



Pacific Gas and Electric Company's Lighting Innovation Midstream Trial Evaluation

Final Report

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Executive Summary

Introduction

Pacific Gas and Electric Company (PG&E) contracted Evergreen Economics, Inc. (“Evergreen”) in November 2013 to conduct an assessment of PG&E’s Lighting Innovation Midstream Trial (“the Trial”).

The Trial provides financial incentives to distributor-level suppliers for the sale of LED replacement lamps to commercial customers in the PG&E service territory. PG&E has offered rebates since April 2013. The distributors typically pass along most or the entire rebate to the commercial customer (in the form of reduced purchase prices). According to PG&E’s research proposal,¹ the purpose of the Trial is to test a midstream incentive program theory for increasing the rate of LED adoption in the commercial sector.

Evergreen designed this study to coordinate with and complement Southern California Edison’s Midstream LED Pilot Evaluation.

Trial Program Theory

The hypothesis of the Trial’s program theory was that “incentives provided to distributors as part of a buy-down program can influence contractors and customers to adopt LED lights.”² The Trial’s program theory also posits that market actors at the distribution/wholesaler level of the commercial lighting market offer a consolidated target for the Trial incentives and outreach – there are fewer distributors than contractors serving the same overall number of commercial building owners.

Researchable Issues

The main objectives of this study include the following:

1. Study the feasibility of the Trial’s design;
2. Determine the effectiveness of offering midstream incentives; and,
3. Compare the midstream Trial to the downstream commercial lighting incentive program.

There are many additional, specific research objectives identified by PG&E and Evergreen in Section 1.2 of the report.

¹ “Midstream Trial_EMV_Study_Proposal 09_27_13_V04.doc”

² “Midstream LED Directional Lamp Trial v2.1.doc”

Data Collection and Analysis Methods

To inform the research objectives, Evergreen analyzed Trial sales data, compared the sales data with PG&E program sales data through the Local Government Partnership (LGP)/Third Party Direct Install Programs and downstream program (including sales via the Trade Professional Alliance), conducted in-depth interviews with LED market actors (LED manufacturers, distributors, and local government partnership and third party direct install LED program implementers³), conducted commercial end-user telephone surveys with Trial LED lamp recipients, and developed recommendations for likely market indicators. We also conducted an evaluability assessment and developed both a lighting rebate programs overview diagram and logic model for the Trial.

Summary of Results

Overall, the findings from this study suggest that the midstream incentives have proven effective. Key evidence includes sales of midstream incentivized LED replacement lamps outpacing sales of LED replacement lamps and/or fixtures through PG&E's other commercial deemed incentive programs during the study period, as well as high levels of satisfaction with the rebate application and payment process from market actors and end-users. Furthermore, prior to the Trial, there were very few projects that received incentives for LED general-purpose lighting products.

It is unclear whether cannibalization – the extent to which competition with other program channels diminishes uptake – is occurring to even a small degree, as there is very little overlap between the 3P DI / LGP projects and Trial projects, and the products offered in the downstream programs are different from those offered through the Trial (fixtures as opposed to LED replacement lamps). While the types of commercial businesses that participate in the different programs are similar, market actors report that the scale of a project is much different for an end-user replacing fixtures versus one replacing lamps (and leaving existing fixtures in place). Based on the lack of overlap and finding that project considerations are much different for fixtures versus lamp replacement projects, as well as positive feedback regarding participation in the Trial (among distributors and end-users), we conclude that the Trial is complimentary to the existing portfolio of PG&E commercial lighting rebate programs.

This evaluation found that the Trial's design is feasible, although the findings suggest that the program logic and theory should be revised. Contractors are less involved than anticipated and participation is driven by very large and very small purchases (as opposed to primarily small projects) many of which are direct sales from distributors to end-use commercial customers.

³ We initially intended to contact lighting installation contractors as well. Data issues and research findings led to PG&E and Evergreen deciding to forgo contractor interviews and focus on other market actors.

Participating distributors and end-users were very satisfied with the Pilot Program. Nearly all of the participating distributors said they were “very likely” to suggest LED lamps to commercial customers due to the Trial. Participating distributors were satisfied with the rebate processing time and qualifying products list, although satisfaction with the products list was mixed among manufacturers. Regardless, end-users expressed high levels of satisfaction with the installed LED equipment.

End users reported that their decision to install LEDs resulted from market actor recommendations (primarily distributors) and that the Trial was easier to participate in compared to other incentive programs (where they are more involved in filling out paperwork, etc.), which suggests that the overall theory – at least from the perspective of the end user – is valid. Furthermore, end-users report that the incentives were important in the decision to install LEDs, with one-third reporting that they would have installed fewer or no LEDs if they were required to handle the incentive application process themselves.

Manufacturers report concern over the quality of the products on the Trial program qualifying product list, as well as a particular concern related to the incentive structure: since the incentive level is tied to the wattage of lamps alone, some manufacturers may opt to develop products that are higher wattage than required in order to qualify for a higher incentive. The concerned manufacturers suggested that the incentive structure should be tied to other performance factors in addition to wattage. Four of the five manufacturers hoped that in the future linear LED products would qualify for the Trial.

Projects that received financial incentives through the Downstream and 3P DI / LGP programs were typically smaller, with approximately 75 percent between one and 40 lamps in size, and approximately 90 percent of projects consisting of 100 units or less (for each program). Similarly, a large proportion of Midstream program projects are 100 lamps or less in size (approximately 86 percent). However, only 61 percent are between one and 40 lamps in size.

The two lamp types most commonly replaced by Trial incentivized LEDs were incandescent lamps and halogen lamps.⁴ Eighty-two percent of Trial LED replacement lamps were installed in sockets with functioning existing lamps, and 18 percent were installed in places where lamps had failed.

Recommendations

The preponderance of evidence suggests that the midstream incentive mechanism would be an effective tool for a full-scale PG&E energy efficiency incentive program. **Thus, the primary recommendation from this early EM&V assessment is to continue offering midstream incentives at the distributor level for LED replacement lamps.** Additional recommendations include:

⁴ See Section 4.3.4 for additional details regarding replaced lamp types.

1. **Revise the program theory and logic model** to reflect that contractors are less involved than anticipated and that most sales are direct from the distributor to the end-user.
2. **Develop systems to track market indicators outlined in section 6.2.** These indicators will help assess the effectiveness of the Trial and conditions in the overall commercial LED replacement lamp market.
3. **Seek to improve end use facility type data in program tracking (ensure that this is required of distributors) and monitor changes in participating end use business types.**
4. **Ensure that end-user contact information is captured for all facilities receiving midstream incentivized LED replacement lamps.** Not capturing this information would open a future program up to significant challenges during EM&V. If failing to capture this information, PG&E takes on a great deal of risk by potentially making it difficult to confirm installations and thus savings. Therefore, effort should be made to ensure program-tracking data includes end-user contact data. PG&E should consider matching end use customer location and business name information with utility account numbers in PG&E's database of utility customers as part of quality insurance protocols.
5. **Consider adding additional lamp specification requirements for qualifying products.** According to the manufacturers themselves, since the incentive amount is only tied to the lamp wattage, there is no direct incentive for them to develop higher quality, higher efficacy lamps.

1 Introduction

Pacific Gas and Electric Company (PG&E) contracted Evergreen Economics, Inc. (“Evergreen”) in November 2013 to conduct an assessment of PG&E’s Lighting Innovation Midstream Trial (“the Trial”).

The Trial provides financial incentives to distributor-level suppliers for the sale of LED replacement lamps to commercial customers in the PG&E service territory. PG&E has offered rebates as part of the Trial since April 2013. The distributors typically pass along most or the entire rebate to the commercial customer (in the form of reduced purchase prices). According to PG&E’s research proposal,⁵ the purpose of the Trial is to test a midstream incentive program theory for increasing the rate of LED adoption in the commercial sector.

For years, the downstream delivery approach – with rebates paid directly to customers – has been the preferred intervention method in the promotion of energy efficient lighting products for the commercial market. However, recent reductions on claimable savings as well as downward adjustments to the total resource costs (TRC) cost effectiveness calculations make it necessary to look at other delivery approaches that may prove to be more effective program models.

Evergreen designed this study to coordinate with and complement Southern California Edison’s Midstream LED Pilot Evaluation.

1.1 Market Barriers and Program Theory

In this section we explain the market barriers that the Trial aims to address, as well as the Trial program theory.

1.1.1 Market Barriers

The Trial aims to address numerous market barriers to adoption of LEDs among nonresidential customers. These barriers include:

- High initial cost
- Longer payback period (than incumbent efficient technology)
- Low end-user and contractor awareness
- Low end-user and contractor knowledge
- Existing market structure and relationships (“status quo”)

In order to overcome the barriers listed above and have a significant, cost effective impact on the LED market, PG&E developed a program theory for the Trial.

⁵ “Midstream Trial_EMV_Study_Proposal 09_27_13_V04.doc”

1.1.2 Trial Program Theory

The hypothesis of the Trial's program theory was that "incentives provided to distributors as part of a buy-down program can influence contractors and customers to adopt LED lights."⁶ This theory was based on five key assumptions regarding the commercial lighting market:

- 1) Commercial building owners rely on contractors for product purchase decisions, and building owners are typically not well-educated about LED products;
- 2) Contractors are the primary source of influence for commercial building owners, and contractors currently know little about LEDs and tend to focus on first cost;
- 3) Contractors may be unwilling to adopt LEDs because sales of LEDs may reduce their amount of work due to long product life;
- 4) Contractors will be motivated by the availability of training and incentives for LED products to learn more about them and to promote them more actively to their clients (the commercial building owners); and,
- 5) Lighting distributors are a source of information for contractors.

Lastly, the Trial's program theory posited that market actors at the distribution/wholesaler level of the commercial lighting market offer a consolidated target for the Trial incentives and outreach – there are fewer distributors than contractors serving the same overall number of commercial building owners.

Through the course of the Trial, it became clear that this program theory did not reflect the full extent of the distributor incentive approach. Additionally, our research findings confirm some of the key assumptions but reject others, primarily due to the finding from the PG&E program team – confirmed by Evergreen – that contractors were not as heavily involved in the replacement lamp market as assumed.

Therefore, while the original program theory may be accurate for cases in which contractors are involved, the theory does not capture the majority of program activities (LED replacement lamp installations by non-contractors). Thus, the program theory discussed above required revision to accurately reflect the reality experienced through implementation of the midstream LED Trial. A revised logic model and further discussion can be found in Section 7.1 of this report.

1.2 Research Objectives and Overview of Approach

The main objectives of this assessment include the following:

- Study the feasibility of the Trial's design;

⁶ "Midstream LED Directional Lamp Trial v2.1.doc"

- Determine the effectiveness of offering midstream incentives;
- Compare the midstream Trial to the downstream commercial lighting incentive program, the third-party direct install programs, and local government partnership programs;
- Solicit feedback from commercial lighting manufacturers, contractors and distributors regarding their experiences with the Trial, including the impact of the Trial on sales channels, product development, and customer engagement;
- Solicit feedback from LGP/Third Party Direct Install program implementers regarding whether the midstream approach targets the same or different customers than direct install;
- Solicit feedback from commercial lighting contractors and distributors regarding end-user customer perspectives regarding the appropriate incentive mechanisms (e.g., downstream versus midstream);
- Solicit feedback from end-users regarding their experiences with the trial.

In addition to the research objectives listed above, the evaluation will inform the following key areas of interest:

- Provide an evaluability assessment to facilitate best practice program design (i.e., setting up appropriate data collection and documentation procedures to assist in ex post evaluation);
- Develop a program logic model and an overview diagram of PG&E lighting market interventions to understand the need (or lack of need) for a midstream approach;
- Understand market actor perspectives on which products are suitable for the midstream incentive structure. Consider if there are other products that PG&E should consider adding or moving to the midstream incentive structure approach;
- The percent of customers asking for LED replacement lamps as opposed to other lighting technologies or LED fixtures;
- Whether distributors and contractors view the midstream Trial as a replacement for the Trade Professional Alliance,⁷ as an additional resource in conjunction with the Trade Professional Alliance, or as unnecessary due to the existence of the Trade Professional Alliance.

There were numerous specific research questions identified by the PG&E and Evergreen team that fall within the categories described above. They are included in the survey instruments in Appendix ABC.

⁷ PG&E's Trade Professional Alliance is a network of energy efficiency trade professionals. Trade Professional Alliance members may submit energy efficiency equipment rebate applications on behalf of their customers.

1.3 Research Approach

To accomplish the research objectives outlined above, Evergreen analyzed Trial and downstream sales data, conducted in-depth interviews with LED manufacturers, participating and non-participating distributors, and local government partnership (LGP) and third party direct install (3P DI) LED program implementers, conducted end-user telephone surveys with Trial LED lamp recipients, and developed recommendations for likely market indicators. We also conducted an evaluability assessment and developed both a lighting rebate programs overview diagram and a logic model for the Trial.

Below we describe the approaches for each of the key research tasks.

1.3.1 Tracking Data Analysis and Program Comparisons

Evergreen analyzed sales data from PG&E's Trial and commercial lighting rebate programs using SPSS.⁸ The analyzed data included Trial data from April 2013 through June 2014, and Standard Program Tracking Database (SPTDB) records covering January 2012 through June 2014 for existing LED incentive programs.

One goal of this comparison is to determine if the midstream financial incentive to lighting distributors is increasing the speed of LED adoption compared to the existing PG&E commercial lighting deemed savings incentive programs (excluding calculated incentive programs). To accomplish this, we analyzed the monthly sales volume for each delivery channel and provided comparisons. Another goal of this research task was to assess differences between projects that received incentives through the existing programs and those that received incentives through the Trial (e.g., typical project size, types of LEDs installed).

Lastly, this analysis task is designed to inform an assessment of program overlap and cannibalization⁹ (from existing rebate program offerings) along with the end-user survey and market actor in-depth interviews. Research questions identified by PG&E regarding overlap and cannibalization include the following:

- Are there contractors that have participated in both the Trial and other existing programs, or is there little overlap between the two?
- Are the types of lighting measures offered in the Trial similar to those offered through other existing programs?
- To what extent do end-users participate in both the Trial and the existing programs?
- How do project characteristics (e.g., size, building type) compare between the Trial and the existing programs?

⁸ SPSS is predictive analytics software developed by IBM®.

⁹ Cannibalization: the extent to which competition with other program channels diminishes uptake.

Due to limitations of the data, we were unable to assess contractor overlap across the existing programs and the Trial. Furthermore, we were unable to analyze LED sales from custom incentive programs because the tracking data does not support lamp or fixture level analysis, and the analysis did not include an assessment of the effect of the incentive amounts across program designs.

1.3.2 In-Depth Interviews with Market Actors and LGP/3P DI Implementers

This section describes the manufacturer, participating and non-participating distributor, and LGP/3P DI in-depth guide development, sample design, and research implementation.

Originally we had planned to interview contractors who installed LED replacement lamps incentivized through the Trial, but after contacting participating distributors – and struggling to reach participating contractors – we found that installations are often done either by internal distributor installers or the end-users themselves, rather than independent contractors. We also found that several of the available contacts listed as contractors (53 of 93) had inaccurate contact information including contacts that had phone numbers listed outside of the PG&E service territory and contacts that were not actually contractors. Evergreen and PG&E made a joint decision to allocate ten of the twenty contractor interview targets to the participating distributor strata to compensate for this shortfall and removed the remaining ten targets from the contractor market actor group. Therefore, contractor interview guide development, sampling, and interview implementation are omitted from the following sections.

1.3.2.1 In-depth Interview Guide Development

Evergreen Economics designed three distinct interview guides that covered the four unique groups of participating and non-participating market actors.

- **Manufacturers:** Participating LED manufactures that supply products that received the Trial rebates;
- **Participating and Non-participating Distributors:** Both lighting distributors that participated and did not participate in the Trial; and
- **LGP/3P DI Program Implementers:** LGPs and 3P DI implementers who run programs that incentivize LED sales.

Evergreen developed in-depth interview guides with assistance and review from PG&E evaluation, measurement and verification (EM&V) staff, program implementation staff, and other stakeholders (including review from consultants contracted by the California Public Utilities Commission Energy Division).

1.3.2.2 In-depth Interview Initial Sample Allocations

PG&E provided Evergreen with 124 records of active market actors with whom the IOU engages to promote their programs. After removing contractor interviews from the scope of

the assessment, we had a target of 40 completed in-depth interviews across manufacturers, participating distributors, non-participating distributors, and LGP/3P DI implementers.

Below we describe the way in which we stratified the interview targets for each market actor group.

Manufacturers

We sampled manufacturers based on two key variables – lamp type and lamp sales. Subsequently, we divided manufacturers into three strata that each represented approximately a third of cumulative lamp sales. These groups included:

- Strata M1: This group represented the manufacturers that sold a large distribution of lamp types and relatively high volumes of all lamp types.
- Strata M2: This group contained manufacturers that sold a substantial number of lamps within the different lamp types, but not necessarily a very diverse selection of lamp types (within each manufacturer).
- Strata M3: This group represented the manufacturers that sold only a couple lamp types and in small volumes.

Distributors (Participating and Non-Participating)

We sampled participating distributors using the same key variables as manufacturers – lamp type and lamp sales – in addition to the initial distinction of Trade Professional Alliance participation. We then divided these groups into three strata that each represented approximately one-third of cumulative lamp sales. These groups were:

- Strata D1: This group represented the participating distributors that sold a large variety of lamp types and relatively high volumes of all lamp types.
- Strata D2: This group contained distributors that sold a substantial number of lamps, but not a very diverse selection of lamp types.
- Strata D3: This group represented the distributors that sell only a couple lamp types and in small volumes.

For non-participating distributors, Evergreen assigned a random number to 50 companies identified as non-participating distributors, and dialed according to the assigned random number.

LGP/Third Party Direct Install Implementers

We did not stratify LGP/Direct Install Implementers due to the low number of contacts that were received. Evergreen received contact information intermittently and attempted to reach contacts as they were received.

1.3.2.3 In-depth Interview Implementation and Target Revision

Evergreen staff conducted a total of 33 in-depth interviews between August 26 and November 13, 2014. Interviews averaged 45 minutes for distributors and 38 minutes for manufacturer representatives. Researchers called the market actors at different times of day to increase the probability of contact. Evergreen staff attempted interviews with potential respondents up to five times each. After the third unanswered telephone call the interviewer left a short message, a call back name and number, and indicated that the contact would be called again in two days for follow-up.

The targets, in addition to the total number of completed interviews, can be seen in Table 1.

Table 1: Market Actor Interview Targets and Completed Interviews

Market Actor	Population	Target	Completed Interviews
Manufacturers	27	5	5
Distributors – Participating	39	20	16
Distributors – Non-participating	50	10	7
LGP/3P DI Implementers	8	5	5
Total	124	40	33

1.3.3 Commercial End-User Midstream Trial LED Recipient Telephone Survey

This section describes the commercial end-user telephone survey guide development, sample design, and research implementation.

1.3.3.1 End-user Survey Guide Development

The Evergreen team developed a commercial end-user Trial LED recipient telephone survey with guidance and review from PG&E EM&V staff, program implementation staff, and other stakeholders (including review from consultants contracted by the California Public Utilities Commission Energy Division). The survey was designed to collect data to inform the overall objective of determining the effectiveness of the Trial compared to existing commercial lighting rebate programs. Specific goals of the end-user telephone survey are described below:

- Collect firmographic information on participating end-users by confirming business type and inquiring about square footage;
- Gauge awareness of end-users with regards to the Trial and incentives;
- Understand end-user motivations for doing the lighting retrofit and the importance of the Trial and incentives in that decision;
- Understand the influence of triggered codes on installation decisions;

- Understand the Trial experience from the end-user perspective including where they are receiving incentivized products, their satisfaction with said products, and the Trial overall;
- Collect information about the pre-existing equipment including: age of lamps (replaced on burnout or early replacement), percent of lamps/fixtures changed/retrofitted, and locations of lamps/fixtures;
- Gauge the relative satisfaction with LED light quality (compared to pre-existing equipment); and,
- Understand participant experience with other rebate programs and the comparative experience (ease or lack thereof) of the Trial.

1.3.3.2 End-user Survey Sample Allocations

Evergreen Economics received Trial Program sales data from PG&E that contained 490 unique installation sites after the removal of sites with no contact information.

We segmented end-users based on three key variables: quantity of replacement lamps purchased, business type, and participation in the PG&E downstream programs (overlap). The specific units purchased bins were selected by analyzing both the proportion of sales and the proportion of projects within a number of potential bins. The units purchased bins are shown in Table 2 along with the number of sites in each group, percent of total sites represented in each group, the total lamp sales (quantity), and the percent of total lamp sales.

Table 2: Sample Disposition by Units Purchased Bins

Units Purchased Bins	Number of Sites	Percent of Total Sites	Total Lamp Sales	Percent of Total Lamp Sales
1 to 20	196	40%	2,190	8%
21 to 40	119	24%	3,513	13%
41 to 60	56	11%	2,887	11%
61 to 100	68	14%	5,241	20%
101 to 200	34	7%	4,926	18%
More than 200	17	3%	8,098	30%
Total	490	100%	26,855	100%

In addition to the units purchased (size) strata, we also stratified by business type and participation in the PG&E downstream programs (where we could identify overlap based on service account ID). Business type is broken out by retail and those who are either not retail or the business type is unknown. Table 3 shows the number of unique sites that fall into each strata.

Table 3: Number of Projects by Strata

Units Purchased Bins	Downstream Participants	Non-Downstream Participants		Total
		Not Retail or Unknown	Retail	
1 to 20	3	166	27	196
21 to 40	1	87	31	119
41 to 60	1	31	24	56
61 to 100	0	32	36	68
101 to 200	0	21	13	34
More than 200	2	5	10	17
Total	7	342	141	490

Table 4 contains the 18 strata and the total number of participating end-user sites targeted within each stratum. Strata and associated targets reflect a desire to conduct interviews with customers across the spectrum of business types, project sizes, and whether they participated in the downstream program (since 2012).

In developing the stratified random sample, we typically allocate sample points evenly across the strata (in this case, that equals approximately four sample points per strata).¹⁰ However, Table 3 (above) shows the sample frame includes strata with very few projects. In those instances where the allocation of sample points is greater than the number of projects within the stratum, we shifted sample points to other strata. We allocated these sample points to the larger “not retail or unknown” group, and allocated slightly more sample points within this group to the smaller projects since these contained the most sites.

Likewise, if the number of responses from a particular stratum is below the target, we mined the next available stratum (within the same units purchased bin). We did not anticipate 100 percent interview success rates in these strata, but rather intended to contact each end-user within those strata with the goal of ensuring we provide those end-users the opportunity to respond to the survey.

¹⁰ This is the standard approach for stratified random samples.

Table 4: End-User Interview Targets by Strata

Units Purchased Bins	Downstream Participants	Non-Downstream Participants		Total
		Not Retail or Unknown	Retail	
1 to 20	3	10	4	17
21 to 40	1	8	4	13
41 to 60	1	7	4	12
61 to 100	0	7	4	11
101 to 200	0	7	4	11
More than 200	2	5	4	11
Total	7	45	23	75

1.3.3.3 End-user Survey Implementation

CIC Research conducted the Computer Assisted Telephone Survey (CATI) between February 3, 2015, and March 4, 2015. CIC Research completed 42 of the 75 targeted end-user surveys. We were unable to meet the target of 75 surveys due to limited projects, limited contact data, and inaccuracies in the provided and purchased contact data. We achieved a survey response rate of approximately 12 percent. Furthermore, all sample points were exhausted and therefore the stratification of projects does not have an impact on the final disposition of respondents; all potential respondents were given the opportunity to respond to the survey (equally across all project sizes and business types).

The total number of completed surveys with end-user Trial LED recipients is shown in Table 5, below.

Table 5: End-user Interview Completes by Strata

Units Purchased Bins	Downstream Participants	Non-Downstream Participants		Total
		Not Retail or Unknown	Retail	
1 to 20	-	12	2	14
21 to 40	-	6	4	10
41 to 60	-	5	-	5
61 to 100	-	3	3	6
101 to 200	-	4	1	5
More than 200	-	-	2	2
Total	-	30	12	42

1.3.4 Evaluability Assessment, Market Indicators and Logic Model / Overview Diagrams

In addition to the primary evaluation activities described above, Evergreen conducted an evaluability assessment of the Trial data, developed recommendations for market indicators of program success and developed a revised program process diagram based on the findings of this evaluation. The methods used to conduct these activities are briefly discussed below:

- *Evaluability Assessment:* Evergreen reviewed all of the data collected by the Midstream Trial implementation staff, and conducted a review to ensure that collected data support evaluation. We considered the ramifications of collecting extra data (such as cost, difficulty, etc.). While, as evaluators, we tend to think that more data is always better for evaluation, this assessment focuses on key, actionable areas where the current program tracking should be improved. Ultimately, collecting the data required for a successful evaluation is a key component of a successful incentive program.
- *Market Indicators:* To develop a better understanding of likely market indicators for future market transformation efforts for a full-fledged midstream incentive program Evergreen reviewed key sources of literature and historical program performance metrics previously adopted by the California IOUs (PG&E included), gathered expert opinion and engaged in discussions with program staff.
- *Logic Model and Overview Diagrams:* Evergreen revisited the original program theory throughout the course of the evaluation. As each research task concluded, Evergreen assessed the impact of the findings on the initial Trial theory and considered appropriate revisions. These considerations are the source for the revised program theory discussion and revised, additional logic model for LED replacement lamp sales that do not involve contractors (in Section 7.1).

Evergreen developed a commercial lighting programs overview diagram and an emerging technologies program overview diagram to primary lighting program process diagram based on a review of program documents and our experience with PG&E commercial lighting incentive programs. Recent developments – most notably the introduction of the umbrella “Statewide Primary Lighting Program” – are included in our graphical representation of PG&E commercial lighting programs.

2 Tracking Data Analysis and Program Comparisons

This section summarizes key findings that support the results presented in the remainder of this report. All findings in this section are based on PG&E incentive program tracking databases.

2.1 Midstream Trial Characterization

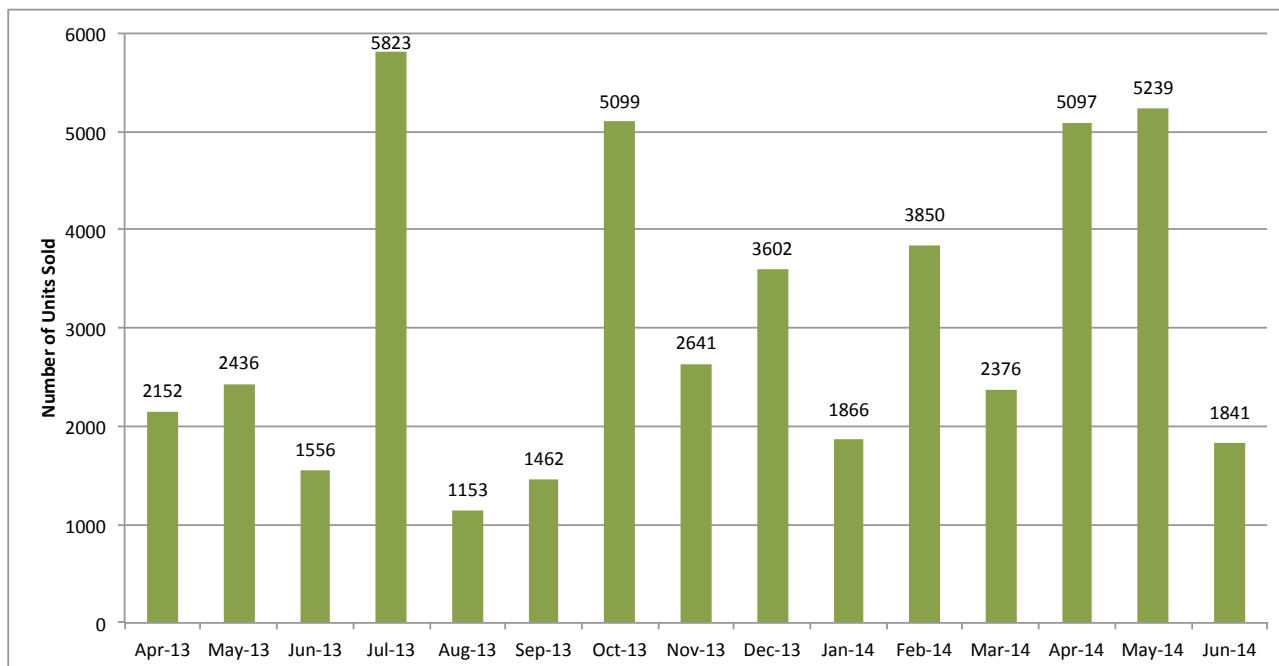
Table 6 below presents a summary of the Trial incentivized sales for the period April 2013 through June 2014. As shown, 52 distributors participated in the Trial during this period, with 46,193 lamps sold across 790 projects.

Table 6: Overall PG&E Midstream Trial Incentivized Sales Summary

Number of Lamps Sold	46,193
Total Number of Distributors	52
Mean Units per Distributor	888
Minimum Units / Distributor (Smallest Distributor)	9
Maximum Units / Distributor (Largest Distributor)	7,229
Total Number of Projects	790

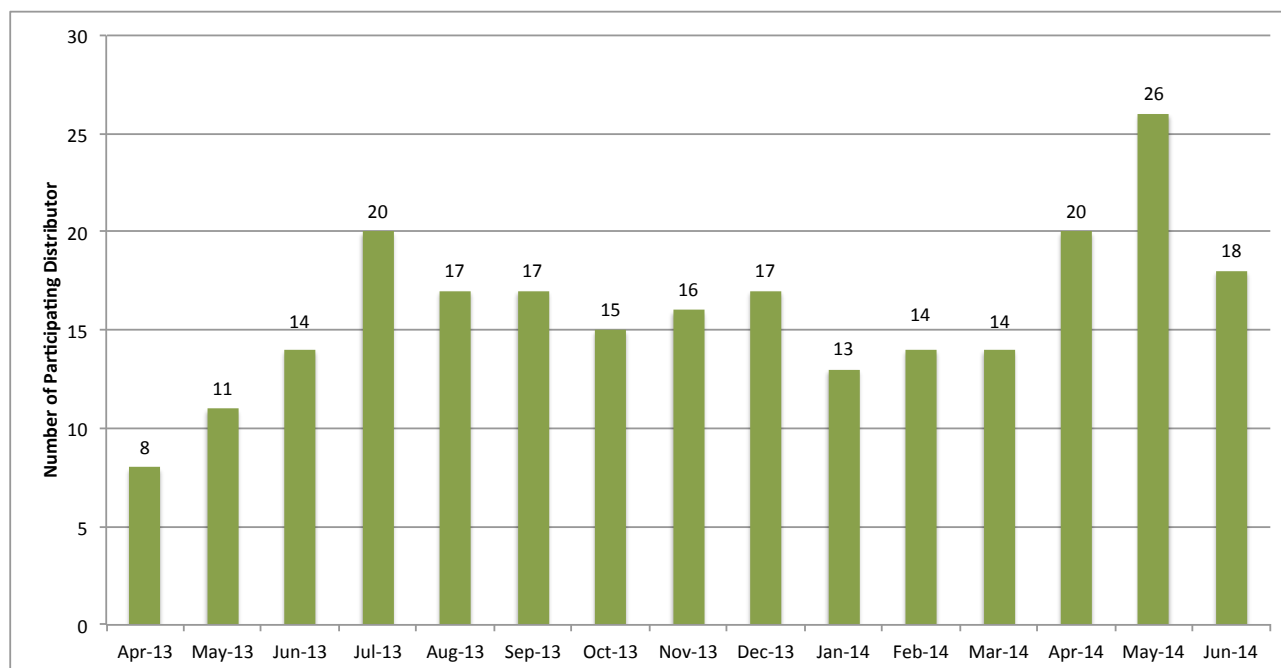
Over the course of the Trial, the number of lamps sold per month varied largely from month to month. Figure 1, below, illustrates the month-to-month variability in Trial sales. The first month of the Trial, April 2013, differed from the rest of the Trial period. As the Trial was ramping up in April 2013 there were relatively few participating distributors (eight, shown in Figure 2) and projects (21, shown in Figure 3). Despite this, the number of lamps sold in April 2013 (2,152, shown in Figure 1) was relatively high due to one very large project in excess of 1,500 units (a large hotel in San Francisco, CA).

Figure 1: Total Units Sold, by Month (PG&E Midstream Trial)



The total number of distributors selling LED replacement lamps with Trial incentives during each month was also variable, as shown below in Figure 2. **Following a ramp up period during the first 3 months, aside from a spike in active distributors in May 2014, the number of active distributors per month varied between 13 and 20 distributors per month.** Notably, in May 2014 there were 10 new distributors who had not participated in the Trial previously.

Figure 2: Total Participating Distributors, by Month (PG&E Midstream Trial)



2.1.1 Project-Level Analysis

For the purposes of this analysis, we defined a project as all lamp installations at a unique project site identified by street address. This means that lamps sold in May 2013 and October 2013 for the same site would be considered part of the same project.

Table 7, below, presents an overview of the number and characteristics of projects in the Midstream Trial. There were 790 projects in total over the Trial period. The average size of a project was 58 lamps. The standard deviation of 108.04 lamps indicates that there was significant variation in the size of projects.

Table 7: Overall Project-Level Descriptive Statistics

Total # Projects	790
Number of Distributors	52
Mean Size of Project	58.48
Std. Deviation	108.04
Minimum Project Size	1
Maximum Project Size	1575

Figure 3 below presents the total number of projects by month. If a project occurs across multiple months, all sales related to the project are assigned to the first month that a lamp

was sold to the site. Similar to total sales, there is variation in the number of projects from month to month, with no discernable trend over the entire study period.

Figure 3: Number of Projects, by Month (PG&E Midstream Trial)

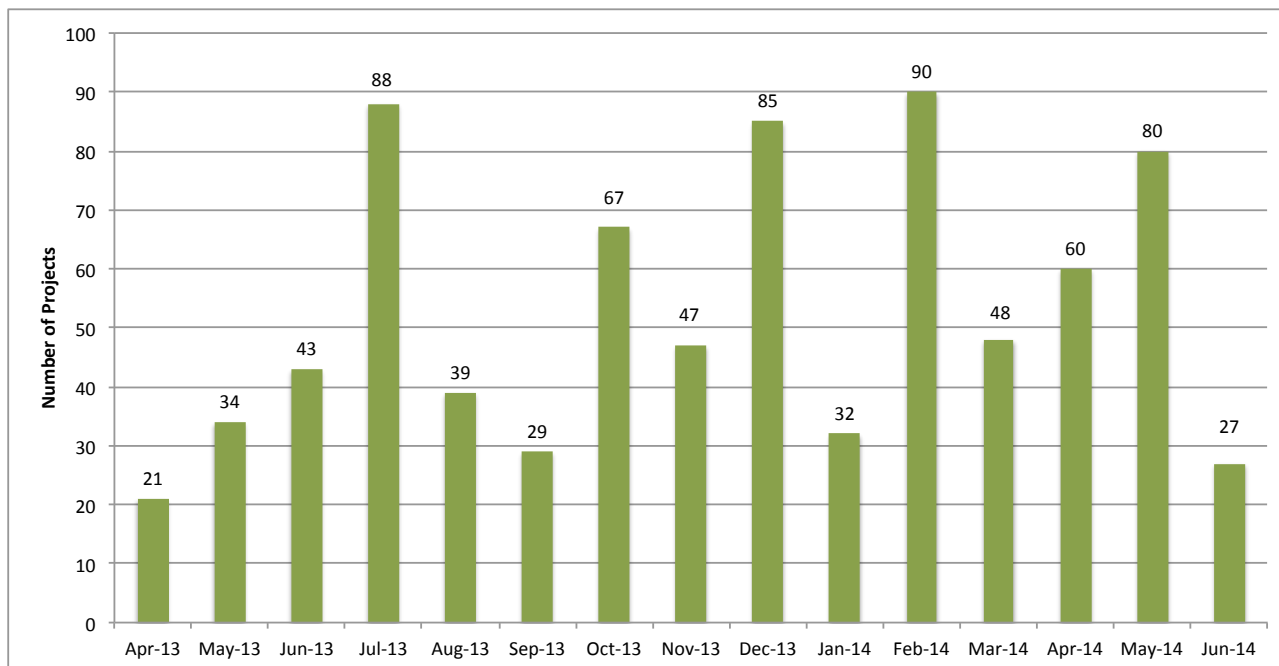
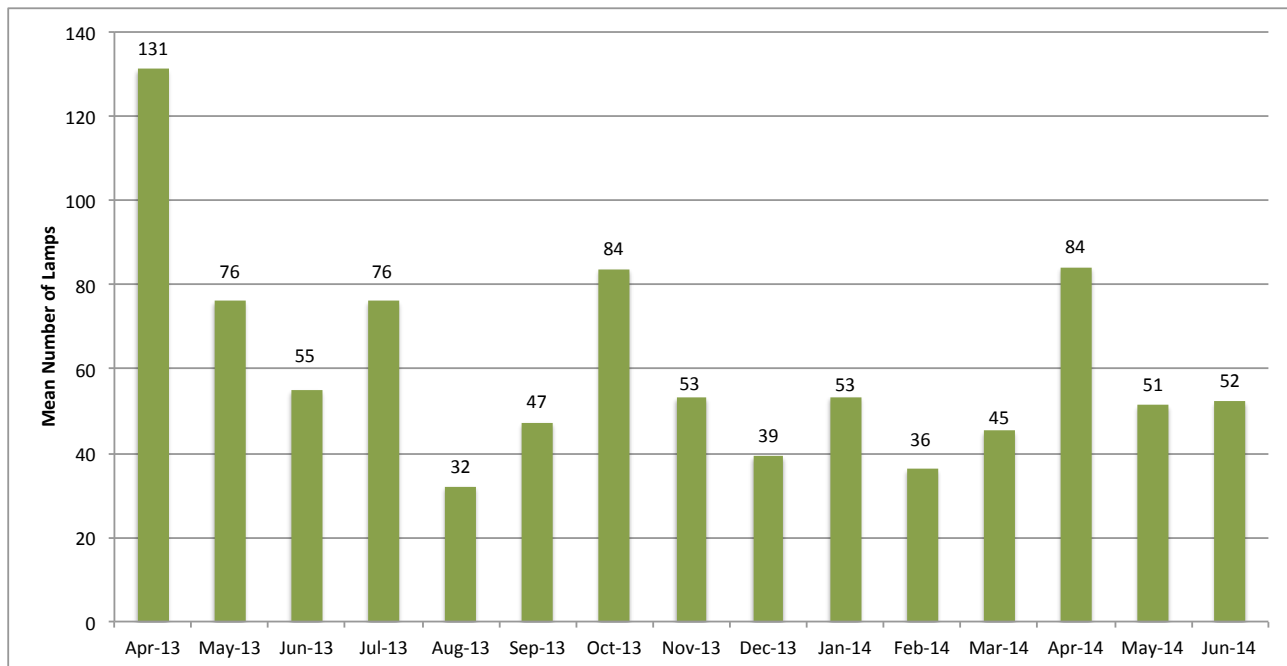


Figure 4 below, presents the average size of a project for each month of the analysis period. Similar to the overall sales, the average project size varies significantly, ranging between 32 lamps per project and 84 lamps per project.¹¹ As noted above, the average project size across the entire analysis period was 58.5 lamps per project. The disposition of project sizes is discussed further in the following section.

¹¹ Our definition of a “project” potentially inflates the average sales in earlier months because all sales to a project are attributed to the first month that a project sale occurred.

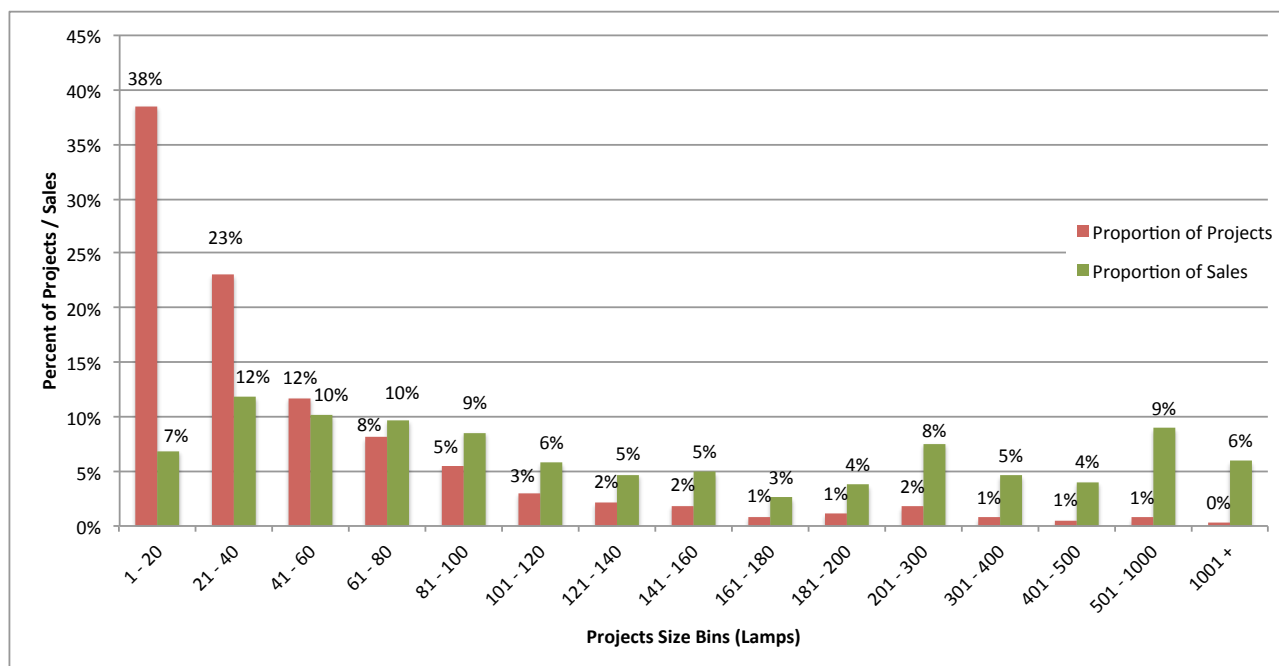
Figure 4: Mean Project Size, by Month (PG&E Midstream Trial)



2.1.2 Disposition of Projects by Size

Figure 5 shows the distribution of projects and project sales by project size. As shown, smaller projects make up the majority of all projects, while the overall sales volume is disproportionately impacted by the fewer, larger sales (this is expected, as one large sale will always make up a more significant proportion of sales than a small sale). Figure 5 illustrates that while there were few large projects that contributed significantly toward total sales – and thus also to program impacts (i.e., kWh savings and kW reduction), PG&E’s Trial largely consists of small projects of fewer than 100 lamps (with *many* projects – 38 percent – consisting of sales of 20 lamps or fewer).

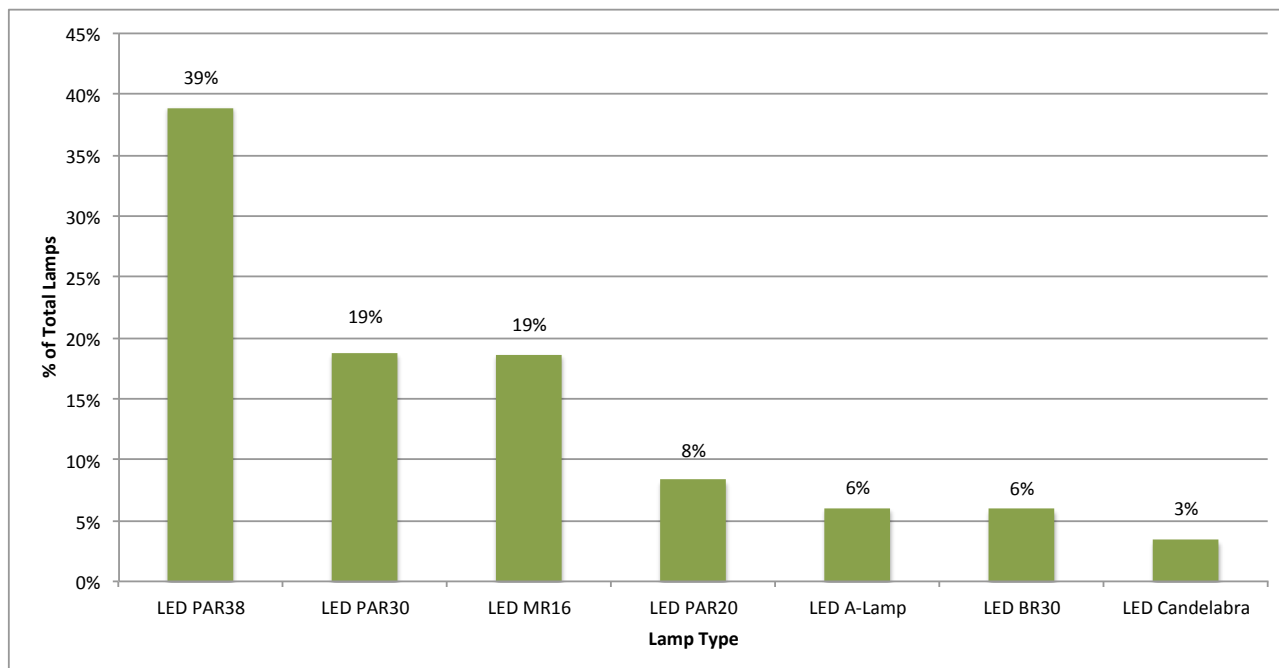
Figure 5: Proportion of Projects, by Project Size Bin (PG&E Midstream Trial)



2.1.3 Total Units by Lamp Type

The following series of figures investigates Trial sales in terms of lamp types sold. Figure 6 below presents the proportion of total lamp sales by lamp type. The most common lamp type sold through the program was the PAR38 lamp that accounted for 39 percent of all lamp sales. While A-lamps only accounted for eight percent of sales and Candelabra lamps accounted for three percent of lamps, the reader must bear in mind that these lamps only became eligible for rebates through the Trial from February 2014, well over halfway through the trial.

Figure 6: Percent of Total Sales, by Lamp Type (PG&E Midstream Trial)



* Note that A-Lamps, Candelabra and BR30 lamps were incentivized beginning in February 2014, whereas MR16 and PAR lamps were incentivized from April 2013.

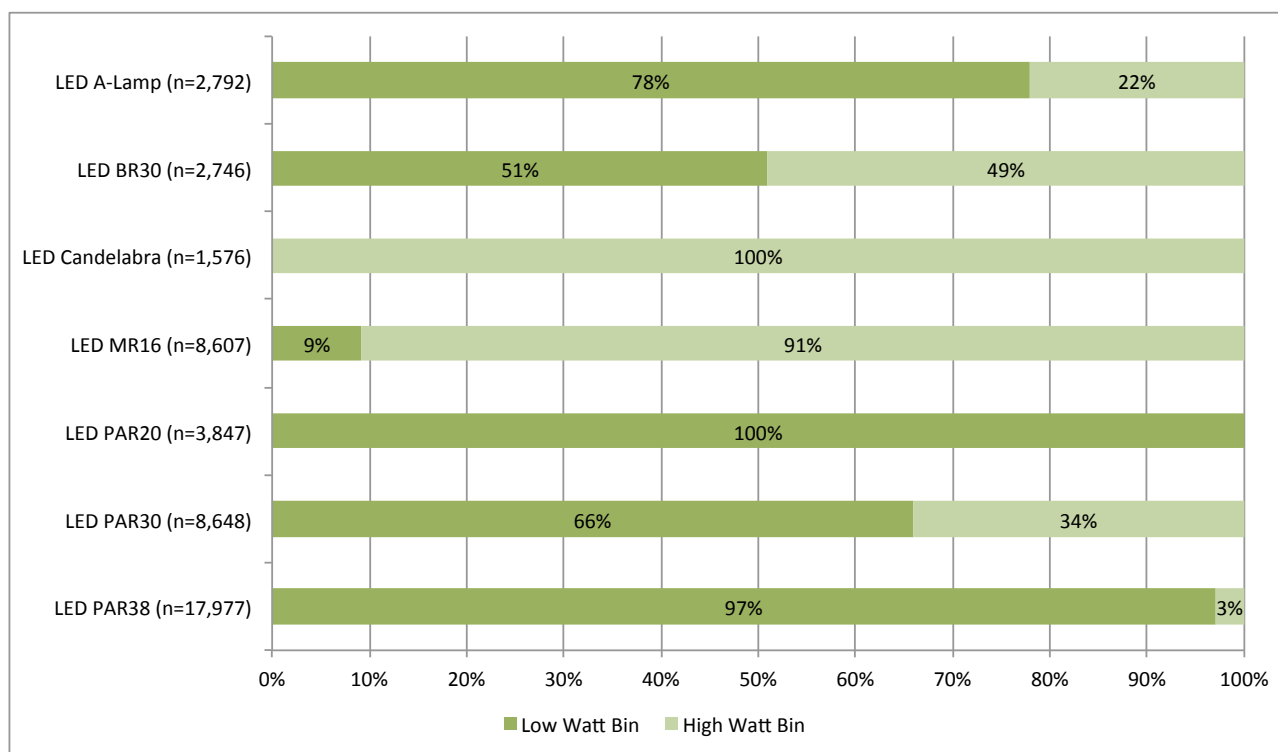
The Trial incentive structure is based on lamp wattage within each lamp category. Each lamp type has one, two or three incentive tiers, with higher wattage tiers receiving greater incentives. To look at lamp type sales further we created two categories for each lamp, low watt and high watt, in line with the incentive structure of the LED Midstream Trial.¹² Table 8 presents the different wattage groups for each lamp type that we use to create Figure 7, which shows the proportion of sales of each lamp type for wattage sizes of the lamps.

¹² PG&E Distributor LED Replacement Lamps Program 2014 Program Facts.
https://www.cainstantrebates.com/ca_media/er/img/PGE_Distributor_lighting_2014_Flyer.pdf

Table 8: Lamp Wattage Categories, by Lamp Type

Lamp Type	Low Wattage Range	High Wattage Range
A-Lamp	< 13 Watts	>= 13 Watts
BR 30	< 11 Watts	>=11 Watts
Candelabra	< 3 Watts	>= 3 Watts
MR 16	< 6 Watts	>= 6 Watts
PAR 20	< 12 Watts	>= 12 Watts
PAR 30	< 15 Watts	>= 15 Watts
PAR 38	< 22 Watts	>= 22 Watts

Figure 7: Proportion of Lamp Type Sold, by Wattage Bin (PG&E Midstream Trial)



In summary, PARs are selling more in the lower wattages, and MRs are selling more in the higher wattages. It is unclear based on the data what factors are contributing to this trend. Some potential factors include, the incentive amounts, demand for lower wattage PARs and higher wattage MRs, or relative availability of lamp types in each wattage tier.

2.1.4 Analysis by Business Type

Figure 8 and Figure 9 present the proportion of total lamp sales and projects by business type as well as the average project size for each business type. As shown, small and large single-story retail sales account for a significant proportion of overall lamp sales in the Trial, 21 percent and 17 percent, respectively. Unfortunately, most sales are attributed to an “Unknown” category, which combines the business codes COM, OTR and UNK. Because we cannot distinguish the make up of these categories we cannot make concrete observations about the distribution of projects or project attributes by business type. Tracking accurate business types in the future would allow for better analysis of the market segments being served by the program.

Figure 8: Proportion of Total Lamp Sales, by Business Type (PG&E Midstream Trial)

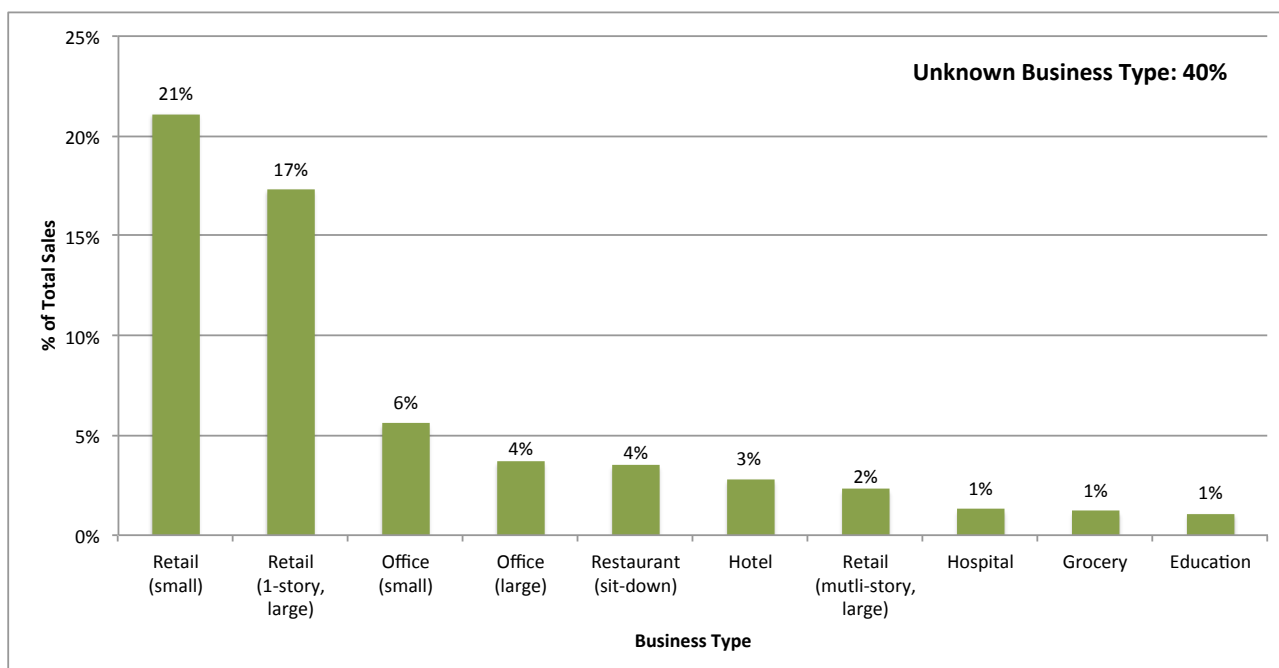
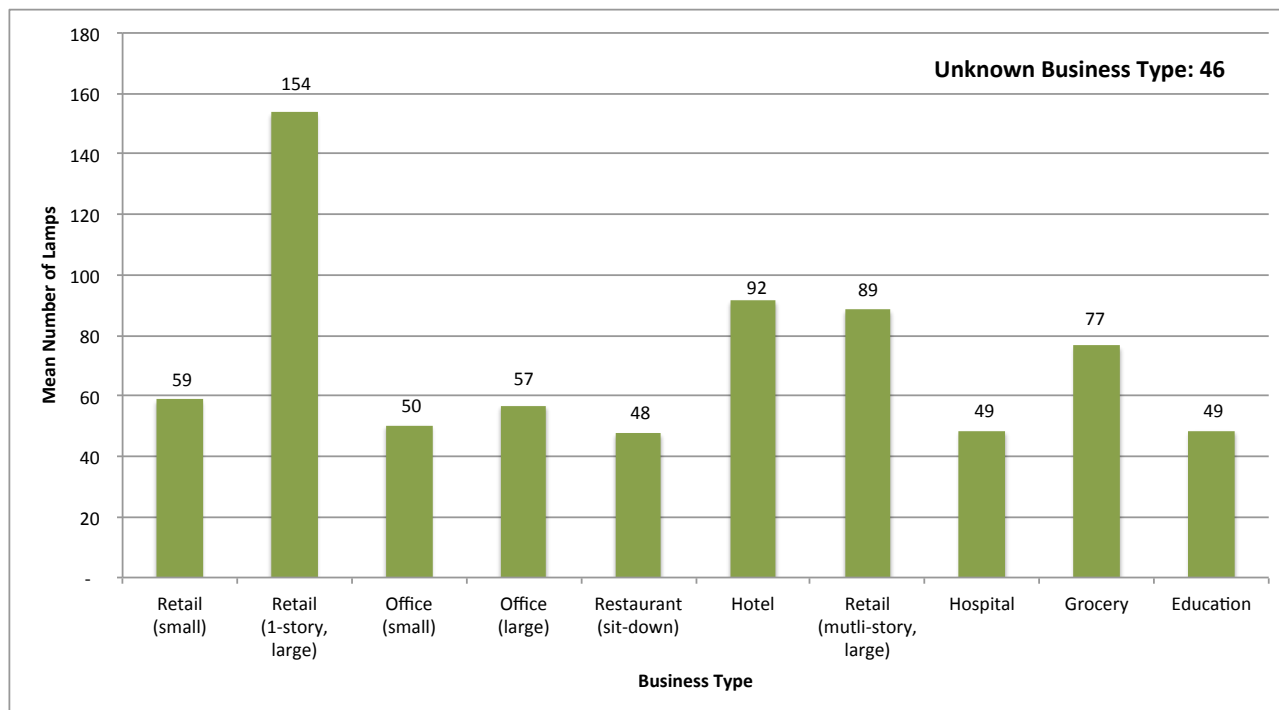


Figure 9, below, shows that average project size is greatest in large single-story retail (154 lamps per project). Hotels, large multi-story retail, and grocery stores all had high average lamps per project as well (92, 89, and 77 lamps per sale, respectively). Interestingly, hospitals averaged only 49 lamps per sale, despite relatively large lighting needs. Replacement lamps may serve a specific purpose within a hospital – thus, the Trial may not always serve different customers than other PG&E lighting programs, but may also serve different needs of the same customers.

Figure 9: Average Project Size by Business Type (PG&E Midstream Trial)



2.2 Comparison to Downstream and LGP / 3P DI

In this section we compare key statistics of the Trial with the Downstream Program – including Trade Professional Alliance (TPA) – and Third Party Direct Install (3P DI) and Local Government Partnership (LGP). The Downstream and TPA programs sold LED fixtures only, while the 3P DI and LGP programs sold a mixture of LED replacement lamps and LED fixtures. For the purpose of this analysis we have combined the 3P DI and LGP programs. Table 9, below, presents overall statistics for the Downstream, TPA, and combined 3P DI and LGP programs alongside the same statistics for the Trial.

Table 9: Overall Program Statistics Comparison – January 2012 - June 2014 (PG&E Program Sales Data)

	Downstream	TPA	LGP / 3P DI	Overall - Non-Midstream	Overall – Midstream Trial
Number of Projects	140	16	696	852	790
Number Lamps / Fixtures Sold	8,047	590	26,492	35,129	46,193
Mean Units / Project	57.48	36.87	38.06	41.23	58.47
Minimum Units / Project	1	1	1	1	1
Maximum Units / Project	2820	109	789	2820	1575

The volume of incentivized sales through the Downstream, 3P DI and LGP programs was small in 2012 and the first quarter of 2013 with the exception of one very large sale in May 2012 to a large department store chain that received a Downstream program incentive. There were no Midstream Trial sales during this period, as the Trial had not yet started.

Downstream and 3P DI / LGP program incentivized sales began to increase in the second quarter of 2013. Figure 10 compares sales from May 2013 through June 2014 for the Downstream, TPA, and 3P DI / LGP programs with Trial sales from the same time-period. All programs have significant variability from month to month over the analysis period, with no strong discernable sales trends over the study period. **The Trial is selling a higher volume of units compared with the other PG&E programs, but it is important to note that the Trial sells only LED lamps while the other programs sell a mixture of fixtures and lamps or only fixtures in the case of the Downstream program.** Furthermore, we did not consider differences in the incentive amounts for the common measures in the 3P DI / LGP and Trial.

Figure 10: Total Lamps Sold, by Month – Program Comparisons: April-2013 through June-2014 (PG&E Program Sales Data)

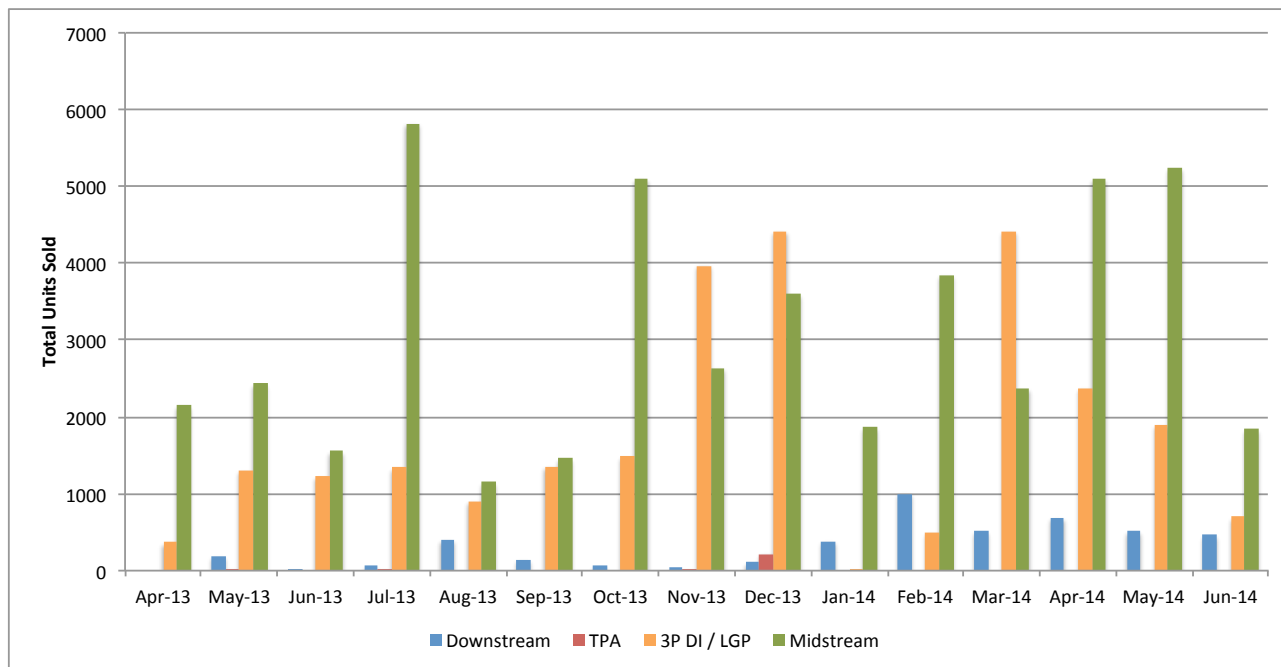
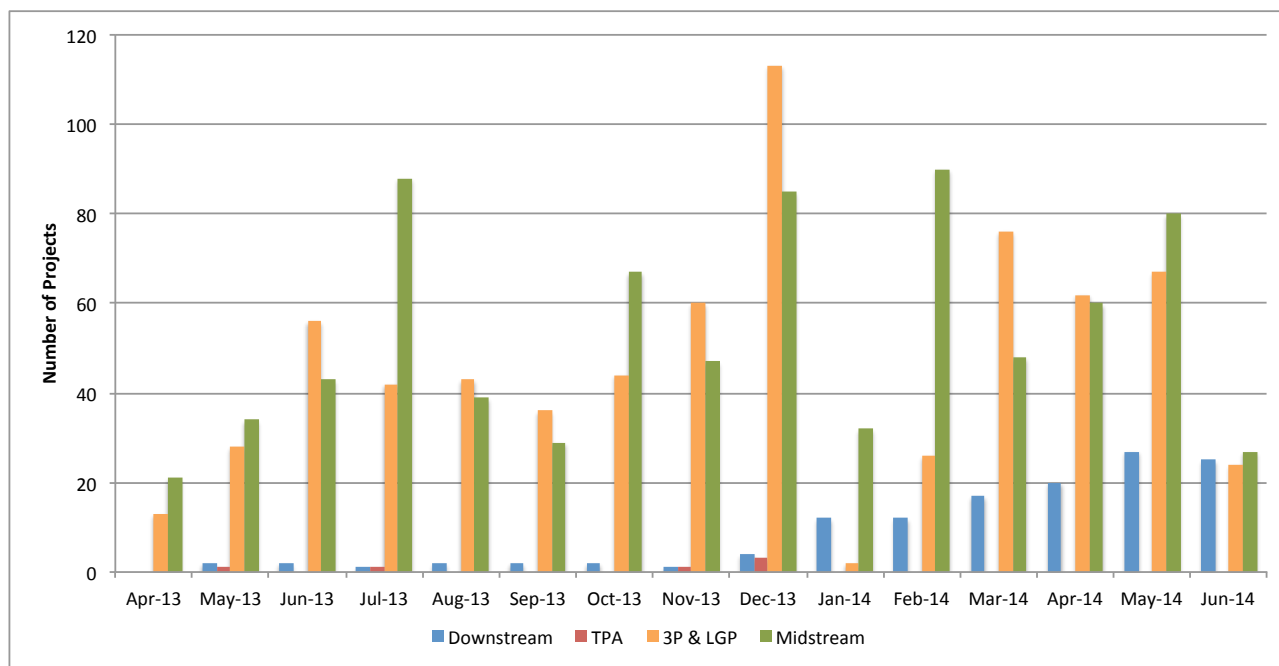


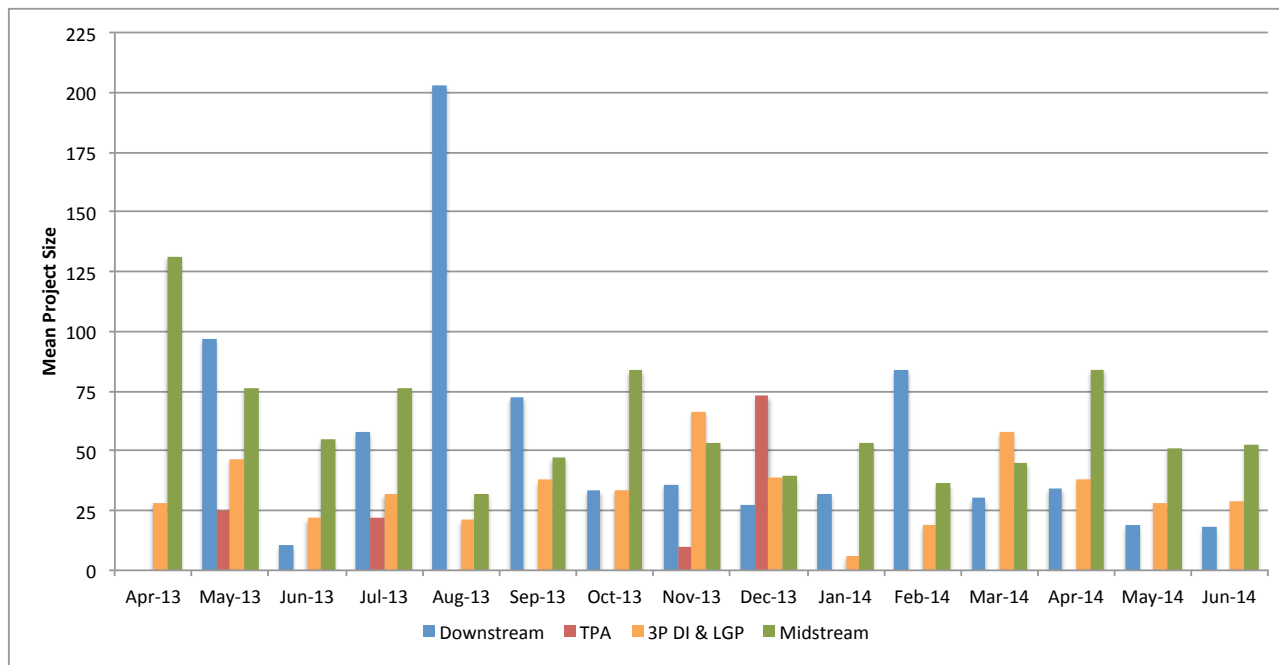
Figure 11 compares the total projects by month for the same period. As noted in the previous section, there is no strong discernable trend in the number of Trial projects. This is also true of the 3P DI and LGP programs which is highly variable but has a similar range of monthly projects completed as the Trial. The Downstream program has a smaller number of projects than either the Trial or 3P DI programs, however, there does appear to be an increasing trend in monthly project numbers in 2014 for total Downstream projects. Again, it is important to note that the Downstream program only provides incentives for LED fixture projects.

Figure 11: Total Projects, by Month – Program Comparisons: April-2013 through June-2014 (PG&E Program Sales Data)



To compare project size over time across the programs, we look at average project size per month from May 2013 to June 2014, as shown in Figure 12. Average project size is variable from month to month across all programs.

Figure 12: Average Number of Units per Project – Program Comparisons: April-2013 through June-2014 (PG&E Program Sales Data)



2.2.1 Project Size Comparisons

The following two figures provide a comparison of the proportion of projects that fall into various project size bins across the programs of interest. Figure 13 compares the Midstream Trial with both the 3P DI / LGP and Downstream and TPA programs in terms of the proportion of projects of various sizes. As shown, **projects that receive financial incentives through the Downstream and 3P DI / LGP programs are typically smaller, with approximately 75 percent between one and 40 lamps in size, and approximately 90 percent 100 units or less (for each program). Similarly, a large proportion of Midstream program projects are 100 units or less in size (86%), however, only 61 percent are between one and 40 lamps in size.**

Figure 13: Proportion of Projects by Project Size Bin – Comparison with Midstream (PG&E Program Sales Data)

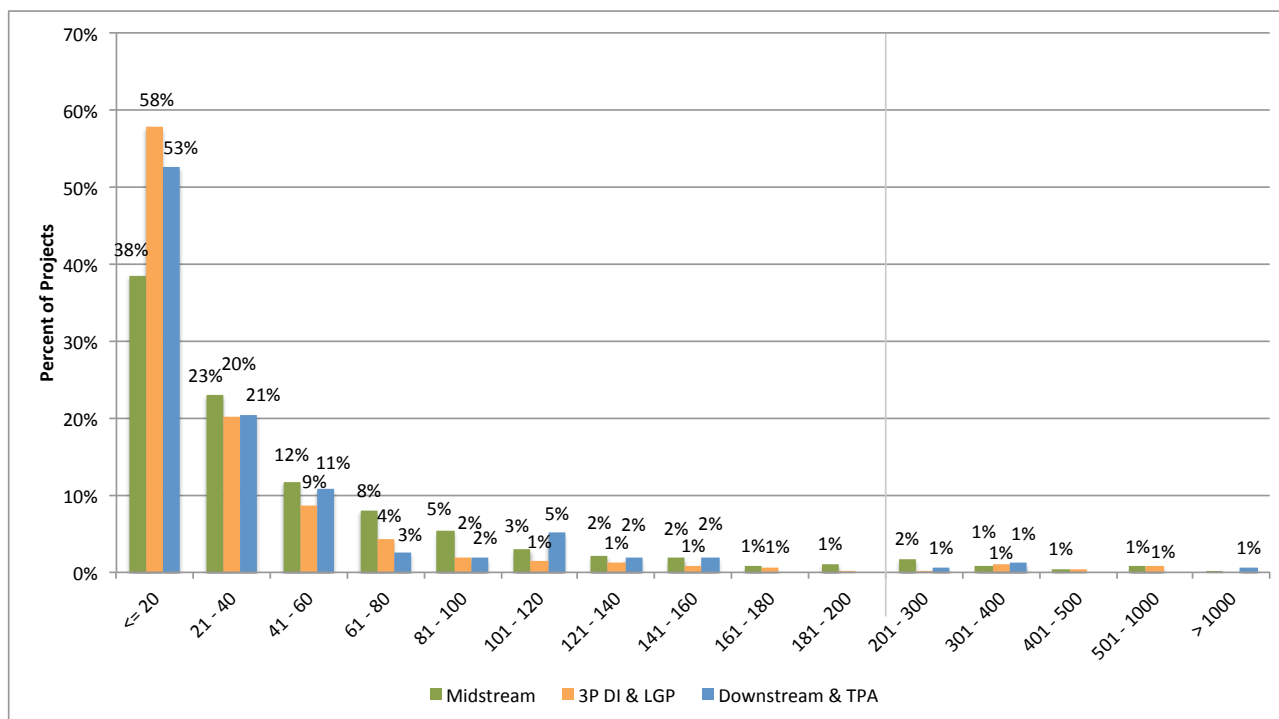


Figure 14 shows the proportion of units sold (lamps or fixtures) by overall project size for the Trial, the Downstream program (and TPA), and the 3P DI / LGP programs. As shown, more than 50 percent of units incentivized through both the Midstream Trial and the Downstream programs are for larger projects over 100 lamps or fixtures. Slightly less than 50 percent of units incentivized through the 3P DI / LGP programs were for projects over 100 units. The Downstream program has the greatest proportion of units sold through projects over 100 units (66%). This shows that while the majority of purchases are comprised of smaller quantities, larger customers are key to the high volume of sales through these incentive programs. Furthermore, these figures indicate that while the Downstream program total sales is disproportionately affected by large projects, the Midstream program sales, as well as the 3P DI / LGP program sales, are more evenly distributed across project sizes.

Figure 14: Proportion of Units Sold by Project Size (PG&E Program Sales Data)

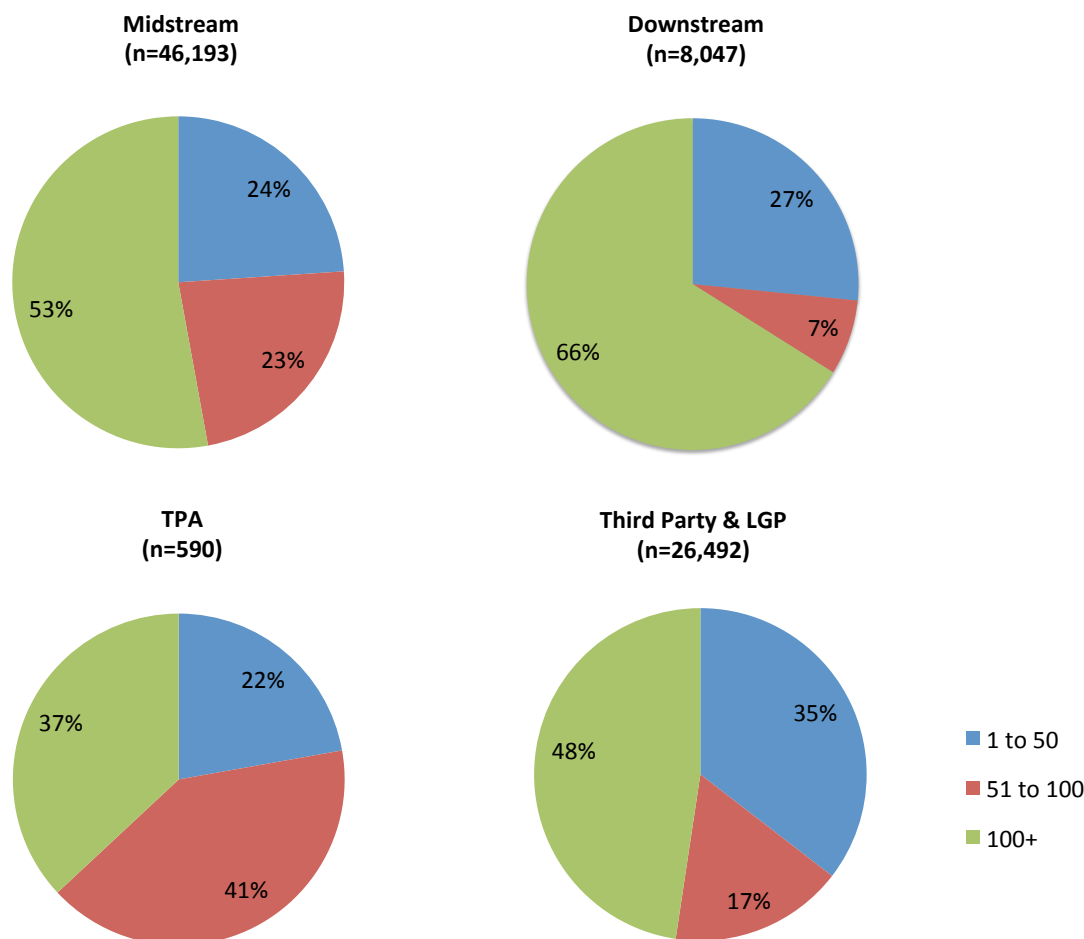
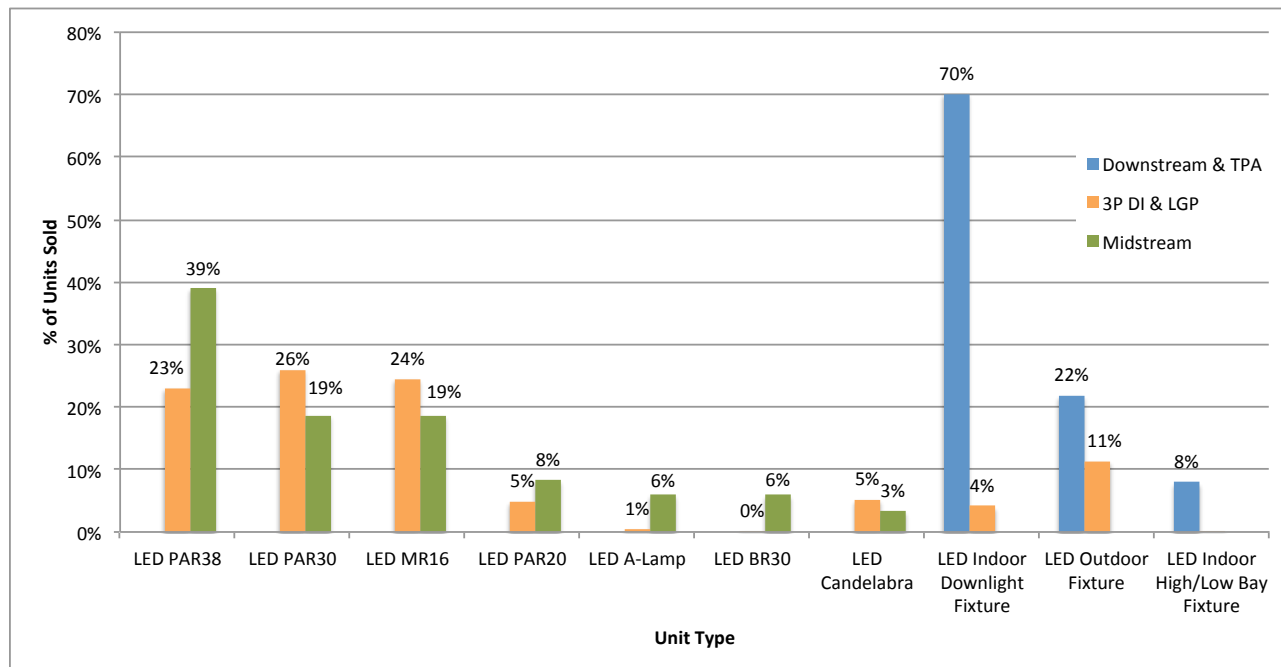


Figure 15 shows the average proportion of sales by lighting type and the average number of units sold per sale, by lighting type. As shown, **the three programs are fundamentally different with regards to what is incentivized.** Midstream Trial incentives are all for LED replacement lamps, mostly LED PARs (66%, across PAR38, PAR30, and PAR20 lamps) and MR16 lamps (19%). Downstream incentives are only available for LED fixtures, and most go towards LED indoor downlight style fixtures (70%). Incentives are available for both fixtures and replacement lamps through 3P DI / LGP programs. In contrast to the downstream program, the majority of fixture sales incentivized through the 3P DI / LGP programs are outdoor LED fixtures. The 3P DI / LGP program lamp sales distribution is similar to the Midstream Trial.

Figure 15: Proportion of Sales by Lighting Type - Comparison with Midstream (PG&E Program Sales Data)

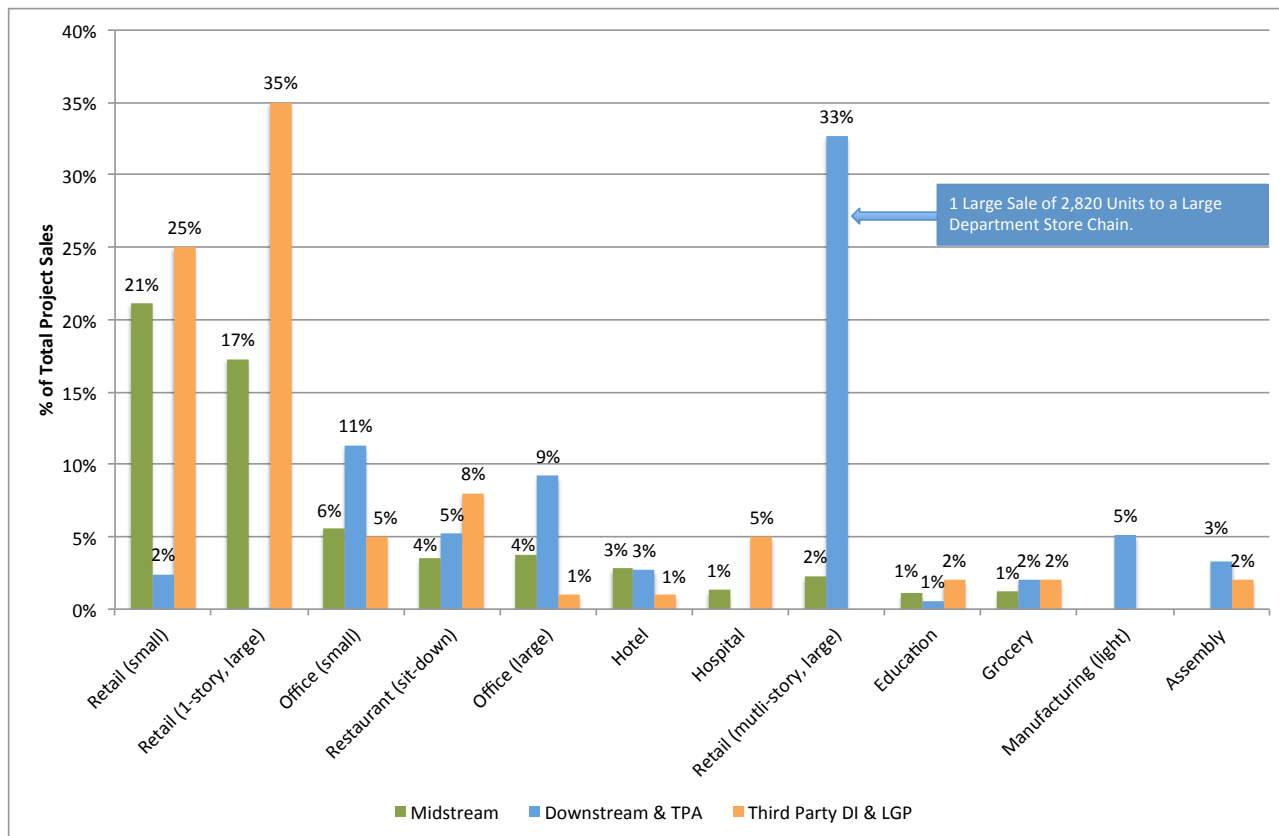


2.2.2 Comparison by Business Type

The next two figures show the proportion of total projects by business type and the mean units per project by business type for the Midstream Trial, the Downstream Program (and TPA), and the 3P DI / LGP programs. It is difficult to compare across programs because of the high proportion of incentivized projects with unknown business type data, particularly in the Midstream Trial data.

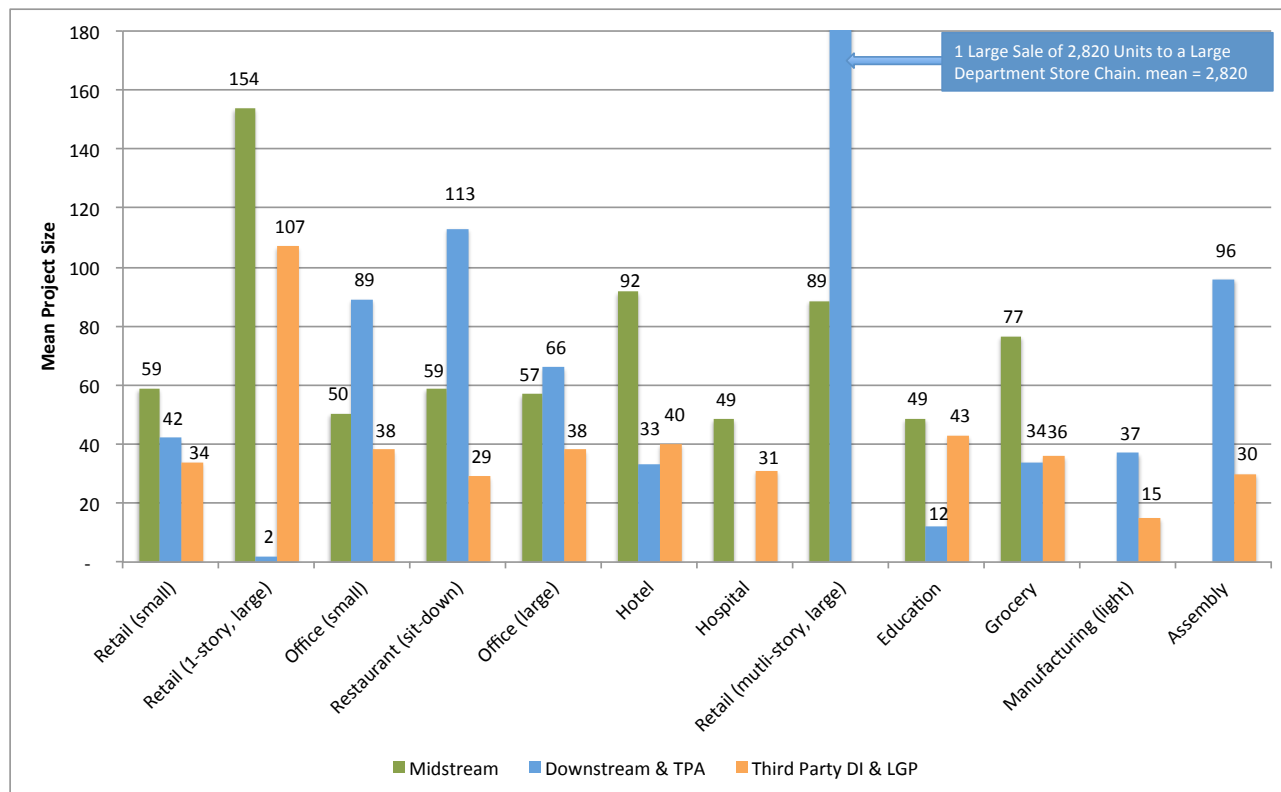
As shown in Figure 16, **it is evident (based on the customers with known business types) that the majority of LED products incentivized through the three program types are installed in similar types of facilities.** Approximately 40 percent of units sold that received Trial incentives are in retail applications (small retail, large retail or multi-story retail), particularly small retail, while 40 percent are unknown. Many of the units sold through the Downstream and TPA Program were also in the retail sector (35 percent), but the majority of those were to one sale in the multi-story large retail sector. Office buildings also contributed significantly to Downstream sales with approximately 20 percent of sales. Retail also accounted for a large proportion of sales (60%) through the 3P DI / LGP programs.

Figure 16: Proportion of Total Sales, by Business Type – Comparison with Midstream (PG&E Program Sales Data)



*This figure does not include the proportion of sales with unknown business type. The proportion of sales with unknown business type for each program are: Midstream (40%), Downstream & TPA (26%), and 3P DI (12%)

Figure 17: Mean Project Size, by Business Type – Comparison with Midstream (PG&E Program Sales Data)



2.2.3 Customer Participation in Both Midstream and Downstream Programs

We also investigated whether customers participated in both the Trial and the downstream programs and 3P DI / LGP programs. We matched sales records between the Trial database and the other program databases using utility Service Account Identification Number (SAID) and street address. If there was a match on either of these variables then the customer was considered to have participated in both programs. There were a total of nine customers that overlapped.

The business types (where available or determined by the evaluation team) and the composition of the lighting projects are shown below, in Table 10. As shown, there are cases where a customer first participated in a downstream program and later received Trial incentivized products, and vice versa, but there is no indication whatsoever that this is double dipping. It is unclear why customers participated in multiple programs over short periods of time for similar (or the same) measures, however **among customers who participated in both the Trial and another PG&E commercial lighting incentive program, many received fixtures from the downstream programs and LED replacement lamps from the Trial** (only sites #4 and #6 participated in 3P DI / LGP programs and received LED replacement lamps through both the Trial and 3P DI / LGP channels).

Table 10: Characteristics of Overlapping Participants of Trial and Other PG&E Lighting Programs

Site	Business Type*	Midstream Trial		Other PG&E Program	
		Measure Type (Quantity)	Install Date	Measure Type (Quantity)	Install Date
1	Unknown (Church)	LED PAR30 (22)	Jul, 2013	LED Indoor Downlight Fixtures (102)	Jan, 2012
2	Unknown (Office)	LED PAR20 (37)	Jul, 2013	LED Indoor Downlight Fixtures (138)	Oct, 2012
3	Unknown	LED PAR38 (20)	Jul, 2013	LED Outdoor Fixture (50)	Apr, 2014
4	Unknown (University)	LED MR16 (50)	Aug, 2013	MR16 (73) PAR20 (73) PAR38 (73)	Dec, 2013
5	Unknown (HOA)	LED MR16 (48) LED PAR38 (28)	Dec, 2013	LED Indoor Downlight Fixtures (33) LED Outdoor Fixtures (33)	Feb, 2014
6	Unknown (Winery)	LED A-Lamp (334) LED MR16 (18) LED PAR30 (113) LED PAR38 (12)	Jan, 2014	MR16 (126) LED Indoor Downlight Fixtures (42) LED Outdoor Fixtures (42)	Dec, 2013
7	Hospital	LED A-Lamp (156) LED Candelabra (85) LED PAR20 (18)	Feb, 2014	LED Outdoor Fixture (3)	Mar, 2014

* Business types in parenthesis were looked up manually and have not been changed in data for analysis.

3 Commercial Lighting Market Actor Interview Findings

In this section we present findings from in-depth interviews with lighting distributors, LED lamp manufacturers, and LGP/3P DI program implementers.

3.1 Distributor In-Depth Interview Findings

We interviewed two groups of lighting distributors – those who have participated in the Trial (and have received incentives for LED replacement lamps through the Trial), and distributors who have not participated in the Trial.

3.1.1 Respondent and Firm Background

The characteristics of respondents and their firms are presented in this section for both participating and nonparticipating distributors.

3.1.1.1 Participating Distributors

We spoke with 16 representatives of participating LED distribution firms.¹³ The firms include seven national electrical distributors, three who provide a combination of manufacturing, distribution, and installation services, three regional electrical distributors that sell only to the commercial sector, one combination lighting showroom and distributor, a building maintenance and janitorial equipment distributor, and a combination lighting consultant and supplier. In addition to LED replacement lamps, most of the distributors also sell LED fixtures (88%) and non-LED lighting products (81%), while only a few (19%) sell non-lighting products (e.g. HVAC, security systems, janitorial equipment).

Since January 2013 one quarter of the participating distributors (25%) reported that less than 25 percent of their lighting sales volume received any type of incentive through a utility rebate program, 31 percent reported 25 to 49 percent received an incentive, 13 percent had 50 to 74 percent incentivized, 13 percent had nearly 100 percent incentivized, and the rest (19%) were not sure.

3.1.1.2 Non-Participating Distributors

We spoke with seven distributors who have not participated in the Trial. All non-participants were aware of the Trial, and supply LED replacement lamps to the commercial sector. The firms include four national distributors (two of LED lighting only, one of LED and other lighting products, and one distributor of a range of electrical products in addition to lighting) and three regional distributors (one of LED lighting products only and two distributors of a wide range of electrical products in addition to lighting). Six of the seven distributors sell lighting fixtures as well as lamps.

¹³ Two of the distributors we spoke with did not have enough time to complete the entire interview and some questions were not applicable for all of the distributors, so the total number of responses for each question varies.

Since January 2013, all but one of the non-participating distributors sold lighting products through a utility rebate program other than the Trial. Specific programs mentioned by distributors were custom programs, commercial deemed programs, direct install programs, and other third party programs (SmartLights, Rightlights, Energy Smart Grocer). Three non-participating distributors that received rebates for their lighting products reported that less than 25 percent of their lighting sales received any type of incentive, one reported that approximately 50 percent received an incentive, and one reported that 95 percent received an incentive (the sixth distributor was unsure).

3.1.2 The LED Market

Distributors were asked a series of questions about the market for LED replacement lamps and fixtures in general. These questions focused on identifying general LED trends including uptake in the market, customer segments for LED bulbs and fixtures, and the likelihood of participating distributors using outside contractors for LED replacement lamp sales.

3.1.2.1 Overall LED Market Conditions

In this section we present and compare the market conditions experienced by distributors who have participated in the Trial to those experienced by non-participating distributors.

Participating Distributors

A majority of participating distributors (60 percent) indicated that while LED replacement lamps are increasing in popularity, less than 50 percent of commercial end-use customers that are replacing or retrofitting their lighting systems are installing LED replacement lamps. These findings are consistent for LED fixtures as well. When asked to estimate the percentage of end-use customers installing LED fixtures as opposed to other light technologies, an equal number of participating distributors (n=3 for each) said less than 25 percent, between 25 and 49 percent, and between 50 and 74 percent.¹⁴ Several distributors indicated that they were unable to provide market-level insight because their primary customer base consists exclusively of commercial customers interested only in LEDs.

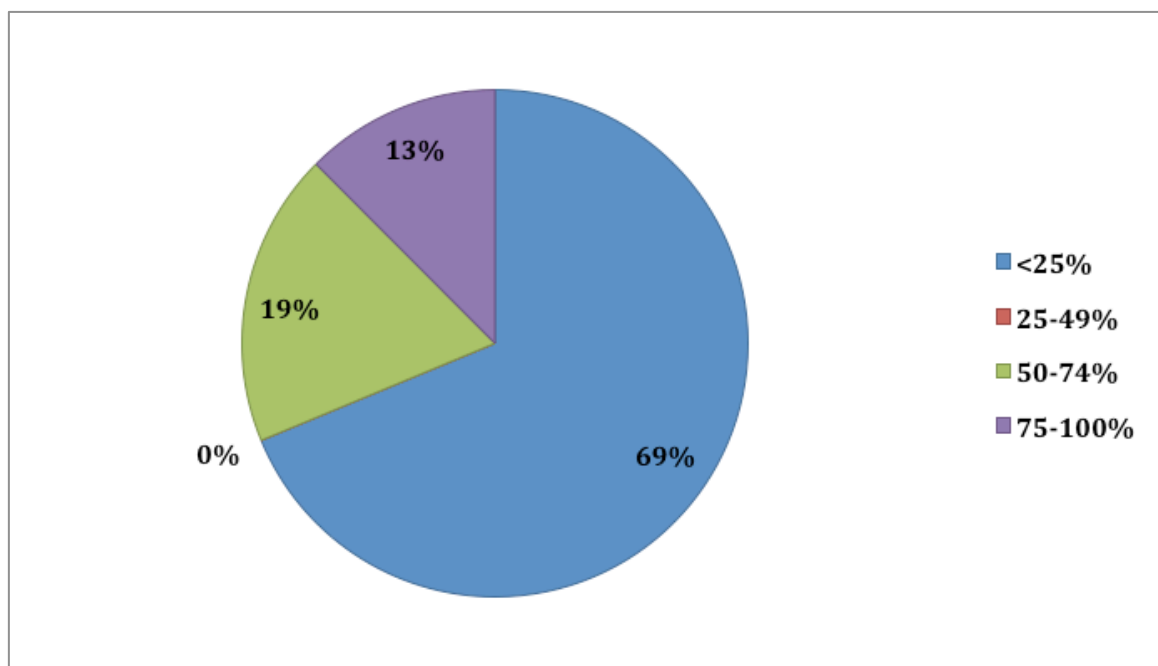
Participating distributors identified several segments of the commercial market that purchase LED technologies more frequently than other segments. The most frequently cited segments included retailers (n=6), hospitality (n=4), restaurants (n=2), and warehouses (n=2). Participating distributors indicated that these commercial segments were more interested in LED options because of their high monthly electricity bills and the overall quantity of lamps in their facilities. Additionally, **participating distributors indicated the biggest differences between customers who purchase LED fixtures versus those who purchase LED lamps include the scope of the replacement project they are undertaking** (n=6), the type of existing equipment in place (n=3), and the type of business or facility (n=4). Customers who purchase LED fixtures are usually involved in large-scale projects that require a substantial

¹⁴ Six were unsure.

capital investment, while customers who purchase LED lamps are generally undergoing smaller-scale projects. Also, companies like high-end retailers or large facilities such as warehouses and universities tend to prefer LED fixtures because of their greater light output (relative to LED replacement lamps), whereas LED lamps are sufficient in most other commercial settings. Overall, participating distributors report that there are no commercial segments that are particularly resistant to LED replacement lamps or fixtures.

To better understand the relationship between participating distributors and lighting contractors, interviewees were asked what percentage of their LED replacement lamp sales go through a contractor. Figure 18 shows that **more than two-thirds of respondents infrequently rely on contractors for LED replacement lamp specification, sales, or installation (69%)**. One of the main reasons cited by multiple participating distributors (n=3) was the relative ease of installing LED bulbs. As a result, end-users can install the LED bulbs themselves and do not require the expertise of an outside contractor. Several distributors (n=5) reported that they do not sell LED lamps directly to contractors, but that contractors work with the distributor to complete the project. Some of these distributors hire contractors on behalf of the end-user (n=2), while others maintain in-house installers (n=1) for LED replacement projects. Similarly, some distributors (n=2) reported that they sell directly to end-users who hire their own contractor for the installation.

Figure 18: Distributor Reported Percent of LED Replacement Lamp Sales to Contractors (n=16)



Additionally, we asked participating distributors what product specifications or performance-related factors are considered most when replacing existing equipment with LED lamps. Distributors indicated that lumen output and color rendering (n=6), available warranties

(n=4), and manufacturer tenure and reputation (n=3) were the most important factors for customers.¹⁵

Participating distributors indicated that recessed down lighting (n=8), high bay applications (n=5), and track lighting (n=4) are the applications in which LEDs are causing the greatest displacement. Within these applications, distributors report that linear fluorescents (n=6), halogens (n=3), and HIDs (n=3) are the most frequently replaced lamp types.

Non-Participating Distributors

Non-participating distributors offered similar insights into the market for LED lighting. When asked to estimate the percentage of commercial end-use customers installing LED lamps as opposed to other lighting technologies, two distributors estimated less than 25 percent, two estimated between 25 and 50 percent, and two estimated 50 percent.¹⁶ Similarly, one distributor estimated that less than 25 percent of commercial end-use customers opted for LED fixtures over other lighting technologies, three estimated between 25 and 50 percent, and one estimated 60 percent.

We asked non-participating distributors to identify differences between customers who install LED lamps over LED fixtures. All respondents stated that the choice is highly dependent on the application but where there is a choice between lamps and fixtures, the decision often comes down to cost and convenience. Customers with lower budgets will more often choose lamps because of lower first cost, lower installation cost and ease of installation, whereas customers with higher budgets will often select fixtures because they tend to be longer lasting and more reliable.

Non-participating distributors most frequently cited retail (n=4), hospitality (n=2), restaurants (n=2), warehouses (n=2), healthcare (n=2), and education (n=2) as market segments that purchase LED technologies more frequently than other segments. Three non-participating distributors also mentioned office buildings as being an important sector for LED technology, particularly for fixtures, but all noted that there is some resistance in this sector – particularly with customers that have recently invested in linear fluorescent technology. Non-participating distributors noted similar reasons to participant distributors for customer interest in LED technology, but also noted that sectors such as retail and restaurants select LEDs because they offer higher quality light and operate at lower temperatures than other available technologies. Beyond market sectors, non-participating distributors also noted that owner-occupied buildings are more likely to adopt LED technology than leased spaces (n=2).

¹⁵ While warranties and manufacturer tenure are not direct product specifications or performance related factors, participating distributors noted that they help signal overall product quality and reliability, and consequently are important factors in the LED replacement process.

¹⁶ One was unwilling to estimate because their customers are already interested in LEDs.

Non-participating distributors identified the following market sectors as resistant to LED technology: manufacturing (n=3), warehouses (n=2), and agriculture (n=1). Reasons provided for resistance to LED technology included high cost of investment for large facilities, especially in sectors such as agriculture where lighting is used intermittently and high quality lighting is not required, and general resistance to retrofitting lighting due to the required disruption to operations. Interestingly, the warehouse sector is the one sector described, by different interviewees, as both accepting of and resistant to LED technology. Two interviewees mentioned that LEDs are promising for warehouses because they are often replacing hard to reach fixtures with high hours of use. Conversely, two interviewees noted that LEDs are not appealing to warehouses because lighting retrofits interrupt normal business.

Non-participating distributors were also asked what percentage of their LED lamp sales is to a contractor (as opposed to an end-user or facilities manager). Four of seven distributors (57%) stated that 50 percent or more of their sales go through a contractor, with one distributor estimating 30 percent of sales, and one distributor estimating five percent of sales. The remaining distributor stated that they do not sell through contractors at all and do all installation work internally. All non-participant distributors who sell fixtures indicated that a significantly higher proportion of their fixture sales went through contractors primarily because of the added complexity of installation.

3.1.2.2 Stocking Practices

Participating and non-participating distributors were asked a series of questions about their stocking practices for lighting products including LED lamps. Half of the participating distributors and all non-participating distributors reported that customer demand is the primary influence in deciding which types of commercial lighting products to stock. Distributors monitor customer demand by reviewing historical sales, gathering feedback from sales representatives, and conducting market share research.

In addition to responding to customer demand, 10 of 16 participating and four of seven non-participating distributors mentioned that relationships with manufacturers and product quality affected what they choose to stock, in general. One participating distributor mentioned that product price was also important, whereas non-participating distributors listed certifications such as ENERGY STAR® rating and DesignLights Consortium™ (DLC) qualifications (n=3), product warranty (n=2), and willingness of manufacturer to help with returns and inventory adjustment (n=2).

Overall, these influences were also the major determinants of LED lamp stocking practices among participating distributors. In addition, participating distributors said that expected lifespan (n=2) and rebate availability (n=1) influenced their stocking practices for LED lamps. Two participating distributors indicated they do not stock LED lamps but rather order them on a per-project basis to avoid overstocking expensive LED technologies. Non-participating distributors did not note any differences in stocking practices for LEDs versus other lighting technologies, although one mentioned that, *“with LEDs we are even more careful with manufacturer relations because the product is constantly changing and is higher cost.”*

Participating distributors report LED products they typically stock include screw-in replacement lamps including down lights and A-lamps (n=11), troffers (n=3), and linear LED tubes (n=1). Common LED types that are stocked by the non-participating distributors include high bay and low bay fixtures (n=4), screw in replacement lamps (n=4), outdoor fixtures (n=3), linear LED tubes (n=3), street lighting (n=1) and case lighting (n=1).

3.1.2.3 LED Sales

In this section we present findings related to LED sales among participating and non-participating distributors. Both groups were asked a series of questions focused on changes in LED sales over the last two years, and all respondents indicated that the LED market has grown since January 2013 regardless of whether they participated in the Trial.

Participating Distributors

All 16 of the interviewed participating distributors indicated they have seen at least some increase in LED replacement lamps sales since January of 2013, although half said they are not sure how much sales have increased. For those that provided an estimated percentage, responses ranged from less than 25 percent to approximately 75 percent depending on the percentage of their business devoted to LED sales. Participating distributors that said they deal primarily with LED products versus other lighting technologies reported larger increases in LED sales overall compared to other distributors.

Despite reports of increases in LED sales across all participating distributors, six out of 11 participating distributors report that their company has not changed their lighting stocking practices since the beginning of 2013 (five distributors were unable to comment). One reason is because some participating distributors said they order LED lamps on a per order basis (n=2) versus traditional stocking methods.

Participating distributors were also asked what factors have contributed to their company's change in LED replacement lamp sales. The two most commonly cited factors included a decrease in price and PG&E incentives (the Trial). Table 11, below, provides a detailed breakdown of the various factors that participating distributors mentioned.

Table 11: Reasons for Increase in LED Sales (n=16)*

Reason for Increase	%
Decrease in price	50%
PG&E incentives (the Trial)	31%
Variety of LEDs available	25%
Improved marketing	25%
Improved quality	25%
Customer education about energy efficiency	19%
Other	13%
Code requirements	6%

* Multiple responses allowed; percentages may not add up to 100%

Non-Participating Distributors

All non-participating distributors indicated they have seen an increase in LED sales since January 2013. Four non-participating distributors were able to approximate the percentage increases and all ranged from between 30 percent and 50 percent increases. Interviewees mentioned linear LED tubes, BR style lamps, PAR lamps, A-lamps and MR16s as particular lamp types with significant increases in sales.

Four of seven non-participating distributors stated that they have changed their stocking practices over the past two years. Of these four, two stated that they have started to stock more linear LED tubes in response to high demand, and two stated they are stocking more LED lamps in general due to high demand.

Non-participating distributors were also asked what factors have contributed to their company's change in LED replacement lamp sales. The responses were similar to those of participating distributors, with all non-participating distributors mentioning decreasing price, customer education and awareness, and the availability of rebate programs as the most important factors in increased LED sales. Interviewees also noted improved product quality, the increasing range of LED products, and greater marketing as influential factors.

3.1.3 Participating Distributor Trial Experience and Interactions

In this section we present findings related to the distributor participation experience in the Trial, as well as their interactions with their customers – lighting contractors and end-users.

3.1.3.1 Trial Experience

Nearly all of the participating distributors (88%, n=14) said they were “very likely” to suggest LED lamps to commercial customers due to the Trial, and the rest (n=2) said they were “somewhat likely”. They explained that they believed the LEDs were often the right choice for their customers (n=10). When asked why they were the right choice, distributors reported the following reasons: low energy use (n=5); long life (n=2); high return

on investment (n=4); high quality light (n=3); and low maintenance costs (n=3). They also said that the midstream incentives motivated them to push LEDs because they were more likely to close a sale (n=3) and that the LEDs were more profitable because they didn't have to pass on the entire incentive and/or customers were willing to purchase more in order to take advantage of the rebates while they were still available (n=3).

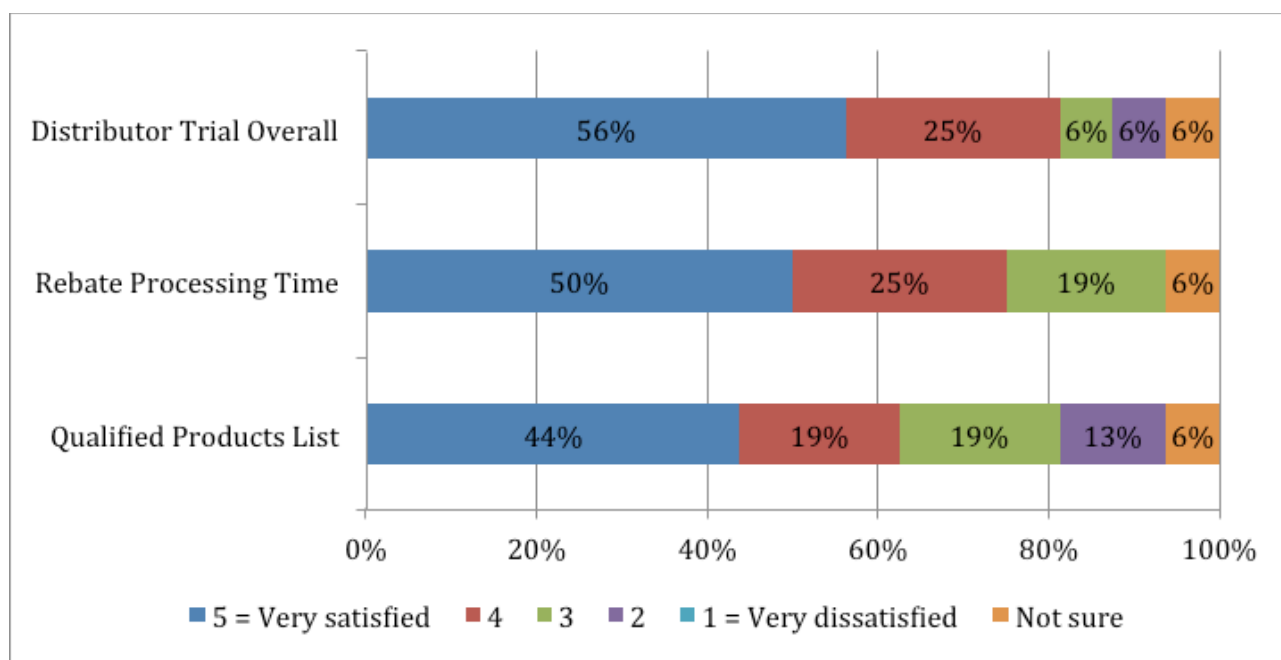
Participating distributors reported high levels of satisfaction with the Trial, with 56 percent (n=9) giving a rating of five out of five (i.e. "very satisfied") and 81 percent (n=13) giving a rating of four or higher, shown in Figure 19. Respondents indicated that there were issues with customer requirements (n=2), rebate applications (n=2), processing time (n=3), and the qualified products list (n=4). However, most of these issues were reportedly resolved after working with PG&E staff, and participating distributors believe the program is running smoothly.

Participating distributors also reported high levels of satisfaction with the rebate processing time, with 50 percent (n=8) giving a rating of five out of five (i.e. "very satisfied") and 75 percent (n=12) giving a rating of four or higher. They indicated that there were a few problems with checks being slow or incorrect, but in general the rebates were issued very quickly compared to other lighting rebate programs.¹⁷

As shown in Figure 19 below, **participating distributor satisfaction with the qualified products list was fairly high**, with 44 percent (n=7) giving a rating of five (i.e. "very satisfied"), 63 percent (n=10) giving a rating of four or higher. One of the two distributors who rated their satisfaction a two out of five mentioned that the list was overwhelming and they ended up selecting a limited number of products from the list to promote with Trial incentives.

¹⁷ The processing usually took about a month, sometimes as fast as two weeks, according to distributors.

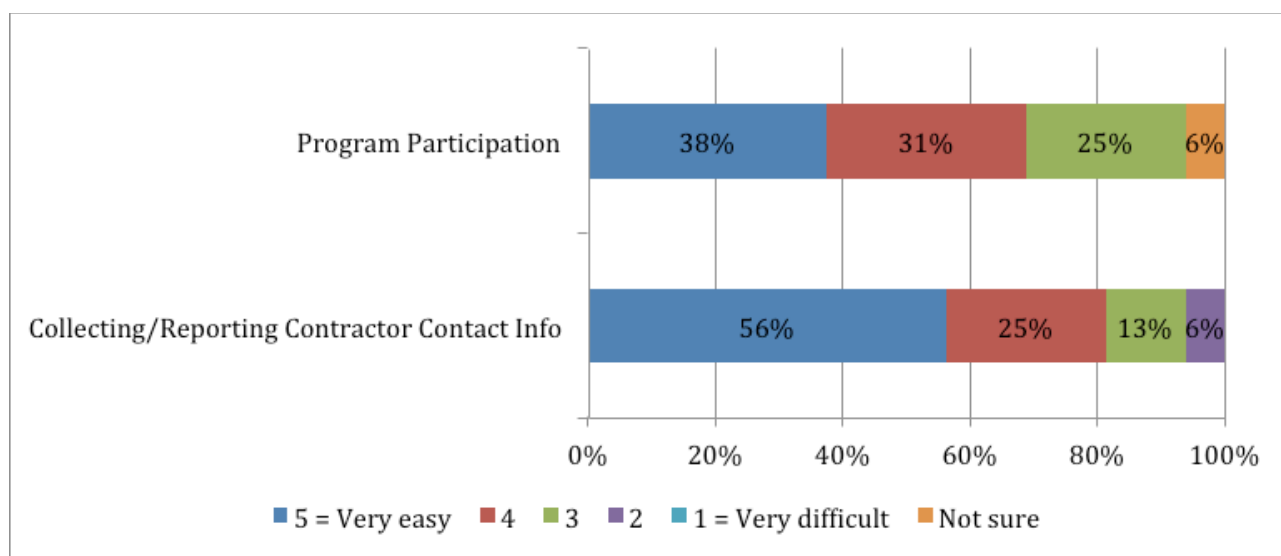
Figure 19: Distributor Satisfaction with the Trial (n=16)



Participating distributors rated their ease of participation fairly high, with six out of 16 giving a rating of five out of five (i.e. “very easy”) and none giving a rating below three; as shown in Figure 20. They explained that the Trial was one of the easiest programs they have participated in, mostly due to the online applications and the fact that they had a dedicated point of contact.¹⁸ **Most participating distributors reported that collecting and reporting contractor/installer contact information to PG&E was not difficult,** as shown in Figure 20.

¹⁸ Some distributors had issues finding LED model numbers for the applications, wanted information about how to avoid common errors (e.g. don’t use apostrophes in the application text), and/or wanted PG&E to send them a confirmation when their applications were accepted and were being processed.

Figure 20: Distributor Ease of Participation, Reporting Contact Information (n=16)



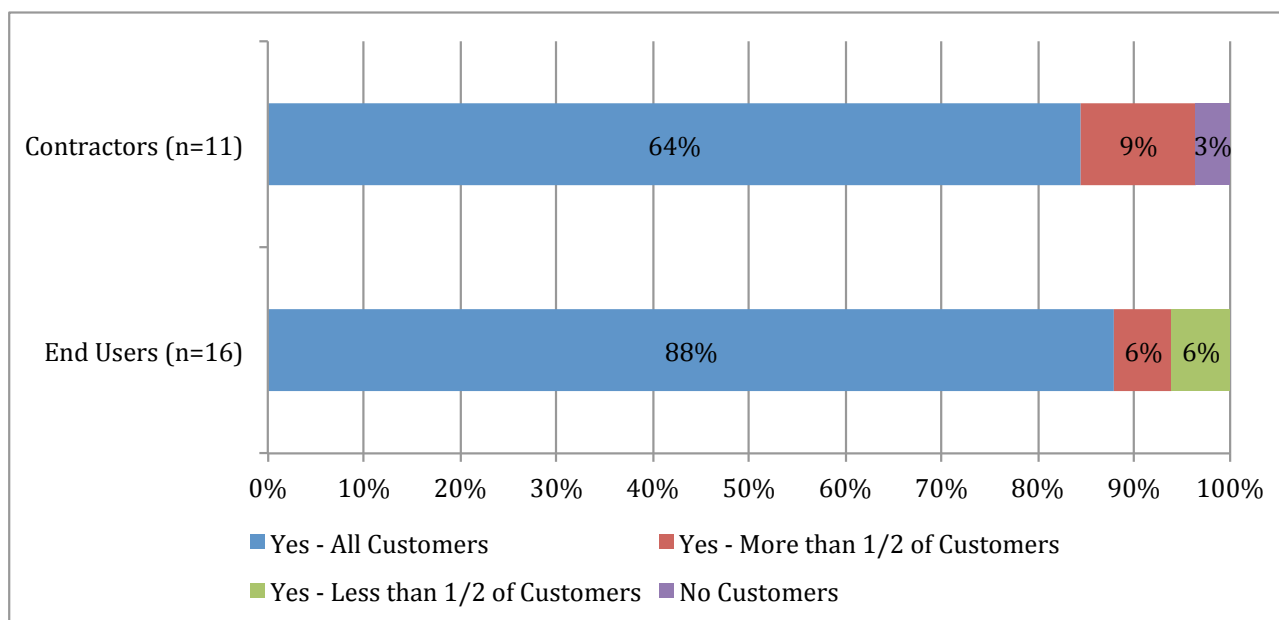
When asked whether their participation would change if reporting contractor/installer contact information was required for all Trial projects where a contractor/installer installed the lighting equipment, 13 percent (n=2) said they would likely reduce their participation, 19 percent (n=3) said they may reduce their participation, 38 percent (n=6) said it would not change their participation, and the rest (n=5) were not sure.¹⁹

3.1.3.2 Communication with Contractors and End-users

We asked the participating distributors whether they told end-users and purchasing contractors about the Trial rebates. As shown in Figure 21, all of the distributors (n=16) told at least some of the end-users, including 88 percent (n=14) who always told end-users. Seven of the 11 participating distributors (64%) said they always tell the contractors.

¹⁹ One distributor cautioned that even if the distributor participation did not change after changing this requirement, it might reduce the effectiveness of the program due to the increased time burden for everyone involved. Another said it would be very easy to provide the contractor name because it is stored in their sales database, but a phone number would be difficult because it would need to be recorded manually by the local branches.

Figure 21: Whether Distributors Tell Customers about Trial Rebates (According to Distributors)



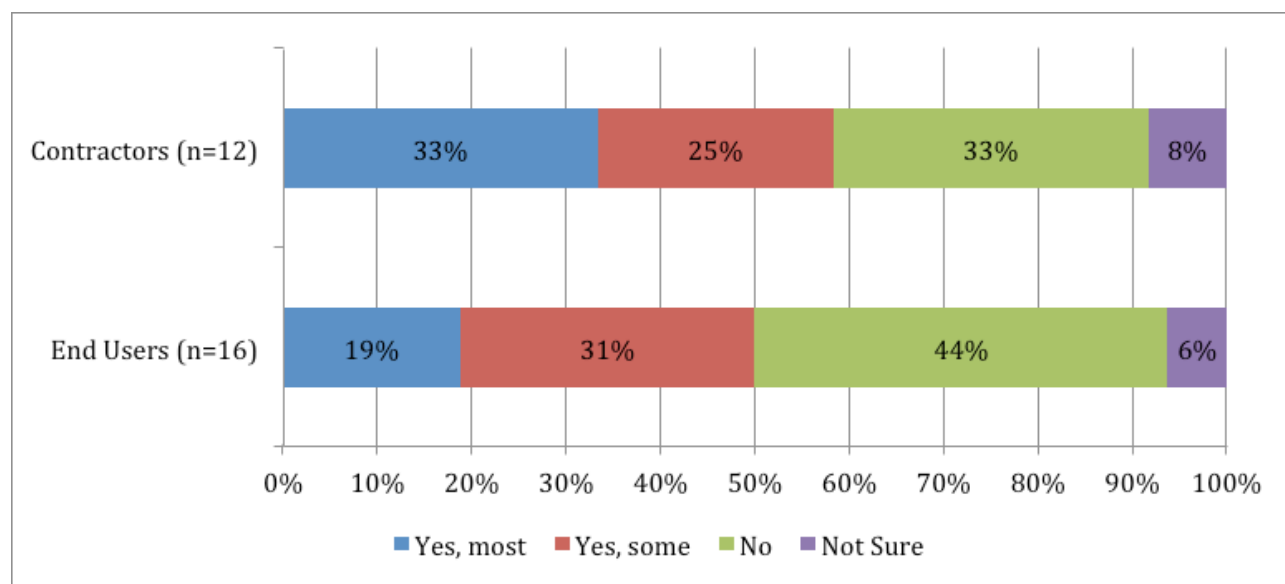
Nearly every participating distributor (15 out of 16) reported that they changed what they presented to end-users due to the discounted price available with Trial incentives. Specifically, 12 of the distributors tell end-users about the discounted price (shown above), four emphasize the importance of timing to take advantage of the rebate, two mention improved return on investment, and one provides end-users with program materials.

Many distributors (11 out of 16) also changed what they presented to contractors as a result of the discounted price. While eight distributors always or typically tell contractors about the discounted price, six also suggest LEDs instead of other products, and one highlights the quality of the light.

Most of the distributors (64%, n=7 out of 11) said that the Trial has not affected their relationships with any of the contractors they work with. Three distributors said that the Trial has strengthened their relationship because it helped the contractors get more business by allowing them to offer discounted LEDs to their customers and one said that the Trial has made the contractors more interested in the efficient lighting technologies.

Next we asked the distributors whether the end-users or contractors would prefer to receive the rebates directly from the utility, as opposed to receiving them through the distributor. Forty-four percent (n=7 out of 16) said the end-users would prefer the distributor rebates, as shown in Figure 22. Equal proportions (33%) report that most contractors would prefer to receive the rebates directly and that contractors preferred distributor rebates.

Figure 22: Would Customers Prefer to Receive Rebates Directly From the Utility Versus Through the Distributor (According to Distributors)?



3.1.3.3 Comparison to Trade Professional Alliance

Approximately half of the participating distributors in our sample are part of PG&E’s Trade Professional Alliance (TPA). The seven participating distributors that overlapped between the Trial and the TPA were asked to discuss their experience in both programs in an effort to compare the two PG&E programs from a distributor perspective.

Among these distributors, three reported they had applied for or received rebates for LED fixtures through the TPA program. The main reasons that less than half of the distributors that participated in both programs have actually taken advantage of the TPA rebates include focusing on LED lamps more often than fixtures (n=2)²⁰ and the additional time required of the TPA application and rebate process – they mentioned the extra step of getting the end-user’s signature that the TPA program requires (n=2) as a barrier to participation.

The vast majority of overlapping participating distributors in our sample indicated a strong preference for the Trial versus their experience with the TPA. From a distributor perspective, because the Trial provides the incentive to the distributors without the extra end-user permission the TPA requires, the Trial is easier to implement on a daily basis and helps streamline the LED incentive process overall.

²⁰ Since the TPA allows market actors to facilitate the downstream rebate process on behalf of their customers, rebates are only available for fixtures (not lamps), as only fixtures qualify for PG&E downstream incentives.

3.1.3.4 Comparison to Direct Install Program

Two of the distributors we spoke with said that they sell lamps to contractors who install them as part of the PG&E's direct install offerings. Three distributors said that none of their lamps are installed this way and the other distributors were unsure.

We asked the two distributors who were involved with the direct install program to answer some additional questions about possible overlap. One said that about 75-80 percent of end-use customers are the same for the direct install programs and the Trial, while the other distributor believed that there was very little overlap. Both said that the midstream program is complementary to the direct install program because the Trial provides incentives to a group of end-users not captured by the direct install programs (those who do not use contractors and/or those who want specific LEDs that are not eligible for incentives through the direct install program), and that the Trial provides an easier option for contractors – particularly for those who are less experienced with rebates. One of these distributors thought that the Trial was superior, while the other said he believed they were complementary.

3.1.4 Non-Participating Distributor Trial Perceptions

Non-participating distributors gave three primary reasons for not participating in the Trial (to date): lack of program product alignment with their product lines (n=3); lack of information and understanding of the program (n=2); and a perception that the program incentives are not high enough to justify the additional work involved in program participation (n=2).

Despite these reasons for not participating, all of the non-participating distributors we spoke with believed there is value in offering rebates directly to distributors. Benefits of the distributor-focused approach (beyond simply reducing the product price) include increased willingness among distributors to promote LEDs (n=2), the more comprehensive and streamlined process (n=1), easier engagement with contractors since distributors do the paperwork (n=1), it provides distributors another marketing tool (n=2), and opportunity for cross promotion with manufacturers and utilities (n=1).

Although all non-participating distributors saw value in the midstream approach, two also highlighted specific concerns. One distributor noted that participating distributors may only pass on a portion of the rebate, that paperwork for distributors is a barrier to participation, and that end-users may not know that they are receiving incentivized products. Another interviewee was concerned with spending extra time pursuing rebates through the program, and claimed that they, *“can't afford the time especially when there is a lot of legwork.”*

On a scale of one to five with five being very likely to participate and one being very unlikely to participate in the Trial, three non-participating distributors gave a score of five, two gave a score of three and two gave a score of two. One interviewee who gave a score of two stated that if T8-style LED replacement tubes were included in the Trial they would be very likely to join the program. Another who gave a score of three said that if the incentives were increased

to a point where it was competitive with incentives through other rebate programs they would be very likely to join because “*the logistics are easier.*”

3.1.5 Cannibalization and Attribution

We asked each of the participating distributors a series of questions to inform our assessment of the effectiveness of the midstream incentive approach on increasing adoption of LED replacement lamps in the commercial sector. Specifically, we asked about the influence of Title 24 requirements, the effectiveness of midstream and downstream incentives, overlap with other incentive programs, and the benefits of this program’s midstream incentive approach.

3.1.5.1 Effects of Title 24

Five of the 16 participating distributors we spoke with said that some of their sales through the distributor LED Trial were required for the customer to comply with California’s Title 24 building code.²¹ Among these distributors, one estimated that less than five percent of their LED replacement lamp sales through the Trial were required to comply with Title 24, and about 30 percent of those LED sales would have occurred in absence of the code requirements. Another distributor reported that 10 to 20 percent of their sales through the program were required by Title 24 and that none of those sales would have occurred in absence of the code requirements.²²

3.1.5.2 Midstream vs. Downstream

Participating distributors were also asked a series of questions related to potential changes to qualifying product types. **If PG&E made a change, and LED replacement lamps qualified for only the downstream rebate as opposed to only the Trial rebate, 38 percent (n=6) of distributors said their sales of LED replacement lamps would increase, 31 percent (n=5) said they would decrease, and 31 percent (n=5) said they would stay the same** (shown in Figure 23, below). Those that predicted their sales would increase believe the main factors that would affect the success of downstream rebates are whether customers are able and willing to find rebates and submit applications (n=3) and whether customers purchase their lamps from distributors (n=1). Those that predicted their sales would decrease believe the main factors are whether customers are able and willing to find rebates and submit applications (n=3) and whether customers have the liquidity to wait for rebates rather than get them at point-of-sale (n=1). Those that predicted their sales would stay the same believe

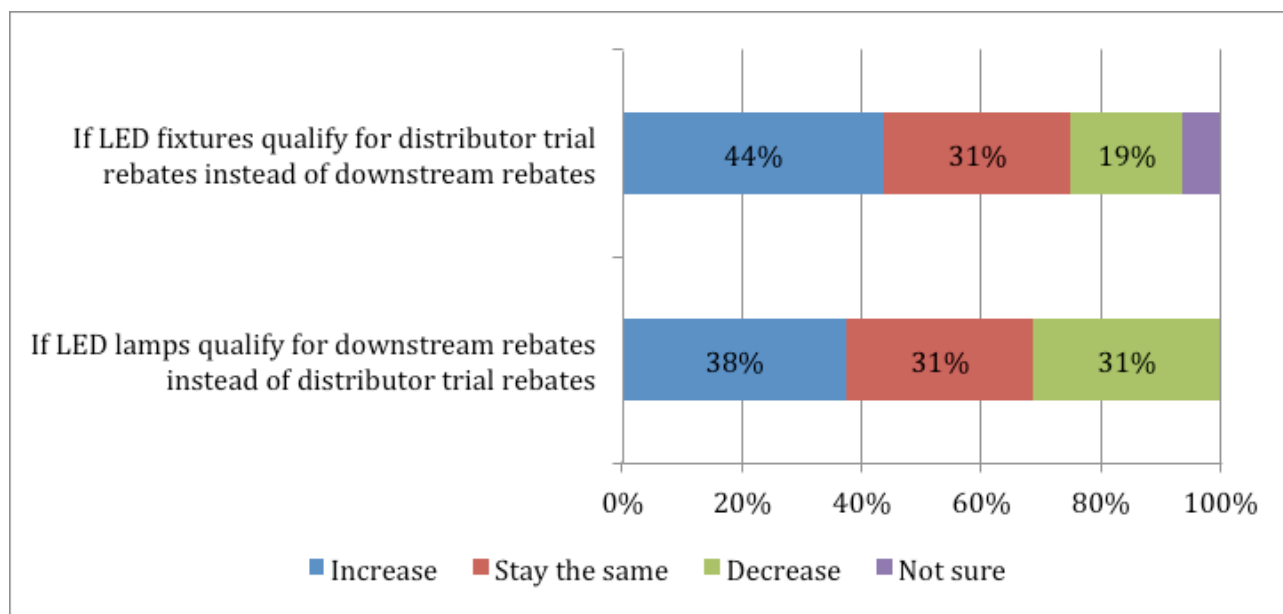
²¹ While we did not ask non-participating distributors specifically about the impact of Title 24, two interviewees volunteered the opinion that, in their recent experience, Title 24 appears to be having a negative impact on the amount of retrofit projects underway. One interviewee stated that the new code “*complicates projects and usually the response is people don’t do anything,*” while the other interviewee noted that Title 24 “*is going to negatively impact retrofits – they (customers) aren’t going to select fixtures, so the new code is going to encourage them to stick with older products.*”

²² The other three distributors were not sure what proportion of their sales resulted from Title 24 compliance.

the main factors are whether the existence of the rebate is all that matters (n=3) and whether customers are able and willing to find rebates and submit applications (n=1).

If PG&E made a different change, and LED fixtures qualified for only the midstream distributor rebate as opposed to only the downstream rebate, 44 percent (n=7) of Trial participating distributors said their sales of LED fixture sales would increase, 19 percent (n=3) said they would decrease, and 31 percent (n=5) said they would stay the same²³ (also shown in Figure 23, below). Those that predicted their sales would increase believe the main factors that would affect the success of midstream rebates are customer education about whether LED lamps or fixtures would be best for their situation (n=4), how much current fixture sales shift from non-participating distributors to those that are able to offer point-of-sale rebates (n=2), and whether customers are able and willing to find rebates and submit applications on their own (n=1). Those that predicted their sales would decrease believe the main factors are customer education about whether LED lamps or fixtures would be best for their situation (n=1) and whether customers are able and willing to find rebates and submit applications on their own (n=1). Those that predicted their sales would stay the same believe the main factor is whether customers are able and willing to find rebates and submit applications on their own (n=2).

Figure 23: Predicted changes in distributor sales of LEDs if PG&E changed the rebate approach (n=16)



²³ One was unsure.

3.1.5.3 Other Incentive Programs

We asked participating distributors to estimate the percentage of retrofits that received incentives through the Trial that would have received incentives through another program in absence of the Trial. Five said none, one said 10 to 15 percent, another said 20 to 30 percent, two said 90 to 100 percent, and the rest were not sure (n=7). The specific rebate programs they mentioned included Express Efficiency, and PG&E's custom rebates.

According to participating distributors, when their customers were eligible for multiple incentive programs, they selected the Trial because of the convenience of point-of-sale rebates (n=4), the convenience of the distributor filling out the application (n=3), the rebate amount (n=1), and because the contractor they were working with suggested that they buy lamps directly from the distributor because it was an easier way to get incentives (n=1).

3.1.6 Impact of Midstream Approach

Participating distributors overwhelmingly believe the Trial has resulted in an increase in sales (n=15). Only one said the Trial had no impact. Among those who perceived an increase from the Trial, four estimated that it caused less than a 25 percent increase, five reported that it caused between a 25 and 49 percent increase, and one reported that it caused a 50 percent increase.

Next we asked the participating distributors to explain why the Trial led to some sales that would not have occurred otherwise. The most common response (n=7) was that customers and contractors are not always able or willing to find available rebates and go through the entire application process, and that this was particularly true for small projects.

Three participating distributors mentioned that the distributor incentive approach causes professional salespeople to push LEDs. Salespeople are usually paid commission and want to devote their time to sales that are likely to occur (rather than promoting something they do not believe will sell), such as those with Trial incentives. Reportedly, salespeople pushing products are much more effective than a pamphlet and downstream rebate because sales staff are trained to answer all of the customer's questions and educate them about the benefits of energy efficiency (and they are personally motivated to make sales due to their commission-based pay).

Overall, 88 percent (n=14) believed that the distributor LED incentive approach is beneficial as an addition to the PG&E program portfolio for lighting, while only one believes it was not beneficial (one was unsure). Among the seven non-participating distributors, five believed the distributor LED incentive approach is beneficial as an addition to the PG&E portfolio and one believed it was not beneficial (one was unsure).

3.2 Manufacturer In-Depth Interview Findings

Evergreen conducted in-depth telephone interviews with lighting manufacturers that supply LED replacement lamps to distributors who received rebates through the Trial.

3.2.1 Respondent and Firm Background

Interview respondents included representatives from one small and four large manufacturers of commercial LED replacement lamps (with products that were sold through the Trial). Respondent and company information is presented below in Table 12.

Table 12: LED Manufacturer and Respondent Characteristic Disposition

	Manufacturer				
	#1	#2	#3	#4	#5
Position	Regional Sales Manager	Utility Relations Manager	Utility Relations Manager	Utility Relations Manager	Business Development Manager
Years in Position	1.5 years	1 year	4 years	6 months	1.5 years
Manufacturer Size	Large	Large	Small	Large	Large
Non-LED Lighting Manufacturer?	No	Yes	No	Yes	No
Other Product Lines?	No	Yes*	No	Yes*	No

* These manufacturers also make consumer electronics and appliances

All interviewees stated that they were knowledgeable about the Trial and PG&E rebate programs in general. Three of the five interviewees stated that their company sold LED and other lighting products that had received incentives through PG&E programs other than the Trial (including upstream programs, Third Party Implementer programs such as Energy Savers and RightLights, Direct Install programs and Custom programs). One interviewee, representing the single small manufacturer, stated that none of their products receive incentives through any PG&E energy efficiency programs other than the Trial.²⁴

We asked interviewees what proportion of their total lighting sales received a rebate in one form or another. All interviewees had difficulty answering this question, claiming that they typically had very little information about where their products are ultimately installed, or whether or not they received a rebate through a utility program. When probed to approximate based on their best judgment, manufacturer estimates varied widely (as shown in Table 13, below).

²⁴ One interviewee was not able to answer this question (they do not track sales all the way to the end-user).

Table 13: Proportion of Lighting Sales Receiving a Rebate

Manufacturer	Proportion of LED Sales Receiving Rebate
#1	70%
#2	90%
#3	15%
#4	Unknown
#5	15%

3.2.2 The LED Market

We asked manufacturers a series of questions about the LED market as a whole. The findings are presented below.

3.2.2.1 Market Penetration of LED Technology

According to interviewed manufacturers, LED sales to the commercial sector have increased significantly over the previous two years, with individual manufacturer representatives quoting LED sales growth between 50 and 70 percent per year. Manufacturers mentioned the following factors contributing to increased sales:

- **Improved LED technology and new product development.** Improvements in overall quality of LED products and the introduction of a wider range of lamp shapes (including A-Lamp, BR and PAR style lamps) have broadened acceptance of LED technology and increased their applicability in commercial settings.
- **Decreasing cost of LED lighting technology.**
- **Increased consumer awareness of LED products.** Consumers have become more knowledgeable about LED technologies and the potential for energy savings.
- **Presence of utility rebate programs.** Awareness of utility rebate programs is growing, as are the number of available programs across the country. Respondents saw this development as a significant factor boosting LED sales. Utility rebate programs lower the first cost of LED products making them more attractive to end-users.
- **Greater demand from commercial end-users for LED products.**

We asked respondents to identify leading market sectors in adoption of LED lighting products, as well as market sectors that are currently resistant to adopt LED technologies. The

manufacturers identified six sectors as leading adopters, including retailers²⁵ (n=4), restaurants (n=3), hotels and hospitality (n=3), manufacturing (n=1), grocery stores (n=1), and healthcare (n=1).

According to the manufacturers, retail stores are most likely to adopt LED lighting because of their specific lighting requirements; retail stores are typically replacing halogen lamps and require high quality lighting that fluorescent technologies often fail to provide. Similarly, manufacturers noted that restaurants are demanding LED lighting because of the need for high quality lighting that enhances the customer experience. Two manufacturers explained that LED adoption among hotels is a relatively recent occurrence, with one stating that in the past hotels were reluctant to change to LED because they had invested in CFL products that were providing satisfactory lighting.²⁶ The one interviewee that identified manufacturing as a leading sector noted that facilities with hard to reach, hard to service fixtures were particularly open to LED technologies.

The interviewees identified three sectors as lagging in LED adoption, including manufacturing (n=2), office buildings (n=2), and industrial facilities (n=1). Interviewees explained that each of these sectors is highly reliant on linear fluorescent technologies for their lighting needs, and are currently more inclined to continue to choose linear fluorescent technologies over linear LED technologies. Reasons for this include the different upfront cost of the technologies (with LEDs typically more expensive) and availability of incentives.²⁷ In addition to specific sectors, manufacturers identified tenant-occupied facilities and businesses with low capital budgets as being resistant to LED lighting solutions.

3.2.2.2 LED Lamps vs. LED Fixtures

We asked manufacturers a series of questions to gauge what proportion of commercial customers are installing LED replacement lamps versus LED fixtures. All respondents reported that estimating these proportions was difficult because technology adoption is highly dependent on sector and lighting application.

Four of the five manufacturers interviewed stated that, in general, more commercial sector customers choose LED replacement lamps over LED fixtures. The primary reasons these interviewees cited for greater demand for lamps were:

- Lower first cost of the product;

²⁵ Interviewees mentioned both small retail such as boutique clothing stores, salons and specialty stores, as well as large retail segments including department stores and car dealerships.

²⁶ This manufacturer did not know why hotels were changing to LED technology but posited that it could be because the cost of LED lamps was falling to a point where the return on investment was more appealing, despite recent investments in CFLs.

²⁷ Two manufacturers noted that in many cases rebates are more readily available and more attractive for linear fluorescent technology than for linear LED technology.

- Lower cost of installation (labor);
- Faster return on investment; and,
- Ease of installation.

One large manufacturer (of LED lighting products only) reported that their LED sales in California consist mainly of fixtures (65%), compared to 20 percent lamps and 15 percent street lighting. This company focuses on sectors with larger facilities, frequently with specialized lighting requirements, so they are often catering to applications better suited by fixtures.

We asked interviewees if there were specific market sectors or customer characteristics that were more likely to install LED replacement lamps versus LED fixtures. All respondents reiterated that while there are certain customer groups that are more likely to adopt one technology over the other, the major determinant is the application of the technology. **All manufacturers noted that new construction projects in any segment tended to be interested in fixtures over lamps, while retrofit projects often involve lamps unless the specific application called for a fixture installation.** Specific market segments noted as being more inclined to install fixtures than to purchase replacement lamps include office spaces, manufacturing and any commercial spaces with linear fluorescent lighting. Segments that were highlighted as being more lamp focused included small retail and hotels. Several interviewees explained that when an application could be a fit for either a new fixture or a new lamp, building owners or project managers would typically base their decision on the payback period (and in these cases, lamps usually prevail). One interviewee noticed that capital rich customers who have a choice will often purchase fixtures because they are perceived as being more reliable in the long-term.

3.2.2.3 LED Sales

We asked manufacturers a series of questions focused on the characteristics of their LED sales over the past two years, and the impact of the Trial on LED sales. As noted previously, all manufacturers have experienced significant increases in sales of LED lighting technologies over the past two years. Interviewees attributed increased sales primarily to decreasing price, improved quality, new product development, improved customer awareness, and the presence of utility rebate programs, including the Trial.

We asked manufacturers to identify any specific LED types that have experienced increased or decreased sales over the past two years. Lamp types identified as experiencing high increases in sales were LED A-lamps (n=4), MR-16 lamps (n=1) and PAR lamps (n=2). Two interviewees noted that BR style LED lamp sales were increasing but not as significantly as other styles, and another mentioned that they had experienced significant increases in their sales of linear LEDs.

All manufacturers indicated that the Trial has positively impacted their company's sales of qualifying lamps in PG&E territory to some degree. Two respondents from large national

manufacturers of LED and other technologies claimed the program was responsible for increases in sales of their LED lamp products of between 10 and 20 percent in PG&E territories. The one small manufacturer – who operates exclusively in California – stated that the Trial impacted 100 percent of their sales in PG&E territory, claiming they would have zero sales in the territory without the Trial.

Another large manufacturer, of LED lighting products only, noted that the Trial has positively impacted sales through distributors who are focused on retail sales – i.e., over the counter sales direct to end-users – that are often small to medium volume. However, the interviewee noted that while it is important to engage these customers, the Trial may be missing out on influencing larger volume sales that go through energy services firms.

To understand how products are delivered to the market, we asked a series of questions about manufacturer sales channels and the impact of the Trial on these sales channels. Prior to January 2013, all five manufacturers stated that the bulk of their sales went through a distributor, with the remainder going either directly through contractors, or direct to end-users through large national accounts and regional field representatives. Four of the five manufacturers have seen increased sales through distributors since the outset of the Trial although none could provide specific figures. Quotes from two large manufacturers about the impact on sales channels are provided below:

“Distribution channels are the bulk of our sales but the Trial has helped move more into the distribution stream and away from contractors.”

“Distributors have become more prevalent for sure. The program has helped make distributors more involved. There is a definite advantage to distributors being more involved. They are closer to end-users, they have the capacity to do the rebate work and they can help market more effectively to end-users and contractors.”

3.2.3 Manufacturer Trial Experience and Interactions

In this section we present findings related to the experiences of manufacturers and their interactions with other market actors involved in the Trial.

3.2.3.1 Marketing Approaches

Manufacturers reported that they engage in a broad range of marketing efforts to promote their LED replacement lamps. Table 14 presents the frequency of responses for each marketing activity mentioned. Manufacturers reported that they employed the same marketing strategies prior to January 2013, when the Trial was initiated.

Table 14: Manufacturer LED Marketing Strategies

Marketing Activity	# of Respondents
Trade Shows	5
Conferences	5

Distributor Outreach	5
Catalogues	5
Targeted end-user outreach	5
Contractor Outreach	4
Magazines	3
Product demonstrations	2
Mass-market advertising (TV ads, Billboards etc.)	1
Co-branding	1

3.2.3.2 Interactions with Distributors

We asked manufacturers to estimate the proportion of their distributors that ask them about the Trial versus the proportion of distributors that they have to educate about the Trial. The results are shown below, in Table 15. As shown, manufacturers tend to reach out to their distributors about the Trial more frequently than distributors approach them about the Trial.

Table 15: Manufacturer Frequency of Outreach to Distributors

Manufacturer	% Distributors that Ask About the Trial	% Distributors Informed by Manufacturers About the Trial
#1	40%	60%
#2	30%	70%
#3	25%	75%
#4	40%	60%
#5	50%	50%
Mean (%)	37%	63%

According to the manufacturers, smaller distributors, who may focus on LED technologies are less likely than larger distributors to be aware of the program. One manufacturer also mentioned that the sophistication of the distributors tracking system and their capacity to complete the rebate process is a factor in distributor interest in the program.

There were also some concerns raised by manufacturers about the role of distributors in the Trial. Specifically, one noted that *“there is the possibility of cheating on the part of distributors”* (passing on less than the full incentive amount), and another reported that *“there is not enough end-user education, we are depending on distributors to educate the end-user and there may be problems with distributors not having the resources or incentive to educate end-users. It is not always in the best interest of the distributor to educate end-users about the program if they do not stock qualified products.”*

3.2.3.3 Satisfaction with Qualified Product List

Satisfaction with the qualified product list is mixed among manufacturers. Table 16 below presents the scores provided by each manufacturer.

Table 16: Reported Satisfaction with the Trial Product List

Manufacturer	Satisfaction Score*
#1	3
#2	5
#3	4
#4	4
#5	2
Mean	3.6

* "1" is very dissatisfied, "5" is very satisfied

The single manufacturer that was less than satisfied with the product list (manufacturer #5 – a manufacturer of LED technology only) stated that they gave the list a low score primarily because it did not cover a lot of their company’s products. **Four of the five manufacturers hoped that in the future linear LED products would qualify for the Trial.** One manufacturer, a large producer of LED and other lighting technologies, would like to see the Trial expand to include fixtures that have been proven successful in other prescriptive programs.

No manufacturers had concerns with specific products on the qualified list. However, one manufacturer expressed concern that some manufacturers may offer lower quality, qualifying products free with the incentive. Another manufacturer was concerned about how products were selected, stating that the process was not sufficiently transparent making it difficult to understand how and why PG&E selected products.

3.2.4 Cannibalization and Attribution

We asked each of the LED manufacturers a series of questions to inform our assessment of the effectiveness of the midstream incentive approach. Specifically, we asked them to compare the midstream and downstream incentive mechanisms on LED replacement lamp sales and overlap with other incentive programs.

3.2.4.1 Midstream vs. Downstream

We asked manufacturers if PG&E made a change, and LED replacement lamps qualified for only the downstream rebate as opposed to only the distributor LED Trial rebate, what impact would this have on their sales of LED lamps. Two manufacturers stated that their sales would decrease, two stated their sales would increase, and one said their sales would remain about the same.

The two manufacturers stating their LED lamp sales would decrease (manufacturers #2 and #3 in Table 12, above) believed this would occur because end-users would not get a point of sale rebate. The two manufacturers stating their sales would increase, a large manufacturer of LED products only and a large manufacturer of LED lighting and other technology, believed their sales would increase because their marketing efforts are geared toward end-users so they could integrate LED lamps into their existing marketing efforts rather than have to change to market to distributors.

We then asked, if PG&E made a different change, and LED fixtures qualified for only the LED distributor Trial rebate as opposed to only the downstream rebate, how would this affect sales of LED fixtures. Of the four manufacturers that produce LED fixtures, one stated their sales would decrease, one stated their sales would decrease in the short term but increase in the long term, one stated their sales would increase, and one stated their sales would remain about the same.

3.2.4.2 Other Incentive Programs

We asked manufacturers if any of the installations that received a Trial incentive would have occurred via another incentive program in the absence of the Trial. Three manufacturers said that none of the sales would have gone through another incentive program, one said some sales would have gone through another program, and one was not sure.

We asked manufacturers to explain why the distributor LED Trial led to some sales that would not have occurred otherwise. Three manufacturers stated that the main reason was that the Trial provides incentives for products that were not incented previously in any other utility rebate program in PG&E territory. The two other manufacturers believe that the increase is due to the Trial transferring the administrative effort of incentive application from the end-user to the distributor, making it easier for end-users and providing a point of sale price reduction.

3.2.5 Impact of Midstream Approach

All manufacturers believe that the Trial's incentives are positively impacting the volume of LED replacement lamp sales in the commercial sector and that the Trial is a beneficial addition to the PG&E program portfolio. Some illustrative excerpts from manufacturers are presented below:

"Distributors are starting to market to sectors where they couldn't reach before. Working closely with distributors and PG&E, we are seeing increasing sales among lamps that would not otherwise be seeing the same increases ... having the instant discount is by far the biggest contributor to the success of the program."

"The Trial is absolutely a beneficial addition. Distributors are more likely to promote LEDs because of the program ... I have had sit down meetings with distributors and have seen them be very excited about the program."

Manufacturers also noted specific impacts related to product development and marketing, discussed below.

3.2.5.1 Trial Influence on Product Development

All of the manufacturers we spoke with stated that the Trial, alone, has not had a strong influence on their company strategy for developing new products, but rebate programs in aggregate do exert strong influence on product development. Two manufacturers mentioned that the Trial and some other programs in California have influenced them to develop products that would meet California LED standards and requirements for ENERGY STAR® certification.

Three manufacturers shared a specific concern about the potential for the Trial, in its current form, to incentivize development of comparatively inefficient products. The concern is that because the incentive level is tied to the wattage of lamps alone, some manufacturers may opt to develop products that are higher wattage than required in order to qualify for a higher incentive. The concerned manufacturers suggested that the incentive structure should be tied to other performance factors in addition to wattage.

Manufacturers also gave the following recommendations for how the Trial could better support manufacturer strategies for developing new products:

- **Maintaining consistency in program requirements.** Two manufacturers stated that there have been cases where products were developed based on a set of program specifications, but these specifications were later changed meaning the new product no longer qualified.
- **Capping incentive amounts based on the price of the lamp** so there is a minimum consumer contribution. This would prevent lower quality, cheaper bulbs being distributed free of charge.
- **Basing incentive amounts in part on the quality of the product warranty** to encourage manufacturers to develop higher quality products.

3.2.5.2 Trial Influence on Product Marketing

While the outreach strategies employed by manufacturers have not changed (see section 3.2.3.1), **all manufacturers indicated that the Trial has influenced the content and relative allocation of marketing across target populations. In particular, all manufacturers stated that they are focusing more of their efforts on reaching out to, and working with, their distributors, and including the Trial as part of their marketing message to distributors.** Manufacturers gave the following examples of specific activities to reach out to or collaborate with distributors:

- Targeting distributors who are willing to participate in the program.
- Conducting conference calls with distributors, contractors, and end-users.

- Developing marketing materials for distributors that highlight the Trial.
- Integrating the Trial in cobranding efforts with distributors.

One manufacturer stated that they are promoting the Trial to their distributors but are doing this more judiciously than they previously were. The reason for this is that for some lamp types, they perceive that the program could effectively promote their competitors brands over their own, particularly when competitor's lamps may be lower cost and lower quality.

3.3 LGP/Third Party Direct Install Implementer In-Depth Interview Findings

Evergreen interviewed a total of five respondents from organizations that implement direct install programs in PG&E territory in order to understand what changes have occurred in the LED market in general, and changes that may have occurred as a result of the Trial.

3.3.1 Respondent and Firm Background

All five of the organizations interviewed work with small/medium businesses (referred to by respondents as "SMBs"). Two of the five respondents we spoke with represent third party implementers that run programs for LGPs in addition to other sector-specific programs, two represented LGPs themselves, and one runs a program that deals solely with SMBs. One of the LGPs works with one of the third party implementers we spoke with in part of their territory, and runs their own direct install program in another part of their territory. The other LGP we spoke with runs their direct install work internally and does not rely on any third parties.

In addition to LEDs (the focus of our discussion), the firms we interviewed offer both non-LED lighting and non-lighting products through their programs.²⁸

3.3.2 The LED Market

The majority (81 percent on average) of projects offered by these firms since January 2013 (when the Trial began) include some form of lighting. When averaged across the four participants who were comfortable providing an estimate, the percentage of lighting projects that included LED replacement lamps was 58 percent.

3.3.2.1 LED Lamps vs. LED Fixtures

Three out of five interviewees report that customers are more interested in LED replacement lamps than LED fixtures. Reported reasons for customers choosing LED replacement lamps over LED fixtures include cost (n=4), Title 24 code (n=2), and return on investment (n=2). Two respondents reported that preference depends on the size of the customer or what the contractor suggests (often factoring in price and light quality). One respondent added that

²⁸ Other products offered include refrigeration, controls, HVAC, programmable thermostats, power strips, occupancy sensors and strip curtains.

fixtures are more popular in exterior settings because “*people want to show off that they are using the latest and greatest.*”

3.3.2.2 LED Installations

We attempted to gauge the percent of commercial end-use customers that prefer LED replacement lamps as opposed to other replacement lamp options (e.g., CFLs, halogens, or incandescent lamps). Respondents generally agreed that the majority of customers prefer LEDs. One person reported that 90 percent prefer LEDs, but that not everyone can afford them, and another respondent reported, “*There is a lot more interest than there is installation.*”

In general, respondents reported that customer preference for LEDs was more related to the applications and current technology in place (incompatible fixtures, recently purchased fluorescent lamps, etc.) rather than specific business types. However, LED fixtures were reported by one respondent to be more common with businesses that can access financing or that will be in one location for a long time (and can recognize maintenance savings). Two respondents reported that the retail sector was receptive to LEDs.²⁹

3.3.3 Interaction with Midstream Trial

All five interviewees we spoke with were familiar with the Trial but only one could say for sure that one or more of their customers had participated in the Trial (two others were unsure).

Both of the LGP representatives we spoke with were sure that none of their customers had taken advantage of the Trial before or when they had worked with them. One knew for certain because they review quotes from distributors to make sure there are no midstream rebates before they incentivize lighting.

3.3.3.1 Policing Double Dipping

While we never directly brought up double dipping (allowing the same products to receive incentives from two separate PG&E programs) in our interview questions, two of the respondents went into great detail about how they avoid double dipping. One respondent has exclusive language in their contracts and requires that their contractors sign agreements. They also collect receipts (where discounts may be shown) to make sure their participants are not collecting rebates through the Trial. They added:

“... if we ever catch anyone double dipping it is grounds for immediate expulsion. Haven’t caught anyone to date. We have had contractors come to us with a question about if they can buy from a distributor and we tell them if they can or can’t buy but we have never had to kick someone out so far. We emphasize that so much in our contractor training.”

²⁹ Other business types mentioned by one respondent each include restaurants, casinos, hospitality, gas stations, warehouses, and car dealerships.

One respondent works directly with a distributor who was a Trial participant and said they work very closely with the distributor to ensure there is zero double dipping. They accomplish this by working with a single sales representative at the distributor who understands the double dipping issue and the importance of ensuring that products do not receive incentives from multiple programs. Each time that a sale is made, they communicate via email to make sure that the rebate was not already applied to the product.

3.3.4 Midstream vs. Direct Install

We asked LGP respondents which types of customers would choose the Trial over their direct install program.

3.3.4.1 When/Why Midstream is Preferred

LGP respondents noted that customers might choose to go through the Trial for one or more of the following reasons:

- **Existing Relationships.** Two respondents believe that if a business has already worked with a distributor, they are more likely to purchase from that distributor in the future, especially if the distributor is close to where they are located. Another respondent added that some companies might have electricians on retainer and want to get work done before the end of the year.
- **Non-Qualifying Products.** One respondent speculated that customers might use the distributor Trial to get LED replacement lamps that they would not be able to get through the downstream program.³⁰
- **Paperwork Requirements.** Two respondents reported that participants who dislike paperwork might prefer to go through the Trial. This was noted for both end-users and contractors. One respondent reported that some contractors dislike certain paperwork requirements and a second respondent said that there are some end-users who do not want to work with them due to the financial documents that they need to provide. The second respondent said that these are rare cases and that it depends more on the particular customer than the business type or size.
- **Business Size.** One respondent noted it might be easier for a large business that has facilities across PG&E territory to purchase LEDs through the Trial compared to “a program like ours that is meant to do work on a site by site basis.” Another respondent added that the size of a project is also relevant and that Trial participants may be “customers who are doing one-off lamp replacements when they burnout. Ten or less lamps at a time.”

³⁰ One respondent also mentioned that they direct their end-use customers to lighting distributors when the customer wants to purchase lamps for storage. This respondent had no evidence that any resulting sales might be receiving Trial incentives.

- **Short Project Timeframe.** One respondent reported that customers who want to get a project done immediately might participate in the Trial as opposed to a direct install program.

3.3.4.2 *When/Why Direct Install is Preferred*

LGP respondents noted that customers might choose to go through their program for the following reasons:

- **Better Incentives.** Three respondents cited higher incentive levels as the reason customers would choose the direct install program over the Trial. One reported that they *“usually beat PG&E and distributor rebates by 10 percent. This allows us to be competitive.”* They added *“We have to have a higher incentive to draw the consumer to us to draw them to the more comprehensive work.”*
- **Low Customer Awareness.** Two respondents mentioned that part of why customers would choose their program over the Trial is due to the level of customer assistance that they offer. This is both in terms of educating customers about their options and helping them through the process once they decide to participate. One respondent noted that customers often are not aware of programs or lighting distributors in general, and doubted that customers would take the time or even know about the ability to go to a distributor for their lighting needs.

That same respondent added they do not see distributors being able to do the same kind of marketing work that their program conducts. They gave an example of a recent marketing campaign they conducted across a large part of California, which covered 400,000 people. They received many phone calls from customers in their region, and attribute this in part due to the increase in awareness of the partnership between their firm and PG&E.

This assistance is also relevant once a customer decides to participate: *“We are involved when the customer needs their hand held to undertake the full scale retrofit of the facility...”*

- **Comprehensive Nature of the Program.** One respondent emphasized the comprehensive nature of their offerings noting that they attract *“... anyone looking for a more comprehensive retrofit. The individually owned businesses don't have purchase agreements with distributors. They'd be the one going to Home Depot and they don't do that often so they depend on us.”* The respondent later qualified this by saying *“there are customers who may benefit from getting one or two lamps at a time.”*

3.3.4.3 *Impact on Direct Install Programs*

We asked LGP / 3P DI interviewees about any impact the Trial may have had on their business. Three of the five interviewees stated that it was hard to tell at this point what the exact impact of the Trial was on their programs. Two respondents were able to identify some effects and added that they have to do additional work now to avoid double dipping or that

customers can be confused about the (now greater) number of PG&E programs. One respondent said,

“We’ve been working to explain these [rebate programs] to customers forever. [There are] four different channels that they can go to for the same product. It is our job to explain this stuff (and we are happy to do that) but it creates more burden for the consumers. We would be an advocate for better consolidating those programs to lower customer confusion. I can tell you I’ve seen customers throw up their hands and say this is crazy and walk away.”

One respondent was particularly concerned about the impact of the additional policing they needed to do with regards to double dipping: *“This is probably the biggest impact the program has had on us. It takes a lot of staff resources to police the double dipping rule.”* This respondent speculated that increased popularity of the Trial could have some (although not significant) impact on their program: *“...even though we don’t see it directly I could see that if the distributor program is very successful and customers have capacity to do the installations on their own it could limit the market that is out there for us to serve. I wouldn’t say significantly because most of the small medium businesses don’t have the ability to do the installs that our contractors do.”*

Another respondent had similar confidence that their programs would still be successful alongside the Trial because *“If we do a good job communicating benefits to consumers we think they will opt for us.”* This respondent predicted that 95 percent of their customer base would choose to go through their direct install program and the remaining five percent would be those that had an electrician on retainer. This same respondent recalled one customer who purchased lighting elsewhere because the customer wanted higher-end products. This respondent noted that this was a very small percentage of their total projects.

Respondents agreed that any impact from the Trial was difficult to perceive. The interviewees reported they are not aware if they are losing customers to the program because *“they are only contacted if the customer had the efficiency need.”* One LGP interviewed stated they would need to talk to the main distributor that they use to find out how many LED replacement lamps are rebated at the distributor level, but reported that they *“haven’t seen any impact to [their] partnership.”*

3.3.4.4 Addition to PG&E Portfolio

LGP interviewee responses to the question “Do you think the Trial is a beneficial addition to the portfolio?” were mixed. One respondent considered the Trial to be a beneficial addition but cautioned that lower requirements related to tracking of installations (including pre-existing equipment, installation verification) might cause problems. They were particularly worried about inaccuracies in tracking including sales happening outside of PG&E territory. Another respondent stated that they were able to fully meet the needs of their customer segment (SMBs) in their region.

A third respondent said that adding the Trial to the portfolio may cutoff the opportunity to engage with end-users about more comprehensive efficiency upgrades (including measures beyond lighting). The quote below shows the struggle that one particular respondent had with this question:

“My blinded perspective is that we’ve got it locked down – there are contractors that may want to avoid the paperwork and the additional burden. However minor we see [the paperwork] being, it matters how they think. There may always be a place for this [program design]... even if it gets just one contractor it is worth it. I’d like to see it come through us because we can move the conversation to a more comprehensive frame, but that all assumes the contractor wants to engage. I’m torn – if it is one contractor who purchases one fixture that is more efficient, I have to say it might be worth it. When you expand it across the state it can be a substantial impact. I understand the importance of alleviating paperwork and administrative burden and giving them an easy solution and from that perspective, I do believe there is a space for distributor rebates – although of course I want [customers] to come to us.”

4 Commercial End-User Midstream Trial LED Recipient Telephone Survey Results

CIC Research completed 42 surveys of end use commercial customers who received LED products incentivized through PG&E’s Midstream Trial.

4.1 Profile of Participating Customers and Projects

In this section we present an overview of the 42 responding firms that received LED replacement lamps incentivized through the Trial. Eight business segments were represented among the respondent firms as shown in Table 17 below.

Table 17: Respondent Business Type

Business Type	N	% of Interviewees
Retail	14	33%
Offices	11	26%
Public Assembly	7	17%
Food Stores	2	5%
Lodging (Hotels, Motels)	2	5%
Condominiums	2	5%
Services	2	5%
Restaurants	2	4%
Total	42	100%

Approximately half of respondents own the facility in which they conduct business (51 percent). Forty-two percent of respondent firms lease their facility and seven percent manage the facility under an agreement with the building owner (the specific structure of the agreements is unknown). Across all segments, nearly every respondent firm reported that they are responsible for paying the electricity bill at their facility (98 percent).

4.2 Motivations for Lighting Retrofits and Trial Program Awareness

This section explores the respondent firms motivations for conducting lighting retrofits, the influence of market actors on the decision to conduct lighting retrofits, their level of awareness of the Trial incentives, and the impact of the Trial incentives on their decision to conduct lighting retrofits.

4.2.1 Motivation to Conduct Lighting Retrofits

The evaluation team asked respondent firms to name the reasons they decided to retrofit their lighting equipment. As shown in Table 18, **the primary reasons respondent firms engaged in lighting retrofits were to lower their energy bill to save money (36%) and to save energy (21%). The most commonly mentioned secondary reason for lighting**

retrofits was saving energy (38%). The incentive reducing the first cost barrier is also very important (see Section 4.2.3, below).

Table 18: Motivations for Conducting Lighting Retrofit

Reasons for Conducting Lighting Retrofit	Primary Reason (n=42)	Secondary Reasons* (n=42)
Lower energy bill / saving money	15 (36%)	15 (36%)
Saving energy	9 (21%)	16 (38%)
Longer measure life	8 (19%)	1 (2%)
Better lighting	4 (10%)	5 (11%)
LEDs emit less heat	2 (5%)	-
Equipment cost savings	1 (2%)	2 (4%)
The rebate / Trial program	1 (2%)	2 (4%)
Previous equipment failed	-	1 (2%)
Corporate practice / scheduled upgrade	-	1 (2%)
Help the environment	-	1 (2%)
Other**	2 (4%)	1 (2%)

* Multiple responses permitted

** "Other" includes the following responses: "to be high tech", "they work in my old fixtures", and "recommended by my electrical contractor".

California Title 24 Code is triggered whenever 10 percent or more of the luminaires in an enclosed space are impacted by a retrofit. The evaluation team asked respondent firms if the updated version of California Title 24 Code was an influencing factor in the retrofit decision. As shown in Table 19 below, approximately one-fifth of respondents (9 respondents) reported that Title 24 building code impacted what lighting equipment they installed in their facility. Note that none of these firms mentioned Title 24 as overall motivations to install the LED replacement lamps (shown above in Table 18).

Table 19: Proportion of Respondents Impacted by Title 24 Code

Type	# of Interviewees (n=42)
Yes	9 (21%)
No	22 (52%)
Don't Know	11 (26%)

4.2.2 Role and Influence of Market Actors on Retrofit Decision

As shown in Table 20 below, only **29 percent of respondents stated that someone outside of their firm approached them to recommend an upgrade to their facility's lighting.**

Table 20: Proportion of Respondents Approached by Outside Company to Conduct Lighting Upgrade

Type	# of Interviewees (n=42)
Approached	12 (29%)
Not approached	23 (55%)
Don't Know	7 (17%)

Among the 12 respondent firms that were approached by an outside market actor, lighting distributors were the most commonly mentioned market actor (58%), as shown in Table 21 below.

Table 21: Business or Individual Who Approached Respondents

Type	# of Interviewees (n=12)
Distributor	7 (58%)
Contractor (Lighting or Electrical)	3 (25%)
Manufacturer	1 (8%)
Friend	1 (8%)

The survey also asked about sources of recommendations for specific equipment, as the business or individual who approached the respondent may not have been the only source of information or recommendations, and many businesses were not approached but rather sought out recommendations from market actors (see Table 20, above). **More than half (55%) of respondents mentioned lighting distributors as a market actor that recommended advanced lighting equipment.** Furthermore, half of all respondents reported that distributors were the most important market actor who recommended advanced lighting equipment. Contractors (14%) were the next most frequently cited market actor involved in recommending and specifying lighting equipment mentioned by end-users.

Despite the initial Trial theory's second assumption that contractors are the most influential market actor (Section 1.1.2), it appears that with distributor incentives for LED replacement lamps the primary source of influence has become distributors, among end-users who received LEDs through the Trial.

Table 22: Market Actors Who Recommended Advanced Lighting Equipment

Type	Mentioned (n=42)	Most Important (n=42)
Distributor	23 (55%)	21 (50%)
Contractor (Lighting or Electrical)	6 (14%)	6 (14%)
PG&E	2 (5%)	2 (5%)
Architect	1 (2%)	1 (2%)
Engineer	1 (2%)	1 (2%)
Manufacturer	1 (2%)	1 (2%)
Energy Services Firm	1 (2%)	-
Friend	1 (2%)	1 (2%)
Don't Know	5 (12%)	5 (12%)
None	4 (10%)	4 (10%)

We asked respondent firms who reported that one or more market actors had recommended installing LED equipment at their facility to provide an assessment of the importance of market actor input in their lighting equipment choice. As shown in Table 23, below, on a ten-point scale, with “1” being “not at all important” and “10” being “extremely important”, overall respondents reported a mean rating of 7.1 out of 10, with 57 percent of respondents reporting an importance rating of seven or greater.

Table 23: Importance of Market Actors in Equipment Choice (n=32)*

Market Actor	Mean Importance (1-10) scale	Min Importance (1-10) scale	Max Importance (1-10) scale
Distributor (n=20)	6.9	2	10 (25%)
Contractor (n=6)	7.3	5	10 (16%)
Other (n=6)	7.3	2	10 (33%)
Overall (n=32)	7.1	6	10 (24%)

*One respondent did not provide a response

The findings from this section indicate that while most firms are making the decision to retrofit lighting internally, market actors such as lighting distributors and contractors provide outreach and information that is influential in their customers’ decisions about what equipment they purchase. Importantly, the primary market actors mentioned by respondent as being influential are distributors.

4.2.3 Incentives to Distributors

Since the Trial approach provides incentives directly to distributors of LED lighting products rather than to end-users, end-users may be unaware that the equipment they purchase is incentivized by PG&E. As shown in Figure 24, **52 percent of respondent firms were aware**

that the products they purchased were incentivized by PG&E, which lowered their final purchase price.

Figure 24: Proportion of Customers Aware that Distributors Receive Incentive (n=42)

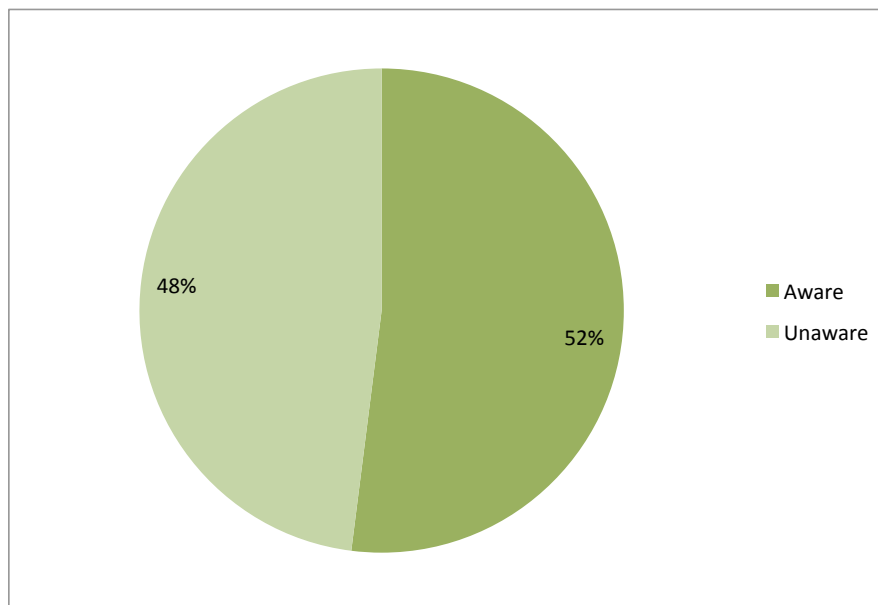


Table 24 shows that the primary source of incentive awareness among end-user respondents was lighting distributors (59%) followed by contractors (23%).

Table 24: Channel Through Which Customer Became Aware of Incentive

Type	# of Interviewees (n=22)
Distributor	13 (59%)
Contractor	5 (23%)
PG&E Website	2 (9%)
Participation at other Company Facility	1 (5%)
Don't Know	1 (5%)

We asked the 22 interviewees who were aware of incentives if they were important in their decision to install new lighting equipment. **On a ten-point scale, with “1” being “not at all important” and “10” being “extremely important”, respondents reported a mean rating of 8.7 out of 10, with 87 percent of respondents reporting an importance rating of seven or greater.**

One third (33%) of respondents who were aware of the incentive stated that they would have installed fewer or no lamps if they were required to submit the rebate application in order to purchase the lighting equipment at the same cost, rather than

receiving the discounted price through the distributor (shown in Table 25, below). We investigated whether this varied by project size and found no significant differences.

Of the respondents who reported that they would install the same number or more lamps through a downstream channel, three general reasons were mentioned: planning to upgrade to LEDs; importance of incentive more important than source of incentive; energy and cost savings are worth time spent on paperwork. This suggests that completing rebate applications may not be a barrier to LED purchases for the majority of respondent firms.

Of the two respondents who reported that they would purchase *more* if they were required to complete a rebate application form, we believe that they may have misinterpreted the question, as both of them reported the high levels of satisfaction (8 or higher) with the Trial. Furthermore, they reported similar reasoning as customers who would have purchased the same amount despite paperwork requirements.

Table 25: Impact on Retrofit if Firm Had to Complete Rebate Application

Number of Lamps Installed	# of Interviewees (n=42)
Same Number	23 (55%)
More	2 (5%)
Fewer	4 (10%)
None	10 (23%)
Don't Know	3 (7%)

4.3 Trial Experience

This section explores the respondent firms experience with the Trial, including where firms purchased their equipment, the size of the retrofit, what equipment was installed, and what equipment was replaced.

4.3.1 Equipment Purchasing

Of the 34 commercial end-user respondents who could recall the supplier who sold them LED replacement lamps through the Trial, almost three quarters (74%) stated that they made the purchase directly from a lighting distributor (as shown in Table 26, below), including all 21 respondents who stated that the most influential market was a distributor.

Table 26: End-user Source for Trial LED Replacement Lamps

Type	# of Interviewees (n=34)
Distributor	25 (74%)
Contractor (Lighting and Electrical)	6 (18%)
Manufacturer	1 (3%)
Home improvement store	2 (6%)

Three quarters of respondents (n=26) who could recall the type of supplier reported that they typically purchased replacement lamps from the same source. Of the eight respondent firms who normally purchased their replacement lamps from a different source than from where they purchased Trial incentivized LEDs, five normally purchase their bulbs from home improvement stores. Three respondents said they normally purchase from a distributor but purchased their Trial lights from a contractor (n=2) or a lighting manufacturer (n=1).

4.3.2 Equipment Installation

As Table 27 shows, 16 respondents personally installed the Trial incentivized LEDs, and another 10 respondents reported that an in-house facility manager, custodian, or colleague installed the LED replacement lamps. Contractors (either electrical or lighting) were responsible for 24 percent of the LED replacement lamp installations, with the remainder of installations being performed by lighting distributors.

Table 27: LED Replacement Lamp Installer

Type	# of Interviewees (n=42)
Respondent; "me", "I did"	16 (38%)
In-house facility managers/custodian/staff	10 (24%)
Contractor	10 (24%)
Lighting distributor	3 (7%)
Don't Know	3 (7%)

Evergreen asked respondents if the installer of the Trial LED replacement lamps was the same person or company that typically installs lighting equipment in their facility. Nearly all respondents (74%) reported that the same person or type of installer usually installs lamps at their facilities (shown in Table 28 below). Also shown, 67 percent of respondents reported that their firm handled the installation in-house. These respondents noted that they were capable of installing replacement lamps and some noted that it is also less costly to install lamps themselves. Of the 10 respondents who relied on an external party to install their replacement lamps, the installation was either part of a larger project, they had an existing contract with an external party, or they lacked requisite expertise.

Table 28: Characteristics of Trial Installer

Trial Installer	Typical Installer		Total*
	Yes	No	
In-house Installer**	25 (64%)	1 (3%)	26 (67%)
External Installer	4 (10%)	9 (23%)	13 (33%)
Total	29 (74%)	10 (26%)	39

* Three respondents did not know if the Trial installer was the typical installer.

** In-house installer includes respondent, in-house facilities manager, custodian or staff.

4.3.3 Scope of Installation

Forty-two percent (42%) of the respondents reported that they had replaced 80 percent or more of their facility’s lamps with Trial LED replacement lamps, as shown below in Table 29. Nearly the same proportion of respondents (41%) reported that lamp replacement impacted more than 80 percent of their facility area (see Table 30, below). However, the breadth of projects ranged significantly, with many respondents reporting that less than 20 percent of their lamps were replaced or facility area impacted (26% and 24%, respectively). It is unclear why some respondents replaced a small proportion of their existing lamps while others replaced most or all of theirs.

Table 29: Proportion of Bulbs Replaced

% of Bulbs replaced	# of Respondents (n=42)
Less than 20%	11 (26%)
20% to less than 40%	6 (14%)
40% to less than 60%	5 (12%)
60% to less than 80%	2 (5%)
80% to less than 100%	9 (21%)
100%	9 (21%)

Table 30: Percent of Facility Area Impacted

% of Facility Area Impacted	# of Respondents (n=41*)
Less than 20%	10 (24%)
20% to less than 40%	4 (10%)
40% to less than 60%	7 (17%)
60% to less than 80%	3 (7%)
80% to less than 100%	5 (12%)
100%	12 (29%)

* One respondent was unable to provide a response

4.3.4 Pre-Existing Equipment

Across the 42 respondent firm sites, LED replacement lamp upgrades were replacing existing equipment in 78 percent of sites. The remaining 22 percent of projects were both retrofitting existing equipment and the installation of replacement lamps in new fixtures or newly constructed spaces. No respondents reported installing equipment in new lighting areas only.

In order to gauge the volume of replaced equipment based on our end-user survey, we weighted self-reported replaced equipment by the Trial purchase volume for each participant. In cases where multiple lamp types were reportedly replaced, we assume that equal proportions each reported lamp type were removed and replaced with Trial supported LED replacement lamps. Based on this analysis, **one-quarter of replaced lamps are estimated to have replaced incandescent lamps, with another 20 percent replacing halogen lamps**, as shown in Table 31, below.

Table 31: Replaced Lamp Type Volume Estimates*

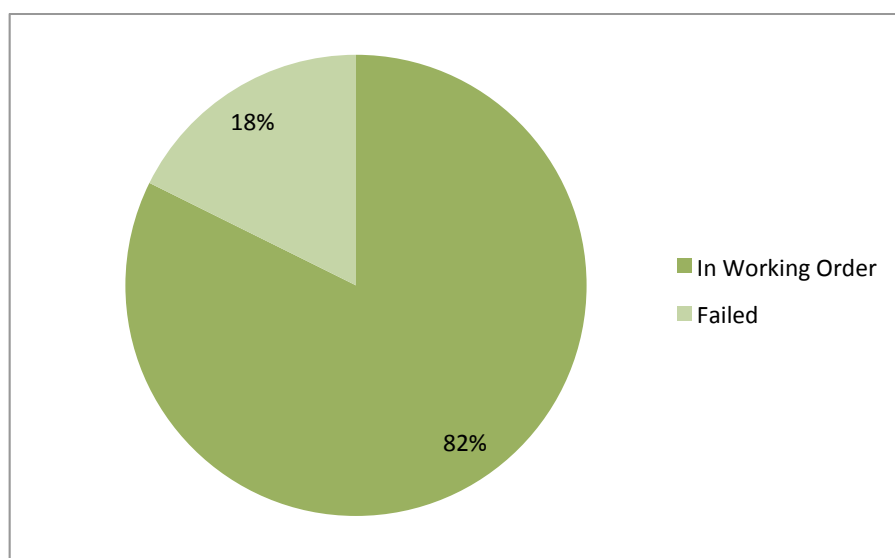
Type	Replaced Volume Estimate
Incandescent Lamps	25%
Halogen Lamps	20%
MR16 Lamps	5%
Screw-in CFLs	4%
T8 fluorescent lamps	3%
Sodium Vapor Lamps	3%
Other**	14%
Don't Know	27%

*Multiple response question; 8 respondents did not know what equipment was replaced.

**"Other" includes: T12 fluorescents, PAR38s, and LEDs, and other fluorescents

In most cases, replacement lamps were replacing equipment that was still in working order. As shown in Figure 25 below, **82 percent of Trial LED replacement lamps were installed in sockets with functioning existing equipment, and 18 percent were installed in places where equipment had failed. No respondents stated that all the equipment had failed.**

Figure 25: Operational Status of Pre-Existing Equipment



Of the 15 respondent firms that stated that some equipment had failed, 14 were able to provide a proportion of lamps that had failed. As shown in Table 32 below, the majority (86%) reported that less than 60 percent of the replaced lamps had failed.

Table 32: Proportion of Replaced Bulbs that had Failed

% of Bulbs replaced	# of Respondents (n=14)
Less than 20%	2 (14%)
20% to less than 40%	5 (36%)
40% to less than 60%	5 (36%)
60% to less than 80%	1 (7%)
80% to less than 100%	1 (7%)
100%	0 (0%)

4.3.5 Satisfaction with New LED Equipment

In general, **commercial end-user respondents expressed high levels of satisfaction with the installed LED equipment.** Respondents provided their level of satisfaction with the light quality, reliability, light output and physical appearance of the LEDs on a ten-point scale, with “10” being “extremely satisfied” and “1” being “not at all satisfied”. The results are presented in Table 33, below. As shown, **light quality, reliability, light output, and physical appearance all received mean satisfaction ratings higher than nine out of 10.**

Table 33: End-user Satisfaction with LED Characteristics (n=42)

LED Characteristic	Mean Satisfaction (1-10) scale	Min Satisfaction (1-10) scale	Max Satisfaction (1-10) scale
Light Quality (n=42)	9.6	6	10 (76%)
Reliability (n=42)	9.7	8	10 (79%)
Light Output (n=42)	9.6	6	10 (81%)
Physical Appearance (n=42)	9.5	6	10 (74%)

4.4 Experience with Other Programs

The Trial appears to be reaching commercial customers that have not participated in other PG&E rebate programs in the past. As shown in Table 34 below, only nine respondent firms out of 42 (21%) stated that they have participated in another PG&E rebate program.

Table 34: Firm Participated in Another PG&E Rebate Program

Response	# of Interviewees (n=42)
Yes	9 (21%)
No	23 (54%)
Don't Know	10 (24%)

Among the nine companies that had received rebates or incentives through another program, four had received rebates for lighting, six for HVAC equipment, two for refrigeration, one for

food services or cooking equipment, one for air containment, and one for swimming pool covers.³¹ Among the four respondent firms that had received a lighting rebate through a program other than the Midstream Trial, one had submitted the application themselves and three reported that a contractor had handled the rebate.

We asked the nine respondents if they thought participation in the other programs was easier or more difficult than participation in the Trial. **Three of the four respondents that participated in another lighting program stated that the Trial was easier to participate in, and one stated that it was about the same.** The respondents who stated that the Trial was easier explained that the program was easier because the distributor handled all the rebate paperwork and dealt with PG&E directly. The respondent that stated the ease of the Trial was about the same explained that while the Trial was easy, it was no easier than the other program they had participated in.³² Respondents that mentioned participation in other programs including programs covering rebates for refrigeration equipment, food services equipment and pool covers, all stated that the Trial was easier to participate in because the paperwork was taken care of by a distributor or contractor.

4.5 Overall Satisfaction with Trial Program

Overall, respondent firms expressed high levels of satisfaction with the Trial.

Respondents rated their level of overall satisfaction on a ten-point scale, with “10” being “extremely satisfied” and “1” being “not at all satisfied”. The results are presented in Table 35, below. As shown, the mean satisfaction score was 9.2 with 79% of respondents providing a score of 10.

Table 35: Overall Program Satisfaction (n=42)

	Mean Satisfaction (1-10) scale	Min Satisfaction (1-10) scale	Max Satisfaction (1-10) scale
Overall Satisfaction	9.2	1	10 (79%)

One respondent reported they were dissatisfied, giving the program a score of one out of ten. This participant was dissatisfied because they were unaware until the survey that they had participated in a rebate program and were uncertain if they could have received a better rebate through another program. While this is not a major concern, it may be worthwhile to encourage distributors to include information about the incentive in their marketing or invoicing.

³¹ Multiple responses were allowed; some respondents had participated in more than one other program.

³² We do not know the details of the other program this respondent participated in.

5 Evaluability Assessment Findings

Evergreen reviewed all of the data collected by the Midstream Trial implementation staff, and conducted a review to ensure that collected data support evaluation. Overall, the Trial has successfully collected most data required for evaluation. However, there are two key areas where data collection strategies could be improved, described below.

5.1 Ensure Tracking of All End-user Contacts

PG&E's Midstream Trial database contained a drop down menu for site contact type ("Application Contact Type") which was populated with one of the following contact types: sales representative, contractor, or end-user. The contact name and phone number were included for most records, but related to the type of contact identified in the Application Contact Type field. **Therefore, for many records there is no contact name or phone number for anyone at the business who received midstream incentivized LED replacement lamps through the Trial; contact information other than business name and installation address was not available for all end use customers.**

While even installation address is superior to available data in upstream programs – where there is no information about the end-user – we believe that **collecting end-user information for a midstream incentive program such as this is feasible, and more important, vastly improves the evaluability of the program.** Since this information is likely collected by lighting distributors (or contractors, in the case of contractor-installed projects), PG&E should consider requiring this information as part of the distributor rebate application. End-user information pertinent to evaluation includes the following:

- 1) Site location (address, city, zip code) – already collected
- 2) Business name – already collected
- 3) Site contact person
- 4) Site contact phone number

We recommend removing the drop down style field for selecting a site contact and requiring that end-user contact information – including phone number – be recorded in the database. We do not recommend that distributors track PG&E customer account numbers, but rather that PG&E identify customers during application quality assurance and append customer account number at that time.

5.2 Improve Tracking of End-user Business Type

As shown in Sections 2.1.4 and 2.2.2, the **end-user business type is unknown for over half of the projects that received LED replacement lamps at reduced cost through the Trial.** While this data is not necessarily required for EM&V, it would be beneficial to document in

order to track market transformation indicators such as the first recommended indicator in Section 6.2, below. **Improving the tracking of business type data will also improve the accuracy of energy savings estimates.**³³ The downstream and 3P DI / LGP collect business type for a larger proportion of customers than the Midstream Trial, although one aspect of the midstream incentive mechanism that appeals to customers and market actors alike is that the end-user isn't responsible for the paperwork; while it may be more difficult to accurately track than for the downstream or direct install programs, accurate tracking of business type can likely be improved.

We recommend that PG&E provide the list of business types available in PG&E's commercial downstream rebate application to contracted distributors, and recommend investigating the feasibility of including business type as a requirement for rebate applications (with a field for "other", with space to specify business types that do not fall within the supplied categories).

5.3 Determine if Tracking All Involved Market Actors is Feasible

In order to better understand the decisions made by end-use customers who receive midstream incentivized LED products, evaluators may want to conduct research with contractors or other lighting installers or specifiers. This is important for understanding and estimating LED sales attribution – whether and to what degree the incentives affected the purchase of the LED products. For this particular program theory, contractors' decisions to promote LEDs to end-users may be impacted by the lower price and, potentially, increased availability (due to changes in distributor stocking practices). Therefore, **it is important to obtain contact data for any market actors involved in a sale and installation between the distributor and the end-user so that evaluators may conduct in-depth interviews or surveys with this population of key market actors.**

We recommend removing the drop down style field for selecting a site contact and requiring that installer information be recorded (even if LED replacement lamps are installed by the distributor or by the end-user).

³³ While the Database for Energy Efficiency Resources (DEER) does have load profiles for unknown business types, ideally a full-scale commercial midstream LED incentive program would only use the default values.

6 Likely Market Indicators

The identification of indicators of market transformation is required in order to assess Trial and program successes. To identify market indicators, Evergreen reviewed key sources of literature and historical program performance metrics previously adopted by the California IOUs (PG&E included).

6.1 Defining Market Indicators

Market indicators, by definition, are tools to assess the overall market; the performance of one program among many (and many external factors) is very difficult to ascertain.³⁴ Thus, tracking many of the metrics discussed in this section will not allow PG&E to directly determine the specific source of market transformation in the commercial lighting market. However, we have noted a few instances in which the proposed market indicators may inform assessment of the Trial specifically.

Below, in Table 36 and Table 37, are key market indicators for the commercial LED market. The indicators are classified based on a key finding from our literature review that there are two types of market indicators: proximate and ultimate. Proximate indicators – shown in Table 36 – *relate* to the transformation of a market, whereas ultimate indicators – shown in Table 37 – are absolute measures of transformation.³⁵

The proximate indicators include measureable indicators of market transformation, including:

- Awareness
- Knowledge
- Attitudes / Beliefs
- Availability
- Market Actor Promotional Effort
- Incremental Cost

Many of these categories contain numerous specific proximate and ultimate indicators, such as awareness of LEDs in general or awareness of distributor-level incentives for LEDs. In the following section we highlight which specific indicators the PG&E commercial lighting program team should consider tracking in order to ensure that the successes and failures or challenges of their market transformation efforts are accounted for in a systematic way.

³⁴ CPUC (2011). *Guidelines for Selecting Market Transformation Indicators (MTIs)*. Available here: ftp://ftp2.cpuc.ca.gov/PG&E20150130ResponseToA1312012Ruling/2011/10/SB_GT&S_0821661.pdf

³⁵ Rosenberg, M. and Hoefgen, L. (2009). *Market Effects and Market Transformation: Their Role in Energy Efficiency Program Design and Evaluation*. Prepared for CIEE.

Table 36: Proximate LED Market Transformation Indicators

Proximate Indicators	Specific Indicators		Source(s)
Awareness	Manufacturers	Awareness of midstream rebates for LEDs	In-depth interviews or CATI surveys
		Distributors	
	Awareness of LED replacement lamps		
	Contractors	Awareness of midstream rebates for LEDs	
		Awareness of LED replacement lamps	
	End-users	Awareness of midstream rebates for LEDs	
Awareness of LED replacement lamps		General population surveys	
Knowledge	Distributor knowledge of LED replacement lamp attributes		In-depth interviews or CATI surveys
	Contractors knowledge of LED replacement lamp attributes		
	End-user knowledge of LED replacement lamp attributes		General population surveys
Attitudes / Beliefs	Distributors	Satisfaction with LED replacement lamps (and specific qualities)	In-depth interviews or CATI surveys
		Willingness to stock LED replacement lamps	
	Contractors	Satisfaction with LED replacement lamps (and specific qualities)	
		Willingness to recommend/specify LED replacement lamps	
	End-users	Satisfaction with LED replacement lamps (and specific qualities)	General population surveys; participant surveys
		Willingness to try LED replacement lamps	General population surveys
Availability	Distributor stocking	Overall quantities (or %)	In-depth interviews or CATI surveys with distributors (hard data likely unobtainable)
		Diversity (brand, style, application, wattage, lumens, etc.)	
	Purchase to receipt duration		End-user participant surveys
	Retail availability	Overall quantities (or %)	Retail shelf surveys (not applicable for midstream Trial; part of LED market transformation overall)
Diversity (brand, style, application, wattage, lumens, etc.)			
Market Actor Promotional Effort	Manufacturer level of promotion		Marketing collateral review; in-depth interviews
	Distributor level of promotion		Marketing collateral review; in-depth interviews or CATI surveys
	Contractor level of promotion		
	End-user perception of promotion by manufacturer, distributor, and contractor		General population surveys; participant surveys
Incremental Cost	Costs of LEDs (by style, application, wattage, lumens, etc.)		Web crawler; in-depth interviews with market actors; tracking data analysis; invoice documentation review; in-store shelf surveys
	Costs of baseline technologies (by technology, style, application, wattage, lumens, etc.)		

Table 37: Ultimate LED Market Transformation Indicators

Ultimate Indicators	Specific Indicators		Source(s)
Market Share / Sales / Saturation	Adoption	Percent of businesses with 1+ LED installed	General population surveys
	Saturation	Percent of commercial lighting consisting of LED technologies	General population surveys; on-sites
	Lighting power density	Watts per square foot, over time (indicative of transformation)	On-sites or review of site-level information; extrapolated to population
	Total market share / sales	Number of products sold within region (or market share)	Difficult to obtain. Typically extrapolated or based on market level assumptions.
	Baseline market share / sales	Number of products sold within region that would have sold in absence of the program (or market share)	Net to gross assessment typically required.
Changes in Codes and Standards	Updates to Title 24; State and Federal legislation		C&S program.

6.2 Recommended Indicators to Track

As noted above, assessing an incentive program based on market-level indicators poses significant challenges. However, to best ensure that program performance is accounted for (in terms of transforming the commercial lighting market) we propose a list of likely market transformation indicators, below:

1. **Program incentivized LED replacement lamp sales volumes.** This indicator is not an ultimate indicator of market transformation, but one component of PG&E commercial LED market transformation. Measuring the volume of midstream incentivized LED replacement lamps along with the volume of similar products through other rebate channels is important to ensure that the market is moving in the preferred direction.³⁶ These data, when compared with data regarding the overall commercial lighting market, can be used to better understand the impact of midstream incentives and other incentive programs on the ultimate indicator of LED market share.

Tracking the number of commercial facilities that purchase LED replacement lamps through distributors, by business type, would be a beneficial addition to the tracking of overall sales volumes. Currently the downstream program is comprised of many retail, restaurant, and office commercial customers. This is also true for end-users that purchased midstream incentivized LED replacement lamps, but the majority of projects went to sites with unknown business types.

2. **LED Price** is an important metric to track for market transformation purposes. This program design is particularly well suited for tracking LED price to commercial customers, as it is a required field in the distributor application. In fact, collecting pricing information was part of the intent of the California IOUs' Lighting Market Transformation program, which is why it was a required piece of information from the distributors as part of the midstream Trial. It will be difficult to attribute changes in price to any particular commercial program, including a midstream incentive program, but this data presents a valuable source of information to track price trends and adapt incentives and program design accordingly.

LED price data collected via a midstream incentive program could supply the Lighting Market Transformation Program with valuable data related to the overall commercial LED market.

3. **Distributor purchase and stocking practices,** LED technologies versus incumbent/other lighting technologies.

³⁶ CPUC (2011). *Guidelines for Selecting Market Transformation Indicators (MTIs)*. Available here: ftp://ftp2.cpuc.ca.gov/PG&E20150130ResponseToA1312012Ruling/2011/10/SB_GT&S_0821661.pdf

LED replacement lamp availability is rapidly becoming less of a *barrier* for consumers, but the availability of other products still means that consumers can select less expensive, less efficient alternatives. Distributors promote what they have in stock, and thus tracking the relative stock of different technologies would support identification of market transformation. What they stock, reportedly, is also directly affected by demand and their inability to return products to the manufacturer (thus they are hesitant at this time to stock relatively expensive LEDs that have fast product cycles). This indicator, however, may be easily affected by factors external to the Trial, including other IOU incentive programs or non-related market changes. Despite this, since this program is actively aiming to affect what distributors sell to their customers – contractors and commercial end-users – it is important to assess stocking practices as they are so intimately tied to what a distributor wants to sell.³⁷

Distributor stocking is very dynamic as products move through their facilities in large quantities – sometimes contractor or end-user orders are in the hundreds or thousands of lamps, as opposed to retail in which customers purchase smaller quantities at a time. Due to the variability and dynamic nature of distributor stocking, we would not recommend collecting this data through detailed shelf surveys, but rather through in-depth interviews or fostering partnerships made through the Trial and with future participating distributors to obtain stocking data from distributors over time.

Product purchase and sell through at a distributor is also closely related to stocking, and should be considered for tracking if a low cost approach is possible (such as partnering with a number of distributors and obtaining sales data – even in aggregate – or conducting detailed in-depth interviews).

It may be possible to utilize an attribution survey battery to understand the degree to which changes in purchasing and stocking practices among distributors were affected by midstream incentives (versus other factors).

4. **Market Actor promotional effort**, which is, potentially, causally related to distributor stocking practices (above).

This proximate indicator of market transformation is especially important for a midstream or upstream program to track. It is also linked to the first indicator (where customers purchase their lighting) because the promotional efforts of commercial lighting market actors can affect the decisions of consumers in the market towards increasing market actor involvement. As shown in Table 36, above, this indicator can be tracked through the monitoring of market actor promotional collateral as well as

³⁷ Evergreen Economics, 2013. *SCE/PG&E Basic/Advanced/LMT Program Process Evaluation: Commercial Lighting Retrofits – Targeted Research, Final Report*. Prepared for SCE and PG&E.

interviews or surveys of market actors or consumer research regarding their perceptions of trade ally promotional efforts. Furthermore, defining quantitative metrics for level of promotion – such as dollars spent on marketing per month, number of campaigns or mailings per month, frequency of LED or PG&E promotion in monthly newsletters, etc. – will best position PG&E to track this indicator in support of claiming market transformation successes.

This indicator is also directly related to the willingness of market actors to promote LEDs to their customers.

7 Midstream Trial Logic Model & Lighting Programs Overview Diagram

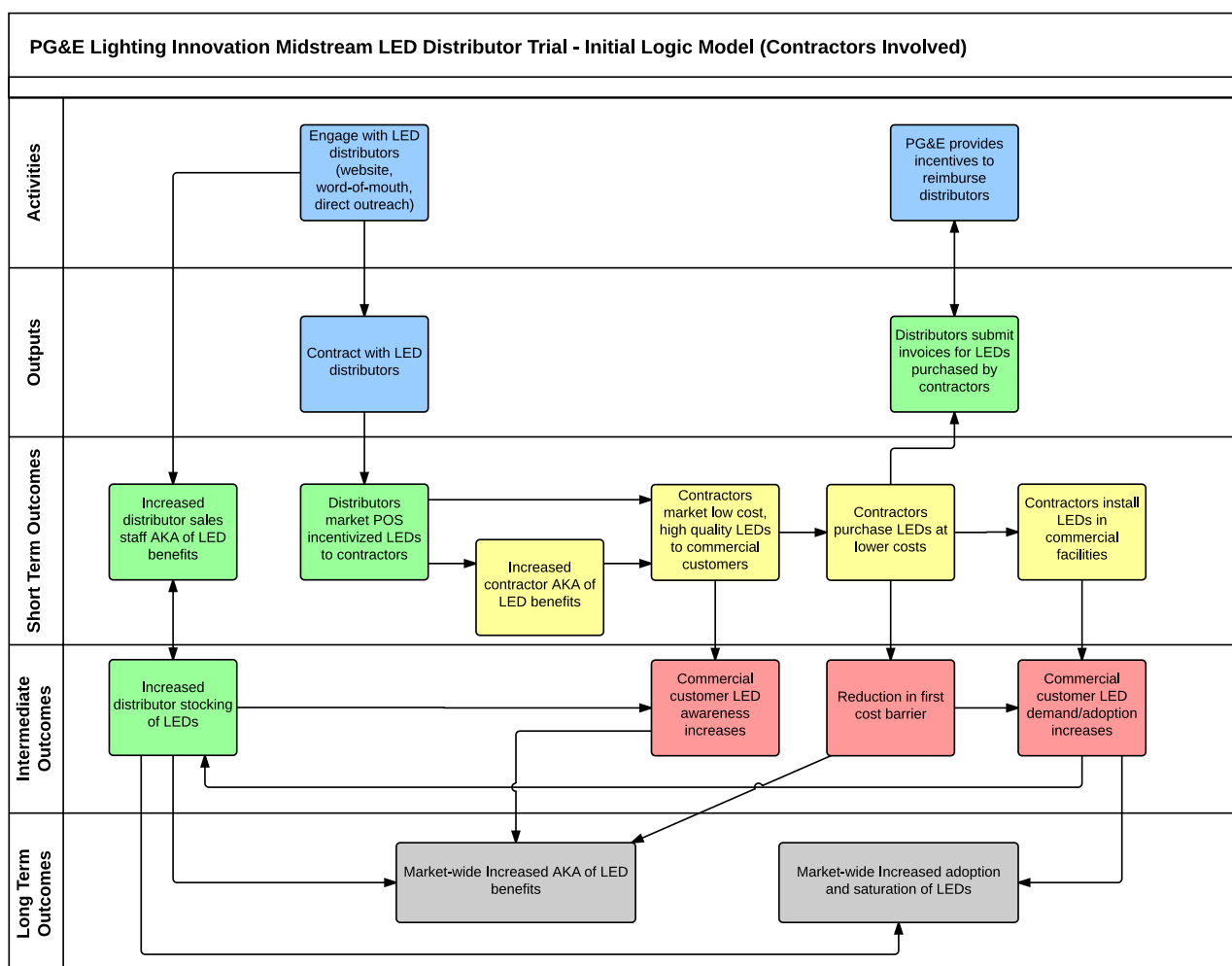
In this section we present the initial Trial logic model, an updated logic model for when contractors are not involved in the Trial-supported sales to commercial end-users, and both a commercial lighting programs overview diagram and emerging technologies program to primary lighting program process diagram.

7.1 Midstream Trial Logic Model

Based on a review of the Trial documentation provided to Evergreen by the PG&E lighting products team, as well as findings from our interviews with market actors, we developed the initial Trial logic model presented in Figure 26, below. This program theory identified contractors as a key market actor in the supply chain, and a key component of the Trial's market transformation program design. As shown below, in yellow, PG&E anticipated that contractors would be the intermediary between lighting distributors and commercial end-users. The Trial aimed to affect the decisions of contractors by influencing what products and messages they received from distributors. The contractors, in turn, would become more aware and educated about the benefits of LEDs, and the reduced cost would increase the likelihood that they would include LEDs in their sales pitches to their commercial customers.

While this program theory, and logic model presented below in Figure 26 are sound for a proportion of the products incentivized through the Trial, it does not account for the way the majority of Trial supported sales occurred: direct to consumer from distributors.

Figure 26: Initial Trial Logic Model (Contractors Involved)*

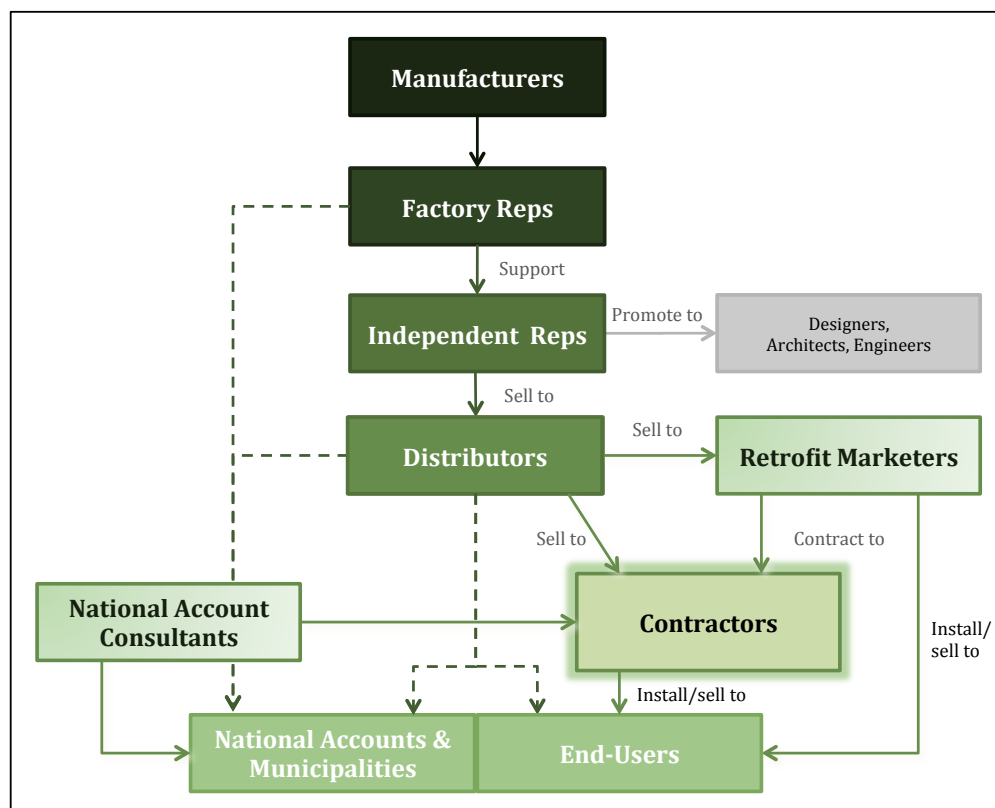


* "AKA" stands for Attitudes, Awareness, and Knowledge

Below, in Figure 27, we present a revised logic model that provides an account of the majority of Trial supported LED replacement lamp installations (note that Figure 26 is still applicable for cases in which a contractor is involved). As show below, **distributors are responsible for engaging with and selling LED replacement lamps to commercial customers, and install them on behalf of customers in some cases.**

For lighting fixtures and retrofits involving the installation of advanced controls strategies, previous research suggests that contractors are typically very important actors in the market.³⁸

Figure 28: Lighting Retrofit Market Actor Relationships³⁹



Source: Evergreen Economics, 2013. *SCE/PG&E Basic/Advanced/LMT Program Process Evaluation: Commercial Lighting Retrofits – Targeted Research, Final Report*. Prepared for SCE and PG&E.

7.2 Lighting Programs Overview Diagram

In addition to the revised logic model and assessment of the program theory, we prepared an overview diagram of the PG&E and statewide commercial energy efficiency lighting rebate programs, as well as a diagram outlining the steps from the Emerging Technologies Program to the Primary Lighting Program.

³⁸ Evergreen Economics, 2013. *SCE/PG&E Basic/Advanced/LMT Program Process Evaluation: Commercial Lighting Retrofits – Targeted Research, Final Report*. Prepared for SCE and PG&E.

³⁹ The cited study found that designers, architects, and engineers were infrequently involved in retrofit situations, which is why there are no connections from that group to the end-users.

As shown in Figure 29, below, the Statewide Primary Lighting Program currently targets the residential market with upstream incentives for energy efficient lighting products. PG&E assumes that some of these lighting products are purchased by customers who install the products in commercial spaces. The Lighting Market Transformation (LMT) Program, Emerging Technologies Program (ETP), and Lighting Innovation Program are active in both residential and commercial lighting markets. The Midstream Distributor LED Trial is an output of the Lighting Innovation Program designed with a commercial focus (see Figure 30 for an overview of how a program design goes from LMT concept to Trial).

In the Statewide Commercial Energy Efficiency Program, lighting rebates are available for retrofit projects through the commercial deemed and calculated incentive programs, and the Trade Professional Alliance exists, in part, to help customers navigate these rebate offerings. There are also a number of targeted (by segment or geography) third party direct install programs, as well as partnerships with local governments. Both of these program types include incentives for lighting equipment upgrades.

For new construction projects, incentives for energy efficient lighting products and systems are available through the Savings by Design Program.

Figure 29: Lighting Programs Overview Diagram

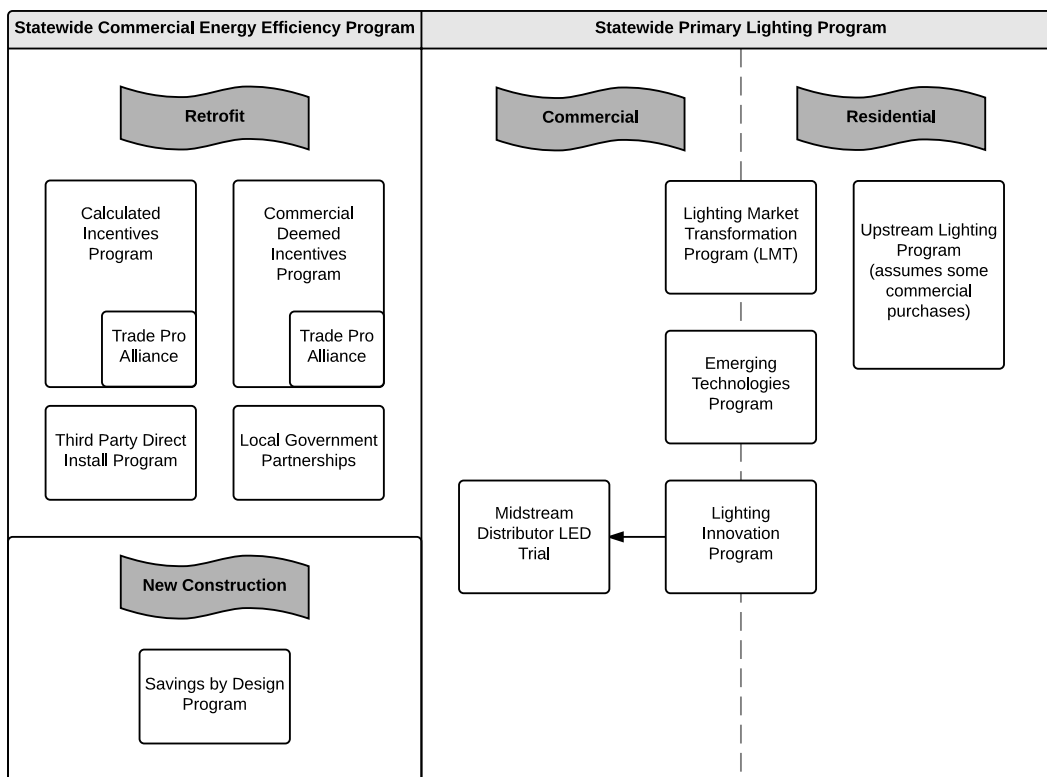
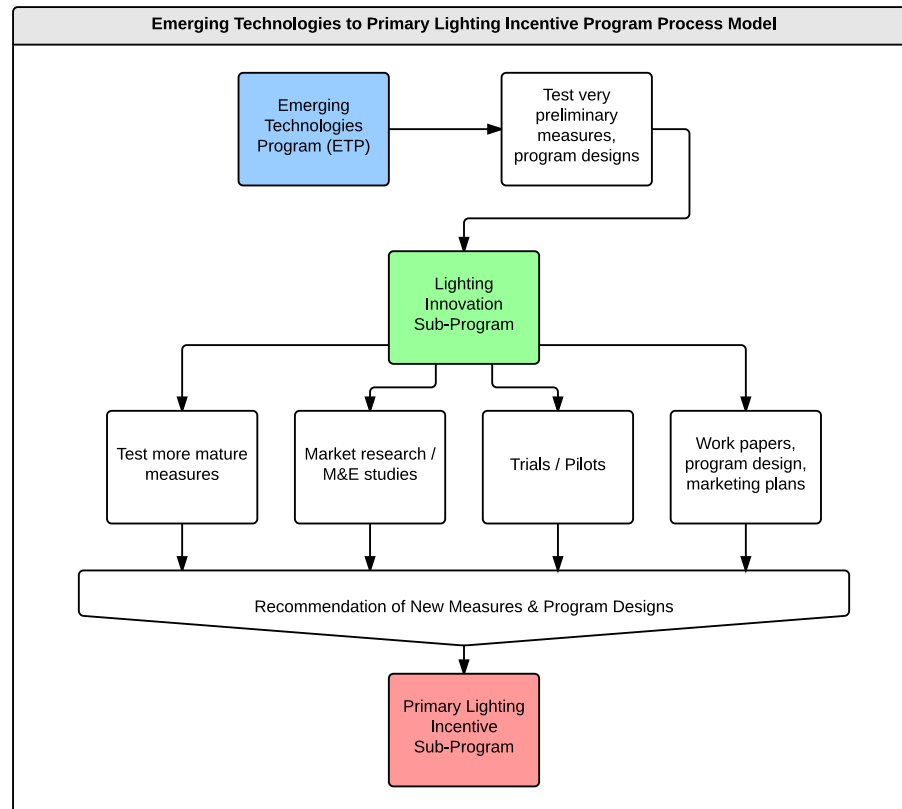


Figure 30 shows how products and program designs move from the ETP to the Lighting Innovation Sub-Program, and eventually to the Primary Lighting Sub-Program. For a program such as the Trial evaluated in this report, multiple aspects of the Trial must flow through this process model, including the measures (LED replacement lamps of different styles and applications) and program design, before PG&E scales a program for the mass markets.

Figure 30: Emerging Technologies to Primary Lighting Process Model



8 Conclusions and Recommendations

Overall the midstream incentives have proven effective, with sales of midstream incentivized LED replacement lamps outpacing sales of LED replacement lamps and/or fixtures through PG&E's other commercial deemed incentive programs. Furthermore, prior to the Trial, there were very few projects that received deemed incentives for any LED general-purpose lighting products.

It is unclear whether cannibalization – the extent to which competition with other program channels diminishes uptake – is occurring to even a small degree, as there is very little overlap between the 3P DI / LGP projects and Trial projects, and the products offered in the downstream programs are different from those offered through the Trial (fixtures as opposed to LED replacement lamps). Market actors report that the scale of a project is much different for an end-user who is replacing their fixtures versus one that is replacing their lamps (and leaving existing fixtures in place). Based on the lack of overlap and finding that project considerations are much different for fixtures versus lamp replacement projects, as well as positive feedback regarding participation in the Trial (among distributors and end-users), we conclude that the Trial is complimentary to the existing portfolio of PG&E commercial lighting rebate programs.

The Trial's design is feasible, although the evaluation findings suggest that the program logic and theory should be revised. Contractors are less involved than anticipated and participation is driven by very large and very small purchases (as opposed to primarily small projects) many of which are direct sales from distributors.

8.1 Conclusions

Findings from the evaluability assessment section of the report (section 5) indicate that tracking of midstream incentive specifics – such as accurate contractor and end-user contact information – should be a priority for PG&E as the Trial transitions to a full-scale incentive program. This is an internal process-related issue that PG&E should consider investigating further. It is possible that end-user and contractor data will continue to be problematic for midstream incentive programs, as the incentive applicant is a distributor.

Conclusions related to the detailed research questions identified by the PG&E team include the following:

- **How do sales trends for LEDs during the Trial compare against historical sales trends?**

Despite the availability of Downstream and 3P DI / LGP incentives for LEDs, sales of LED products via these deemed incentive channels were very low prior to the start of the Trial. Trial incentivized LED replacement lamps comprise the majority of LED products supported by PG&E through deemed incentive programs during the study period (from April 2013 to

June 2014). We were unable to analyze LED sales from custom incentive programs because the tracking data does not support lamp or fixture level analysis.

All participating and non-participating distributors have seen an increase in LED sales since January 2013. General decreases in LED price and the Trial rebates were the two most frequently cited reasons for increases in LED sales among participating distributors.

In addition, all interviewed manufacturers reported significant increases in sales of LEDs, as well. They attributed increased sales primarily to decreasing price, improved quality, new product development, improved customer awareness, and the presence of utility rebate programs, including the Trial.

- **How does the midstream delivery mechanism compare to downstream programs and 3P DI / LGP programs (e.g., Types of customers? Size and types of projects?) Are end-users receiving incentivized products from their normal sources?**

Projects that received financial incentives through the Downstream and 3P DI / LGP programs were typically smaller than projects that received incentives through the Trial, but all programs primarily served projects of 100 units or less.

The three programs that we compared are fundamentally different with regards to the volumes of incentivized products. Midstream Trial incentives are all for LED replacement lamps, mostly LED PARs (66%, across PAR38, PAR30, and PAR20 lamps) and MR16s (19%). Downstream incentives are only available for LED fixtures, and most go towards LED indoor downlight style fixtures (70%). Incentives are available for both fixtures and replacement lamps through 3P DI / LGP programs. The distribution of 3P DI / LGP incentives across product types differ from the downstream programs for fixtures; the majority of 3P DI / LGP fixture incentives are for outdoor LED fixtures. The 3P DI / LGP program lamp sales distribution is similar to the Midstream Trial, although with a higher proportion of incentives for MR16 style lamps.

It is evident (based on the customers with known business types) that the majority of LED products incentivized through the three program types are installed in similar types of facilities. Among known business types, retail, restaurants, and offices all appear in the top categories supported by each of the programs (in terms of the proportion of units). For the Trial, most incentivized lamps went to small retail, large one-story retail, small offices, sit-down restaurants, and large offices (in order of quantity; total of 52 percent of Trial lamps; 40 percent were to unknown business types). For downstream, most fixtures were installed in large multi-story retail, small offices, large offices, and sit-down restaurants (58 percent; 26 percent unknown). Lastly, for 3P DI / LGP, most LED products went to large single-story retail, small retail, sit-down restaurants, and small offices (73 percent; 12 percent unknown).

Close to 30 percent of the commercial end use respondents we surveyed (29%) stated that someone outside of their firm approached them to recommend an upgrade to their facility's lighting. Among these 12 firms, distributors were the most commonly mentioned source of

outreach (58%). According to end-user survey respondents, 74 percent of sales were direct to consumer (from a distributor). Three quarters of respondents (n=26) who could recall the type of supplier reported that they typically purchased replacement lamps from the same source.

The vast majority of overlapping participating distributors in our sample indicated a strong preference for the Trial versus their experience with the Trade Professional Alliance (TPA).

- **Is this an effective delivery mechanism (e.g., uptake; ease of participation) that PG&E should consider scaling up?**

Uptake

The number of distributors selling LED replacement lamps with Trial incentives grew over the course of the Trial. Since June 2013, between 13 and 26 distributors participated in the Trial each month. The content of manufacturer outreach to distributors (to support and stock their brand) has shifted as a result of the Trial, with manufacturers focusing on cobranding efforts and the development of marketing materials that highlight the Trial.

Nearly all of the participating distributors (88%, n=14) said they were “very likely” to suggest LED lamps to commercial customers due to the Trial, and the rest (n=2) said they were “somewhat likely”.

Ease of Participation

Participating distributors rated their ease of participation an average of 4.1 (out of five) with “1” being very difficult and “5” being very easy. None reported ease of participation less than three out of five. Some distributors had issues finding LED model numbers for the applications, wanted information about how to avoid common errors (e.g. don’t use apostrophes in the application text), and/or want PG&E to send them a confirmation when their applications are accepted and are being processed. These are issues that PG&E program staff can easily resolve with the distributors and do not indicate systemic concerns related specifically to the midstream incentive mechanism.

Participating distributors also reported that collecting and reporting contractor or installer contact information was relatively easy, reporting an average rating of 4.3 out of 5, with “1” being very difficult and “5” being very easy.

End-users reported that the Trial was very easy to participate in compared to other incentive programs (where they are more involved in filling out paperwork, etc.).

- **What is the degree of overlap with downstream programs? Does this cannibalize or optimize/supplement the downstream program?**

There were a total of seven customers that received incentivized LED products through midstream and other incentive channels over the study period. In five of the seven cases, the

customer received LED replacement lamps through the Trial and LED fixtures with downstream incentives. There are cases where a customer first participated in a downstream program and later received Trial incentivized products, and vice versa. It is unclear why customers participated in multiple programs over short periods of time for similar (or the same) measures, but there is no indication that double dipping is involved.

If only downstream rebates were available for LED replacement lamps (as opposed to only midstream incentives), nearly equal shares of participating distributors thought that their LED sales would increase (38%), stay the same (31%), and decrease (31%). However, 15 of the 16 interviewed distributors reported increases in LED sales attributable directly to the Trial. Overall, 14 participating distributors believed that the distributor LED incentive approach is beneficial as an addition to the PG&E program portfolio for lighting, while only one believes it was not beneficial (and one was not sure). This mixed assessment of the value of the midstream approach versus traditional downstream incentives suggests that distributors likely view any incentive as beneficial, and that while the midstream incentive mechanism is desirable for many reasons (see findings related to satisfaction, etc.), similar market transformation effects may be possible through other incentive mechanisms (i.e., downstream).

The Trial does, however, appear to be reaching many commercial customers that have not participated in other PG&E rebate programs in the past. Only 21 percent of respondent firms stated that they have participated in another PG&E rebate program (including for lighting, refrigeration equipment, food services equipment, pool covers). Furthermore, 33 percent of customers reported that they would have installed fewer or no LEDs if they were required to handle the incentive application process themselves.

- **How satisfied are distributors and end-users participating in the Trial with their experience? What is the relative level of satisfaction with LED light quality (compared to pre-existing equipment) amongst end-users? How satisfied are manufacturers with the qualifying products list?**

Overall, participating distributors were very satisfied with the Midstream LED Distributor Trial (average satisfaction of 4.4 out of five, with “1” being very dissatisfied and “5” being very satisfied). Overall, end-use commercial customers were also very satisfied with the Trial (average satisfaction of 9.2 out of ten, with “1” being very dissatisfied and “10” being very satisfied). Nearly 80 percent of end-users reported a 10/10 satisfaction with the Trial.

Participating distributors were satisfied with the rebate processing time, rating it a 4.3 out of five (on a scale of one to five, with “1” being very dissatisfied and “5” being very satisfied). Participating distributors were also satisfied with the qualifying products list, rating it an average of four out of five (with “1” being very dissatisfied and “5” being very satisfied).

End-users expressed high levels of satisfaction with the installed LED equipment. They rated LED characteristics on a scale of “1” to “10” with “1” being very dissatisfied and “10” being very satisfied. Light quality received an average rating of 9.6/10, reliability received a rating

of 9.7/10, light output received an average rating of 9.6/10, and physical appearance received a rating of 9.5/10.

Satisfaction with the qualified product list is mixed among manufacturers. Four of the five manufacturers hoped that in the future linear LED products would qualify for the Trial.

Manufacturers report concern over the quality of the products on the qualifying product list, as well as a particular concern related to the incentive structure: since the incentive level is tied to the wattage of lamps alone, some manufacturers may opt to develop products that are higher wattage than required in order to qualify for a higher incentive. The concerned manufacturers suggested that the incentive structure should be tied to other performance factors in addition to wattage.

- **Are current participating distributors and contractors unique from the general pool of distributors and contractors that sell lighting products to PG&E businesses?**

Since January 2013, all but one of the distributors has sold lighting products through a utility rebate program other than the Trial (note that they may not always know if a contractor or end-user applies for a rebate). They are not a unique pool of distributors.

It is unclear if the contractors who installed LEDs through PG&E's Trial are unique from the general pool that sell to PG&E's commercial customers.

- **What types of pre-existing equipment are being replaced through the Trial?**

The two lamp types most commonly replaced by Trial incentivized LEDs were incandescent lamps and halogen lamps.⁴⁰ Eighty-two percent of Trial LED replacement lamps were installed in sockets with functioning existing equipment, and 18 percent were installed in places where equipment had failed. No respondents stated that all the equipment had failed.

- **What are end-user motivations for doing the lighting retrofit and what is the importance of the Trial and incentives in their decision (i.e., is code compliance influencing their decision)? Are end-users aware of the Trial and incentives?**

The primary, unprompted reasons commercial end-users engaged in lighting retrofits was to lower their energy bill to save money (36%) and to save energy (21%). The most commonly mentioned secondary reason for lighting retrofits was saving energy (28%).

Slightly more than half of end-users were aware that the LED products installed at their facilities received an incentive from PG&E to lower the price (52%).

⁴⁰ See Section 4.3.4 for additional details regarding replaced lamp types.

The incentives were important in the decision to install LEDs. On a ten-point scale, with “1” being “not at all important” and “10” being “extremely important”, end-users reported a mean rating of 8.7 out of 10. For one-third of end-user respondents (33%) paperwork requirements typical of a downstream program would have led to fewer or no LED replacement lamp or fixture installs.

➤ **How likely are additional (i.e., non-participating) distributors to participate in a midstream incentive program?**

Non-participating distributors reported three primary reasons for not participating in the Trial (to date): lack of program product alignment with their product lines (n=3); lack of information and understanding of the program (n=2); and a perception that the program incentives are not high enough to justify the additional work involved in program participation (n=2).

Despite these reasons for not participating, all of the non-participating distributors we spoke with believed there is value in offering rebates directly to distributors. On a scale of one to five with five being very likely to participate and one being very unlikely to participate in the Trial, three non-participating distributors gave a score of five, two gave a score of three and two gave a score of two.

8.2 Recommendations

The preponderance of evidence suggests that the midstream incentive mechanism would be an effective tool for a full-scale PG&E energy efficiency incentive program. **Thus, the primary recommendation from this early EM&V assessment is to continue offering midstream incentives at the distributor level for LED replacement lamps.**

Additional recommendations include:

1. **Revise the program theory and logic model** to reflect that contractors are less involved than anticipated and that most sales are direct from the distributor to the end-user.

It is important that the program theory and logic model reflect the operationalized program, as best practice evaluation requires testing the key elements of the theory to ensure that market transformation activities are adequately defined and leading to the desired outcomes.

2. **Develop systems to track market indicators outlined in section 6.2.** These indicators will help assess the effectiveness of the Trial and conditions in the overall commercial LED replacement lamp market. Tracking should balance the cost of additional precision with the need for additional precision (for example, we do not necessarily recommend conducting distributor shelf surveys to assess changes in distributor stocking practices).

3. **Seek to improve end use facility type data in program tracking (ensure that this is required of distributors) and monitor changes in participating end use business types.** Improving the tracking of this metric – which is also described as an option in section 6.2 – will ensure that PG&E better understands what types of end-users purchase LED replacement lamps with midstream incentives. Improving the tracking of business type data will also improve the accuracy of energy savings estimates⁴¹ (for more information please see Section 5).
4. **Ensure that end-user contact information is captured for all facilities receiving midstream incentivized LED replacement lamps.** Not capturing this information would open a future program up to significant challenges during EM&V. If failing to capture this information, PG&E takes on a great deal of risk by potentially making it difficult to confirm installations and thus savings. Therefore, effort should be made to ensure program-tracking data includes end-user contact data. PG&E should consider matching end use customer location and business name information with utility account numbers in PG&E’s database of utility customers as part of quality insurance protocols (for more information please see Section 5).
5. **Consider adding additional lamp specification requirements for qualifying products.** According to the manufacturers themselves, since the incentive amount is only tied to the lamp wattage, there is no direct incentive for them to develop higher quality, higher efficacy lamps. Furthermore, with rapidly declining LED price, it is recommended that PG&E consider capping the incentive amount based on the price of the lamp, ensuring that the consumer must contribute financially in order to receive the lamps.

⁴¹ While the Database for Energy Efficiency Resources (DEER) does have load profiles for unknown business types, ideally a full-scale commercial midstream LED incentive program would only use the default values

Appendix A – Recommendations Table

Recommendation	Program or Database	Summary of Findings	Additional Supporting Information	Recommendation	Recommendation Recipient	Affected Workpaper or DEER
1	Lighting Innovation Midstream LED Trial	The Trial's design is feasible, although the evaluation findings suggest that the program logic and theory should be revised. Contractors are less involved than anticipated and participation is driven by very large and very small purchases (as opposed to primarily small projects) many of which are direct sales from distributors.	N/A	Revise the program theory and logic model to reflect that contractors are less involved than anticipated and that most sales are direct from the distributor to the end-user.	PG&E	N/A
2	Lighting Innovation Midstream LED Trial	To best ensure that program performance is accounted for (in terms of transforming the commercial lighting market) we propose a list of likely market transformation indicators, below: 1. Program incentivized LED replacement lamp sales volumes 2. LED Price 3. Distributor purchase and stocking practices 4. Market Actor promotional effort	N/A	Develop systems to track market indicators. These indicators will help assess the effectiveness of the Trial and conditions in the overall commercial LED replacement lamp market. Tracking should balance the cost of additional precision with the need for additional precision (for example, we do not necessarily recommend conducting distributor shelf surveys to assess changes in distributor stocking practices).	PG&E	N/A
3	Lighting Innovation Midstream LED Trial	End-user business type is unknown for over half of the projects that received LED replacement lamps at reduced cost through the Trial	N/A	Seek to improve end use facility type data in program tracking (ensure that this is required of distributors) and monitor changes in participating end use business types	PG&E	N/A
4	Lighting Innovation Midstream LED Trial	For many Trial tracking records there is no contact name or phone number for anyone at the business who received midstream incentivized LED replacement lamps through the Trial; contact information other than business	N/A	Ensure that end-user contact information is captured for all facilities receiving midstream incentivized LED replacement lamps	PG&E	N/A

		name and installation address was not available for all end use customers				
5	Lighting Innovation Midstream LED Trial	Manufacturers report concern over the quality of the products on the qualifying product list, as well as a particular concern related to the incentive structure: since the incentive level is tied to the wattage of lamps alone, some manufacturers may opt to develop products that are higher wattage than required in order to qualify for a higher incentive. The concerned manufacturers suggested that the incentive structure should be tied to other performance factors in addition to wattage. They also suggested capping incentive amounts based on the price of the lamp so there is a minimum consumer contribution. This would prevent lower quality, cheaper bulbs being distributed free of charge	N/A	Consider adding additional lamp specification requirements for qualifying products. According to the manufacturers themselves, since the incentive amount is only tied to the lamp wattage, there is no direct incentive for them to develop higher quality, higher efficacy lamps. Furthermore, with rapidly declining LED price, it is recommended that PG&E consider capping the incentive amount based on the price of the lamp, ensuring that the consumer must contribute financially in order to receive the lamps	PG&E	N/A

Appendix B – Survey and Interview Guides

This appendix contains the survey and interview guides developed and used as part of this evaluation.

Commercial End-user Interview Guide: PG&E and SCE LED Midstream Trial/Pilot Evaluations 1/13/15

Background:

Data from market actors and commercial end-user customers are expected to inform the lighting innovation midstream trial/pilot evaluations and assist with interpretation of the comparison analysis that is also being done as part of the evaluations. The PG&E trial and the SCE pilot rely on midstream incentives through participating electrical distributors to increase the sales of LED retrofit lighting products.

Purpose:

The target audience for this interview guide is end-users who installed (or hired someone to install) LEDs that were incentivized through the midstream trial/pilot in their commercial facilities in the PG&E and SCE service territories. The overall objective of this research task is to elicit information from end-users as part of a larger assessment aimed at determining if a direct midstream approach is a better or complimentary way to engage the lighting supply community to increase market penetration of LED replacement lamps (and fixtures, in the case of SCE) in the commercial sector (compared to the downstream rebate program and Trade Professional Alliance at PG&E).

Sample Frame Variables:

IOU: Either “SCE” or “PG&E”.

Contact Name: The first and last name of the contact for the rebate.

Business Name: The name of the business.

Contact Address: The address where the retrofit took place.

MEASURE: LED Replacement Lamps, LED Replacement Lamps and LED Fixtures, LED Fixtures

Month/Year of Install: Installation month and year, from IOU midstream tracking data

Introduction

Int. 1. [If < **CONTACT NAME** > is available, ask] Hello, my name is _____ and I am calling from CIC Research on behalf of <**IOU**>. This is not a sales call. May I please speak with <**CONTACT NAME**>?

Int. 1.a. [If <**Contact Name**> is *not* available, ask] Hello, my name is _____ and I am calling from CIC Research on behalf of <**IOU**>. This is not a sales call. May I please speak with the person at <**BUSINESS NAME**> who is most knowledgeable about your recent lighting upgrade in <**Month/Year of Install**> at <**CONTACT ADDRESS**>?
[RECORD NAME: _____]
[If “No”, Thank and Terminate]

Int. 2. [If contact not available, say] Is there a good time to call back in order to speak with <**CONTACT NAME**>? When?
[RECORD TIME; SCHEDULE CALL BACK]

Int. 3. [If Int. 2 = no / not available / no good time] Is there someone else at your business who is knowledgeable about your company’s lighting retrofit at <**CONTACT ADDRESS**> that I may be able to speak with? May I please speak with them?
[RECORD NAME: _____]
[If “No”, Thank and Terminate]

Int. 4. Hello, my name is _____ and I am calling from CIC Research on behalf of <**IOU**>. I’m calling because our records show that your business recently installed new LED light bulb(s) [or fixture(s) if SCE] through the <**IOU**> LED Distributor [If PG&E: Trial; if SCE: Pilot Program] at <**CONTACT ADDRESS**>. Do you recall this?

1. Yes
2. No [Return to **Int. 3.**]
88. Don’t Know [Return to **Int. 3.**]
99. Refused [Return to **Int. 3.**]

Int. 5. [If **Int. 4.** = 1] Are you the best person to speak with about your business' experience specifically related to this installation?

1. Yes
2. No [Return to **Int. 3.**]
88. Don't Know [Return to **Int. 3.**]
99. Refused [Return to **Int. 3.**]

[IF NEEDED] <IOU>, would like to better understand how businesses like yours make decisions about LED products to help <IOU> to understand what type of rebate programs they should offer in the future. Your input is very important to help improve the energy efficiency programs offered by <IOU>.

[If **Int. 5.** = 1] Great! I want to ensure you that this is not a sales call and we will keep everything you say confidential. Nothing you say will be attributed to yourself or your company, and all results will be reported in aggregate. The purpose of this interview is to improve <IOU>'s LED rebates to better serve customers in the future. We appreciate your participation and assistance with this research! The interview will take approximately 15 minutes to complete.

Midstream Trial/Pilot Experiences

Let's start by talking about your decision to install <MEASURE>...

Q 1. What was the single main reason you decided to install <MEASURE> at your facility?
[DO NOT READ CHOICES; ONE ANSWER ONLY; PROBE TO CODE]

1. Equipment cost savings
2. Saving energy
3. Lower energy bill
4. Previous equipment failed
5. Better lighting
6. To be "high-tech"
7. To be "green" / help the environment
8. Corporate practice / direction from corporate / planned renovation
9. The LED trial / pilot program
10. The rebate
11. To comply with building codes (Title 24)
12. Past participation in similar program
13. Recommended by general contractor
14. Recommended by electrical contractor
15. Recommended by lighting contractor
16. Recommended by lighting designer
17. Recommended by in-house facility manager(s)
18. Recommended by property management company
19. Recommended by lighting distributor
20. Recommended by manufacturer representative
21. Recommended by lighting showroom / fixture showroom staff
22. Recommended by architect
23. Recommended by engineer
24. Recommended by friend
25. Recommended by family member
26. Recommended by colleague
27. Recommended by energy services firm
28. Recommended by energy services firm staff
29. Recommended by home improvement store staff
30. Recommended by grocery store staff
31. Recommended by drug store staff
32. Recommended by hardware store staff
33. Recommended by trade association (Specify: _____)
77. Other (Specify: _____)
88. Don't Know
99. Refused

Q 2. Are there any other reasons you decided to install <MEASURE> at your facility? [DO NOT READ CHOICES; ACCEPT MULTIPLES]

1. Equipment cost savings
2. Saving energy
3. Lower energy bill
4. Previous equipment failed
5. Better lighting
6. To be “high-tech”
7. To be “green” / help the environment
8. Corporate practice / direction from corporate / planned renovation
9. The LED trial / pilot program
10. The rebate
11. To comply with building codes (Title 24)
12. Past participation in similar program
13. Recommended by general contractor
14. Recommended by electrical contractor
15. Recommended by lighting contractor
16. Recommended by lighting designer
17. Recommended by in-house facility manager(s)
18. Recommended by property management company
19. Recommended by lighting distributor
20. Recommended by manufacturer representative
21. Recommended by lighting showroom / fixture showroom staff
22. Recommended by architect
23. Recommended by engineer
24. Recommended by friend
25. Recommended by family member
26. Recommended by colleague
27. Recommended by energy services firm staff
28. Recommended by home improvement store staff
29. Recommended by grocery store staff
30. Recommended by drug store staff
31. Recommended by hardware store staff
32. Recommended by trade association (Specify: _____)
77. Other (Specify: _____)
88. Don't Know
99. Refused

Q 3 Thinking about your recent <MEASURE> purchase in <MONTH/YEAR OF INSTALL> at <CONTACT ADDRESS>, did someone outside of your company approach you to upgrade your facility's lighting?

1. Yes

No

77. Other (Specify: _____)

88. Don't Know

99. Refused

Q 4. [If Q 3= 1] What type of business or individual approached you about upgrading your facility's lighting? [DO NOT READ LIST BUT PROBE TO CODE ANSWER GIVEN; ACCEPT ONE; IF MORE THAN 1 ANSWER GIVEN, ASK WHICH ONE WAS FIRST]

1. Lighting designer
2. Architect
3. General contractor
4. Electrical contractor
5. Engineer
6. Lighting contractor
7. Lighting distributor
8. Lighting manufacturer representative
9. Lighting showroom / fixture showroom
10. Corporate headquarters
11. In-house facility manager(s)
12. Property management company
13. Friend
14. Family member
15. Colleague
16. Energy services firm
17. Home improvement store
18. Grocery store
19. Drug store
20. Hardware store
21. Online / Internet
22. Trade association (Specify: _____)
77. Other (Specify: _____)
88. Don't Know
99. Refused

Q 5. Now thinking of the specific <MEASURE> that you recently purchased, what types of businesses or individuals were involved in specifying or recommending the specific types of <MEASURE> you installed? [DO NOT READ LIST BUT PROBE TO CODE ANSWER GIVEN; ACCEPT MULTIPLES] (PROBE WELL:) Any others?

1. None
2. Lighting designer
3. Architect
4. General contractor

5. Electrical contractor
6. Engineer
7. Lighting contractor
8. Lighting distributor
9. Lighting manufacturer representative
10. Lighting showroom / fixture showroom
11. Corporate headquarters
12. In-house facility manager(s)
13. Property management company
14. Friend
15. Family member
16. Colleague
17. Energy services firm
18. Home improvement store
19. Grocery store
20. Drug store
21. Hardware store
22. Online / Internet
23. Trade association (Specify: _____)
77. Other (Specify: _____)
88. Don't Know
99. Refused

[If more than one type mentioned in **Q 5**, ask **Q 6**. If only one mentioned in **Q 5**, populate **Q 6** with the response from **Q 5**]

Q 6. Which type of company or individual had the greatest influence on your organization's selection of the specific <MEASURE> you installed? Was it ...(READ ANSWERS GIVEN IN **Q 5**) [ACCEPT ONE]

1. None
2. Lighting designer
3. Architect
4. General contractor
5. Electrical contractor
6. Engineer
7. Lighting contractor
8. Lighting distributor
9. Lighting manufacturer representative
10. Lighting showroom / fixture showroom
11. Corporate headquarters
12. In-house facility manager(s)
13. Property management company

14. Friend
15. Family member
16. Colleague
17. Energy services firm
18. Home improvement store
19. Grocery store
20. Drug store
21. Hardware store
22. Online / Internet
23. Trade association (Specify: _____)
77. Other (Specify: _____)
88. Don't Know
99. Refused

Q 7. [If **Q 6** = 2 to 77] Now, considering the influence from **<Q 6>** on your decision to install **<MEASURE>**. On a scale of 1 to 10, where “1” is “not at all important” and “10” is “extremely important”, how important was the influence from **<Q 6>** in your decision to install **<MEASURE>**?

__ [Enter 1 - 10]

88. Don't Know
99. Refused

Q 8. [If **<MEASURE>** = “LED Replacement Lamps” or “LED Replacement Lamps and LED Fixtures”] What type of company or individual sold the **LED replacement light bulbs** to your business? [DO NOT READ LIST BUT PROBE TO CODE ANSWER GIVEN]

1. Lighting designer
2. Architect
3. General contractor
4. Electrical contractor
5. Engineer
6. Lighting contractor
7. Lighting distributor
8. Lighting manufacturer representative
9. Lighting showroom / fixture showroom
10. Corporate headquarters
11. In-house facility manager(s)
12. Property management company
13. Friend
14. Family member
15. Colleague
16. Energy services firm
17. Home improvement store

- 18. Grocery store
- 19. Drug store
- 20. Hardware store
- 21. Online / Internet
- 22. Trade association (Specify: _____)
- 77. Other (Specify: _____)
- 88. Don't Know
- 99. Refused

Q 9. [If <MEASURE> = "LED Replacement Lamps" or "LED Replacement Lamps and LED Fixtures" and If **Q 8** < 88] Does your business typically buy replacement light bulbs from a <Q 8>?

- 1. Yes
- 2. No
- 77. Other (Specify: _____)
- 88. Don't Know
- 99. Refused

Q 10. [If **Q 9** >/= 2] From what type of company or individual does your business typically purchase replacement light bulbs? [DO NOT READ LIST BUT PROBE TO CODE ANSWER GIVEN]

- 1. Lighting designer
- 2. Architect
- 3. General contractor
- 4. Electrical contractor
- 5. Engineer
- 6. Lighting contractor
- 7. Lighting distributor
- 8. Lighting manufacturer representative
- 9. Lighting showroom / fixture showroom
- 10. Corporate headquarters
- 11. In-house facility manager(s)
- 12. Property management company
- 13. Friend
- 14. Family member
- 15. Colleague
- 16. Energy services firm
- 17. Home improvement store
- 18. Grocery store
- 19. Drug store
- 20. Hardware store
- 21. Online / Internet

- 22. Trade association (Specify: _____)
- 77. Other (Specify: _____)
- 88. Don't Know
- 99. Refused

Q 11. [If <MEASURE> = “LED Replacement Lamps” or “LED Replacement Lamps and LED Fixtures”] Who physically installed the **LED replacement light bulbs** at your facility? [DO NOT READ LIST BUT PROBE TO CODE ANSWER GIVEN]

- 1. [Respondent; “me”, “I did”]
- 2. Lighting designer
- 3. Architect
- 4. General contractor
- 5. Electrical contractor
- 6. Engineer
- 7. Lighting contractor
- 8. Lighting distributor
- 9. Lighting manufacturer representative
- 10. Lighting showroom / fixture showroom staff
- 11. Corporate headquarters
- 12. In-house facility manager(s)
- 13. Property management company
- 14. Friend
- 15. Family member
- 16. Colleague
- 17. Energy services firm
- 18. Trade association (Specify: _____)
- 77. Other (Specify: _____)
- 88. Don't Know
- 99. Refused

Q 12. [If Q 11=1 say “Do you”; otherwise say “Does a/an <Q 11>”] typically handle the installation of replacement light bulbs at your facility?

- 1. Yes
- 2. No
- 3. Sometimes
- 77. Other (Specify: _____)
- 88. Don't Know
- 99. Refused

Q 13. [If Q 11=1] Why did you, rather than someone else, install the LED replacement light bulbs for your recent upgrade? [ACCEPT MULTIPLE]

1. Company protocol
2. Property manager protocol
3. Purchased direct from distributor
4. Ease of installation
5. Only employee
6. Part of my job description
7. Insurance requirement
77. Other (Specify: _____)
88. Don't Know
99. Refused

Q 14. [If **Q 11**= 2 through 77] Why did a/an **<Q 11>** install the LED replacement light bulbs for your recent upgrade, as opposed to doing it yourself? [ACCEPT MULTIPLE]

1. Company protocol
2. Property manager protocol
3. Difficulty of installation
4. Part of larger project that required **<Q 11>**
5. Approached by **<Q 11>**
6. Have trained staff / in-house facilities manager
7. Part of their job description
8. Not comfortable with electrical work
9. Insurance requirement
77. Other (Specify: _____)
88. Don't Know
99. Refused

Q 15. [If **<MEASURE>** = "LED Replacement Lamps and LED Fixtures" or "LED Fixtures"] What type of company or individual sold the **LED fixtures** to your business? [DO NOT READ LIST BUT PROBE TO CODE ANSWER GIVEN]

1. Lighting designer
2. Architect
3. General contractor
4. Electrical contractor
5. Engineer
6. Lighting contractor
7. Lighting distributor
8. Lighting manufacturer representative
9. Lighting showroom / fixture showroom
10. Corporate headquarters
11. In-house facility manager(s)
12. Property management company
13. Friend

14. Family member
15. Colleague
16. Energy services firm
17. Home improvement store
18. Grocery store
19. Drug store
20. Hardware store
21. Online / Internet
22. Trade association (Specify: _____)
77. Other (Specify: _____)
88. Don't Know
99. Refused

Q 16. [If <MEASURE> = "LED Replacement Lamps and LED Fixtures" or "LED Fixtures" and If Q 15< 88] Does your business typically buy new fixtures from a <Q 15>?

1. Yes
2. No
77. Other (Specify: _____)
88. Don't Know
99. Refused

Q 17. [If Q 15 > 2] From what type of company or individual does your business typically purchase fixtures? [DO NOT READ LIST BUT PROBE TO CODE ANSWER GIVEN]

1. Lighting designer
2. Architect
3. General contractor
4. Electrical contractor
5. Engineer
6. Lighting contractor
7. Lighting distributor
8. Lighting manufacturer representative
9. Lighting showroom / fixture showroom
10. Corporate headquarters
11. In-house facility manager(s)
12. Property management company
13. Friend
14. Family member
15. Colleague
16. Energy services firm
17. Home improvement store
18. Grocery store
19. Drug store

- 20. Hardware store
- 21. Online / Internet
- 22. Trade association (Specify: _____)
- 77. Other (Specify: _____)
- 88. Don't Know
- 99. Refused

Q 18. [If <MEASURE> = “LED Replacement Lamps and LED Fixtures” or “LED Fixtures”] Who physically installed the **LED fixtures** at your facility? [DO NOT READ LIST BUT PROBE TO CODE ANSWER GIVEN]

- 1. [Respondent; “me”, “I did”]
- 2. Lighting designer
- 3. Architect
- 4. General contractor
- 5. Electrical contractor
- 6. Engineer
- 7. Lighting contractor
- 8. Lighting distributor
- 9. Lighting manufacturer representative
- 10. Lighting showroom / fixture showroom staff
- 11. Corporate headquarters
- 12. In-house facility manager(s)
- 13. Property management company
- 14. Friend
- 15. Family member
- 16. Colleague
- 17. Energy services firm
- 18. Trade association (Specify: _____)
- 77. Other (Specify: _____)
- 88. Don't Know
- 99. Refused

Q 19. [If Q 18=1 say “Do you”; otherwise say “Does a/an <Q 18>”] typically handle the installation of electrical equipment, such as lighting fixtures, at your facility?

- 1. Yes
- 2. No
- 3. Sometimes
- 77. Other (Specify: _____)
- 88. Don't Know
- 99. Refused

Q 20. Why did [If **Q 18**=1 say “you”; otherwise say “a/an **<Q 18>**”], rather than someone else, install the LED fixtures for your recent upgrade, as opposed to someone else? [ACCEPT MULTIPLE]

1. Company protocol
4. Property manager protocol
5. Purchased direct from distributor
6. Ease of installation
7. Difficulty of installation
8. Part of larger project that required **<Q 18>**
9. Approached by **<Q 18>**
10. Have trained staff / in-house facilities manager
11. Not comfortable with electrical work
12. Insurance requirement
77. Other (Specify: _____)
88. Don't Know
99. Refused

Q 21. Were you aware that the lighting distributor who supplied **<MEASURE>** received financial assistance from **<IOU>** in order to provide lower priced **<MEASURE>** to commercial customers like yourself?

1. Yes
2. No
77. Other (Specify: _____)
88. Don't Know
99. Refused

[IF NEEDED TO SATISFY RESPONDENT: *TRIAL/PILOT DESCRIPTION*: In the **<IOU>** program, financial assistance is provided to distributors who stock and sell LED replacement light bulbs to either contractors or other professional installers, or directly to businesses like yours.]

Q 22. [If **Q 21** = 1] How did you become aware that the lighting distributor who supplied **<MEASURE>** received financial assistance from **<IOU>**? [DO NOT READ; ACCEPT ONE; PROBE TO CODE]

1. Lighting designer
2. Architect
3. General contractor
4. Electrical contractor
5. Engineer
6. Lighting contractor
7. Lighting distributor
8. Lighting manufacturer representative

9. Corporate headquarters
10. In-house facility manager(s)
11. Property management company
12. Friend
13. Family member
14. Colleague
15. Trade association (Specify: _____)
16. Promotional event
17. Distributor event
18. Email
19. Flier
20. Participation at other company facility / location
21. <IOU>Website
22. Invoice documentation
77. Other (Specify: _____)
88. Don't Know
99. Refused

Q 23. [If Q 21 = 1] Now, considering the importance of the financial assistance that <IOU> provided to the lighting distributor in order to reduce the cost of the <MEASURE>. On a scale of 1 to 10, where “1” is “not at all important” and “10” is “extremely important”, how important was the financial assistance from <IOU> in your decision to install <MEASURE>?

__ [Enter 1 - 10]

88. Don't Know
99. Refused

Q 24. [If Q 23 = 1-10] Why do you say that? [OPEN-ENDED; RECORD RESPONSE VERBATIM]

Q 25. If you were required to submit a rebate application in order to receive the <MEASURE> at the same cost, instead of receiving the discounted price directly through the distributor, would you have installed the same number, more, fewer, or no <MEASURE>?

1. Same number
2. More
3. Fewer
4. No / none
77. Other (Specify: _____)
88. Don't Know

99. Refused

Q 26. Why do you say that? [OPEN-ENDED; RECORD RESPONSE VERBATIM]

Q 27. [If **Q 1** and **Q 2** ≠ 11] Did California's Title 24 building code impact what lighting equipment you selected to install at your facility?

1. Yes
2. No
77. Other (Specify: _____)
88. Don't Know
99. Refused

[IF NEEDED FOR CLARIFICATION, *NOT IF THEY DO NOT KNOW ABOUT TITLE 24 AT ALL*: California's Title 24 building code has certain requirements regarding the efficiency levels of retrofitted lighting fixtures in commercial and residential buildings throughout California]

Q 28. [If **Q 1** and **Q 2** = 11 or if **Q 27** = 1] How did California's Title 24 building code impact what lighting equipment you selected to install? [OPEN-ENDED; RECORD RESPONSE VERBATIM]

Equipment Choice

Q 29. Did your lighting upgrade in <MONTH/YEAR OF INSTALL> at <CONTACT ADDRESS> involve replacing existing equipment, providing lighting to new areas of your facility, or a mixture of both?

1. Replacing existing equipment (only)
2. Lighting new areas (only)
3. Both
77. Other (Specify: _____)
88. Don't Know
99. Refused

Q 30. [If <MEASURE> = “LED Replacement Lamps” or “LED Replacement Lamps and LED Fixtures”] What types of light bulbs were **replaced** during your recent lighting upgrade? [DO NOT READ; ACCEPT MULTIPLES]

1. Screw-in CFLs
2. Hardwired CFLs
3. Incandescents
4. LEDs
5. High performance T8 fluorescent lamps
6. T8 fluorescent lamps
7. T10 fluorescent lamps
8. T12 fluorescent lamps
9. T5 fluorescent lamps
10. Cold Cathodes
11. Halogens
12. HIDs (High Intensity Discharge)
13. Induction lighting
77. Other (Specify: _____)
88. Don't Know
99. Refused

Q 31. [If <MEASURE> = “LED Replacement Lamps” or “LED Replacement Lamps and LED Fixtures”] Were the light bulbs that you replaced in working order, or had some or all of them failed (burned out)?

1. All in working order
2. Some had failed / burned out
3. All had failed / burned out
77. Other (Specify: _____)
88. Don't Know
99. Refused

Q 32. [If Q 31 = 2] Approximately what percent of the replaced light bulbs had failed prior to installing LED replacement light bulbs?

- ___ [Enter %]
88. Don't Know
 99. Refused

Q 33. [If <IOU> = SCE and <MEASURE> = “LED Replacement Lamps and LED Fixtures” or “LED Fixtures”] What types of light fixtures were **replaced** during your lighting upgrade in <MONTH/YEAR OF INSTALL> at <CONTACT ADDRESS>? [DO NOT READ; ACCEPT MULTIPLE]

1. Standard screw-in fixtures
2. Hardwired CFL fixtures
3. LED fixtures
4. High performance T8 fixtures
5. T8 fluorescent fixtures
6. T10 fluorescent fixtures
7. T12 fluorescent fixtures
8. T5 fluorescent fixtures
9. Electronic Ballast
10. Magnetic Ballast
11. Cold Cathode fixtures
12. Hardwired Halogen fixtures
13. HIDs (High Intensity Discharge) fixtures
14. Induction lighting fixtures
77. Other (Specify: _____)
88. Don't Know
99. Refused

[Ask **Q 34** and **Q 35** (if applicable) for each answer to **Q 33**]

Q 34. [If **<IOU>** = SCE and **<MEASURE>** = "LED Replacement Lamps and LED Fixtures" or "LED Fixtures"] Approximately how old were the replaced **<Q 33>**?

__ [Enter years]

88. Don't Know
99. Refused

Q 35. [If **<IOU>** = SCE and **Q 34**= 88] Would you say the replaced fixtures were... [READ ANSWERS; ACCEPT ONE]

1. Less than 1 year old?
2. 1 - 2 years old?
3. 2 - 3 years old?
4. 3 - 4 years old?
5. 4 - 5 years old?
6. 5 - 10 years old?
7. 10 years old or older?
88. Don't Know
99. Refused

Q 36. [If **<IOU>** = SCE and **<MEASURE>** = "LED Replacement Lamps and LED Fixtures" or "LED Fixtures"] Were the light fixtures that you replaced in working order, or had some or all of them failed (burned out)?

1. All in working order
2. Some had failed / burned out
3. All had failed / burned out
77. Other (Specify: _____)
88. Don't Know
99. Refused

Q 37. [If <IOU> = SCE and Q 36= 2] Approximately what percent of the replaced light fixtures had failed prior to installing LED fixtures?

- ___ [Enter %]
88. Don't Know
99. Refused

Q 38. Approximately what percent of your facility's existing light bulbs were replaced as part of your lighting upgrade in <MONTH/YEAR OF INSTALL> at <CONTACT ADDRESS>?

- ___ [Enter %]
88. Don't Know
99. Refused

Q 39. [If <IOU> = SCE and <MEASURE> = "LED Replacement Lamps and LED Fixtures" or "LED Fixtures"] Approximately what percent of your facility's lighting fixtures were retrofitted or replaced as part of your lighting upgrade in <MONTH/YEAR OF INSTALL> at <CONTACT ADDRESS>?

- ___ [Enter %]
88. Don't Know
99. Refused

Q 40. Approximately what percent of your facility's area was impacted by your lighting upgrade?

- ___ [Enter %]
88. Don't Know
99. Refused

Q 41. In what locations in your facility were the <MEASURES> installed? [DO NOT READ; ACCEPT MULTIPLE]

1. Entryway / front desk / waiting room / lobby
2. Offices
3. Hallways / walkways
4. Stairways / stairwells / stairs

5. Open offices / cubicles
6. Bathrooms
7. Meeting / conference rooms
8. Kitchen / break room
9. Copy room
10. Mail room
11. Dining room
12. Classrooms
13. Warehouse
14. Storage / closets
15. Retail floor
16. Changing rooms
17. Product displays
18. Gym
19. Pool room
20. Garage
21. Locker room
22. Patient rooms
23. Utility room / boiler room
24. Refrigeration / walk in refrigerator
25. Outside
77. Other (Specify: _____)
88. Don't Know
99. Refused

[IF MEASURE = "LED REPLACEMENT LAMPS AND LED FIXTURES", ASK Q 42 – Q 49 FIRST FOR "LED REPLACEMENT LAMPS" THEN FOR "LED FIXTURES"; ELSE GO THROUGH QUESTIONS ONCE FOR WHICHEVER MEASURE THEY HAVE (LAMPS OR FIXTURES)]

Q 42. On a scale of 1 to 10, where "1" is "not at all satisfied" and "10" is "extremely satisfied", how satisfied are you with the *light quality* of the <MEASURE> installed at your facility?

___ [Enter 1 – 10]

88. Don't Know
99. Refused

Q 43. [ASK If Q 42 < 4] Why do you say that? [OPEN-ENDED; RECORD RESPONSE VERBATIM]

Q 44. On a scale of 1 to 10, where “1” is “not at all satisfied” and “10” is “extremely satisfied”, how satisfied are you with the *light output – the amount of light* – of the <MEASURE> installed at your facility?

__ [Enter 1 – 10]

88. Don't Know

99. Refused

Q 45. [ASK If Q 44 < 4] Why do you say that? [OPEN-ENDED; RECORD RESPONSE VERBATIM]

Q 46. On a scale of 1 to 10, where “1” is “not at all satisfied” and “10” is “extremely satisfied”, how satisfied are you with the *physical appearance* of the <MEASURE> installed at your facility?

__ [Enter 1 – 10]

88. Don't Know

99. Refused

Q 47. [ASK If Q 46 < 4] Why do you say that? [OPEN-ENDED; RECORD RESPONSE VERBATIM]

Q 48. On a scale of 1 to 10, where “1” is “not at all satisfied” and “10” is “extremely satisfied”, how satisfied are you with the *reliability* of the <MEASURE> installed at your facility?

__ [Enter 1 – 10]

88. Don't Know

99. Refused

Q 49. [ASK If Q 48 < 4] Why do you say that? [OPEN-ENDED; RECORD RESPONSE VERBATIM]

Participation in Other Programs

Q 50. Aside from the recent lighting upgrade that we have talked about today, has your company received any <IOU> rebates or incentives for the purchase and installation of other energy efficiency equipment?

1. Yes

2. No
77. Other (Specify: _____)
88. Don't Know
99. Refused

Q 51. [If **Q 50**=1] For what other types of equipment? [DO NOT READ; ACCEPT MULTIPLE]

1. Lighting
2. HVAC / Air Conditioning / Heating
3. Boilers
4. Water Heating
5. Steam Traps
6. Refrigeration
7. Food Services / Cooking
8. Business Computing
77. Other (Specify: _____)
88. Don't Know
99. Refused

Q 52. [If **Q 51**=1] When you participated in these other lighting programs, did you submit a rebate application in order to obtain a rebate for the lighting installation, or did a contractor handle the paperwork on your behalf?

1. Respondent firm submitted rebate
2. Contractor
77. Other (Specify: _____)
88. Don't Know
99. Refused

[Ask **Q 53** and **Q 55** (if applicable) for all answers to **Q 51**]

Q 53. Thinking about your participation in <IOU>'s <Q 51> program, was it part of the [If <IOU> = PG&E, say: "PG&E Customized Retrofit Incentive Program"; If <IOU> = SCE, say: "SCE Energy Efficiency Customized Solutions Program"] ?

1. Yes
2. No
3. Maybe
77. Other (Specify: _____)
88. Don't Know
99. Refused

Q 54. [If **Q 50**=1] Please think about your participation in <IOU>'s <Q 51> program compared to your recent lighting upgrade that included <MEASURE> through the LED

Distributor [If PG&E: Trial; if SCE: Pilot Program]. Overall, would you say it was easier, about the same, or more difficult to participate in the LED Distributor [If PG&E: Trial; if SCE: Pilot Program]?

1. Easier
2. The same
3. More difficult
77. Other (Specify: _____)
88. Don't Know
99. Refused

Q 55. Why do you say that? [OPEN-ENDED; RECORD RESPONSE VERBATIM]

Q 56. On a scale of 1 to 10, where “1” is “not at all satisfied” and “10” is “extremely satisfied”, how satisfied are you with the distributor LED trial overall?

- __ [Enter 1 - 10]
88. Don't Know
 99. Refused

Q 57. [ASK If Q 56 < 4] Why do you say that? [OPEN-ENDED; RECORD RESPONSE VERBATIM]

Respondent and Firm Background Information

We are almost done, I just have a few questions about you and your facility for statistical purposes.

Q 58. What is your job title?

1. Plant Manager
2. Facility Manager
3. Energy Manager
4. President/CEO
5. Owner/Co-owner/Partner/Member of LLP
6. General Manager
77. Other (Specify: _____)
88. Don't Know
99. Refused

Q 59. What is the main business activity at this facility? [Do not read list]

1. Offices (non-medical)
2. Restaurant/Food Service
3. Retail Stores
4. Food Stores (grocery/liquor/convenience)
5. Agricultural (farms, greenhouses)
6. Warehouse
7. Health Care
8. Education
9. Lodging (hotel/rooms)
10. Public Assembly (church/fitness/theater/library/museum/convention)
11. Services (hair/nail/massage/spa/gas/repair)
12. Industrial (food processing plant/manufacturing)
13. Laundry (coin-operated/commercial laundry facility/dry cleaning)
14. Condo Association/Apartment Manager (garden style/mobile home park/high-rise/townhouse)
15. Public Service (fire/police/postal/military)
77. Other (Specify: _____)
88. Don't Know
99. Refused

Q 60. Does your organization own, lease, or manage your space?

1. Own
2. Lease
3. Manage
77. Other (Specify: _____)
88. Don't Know
99. Refused

Q 61. [If Q 60= 2] How long is the remaining term of your lease?

1. 1 year
2. 2 years
3. 3 years
4. 4 years
5. 5 years
6. 6 years
7. 7 years
8. 8 years
9. 9 years
10. 10 years

- 11. More than 10 years
- 12. Month to month
- 77. Other (Specify: _____)
- 88. Don't Know
- 99. Refused

Q 62. Does your organization pay the electric utility bill at this location?

- 1. Yes
- 2. No
- 77. Other (Specify: _____)
- 88. Don't Know
- 99. Refused

Q 63. What is the approximate total square footage at your location?

- __ [Enter #]
- 88. Don't Know
- 99. Refused

Q 64. [If Q 63= 88] Would you say the floor area is...

- 1. < 1,500 square feet?
- 2. 1,500 - 5,000 square feet?
- 3. 5,000 - 10,000 square feet?
- 4. 10,000 - 25,000 square feet?
- 5. 25,000 - 50,000 square feet?
- 6. 50,000 - 75,000 square feet?
- 7. 75,000 - 100,000 square feet?
- 8. Over 100,000 square feet?
- 88. Don't Know
- 99. Refused

Those are all my questions. Before I let you go, is there anything you'd like to add, anything that you think I should have asked about or that we should keep in mind as we conduct this research into LEDs in California?

Thank you very much for your time on the phone today!

Lighting Distributor Interview Guide

PG&E and SCE LED Midstream Trial Evaluations

August 13, 2014

Background:

Data from two (SCE) to three (PG&E) groups of market actors are expected to inform the lighting innovation midstream trial evaluations and assist with interpretation of the comparison analysis that is also being done as part of the evaluations. The trials rely on midstream incentives through participating electrical distributors to increase the sales of LED retrofit lighting products.

Purpose

The target audience for this interview guide is lighting distributors who stock and supply LEDs to contractors or end-users in the PG&E and SCE service territories. We will interview two groups of lighting distributors – those who have participated in the midstream trial (and have received incentives for LED replacement lamps through the trial), and distributors who have not participated in the trial. The overall objective of this research task is to elicit information from distributors as part of a larger assessment aimed at determining if a direct midstream approach is a better or complimentary way to engage the lighting supply community to increase market penetration of LED replacement lamps (and fixtures, in the case of SCE) in the commercial sector (compared to the downstream rebate program and Trade Professional Alliance at PG&E). We would also like to determine if the differences in measures and demand for measures offered by each program can account for any differences in sales volumes, or if the rebate process/program design is responsible.

Introduction

Hi, my name is _____, and I'm calling from Evergreen Economics on behalf of (Pacific Gas and Electric/Southern California Edison) (PG&E/SCE). We are an independent firm hired to help (PG&E/SCE) to improve their programs for customers seeking lighting upgrades. (PG&E/SCE) recently started providing incentives to distributors who stock and sell LED replacement lamps (if SCE=1, and fixtures) to the commercial sector. Throughout this questionnaire we will be calling this program the distributor LED trial.

[If PG&E distributor, say “and we are offering you a \$100 incentive, no strings attached, if you complete the survey”].

[Participating Distributors]

Are you aware of the (PG&E/SCE) distributor LED trial that I just described? [If not, describe program and confirm that they are aware – if not, ask if someone else would be better to talk with; If no knowledge of program, and nobody else to talk with, Thank and Terminate]

Have you received incentives from (PG&E/SCE) through the distributor LED trial (where incentives are provided to distributors who stock and sell LED replacement lamps (if SCE=1, and fixtures) to the commercial sector? [If “no”, say that our records show their firm has, and ask if someone else would be better to talk with; If no knowledge of program, and nobody else to talk with, Thank and Terminate]

[Non-participating Distributors]

Are you aware of the (PG&E/SCE) distributor LED trial? [If not, describe program and confirm that they are aware – if not, ask if someone else would be better to talk with; continue survey with person most knowledgeable about (PG&E/SCE) distributor LED trial or (PG&E/SCE) rebate programs in general]

[If Agreed to Participate] Great. The purpose of this research is to solicit feedback from your firm and other firms distributing LED replacement lamps (if SCE=1, and fixtures) to the commercial sector. My questions should take [If participating distributor say: 30-45 minutes; if non-participating distributor say: 20 minutes].

Can you discuss this now, or would it be better to schedule a time to talk?

[Screen for correct person – person who knows most about lighting equipment]

[Get contact’s full name, email address and telephone number.]

[If scheduled, immediately send an email with the date and time of the call and an Outlook appointment (with reminder set for ½ hour before call).]

[Send reminder email one day prior to call if scheduled more than 3 days in advance. (Text for email will be provided.)]

TRIAL=1 for participating distributors

Respondent and Firm Background Information

I’d like to start by finding out a bit about you, your company, and your job.

- Q1. What does [company name] do? Anything else?
- Q2. [If not mentioned in Q1] Just to confirm, [company name] does distribute (stock and sell) LED replacement lamps [If SCE read: and/or LED fixtures] for the commercial sector, correct? [If not, thank and terminate.]
- Q3. [If not mentioned in Q1 or Q2] Do you distribute LED fixtures for the commercial sector?
- Q4. [If not mentioned in Q1] Do you distribute non-LED products? What types of products?

- Q5. What is your position at [company name]? [Probe for: Title, and responsibilities/description]
- Q6. How long have you been at [company name]?
- Q7. Since [If PG&E=1 read “January”; If SCE=1 read “July”] 2013, has [company name] sold lighting products that received incentives through any utility rebate programs besides (PG&E’s/SCE’s) distributor LED trial? [If yes, probe on which (PG&E/SCE) rebate programs]
- Q8. [If Q7=Yes] Since [If PG&E=1 read “January”; If SCE=1 read “July”] 2013, approximately what percent of your lighting or fixture sales received a rebate in one form or another? [Probe on overall and specific to (PG&E/SCE) if known; Probe for differences between LEDs and other technologies.]

General Market Questions

Now I would like to ask a few questions about the market for LED replacement lamps and fixtures in general.

- Q9. [If PG&E=1 and Q2=Yes and Q3 or Q4=Yes] What percent of commercial end-use customers that are replacing or retrofitting their lighting systems are installing LED replacement lamps as opposed to other lighting technologies (including LED fixtures)?
- Q10. [If PG&E=1 and Q3=Yes and Q2 or Q4=Yes] And what percent are installing LED fixtures as opposed to other lighting technologies (including LED lamps)?
- Q11. [If PG&E=1 and Q2=Yes and Q3=Yes] Are commercial end-use customers more interested in LED replacement lamps or in LED fixtures? Why do you say that? [Probe for differences in applicability, ease of installation, cost, ROI, etc.]
- Q12. [If PG&E=1] Are there any segments of the commercial market that purchase LED replacement lamps or LED fixtures more frequently than other segments? [Probe on business type, business size, own/lease, going through remodel] Are there any segments that are particularly resistant to LED replacement lamps or LED fixtures?
- Q13. [If PG&E=1] Are there any differences between customers who prefer LED lamps versus LED fixtures?
- Q14. Approximately what percent of your LED replacement lamp sales go through a contractor?
- Q15. And what percent go directly to an end-use customer or facilities manager? [If Q14 + Q15 < 100%, ask about remaining replacement lamps]
- Q16. And approximately what percent of your LED fixture sales go through a contractor?
- Q17. And what percent go directly to an end-use customer or facilities manager? [If Q16 + Q17 < 100%, ask about remaining replacement lamps]

- Q18. [If Q14 \neq Q16] Why is there a difference in the percent of LED replacement lamp sales versus LED fixture sales that go through contractors? [Probe for differences in installation complexity]
- Q19. When replacing existing equipment with LEDs, what product specifications or performance-related factors are considered most when selecting the LED products:
- Lumen equivalency?
 - Wattage equivalency?
 - Other factors? Like what? [Probe for influence of code requirements]

With our next two questions we're trying to gather your initial reaction regarding which part of the market is being most affected by LEDs.

- Q20. In which application type (for example: recessed downlighting, high bay, exterior flood) are LEDs causing the greatest amount of displacement of non-LED technologies?
- Q21. Within that application, which type of lighting equipment (for example: halogen, linear fluorescent, CFL) is being displaced the most by LEDs?

Stocking

I'd like to ask you about some specific products and whether you stock them, and if your customers are asking for them.

- Q22. What influences which types of commercial lighting products you stock (including LEDs and all other lighting technologies)? [Probe for product types and negotiations with manufacturer representatives.]

Thinking about LED lighting products...

- Q23. How does your company determine what LED products to stock? [Probe for LED lamps vs. fixtures (interior and exterior), LED vs. traditional technologies (e.g., fluorescents and incandescent/halogens), high-end vs. mid-range vs. budget products, negotiations with manufacturer reps; what do they want to carry, how does it show up on their shelf]
- Q24. Do you currently have any LED lighting products (besides exit signs) in stock? Which types? [If no] Why not?
- Q25. Does the relative availability of LED products affect what is installed in commercial applications (if something is in stock versus special order)? [If yes] in what ways? [Probes: other technologies, lamps vs. fixtures, quantity, and manufacturer]

Participation and Trial Experience

Midstream Trial

[If TRIAL=1] Now I have some questions about your experience with the (PG&E/SCE) distributor LED trial (where distributors are given rebates directly for LED lamps (if SCE=1 and fixtures)).

- Q26. [If TRIAL=1] How likely are you to encourage LED (if PG&E=1: lamps, if SCE=1: lamps and fixtures) to commercial customers due to the (PG&E/SCE) distributor LED trial? Very likely, somewhat likely, or not very likely? Tell me more about that.
- Q27. [If TRIAL=1] How satisfied were you with the (PG&E/SCE) distributor LED trial overall, on a scale of one to five with one being very dissatisfied and five being very satisfied? Why do you give it that rating?
- Q28. [If TRIAL=1] How would you rate your ease of participation in the (PG&E/SCE) distributor LED trial on a scale of one to five with one being very difficult and five being very easy? Why do you give it that rating?
- Q29. [If TRIAL=1] How satisfied were you with the rebate processing time in the distributor LED trial on a scale of one to five with one being very dissatisfied and five being very satisfied? Why do you give it that rating?
- Q30. [If TRIAL=1] How satisfied were you with the qualified products list in the distributor LED trial on a scale of one to five with one being very dissatisfied and five being very satisfied? Why do you give it that rating? [Probe for LEDs (and fixtures if SCE=1) that should be added/removed from Trial; concerns about specific qualifying products, etc.]
- Q31. [If TRIAL=1] How would you rate the ease of collecting and reporting contractor or installer contact information to (PG&E/SCE), on a scale of one to five with one being very difficult and five being very easy? Why do you give it that rating?
- Q32. [If TRIAL=1] If reporting installer or contractor information were required for all distributor LED trial projects where an installer or contractor installed the lighting equipment, would this affect your participation in any way? How so?
- Q33. [If TRIAL=1] Do you think any other types of commercial energy efficiency equipment – lighting or otherwise – would benefit from a distributor incentive approach? What types? Why?
- Q34. [If TRIAL=1] Do you tell purchasing contractors about the (PG&E/SCE) distributor LED trial rebates?
- Q35. [If TRIAL=1] Does the discounted price affect what you present to contractors? How so? [Probe on pricing, options, brand, comparisons, payback period, ROI]
- Q36. [If TRIAL=1] Do you think that contractors would prefer to receive a rebate directly from the utility, as opposed to through a distributor (via the distributor LED trial)?
- Q37. [If TRIAL=1] Has the (PG&E/SCE) distributor LED trial affected your relationships with any of the contractors that you work with? How so?
- Q38. [If TRIAL = 1 and Q15 or Q17 > 0%] Do you tell end use customers and/or facilities managers about the (PG&E/SCE) distributor LED trial rebates?

- Q39. [If TRIAL = 1 and Q15 or Q17 > 0%] Does the discounted price affect what you present to end use customers and/or facilities managers? How so? [Probe on pricing, options, brand, comparisons, payback period, ROI]
- Q40. [If TRIAL = 1 and Q15 or Q17 > 0%] Do you think that end use customers and/or facilities managers would prefer to receive a rebate directly from the utility as opposed to through a distributor (via the distributor LED trial)?

Questions for Midstream Trial Non-participants:

- Q41. [If TRIAL=0] Have you made any changes to your lighting stocking practices over the past two years? What changes have you made and when did they occur? What caused the change [Probe for effect of general market changes and other programs]
- Q42. [If PG&E=1 and TRIAL=0] We would like to understand the reasons that your company has not yet participated in the PG&E distributor LED trial. Are there any reasons why your company hasn't participated yet? Like what? [Haven't had interest, haven't discussed, haven't had opportunity, probe for additional reasons...]
- Q43. [If TRIAL=0] Do you see value in LED rebates being offered directly to distributors or not? [If yes] Like what? [If no] Why not?
- Q44. [If TRIAL=0] Do you have any concerns related to LED rebates offered directly to distributors or not? Like what?
- Q45. [If TRIAL=0] How likely or unlikely are you to participate in the (PG&E/SCE) distributor LED trial in the future [If SCE=1: if it is expanded to all distributors]? Please rate your likelihood to participate on a scale of one to five, with one being very unlikely and five being very likely. Why do you give that rating?

[PG&E ONLY] Trade Professional Alliance

Now I have some questions about your experience with PG&E's Trade Professional Alliance (which is part of their end-user rebate program in which distributors and contractors can receive rebates for LED fixtures directly from PG&E on behalf of commercial end-users, with permission from the end-user).

- Q46. [If PG&E=1 and TPA=1] According to PG&E's records, you participated in their Trade Professional Alliance... Is this correct? [If needed: this is an alliance of trade professionals where you can receive rebate updates, rebate payments, and event invitations from PG&E]
- Q47. [If PG&E=1 and Q46=1] Since January 2013, has your company applied for or received rebates for LED fixtures through PG&E's Trade Professional Alliance by getting customer permission?
- Q48. [If PG&E=1 and Q47=Yes] Please describe the influence that the Trade Professional Alliance has had on your sales of LED fixtures. Have LED fixture sales increased,

decreased or not changed since January 2013? [If increased or decreased ask:] By how much?

[PG&E ONLY] Trial and Trade Professional Alliance Overlap:

[If PG&E=1, TRIAL=1 and Q47=Yes] Now I'd like to discuss any overlap between the PG&E distributor LED trial and the PG&E Trade Professional Alliance incentives.

- Q49. [If PG&E=1, TRIAL=1 and Q47=Yes] How does the Trade Professional Alliance rebate approach vary from that of the distributor LED trial rebates? Please explain. [Probe for differences in measures and program processes]
- Q50. [If PG&E=1, TRIAL=1 and Q47=Yes] Are the commercial end-use customers for both PG&E rebate programs (distributor LED trial and Trade Professional Alliance fixtures) the same? [If not the same, probe for differences]
- Q51. [If PG&E=1, TRIAL=1 and Q47=Yes] What factors influence whether sales go through the distributor LED trial or the Trade Professional Alliance LED fixtures program? [Probe for differences in program structure].
- Q52. [If PG&E=1, TRIAL=1 and Q47=Yes] Is the distributor LED trial a complementary, superior, or inferior program design than the Trade Professional Alliance structure (where you can receive an incentive for a specific project on behalf of a customer, with their approval)? Why do you say that? Do you prefer one to the other?

[PG&E ONLY] Trial and Direct Install overlap

[If PG&E=1 and TRIAL=1] Now I'd like to discuss any overlap between the PG&E distributor LED trial and PG&E commercial lighting direct install programs, where installers typically go door-to-door to sell lighting installations.

- Q53. [If PG&E=1 and TRIAL=1] Do any of the LED fixtures or lamps you distribute get installed by contractors through one of PG&E's direct install programs?
- Q54. [If PG&E=1, TRIAL=1 and Q53="Yes"] Are the commercial end-use customers for both rebate programs (distributor LED trial and direct install) the same? [If not the same, probe for differences]
- Q55. [If PG&E=1, TRIAL=1 and Q53="Yes"] What factors influence whether sales go through the distributor LED trial or the direct install program? [Probe for differences in program structure].
- Q56. [If PG&E=1, TRIAL=1 and Q53=Yes] Is the distributor LED trial a complementary, superior, or inferior program design than the direct install program structure? Why do you say that? Do you prefer one over the other?

[SCE ONLY] Trial and Downstream overlap:

[If TRIAL=1] Now I'd like to discuss any overlap with SCE's downstream programs where commercial end-use customers receive rebates directly from SCE for the installation of

efficient technologies such as lighting and LEDs. These programs are commonly known as express, calculated, deemed, or prescriptive. To make things simpler, we will refer to these programs collectively as downstream programs going forward.

- Q57. [If SCE=1, TRIAL=1] How does the downstream rebate approach vary from that of the distributor LED rebates? Please explain. [Probe for differences in measures and program processes]
- Q58. [If SCE=1 and TRIAL=1] Are the commercial end-use customers for both SCE rebate programs (distributor LED trial and downstream programs) the same? [If not the same, probe for differences]
- Q59. [If SCE=1, TRIAL=Yes] What factors influence whether you access rebates through the distributor LED trial or whether commercial end use customers access rebates through the downstream programs? [Probe for differences in program structure]
- Q60. [If SCE=1, TRIAL=Yes] Do customers ever receive downstream rebates for products that were rebated by SCE at the distributor level (to you)? Please explain. [Probe for frequency, program rules/requirements]
- Q61. [If SCE=1, TRIAL=1] Is the distributor LED trial a complementary, superior, or inferior program design than the downstream rebate program structures? Why do you say that? Do you prefer one over the other?

LED Sales

Now I have a few questions about recent changes you may or may not have seen in the LED market... [If SCE=1 First I am going to ask about LED replacement lamps and then I'll ask about LED fixtures specifically.]

- Q62. Have you noticed any changes in your company's sales of LED replacement lamps since [If PG&E=1 read "January"; If SCE=1 read "July"] 2013? [Probe for % increase/decrease] Are any types of LED replacement lamp sales increasing or decreasing more than others? Which types?
- Q63. [If Q62=Yes] What factors do you think have contributed to this change in your company's LED replacement lamp sales? Which of the factors have had the largest impact? [Probe for effect of distributor LED trial as well as other effects, such as general market changes and other programs]
- Q64. [If SCE=1] Have you noticed any changes in your company's sales of LED fixtures since July 2013? [Probe for % increase/decrease] Are any types of LED fixture sales increasing or decreasing more than others? Which types?
- Q65. [If Q64=Yes and SCE=1] What factors do you think have contributed to this change in your company's LED fixture sales? Which of the factors have had the largest impact? [Probe for effect of distributor LED trial as well as other effects, such as general market changes and other programs]

- Q66. Have you made any changes to your lighting stocking practices since [If PG&E=1 read “January”; If SCE=1 read “July”] of 2013? What changes have you made? [If SCE=1 have respondent specify fixtures or lamps]
- Q67. [If Q64=Yes] What factors do you think have contributed to this change in your company’s stocking? Which of the factors have had the largest impact? [Probe for effect of distributor LED trial as well as other effects, such as general market changes and other programs. If SCE=1 have respondent specify fixtures or lamps]

Cannibalization and Attribution:

I would like to ask you a few questions related to your sales through the distributor trial, and code requirements in California.

[IF NEEDED: In the updated version of Title 24, lighting systems will be required to meet all code requirements, including both maximum allowable lighting power density (LPD) and required control functionality, whenever 10% or more of the luminaires (i.e. fixtures) in an enclosed space are impacted by a retrofit. There is an exception for modifications in place that allows 10% of luminaires to be modified per year, per enclosed space in a building of more than 40 luminaires without triggering the requirement that all luminaires and controls in the impacted enclosed spaces be brought up to code.]

- Q68. Were any of your sales through the distributor LED trial required of the customer to comply with California Title 24 building code? Please explain.
- Q69. [If Q68=YES] Approximately what percent of your LED replacement lamp (if SCE=1 and fixture) sales through the distributor LED trial occurred to comply with California Title 24 building code?
- Q70. [If Q68=YES] Thinking *only* about the sales that were made to comply with California Title 24 building code... Would sales of the same or similar LED replacement lamps (if SCE=1 and/or fixtures) have occurred in absence of the code requirements? Approximately what percent?

Now I want to continue our conversation about sales by talking a bit more about the different available rebate options.

- Q71. [If TRIAL=1] In absence of the (PG&E/SCE) distributor LED trial, would any of the retrofits that received distributor LED trial incentives have received rebates via another incentive program?
- Q72. [If Q68=Yes] Approximately what percent of retrofits would have received rebates through another incentive program [in absence of the (PG&E/SCE) distributor LED trial incentives]? Through which programs? What are the reasons that they would go through the (PG&E/SCE) distributor LED trial as opposed to another incentive program?

- Q73. [If Q68=No or Q72<100%/all] What is it about the (PG&E/SCE) distributor LED trial that led to some sales that would not have occurred otherwise? [Probe for differences in program design/format; product types]
- Q74. [If TRIAL=0] Do you think distributor LED trial rebates (rebates provided to you, rather than the end user) would overlap with other incentive programs? If yes, how do they help or hinder any efforts to increase LED product sales? [Probe on sales, customer wants and needs]]

[If TRIAL=1 and PG&E=1] Now we are going to talk a bit about the PG&E downstream rebate program – which provides incentives to the commercial customers for purchasing LED fixtures, but not LED replacement lamps – as compared to the PG&E distributor LED trial – which provides incentives to distributors for selling LED replacement lamps, but not fixtures. I am going to present you with a couple of hypothetical situations, followed by questions...

- Q75. [If TRIAL=1 and PG&E=1] If PG&E made a change, and LED replacement lamps qualified for ONLY the downstream rebate – to the end-user – as opposed to ONLY the distributor LED trial rebate, what impact would that have on your volume of sales of LED replacement lamps? Would you expect your:
- a) Sales to remain about the same?
 - b) Sales to increase?
 - c) Sales to decrease?

Why do you say that? [Probe for importance of program design aspects]

- Q76. [If TRIAL=1 and PG&E=1] Now, If PG&E made a different change, and LED fixtures qualified for ONLY the distributor LED trial rebate – to distributors – as opposed to ONLY the downstream rebate – to end-users – what impact would that have on the volume of sales of LED fixtures? Would you expect your:
- a) Sales to remain about the same?
 - b) Sales to increase?
 - c) Sales to decrease?

Why do you say that? [Probe for importance of program design aspects]

- Q77. [If TRIAL=1 and SCE=1] In the future SCE may not be able to offer the same LED products in two separate programs (like the distributor LED trial and the downstream program) and SCE would like us to solicit feedback regarding the best way to divide LED products into the two programs. Which LED products do you think would work best in which program? [Probe for fixtures vs. lamps and sub types (e.g. A-lamp, candelabra, MR-16, Par20, Par30, Par38, R-BR)]

- Q78. Overall, do you believe the (PG&E/SCE) distributor LED trial incentives are impacting the volume of LED replacement lamp sales into the commercial sector? How so? [Probe for % increase/decrease, reasons for change]
- Q79. [If SCE=1] Overall, do you believe the SCE distributor LED trial incentives are impacting the volume of LED fixture sales into the commercial sector? How so? [Probe for % increase/decrease, reasons for change]
- Q80. Do you think that overall, the distributor LED incentive approach is beneficial as an addition to the (PG&E/SCE) program portfolio for lighting or not? Why do you say that?

Wrap Up

Those are all my questions. Before I let you go, is there anything you'd like to add, anything that you think I should have asked about or that we should keep in mind as we conduct this research into LEDs in California?

Thank you very much for your time on the phone today!

Lighting Manufacturer Interview Guide

PG&E LED Midstream Trial Evaluation

August 13, 2014

Background:

Data from three groups of market actors are expected to inform the lighting innovation midstream trial evaluation and assist with interpretation of the comparison analysis that is being done as part of the evaluation. The trial relies on midstream incentives through participating electrical distributors to increase the sales of LED replacement lamps for commercial applications.

Purpose

The target audience for this interview guide is lighting manufacturers that supply LED replacement lamps to distributors who receive rebates from PG&E as part of the lighting innovation midstream trial. The overall objective of this interview guide is to elicit feedback from manufacturers as part of a larger assessment aimed at determining if a direct midstream approach is a better or complimentary way to engage the lighting supply community to increase market penetration of LED replacement lamps in the commercial sector (compared to the downstream rebate program and Trade Professional Alliance). We would also like to determine if the differences in eligible measures and demand for measures offered by each program can account for any differences in sales volumes, or if the rebate process/program design is responsible.

Introduction

Hi, my name is _____, and I'm calling from Evergreen Economics on behalf Pacific Gas and Electric (PG&E). We are an independent firm hired to help PG&E improve their programs for customers seeking lighting upgrades. PG&E recently started providing incentives to distributors who sell your LED replacement lamps to the commercial sector. Throughout this questionnaire we will be calling this program the distributor LED trial.

Are you aware of the PG&E distributor LED trial? [If not, describe program and confirm that they are aware – if not, ask if someone else would be better to talk with; If no knowledge of program, and nobody else to talk with, Thank and Terminate]

Great. The purpose of this research is to solicit feedback from your firm and other firms supplying lamps through this program in order to improve future program design.

My questions should take 20-30 minutes, and we are offering you a \$100 incentive, no strings attached, if you complete the survey. Can you discuss this now, or would it be better to schedule a time to talk?

[Screen for correct person – person who knows most about LED lighting equipment]

[Get contact's full name, email address and telephone number.]

[If scheduled, immediately send an email with the date and time of the call and an Outlook appointment (with reminder set for ½ hour before call).]

[Send reminder email one day prior to call if scheduled more than 3 days in advance. (Text for email will be provided.)]

Respondent and Firm Background Information

I'd like to start by finding out a bit about you, your company, and your job.

- Q1. What does [company name] do? Anything else?
- Q2. [If not mentioned in Q1] Just to confirm, [company name] does manufacture LED replacement lamps for the commercial sector, correct? [If not, thank and terminate.]
- Q3. [If not mentioned in Q1] Do you manufacture LED fixtures for the commercial sector?
- Q4. [If not mentioned in Q1] Do you manufacture non-LED products? What types of products?
- Q5. What is your position at [company name]? [Probe for: Title, and responsibilities/description]
- Q6. How long have you been at [company name]?
- Q7. Since January 2013, has [company name] sold lighting products that received PG&E incentives through any other utility rebate programs besides PG&E's midstream LED trial? [If yes, probe on which PG&E rebate programs]
- Q8. [If Q7=Yes] Since January 2013, approximately what percent of your lighting sales received a rebate in one form or another? [Probe on overall and specific to PG&E if known; Probe for differences between LEDs and other technologies.]

General Market Questions

Now I would like to ask a few questions about the market for LED replacement lamps in general.

- Q9. [If Q2=Yes and Q3or Q4=Yes] What percent of commercial end-use customers that are replacing or retrofitting their lighting systems are installing LED replacement lamps as opposed to other lighting technologies (including LED fixtures)?
- Q10. [If Q3=Yes and Q2or Q4=Yes] And what percent are installing LED fixtures as opposed to other lighting technologies (including LED lamps)?
- Q11. [If Q2=Yes and Q3=Yes] Are commercial end-use customers more interested in LED replacement lamps or in LED fixtures? Why do you say that? [Probe for differences in applicability, ease of installation, cost, ROI, etc.]

- Q12. Are there any segments of the commercial market that purchase LED replacement lamps or LED fixtures more frequently than other segments? [Probe on business type, business size, own/lease, going through remodel] Are there any segments that are particularly resistant to LED replacement lamps or LED fixtures?
- Q13. Are there any differences between customers who prefer LED lamps versus LED fixtures?

Marketing Approaches to LED Replacement Lamps

Now I have a few questions about how you market LEDs.

- Q14. Historically (before January 2013), how were you marketing LED replacement lamps for the commercial market? [Probe for tradeshow/conferences, contractor/distributor outreach, magazines, catalogs, etc.]
- Q15. Has the way you market the LEDs that qualify for distributor LED rebates changed since the start of the PG&E distributor LED trial? If yes, how have your marketing efforts changed since the start of PG&E's distributor LED trial? [Probe for tradeshow/conferences, contractor/distributor outreach, magazines, catalogs, etc.]
- Q16. Do you include the PG&E distributor LED trial as part of your marketing message when you are trying to sell products to distributors? Please explain.
- Q17. Do distributors ask about the distributor LED trial specifically when contacting you, or do you generally mention it to them first? [Probe for percent that approach manufacturer vs. those that require outreach; differences between those that approach manufacturer vs. those that require outreach]
- Q18. Has the distributor LED trial had an impact on your strategy for developing new products? Please explain.
- Q19. Do you have any recommendations for how the distributor LED trial could better support manufacturers' existing strategies for developing new products? Like what?

LED Sales

Now I have a couple of questions about sales channels (how your LEDs go from manufacturing to purchase and installation).

- Q20. Prior to January 2013, how were you selling LEDs to the commercial market – what sales channels were you relying on? [Probe for % sold to distributors, contractors, designers/architects, end-user, retail and other]
- Q21. Do you see different sales channels becoming more or less prevalent since the start of the distributor LED trial? Please explain. [Probe for changes in % sold to distributors, contractors, designers/architects, end-user, retail and other]

My next questions are about the products that qualify for the PG&E distributor LED rebates.

- Q22. How satisfied were you with the qualified products list in the PG&E distributor LED trial on a scale of one to five with one being very dissatisfied and five being very satisfied? Why do you give it that rating?
- Q23. [If not mentioned in Q22] Are there any LED products that you think should qualify for a distributor LED incentive that currently do not qualify? Please explain.
- Q24. [If not mentioned in Q22] Do you have any concerns about any of the products available through the PG&E distributor LED trial? If yes, what are they? Which products? [Probe on safety, quality, cost, applications, usefulness]

Now I have a couple of questions about sales of [company name] LEDs.

- Q25. Have you noticed any changes in your company's sales of LED replacement lamps over the past two years? [Probe for % increase/decrease] Are any types of LED replacement lamp sales increasing or decreasing more than others? Which types?
- Q26. [If Q23=Yes] What factors do you think have contributed to this change in your company's LED replacement lamp sales? Which of the factors have had the largest impact? [Probe for effect of distributor LED trial as well as other effects, such as general market changes and other programs]

Cannibalization and Attribution:

- Q27. In absence of the PG&E distributor LED trial, would any of the installations that received distributor LED trial incentives occurred via another incentive program?
- Q28. [If Q25=Yes] Approximately what percent of installations would have occurred through another incentive program (in absence of PG&E's distributor LED trial incentives)? Through which programs? What are the reasons that they would go through the PG&E distributor LED trial as opposed to another incentive program?
- Q29. [If Q25=No or Q26<100%/all] What is it about the PG&E distributor LED trial that led to some sales that would not have occurred otherwise? [Probe for differences in program design/format; product types]

Now we are going to talk a bit about the PG&E downstream rebate program – which provides incentives to commercial customers for purchasing LED fixtures, but not LED replacement lamps – as compared to PG&E's distributor LED trial – which provides incentives to distributors for selling LED replacement lamps, but not fixtures. I am going to present you with a couple of hypothetical situations, followed by questions...

- Q30. If PG&E made a change, and LED replacement lamps qualified for ONLY the downstream rebate – to the end-user – as opposed to ONLY the distributor LED trial rebate, what impact would that have on your volume of sales of LED replacement lamps? Would you expect your:
- a) Sales to remain about the same?

b) Sales to increase?

c) Sales to decrease?

Why do you say that? [Probe for importance of program design aspects]

Q31. Now, If PG&E made a different change, and LED fixtures qualified for ONLY the distributor LED trial rebate – to the distributor – as opposed to ONLY the downstream rebate – to the end-user – what impact would that have on your volume of sales of LED fixtures? Would you expect your:

a) Sales to remain about the same?

b) Sales to increase?

c) Sales to decrease?

Why do you say that? [Probe for importance of program design aspects]

Q32. Overall, do you believe the PG&E distributor LED trial incentives are impacting the volume of LED replacement lamp sales into the commercial sector? How so? [Probe for % increase/decrease, reasons for change]

Q33. Do you think that overall, the distributor LED incentive approach is beneficial as an addition to the PG&E program portfolio for lighting? Why do you say that?

Wrap Up

Those are all my questions. Before I let you go, is there anything you'd like to add, anything that you think I should have asked about, or that we should keep in mind as we conduct this research?

Thank you very much for your time on the phone today!

Appendix C – Midstream Trial Incentive Table (1/2014)

Bulb Type on ENERGY STAR®	Lamp Type	Wattage Range	Incentive
Effective 1/1/2014 (by sales date)			
MR - Multifaceted reflector	MR16	<6 Watts	\$5.00
		≥6 Watts	\$12.50
PAR - Parabolic Aluminum Reflector	PAR20	≤ 11 watts	\$7.50
		< 15 Watts	\$12.50
	PAR30	≥15 Watts	\$17.50
		PAR38	< 22 Watts
		≥22 Watts	\$25.00
Additional measures effective 2/14/2014 (by sales data)			
A - Arbitrary (standard incandescent shape)	Standard A-Lamp	<13 Watts	\$5.00
		13 to <23 Watts	\$10.00
		≥23 Watts	\$15.00
BR - Bulged Reflector or R - Reflector	R or BR	<11 Watts	\$7.50
		≥11 Watts	\$15.00
CA - Candle with angular tip or C - Candle	Candelabra	<3 Watts	\$5.00
		≥3 Watts	\$7.50
G - Globe	Globe	<3 Watts	\$2.50
		≥3 Watts	\$5.00