

2015 Residential Energy
Efficiency Program Evaluation
prepared for
Alameda Municipal Power



energy & resource
solutions

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EXECUTIVE SUMMARY

This report documents the evaluation activities undertaken by ERS for Alameda Municipal Power (AMP). The evaluation focused on the program performance and the impacts from energy savings impacts of the residential lighting programs and refrigerator/freezer recycling program during the 2015 program year.

Evaluation Objectives

The evaluation effort had three primary objectives:

- ❑ Verify the efficacy of the residential light-emitting diode (LED) lamp direct-mail campaign and estimate the energy savings achieved.
- ❑ Verify the reported energy savings for the residential LED program rebate applications submitted with receipt-only proof of purchase (no post-installation inspections completed by program staff).
- ❑ Review the refrigerator and freezer recycling program to verify the reported energy savings.

Results and Recommendations

The key findings resulting from this evaluation are as follows:

- ❑ The installation rate for the Direct Mail Lighting Campaign is high. 90% of those surveyed indicated that the LED light bulbs provided by AMP were installed.
- ❑ The reported energy savings for the Direct Mail Lighting Campaign is a conservative estimate of the actual savings achieved. Verified savings indicate a 175% realization rate, but this estimate is likely overstated due to uncertainties associated with preexisting lamp sizes reported by customers.
- ❑ The installation rate for the LED Rebate Lighting Program participants is also high; 89% of the lamps expected to be installed were verified on-site. The verified savings for these participants is 114,785 kWh. Compared to the reported savings of 115,389 kWh, the realization rate is 99.5%.
- ❑ The refrigerator recycling program verified savings for program year 2015 is 7,392 kWh with a realization rate of 57%. Verified savings are based on recycler records, which were incomplete and likely underrepresent the number of recycled refrigerators.
- ❑ Customer satisfaction with the LED light bulbs installed was generally very high.
- ❑ The majority of customers across both lighting programs were satisfied with the LED lamps installed, including the quantity and quality of light emitted.

Based on the results of the evaluation, ERS offers the following recommendations:

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- ❑ For the refrigerator recycling program, ERS recommends using the updated DEER savings estimates for reporting future program savings. Given the measure savings have been reduced, AMP should require its recycler to provide AMP the make/model and year of each recycled refrigerator. This would allow AMP to assess if the updated savings estimates are representative of the refrigerators being recycled in its program.
 - ❑ For reporting lighting program savings, ERS recommends using the LED lighting measures provided in the E3 reporting tool. An updated E3 spreadsheet based on a 2016 update to the CMUA POU TRM will soon be available for reporting future program savings.

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APPENDIX A: SURVEY INSTRUMENT – DIRECT-MAIL CAMPAIGN

APPENDIX B: SURVEY INSTRUMENT – LIGHTING PROGRAM

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Introduction

During program year 2015, Alameda Municipal Power (AMP) offered the following three residential energy efficiency programs:

- ☐ Residential light-emitting diode (LED) lamp direct-mail campaign
- ☐ Residential LED lighting rebate program
- ☐ Residential refrigerator and freezer rebate and recycling program

The evaluation focused on the program performance and the impacts from energy savings impacts of the residential lighting programs and refrigerator/freezer recycling program during the 2015 program year.

1.1 Evaluation Objectives

The evaluation effort had three primary objectives:

- ☐ Verify the efficacy of the residential light-emitting diode (LED) lamp direct-mail campaign and estimate the energy savings achieved.
- ☐ Verify the reported energy savings for the residential LED program rebate applications submitted with receipt-only proof of purchase (no post-installation inspections completed by program staff).
- ☐ Review the refrigerator and freezer recycling program to verify the reported energy savings.

1.2 Evaluation Activities

The evaluation consisted of five activities:

Conduct research – ERS conducted the initial research and review of similar evaluation efforts, AMP's program process and procedures, publicly owned utility (POU) compliance, reporting requirements and methodologies, and program- and/or project-specific technologies used to save energy.

Review program documentation and data – ERS reviewed the program documentation, including the program tracking database and rebate data for the customers who participated in its programs. ERS also reviewed invoice data from the recycling contractor to verify the quantity of refrigerators recycled.

Develop evaluation and survey plan – ERS developed a site verification plan for assessing measure installation and operational performance and developed survey guides used with AMP customers to gather the data required.

Conduct surveys and site visits – Once the evaluation plan and survey guides were finalized, customers were contacted both over the phone and in person so that we could gain an understanding of their participation in AMP’s efficiency programs. This data was compiled and analyzed and was the basis for the majority of the evaluation’s observations and recommendations. For the refrigerator recycling program, the recycling contractor was interviewed over the phone regarding their internal processes and procedures.

Estimate and validate energy savings – ERS combined the research and data collection results to analyze and develop the energy savings estimates per the methodologies described in Section 3.

1.3 Report Structure

The remainder of this report consists of six segments:

- ❑ Section 2 describes the methodologies employed for data collection, sampling, and estimating energy savings.
- ❑ Section 3 provides the results of our outreach to AMP customers and their corresponding experience with the LED lamp direct-mail campaign.
- ❑ Section 4 provides the results of our survey work and site visits with AMP customers who received rebates for LED lamps through the residential LED rebate program.
- ❑ Section 5 provides the results of our review of the refrigerator/freezer recycling program, including observations made related to process and program success.
- ❑ Section 6 includes feedback provided by customers regarding AMP’s residential programs and their offerings.
- ❑ Section 7 summarizes our conclusions and provides program recommendations based on the data gathered throughout the course of the evaluation.

Methodology

This section describes the measurement and verification (M&V) objectives and methodologies for sampling, data collection, savings verification, and the calculation of installation rates.

2.1 Sampling

For the direct mail lighting campaign, ERS developed a random sample of customers to survey. The sample frame included all 30,352 of AMP's residential customers. Based on simple random sampling with a relative precision of 10% at the 90% confidence interval, the minimum sample size is 68 customers. We selected 107 customers to ensure that a minimum of 68 surveys were completed. Of the 107 customers, 73 completed the survey. Adding the customers surveyed from the LED lighting program (who also received LED lamps through the direct mail campaign), a total of 100 customer surveys were completed.

For the LED lighting program, AMP provided a list of 447 program participants. Based on simple random sampling with relative precision of 20% at the 90% confidence interval, the minimum sample size is 16 participants. ERS initially selected 35 participants to ensure the minimum of 16 participants was achieved. The final results were 27 participants were evaluated.

2.2 Data Collection

The following section discusses the data collection methodologies used to evaluate the lighting and recycling programs.

2.2.1 Direct-Mail and Residential LED Lighting Programs

AMP provided two complete lists of program participants for both the Direct-Mail and Residential LED Lighting Programs from program year 2015. From these lists two sample sets of AMP residential customers were targeted for outreach: those who received two free LED lamps via the direct-mail campaign, and those who received a rebate for LED lamps they purchased.

Customers in both samples were notified via postcard sent by US mail of the intent to conduct surveys and/or site-visits.

- ❑ 107 AMP customers were selected to be surveyed for the Direct-Mail program. Out of this sample, 73 surveys were completed. The remaining customers either did not want to participate or could not be reached despite multiple attempts.

- ❑ 35 AMP customers who participated in the LED Light Bulb Rebate Program were selected to have site visits. This sample had a lower success rate due to customers who either could not be reached or were not willing to participate. The sample was therefore expanded to include a total of 62 customers. Out of these 62 customers, 27 outreach attempts were successful. Site-visits were conducted at 10 locations, and 17 surveys were completed over the phone with those who wanted to assist with the evaluation but did not want to have ERS visit their home.

ERS conducted phone surveys and in-person verification site-visits with AMP customers in order to verify information about the LED lamps installed and to gain an understanding of the customers' experience with the programs. This information allowed for the calculation of installation rates, energy savings, as well as provided insight into the success of AMP's efforts in marketing its programs. This also yielded useful feedback from the customers regarding their experience with the program and familiarity with energy efficiency measures in general.

2.2.2 Refrigerator and Freezer Recycling Program

A complete list of Refrigerator and Freezer Recycling Program participants from 2015 was provided by AMP. This program included the removal of customers' secondary refrigerators, and differs from the refrigerator rebate program that provided a rebate for the replacement of an old, inefficient refrigerator with a new, energy efficient unit.

The total count of participants for this program year was 21 customers. Program participant data was received from AMP and was reviewed and compared to records obtained from the residential appliance recycling contractor.

2.3 Verification of Energy Savings

The following methodologies were used to calculate program energy savings.

2.3.1 Direct-Mail and Residential LED Lighting

To estimate energy savings for the sampled customers, ERS used the calculation methodologies provided in the California Municipal Utilities Association technical reference manual (CMUA TRM). To adjust savings for as-found conditions, the key estimate parameters used for each program are presented in Table 2-1.

Table 2-1. Energy Saving Estimate Key Parameters

| Parameter | LED Lighting Program | Direct Mail Campaign |
|---|---|-----------------------------------|
| Baseline lamp/fixture power | 0.048 kW | 0.066 kW |
| New lamp/fixture power | Installed LED lamp wattage, varies per rebate application | 10 W per lamp |
| HVAC interactive effects factor | Default values from CMUA TRM | Default values from CMUA TRM |
| Coincident peak demand reduction factor (kWp) | Default values from CMUA TRM | Default values from CMUA TRM |
| Annual operating hours | 541 hours – default from CMUA TRM | 541 hours – default from CMUA TRM |

| | | |
|--------------------|-----|-----|
| Installation rates | 89% | 90% |
|--------------------|-----|-----|

All energy savings calculations performed by ERS are provided to AMP in a spreadsheet file.

ERS attempted to determine baseline power by obtaining the wattage of the lamps that were replaced by the new LED lamps. While it is possible that those interviewed were aware of the specific lamp types and wattages previously installed, it is also possible that many respondents incorrectly correlated lamp wattage with lamp brightness, therefore mischaracterizing what may be a 13 W CFL lamp as a 60 W incandescent.

In addition, respondents indicated a significant number of lamps replaced (29%) were 100W incandescents. Given a 10W LED does not emit an equivalent amount of light when compared to a 100W incandescent, respondents either reduced their lighting levels, or were mistaken about the lamp replaced. These uncertainties, though it is not quantifiable, potentially lead to overstated energy savings.

For annual operating hours, ERS asked customers about the frequency of their lamps' operation, and the responses varied widely and were deemed too inconsistent to be reliable. While the information gathered from those surveyed as well as those interviewed on-site provided valuable information regarding the lighting systems installed, often the proposed daily and weekly hours of operation were repeatedly inconsistent. For example, none of those surveyed as part of the Direct-Mail Program were able to provide definitive daily operating hours, and those interviewed as part of the LED Residential Lighting Program provided a variety of responses. Therefore, the default operating hours for residential dwellings from the CMUA TRM were used for estimating savings.

2.3.2 Refrigerator and Freezer Recycling Program

Refrigerator quantities recycled were checked against the AMP database and records provided by the recycling contractor. This resulted in a verifiable quantity of refrigerators recycled.

The CMUA TRM methodology for calculating the corresponding energy savings was then used. Specifically, the energy savings per recycled refrigerator (or "unit energy savings") was multiplied by the verified quantity of units recycled. Table 2-2 presents the methodology.

Table 2-2. Savings Methodology for Refrigerator and Freezer Recycling Program

| Savings Calculation | |
|-------------------------------|--|
| Annual energy savings formula | Energy savings are taken directly from the DEER database. Unit savings are weighted values based on a combination of different unit sizes and types, whether the unit was removed from conditioned or unconditioned space, and whether the unit was replaced/recycled or removed/recycled. |
| Unit energy savings | 616 kWh per refrigerator recycled 643 kWh per freezer recycled |
| Peak demand reduction | Refrigerator – 0.124 kW Freezer – 0.129 kW |

2.4 Program Net Impact

The net impact (net energy savings) of an energy efficiency program is used to measure the program's cost-effectiveness. The net impact is estimated by adjusting the program's gross energy savings by the amount of energy savings that is expected to occur in the absence of the program.

To determine the net impact, an NTG factor is used to adjust the gross energy savings for free ridership and spillover. Free ridership describes the program participants who would have implemented energy efficiency in the absence of the program, and spillover describes the program's ability to indirectly influence customer or market behavior, leading to increased energy efficiency.

The E3 report incorporates NTG factors in its cost-effectiveness calculations. The NTG factors used by POU are taken from DEER, which provides a list of factors developed from net impact studies of investor-owned utility (IOU) programs. Although the scale and program delivery methods for these larger IOU programs can greatly differ from POU programs, the available NTG factors are considered to be the best available sources of data for estimating the net program impact.

Based on the values available in the E3 compliance reporting tool, the NTG factor for residential lighting program is 0.54 and the NTG for refrigerator recycling programs is 0.70.

Direct-Mail Lighting Campaign

Between February and April of 2015 two LED light bulbs were mailed to all 30,353 residential customers in Alameda Municipal Power's service territory. A sample of these customers who participated in the Direct-Mail campaign was surveyed by ERS over the phone regarding the lamps received and related information. This information was used to gauge the success of the program and the corresponding level of customer satisfaction. The customer surveys took place in March of 2016. This section provides the consolidated results of the customer surveys.

3.1 Phone Surveys

Customers were surveyed during the month of March in 2016 regarding the two free LED light bulbs received in early 2015. The main objective of the phone surveys was to gain an understanding of the site-specific energy savings resulting from the receipt of the two free LED light bulbs received. Specifically, customers were asked whether the two LED lamps received as part of the campaign were installed, and if so what types of lamps they replaced.

A sample of the survey questions asked includes the following:

- ☐ Did you install the two free LED light bulbs received? If so, what types of light bulbs did they replace?
- ☐ Are you happy with the performance of the new LED light bulbs? Are they still installed or have they been replaced?
- ☐ Have you since purchased additional LED lamps? If so, what type and how many?

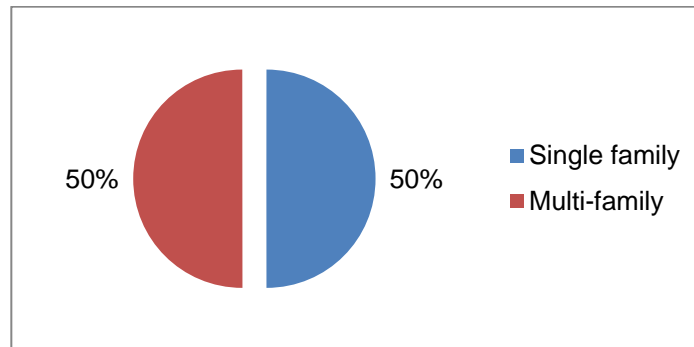
More details regarding the entire list of survey questions can be found in the appendix.

A recurring comment from those surveyed included the confusion over the delay between the time when they mailed the light bulbs and the current evaluation (approximately 1 year). They mentioned that their responses to the survey questions asked might be improved if the evaluation were closer to when the campaign occurred.

3.2 Customer Type

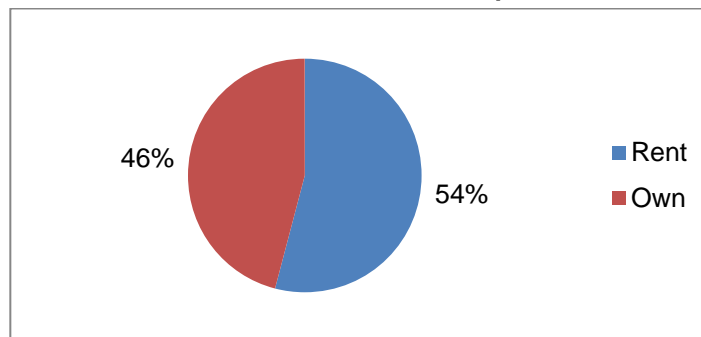
The housing types of those surveyed are summarized in Figure 3-1, which revealed that there was an even split of those who lived in single-family home versus those who lived in a multifamily home.

Figure 3-1. Customer Housing Type



Customers were also asked whether they rented their home or if it was owned. A slight majority responded that they rented the home where they are currently living, as shown in Figure 3-2.

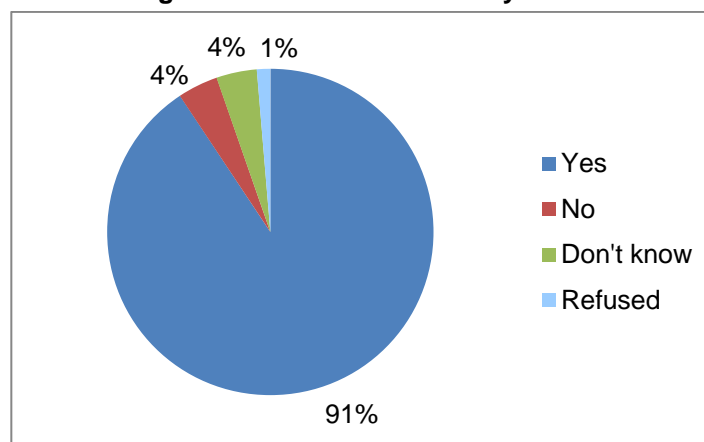
Figure 3-2. Do You Rent or Own Your Home/Apartment/Condominium?



3.3 Installation Rate

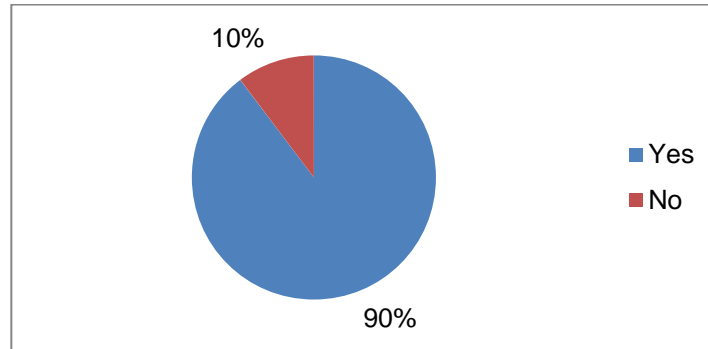
Determining the installation rate of the LED lamps distributed as part of the direct-mail campaign is a crucial metric for determining the program's success. Customers were therefore asked first whether they recalled receiving these lamps in the mail, and if so, whether they had been installed. Figure 3-3 provides that survey question and the installation results.

Figure 3-3. Do You Recall Receiving Two Free LED Light Bulbs from AMP in Early 2015?



Among those who recalled receiving the two free LED light bulbs, customers were asked whether they had since been installed. The same question was asked among those selected for the Residential LED Lighting Program surveys, and were added to the totals. The results are that 90% of customers surveyed stated that they installed the two free LED light bulbs received via the direct-mail campaign, which is equivalent to a 90% installation rate.

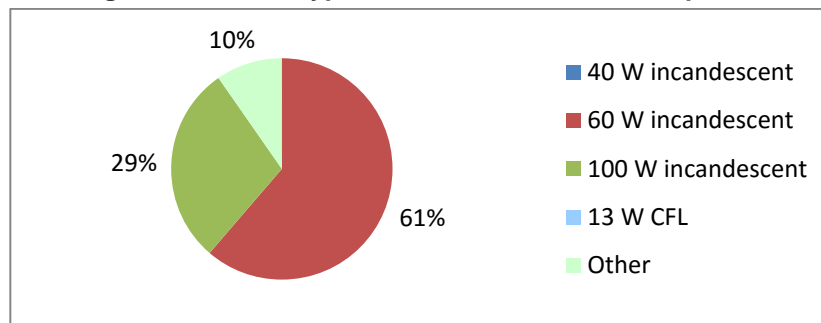
Figure 3-4. Did You Install the Free LED Lamps?



3.4 Savings Estimate

To determine the per-site energy savings, customers were surveyed on the types and quantities of lamps installed prior to the installation of the LED light bulbs. This data was used to establish a baseline for this program. Lamp types classified as “other” were mostly LED light bulbs that had failed, according to the customers’ feedback. Therefore, an average wattage of 10 W was used for the lamp type “Other”:

Figure 3-5. What Type of Bulbs Did the LEDs Replace?



The weighted average wattage of the preexisting lamps is 66.6 W and is used as the baseline wattage for estimating savings.

Factoring in the installation rate and weighted-average baseline lamp wattage, the verified annual savings for the 56,656 LED lamps issued is 1,491,096 kilowatt-hours. When compared to AMP’s reported savings of 850,642 kilowatt-hours, it represents a 175% realization rate.

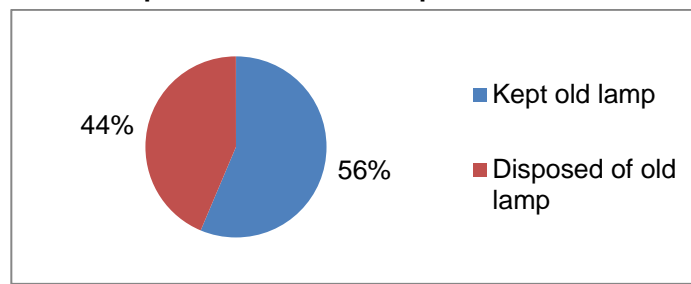
The primary difference between reported and verified savings is due to differences in baseline lamp wattage. AMP’s reported savings are based the assumption that one third of the lamps replaced would be 13W CFLs and two thirds of the lamps would be 60W incandescents. Based on

wattages provided by respondents, the verified savings uses an average of 66.6W while the average wattage for the reported savings is 44.5W. As noted in Section 2, there are some uncertainties associated with the respondents answers regarding the size of the lamp replaced that would tend to overestimate savings. The other less impactful differences between reported and verified savings are the verified savings account for HVAC interactive effects (increases estimated savings) and the actual installation rate (decreases estimated savings).

3.5 Savings Persistence

One noteworthy observation was that more than half of the customers kept the old lamps replaced by the LED light bulbs. This presents the potential for “snapback,” or the situation where the customer removes the LED light bulb and re-installs the previously installed lamp, thereby negating the energy savings.

Figure 3-6. Did You Keep the Light Bulbs That Were Replaced or Did You Dispose of Them?



Despite this observation, it is expected that measure persistence is high because the majority of those surveyed indicated that they liked the performance of the LEDs installed.

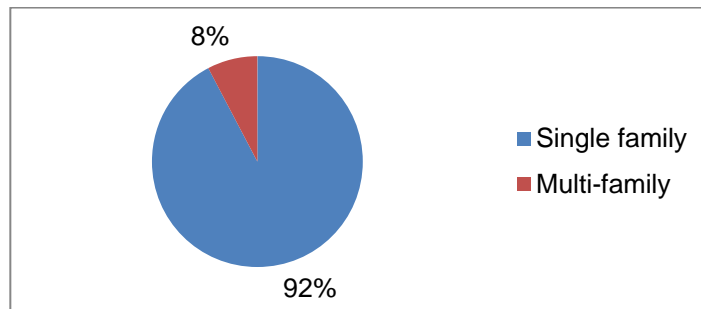
Residential LED Lighting Program

During program year 2015 Alameda Municipal Power offered a Residential LED Lighting Rebate program that allowed AMP customers to receive a rebate for eligible LED light bulbs. A sample of the customers who participated in the Residential LED Lighting Program but did not receive a post-installation inspection by the program were surveyed by ERS over the phone and interviewed on-site regarding the lamps received and related information. While on-site, the installed LED light bulbs were also verified. This information was used to gauge the success of the program and the corresponding level of customer satisfaction.

4.1 Customer Types

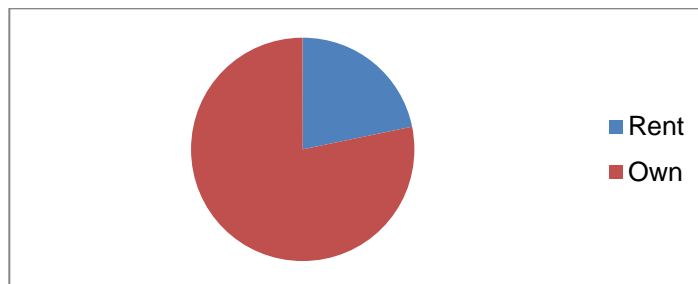
The housing types of those surveyed are summarized in Figure 4-1, which revealed that there was a majority of customers who live in a single-family home.

Figure 4-1. Customer Housing Type



Customers were also asked whether they rented their home or if it was owned. A majority responded that they owned the home where they are currently living, as shown in Figure 4-2.

Figure 4-2. Do You Rent or Own Your Home/Apartment/Condominium?



4.2 Phone Surveys and Site Visits

Similar to the surveys conducted for the Direct-Mail campaign, phone surveys we completed in order to calculate site-specific energy savings resulting from the purchase and installation of the LED lamps that received rebates. Specifically, customers were asked about the lamps that received rebates, what types of lamps they replaced, and their satisfaction with the product they selected, and other questions aimed at understanding the customer's experience.

Site-visits were conducted in order to verify the installation of the LED light bulb type and quantity per the program documentation provided by AMP. If a customer agreed to a site visit, in addition to verifying LED light bulbs, the survey conducted over the phone for other customers was instead conducted in-person.

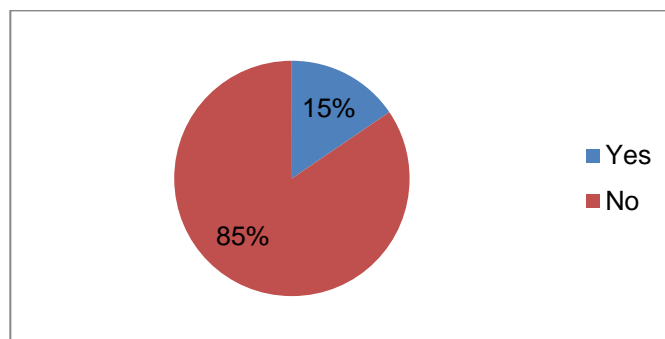
4.3 Installation Rate

A comprehensive lighting inventory was conducted on-site with the assistance of the customer. For those who participated in the phone survey, responses were recorded and tallied with the site-visit observations. A total of 489 LED light bulbs received rebates, out of which 436 were identified on-site. This results in an 89.2% installation rate.

4.4 Spillover

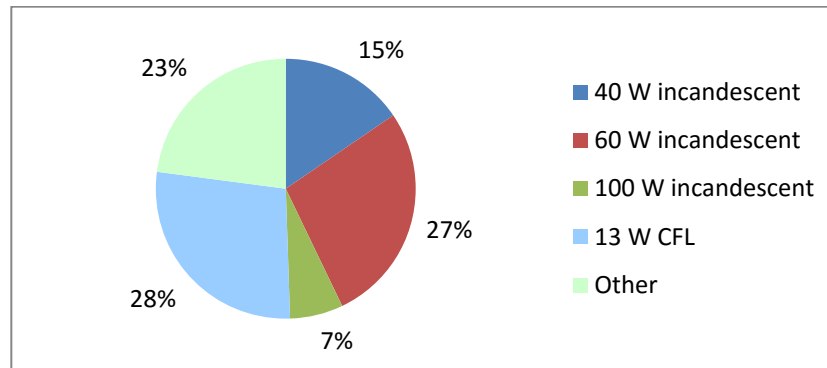
Spillover accounts for additional energy savings realized as a result of program participants pursuing energy efficient measures that were not submitted to the utility. For example, multiple participants indicated that after receiving a rebate for lamps they had purchased, they had gone out and purchased additional LED lamps that did not receive a rebate. This may in part reflect that from August 2015 to March of 2016, AMP did not have an active LED rebate program.

Figure 4-3. Have You Since Purchased Additional LED Lamps?



4.5 Savings Estimate

In order to estimate the preexisting lamp types and quantities, participants were surveyed on the lamps previously installed:

Figure 4-4. What Type of Bulbs Did the LEDs Replace?

To determine the installed wattages of the LED light bulbs that received incentives, light bulb make and model information provided by AMP and was used to look up the product-specific input wattages on the ENERGY STAR qualified products list.

An interesting observation related to this data set includes the quantity of customers who previously had 13 W CFL light bulbs installed. Unlike the direct-mail survey respondents who claimed to have an average 90% incandescent lamps previously installed, these customers only had 32% incandescent lamps previously installed. By comparison, they had 42% CFL light bulbs installed prior to replacing them with LED equivalents, which aligns with their inclination to pursue energy-efficient measures such as LED light bulbs and ENERGY STAR appliances (see Section 7.5).

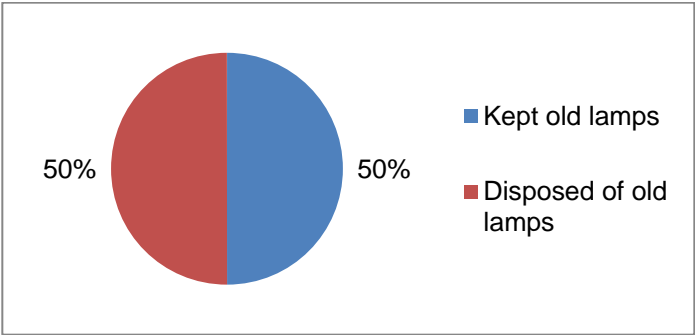
Factoring in the weighted average size of the lamp replaced (47.8W) and the installation rate, the verified annual savings for the random sample sites is 8,598 kilowatt-hours compared to the reported savings of 8,553 kilowatt-hours, resulting in a realization rate of 99.5%. Applying the realization rate to the population of customers were not required to have a post-inspection, the verified savings is 114,785 kilowatt-hours compared to the reported savings of 115,389 kilowatt-hours.

Although ERS found only 89% of the LED lamps were installed (decreases savings), the verified savings accounts for HVAC interactive effects (increases savings). Baseline wattages were similar, so the result is a close match of verified and reported savings.

4.6 Savings Persistence

As was the case with Direct-Mail campaign, customers who purchased LED light bulbs through the Residential LED Lighting Program tended to keep the lamps replaced. This again presents the potential for “snapback” if the previous inefficient lamps are re-installed.

Figure 4-5. Did You Keep the Light Bulbs That Were Replaced or Did You Dispose of Them?



Refrigerator and Freezer Recycling

ERS reviewed the program documents for AMP's refrigerator and freezer recycling program for program year 2015. ERS reviewed the level of detail in the program records and compared that to the records maintained by the recycling contractor to confirm that the units were removed from the grid.

A brief interview with the recycling contractor was also conducted, which resulted in a detailed explanation of the process for decommissioning and disposing of used appliances and their components.

5.1 Verification of Recycling Records

ERS compared AMP's records of refrigerator recycling program participants from program year 2015 and those provided by the recycling contractor. However, after multiple communications with the recycling contractor, it was revealed that complete records for program year 2015 was not available. Therefore, the contractor was not able to provide complete documentation that supported the proposed recycling quantities in the data provided by AMP.

All 21 customers who participated in the recycling program in program year 2015 were reviewed and of that sample only 12 had back-up records from the recycling contractor that verified that the old refrigerator had been removed. According to the contractor's notes, some of those pick-up addresses did not result in the recycling of a refrigerator (notes such as "unit not there" and "cancelled"). Discrepancies between the contractor's notes and the AMP data, as well as addresses omitted from the contractor's records, were taken into account when verifying the success of the program.

Using the recycled refrigerator quantities from 2015, the recycling program had 12 out of 21 verifiable pickups, which is equal to a removal rate of 57%. As mentioned above, the data provided was incomplete and the percentage of verifiable pickups is likely higher, although this cannot be confirmed.

5.2 Overview Interview with Recycling Contractor

According to the recycling contractor who was interviewed, the procedure for recycling used refrigerators is as follows:

- ☐ Staff pick-up old refrigerator/freezer from residence and return to facility to disassemble.
- ☐ Any refrigerant in the appliance is evacuated from the equipment and stored.

- ☐ R22 refrigerant, if present, is separated and stored.
- ☐ A refrigerant recycling contractor picks up and recycles used refrigerants.
- ☐ Remaining mechanical equipment and metal components (compressor, etc.) recycled at a local facility.

5.3 Savings Estimate

The energy savings methodology used to calculate energy savings associated with this program was derived from the CMUA TRM. Specifically, the CMUA TRM includes a deemed energy savings value per refrigerator or freezer recycled, presented in Table 5-1:

Table 5-1. Unit Energy Savings per CMUA TRM

| Measure | Yearly Deemed Energy Savings |
|------------------------|------------------------------|
| Refrigerator recycling | 616 kWh per refrigerator |
| Freezer recycling | 643 kWh per freezer |

Based on the data gathered from the records gathered by both AMP and the recycling contractor, ERS calculated that a total of 12 refrigerators and 0 freezers were recycled throughout the course of the 2015 program year. This total reflects customers who only recycled their refrigerator and does not include those that replaced their old refrigerator with a new high-efficiency unit.

It is ERS's understanding that AMP uses the E3 reporting tool to estimate measure savings and the savings in are taken from the CMUA TRM. Therefore, the verified savings are equal to the reported savings multiplied by the actual removal rate. The reported savings is 12,936 kWh, the verified savings is 7,392 kWh, with a realization rate of 57%.

5.4 Program Findings

Refrigerator and recycling programs around the state and around the country have achieved near market saturation. Recycling contractors such as JACO Environmental out of Hayward, CA, shut down due to a decrease in demand for its services¹. The number of remaining refrigerators and freezers currently installed that are candidates for such a recycling program have diminished significantly, and programs are therefore either reducing the amount of energy savings claimed from these types of initiatives, or are eliminating them altogether.

The following recommendation regarding appliance recycling programs is derived from the 2016 CMUA TRM update from March 15, 2016: "Recent updates to DEER for 2016 indicate that the savings potential for recycling programs has been reduced by close to half of the previous savings estimates. It is not fully documented as to why the savings have been reduced, but it is most likely associated with relatively newer, more efficient units being recycled. Program

¹ <http://www.theheraldbusinessjournal.com/article/20151130/BIZ/151139961>

administrators should use the updated DEER savings estimates (included with TRM spreadsheet documentation) for reporting savings after 1/1/2017.”

Customer Feedback

Customers surveyed often provided valuable feedback regarding their experience with the AMP programs, some of which were prompted by survey questions while others came up during a conversation with the surveyor. This section highlights some of that feedback.

6.1 Influence of Rebate

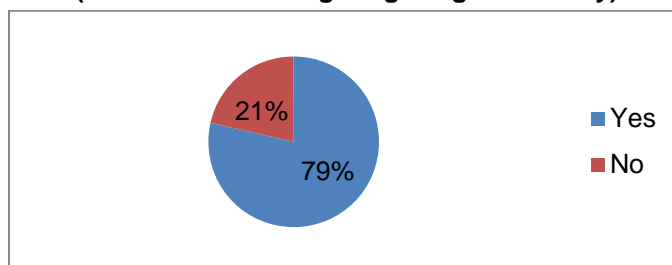
A reoccurring comment among Residential LED Lighting Program participants was the rebate was important motivator in decision to purchase LED lamps when the most common type of previously installed lamps were 13W CFLs. Most indicated that the direct-mail campaign did not have much of an effect on their decision to purchase LEDs, but the reduced price resulting from the rebate was essential.

6.2 ENERGY STAR Appliance Survey

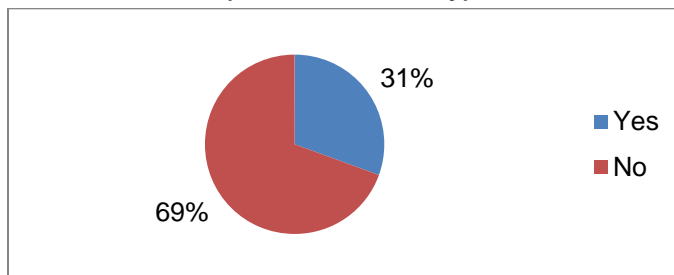
Participants in the LED Residential Lighting Program typically had at least one ENERGY STAR appliance in their home. This is somewhat intuitive because these customers were motivated to go out and purchase LED light bulbs and therefore had an understanding of the potential energy efficiency and performance benefits of doing so. They would therefore also tend to grasp the concept of installing a high-efficiency ENERGY STAR appliance in order to achieve similar results.

On the other hand, those who received the free LED light bulbs via the Direct-Mail campaign did not seek out this technology and therefore were not motivated by the potential benefits to go out and purchase the lamps on their own. These customers had a low incidence of ENERGY STAR appliances present in their home, leading to the conclusion that energy savings in general was not a priority for these individuals.

**Figure 6-1. Do You Own Any ENERGY STAR Appliances?
(Residential LED Lighting Program survey)**



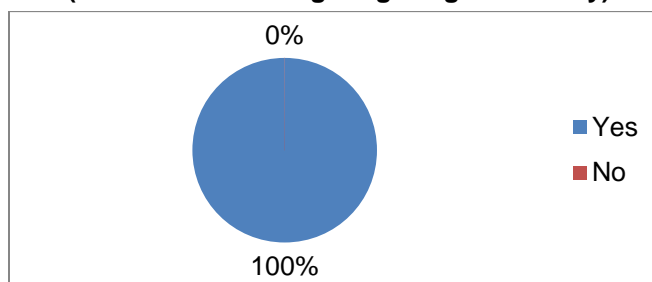
**Figure 6-2. Do You Own Any ENERGY STAR Appliances?
(Direct-mail survey)**



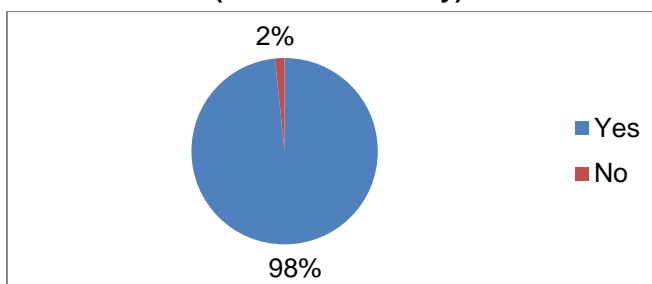
6.3 Customer Satisfaction with Light Bulbs

Customer satisfaction was very high with regards to the LED lamps installed. Customers were satisfied with both the LED lamps received via the direct-mail campaign, and were also very pleased with the LED lamps purchased at their local retailer. This was a positive revelation, as the lamps purchased through the LED rebate program varied greatly in lamp type, make/model, and wattage. To have such a wide variety of lamps receive favorable reviews is a strong indicator that the LED lamp industry is now quite mature and well-suited to supersede incandescent and CFL technologies.

**Figure 6-3. Are You Happy with the Way the LED Light Bulbs Look (Amount of light/color of light)?
(Residential LED Lighting Program survey)**



**Figure 6-4. Are You Happy with the Way the LED Light Bulbs Look (Amount of light/color of light)?
(Direct-Mail Survey)**



6.4 Marketing

The evaluators' observations regarding AMP program marketing include the following:

- ❑ All seventy customers from the Direct-Mail survey responded that they had not heard of AMP's energy efficiency programs.
- ❑ Two out of three customers interviewed regarding the residential LED program responded that they had not heard of AMP's other energy efficiency programs aside from the LED rebate program they had participated in.

A potential reason for the lack of familiarity of AMP's energy efficiency programs among its residential customers may be simply due to the program names used in the survey. For example, a customer is likely more familiar with the term "rebate" than they are with "energy efficiency program." While the survey questions were designed with the customers' perspective in mind, there may have been a gap between the phrasing used and the typical customer's understanding of utility energy efficiency program offerings.

Conclusions and Recommendations

The following section highlights the conclusions derived from the evaluation efforts and provides recommendations for future program implementation.

7.1 Conclusions

- ❑ The installation rate for the Direct Mail Lighting Campaign is high. 90% of those surveyed indicated that the LED light bulbs provided by AMP were installed.
- ❑ The reported energy savings for the Direct Mail Lighting Campaign is a conservative estimate of the actual savings achieved. Verified savings indicate a 175% realization rate, but this estimate is likely overstated due to uncertainties associated with preexisting lamp sizes reported by customers.
- ❑ The installation rate for the LED Rebate Lighting Program participants is also high; 89% of the lamps expected to be installed were verified on-site. The verified savings for these participants is 114,785 kWh. Compared to the reported savings of 115,389 kWh, the realization rate is 99.5%.
- ❑ The refrigerator recycling program verified savings for program year 2015 is 7,392 kWh with a realization rate of 57%. Verified savings are based on recycler records, which were incomplete and likely underrepresent the number of recycled refrigerators.
- ❑ Customer satisfaction with the LED light bulbs installed was generally very high.
- ❑ The majority of customers across both lighting programs were satisfied with the LED lamps installed, including the quantity and quality of light emitted.

Table 7-1 presents a summary of verified and reported savings for each program

Table 7-1. Verified Energy and Peak Demand Savings

| Program | Verified Yearly Energy Savings | Program Reported Energy Savings | Realization Rate |
|--------------------------------|--------------------------------|---------------------------------|------------------|
| LED Direct-Mail | 1,491,09 kWh | 850,642 kWh | 175.0% |
| LED Rebate Program | 114,785 kWh | 115,389 kWh | 99.5% |
| Refrigerator Recycling Program | 7,392 kWh | 12,936 kWh | 57.1% |

7.2 Recommendations

Based on the results of the evaluation, ERS offers the following recommendations:

- ❑ For the refrigerator recycling program, ERS recommends using the updated DEER savings estimates for reporting future program savings. Given the measure savings have been reduced, AMP should require its recycler to provide AMP the make/model and year of each recycled refrigerator. This would allow AMP to assess if the updated savings estimates are representative of the refrigerators being recycled in its program.
- ❑ For reporting lighting program savings, ERS recommends using the LED lighting measures provided in the E3 reporting tool. An updated E3 spreadsheet based on a 2016 update to the CMUA POU TRM will soon be available for reporting future program savings.

AMP LED Direct-Mail Campaign Customer Survey

ers

1. INTRODUCTION

Hello, my name is ___ and I am calling from on behalf of Alameda Municipal Power. May I please speak with (name of customer)?

- a. *If customer agrees to speak (repeat introduction above, if needed), proceed to Section 2.*
- b. *If customer agrees to speak but is not able to do so right away, ask when would be a more convenient time to call back, confirming their phone number.*
- c. *If customer is hesitant, provide AMP phone number for them to call back at their convenience: (510) 814-6419*
- d. *If customer is not available, ask individual who answered phone if they are aware of receiving LED lamps from AMP. If so, proceed to Section 2.*

2. LED DIRECT-MAIL LAMPS

1. The reason I am calling is Alameda Municipal Power mailed you two free LED light bulbs between February and April of 2015. You may remember the postcard that was sent with these light bulbs.

In order to get more information about the success of this program and how much energy it saved, I would like to ask you just a few questions about those light bulbs, which should only take about 5 minutes. Is that OK with you?

If they object, try explaining that AMP must comply with state mandates for verifying energy savings achieved by their programs and it would greatly help if you could help us by answering just a few questions.

If they request a contact at AMP to confirm, provide the following:

Rebecca Irwin
Assistant General Manager
Alameda Municipal Power
Phone: 510-814-6419
Email: irwin@alamedamp.com

Before I begin, do you have any questions?

2. Our records indicate that you received two LED light bulbs in the mail from AMP in early 2015. Do you remember receiving these light bulbs?
 - a. Yes
 - b. No
 - c. Don't know

If customer does not remember, provide description of packaging to help them – it was a purple box with Victorian houses and lightbulbs dangling down over the houses, etc.

- d. Refused to answer

If participant responds with "don't know" or refuses to respond, end survey

3. Did you install either of the light bulbs?
 - a. If yes: where did you install the bulbs?
4. What type of bulbs did the LEDs replace (for example, 60-watt incandescent, a CFL)?
5. Did you keep the replaced light bulbs or dispose of them?
6. Approximately how many hours per day are these lights on?
7. Is that consistent from day to day (for example, are these lights on more on certain days of the week as compared to others)?
8. Are you happy with the way the LED light bulbs look (amount of light/color of light)?

Note response:

9. Are the LED light bulbs still installed or have you replaced them (for example, did they fail)?

3. IMPACT/SPILLOVER

10. Have you since purchased additional LED lamps?

If participant responds with "no," proceed to Section 4 below

11. How many have you purchased?
12. Do you know their wattage?
13. Do you know what types of lamps/wattages they replaced?

4. CUSTOMER TYPE AND PROGRAM AWARENESS

14. Do you own any ENERGY STAR appliances?

15. Have you participated in any of AMP's residential energy efficiency programs?

If "yes," note programs and measures

16. Have you heard about AMP's energy efficiency programs?

a. If yes, which ones?

b. Where did you hear about them?

17. Do you live in a single family or multi-family home, such as an apartment building?

18. Do you rent or own your home/apartment/condominium?

5. END SURVEY

I appreciate you taking the time to speak with me. Thanks again and have a good day.

AMP Residential LED Lighting Program Participant Survey

ers

1. INTRODUCTION

Hello, my name is ___ and I am calling from on behalf of Alameda Municipal Power. May I please speak with (name of program participant)?

- a. *If customer agrees to speak (repeat introduction above, if needed), proceed to Section 2.*
- b. *If customer agrees to speak but is not able to do so right away, ask when would be a more convenient time to call back, confirming their phone number.*
- c. *If customer is hesitant, provide AMP phone number for them to call back at their convenience: (510) 814-6419*

2. SCHEDULING SITE VISIT

1. The reason I am calling is Alameda Municipal Power is evaluating the effectiveness of its energy efficiency programs and I would like to verify our information about the rebate you received from AMP for the LED light bulbs you purchased.

If possible, I would like to schedule a time to visit and verify the installation of these lamps in-person. This visit will help AMP understand how the lamps are being used and how much energy they are saving.

If you would be OK with an AMP representative visiting your home, we will give you a \$50 gift card as a “thank you” for your participation. Is this something you would be interested in helping us with?

If they accept, schedule site visit noting the name of ERS staff to be present. Then, explain how they will receive the \$50 gift card (via an email notice from Giftly).

If they request a contact at AMP to confirm, provide the following:

Rebecca Irwin
Assistant General Manager
Alameda Municipal Power
Phone: 510-814-6419
Email: irwin@alamedamp.com

If they object, try explaining that AMP must comply with state mandates for verifying energy savings achieved by their programs and it would greatly help if you allowed AMP to collect information about the lamps by conducting a visit to your home. If they decline, ask if instead they would be willing to answer a few questions:

2. I have just a few questions to ask, which will take approximately 5 minutes. Is that OK with you? Before I begin, do you have any questions?

3. COMPLETE SURVEY (IF UNABLE TO SCHEDULE SITE-VISIT)

3. Our records indicate that you received rebates for (quantity) LED light bulbs purchased on (date). Is that correct?

- a. Yes

- b. No

If no, then prompt to find out if someone is familiar with the lamps purchased or the rebate received.

- c. Don't know

- d. Refused

If participant responds with "don't know" or refuses to respond, end survey

4. According to our records, you purchased (state lamp quantity/size/type from rebate form to customer). Is this accurate?
5. What type of light bulbs did the LEDs replace (for example, 60-watt incandescent)?
6. Approximately how many hours per day are these lights on?

If installed in multiple locations, prompt for each location installed

7. Is that consistent from day to day (for example, do they operate more on certain days of the week as compared to others)?
8. Are you happy with the way the LED light bulbs look (amount of light/color of light)?

Note response:

9. Are the LED light bulbs still installed or have you replaced them (for example, did they fail)?
10. You also received two free LEDs mailed to you directly from AMP – do you recall receiving those light bulbs as well?
 - a. Did you install?
 - b. If so, where?

- c. Did the free LEDs in any way affect your decision to purchase the LED light bulbs you received a rebate for?

4. IMPACT/SPILLOVER

- 11. Have you since purchased additional LED light bulbs that did not receive rebates?

If participant responds with "no," proceed to Section 4 below

- 12. How many have you purchased?
- 13. Do you know their wattage?
- 14. Do you know what types of light bulbs/wattages they replaced?

5. CUSTOMER TYPE AND PROGRAM AWARENESS

- 15. Do you own any ENERGY STAR appliances?
- 16. Have you participated in any of AMP's other residential energy efficiency programs?

If "yes," note programs and measures

- 17. Have you heard about any of AMP's other energy efficiency programs?
 - a. If yes, which ones?
 - b. Where did you hear about them?
- 18. Do you live in a single family or multi-family home, such as an apartment building?
- 19. Do you rent or own your home/apartment/condominium?

6. END SURVEY

I appreciate you taking the time to speak with me. Thanks again and have a good day.



ALAMEDA
MUNICIPAL POWER

A Department of the City of Alameda



Help evaluate AMP's energy-efficiency programs.



2000 Grand Street,
Alameda, CA 94501

> **Between February and April of 2015,**

you received two free LED light bulbs from your community-owned electric utility, Alameda Municipal Power (AMP).

AMP has contracted with Energy & Resource Solutions (ERS) to evaluate the success of this campaign and to determine the amount of energy and greenhouse gases it saved. As part of ERS's evaluation, they will be surveying a random sample of AMP's customers.

> **In the coming weeks,**

you will receive a phone call from ERS asking you to participate in a brief survey. Your feedback is important, so we hope that you will be able to participate.

If you have questions, please don't hesitate to contact me.

Rebecca Irwin - Alameda Municipal Power
(510) 814-6419
irwin@alamedamp.com

2000 Grand Street,
Alameda, CA 94501

- **In 2015** you received a rebate from your community-owned electric utility, Alameda Municipal Power (AMP), for LED light bulbs that you purchased.

AMP has contracted with Energy & Resource Solutions (ERS) to evaluate the success of this program and to determine the amount of energy and greenhouse gases it saved. As part of ERS's evaluation, they will be surveying a random sample of AMP's customers to gather information about the installation of these light bulbs.

- **In the coming weeks,** you will receive a phone call from ERS asking you to participate in a brief survey. Your feedback is important, so we hope that you will be able to participate.

If you have questions, please don't hesitate to contact me.

Rebecca Irwin - Alameda Municipal Power
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