FINAL IMPACT EVALUATION

NonResidential Lighting Sector

Program Year 2019

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EXECUTIVE SUMMARY

1-1 OVERVIEW

This study evaluates energy efficient light emitting diode (LED) indoor tubes and fixtures, a subset of lighting technologies administered by Pacific Gas and Electric (PG&E), Southern California Edison (SCE) and San Diego Gas and Electric's (SDG&E) 2019 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, our evaluation team found few differences in how these three program administrators (PAs) claimed savings compared to the savings that this evaluation actually realized. Based on telephone surveys with program participants, key findings from this evaluation include:

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

1-2 ENERGY EFFICIENCY TECHNOLOGIES STUDIED

This evaluation focused on six LED technologies which the PA's 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 fluorescent light tube for an efficient LED tube, with no other changes to the fixture or casing.
- 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 typically 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 indoor LED technologies rebated in 2019 represent roughly 4.6% of the total megawatt hour (MWh) energy savings reported by all program technologies statewide, over the life of the technologies – referred to as lifecycle savings.

Table 1-1 presents the distribution of reported MWh energy savings across the six technologies for each PA, along with the statewide total.

Table 1-1: Percentage of 2019 Reported MWh Savings by Portfolio and Lighting Technology for Commercial Programs

2019 Lighting Technology	Percent of Portfolio Lifecycle MWh Savings			
	Statewide	PG&E	SCE	SDG&E
Indoor LED Fixture	**2.1%**	2.6%	1.3%	2.3%
Indoor LED Tubes	**2.0%**	-	2.5%	8.9%
Outdoor LED Fixture	**0.3%**	0.3%	0.3%	0.3%
Indoor LED Light Bulbs	**0.1%**	0.1%	0.0%	0.0%
Indoor LED Reflector Light Bulbs	**0.1%**	0.0%	0.1%	0.6%
Indoor LED Decorative Light Bulbs	**0.0%**	0.0%	0.0%	0.0%
TOTAL	**4.6%**	**3.1%**	**4.2%**	**12.1%**

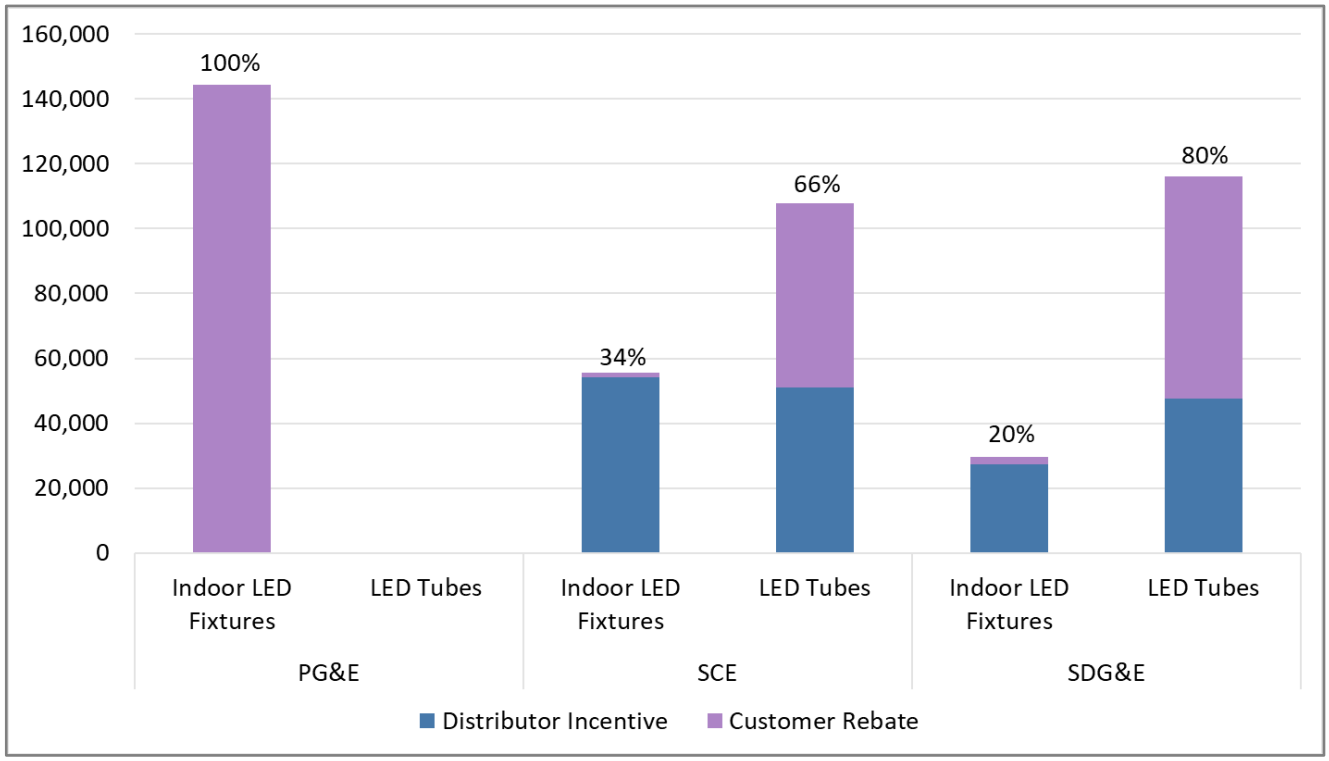
As shown, indoor LED fixtures and indoor LED tubes comprised the majority of the lifecycle MWh savings. For this reason, we focused the evaluation on these two measures and the other four measures were not evaluated. Therefore, we only developed evaluated savings values for indoor LED fixtures and tubes, and passed through the savings reported by the PAs for the other four measures.

Customers had two different paths they could take to purchase and install these measures. The first is a more traditional approach where the customer purchases the equipment from a retail outlet or directly through their installation contractor, and receives a rebate from the PA. The second is where the customer purchases the equipment through a distributor. In this case, the distributor receives the incentive from the PA and typically passes some of that savings down to the customer.

Figure 1-1 below presents the distribution of lifecycle MWh savings for indoor LED Fixtures and tubes for each of the two paths to participation, based on who receives the program's financial incentive. PG&E did not offer indoor LED tubes and did not provide any distributor incentives for indoor LED tubes. Customer rebates of indoor fixtures account for all of PG&E's reported savings. SCE and SDG&E

primarily paid distributor incentives for indoor LED fixtures, but had a more even split for indoor LED tubes. Indoor LED tubes also comprised the most significant percentage of savings for SCE and SDG&E, at 66% and 80%, respectively. By relying on distributors to pursue indoor fixture installations, it is possible that SCE and SDG&E missed opportunities to capture additional fixture installations through the more traditional customer rebate route.

Figure 1-1: Distribution of Claimed Lifecycle MWh Savings for Evaluated LED Tube and Fixture Technologies by PA (2019)



1-3 APPROACH

The study's primary objective is to evaluate program savings claims for the six lighting technologies and to conduct research that develops revised estimates of savings. This study examines key parameters that make up the energy savings (in MWh) and demand savings (in MW) achieved 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).**
- **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.**

Due to COVID-19 limitations to on-site visits at participating customer sites, we relied on telephone surveys to collect the information necessary to study each parameter. We conducted a total of 200 telephone surveys with customers, with the objective of being able to estimate these parameters at a high level of statistical precision.[1] In the customer response analysis, we referred to similar customer data, and to lighting operation data collected on site in previous evaluations.

We then compared the savings reported by the programs for each parameter to evaluation results developed using the telephone survey data collected. We refer to the ratio of the evaluated savings to reported savings as the "realization rate," or the rate at which *reported* savings are realized through the evaluation.

The evaluation also examines how successful the programs were at influencing customers to install energy efficient technologies that they would not have installed without the programs. We refer to customers who would have installed the same energy efficient equipment in the absence of the program 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 the programs generate "net" of free riders, referred to as "net savings." We refer to the ratio between the net and gross levels of savings as the net-to-gross ratio. 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.

[1] We designed the sample for the 200 surveys to be able to estimate savings for each PA at a 10% to 15% relative precision, measured at the 90% statistical confidence level.

To estimate the net-to-gross ratio, we used the 200 customer telephone surveys discussed above, and also interviewed an additional 46 distributors that participated in the program. The telephone surveys with customers 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 survey with distributors asked how the program influenced how they stock, promote and price lighting equipment.

We did develop separate net-to-gross ratios for the two different paths to participation. For the customer rebate path, we only used customer surveys because the distributors were not involved. However, for the distributor rebate path, we relied on both customer and distributor surveys as the program was influential to both parties. Because we were very successful in interviewing a large majority of the distributors, the net-to-gross ratios for that path were more heavily weighted towards the distributor responses than the customers'.[2]

1-4 RESULTS

Table 1-1 below presents the net-to-gross ratios we estimated for this evaluation, shown by PA, technology, and path to participation. Overall, our evaluated net-to-gross ratios tend to be similar to the reported values.

The evaluated net-to-gross ratios for the customer and distributor paths are nearly identical for both SCE and SDG&E. They agree with the reported net-to-gross ratio for the customer path, but they are slightly lower for the distributor path. For PG&E the evaluated value is lower than reported.

[2] The 46 distributors we surveyed represented 90% of SCE's population savings and 81% of SDG&E's population savings. However, only 96 of the 200 cusomtomers we surveyd used the distributor incentive path to participation, and they only represented 10% of SCE's population savings and 9% of SDG&E's population savings.

Table 1-2: Reported and Evaluated Net-to-Gross Ratios for LED Technologies by PA

PA	2019 Lighting Technology	Incentive Path	Net-to-Gross Ratio	
			Reported	Evaluated
PG&E	Indoor LED Fixtures	Customer	0.78	0.72
SCE	Indoor LED Fixtures and Tubes	Customer	0.69	0.69
		Distributor	0.76	0.68
SDG&E	Indoor LED Fixtures and Tubes	Customer	0.74	0.75
		Distributor	0.81	0.73

Table 1-3 presents the net lifecycle savings results of this evaluation. For each technology, we show the evaluated and reported net lifecycle savings values (MWh), and the net realization rates. For PG&E the net realization rate was 101% for indoor lighting fixtures. SCE and SDG&E realized 87% and 88% of the net reported savings for indoor LED fixtures and exceeded the reported savings for LED tubes at 127% and 101%, respectively.

Table 1-3: Net MWh Realization Rates for Evaluated Technologies

PA	2019 Lighting Technology	Life Cycle Net MWh Savings		
		Reported	Evaluated	Net Realization Rate (Evaluated/Reported)
PG&E	Indoor LED Fixture	112,639	114,104	101%
	Indoor LED Tubes*	-	-	-
SCE	Indoor LED Fixture	46,924	40,659	87%
	Indoor LED Tubes	72,854	92,703	127%
SDG&E	Indoor LED Fixture	26,256	23,052	88%
	Indoor LED Tubes	86,990	87,522	101%

* Note that PG&E did not rebate indoor LED tubes in 2019, which is why this row is blank.

1-5 KEY EVALUATION FINDINGS

Below are the key findings we identified because of this evaluation effort. These results are based on the 200 participant telephone surveys we conducted as part of this evaluation, as well as the review we performed on program tracking data and program documentation:

Installations:

- **Customers verified that they did indeed install the measures and quantities that the PA's reported.**
- **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.
- **It is possible that SCE and SDG&E missed opportunities in 2019 to capture additional fixture installations through the more traditional customer rebate route.** SCE and SDG&E appear to have relied more on distributors to pursue indoor fixture installations, as very few were installed through the customer rebate path.
- **PG&E may also have missed opportunities in 2019 to capture additional installations by broadening their distributor incentive programs to include indoor LED fixtures and/or tubes.** During 2019, PG&E did not use this path of participation for indoor LED fixtures and/or tubes.
- **Some of the PAs sometimes incorrectly reported the type of quantities that participants installed.** For example, at times they were supposed to report the amount of light generated by the installed lighting system (in lumens) but instead reported the number of fixtures that participants installed.

Operating Hours and Measure Life:

- **Overall, we found higher operating hours – especially within specific sectors like retail establishments – than the PAs claimed.** Higher evaluated operating hours lead to more significant annual energy savings.
- **Operating hours differed more across building type (e.g., office, retail, etc.) than they did across PA or path of participation.** Therefore, when developing reported and evaluated savings values, it is more important to estimate operating hours by building type than it is by PA or by path of participation.

- **As a result of the increased hours of operation, the life of the measure decreases, in terms of years.** The more the lighting system is used, the sooner it is likely to fail or need to be replaced. This leads to less lifecycle energy savings, sometimes cancelling out the benefit of the increase in annual operating hours.

Program Influence:

- **We found that the programs were fairly influential in the customers' decision to install LED bulbs.** Overall, at the PA level, net-to-gross ratios ranged from 0.68 to 0.75.
- **The programs had similar influence on the two paths to participation**. Both distributors and customers reported similar levels of influence as a result of the participation in the SCE and SDG&E programs, with the net-to-gross ratios differing by 0.02 or less.

1-6 RECOMMENDATIONS

Tracking Participation:

- **Program Administrators should ensure that they are correctly tracking the type of quantity (fixture counts versus lighting output) being installed so their reported savings values are calculated accurately.**
- **It is also important that the PAs continue to collect accurate customer contact information for the programs using distributor incentives to support future evaluation efforts.** Ideally, the PAs would collect contact information for someone knowledgeable about the equipment that was installed.

Documenting Reported Savings:

- **The PAs should provide all workpaper documentation (documents, savings calculation workbooks and supporting documents) for posting onto the CPUC's Workpaper archive website.**

Paths to Participation:

- **The PA's should continue to utilize both the customer rebate and distributor incentive paths to participation.** Both approaches appear to be an effective path to participation, offering similar levels of influence over decision making and gross energy savings.

Future Evaluations:

- **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.** Program Administrators should consider instituting a new high-HOU claim category that can better fit sites with 24/7 operation.

- **Future evaluations should continue to monitor the age and condition of existing fixtures like fluorescent technologies.** LED tube lamps 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 it requires replacement.

1-7 CONTACT INFORMATION

The California Public Utilities Commission (CPUC) Project Manager for this study was Mr. Jacob Rudolph. Mr. John Cavalli of Quantum Energy Analytics served as the manager of the impact evaluation.

Table 1-4: Contact Information

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SECTION 2:

INTRODUCTION AND OVERVIEW OF STUDY

This report documents the activities and results of the 2019 Nonresidential Deemed Lighting Impact Evaluation of the California energy efficiency programs implemented by three program administrators (PA): Pacific Gas and Electric (PG&E), Southern California Edison (SCE), and San Diego Gas and Electric (SDG&E.) 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[3] (ESPI) decision for program year (PY) 2019. The CPUC adopted the ESPI mechanism on September 5, 2013 in D.13-09-023, which provides monetary incentives to Program Administrators (PAs) for performance in resource and non-resource program activities.

This evaluation focuses on energy efficiency (EE) resource program savings – measured in net evaluated (ex post) lifecycle energy and demand savings – realized by lighting programs in PY2019. Our 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 PY2019 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 lighting 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 and uses this information to update the Net-to-Gross Ratios (NTGRs) and gross/net first year and lifecycle savings for the measures detailed in the ESPI decision.

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

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 (ex ante) gross or net savings estimates and inform future savings values for lighting technologies identified in the PY2019 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 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 ESPI process uses the following criteria to identify the measure groups and parameters selected for ex post verification:

- **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**

The final 2019 ESPI Uncertain List identifies several lighting measures that are subject to some level of ex post evaluation for PY2019. Table 2-1 below summarizes the source of uncertainty surrounding the claimed energy and demand impacts for each measure and details which parameters we studied for ex post evaluation. The PY2017 and PY2018 uncertain lists included the measures presented below. The remainder of the report discusses these parameters and how we studied them, in more detail.

Table 2-1: Overview of PY2019 Measure Uncertainty

2019 ESPI Measure	Measure Type	LC GWh Savings (SW)	% of PY2019 LC GWh Savings (SW)	2019 ESPI Measure	Uncertain Parameters Studied in 2019
Indoor LED Fixture	High/Non-Highbay	229.6	2.1%	X	Gross Realization Rate (GRR), EUL, NTG Ratio
Indoor LED Tube Lamps	T-LED	224.0	2.0%	X	
LED Lamp	A-Lamps	7.5	0.1%	X	
	Specialty Lamps			X	
LED Reflector Lamps	MR-16 and Reflector Lamps	14.3	0.1%	X	
Outdoor LED Fixture	Non-Street Light	34.5	0.3%	X	

In PY2019 indoor LED fixture and T-LED technologies represent a significant proportion of portfolio level lifecycle savings at the statewide level (4.1% combined), followed by outdoor LED fixtures (0.3%). Indoor lamp and reflector lamp technologies represent a combined 0.2% of total claimed lifecycle (LC) kWh savings at the statewide level (SW).

In PY2019, PA programs rebated indoor LED technologies in two ways:

- **By lamp or fixture: claimed savings estimates are 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 lamps or fixtures rebated.**
  - Lamps evaluated in PY2019: T-LEDs. These lamps work with T8 ballasts, so they typically replace T8 fluorescents in existing indoor fixtures.
  - Indoor fixtures evaluated in PY2019: long LEDs that typically, but not always, replace HID or HPS lamps, and are typically, but not always, installed in high-bay applications. They are often marketed as "linear" or "flat" high bay LED fixtures. An indoor LED fixture uses an LED driver to control the voltage and amperage of the power delivered to the fixture.

- **By kilolumen: total claimed savings estimates are based on total kilolumens (or light output) installed. The unit of savings is the demand or energy savings per claimed kilolumen installed.**
  - **Indoor kilolumen luminaires evaluated in PY2019: long LEDs that typically, but not always, replace linear T10 or T12 fixtures, and they are typically, but not always, installed in low-bay applications such as dropped ceilings. They are marketed, variously, as "flat panels", "direct kits", "troffer fixtures", or "LED luminaires".**

The remainder of this report uses the term "T-LED" to refer to indoor LED tube lamps installed in existing T8 fixtures, "indoor fixtures" to refer to indoor lighting fixtures for which the unit of savings is the "fixture", and "kilolumen luminaires" to refer to indoor lighting fixtures for which the unit of savings is the "kilolumen." This divides the "indoor high/non-highbay" uncertain ESPI measure into "indoor fixtures" and "kilolumen luminaires."

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 the measures that account for significant claims in PY2019. The research objectives include developing net and gross ex post impacts for the measures detailed above. The following tasks utilize new primary data collection 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 includes:

- **Confirm installations (verification). Due to COVID-19, in PY2019 we conducted verification of measure installations through telephone interviews with participating sites.**
- **Estimate 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.**
- **Develop 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 2019 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 deemed lighting measure savings.

Table 2-2: Percentage of 2019 Ex Ante Gross kWh Savings by Portfolio and Deemed ESPI Lighting

2019 ESPI Uncertain Measure	Percent of Portfolio Lifecycle kWh Savings				Percent of Lifecycle kWh Savings Among All NR Deemed ESPI Lighting Measures			
	SW	PG&E	SCE	SDG&E	SW	PG&E	SCE	SDG&E
Indoor High/Non-HighBay - Fixtures	**0.6%**	0.8%	0.4%	0.5%	**13.5%**	27.0%	8.7%	4.4%
Indoor High/Non-HighBay - Kilolumen Luminaires	**1.4%**	1.7%	0.9%	1.7%	**31.5%**	57.1%	22.1%	14.4%
T-LED	**2.0%**	0.0%	2.5%	8.9%	**43.9%**		59.9%	73.6%
A-Lamps	**0.1%**	0.1%	0.0%	0.0%	**1.1%**	2.8%	0.5%	0.0%
Specialty Lamps	**0.0%**	0.0%	0.0%	0.0%	**0.3%**	0.2%	0.6%	0.1%
MR-16 and Reflector Lamps	**0.1%**	0.0%	0.1%	0.6%	**2.8%**	1.6%	2.1%	5.0%
Outdoor LED Fixture	**0.3%**	0.3%	0.3%	0.3%	**6.8%**	11.4%	6.1%	2.4%
TOTAL	**4.6%**	**3.1%**	**4.2%**	**12.1%**	***100.0%***	***100.0%***	***100.0%***	***100.0%***

As shown in Table 2-2, each of these uncertain measures contributes varying levels of claimed lifecycle gross portfolio savings. Overall, they represent roughly 4.6% of total claimed kWh savings at the statewide level. Indoor LED fixture, Kilolumen Luminaire and T-LED claims represent roughly 89% of that total. Outdoor fixtures and indoor LED lamp measures represent the remaining 11%, at the statewide level.

The aggregate measures listed are comprised of seven deemed measure groups and over 350 unique measure names.[4] Our evaluation team mapped each of the measure groups and measure names in the tracking data to these deemed ESPI uncertain measures. We also referenced work papers for some measures where the measure name was too generalized, to more accurately map it to a specific measure category. The PY2019 evaluation focuses on the measures with highest statewide savings: indoor high/non-high bay fixtures (indoor fixtures and indoor luminaires) and T-LEDs.

2-3-1 Indoor T-LEDs and Fixtures

As presented in Table 2-2, LED indoor fixture and T-LED measures represent roughly 4.1% of statewide lifecycle portfolio energy savings and 89% of the statewide kWh savings for all the deemed ESPI lighting measures. Indoor T-LED lamps are installed directly into existing linear fluorescent (LF) fixtures and are designed to operate with existing electronic ballasts. The indoor LED fixture measure group represents several different technology types and applications. Linear fixtures can 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.

In PY2019 the PAs rebated LED measures through downstream and midstream delivery channels.

- **The downstream delivery channel requires the customer to identify the number and type of lighting measures eligible for rebate that they intend to install, as well as provide site-level information. The customer then purchases and installs the lighting measures. Upon verification of installation the PA issues the rebate to the customer.**
- **In the midstream delivery channel, a program-participating distributor provides point of purchase incentives to customers. The distributor informs the customer which of the available lighting measures are discounted on behalf of the PA. At the time of purchase the distributor collects the**

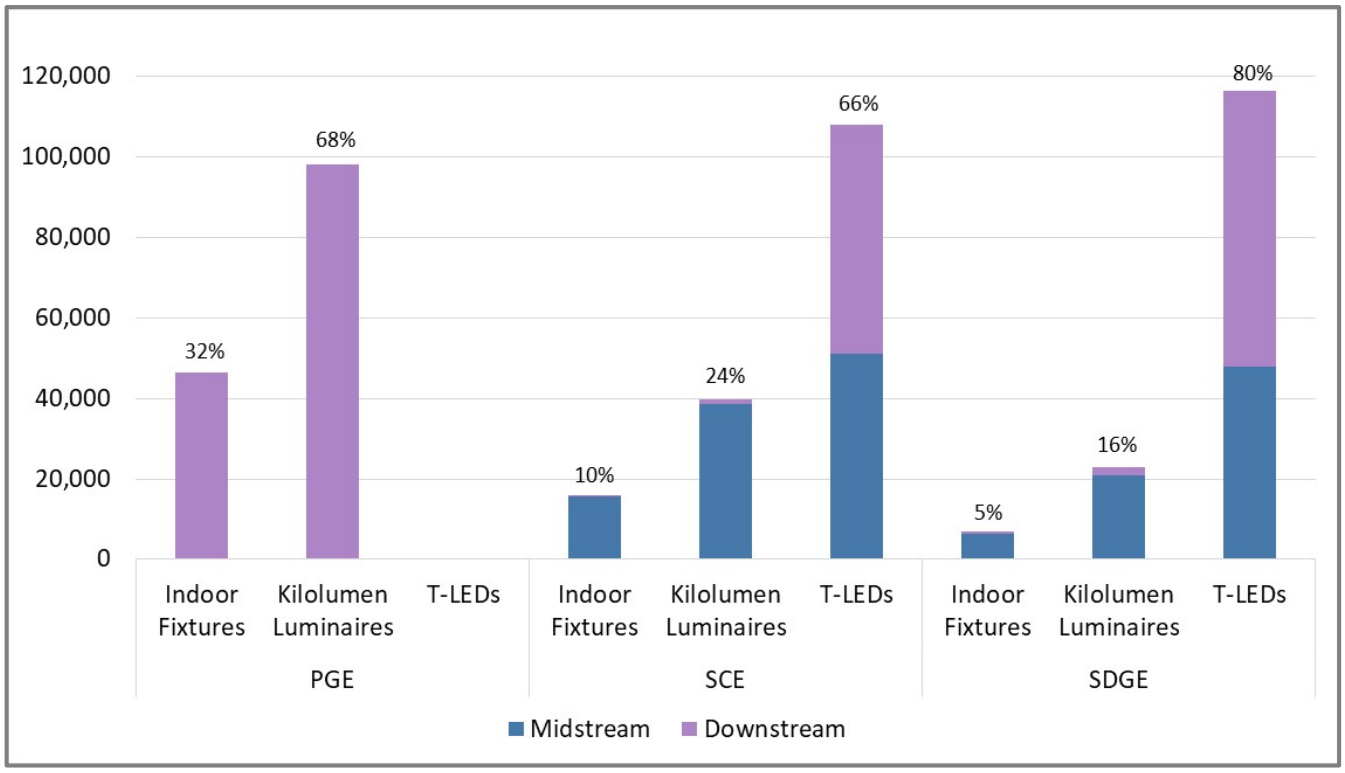
[4] Appendix E provides a detailed mapping of how each ESPI measure was mapped to a specific measure name found in the 2019 program tracking data.

site information and the required equipment installation information from the customer and submits it to the PA for verification. The PA issues the rebate to the distributor.

From the gross evaluation standpoint, a measure installed through the downstream delivery channel is expected to function identically to a measure installed through the midstream delivery channel, if installed in similar conditions. But since the two types of channels use different approaches to persuade a customer to buy and install the measures, this might lead to different net-of-free-ridership (net) results for the two types of channels.

Figure 2-1 presents the distribution of lifecycle MWh savings for the evaluated indoor LED measures, by PA and delivery channel, with the percentages of evaluated PA claims for PY2019.

Figure 2-1: Distribution of PY2019 Lifecycle MWh Savings for Evaluated Indoor LED Measures by PA and Delivery Channel



In PY2019, PG&E rebated indoor LED fixtures and kilolumen luminaires exclusively through downstream channels and did not rebate T-LED measures at all. For SCE and SDG&E, T-LED measures comprised the most significant percentage of claimed savings in PY2019, split between the downstream and midstream channels. Indoor LED fixtures and kilolumen luminaires also represented a significant share of claims for SCE and SDG&E and were predominantly installed through the midstream program delivery channel. SCE and SDG&E's reliance on the midstream channel to capture indoor fixture installations may have caused them to miss opportunities for additional fixture installations through the more traditional downstream channel.

2-4 Overview of Impact Evaluation Methodology

Our evaluation team utilized a gross realization rate (GRR) approach to develop gross and net ex post kW and kWh savings for the PY2019 ESPI measures detailed above. For each of the deemed ESPI measures selected for evaluation, we estimated site-specific gross ex post impacts for a sample of program participants. We then compared those impacts to the claimed savings for each site-measure to develop a ratio of evaluated to claimed gross savings. Our evaluation team developed GRRs for specific participant segments and applied these rates to the population of participants in order to develop program population estimates of ex post gross savings.

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

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

To develop ex post gross kWh (energy) savings estimates, we aggregated the hourly (i) impacts for each measure to develop an annual or 8,760 load shape and summed. We then averaged these hourly impacts across specific hours to develop an ex post gross kW (demand) savings estimate. We present a more detailed discussion of the impact evaluation methodology in Section 5.

To develop net savings values, we first estimate a net-to-gross ratio (NTGR), utilizing a standardized Self-Report Approach (SRA) based on participant telephone survey data. We applied the resulting NTGRs to the ex ante gross impacts in order to estimate net savings for the population of program participants.

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. The survey asks respondents 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. Section 6 discusses this methodology in detail.

Originally, the Nonresidential NTG framework focused only on Downstream programs, which deliver incentives directly to end-use customers. This 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.

As discussed above, Midstream programs are positioned higher up in the supply chain, and they work through vendors (e.g., distributors, contractors, and design professionals) to deliver incentives to customers. This elevates the importance of the distributor in the customer decision making process and requires a different NTG framework. The NTG Midstream approach applies to programs delivered through vendors who deliberately 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 we 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. This approach (Midstream A) utilizes both customer and distributor responses to estimate the NTGR.**
- **Programs that work entirely with vendors, where customer contact data is not collected, and where it is believed the end-user may not be aware of the program. This approach (Midstream B) only utilizes distributor responses to estimate the NTGR.**

The remainder of this report includes the following:

- Section 3 discusses the data sources used 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, operating hours and effective useful life (EUL).
- Section 6 discusses the methodology and results of 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 survey instrument.
- Appendix C presents the distributor telephone survey instrument.
- Appendix D presents the method used to adjust the self-reported operating schedules.
- Appendix E presents the ESPI measure mapping from measure name in the tracking data.
- Appendix F presents the evaluators responses to public comment.

SECTION 3:

DATA SOURCES

Our 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. We supplemented existing data sources with new primary data collection (telephone surveys.) 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 PY2019 ESPI Measures

2019 ESPI Measure	Data Source New Phone Surveys	Evaluation Update	
		NTG	Gross
Indoor LED High/Non-Highbay Fixture	X	X	X
Indoor T-LED Lamps	X	X	X
Outdoor LED Fixture		Pass Through	Pass Through
Indoor LED A-Lamps		Pass Through	Pass Through
Indoor LED Reflector Lamps		Pass Through	Pass Through
Indoor LED Specialty Lamps		Pass Through	Pass Through

Our evaluation team collected telephone survey data for LED fixture measures: indoor high/non-highbay fixtures and T-LEDs – the claimed savings for these measures have continued to increase substantially over the past few program years and new technologies have become eligible for rebates through energy efficiency (EE) programs. Conversely, the claimed savings for indoor LED lamp technologies and outdoor fixtures, 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 and PY2018 impact evaluation, for PY2019:

- **We conducted new primary research for the indoor fixture and indoor TLED measures, for both gross and net evaluations.**
- **We did not conduct any new research on indoor LED lamp technologies or outdoor LED fixtures; ex ante gross and net savings for these measures have been passed through.**

3-1 PROGRAM TRACKING DATA

Prior to data collection and sample planning, we reviewed the program tracking data for PY2019 participants. Each of the PAs uploaded these data to a centralized server. Our evaluation team analyzed, cleaned, re-categorized, reformatted, and merged these separate datasets into one program tracking database. Within the database we reviewed the measure groups identified by the 2019 ESPI uncertain list to gain insight into the number of program participants receiving rebates for PY2019 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 MEASURE VERIFICATION AND FACILITY OPERATION SURVEYS

Our evaluation team conducted telephone surveys with customers who installed indoor LED fixtures and T-LEDs through downstream and midstream lighting programs in PY2019. The purpose of these telephone calls was to collect site-specific information that we could use to support the parameter estimates in the impact algorithm. Specifically, the survey verified the type and location of the new lighting measures installed, the rebated quantities, and whether the new lighting fixtures were controlled by a switch, an occupancy sensor, a time clock, electric panel, or photocell. Finally, we collected self-report data on lighting equipment usage schedules and business hours to aid in the development of pre- and post-retrofit load shapes.

3-2-1 Existing On-site Data Used to Support Pre- and Post-Retrofit Operating Hours

Our evaluation team utilized 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 that participants installed in a variety of building and area types. We compared these logger data against the self-reported lighting operating schedules reported by the on-site contact, as well as against the business hours of the business/facility. We analyzed the logger data, self-reported lighting schedules, and business hours in variety of ways:

- **We compared actual hourly logger data to hourly self-reported operating schedules during the open hours of the business/facility by day type (weekend vs. weekday).**
- **We analyzed actual hourly logger data 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.
- **We performed these comparisons at the control level – we analyzed measures controlled by a switch separately from measures controlled by an occupancy sensor.**
- **Our analysis produced a set of adjustment factors at control type/building type/day type, which we used in conjunction with self-reported business schedules in cases when loggers cannot be deployed to capture actual patterns of lighting operation (e.g., fixtures located in businesses that do not allow logger installation, or that are inaccessible due to COVID-19.)**

Section 5 and Appendix D discuss this methodology in more detail. It is important to note that with this approach, we are not explicitly using operating hour values from 2013-14, but rather we are using the relationship between the 2013-14 logger data results and the participant's self reported operating hours. We believe the *ability* for customers *to estimate* their lighting system's operating profile has not changed

substantially over time. This is evident from our PY2017 and PY2018 evaluations where we tested this hypothesis and found the adjusted self-reported hours of operation to be within a few percent of the lighting logger results. The PY2017 evaluation report provided a detailed analysis of this comparison using 522 sites and found only a 3% difference between the adjusted self-reported hours of operation and the lighting logger results.[5]

Table 3-2 below presents the number of sites and loggers that we used in the adjustment factor and business hour rate development analysis. These summaries detail the control type of the linear fluorescent fixtures that were monitored along with the facility and activity area of measure installation.

Table 3-2: Logger Data Used for Adjustment Factors and Business Hour Rates (2013-2014)

Building Type	Occupancy Sensors		Switch	
	Total Sites	Total Loggers	Total Sites	Total Loggers
Assembly	3	5	36	213
Education – Primary School	4	13	41	299
Manufacturing – Light Assembly	18	42	83	395
Office – Large	1	5	8	73
Office – Small	2	4	30	151
Restaurant	3	4	12	44
Retail – Large	13	31	38	185
Retail – Small	15	21	81	245
Warehouse	19	53	39	196
All Building Types	**83**	**186**	**400**	**1,524**

[5] http://www.calmac.org/publications/2017_Nonresidential_ESPI_Deemed_Lighting_Impact_Evaluation_-_Final_Report.pdf

Overall, measures installed on a switch represent the most significant data source for the adjustment factors – 1,524 loggers deployed in 400 sites. Measures controlled by an occupancy sensor were monitored with 186 loggers installed across 83 sites.

As discussed above, in PY2019 we relied on telephone surveys to verify installation of rebated LED technologies at a variety of building types. We then utilized self-reported lighting and business schedules from PY2019 and adjustment factors from 2013-2014 to develop coincident demand factors and annual hours of use for indoor T-LED and LED fixtures. Table 3-3 presents the number of sites – by building type and control type – from which we collected and analyzed self-reported information in PY2019.

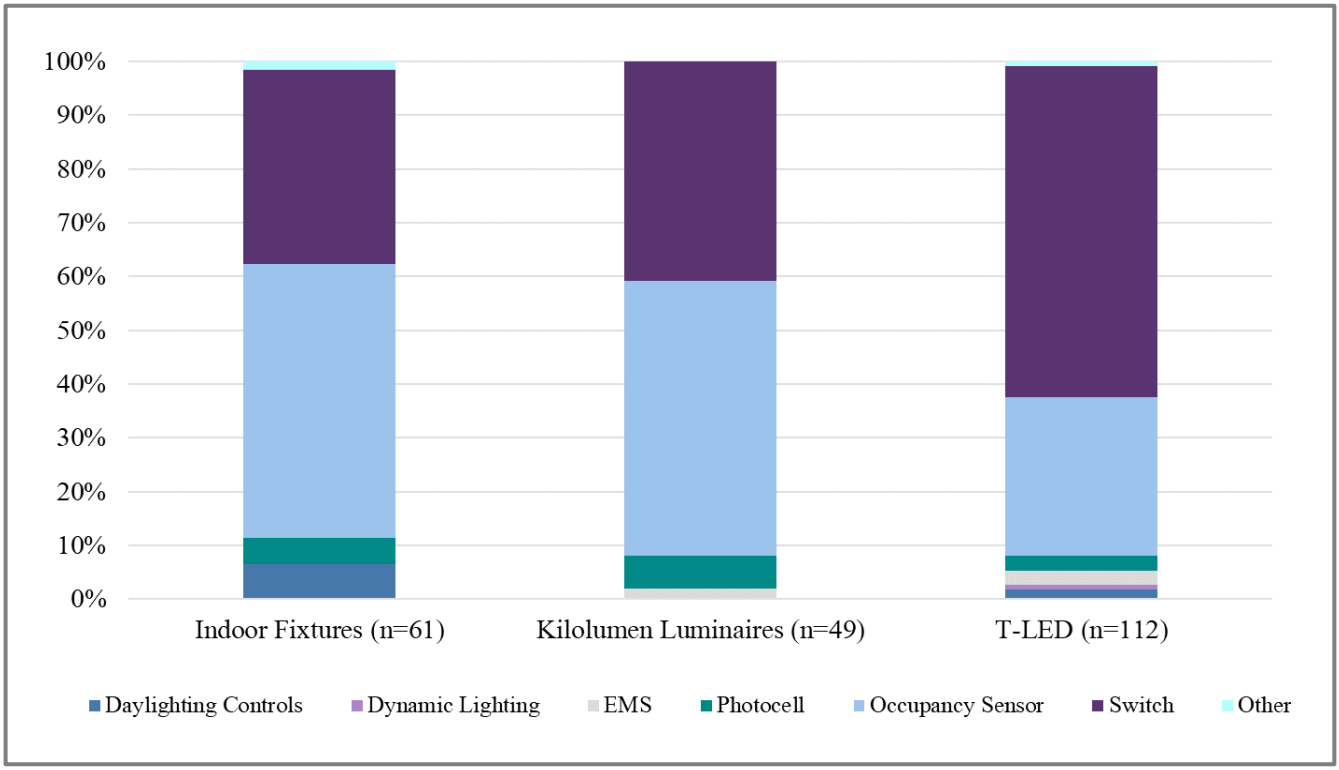
Table 3-3: Indoor LED Measure Installation by Building Type (PY2019)

Building Type	Occupancy Sensors	Switch	Other
Assembly	6	5	2
Education – Primary School	10	2	0
Manufacturing – Light Assembly	13	12	5
Office – Large	7	6	3
Office – Small	14	33	6
Restaurant	1	3	0
Retail – Large	2	2	0
Retail – Small	13	33	0
Warehouse	5	3	2
Other	4	5	3
All Building Types	**75**	**104**	**21**

The schedule for each installation has a significant impact on the overall operating hours and coincidence demand factors. For example, an LED fixture installed in a clothing store will generally have higher annual operating hours and a differing load shape than an identical fixture installed in a school. The sample of verified indoor fixtures were most prominently installed in offices (69) and retail establishments (50 total).

The operating hour analysis also included the control type of the post-retrofit equipment. The adjustment factors are different for measures that function with an occupancy sensor compared to those that function with a switch. No adjustment factors are available for rebated measures that are installed on circuits connected directly to timeclocks, electric panels, and energy management systems (EMS), because such configurations were rare in 2013-2014. Figure 3-1 presents the distribution of control type associated with each of the rebated measures evaluated in PY2019.

Figure 3-1: Distribution of Control Type by LED Technology (PY2019)



As we found in previous years, most indoor LED measures surveyed in PY2019 were controlled directly by switches or occupancy sensors, with a small percentage being controlled by time clocks, EMS or photocells.

3-3 PROGRAM INFLUENCE TELEPHONE SURVEYS

The customer telephone surveys described in Section 3-2 also included questions in support of the NTG analysis. The surveys recorded program influence responses from participating site building owners and operators. The sample included participating sites that installed LED lighting measures through downstream programs, and through midstream programs, i.e. programs positioned higher up in the supply chain that work through vendors (e.g., distributors, contractors, and design professionals.) For measures offered through midstream programs the NTG analysis relies on both customer and distributor responses to batteries of questions, so we also interviewed distributors involved with these programs. A detailed description of the self-report attribution and NTG analysis can be found in Section 6. Overall, the surveys were administered to:

- Identify the facility type
- 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 PROGRAM ADMINISTRATOR WORKPAPERS AND DEER

Our evaluation team also reviewed the Workpapers that govern the LED measures installed in PY2019, the DEER database, and any relevant lighting dispositions that impacted the PY2019 measures studied in this evaluation. Furthermore, we conducted a comparative analysis using ex ante parameter estimates from PA Workpapers, unit energy consumption values calculated in Workpaper calculation sheets, and lighting parameters downloaded from DEER. We compared these ex ante estimates against the gross ex post parameters developed using new primary data collection for each of the measures to develop gross realization rates for each of the T-LED and indoor LED fixture measures we evaluated.

SECTION 4:

SAMPLE DESIGN

This section of the report presents the population of PY2019 nonresidential ESPI measures subject to evaluation and describes the sampling approach we utilized to satisfy the impact evaluation objectives detailed in Section 2. Our evaluation team designed the sampling strategy to provide statistically significant impact results for PY2019 program participants while maintaining evaluation delivery timelines and project budgets. We developed the sample design prior to the commencement of data collection activities, based on several factors:

- **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 telephone sample frame for indoor LED fixtures and T-LEDs supports the evaluation of statistically significant gross realization rates (GRR) and NTG parameter estimates, while adhering to evaluation reporting deadlines and project budgets. The sample frame targets indoor LED fixtures, indoor LED kilolumen luminaires, and T-LED measures receiving rebates in PY2019 through a downstream or midstream program delivery mechanism. We utilized a stratified random sampling approach to produce ex post NTG ratios and GRRs for the evaluated population.

Our evaluation team set sampling targets based on coefficients of variation[6] (COV) developed from previous nonresidential lighting NTG and gross studies conducted for California PAs. Impact

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

evaluations from 2013-2018 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% confidence interval. With a COV of 0.4, the evaluator could achieve a 10% relative precision at the 90% confidence 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
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 TELEPHONE SURVEY SAMPLE DESIGN (PY2019)

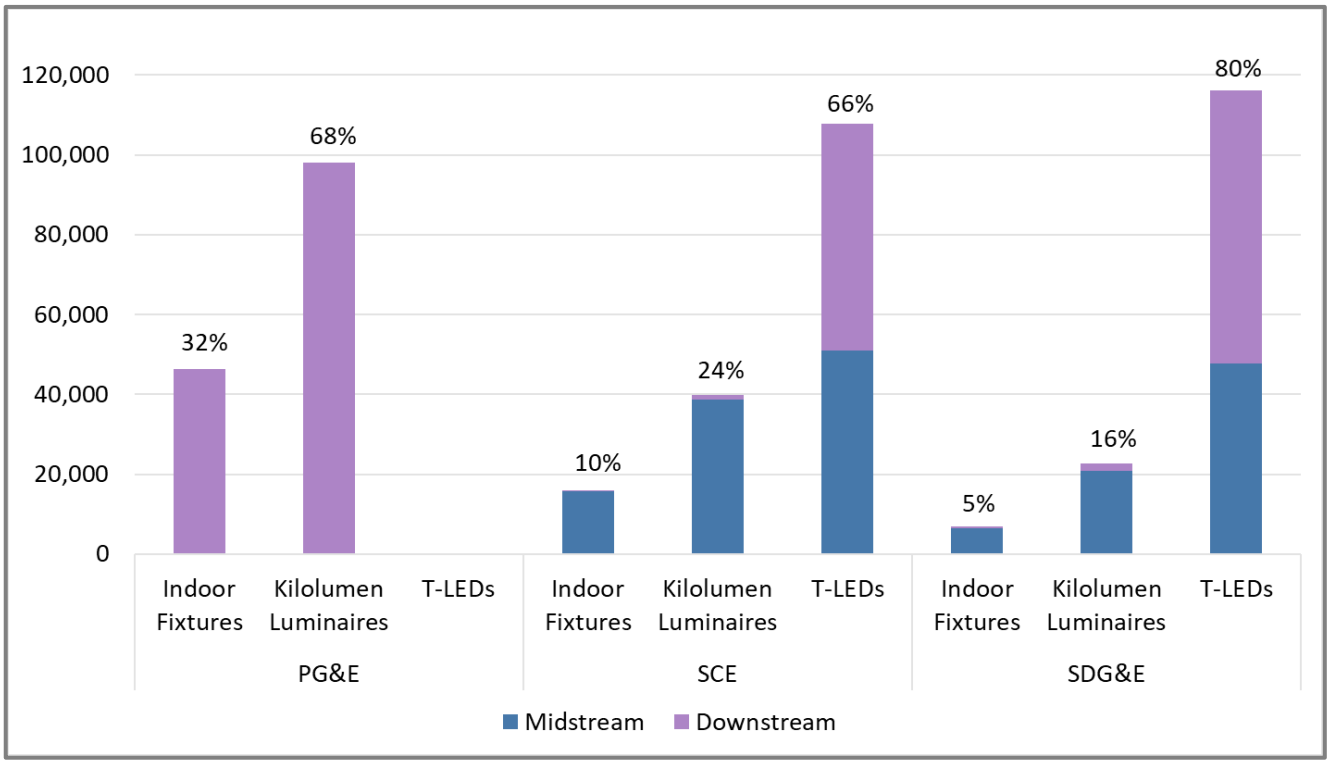
We carefully reviewed the program tracking data to confirm the measures were deemed, installed in nonresidential facilities, and delivered through downstream or midstream delivery channels. For T-LEDs and indoor LED fixture measures, we conducted telephone surveys for nonresidential downstream and midstream lighting program participants in PY2019 to collect both the parameters used in the impact algorithm for specific measures, and the net-of-free-ridership responses for the NTG analysis.

Telephone interviews collected information in support of the following parameters:

- Installation rates, lighting control types, location of lighting technologies, and site operation schedules (gross analysis).
- The equipment that was replaced, the age and condition of that equipment prior to the retrofit, and program and vendor influence on the new lighting measure installations (net analysis.)

Figure 4-1 presents the distribution of lifecycle MWh savings for indoor LED fixture and T-LED measures. Percentages shown refer to the evaluated claims for each PA.

Figure 4-1: Distribution of Claimed Lifecycle MWh Savings for Evaluated T-LED and Fixture Measures by PA (PY2019)



For PG&E, indoor LED fixtures and kilolumen luminaires accounted for all evaluated lifecycle MWh claims for PY2019 and were rebated exclusively through downstream channels. PG&E did not rebate T-LED measures at all. For SCE and SDG&E, T-LED measures comprised the most significant percentage of evaluated claims in PY2019, at 66% and 80%, respectively, split between the downstream and

midstream delivery channels. Indoor LED fixtures and kilolumen luminaires accounted for a significant share of claims (34% for SCE and 20% for SDG&E,) predominantly installed through the midstream program delivery channel.

Table 4-2 presents the telephone survey sample design for indoor LED fixture and T-LED measures along with the number of nonresidential deemed participants, the ex ante lifecycle MWh savings, the percentage of lifecycle savings, sample targets and the expected gross precision levels (by PA). Overall, we expected to complete 200 telephone verification surveys across the three PAs and sample targets were set:

- **To develop gross realization rates with a high level of precision**
- **Based on the distribution of ex ante lifecycle savings associated with each measure category (by PA and downstream vs. midstream distribution channel)**
- **Based on the practicality of being able to achieve the number of completed surveys given the number of sites in the population and budgetary considerations**

For measures representing a less significant percentage of a given PA's savings, we "passed through" ex ante savings values and did not included these measures in the table.

Based on past experience with similar lighting measures, we anticipated the coefficient of variation (COV) for the gross data to fall in the range of 0.5 to 0.7. The table presents the expected precision values. For the net evaluation we anticipated the COV to be in the range of 0.3-0.4, again similar to previous studies. Due to the lower variability in the net data, the expected precision values for NTGRs to fall in the 90/5-90/15 range.

Table 4-2: PY2019 Sample Design for T-LED and LED Fixtures

PA	LED Type	Midstream (1=yes)	N Sites	Lifecycle Gross Savings		Sample Target n	Expected 90% CI for GRR
				MWh	%		
PG&E	Indoor LED Fixture	0	485	46,361	32%	25	90/15-90/20
		1	-	-	-		
	Indoor Kilolumen Luminaire	0	533	98,040	68%	25	90/15-90/20
		1	-	-	-		
	Indoor T-LED	0	-	-	-		
		1	-	-	-		
	All		**1,018**	**144,401**	**100%**	**50**	90/10-90/15
SCE	Indoor LED Fixture	0	2	62	0%		
		1	142	15,605	10%	5	90/30-90/50
	Indoor Kilolumen Luminaire	0	36	1,207	1%		
		1	159	38,588	24%	20	90/15-90/25
	Indoor T-LED	0	6,076	56,947	35%	25	90/15-90/25
		1	1,118	50,893	31%	25	90/15-90/25
	All		**7,533**	**163,303**	**100%**	**75**	90/10-90/15
SDG&E	Indoor LED Fixture	0	22	598	0%		
		1	38	6,379	4%	8	90/25-90/40
	Indoor Kilolumen Luminaire	0	59	1,941	1%		
		1	64	20,820	14%	17	90/15-90/25
	Indoor T-LED	0	3,401	68,430	47%	25	90/15-90/25
		1	339	47,688	33%	25	90/15-90/25
	All		**3,923**	**145,857**	**100%**	**75**	90/10-90/15

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

Table 4-3 presents the achieved survey completes for each measure, and the percent of claimed population-level lifecycle MWh savings captured by the completes. We met or exceeded quotas by site for the T-LED measures. Due to limited sample for midstream indoor LED fixtures for SCE and SDG&E, we fell short of quotas for these measures. Overall, since many commercial businesses install multiple measures at their facility, we did complete more site-measures than the initial quotas.

Table 4-3: Achieved PY2019 Sample Design for T-LED and LED Fixtures

PA	LED Type	Midstream (1=yes)	Lifecycle Gross Savings		Sample Target n	n Achieved	% LC MWh Captured
			MWh	%			
PG&E	Indoor LED Fixture	0	46,361	32%	25	33	8%
		1	-	-			
	Indoor Kilolumen Luminaire	0	98,040	68%	25	31	3%
		1	-	-			
	Indoor T-LED	0	-	-			
		1	-	-			
	All		**144,401**	**100%**	**50**	**64**	
SCE	Indoor LED Fixture	0	62	0%			
		1	15,605	10%	5	22	14%
	Indoor Kilolumen Luminaire	0	1,207	1%			
		1	38,588	24%	20	14	14%
	Indoor T-LED	0	56,947	35%	25	26	2%
		1	50,893	31%	25	32	5%
	All		**163,303**	**100%**	**75**	**94**	
SDG&E	Indoor LED Fixture	0	598	0%			
		1	6,379	4%	8	6	7%
	Indoor Kilolumen Luminaire	0	1,941	1%			
		1	20,820	14%	17	4	3%
	Indoor T-LED	0	68,430	47%	25	25	1%
		1	47,688	33%	25	29	11%
	All		**145,857**	**100%**	**75**	**64**	

4-2 MIDSTREAM DISTRIBUTOR SURVEY SAMPLE DESIGN (PY2019)

As discussed previously, in PY2019 the PAs rebated LED measures through midstream programs which provide rebates directly through distributor delivery channels. A participating distributor signs an agreement with the PA, and they provide point of purchase incentives to customers. The distributor notifies the customer that they are receiving already-rebated measures on behalf of the PA; the distributor collects the site information and the required equipment installation information and submits it to the PA

for verification and payment. Below we summarize the midstream programs that offered LED installations in PY2019:

- PG&E – Commercial Deemed Incentive Program (PGE21012)
  - Qualifying LED reflector and accent lamps
- SCE – Midstream Point of Purchase Program MPOP (SCE-13-SW-002H)
  - Qualifying LED reflector and accent lamps; fixture technologies including T-LEDs, high/low bays and downlight fixtures
- SDG&E – Commercial Deemed Incentive Program (SDGE3223)
  - Qualifying LED reflector and accent lamps; fixture technologies including T-LEDs, high/low bays and downlight fixtures
- SDG&E – Industrial Deemed Incentive Program (SDGE3233)
  - Qualifying T-LEDs and high/low bay fixtures
- SDG&E – Commercial Deemed Incentive Program (SDGE3239)
  - Qualifying high/low bay fixtures

As mentioned above, we administered a customer telephone survey to PY2019 program participants to collect data in support of Net-To-Gross ratio estimation for indoor fixture and T-LED installations. Table 4-3 above summarizes the telephone survey sample design. The NTG evaluation for customers who installed LED measures through a downstream channel exclusively utilizes findings from the customer telephone interviews. The NTG evaluation for midstream measures uses a hybrid approach that relies on a combination of findings from interviews with customers and lighting distributors. A distributor survey was therefore necessary, as discussed in more detail in Section 6.

Table 4-4 shows the number of unique distributors who supplied midstream indoor fixtures or T-LEDs to customers to SCE and SDG&E in PY2019. The distributor survey attempted a census of these. The table also shows the number of distributors who agreed to participate in the distributor telephone survey.

Table 4-4: Midstream Indoor Fixture and T-LED Distributors (PY2019)

PA	N Distributors	N Survey Completes
SCE	46	36
SDG&E	18	10

The distributors who agreed to complete the survey account for 90% of midstream claims for SCE and 81% of midstream claims for SDG&E.

SECTION 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 LED fixtures. As mentioned, COVID-19 precluded in-person primary data collection, and this limited the impact parameters that this study could evaluate. The key savings algorithm input parameters that we could examine include operating hours, coincidence factors (CF) and the EUL. We obtained installation rates and wattage differentials from reviews of the tracking database and program workpapers. As discussed in Section 2, we developed site-specific ex post impacts at different levels of aggregation. The ratio of these impacts to the ex ante claimed savings represent a gross realization rate – the gross savings realized as a result of the ex post evaluation. Below we discuss the parameters obtained from the telephone survey data collection, and the summaries developed through data analysis.

5-1 GROSS IMPACT METHODOLOGY

As mentioned in Section 2, our evaluation team estimated site-specific gross realization rates by developing hourly impacts and impact load profiles. We aggregated these profiles 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). We 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. To estimate impact load profiles, we utilized the following general approach based on developing hourly impacts to generate hourly ex post gross impacts.

$$Impact\_Hour\_i = \left[\begin{matrix} (BaselineWattage \times Percent\_On\_Pre\_Hour\_i) \\ -(PostWattage \times Percent\_On\_Post\_Hour\_i) \end{matrix} \right]$$

We then aggregated the hourly impacts for each measure to develop an annual ex post gross kWh savings estimate and – averaged over specific hours – to develop an ex post gross kW savings estimate.

Our evaluation team conducted no new primary research on accelerated replacement. As a result, the ex post analysis utilized each program's claim of normal replacement (NR, which includes replacement on burnout) new construction (NC), or accelerated retirement (AR). The programs rebated all indoor high/low-bay fixture measures as NR or NC, meaning that these measures used a single baseline methodology. However, the programs claimed T-LED measures as AR. 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; when the pre-existing ballast fails, so does the entire fixture. Therefore, T-LED 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, the Database for Energy Efficient Resources).

Because all measures are all NR or NC, it is not necessary to estimate pre-installation operating hours, as those approaches do not use the existing measure as the baseline. Instead, the pre-installation operating hours are set equal to the post-installation operating hours. Similarly, pre-installation wattage information is not necessary and instead a baseline wattage is stipulated.

For post-installation wattage, we would typically attempt to collect that information during an on-site visit by doing make/model lookups. However, due to COVID-19, we did not conduct any in-person field activities. Because of this, we utilized wattage information from the workpapers and the measure code level. We find workpaper estimates of post-installation wattages to generally be fairly reliable as the measure being installed is known.

Below is a brief description of how we developed first year and lifecycle ex post impacts in the PY2019 evaluation. We discuss the individual parameter estimates in more detail thereafter.

5-1-1 First Year Impact

$$FirstYearImpact = Installation\ Rate\ x\ Quantity\ x\ (PercentOn\ x\ (BaselineWattage - PostWattage)\ x\ IE)$$

Installation Rate = the percentage of measures reported as installed in the tracking database that were verified and found to be in place and operable. We used telephone survey data to evaluate the installation rate as discussed below in Section 5.2.1.

Quantity = the quantity of measures reported installed in the tracking database. We discuss this parameter below in section 5.2.2.

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. We used self-report telephone survey data to develop operating hours and coincident diversity factors (CDF), and adjusted these values using logger data from previous evaluation efforts. We discuss the operating hour analysis below in Section 5.2.3.

BaselineWattage = the wattage associated with the replaced measure.

PostWattage = the wattage associated with the installed measure.

BaselineWattage-PostWattage=DeltaWatts. We used Workpaper calculation sheets to obtain the wattage differential by measure code.

IE = the HVAC interactive effects. DEER provides a set of factors that incorporate the kWh and kW HVAC interactive effects associated with the rebated measures. For each measure, the kWh factors multiply the annual kWh impact, and the kW factors multiply the kW demand impact. We applied different factors to each measure and participant based on the measure type, the participant's PA, the climate zone where the participant is located, the building type of the participant, and the vintage of the participant's facility (new or existing.) We discuss the interactive effects below in Section 5.2.5.

5-1-2 Lifecycle Impact

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

FirstYearImpact = the energy or demand savings associated with the installed measure in the first year of operation.

EUL = the effective useful life of the measure. The EUL is the ratio between the lamp/fixture rated life and the post-retrofit hours of operation. As discussed above, we estimated the post-retrofit hours of operation by aggregating the percent "ON" throughout the year. The Workpapers claim 50,000 hours rated life for all measures that we evaluated in PY2019 and EUL life caps of 12 years for indoor fixtures and 16 years for indoor Kilolumen luminaires. For T-LED measures, the EUL represents the RUL of the existing fluorescent ballast, which is 5 years per DEER. We discuss the EUL analysis in Section 5.2.4.

5-2 GROSS IMPACTS

As discussed above, we employed a gross realization rate approach for this evaluation. We used the individual parameter estimates corresponding to each site-measure to develop site-specific ex post savings estimates. Below is a discussion of the parameter estimates along with summaries from the telephone survey sample. It is important to note that we estimated the GRR's using site-specific ex post savings, and that we did not explicitly use the average parameter values presented below, to develop UES values and apply those to the population as would be done in a UES approach.

5-2-1 Installation Rates

The installation rate is defined as the percentage of equipment found to be installed and operable. Due to COVID-19 limitations to in-person primary data collection, the evaluation team replaced on-site verification of measure installation with customer confirmation of measure installation during the telephone survey. The self-reported installation rate is 100% for all measures, which agrees with on-site verification results from PY2018 (99% for indoor fixtures and kilolumen luminaires, and 97% for T-LEDs.) The evaluation team accepts the tracking database installation rates without adjustment.

5-2-2 Quantity

In PY2019, programs rebated LED technologies in two ways:

- **By fixture or lamp**
  - For measures where the rebated unit basis is fixture or lamp, the claimed savings are a product of the energy savings (UES) for each lamp or fixture and the total number of fixtures or lamps rebated. The UES is the demand or energy savings per fixture or lamp installed.
- **By unit of savings (Kilolumen)**
  - Some programs rebated measures, and calculated claimed savings, not by the total number of fixtures/lamps installed, but by the total kilolumens (or light output) installed. The claimed savings are a product of the unit of savings and the claimed kilolumen installed. The UES is the demand or energy savings per kilolumen.

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 (normalizing unit=fixture.) If the unit basis was *kilolumen*, the PA would make a claim based on a minimum efficacy (i.e., a 40-watt LED fixture with a minimum efficacy of 125 lumens per watt, or 5,000 lumens). The program tracking data would classify that claim as such (normalizing unit=kilolumen.)

In PY2018 the evaluation team found evidence of incorrect reporting of quantity for kilolumen measures in the tracking database: certain measure codes for SCE and SDG&E were associated with what appeared to be a number of fixtures, rather than a number of kilolumen installed.[7] In PY2019 we found similar evidence for kilolumen measures rebated by two SCE programs:

- **SCE-13-TP-018, for which all measure codes with kilolumen as the unit basis claim what appears to be a number of fixtures instead of a number of kilolumen.** We did not include these downstream indoor fixture measures in the sample design. Since there is no additional information that allows a correction of the quantity installed, the evaluation accepts the existing quantities, but cautions that this may underestimate savings for these measures.

[7] For a detailed discussion of this issue, please refer to the PY2018 report: http://www.calmac.org/publications/2018_Nonresidential_ESPI_Deemed_Lighting_Impact_Evaluation_-_Final_Report_and_Appendices.pdf

- **SCE-13-SW-002H, for which the unit basis field is sometimes set to fixtures (Version=ExAnte2019) and other times to kilolumen (Version=ExAnte2020).** All such records share the same set of UES values for a given business type/climate zone and are in fact fixtures installed under Workpaper SCE17LG111.1. We did sample these midstream measures in the PY2019 evaluation, and we analyzed them as indoor fixture measures, rather than as kilolumen luminaire measures.

We did not find any incorrect reporting of quantity for kilolumen measures for PG&E or SDG&E programs.

5-2-3 Operating Hour Analysis Methodology

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

Due to COVID-19 limitations to on-site visits and in-person primary data collection,[8] we conducted an adjusted self-report and business hour analysis for PY2019. Essentially, we used telephone surveys to collect weekly business operating schedules and lighting usage for each activity area where participants installed new lighting measures and relied on the 2013-2014 adjustment factors to develop load shape profiles and estimate peak hour coincident demand factors (CDF) and annual hours of use (HOU).

Rather than making a single adjustment to the total annual operating hours, we grouped self-reported business hours into four different use periods, and adjusted them separately for each use period:

- **All hours of the day when a business is open represent the Open period (for example: 9 AM to 5 PM).**
- **The one hour before opening and the one hour after closing, respectively, are Opening shoulder (for example: 8-9 AM) and the Closing shoulder (for example: 5-6 PM.)**

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

- **All hours for which the business is closed, not overlapping with one of the two shoulder periods, represent the Closed period (for example: 6 PM to 8 AM.)**

Since day type – weekday vs. weekend – and lighting control type – switch, occupancy control, photocell, etc. – also influence lighting operation and lighting savings, we applied different adjustments by day type and by lighting control type.

Figure 5-1 presents an example of the four usage periods recorded from a private office in a previous study, along with three usage profiles: the business hours of the site, the self-reported hours of operation for lights at the site, and actual lighting operation based on loggers deployed at the site.

Figure 5-1: Example Daily Load Profile for a Linear Fluorescent Fixture Installed in an Office

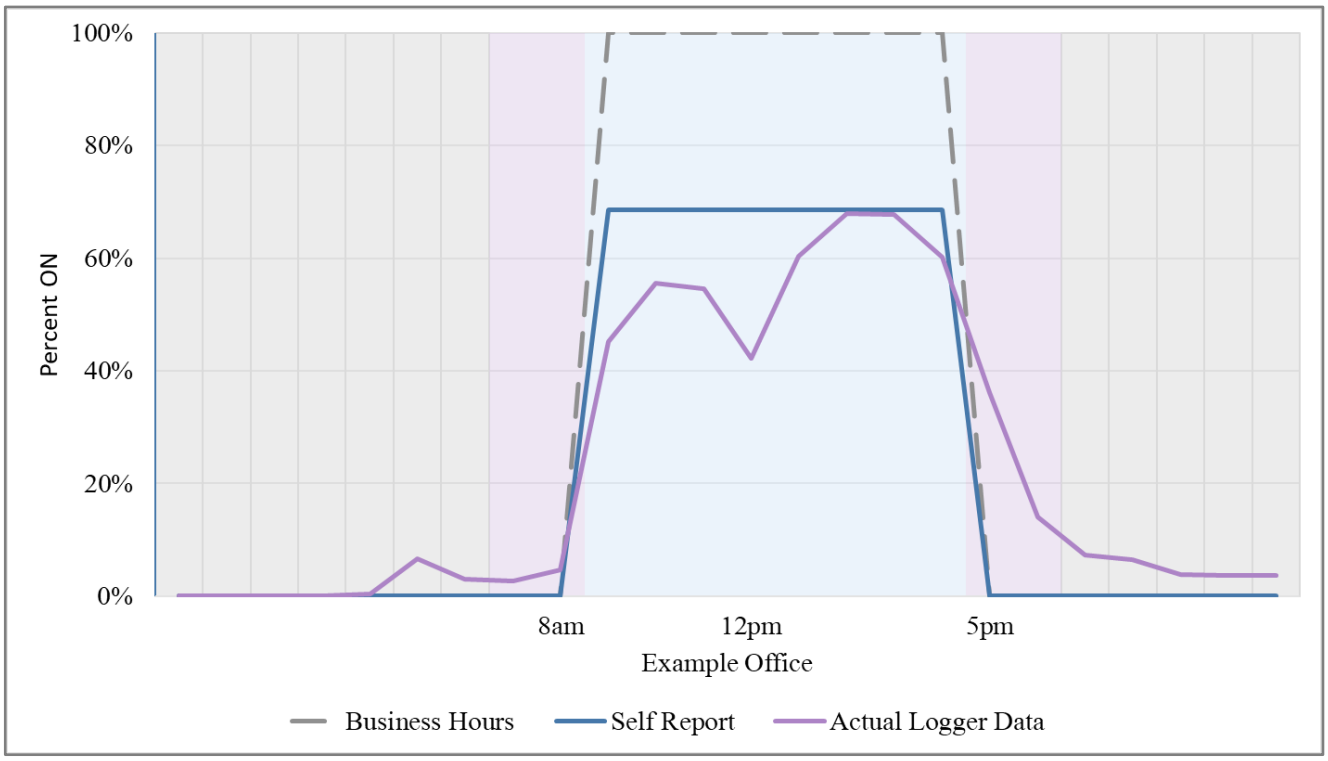


Figure 5-1 reveals a few important distinctions that, ultimately, represent the motivation behind the development and application of adjustment factors at this level:

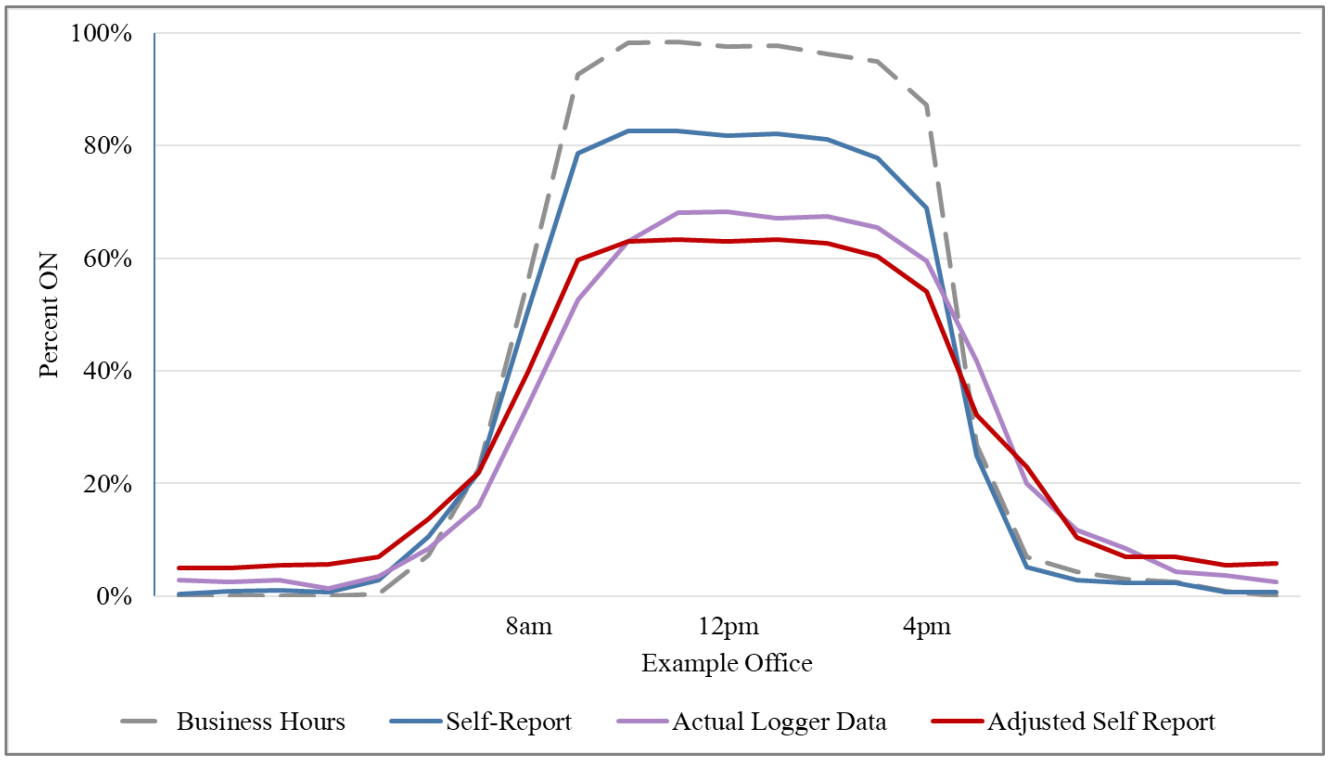
- **Business hours alone are not a reliable proxy to develop use shapes and lighting load impacts.**
- **Customer self-reported lighting usage, which the on-site contact provided, indicated that only 70% of the lights typically operate during the open period (highlighted in blue).**
- **Actual lighting usage, collected in 2013-2014 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 violet) and non-shoulder closed periods (highlighted in gray).**

As mentioned previously, for the PY2019 evaluation we were able to collect site business hours and self-reported lighting operation schedules, but we could not deploy lighting loggers due to COVID-19 conditions. We therefore relied on adjustment factors from the 2013-2014 impact evaluations to produce lighting operation profiles that are closer to what we would have found from lighting loggers. The 2013-2014 adjustment factors represent actual logger-to-self-reported lighting usage, by day type, business type, and lighting control. They can be applied to self-reported hours of operation for the same day type, business type and lighting control in situations when lighting loggers cannot be deployed (for example: if access to the lighting technologies is limited, such as during COVID-19.) By combining the primary schedule information obtained from the telephone surveys with the 2013-2014 adjustment factors we did not intend to predict lighting usage at a single site, but rather for the entire sample of similar technologies, building types and space types.

Our evaluation team adjusted the self-reported lighting operation schedules by time period, day type and lighting control where possible. Since the 2013-2014 adjustment factors are less than robust for some building type-day type-control type combinations, for some sites we developed and applied the adjustment factors at day type-control type level. For sites where we had no adjustment factors available (i.e. control types other than switch or occupancy sensor) we used the unadjusted self-reported hours of

operation, adjusted for any self-reported lighting-specific schedules. After we adjusted the operation schedules for all sites, we developed proxy load profiles. Figure 5-2 presents an example of average daily profiles from the sample of offices monitored in 2013-2014.

Figure 5-2: Aggregated Daily Load Profile for Linear Fluorescents Installed in an Office



This graph compares the hourly self-reported lighting operation profiles (in blue) against the average hourly usage rates based on facility business hours, and the actual hourly logger data collected and aggregated for the site (in violet). The resulting adjusted load profile (in red) is very similar to the actual logger profile (in violet).

We used this method to develop adjusted load profiles for the PY2019 sample of sites. Table 5-1 presents the resulting average annual operating hours (HOU) and coincident diversity factor (CDF). We also show the number of site-measures evaluated along with the relative precision for each estimate, measured at the 90% confidence interval. It is important to note that we estimated the GRR's using site-

specific ex post savings, and that we did not explicitly use these average HOU and CDFs to develop per UES values and apply those to the population as would be done in a UES approach.

Table 5-1: T-LED and Fixture Post-Retrofit Annual Hours of Operation and Coincidence Factors by Building Type (PY2019)

Building Type	n Sites	Annual Operating Hours	RP	Coincidence Factor	RP
Assembly	13	2,876	44%	0.48	27%
Education - Primary School	12	1,690	6%	0.51	7%
Grocery	3	7,455	19%	0.97	8%
Hospital	6	5,296	20%	0.64	20%
Hotel	3	3,558	42%	0.41	42%
Manufacturing - Light Industrial	30	3,092	28%	0.55	16%
Office - Large	16	2,621	25%	0.59	7%
Office - Small	53	2,726	30%	0.58	10%
Restaurant	4	4,351	17%	0.79	7%
Retail - Large	4	3,756	60%	0.63	18%
Retail - Small	46	2,660	17%	0.65	8%
Warehouse	10	3,021	21%	0.44	27%
All Building Types	**200**	**2,892**	**12%**	**0.59**	**5%**

As shown in the table, we collected and adjusted self-report data from a total of 200 business and lighting schedules that installed T-LED and indoor LED fixture measures. The sites that completed our participant survey belong to a wide variety of business types – retail, offices, restaurants, grocery, etc.

5-2-4 EUL Analysis

The Effective Useful Life (EUL) is a function of the service life of the measure divided by the ex post annual operating hours.

For indoor high/low-bay fixtures, the EUL is defined as:

EUL = Minimum of either $\frac{Service\ Life\ (hours)}{Annual\ Hours\ of\ Use}$

or 12 years for indoor fixtures, 16 years for indoor kilolumen luminaires

Where:

Service Life = the rated service life of the measure: 50,000 hours for all evaluated fixtures.

Annual Hours of Use = the site-specific estimate of post-retrofit annual hours of use (HOU) as outlined in Table 5-1.

For T-LEDs, which are installed in existing fixtures:

EUL = RULballast

Where:

RULballast =1/3*EUL of the replaced fixture: 5 years for all evaluated T-LEDs

The maximum allowable values of 12, 16 and 5 years are consistent with the workpapers that govern these measures.[9]

Table 5-2 presents the average HOU for T-LED and indoor fixtures, along with the rated service life, the ratio of service life to HOU, and the maximum allowable EUL (or "capped EUL".) Also shown are the number of telephone surveys we conducted for this evaluation that we used to develop each of these estimates. Consistent with the Workpapers that govern measure installations, the EUL fields from the tracking database reflect EUL caps of 12 years for indoor LED fixtures, 16 years for indoor kilolumen

[9] The following Workpapers governed lighting measure installations in PY2019:
PGECOLTG178-3, PGECOLTG178-4, SCE17LG111.0, SCE17LG111.1, WPSDGENRLG0080-4 and WPSDGENRLG0080-5 for Indoor Fixtures
PGECOLTG179-5, PGECOLTG179-6, SCE17LG118.0, SCE17LG118.1 and WPSDGENRLG0083-1 for Kilolumen Luminaires
SCE17LG117.1 and WPSDGENRLG0084-0 for T-LEDs

Luminaires, and 5 years for T-LEDs (which is set equal the RUL for the fluorescent ballast set to one-third of 15 years). Therefore, when we calculated the lifecycle GRRs, we estimated ex post savings for each site using the site-specific EUL or the cap, whichever was less.

Table 5-2: Service Life and Post-Retrofit EUL for T-LED and Fixture Measures

LED Measure	n Site Measures	Annual Hours of Use (HOU)	HOU RP	Service Life	Ratio Service Life to HOU	Capped EUL
Indoor LED Fixture	61	3,024	21%	50,000 hrs/ 12 years	16.5	12.0
Indoor Kilolumen Luminaire	49	2,630	25%	50,000 hrs/ 16 years	19.0	16.0
T-LED	112	3,036	15%	50,000 hrs	16.5	5.0

*The T-LED EUL is the RUL of the ballast of the existing fixtures.

For each LED measure the ratio between the rated service life (50,000 hours) and the aggregate average HOU (from the adjusted profile analysis) exceeds the maximum allowable EUL; this confirms that the capped EULs claimed by the PAs are conservative. However, at site level, there are cases where site-specific HOUs are large enough that the ratio is less than the maximum allowable EUL. For example, out of 200 sites surveyed, 31 sites (grocery stores, retail establishments, hospitals, manufacturing facilities, and offices) operate 24-hours a day. Our estimate of the GRRs relies on the individual site-level values, which may be less than the EUL cap.

5-2-5 Interactive Effects Methodology

DEER provides a set of factors that capture the kWh and kW HVAC interactive effects (IE) associated with the rebated measures. The evaluation team adopted the IE factors that the PAs used to develop the ex-ante unit energy savings (UES). For example, we calculate the kWh UES as:

$$UES_{kWh} = DeltaWatts \; x \; HOU \; x \; IE_{kWh}$$

As in the case of the wattage differential, we used the Workpaper calculation sheets to obtain the HVAC interactive effects factors by measure code. In so doing, we confirmed that each PA uses its own system to select DEER values (HOU, CDF and IE).

- PG&E uses DEER parameters at business type/PA level for all measures, whereas SCE uses DEER parameters at business type/climate zone level. SDG&E also uses DEER parameters and business type/climate zone level for downstream measures, and "Com/PA" values for midstream measures, regardless of business type or climate zone.
- Indoor LED fixtures use DEER parameters developed for "High Bay" lighting measures, whereas Kilolumen luminaires use the DEER parameters developed for "Long Fluorescent" lighting measures. For T-LEDs SCE uses "High Bay" DEER parameters, whereas SDG&E uses "Long Fluorescent" DEER parameters.
- Indoor Fixtures and Kilolumen Luminaires use the measure case parameters for the "Building OS" occupancy sensor DEER scenario, with the exception of SDG&E, which uses the parameters for the "All Space OS" scenario. For T-LEDs SCE uses the parameters for the "No OS" scenario, whereas SDG&E uses the parameters for the baseline case "Building OS" scenario.

5-3 GROSS EVALUATION RESULTS

Table 5-3 presents the evaluation results for first year (FY) and lifecycle (LC) GRRs and the corresponding relative precision (RP) at the 90% confidence level.

Table 5-3: Gross Realization Rates for T-LEDs and Indoor Fixtures (PY2019) by Delivery Approach

PA	Measure Type	Mid-stream	Sites n	FY kWh		FY kW		LC kWh		LC kW	
				GRR	RP	GRR	RP	GRR	RP	GRR	RP
Statewide	LED Fixture	0,1	61	1.19	0.22	0.96	0.11	1.02	0.15	0.87	0.10
	Kilolumen Luminaire	0,1	49	1.45	0.28	1.30	0.14	1.13	0.11	1.15	0.14
SCE	T-LED	0	26	1.12	0.24	1.01	0.07	1.12	0.24	1.01	0.07
		1	32	1.40	0.33	1.02	0.13	1.40	0.33	1.02	0.13
		0,1	58	1.25	0.21	1.02	0.07	1.25	0.21	1.02	0.07
SDG&E	T-LED	0	25	0.73	0.21	0.69	0.09	0.73	0.21	0.69	0.09
		1	29	1.40	0.24	0.92	0.17	1.40	0.24	0.91	0.18
		0,1	54	1.00	0.16	0.78	0.09	1.00	0.17	0.77	0.09

*Midstream = 1 denotes results for midstream programs, Midstream = 0 denotes results for downstream programs, Midstream = 0,1 denotes results for all programs.

The sheer volume of T-LED installations for SCE and SDG&E, through both mid- and downstream channels, ensured that we could complete a sufficient number of surveys. The gross realization rates for T-LEDs can be reported both at PA-technology-delivery mechanism level, and combined to the PA-technology level. Due to limited sample size for SCE and SDG&E midstream fixture and kilolumen installations, PA-level results are not sufficiently robust; we report results for these technologies at statewide level instead.

- **First Year kWh GRRs are essentially the ratio of a weighted average ex-post annual hours of use to a weighted average DEER-based ex-ante annual hours of use.** Similarly, the First Year kW GRRs are essentially the ratio of the ex-post and ex-ante CDFs. Lighting technologies for which evaluation GRRs are higher than 1.0 are those for which evaluation found higher hours of use (or CDFs) than the DEER-based claims.
  - **As shown in Table 5-3, only SDG&E downstream T-LEDs have an aggregate First Year GRRs<1 for both kWh and kW.** This can be traced back to a small number of sites with very limited hours of operation that were included in the PY2019 evaluation (for example: sites that operate only for a few hours on Saturdays, which translates into a very low HOU).

- **Lifecycle GRRs are essentially the ratio of a weighted average ex-post measure life span (in hours) to a weighted average DEER-based measure life span (in hours).** The measure life spans reflect evaluation results for both the hours of use and the EUL of each lighting measure: given a rated measure life of 50,000 hours, as the annual hours of use increase, the EUL decreases.
  - **For indoor fixtures and kilolumen luminaires these two effects are not proportional due to the EUL cap for these lighting measures; the two offsetting factors cause the Lifecycle GRRs to be closer to 1.0 than the First Year GRRs.** This also explains why the relative precision for these measures is lower for Lifecycle than for First Year, as the offsetting factors reduce variability.
  - **T-LED Lifecycle GRRs are almost identical to First Year GRRs because the measure life span is dictated by the RUL of the fixture ballast, rather than the rated life of the T-LEDs installed.** This means the ex ante and ex post EULs are identical, so the site-level ratio of ex post to ex ante life span is equal to the site-level ratio of ex post to ex ante annual hours of use.

Table 5-4 presents an equivalent set of evaluation results, in which the indoor fixture and kilolumen technologies are combined into one "indoor high/non-high bay fixture" for each PA. The T-LED results reflect both downstream and midstream installations.

Table 5-4: Gross Realization Rates for T-LEDs and Indoor Fixtures (PY2019)

PA	Measure Type	Mid-stream	FY kWh		FY kW		LC kWh		LC kW	
			GRR	RP	GRR	RP	GRR	RP	GRR	RP
PG&E	Indoor High/non-highbay Fixtures	0,1	1.36	0.20	1.17	0.11	1.09	0.09	1.06	0.11
SCE	Indoor High/non-highbay Fixtures	0,1	1.36	0.20	1.18	0.11	1.10	0.09	1.07	0.11
	T-LED	0,1	1.25	0.21	1.02	0.07	1.25	0.21	1.02	0.07
SDG&E	Indoor High/non-highbay Fixtures	0,1	1.38	0.21	1.20	0.11	1.10	0.09	1.08	0.12
	T-LED	0,1	1.00	0.16	0.78	0.09	1.00	0.17	0.77	0.09

* Midstream = 0,1 denotes results for all programs.

SECTION 6:

NET-TO-GROSS ANALYSIS

For this evaluation, we relied on telephone surveys to verify the installation of sampled measures and acquire information about the influence of the program on the purchase and installation of the measure. The questions asked of interviewees gathered information that allowed our evaluation team to estimate participant free-ridership to support the development of net-to-gross ratios (NTGRs) and net savings values. We asked a standard battery of Net-to-Gross (NTG) questions of all telephone 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, we estimate a net-of-free-ridership ratio for sampled projects we evaluate through analysis of surveys and/or professional in-depth interviews.**
- **Second, we develop a net-of-free ridership estimate for the population by extrapolating from the sampled projects to the entire population sample frame.** [10]

Over the last several evaluation cycles, Net-to-Gross (NTG) analysis for Nonresidential programs used a standardized Self-Report Approach (SRA)[11] that is based on the results of self-report telephone surveys with program participants and has been in place since the 2006-2008 evaluation cycle. This PY2019 evaluation continues the use of this standard SRA framework with updates developed during PY2018,

[10] Please note that the 0.05 market effects adder is not included in the NTGR. The NTGR is defined as one minus free ridership. The market effects adder is, however, included in the final ex-post net savings values presented in Chapter 1 and 7 and Appendices AA and AB.

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

through a collaborative process by team members from both the Group A and Group D evaluations. The net-to-gross scoring methodology used since PY2018 has an expanded framework to address both downstream and midstream programs.

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 question structure more accurately reflects the complex nature of real-world decision making and helps to ensure that all non-program influences are in consideration when we are assessing the unique contribution of the program to the energy efficiency project's implementation. Rather than focusing only on the respondents rating of the program's importance, we ask respondents 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. The method uses a 0 to 10 scoring system for key questions used to estimate the NTGR, rather than using fixed categories with assigned weights.

6-2 NTG Approach for Downstream Programs

The SRA methodology for downstream programs consists of an average of three components, termed program attribution indices (PAI) and referred to as PAI-2, PAI-3, PAI-N6. Note that the evaluation team dropped the PAI-1 score in the PY2017 evaluation and subsequently added the PAI-N6 score in the PY2018 evaluation.[12] We score these indices from participant survey responses about the decision to install a program measure.

- **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 the customer eventually adopted or installed. This score is determined by asking respondents to assign importance values to both the program and

[12] For a detailed discussion on the reasoning for replacing this index, please refer to the PY2018 report: http://www.calmac.org/publications/2018_Nonresidential_ESPI_Deemed_Lighting_Impact_Evaluation_-_Final_Report_and_Appendices.pdf

most important non-program influences so that the two values total 10. 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, then we reduce the program influence score by half.

- **PAI-2 Question Bank**

N2 Did your organization make the decision to install the new energy efficient equipment before after, or at the same time as you became aware that rebates were available through the PROGRAM?
N41 How many of the ten points would you give to the importance of the PROGRAM in your decision?
N42 and how many points would you give to all of these other non-program factors?

- **PAI-2 Score**
  - $\boldsymbol{if}\ N2 = Before$
  - $\boldsymbol{then}\ PAI2 = \frac{N41}{2}$
  - $\boldsymbol{else}\ PAI2 = N41$

- **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).

  - **PAI-3 Question Bank**

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 equipment that you did for this project regardless of when you would have installed it?

- PAI-3 Score
  - $PAI3 = 10 - N5$

- **Score PAI-N6** captures a more specific action the respondent would have taken if the program had not been available. The action taken by the respondent gives an indication of the level of influence the program has on the customer. For instance, if the customer indicates that without the program, they would have installed equipment of lower efficiency or quantity, this indicates that the program has a degree of influence on energy savings. If, however, the customer indicates that without the program they would have kept their previous equipment, this indicates that the program has completely influenced energy savings. If the respondent indicates that without the program, they would have repaired the existing equipment, then PAI-N6 is set to missing, and the overall net-to-gross ratio is the average of PAI-2 and PAI-3. This is because the resulting efficiency of the repaired equipment is unknown, therefore we excluded this response from the analysis.

  - PAI-N6 Question Bank

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 fewer units* *2 Install standard efficiency equipment or whatever is 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 _____)* *88 Don't know* *99 Refused*
N6a How many fewer units would you have installed? (It is okay to take an answer such as ...HALF...or 10 percent fewer ... etc.)

➢ PAI-N6 Score

Criteria	*PAI-N6 Score*	*Score Rationale*
if $N6 = 1$	***then*** $PAIN6 = 10 * \%\ units\ installed\ due\ to\ program\ (N6a)$	*If the customer would have installed fewer units without the program, we score them with partial credit as being a net participant, proportional to the percentage of fewer units they would have installed.*
if $N6 = 2\ OR\ N6 = 4$	***then*** $PAIN6 = 10$	*If the customer would have done nothing or installed equipment of baseline efficiency, we score them as a net participant.*
if $N6 = 3$	***then*** $PAIN6 = 7.5$	*If the customer would have installed more efficient equipment than code, but less than what they installed under the program, they get partial credit as being a net participant. We give a score of PAI_N6 = 7.5 based on evaluator judgement, as no specifics about what the customer would have installed are known.*
if $N6 = 5$	***then*** $PAIN6 = 0$	*If the customer would have taken the same action as under the program, we score them as a free rider.*
if $N6 = 6$	***then*** $PAIN6\ is\ missing$	*If the customer would have repaired the existing equipment, the resulting efficiency of the repaired equipment is unknown. Therefore, the PAI_N6 score is set to missing and not used.*
if $N6 = 77$	*We review the response and provide a score based on judgment, frequently a 0 or 1*	*If the customer provides another response, we review the response, and develop a score based on that response.*

When there are missing data or 'don't knows' to critical elements of each score, then we do not use that PAI score. As long as there are at least two valid PAI scores, then the overall NTGR is set equal to the

average of these valid scores, divided by ten. If we can only obtain one or no valid PAI scores, then the NTGR is set to missing.

6-3 OVERVIEW OF NTG APPROACH FOR MIDSTREAM PROGRAMS

Downstream programs focus on delivering incentives directly to end-use customers. However, 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. For midstream programs, we utilize both end-use customer surveys and vendor surveys in calculating NTGRs whenever possible.

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 that we use in the evaluation:

- **Programs that work through vendors and collect customer contact data, and where the end-user could be aware of the program (Midstream A).**
- **Programs that work entirely with vendors, but do not collect customer contact data, and where the end-user may not be aware of the program (Midstream B).**

For this evaluation, the Midstream approach as described for the evaluated lighting programs, applies to programs delivered through distributors that meaningfully change how they stock, promote and price program-qualified energy efficient equipment as a result of their participation in the program.

6-3-1 Midstream NTG Protocol

The evaluation of Midstream A programs involves data collection with both customers and vendors. In contrast, the evaluation of Midstream B programs involves data collection only with vendors.

For Midstream B programs that work exclusively with vendors and do not collect customer information, telephone or web surveys with end-use customers are not feasible. In addition, for Midstream B (as well as Midstream A) programs, evaluators need to determine if the vendor changed their practices in a way that ultimately influenced the customer's buying decision. For Midstream B programs, the NTGR metric is solely based on responses from the vendor surveys.

For Midstream A programs, evaluators need to survey end-use customers and their associated equipment vendors. As with Downstream programs, evaluators query customers about 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. Assessing the influence of the program on vendors involves conducting in-depth interviews with participating vendors. For this evaluation, we interviewed 46 participating distributors and asked them how the program influenced their stocking, pricing and promotion practices, and alternatively, how they would behave in the absence of the program.

6-4 NTG Approach for Nonresidential Midstream Lighting Programs

For this evaluation, we utilize method A, and develop both customer and distributor-based estimates of program influence. In order to develop an overall estimate of the NTGR, we combine the results of the customer and distributor analyses. In cases where there are multiple customer surveys completed associated with a specific distributor, the customer and distributor-based estimates are combined into a single NTGR metric assigned to that distributor, as discussed in more detail below.

6-4-1 Customer Component

For the **Customer** component, we used the standard NTG framework[13], where we conducted participating customer surveys, and used this information to calculate the customer-based NTGR.

[13] See 6-2 for customer NTG framework.

6-4-2 Distributor Component

The **Distributor** component of this Midstream Nonresidential Lighting 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 Distributor'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.**
  - Program Importance Score Question Bank

> *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 contractors and your other customers purchase the energy efficient measure at this time?*

  - Program Importance Score
    - $Program\ Importance\ Score = A5$

- **The *Relative Program Influence Score* is based on the Distributor'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.**
  - Relative Importance Score Question Bank

> *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?*

  - Relative Importance Score
    - $Relative\ Importance\ Score = A5a\ program\ factor\ score$

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

> *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 contractors and your other customers?*

  - No-Program Score
    - $No\ Program\ Score = 10 - A6$

The Distributor-based NTGR is simply the average of these three scores divided by 10. If we only obtain two valid responses, we average the two values, otherwise the NTGR is set to missing if there are not at least two valid responses.

6-4-3 Combined NTGR

Once we calculate the distributor and customer scores, the overall NTGR is determined from a combination of findings from the participating customer and participating distributor surveys as discussed below.

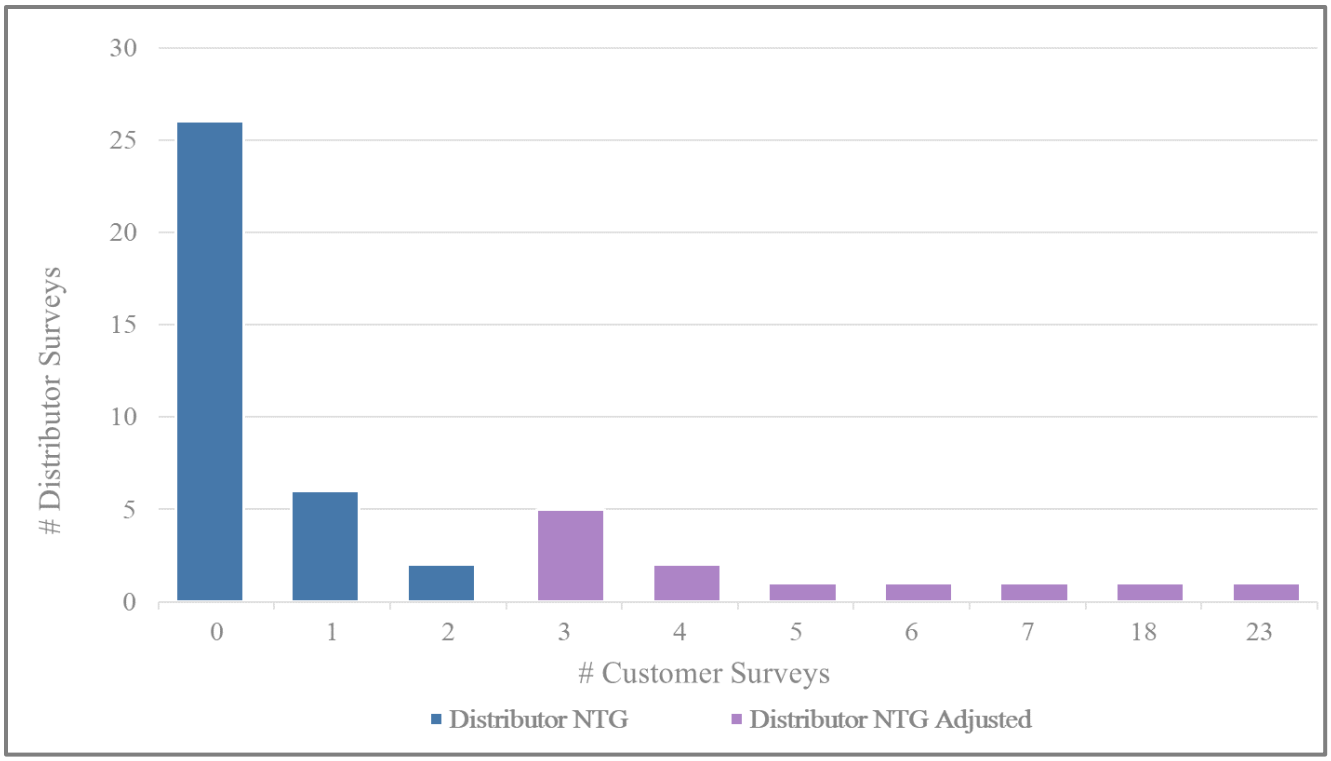
As shown in Table 6-2 we interviewed 46 distributors that represented 90% of SCE's population savings and 81% of SDG&E's population savings. However, the 96 customers we interviewed only represented 10% of SCE's population savings and 9% of SDG&E's population savings. Because we interviewed distributors with such a high percentage of savings and customers with a significantly lower percentage of savings, our approach for combining the distributor and customer NTGRs uses the Distributor responses as the basis for the overall NTGR, and then uses the customer responses to adjust the distributor scores. We adjusted the distributor score by averaging the individual distributor NTGR with

the average customer NTGR[14] for customers that used that distributor. We only applied this process if we surveyed at least 3 customers associated with a given distributor. We did not adjust the distributor score if we only interviewed 1 or 2 customers.

The figure below shows the number of customer survey completes for each of the 46 distributors surveyed. We only adjusted the distributor NTG score (resulting in averaging the distributor and customer NTG ratio) for 12 distributors where we surveyed three or more customers. Although only 12 of the 46 distributors had at least three corresponding customer surveys, they tended to be those with the largest corresponding program savings, and made up 62% of the total savings among the 46 distributors surveyed.

[14] Note that we averaged the customer NTGRs by weighting by the each customer's ex post lifecycle savings.

Figure 6-1: Number of Customer Surveys Completed for Distributors with Adjusted NTG Scores



The overall NTGR is based on the final adjusted distributor NTGRs.

$$NTGR_{adjusted\_distributor} = average(NTGR_{distributor}, NTGR_{customer}),$$

$$\boldsymbol{if}\ n_{customer\ surveys/distributor} > 3$$

$$\boldsymbol{else}$$

$$NTGR_{adjusted\_distributor} = NTGR_{distributor}$$

6-5 NTG RESULTS

Table 6-1 and Table 6-2 present the ex post NTGR scores by sample strata that we developed for the evaluated sampling domains using the above methodology, for downstream and midstream programs, respectively.

These tables also present the ex ante NTG values, as well as the average PAI2, PAI3 and PAI N6 scores for each segment. We weighted these results by ex post lifecycle kWh.

Table 6-1: Ex Ante and Ex Post Net-To-Gross Ratios and NTG Scores for the Downstream Delivery Approach by PA and Measure Type

PA	Measure Type	Responses	NTGR			PAI Score		
		n	Ex Ante	Ex Post	Relative Precision	PAI2	PAI3	PAI N6
PG&E	Fixtures	33	0.91	0.58	15%	5.28	5.28	6.86
	Kilolumens	31	0.65	0.71	9%	5.40	7.03	9.02
	Subtotal	64	0.73	0.67	8%	5.36	6.50	8.34
SCE	TLED	26	0.63	0.67	12%	5.51	7.00	8.20
SDG&E	TLED	25	0.69	0.75	9%	6.87	6.70	9.84

*Please note that the market effects adder is not included in the NTGR.

Table 6-2: Ex Ante and Ex Post Net-To-Gross Ratios and NTG Scores for the Midstream Delivery Approach by PA

PA	Responses		% of Distributors Surveyed		NTGR			PAI Score			Vendor NTG Scores		
	Parts.	Distrs.	% N	% Savings	Ex Ante	Ex Post	RP	PAI 2	PAI 3	PAI N6	Score 1	Score 2	Score 3
SCE	59	36	78%	90%	0.71	0.62	4%	5.47	6.53	8.29	8.46	6.03	3.29
SDG&E	37	10	56%	81%	0.76	0.65	10%	5.22	4.76	7.50	8.98	7.21	5.31

*Please note that the market effects adder is not included in the NTGR.

Table 6-3 illustrates how DEER could utilize these values in the future if it used a single statewide number for a measure and delivery approach. The table presents results by delivery approach and measure type when the data could support an estimate at that level. These values represent the statewide averages presented in the tables above, weighted by ex post lifecycle savings.

Table 6-3: Recommended Statewide DEER NTG Values Based on Evaluated Results

Measure Type	Deemed Downstream	Deemed Midstream
Fixtures	0.67	0.63
TLEDs	0.71	0.63

*Please note that the market effects adder is not included in the NTGR.

6-5-1 PG&E Indoor LED Fixtures and Kilolumens, Downstream Delivery

- The ex post NTG ratio for Fixtures was substantially less than ex ante (0.58 ex post vs. 0.91 ex ante); however, the ex post NTG ratio for Kilolumens (0.71 ex post vs. 0.65 ex ante) exceeded the ex ante value. Overall, the NTG ratio for these measures was 0.67, compared to a value of 0.73 for ex ante.

- For Fixtures, the PAI-2, PAI-3 and PAI-N6 scores of 5.28, 5.28 and 6.86 were moderate and in-line with the NTGR of 0.58. Kilolumens, having PAI-2, PAI-3 and PAI-N6 scores of 5.40, 7.03, 9.02, had significantly higher PAI-2 and PAI-3 scores than Fixtures, raising the overall NTG score to 0.71. These scores and the resulting NTG ratios suggest a medium level of program influence for these two lamp types.

6-5-2 SCE Indoor TLEDs, Downstream Delivery

- SCE TLEDs exhibited medium program influence based on an NTGR of 0.67. PAI-2, PAI-3 and PAI-N6 score values varied somewhat, with weighted average values ranging from 5.51 (PAI-2) to 8.20 (PAI-N6). This ex post NTGR exceeded the ex ante value of 0.63.

6-5-3 SDG&E Indoor TLEDs, Downstream Delivery

- SDG&E TLEDs exhibited slightly higher program influence based on an NTGR of 0.75. PAI-2, PAI-3 and PAI-N6 score values are higher than SCE's TLED PAI-2, PAI-3, PAI-N6 values, ranging from 6.70 (PAI-3) to 9.84(PAI-N6). This ex post NTGR was also larger than the ex ante value of 0.69.

6-5-4 SCE Indoor LED Lamps, Midstream Delivery

- The 0.62 ex post NTGR value for the midstream delivery is slightly lower than that for the downstream TLED measure (0.67), which may be due to the delivery mechanism or due to differences in the technologies that the programs offered midstream (fixtures versus TLEDs). It is important to note that this result is based on the distributor responses, with customer response adjustments when appropriate, whereas the downstream result is based solely on the participants. This ex post NTGR was lower than the ex ante value of 0.71.

6-5-5 SDG&E Indoor LED Lamps, Midstream Delivery

- The 0.65 ex post NTGR for the midstream delivery compares well to the SCE midstream value (0.62), but is substantially lower than that for the SDG&E downstream TLED measure (0.75). Again, this could be due to differences in the delivery mechanism or technologies. This ex post NTGR is substantially lower than the ex ante value of 0.76. Also, as stated above, note that this result is based on the distributor responses, with customer response adjustments when appropriate, whereas the downstream result is based solely on the participants.

SECTION 7:

EVALUATION RESULTS

This section of the report presents the gross and net realization rates we developed for the PY2019 deemed ESPI lighting measures discussed throughout the report. We studied a subset of the measures within the PY2019 population of nonresidential deemed measures. Table 7-1 presents the ESPI measures subject to ex post evaluation for PY2019 along with the measure types ultimately evaluated.

Table 7-1: Data Sources and Ex Post Update for PY2019 ESPI Measures

2019 ESPI Measure	Data Source	Evaluation Update	
	New Phone Surveys	Gross	NTG
Indoor LED High/Non-Highbay Fixtures	X	X	X
Indoor LED High/Non-Highbay Kilolumen Luminaires	X	X	X
Indoor T-LED Lamps	X	X	X
Outdoor LED Fixture		Pass Through	Pass Through
Indoor LED A-Lamps		Pass Through	Pass Through
Indoor LED Reflector Lamps		Pass Through	Pass Through
Indoor LED Specialty Lamps		Pass Through	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 Program Administrator (PA). Realization rates that are *italicized* signify the ex ante savings were passed through.

Table 7-2: PG&E First Year Gross MWh and MW Realization Rates for Evaluated Measures

2019 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	Indoor LED Fixture	4,139	4,927	119%	22%	0.9	0.9	96%	11%
	Indoor Kilolumen Luminaire	7,623	11,062	145%	28%	1.6	2.1	130%	14%
	Outdoor LED Fixture	*1,632*	*1,632*	*100%*	-	-	-	-	-
LED Lamp	A-Lamps	*450*	*450*	*100%*	-	*0.1*	*0.1*	*100%*	-
	Reflector Lamps	*292*	*292*	*100%*	-	*0.1*	*0.1*	*100%*	-
	Specialty Lamps	*32*	*32*	*100%*	-	*0.0*	*0.0*	*100%*	-
LED T-LED	Linear Lamp	-	-	-	-	-	-	-	-

Table 7-3: SCE First Year Gross MWh and MW Realization Rates for Evaluated Measures

2019 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	Indoor LED Fixture	1,330	1,583	119%	22%	0.4	0.4	96%	11%
	Indoor Kilolumen Luminaire	2,540	3,686	145%	28%	0.8	1.0	130%	14%
	Outdoor LED Fixture	*1,045*	*1,045*	*100%*	-	-	-	-	-
LED Lamp	A-Lamps	*84*	*84*	*100%*	-	*0.0*	*0.0*	*100%*	-
	Reflector Lamps	*416*	*416*	*100%*	-	*0.1*	*0.1*	*100%*	-
	Specialty Lamps	*131*	*131*	*100%*	-	*0.0*	*0.0*	*100%*	-
LED T-LED	Linear Lamp	21,707	27,138	125%	21%	6.2	6.3	102%	7%

Table 7-4: SDG&E First Year Gross MWh and MW Realization Rates for Evaluated Measures

2019 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	Indoor LED Fixture	582	693	119%	22%	0.1	0.1	96%	11%
	Indoor Kilolumen Luminaire	1,423	2,064	145%	28%	0.3	0.5	130%	14%
	Outdoor LED Fixture	*318*	*318*	*100%*	-	-	-	-	-
LED Lamp	A-Lamps	*7*	*7*	*100%*	-	*0.0*	*0.0*	*100%*	-
	Reflector Lamps	*924*	*924*	*100%*	-	*0.2*	*0.2*	*100%*	-
	Specialty Lamps	*35*	*35*	*100%*	-	*0.0*	*0.0*	*100%*	-
LED T-LED	Linear Lamp	23,465	23,574	100%	16%	6.2	4.8	78%	9%

As mentioned in Section 5, First Year GRRs are essentially the ratio of a weighted average ex-post annual hours of use to a weighted average DEER-based ex-ante annual hours of use. Lighting technologies for which evaluation GRRs are higher than 1.0 are those for which evaluation found higher hours of use than the DEER-based claims.

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

2019 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	Indoor LED Fixture	46,361	47,430	102%	15%	10.5	9.1	87%	10%
	Indoor Kilolumen Luminaire	98,040	110,380	113%	11%	21.3	24.5	115%	14%
	Outdoor LED Fixture	*19,580*	*19,580*	*100%*	-	-	-	-	-
LED Lamp	A-Lamps	*4,862*	*4,862*	*100%*	-	*0.9*	*0.9*	*100%*	-
	Reflector Lamps	*2,712*	*2,712*	*100%*	-	*0.6*	*0.6*	*100%*	-
	Specialty Lamps	*269*	*269*	*100%*	-	*0.0*	*0.0*	*100%*	-
LED T-LED	Linear Lamp	-	-	-	-	-	-	-	-

Table 7-6: SCE Lifecycle Gross MWh and MW Realization Rates for Evaluated Measures

2019 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	Indoor LED Fixture	15,667	16,029	102%	15%	4.8	4.2	87%	10%
	Indoor Kilolumen Luminaire	39,795	44,804	113%	11%	12.4	14.3	115%	14%
	Outdoor LED Fixture	*11,068*	*11,068*	*100%*	-	-	-	-	-
LED Lamp	A-Lamps	*936*	*936*	*100%*	-	*0.3*	*0.3*	*100%*	-
	Reflector Lamps	*3,726*	*3,726*	*100%*	-	*1.0*	*1.0*	*100%*	-
	Specialty Lamps	*1,121*	*1,121*	*100%*	-	*0.3*	*0.3*	*100%*	-
LED T-LED	Linear Lamp	107,841	134,740	125%	21%	30.9	31.4	102%	7%

Table 7-7: SDG&E Lifecycle Gross MWh and MW Realization Rates for Evaluated Measures

2019 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	Indoor LED Fixture	6,977	7,138	102%	15%	1.7	1.5	87%	10%
	Indoor Kilolumen Luminaire	22,762	25,626	113%	11%	5.6	6.4	115%	14%
	Outdoor LED Fixture	*3,819*	*3,819*	*100%*	-	-	-	-	-
LED Lamp	A-Lamps	*50*	*50*	*100%*	-	*0.0*	*0.0*	*100%*	-
	Reflector Lamps	*7,852*	*7,852*	*100%*	-	*1.9*	*1.9*	*100%*	-
	Specialty Lamps	*236*	*236*	*100%*	-	*0.1*	*0.1*	*100%*	-
LED T-LED	Linear Lamp	116,119	116,372	100%	17%	30.8	23.8	77%	9%

Lifecycle GRRs are essentially the ratio of a weighted average ex-post measure life span (in hours) to a weighted average DEER-based measure life span (in hours). The measure life spans reflect evaluation results for both the hours of use and the EUL of each lighting measure: given a rated measure life of 50,000 hours, as the annual hours of use increase, the EUL decreases. These two effects are not

proportional due to the EUL cap for each lighting measure, but these two offsetting factors cause the Lifecycle GRRs to be closer to 1.0 than the First Year GRRs.

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 fixtures and T-LEDs, as discussed in Section 6, plus the 0.05 market adder.[15] Table 7-9 presents the resulting measure-level NTG ratios.

[15] Please note that the 0.05 market effects adder is not included in the NTGR values presented in Section 6, however they are included in the final ex-post net savings values presented in Chapter 1 and 7 and Appendices AA and AB.

Table 7-8: Ex Ante and Ex Post Net-to-Gross Ratios for LED Measures by PA

PA	Measure Type	Midstream	Sites n	NTGR		
				Ex Ante	Ex Post	RP
PG&E	LED Fixture	0	33	0.96	0.63	15%
	Kilolumen Luminaire	0	31	0.70	0.76	9%
SCE	LED Fixture	1	64	0.76	0.67	4%
	Kilolumen Luminaire	1				
	T-LED	1				
	T-LED	0	26	0.68	0.72	12%
SDG&E	LED Fixture	1	37	0.81	0.70	10%
	Kilolumen Luminaire	1				
	T-LED	1				
	T-LED	0	25	0.74	0.80	9%

Table 7-9: Measure-level Net-to-Gross Ratios by PA

PA	Measure Type	Midstream	NTGR		
			Ex Ante	Ex Post	RP
PG&E	LED Fixture	0	0.96	0.63	15%
	Kilolumen Luminaire	0	0.70	0.76	9%
SCE	LED Fixture	0,1	0.96	0.67	4%
	Kilolumen Luminaire	0,1	0.80		
	T-LED	0,1	0.68	0.69	5%
SDG&E	LED Fixture	0,1	0.95	0.70	10%
	Kilolumen Luminaire	0,1	0.86		
	T-LED	0,1	0.75	0.75	6%

*Midstream = 1 denotes results for midstream programs, Midstream = 0 denotes results for downstream programs, Midstream = 0,1 denotes results for all programs.

Table 7-10 through Table 7-12 below present 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 7-10: PG&E First Year Net MWh and MW Realization Rates for Evaluated Measures

2019 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	Indoor LED Fixture	3,969	3,103	78%	0.9	0.6	63%
	Indoor Kilolumen Luminaire	5,301	8,442	159%	1.1	1.6	145%
	Outdoor LED Fixture	*1,563*	*1,563*	*100%*	-	-	-
LED Lamp	A-Lamps	*296*	*296*	*100%*	*0.1*	*0.1*	*100%*
	Reflector Lamps	*280*	*280*	*100%*	*0.1*	*0.1*	*100%*
	Specialty Lamps	*31*	*31*	*100%*	*0.0*	*0.0*	*100%*
LED T-LED	Linear Lamp	-	-	-	-	-	-

Table 7-11: SCE First Year Net MWh and MW Realization Rates for Evaluated Measures

2019 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	Indoor LED Fixture	1,274	1,058	83%	0.4	0.3	67%
	Indoor Kilolumen Luminaire	2,029	2,463	121%	0.6	0.7	107%
	Outdoor LED Fixture	*937*	*937*	*100%*	*0.0*	-	-
LED Lamp	A-Lamps	*81*	*81*	*100%*	*0.0*	*0.0*	*100%*
	Reflector Lamps	*399*	*399*	*100%*	*0.1*	*0.1*	*100%*
	Specialty Lamps	*126*	*126*	*100%*	*0.0*	*0.0*	*100%*
LED T-LED	Linear Lamp	14,661	18,671	127%	4.2	4.3	103%

Table 7-12: SDG&E First Year Net MWh and MW Realization Rates for Evaluated Measures

2019 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	Indoor LED Fixture	555	487	88%	0.1	0.1	71%
	Indoor Kilolumen Luminaire	1,225	1,452	119%	0.3	0.3	106%
	Outdoor LED Fixture	*304*	*304*	*100%*	-	-	-
LED Lamp	A-Lamps	*7*	*7*	*100%*	*0.0*	*0.0*	*100%*
	Reflector Lamps	*885*	*885*	*100%*	*0.2*	*0.2*	*100%*
	Specialty Lamps	*33*	*33*	*100%*	*0.0*	*0.0*	*100%*
LED T-LED	Linear Lamp	17,576	17,730	101%	4.7	3.6	78%

NRRs differ from the GRRs by the ratio of Ex post to Ex ante NTGRs. Because the ex post NTGRs are less than ex ante, the NRRs tend to be less than the GRRs.

7-4 NET LIFECYCLE REALIZATION RATES

Table 7-13 through Table 7-15 present 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 7-13: PG&E Lifecycle Net MWh and MW Realization Rates for Evaluated Measures

2019 ESPI Measure	Measure Type	Lifecycle Net MWh Savings			Lifecycle Net MW Savings		
		Ex Ante	Ex Post	NRR	Ex Ante	Ex Post	NRR
LED Fixture	Indoor LED Fixture	44,445	29,867	67%	10.1	5.7	57%
	Indoor Kilolumen Luminaire	68,193	84,237	124%	14.6	18.7	129%
	Outdoor LED Fixture	*18,754*	*18,754*	*100%*	-	-	-
LED Lamp	A-Lamps	*3,203*	*3,203*	*100%*	*0.6*	*0.6*	*100%*
	Reflector Lamps	*2,603*	*2,603*	*100%*	*0.6*	*0.6*	*100%*
	Specialty Lamps	*258*	*258*	*100%*	*0.0*	*0.0*	*100%*
LED T-LED	Linear Lamp	-	-	-	-	-	-

Table 7-14: SCE Lifecycle Net MWh and MW Realization Rates for Evaluated Measures

2019 ESPI Measure	Measure Type	Lifecycle Net MWh Savings			Lifecycle Net MW Savings		
		Ex Ante	Ex Post	NRR	Ex Ante	Ex Post	NRR
LED Fixture	Indoor LED Fixture	15,013	10,713	71%	4.6	2.8	60%
	Indoor Kilolumen Luminaire	31,912	29,945	94%	10.0	9.5	95%
	Outdoor LED Fixture	*10,287*	*10,287*	*100%*	-	-	-
LED Lamp	A-Lamps	*898*	*898*	*100%*	*0.3*	*0.3*	*100%*
	Reflector Lamps	*3,573*	*3,573*	*100%*	*1.0*	*1.0*	*100%*
	Specialty Lamps	*1,076*	*1,076*	*100%*	*0.3*	*0.3*	*100%*
LED T-LED	Linear Lamp	72,854	92,703	127%	20.9	21.6	103%

Table 7-15: SDG&E Lifecycle Net MWh and MW Realization Rates for Evaluated Measures

2019 ESPI Measure	Measure Type	Lifecycle Net MWh Savings			Lifecycle Net MW Savings		
		Ex Ante	Ex Post	NRR	Ex Ante	Ex Post	NRR
LED Fixture	Indoor LED Fixture	6,653	5,022	75%	1.6	1.0	64%
	Indoor Kilolumen Luminaire	19,602	18,030	92%	4.8	4.5	94%
	Outdoor LED Fixture	*3,650*	*3,650*	*100%*	-	-	-
LED Lamp	A-Lamps	*48*	*48*	*100%*	*0.0*	*0.0*	*100%*
	Reflector Lamps	*7,522*	*7,522*	*100%*	*1.9*	*1.9*	*100%*
	Specialty Lamps	*226*	*226*	*100%*	*0.1*	*0.1*	*100%*
LED T-LED	Linear Lamp	86,990	87,522	101%	23.1	17.9	78%

SECTION 8:

CONCLUSIONS AND RECOMMENDATIONS

This section of the report highlights conclusions and recommendations related to the findings that we developed based on this evaluation. We tie each conclusion to the relevant section of the report.

Conclusions and recommendations are numbered below. Appendix AC summarizes these corresponding conclusions and recommendations and provides the numbering scheme for easy reference.

Operating Hours and Measure Life:

Conclusion 1 [Section 5]: Overall, we found higher operating hours – especially within specific sectors like retail establishments – than the PAs claimed. Higher evaluated operating hours lead to more significant annual energy savings. Our evaluation team found HOU claims and associated energy/demand savings used a building type designation that do not correspond to the actual activity level within a facility. For example, out of 200 sites surveyed, 31 sites (grocery stores, retail establishments, hospitals, manufacturing facilities, and offices) 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, the ex ante/DEER team should consider having businesses that operate 24 hours a day be a unique case, and claimed operating hours should be updated to reflect higher activity within these facilities.

Conclusion 2 [Section 5]: As a result of the increased hours of operation, the life of the measure decreases, in terms of years. The more the lighting system is used, the sooner it is likely to fail or need

to be replaced. This leads to less lifecycle energy savings, sometimes cancelling out the benefit of the increase in annual operating hours.

- **Recommendation 2: Future evaluations should continue to monitor the age and condition of existing fixtures like fluorescent technologies.** LED tube lamps replace the fluorescent tube lamps, 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 it requires replacement.

Program Influence:

Conclusion 3 [Section 6]: In general, lighting measures exhibited medium program influence levels for both midstream and downstream approaches. NTGR values vary somewhat by measure type, delivery approach and PA and range from a low of 0.58 (PG&E Downstream Indoor LED Fixtures) to a high of 0.75 (SDG&E Downstream Indoor T-LEDs). Values for the midstream delivery approach show less variation between SCE (0.62) and SDG&E (0.65) but are only robust enough to report at the PA level. In most cases, ex post NTGR values are less than ex ante values. The midstream result is based on a combination of participant and distributor survey results, while the downstream result is based solely on participant survey results.

- **Recommendation 3: The PA's should continue to utilize both the midstream and downstream approaches.** Both approaches appear to be an effective means of influencing customers to install energy efficient lighting equipment, offering similar levels of influence over decision making.

Tracking Participation

Conclusion 4 [Section 5 and Section 6]: The quality of contact information for midstream program participating customers was drastically improved over prior evaluations. Although some participant contact information provided by the IOUs corresponded to distributors or contractors, rather than to the participants, the large majority of customer contact information was reliable. In previous evaluations, we found that some programs provided no customer contact information, or little reliable data.

- **Recommendation 4: With the transition to 3P programs that include a Midstream delivery approach, it is important that the PA's continue to reliably collect both customer and distributor contact information to support the evaluation process.** The Midstream NTG framework generally calls for values that are based on a combination of customer and distributor survey results.

Conclusion 5 [Section 5]: The evaluation team found evidence of some SCE 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.

- **Recommendation 5: PAs 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.**

Documenting Reported Savings:

Conclusion 6 [Over-arching]: When comparing ex post results to ex ante parameter estimates, we could not always find complete documentation detailing the specific parameters comprised of the ex ante claimed savings values. For example: some workbook calculations included only UES values, but did not make available the delta watts, HOU, CDF, and IE parameters that contributed to the UES values claimed.

- **Recommendation 6: All workpaper documentation (workbook calculations and supporting documents) should be posted on the workpaper project archive (WPA) at www.deeresources.info.**

Conclusion 7 [Section 5]: While researching and summarizing the DEER HOU, CDF and IE parameters that contribute to the claimed UES values, we confirmed that each PA uses its own system to select DEER values.

- PG&E uses DEER parameters at business type/IOU level for all measures, whereas SCE uses DEER parameters at business type/climate zone level. SDG&E also uses DEER parameters and business type/climate zone level for downstream measures but uses "Com/IOU" values for midstream measures, regardless of business type or climate zone.
- Indoor LED fixtures use DEER parameters developed for "High Bay" lighting measures, whereas Kilolumen luminaires use the DEER parameters developed for "Long

Fluorescent" lighting measures. For T-LEDs SCE uses "High Bay" DEER parameters, whereas SDG&E uses "Long Fluorescent" DEER parameters.

- Indoor LED and Kilolumen Luminaires use the measure case parameters for the "Building OS" occupancy sensor DEER scenario, with the exception of SDG&E, which uses the parameters for the "All Space OS" scenario. For T-LEDs SCE uses the parameters for the "No OS" scenario, whereas SDG&E uses the parameters for the baseline case "Building OS" scenario.

- **Recommendation 7: Workbook calculations and supporting documents should also include the exact set of DEER parameters (building type/climate zone/lighting technology/occupancy sensor scenario) and a brief rationale as to why a given lighting measure used a certain selection.**

APPENDIX AA:

STANDARDIZED REPORTING TABLES

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_HIGH_LOWBAY_FIXTURE	46,361	47,430	1.02	0.0%	1.02
PGE	PGE_LED_HIGH_LOWBAY_KILOLUMEN	98,040	110,380	1.13	0.0%	1.13
PGE	PGE_Passthrough_LED_ACCENT	269	269	1.00	100.0%	
PGE	PGE_Passthrough_LED_A-LAMP	4,862	4,862	1.00	100.0%	
PGE	PGE_Passthrough_LED_OUTDOOR_FIXTURE	19,580	19,580	1.00	100.0%	
PGE	PGE_Passthrough_LED_REFLECTOR	2,712	2,712	1.00	100.0%	
PGE	PGE_Passthrough_LED_STREET	1,952	1,952	1.00	100.0%	
PGE	**Total**	**173,775**	**187,184**	**1.08**	**16.9%**	**1.09**
SCE	SCE_LED_HIGH_LOWBAY_FIXTURE	15,667	16,029	1.02	0.0%	1.02
SCE	SCE_LED_HIGH_LOWBAY_KILOLUMEN	39,795	44,804	1.13	0.0%	1.13
SCE	SCE_LED_TLED	107,841	134,740	1.25	0.0%	1.25
SCE	SCE_Passthrough_LED_ACCENT	1,121	1,121	1.00	100.0%	
SCE	SCE_Passthrough_LED_A-LAMP	936	936	1.00	100.0%	
SCE	SCE_Passthrough_LED_OUTDOOR_FIXTURE	11,068	11,068	1.00	100.0%	
SCE	SCE_Passthrough_LED_REFLECTOR	3,726	3,726	1.00	100.0%	
SCE	SCE_Passthrough_LED_STREET	79,540	79,540	1.00	100.0%	
SCE	**Total**	**259,693**	**291,962**	**1.12**	**37.1%**	**1.20**
SDGE	SDGE_LED_HIGH_LOWBAY_FIXTURE	6,977	7,138	1.02	0.0%	1.02
SDGE	SDGE_LED_HIGH_LOWBAY_KILOLUMEN	22,762	25,626	1.13	0.0%	1.13
SDGE	SDGE_LED_TLED	116,119	116,372	1.00	0.0%	1.00
SDGE	SDGE_Passthrough_LED_ACCENT	236	236	1.00	100.0%	
SDGE	SDGE_Passthrough_LED_A-LAMP	50	50	1.00	100.0%	
SDGE	SDGE_Passthrough_LED_OUTDOOR_FIXTURE	3,819	3,819	1.00	100.0%	
SDGE	SDGE_Passthrough_LED_REFLECTOR	7,852	7,852	1.00	100.0%	
SDGE	**Total**	**157,814**	**161,093**	**1.02**	**7.6%**	**1.02**
LCE	LCE_Passthrough	1,810	1,810	1.00	100.0%	
LCE	**Total**	**1,810**	**1,810**	**1.00**	**100.0%**	
	Statewide	***593,091***	***642,048***	***1.08***	***23.5%***	***1.11***

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_HIGH_LOWBAY_FIXTURE	44,445	29,867	0.67	0.0%	0.96	0.63	0.96	0.63
PGE	PGE_LED_HIGH_LOWBAY_KILOLUMEN	68,193	84,237	1.24	0.0%	0.70	0.76	0.70	0.76
PGE	PGE_Passthrough_LED_ACCENT	258	258	1.00	100.0%	0.96	0.96		
PGE	PGE_Passthrough_LED_A-LAMP	3,203	3,203	1.00	100.0%	0.66	0.66		
PGE	PGE_Passthrough_LED_OUTDOOR_FIXTURE	18,754	18,754	1.00	100.0%	0.96	0.96		
PGE	PGE_Passthrough_LED_REFLECTOR	2,603	2,603	1.00	100.0%	0.96	0.96		
PGE	PGE_Passthrough_LED_STREET	1,874	1,874	1.00	100.0%	0.96	0.96		
PGE	**Total**	**139,331**	**140,796**	**1.01**	**19.2%**	**0.80**	**0.75**	**0.78**	**0.72**
SCE	SCE_LED_HIGH_LOWBAY_FIXTURE	15,013	10,713	0.71	0.0%	0.96	0.67	0.96	0.67
SCE	SCE_LED_HIGH_LOWBAY_KILOLUMEN	31,912	29,945	0.94	0.0%	0.80	0.67	0.80	0.67
SCE	SCE_LED_TLED	72,854	92,703	1.27	0.0%	0.68	0.69	0.68	0.69
SCE	SCE_Passthrough_LED_ACCENT	1,076	1,076	1.00	100.0%	0.96	0.96		
SCE	SCE_Passthrough_LED_A-LAMP	898	898	1.00	100.0%	0.96	0.96		
SCE	SCE_Passthrough_LED_OUTDOOR_FIXTURE	10,287	10,287	1.00	100.0%	0.93	0.93		
SCE	SCE_Passthrough_LED_REFLECTOR	3,573	3,573	1.00	100.0%	0.96	0.96		
SCE	SCE_Passthrough_LED_STREET	51,701	51,701	1.00	100.0%	0.65	0.65		
SCE	**Total**	**187,314**	**200,896**	**1.07**	**36.1%**	**0.72**	**0.69**	**0.73**	**0.68**
SDGE	SDGE_LED_HIGH_LOWBAY_FIXTURE	6,653	5,022	0.75	0.0%	0.95	0.70	0.95	0.70
SDGE	SDGE_LED_HIGH_LOWBAY_KILOLUMEN	19,602	18,030	0.92	0.0%	0.86	0.70	0.86	0.70
SDGE	SDGE_LED_TLED	86,990	87,522	1.01	0.0%	0.75	0.75	0.75	0.75
SDGE	SDGE_Passthrough_LED_ACCENT	226	226	1.00	100.0%	0.96	0.96		
SDGE	SDGE_Passthrough_LED_A-LAMP	48	48	1.00	100.0%	0.96	0.96		
SDGE	SDGE_Passthrough_LED_OUTDOOR_FIXTURE	3,650	3,650	1.00	100.0%	0.96	0.96		
SDGE	SDGE_Passthrough_LED_REFLECTOR	7,522	7,522	1.00	100.0%	0.96	0.96		
SDGE	**Total**	**124,693**	**122,020**	**0.98**	**9.2%**	**0.79**	**0.76**	**0.78**	**0.74**
LCE	LCE_Passthrough	1,221	1,221	1.00	100.0%	0.67	0.67		
LCE	**Total**	**1,221**	**1,221**	**1.00**	**100.0%**	**0.67**	**0.67**		
	Statewide	***452,558***	***464,933***	***1.03***	***23.6%***	***0.76***	***0.72***	***0.76***	***0.71***

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_HIGH_LOWBAY_FIXTURE	10.5	9.1	0.87	0.0%	0.87
PGE	PGE_LED_HIGH_LOWBAY_KILOLUMEN	21.3	24.5	1.15	0.0%	1.15
PGE	PGE_Passthrough_LED_ACCENT	0.0	0.0	1.00	100.0%	
PGE	PGE_Passthrough_LED_A-LAMP	0.9	0.9	1.00	100.0%	
PGE	PGE_Passthrough_LED_OUTDOOR_FIXTURE	0.0	0.0			
PGE	PGE_Passthrough_LED_REFLECTOR	0.6	0.6	1.00	100.0%	
PGE	PGE_Passthrough_LED_STREET	0.0	0.0			
PGE	**Total**	**33.4**	**35.2**	**1.05**	**4.7%**	**1.06**
SCE	SCE_LED_HIGH_LOWBAY_FIXTURE	4.8	4.2	0.87	0.0%	0.87
SCE	SCE_LED_HIGH_LOWBAY_KILOLUMEN	12.4	14.3	1.15	0.0%	1.15
SCE	SCE_LED_TLED	30.9	31.4	1.02	0.0%	1.02
SCE	SCE_Passthrough_LED_ACCENT	0.3	0.3	1.00	100.0%	
SCE	SCE_Passthrough_LED_A-LAMP	0.3	0.3	1.00	100.0%	
SCE	SCE_Passthrough_LED_OUTDOOR_FIXTURE	0.0	0.0			
SCE	SCE_Passthrough_LED_REFLECTOR	1.0	1.0	1.00	100.0%	
SCE	SCE_Passthrough_LED_STREET	0.0	0.0			
SCE	**Total**	**49.8**	**51.5**	**1.03**	**3.3%**	**1.03**
SDGE	SDGE_LED_HIGH_LOWBAY_FIXTURE	1.7	1.5	0.87	0.0%	0.87
SDGE	SDGE_LED_HIGH_LOWBAY_KILOLUMEN	5.6	6.4	1.15	0.0%	1.15
SDGE	SDGE_LED_TLED	30.8	23.8	0.77	0.0%	0.77
SDGE	SDGE_Passthrough_LED_ACCENT	0.1	0.1	1.00	100.0%	
SDGE	SDGE_Passthrough_LED_A-LAMP	0.0	0.0	1.00	100.0%	
SDGE	SDGE_Passthrough_LED_OUTDOOR_FIXTURE	0.0	0.0			
SDGE	SDGE_Passthrough_LED_REFLECTOR	1.9	1.9	1.00	100.0%	
SDGE	**Total**	**40.0**	**33.7**	**0.84**	**5.0%**	**0.83**
LCE	LCE_Passthrough	0.5	0.5	1.00	100.0%	
LCE	**Total**	**0.5**	**0.5**	**1.00**	**100.0%**	
	Statewide	***123.7***	***120.9***	***0.98***	***4.6%***	***0.98***

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_HIGH_LOWBAY_FIXTURE	10.1	5.7	0.57	0.0%	0.96	0.63	0.96	0.63
PGE	PGE_LED_HIGH_LOWBAY_KILOLUMEN	14.6	18.7	1.29	0.0%	0.68	0.76	0.68	0.76
PGE	PGE_Passthrough_LED_ACCENT	0.0	0.0	1.00	100.0%	0.96	0.96		
PGE	PGE_Passthrough_LED_A-LAMP	0.6	0.6	1.00	100.0%	0.65	0.65		
PGE	PGE_Passthrough_LED_OUTDOOR_FIXTURE	0.0	0.0						
PGE	PGE_Passthrough_LED_REFLECTOR	0.6	0.6	1.00	100.0%	0.96	0.96		
PGE	PGE_Passthrough_LED_STREET	0.0	0.0						
PGE	**Total**	**25.9**	**25.7**	**0.99**	**4.8%**	**0.77**	**0.73**	**0.77**	**0.73**
SCE	SCE_LED_HIGH_LOWBAY_FIXTURE	4.6	2.8	0.60	0.0%	0.96	0.67	0.96	0.67
SCE	SCE_LED_HIGH_LOWBAY_KILOLUMEN	10.0	9.5	0.95	0.0%	0.81	0.67	0.81	0.67
SCE	SCE_LED_TLED	20.9	21.6	1.03	0.0%	0.68	0.69	0.68	0.69
SCE	SCE_Passthrough_LED_ACCENT	0.3	0.3	1.00	100.0%	0.96	0.96		
SCE	SCE_Passthrough_LED_A-LAMP	0.3	0.3	1.00	100.0%	0.96	0.96		
SCE	SCE_Passthrough_LED_OUTDOOR_FIXTURE	0.0	0.0						
SCE	SCE_Passthrough_LED_REFLECTOR	1.0	1.0	1.00	100.0%	0.96	0.96		
SCE	SCE_Passthrough_LED_STREET	0.0	0.0						
SCE	**Total**	**37.2**	**35.5**	**0.95**	**4.2%**	**0.75**	**0.69**	**0.74**	**0.68**
SDGE	SDGE_LED_HIGH_LOWBAY_FIXTURE	1.6	1.0	0.64	0.0%	0.95	0.70	0.95	0.70
SDGE	SDGE_LED_HIGH_LOWBAY_KILOLUMEN	4.8	4.5	0.94	0.0%	0.86	0.70	0.86	0.70
SDGE	SDGE_LED_TLED	23.1	17.9	0.78	0.0%	0.75	0.75	0.75	0.75
SDGE	SDGE_Passthrough_LED_ACCENT	0.1	0.1	1.00	100.0%	0.96	0.96		
SDGE	SDGE_Passthrough_LED_A-LAMP	0.0	0.0	1.00	100.0%	0.96	0.96		
SDGE	SDGE_Passthrough_LED_OUTDOOR_FIXTURE	0.0	0.0						
SDGE	SDGE_Passthrough_LED_REFLECTOR	1.9	1.9	1.00	100.0%	0.96	0.96		
SDGE	**Total**	**31.4**	**25.4**	**0.81**	**6.1%**	**0.79**	**0.75**	**0.78**	**0.74**
LCE	LCE_Passthrough	0.3	0.3	1.00	100.0%	0.67	0.67		
LCE	**Total**	**0.3**	**0.3**	**1.00**	**100.0%**	**0.67**	**0.67**		
	Statewide	***94.8***	***86.9***	***0.92***	***5.3%***	***0.77***	***0.72***	***0.76***	***0.71***

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_HIGH_LOWBAY_FIXTURE	-281	-287	1.02	0.0%	1.02
PGE	PGE_LED_HIGH_LOWBAY_KILOLUMEN	-887	-999	1.13	0.0%	1.13
PGE	PGE_Passthrough_LED_ACCENT	-1	-1	1.00	100.0%	
PGE	PGE_Passthrough_LED_A-LAMP	-34	-34	1.00	100.0%	
PGE	PGE_Passthrough_LED_OUTDOOR_FIXTURE	0	0			
PGE	PGE_Passthrough_LED_REFLECTOR	-18	-18	1.00	100.0%	
PGE	PGE_Passthrough_LED_STREET	0	0			
PGE	**Total**	**-1,222**	**-1,340**	**1.10**	**4.4%**	**1.10**
SCE	SCE_LED_HIGH_LOWBAY_FIXTURE	-37	-38	1.02	0.0%	1.02
SCE	SCE_LED_HIGH_LOWBAY_KILOLUMEN	-3	-3	1.13	0.0%	1.13
SCE	SCE_LED_TLED	-358	-448	1.25	0.0%	1.25
SCE	SCE_Passthrough_LED_ACCENT	-2	-2	1.00	100.0%	
SCE	SCE_Passthrough_LED_A-LAMP	-1	-1	1.00	100.0%	
SCE	SCE_Passthrough_LED_OUTDOOR_FIXTURE	0	0			
SCE	SCE_Passthrough_LED_REFLECTOR	-10	-10	1.00	100.0%	
SCE	SCE_Passthrough_LED_STREET	0	0			
SCE	**Total**	**-411**	**-502**	**1.22**	**3.2%**	**1.23**
SDGE	SDGE_LED_HIGH_LOWBAY_FIXTURE	-53	-54	1.02	0.0%	1.02
SDGE	SDGE_LED_HIGH_LOWBAY_KILOLUMEN	-215	-242	1.13	0.0%	1.13
SDGE	SDGE_LED_TLED	-965	-967	1.00	0.0%	1.00
SDGE	SDGE_Passthrough_LED_ACCENT	-1	-1	1.00	100.0%	
SDGE	SDGE_Passthrough_LED_A-LAMP	0	0	1.00	100.0%	
SDGE	SDGE_Passthrough_LED_OUTDOOR_FIXTURE	0	0			
SDGE	SDGE_Passthrough_LED_REFLECTOR	-23	-23	1.00	100.0%	
SDGE	**Total**	**-1,256**	**-1,286**	**1.02**	**1.9%**	**1.02**
LCE	LCE_Passthrough	-9	-9	1.00	100.0%	
LCE	**Total**	**-9**	**-9**	**1.00**	**100.0%**	
	Statewide	***-2,897***	***-3,136***	***1.08***	***3.4%***	***1.09***

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_HIGH_LOWBAY_FIXTURE	-269	-181	0.67	0.0%	0.96	0.63	0.96	0.63
PGE	PGE_LED_HIGH_LOWBAY_KILOLUMEN	-626	-763	1.22	0.0%	0.71	0.76	0.71	0.76
PGE	PGE_Passthrough_LED_ACCENT	-1	-1	1.00	100.0%	0.96	0.96		
PGE	PGE_Passthrough_LED_A-LAMP	-23	-23	1.00	100.0%	0.66	0.66		
PGE	PGE_Passthrough_LED_OUTDOOR_FIXTURE	0	0						
PGE	PGE_Passthrough_LED_REFLECTOR	-17	-17	1.00	100.0%	0.96	0.96		
PGE	PGE_Passthrough_LED_STREET	0	0						
PGE	**Total**	**-936**	**-984**	**1.05**	**4.4%**	**0.77**	**0.73**	**0.77**	**0.73**
SCE	SCE_LED_HIGH_LOWBAY_FIXTURE	-35	-25	0.71	0.0%	0.96	0.67	0.96	0.67
SCE	SCE_LED_HIGH_LOWBAY_KILOLUMEN	-3	-2	0.79	0.0%	0.96	0.67	0.96	0.67
SCE	SCE_LED_TLED	-247	-308	1.25	0.0%	0.69	0.69	0.69	0.69
SCE	SCE_Passthrough_LED_ACCENT	-2	-2	1.00	100.0%	0.96	0.96		
SCE	SCE_Passthrough_LED_A-LAMP	-1	-1	1.00	100.0%	0.96	0.96		
SCE	SCE_Passthrough_LED_OUTDOOR_FIXTURE	0	0						
SCE	SCE_Passthrough_LED_REFLECTOR	-9	-9	1.00	100.0%	0.96	0.96		
SCE	SCE_Passthrough_LED_STREET	0	0						
SCE	**Total**	**-297**	**-348**	**1.17**	**4.3%**	**0.72**	**0.69**	**0.71**	**0.69**
SDGE	SDGE_LED_HIGH_LOWBAY_FIXTURE	-50	-38	0.75	0.0%	0.96	0.70	0.96	0.70
SDGE	SDGE_LED_HIGH_LOWBAY_KILOLUMEN	-186	-170	0.91	0.0%	0.87	0.70	0.87	0.70
SDGE	SDGE_LED_TLED	-728	-727	1.00	0.0%	0.75	0.75	0.75	0.75
SDGE	SDGE_Passthrough_LED_ACCENT	-1	-1	1.00	100.0%	0.96	0.96		
SDGE	SDGE_Passthrough_LED_A-LAMP	0	0	1.00	100.0%	0.96	0.96		
SDGE	SDGE_Passthrough_LED_OUTDOOR_FIXTURE	0	0						
SDGE	SDGE_Passthrough_LED_REFLECTOR	-22	-22	1.00	100.0%	0.96	0.96		
SDGE	**Total**	**-987**	**-958**	**0.97**	**2.3%**	**0.79**	**0.74**	**0.78**	**0.74**
LCE	LCE_Passthrough	-6	-6	1.00	100.0%	0.66	0.66		
LCE	**Total**	**-6**	**-6**	**1.00**	**100.0%**	**0.66**	**0.66**		
	Statewide	***-2,225***	***-2,296***	***1.03***	***3.7%***	***0.77***	***0.73***	***0.77***	***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_HIGH_LOWBAY_FIXTURE	4,139	4,927	1.19	0.0%	1.19
PGE	PGE_LED_HIGH_LOWBAY_KILOLUMEN	7,623	11,062	1.45	0.0%	1.45
PGE	PGE_Passthrough_LED_ACCENT	32	32	1.00	100.0%	
PGE	PGE_Passthrough_LED_A-LAMP	450	450	1.00	100.0%	
PGE	PGE_Passthrough_LED_OUTDOOR_FIXTURE	1,632	1,632	1.00	100.0%	
PGE	PGE_Passthrough_LED_REFLECTOR	292	292	1.00	100.0%	
PGE	PGE_Passthrough_LED_STREET	163	163	1.00	100.0%	
PGE	**Total**	**14,331**	**18,558**	**1.29**	**17.9%**	**1.36**
SCE	SCE_LED_HIGH_LOWBAY_FIXTURE	1,330	1,583	1.19	0.0%	1.19
SCE	SCE_LED_HIGH_LOWBAY_KILOLUMEN	2,540	3,686	1.45	0.0%	1.45
SCE	SCE_LED_TLED	21,707	27,138	1.25	0.0%	1.25
SCE	SCE_Passthrough_LED_ACCENT	131	131	1.00	100.0%	
SCE	SCE_Passthrough_LED_A-LAMP	84	84	1.00	100.0%	
SCE	SCE_Passthrough_LED_OUTDOOR_FIXTURE	1,045	1,045	1.00	100.0%	
SCE	SCE_Passthrough_LED_REFLECTOR	416	416	1.00	100.0%	
SCE	SCE_Passthrough_LED_STREET	19,885	19,885	1.00	100.0%	
SCE	**Total**	**47,138**	**53,968**	**1.14**	**45.7%**	**1.27**
SDGE	SDGE_LED_HIGH_LOWBAY_FIXTURE	582	693	1.19	0.0%	1.19
SDGE	SDGE_LED_HIGH_LOWBAY_KILOLUMEN	1,423	2,064	1.45	0.0%	1.45
SDGE	SDGE_LED_TLED	23,465	23,574	1.00	0.0%	1.00
SDGE	SDGE_Passthrough_LED_ACCENT	35	35	1.00	100.0%	
SDGE	SDGE_Passthrough_LED_A-LAMP	7	7	1.00	100.0%	
SDGE	SDGE_Passthrough_LED_OUTDOOR_FIXTURE	318	318	1.00	100.0%	
SDGE	SDGE_Passthrough_LED_REFLECTOR	924	924	1.00	100.0%	
SDGE	**Total**	**26,753**	**27,615**	**1.03**	**4.8%**	**1.03**
LCE	LCE_Passthrough	374	374	1.00	100.0%	
LCE	**Total**	**374**	**374**	**1.00**	**100.0%**	
	Statewide	***88,597***	***100,515***	***1.13***	***29.1%***	***1.19***

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_HIGH_LOWBAY_FIXTURE	3,969	3,103	0.78	0.0%	0.96	0.63	0.96	0.63
PGE	PGE_LED_HIGH_LOWBAY_KILOLUMEN	5,301	8,442	1.59	0.0%	0.70	0.76	0.70	0.76
PGE	PGE_Passthrough_LED_ACCENT	31	31	1.00	100.0%	0.96	0.96		
PGE	PGE_Passthrough_LED_A-LAMP	296	296	1.00	100.0%	0.66	0.66		
PGE	PGE_Passthrough_LED_OUTDOOR_FIXTURE	1,563	1,563	1.00	100.0%	0.96	0.96		
PGE	PGE_Passthrough_LED_REFLECTOR	280	280	1.00	100.0%	0.96	0.96		
PGE	PGE_Passthrough_LED_STREET	156	156	1.00	100.0%	0.96	0.96		
PGE	**Total**	**11,596**	**13,871**	**1.20**	**20.1%**	**0.81**	**0.75**	**0.79**	**0.72**
SCE	SCE_LED_HIGH_LOWBAY_FIXTURE	1,274	1,058	0.83	0.0%	0.96	0.67	0.96	0.67
SCE	SCE_LED_HIGH_LOWBAY_KILOLUMEN	2,029	2,463	1.21	0.0%	0.80	0.67	0.80	0.67
SCE	SCE_LED_TLED	14,661	18,671	1.27	0.0%	0.68	0.69	0.68	0.69
SCE	SCE_Passthrough_LED_ACCENT	126	126	1.00	100.0%	0.96	0.96		
SCE	SCE_Passthrough_LED_A-LAMP	81	81	1.00	100.0%	0.96	0.96		
SCE	SCE_Passthrough_LED_OUTDOOR_FIXTURE	937	937	1.00	100.0%	0.90	0.90		
SCE	SCE_Passthrough_LED_REFLECTOR	399	399	1.00	100.0%	0.96	0.96		
SCE	SCE_Passthrough_LED_STREET	12,925	12,925	1.00	100.0%	0.65	0.65		
SCE	**Total**	**32,432**	**36,661**	**1.13**	**44.6%**	**0.69**	**0.68**	**0.70**	**0.68**
SDGE	SDGE_LED_HIGH_LOWBAY_FIXTURE	555	487	0.88	0.0%	0.95	0.70	0.95	0.70
SDGE	SDGE_LED_HIGH_LOWBAY_KILOLUMEN	1,225	1,452	1.19	0.0%	0.86	0.70	0.86	0.70
SDGE	SDGE_LED_TLED	17,576	17,730	1.01	0.0%	0.75	0.75	0.75	0.75
SDGE	SDGE_Passthrough_LED_ACCENT	33	33	1.00	100.0%	0.96	0.96		
SDGE	SDGE_Passthrough_LED_A-LAMP	7	7	1.00	100.0%	0.96	0.96		
SDGE	SDGE_Passthrough_LED_OUTDOOR_FIXTURE	304	304	1.00	100.0%	0.96	0.96		
SDGE	SDGE_Passthrough_LED_REFLECTOR	885	885	1.00	100.0%	0.96	0.96		
SDGE	**Total**	**20,585**	**20,900**	**1.02**	**6.0%**	**0.77**	**0.76**	**0.76**	**0.75**
LCE	LCE_Passthrough	256	256	1.00	100.0%	0.68	0.68		
LCE	**Total**	**256**	**256**	**1.00**	**100.0%**	**0.68**	**0.68**		
	Statewide	***64,870***	***71,687***	***1.11***	***28.2%***	***0.73***	***0.71***	***0.74***	***0.71***

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_HIGH_LOWBAY_FIXTURE	0.9	0.9	0.96	0.0%	0.96
PGE	PGE_LED_HIGH_LOWBAY_KILOLUMEN	1.6	2.1	1.30	0.0%	1.30
PGE	PGE_Passthrough_LED_ACCENT	0.0	0.0	1.00	100.0%	
PGE	PGE_Passthrough_LED_A-LAMP	0.1	0.1	1.00	100.0%	
PGE	PGE_Passthrough_LED_OUTDOOR_FIXTURE	0.0	0.0			
PGE	PGE_Passthrough_LED_REFLECTOR	0.1	0.1	1.00	100.0%	
PGE	PGE_Passthrough_LED_STREET	0.0	0.0			
PGE	**Total**	**2.7**	**3.2**	**1.16**	**5.7%**	**1.17**
SCE	SCE_LED_HIGH_LOWBAY_FIXTURE	0.4	0.4	0.96	0.0%	0.96
SCE	SCE_LED_HIGH_LOWBAY_KILOLUMEN	0.8	1.0	1.30	0.0%	1.30
SCE	SCE_LED_TLED	6.2	6.3	1.02	0.0%	1.02
SCE	SCE_Passthrough_LED_ACCENT	0.0	0.0	1.00	100.0%	
SCE	SCE_Passthrough_LED_A-LAMP	0.0	0.0	1.00	100.0%	
SCE	SCE_Passthrough_LED_OUTDOOR_FIXTURE	0.0	0.0			
SCE	SCE_Passthrough_LED_REFLECTOR	0.1	0.1	1.00	100.0%	
SCE	SCE_Passthrough_LED_STREET	0.0	0.0			
SCE	**Total**	**7.6**	**7.9**	**1.04**	**2.2%**	**1.04**
SDGE	SDGE_LED_HIGH_LOWBAY_FIXTURE	0.1	0.1	0.96	0.0%	0.96
SDGE	SDGE_LED_HIGH_LOWBAY_KILOLUMEN	0.3	0.5	1.30	0.0%	1.30
SDGE	SDGE_LED_TLED	6.2	4.8	0.78	0.0%	0.78
SDGE	SDGE_Passthrough_LED_ACCENT	0.0	0.0	1.00	100.0%	
SDGE	SDGE_Passthrough_LED_A-LAMP	0.0	0.0	1.00	100.0%	
SDGE	SDGE_Passthrough_LED_OUTDOOR_FIXTURE	0.0	0.0			
SDGE	SDGE_Passthrough_LED_REFLECTOR	0.2	0.2	1.00	100.0%	
SDGE	**Total**	**6.9**	**5.6**	**0.81**	**3.3%**	**0.81**
LCE	LCE_Passthrough	0.1	0.1	1.00	100.0%	
LCE	**Total**	**0.1**	**0.1**	**1.00**	**100.0%**	
	Statewide	***17.3***	***16.8***	***0.97***	***3.8%***	***0.97***

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_HIGH_LOWBAY_FIXTURE	0.9	0.6	0.63	0.0%	0.96	0.63	0.96	0.63
PGE	PGE_LED_HIGH_LOWBAY_KILOLUMEN	1.1	1.6	1.45	0.0%	0.69	0.76	0.69	0.76
PGE	PGE_Passthrough_LED_ACCENT	0.0	0.0	1.00	100.0%	0.96	0.96		
PGE	PGE_Passthrough_LED_A-LAMP	0.1	0.1	1.00	100.0%	0.65	0.65		
PGE	PGE_Passthrough_LED_OUTDOOR_FIXTURE	0.0	0.0						
PGE	PGE_Passthrough_LED_REFLECTOR	0.1	0.1	1.00	100.0%	0.96	0.96		
PGE	PGE_Passthrough_LED_STREET	0.0	0.0						
PGE	**Total**	**2.1**	**2.3**	**1.08**	**5.8%**	**0.79**	**0.73**	**0.78**	**0.72**
SCE	SCE_LED_HIGH_LOWBAY_FIXTURE	0.4	0.3	0.67	0.0%	0.96	0.67	0.96	0.67
SCE	SCE_LED_HIGH_LOWBAY_KILOLUMEN	0.6	0.7	1.07	0.0%	0.81	0.67	0.81	0.67
SCE	SCE_LED_TLED	4.2	4.3	1.03	0.0%	0.68	0.69	0.68	0.69
SCE	SCE_Passthrough_LED_ACCENT	0.0	0.0	1.00	100.0%	0.96	0.96		
SCE	SCE_Passthrough_LED_A-LAMP	0.0	0.0	1.00	100.0%	0.96	0.96		
SCE	SCE_Passthrough_LED_OUTDOOR_FIXTURE	0.0	0.0						
SCE	SCE_Passthrough_LED_REFLECTOR	0.1	0.1	1.00	100.0%	0.96	0.96		
SCE	SCE_Passthrough_LED_STREET	0.0	0.0						
SCE	**Total**	**5.4**	**5.4**	**1.01**	**3.0%**	**0.71**	**0.69**	**0.71**	**0.68**
SDGE	SDGE_LED_HIGH_LOWBAY_FIXTURE	0.1	0.1	0.71	0.0%	0.95	0.70	0.95	0.70
SDGE	SDGE_LED_HIGH_LOWBAY_KILOLUMEN	0.3	0.3	1.06	0.0%	0.86	0.70	0.86	0.70
SDGE	SDGE_LED_TLED	4.7	3.6	0.78	0.0%	0.75	0.75	0.75	0.75
SDGE	SDGE_Passthrough_LED_ACCENT	0.0	0.0	1.00	100.0%	0.96	0.96		
SDGE	SDGE_Passthrough_LED_A-LAMP	0.0	0.0	1.00	100.0%	0.96	0.96		
SDGE	SDGE_Passthrough_LED_OUTDOOR_FIXTURE	0.0	0.0						
SDGE	SDGE_Passthrough_LED_REFLECTOR	0.2	0.2	1.00	100.0%	0.96	0.96		
SDGE	**Total**	**5.3**	**4.3**	**0.80**	**4.2%**	**0.77**	**0.76**	**0.76**	**0.75**
LCE	LCE_Passthrough	0.1	0.1	1.00	100.0%	0.67	0.67		
LCE	**Total**	**0.1**	**0.1**	**1.00**	**100.0%**	**0.67**	**0.67**		
	Statewide	***12.9***	***12.1***	***0.93***	***4.5%***	***0.75***	***0.72***	***0.74***	***0.71***

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_HIGH_LOWBAY_FIXTURE	-26	-31	1.19	0.0%	1.19
PGE	PGE_LED_HIGH_LOWBAY_KILOLUMEN	-72	-105	1.45	0.0%	1.45
PGE	PGE_Passthrough_LED_ACCENT	0	0	1.00	100.0%	
PGE	PGE_Passthrough_LED_A-LAMP	-3	-3	1.00	100.0%	
PGE	PGE_Passthrough_LED_OUTDOOR_FIXTURE	0	0			
PGE	PGE_Passthrough_LED_REFLECTOR	-2	-2	1.00	100.0%	
PGE	PGE_Passthrough_LED_STREET	0	0			
PGE	**Total**	**-103**	**-141**	**1.36**	**5.0%**	**1.38**
SCE	SCE_LED_HIGH_LOWBAY_FIXTURE	-3	-4	1.19	0.0%	1.19
SCE	SCE_LED_HIGH_LOWBAY_KILOLUMEN	0	0	1.45	0.0%	1.45
SCE	SCE_LED_TLED	-73	-91	1.25	0.0%	1.25
SCE	SCE_Passthrough_LED_ACCENT	0	0	1.00	100.0%	
SCE	SCE_Passthrough_LED_A-LAMP	0	0	1.00	100.0%	
SCE	SCE_Passthrough_LED_OUTDOOR_FIXTURE	0	0			
SCE	SCE_Passthrough_LED_REFLECTOR	-1	-1	1.00	100.0%	
SCE	SCE_Passthrough_LED_STREET	0	0			
SCE	**Total**	**-78**	**-97**	**1.24**	**2.3%**	**1.25**
SDGE	SDGE_LED_HIGH_LOWBAY_FIXTURE	-4	-5	1.19	0.0%	1.19
SDGE	SDGE_LED_HIGH_LOWBAY_KILOLUMEN	-13	-19	1.45	0.0%	1.45
SDGE	SDGE_LED_TLED	-195	-196	1.00	0.0%	1.00
SDGE	SDGE_Passthrough_LED_ACCENT	0	0	1.00	100.0%	
SDGE	SDGE_Passthrough_LED_A-LAMP	0	0	1.00	100.0%	
SDGE	SDGE_Passthrough_LED_OUTDOOR_FIXTURE	0	0			
SDGE	SDGE_Passthrough_LED_REFLECTOR	-3	-3	1.00	100.0%	
SDGE	**Total**	**-216**	**-224**	**1.04**	**1.5%**	**1.04**
LCE	LCE_Passthrough	-2	-2	1.00	100.0%	
LCE	**Total**	**-2**	**-2**	**1.00**	**100.0%**	
	Statewide	***-399***	***-464***	***1.16***	***3.0%***	***1.17***

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_HIGH_LOWBAY_FIXTURE	-25	-20	0.78	0.0%	0.96	0.63	0.96	0.63
PGE	PGE_LED_HIGH_LOWBAY_KILOLUMEN	-51	-80	1.57	0.0%	0.71	0.76	0.71	0.76
PGE	PGE_Passthrough_LED_ACCENT	0	0	1.00	100.0%	0.96	0.96		
PGE	PGE_Passthrough_LED_A-LAMP	-2	-2	1.00	100.0%	0.66	0.66		
PGE	PGE_Passthrough_LED_OUTDOOR_FIXTURE	0	0						
PGE	PGE_Passthrough_LED_REFLECTOR	-2	-2	1.00	100.0%	0.96	0.96		
PGE	PGE_Passthrough_LED_STREET	0	0						
PGE	**Total**	**-80**	**-104**	**1.30**	**5.1%**	**0.77**	**0.73**	**0.77**	**0.73**
SCE	SCE_LED_HIGH_LOWBAY_FIXTURE	-3	-3	0.83	0.0%	0.96	0.67	0.96	0.67
SCE	SCE_LED_HIGH_LOWBAY_KILOLUMEN	0	0	0.90	0.0%	1.08	0.67	1.08	0.67
SCE	SCE_LED_TLED	-50	-62	1.25	0.0%	0.69	0.69	0.69	0.69
SCE	SCE_Passthrough_LED_ACCENT	0	0	1.00	100.0%	0.96	0.96		
SCE	SCE_Passthrough_LED_A-LAMP	0	0	1.00	100.0%	0.96	0.96		
SCE	SCE_Passthrough_LED_OUTDOOR_FIXTURE	0	0						
SCE	SCE_Passthrough_LED_REFLECTOR	-1	-1	1.00	100.0%	0.96	0.96		
SCE	SCE_Passthrough_LED_STREET	0	0						
SCE	**Total**	**-55**	**-67**	**1.22**	**3.1%**	**0.71**	**0.69**	**0.70**	**0.69**
SDGE	SDGE_LED_HIGH_LOWBAY_FIXTURE	-4	-4	0.87	0.0%	0.96	0.70	0.96	0.70
SDGE	SDGE_LED_HIGH_LOWBAY_KILOLUMEN	-12	-14	1.18	0.0%	0.87	0.70	0.87	0.70
SDGE	SDGE_LED_TLED	-147	-148	1.00	0.0%	0.75	0.75	0.75	0.75
SDGE	SDGE_Passthrough_LED_ACCENT	0	0	1.00	100.0%	0.96	0.96		
SDGE	SDGE_Passthrough_LED_A-LAMP	0	0	1.00	100.0%	0.96	0.96		
SDGE	SDGE_Passthrough_LED_OUTDOOR_FIXTURE	0	0						
SDGE	SDGE_Passthrough_LED_REFLECTOR	-3	-3	1.00	100.0%	0.96	0.96		
SDGE	**Total**	**-166**	**-168**	**1.01**	**1.8%**	**0.77**	**0.75**	**0.77**	**0.75**
LCE	LCE_Passthrough	-1	-1	1.00	100.0%	0.67	0.67		
LCE	**Total**	**-1**	**-1**	**1.00**	**100.0%**	**0.67**	**0.67**		
	Statewide	***-302***	***-340***	***1.12***	***3.3%***	***0.76***	***0.73***	***0.75***	***0.73***

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_FIXTURE	0	0.0%	0.0%	11.5	1,040.9	108.1	92.9
PGE	PGE_LED_HIGH_LOWBAY_KILOLUMEN	0	0.0%	0.0%	13.9	285.5	28.6	22.2
PGE	PGE_Passthrough_LED_ACCENT	1	0.0%		8.8	189.2	22.5	22.5
PGE	PGE_Passthrough_LED_A-LAMP	1	0.0%		11.5	859.2	79.6	79.6
PGE	PGE_Passthrough_LED_OUTDOOR_FIXTURE	1	0.0%		12.0	1,381.5	115.1	115.1
PGE	PGE_Passthrough_LED_REFLECTOR	1	0.0%		9.4	451.4	48.6	48.6
PGE	PGE_Passthrough_LED_STREET	1	0.0%		12.0	1,673.8	139.5	139.5
SCE	SCE_LED_HIGH_LOWBAY_FIXTURE	0	0.0%	0.0%	11.8	919.3	90.8	78.0
SCE	SCE_LED_HIGH_LOWBAY_KILOLUMEN	0	0.0%	0.0%	15.9	252.7	20.8	16.1
SCE	SCE_LED_TLED	0	0.0%	0.0%	5.0	158.9	32.0	32.0
SCE	SCE_Passthrough_LED_ACCENT	1	0.0%		9.7	286.2	33.4	33.4
SCE	SCE_Passthrough_LED_A-LAMP	1	0.0%		11.5	353.7	31.8	31.8
SCE	SCE_Passthrough_LED_OUTDOOR_FIXTURE	1	0.0%		7.9	843.6	79.6	79.6
SCE	SCE_Passthrough_LED_REFLECTOR	1	0.0%		9.8	465.4	52.0	52.0
SCE	SCE_Passthrough_LED_STREET	1	0.0%		4.0	999.1	249.8	249.8
SDGE	SDGE_LED_HIGH_LOWBAY_FIXTURE	0	0.0%	0.0%	12.0	1,536.4	149.1	128.1
SDGE	SDGE_LED_HIGH_LOWBAY_KILOLUMEN	0	0.0%	0.0%	16.0	313.7	25.3	19.6
SDGE	SDGE_LED_TLED	0	100.0%	100.0%	14.9	175.1	35.5	11.8
SDGE	SDGE_Passthrough_LED_ACCENT	1	0.0%		7.2	138.8	20.4	20.4
SDGE	SDGE_Passthrough_LED_A-LAMP	1	0.0%		7.1	475.3	67.1	67.1
SDGE	SDGE_Passthrough_LED_OUTDOOR_FIXTURE	1	0.0%		12.0	1,496.3	124.7	124.7
SDGE	SDGE_Passthrough_LED_REFLECTOR	1	0.0%		9.6	728.0	85.7	85.7
LCE	LCE_Passthrough	1	9.0%		5.7	145.7	30.1	27.5

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_FIXTURE	0	0.0%	0.0%	11.5	-6.3	-0.7	-0.6
PGE	PGE_LED_HIGH_LOWBAY_KILOLUMEN	0	0.0%	0.0%	13.9	-2.6	-0.3	-0.2
PGE	PGE_Passthrough_LED_ACCENT	1	0.0%		8.8	-0.9	-0.1	-0.1
PGE	PGE_Passthrough_LED_A-LAMP	1	0.0%		11.5	-6.1	-0.6	-0.6
PGE	PGE_Passthrough_LED_OUTDOOR_FIXTURE	1	0.0%		12.0	0.0	0.0	0.0
PGE	PGE_Passthrough_LED_REFLECTOR	1	0.0%		9.4	-2.9	-0.3	-0.3
PGE	PGE_Passthrough_LED_STREET	1	0.0%		12.0	0.0	0.0	0.0
SCE	SCE_LED_HIGH_LOWBAY_FIXTURE	0	0.0%	0.0%	11.8	-2.2	-0.2	-0.2
SCE	SCE_LED_HIGH_LOWBAY_KILOLUMEN	0	0.0%	0.0%	15.9	0.0	0.0	0.0
SCE	SCE_LED_TLED	0	0.0%	0.0%	5.0	-0.5	-0.1	-0.1
SCE	SCE_Passthrough_LED_ACCENT	1	0.0%		9.7	-0.6	-0.1	-0.1
SCE	SCE_Passthrough_LED_A-LAMP	1	0.0%		11.5	-0.4	0.0	0.0
SCE	SCE_Passthrough_LED_OUTDOOR_FIXTURE	1	0.0%		7.9	0.0	0.0	0.0
SCE	SCE_Passthrough_LED_REFLECTOR	1	0.0%		9.8	-1.2	-0.2	-0.2
SCE	SCE_Passthrough_LED_STREET	1	0.0%		4.0	0.0	0.0	0.0
SDGE	SDGE_LED_HIGH_LOWBAY_FIXTURE	0	0.0%	0.0%	12.0	-11.6	-1.1	-1.0
SDGE	SDGE_LED_HIGH_LOWBAY_KILOLUMEN	0	0.0%	0.0%	16.0	-3.0	-0.2	-0.2
SDGE	SDGE_LED_TLED	0	100.0%	100.0%	14.9	-1.5	-0.3	-0.1
SDGE	SDGE_Passthrough_LED_ACCENT	1	0.0%		7.2	-0.5	-0.1	-0.1
SDGE	SDGE_Passthrough_LED_A-LAMP	1	0.0%		7.1	-1.8	-0.2	-0.2
SDGE	SDGE_Passthrough_LED_OUTDOOR_FIXTURE	1	0.0%		12.0	0.0	0.0	0.0
SDGE	SDGE_Passthrough_LED_REFLECTOR	1	0.0%		9.6	-2.1	-0.3	-0.3
LCE	LCE_Passthrough	1	9.0%		5.7	-0.7	-0.1	-0.1

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_HIGH_LOWBAY_FIXTURE	0	0.0%	0.0%	11.5	655.5	68.1	58.5
PGE	PGE_LED_HIGH_LOWBAY_KILOLUMEN	0	0.0%	0.0%	13.9	217.9	21.8	16.9
PGE	PGE_Passthrough_LED_ACCENT	1	0.0%		8.8	181.6	21.6	21.6
PGE	PGE_Passthrough_LED_A-LAMP	1	0.0%		11.5	565.9	52.4	52.4
PGE	PGE_Passthrough_LED_OUTDOOR_FIXTURE	1	0.0%		12.0	1,323.2	110.3	110.3
PGE	PGE_Passthrough_LED_REFLECTOR	1	0.0%		9.4	433.4	46.7	46.7
PGE	PGE_Passthrough_LED_STREET	1	0.0%		12.0	1,606.9	133.9	133.9
SCE	SCE_LED_HIGH_LOWBAY_FIXTURE	0	0.0%	0.0%	11.8	614.4	60.7	52.2
SCE	SCE_LED_HIGH_LOWBAY_KILOLUMEN	0	0.0%	0.0%	15.9	168.9	13.9	10.8
SCE	SCE_LED_TLED	0	0.0%	0.0%	5.0	109.3	22.0	22.0
SCE	SCE_Passthrough_LED_ACCENT	1	0.0%		9.7	274.7	32.1	32.1
SCE	SCE_Passthrough_LED_A-LAMP	1	0.0%		11.5	339.5	30.5	30.5
SCE	SCE_Passthrough_LED_OUTDOOR_FIXTURE	1	0.0%		7.9	784.0	71.4	71.4
SCE	SCE_Passthrough_LED_REFLECTOR	1	0.0%		9.8	446.3	49.9	49.9
SCE	SCE_Passthrough_LED_STREET	1	0.0%		4.0	649.4	162.4	162.4
SDGE	SDGE_LED_HIGH_LOWBAY_FIXTURE	0	0.0%	0.0%	12.0	1,080.9	104.9	90.2
SDGE	SDGE_LED_HIGH_LOWBAY_KILOLUMEN	0	0.0%	0.0%	16.0	220.7	17.8	13.8
SDGE	SDGE_LED_TLED	0	100.0%	100.0%	14.9	131.7	26.7	8.9
SDGE	SDGE_Passthrough_LED_ACCENT	1	0.0%		7.2	133.2	19.6	19.6
SDGE	SDGE_Passthrough_LED_A-LAMP	1	0.0%		7.1	456.3	64.4	64.4
SDGE	SDGE_Passthrough_LED_OUTDOOR_FIXTURE	1	0.0%		12.0	1,430.3	119.2	119.2
SDGE	SDGE_Passthrough_LED_REFLECTOR	1	0.0%		9.6	697.4	82.1	82.1
LCE	LCE_Passthrough	1	9.0%		5.7	98.2	20.6	18.2

Per Unit (Quantity) Net Energy Savings (Therms)

PA	Standard Report Group	Pass Through	% ER Ex-Ante	% ER Ex-Post	Average EUL (yr)	Ex-Post Lifecycle	Ex-Post First Year	Ex-Post Annualized
PGE	PGE_LED_HIGH_LOWBAY_FIXTURE	0	0.0%	0.0%	11.5	-4.0	-0.4	-0.4
PGE	PGE_LED_HIGH_LOWBAY_KILOLUMEN	0	0.0%	0.0%	13.9	-2.0	-0.2	-0.2
PGE	PGE_Passthrough_LED_ACCENT	1	0.0%		8.8	-0.8	-0.1	-0.1
PGE	PGE_Passthrough_LED_A-LAMP	1	0.0%		11.5	-4.0	-0.4	-0.4
PGE	PGE_Passthrough_LED_OUTDOOR_FIXTURE	1	0.0%		12.0	0.0	0.0	0.0
PGE	PGE_Passthrough_LED_REFLECTOR	1	0.0%		9.4	-2.8	-0.3	-0.3
PGE	PGE_Passthrough_LED_STREET	1	0.0%		12.0	0.0	0.0	0.0
SCE	SCE_LED_HIGH_LOWBAY_FIXTURE	0	0.0%	0.0%	11.8	-1.5	-0.2	-0.1
SCE	SCE_LED_HIGH_LOWBAY_KILOLUMEN	0	0.0%	0.0%	15.9	0.0	0.0	0.0
SCE	SCE_LED_TLED	0	0.0%	0.0%	5.0	-0.4	-0.1	-0.1
SCE	SCE_Passthrough_LED_ACCENT	1	0.0%		9.7	-0.5	-0.1	-0.1
SCE	SCE_Passthrough_LED_A-LAMP	1	0.0%		11.5	-0.4	0.0	0.0
SCE	SCE_Passthrough_LED_OUTDOOR_FIXTURE	1	0.0%		7.9	0.0	0.0	0.0
SCE	SCE_Passthrough_LED_REFLECTOR	1	0.0%		9.8	-1.2	-0.2	-0.2
SCE	SCE_Passthrough_LED_STREET	1	0.0%		4.0	0.0	0.0	0.0
SDGE	SDGE_LED_HIGH_LOWBAY_FIXTURE	0	0.0%	0.0%	12.0	-8.2	-0.8	-0.7
SDGE	SDGE_LED_HIGH_LOWBAY_KILOLUMEN	0	0.0%	0.0%	16.0	-2.1	-0.2	-0.1
SDGE	SDGE_LED_TLED	0	100.0%	100.0%	14.9	-1.1	-0.2	-0.1
SDGE	SDGE_Passthrough_LED_ACCENT	1	0.0%		7.2	-0.5	-0.1	-0.1
SDGE	SDGE_Passthrough_LED_A-LAMP	1	0.0%		7.1	-1.7	-0.2	-0.2
SDGE	SDGE_Passthrough_LED_OUTDOOR_FIXTURE	1	0.0%		12.0	0.0	0.0	0.0
SDGE	SDGE_Passthrough_LED_REFLECTOR	1	0.0%		9.6	-2.0	-0.3	-0.3
LCE	LCE_Passthrough	1	9.0%		5.7	-0.5	-0.1	-0.1

APPENDIX AC:

RESPONSE TO RECOMENDATIONS

EM&V Impact Study Recommendations

Study Title: 2019 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)
1	CPUC	5	Overall, we found higher operating hours – especially within specific sectors like retail establishments – than the PAs claimed. Higher evaluated operating hours lead to more significant annual energy savings. Our evaluation team found HOU claims and associated energy/demand savings used a building type designation that do not correspond to the actual activity level within a facility. For example, out of 200 sites surveyed, 31 sites (grocery stores, retail establishments, hospitals, manufacturing facilities, and offices) operate 24-hours a day and had much greater reported HOU than claimed.	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, the ex ante/DEER team should consider having businesses that operate 24 hours a day be a unique case, and claimed operating hours should be updated to reflect higher activity within these facilities.		

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)
2	CPUC	5	As a result of the increased hours of operation, the life of the measure decreases, in terms of years. The more the lighting system is used, the sooner it is likely to fail or need to be replaced. This leads to less lifecycle energy savings, sometimes cancelling out the benefit of the increase in annual operating hours.	Future evaluations should continue to monitor the age and condition of existing fixtures like fluorescent technologies. LED tube lamps replace the fluorescent tube lamps, 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 it requires replacement.		

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)
3	PG&E, SCE, SDG&E	6	In general, lighting measures exhibited medium program influence levels for both midstream and downstream approaches. NTGR values vary somewhat by measure type, delivery approach and PA and range from a low of 0.58 (PG&E Downstream Indoor LED Fixtures) to a high of 0.75 (SDG&E Downstream Indoor T-LEDs). Values for the midstream delivery approach show less variation between SCE (0.62) and SDG&E (0.65) but are only robust enough to report at the PA level. In most cases, ex post NTGR values are less than ex ante values. The midstream result is based on a combination of participant and distributor survey results, while the downstream result is based solely on participant survey results.	The PA's should continue to utilize both the midstream and downstream approaches. Both approaches appear to be an effective means of influencing customers to install energy efficient lighting equipment, offering similar levels of influence over decision making.		

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	5, 6	The quality of contact information for midstream program participating customers was drastically improved over prior evaluations. Although some participant contact information provided by the IOUs corresponded to distributors or contractors, rather than to the participants, the large majority of customer contact information was reliable. In previous evaluations, we found that some programs provided no customer contact information, or little reliable data.	With the transition to 3P programs that include a Midstream delivery approach, it is important that the PA's collect both customer and distributor contact information to support the evaluation process. The Midstream NTG framework generally calls for values that are based on a combination of customer and distributor survey results.		
5	PG&E, SCE, SDG&E	5	The evaluation team found evidence of some SCE 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.	PAs 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.		

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)
6	PG&E, SCE, SDG&E	Over-Arching	When comparing ex post results to ex ante parameter estimates, we could not always find complete documentation detailing the specific parameters comprised of the ex ante claimed savings values. For example: some workbook calculations included only UES values, but did not make available the delta watts, HOU, CDF, and IE parameters that contributed to the UES values claimed.	All workpaper documentation (workbook calculations and supporting documents) should be posted on the workpaper project archive (WPA) at www.deeresources.info.		
7	PG&E, SCE, SDG&E	5	While researching and summarizing the DEER HOU, CDF and IE parameters that contribute to the claimed UES values, we confirmed that each PA uses its own system to select DEER values.	Workbook calculations and supporting documents should also include the exact set of DEER parameters (building type/climate zone/lighting technology/occupancy sensor scenario) and a brief rationale as to why a given lighting measure used a certain selection.		

APPENDIX A:

UPDATES TO NTG FRAMEWORK

This Appendix describes updates that the evaluation team made to the Nonresidential Net-to-Gross (NTG) framework for downstream programs during for the 2018 evaluation cycle. Evaluators have used this framework with minor modifications since the 2006-2008 evaluation cycle. Team members from both the Group A and Group D evaluation teams coordinated to develop changes that the evaluation team incorporated into the Small Commercial and Lighting evaluations that resulted in an alternative to the PAI-1 score. The evaluation team used these changes for the PY2019 evaluations for the Small Commercial and Nonresidential Lighting evaluations.

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 Nonresidential Working Group originally developed the existing Nonresidential Net-to-Gross (NTG) framework during the 2006-2008 evaluation cycle and updated it modestly during the 2010-2012 cycle. They designed the approach 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).

[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.

A-1 STANDARDIZED NONRESIDENTIAL NTG ALGORITHM IMPROVEMENTS

A-1-1 Previous 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).

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 decision making 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

[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.

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 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.

A-1-2 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.*

A-2 ALTERNATIVE TO CURRENT PAI-1 SCORING STRUCTURE

A-2-1 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% 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% of the time, and at least one non-program factor 80% of the time. Furthermore, 66% 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.

A-2-2 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

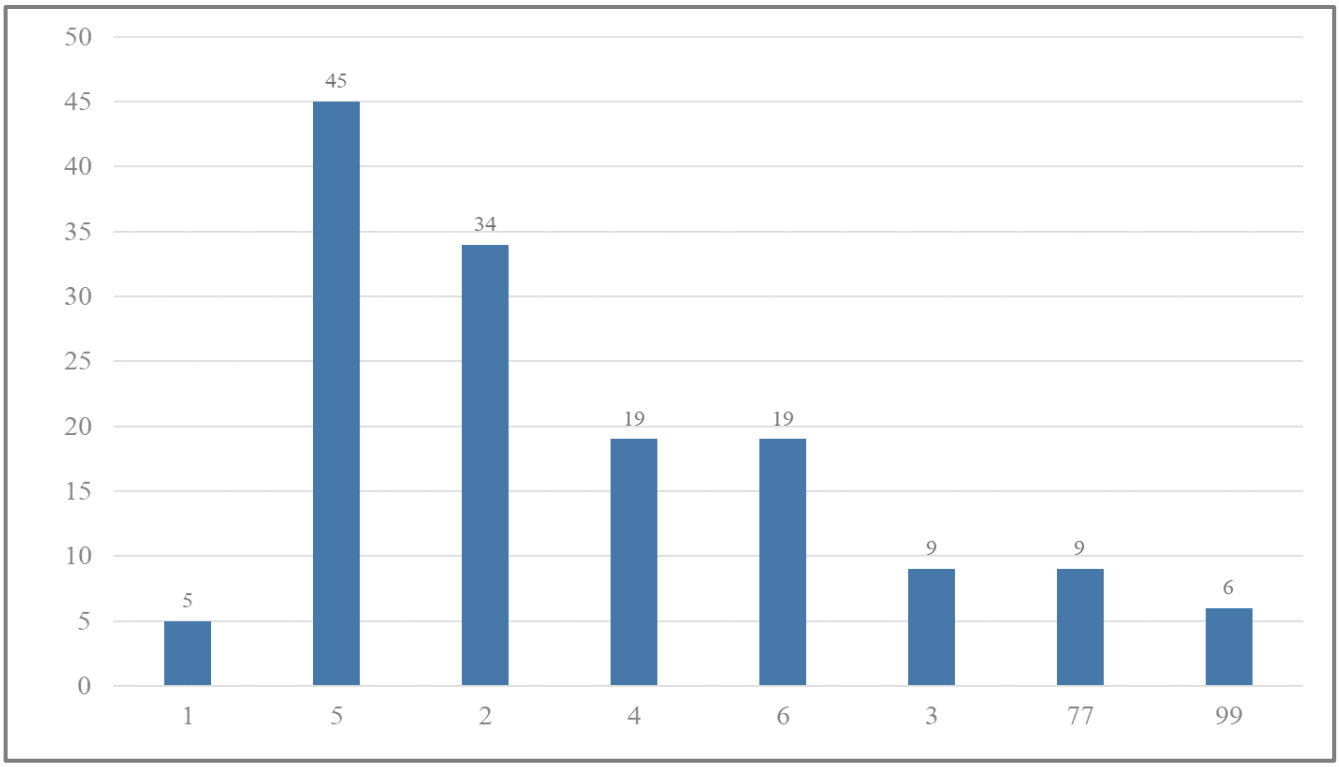
NTGR_2c – PAI-1 alternative 3 = Assign value based on No Program actions (N6). This Approach uses the N6 value and assigns a PAI score as follows.

- **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%). Other categories that were commonly selected were 2 (Install standard efficiency equipment or whatever required by code, 34%), 4 (Done nothing, 19% and 6 (Repair/rewind or overhaul the existing equipment, 19%).

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)

A-2-3 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

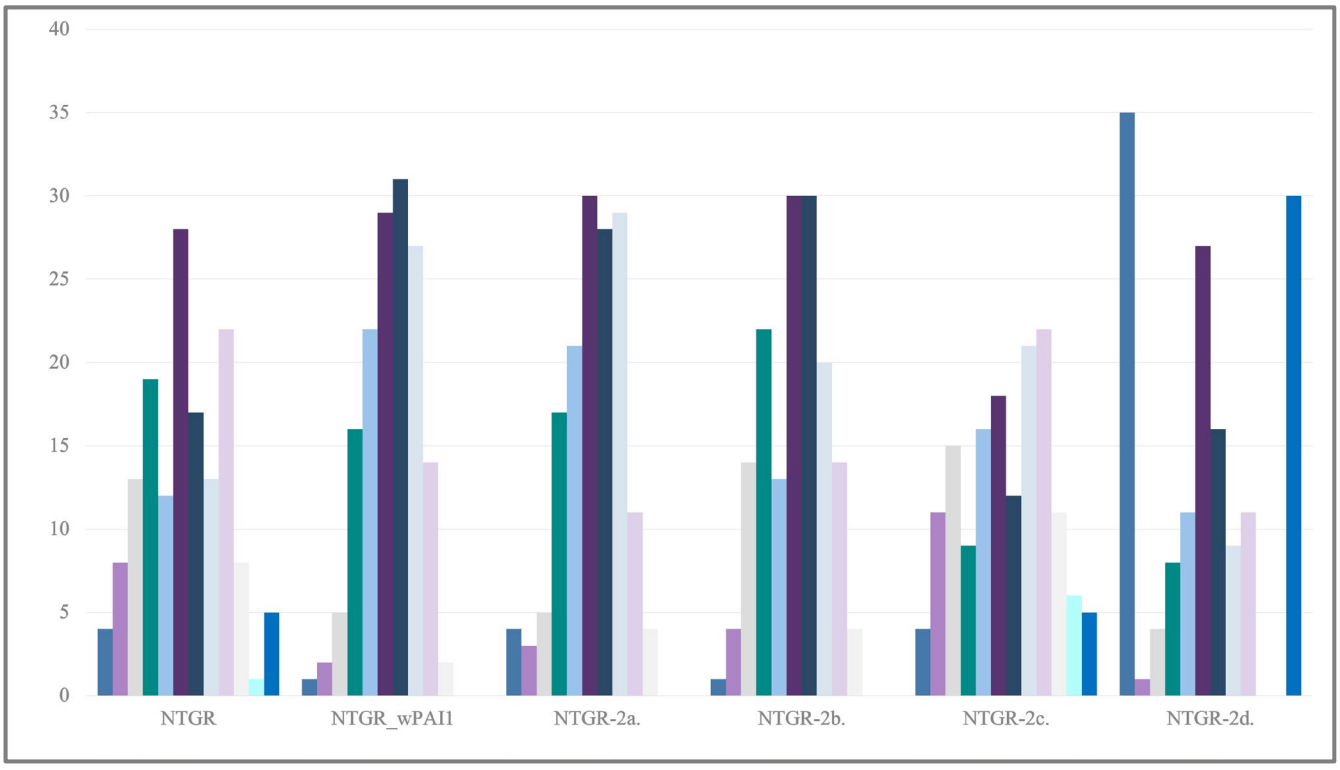
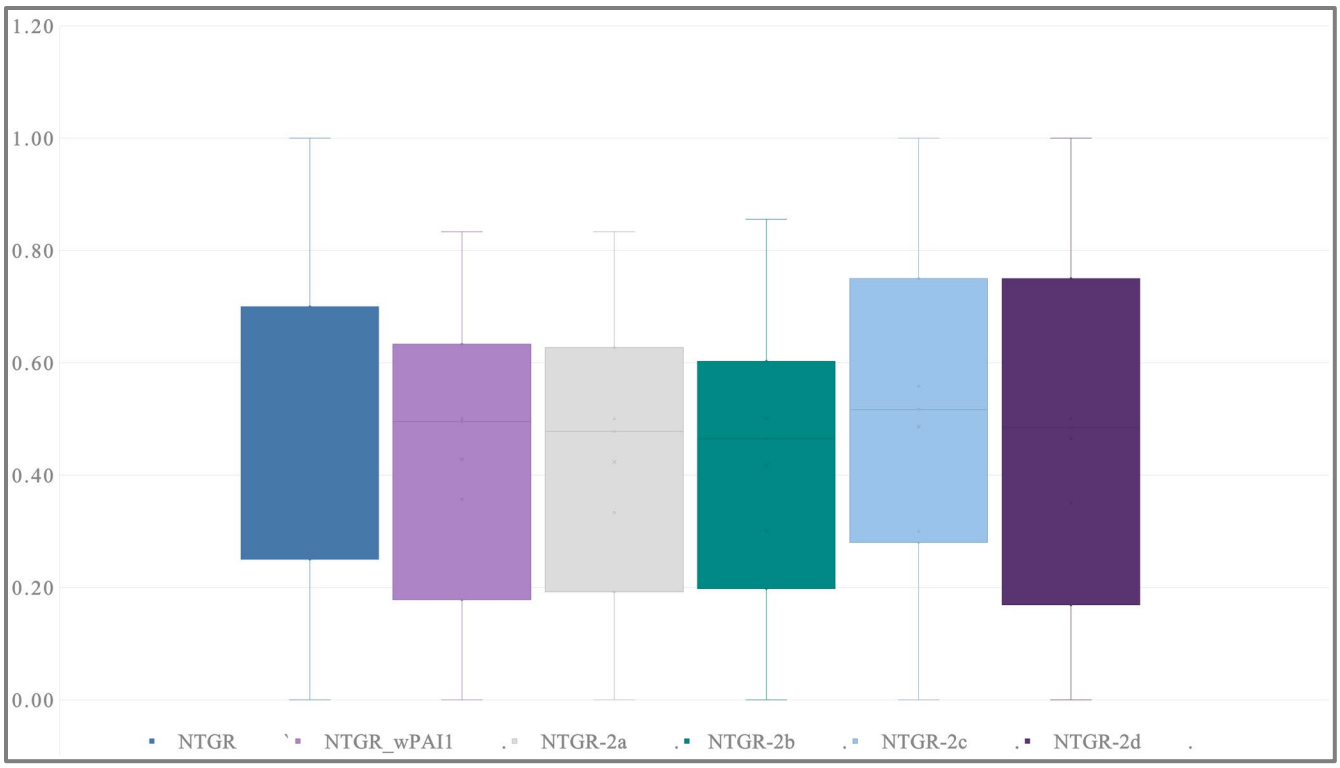


Figure A-3 below provides mean NTGR values and 90% confidence intervals across all six cases. The whiskers indicate the range of values analyzed.

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.**

A-2-4 Method Change

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.

APPENDIX B:

PARTICIPANT PHONE SURVEY

Participant Survey for CPUC
PY2019 Downstream Lighting Evaluation

INTRODUCTION AND FINDING CORRECT RESPONDENT

OUTCOME1 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.

XX	BEGIN THE INTERVIEW	Continue
101	NO ANSWER	Record response and attempt again at a later time
102	BUSY	Record response and attempt again at a later time
111	CHANGED NUMBER	Record new number and attempt again
107	ANSWERING MACHINE / VOICE MAIL	Record response and attempt again at a later time
104	CALLBACK - Specific	Record Response and schedule time to callback
105	CALLBACK - General	Record Response and get best time to callback
5	NON-WORKING NUMBER	Record response and resolve record
6	NON-BUSINESS NUMBER	Record Response and T&T
14	OTHER PHONE PROBLEM / FAX / MODEM	Record Response and T&T
12	REFUSAL	Record Response and T&T
19	ASKED TO BE PLACED ON DNC LIST	Record Response and T&T
15	LANGUAGE/HEARING PROBLEM	Record Response and T&T
10	CLAIMS TO HAVE BEEN PREVIOUSLY INTERVIEWED	Record Response and T&T
94	MAXIMUM CALL ATTEMPTS	Record response and resolve record
900	DUPLICATE PHONE NUMBER	DO NOT LOAD - RESOLVE RECORD
901	ON PMR DNC LIST	DO NOT LOAD - RESOLVE RECORD
999	INVALID PHONE NUMBER	DO NOT LOAD - RESOLVE RECORD

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
02	CALL BACK TO REACH PROPER PARTY	Record response and get best time to callback
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 2019...I was told that would be you.
...Your organization participated in <%UTILITY>'s <%PROGRAM> by installing lighting equipment IN 2019.
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?
[If you need to provide validation for this survey, provide the following contact name and number: Coby Rudolph, California Public Utilities Commission, 405-703-1072/ coby.rudolph@cpuc.ca.gov and the following website: www.cpuc.ca.gov/eevalidation]

1	Yes	DISPLAY
2	No, there is someone else	PBLOCK Hi
3	No and I don't know who to refer you to	Thank&Terminate
5	Property management company handles this	PMNAME
99	Don’t know/refused	Thank&Terminate

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

1	Yes - RECORD	Record Response and T&T
88	Refused	Thank&Terminate
99	Don't Know	Thank&Terminate

PBLOCK Hi 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	Thank&Terminate

May_I May I speak with him/her?

77	Yes	Intro3:s
88	No (not available right now@, set cb)	Get best time to callback

DISPLAY

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. For more information about opting out and how we use and secure your information, see our Privacy Policy at https://pac01.us?PP.

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]

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

Participant Survey for CPUC
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ROLE OF CONTRACTORS

V1 Did you use a contractor/vendor to install any of the 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	V2ab
2	No	V3
88	Refused	V3
99	Don't Know	V3

V2a = 1; else skip to V2b

V2ab Did the VENDOR recommend purchasing high efficiency equipment instead of standard efficiency equipment?

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

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	V3a
2	No	AP9
88	Refused	AP9
99	Don't Know	AP9

V3a Did you install what your VENDOR recommended?

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

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

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?

V4a

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

V4b

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.

AP9 How did you FIRST learn about <%UTILITY>'s program? [DO NOT READ ANSWERS] (SINGLE RESPONSE)

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]

AP9a How ELSE did you learn about <%UTILITY>'s program? [DO NOT READ LIST, ACCEPT MULTIPLES]

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]
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?
N33 !___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

Participant Survey for CPUC
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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.	A3[A]

IF DEEMED = 1 START LOOP FOR DEEMED MEASURES (<%LT_MEAS_x>, WHERE x = 1, 2, or 3); ELSE SKIP TO LI30

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_INSTALL_DATE_NU
2	Yes - Installed Different Quanity	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

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

Ask if A3[A-C] = 2 or A3a[A-C] = 1

A3[A-C]_QTY Approximately how many units of <%LT_MEAS_x> were installed under the %PROGRAM program? An estimate is okay.

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

IF A3_QTY IN (88, 99)

A3[A-C]_OTH 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

IF ^UNRECORDED(DEEM_INSTALL_DATEx)

DEEM_INSTALL_DATEx_NU 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	2018	DEEM_INSTALL_MONTHx
2	2019	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 LI185[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	LI191a
2	Private office	LI191a
3	Hallway	LI191a
4	Lobby	LI191a
5	Stairwell	LI191a
6	Kitchen/Break area	LI191a
7	Restrooms	LI191a
8	Dining	LI191a
9	Retail space	LI191a
10	Conference room	LI191a
11	Warehouse	LI191a
12	Storage	LI191a
13	Outdoor	LI191a
14	Guest rooms	LI191a
15	Gynasium	LI191a
77	Other	LI191a
88	Refused	LI191a
99	Don't know	LI191a

ASK ONLY IF LEDINTx = 1
ASK ONLY FOR RESPONSE CATEGORIES SELECTED IN QUESTION LI191[A-C]
IF ONLY ONE RESPONSE, THEN SET THAT RESPONSE TO 100%
If LI191[A-C] only equaled 88 or 99, then SKIP to LI191c

LI191a[A-C] What percentage of the LED lamps/fixtures were installed in each of these areas? (TOTAL SHOULD SUM TO 100%)

1	Open office	LI191c
2	Private office	LI191c
3	Hallway	LI191c
4	Lobby	LI191c
5	Stairwell	LI191c
6	Kitchen/Break area	LI191c
7	Restrooms	LI191c
8	Dining	LI191c
9	Retail space	LI191c
10	Conference room	LI191c
11	Warehouse	LI191c
12	Storage	LI191c
13	Outdoor	LI191c
14	Guest rooms	LI191c
15	Gynasium	LI191c
77	Other	LI191c
88	Refused	LI191b
99	Don't know	LI191b

If LI191a[A-C] = 88 or 99, then ASK, else SKIP to LI191c

LI191b[A-C] Where was the primary area where you installed the LED fixtures/lamps that you recived through the program? (ACCEPT ONLY ONE RESPONSE)

1	Open office	LI191c
2	Private office	LI191c
3	Hallway	LI191c
4	Lobby	LI191c
5	Stairwell	LI191c
6	Kitchen/Break area	LI191c
7	Restrooms	LI191c
8	Dining	LI191c
9	Retail space	LI191c
10	Conference room	LI191c
11	Warehouse	LI191c
12	Storage	LI191c
13	Outdoor	LI191c
14	Guest rooms	LI191c
15	Gynasium	LI191c
77	Other	LI191c
88	Refused	LI191c
99	Don't know	LI191c

LI191c[A-C] Of the LED fixtures/lamps you recived through the program, are any of the lights being controlled by occupancy sensors, dimming or daylighting controls, or other types of controls? [If Yes, probe for which type; accept multiples]

1	No controls (i.e., manual on-off switches)	LI192
2	Occupancy Sensors	LI191d
3	Dimming Controls	LI191d
4	Daylighting Controls	LI191d
5	Energy Management System	LI191d
6	Dynamic lighting systems that vary energy input based on control settings	LI191d
77	Other	LI191d
88	Refused	LI192
99	Don't know	LI192

ASK ONLY FOR RESPONSE CATEGORIES SELECTED IN QUESTION LI191[A-C]
If LI191[A-C] only equaled 88 or 99, then SKIP to LI192
Else, IF ONLY ONE RESPONSE AND LI191C[A-C] IN (2,3,4,5,6,77), THEN SET THAT RESPONSE TO 1, and skip to LI192

LI191d[A-C] Of the areas you mentioned above where the lighting was installed, which of these areas were controlled?

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	Gynasium	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	DEL11
2	Worse	NEXT SECTION (NTG BATTERY)
3	Same	NEXT SECTION (NTG BATTERY)
88	Refused	DEL11
99	Don't know	DEL11

If DEL5 in (1, 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	NEXT SECTION (NTG BATTERY)
88	Refused	NEXT SECTION (NTG BATTERY)
99	Don't know	NEXT SECTION (NTG BATTERY)

Participant Survey for CPUC
PY2019 Downstream Lighting Evaluation

NET TO GROSS BATTERY

DISPLAY I

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.

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

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. There are many equipment features that you may consider in your purchase decisions other than energy efficiency. These might include such features as the performance of the equipment or how well it fits into your space. However, in the following questions, we are interested specifically in how the program might or might not have affected your decisions about the energy efficiency of the equipment. That is, we are interested in what influenced you to choose the equipment you did rather than a less efficient version. Using a scale of 0 to 10 where 0 means not at all

DISPLAY 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 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 >= 3 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 >= 1, 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

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
NCC3 decision making fairly low, why is that?

77	RECORD VERBATIM	CC3a
88	Don't know	CC3a
99	Refused	CC3a

IF AA3 ^= 2 and AA3 ^= 9 and AA3^=10 AND N3r > 7 THEN ASK
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
NCC3a 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
What financial calculations does your company typically make before proceeding with the installation of energy efficient
P1 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
What is your threshold in terms of the payback or return on investment your company uses before deciding to proceed with
P2A 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
On a scale of 0 to 10, with a zero meaning NOT AT ALL IMPORTANT and 10 meaning Very Important, how important in
P4 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
The rebate seemed to make the difference between meeting your financial criteria and not meeting them, but you are saying
P3a 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 in choosing to go with energy-efficient equipment rather than a less efficient version of the equipment?

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

ASK ALL

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	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.

IF REPLACE(1)

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 (_____)	N5a
88	Refused	N5B
99	Don't know	N5B

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

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
88	Don't know	N6
99	Refused	N6

CONSISTENCY CHECKS
IF N3b > 7 and N5 > 7, THEN ASK

N5a 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?

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

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	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)

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?

#	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

Now I would like you to think one last time about what action you would have taken if the program had not been available.

N6 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 OPERATIING HOURS SECTION

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

DISPLAY 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

IF LT3 = 1 or 2, THEN ASK. ELSE GO TO OPERATING HOURS SECTION

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? [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

Participant Survey for CPUC
PY2019 Downstream Lighting Evaluation

OPERATING HOURS

DISPLAY The next few questions are to help us get a full understanding of your organization's operational hours. They are focused on your typical operating schedule *before* the COVID-19 shutdown.

ALWAYS Before the COVID-19 shutdown, was your organization operation 24 hours a day, 7 days a week?

1	Yes	HOLIDAYS
2	No	HOLIDAYS
88	Refused	HOLIDAYS

HOLIDAYS Before the COVID-19 shutdown, did your facility closed 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 - January 18, 2010 (3rd Monday in January)	DAYS
3	President's Day - February 15, 2010 (3rd Monday in February)	DAYS
4	Memorial Day - May 31, 2010 (Last Monday in May)	DAYS
5	Independence Day - July 4th (Or Surrounding Monday/Friday if July 4 is a weekend)	DAYS
6	Labor Day - September 6, 2010 (First Monday in September)	DAYS
7	Thanksgiving - November 26, 2010 (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 or 88; else skip to CUSTOMER CHARACTERISTICS;

DAYS Before the COVID-19 shutdown, was 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 or 88)&^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

Ask if ALWAYS(2 or 88)&^DAYS(2); else skip to WEDNESDAY_OPEN;

TUESDAY_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

IF TUESDAY_OPEN(1||65)

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	WEDNESDAY_OPEN
88	REFUSED	WEDNESDAY_OPEN
99	DON'T KNOW	WEDNESDAY_OPEN

Ask if ALWAYS(2 or 88)&^DAYS(3); else skip to THURSDAY_OPEN;

WEDNESDAY_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

IF WEDNESDAY_OPEN(1||65)

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	THURSDAY_OPEN
88	REFUSED	THURSDAY_OPEN
99	DON'T KNOW	THURSDAY_OPEN

Ask if ALWAYS(2 or 88)&^DAYS(4); else skip to FRIDAY_OPEN;

THURSDAY_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 or 88)&^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 or 88)&^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 or 88)&^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 facilities have different schedules for certain times of the year. Before the COVID-19 shutdown, did your organization maintain a different schedule for certain months of the year?

1	Yes	MONTHS
2	No	LGT_SCHD_1
88	REFUSED	LGT_SCHD_1
99	DON'T KNOW	LGT_SCHD_1

Ask if DIFF_SCHEDULE = 1; Else skip to LGT_SCHD_1;

MONTHS Before COVID-19 shutdown, during which months of the year does the schedule vary from the times I just recorded?

1	January	ALT_ALWAYS
2	February	ALT_ALWAYS
3	March	ALT_ALWAYS
4	April	ALT_ALWAYS
5	May	ALT_ALWAYS
6	June	ALT_ALWAYS
7	July	ALT_ALWAYS
8	August	ALT_ALWAYS
9	September	ALT_ALWAYS
10	October	ALT_ALWAYS
11	November	ALT_ALWAYS
12	December	ALT_ALWAYS
88	REFUSED	ALT_ALWAYS
99	DON'T KNOW	ALT_ALWAYS

ALT_ALWAYS Was your organization operation 24 hours a day, 7 days a week?

1	Yes	LGT_SCHD_1
2	No	ALT_DAYS
88	Refused	ALT_DAYS

If ^ALT_ALWAYS(1) then ask; Else skip to LGT_SCHD_1;

ALT_DAYS Before the COVID_19 shutdown, during this alternate schedule, is your facility closed any of the 7 days of the week? If so, which days were 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

Ask if DIFF_SCHEDULE(1)&^ALT_DAYS(1); else skip to ALT_TUESDAY_OPEN;

ALT_MONDAY_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

IF ALT_MONDAY_OPEN(1||64)

ALT_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	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	SURVEY ONSITES RECRUIMENT SECTION
88	REFUSED	SURVEY ONSITES RECRUIMENT SECTION
99	DON'T KNOW	SURVEY ONSITES RECRUIMENT SECTION

IF LI191[A] = 88 OR 99 SKIP TO CC2a
IF LI191a[A] = (88 OR 99) AND LI191b[A] = (88 OR 99) THEN SKIP TO CC2a

Before the COVID-19 shutdown, did ALL of the new lighting equipment generally operate in tandem with the facility schedule you just provided?

PROBE AS NEEDED:

LGT_SCHD_1 That is, the lights generally got turned on when the facility opened and got shut off when the facility closed ==> ANSWER: Yes.

Or is the schedule of operation instead different for some of the new lighting equipment due to schedule differences for certain areas in the facility or other factors ==> ANSWER: No.

1	Yes	LGT_SCHD_2
2	No	LGT_AA1_1
88	REFUSED	LGT_AA1_1
99	DON'T KNOW	LGT_AA1_1

LGT_SCHD_2 Before the COVID-19 shutdown, and thinking about how lights operated on average across all the different areas of the facility, what percent of the new lighting equipment would generally be illuminated during the hours the facility was open?

That is, what percentage of the new lighting would be turned on when the facility was open, on average?

	ENTER PERCENTAGE_____	LGT_SCHD_3
888	REFUSED	LGT_SCHD_3
999	DON'T KNOW	LGT_SCHD_3

LGT_SCHD_3 Now thinking about when the facility is closed; before the COVID-19 shutdown, what percentage of the new lighting would still be turned on, even thought the facility was closed?

	ENTER PERCENTAGE_____	CC2A
888	REFUSED	CC2A
999	DON'T KNOW	CC2A

IF LGT_SCHED_1 = 1, then SKIP TO CC2A

Create the following variables:

Let %Activity_Area_1 = the area description corresponding to the maximum percentage value from LI191a[A] (therefore, Open office, Private office, Hallway, etc..)
Note - this is only the value that corresponds to Measure #1

If LI191a[A] = (88 or 99) AND LI191b[A] is (NOT 88 or 99) then
Let %Activity_Area_1 = LI191b[A]

If {the max value LI191a[A] = 80%} OR {LI191a[A] = (88 or 99) AND LI191b[A] is (NOT 88 or 99)}
then
Let %LgtAreas = 1; and
Let %Activity_Area_2 = missing

Else
Let %LgtAreas = 2; and
Let %Activity_Area_2 = the area description corresponding to the second highest percentage value from LI191a[A]

Thinking only about the **<%LT_MEAS_1>** that was installed in the **<%Activity_Area_1>**, before the COVID-19 shutdown, did this lighting generally operate in tandem with the facilit schedule you just provided?

PROBE AS NEEDED:

LGT_AA1_1

That is, did the **<%LT_MEAS_1>** that was installed in the **<%Activity_Area_1>** generally get turned on when the facility opened and get shut off when the facility closed ==> ANSWER: Yes.

Or was the schedule of operation instead different for the **<%LT_MEAS_1>** that was installed in the **<%Activity_Area_1>** ==> ANSWER: No.

1	Yes	LGT_AA2_1
2	No	LGT_AA2_1
88	REFUSED	LGT_AA2_1
99	DON'T KNOW	LGT_AA2_1

IF <%LgtAreas> = 1, then SKIP TO LGT_AA1_2

Now thinking only about the new **<%LT_MEAS_1>** that was installed in the **<%Activity_Area_2>**, before the COVID-19 shutdown, did this lighting generally operate in tandem with the facilit schedule you just provided?

PROBE AS NEEDED:

LGT_AA2_1

That is, did the **<%LT_MEAS_1>** that was installed in the **<%Activity_Area_2>** get turned on when the facility opened and get shut off when the facility closed ==> ANSWER: Yes.

Or was the schedule of operation instead different for the **<%LT_MEAS_1>** that was installed in the **<%Activity_Area_2>** ==> ANSWER: No.

1	Yes	LGT_AA1_2
2	No	LGT_AA1_2
88	REFUSED	LGT_AA1_2
99	DON'T KNOW	LGT_AA1_2

IF LGT_AA1_1 = 1, THEN ASK, ELSE SKIP TO LGT_AA2_2

LGT_AA1_2

Thinking only about the new **<%LT_MEAS_1>** that was installed in the **<%Activity_Area_1>**, before the COVID-19 shutdown, what percentage of this new lighting would be turned on when the facility was open, on average?

	ENTER PERCENTAGE_____	LGT_AA1_3
888	REFUSED	LGT_AA1_3
999	DON'T KNOW	LGT_AA1_3

LGT_AA1_3

Thinking about when the facility is closed; before the COVID-19 shutdown, what percentage of the new **<%LT_MEAS_1>** that was installed in the **<%Activity_Area_1>**, would still be turned on, even thought the facility was closed?

	ENTER PERCENTAGE_____	LGT_AA2_2
888	REFUSED	LGT_AA2_2
999	DON'T KNOW	LGT_AA2_2

IF LGT_AA1_2 = 1, THEN ASK, ELSE SKIP TO ALWAYS_AA1

LGT_AA2_2 Now thinking only about the new **<%LT_MEAS_1>** that was installed in the **<%Activity_Area_2>**, before the COVID-19 shutdown, what percentage of this new lighting would be turned on when the facility was open, on average?

	ENTER PERCENTAGE_____	LGT_AA2_3
888	REFUSED	LGT_AA2_3
999	DON'T KNOW	LGT_AA2_3

LGT_AA2_3 Thinking about when the facility is closed; before the COVID-19 shutdown, what percentage of the new **<%LT_MEAS_1>** that was installed in the **<%Activity_Area_2>**, would still be turned on, even thought the facility was closed?

	ENTER PERCENTAGE_____	ALWAYS_AA_1
888	REFUSED	ALWAYS_AA_1
999	DON'T KNOW	ALWAYS_AA_1

ASK if LGT_AA1_1 = (2, 88 or 99); else skip to SAME_AA1_AA2;

ALWAYS_AA1 Now we'd like you to think about lighting schedules in the facility that DO NOT coincid with the facility schedule of operation. We'd like you to only consider the new **<%LT_MEAS_1>** that was installed in the **<%Activity_Area_1>**

Before the COVID-19 shutdown, was the new **<%LT_MEAS_1>** that was installed in the **<%Activity_Area_1>**, always on, 24 hours a day, 7 days a week?

1	Yes	SAME_AA1_AA2
2	No	DAYS_1
88	REFUSED	DAYS_1

DAYS_1 Before the COVID-19 shutdown, for the new **<%LT_MEAS_1>** that was installed in the **<%Activity_Area_1>**, were the lights not used at all during any of the 7 days of the week? If so, which days were the lights always OFF?

1	Monday	MONDAY_OPEN_1
2	Tuesday	MONDAY_OPEN_1
3	Wednesday	MONDAY_OPEN_1
4	Thursday	MONDAY_OPEN_1
5	Friday	MONDAY_OPEN_1
6	Saturday	MONDAY_OPEN_1
7	Sunday	MONDAY_OPEN_1
66	Open EVERYDAY	MONDAY_OPEN_1
88	REFUSED	MONDAY_OPEN_1
99	DON'T KNOW	MONDAY_OPEN_1

ASK if ALWAYS_AA1 (2 or 88)&^DAYS_1(1); else skip to TUESDAY_OPEN_1;

MONDAY_OPEN_1 For this first unique lighting schedule, what time were the lights turned on on MONDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	MONDAY_CLOSE_1
88	REFUSED	MONDAY_CLOSE_1
99	DON'T KNOW	MONDAY_CLOSE_1

IF MONDAY_OPEN_1(1||64)

MONDAY_CLOSE_

1 And what time were the lights turned off on MONDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	TUESDAY_OPEN_1
88	REFUSED	TUESDAY_OPEN_1
99	DON'T KNOW	TUESDAY_OPEN_1

Ask if ALWAYS_AA1(2 or 88)&^DAYS_1(2); else skip to WEDNESDAY_OPEN_1;

TUESDAY_OPEN_1 What time were the lights turned on on TUESDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	TUESDAY_CLOSE_1
88	REFUSED	TUESDAY_CLOSE_1
99	DON'T KNOW	TUESDAY_CLOSE_1

IF TUESDAY_OPEN_1(1||65)

TUESDAY_CLOSE_

1 And what time were the lights turned off on TUESDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	WEDNESDAY_OPEN_1
88	REFUSED	WEDNESDAY_OPEN_1
99	DON'T KNOW	WEDNESDAY_OPEN_1

Ask if ALWAYS_AA1(2 or 88)&^DAYS_1(3); else skip to THURSDAY_OPEN_1;

WEDNESDAY_OPEN_1 What time were the lights turned on on WEDNESDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	WEDNESDAY_CLOSE_1
88	REFUSED	WEDNESDAY_CLOSE_1
99	DON'T KNOW	WEDNESDAY_CLOSE_1

IF WEDNESDAY_OPEN_1(1||65)

WEDNESDAY_CLOSE_1 And what time were the lights turned off on WEDNESDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	THURSDAY_OPEN_1
88	REFUSED	THURSDAY_OPEN_1
99	DON'T KNOW	THURSDAY_OPEN_1

Ask if ALWAYS_AA1(2 or 88)&^DAYS_1(4); else skip to FRIDAY_OPEN_1;

THURSDAY_OPEN_1 What time were the lights turned on on THURSDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	THURSDAY_CLOSE_1
88	REFUSED	THURSDAY_CLOSE_1
99	DON'T KNOW	THURSDAY_CLOSE_1

IF THURSDAY_OPEN_1(1||65)

THURSDAY_CLOSE_1 And what time were the lights turned off on THURSDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	FRIDAY_OPEN_1
88	REFUSED	FRIDAY_OPEN_1
99	DON'T KNOW	FRIDAY_OPEN_1

Ask if ALWAYS_AA1(2 or 88)&^DAYS_1(5); else skip to SATURDAY_OPEN_1;

FRIDAY_OPEN_1 What time were the lights turned on on FRIDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	FRIDAY_CLOSE_1
88	REFUSED	FRIDAY_CLOSE_1
99	DON'T KNOW	FRIDAY_CLOSE_1

IF FRIDAY_OPEN_1(1||65)

FRIDAY_CLOSE_1 And what time were the lights turned off on FRIDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	SATURDAY_OPEN_1
88	REFUSED	SATURDAY_OPEN_1
99	DON'T KNOW	SATURDAY_OPEN_1

Ask if ALWAYS_AA1(2 or 88)&^DAYS_1(6); else skip to SUNDAY_OPEN_1;

SATURDAY_OPEN_1 What time were the lights turned on on SATURDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	SATURDAY_CLOSE_1
88	REFUSED	SATURDAY_CLOSE_1
99	DON'T KNOW	SATURDAY_CLOSE_1

IF SATURDAY_OPEN_1(1||65)

SATURDAY_CLOSE_1 And what time were the lights turned off on SATURDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	SUNDAY_OPEN_1
88	REFUSED	SUNDAY_OPEN_1
99	DON'T KNOW	SUNDAY_OPEN_1

Ask if ALWAYS_AA1(2 or 88)&^DAYS_1(7); else skip to LIGHTING_SCHEDULES_1_1;

SUNDAY_OPEN_1 What time were the lights turned on on SUNDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	SUNDAY_CLOSE_1
88	REFUSED	SUNDAY_CLOSE_1
99	DON'T KNOW	SUNDAY_CLOSE_1

IF SUNDAY_OPEN_1(1||65)

SUNDAY_CLOSE_1 And what time were the lights turned off on SUNDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	LGT_AA1_4
88	REFUSED	LGT_AA1_4
99	DON'T KNOW	LGT_AA1_4

LGT_AA1_4

Now, I'd like you to consider this unique lighting schedule we've been discussing for the new **<%LT_MEAS_1>** that was installed in the **<%Activity_Area_1>**. And think of the period of time when the lights are typically on, versus typically off. Even though the lighting is typically on, 100% of the lights may not be on the full time. And conversely, even though the lighting may typically be off, some lights may still be left on.

For the period when lighting is typically on, what percentage of this new lighting, on average, would actually be turned on?

	ENTER PERCENTAGE_____	LGT_AA1_5
888	REFUSED	LGT_AA1_5
999	DON'T KNOW	LGT_AA1_5

LGT_AA1_5

And conversely, what percent of these new **<%LT_MEAS_1>** that was installed in the **<%Activity_Area_1>** might actually be turned on, on average, during the time period when the lighting was typically off.

	ENTER PERCENTAGE_____	SAME_AA1_AA2
88	REFUSED	SAME_AA1_AA2
99	DON'T KNOW	SAME_AA1_AA2

ASK IF <%LgtAreas = 2> and LGT_AA2_1 = (2, 88 or 99); ELSE SKIP TO CC2a

Now we'd like to talk about just one more lighting schedule. For this lighting schedule, we would like you to consider the new **<%LT_MEAS_1>** that was installed in the **<%Activity_Area_2>**

SAME_AA1_AA2

Does this lighting in the **<%Activity_Area_2>** operate according to the same schedule as the **<%LT_MEAS_1>** that was installed in the **<%Activity_Area_1>**?

1	Yes	CC2a
2	No	ALWAYS_AA2
88	REFUSED	ALWAYS_AA2

ALWAYS_AA2

Before the COVID-19 shutdown, was the new **<%LT_MEAS_1>** that was installed in the **<%Activity_Area_2>** always on, 24 hours a day, 7 days a week?

1	Yes	CC2a
2	No	DAYS_2
88	REFUSED	DAYS_2

DAYS_2

Before the COVID-19 shutdown, for the new **<%LT_MEAS_1>** that was installed in the **<%Activity_Area_2>**, were the lights not used at all during any of the 7 days of the week? If so, which days were the lights always OFF?

1	Monday	MONDAY_OPEN_2
2	Tuesday	MONDAY_OPEN_2
3	Wednesday	MONDAY_OPEN_2
4	Thursday	MONDAY_OPEN_2
5	Friday	MONDAY_OPEN_2
6	Saturday	MONDAY_OPEN_2
7	Sunday	MONDAY_OPEN_2
66	Open EVERYDAY	MONDAY_OPEN_2
88	REFUSED	MONDAY_OPEN_2
99	DON'T KNOW	MONDAY_OPEN_2

ASK if ALWAYS_AA2 (2 or 88)&^DAYS_2(1); else skip to TUESDAY_OPEN_2;

MONDAY_OPEN_2

For this second unique lighting schedule, what time were the lights turned on on MONDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	MONDAY_CLOSE_2
88	REFUSED	MONDAY_CLOSE_2
99	DON'T KNOW	MONDAY_CLOSE_2

IF MONDAY_OPEN_2(1||64)

MONDAY_CLOSE_2

And what time were the lights turned off on MONDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	TUESDAY_OPEN_2
88	REFUSED	TUESDAY_OPEN_2
99	DON'T KNOW	TUESDAY_OPEN_2

Ask if ALWAYS_AA2(2 or 88)&^DAYS_2(2); else skip to WEDNESDAY_OPEN_2;

TUESDAY_OPEN_2 What time were the lights turned on on TUESDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	TUESDAY_CLOSE_2
88	REFUSED	TUESDAY_CLOSE_2
99	DON'T KNOW	TUESDAY_CLOSE_2

IF TUESDAY_OPEN_2(1||65)

TUESDAY_CLOSE_2 And what time were the lights turned off on TUESDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	WEDNESDAY_OPEN_2
88	REFUSED	WEDNESDAY_OPEN_2
99	DON'T KNOW	WEDNESDAY_OPEN_2

Ask if ALWAYS_AA2(2 or 88)&^DAYS_2(3); else skip to THURSDAY_OPEN_2;

WEDNESDAY_OPEN_2 What time were the lights turned on on WEDNESDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	WEDNESDAY_CLOSE_2
88	REFUSED	WEDNESDAY_CLOSE_2
99	DON'T KNOW	WEDNESDAY_CLOSE_2

IF WEDNESDAY_OPEN_2(1||65)

WEDNESDAY_CLOSE_2 And what time were the lights turned off on WEDNESDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	THURSDAY_OPEN_2
88	REFUSED	THURSDAY_OPEN_2
99	DON'T KNOW	THURSDAY_OPEN_2

Ask if ALWAYS_AA2(2 or 88)&^DAYS_2(4); else skip to FRIDAY_OPEN_2;

THURSDAY_OPEN_2 What time were the lights turned on on THURSDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	THURSDAY_CLOSE_2
88	REFUSED	THURSDAY_CLOSE_2
99	DON'T KNOW	THURSDAY_CLOSE_2

IF THURSDAY_OPEN_2(1||65)

THURSDAY_CLOSE_2 And what time were the lights turned off on THURSDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	FRIDAY_OPEN_2
88	REFUSED	FRIDAY_OPEN_2
99	DON'T KNOW	FRIDAY_OPEN_2

Ask if ALWAYS_AA2(2 or 88)&^DAYS_2(5); else skip to SATURDAY_OPEN_2;

FRIDAY_OPEN_2 What time were the lights turned on on FRIDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	FRIDAY_CLOSE_2
88	REFUSED	FRIDAY_CLOSE_2
99	DON'T KNOW	FRIDAY_CLOSE_2

IF FRIDAY_OPEN_2(1||65)

FRIDAY_CLOSE_2 And what time were the lights turned off on FRIDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	SATURDAY_OPEN_2
88	REFUSED	SATURDAY_OPEN_2
99	DON'T KNOW	SATURDAY_OPEN_2

Ask if ALWAYS_AA2(2 or 88)&^DAYS_2(6); else skip to SUNDAY_OPEN_2;

SATURDAY_OPEN_2 What time were the lights turned on on SATURDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	SATURDAY_CLOSE_2
88	REFUSED	SATURDAY_CLOSE_2
99	DON'T KNOW	SATURDAY_CLOSE_2

IF SATURDAY_OPEN_2(1||65)

SATURDAY_CLOSE_2 And what time were the lights turned off on SATURDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	SUNDAY_OPEN_2
88	REFUSED	SUNDAY_OPEN_2
99	DON'T KNOW	SUNDAY_OPEN_2

Ask if ALWAYS_AA2(2 or 88)&^DAYS_2(7); else skip to LIGHTING_SCHEDULES_1_2;

SUNDAY_OPEN_2 What time were the lights turned on on SUNDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	SUNDAY_CLOSE_2
88	REFUSED	SUNDAY_CLOSE_2
99	DON'T KNOW	SUNDAY_CLOSE_2

IF SUNDAY_OPEN_2(1||65)

SUNDAY_CLOSE_2 And what time were the lights turned off on SUNDAY?

	Record Time 1AM - 12:30 AM in 12 hour format by half hour as 1-24	LGT_AA2_4
88	REFUSED	LGT_AA2_4
99	DON'T KNOW	LGT_AA2_4

LGT_AA2_4 Now, I'd like you to consider this unique lighting schedule we've been discussing for the new **<%LT_MEAS_1>** that was installed in the **<%Activity_Area_2>**. And think of the period of time when the lights are typically on, versus typically off. Even though the lighting is typically on, 100% of the lights may not be on the full time. And conversely, even though the lighting may typically be off, some lights may still be left on.

For the period when lighting is typically on, what percentage of this new lighting, on average, would actually be turned on?

	ENTER PERCENTAGE_____	LGT_AA2_5
888	REFUSED	LGT_AA2_5
999	DON'T KNOW	LGT_AA2_5

LGT_AA2_5 And conversely, what percent of these new **<%LT_MEAS_1>** that was installed in the **<%Activity_Area_2>** might actually be turned on, on average, during the time period when the lighting was typically off.

	ENTER PERCENTAGE_____	CC2a
88	REFUSED	CC2a
99	DON'T KNOW	CC2a

Participant Survey for CPUC
PY2019 Downstream Lighting Evaluation

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	C0
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	Refused	CC6
99	Don't know	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	CC11a
2	No	CC11a
88	Refused	CC11a
99	Don't know	CC11a

CC11a In what year was your facility built, approximately?

7777	Year	CC12a
8888	Refused	CC12a
9999	Don't know	CC12a

IF CC11a in (88, 99) then ask; else skip to CC12a

CC11b Would you say it was…

1	After 2010	CC12a
2	Between 2006 and 2010	CC12a
3	Between 2000 and 2005	CC12a
4	In the 1990s	CC12a
5	In the 1980s	CC12a
6	In the 1970s	CC12a
7	In the 1960s or	CC12a
8	Before 1960	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	Refused	BC090
99	Don't know	BC090

Participant Survey for CPUC
PY2019 Downstream Lighting Evaluation

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	BC100
3	Stayed the same	Vendor_Name
88	Refused	Vendor_Name
99	Don't know	Vendor_Name

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	2017	OtherChanges
2	2018	OtherChanges
3	2019	OtherChanges
88	Refused	OtherChanges
99	Don't know	OtherChanges

OtherChanges Before the COVID pandemic, did you make any other equipment changes to your facility, since 2017? Probe for any other changes to lighting, HVAC, refrigeration installs, etc.

77	YES _ RECORD VERBATIM	OtherChg_Date
02	NO	Vendor_Name
99	Don't know	Vendor_Name

OtherChg_Date Approximately when did these changes occur

77	YES _ RECORD VERBATIM	Vendor_Name
99	Don't know	Vendor_Name

Ask if V1(1)

Vendor_Name 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.	

APPENDIX C:

DISTRIBUTOR NTG PHONE SURVEY

Distributor NTG Survey Instrument for 2019 Midstream Programs

Introduction

AA1 This is <%Interviewer> calling on behalf of the California Public Utilities Commission from <%SURVEY FIRM>> regarding your firm's involvement with the sales and/or installations of ...<%MEASURE_LONG>… through ...<%PROGRAM_LONG> ... between January 1, 2019 and December 31, 2019._____Our records indicate that ...<%CONTACT>... would be the person most knowledgeable about this. Are they available?

1 Yes A1

2 No AA2

AA2 Who would be the person most knowledgeable about your firm's involvement with the ...<%PROGRAM > during 2019?

1 Record name and phone number and start over

A1 <%UTILITY>... has indicated that your firm participates in the <% PROGRAM > and was involved in selling and/or installing energy-efficient...<%MEASURE> throughout their service territory during 2019. 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 program-qualifying...<%MEASURE> through the <% PROGRAM>. Is that correct??

1 Yes A3

2 No Just questions for installs

READ: Throughout the remainder of this survey, for the sake of brevity, I'm going to refer to the <%PROGRAM> qualifying equipment that you sell as "%MEASURE".

The focus of this survey is on your business' sales and promotional practices of <%MEASURE> **before** the COVID-19 shutdown. Please answer the following questions based on your business' approach during 2019; that is, before the COVID-19 shutdown.

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

___ Increased 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, I am going to ask you to rate the importance of the various <%PROGRAM> and non-program factors in influencing your decision to recommend <%MEASURE> to contractors and your other 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 <%MEASURE> to contractors and your other customers.

(Do not read – note that these are the program factors)

Program incentive	Record 0 to 10 score (_____)
Program promotional materials	Record 0 to 10 score (_____)
Program-provided training of sales staff	Record 0 to 10 score (_____)
Information from <%UTILITY> website	Record 0 to 10 score (_____)

(Do not read – note that these are the non-program factors)

Increased awareness of LED benefits among contractors and customers	Record 0 to 10 score (_____)
Reduced high-efficiency LED Lighting prices from Manufacturers	Record 0 to 10 score (_____)
Availability of manufacturers' promotional rebates/spiffs	Record 0 to 10 score (_____)

Information about the cost-effectiveness of more efficient units Record 0 to 10 score (_____)

Increased stocking of high-efficiency LED Lighting Record 0 to 10 score (_____)

Past participation in <%UTILITY> rebate or audit program Record 0 to 10 score (_____)

A4a Was there any other important way that the <%PROGRAM> influenced the recommendations you provide regarding <%MEASURE>? (if yes…) What was the most important other way?

RECORD ANSWER HERE:

A4aa Using a 0 to 10 scale, how important did this factor influence the recommendations you made regarding <%MEASURE>?

Record 0 to 10 score (_____) A5

Next, I am going to ask you to rate the importance of the <%PROGRAM> in general in influencing your decision to recommend <%MEASURE>to contractors and your other 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 contractors and your other customers purchase the energy efficient <%MEASURE> at this time?

Record 0 to 10 score (_____) A6

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 in A4]

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 in A4.]

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 (_____) [List just the value for the program factors]

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 contractors and your other customers?

Record 0 to 10 score (_____) A7

A7 Approximately, in what percent of sales situations did you recommend <%MEASURE>before you learned about the <%PROGRAM>?

% Record PERCENTAGE A8

A8 And approximately in what percent of sales situations do you recommend <%MEASURE>now that you have worked with the <%PROGRAM>?

% Record PERCENTAGE A9

A9 And what role, if any, has the <%PROGRAM> played in your increasing your recommendations of <%MEASURE> since you began working with the Program?

Record Answer

A10 Approximately, what percentage of your lighting sales over the last 12 months that were installed in <%UTILITY>'s service territory are LEDs 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 and other customers in <%UTILITY>'s territory to purchase program qualifying ...<%MEASURE>...?

% Record PERCENTAGE A11a

IF A11 << 100;

A11a In what situations do you NOT encourage your contractors and othe customers to purchase energy efficient equipment if they qualify for a rebate? Why is that?

RECORD ANSWER HERE:

A12 Of those installations of ...<%MEASURE>... 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>.. in areas where your contractors and other customers do not have access to incentives for energy efficient models?

1 Yes A14a

2 No A16

A14a. And what role, if any, have the California utilities' rebate programs played in your decision to promote and sell <%MEASURE> in areas where contractors and your other customers do not have access to incentives for energy efficient models?

RECORD ANSWER HERE:

A15 About what percent of your sales of ...<%MEASURE> ... 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...<%MEASURE >..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 equipment stocking practices as a result of the <%UTILITY> Program?

1 Yes A16a

2 No A17

A16a How so? **RECORD ANSWER HERE:**

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 D:

SELF-REPORT AND BUSINESS HOUR METHODOLGY

This section includes a copy of a paper published as part of the 2015 International Energy Program Evaluation Conference (IEPEC). The paper explains the methodology used to leverage self-reported operating hours for lighting installed in commercial buildings when a large-scale monitoring effort is not feasible.

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

[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.

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 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.

[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.

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 D-1: Actual, Self-Reported Lighting Usage and Business Hours for a Logger Monitoring an Office

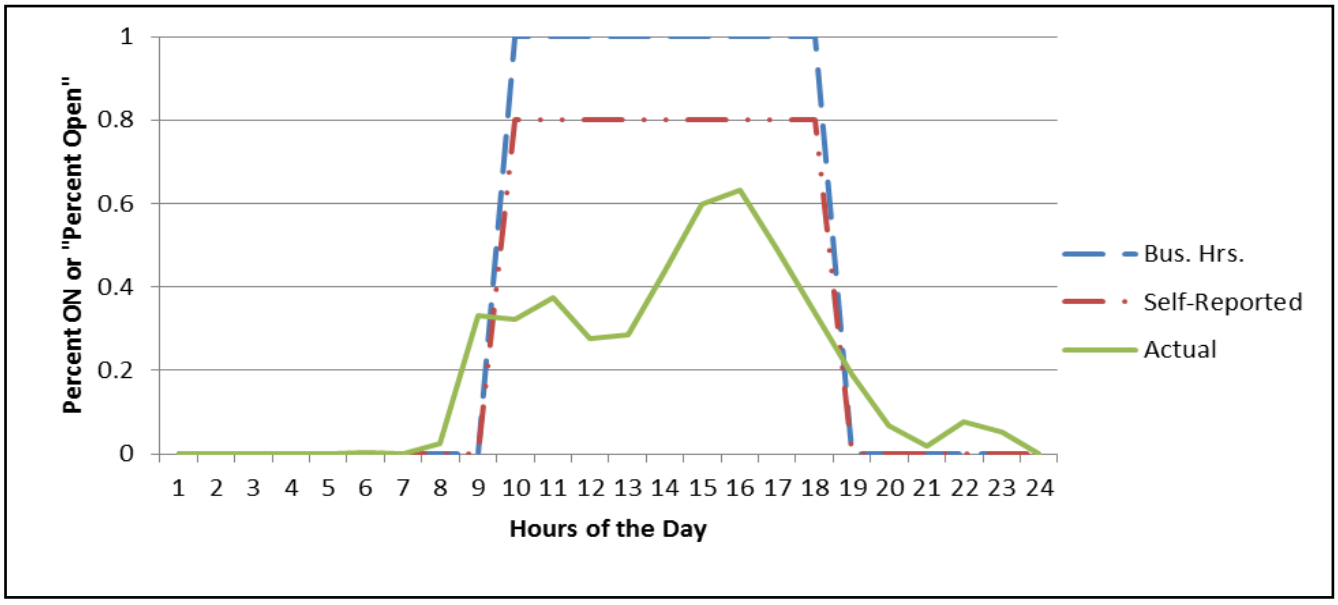


Figure 1 reveals a few important distinctions that, ultimately, represent the motivation behind this analysis. The first is that business hours may not be a reliable proxy to use in developing usage shapes and lighting load impacts. Customer self-reported lighting usage, which was garnered from the on-site 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 D-1: Self-Reported Adjustment Factors – Non-Linear Fluorescent

Building Type	Activity Area	# 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

Building Type	Activity Area	# Sites	Self-Reported Adjustment		Business Hour Usage Rates		
			Self-Reported Usage	Adjustment Factor	Open Shoulder	Closed Shoulder	Closed
Lodging	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**
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

Building Type	Activity Area	# Sites	Self-Reported Adjustment		Business Hour Usage Rates		
			Self-Reported Usage	Adjustment Factor	Open Shoulder	Closed Shoulder	Closed
Restaurant	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**
Restaurant	Auto Repair	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

[5] A 42 percent actual divided by the 55 percent self-report yields an adjustment factor of 0.77 throughout open hours.

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.

Table D-2: Self-Reported Adjustment Factors – Linear Fluorescent

Building Type	Activity Area	# 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

Building Type	Activity Area	# Sites	Self-Reported Adjustment		Business Hour Usage Rates		
			Self-Reported Usage	Adjustment Factor	Open Shoulder	Closed Shoulder	Closed
	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**
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

Building Type	Activity Area	# Sites	Self-Reported Adjustment		Business Hour Usage Rates		
			Self-Reported Usage	Adjustment Factor	Open Shoulder	Closed Shoulder	Closed
	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	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**
Retail - Large	Auto Repair	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
Retail - Large	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

Building Type	Activity Area	# Sites	Self-Reported Adjustment		Business Hour Usage Rates		
			Self-Reported Usage	Adjustment Factor	Open Shoulder	Closed Shoulder	Closed
	All	**51**	**94%**	**0.82**	**0.56**	**0.51**	**0.31**
Retail - Small	Auto Repair	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**

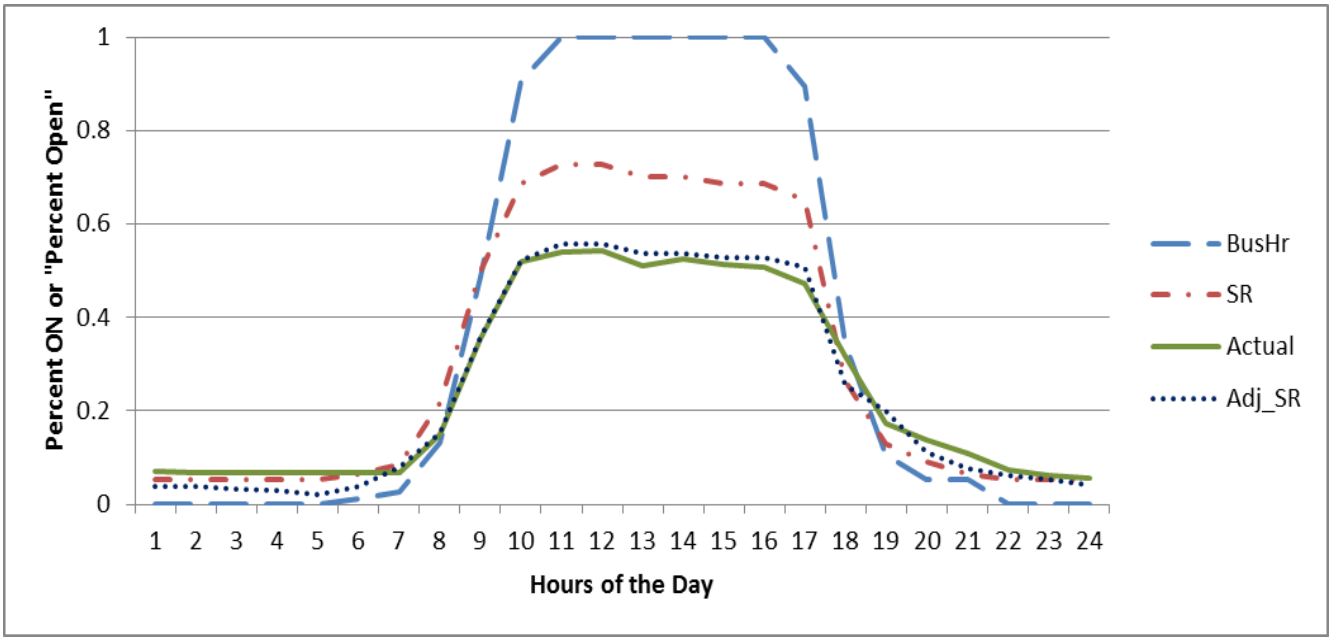
The results from the adjustment factor analysis for linear technologies yield similar results to the non-linear lighting analysis for some building types and different results for others. The similarities and differences result from both the self-reported lighting usage as well as the accuracy of the 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 D-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.

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APPENDIX E:

MEASURE NAME TO ESPI MAPPING

MeasureClass	Channel	NormUnit	Measurename
A-LAMP	Downstream	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 13 TO <14W LED
A-LAMP	Downstream	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 10 TO <11W LED
A-LAMP	Downstream	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 11 TO <12W LED
A-LAMP	Downstream	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 12 TO <13W LED
A-LAMP	Downstream	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 14 TO <15W LED
A-LAMP	Downstream	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 15 TO <16W LED
A-LAMP	Downstream	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 16 TO <17W LED
A-LAMP	Downstream	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 17 TO <18W LED
A-LAMP	Downstream	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 18 TO <19W LED
A-LAMP	Downstream	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 20 TO <21W LED
A-LAMP	Downstream	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 21 TO <22W LED
A-LAMP	Downstream	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 22 TO <23W LED
A-LAMP	Downstream	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 23 TO <24W LED
A-LAMP	Downstream	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 24 TO <25W LED
A-LAMP	Downstream	FIXTURE	LED SURFACE, PENDANT, TRACK, ACCENT, AND RECESSED DOWNLIGHT: INSTALL 25W LED
A-LAMP	Downstream	LAMP	COMMERCIAL LED CAN RETROFIT: 21 TO <23 WATTS
A-LAMP	Downstream	LAMP	COMMERCIAL LED CAN RETROFIT: >=23 WATTS
A-LAMP	Downstream	LAMP	LED LAMP: CANRET 10 WATTS NON-DIMMABLE
A-LAMP	Downstream	LAMP	LED LAMP: CANRET 11 WATTS NON-DIMMABLE
A-LAMP	Downstream	LAMP	LED LAMP: CANRET 13 WATTS NON-DIMMABLE
A-LAMP	Midstream	LAMP	LED LAMP: CANRET 12 WATTS NON-DIMMABLE
A-LAMP	Midstream	LAMP	LED LAMP: CANRET 13 WATTS NON-DIMMABLE
A-LAMP	Midstream	LAMP	LED LAMP: CANRET 14 WATTS NON-DIMMABLE
A-LAMP	Midstream	LAMP	LED LAMP: CANRET 18 WATTS NON-DIMMABLE
A-LAMP	Midstream	LAMP	LED LAMP: CANRET 19 WATTS NON-DIMMABLE
A-LAMP	Midstream	LAMP	LED LAMP: CANRET 21 WATTS NON-DIMMABLE
SPECIALTY LAMPS	Downstream	LAMP	LED CANDELABRA <3W
SPECIALTY LAMPS	Downstream	LAMP	LED CANDELABRA >=3 TO <=5
SPECIALTY LAMPS	Downstream	LAMP	LED LAMP: CANDLE 4 WATTS NON-DIMMABLE
SPECIALTY LAMPS	Downstream	LAMP	LED LAMP: CANDLE, 3 WATTS, NON-DIMMABLE
SPECIALTY LAMPS	Downstream	LAMP	LED LAMP: CANDLE, 4 WATTS, NON-DIMMABLE
SPECIALTY LAMPS	Downstream	LAMP	LED LAMP: CANDLE, 5 WATTS, NON-DIMMABLE
SPECIALTY LAMPS	Downstream	LAMP	4 WATT CANDELABRA LED REPLACING CANDELABRA BASECASE TOTAL WATTS = 4.61 X MSR WATTS
SPECIALTY LAMPS	Downstream	LAMP	5 WATT CANDELABRA LED REPLACING CANDELABRA BASECASE TOTAL WATTS = 4.61 X MSR WATTS
SPECIALTY LAMPS	Downstream	LAMP	COMMERCIAL LED CANDELABRA: 2 TO <3 WATT
SPECIALTY LAMPS	Downstream	LAMP	COMMERCIAL LED CANDELABRA: 3 TO <4 WATT
SPECIALTY LAMPS	Downstream	LAMP	COMMERCIAL LED CANDELABRA: 4 TO <5 WATT
SPECIALTY LAMPS	Downstream	LAMP	COMMERCIAL LED CANDELABRA: >=5 WATT
SPECIALTY LAMPS	Downstream	LAMP	LED LAMP: CANDLE 5 WATTS NON-DIMMABLE
SPECIALTY LAMPS	Midstream	LAMP	LED LAMP: CANDLE 3 WATTS NON-DIMMABLE
SPECIALTY LAMPS	Downstream	LAMP	LED LAMP: GLB 6 WATTS NON-DIMMABLE
SPECIALTY LAMPS	Downstream	LAMP	LED LAMP: GLB, 4 WATTS, NON-DIMMABLE
SPECIALTY LAMPS	Downstream	LAMP	LED LAMP: GLB, 5 WATTS, NON-DIMMABLE
SPECIALTY LAMPS	Downstream	LAMP	LED LAMP: GLB, 6 WATTS, NON-DIMMABLE
SPECIALTY LAMPS	Downstream	LAMP	10 WATT GLOBE LED REPLACING GLOBE BASECASE TOTAL WATTS = 3.10 X MSR WATTS
SPECIALTY LAMPS	Downstream	LAMP	4 WATT GLOBE LED REPLACING GLOBE BASECASE TOTAL WATTS = 3.10 X MSR WATTS
SPECIALTY LAMPS	Downstream	LAMP	6 WATT GLOBE LED REPLACING GLOBE BASECASE TOTAL WATTS = 3.10 X MSR WATTS
SPECIALTY LAMPS	Downstream	LAMP	LED LAMP: GLB 10 WATTS NON-DIMMABLE
SPECIALTY LAMPS	Downstream	LAMP	LED LAMP: GLB 6 WATTS NON-DIMMABLE
SPECIALTY LAMPS	Midstream	LAMP	5 WATT GLOBE LED REPLACING GLOBE BASECASE TOTAL WATTS = 3.10 X MSR WATTS
REFLECTOR LAMP	Downstream	FIXTURE	10 WATT DOWN LIGHT (NON RES) LED REPLACING PAR30 BASECASE TOTAL WATTS = 2.34 X MSR WATTS
REFLECTOR LAMP	Downstream	FIXTURE	11 WATT DOWN LIGHT (NON RES) LED REPLACING PAR30 BASECASE TOTAL WATTS = 2.34 X MSR WATTS
REFLECTOR LAMP	Downstream	FIXTURE	12 WATT DOWN LIGHT (NON RES) LED REPLACING PAR30 BASECASE TOTAL WATTS = 2.34 X MSR WATTS
REFLECTOR LAMP	Downstream	FIXTURE	13 WATT DOWN LIGHT (NON RES) LED REPLACING PAR30 BASECASE TOTAL WATTS = 2.34 X MSR WATTS
REFLECTOR LAMP	Downstream	LAMP	LED PAR20: 11 WATTS
REFLECTOR LAMP	Downstream	LAMP	LED PAR30: 10 TO <11 WATTS
REFLECTOR LAMP	Downstream	LAMP	LED PAR30: 11 TO <12 WATTS
REFLECTOR LAMP	Downstream	LAMP	LED PAR30: 12 TO <13 WATTS
REFLECTOR LAMP	Downstream	LAMP	LED PAR30: 13 TO <14 WATTS
REFLECTOR LAMP	Downstream	LAMP	LED PAR30: 19 TO <20 WATTS
REFLECTOR LAMP	Downstream	LAMP	LED PAR30: 20 WATTS
REFLECTOR LAMP	Downstream	LAMP	LED PAR30: <10 WATTS
REFLECTOR LAMP	Downstream	LAMP	LED PAR38: 12 TO <13 WATTS
REFLECTOR LAMP	Downstream	LAMP	LED PAR38: 13 TO <14 WATTS
REFLECTOR LAMP	Downstream	LAMP	LED PAR38: 14 TO <15 WATTS
REFLECTOR LAMP	Downstream	LAMP	LED PAR38: 15 TO <16 WATTS
REFLECTOR LAMP	Downstream	LAMP	LED PAR38: 16 TO <17 WATTS
REFLECTOR LAMP	Downstream	LAMP	LED PAR38: 17 TO <18 WATTS
REFLECTOR LAMP	Downstream	LAMP	LED PAR38: 18 TO <19 WATTS
REFLECTOR LAMP	Downstream	LAMP	LED PAR38: 19 TO <20 WATTS
REFLECTOR LAMP	Downstream	LAMP	LED PAR38: 25 TO <26 WATTS
REFLECTOR LAMP	Downstream	LAMP	LED PAR38: 26 TO <27 WATTS
REFLECTOR LAMP	Downstream	LAMP	LED R-BR: 14 TO <=22 WATTS
REFLECTOR LAMP	Downstream	LAMP	LED R/BR LAMP: 10 WATTS, NON-DIMMABLE
REFLECTOR LAMP	Downstream	LAMP	LED R/BR LAMP: 11 WATTS NON-DIMMABLE
REFLECTOR LAMP	Downstream	LAMP	LED R/BR LAMP: 11 WATTS, NON-DIMMABLE
REFLECTOR LAMP	Downstream	LAMP	LED R/BR LAMP: 15 WATTS, NON-DIMMABLE
REFLECTOR LAMP	Downstream	LAMP	LED R/BR LAMP: 6 WATTS, NON-DIMMABLE

MeasureClass	Channel	NormUnit	Measurename
REFLECTOR LAMP	Downstream	LAMP	LED R/BR LAMP: 7 WATTS NON-DIMMABLE
REFLECTOR LAMP	Downstream	LAMP	LED R/BR LAMP: 7 WATTS, NON-DIMMABLE
REFLECTOR LAMP	Downstream	LAMP	LED R/BR LAMP: 8 WATTS, NON-DIMMABLE
REFLECTOR LAMP	Downstream	LAMP	LED R/BR LAMP: 9 WATTS NON-DIMMABLE
REFLECTOR LAMP	Downstream	LAMP	LED R/BR LAMP: 9 WATTS, NON-DIMMABLE
REFLECTOR LAMP	Downstream	LAMP	10 WATT R-BR LAMP LED REPLACING R-BR BASECASE TOTAL WATTS = 4.17 X MSR WATTS
REFLECTOR LAMP	Downstream	LAMP	10 WATT TO < 11 WATT PAR30 LED
REFLECTOR LAMP	Downstream	LAMP	11 WATT DOWN LIGHT (NON RES) LED REPLACING PAR30 BASECASE TOTAL WATTS = 2.34 X MSR WATTS
REFLECTOR LAMP	Downstream	LAMP	11 WATT R-BR LAMP LED REPLACING R-BR BASECASE TOTAL WATTS = 3.28 X MSR WATTS
REFLECTOR LAMP	Downstream	LAMP	11 WATT TO < 12 WATT PAR30 LED
REFLECTOR LAMP	Downstream	LAMP	12 WATT R-BR LAMP LED REPLACING R-BR BASECASE TOTAL WATTS = 3.28 X MSR WATTS
REFLECTOR LAMP	Downstream	LAMP	12 WATT TO < 13 WATT PAR30 LED
REFLECTOR LAMP	Downstream	LAMP	12 WATT TO < 13 WATT PAR38 LED
REFLECTOR LAMP	Downstream	LAMP	13 WATT TO < 14 WATT PAR30 LED
REFLECTOR LAMP	Downstream	LAMP	13 WATT TO < 14 WATT PAR38 LED
REFLECTOR LAMP	Downstream	LAMP	15 WATT TO < 16 WATT PAR38 LED
REFLECTOR LAMP	Downstream	LAMP	17 WATT R-BR LAMP LED REPLACING R-BR BASECASE TOTAL WATTS = 2.97 X MSR WATTS
REFLECTOR LAMP	Downstream	LAMP	17 WATT TO < 18 WATT PAR38 LED
REFLECTOR LAMP	Downstream	LAMP	6 WATT R-BR LAMP LED REPLACING R-BR BASECASE TOTAL WATTS = 4.17 X MSR WATTS
REFLECTOR LAMP	Downstream	LAMP	7 WATT R-BR LAMP LED REPLACING R-BR BASECASE TOTAL WATTS = 4.17 X MSR WATTS
REFLECTOR LAMP	Downstream	LAMP	8 WATT R-BR LAMP LED REPLACING R-BR BASECASE TOTAL WATTS = 4.17 X MSR WATTS
REFLECTOR LAMP	Downstream	LAMP	9 WATT R-BR LAMP LED REPLACING R-BR BASECASE TOTAL WATTS = 4.17 X MSR WATTS
REFLECTOR LAMP	Downstream	LAMP	COMMERCIAL LED PAR20: 7 TO <8 WATTS
REFLECTOR LAMP	Downstream	LAMP	COMMERCIAL LED PAR30: 10 TO <11 WATTS
REFLECTOR LAMP	Downstream	LAMP	COMMERCIAL LED PAR30: 11 TO <12 WATTS
REFLECTOR LAMP	Downstream	LAMP	COMMERCIAL LED PAR30: 14 TO <15 WATTS
REFLECTOR LAMP	Downstream	LAMP	COMMERCIAL LED PAR30: 15 TO <16 WATTS
REFLECTOR LAMP	Downstream	LAMP	COMMERCIAL LED PAR30: 20 TO <21 WATTS
REFLECTOR LAMP	Downstream	LAMP	COMMERCIAL LED PAR30: 9 TO <10 WATTS
REFLECTOR LAMP	Downstream	LAMP	COMMERCIAL LED PAR38: 15 TO <16 WATTS
REFLECTOR LAMP	Downstream	LAMP	COMMERCIAL LED PAR38: 25 TO <26 WATTS
REFLECTOR LAMP	Downstream	LAMP	COMMERCIAL LED PAR38: 26 TO <27 WATTS
REFLECTOR LAMP	Downstream	LAMP	COMMERCIAL LED PAR38: >=27 WATTS
REFLECTOR LAMP	Downstream	LAMP	COMMERCIAL LED R/BR LAMP: 11 TO <12 WATTS
REFLECTOR LAMP	Downstream	LAMP	COMMERCIAL LED R/BR LAMP: 12 TO <13 WATTS
REFLECTOR LAMP	Downstream	LAMP	COMMERCIAL LED R/BR LAMP: 13 TO <14 WATTS
REFLECTOR LAMP	Downstream	LAMP	COMMERCIAL LED R/BR LAMP: 7 TO <8 WATTS
REFLECTOR LAMP	Downstream	LAMP	COMMERCIAL LED R/BR LAMP: 8 TO <9 WATTS
REFLECTOR LAMP	Downstream	LAMP	LED LAMP: PAR30 10 WATTS NON-DIMMABLE
REFLECTOR LAMP	Downstream	LAMP	LED LAMP: PAR30 11 WATTS NON-DIMMABLE
REFLECTOR LAMP	Downstream	LAMP	LED LAMP: PAR30 12 WATTS NON-DIMMABLE
REFLECTOR LAMP	Downstream	LAMP	LED LAMP: PAR38 12 WATTS NON-DIMMABLE
REFLECTOR LAMP	Downstream	LAMP	LED LAMP: PAR38 15 WATTS NON-DIMMABLE
REFLECTOR LAMP	Downstream	LAMP	LED LAMP: REFR 11 WATTS NON-DIMMABLE
REFLECTOR LAMP	Downstream	LAMP	LED LAMP: REFR 12 WATTS NON-DIMMABLE
REFLECTOR LAMP	Downstream	LAMP	LED LAMP: REFR 17 WATTS NON-DIMMABLE
REFLECTOR LAMP	Downstream	LAMP	LED LAMP: REFR 7 WATTS NON-DIMMABLE
REFLECTOR LAMP	Downstream	LAMP	LED LAMP: REFR 8 WATTS NON-DIMMABLE
REFLECTOR LAMP	Downstream	LAMP	LED LAMP: REFR 9 WATTS NON-DIMMABLE
REFLECTOR LAMP	Midstream	FIXTURE	13 WATT DOWN LIGHT (NON RES) LED REPLACING PAR30 BASECASE TOTAL WATTS = 2.34 X MSR WATTS
REFLECTOR LAMP	Midstream	FIXTURE	15 WATT DOWN LIGHT (NON RES) LED REPLACING PAR30 BASECASE TOTAL WATTS = 2.34 X MSR WATTS
REFLECTOR LAMP	Midstream	FIXTURE	21 WATT DOWN LIGHT (NON RES) LED REPLACING PAR30 BASECASE TOTAL WATTS = 2.34 X MSR WATTS
REFLECTOR LAMP	Midstream	LAMP	11 WATT R-BR LAMP LED REPLACING R-BR BASECASE TOTAL WATTS = 3.28 X MSR WATTS
REFLECTOR LAMP	Midstream	LAMP	13 WATT DOWN LIGHT (NON RES) LED REPLACING PAR30 BASECASE TOTAL WATTS = 2.34 X MSR WATTS
REFLECTOR LAMP	Midstream	LAMP	17 WATT R-BR LAMP LED REPLACING R-BR BASECASE TOTAL WATTS = 2.97 X MSR WATTS
REFLECTOR LAMP	Midstream	LAMP	7 WATT R-BR LAMP LED REPLACING R-BR BASECASE TOTAL WATTS = 4.17 X MSR WATTS
REFLECTOR LAMP	Midstream	LAMP	LED LAMP: REFR 6 WATTS NON-DIMMABLE
REFLECTOR LAMP	Midstream	LAMP	LED LAMP: REFR 9 WATTS NON-DIMMABLE
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGH/LOW BAY: 110 LPW TO <130 LPW 0 TO <48 W
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGH/LOW BAY: 110 LPW TO <130 LPW 48 TO <71 W
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGH/LOW BAY: 110 LPW TO <130 LPW, 0 TO <48 W
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGH/LOW BAY: 110 LPW TO <130 LPW, 48 TO <71 W
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGH/LOW BAY: 110 LPW TO <130 LPW, 71 TO <90 W
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGH/LOW BAY: 120 LPW TO <130 LPW, 125 TO <153 W
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGH/LOW BAY: 120 LPW TO <130 LPW, 90 TO <125 W
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGH/LOW BAY: 125 LPW TO <135 LPW, 153 TO <187 W
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGH/LOW BAY: 125 LPW TO <135 LPW, 187 TO <212 W
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGH/LOW BAY: 125 LPW TO <135 LPW, 212 TO <246 W
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGH/LOW BAY: 125 LPW TO <135 LPW, 246 TO <283 W
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGH/LOW BAY: >=130 LPW, 0 TO <42 W
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGH/LOW BAY: >=130 LPW, 113 TO <140 W
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGH/LOW BAY: >=130 LPW, 42 TO <60 W
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGH/LOW BAY: >=130 LPW, 60 TO <82 W
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGH/LOW BAY: >=130 LPW, 82 TO <113 W
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGH/LOW BAY: >=135 LPW, 140 TO <174 W
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGH/LOW BAY: >=135 LPW, 174 TO <194 W
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGH/LOW BAY: >=135 LPW, 194 TO <227 W
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGH/LOW BAY: >=135 LPW, 227 TO <262 W

MeasureClass	Channel	NormUnit	Measurename
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGHBAY LUMINAIRE RATED FROM 11800 TO < 14800 LUMENS AND >= 130 LPW
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGHBAY LUMINAIRE RATED FROM 14800 TO < 18500 LUMENS AND >= 130 LPW
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGHBAY LUMINAIRE RATED FROM 18500 TO < 23100 LUMENS AND >= 130 LPW
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGHBAY LUMINAIRE RATED FROM 23100 TO < 30000 LUMENS AND >= 135 LPW
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGHBAY LUMINAIRE RATED FROM 30000 TO < 39000 LUMENS AND >= 125 LPW AND < 135 LPW
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGHBAY LUMINAIRE RATED FROM 30000 TO < 39000 LUMENS AND >= 135 LPW
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGHBAY LUMINAIRE RATED FROM 39000 TO < 50700 LUMENS AND >= 135 LPW
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGHBAY LUMINAIRE RATED FROM 4500 TO < 5400 LUMENS AND >= 130 LPW
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGHBAY LUMINAIRE RATED FROM 5400 TO < 6500 LUMENS AND >= 130 LPW
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGHBAY LUMINAIRE RATED FROM 6500 TO < 7800 LUMENS AND >= 110 LPW AND < 130 LPW
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGHBAY LUMINAIRE RATED FROM 6500 TO < 7800 LUMENS AND >= 130 LPW
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGHBAY LUMINAIRE RATED FROM 7800 TO < 9400 LUMENS AND >= 130 LPW
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGHBAY LUMINAIRE RATED FROM 9400 TO < 11800 LUMENS AND >= 110 LPW AND < 130 LPW
INDOOR FIXTURE	Downstream	FIXTURE	LED HIGHBAY LUMINAIRE RATED FROM 9400 TO < 11800 LUMENS AND >= 130 LPW
INDOOR FIXTURE	Downstream	FIXTURE	LED FIX: HIGH/LOW BAY 125 LPW TO <135 LPW 187 TO <212 W LED REPLACING 100% LED 25TH PERCENTILE EFFICACY
INDOOR FIXTURE	Downstream	FIXTURE	LED FIXTURE: HIGH/LOW BAY >=130 LPW 113 TO <140 W
INDOOR FIXTURE	Downstream	FIXTURE	LED FIXTURE: HIGH/LOW BAY >=130 LPW 113 TO <140 W LED REPLACING 10% HPT8 6 LAMP LF FIXTURE & 90% LED 25TH % EFFICACY
INDOOR FIXTURE	Downstream	FIXTURE	LED FIXTURE: HIGH/LOW BAY >=130 LPW 82 TO <113 W
INDOOR FIXTURE	Downstream	FIXTURE	LED FIXTURE: HIGH/LOW BAY >=135 LPW 174 TO <194 W
INDOOR FIXTURE	Downstream	FIXTURE	LED FIXTURE: HIGH/LOW BAY >=135 LPW 174 TO <194 W LED REPLACING 100% LED 25TH PERCENTILE EFFICACY
INDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-LED FIXTURE: HIGH/LOW BAY, 120 LPW TO <130 LPW, 125 TO <153 W
INDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-LED FIXTURE: HIGH/LOW BAY, 120 LPW TO <130 LPW, 90 TO <125 W
INDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-LED FIXTURE: HIGH/LOW BAY, 125 LPW TO <135 LPW, 153 TO <187 W
INDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-LED FIXTURE: HIGH/LOW BAY, 125 LPW TO <135 LPW, 212 TO <246 W
INDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-LED FIXTURE: HIGH/LOW BAY, >=130 LPW, 113 TO <140 W
INDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-LED FIXTURE: HIGH/LOW BAY, >=130 LPW, 42 TO <60 W
INDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-LED FIXTURE: HIGH/LOW BAY, >=130 LPW, 60 TO <82 W
INDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-LED FIXTURE: HIGH/LOW BAY, >=130 LPW, 82 TO <113 W
INDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-LED FIXTURE: HIGH/LOW BAY, >=135 LPW, 140 TO <174 W
INDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-LED FIXTURE: HIGH/LOW BAY, >=135 LPW, 174 TO <194 W
INDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-LED FIXTURE: HIGH/LOW BAY, >=135 LPW, 227 TO <262 W
INDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-LED FIXTURE: HIGHBAY LUMINAIRE RATED FROM 11800 TO 14799 LUMENS AND >= 130 LPW (SWLG011R)
INDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-LED FIXTURE: HIGHBAY LUMINAIRE RATED FROM 14800 TO 18499 LUMENS AND >= 130 LPW (SWLG011S)
INDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-LED FIXTURE: HIGHBAY LUMINAIRE RATED FROM 18500 TO 23099 LUMENS AND >= 130 LPW (SWLG011T)
INDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-LED FIXTURE: HIGHBAY LUMINAIRE RATED FROM 23100 TO 29999 LUMENS AND >= 125 LPW AND < 135 LPW (SWLG011I)
INDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-LED FIXTURE: HIGHBAY LUMINAIRE RATED FROM 23100 TO 29999 LUMENS AND >= 135 LPW (SWLG011U)
INDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-LED FIXTURE: HIGHBAY LUMINAIRE RATED FROM 30000 TO 38999 LUMENS AND >= 135 LPW (SWLG011V)
INDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-LED FIXTURE: HIGHBAY LUMINAIRE RATED FROM 39000 TO 50699 LUMENS AND >= 135 LPW (SWLG011W)
INDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-LED FIXTURE: HIGHBAY LUMINAIRE RATED FROM 6500 TO 7799 LUMENS AND >= 110 LPW AND < 130 LPW (SWLG011C)
INDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-LED FIXTURE: HIGHBAY LUMINAIRE RATED FROM 6500 TO 7799 LUMENS AND >= 130 LPW (SWLG011O)
INDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-LED FIXTURE: HIGHBAY LUMINAIRE RATED FROM 9400 TO 11799 LUMENS AND >= 130 LPW (SWLG011Q)
INDOOR FIXTURE	Midstream	FIXTURE	23100 TO < 30000 LUMENS =135 LPW LED HIGH BAY LUMINAIRE LED REPLACING 10% LF FIXT & 10% TLED & 80% LED 25TH %TILE EFFICACY
INDOOR FIXTURE	Midstream	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
INDOOR FIXTURE	Midstream	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
INDOOR FIXTURE	Midstream	FIXTURE	LED FIX: HIGH/LOW BAY 125 LPW TO <135 LPW 212 TO <246 W LED REPLACING 100% LED 25TH PERCENTILE EFFICACY
INDOOR FIXTURE	Midstream	FIXTURE	LED FIX: HIGH/LOW BAY 125 LPW TO <135 LPW 246 TO <283 W LED REPLACING 100% LED 25TH PERCENTILE EFFICACY
INDOOR FIXTURE	Midstream	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
INDOOR FIXTURE	Midstream	FIXTURE	LED FIXTURE: HIGH/LOW BAY 120 LPW TO <130 LPW 90 TO <125 W
INDOOR FIXTURE	Midstream	FIXTURE	LED FIXTURE: HIGH/LOW BAY 120 LPW TO <130 LPW 90 TO <125 W LED REPLACING 10% HPT8 6 LAMP LF FIXTURE & 90% LED 25TH % EFFICACY
INDOOR FIXTURE	Midstream	FIXTURE	LED FIXTURE: HIGH/LOW BAY >=130 LPW 0 TO <42 W LED REPLACING 20% HPT8 2 LAMP LF FIXTURE & 80% LED 25TH % EFFICACY
INDOOR FIXTURE	Midstream	FIXTURE	LED FIXTURE: HIGH/LOW BAY >=130 LPW 113 TO <140 W
INDOOR FIXTURE	Midstream	FIXTURE	LED FIXTURE: HIGH/LOW BAY >=130 LPW 113 TO <140 W LED REPLACING 10% HPT8 6 LAMP LF FIXTURE & 90% LED 25TH % EFFICACY
INDOOR FIXTURE	Midstream	FIXTURE	LED FIXTURE: HIGH/LOW BAY >=130 LPW 42 TO <60 W LED REPLACING 20% HPT8 2 LAMP LF FIXTURE & 80% LED 25TH % EFFICACY
INDOOR FIXTURE	Midstream	FIXTURE	LED FIXTURE: HIGH/LOW BAY >=130 LPW 60 TO <82 W LED REPLACING 20% HPT8 2 LAMP LF FIXTURE & 80% LED 25TH % EFFICACY
INDOOR FIXTURE	Midstream	FIXTURE	LED FIXTURE: HIGH/LOW BAY >=130 LPW 82 TO <113 W LED REPLACING 10% HPT8 6 LAMP LF FIXTURE & 90% LED 25TH % EFFICACY
INDOOR FIXTURE	Midstream	FIXTURE	LED FIXTURE: HIGH/LOW BAY >=135 LPW 140 TO <174 W
INDOOR FIXTURE	Midstream	FIXTURE	LED FIXTURE: HIGH/LOW BAY >=135 LPW 140 TO <174 W LED REPLACING 10% HPT8 6 LAMP LF FIXTURE & 90% LED 25TH % EFFICACY
INDOOR FIXTURE	Midstream	FIXTURE	LED FIXTURE: HIGH/LOW BAY >=135 LPW 174 TO <194 W

MeasureClass	Channel	NormUnit	Measurename
INDOOR FIXTURE	Midstream	FIXTURE	LED FIXTURE: HIGH/LOW BAY >=135 LPW 174 TO <194 W LED REPLACING 100% LED 25TH PERCENTILE EFFICACY
INDOOR FIXTURE	Midstream	FIXTURE	LED FIXTURE: HIGH/LOW BAY >=135 LPW 194 TO <227 W LED REPLACING 100% LED 25TH PERCENTILE EFFICACY
INDOOR FIXTURE	Midstream	FIXTURE	LED FIXTURE: HIGH/LOW BAY >=135 LPW 227 TO <262 W LED REPLACING 100% LED 25TH PERCENTILE EFFICACY
INDOOR FIXTURE	Midstream	FIXTURE	LED HIGHBAY LUMINAIRE RATED FROM 11800 TO < 14800 LUMENS AND >= 110 LPW AND < 130 LPW
INDOOR FIXTURE	Midstream	FIXTURE	LED HIGHBAY LUMINAIRE RATED FROM 11800 TO < 14800 LUMENS AND >= 130 LPW
INDOOR FIXTURE	Midstream	FIXTURE	LED HIGHBAY LUMINAIRE RATED FROM 14800 TO < 18500 LUMENS AND >= 130 LPW
INDOOR FIXTURE	Midstream	FIXTURE	LED HIGHBAY LUMINAIRE RATED FROM 18500 TO < 23100 LUMENS AND >= 120 LPW AND < 130 LPW
INDOOR FIXTURE	Midstream	FIXTURE	LED HIGHBAY LUMINAIRE RATED FROM 18500 TO < 23100 LUMENS AND >= 130 LPW
INDOOR FIXTURE	Midstream	FIXTURE	LED HIGHBAY LUMINAIRE RATED FROM 23100 TO < 30000 LUMENS AND >= 125 LPW AND < 135 LPW
INDOOR FIXTURE	Midstream	FIXTURE	LED HIGHBAY LUMINAIRE RATED FROM 23100 TO < 30000 LUMENS AND >= 135 LPW
INDOOR FIXTURE	Midstream	FIXTURE	LED HIGHBAY LUMINAIRE RATED FROM 30000 TO < 39000 LUMENS AND >= 135 LPW
INDOOR FIXTURE	Midstream	FIXTURE	LED HIGHBAY LUMINAIRE RATED FROM 39000 TO < 50700 LUMENS AND >= 135 LPW
INDOOR FIXTURE	Midstream	FIXTURE	LED HIGHBAY LUMINAIRE RATED FROM 50700 TO < 65900 LUMENS AND >= 135 LPW
INDOOR FIXTURE	Midstream	FIXTURE	LED HIGHBAY LUMINAIRE RATED FROM 6500 TO < 7800 LUMENS AND >= 110 LPW AND < 130 LPW
INDOOR FIXTURE	Midstream	FIXTURE	LED HIGHBAY LUMINAIRE RATED FROM 6500 TO < 7800 LUMENS AND >= 130 LPW
INDOOR FIXTURE	Midstream	FIXTURE	LED HIGHBAY LUMINAIRE RATED FROM 7800 TO < 9400 LUMENS AND >= 130 LPW
INDOOR FIXTURE	Midstream	FIXTURE	LED HIGHBAY LUMINAIRE RATED FROM 9400 TO < 11800 LUMENS AND >= 130 LPW
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	1 X 4 LED INTEGRATED RETROFIT KIT RATED GREATER THAN OR EQUAL TO 125 LPW AND < 140 LPW
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	1 X 4 LED NEW LUMINAIRE RATED GREATER THAN OR EQUAL TO 125 LPW AND < 140 LPW
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	1X4 LED INTEGRATED RETROFIT KIT RATED GREATER THAN OR EQUAL TO 125 LPW AND LESS THAN 140 LPW, AMBIENT INTERIOR COMMERCIAL SPACES
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	1X4 LED NEW LUMINAIRE RATED GREATER THAN OR EQUAL TO 125 LPW AND LESS THAN 140 LPW, AMBIENT INTERIOR COMMERCIAL SPACES
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	2 X 2 LED INTEGRATED RETROFIT KIT RATED GREATER THAN OR EQUAL TO 125 LPW AND < 140 LPW
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	2 X 2 LED INTEGRATED RETROFIT KIT RATED GREATER THAN OR EQUAL TO 140 LPW
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	2 X 2 LED NEW LUMINAIRE RATED GREATER THAN OR EQUAL TO 125 LPW AND < 140 LPW
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	2 X 2 LED NEW LUMINAIRE RATED GREATER THAN OR EQUAL TO 140 LPW
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	2 X 4 LED INTEGRATED RETROFIT KIT RATED GREATER THAN OR EQUAL TO 125 LPW AND < 140 LPW
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	2 X 4 LED INTEGRATED RETROFIT KIT RATED GREATER THAN OR EQUAL TO 140 LPW
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	2 X 4 LED NEW LUMINAIRE RATED GREATER THAN OR EQUAL TO 125 LPW AND < 140 LPW
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	2 X 4 LED NEW LUMINAIRE RATED GREATER THAN OR EQUAL TO 140 LPW
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	2X2 LED INTEGRATED RETROFIT KIT RATED GREATER THAN OR EQUAL TO 125 LPW AND LESS THAN 140 LPW, AMBIENT INTERIOR COMMERCIAL SPACES
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	2X2 LED INTEGRATED RETROFIT KIT RATED GREATER THAN OR EQUAL TO 140 LPW, AMBIENT INTERIOR COMMERCIAL SPACES
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	2X2 LED NEW LUMINAIRE RATED GREATER THAN OR EQUAL TO 125 LPW AND LESS THAN 140 LPW, AMBIENT INTERIOR COMMERCIAL SPACES
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	2X2 LED NEW LUMINAIRE RATED GREATER THAN OR EQUAL TO 140 LPW, AMBIENT INTERIOR COMMERCIAL SPACES
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	2X4 LED INTEGRATED RETROFIT KIT RATED GREATER THAN OR EQUAL TO 125 LPW AND LESS THAN 140 LPW AMBIENT INTERIOR COMMERCIAL SPACES
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	2X4 LED INTEGRATED RETROFIT KIT RATED GREATER THAN OR EQUAL TO 125 LPW AND LESS THAN 140 LPW, AMBIENT INTERIOR COMMERCIAL SPACES
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	2X4 LED INTEGRATED RETROFIT KIT RATED GREATER THAN OR EQUAL TO 140 LPW, AMBIENT INTERIOR COMMERCIAL SPACES
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	2X4 LED NEW LUMINAIRE RATED GREATER THAN OR EQUAL TO 125 LPW AND LESS THAN 140 LPW, AMBIENT INTERIOR COMMERCIAL SPACES
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	2X4 LED NEW LUMINAIRE RATED GREATER THAN OR EQUAL TO 140 LPW, AMBIENT INTERIOR COMMERCIAL SPACES
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	LED DIRECT LINEAR AMBIENT 4 FT. RETROFIT KIT RATED GREATER THAN OR EQUAL TO 125 LPW AND < 140 LPW
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	LED DIRECT LINEAR AMBIENT 8 FT. RETROFIT KIT RATED GREATER THAN OR EQUAL TO 140 LPW
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	LED DIRECT/INDIRECT LINEAR AMBIENT 4 FT. NEW LUMINAIRE RATED GREATER THAN OR EQUAL TO 125 LPW AND < 140 LPW
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	LED DIRECT/INDIRECT LINEAR AMBIENT 4 FT. NEW LUMINAIRE RATED GREATER THAN OR EQUAL TO 140 LPW
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	LED DIRECT/INDIRECT LINEAR AMBIENT 8 FT. NEW LUMINAIRE RATED GREATER THAN OR EQUAL TO 125 LPW AND < 140 LPW
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	LED DIRECT/INDIRECT LINEAR AMBIENT 8 FT. NEW LUMINAIRE RATED GREATER THAN OR EQUAL TO 140 LPW
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	1 X 4 LED INTEGRATED RETROFIT KIT RATED GREATER THAN OR EQUAL TO 125 LPW AND < 140 LPW
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	2 X 2 LED INTEGRATED RETROFIT KIT RATED GREATER THAN OR EQUAL TO 125 LPW AND < 140 LPW
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	2 X 2 LED NEW LUMINAIRE RATED GREATER THAN OR EQUAL TO 125 LPW AND < 140 LPW
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	2 X 4 LED INTEGRATED RETROFIT KIT RATED GREATER THAN OR EQUAL TO 125 LPW AND < 140 LPW
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	2 X 4 LED NEW LUMINAIRE RATED GREATER THAN OR EQUAL TO 140 LPW
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	2X2 LED INTEGRATED RETROFIT KIT RATED GREATER THAN OR EQUAL TO 125 LPW AND LESS THAN 140 LPW AMBIENT INTERIOR COMMERCIAL SPACES
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	2X2 LED LUMINAIRE BETWEEEN 125 LPW AND 140 LPW LED REPLACING 67% LED FIXT 33% TLED
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	2X4 LED INTEGRATED RETROFIT KIT RATED GREATER THAN OR EQUAL TO 125 LPW AND LESS THAN 140 LPW AMBIENT INTERIOR COMMERCIAL SPACES
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	LED DIRECT LINEAR AMBIENT 2 FT. RETROFIT KIT RATED GREATER THAN OR EQUAL TO 125 LPW AND < 140 LPW
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	LED DIRECT LINEAR AMBIENT 4 FT. RETROFIT KIT RATED GREATER THAN OR EQUAL TO 125 LPW AND < 140 LPW
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	LED DIRECT LINEAR AMBIENT 4 FT. RETROFIT KIT RATED GREATER THAN OR EQUAL TO 140 LPW
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	LED DIRECT/INDIRECT LINEAR AMBIENT 4 FT. NEW LUMINAIRE RATED GREATER THAN OR EQUAL TO 125 LPW AND < 140 LPW
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	LIGHTING - INTERIOR INTEGRATED LED RETROFIT KITS - SIZE 1X4, >=125 TO 139 LPW (SWLG012K)
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	LIGHTING - INTERIOR INTEGRATED LED RETROFIT KITS - SIZE 1X4, >=140 LPW
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	LIGHTING - INTERIOR INTEGRATED LED RETROFIT KITS - SIZE 2X2, >=125 TO 139 LPW (SWLG012I)
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	LIGHTING - INTERIOR INTEGRATED LED RETROFIT KITS - SIZE 2X2, >=140 LPW

MeasureClass	Channel	NormUnit	Measurename
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	LIGHTING - INTERIOR INTEGRATED LED RETROFIT KITS - SIZE 2X4, >=125 TO 139 LPW (SWLG012G)
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	LIGHTING - INTERIOR INTEGRATED LED RETROFIT KITS - SIZE 2X4, >=140 LPW
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	LIGHTING - INTERIOR LED DIRECT LINEAR AMBIENT 4FT., RETROFIT KIT. >=125 TO 139 LPW (SWLG012U)
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	LIGHTING - INTERIOR LED DIRECT LINEAR AMBIENT 8FT., RETROFIT KIT. >=125 TO 139 LPW (SWLG012W)
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	LIGHTING - INTERIOR LED NEW DIRECT/INDIRECT AMBIENT LUMINAIRE - 4FT., >=125 TO 139 LPW (SWLG012O)
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	LIGHTING - INTERIOR LED NEW DIRECT/INDIRECT AMBIENT LUMINAIRE - 4FT., >=140 LPW
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	LIGHTING - INTERIOR LED NEW DIRECT/INDIRECT AMBIENT LUMINAIRE - 8FT., >=125 TO 139 LPW (SWLG012Q)
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	LIGHTING - INTERIOR LED NEW DIRECT/INDIRECT AMBIENT LUMINAIRE - 8FT., >=140 LPW
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	LIGHTING - INTERIOR LED NEW LUMINAIRE - SIZE 2X2, >=125 TO 139 LPW (SWLG012C)
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	LIGHTING - INTERIOR LED NEW LUMINAIRE - SIZE 2X2, >=125 TO 139 LPW, (SWLG012C)
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	LIGHTING - INTERIOR LED NEW LUMINAIRE - SIZE 2X2, >=140 LPW
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	LIGHTING - INTERIOR LED NEW LUMINAIRE - SIZE 2X4, >=140 LPW
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	LIGHTING - INTERIOR LED NEW LUMINAIRE - SIZE 2X4, >=125 TO 139 LPW (SWLG012A)
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	2X2 LED RETROFIT KIT BETWEEEN 125 LPW AND 140 LPW LED
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	2X4 LED INTERIOR LUMINAIRE BETWEEN 125 LPW AND 140 LPW LED
KILOLUMEN LUMINAIRE	Downstream	KILOLUMEN	2X4 LED INTERIOR RETROFIT KIT BETWEEN 125 LPW AND 140 LPW LED
KILOLUMEN LUMINAIRE	Midstream	KILOLUMEN	1X4 LED INTEGRATED RETROFIT KIT RATED GREATER THAN OR EQUAL TO 125 LPW AND LESS THAN 140 LPW AMBIENT INTERIOR COMMERCIAL SPACES
KILOLUMEN LUMINAIRE	Midstream	KILOLUMEN	2X2 LED INTEGRATED RETROFIT KIT RATED GREATER THAN OR EQUAL TO 125 LPW AND LESS THAN 140 LPW AMBIENT INTERIOR COMMERCIAL SPACES
KILOLUMEN LUMINAIRE	Midstream	KILOLUMEN	2X4 LED INTEGRATED RETROFIT KIT RATED GREATER THAN OR EQUAL TO 125 LPW AND LESS THAN 140 LPW AMBIENT INTERIOR COMMERCIAL SPACES
KILOLUMEN LUMINAIRE	Midstream	KILOLUMEN	2X4 LED NEW LUMINAIRE RATED GREATER THAN OR EQUAL TO 125 LPW AND LESS THAN 140 LPW AMBIENT INTERIOR COMMERCIAL SPACES
KILOLUMEN LUMINAIRE	Midstream	KILOLUMEN	1X4 LED LUMINAIRE BETWEEN 125 LPW AND 140 LPW LED
KILOLUMEN LUMINAIRE	Midstream	KILOLUMEN	1X4 LED RETROFIT KIT BETWEEN 125 LPW AND 140 LPW LED
KILOLUMEN LUMINAIRE	Midstream	KILOLUMEN	2X2 LED LUMINAIRE BETWEEEN 125 LPW AND 140 LPW LED
KILOLUMEN LUMINAIRE	Midstream	KILOLUMEN	2X2 LED RETROFIT KIT BETWEEEN 125 LPW AND 140 LPW LED
KILOLUMEN LUMINAIRE	Midstream	KILOLUMEN	2X2 LED RETROFIT KIT RATED GREATER THAN OR EQUAL TO 140 LPW LED
KILOLUMEN LUMINAIRE	Midstream	KILOLUMEN	2X4 LED INTERIOR LUMINAIRE BETWEEN 125 LPW AND 140 LPW LED
KILOLUMEN LUMINAIRE	Midstream	KILOLUMEN	2X4 LED INTERIOR RETROFIT KIT BETWEEN 125 LPW AND 140 LPW LED
KILOLUMEN LUMINAIRE	Midstream	KILOLUMEN	2X4 LED RETROFIT KIT RATED GREATER THAN OR EQUAL TO 140 LPW LED
T-LED	Downstream	LAMP	(1) 48IN T8 LAMP LED REPLACING (1) 48IN T8 LINEAR FLUORESCENT
T-LED	Downstream	LAMP	LED T8 LAMP UL TYPE A 4 FOOT
T-LED	Downstream	LAMP	LED T8 LAMP_DIRECT INSTALL (SWLG009A)
T-LED	Downstream	LAMP	LED T8 LAMP_PREREBDOWN (SWLG009A)
T-LED	Midstream	LAMP	(1) 48IN T8 LAMP LED REPLACING (1) 48IN T8 LINEAR FLUORESCENT
T-LED	Midstream	LAMP	LED T8 LAMP UL TYPE A 4 FOOT
T-LED	Midstream	LAMP	LED T8 LAMP_PREREBUP_MID-STREAM (SWLG009A)
OUTDOOR FIXTURE	Downstream	FIXTURE	LED OUTDOOR FUEL PUMP CANOPY LIGHTING: INSTALL 0 - 19 WATTS FIXTURE
OUTDOOR FIXTURE	Downstream	FIXTURE	LED OUTDOOR FUEL PUMP CANOPY LIGHTING: INSTALL 100 - 153 WATTS FIXTURE
OUTDOOR FIXTURE	Downstream	FIXTURE	LED OUTDOOR FUEL PUMP CANOPY LIGHTING: INSTALL 20 - 29 WATTS FIXTURE
OUTDOOR FIXTURE	Downstream	FIXTURE	LED OUTDOOR FUEL PUMP CANOPY LIGHTING: INSTALL 30 - 46 WATTS FIXTURE
OUTDOOR FIXTURE	Downstream	FIXTURE	LED OUTDOOR FUEL PUMP CANOPY LIGHTING: INSTALL 47 - 59 WATTS FIXTURE
OUTDOOR FIXTURE	Downstream	FIXTURE	LED OUTDOOR FUEL PUMP CANOPY LIGHTING: INSTALL 60 - 73 WATTS FIXTURE
OUTDOOR FIXTURE	Downstream	FIXTURE	LED OUTDOOR FUEL PUMP CANOPY LIGHTING: INSTALL 74 - 99 WATTS FIXTURE
OUTDOOR FIXTURE	Downstream	FIXTURE	LED OUTDOOR PARKING GARAGE LIGHTING: INSTALL 0 - 38 WATTS FIXTURE
OUTDOOR FIXTURE	Downstream	FIXTURE	LED OUTDOOR PARKING GARAGE LIGHTING: INSTALL 39 - 56 WATTS FIXTURE
OUTDOOR FIXTURE	Downstream	FIXTURE	LED OUTDOOR PARKING GARAGE LIGHTING: INSTALL 57 - 88 WATTS FIXTURE
OUTDOOR FIXTURE	Downstream	FIXTURE	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 0 - 29 W FIXTURE
OUTDOOR FIXTURE	Downstream	FIXTURE	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 108 - 146 W FIXTURE
OUTDOOR FIXTURE	Downstream	FIXTURE	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 147 - 235 W FIXTURE
OUTDOOR FIXTURE	Downstream	FIXTURE	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 236 - 390 W FIXTURE
OUTDOOR FIXTURE	Downstream	FIXTURE	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 30 - 45 W FIXTURE
OUTDOOR FIXTURE	Downstream	FIXTURE	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 391 - 571 W FIXTURE
OUTDOOR FIXTURE	Downstream	FIXTURE	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 46 - 68 W FIXTURE
OUTDOOR FIXTURE	Downstream	FIXTURE	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 69 - 90 W FIXTURE
OUTDOOR FIXTURE	Downstream	FIXTURE	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 91 - 107 W FIXTURE
OUTDOOR FIXTURE	Downstream	FIXTURE	LED OUTDOOR WALL-MOUNTED AREA LIGHTING: INSTALL 0 - 25 WATTS FIXTURE
OUTDOOR FIXTURE	Downstream	FIXTURE	LED OUTDOOR WALL-MOUNTED AREA LIGHTING: INSTALL 127 - 203 WATTS FIXTURE
OUTDOOR FIXTURE	Downstream	FIXTURE	LED OUTDOOR WALL-MOUNTED AREA LIGHTING: INSTALL 26 - 39 WATTS FIXTURE
OUTDOOR FIXTURE	Downstream	FIXTURE	LED OUTDOOR WALL-MOUNTED AREA LIGHTING: INSTALL 40 - 58 WATTS FIXTURE
OUTDOOR FIXTURE	Downstream	FIXTURE	LED OUTDOOR WALL-MOUNTED AREA LIGHTING: INSTALL 59 - 78 WATTS FIXTURE
OUTDOOR FIXTURE	Downstream	FIXTURE	LED OUTDOOR WALL-MOUNTED AREA LIGHTING: INSTALL 79 - 97 WATTS FIXTURE
OUTDOOR FIXTURE	Downstream	FIXTURE	LED OUTDOOR WALL-MOUNTED AREA LIGHTING: INSTALL 98 - 126 WATTS FIXTURE
OUTDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-COMMERCIAL OUTDOOR WALL-MOUNTED AREA: LED FIXTURE: INSTALL 0 - 25 W
OUTDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-COMMERCIAL OUTDOOR WALL-MOUNTED AREA: LED FIXTURE: INSTALL 127 - 203 W
OUTDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-COMMERCIAL OUTDOOR WALL-MOUNTED AREA: LED FIXTURE: INSTALL 26 - 39 W
OUTDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-COMMERCIAL OUTDOOR WALL-MOUNTED AREA: LED FIXTURE: INSTALL 40 - 58 W
OUTDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-COMMERCIAL OUTDOOR WALL-MOUNTED AREA: LED FIXTURE: INSTALL 59 - 78 W
OUTDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-COMMERCIAL OUTDOOR WALL-MOUNTED AREA: LED FIXTURE: INSTALL 79 - 97 W
OUTDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-COMMERCIAL OUTDOOR WALL-MOUNTED AREA: LED FIXTURE: INSTALL 98 - 126 W
OUTDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-COMMERCIAL PARKING GARAGE: LED FIXTURE: RATED FROM 5600 TO 6999 LUMENS AND >= 120 LPW
OUTDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-COMMERCIAL POLE/ARM-MOUNTED ROAD & AREA: LED FIXTURE, INSTALL 108 - 146 W
OUTDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-COMMERCIAL POLE/ARM-MOUNTED ROAD & AREA: LED FIXTURE, INSTALL 147 - 235 W
OUTDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-COMMERCIAL POLE/ARM-MOUNTED ROAD & AREA: LED FIXTURE, INSTALL 236 - 390 W
OUTDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-COMMERCIAL POLE/ARM-MOUNTED ROAD & AREA: LED FIXTURE, INSTALL 30 - 45 W
OUTDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-COMMERCIAL POLE/ARM-MOUNTED ROAD & AREA: LED FIXTURE, INSTALL 391 - 571 W
OUTDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-COMMERCIAL POLE/ARM-MOUNTED ROAD & AREA: LED FIXTURE, INSTALL 46 - 68 W

MeasureClass	Channel	NormUnit	Measurename
OUTDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-COMMERCIAL POLE/ARM-MOUNTED ROAD & AREA: LED FIXTURE, INSTALL 69 - 90 W
OUTDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-COMMERCIAL POLE/ARM-MOUNTED ROAD & AREA: LED FIXTURE, INSTALL 91 - 107 W
OUTDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-COMMERICAL OUDOOR FUEL PUMP CANOPY: LED FIXTURE: INSTALL 0 - 19 W
OUTDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-COMMERICAL OUDOOR FUEL PUMP CANOPY: LED FIXTURE: INSTALL 30 - 46 W
OUTDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-COMMERICAL OUDOOR FUEL PUMP CANOPY: LED FIXTURE: INSTALL 47 - 59 W
OUTDOOR FIXTURE	Downstream	FIXTURE	LIGHTING-COMMERICAL OUDOOR FUEL PUMP CANOPY: LED FIXTURE: INSTALL 60 - 73 W
OUTDOOR FIXTURE	Midstream	EACH	LED OUTDOOR PARKING GARAGE LIGHTING: INSTALL 39 - 56 WATTS FIXTURE LED REPLACING 60% LED 20% LINEAR FLUORESCENT AND 20% MH
OUTDOOR FIXTURE	Midstream	EACH	LED OUTDOOR PARKING GARAGE LIGHTING: INSTALL 57 - 88 WATTS FIXTURE LED REPLACING 60% LED 20% LINEAR FLUORESCENT AND 20% MH
OUTDOOR FIXTURE	Midstream	EACH	LED OUTDOOR PARKING GARAGE LIGHTING: INSTALL 89 - 113 WATTS FIXTURE LED REPLACING 60% LED 20% LINEAR FLUORESCENT AND 20% MH
OUTDOOR FIXTURE	Midstream	EACH	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 0 - 29 W FIXTURE LED REPLACING 100% LED AT 25TH PERCENTILE LIGHTING FACTS
OUTDOOR FIXTURE	Midstream	EACH	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 108 - 146 W FIXTURE LED REPLACING 100% LED AT 25TH PERCENTILE LIGHTING FACTS
OUTDOOR FIXTURE	Midstream	EACH	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 147 - 235 W FIXTURE LED REPLACING 100% LED AT 25TH PERCENTILE LIGHTING FACTS
OUTDOOR FIXTURE	Midstream	EACH	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 236 - 390 W FIXTURE LED REPLACING 100% LED AT 25TH PERCENTILE LIGHTING FACTS
OUTDOOR FIXTURE	Midstream	EACH	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 30 - 45 W FIXTURE LED REPLACING 100% LED AT 25TH PERCENTILE LIGHTING FACTS
OUTDOOR FIXTURE	Midstream	EACH	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 391 - 571 W FIXTURE LED REPLACING 100% LED AT 25TH PERCENTILE LIGHTING FACTS
OUTDOOR FIXTURE	Midstream	EACH	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 46 - 68 W FIXTURE LED REPLACING 100% LED AT 25TH PERCENTILE LIGHTING FACTS
OUTDOOR FIXTURE	Midstream	EACH	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 69 - 90 W FIXTURE LED REPLACING 100% LED AT 25TH PERCENTILE LIGHTING FACTS
OUTDOOR FIXTURE	Midstream	EACH	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 91 - 107 W FIXTURE LED REPLACING 100% LED AT 25TH PERCENTILE LIGHTING FACTS
OUTDOOR FIXTURE	Midstream	EACH	LED OUTDOOR WALL-MOUNTED AREA LIGHTING: INSTALL 0 - 25 WATTS FIXTURE LED REPLACING 100% LED AT 25TH PERCENTILE LIGHTING FACTS
OUTDOOR FIXTURE	Midstream	EACH	LED OUTDOOR WALL-MOUNTED AREA LIGHTING: INSTALL 204 - 337 WATTS FIXTURE LED REPLACING 100% LED AT 25TH PERCENTILE LIGHTING FACTS
OUTDOOR FIXTURE	Midstream	EACH	LED OUTDOOR WALL-MOUNTED AREA LIGHTING: INSTALL 26 - 39 WATTS FIXTURE LED REPLACING 100% LED AT 25TH PERCENTILE LIGHTING FACTS
OUTDOOR FIXTURE	Midstream	EACH	LED OUTDOOR WALL-MOUNTED AREA LIGHTING: INSTALL 40 - 58 WATTS FIXTURE LED REPLACING 100% LED AT 25TH PERCENTILE LIGHTING FACTS
OUTDOOR FIXTURE	Midstream	FIXTURE	LED FIXTURE: POLE-MOUNTED EXTERIOR RATED 146 WATTS
OUTDOOR FIXTURE	Midstream	FIXTURE	LED FIXTURE: POLE-MOUNTED EXTERIOR RATED 235 WATTS
OUTDOOR FIXTURE	Midstream	FIXTURE	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 108 - 146 W FIXTURE LED REPLACING 100% LED AT 25TH PERCENTILE LIGHTING FACTS
OUTDOOR FIXTURE	Midstream	FIXTURE	LED OUTDOOR POLE/ARM-MOUNTED AREA LIGHTING: INSTALL 236 - 390 W FIXTURE LED REPLACING 100% LED AT 25TH PERCENTILE LIGHTING FACTS
OUTDOOR FIXTURE	Midstream	FIXTURE	LED PARKING GARAGE LUMINAIRE RATED > 7000 TO 8800 LUMENS AND >= 120 LPW

APPENDIX F:

RESPONSE TO COMMENTS

Comment #	PA	Location	Page	Topic	Question/Comment	Evaluator Response
1	PG&E	1-1	1-1	LED tube replacements	Can the evaluator please state in the report what proportion of lamps replaced by the TLED or LED fixtures is older generation LED or TLED technology?	Most respondents indicated that the new LED technologies were replacing T8s or other fluorescents (T10, T12, T5, or other unspecified fluorescent technologies); there were also a handful of sites reporting HID/Metal Halide/High-Pressure Sodium lamps. Only one SCE respondent indicated that their new TLEDs were replacing older generation LED lamps.
2	PG&E	1-1	1-1	HOU values	Is there any speculation on why the HOU values deviate, other than the possiblity that the IOU has made conservative HOU estimates based on the customer input? If the evaluators could speak to this in the report, it would be helpful.	The IOU workpapers all used DEER values for the HOU in their ex ante savings calculations. The DEER HOU values specified are all lower than what we found in this year's and last year's evaluation, which is why we have recommended those values being updated. The ex post values are in part higher because we found a number of business to operate at or near 24 hours a day, 7 days a week. This is why we have also provided a recommendation to create a special business type category for 24/7 operation.
3	PG&E	1-2	1-3	Typo	Figure 1-1 presents the distribution of lifecycle MWh savings for indoor LED Fixtures and tubes (fixes "sand").	Thank you, we have made that edit in the report.
4	PG&E	Executive Summary	Pgs 1-7	NTG	The report indicates that the NTG evaluated is only 0.72 compared to 0.78 reported by PG&E; however, the report does not seem to take into account the fact that PG&E's delivery type is more of a direct install or downstream approach, so perhaps the sample (customers interviewed) should be larger, when compared to Upstream program?	We feel the total sample size of 64 points was more than sufficient for PG&E as indicated by the relative precisions presented in table 6-1 (15% for fixtures with 33 points and 9% for kilolumen with 31 points). Also, according to the tracking data, only 1% of the PG&E fixture and kilolumen measures used a DI approach. PG&E assumes an ex ante NTGR of 0.96 (0.91 + 0.5 market affects adder) for a significant portion of their population, and 0.65 (0.60 + 0.05 adder) for most of the remainder of their population, resulting in an average of 0.78. Although these are DEER approved values, the 0.96 value may be more appropriate for DI types of installations, and the 0.65 for most other downstream deemed applications. Had PG&E used 0.96 only for their direct installation projects, and 0.65 for most of the remainder, the ex ante would have been very close to 0.65 and the ex post would have been shown to be higher at 0.72 (instead of lower).
5	PG&E	Executive Summary	5-8	EUL	The report states that the hours of operation for this study were estimated using adjustment factors from 2013-2014 (Due to COVID-19); we think this is a concern for the accuracy of the lifecycle analysis of this measures.	The lighting schedules for PY2019 reflect pre-COVID-19 ("normal") operation. The COVID-19 reference was to indicate that we were not able to conduct our usual evaluation activities, which include installing loggers to capture lighting operation on site. In the absence of logger data we could have derived HOU values based on self-reported lighting operation only. However, past evaluations show that self-reported information overstates actual lighting operation. There is no reason to believe that the quality of self-reported information regarding the operation of tube lamps changed significantly in 2019 as compared to 2013-2014. This is why we used the adjustment factors derived in 2013-2014 for long tubes; these adjustment factors vary by building type, day type, and control type (switch or occupancy sensor.) In other words, we believe the use of these factors is appropriate because we believe the self-reported operation schedule for long tubes is as overstated in 2019 as it was in 2013-2014. Note that the evaluated HOU are still higher than the DEER-based HOU that form the basis of the claims.
6	PG&E	6-5	6-12	NTR Results	Can the evaluators explain the large difference between ExAnte and ExPost for PG&E Downstream Fixtures (0.91 vs 0.58 in Table 6-1) which is significantly different from any of the other ExAnte to ExPost comparisons?	For the fixture measure, PG&E used almost exclusively a 0.91 NTGR (not including the 0.05 market affects adder), but used the 0.60 value most frequently for the Kilolumen measures. Had PG&E used the 0.60 ex ante value, it would be very similar to the 0.58 ex post NTGR. The reason for this difference is due to PG&E using the high ex ante value for this measure. As mentioned above, if PG&E used 0.91 (or 0.96 including the market affects adder) for DI and 0.60 for most other installations, the overall ex ante value would have been close to 0.60, which is also close to the ex post 0.58 value.
7	PG&E	7-3	7-7	Typo	Table 7-8 appears to be mislabeled since it does not include PAI scores. Could the evaluators review this and correct, if needed?	Thank you, you are correct. We have made that edit in the report.

Comment #	PA	Location	Page	Topic	Question/Comment	Evaluator Response
8	PG&E	8	8-2	Recommendations	"Conclusion 3: In general, lighting measures exhibited medium program influence levels for both midstream and downstream approaches. Recommendation 3: The PA's should continue to utilize both the midstream and downstream approaches" Can the evaluators provide a recommendation in the report that is focused on how to improve program influence or otherwise limit free-ridership?	We did not do any type of assessment of how to reduce free ridership. However, as we mentioned above, only 4% of PG&E's measures were delivered through a DI approach according to the tracking data. DI programs have shown higher NTGRs in the past, relative to other downstream deemed programs. So using this delivery approach may result in higher NTGRs; however we did not do any analysis this year to support that statement.
9	SDG&E	3-2-1	Pg. 32 (3-6)	HOU values	The report states that no adjustment factors were available for rebated measures that are installed on circuits connected directly to timeclocks, electric panels, and EMS. Does that mean the HOU was not adjusted for these measures?	For such measures we estimated the HOU based on a schedule derived from facility operating hours, adjusted by the self-reported percentage of lamps switched on during operation. No additional logger-based adjustments were applied, since we had none available. In other words: we still used the survey-based information to estimate an HOU, rather than pass through the DEER-based HOU.
10	SDG&E	6-4-3	Pg. 66 (6-9)	NTG	Why did the evaluation team decide to use three customer survey completes as the threshold to adjust the distributor score?	We used Figure 6-1 to help us in our decision on what to use for a cutpoint. We were not comfortable using only 1 or 2 points. Because there were a relatively large number of distributors with 3 customer responses, we decided to use that as a cutpoint and felt relatively comfortable that 3 responses provided enough diversity. Had there only been, say 1 or 2 distributors with 3 customers, or more distributors with 4+ customer responses, we may have chosen a higher cutpoint. Furthermore, the average customer NTGR was similar to the average distributor NTGR, so there was not a lot of sensitivity to the cutpoint. The difference for SDG&E, for example, for a cutpoint of only a single customer versus ten customers as the cutpoint, resulted in a difference to the NTGR by only 0.02.
11	SDG&E	6-4-3	Pg. 67 (6-10)	NTG	Has the evaluation team considered different methods of triangulating distributor and customer NTGRs, instead of taking the average? For example, the Illinois Energy Efficiency Stakeholder Advisory Group developed an approach that combines distributor FR and end-user FR values that weights the scores according to likely bias, accuracy, and representativeness of the results.	We did consider three different approaches. However, as mentioned above, because the customer and distributor NTGRs were very similar, the different approaches on how customer and distributor responses were weighted did not result in NTGRs that varied much. In addition to the approach we used (adjusting the distributor responses), we tried a similar approach where we used the customer responses as the basis and adjusted those using the distributor responses. And we also considered an approach where we treated the distributors and customers as two separate independent estimates and averaged the two (so equal weight). All three approaches gave results within 0.04 of each other.
12	SDG&E	8	Pg. 84 (8-2)	Recommendations	Recommendation 4. For SDG&E, we have the Qualified Purchaser Acknowledgement Form that the customer has to fill out when purchasing the lights. The distributor contact is also documented. See link: https://www.sdge.com/sites/default/files/documents/FINAL_S2070008_InstantLighting_QualifyingPurchaserAcknowledgementForm.pdf?nid=8451	Thank you for your comment. The form that you are using to obtain customer contact information is very helpful. We have modified our finding and recommendation in the report. When we received the original tracking data, customer contact information was not included, however SCE and SDG&E were able to provide this information through a data request. The contact information we received for this evaluation was much better than what we have worked with in prior years, which was very helpful for our evaluation this year. The main point of our recommendation is that we would like to make sure that as programs transition more to 3P, that this data still continues to be collected. We will modify the report to reflect this and to point out that the quality of information that was received this year was improved over prior years, where similar recommendations were made. Thank you!
13	SDG&E	8	Pg. 83 (8-1)	Recommendations	Recommendation 2. This recommendation could be challenging if future evaluations plan to rely on customer self-reports to inform age/condition of existing fixtures. Customers may not track when the existing fixture had been installed, which would make future evaluations difficult to monitor the age/condition.	We have been collecting the age and condition of replaced equipment on our telephone surveys for the past several evaluation cycles (in addition to collecting similar information on site). We agree that one cannot always get a self-reported value, but we have been able to do so in most cases. Of course, the information would be most reliable if collected when the new lighting measures are installed.