Bright Opportunities: A New Way of Getting LEDs Into the Commercial and Industrial Market

Chris Dyson, DNV KEMA, Madison, WI
William Blake, National Grid, Waltham, MA

ABSTRACT

The Bright Opportunities Program is a relatively new Massachusetts program that promotes LED bulbs and low-wattage linear fluorescent lamps in the Commercial and Industrial (C&I) sector. The program has an upstream design, which provides significant incentives to lighting distributors to buy down the cost of lighting products.

This process evaluation was completed in May 2013. It involved telephone surveys and site visits with over 200 participating end users and in-depth interviews with over 50 lighting distributors and contractors.

The evaluators concluded that this was a well-designed and well-run program. The evidence they cited included generally high program satisfaction levels from end users and trade allies, few barriers to program participation, generally high program net-to-gross ratios, and few significant complaints from program implementers.

The evaluation found that the non-food retail stores, industrial/manufacturing facilities, and schools were the C&I/ institutional customers that were most frequently purchasing the LED bulbs. Saving energy was the primary motivation for these lighting purchases with reduced maintenance costs or environmental considerations being cited much less often. Seventy-six percent of the participating end users said they were aware that they had received discounted bulbs, but a much lower percentage of these knew the source or size of these discounts.

Two thirds of the participating end users said that the LED bulbs they installed were replacing either incandescent or halogen bulbs. Only 11% said that their LED bulbs were replacing CFLs.

While satisfaction with the discounted lighting products was generally very high (>90%), only 72% of participants using the LED bulbs in dimmer switches were satisfied with their performance. A large majority of the participating lighting distributors and contractors were satisfied with all aspects of the program except the program's marketing efforts.

Introduction

This paper summarizes a 2013 process evaluation of the Bright Opportunities Program, a Massachusetts upstream lighting program that promotes LED bulbs and low-wattage linear fluorescent lamps in the Commercial and Industrial (C&I) sector. This evaluation was completed in May 2013. This paper begins with a description of the program and with the process evaluation scope. It then summarizes the key process evaluation findings based on a survey of participating end users as well as with in-depth interviews with lighting distributors and contractors.

Program Description

The Bright Opportunities Program is a relatively new program, which attempts to increase the market penetration of energy-efficient lighting technologies through the use of upstream incentives that are used to

buy down the cost of these lighting technologies at the lighting distributor level. All five electric Program Administrators (PAs) in the state are participating in the program. The program began offering upstream incentives on low-wattage linear fluorescent lighting technologies in September 2011 and incentives for LED lighting technologies in November 2011. In the case of the LED lighting technologies, the upstream incentives replaced downstream incentives that the Massachusetts C&I programs previously offered for these technologies.

Over time the program has expanded the types of LED and linear fluorescent bulbs/lamps for which buydown discounts are offered. Table 1 shows the bulbs/lamps discounted by the program.

Table 1. LED and Linear Fluorescent Bulbs/Lamps Discounted by the Program

Bulb/Lamp Type	Period Bulb Became Program-Eligible
LED Bulbs	
PAR20, PAR30, PAR38, MR-16	November 2011
BR30, BR40, GU10	March 2012
PAR16, A-Lamp, Decorative Lamps (including G and B shapes)	April 2012
Linear Fluorescent Lamps	
Reduced wattage 28 watt T8 lamp, reduced wattage 47-51 watt T5HO lamp	September 2011
Reduced wattage 25 watt T8 lamp, reduced wattage 25-28 watt T8 U-bend lamp	April 2012

Evaluation Description

The original research objectives of the process evaluation for the Bright Opportunities Program included determining whether this new program was appropriately designed, assessing whether the program was being delivered in an efficient and effective manner, providing estimates of net-to-gross ratios for the program net of free-ridership, and providing estimates of participant spillover.

In subsequent discussions with the Massachusetts Energy Efficiency Advisory Council (EEAC) Consultants and the PAs and their consultants, it became clear that there were additional researchable questions that they wanted the process evaluation to cover. These included whether the participating lighting distributors were telling their customers that they were receiving buydown discounts and what the size and sources of these discounts were. Other researchable questions included what types of C&I customers were purchasing the LED bulbs, whether participants faced any barriers or challenges in implementing their lighting projects and what types of light bulbs the LED bulbs were replacing.

Most upstream lighting programs do not collect information on which customers purchased their bulbs. Yet the Bright Opportunities Program required the lighting distributors who sold the program-discounted bulbs/lamps to collect this customer information and submit it to the program contractors for

incorporation into the program tracking database. This customer contact information provided evaluators with a unique opportunity to learn about the program participants. DNV KEMA collected most of the information for this process evaluation from two sources:

1. *Participating end user surveys:* Between November and December 2012 we completed Computer-Aided Telephone Interview (CATI) surveys with 200 participants who purchased program-discounted bulbs from November 2011 through November 2012. In addition to these telephone surveys, there were also onsite surveys that the evaluators conducted when they were installing or removing lighting loggers at the end user's site. The telephone survey was longer than the onsite survey and contained more questions relevant to the process evaluation. The onsite survey focused more on questions relevant to the impact evaluation, although there were some process evaluation questions in this survey also. This paper only presents results from the telephone survey, since the onsite survey data was only partially available at the time this paper was written. Some of the topics covered by the end user surveys included company characteristics (firmographics, company energy-related policies), topics related to the impact evaluation (installation verification, hours of operation of rebated lamps, equipment replaced by rebated lamps), barriers/challenges encountered in the lighting purchases/projects, motivations for participation, satisfaction with the lighting products, satisfaction with the lighting distributors/contractors, and program attribution (information need to calculate net-to-gross ratios and participant spillover).
2. *In-depth interviews with lighting distributors and contractors:* Between December 2012 and March 2013 we conducted in-depth telephone interviews with 25 participating lighting distributors, eight nonparticipating lighting distributors, and 25 participating lighting installation contractors.[1] Some of the topics covered by these lighting distributor and contractor interviews included company characteristics (firmographics, company energy-related policies), company sales strategies (including the role of program discounts and energy efficiency in general), reasons for program involvement, barriers to program participation, satisfaction with program activities and the program as a whole, and program attribution (information need to calculate net-to-gross ratios and spillover).

The evaluators also conducted interviews with program managers and the staff of the primary program implementation contractor and reviewed program materials.

Survey/Interview Results

This section summarizes some key findings from our surveys of participating end users and in-depth interviews with lighting distributors and contractors.

Participant Characteristics

Since the LED bulb is a relatively new lighting technology and since these bulbs are more expensive than alternative technologies (e.g., CFLs, EISA-compliant halogens) even with substantial program buydown discounts, we were interested in learning what kinds of C&I customers would purchase these bulbs. We asked the participating customers to indicate their primary economic activity. Figure 1 shows that non-food retail, industrial/manufacturing, and schools were the most common economic activities of the organizations we surveyed. When we asked the participating lighting distributors to characterize their LED customers

[1] While the large majority of the recipients of the program-discounted lamps/bulbs were C&I end users, 255 lighting contractors also received program-discounted lamps/bulbs. We administered an interview guide to a sample of these lighting contractors that was a slight variation of the one we administered to lighting distributors.

through the program, they provided descriptions (e.g., retailers, institutions, schools) that largely mirrored the self-characterizations of the participating end users.

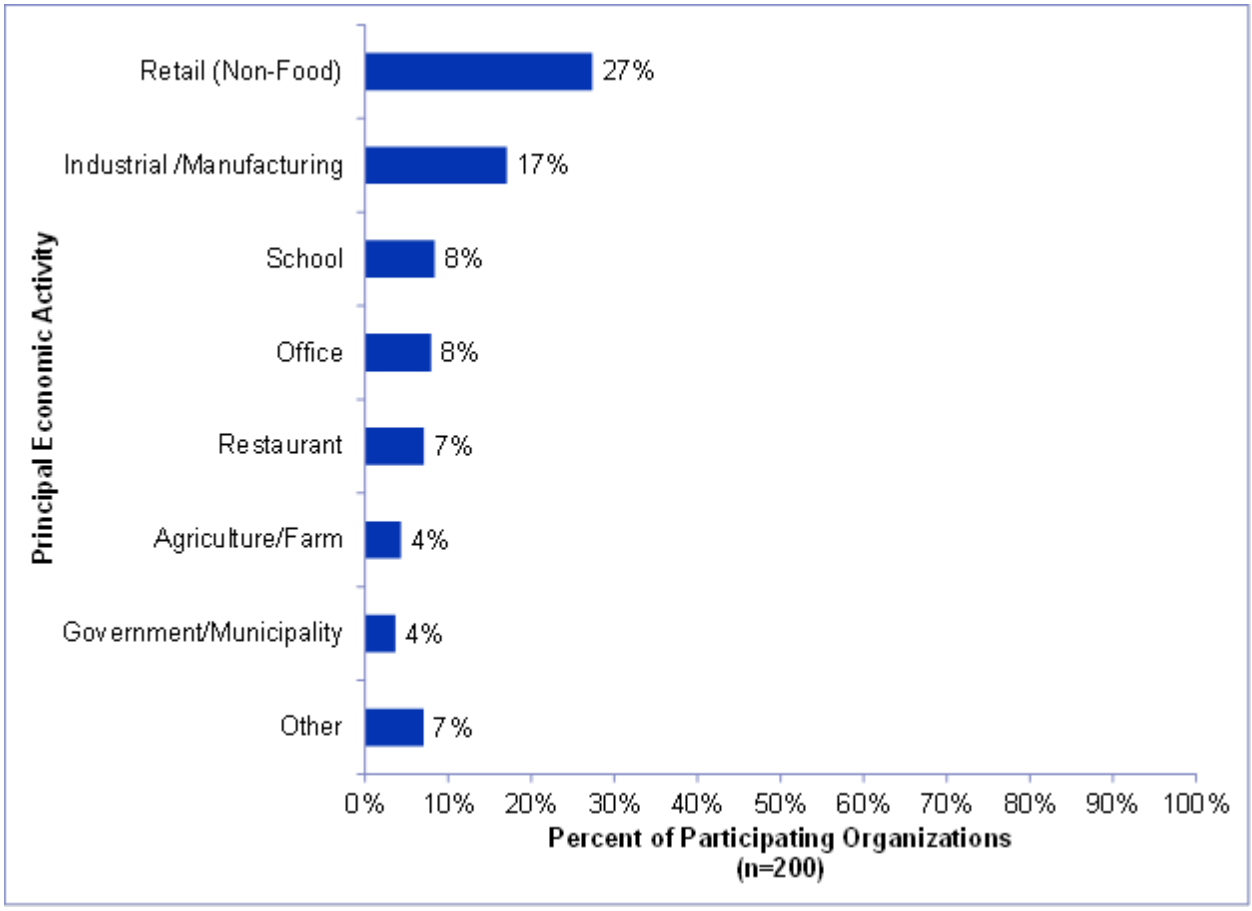

Figure 1. Primary Economic Activity - End users

We also hypothesized that organizations purchasing LED lighting might be more conscious of energy efficiency in their equipment purchase decisions and other standard practices than the typical organizations. Massachusetts had conducted a C&I general population survey that might have helped determine the energy efficiency practices of a "typical organization." Unfortunately this survey did not collection information about the energy efficiency practices of these organizations and our evaluation scope did not allow us to conduct our own general population survey that would include these energy efficiency questions.

Therefore to test our theory we had to rely on a subset of our own survey sample as a de facto comparison group. These were program participants who had received discounted linear fluorescents through the program. Because this was a relatively infrequent lighting technology within the program (< 20% of total program energy savings), we had assigned participants who received these linear fluorescents to their own unique stratum within our sample frame.

This was a less satisfactory comparison group for two reasons. First these linear fluorescent participants, just by virtue of being program participants, may have been more energy-conscious than the typical organization. Second about a quarter of these participants had also received LED bulbs through the program in addition to the linear fluorescents. Therefore it was not a pure non-LED baseline. However, this imperfect comparison group was the only one available to test our theory.

This comparison found that the LED participants were no more likely to have energy managers on staff than the linear fluorescent participants were. Forty-nine percent of the linear fluorescent participants had energy managers on staff compared to 42 percent of the LED participants. The LED participants were

about as equally likely (18%) as the linear fluorescent participants (17%) to have requirements or guidelines for the purchase, replacement, or maintenance of energy-using equipment. When we asked the participants who reported having such guidelines what these guidelines were, the linear fluorescent participants were more likely (85% of respondents) than the LED participants (73%) to say that these guidelines concerned energy savings or energy efficiency.

In summary, the LED participants were no more likely than the linear fluorescent participants were to engage in energy efficiency practices such as having energy managers on staff or having equipment purchase guidelines that emphasized energy efficiency. Yet company size may have also been a factor in these differences. The linear fluorescent participants were, on average, larger than the LED participants with an average of 74 employees compared to 45 employees for the LED participants. So it is possible that the linear fluorescent participants were more likely to have an energy manager simply because they had more companies of a size that could support a dedicated energy manager.

We were also interested in knowing whether the significant size of the program's buydown discounts, for LED bulbs might have made these bulbs accessible to new types of customers. We asked the lighting distributors and contractors if program participation had any impact on the types of customers they were selling to. Nearly half (47%) of the lighting distributors said that it had and they explained that they had observed more lighting sales with individual businesses such as retail outlets or small commercial businesses instead of large contracts. Interestingly the contractors did not report similar changes in the types of customers they served.

Project Characteristics

One of the research objectives of the process evaluation was to determine whether the program participants faced any barriers or challenges when implementing the projects. Few end users (12%) reported any barriers to using the participating lighting technologies. Linear fluorescent end users did not report any barriers. Most of the LED end users who said they had encountered barriers or challenges reported performance or lighting quality issues with the LED bulbs. Nearly half (46%) of those reporting problems said they had trouble operating the bulbs with dimmer switches and one third said that they had difficulty fitting the bulbs in fixtures. Participating distributors could not cite any reasons why companies would not participate, and they even voiced confusion and surprise that any customers would not. The few who did provide specific barriers cited program paperwork, program awareness, payment issues, and other issues.

We were interested in learning what kinds of light bulbs the LED bulbs were replacing and with what frequency the LED bulbs were replacing energy-efficient alternatives such as CFLs vs. less-efficient alternatives such as incandescent or halogen bulbs. Figure 2 shows that two thirds of the participating LED end users reported that their LED bulbs replaced incandescent or halogen bulbs.

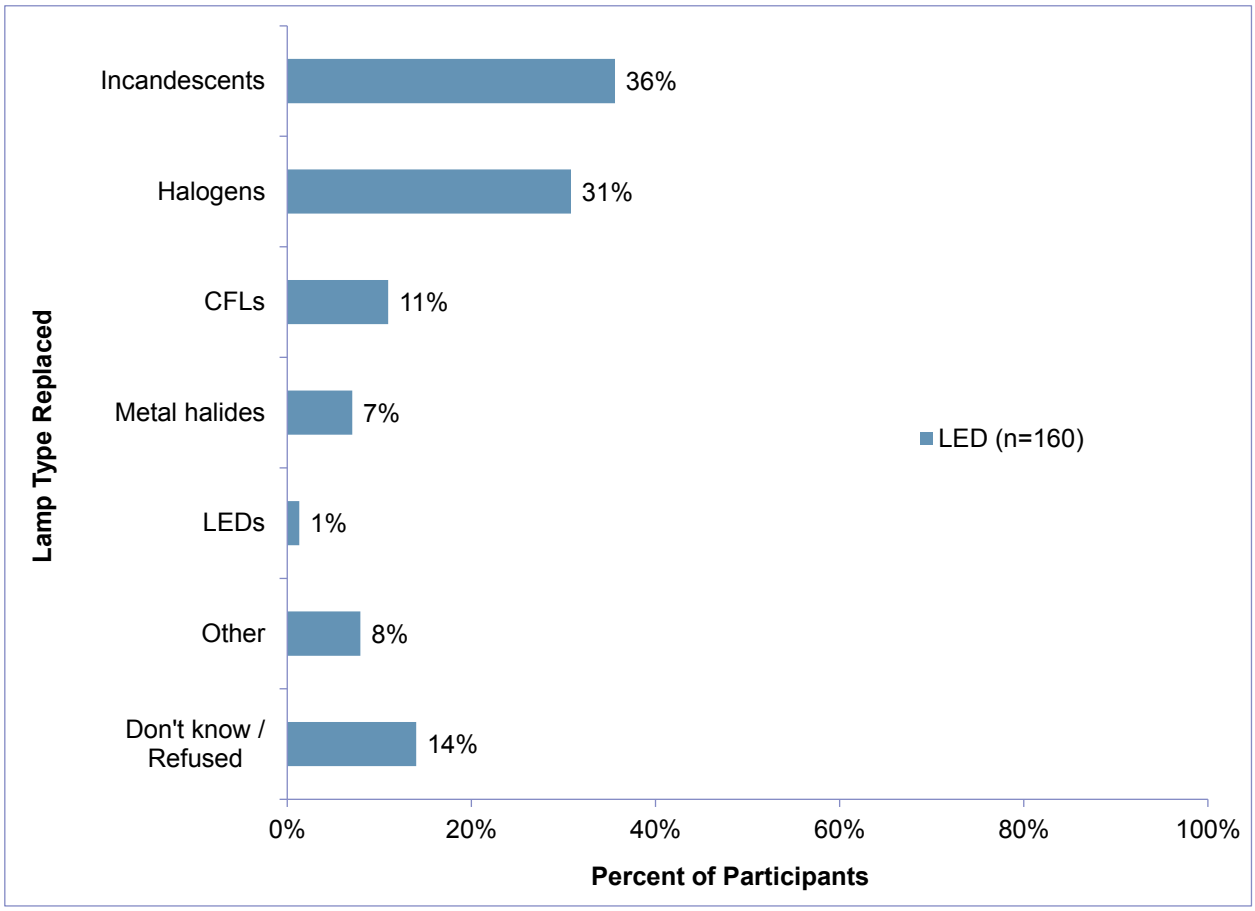

Figure 2: Type of Lamp Replaced by LED

Note: Totals exceeds 100% because multiple answers were accepted.

We asked all the participating end users if the bulbs they purchased that were funded by the program were to be used as part of a larger project. We were interested in this question because we hypothesized that if these purchases were part of a larger project, end users might be more willing to absorb the higher costs of the LED lighting, either because it was a building project that had some broader energy efficiency goal or simply because the greater expenditures of a large retrofit project would make the higher LED costs less conspicuous. Both these scenarios would have implications for free ridership, which we were also measuring. Our survey found that only 26 percent of the participating end users said that they purchased lighting funded by the program as part of a larger project. In addition, when we asked the participants what other equipment was used in these larger projects, the larger majority indicated that these larger projects were lighting retrofits that included many other lighting technologies besides LED bulbs.

Rebate Awareness

The program implementers were somewhat concerned that due to the "upstream" nature of the program, where the discounts went directly to lighting distributors rather than the end users, many end users might be unaware that they had received a discount or might be unaware of the size or source of these rebates. Yet awareness of the discounts was high, with 76 percent of participants saying they were aware that their lamp purchases were discounted. This did not vary significantly between LED participants (77%) and linear fluorescent participants (73%). This level of awareness matched closely information from the

interviews with participating lighting distributors. We asked the lighting distributors if they referenced the buydown price discounts from the Bright Opportunities program in any marketing materials or sales pitches. Seventy-two percent of the lighting distributors said that they did.

We asked the participating end users how they heard about the program. The most frequently-cited information sources included contractors or equipment suppliers (34% of respondents) and electricity service providers (28%). The survey also asked participating end users if their contractor or equipment supplier mentioned any discounts were available on the purchased lamps. Most of them (62%) said that their equipment suppliers did mention that the lamps were discounted. LED end user participants were more likely (66%) than linear fluorescent participants (52%) to say that their equipment suppliers mentioned the discounts. The larger size of the LED discounts may explain why suppliers mentioned them more often.

While awareness of the buydown discounts was fairly high, the participating end user knowledge of the source and size of these discounts was much lower. Only about half (51%) of the respondents who said their equipment suppliers mentioned the discounts also reported that their suppliers identified a source for the discount. Of the cited sources, electricity service providers were the most common (15% of all respondents), followed by the MASS Save program (7%) and the State of Massachusetts (4%). Furthermore of those respondents who said that they were aware that they had received a discount, most (77% of the LED end users and 91% of linear fluorescent end users) did not know the dollar value of the discount. The survey asked those who said they did not know a dollar amount to estimate a percentage discount. Again, most respondents said they could not estimate the size of the discounts for both LEDs and linear fluorescents. Those who did make an estimate were inaccurate by a wide margin.

Motivations for Installing the Lighting

The surveys also asked the end users the source most responsible for recommending the purchase of the LEDs or linear fluorescent lamps that received the incentives. The most common answer was the respondent himself/ herself. Distributors/equipment suppliers and contractors/installers were also common answers (Figure 3).

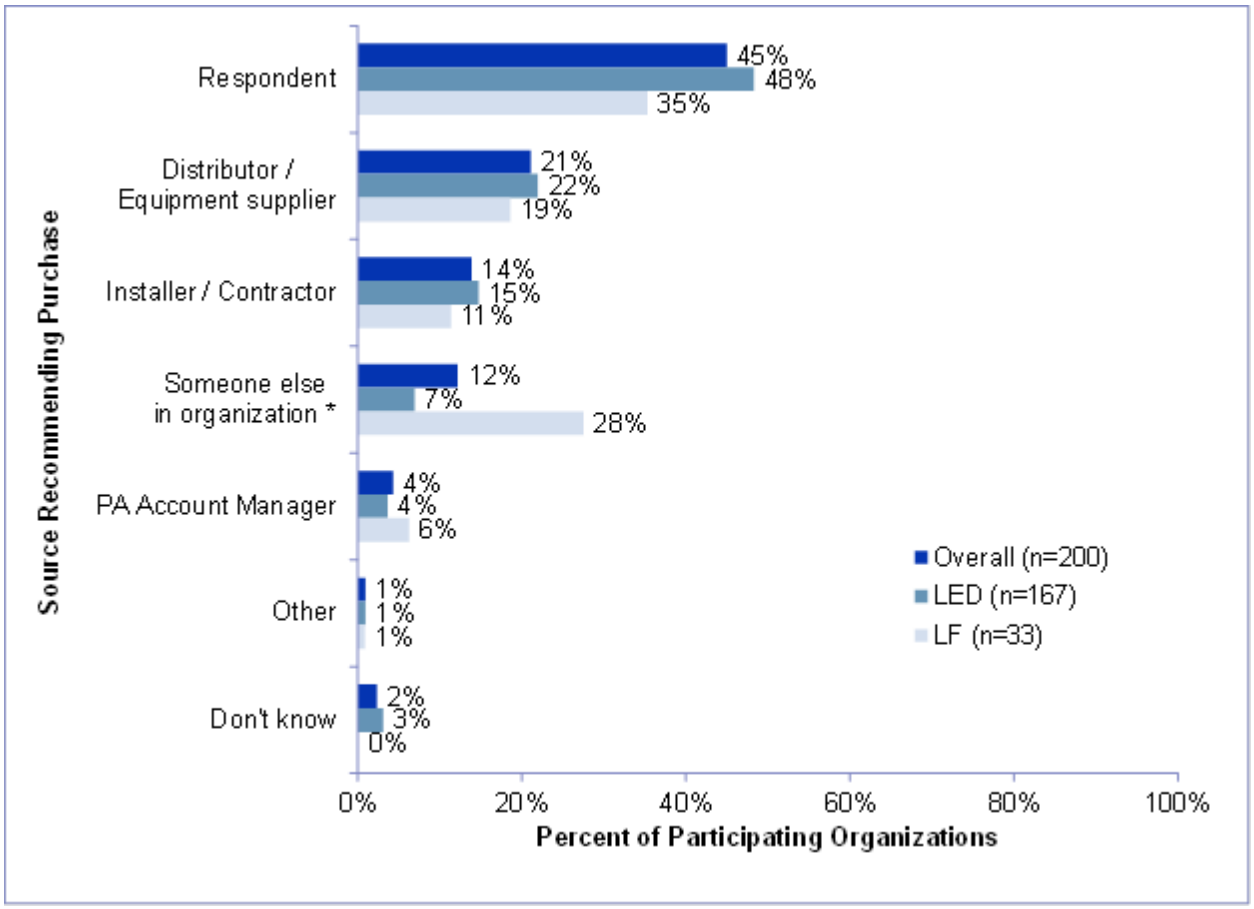

Figure 3. Source Most Responsible for Recommending Purchase of Energy Efficient Bulbs

We asked the participants what factors motivated their organizations to consider installing the LED or linear fluorescent bulbs. Figure 4 shows that the participants primarily said they installed the energy-efficient bulbs/lamps to save energy and reduce energy bills.

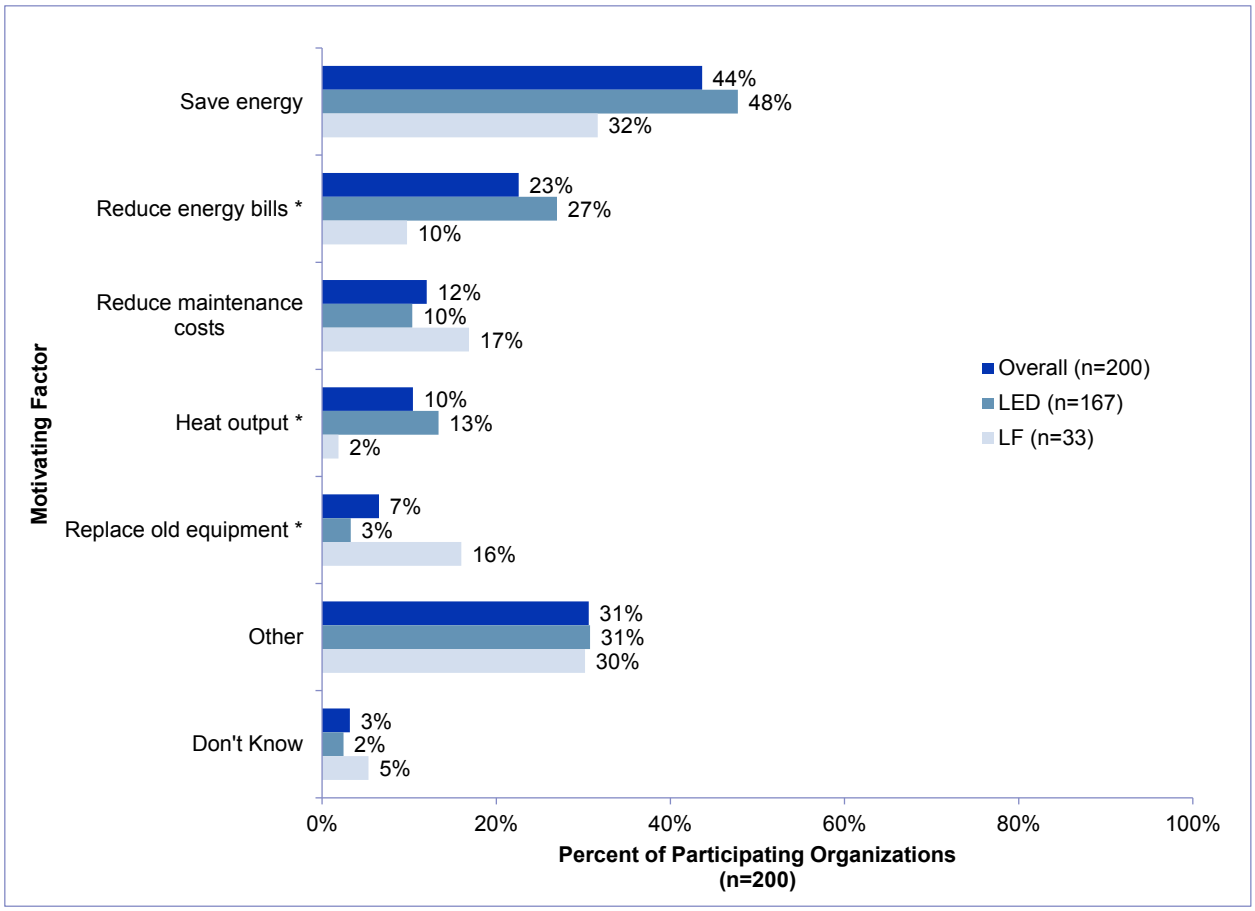

Figure 4. Motivations to Purchase Bulbs/Lamps

* Difference between LED and linear fluorescent is statistically significant at 90% confidence level.

Note: Totals exceed 100% because multiple answers were accepted.

Other included the following responses (each mentioned by less than 5% of the respondents): get incentives, pro-environmental corporate policies, longevity, old equipment failed, quality of light, installer/contractor recommendation, old equipment working poorly, distributor/salesperson recommendation, recommendation of PA staff, the technical assistance offered through the program, recommendation of internal staff, past experience with program, and unspecified other reasons.

Program Satisfaction

We asked both the participating trade allies and the participating C&I end users about their level of satisfaction with the program. The following subsections summarize the responses of each of these groups.

Participating Trade Ally Satisfaction

The evaluators were interested in knowing whether the program's data tracking and reporting requirements were burdensome to participating lighting distributors. Most retail-focused upstream lighting programs rely on lighting manufacturers to handle the program data tracking and reporting requirements such as documenting bulb shipments. In contrast, the Bright Opportunities Program relies on lighting distributors, which are generally much smaller and less sophisticated companies than lighting manufacturers, to handle these requirements.

Furthermore the Bright Opportunities Program's reporting requirements are more challenging than those for the typical retail-focused upstream lighting program. Most retail-focused programs require lighting

manufacturers to report on the type and volume of energy-efficient bulbs shipped at the retailer level. Yet the Bright Opportunities Program not only requires information on the type and quantity of lamps sold, but also the name, location, and contact information of each customer to whom they sold the discounted lighting products.

We asked participating lighting distributors and contractors if the reporting requirements of the program were reasonable. A large majority (77% of the distributors, 74% of the contractors) gave an unqualified "yes" to this question. Only a tiny minority (5% of the distributors, 9% of the contractors) said that the requirements were not reasonable. The remainder of the respondents said "yes" to the question but added a comment or complaint which indicated that they were not totally satisfied with these requirements.

We also asked the participating trade allies about their level of satisfaction with the incentive payment process, the program's marketing efforts, and the program as a whole. For all these satisfaction questions we asked them to use a five-point satisfaction scale where five equaled "very satisfied and one equals "very dissatisfied." We considered satisfaction ratings of 4 or 5 on this scale to indicate that the participants were satisfied. Satisfaction levels for the incentive payment process (88% for distributors) and the program as a whole (100% of distributors and 89% of contractors) were very high. However, only a small majority of the participating distributors (60%) and contractors (53%) were satisfied with the program's marketing efforts. The most common reasons for dissatisfaction were unawareness of any marketing efforts and low customer awareness of the program.

Participating End User Satisfaction

We asked the participating customers about their satisfaction with the bulbs or lamps they received through the program as well as with the lighting distributors who provided them. Once again we asked them to use a five-point satisfaction scale where five equaled "very satisfied and one equals "very dissatisfied."

General participant satisfaction with the LED bulbs and linear fluorescent lamps was very high with 90 percent of the LED participants satisfied (4 or 5 on the satisfaction scale) and 99 percent of the linear fluorescent participants satisfied. Yet when we asked a subset of LED participants who had used their LED bulbs in dimmer switches how satisfied they were with the performance of these bulbs in these switches, the level of satisfaction dropped to 72 percent. When asked to explain why they were less-than-satisfied, the most common reasons included the bulbs not working properly (39% of the respondents) and the bulbs flickering (36%).

We asked all the participants how satisfied they were with the contractor or equipment supplier from whom they purchased the program-discounted bulbs. Levels of satisfaction were very high with 95 percent of the participants satisfied with their contractors or equipment suppliers. The LED participants were more likely than the linear fluorescent participants to be "very satisfied" with their contractors/suppliers. This may have been due to the fact that the LED bulb buydown amounts were much larger than those for the linear fluorescent lamps.

Conclusions and Recommendations for Program Improvements

The evaluators concluded that the Bright Opportunities Program was a well-designed and well-run program. The evidence they cited for this included:

- Generally high program satisfaction levels from end users and participating trade allies;
- The lack of barriers to program participation;
- The generally high program net-to-gross ratios (76-89% for LED bulbs depending on the methodology); and
- The lack of significant complaints from program implementers.

For these reasons the evaluators only had a couple of recommendations for program improvements. These included:

- *Do more marketing of the program, especially to end users:* Only a small majority of the participating distributors and contractors were satisfied with the program's marketing efforts. Participating distributors who were less-than-satisfied cited a lack of marketing support, saying that while they were receiving information and marketing, it was not reaching end users who ultimately drive sales. Some distributors also felt that they were largely on their own in communicating the program to end users. Participating contractors who were less-than-satisfied with the program marketing efforts in some cases said that they had not even heard of the program and in a few case were not even aware they had received discounted prices, thinking it was the regular price.
- *Encourage participating trade allies to do more to educate their customers about the source and size of the buydown discounts:* Although 76 percent of the participating end users we surveyed said they were aware that they had received discounted bulbs, when we asked them an open-ended question as to the source for this information, only 34 percent mentioned their contractor or equipment supplier. When we asked the participating end users a direct question as to whether their contractor or equipment supplier mentioned the program discounts, 62 percent said that they had. Yet only about half (51%) of the respondents who said their equipment suppliers mentioned the discounts also reported that their suppliers identified a source for the discount. Finally very few of the respondents knew the dollar value of the discounts they received or could provide reasonably accurate estimates of size of the discounts they received in percentage terms.
- *Do more consumer education about the use of LED bulbs in dimmer switches.* We recommended that the program provide more education/resources on the performance of LEDs on dimmer switches and encourage distributors/manufacturers/contractors to do the same. Such information might include recommended dimmer lists and general information on the technical challenges of LEDs on dimmers, including minimum load ratings. While 90 percent of the participants who used LED bulbs through the program were satisfied with the performance of these bulbs, only 72 percent of participants who had used LED bulbs in dimmer switches were satisfied with their performance. In addition, of the few end users (about 16%) who reported any barriers to using the LED bulbs, nearly half (46%) of those reporting problems said they had trouble operating the bulbs with dimmer switches. Finally of those distributors/contractors reporting customer complaints, the most frequently-cited complaint concerned the performance of the LED bulbs controlled by dimmer switches.