.78	0.00	0.00
REFUSED	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DON'T KNOW	0.33	0.00	0.00	0.90	3.43	0.00	0.00	0.00	0.00
n	*170*	*35*	*10*	*35*	*19*	*13*	*25*	*33*	12
<A3A> According to our records, your organization installed <LT_QTY_n> <LT_MEAS_n> through <UTILITY>'s program, is this correct?									
Yes - Quantity is Correct	96.14	97.77	98.66	95.17	88.34	92.84	99.68	92.81	96.00
Installed Different Quantity	3.86	2.23	1.34	4.83	11.66	7.16	0.32	7.19	4.00
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	*12*
<A3A_OTH> Would you say that the number of <LT_MEAS_n> installed are...									
50 - 100 units	48.46	0.00	0.00	0.00	0.00	0.00	0.00	100.00	100.00
More than 100 units	51.54	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
n	*2*	*1*	*0*	*0*	*0*	*0*	*0*	*1*	*1*
<Deem_install_date1_nu> Our records indicate that your organization installed <LT_MEAS_n> on <DEEM_INSTALL_DATE_n>. Is this correct?									
Yes	95.27	99.14	99.25	87.13	91.65	92.16	97.17	98.65	79.06
No	3.43	0.00	0.00	12.87	0.00	0.00	1.27	0.00	20.94
REFUSED	0.13	0.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DON'T KNOW	1.17	0.34	0.75	0.00	8.35	7.84	1.56	1.35	0.00
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	*12*

	DOWNSTREAM ALL	DOWNSTREAM PGE_LED_A-LAMP	DOWNSTREAM PGE_LED_ACCENT	DOWNSTREAM PGE_LED_REFLECTOR	DOWNSTREAM SCE_LED_REFLECTOR	DOWNSTREAM SDGE_LED_A-LAMP	DOWNSTREAM SDGE_LED_ACCENT	DOWNSTREAM SDGE_LED_REFLECTOR	MIDSTREAM SCE
<Deem_install_year1> In what year did you install <LT_MEAS_n>?									
2017	5.76	0.00	0.00	0.00	0.00	0.00	44.98	0.00	0.00
2018	78.47	100.00	100.00	100.00	100.00	0.00	12.53	0.00	0.00
DON'T KNOW	15.77	0.00	0.00	0.00	0.00	100.00	42.49	100.00	100.00
n	*11*	*2*	*1*	*1*	*1*	*2*	*3*	*1*	*1*
<Deem_install_month1> And what month?									
December	79.41	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00
Spring	5.94	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00
REFUSED	3.17	60.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DON'T KNOW	11.48	39.68	100.00	0.00	0.00	0.00	100.00	0.00	0.00
n	*7*	*2*	*1*	*1*	*1*	*0*	*2*	*0*	*0*
<LI20A> What type of lighting was removed and replaced when you installed <LT_MEAS_n> through the program?									
High performance T8 (1' diameter bulbs)	0.09	0.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00
T8 fluorescent fixtures (1' diameter bulbs)	44.85	51.47	82.68	10.41	12.62	54.61	37.65	81.86	10.13
T10 fluorescent fixtures	8.25	0.11	0.00	25.27	18.11	0.00	0.00	7.23	0.00
T12 Fixtures (1.5' diameter bulbs)	13.10	0.44	0.75	0.00	0.00	2.46	0.00	61.73	14.14
Compact HID (High Density Discharge) Fixtures LI21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Screw-in Modular CFLs	14.51	45.31	0.00	14.31	0.00	0.00	0.00	0.00	44.28
Hardwire CFL Fixtures	0.04	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Incandescent	22.76	45.55	81.35	22.24	34.37	6.75	6.17	4.61	54.75
CFL Exit Signs	2.16	0.00	0.00	0.00	0.00	0.00	10.11	0.00	0.00
LED Exit Signs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Halogen bulbs	5.85	0.26	7.12	4.80	0.00	0.00	16.75	3.72	52.60
Reflectors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Electronic Ballast	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Magnetic Ballast	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Manual Switches	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lighting Controls, Time Clock	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lighting Controls, Occupancy Sensor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lighting Controls, Bypass/Delay Timers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lighting Controls, Photocell	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Fluorescent	6.92	0.54	0.00	13.08	12.88	11.68	13.47	0.15	1.03
Fat/Thick Tubes	0.89	1.05	0.00	1.82	0.00	0.00	0.88	0.00	3.39
Skinny/Thin Tubes	9.51	35.65	7.12	1.40	1.53	0.00	0.45	0.65	0.86
T5 Fixtures (5/8' diameter)	0.09	0.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Screw-in LEDs	2.98	0.15	0.00	9.17	0.00	0.00	0.00	3.30	0.00
Screw-in LEDs Reflector Lamps	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LED Fixtures or Panels (e.g., replacement for linear fixtures)	10.39	0.00	0.00	32.32	0.00	0.00	11.20	0.29	0.00
DID NOT REMOVE ANYTHING-ADDITIONAL EQUIP ONLY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other	4.64	1.58	0.00	11.37	1.61	2.14	3.04	3.39	20.94
REFUSED	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DON''T KNOW	7.24	1.39	3.75	0.24	27.94	22.35	22.62	2.39	0.00
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	12

	DOWNSTREAM ALL	DOWNSTREAM PGE_LED_A-LAMP	DOWNSTREAM PGE_LED_ACCENT	DOWNSTREAM PGE_LED_REFLECTOR	DOWNSTREAM SCE_LED_REFLECTOR	DOWNSTREAM SDGE_LED_A-LAMP	DOWNSTREAM SDGE_LED_ACCENT	DOWNSTREAM SDGE_LED_REFLECTOR	MIDSTREAM SCE
<LI22A> Approximately how old was the equipment that were removed and replaced? Would you say...									
Less than 5 years old	38.48	51.52	79.18	47.75	20.57	24.42	32.91	15.59	16.28
Between 5 and 10 years old	31.65	37.46	6.44	20.47	19.72	2.98	58.81	19.66	12.37
Between 10 and 15 years old	19.75	0.45	7.12	20.29	30.64	52.66	6.18	51.86	2.03
More than 15 years old	8.61	9.49	4.32	11.49	13.85	17.07	0.58	11.36	6.14
REFUSED	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.94
DON'T KNOW	1.51	1.08	2.94	0.00	15.23	2.87	1.52	1.53	42.23
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	12
<LI23A> How would you describe the removed equipment's condition? Would you say they were in...									
Poor condition	4.36	0.48	3.73	11.82	14.24	0.00	1.48	2.39	18.10
Fair condition	63.74	88.47	17.69	49.80	50.15	20.40	59.44	70.73	54.65
Good condition	31.58	11.05	75.65	38.38	35.61	71.44	39.09	26.88	5.86
REFUSED	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.94
DON'T KNOW	0.32	0.00	2.94	0.00	0.00	8.16	0.00	0.00	0.44
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	*12*
<HB1> Thinking about all of the types of LED fixtures/lamps that were installed through the program, what is the highest height, in feet, above the area they light?									
5 - 10	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	*12*
<DEL5> Is the amount of lighting better, worse, or the same than before your LED retrofit?									
Better	68.24	46.49	98.45	77.82	76.23	86.86	66.78	75.30	75.64
Worse	4.08	0.00	0.00	15.19	2.84	0.00	1.27	0.00	0.00
Same	25.32	53.46	1.55	6.99	20.92	13.14	31.95	13.49	3.41
REFUSED	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.94
DON'T KNOW	2.36	0.05	0.00	0.00	0.00	0.00	0.00	11.21	0.00
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	12
<AA3> There are usually a number of reasons why an organization like yours decides to participate in energy efficiency programs like this one. In your own words, can you tell me why you decided to participate in this program?									
To replace old or outdated equipment	14.90	0.20	7.03	9.15	7.95	56.93	0.63	50.23	2.04
As part of a planned remodeling, build-out, or expansion	0.27	0.00	5.69	0.00	2.51	0.00	0.00	0.00	0.00
To gain more control over how the equipment was used	1.00	0.00	0.00	2.91	5.44	0.00	0.00	0.61	0.00
Maintenance downtime/associated expenses for old equipment were too high	1.43	0.00	0.00	1.98	0.00	10.97	0.00	3.15	0.00
Had process problems and were seeking a solution	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
To improve equipment performance	9.11	0.37	0.00	21.21	22.43	0.41	2.45	12.66	0.00
To improve production as a result of the change in equipment	9.63	0.00	0.00	0.00	2.51	4.28	1.42	43.77	0.00
To comply with codes set by regulatory agencies	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
To improve visibility/plant safety	1.48	0.00	0.00	5.18	0.00	0.00	0.00	1.00	0.00
To comply with company policies regarding regular equipment retrofits or remodeling	8.64	35.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
To get a rebate from the program	42.69	44.45	92.13	53.59	28.17	70.79	6.05	55.52	70.66
To protect the environment	3.77	2.98	0.00	0.99	7.95	0.00	9.56	2.56	5.12
To reduce energy costs	85.33	97.72	47.11	71.87	85.77	84.75	89.35	88.98	98.97
To reduce energy use/power outages	25.85	52.91	41.98	17.08	6.86	3.20	19.19	14.30	44.28
To update to the latest technology	14.03	0.20	0.00	19.55	0.00	0.00	0.00	43.96	0.86
To improve the comfort level of the facility	2.47	1.89	0.00	4.17	5.44	0.00	0.65	3.30	0.00
Other	13.87	5.96	7.12	22.25	45.85	0.00	6.75	19.02	5.12
REFUSED	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DON'T KNOW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	12

	DOWNSTREAM ALL	DOWNSTREAM PGE_LED_A-LAMP	DOWNSTREAM PGE_LED_ACCENT	DOWNSTREAM PGE_LED_REFLECTOR	DOWNSTREAM SCE_LED_REFLECTOR	DOWNSTREAM SDGE_LED_A-LAMP	DOWNSTREAM SDGE_LED_ACCENT	DOWNSTREAM SDGE_LED_REFLECTOR	MIDSTREAM SCE
<AA3A> Had the equipment that you replaced reached the end of its useful life?									
Yes	41.92	99.86	80.93	39.64	100.00	0.00	0.00	0.00	0.00
No	56.39	0.14	19.07	60.36	0.00	77.54	100.00	100.00	0.00
DON'T KNOW	1.69	0.00	0.00	0.00	0.00	22.46	0.00	0.00	0.00
n	*23*	*3*	*2*	*7*	*2*	*3*	*1*	*5*	0
<N2> Did your organization make the decision to install this new equipment before or, after, or at the same time as you became aware of that rebates were available through the PROGRAM?									
Before	29.88	45.56	2.94	18.64	7.95	0.00	11.38	54.98	3.39
After	19.37	8.32	44.71	14.91	19.18	70.14	25.36	20.71	52.28
Same time	46.07	44.64	49.37	65.05	69.50	28.15	48.28	21.69	44.33
DON'T KNOW	4.69	1.47	2.98	1.40	3.37	1.71	14.98	2.63	0.00
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	*12*
<N3A> How would you rate the importance of the age or condition of the old equipment?									
0 Not at all important	8.50	3.20	34.41	6.50	6.84	17.73	9.78	10.48	2.97
1	0.27	0.00	0.00	0.00	0.00	0.00	0.00	1.28	2.03
2	0.37	1.04	0.00	0.00	0.00	0.00	0.00	0.55	0.00
3	24.73	48.64	1.34	0.00	8.35	0.00	0.00	60.53	0.00
4	0.22	0.00	0.00	0.51	3.37	0.00	0.00	0.00	0.00
5	14.79	4.29	11.40	28.61	0.84	19.22	22.63	4.60	0.86
6	8.50	0.10	0.00	6.61	0.00	0.00	24.98	7.25	10.37
7	17.19	36.34	41.24	19.58	0.00	4.10	7.39	2.17	0.00
8	9.09	0.25	2.98	15.30	40.80	54.26	4.11	8.18	53.30
9	2.73	4.59	0.00	0.48	22.68	0.00	1.42	2.63	0.00
10 Extremely important	7.54	1.56	8.63	22.41	12.57	0.00	2.41	2.35	30.47
DON'T KNOW	6.08	0.00	0.00	0.00	4.55	4.69	27.28	0.00	0.00
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	12
<N3B> How would you rate the importance of the availability of the PROGRAM rebate?									
0 Not at all important	0.61	0.29	0.00	0.43	0.00	0.00	0.62	1.46	0.00
3	0.18	0.00	0.00	0.00	0.00	5.70	0.00	0.12	0.00
4	0.61	0.20	0.00	2.28	0.00	0.00	0.00	0.00	0.00
5	1.46	0.26	0.00	3.03	2.45	10.97	1.20	0.19	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.04
7	14.09	46.52	0.00	3.61	9.30	0.00	5.17	2.62	2.94
8	4.51	0.78	3.78	8.85	18.47	16.78	3.59	1.34	9.02
9	4.96	0.76	1.34	3.78	4.90	1.71	3.04	14.20	2.47
10 Extremely important	66.62	50.35	94.88	78.02	55.01	60.56	56.52	80.09	83.52
REFUSED	3.53	0.00	0.00	0.00	3.48	0.00	16.08	0.00	0.00
DON'T KNOW	3.44	0.85	0.00	0.00	6.40	4.28	13.77	0.00	0.00
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	12

	DOWNSTREAM ALL	DOWNSTREAM PGE_LED_A-LAMP	DOWNSTREAM PGE_LED_ACCENT	DOWNSTREAM PGE_LED_REFLECTOR	DOWNSTREAM SCE_LED_REFLECTOR	DOWNSTREAM SDGE_LED_A-LAMP	DOWNSTREAM SDGE_LED_ACCENT	DOWNSTREAM SDGE_LED_REFLECTOR	MIDSTREAM SCE
<N3D> How would you rate the importance of the recommendation from an equipment vendor that sold you the equipment and/or installed it for you?									
0 Not at all important	17.92	2.71	72.94	0.00	0.00	0.00	0.00	65.42	0.00
1	0.21	4.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.63	0.00	0.00	0.00	0.00	0.00	0.00	2.65	0.00
3	0.09	0.86	0.00	0.00	0.00	0.00	0.00	0.18	0.00
4	2.50	29.88	0.00	3.14	0.00	0.00	0.00	0.00	0.00
5	0.23	4.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	5.40	0.00	0.00	17.92	0.00	0.00	0.00	0.00	0.00
7	0.38	2.78	0.00	0.00	0.00	0.00	0.74	0.00	0.00
8	17.01	11.84	0.00	11.91	19.01	0.94	37.17	1.90	22.58
9	8.95	0.79	13.44	3.75	4.36	70.51	0.00	20.59	0.00
10 Extremely important	36.22	39.19	13.62	63.29	71.71	22.83	31.01	8.84	77.42
REFUSED	5.99	3.47	0.00	0.00	0.00	0.00	18.32	0.00	0.00
DON'T KNOW	4.48	0.00	0.00	0.00	4.93	5.72	12.76	0.43	0.00
n	*110*	*24*	*6*	*25*	*12*	*8*	*16*	*19*	*6*
<N3E> How would you rate the importance of your previous experience with similar types of energy efficient projects?									
0 Not at all important	19.92	6.48	42.48	27.43	14.91	74.68	9.21	27.66	33.97
2	0.97	0.00	0.00	0.00	0.00	0.00	4.52	0.00	0.00
3	0.97	3.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.01	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	9.52	35.82	0.00	0.32	0.00	0.00	1.20	2.35	0.00
7	5.29	0.00	47.67	0.24	0.00	0.00	10.76	6.13	0.00
8	17.02	46.68	0.00	2.37	10.12	0.00	14.98	7.76	10.37
9	4.54	0.00	0.00	15.82	0.00	0.25	0.46	2.63	11.96
10 Extremely important	30.78	2.95	9.85	50.34	32.22	4.16	26.77	50.85	43.71
REFUSED	4.43	0.00	0.00	3.48	5.09	0.00	16.08	0.00	0.00
DON'T KNOW	6.56	4.04	0.00	0.00	37.66	20.92	16.01	2.62	0.00
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	*12*
<N3F> How would you rate the importance of your previous experience with the UTILITY's program or a similar utility program?									
0 Not at all important	22.57	5.92	47.36	42.45	18.65	20.19	9.21	28.93	85.22
2	0.97	0.00	0.00	0.00	0.00	0.00	4.52	0.00	0.00
3	0.03	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	2.16	0.00	0.00	0.00	0.00	0.00	10.11	0.00	0.00
5	12.50	39.37	44.77	0.20	0.00	0.00	5.34	1.00	0.00
7	3.60	0.00	0.00	0.24	0.00	0.00	11.84	4.86	0.00
8	14.79	47.04	0.00	0.09	10.12	2.53	3.55	10.73	0.00
9	4.35	0.46	0.00	13.03	0.00	0.25	2.97	1.91	10.37
10 Extremely important	28.89	5.12	7.87	38.23	33.81	56.11	23.41	50.51	4.41
REFUSED	4.43	0.00	0.00	3.48	5.09	0.00	16.08	0.00	0.00
DON'T KNOW	5.71	1.98	0.00	2.28	32.33	20.92	12.97	2.05	0.00
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	12

	DOWNSTREAM ALL	DOWNSTREAM PGE_LED_A-LAMP	DOWNSTREAM PGE_LED_ACCENT	DOWNSTREAM PGE_LED_REFLECTOR	DOWNSTREAM SCE_LED_REFLECTOR	DOWNSTREAM SDGE_LED_A-LAMP	DOWNSTREAM SDGE_LED_ACCENT	DOWNSTREAM SDGE_LED_REFLECTOR	MIDSTREAM SCE
<N3G> How would you rate the importance of information from the Program, Utility, or Program Administrator training course?									
0 Not at all important	47.16	44.08	0.00	49.93	0.00	0.00	22.58	79.61	100.00
2	1.63	0.00	0.00	0.00	0.00	0.00	8.23	0.00	0.00
5	27.53	55.92	0.00	21.21	0.00	0.00	18.40	0.00	0.00
8	7.29	0.00	0.00	28.86	0.00	0.00	0.00	0.00	0.00
10 Extremely important	0.22	0.00	0.00	0.00	0.00	0.00	1.13	0.00	0.00
REFUSED	5.81	0.00	0.00	0.00	0.00	0.00	29.27	0.00	0.00
DON'T KNOW	10.35	0.00	0.00	0.00	0.00	100.00	20.39	20.39	0.00
n	*17*	*2*	*0*	*5*	*0*	*1*	*7*	*2*	1
<N3H> How would you rate the importance of information from the Program, Utility, or Program Administrator Marketing materials?									
0 Not at all important	32.92	40.42	52.01	19.90	11.65	6.75	13.33	62.58	31.50
1	0.45	0.00	0.00	1.82	0.00	0.00	0.00	0.00	0.00
2	1.67	0.25	2.73	0.00	0.00	0.00	5.33	1.78	0.00
3	0.57	0.05	0.00	2.26	0.00	0.00	0.00	0.00	0.00
4	0.64	0.00	7.12	0.00	0.00	14.93	0.00	0.00	0.00
5	21.85	49.64	0.00	3.46	1.61	0.00	34.19	7.70	45.18
6	3.41	0.10	0.00	13.64	0.00	0.00	0.00	0.17	0.00
7	4.05	1.89	0.00	11.78	2.76	0.00	2.91	0.00	0.00
8	5.27	1.00	0.00	5.85	9.19	1.61	10.24	5.30	13.44
9	2.43	0.25	0.00	0.11	0.00	52.90	0.00	4.54	0.00
10 Extremely important	17.03	5.71	35.16	41.18	66.87	17.39	3.58	5.75	0.00
REFUSED	3.53	0.00	0.00	0.00	3.48	0.00	16.08	0.00	0.00
DON'T KNOW	6.18	0.69	2.98	0.00	4.44	6.42	14.34	12.19	9.88
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	*12*
<N3J> How would you rate the importance of standard practice in your business/industry?									
0 Not at all important	14.22	7.79	79.97	26.22	5.44	2.46	2.47	11.35	20.44
2	1.59	0.65	0.00	0.00	0.00	0.00	4.97	1.78	0.00
3	0.38	1.01	0.00	0.53	0.00	0.00	0.00	0.00	0.00
4	0.01	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	4.94	1.72	7.93	3.12	0.00	14.93	1.20	13.56	0.00
6	0.26	0.10	0.00	0.73	0.00	2.14	0.00	0.00	0.00
7	13.43	45.20	0.00	0.50	2.51	52.66	1.11	3.09	0.00
8	23.39	39.26	5.69	20.72	19.24	19.21	28.21	7.21	10.37
9	1.42	0.10	2.73	3.03	0.00	0.25	0.00	2.63	42.23
10 Extremely important	31.13	1.61	0.75	39.70	57.33	2.77	31.62	59.88	26.96
REFUSED	3.57	0.00	0.00	0.00	3.48	0.00	16.08	0.15	0.00
DON'T KNOW	5.67	2.50	2.94	5.44	12.00	5.59	14.34	0.36	0.00
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	*12*
<N3L> How would you rate the endorsement or recommendation by your account rep?									
0 Not at all important	27.78	0.00	0.00	34.46	0.00	0.00	0.00	0.00	0.00
4	4.06	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00
5	6.93	0.00	0.00	7.77	0.00	0.00	5.07	0.00	0.00
7	0.11	9.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.11	9.56	0.00	0.00	0.00	0.00	0.00	0.00	100.00
9	0.92	0.00	0.00	0.00	81.71	0.00	0.00	0.00	0.00
10 Extremely important	57.09	80.57	0.00	54.03	18.29	0.00	94.93	0.00	0.00
DON'T KNOW	3.01	0.00	0.00	3.73	0.00	0.00	0.00	0.00	0.00
n	*15*	*4*	*0*	*6*	*2*	*0*	*2*	*1*	1

	DOWNSTREAM ALL	DOWNSTREAM PGE_LED_A-LAMP	DOWNSTREAM PGE_LED_ACCENT	DOWNSTREAM PGE_LED_REFLECTOR	DOWNSTREAM SCE_LED_REFLECTOR	DOWNSTREAM SDGE_LED_A-LAMP	DOWNSTREAM SDGE_LED_ACCENT	DOWNSTREAM SDGE_LED_REFLECTOR	MIDSTREAM SCE
<N3M> How would you rate corporate policy or guidelines?									
0 Not at all important	26.95	0.00	0.00	57.43	0.00	100.00	30.91	20.39	0.00
4	3.65	0.00	0.00	0.00	0.00	0.00	18.40	0.00	0.00
6	14.60	44.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	21.98	55.92	0.00	13.71	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
10 Extremely important	22.76	0.00	0.00	28.86	0.00	0.00	0.00	79.61	0.00
REFUSED	5.81	0.00	0.00	0.00	0.00	0.00	29.27	0.00	0.00
DON'T KNOW	4.25	0.00	0.00	0.00	0.00	0.00	21.42	0.00	0.00
n	*17*	*2*	*0*	*5*	*0*	*1*	*7*	*2*	1
<N3N> How would you rate payback or return on investment of installing this equipment?									
0 Not at all important	1.50	0.31	2.15	2.71	0.00	5.70	0.00	2.55	0.00
2	0.18	0.36	0.00	0.00	0.00	0.00	0.45	0.00	0.00
3	4.61	0.12	0.00	8.34	0.00	0.00	11.84	0.00	0.00
4	0.39	0.00	0.00	0.00	0.00	14.93	0.00	0.00	0.00
5	5.14	1.83	75.65	3.03	0.00	0.00	4.07	2.20	0.00
6	0.12	0.05	2.98	0.00	0.00	0.00	0.00	0.00	0.00
7	1.21	0.00	0.00	0.00	0.00	0.00	4.88	0.80	0.00
8	6.97	0.82	0.00	14.52	9.30	13.75	3.67	8.60	14.00
9	17.83	46.43	0.00	3.25	2.51	0.90	13.02	13.84	2.03
10 Extremely important	57.77	49.51	19.23	66.02	75.29	58.32	50.52	69.03	83.97
REFUSED	0.10	0.00	0.00	0.00	3.48	0.00	0.00	0.00	0.00
DON'T KNOW	4.19	0.56	0.00	2.13	9.42	6.40	11.56	2.99	0.00
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	*12*
<N3O> How would you rate improved product quality?									
0 Not at all important	2.04	0.60	37.39	0.00	10.12	0.00	1.27	0.18	20.94
1	0.39	0.00	0.00	0.00	0.00	14.93	0.00	0.00	2.03
2	0.29	0.00	0.00	0.00	0.00	0.00	0.00	1.36	5.12
3	2.38	0.00	0.00	0.00	0.00	0.00	0.00	11.40	0.00
4	0.56	0.00	0.00	2.28	0.00	0.00	0.00	0.00	0.00
5	5.60	0.57	0.80	16.47	2.76	0.00	3.78	2.40	10.37
6	0.57	0.52	0.00	0.00	0.00	0.00	0.00	2.14	0.00
7	8.46	3.93	41.98	8.34	8.35	0.00	5.17	12.74	0.00
8	7.19	1.03	8.46	7.95	5.35	16.92	17.84	1.35	0.44
9	22.59	47.39	8.42	14.87	0.00	52.66	19.67	7.45	9.02
10 Extremely important	46.27	44.33	0.00	49.35	59.58	11.22	40.72	60.85	52.08
REFUSED	0.10	0.00	0.00	0.00	3.48	0.00	0.00	0.00	0.00
DON'T KNOW	3.57	1.62	2.94	0.73	10.36	4.28	11.56	0.12	0.00
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	*12*

	DOWNSTREAM ALL	DOWNSTREAM PGE_LED_A-LAMP	DOWNSTREAM PGE_LED_ACCENT	DOWNSTREAM PGE_LED_REFLECTOR	DOWNSTREAM SCE_LED_REFLECTOR	DOWNSTREAM SDGE_LED_A-LAMP	DOWNSTREAM SDGE_LED_ACCENT	DOWNSTREAM SDGE_LED_REFLECTOR	MIDSTREAM SCE
<N3R> How would you rate compliance with your organization's normal remodeling or equipment replacement practices?									
0 Not at all important	31.38	53.24	80.18	33.49	21.54	8.16	6.50	25.16	49.72
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.03
2	0.45	0.36	1.34	0.00	8.35	0.00	0.00	0.36	0.00
3	0.45	0.00	0.00	1.82	0.00	0.00	0.00	0.00	0.00
4	0.43	0.15	0.00	0.00	0.00	0.70	0.00	1.78	2.94
5	6.37	0.48	0.00	14.25	2.76	2.89	5.17	7.13	0.00
6	0.82	0.00	2.73	0.00	0.00	0.00	0.00	3.49	0.00
7	5.68	3.98	0.00	7.41	13.62	0.00	10.11	1.69	2.04
8	7.53	0.00	0.00	3.80	2.51	0.25	22.94	7.77	0.00
9	2.04	0.00	0.00	0.00	0.00	53.56	2.91	0.00	0.00
10 Extremely important	33.98	38.04	12.81	34.10	29.57	2.14	22.04	49.45	43.26
REFUSED	3.53	0.00	0.00	0.00	3.48	0.00	16.08	0.00	0.00
DON'T KNOW	7.35	3.76	2.94	5.14	18.16	32.30	14.25	3.18	0.00
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	*12*
<N3S> Were there any other factors we haven't discussed that were influential in your decision to install/delamp this MEASURE?									
Nothing else influential	86.04	96.85	100.00	87.86	94.91	100.00	100.00	51.80	91.94
Other	13.37	2.99	0.00	12.14	5.09	0.00	0.00	45.57	8.06
DON'T KNOW	0.59	0.15	0.00	0.00	0.00	0.00	0.00	2.63	0.00
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	12
<N3SS> Using the same zero to 10 scale, how would you rate the influence of this factor?									
0 Not at all important	0.24	0.00	0.00	1.09	0.00	0.00	0.00	0.00	0.00
5	0.95	0.00	0.00	0.00	0.00	0.00	0.00	1.33	0.00
6	0.17	0.00	0.00	0.75	0.00	0.00	0.00	0.00	0.00
7	1.57	0.00	0.00	0.00	0.00	0.00	0.00	2.20	0.00
8	5.35	0.00	0.00	23.99	0.00	0.00	0.00	0.00	0.00
9	15.76	0.00	0.00	70.71	0.00	0.00	0.00	0.00	0.00
10 Extremely important	75.23	100.00	0.00	3.46	31.65	0.00	0.00	96.46	100.00
REFUSED	0.74	0.00	0.00	0.00	68.35	0.00	0.00	0.00	0.00
n	*16*	*4*	*0*	*6*	*2*	*0*	*0*	*4*	2
<P1> What financial calculations does your company typically make before proceeding with the installation of energy efficient equipment like you installed through the program?									
Payback	71.56	62.57	85.32	61.37	26.18	69.81	47.12	92.12	30.16
Return on investment	49.45	46.94	0.00	4.29	26.18	70.14	58.71	76.64	3.80
Other	31.81	34.42	14.68	93.23	50.29	25.46	20.47	1.43	69.84
REFUSED	0.83	0.00	0.00	0.00	0.00	0.00	0.00	2.11	0.00
DON'T KNOW	6.40	17.08	0.00	0.80	23.53	4.40	20.82	1.15	0.00
n	*65*	*20*	*3*	*12*	*6*	*7*	*8*	*9*	*9*
<P2A> What is your threshold in terms of the payback or return on investment your company uses before deciding to proceed with installing energy efficient equipment like you installed through the program?									
6 months to 1 year	13.51	20.69	0.00	0.00	100.00	0.00	100.00	0.00	63.93
1 to 2 years	18.78	0.00	0.00	95.13	0.00	0.00	0.00	0.00	5.33
2 to 3 years	14.89	63.47	0.00	2.73	0.00	0.00	0.00	20.27	0.00
3 to 5 years	6.36	0.00	0.00	0.00	0.00	100.00	0.00	0.61	12.59
Over 5 years	45.01	0.00	100.00	0.00	0.00	0.00	0.00	79.12	0.00
REFUSED	0.55	8.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DON'T KNOW	0.91	7.44	0.00	2.14	0.00	0.00	0.00	0.00	18.14
n	*16*	*5*	*1*	*4*	*1*	*1*	*1*	*3*	*4*

	DOWNSTREAM ALL	DOWNSTREAM PGE_LED_A-LAMP	DOWNSTREAM PGE_LED_ACCENT	DOWNSTREAM PGE_LED_REFLECTOR	DOWNSTREAM SCE_LED_REFLECTOR	DOWNSTREAM SDGE_LED_A-LAMP	DOWNSTREAM SDGE_LED_ACCENT	DOWNSTREAM SDGE_LED_REFLECTOR	MIDSTREAM SCE
<P3> Did the rebate move your energy efficient equipment project within this acceptable range?									
Yes	85.02	25.29	100.00	92.42	12.00	75.81	88.81	96.12	100.00
No	7.34	54.06	0.00	7.58	28.49	0.00	2.47	0.62	0.00
REFUSED	1.13	0.00	0.00	0.00	9.80	0.00	0.00	2.11	0.00
DON'T KNOW	6.51	20.65	0.00	0.00	49.71	24.19	8.72	1.15	0.00
n	*65*	*20*	*3*	*12*	*6*	*7*	*8*	*9*	*9*
<P4> On a scale of 0 to 10, with a zero meaning NOT AT ALL IMPORTANT and 10 meaning Very Important, how important in your decision was it that the project was in the acceptable range?									
0 Not at all important	33.52	0.00	0.00	0.00	0.00	0.00	0.00	75.83	0.00
5	0.23	10.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.09	4.09	0.00	0.00	0.00	0.00	0.00	0.00	5.47
8	10.25	4.18	7.38	14.78	0.00	0.00	33.32	0.59	16.77
9	2.79	13.81	0.00	0.41	0.00	0.00	13.62	0.00	3.80
10 Extremely important	52.12	33.66	92.62	83.80	100.00	100.00	53.06	23.58	73.96
REFUSED	0.46	20.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DON'T KNOW	0.54	13.07	0.00	1.01	0.00	0.00	0.00	0.00	0.00
n	*41*	*13*	*3*	*11*	*2*	*3*	*4*	*5*	*9*
<N41> How many of the ten points would you give to the importance of the PROGRAM in your decision?									
0 Not at all important	0.31	0.00	0.00	0.00	0.00	0.00	0.00	1.46	26.86
2	10.31	0.02	0.00	2.26	0.00	0.00	2.22	44.38	0.00
3	1.19	0.22	0.00	4.02	0.00	5.70	0.00	0.00	5.12
4	0.80	0.98	0.00	0.00	3.37	0.00	0.00	2.22	0.00
5	23.38	37.89	0.00	25.11	36.33	14.14	18.23	13.06	15.42
6	4.59	2.14	0.00	0.13	0.00	14.93	11.84	5.34	0.00
7	5.52	0.16	17.63	1.34	0.00	0.00	8.20	13.35	10.37
8	25.20	47.08	41.24	28.30	10.82	2.98	22.74	0.76	42.23
9	5.92	0.00	0.00	15.20	1.42	52.66	0.00	3.63	0.00
10 Extremely important	13.10	7.73	41.13	13.03	33.39	2.14	20.48	5.87	0.00
REFUSED	0.92	0.00	0.00	2.28	3.48	0.00	0.00	1.27	0.00
DON'T KNOW	8.77	3.78	0.00	8.32	11.18	7.45	16.30	8.67	0.00
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	12
<N42> And how many points would you give to all of these other non-program factors?									
0 Not at all important	12.96	7.73	41.13	13.03	33.39	2.14	20.48	5.18	0.00
1	5.92	0.00	0.00	15.20	1.42	52.66	0.00	3.63	0.00
2	25.20	47.08	41.24	28.30	10.82	2.98	22.74	0.76	42.23
3	5.52	0.16	17.63	1.34	0.00	0.00	8.20	13.35	10.37
4	4.59	2.14	0.00	0.13	0.00	14.93	11.84	5.34	0.00
5	23.38	37.89	0.00	25.11	36.33	14.14	18.23	13.06	15.42
6	0.80	0.98	0.00	0.00	3.37	0.00	0.00	2.22	0.00
7	1.19	0.22	0.00	4.02	0.00	5.70	0.00	0.00	5.12
8	10.31	0.02	0.00	2.26	0.00	0.00	2.22	44.38	0.00
10 Extremely important	0.31	0.00	0.00	0.00	0.00	0.00	0.00	1.46	26.86
REFUSED	0.92	0.00	0.00	2.28	3.48	0.00	0.00	1.27	0.00
DON'T KNOW	8.91	3.78	0.00	8.32	11.18	7.45	16.30	9.36	0.00
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	12

	DOWNSTREAM ALL	DOWNSTREAM PGE_LED_A-LAMP	DOWNSTREAM PGE_LED_ACCENT	DOWNSTREAM PGE_LED_REFLECTOR	DOWNSTREAM SCE_LED_REFLECTOR	DOWNSTREAM SDGE_LED_A-LAMP	DOWNSTREAM SDGE_LED_ACCENT	DOWNSTREAM SDGE_LED_REFLECTOR	MIDSTREAM SCE
<N41P> How many of the ten points would you give to the importance of the PROGRAM in your decision TO INSTALL YOUR EQUIPMENT AT THE TIME YOU DID?									
0 Not at all important	0.31	0.00	0.00	0.00	0.00	0.00	0.00	1.46	26.86
2	9.73	0.12	0.00	2.26	0.00	0.00	0.00	43.77	0.00
3	0.98	0.22	0.00	2.91	0.00	5.70	0.00	0.29	5.12
4	0.09	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	27.18	37.81	2.73	25.11	25.75	26.61	35.38	13.22	13.38
6	3.08	2.14	0.00	0.13	0.00	0.00	11.84	0.00	2.04
7	17.24	45.26	12.81	5.60	8.35	3.37	1.42	18.24	10.37
8	8.36	1.14	41.24	20.80	10.82	4.22	3.98	1.35	42.23
9	1.46	0.00	0.00	0.48	1.42	0.00	2.91	3.23	0.00
10 Extremely important	21.44	8.73	43.22	35.11	30.82	52.66	24.76	7.94	0.00
REFUSED	0.92	0.00	0.00	2.28	3.48	0.00	0.00	1.27	0.00
DON'T KNOW	9.21	4.22	0.00	5.29	19.35	7.45	19.72	9.24	0.00
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	12
<N42P> And how many points would you give to all of these other non-program factors?									
0 Not at all important	21.40	8.56	43.22	35.11	30.82	52.66	24.76	7.94	0.00
1	1.46	0.00	0.00	0.48	1.42	0.00	2.91	3.23	0.00
2	8.36	1.14	41.24	20.80	10.82	4.22	3.98	1.35	42.23
3	17.24	45.26	12.81	5.60	8.35	3.37	1.42	18.24	10.37
4	3.08	2.14	0.00	0.13	0.00	0.00	11.84	0.00	2.04
5	27.18	37.81	2.73	25.11	25.75	26.61	35.38	13.22	13.38
6	0.09	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.98	0.22	0.00	2.91	0.00	5.70	0.00	0.29	5.12
8	9.73	0.12	0.00	2.26	0.00	0.00	0.00	43.77	0.00
10 Extremely important	0.31	0.00	0.00	0.00	0.00	0.00	0.00	1.46	26.86
REFUSED	0.92	0.00	0.00	2.28	3.48	0.00	0.00	1.27	0.00
DON'T KNOW	9.25	4.38	0.00	5.29	19.35	7.45	19.72	9.24	0.00
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	12
<REPLACE> Was the installation of this measure a replacement of existing equipment or was it additional equipment you installed in your facility?									
Replace/Modification/Retrofit	99.73	100.00	100.00	99.10	98.39	100.00	100.00	100.00	100.00
Add-on	0.27	0.00	0.00	0.90	1.61	0.00	0.00	0.00	0.00
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	*12*
<N5> If THE PROGRAM had NOT BEEN AVAILABLE, what is the likelihood that you would have installed exactly the same program-qualifying energy efficient equipment that you did for this project regardless of when you would have installed it?									
0 Not at all likely	40.86	47.24	38.91	42.30	41.28	35.18	51.50	21.88	11.99
1	0.75	0.15	7.12	0.00	3.43	0.00	0.00	1.78	0.00
2	6.12	0.11	2.73	17.79	9.45	0.00	4.78	1.78	0.00
3	2.86	0.20	1.34	3.31	5.53	2.55	3.04	5.19	10.37
4	3.48	0.40	0.00	2.28	3.54	0.00	12.40	0.34	48.20
5	17.92	46.07	0.00	19.00	0.00	54.37	0.62	2.41	0.44
6	1.12	0.10	0.00	1.93	13.84	0.90	0.00	1.00	5.12
7	4.76	0.84	5.69	7.14	8.49	0.00	0.00	11.36	20.94
8	13.07	0.17	0.00	3.41	0.00	1.06	10.74	47.09	0.00
9	0.48	0.00	2.98	0.00	2.55	0.25	1.20	0.19	0.00
10 Extremely likely	4.83	4.28	0.00	2.85	11.90	5.70	11.20	1.01	2.94
DON'T KNOW	3.76	0.44	41.24	0.00	0.00	0.00	4.52	5.97	0.00
n	*176*	*38*	*10*	*34*	*19*	*14*	*26*	*35*	*12*

	DOWNSTREAM ALL	DOWNSTREAM PGE_LED_A-LAMP	DOWNSTREAM PGE_LED_ACCENT	DOWNSTREAM PGE_LED_REFLECTOR	DOWNSTREAM SCE_LED_REFLECTOR	DOWNSTREAM SDGE_LED_A-LAMP	DOWNSTREAM SDGE_LED_ACCENT	DOWNSTREAM SDGE_LED_REFLECTOR	MIDSTREAM SCE
<N5AA> If THE PROGRAM had NOT BEEN AVAILABLE, what is the likelihood that you would have installed exactly the same energy efficient equipment at the same time as you did?									
4	82.85	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00
10 Extremely likely	17.15	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00
n	*2*	*0*	*0*	*1*	*1*	*0*	*0*	*0*	*0*
<NN5AA> Would you like for me to change your score on the importance of the rebate and/or change your rating on the likelihood you would install the same equipment without the rebate and/or we can change both if you wish?									
No change	84.52	100.00	100.00	100.00	100.00	100.00	5.89	98.74	0.00
Record how they would rate rebate influence and how they would rate likelihood to install without the rebate	15.48	0.00	0.00	0.00	0.00	0.00	94.11	1.26	0.00
n	*20*	*3*	*1*	*3*	*3*	*2*	*2*	*6*	*0*
<REVISED_N3B> How would you rate the importance of the availability of the PROGRAM rebate?									
10 Extremely important	100.00	0.00	0.00	0.00	0.00	0.00	100.00	100.00	0.00
n	*2*	*0*	*0*	*0*	*0*	*0*	*1*	*1*	*0*
<REVISED_N5> If THE PROGRAM had NOT BEEN AVAILABLE, what is the likelihood that you would have installed exactly the same program-qualifying energy efficient equipment that you did for this project regardless of when you would have installed it?									
5	100.00	0.00	0.00	0.00	0.00	0.00	100.00	100.00	0.00
n	*2*	*0*	*0*	*0*	*0*	*0*	*1*	*1*	*0*
<N5B> Using the same scale as before, if the program had not been available, what is the likelihood that you would have done this project at the same time as you did?									
0 Not at all likely	55.04	61.26	81.48	63.99	53.30	43.43	55.72	34.02	17.97
1	3.86	1.34	0.00	0.00	0.00	0.00	14.75	1.78	0.00
2	8.38	0.11	7.12	29.33	17.38	1.71	0.45	1.53	2.03
3	1.81	0.00	0.00	1.84	8.49	0.90	1.42	3.79	10.37
4	2.59	0.35	2.98	0.09	5.53	0.00	10.11	0.29	1.03
5	13.95	36.45	0.00	4.75	0.85	52.66	0.63	11.33	44.28
6	0.22	0.10	5.69	0.00	0.00	0.00	0.00	0.00	0.00
7	0.42	0.17	2.73	0.00	10.28	0.00	0.00	0.00	0.00
8	0.17	0.10	0.00	0.00	4.16	1.06	0.00	0.00	0.00
9	0.01	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00
10 Extremely likely	11.60	0.12	0.00	0.00	0.00	0.00	11.20	43.77	24.33
DON'T KNOW	1.96	0.00	0.00	0.00	0.00	0.00	5.72	3.49	0.00
n	*176*	*38*	*10*	*34*	*19*	*14*	*26*	*35*	12
<N6> If the program had not been available, which of the following alternatives would you have been MOST likely to do?									
Install/Delamp fewer units	2.20	0.00	0.00	1.78	10.12	0.00	0.00	7.08	0.00
Install standard efficiency equipment or whatever required by code	4.89	1.01	44.77	5.63	13.86	0.00	4.51	1.69	0.00
Install equipment more efficient than code but less efficient than what you installed through the program	3.44	0.00	0.00	13.27	5.44	0.90	0.00	0.00	0.00
Do nothing (keep existing equipment as is)	50.82	56.53	39.44	39.62	44.49	76.52	81.05	25.94	9.02
Do the same thing I would have done as I did through the program	28.41	36.91	5.69	17.57	4.12	1.06	12.39	58.16	2.94
Repair/rewind or overhaul the existing equipment	2.11	0.48	7.12	4.52	8.35	13.68	0.00	0.19	8.02
Something else	7.55	5.07	2.98	17.43	13.62	7.84	2.05	4.33	80.02
DON'T KNOW	0.59	0.00	0.00	0.18	0.00	0.00	0.00	2.63	0.00
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	12

	DOWNSTREAM ALL	DOWNSTREAM PGE_LED_A-LAMP	DOWNSTREAM PGE_LED_ACCENT	DOWNSTREAM PGE_LED_REFLECTOR	DOWNSTREAM SCE_LED_REFLECTOR	DOWNSTREAM SDGE_LED_A-LAMP	DOWNSTREAM SDGE_LED_ACCENT	DOWNSTREAM SDGE_LED_REFLECTOR	MIDSTREAM SCE
<N6AA> Would you have acted at the same time as you did under the program, within a year, or at a later time?									
Same time	15.23	0.58	0.00	45.94	37.64	0.00	0.00	8.61	0.00
Within one year	61.75	95.07	0.00	26.57	16.23	53.86	72.58	71.47	100.00
At a later time	22.65	3.45	100.00	27.14	46.13	46.14	27.42	19.69	0.00
DON'T KNOW	0.38	0.89	0.00	0.35	0.00	0.00	0.00	0.23	0.00
n	*50*	*9*	*4*	*10*	*7*	*2*	*6*	*12*	*1*
<N6AC> Would it have been…									
Less than one year	1.73	0.00	0.00	0.00	65.86	0.00	0.00	0.00	0.00
About a year	12.24	0.00	1.91	100.00	34.14	0.00	0.00	0.00	0.00
A couple of years	24.58	0.00	0.00	0.00	0.00	0.00	84.33	0.00	0.00
More than four years	2.84	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00
DON'T KNOW	58.62	0.00	98.09	0.00	0.00	0.00	15.67	0.00	0.00
n	*8*	*0*	*2*	*1*	*2*	*0*	*2*	*1*	0
<N6BA> How long would you have waited to replace your equipment?									
Less than one year	0.06	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00
About a year	4.91	0.41	0.00	23.66	0.00	0.00	0.80	0.00	0.00
A couple of years	12.75	0.65	0.00	2.07	20.77	2.39	30.67	10.47	0.00
A few years	2.15	0.28	3.40	4.09	12.17	5.59	0.56	4.59	0.00
More than four years	42.45	86.27	89.14	0.61	7.01	0.92	34.76	43.15	0.00
REFUSED	1.46	0.00	0.00	7.64	0.00	0.00	0.00	0.00	0.00
DON'T KNOW	36.22	12.17	7.46	61.94	60.05	91.10	33.21	41.79	100.00
n	*98*	*22*	*4*	*18*	*11*	*7*	*18*	*18*	1
<N6CA> Would you still have replaced your equipment at the same time as you did under the program, within a year, or at a later time?									
Same time	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.55
Within one year	6.44	6.97	0.00	0.00	0.00	0.00	100.00	0.00	39.13
At a later time	89.39	93.03	100.00	98.95	100.00	27.32	0.00	90.07	60.31
DON'T KNOW	4.17	0.00	0.00	1.05	0.00	72.68	0.00	9.93	0.00
n	*19*	*5*	1.00	*4*	*1*	*2*	*2*	*4*	*7*
<N6CB> How many years later would it have been?									
About a year	15.22	0.00	100.00	0.00	100.00	0.00	0.00	47.35	0.00
A couple of years	17.11	0.00	0.00	12.99	0.00	0.00	0.00	52.65	0.00
More than four years	51.17	0.00	0.00	87.01	0.00	0.00	0.00	0.00	8.28
DON'T KNOW	16.50	100.00	0.00	0.00	0.00	100.00	0.00	0.00	91.72
n	*13*	*4*	*1*	*3*	*1*	*1*	*0*	*3*	*4*
<N6CC> Would it have been…									
A couple of years	70.91	74.42	0.00	0.00	0.00	0.00	0.00	0.00	95.42
More than four years	24.10	20.36	0.00	0.00	0.00	100.00	0.00	0.00	4.58
DON'T KNOW	4.98	5.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00
n	*5*	*4*	*0*	*0*	*0*	*1*	*0*	*0*	*2*

	DOWNSTREAM ALL	DOWNSTREAM PGE_LED_A-LAMP	DOWNSTREAM PGE_LED_ACCENT	DOWNSTREAM PGE_LED_REFLECTOR	DOWNSTREAM SCE_LED_REFLECTOR	DOWNSTREAM SDGE_LED_A-LAMP	DOWNSTREAM SDGE_LED_ACCENT	DOWNSTREAM SDGE_LED_REFLECTOR	MIDSTREAM SCE
<ER2> How many more years do you think your equipment would have gone before failing and required replacement?									
2	62.34	99.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	4.14	0.00	0.00	9.98	100.00	0.00	0.00	22.03	0.00
4	12.46	0.00	0.00	9.34	0.00	92.49	0.00	14.32	0.00
5	12.46	0.00	0.00	9.34	0.00	92.49	0.00	14.32	0.00
8	1.42	0.00	80.93	0.00	0.00	0.00	0.00	0.00	0.00
10	9.03	0.57	0.00	53.45	0.00	0.00	0.00	0.00	0.00
DON'T KNOW	10.62	0.00	19.07	27.23	0.00	7.51	100.00	63.66	0.00
n	*19*	*3*	*2*	*7*	*1*	*2*	*1*	*3*	0
<ER6> How much downtime did you experience in the past year?									
0	100.00	0.00	0.00	100.00	0.00	100.00	0.00	100.00	0.00
n	*3*	*0*	*0*	*1*	*0*	*1*	*0*	*1*	*0*
<ER9> In your opinion, based on the economics of operating this equipment, for how many more years could you have kept this equipment functioning?									
2	8.36	0.00	0.00	25.02	0.00	16.16	100.00	22.03	0.00
3	0.84	0.00	0.00	5.28	0.00	0.00	0.00	0.00	0.00
4	12.20	0.00	0.00	9.34	0.00	77.54	0.00	14.32	0.00
5	1.09	0.00	0.00	0.00	100.00	0.00	0.00	0.00	100.00
8	1.39	0.00	80.93	0.00	0.00	0.00	0.00	0.00	0.00
10	0.35	0.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	5.06	0.00	0.00	31.83	0.00	0.00	0.00	0.00	0.00
20	0.33	0.00	19.07	0.00	0.00	0.00	0.00	0.00	0.00
30	3.44	0.00	0.00	21.62	0.00	0.00	0.00	0.00	0.00
DON'T KNOW	66.95	99.43	0.00	6.90	0.00	6.30	0.00	63.66	0.00
n	*20*	*3*	*2*	*7*	*1*	*3*	*1*	*3*	*1*
<PP4> How would you rate your OVERALL satisfaction with the PROGRAM?									
2	0.56	0.00	0.00	0.00	10.12	0.00	1.27	0.00	0.00
3	0.56	0.00	0.00	2.28	0.00	0.00	0.00	0.00	0.00
4	0.27	0.00	0.00	0.00	0.00	0.00	0.00	1.28	0.00
5	1.17	0.26	0.00	0.00	4.55	5.70	0.00	3.97	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.02
7	16.31	45.15	41.24	4.67	8.35	0.00	6.08	5.97	0.00
8	13.91	36.74	5.69	2.91	12.14	14.93	5.36	10.55	13.31
9	15.10	7.00	0.00	24.05	2.51	54.49	24.98	3.13	42.23
10 Completely satisfied	52.12	10.85	53.07	66.08	62.34	24.89	62.30	75.11	14.49
REFUSED	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.94
n	*178*	*38*	*10*	*35*	*20*	*14*	*26*	*35*	12
<LT2> For how many years have you been participating in %UTILITY's energy efficiency programs?									
Less than 1 year	15.99	45.15	0.00	0.76	4.43	2.26	15.26	3.53	0.00
2 to 5 years	42.45	11.60	90.15	61.26	64.17	41.65	54.91	36.90	96.61
5 to 10 years	14.72	36.01	2.73	16.99	21.28	3.07	4.33	0.70	0.44
10 to 20 years	18.21	1.19	7.12	4.37	10.12	0.00	20.14	54.66	2.94
20 to 30 years	3.80	0.15	0.00	15.86	0.00	0.00	0.00	1.78	0.00
Over 30 years	4.83	5.91	0.00	0.75	0.00	53.03	5.36	2.44	0.00
n	175	38	10	34	20	13	25	35	*12*

	DOWNSTREAM ALL	DOWNSTREAM PGE_LED_A-LAMP	DOWNSTREAM PGE_LED_ACCENT	DOWNSTREAM PGE_LED_REFLECTOR	DOWNSTREAM SCE_LED_REFLECTOR	DOWNSTREAM SDGE_LED_A-LAMP	DOWNSTREAM SDGE_LED_ACCENT	DOWNSTREAM SDGE_LED_REFLECTOR	MIDSTREAM SCE
<LT3> During this time, how many times has your organization participated in these PROGRAM(s)?									
7 to 10 times, or more	14.52	39.64	5.18	0.00	0.00	0.00	0.00	2.58	90.05
4 to 7 times	11.60	0.00	78.34	33.92	0.00	1.20	5.34	7.93	6.95
2 to 4 times	42.77	5.35	15.06	59.24	77.78	0.42	57.48	80.93	0.00
less than 2 times	26.12	49.99	1.42	5.86	22.22	8.98	34.63	6.43	3.00
DON'T KNOW	4.99	5.03	0.00	0.97	0.00	89.41	2.55	2.13	0.00
n	*84*	*20*	*5*	*12*	*7*	*7*	*14*	*19*	4
<CA6> What type of equipment did you install through this (these) program(s)?									
Indoor lighting	98.97	99.94	100.00	100.00	54.77	65.65	100.00	100.00	80.09
Cooling equipment	1.02	0.18	0.00	1.67	0.00	0.00	0.00	2.63	0.00
Natural gas equipment, such as water heater, furnace or appliances	2.28	0.17	0.00	1.67	0.00	0.00	0.00	8.11	0.00
Insulation or windows	1.96	0.00	5.18	0.00	45.23	0.00	5.48	0.00	0.00
Refrigeration	1.64	0.34	5.18	1.67	0.00	0.00	6.34	0.00	0.00
Industrial process equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Greenhouse heat curtains	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Food service equipment	0.06	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other equipment	3.90	2.17	5.18	4.47	45.23	34.35	5.83	0.50	19.91
REFUSED	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DON'T KNOW	0.02	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
n	*74*	*16*	*5*	*11*	*7*	*6*	*13*	*16*	4
<LT8> Have these programs had any long-term influence on your organization's energy efficiency related practices and policies that go beyond the immediate effect of incentives on individual projects?									
Yes ALWAYS	39.72	1.97	6.20	100.00	0.00	100.00	100.00	100.00	22.11
DON'T KNOW	60.28	98.03	93.80	0.00	0.00	0.00	0.00	0.00	77.89
n	*11*	*4*	*2*	*1*	*0*	*1*	*1*	*2*	2

* Values are shown as percent of respondents.
* n is the number of respondents.

APPENDIX F MEASURE NAME TO ESPI MEASURE MAPPING

MeasureClass	NormUnit	Measurename
LED_A-LAMP	LAMP	100W EQUIVALENT 100 LPW (LUMENS/WATT)
LED_A-LAMP	LAMP	100W EQUIVALENT 110 LPW (LUMENS/WATT)
LED_A-LAMP	LAMP	100W EQUIVALENT 90 LPW (LUMENS/WATT)
LED_A-LAMP	LAMP	40W EQUIVALENT 100 LPW (LUMENS/WATT)
LED_A-LAMP	LAMP	40W EQUIVALENT 68 LPW (LUMENS/WATT)
LED_A-LAMP	LAMP	40W EQUIVALENT 80 LPW (LUMENS/WATT)
LED_A-LAMP	LAMP	40W EQUIVALENT 90 LPW (LUMENS/WATT)
LED_A-LAMP	LAMP	60W EQUIVALENT 100 LPW (LUMENS/WATT)
LED_A-LAMP	LAMP	60W EQUIVALENT 110 LPW (LUMENS/WATT)
LED_A-LAMP	LAMP	60W EQUIVALENT 80 LPW (LUMENS/WATT)
LED_A-LAMP	LAMP	60W EQUIVALENT 90 LPW (LUMENS/WATT)
LED_A-LAMP	LAMP	7-WATT LED A-LAMP 310-749 LUMENS
LED_A-LAMP	LAMP	75W EQUIVALENT 100 LPW (LUMENS/WATT)
LED_A-LAMP	LAMP	75W EQUIVALENT 110 LPW (LUMENS/WATT)
LED_A-LAMP	LAMP	75W EQUIVALENT 120 LPW (LUMENS/WATT)
LED_A-LAMP	LAMP	75W EQUIVALENT 90 LPW (LUMENS/WATT)
LED_A-LAMP	LAMP	9-WATT LED A-LAMP 750-1049 LUMENS
LED_A-LAMP	Lamp	100W EQUIVALENT LED A-LAMP 100 LPW (LUMENS/WATT) LED
LED_A-LAMP	Lamp	40W EQUIVALENT LED A-LAMP 100 LPW (LUMENS/WATT) LED
LED_A-LAMP	Lamp	60W EQUIVALENT LED A-LAMP 80 LPW (LUMENS/WATT) LED
LED_A-LAMP	Lamp	60W EQUIVALENT LED A-LAMP 90 LPW (LUMENS/WATT) LED
LED_A-LAMP	Lamp	75W EQUIVALENT LED A-LAMP 100 LPW (LUMENS/WATT) LED
LED_A-LAMP	Lamp	75W EQUIVALENT LED A-LAMP 90 LPW (LUMENS/WATT) LED
LED_A-LAMP	Lamp	> 10 TO 30 WATT A-LAMP LED REPLACING A19 BASECASE TOTAL WATTS = 2.96 X MSR WATTS
LED_A-LAMP	Lamp	LED - (DI) A -LAMP 1490-2600 LUMENS, 100W EISA, LPW=100, COMPSCORE=297, DWP=19.1
LED_A-LAMP	Lamp	LED- (DI) A -LAMP 1050-1489 LMS, 75W EISA, LPW=100, COMPSCORE=297, DWP=13.5
LED_A-LAMP	Lamp	LED- (DI) A-LAMP 750-1049 LMS, 60W EISA, LPW=90, COMPSCORE=297, DWP=9.2
LED_A-LAMP	Lamp	UP TO 10 WATT A-LAMP LED REPLACING A19 BASECASE TOTAL WATTS = 2.96 X MSR WATTS
LED_ACCENT	LAMP	LED CANDELABRA 3 TO 5
LED_ACCENT	LAMP	LED CANDELABRA <3W
LED_ACCENT	LAMP	LED CANDELABRA >=3 TO <=5
LED_ACCENT	LAMP	LED GLOBE: 3 TO 10 WATTS
LED_ACCENT	LAMP	LED GLOBE: >=3 TO <=10 WATTS
LED_ACCENT	Lamp	<3 WATT CANDELABRA LED
LED_ACCENT	Lamp	<3 WATT GLOBE LED
LED_ACCENT	Lamp	=3 TO =10 WATTS GLOBE LED
LED_ACCENT	Lamp	=3 WATT TO =5 WATT CANDELABRA LED
LED_ACCENT	Lamp	=3 WATT TO =5 WATT CANDELABRA LED REPLACING CANDELABRA BASECASE TOTAL WATTS = 7.35 X MSR WATTS
LED_ACCENT	Lamp	>= 4 WATT CANDELABRA LED REPLACING CANDELABRA BASECASE TOTAL WATTS = 7.35 X MSR WATTS

MeasureClass	NormUnit	Measurename
LED_ACCENT	Lamp	COMMERCIAL LED CANDELABRA: 4 TO <5 WATT
LED_ACCENT	Lamp	COMMERCIAL-LED - CANDALEBRA 2 WATT
LED_ACCENT	Lamp	COMMERCIAL-LED - CANDALEBRA 5 WATT
LED_ACCENT	Lamp	LED - CANDALEBRA 4 WATT
LED_ACCENT	Lamp	LED SCREW-IN GLOBE 7.5 WATT
LED_HIGH_LOWBAY	FIXTURE	LED HIGH/LOW BAY: 110 LPW TO <130 LPW, 0 TO <48 W
LED_HIGH_LOWBAY	FIXTURE	LED HIGH/LOW BAY: 110 LPW TO <130 LPW, 48 TO <71 W
LED_HIGH_LOWBAY	FIXTURE	LED HIGH/LOW BAY: 110 LPW TO <130 LPW, 71 TO <90 W
LED_HIGH_LOWBAY	FIXTURE	LED HIGH/LOW BAY: 120 LPW TO <130 LPW, 125 TO <153 W
LED_HIGH_LOWBAY	FIXTURE	LED HIGH/LOW BAY: 120 LPW TO <130 LPW, 90 TO <125 W
LED_HIGH_LOWBAY	FIXTURE	LED HIGH/LOW BAY: 125 LPW TO <135 LPW, 153 TO <187 W
LED_HIGH_LOWBAY	FIXTURE	LED HIGH/LOW BAY: 125 LPW TO <135 LPW, 187 TO <212 W
LED_HIGH_LOWBAY	FIXTURE	LED HIGH/LOW BAY: 125 LPW TO <135 LPW, 212 TO <246 W
LED_HIGH_LOWBAY	FIXTURE	LED HIGH/LOW BAY: 125 LPW TO <135 LPW, 246 TO <283 W
LED_HIGH_LOWBAY	FIXTURE	LED HIGH/LOW BAY: 40 TO 131 WATTS, REPLACING 175W PS-MH
LED_HIGH_LOWBAY	FIXTURE	LED HIGH/LOW BAY: 40 TO 131 WATTS, REPLACING T8 FLUORESCENT 2ND GENERATION 4L VHLO
LED_HIGH_LOWBAY	FIXTURE	LED HIGH/LOW BAY: > 500 TO 750 WATTS, REPLACING 1000W PS-MH
LED_HIGH_LOWBAY	FIXTURE	LED HIGH/LOW BAY: >131 TO 160 WATTS, REPLACING 200W PS-MH
LED_HIGH_LOWBAY	FIXTURE	LED HIGH/LOW BAY: >131 TO 160 WATTS, REPLACING T8 FLUORESCENT 2ND GENERATION 6L VHLO
LED_HIGH_LOWBAY	FIXTURE	LED HIGH/LOW BAY: >160 TO 187 WATTS, REPLACING 250 W PS-MH
LED_HIGH_LOWBAY	FIXTURE	LED HIGH/LOW BAY: >160 TO 220 WATTS, REPLACING T8 FLUORESCENT 2ND GENERATION 8L VHLO
LED_HIGH_LOWBAY	FIXTURE	LED HIGH/LOW BAY: >187 TO 220 WATTS, REPLACING 320W PS-MH
LED_HIGH_LOWBAY	FIXTURE	LED HIGH/LOW BAY: >220 TO 262 WATTS, REPLACING 350W PS-MH
LED_HIGH_LOWBAY	FIXTURE	LED HIGH/LOW BAY: >262 TO 280 WATTS, REPLACING 400W PS-MH
LED_HIGH_LOWBAY	FIXTURE	LED HIGH/LOW BAY: >280 TO 320 WATTS, REPLACING 450W PS-MH
LED_HIGH_LOWBAY	FIXTURE	LED HIGH/LOW BAY: >320 TO 500 WATTS, REPLACING 750W PS-MH
LED_HIGH_LOWBAY	FIXTURE	LED HIGH/LOW BAY: >=130 LPW, 0 TO <42 W
LED_HIGH_LOWBAY	FIXTURE	LED HIGH/LOW BAY: >=130 LPW, 113 TO <140 W
LED_HIGH_LOWBAY	FIXTURE	LED HIGH/LOW BAY: >=130 LPW, 42 TO <60 W
LED_HIGH_LOWBAY	FIXTURE	LED HIGH/LOW BAY: >=130 LPW, 60 TO <82 W
LED_HIGH_LOWBAY	FIXTURE	LED HIGH/LOW BAY: >=130 LPW, 82 TO <113 W
LED_HIGH_LOWBAY	FIXTURE	LED HIGH/LOW BAY: >=135 LPW, 140 TO <174 W
LED_HIGH_LOWBAY	FIXTURE	LED HIGH/LOW BAY: >=135 LPW, 174 TO <194 W
LED_HIGH_LOWBAY	FIXTURE	LED HIGH/LOW BAY: >=135 LPW, 194 TO <227 W
LED_HIGH_LOWBAY	FIXTURE	LED HIGH/LOW BAY: >=135 LPW, 227 TO <262 W
LED_HIGH_LOWBAY	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 13 TO <14W LED
LED_HIGH_LOWBAY	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 10 TO <11W LED
LED_HIGH_LOWBAY	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 11 TO <12W LED
LED_HIGH_LOWBAY	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 12 TO <13W LED
LED_HIGH_LOWBAY	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 14 TO <15W LED

MeasureClass	NormUnit	Measurename
LED_HIGH_LOWBAY	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 15 TO <16W LED
LED_HIGH_LOWBAY	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 16 TO <17W LED
LED_HIGH_LOWBAY	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 17 TO <18W LED
LED_HIGH_LOWBAY	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 18 TO <19W LED
LED_HIGH_LOWBAY	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 19 TO <20W LED
LED_HIGH_LOWBAY	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 20 TO <21W LED
LED_HIGH_LOWBAY	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 21 TO <22W LED
LED_HIGH_LOWBAY	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 22 TO <23W LED
LED_HIGH_LOWBAY	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 23 TO <24W LED
LED_HIGH_LOWBAY	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 24 TO <25W LED
LED_HIGH_LOWBAY	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 25W LED
LED_HIGH_LOWBAY	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 7 TO < 8W LED
LED_HIGH_LOWBAY	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 8 TO < 9W LED
LED_HIGH_LOWBAY	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 9 TO < 10W LED
LED_HIGH_LOWBAY	Fixture	40 TO 131 WATT HIGH/LOW BAY LED REPLACING 175 WATT PULSE START METAL HALIDE
LED_HIGH_LOWBAY	Fixture	>160 TO 187 WATT HIGH/LOW BAY LED REPLACING 250 WATT PULSE START METAL HALIDE
LED_HIGH_LOWBAY	Fixture	>160 TO 220 WATT HIGH/LOW BAY LED REPLACING (8) 48IN T8 VHLO
LED_HIGH_LOWBAY	Fixture	>220 TO 262 WATT HIGH/LOW BAY LED REPLACING 350 WATT PULSE START METAL HALIDE
LED_HIGH_LOWBAY	Fixture	COMMERCIAL LED RECESSED DOWNLIGHT 21 WATT
LED_HIGH_LOWBAY	Fixture	HIGH BAY LED: >131 TO 160 WATTS
LED_HIGH_LOWBAY	Fixture	HIGH BAY LED: >160 TO 187 WATTS
LED_HIGH_LOWBAY	Fixture	LED FIX: HIGH/LOW BAY 120 LPW TO <130 LPW 125 TO <153 W LED REPLACING 10% HPT8 6 LAMP LF FIXTURE & 90% LED 25TH % EFFICACY
LED_HIGH_LOWBAY	Fixture	LED FIX: HIGH/LOW BAY 125 LPW TO <135 LPW 153 TO <187 W LED REPLACING 10% HPT8 6 LAMP LF FIXTURE & 90% LED 25TH % EFFICACY
LED_HIGH_LOWBAY	Fixture	LED FIX: HIGH/LOW BAY 125 LPW TO <135 LPW 212 TO <246 W LED REPLACING 100% LED 25TH PERCENTILE EFFICACY
LED_HIGH_LOWBAY	Fixture	LED FIX: HIGH/LOW BAY 125 LPW TO <135 LPW 246 TO <283 W LED REPLACING 100% LED 25TH PERCENTILE EFFICACY
LED_HIGH_LOWBAY	Fixture	LED FIXTURE: 22 TO 39 WATTS

MeasureClass	NormUnit	Measurename
LED_HIGH_LOWBAY	Fixture	LED FIXTURE: HIGH/LOW BAY 110 LPW TO <130 LPW 48 TO <71 W LED REPLACING 20% HPT8 2 LAMP LF FIXTURE & 80% LED 25TH % EFFICACY
LED_HIGH_LOWBAY	Fixture	LED FIXTURE: HIGH/LOW BAY >=130 LPW 0 TO <42 W LED REPLACING 20% HPT8 2 LAMP LF FIXTURE & 80% LED 25TH % EFFICACY
LED_HIGH_LOWBAY	Fixture	LED FIXTURE: HIGH/LOW BAY >=130 LPW 113 TO <140 W LED REPLACING 10% HPT8 6 LAMP LF FIXTURE & 90% LED 25TH % EFFICACY
LED_HIGH_LOWBAY	Fixture	LED FIXTURE: HIGH/LOW BAY >=130 LPW 42 TO <60 W LED REPLACING 20% HPT8 2 LAMP LF FIXTURE & 80% LED 25TH % EFFICACY
LED_HIGH_LOWBAY	Fixture	LED FIXTURE: HIGH/LOW BAY >=130 LPW 60 TO <82 W LED REPLACING 20% HPT8 2 LAMP LF FIXTURE & 80% LED 25TH % EFFICACY
LED_HIGH_LOWBAY	Fixture	LED FIXTURE: HIGH/LOW BAY >=130 LPW 82 TO <113 W LED REPLACING 10% HPT8 6 LAMP LF FIXTURE & 90% LED 25TH % EFFICACY
LED_HIGH_LOWBAY	Fixture	LED FIXTURE: HIGH/LOW BAY >=135 LPW 140 TO <174 W LED REPLACING 10% HPT8 6 LAMP LF FIXTURE & 90% LED 25TH % EFFICACY
LED_HIGH_LOWBAY	Fixture	LED FIXTURE: HIGH/LOW BAY >=135 LPW 174 TO <194 W LED REPLACING 100% LED 25TH PERCENTILE EFFICACY
LED_HIGH_LOWBAY	Fixture	LED FIXTURE: HIGH/LOW BAY >=135 LPW 194 TO <227 W LED REPLACING 100% LED 25TH PERCENTILE EFFICACY
LED_HIGH_LOWBAY	Fixture	LED FIXTURE: HIGH/LOW BAY >=135 LPW 227 TO <262 W LED REPLACING 100% LED 25TH PERCENTILE EFFICACY
LED_HIGH_LOWBAY	Fixture	LIGHTING-LED FIXTURE: HIGH/LOW BAY, 110 LPW TO <130 LPW, 71 TO <90 W
LED_HIGH_LOWBAY	Fixture	LIGHTING-LED FIXTURE: HIGH/LOW BAY, 120 LPW TO <130 LPW, 90 TO <125 W
LED_HIGH_LOWBAY	Fixture	LIGHTING-LED FIXTURE: HIGH/LOW BAY, 125 LPW TO <135 LPW, 153 TO <187 W
LED_HIGH_LOWBAY	Fixture	LIGHTING-LED FIXTURE: HIGH/LOW BAY, 125 LPW TO <135 LPW, 246 TO <283 W
LED_HIGH_LOWBAY	Fixture	LIGHTING-LED FIXTURE: HIGH/LOW BAY, >=130 LPW, 0 TO <42 W
LED_HIGH_LOWBAY	Fixture	LIGHTING-LED FIXTURE: HIGH/LOW BAY, >=130 LPW, 113 TO <140 W
LED_HIGH_LOWBAY	Fixture	LIGHTING-LED FIXTURE: HIGH/LOW BAY, >=130 LPW, 42 TO <60 W
LED_HIGH_LOWBAY	Fixture	LIGHTING-LED FIXTURE: HIGH/LOW BAY, >=130 LPW, 60 TO <82 W
LED_HIGH_LOWBAY	Fixture	LIGHTING-LED FIXTURE: HIGH/LOW BAY, >=130 LPW, 82 TO <113 W
LED_HIGH_LOWBAY	Fixture	LIGHTING-LED FIXTURE: HIGH/LOW BAY, >=135 LPW, 140 TO <174 W
LED_HIGH_LOWBAY	KILOLUMEN	1X4 LED INTEGRATED RETROFIT KIT RATED GREATER THAN OR EQUAL TO 125 LPW AND LESS THAN 140 LPW, AMBIENT INTERIOR COMMERCIAL SPACES
LED_HIGH_LOWBAY	KILOLUMEN	1X4 LED INTEGRATED RETROFIT KIT RATED 110 AND <125 LPW, AMBIENT INTERIOR COMMERCIAL SPACES
LED_HIGH_LOWBAY	KILOLUMEN	1X4 LED NEW LUMINAIRE RATED GREATER THAN OR EQUAL TO 125 LPW AND LESS THAN 140 LPW, AMBIENT INTERIOR COMMERCIAL SPACES
LED_HIGH_LOWBAY	KILOLUMEN	1X4 LED NEW LUMINAIRE RATED 125 LPW, AMBIENT INTERIOR COMMERCIAL SPACES
LED_HIGH_LOWBAY	KILOLUMEN	2X2 LED INTEGRATED RETROFIT KIT RATED GREATER THAN OR EQUAL TO 125 LPW AND LESS THAN 140 LPW, AMBIENT INTERIOR COMMERCIAL SPACES
LED_HIGH_LOWBAY	KILOLUMEN	2X2 LED INTEGRATED RETROFIT KIT RATED GREATER THAN OR EQUAL TO 140 LPW, AMBIENT INTERIOR COMMERCIAL SPACES
LED_HIGH_LOWBAY	KILOLUMEN	2X2 LED INTEGRATED RETROFIT KIT RATED 125 LPW, AMBIENT INTERIOR COMMERCIAL SPACES
LED_HIGH_LOWBAY	KILOLUMEN	2X2 LED NEW LUMINAIRE RATED GREATER THAN OR EQUAL TO 125 LPW AND LESS THAN 140 LPW, AMBIENT INTERIOR COMMERCIAL SPACES
LED_HIGH_LOWBAY	KILOLUMEN	2X2 LED NEW LUMINAIRE RATED GREATER THAN OR EQUAL TO 140 LPW, AMBIENT INTERIOR COMMERCIAL SPACES

MeasureClass	NormUnit	Measurename
LED_HIGH_LOWBAY	KILOLUMEN	2X2 LED NEW LUMINAIRE RATED 125 LPW, AMBIENT INTERIOR COMMERCIAL SPACES
LED_HIGH_LOWBAY	KILOLUMEN	2X4 LED INTEGRATED RETROFIT KIT RATED GREATER THAN OR EQUAL TO 125 LPW AND LESS THAN 140 LPW, AMBIENT INTERIOR COMMERCIAL SPACES
LED_HIGH_LOWBAY	KILOLUMEN	2X4 LED INTEGRATED RETROFIT KIT RATED GREATER THAN OR EQUAL TO 140 LPW, AMBIENT INTERIOR COMMERCIAL SPACES
LED_HIGH_LOWBAY	KILOLUMEN	2X4 LED INTEGRATED RETROFIT KIT RATED 125 LPW, AMBIENT INTERIOR COMMERCIAL SPACES
LED_HIGH_LOWBAY	KILOLUMEN	2X4 LED NEW LUMINAIRE RATED GREATER THAN OR EQUAL TO 125 LPW AND LESS THAN 140 LPW, AMBIENT INTERIOR COMMERCIAL SPACES
LED_HIGH_LOWBAY	KILOLUMEN	2X4 LED NEW LUMINAIRE RATED GREATER THAN OR EQUAL TO 140 LPW, AMBIENT INTERIOR COMMERCIAL SPACES
LED_HIGH_LOWBAY	KILOLUMEN	2X4 LED NEW LUMINAIRE RATED 110 AND <125 LPW, AMBIENT INTERIOR COMMERCIAL SPACES
LED_HIGH_LOWBAY	KILOLUMEN	2X4 LED NEW LUMINAIRE RATED 125 LPW, AMBIENT INTERIOR COMMERCIAL SPACES
LED_HIGH_LOWBAY	KiloLumen	LIGHTING - INTERIOR INTEGRATED LED RETROFI KITS - SIZE 2X2, >=125 TO 139 LPW
LED_HIGH_LOWBAY	KiloLumen	LIGHTING - INTERIOR INTEGRATED LED RETROFI KITS - SIZE 2X2, >=140 LPW
LED_HIGH_LOWBAY	KiloLumen	LIGHTING - INTERIOR INTEGRATED LED RETROFIT KITS - SIZE 1X4, >=125 TO 139 LPW
LED_HIGH_LOWBAY	KiloLumen	LIGHTING - INTERIOR INTEGRATED LED RETROFIT KITS - SIZE 2X4, >=125 TO 139 LPW
LED_HIGH_LOWBAY	KiloLumen	LIGHTING - INTERIOR INTEGRATED LED RETROFIT KITS - SIZE 2X4, >=140 LPW
LED_HIGH_LOWBAY	KiloLumen	LIGHTING - INTERIOR LED NEW LUMINAIRE - SIZE 1X4, >=125 TO 139 LPW
LED_HIGH_LOWBAY	KiloLumen	LIGHTING - INTERIOR LED NEW LUMINAIRE - SIZE 2X2, >=125 TO 139 LPW,
LED_HIGH_LOWBAY	KiloLumen	LIGHTING - INTERIOR LED NEW LUMINAIRE - SIZE 2X2, >=140 LPW
LED_HIGH_LOWBAY	KiloLumen	LIGHTING - INTERIOR LED NEW LUMINAIRE - SIZE 2X4, >=140 LPW
LED_HIGH_LOWBAY	KiloLumen	LIGHTING - INTERIOR LED NEW LUMINAIRE - SIZE 2X4, >=125 TO 139 LPW
LED_HIGH_LOWBAY	Kilolumen	1X4 LED LUMINAIRE BETWEEN 125 LPW AND 140 LPW LED
LED_HIGH_LOWBAY	Kilolumen	1X4 LED RETROFIT KIT BETWEEN 125 LPW AND 140 LPW LED
LED_HIGH_LOWBAY	Kilolumen	2X2 LED LUMINAIRE BETWEEEN 125 LPW AND 140 LPW LED
LED_HIGH_LOWBAY	Kilolumen	2X2 LED LUMINAIRE RATED GREATER THAN OR EQUAL TO 140 LPW LED
LED_HIGH_LOWBAY	Kilolumen	2X2 LED RETROFIT KIT BETWEEEN 125 LPW AND 140 LPW LED
LED_HIGH_LOWBAY	Kilolumen	2X2 LED RETROFIT KIT RATED GREATER THAN OR EQUAL TO 140 LPW LED
LED_HIGH_LOWBAY	Kilolumen	2X4 LED INTERIOR LUMINAIRE BETWEEN 125 LPW AND 140 LPW LED
LED_HIGH_LOWBAY	Kilolumen	2X4 LED INTERIOR RETROFIT KIT BETWEEN 125 LPW AND 140 LPW LED
LED_HIGH_LOWBAY	Kilolumen	2X4 LED LUMINAIRE RATED GREATER THAN OR EQUAL TO 140 LPW LED
LED_HIGH_LOWBAY	Kilolumen	2X4 LED RETROFIT KIT RATED GREATER THAN OR EQUAL TO 140 LPW LED
LED_HIGH_LOWBAY	Lamp	= 15 WATT DOWN LIGHT (NON RES) LED REPLACING PAR30 BASECASE TOTAL WATTS = 3.42 X MSR WATTS
LED_HIGH_LOWBAY	Lamp	COMMERCIAL LED CAN RETROFIT: 20 TO <21 WATTS
LED_HIGH_LOWBAY	Lamp	COMMERCIAL LED CAN RETROFIT: 21 TO <23 WATTS
LED_HIGH_LOWBAY	Lamp	COMMERCIAL LED CAN RETROFIT: >=23 WATTS
LED_OUTDOOR_FIXTURE	Each	LED FIXTURE: POLE-MOUNTED EXTERIOR RATED 107 WATTS
LED_OUTDOOR_FIXTURE	Each	LED FIXTURE: POLE-MOUNTED EXTERIOR RATED 146 WATTS
LED_OUTDOOR_FIXTURE	Each	LED FIXTURE: POLE-MOUNTED EXTERIOR RATED 235 WATTS
LED_OUTDOOR_FIXTURE	Each	LED FIXTURE: POLE-MOUNTED EXTERIOR RATED 390 WATTS
LED_OUTDOOR_FIXTURE	Each	LED FIXTURE: POLE-MOUNTED EXTERIOR RATED 68 WATTS
LED_OUTDOOR_FIXTURE	Each	LED FIXTURE: POLE-MOUNTED EXTERIOR RATED 90 WATTS
LED_OUTDOOR_FIXTURE	Each	LED FIXTURE: WALL-MOUNTED EXTERIOR RATED 337 WATTS
LED_OUTDOOR_FIXTURE	Each	LED FIXTURE: WALL-MOUNTED EXTERIOR RATED 58 WATTS

MeasureClass	NormUnit	Measurename
LED_OUTDOOR_FIXTURE	Each	LED OUTDOOR PARKING GARAGE LIGHTING: INSTALL 57 - 88 WATTS FIXTURE LED REPLACING 60% LED 20% LINEAR FLUORESCENT AND 20% MH
LED_OUTDOOR_FIXTURE	Each	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 108 - 146 W FIXTURE LED REPLACING 100% LED AT 25TH PERCENTILE LIGHTING FACTS
LED_OUTDOOR_FIXTURE	Each	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 147 - 235 W FIXTURE LED REPLACING 100% LED AT 25TH PERCENTILE LIGHTING FACTS
LED_OUTDOOR_FIXTURE	Each	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 236 - 390 W FIXTURE LED REPLACING 100% LED AT 25TH PERCENTILE LIGHTING FACTS
LED_OUTDOOR_FIXTURE	Each	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 30 - 45 W FIXTURE LED REPLACING 100% LED AT 25TH PERCENTILE LIGHTING FACTS
LED_OUTDOOR_FIXTURE	Each	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 391 - 571 W FIXTURE LED REPLACING 100% LED AT 25TH PERCENTILE LIGHTING FACTS
LED_OUTDOOR_FIXTURE	Each	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 46 - 68 W FIXTURE LED REPLACING 100% LED AT 25TH PERCENTILE LIGHTING FACTS
LED_OUTDOOR_FIXTURE	Each	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 69 - 90 W FIXTURE LED REPLACING 100% LED AT 25TH PERCENTILE LIGHTING FACTS
LED_OUTDOOR_FIXTURE	Each	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 91 - 107 W FIXTURE LED REPLACING 100% LED AT 25TH PERCENTILE LIGHTING FACTS
LED_OUTDOOR_FIXTURE	Each	LED OUTDOOR WALL-MOUNTED AREA LIGHTING: INSTALL 0 - 25 WATTS FIXTURE LED REPLACING 100% LED AT 25TH PERCENTILE LIGHTING FACTS
LED_OUTDOOR_FIXTURE	Each	LED OUTDOOR WALL-MOUNTED AREA LIGHTING: INSTALL 26 - 39 WATTS FIXTURE LED REPLACING 100% LED AT 25TH PERCENTILE LIGHTING FACTS
LED_OUTDOOR_FIXTURE	Each	LED OUTDOOR WALL-MOUNTED AREA LIGHTING: INSTALL 40 - 58 WATTS FIXTURE LED REPLACING 100% LED AT 25TH PERCENTILE LIGHTING FACTS
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR AREA LIGHTING - INSTALL 0-50 W FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR AREA LIGHTING - INSTALL 111-150 W FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR AREA LIGHTING - INSTALL 151-192 W FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR AREA LIGHTING - INSTALL 193-225 W FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR AREA LIGHTING - INSTALL 226-265 W FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR AREA LIGHTING - INSTALL 266-500 W FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR AREA LIGHTING - INSTALL 501-750 W FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR AREA LIGHTING - INSTALL 51-70 W FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR AREA LIGHTING - INSTALL 71-110 W FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR FUEL PUMP CANOPY LIGHTING: INSTALL 0 - 19 WATTS FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR FUEL PUMP CANOPY LIGHTING: INSTALL 100 - 153 WATTS FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR FUEL PUMP CANOPY LIGHTING: INSTALL 20 - 29 WATTS FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR FUEL PUMP CANOPY LIGHTING: INSTALL 30 - 46 WATTS FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR FUEL PUMP CANOPY LIGHTING: INSTALL 47 - 59 WATTS FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR FUEL PUMP CANOPY LIGHTING: INSTALL 60 - 73 WATTS FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR FUEL PUMP CANOPY LIGHTING: INSTALL 74 - 99 WATTS FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR PARKING GARAGE LIGHTING: INSTALL 0 - 38 WATTS FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR PARKING GARAGE LIGHTING: INSTALL 39 - 56 WATTS FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR PARKING GARAGE LIGHTING: INSTALL 57 - 88 WATTS FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR PARKING GARAGE LIGHTING: INSTALL 89 - 113 WATTS FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 0 - 29 W FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 108 - 146 W FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 147 - 235 W FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 236 - 390 W FIXTURE

MeasureClass	NormUnit	Measurename
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 30 - 45 W FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 391 - 571 W FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 46 - 68 W FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 69 - 90 W FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 91 - 107 W FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR WALL-MOUNTED AREA LIGHTING: INSTALL 0 - 25 WATTS FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR WALL-MOUNTED AREA LIGHTING: INSTALL 127 - 203 WATTS FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR WALL-MOUNTED AREA LIGHTING: INSTALL 204 - 337 WATTS FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR WALL-MOUNTED AREA LIGHTING: INSTALL 26 - 39 WATTS FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR WALL-MOUNTED AREA LIGHTING: INSTALL 40 - 58 WATTS FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR WALL-MOUNTED AREA LIGHTING: INSTALL 59 - 78 WATTS FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR WALL-MOUNTED AREA LIGHTING: INSTALL 79 - 97 WATTS FIXTURE
LED_OUTDOOR_FIXTURE	FIXTURE	LED OUTDOOR WALL-MOUNTED AREA LIGHTING: INSTALL 98 - 126 WATTS FIXTURE
LED_OUTDOOR_FIXTURE	Fixture	114 TO 123 WATT EXTERIOR FIXTURE WITH MOTION CONTROL AND PHOTO SENSOR LED REPLACING 250 WATT PULSE START METAL HALIDE
LED_OUTDOOR_FIXTURE	Fixture	121 TO 150 WATT EXTERIOR FIXTURE WITH MOTION CONTROL AND PHOTO SENSOR LED REPLACING 250 WATT HIGH PRESSURE SODIUM
LED_OUTDOOR_FIXTURE	Fixture	124 TO 161 WATT EXTERIOR FIXTURE WITH MOTION CONTROL AND PHOTO SENSOR LED REPLACING 320 WATT PULSE START METAL HALIDE
LED_OUTDOOR_FIXTURE	Fixture	124 TO 161 WATT EXTERIOR LED FIXTURE MOUNTED 15 TO <24 FT. WITH MOTION CONTROL AND PHOTO SENSOR LED REPLACING 320 WATT PULSE START METAL HALIDE
LED_OUTDOOR_FIXTURE	Fixture	162 TO 194 WATT EXTERIOR FIXTURE WITH MOTION CONTROL AND PHOTO SENSOR LED REPLACING 350 WATT PULSE START METAL HALIDE
LED_OUTDOOR_FIXTURE	Fixture	195 TO 226 WATT EXTERIOR LED FIXTURE MOUNTED 15 TO <24 FT. WITH MOTION CONTROL AND PHOTO SENSOR LED REPLACING 400 WATT PULSE START METAL HALIDE
LED_OUTDOOR_FIXTURE	Fixture	227 TO 254 WATT EXTERIOR LED FIXTURE MOUNTED 15 TO <24 FT. WITH MOTION CONTROL AND PHOTO SENSOR LED REPLACING 450 WATT PULSE START METAL HALIDE
LED_OUTDOOR_FIXTURE	Fixture	255 TO 325 WATT EXTERIOR FIXTURE WITH MOTION CONTROL AND PHOTO SENSOR LED REPLACING 575 WATT PULSE START METAL HALIDE
LED_OUTDOOR_FIXTURE	Fixture	255 TO 325 WATT EXTERIOR LED FIXTURE MOUNTED 15 TO <24 FT. WITH MOTION CONTROL AND PHOTO SENSOR LED REPLACING 575 WATT PULSE START METAL HALIDE
LED_OUTDOOR_FIXTURE	Fixture	441 TO 517 WATT EXTERIOR LED FIXTURE MOUNTED 15 TO <24 FT. WITH MOTION CONTROL AND PHOTO SENSOR LED REPLACING 875 WATT PULSE START METAL HALIDE
LED_OUTDOOR_FIXTURE	Fixture	45 TO 67 WATT EXTERIOR FIXTURE WITH MOTION CONTROL AND PHOTO SENSOR LED REPLACING 150 WATT PULSE START METAL HALIDE
LED_OUTDOOR_FIXTURE	Fixture	45 TO 67 WATT EXTERIOR LED FIXTURE MOUNTED 15 TO <24 FT. WITH MOTION CONTROL AND PHOTO SENSOR LED REPLACING 150 WATT PULSE START METAL HALIDE
LED_OUTDOOR_FIXTURE	Fixture	68 TO 90 WATT EXTERIOR FIXTURE WITH MOTION CONTROL AND PHOTO SENSOR LED REPLACING 175 WATT PULSE START METAL HALIDE
LED_OUTDOOR_FIXTURE	Fixture	68 TO 90 WATT EXTERIOR LED FIXTURE MOUNTED 15 TO <24 FT. WITH MOTION CONTROL AND PHOTO SENSOR LED REPLACING 175 WATT PULSE START METAL HALIDE

MeasureClass	NormUnit	Measurename
LED_OUTDOOR_FIXTURE	Fixture	91 TO 113 WATT EXTERIOR FIXTURE WITH MOTION CONTROL AND PHOTO SENSOR LED REPLACING 200 WATT PULSE START METAL HALIDE
LED_OUTDOOR_FIXTURE	Fixture	91 TO 113 WATT EXTERIOR LED FIXTURE MOUNTED 15 TO <24 FT. WITH MOTION CONTROL AND PHOTO SENSOR LED REPLACING 200 WATT PULSE START METAL HALIDE
LED_OUTDOOR_FIXTURE	Fixture	LED FIXTURE: POLE-MOUNTED EXTERIOR RATED 146 WATTS
LED_OUTDOOR_FIXTURE	Fixture	LED FIXTURE: POLE-MOUNTED EXTERIOR RATED 390 WATTS
LED_OUTDOOR_FIXTURE	Fixture	LED FIXTURE: POLE-MOUNTED EXTERIOR RATED 90 WATTS
LED_OUTDOOR_FIXTURE	Fixture	LED FIXTURE: WALL-MOUNTED EXTERIOR RATED 337 WATTS
LED_OUTDOOR_FIXTURE	Fixture	LED FIXTURE: WALL-MOUNTED EXTERIOR RATED 58 WATTS
LED_OUTDOOR_FIXTURE	Fixture	LIGHTING-COMMERCIAL OUTDOOR WALL-MOUNTED AREA: LED FIXTURE: INSTALL 0 - 25 W
LED_OUTDOOR_FIXTURE	Fixture	LIGHTING-COMMERCIAL OUTDOOR WALL-MOUNTED AREA: LED FIXTURE: INSTALL 127 - 203 W
LED_OUTDOOR_FIXTURE	Fixture	LIGHTING-COMMERCIAL OUTDOOR WALL-MOUNTED AREA: LED FIXTURE: INSTALL 26 - 39 W
LED_OUTDOOR_FIXTURE	Fixture	LIGHTING-COMMERCIAL OUTDOOR WALL-MOUNTED AREA: LED FIXTURE: INSTALL 40 - 58 W
LED_OUTDOOR_FIXTURE	Fixture	LIGHTING-COMMERCIAL OUTDOOR WALL-MOUNTED AREA: LED FIXTURE: INSTALL 59 - 78 W
LED_OUTDOOR_FIXTURE	Fixture	LIGHTING-COMMERCIAL OUTDOOR WALL-MOUNTED AREA: LED FIXTURE: INSTALL 79 - 97 W
LED_OUTDOOR_FIXTURE	Fixture	LIGHTING-COMMERCIAL OUTDOOR WALL-MOUNTED AREA: LED FIXTURE: INSTALL 98 - 126 W
LED_OUTDOOR_FIXTURE	Fixture	LIGHTING-COMMERCIAL PARKING GARAGE: LED FIXTURE: INSTALL 39 - 56 W
LED_OUTDOOR_FIXTURE	Fixture	LIGHTING-COMMERCIAL POLE/ARM-MOUNTED ROAD & AREA: LED FIXTURE, INSTALL 0 - 29 W
LED_OUTDOOR_FIXTURE	Fixture	LIGHTING-COMMERCIAL POLE/ARM-MOUNTED ROAD & AREA: LED FIXTURE, INSTALL 108 - 146 W
LED_OUTDOOR_FIXTURE	Fixture	LIGHTING-COMMERCIAL POLE/ARM-MOUNTED ROAD & AREA: LED FIXTURE, INSTALL 147 - 235 W
LED_OUTDOOR_FIXTURE	Fixture	LIGHTING-COMMERCIAL POLE/ARM-MOUNTED ROAD & AREA: LED FIXTURE, INSTALL 236 - 390 W
LED_OUTDOOR_FIXTURE	Fixture	LIGHTING-COMMERCIAL POLE/ARM-MOUNTED ROAD & AREA: LED FIXTURE, INSTALL 30 - 45 W
LED_OUTDOOR_FIXTURE	Fixture	LIGHTING-COMMERCIAL POLE/ARM-MOUNTED ROAD & AREA: LED FIXTURE, INSTALL 391 - 571 W
LED_OUTDOOR_FIXTURE	Fixture	LIGHTING-COMMERCIAL POLE/ARM-MOUNTED ROAD & AREA: LED FIXTURE, INSTALL 46 - 68 W
LED_OUTDOOR_FIXTURE	Fixture	LIGHTING-COMMERCIAL POLE/ARM-MOUNTED ROAD & AREA: LED FIXTURE, INSTALL 69 - 90 W
LED_OUTDOOR_FIXTURE	Fixture	LIGHTING-COMMERCIAL POLE/ARM-MOUNTED ROAD & AREA: LED FIXTURE, INSTALL 91 - 107 W
LED_OUTDOOR_FIXTURE	Fixture	LIGHTING-COMMERICAL OUDOOR FUEL PUMP CANOPY: LED FIXTURE: INSTALL 100 - 153 W
LED_OUTDOOR_FIXTURE	Fixture	LIGHTING-COMMERICAL OUDOOR FUEL PUMP CANOPY: LED FIXTURE: INSTALL 20 - 29 W

MeasureClass	NormUnit	Measurename
LED_OUTDOOR_FIXTURE	Fixture	LIGHTING-COMMERICAL OUDOOR FUEL PUMP CANOPY: LED FIXTURE: INSTALL 47 - 59 W
LED_OUTDOOR_FIXTURE	Fixture	LIGHTING-COMMERICAL OUDOOR FUEL PUMP CANOPY: LED FIXTURE: INSTALL 60 - 73 W
LED_OUTDOOR_FIXTURE	Fixture	LIGHTING-COMMERICAL OUDOOR FUEL PUMP CANOPY: LED FIXTURE: INSTALL 74 - 99 W
LED_REFLECTOR	LAMP	LED MR-16: 6 TO <7 WATTS
LED_REFLECTOR	LAMP	LED MR-16: 7 TO <8 WATTS
LED_REFLECTOR	LAMP	LED MR-16: 8 TO <9 WATTS
LED_REFLECTOR	LAMP	LED MR-16: <6 WATTS
LED_REFLECTOR	LAMP	LED PAR16: 6 TO < 7 WATTS
LED_REFLECTOR	LAMP	LED PAR16: 7 WATTS
LED_REFLECTOR	LAMP	LED PAR16: <6 WATTS
LED_REFLECTOR	LAMP	LED PAR20: 11 WATTS
LED_REFLECTOR	LAMP	LED PAR30: 14 TO <15 WATTS
LED_REFLECTOR	LAMP	LED PAR30: 15 TO <16 WATTS
LED_REFLECTOR	LAMP	LED PAR30: 10 TO <11 WATTS
LED_REFLECTOR	LAMP	LED PAR30: 11 TO <12 WATTS
LED_REFLECTOR	LAMP	LED PAR30: 12 TO <13 WATTS
LED_REFLECTOR	LAMP	LED PAR30: 13 TO <14 WATTS
LED_REFLECTOR	LAMP	LED PAR30: 17 TO <18 WATTS
LED_REFLECTOR	LAMP	LED PAR30: 19 TO <20 WATTS
LED_REFLECTOR	LAMP	LED PAR30: <10 WATTS
LED_REFLECTOR	LAMP	LED PAR38: 12 TO <13 WATTS
LED_REFLECTOR	LAMP	LED PAR38: 13 TO <14 WATTS
LED_REFLECTOR	LAMP	LED PAR38: 14 TO <15 WATTS
LED_REFLECTOR	LAMP	LED PAR38: 15 TO <16 WATTS
LED_REFLECTOR	LAMP	LED PAR38: 16 TO <17 WATTS
LED_REFLECTOR	LAMP	LED PAR38: 17 TO <18 WATTS
LED_REFLECTOR	LAMP	LED PAR38: 18 TO <19 WATTS
LED_REFLECTOR	LAMP	LED PAR38: 19 TO <20 WATTS
LED_REFLECTOR	LAMP	LED PAR38: 20 TO <21 WATTS
LED_REFLECTOR	LAMP	LED PAR38: 26 TO <27 WATTS
LED_REFLECTOR	LAMP	LED PAR38: 27 WATTS
LED_REFLECTOR	LAMP	LED PAR38: < 12 WATTS
LED_REFLECTOR	LAMP	LED R-BR: <11 WATTS
LED_REFLECTOR	LAMP	LED R-BR: 11 TO <14 WATTS
LED_REFLECTOR	LAMP	LED R-BR: 14 TO 22 WATTS
LED_REFLECTOR	LAMP	LED R-BR: 14 TO <=22 WATTS
LED_REFLECTOR	Lamp	10 WATT TO < 11 WATT PAR30 LED
LED_REFLECTOR	Lamp	10 WATT TO < 11 WATT PAR30 LED REPLACING PAR30 BASECASE TOTAL WATTS = 2.94 X MSR WATTS
LED_REFLECTOR	Lamp	11 TO <14 WATTS R-BR LAMP LED
LED_REFLECTOR	Lamp	11 TO <14 WATTS R-BR LAMP LED REPLACING R-BR BASECASE TOTAL WATTS = 4.13 X MSR WATTS
LED_REFLECTOR	Lamp	11 WATT TO < 12 WATT PAR30 LED
LED_REFLECTOR	Lamp	11 WATT TO < 12 WATT PAR30 LED REPLACING PAR30 BASECASE TOTAL WATTS = 2.94 X MSR WATTS

MeasureClass	NormUnit	Measurename
LED_REFLECTOR	Lamp	12 WATT TO < 13 WATT PAR30 LED
LED_REFLECTOR	Lamp	12 WATT TO < 13 WATT PAR30 LED REPLACING PAR30 BASECASE TOTAL WATTS = 2.94 X MSR WATTS
LED_REFLECTOR	Lamp	12 WATT TO < 13 WATT PAR38 LED
LED_REFLECTOR	Lamp	13 WATT TO < 14 WATT PAR30 LED REPLACING PAR30 BASECASE TOTAL WATTS = 2.94 X MSR WATTS
LED_REFLECTOR	Lamp	13 WATT TO < 14 WATT PAR38 LED REPLACING PAR38 BASECASE TOTAL WATTS = 3.28 X MSR WATTS
LED_REFLECTOR	Lamp	14 TO =22 WATTS R-BR LAMP LED
LED_REFLECTOR	Lamp	14 TO =22 WATTS R-BR LAMP LED REPLACING R-BR BASECASE TOTAL WATTS = 3.73 X MSR WATTS
LED_REFLECTOR	Lamp	14 WATT TO < 15 WATT PAR30 LED
LED_REFLECTOR	Lamp	14 WATT TO < 15 WATT PAR30 LED REPLACING PAR30 BASECASE TOTAL WATTS = 2.94 X MSR WATTS
LED_REFLECTOR	Lamp	15 WATT TO < 16 WATT PAR30 LED REPLACING PAR30 BASECASE TOTAL WATTS = 2.94 X MSR WATTS
LED_REFLECTOR	Lamp	15 WATT TO < 16 WATT PAR38 LED
LED_REFLECTOR	Lamp	15 WATT TO < 16 WATT PAR38 LED REPLACING PAR38 BASECASE TOTAL WATTS = 3.28 X MSR WATTS
LED_REFLECTOR	Lamp	17 WATT TO < 18 WATT PAR38 LED
LED_REFLECTOR	Lamp	17 WATT TO < 18 WATT PAR38 LED REPLACING PAR38 BASECASE TOTAL WATTS = 3.28 X MSR WATTS
LED_REFLECTOR	Lamp	18 WATT TO < 19 WATT PAR38 LED
LED_REFLECTOR	Lamp	18 WATT TO < 19 WATT PAR38 LED REPLACING PAR38 BASECASE TOTAL WATTS = 3.28 X MSR WATTS
LED_REFLECTOR	Lamp	19 WATT TO < 20 WATT PAR38 LED
LED_REFLECTOR	Lamp	19 WATT TO < 20 WATT PAR38 LED REPLACING PAR38 BASECASE TOTAL WATTS = 3.28 X MSR WATTS
LED_REFLECTOR	Lamp	6 WATT TO < 7 WATT MR16 LED REPLACING MR16 BASECASE TOTAL WATTS = 4.24 X MSR WATTS
LED_REFLECTOR	Lamp	7 WATT TO < 8 WATT MR16 LED REPLACING MR16 BASECASE TOTAL WATTS = 4.24 X MSR WATTS
LED_REFLECTOR	Lamp	8 WATT TO < 9 WATT MR16 LED REPLACING MR16 BASECASE TOTAL WATTS = 4.24 X MSR WATTS
LED_REFLECTOR	Lamp	< 12 WATT PAR38 LED REPLACING PAR38 BASECASE TOTAL WATTS = 3.28 X MSR WATTS
LED_REFLECTOR	Lamp	< 6 WATT MR16 LED REPLACING MR16 BASECASE TOTAL WATTS = 4.24 X MSR WATTS
LED_REFLECTOR	Lamp	<11 WATTS R-BR LAMP LED
LED_REFLECTOR	Lamp	<11 WATTS R-BR LAMP LED REPLACING R-BR BASECASE TOTAL WATTS = 5.24 X MSR WATTS
LED_REFLECTOR	Lamp	
LED_REFLECTOR	Lamp	= 11 WATTS PAR20 LED REPLACING PAR20 BASECASE TOTAL WATTS = 4.04 X MSR WATTS
LED_REFLECTOR	Lamp	> 17 TO 25 WATT PAR38 LED REPLACING PAR38 BASECASE TOTAL WATTS = 3.81 X MSR WATTS
LED_REFLECTOR	Lamp	COMMERCIAL LED PAR30: 11 TO <12 WATTS

MeasureClass	NormUnit	Measurename
LED_REFLECTOR	Lamp	COMMERCIAL LED PAR30: 13 TO <14 WATTS
LED_REFLECTOR	Lamp	COMMERCIAL LED PAR30: 14 TO <15 WATTS
LED_REFLECTOR	Lamp	COMMERCIAL LED PAR30: 20 TO <21 WATTS
LED_REFLECTOR	Lamp	COMMERCIAL LED PAR38: 13 TO <14 WATTS
LED_REFLECTOR	Lamp	COMMERCIAL LED PAR38: 16 TO <17 WATTS
LED_REFLECTOR	Lamp	COMMERCIAL LED PAR38: 20 TO <21 WATTS
LED_REFLECTOR	Lamp	COMMERCIAL LED PAR38: 25 TO <26 WATTS
LED_REFLECTOR	Lamp	COMMERCIAL LED PAR38: 26 TO <27 WATTS
LED_REFLECTOR	Lamp	COMMERCIAL LED R/BR LAMP: 12 TO <13 WATTS
LED_REFLECTOR	Lamp	COMMERCIAL LED R/BR LAMP: 13 TO <14 WATTS
LED_REFLECTOR	Lamp	COMMERCIAL LED R/BR LAMP: 7 TO <8 WATTS
LED_REFLECTOR	Lamp	COMMERCIAL LED R/BR LAMP: 9 TO <10 WATTS
LED_REFLECTOR	Lamp	COMMERCIAL-LED SCREW-IN PAR20 8 WATT
LED_REFLECTOR	Lamp	COMMERCIAL-LED SCREW-IN PAR30 13 WATT
LED_REFLECTOR	Lamp	COMMERCIAL-LED SCREW-IN PAR38 17 WATT
LED_REFLECTOR	Lamp	COMMERCIAL-LED SCREW-IN R30 13 WATT
LED_REFLECTOR	Lamp	COMMERCIAL-LED SCREW-IN R40 16 WATT
LED_REFLECTOR	Lamp	LED SCREW-IN PAR30 11 WATT
LED_REFLECTOR	Lamp	LED SCREW-IN PAR30 12 WATT
LED_REFLECTOR	Lamp	LED SCREW-IN PAR38 13 WATT
LED_REFLECTOR	Lamp	LED SCREW-IN PAR38 16 WATT
LED_REFLECTOR	Lamp	LED SCREW-IN PAR38 19 WATT
LED_REFLECTOR	Lamp	UP TO 15 WATT PAR30 LED REPLACING PAR30 BASECASE TOTAL WATTS = 3.42 X MSR WATTS
LED_REFLECTOR	Lamp	UP TO 6 WATT MR16 LED REPLACING MR16 BASECASE TOTAL WATTS = 4.24 X MSR WATTS
LED_TLED	Lamp	(1) 48IN T8 LAMP LED REPLACING (1) 48IN T8 LINEAR FLUORESCENT
LED_TLED	Lamp	LED T8 LAMP_DIRECT INSTALL
LED_TLED	Lamp	LED T8 LAMP_PREREBUP_MID-STREAM

APPENDIX G RESPONSE TO COMMENTS

Comment #	PA	Location	Page	Topic	Question/Comment	Evaluator Response
1	PG&E	Executive Summary Table 1-3	1-5	Dashes in table	Can Itron please explain what the dashes in the table represent? Also, there are some spaces in the table that are blank. What's the difference?	The evaluation team has clarified in the table. Dashes mean that NO Net evaluation updates were made, and blanks mean there were NO claimed savings for that measure in PY2018.
2	PG&E	Executive Summary 1.5 Findings	1-6	Higher operating hours found within some sectors	Can Itron please provide specific guidance in the report to aid the utilities to apply a better HOU collection model? Can the report speak to whether or not these higher operating hours conflict with or appear to be consistent with DEER hours?	The evaluation team discusses this finding and recommendation in more detail in Section 7 and Appendix AC. The report details that evaluated operating hours in some sectors like retail - not all - are not consistent with DEER hours. They were higher, on average, than the DEER HOU.
3	PG&E	Executive Summary 1.5 Findings	1-6	Indoor LED Tubes were primarily replacing FL tubes and fixtures	Can Itron please discuss in the report if there is an expectation, based on the life expectancy of previous generation TLED replacement products, that this measure would have a significant population of retrofit activity that began with an LED or TLED fixture of some form? The report seems to imply that this might be the case, but then confirms that it was not the case.	The evaluation did not imply this. The evaluation found linear fluorescent technologies (lamps and fixtures) as the predominant baseline technology of LED fixture and TLED retrofits. Our team can not speak to the population of retrofit activity that began with LED because the evaluation team found little evidence of LED in the baseline.
4	PG&E	Executive Summary 1.5 Findings	1-6	Errors reported in the savings values for some measures.	On page 1-6, as well as later in the report, it states, "The evaluation team found discrepancies in the program tracking data that had a negative impact on the reported savings values for some measures. For some indoor LED technologies, the claimed savings were far less than evaluated savings because the IOU claimed savings were misreported in the program tracking data." Can Itron please provide more substantial discussion of what the errors were, and which IOUs this finding pertains to, so that IOUs program staff may act to correct these errors in future program activity?	The evaluation team provides a detailed discussion of this in Section 5.2.1. The evaluation team found no discrepancies in reporting for PG&E and no discernible programmatic issues in SDG&E. Two downstream programs in SCE appear to have the issue from a programmatic perspective.
5	PG&E	Executive Summary, Recommendations	1-7	Tracking of savings claims	On page 1-7, as well as later in the report, it states, "Program Administrators should continue to carefully track program claims, to make sure claimed savings reflect how the actual claims should be accounted for." Could Itron please provide more detail on this recommendation for greater understanding? Also does this recommendation pertain to specific IOUs or all IOUs?	The evaluation team provides more detail on this recommendation in Section 7 and Appendix AC, along with how these discrepancies impact evaluated savings in Section 5 and Section 7. Section 5.2.1 also discusses how this was not an issue in PY2018 for PG&E. However, as discussed in ID 7 of Appendix AC, the recommendation pertains to all PAs for any future program years.
6	PG&E	Executive Summary 1.6 Recommendations	1-7	Monitor the age and condition of existing fixtures involved in a retrofit.	Can Itron discuss in the report if the recommendations impact both the Type A TLED and full LED retrofit projects? Also will there be different recommendations for complete electronics replacements in a LED retrofit tray approach or the Type B or C TLED products?	Section 8 discusses this in more detail. While understanding the age and condition of existing LF ballasts for TLED is important from a program planning perspective and was a finding in Conclusion 2b, the recommendation in Recommendation 2 explicitly discusses LED fixture replacements only.
7	PG&E	Section 2.3.2	2-5	TLED lamp discussion	Can Itron please explain in the report why Type B and Type C TLEDs were not included in this evaluation? Is it because they don't exist in any of the program measures, or are they being treated as a different product or measure category?	In PY2018, Type A TLEDs were the only program eligible lamp technologies.
8	PG&E	Section 3.2	3-2? 3-9?	Discussion of TLED products	Related to the comment above, could Itron please provide detail in the report on how the Type A TLEDs differ from Type B and C, and whether they were excluded because of the program design or for another reason?	See response above to Comment #7.
9	PG&E	Section 3.2.2	3-4	Discussion of 2013-2014 evaluation for estimated operating hours	Considering the differences in occupancy sensor requirements since 2013-14, is there any expectation that there may be greater occupancy sensor impacts in the savings calculations than are observed in the older evaluations? How many of the spaces that include occupancy sensors had these added as part of the retrofit? Since OS additions do not trigger code and the TLED retrofit also does not trigger code, is the savings associated with this included in the savings calculations?	The evaluation team collects, from on-site verification, the pre- and post-retrofit control type (and schedule) for each rebated installation. The evaluation team found no evidence that controls were installed at the same time as the installation of the rebated fixtures/lamps (i.e., the pre- and post-retrofit schedules were identical).
10	PG&E	Section 3.2.2 Figure 3-1	3-9	Distribution of Control Type by LED Technology	The preponderance of Switch-controlled indoor fixtures and TLEDs appears to indicate that there may be many insufficiently controlled lighting systems in commercial spaces. Is there any estimate to the amount of these that would be switched or controlled by OS under the current code? Also, what percentage of these are code-deficient based on reasonable age assumptions for the buildings?	The evaluation team cannot speak to these questions as they were not under scope for this evaluation.
11	PG&E	Section 3.2.2, Table 3-3	3-5	Possible errors in table	It appears there may be some errors in the "Total" numbers in Table 3-3. For example, it says the Total Sites for Total Assembly is 36, but it may actually be 114. Other totals also appear to be incorrect. Could Itron please check these values?	These values are correct. The "Total" value represents the total unique sites for that building type. The other values are the total site-activity areas. For example, there were a total of 36 Assembly sites used in that analysis. For the 114 total - 17 of the 36 had classrooms, 23 of the 36 had offices, 14 of the 36 had hallway/lobbies, etc.
12	PG&E	Section 3.2.2, Table 3-3	3-5	Adjustment Factors	Table 3-3 mentions Adjustment Factors. Could the report explain what those are?	Section 5.2.2 and Appendix D discuss this in detail

Comment #	PA	Location	Page	Topic	Question/Comment	Evaluator Response
13	PG&E	Section 4.1	4-3	Mention of "passed through" measures with less significant percentage of the savings	Was it not possible to include Outdoor verification in sites that also had indoor verification? It appears that the sample design may have intended the pass through to occur, but was this due to the non-overlap of samples that have both indoor and outdoor retrofit activity?	Outdoor fixtures in SCE and SDG&E were "passed through" because claimed savings were far less than those claimed by indoor fixtures and T-LEDs. In PG&E, they were evaluated because they represented a significant percentage of savings (Figure 4-1). Also, in PG&E, if a sample participant was pulled for an indoor technology and that participant also installed a rebated outdoor fixture, the surveyors collected information on the outdoor measure and our team evaluated the outdoor measure. This sample point would represent an incremental sample point to the outdoor fixture quota.
14	PG&E	Section 4.1, page 4-3	4-3	Clarification on T-LED measures	The report states, "T-LED measures were not rebated in PY2018". Did you mean to say, "T-LED measures were not rebated in PY2018 in the PG&E service territory"?	That's correct. The previous sentence discusses the distribution of savings for indoor and outdoor fixture technologies in PG&E and the following sentence discusses the distribution of savings in SCE and SDG&E by technology.
15	PG&E	Section 4.2, page 4-5	4-5	Downstream customer phone survey completes	In the following sentence, could the report also state how many total interviews were completed? "Overall, the evaluation team expected to complete 180 downstream self-report customer phone surveys across the three PAs and sample targets were set:"	Table 4-5 provides this information. We have added text above this table to detail the number of completes.
16	PG&E	Section 5.1	5-2	Discussion about operating hours, pre and post are assumed equivalent.	Is it reasonable to expect that when the impacted luminaires were retrofitted, the controls may have been brought up to the current code? Is there any supporting information in either direction for the impacted sites? The seemingly high number of non-occupancy controlled luminaires in Table 3-3 seems to indicate that there is high potential for energy savings by including OS controls.	The evaluation team found little evidence of this as discussed in Section 3 and presented in Figure 3-1.
17	PG&E	Section 5.2.1	5-7	Kilolumen rates - Figure 5-3	Could the authors of the report please provide feedback to the PAs regarding claimed kilolumens to modify the methods for developing estimates to improve accuracy?	The evaluation team suggests that if a technology is rebated based on a specific unit basis like kilolumens, then the correct unit basis and unit quantity be reported.
18	PG&E	Section 5.2.3 Tables 5-9 and 5-10	5-16 5-17	TLED output in LPW	Can the report please clarify that these are not "in-situ" values for TLED, and therefore are not directly comparable to the output of an actual photometric test result that uses absolute lumens from a complete luminaire, as is likely the case for the other two categories of products?	The report discusses in Section 3.2 and Section 5.2.3 that light output summaries were based on manufacturer sheets for a given lamp technology. These are total lumens of the fixtures, based on the configuration of the system and the ballast factor, as per manufacturer specification sheets.
19	PG&E	Section 6.2.3	6-5	Responses to Q6	First response; "install standard efficiency products" and "do nothing" do not seem to be functionally equivalent under some circumstances, especially if the building was not designed to meet the current code. This also impacts the EUL of the lighting system going forward. Plus, the response to this question implies that something had to be done (if the response was install standard efficiency equipment). It seems that these two responses should be treated differently. What are Itron's thoughts on this?	From a NTG/program influence standpoint, these responses are the same. The program did not influence the efficiency level of what the participant would have installed absent the program- either they would have left the existing measure in place (assuming some RUL remained) or would have replaced the existing measure with the minimum required efficiency equipment.
20	PG&E	Section 6.4 Table 6-2	6-8	PG&E midstream results	The PG&E midstream results appear to have been included with the downstream data because end user contract information was not provided to the evaluation team. However, the protocol described in Section 6.3 and 6.3.1 appear to indicate that this was an acceptable level of documentation. Can Itron please explain in the report why the PG&E midstream program was not treated as a different measure than the downstream program? Also, could Itron please provide some documentation to explain how/where the combination of the two measures occurred?	For the NTG analysis, the PG&E midstream component was not analyzed as discussed in section 4.2 of the report. Therefore, NTGRs were passed through for midstream measures. The report presents NTGRs separately for downstream (all IOUs) and midstream (SCE only). This is clarified in the report. For the gross analysis, there were no midstream LED fixtures so only downstream LED fixtures were studied.
21	PG&E	Section 8	8-1	Conclusion 1a and 1b	Can Itron please share their thoughts on whether or not DEER profiles or other more detailed use profiles would be more effective for generating the savings claims without the effort of monitoring?	There is a wealth of existing monitoring data from previous evaluations that we think can be utilized to develop reliable profiles to support more accurate ex ante savings claims that would not require additional monitoring. We also support ongoing monitoring for ex post evaluation purposes, and the continuing use of available monitoring data from these studies for future updates to profiles and hours of use estimates for ex ante savings purposes.
22	SCE	Section 8	8-1	Conclusion 1	Section 5 of the report noted that ex post operating hours for certain commercial sectors were “substantially” higher than ex ante assumption. This is not the first time that evaluation professionals have discovered a negative bias in lighting ex ante assumptions for lighting and we welcome other research in other high impact deemed measures. SCE looks forward to working with the ex-ante team to incorporate these adjustments.	Thanks for your comment.

Comment #	PA	Location	Page	Topic	Question/Comment	Evaluator Response
23	SCE	Section 8	8-1	Conclusion 2	Section 5 also reported the following: "The PA's assumed a replacement on burnout baseline for LED Fixture measures. However, we found that T-LEDs and retrofit kits were predominantly replacing linear fluorescent systems – T-LEDs were installed in fixtures with existing wiring and ballasts. Therefore, it's likely there is significant stock of LF systems still out there with well-functioning ballasts, so an opportunity for accelerated replacement may exist for LED Fixture retrofits." a. The evaluation team recommends exploring accelerated replacement path for LED Fixture retrofits. As industry standard practice moves towards LEDs for replacement on burnout of linear fixtures, accelerated replacement may be the more cost-effective path for this measure. Furthermore, The PA's should track the age and condition of linear fluorescent ballasts where T-LED lamps are being installed. b.SCE agrees with this recommendation and looks forward to working with ED to take appropriate action.	Thanks for your comment.
24	SCE	Section 8	8-2	Conclusion 3	Section 5 also notes that the appropriate baselines may not be LED for some program participants: A not insignificant percentage of program participants installing LED fixture measures self-reported metal halide (MH), mercury vapor (MV) and high-pressure sodium (HPS) as the baseline technology replaced as part of the retrofit –especially for outdoor LED fixture measures. a.The research team suggests future market studies to track typical baseline technology. SCE agrees that market studies on a regular basis can provide key inputs with more reliability than ad hoc dispositions and ISP studies. These studies can determine typical product age/EUL/RUL to inform baseline selections.	Thanks for your comment.
25	SCE	Section 8	8-2	Conclusion 6	SCE appreciates the revisions to the Net to Gross methodology by Itron. This important work need not have been done and we appreciate the effort. a.This Appendix describes updates made to the current Nonresidential Net-to-Gross (NTG) framework for this 2018 evaluation cycle. This framework has been used with minor modifications since the 2006-2008 evaluation cycle. Team members from both the Group A and Group D evaluation teams coordinated to develop two changes that have been incorporated into the 2018 Small Commercial and Lighting evaluations: i. 1. An alternative to the current PAI-1 score. This is designed to address problems identified in previous evaluation cycles. ii.2. Expansion of the framework to address Midstream programs. b.The expanded framework incorporates a Vendor score and combines it with the Participating Customer score if certain conditions are met. The updates apply to the following nonresidential programs and measures for the PY2018 evaluation cycle. The Group A and Group D evaluation teams will consider modifications to these updates as well as expansion to additional measures for the PY2019 evaluations. c.SCE looks forward to collaborating on further revisions and exploring how these changes impacted the 2018 results if possible (For example, what NTG values would the 2010-2012 regime have produced.)	Thank you for your comments. We expect there will be a NTG webinar scheduled in the future which will likely be the forum for your collaboration and feedback.
26	SDG&E	Section 1.5 p. 1-6	1-6	Lack of explanation or data source for the observation: "Free ridership levels were below 30% for most technologies for each IOU. There was only one segment (SDG&E reflector bulbs) with a high level of free ridership (43%), primarily driven by two very large installations where the customers claimed they would have still installed the bulbs in the absence of the program."	Please provide the reference or data analysis that leads to the observation regarding SDG&E's free ridership on reflector bulbs.	Section 6.4 provides the results of the NTG analysis, which shows in Table 6-2 that SDG&E's NTGR for reflector bulbs was 0.57. Because NTGR equals one minus free ridership, this means the free ridership rate on reflector bulbs was 43%.
27	SDG&E				SDG&E also supports PG&E's submitted comments on this study.	Thanks for your comment. We have addressed those additional comments above.