

works to overcome this limitation, but inadequate information transfer from one property manager to another at the respective properties can and does leave gaps in understanding that can influence program participation.

Enrollment and CFL Ordering Process

The program's enrollment application consists of an Excel spreadsheet with three tabs: basic property information, a worksheet for calculating CFL orders, and the range of apartment addresses to verify they are Duke Energy customers. A digital document is used to minimize errors that may arise during the act of transferring data from handwritten forms. Although the application is straightforward to complete without assistance, Honeywell tries to eliminate any potential hesitancy on the part of property managers by offering to help them to fill out the forms in person or by phone if they desire.

The CFL worksheet tab on the application form collects floor plan names, number of bedrooms, number of units, number of CFLs per unit (up to 12), and the current number of CFLs already installed. This yields the total number of bulbs that the property is requesting. Based upon past experience in other Duke Energy service territories, Honeywell recognizes that properties rarely install 100 percent of the bulbs that they request for a variety of reasons, such as pre-existing CFLs, tenant refusals, ineligible sockets, and miscounts. As a result Honeywell routinely reduces the final bulb order number by between 20 and 25 percent. This helps decrease the need to collect uninstalled CFLs when the property is finished with the installs. Properties are informed of this practice and if additional bulbs are necessary they can be delivered separately. If the CFL count is not exactly right when the installs are done, properties are permitted to keep up to 30 bulbs to replace those that burn out. Should more than 30 CFLs be leftover, Honeywell makes arrangements for their collection and use at other properties.

Before a property is approved and its CFLs are ordered, Honeywell checks its own database to confirm that the property has not previously participated. Then Honeywell enters the apartment addresses provided into Duke Energy's online look up tool in order to verify that they are qualifying Duke Energy customers. Once approved, Honeywell sends the property's adjusted CFL order to AM Conservation for fulfillment with shipping sent directly the property.

One other factor that is addressed during the enrollment process is setting the timing for the installs. The program's participation contract allows properties up to 90 days to complete the installs. In most cases that is enough time. However, if property managers are concerned about their companies' abilities to finish within that timeframe, Honeywell offers them two possibilities. Either they can break the task into two smaller phases with a portion done first and a second portion initiated after the first has been completed, or the property manager can complete the enrollment process and then postpone the delivery date of the CFLs. This latter option has proven useful for properties that have their busy seasons during the summer. With increased tenant turnover and other maintenance tasks during the warm weather months, sometimes property managers feel that their maintenance crews will not have time to complete the installs if the 90 day window stretches through the summer.

Fulfillment, Shipping, and Delivery

AM Conservation receives the bulb orders from Honeywell and ships the bulbs en masse to the designated property. A unique program ID number is used to track and report data regarding customer information, shipment sizes and delivery dates. Confirmation emails are sent to Honeywell when the order has been received, when the order has shipped, and again when the order arrives at the property. The bulb order data is also sent to Duke Energy for billing and bulb reconciliation purposes.

While Duke Energy pays for the CFLs, the bulb shipping fees are invoiced to and paid by Honeywell. Prior to January 1, 2013 shipping charges were paid by the properties. However, Duke Energy and Honeywell determined that the requirement for properties to pay shipping expenses was reducing the number of enrollments. Common reasons included budget limitations and delays caused by the need for additional corporate approvals for shipping fees or invoice processing issues—all of which necessitated persistent follow up and could cause potential new CFL installations to stall for months before commencing. As a result, Honeywell agreed to absorb the costs of the shipping without remuneration from Duke Energy. Honeywell representatives said they deemed the extra costs to be a worthwhile expenditure to eliminate the shipping barrier, increase overall program participation, and speed the install process.

During the first fiscal year of the program from start on July 24, 2012 to June 30, 2013, AM Conservation shipped 7,152 CFLs to participating properties. Between July 1, 2013 and December 31, 2013, there were 10,272 CFLs shipped. CFL shipping numbers do not always align exactly with the program's final bulb install numbers since Honeywell collects leftover CFLs from approximately 25% of properties and stores them while waiting to transfer them to other participating properties.

No issues were reported with fulfillment or bulb tracking. When asked about shipping, the Honeywell representative indicated the bulb breakage during transit appeared to be slightly higher during 2013 than in 2012. No specific numbers were provided.

Bulb Installation and Documentation

During the interval between bulb orders and shipping delivery, Honeywell emails property managers an Excel spreadsheet for tracking the CFL installs. The spreadsheet states in red, "Don't install more than 12 bulbs per unit." It also has a place for the maintenance manager (or other installer) to sign, verifying accuracy and acknowledging the possibility of a quality assurance inspection.

Honeywell's email message reiterates the timelines for the installs and provides general instructions for what to do once the shipment arrives. It also directs property managers to Duke Energy's website where they can download PDF files, including a leave-behind document for bulb recipients that educates people about CFLs, and a convenient tenant notification letter that property managers can customize and print to inform their tenants of upcoming installs. Forty percent of property managers we interviewed indicated that they used the notification letter. Of those who used it, everyone indicated that it worked well and no one suggested any improvements.

Honeywell supplements its email communications with phone calls to the property's maintenance staff using the number on file. The phone conversation also serves as a chance to confirm the bulb count, to ensure the program guidelines for installation are clear, and to educate the maintenance staff about the importance of accurate data collection and reporting. Honeywell makes follow up phone calls at approximately two week intervals throughout the install period to check progress and answer any questions. The dates of the calls and status of the install process are noted in the program database.

As noted earlier, the current program design requires property management companies to use their staff—and not their tenants—to directly install the CFLs and record their locations in the tracking spreadsheet. Properties employ a variety of strategies to accomplish the installs with most opting to set aside blocks of time to install the CFLs in large numbers of units within a short time. Sometimes the new bulb installs are paired with scheduled maintenance activities, such as replacing furnace filters, replacing smoke alarm batteries, and/or inspections. Other times the CFL installs are conducted independently of other activities. Regardless of the method selected, the number of CFL installs ultimately achieved by the program depends upon the properties providing their own staff time. This limits the program's potential by not appearing attractive to any properties unwilling to allocate their labor force. Duke Energy has taken this into consideration and reports that it has incorporated a program design change that calls for direct CFLs installs under the program administration of a new vendor starting in 2014.

Tracking, Reporting, and Quality Assurance

When a property completes its bulb installations the person in charge emails the Excel worksheets used for CFL tracking back to Honeywell. The data provided is then reviewed and reconciled to account for the reported number of bulbs shipped and those actually installed, including damaged and defective bulbs. The adjusted data is then imported into Honeywell's database that documents the official quantity of installed bulbs by the program.

If any errors are found in the Excel worksheets the properties will be automatically flagged as needing follow up quality assurance inspections. Issues that can trigger an onsite inspection include: excess or zero bulb counts, CFL installs of more than 12 per unit, unlikely dates of installs, indications that CFLs were installed in inappropriate locations such as outdoor sockets, or worksheet entries with the exact same numeric and text listed for all units.

TecMarket Works found no quality assurance problems associated with Duke Energy's Kentucky operations of this program. However, a universal data handling error was discovered and this may have affected the records used for quality assurance inspections. The data handling error was discovered during a TecMarket Works investigation of this program's Indiana operations, where quality assurance issues were identified. Because those issues resulted in changes to the way that Duke Energy and Honeywell handled the program's quality assurance activities across all of Duke Energy's service territories, including Kentucky, those findings and the resulting changes are discussed below.

During the spring of 2013, the TecMarket Works team discovered that among the 40 properties that were selected for impact evaluation in Indiana, four properties (10%) were found to have one tenant residence apiece with zero CFLs installed, despite 1) the property managers at those

locations having filed completed Excel worksheets indicating that CFLs had been installed in the unit, and 2) Honeywell having conducted inspections on some of those properties.

When this matter was brought to the attention of Duke Energy in May of 2013, Duke Energy and Honeywell conducted a root cause analysis, the results of which were used to revise the quality assurance processes within Honeywell's offices and in the field. The analysis revealed the following:

- The program's originally established quality assurance standards required that Honeywell inspect 5% of all participating properties. However, since Honeywell was only inspecting a fixed number of three units per property regardless of the total number of units at that complex, the vendor was not necessarily conducting a sufficient amount of inspections to derive a statistically valid sample at larger properties.
- No standard had been established for passing or failing the quality assurance inspections. For instance, is it considered a fail if: CFLs were moved or removed by tenants after the installs were completed, if CFLs were installed in a qualifying socket but actual locations don't match the areas listed on the worksheet, or if the bulb count is legitimately inaccurate. These and other possibilities needed to be considered and answers determined.
- No standard was established for follow up inspections to ensure that stipulated corrections had been made.
- No standard had been established for how to rectify inaccurate bulb counts or worksheet records that did not match actual inspection findings.
- Honeywell's quality assurance findings were not being reported to Duke Energy in association with the property installation records.
- Honeywell did not report its property-specific quality assurance findings during bi-weekly meetings between Duke Energy and Honeywell.
- Most importantly, no mechanism was established to incorporate bulb count discrepancies identified during the quality assurance findings into the program's final official bulb counts.

Two other areas were also found to have contributed to the quality assurance lapse. The first contributory factor involved insufficient Honeywell staffing levels for the Indiana service territory. Honeywell lost its original Indiana field representative in January of 2013. This position was not refilled until May of 2013. During the interim, Honeywell relied upon its project coordinator in North Carolina to serve its Midwest territories via periodic field visits. The majority of the quality assurance lapses identified by TecMarket Works occurred during the time interval between full staffing levels at Honeywell. Interviews with all parties reflected confidence in the new staffing arrangement and in the subsequent enhancements to Honeywell's quality assurance procedures.

The second contributory factor to the quality assurance issues was the above-mentioned data management error, which did involve Kentucky properties. This error arose because Honeywell staff consistently mis-sorted bulb install data for individual properties in Microsoft Excel. As the Honeywell employee sorted the files by unit address, only part of the data was sorted. This occurred because the sorting process did not select all records prior to the sorting function. As a result, socket locations and bulb numbers became dissociated with the apartments in which they

were originally installed. These mismatched files became the official property records which were subsequently uploaded to the secure FTP server and transferred to Duke Energy.

Once this problem was identified, several things became clear. First, the mismatching of records occurred at the individual property level. As a result, the actual number of bulbs installed at the property remained accurate. However, the bulb counts at the apartment level did not. Second, the mismatched records were the ones used by Honeywell when their inspectors returned to the property for quality assurance inspections, thereby introducing a condition in which the official records for an apartment would not match what the Honeywell inspector was actually seeing in that apartment. This possibility was somewhat mitigated by the fact that all the newly installed bulbs were the same brand and wattage and that properties have a limited number of floor plans. So apartments receiving 12 CFLs apiece would still reflect an accurate count even if the original data points were attributed to different apartments. Likewise a standard program bulb listed as being installed in a kitchen socket could still be accurate even if the sorting error attributed the locations to different apartments.

The main challenge with the mismatching of records arose when Duke Energy and Honeywell sought to correct the issue. The simple solution would seem to be to locate the original installation record files sent by the properties and have Honeywell re-upload them to the Duke Energy server to replace the flawed data. But this was determined to be infeasible because the uploading process would automatically time stamp the installs with the current date rather than the retroactive date for the original upload, requiring individual adjustments for each installation. For this reason, Honeywell worked with Duke Energy to correct the data on the Duke Energy side of the system by matching account numbers, premise IDs, bulb counts, and locations in the Duke Energy program records. As of the time of this evaluation all records are reported to have been corrected.

The above mentioned quality assurance issues were identified and discussed by Duke Energy and Honeywell during the summer of 2013. At that time, Honeywell began to implement changes as soon as resolution to each issue became clear. Some resolutions went into effect as early as June of 2013. Others were still under discussion during process evaluation interviews conducted during October of 2013. Specific changes to the program's quality assurance made by October 2013 are described below. They include:

- Duke Energy reinforced Honeywell's responsibility to ensure accuracy of bulb count data.
- Honeywell increased the level of education and communication with properties regarding the importance of qualified socket locations and the accuracy of bulb tracking information in order to minimize human errors.
- On any given property that is subject to inspection, 5% of units must now be inspected. If that 5% comprises less than five units on that property, then a minimum of five units must be inspected.
- Honeywell originally only conducted inspections after all the installs were complete. Since June 2013 they have added multiple inspection opportunities in order to visit properties while installs are still in progress. By adding these mid-process inspections Honeywell now makes it possible to catch and correct errors before the installs are

complete, making it easier for the property to rectify the situation and ensure that the final paperwork is accurate.

- Honeywell also began doing surprise inspections (although only of vacant units in order to comply with state laws and rental agreements).
- Duke Energy now requires that all post-install inspections be conducted within two weeks of Honeywell receiving the completed bulb tracking worksheets from the property. This reduces the likelihood of CFLs being moved or removed by tenants.
- Reason for failing a quality assurance inspection have been clarified and now include any bulb count discrepancies, any bulb location discrepancies, no record of installs, inventory discrepancies, and refusal to participate in a quality assurance inspection.
- If a property has discrepancies in more than one unit, an additional 10% of units are now inspected. If the additional units all pass inspection, the property passes the inspection. If the property has any further discrepancies in the additional 10% of units, it is considered a fail. If allowed by the tenant, photographs are taken to document the issue.
- The inspection results are recorded on the Honeywell quality assurance spreadsheet and entered into the company's tracking system. They are also uploaded to Duke Energy's online SharePoint system.
- The two companies have instituted bi-weekly meetings to review the quality assurance measures, inspection results, trends, and further means to increase compliance.

Updated quality assurance inspection procedures were as follows. The Honeywell inspectors prepare for the site visit by ensuring that they have the corrected property bulb installation records. Upon arrival the Honeywell inspector speaks with the person in charge of the installs. This is usually the property's maintenance supervisor. First the property's installation worksheet entries are reviewed to check overall progress of the installs, as well as to look for numeric entry patterns that might indicate problems, such as bulb counts above 12 or the exact same entry in the number of bulbs placed in service each time, which is possible with standard unit floor plans but unlikely given tenant refusals and pre-existing CFLs. Next the inspector visits units that have completed installs to compare the information listed in the worksheets with actual bulb locations. When feasible, units in diverse areas of the property are targeted, as are units completed at different times or by different maintenance staff members. Upon entry into the units, the inspector removes any coverings from light fixtures in order to visually confirm that the CFLs are the brand and wattage supplied by the program. Inspection check sheets are used to note anomalies, as well as any uninspected light sockets, such as those in rooms with doors closed to keep dogs at bay. Inspection reports are compiled after each inspection with copies going to Honeywell and Duke Energy.

If errors are identified, the maintenance person is informed of the need to correct the problem. The property is given six months to fix the problem before a follow up inspection. The timeframe was neither discussed with nor agreed to by Duke Energy. While TecMarket Works considers six months to be an extended period of time for a follow up inspection, it is important to reiterate that no specific quality assurance issues were identified during the inspections and thus there has been no need for follow up.

During scheduled inspections, property managers are typically notified two weeks in advance and they are asked to notify all their tenants of a possible inspection on the given day. If

necessary, access and timing of scheduled inspections can be adjusted based upon the specific requirements listed in property leasing agreements. Upon arrival at the site, Honeywell selects 5% of units at random. Occasionally a selected unit cannot be inspected due to tenant refusals. During surprise inspections only vacant units are examined in order to comply with state laws regarding notification periods.

TecMarket Works commends Duke Energy and Honeywell on the use of random selection for identifying properties and individual units for inspection. This method provides for good quality control design. However, we also note the practice has potential to reduce property manager and tenant satisfaction with the program, which may in turn diminish word of mouth referrals among sister properties within the same corporate structure. This is because random inspections require the property manager to notify all tenants about the possibility of entry into their units. In other words, even if only a few units are ultimately entered, all the tenants must be put on notice. Because only one property manager that we spoke with had been involved in an on-site inspection and she reported no issues with the quality assurance process, TecMarket Works cannot ascertain the degree to which future inspections might affect satisfaction ratings, but it does remain a possibility, albeit potentially remote.

While the various changes noted above have made considerable strides toward enhancing the program's quality assurance processes, TecMarket Works found that a few important factors remained unresolved at the time of our review, including the following:

- Despite conversations between Duke Energy and Honeywell on the topic as of Dec 31, 2013 no mechanism had been established regarding how anomalies in bulb count and location were to be reflected in the program's official CFL bulb count tallies.
- No protocol had been established for the next steps required if a property fails a follow up quality assurance inspection.
- The currently revised quality assurance protocols call for an additional 10% of units to be inspected if any errors are found upon initial inspection. Given that 10% of units may equate to upwards of 50 units to be inspected at a 500 unit complex, Honeywell had requested that the 10% figure be capped with a maximum number of units to be inspected on a given property if no further problems are found. No agreement about this item had yet been reached.

Management Communication and Coordination

All parties we spoke with reported positive working relationships between Duke Energy and Honeywell. Representatives from the two entities meet biweekly to review progress toward goals, discuss challenges or discrepancies, adjust strategy, and coordinate marketing and field activities. All communications are reported to be effective and timely.

Working relationships between Duke Energy and AM Conservation are similarly positive. Duke Energy describes AM Conservation as "Great. They're very responsive to the program needs. They go above and beyond, making any necessary adjustments, taking initiative to call customers, or creating additional reports." Honeywell and AM Conservation also report an "effective business partnership."

Key Findings and Conclusions from Management Interviews

Duke Energy and its key vendors, Honeywell and AM Conservation, work well together with no issues in communications or operational effectiveness. Program marketing, property enrollment, CFL ordering, and shipping are all reported to be working effectively, as are communications between participating properties and the vendors.

Working in concert with its two vendors, Duke Energy ensured that the program exceeded its goals for CFL installs in fiscal year 2013 and that the program had reached more than 80% of its annual goal for fiscal year 2014. Specifically between program inception in July of 2012 and December 31, 2013, Duke Energy reports that 18, 213 CFLs have been installed in 1,787 units at 16 participating properties in Kentucky.

As mentioned in the *Quality Assurance Inspections* section, Honeywell's mishandling of bulb install data presented the potential for quality assurance issues; although no issues were actually discovered by TecMarket Works, Duke Energy or Honeywell. Nonetheless, as a result of issues identified in Indiana, the utility and its vendor worked diligently and in good faith to improve the program's procedures, implementing notable changes to educate properties, and increasing the rigor of inspections.

Overall the program is well managed and well run within the parameters of its current design. The program's primary design limitation arises from the central requirement that participating properties must install the CFLs themselves. Because the program relies on properties to accomplish its objectives, implementation remains subject to customer timeframes, the availability of customer staff to complete the installs, and the potential for customer-induced errors, including inappropriate bulb locations, miscounts, and data reporting issues. Duke Energy is aware of this and has taken steps to change the program design to one of direct installs by a third party vendor starting in 2014.

Keeping in mind the shift to a new program design and an associated change of third-party implementer, TecMarket Works makes the recommendations noted below.

Recommendations for Program Improvements

Recommendation: Reconsider the program limitation regarding only installing CFLs in permanent fixtures in tenant homes. Additional energy savings may be achieved if the allows additional CFLs to be placed in high use, impermanent sockets in tenant homes.

Recommendation: As permitted within regulatory filings, consider expanding program eligibility rules to cover businesses, as well. Allowing CFL installs in light sockets associated directly with the property management company, such as offices, common areas, and exterior lighting would expand the program's potential to save energy without significantly increasing its operational costs, since the program implementer will already be interacting with the property managers anyway. Such a move would also help to overcome one of the property managers' objections to participation: As a residential-only program, the energy/cost savings only accrue to the tenants and not the business itself, thereby reducing their interest in participating.

Recommendation: Consider incorporating periodic ride-alongs with staff members from the new program implementer as they visit properties for sales visits and quality assurance inspections. In addition to providing an opportunity to observe these new staff members in action, such ride-along visits create opportunities for direct interaction with property managers and tenants, providing firsthand knowledge to supplement the more traditional filtered information received through vendor reporting methods, staff meetings and other vendor updates.

Recommendation: Using handheld devices such as iPads during installations and quality assurance inspections will help speed record-keeping and reduce the possibility of errors introduced during the manual transfer of data written on clipboards and later entered into spreadsheets.

Recommendation: Consider hiring a separate firm to provide quality assurance for the program. Separating the responsibilities for direct installs and quality assurance will decrease potential opportunities for conflicts of interest while increasing the rigor of the installations and data tracking. Establish clear standards and practices for quality assurance inspections, including appropriate numbers of inspections, pass/fail thresholds, resolution paths, time lines, and reporting processes.

Property Manager Interview Results

Introduction

The findings discussed in this section were derived from telephone interviews conducted with participating property managers and maintenance supervisors in order to learn their opinions of program implementation, to determine their satisfaction levels, and to assess overall program design. In all, TecMarket Works completed 10 Kentucky property manager phone interviews out of a total population of 15 qualified properties, under the management of a total of 12 property managers, since some individuals were responsible for more than one property. This represents an 83.3% completion rate. Of the two property managers not represented in the survey, one declined to participate, while the other incomplete was due to a change in management since the time of the installs. Such changes are to be expected given that in some cases the CFL installs were completed up to a year prior to the time of the survey.

The phone survey was conducted from January 7 to 15, 2014, over which time property management companies were contacted a maximum of four times or until the contact resulted in a completed interview or a refusal to participate. Upon successfully contacting a property management company, the interviewer asked if the property manager was familiar with the program. If the property manager was unfamiliar, such as being hired after the install process had been completed, the interviewer attempted to speak with someone else who was on staff at the time, such as the regional manager, maintenance supervisor, or assistant manager. Because of each survey respondent's varying levels of participation in the program, including involvement in ordering, installations, and tracking processes, and because of the long lag time between some installs and the telephone survey, not every interviewee could speak to every question. Thus respective sample sizes are noted for each question.

Program Involvement

Among the property managers we spoke with, 10% claimed to have signed up for the program more than 18 months prior to the survey, while 30% had joined between 12 and 18 months before the survey. Another 40% partnered with Duke Energy between six and 12 months prior. While 10% signed up between three and six month before the survey. Ten percent said they were unsure when their company first signed up (Figure 2).

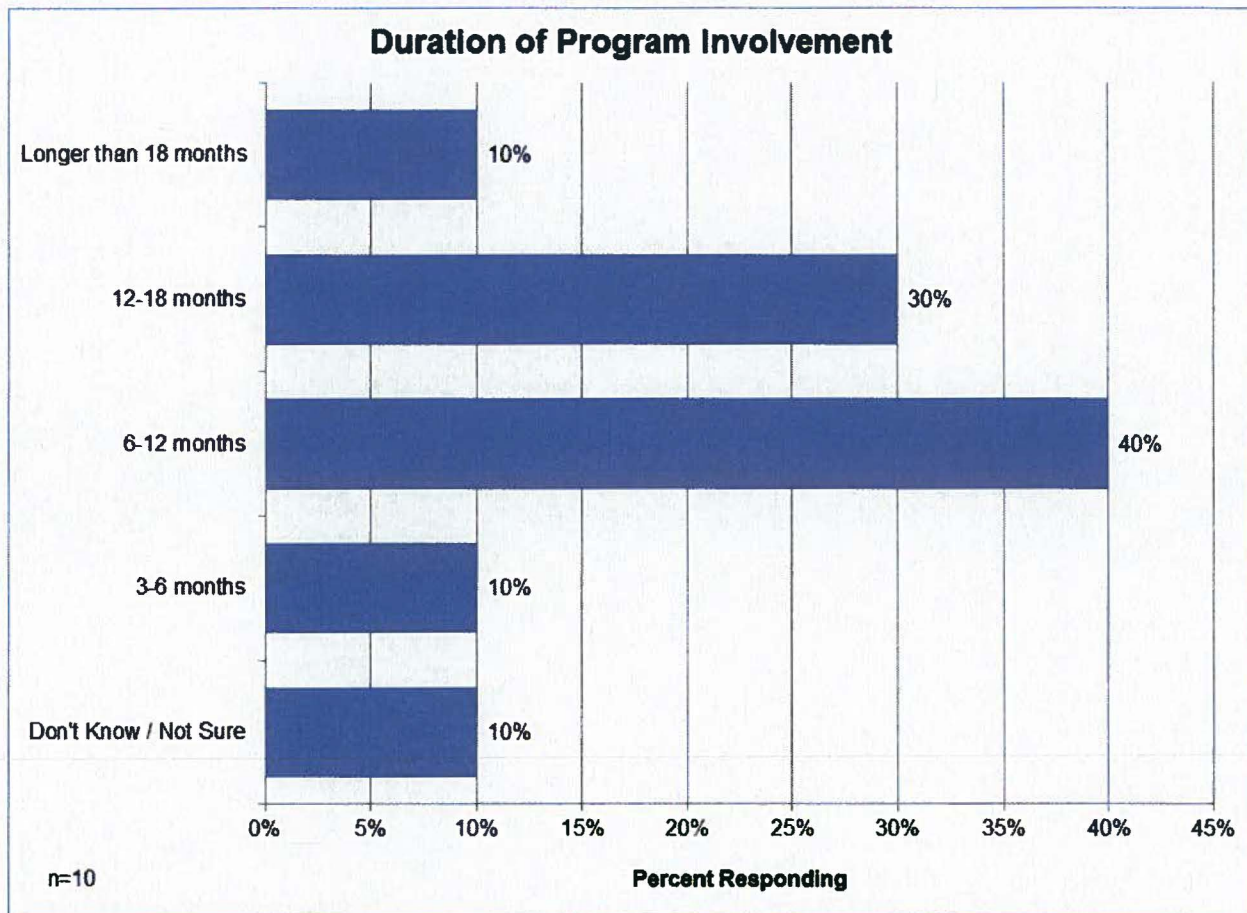


Figure 2. Length of Program Involvement

When asked about their reasons for joining the program, saving money was the most popular response with 70% of property managers citing the reason (Figure 3). Providing a service to tenants was the second most frequent reason (50%). Helping the environment (10%) and following company directives (10%) were also mentioned. Comments given for “Other” included the following verbatim statements: *“It’s another opportunity to visit our units,”* and *“I heard about it when I worked in Cincinnati.”* All respondents who shared motivations, said that their reasons for participation had been met.

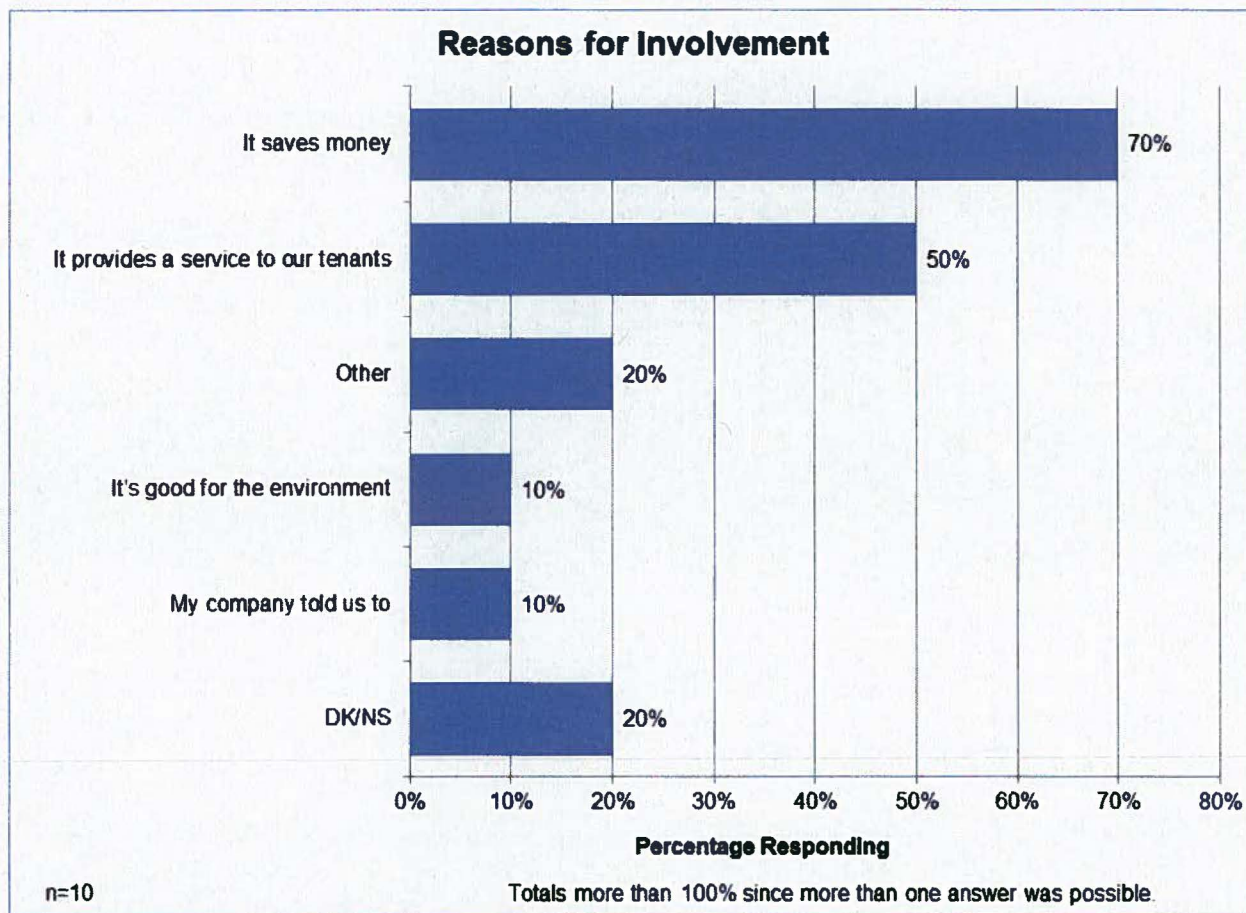


Figure 3. Reasons for Program Involvement

When asked if the program had made any noticeable difference in their businesses, opinions were mixed. The most popular response was “yes” because the program saved the property money on bulb purchases. Less direct advantages focused on improving the company’s image with tenants. Other comments were less definitive. The full range of verbatim replies are shown below.

- *Yes. Free bulbs are a big help.*
- *It saves on bulb purchases and electric bills. Tenants appreciate it.*
- *It saves money on buying bulbs.*
- *Tenants felt like we were giving them something. This adds to our rapport.*
- *Our residents like that we are going green. They really like that the bulbs are energy efficient. It helps with our customer services.*
- *Not really, but it was nice for tenants. We don't use it as a marketing tool.*
- *Not really.*
- *I can't say. We didn't get any feedback.*

Because current program participants are often a good source of suggestions regarding how to recruit similar people, the survey asked property managers how Duke Energy might increase program enrollments. Those we spoke with offered a list of creative ideas including advertising on the exterior of Duke Energy’s Cincinnati offices, providing before and after energy bills to

demonstrate energy savings, and sending marketing packages to property management companies with sample CFLs to be tried in their offices. Their verbatim suggestions included the following:

- *Use bill stuffers, advertise on the Duke building in Cincinnati, send a care package to the office with a few bulbs to get them to try them and sign up.*
- *Focus on how the program helps the residents.*
- *Show before and after energy bills to demonstrate the savings.*
- *Go to trade shows.*
- *Work with housing authorities.*
- *DK/NS (5)*

Bulb Ordering, Shipping, and Communications

Eighty percent of the property managers had no issues with the bulb ordering and shipping process, but two people (20%) reported difficulties. One issue involved difficulty arranging to pay for the shipping during the 2012 timeframe. This barrier was subsequently eliminated beginning on January 1, 2013 when Honeywell began paying the costs for CFL shipping. The other difficulty involved a property that experienced multiple shipping issues, including delayed arrival of the delivery truck, broken bulbs, and poor communications between the property, AMC and actual shipping delivery company. Honeywell was cited as being helpful in resolving the difficulties. Verbatim comments are listed below. Problematic issues are shown first.

- *Honeywell was fine, but dealing with the company that sent the bulbs [AMC] was a pain. We called them about shipments that didn't arrive. They didn't know what we were talking about. There was no lift on the truck and they expected us to unload the truck by hand. Plus we had crushed cases of bulbs. The labels on the boxes said they were not supposed to be stacked or shrink wrapped but they were. Shipping took three days longer than expected and it made us look bad with tenants and caused our timelines to be off. And that was only because Honeywell was helpful in dealing with the other company [AMC]. Also the bulbs we received in our first shipment burned out on a wide scale basis. The second shipment seemed fine. [Note: The second shipment refers to the fact that the property did CFL installs in two phases. The property manager was unaware of the CFL warranty and the possibility of free replacement bulbs.]*
- *Ordering took a while and it was confusing. I collected the info and sent in the invoice, but the paperwork didn't go through for the shipping.*
- *It worked well. Honeywell helped with the spreadsheets.*
- *It was easy and we got them right away.*
- *It was alright as it was.*
- *It was fine.*
- *It was perfect.*
- *I wasn't involved. (2)*

Lead Time, Support, and Training

We also sought feedback about the lead time, training, and support that the program provides to participating properties. Three people provided constructive suggestions, all of which focused on

some manner of improving the explanations regarding which sockets are eligible for inclusion in the program. Increased clarity will reduce confusion and decrease the amount of excess bulb orders. These three suggestions top the list of verbatim comments listed below.

- *They needed better explanations about acceptable inside [socket] locations and about not using outside locations. If it was there, we didn't see it.*
- *We had bulbs installed in hallways and needed to take them out since they were not eligible.*
- *We had more bulbs than we knew what to do with. Duke contacted the residents and said they would send bulbs directly. So we put the ones from this program in the sockets and took the extras for storage but Duke kept sending more bulbs to residents and they gave to us so we put some extras in the common areas.*
- *It was fine as best as I remember.*
- *I wasn't involved. (2)*

Tenant Notification and Program Materials

When asked how they informed their tenants about the upcoming CFL installs, 70% of property managers said they used their own letter, while 40% said they used the form letter provided by Duke Energy. The overlap arose because some people used a modified version of the form letter, thereby feeling it appropriate to provide both answers, which is allowable based on the survey question construction. One property (10%) supplemented the individual tenant letters with a notice posted in common areas on the property. A graphic representation of the responses is shown in Figure 4 below.

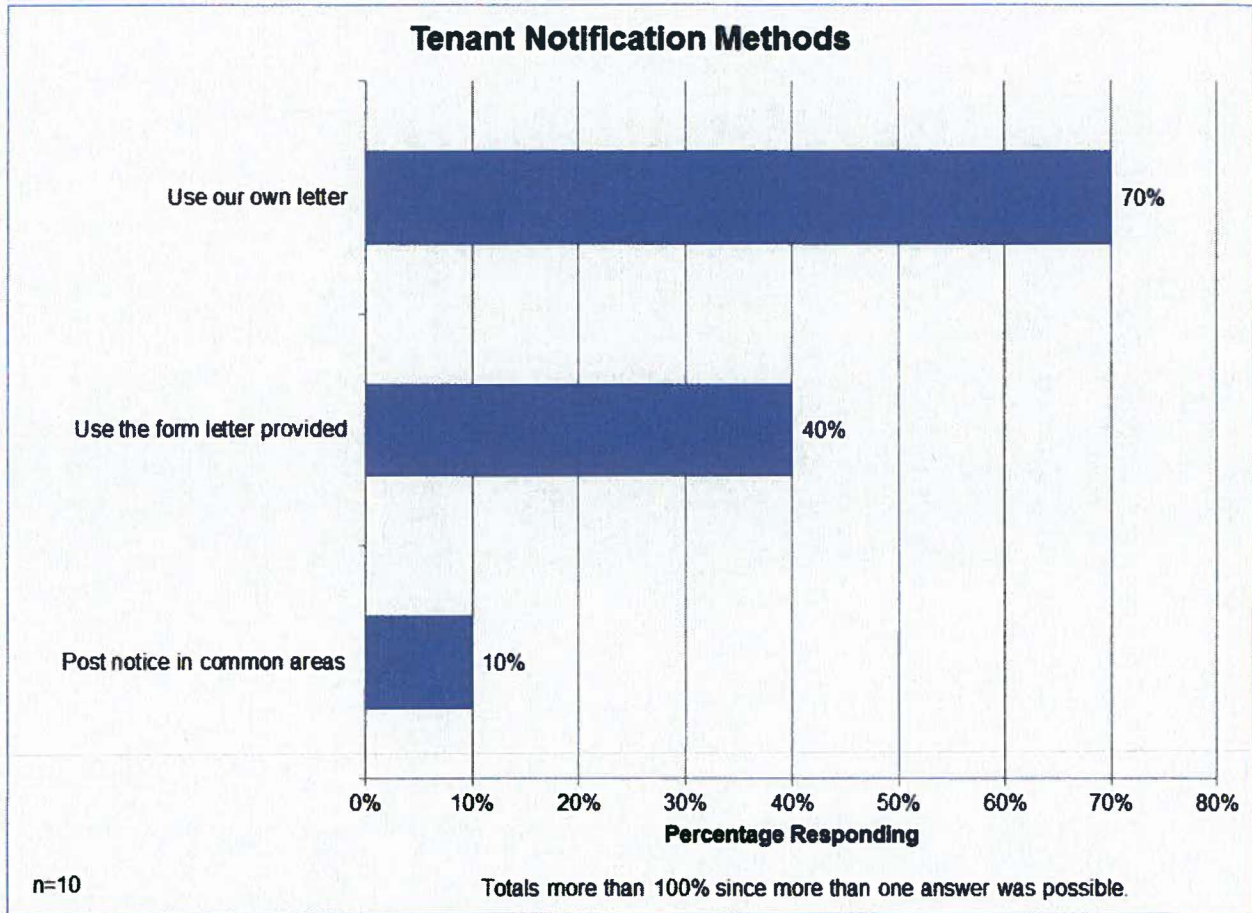


Figure 4. Tenant Notification Methods

In addition to the above mentioned form letter, Duke Energy also provides a PDF file containing information regarding the CFLs, including lifetime savings, purchasing information, and safety and disposal tips. Property managers were asked if they provided these information sheets to their tenants and if the sheets were adequate to their needs. Two thirds (67% of respondents said they shared the file with their tenants, while one third (33%) said they did not use them (Figure 5).

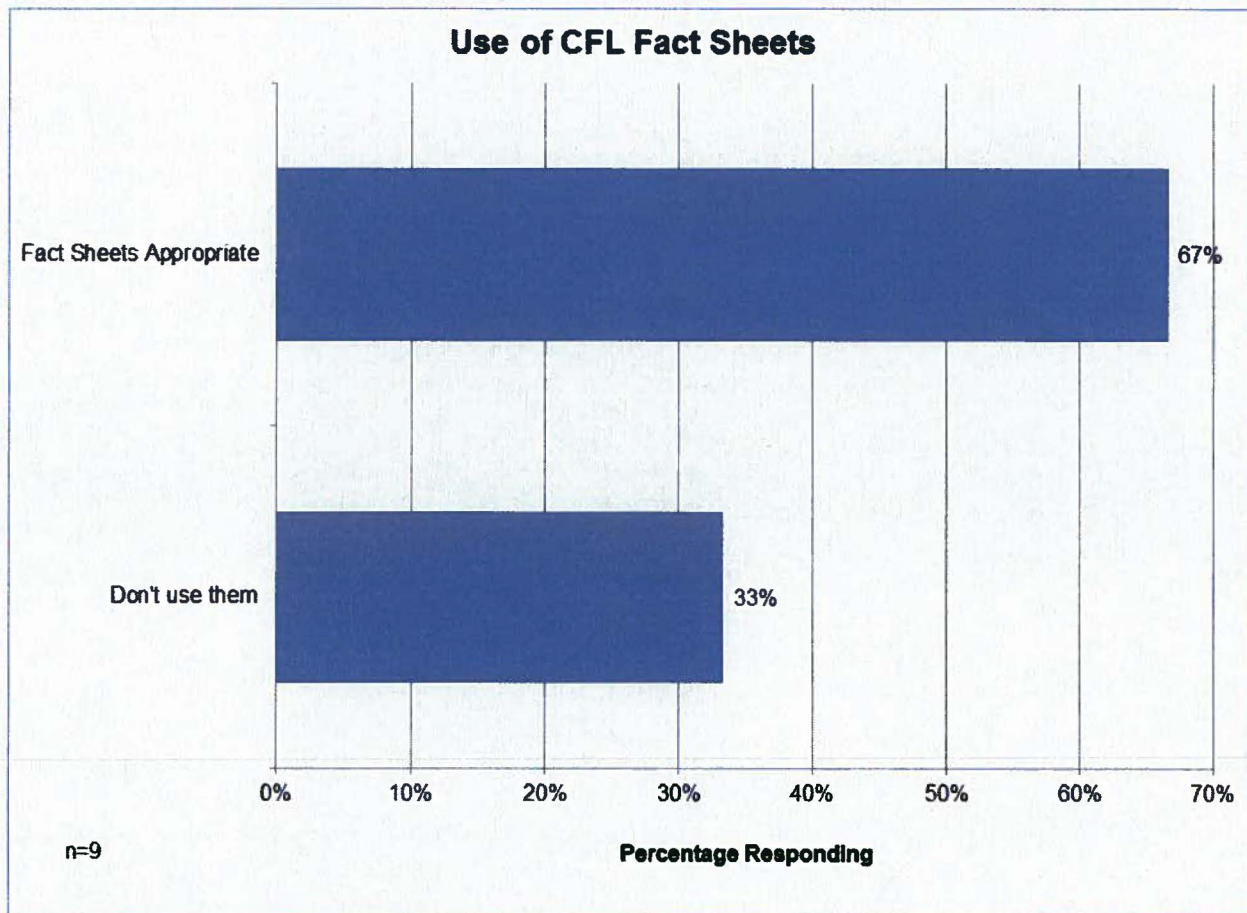


Figure 5. Use of CFL Fact Sheets

Bulb Replacement

Replacement Policies

To determine if the program had any effect on property managers' bulb replacement practices, we first ascertained what their initial bulb replacement policies were prior to participation in the CFL program. All property managers (100%) indicated that it is their policy to replace any missing or broken bulbs prior to a new tenant occupying the unit (Figure 6). After that, most landlords indicated that bulb replacement was a tenant responsibility. However, 40% of properties said they will replace bulbs upon tenant request. While 30% of properties indicated that it was their policy to replace linear fluorescent bulbs but not standard bulbs.

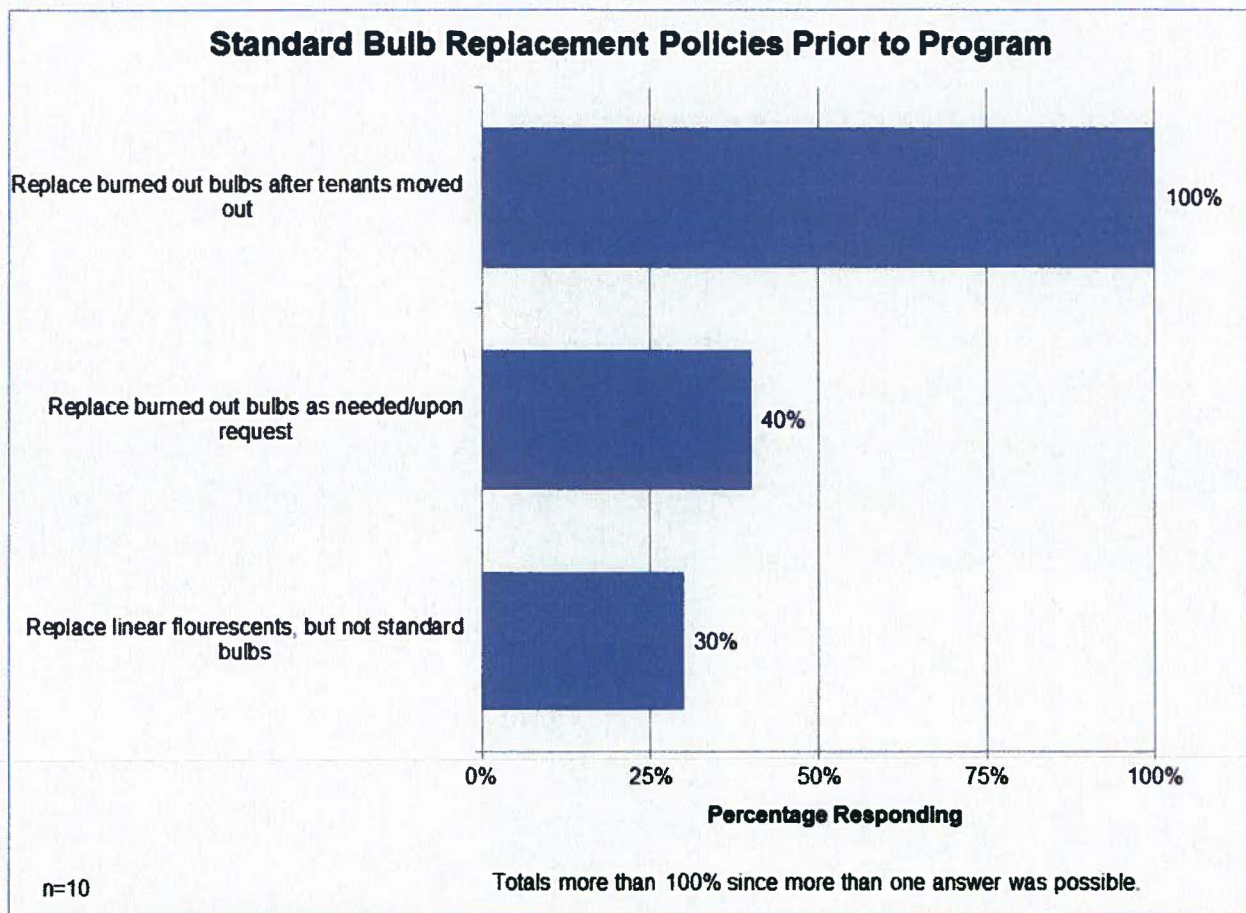


Figure 6. Standard Bulb Replacement Policies

Standard Bulb Types

When next asked what types of bulbs they typically stock as replacement lightbulbs, all property managers (100%) indicated that the most common type and wattage of bulb they stock are 60 watt incandescents. Twenty percent of properites reported also carrying 40 watt incansdesants, while 10% said they also stocked 100 watt incandescents (Figure 7). No other bulb or wattage types were mentioned.

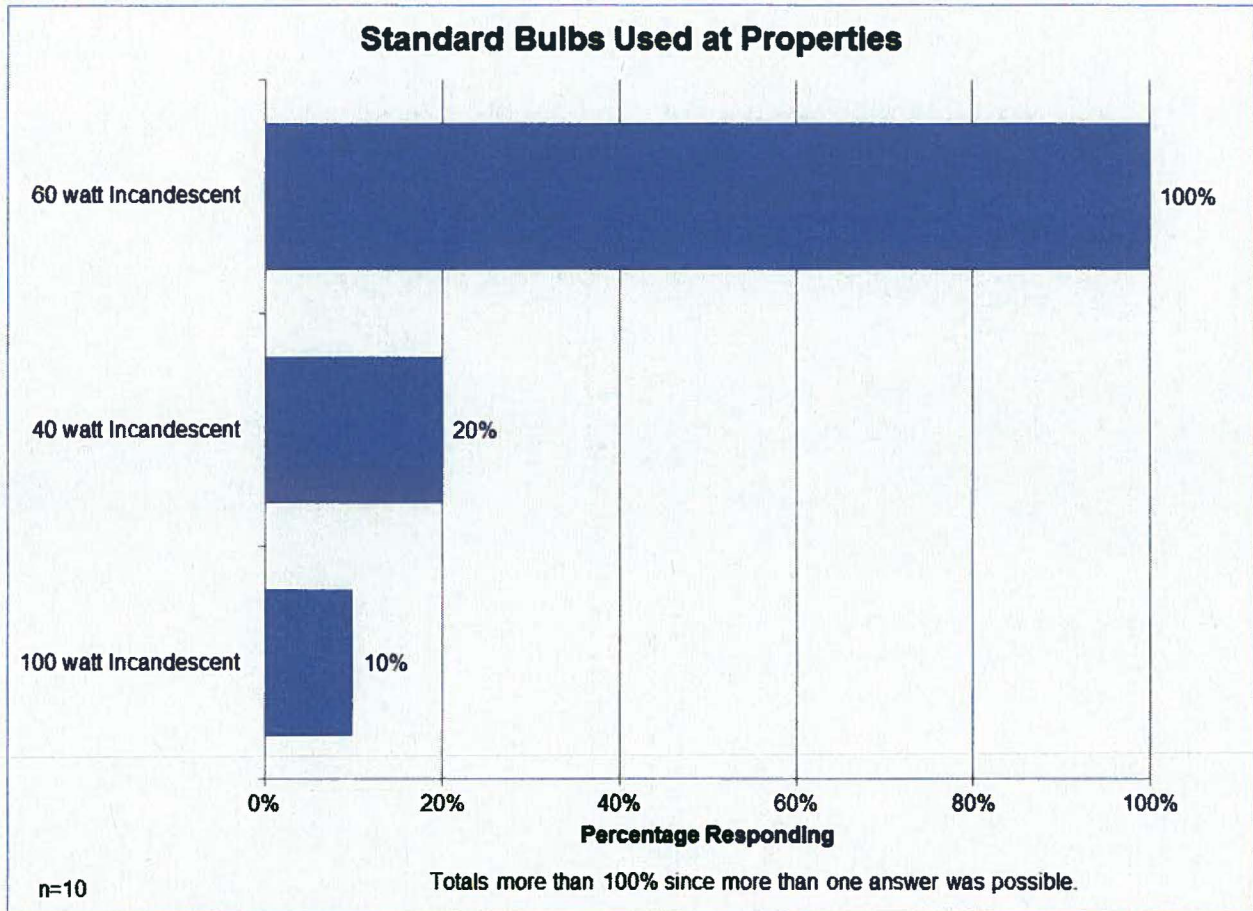


Figure 7. Standard Type and Wattage of Bulbs

Changes in Bulb Replacement Type

One of the primary aims of the program is to encourage properties to switch from providing incandescent bulbs to CFLs after the program ends. Among the property managers that we spoke with 60% said they had switched to CFLs after participating in the program. One person (10%) indicated that they would use up existing stocks of incandescent and then make the switch. The higher cost of CFLs was a factor for two property managers (20%), while a third person (10%) remained unsure of her property management firm's future policies. Their responses are shown in Figure 8 below.

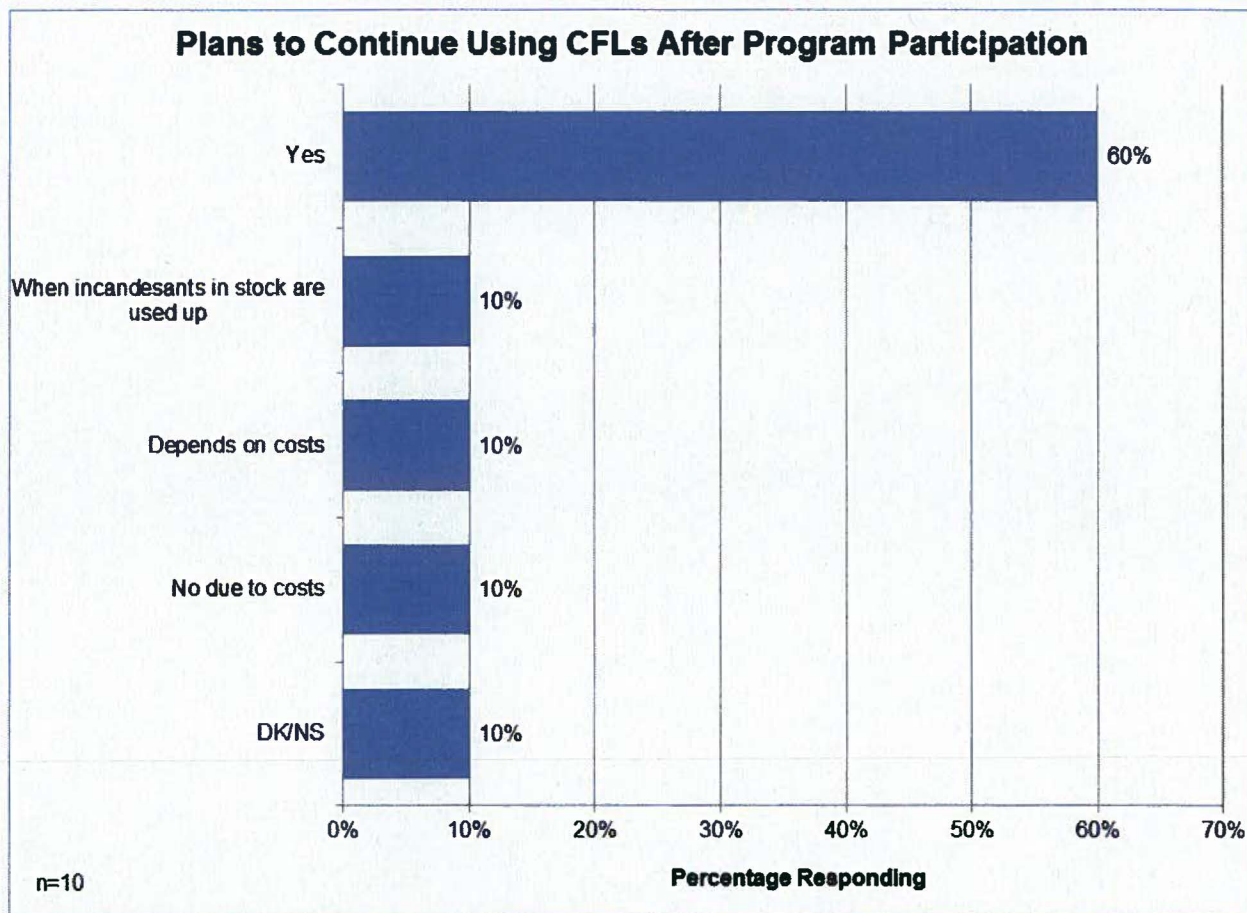


Figure 8. Plans for Continued Use of CFLs

Program Influence of Company Bulb Policies

Without the program 80% of property managers said that they would not have provided CFLs in their units. Among the remainder, 10% said they thought they would have made the switch eventually, while another 10% had just started buying CFLs but said the program sped things considerably and that without it the change would have taken more time (Figure 9).

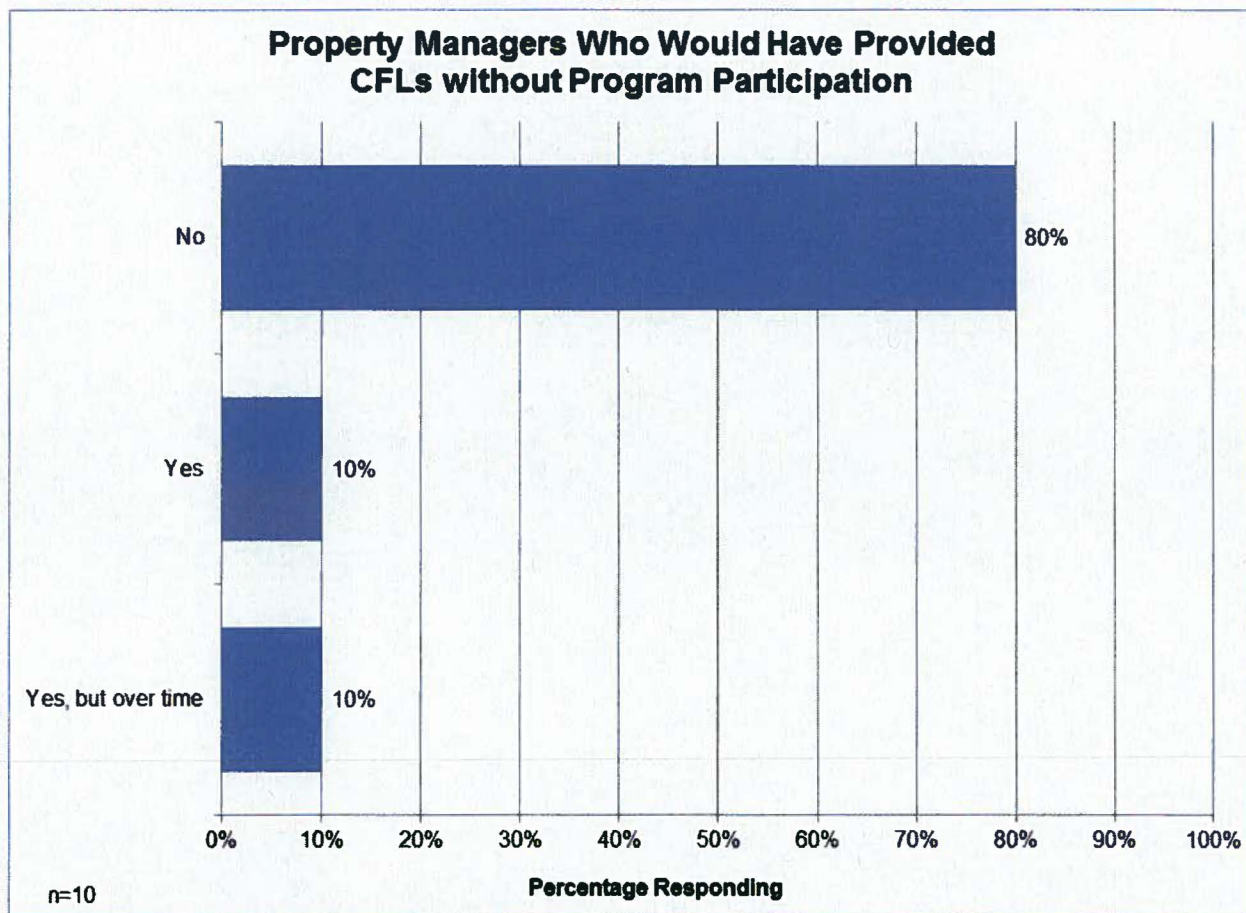


Figure 9. CFL Installs Without the Program

Perceived Importance of Program for Shifting to Use of CFLs

Despite the fact, that one property had already starting buying CFLs and another property planned to adopt CFLs eventually (see above question), property managers were unanimous in their opinion that programs such as this were necessary to get properties to begin using CFLs. When a follow up question asked the cost of buying CFLs was the most frequently cited reason. A list of their verbatim comments includes:

- *Otherwise it is too expensive. (2)*
- *It's a great program. It saved us money. (2)*
- *It's especially helpful for low income properties.*
- *It helps make people aware of the benefits.*
- *It's more efficient that way.*

Type and Number of CFLs Ordered

Ninety percent of survey respondents indicated that the program was providing the most appropriate type of bulbs, while 10% felt that the program should be providing brighter bulbs for senior citizens. When asked how many CFLs they ordered per unit, the properties ordered an average of 7.6 bulbs for a one bedroom unit, 10.8 CFLs for two bedroom units, and 10.7 CFLs for three bedroom units. Bulb orders for one bedroom units ranged from three to 11 CFLs with

no property ordering the maximum allowable amount of 12 CFLs per unit. Meanwhile 40% of respondents ordered 12 CFLs for their two bedroom units and 20% of respondents ordered the maximum for three bedroom units. Only 30% of properties indicated that they had three bedroom units. Table 13 shows a more complete look at the typical amount of bulbs ordered by size of unit.

Table 13. Number of Bulbs Ordered by Type of Unit

Number of Bulbs Installed	One Bedroom Unit		Two Bedroom Unit		Three Bedroom Unit	
	N	Percent Respondents	N	Percent Respondents	N	Percent Respondents
DN/NS	---	---	---	---	---	---
Don't have units that size	---	---	2	20%	7	70%
1	---	---	---	---	---	---
2	---	---	---	---	---	---
3	1	10%	---	---	---	---
4	1	10%	---	---	---	---
5	1	10%	---	---	---	---
6	---	---	1	10%	---	---
7	1	10%	---	---	---	---
8	1	10%	---	---	1	10%
9	2	20%	---	---	---	---
10	2	20%	1	10%	---	---
11	1	10%	2	20%	---	---
12	---	---	4	40%	2	20%
Average	7.6	---	10.8	---	10.7	---

Bulb Installation and Documentation

Number of Bulbs Installed

Sixty percent of respondents felt that the number of CFLs provided by the program was appropriate, compared to 40% who did not. Among those who did not, four comments were given:

- *We would have liked more than 12 per unit.*
- *We were a few bulbs short.*
- *We ordered too many and needed to send some back.*
- *We had some CFLs leftover.*

In all, 70% of properties reported having leftover CFLs of differing amounts. When asked how many leftover bulbs they had, one person said they came within five extra CFLs of the original projection used for their bulb order. Another property manager indicated that they averaged one CFL too many per unit, while another property ordered an average of two too many CFLs per unit. According to property managers, overages such as these arise for three common reasons: 1)

miscalculated bulb orders due to lack of clarity regarding socket eligibility, 2) not reducing the bulb order to allow for pre-existing CFLs installed by tenants (in some cases, CFLs provided directly from Duke Energy), and 3) their not accounting for fewer bulbs needed due to refusals by tenants to allow CFLs to be installed in certain sockets. It is for reasons such as these that Duke Energy and Honeywell commonly reduce actual bulb shipment quantities to 75-80% of the initially requested amounts.

Leftover CFLs

When asked what happened to those remaining CFLs, 30% of properties indicated that a Honeywell representative had collected the extra CFLs, while an additional 30% said they had the leftover CFLs in storage. This is not unusual given the program's policy of allowing properties with 30 or fewer remaining bulbs to keep them as replacements for CFLs that burnout. Among the other of survey respondents, 10% said they were awaiting pickup by Honeywell, while 20% of property managers indicated that they had installed the leftovers in non-residential areas of their properties. One person (10%) was unsure what had happened to the leftovers (Figure 10).

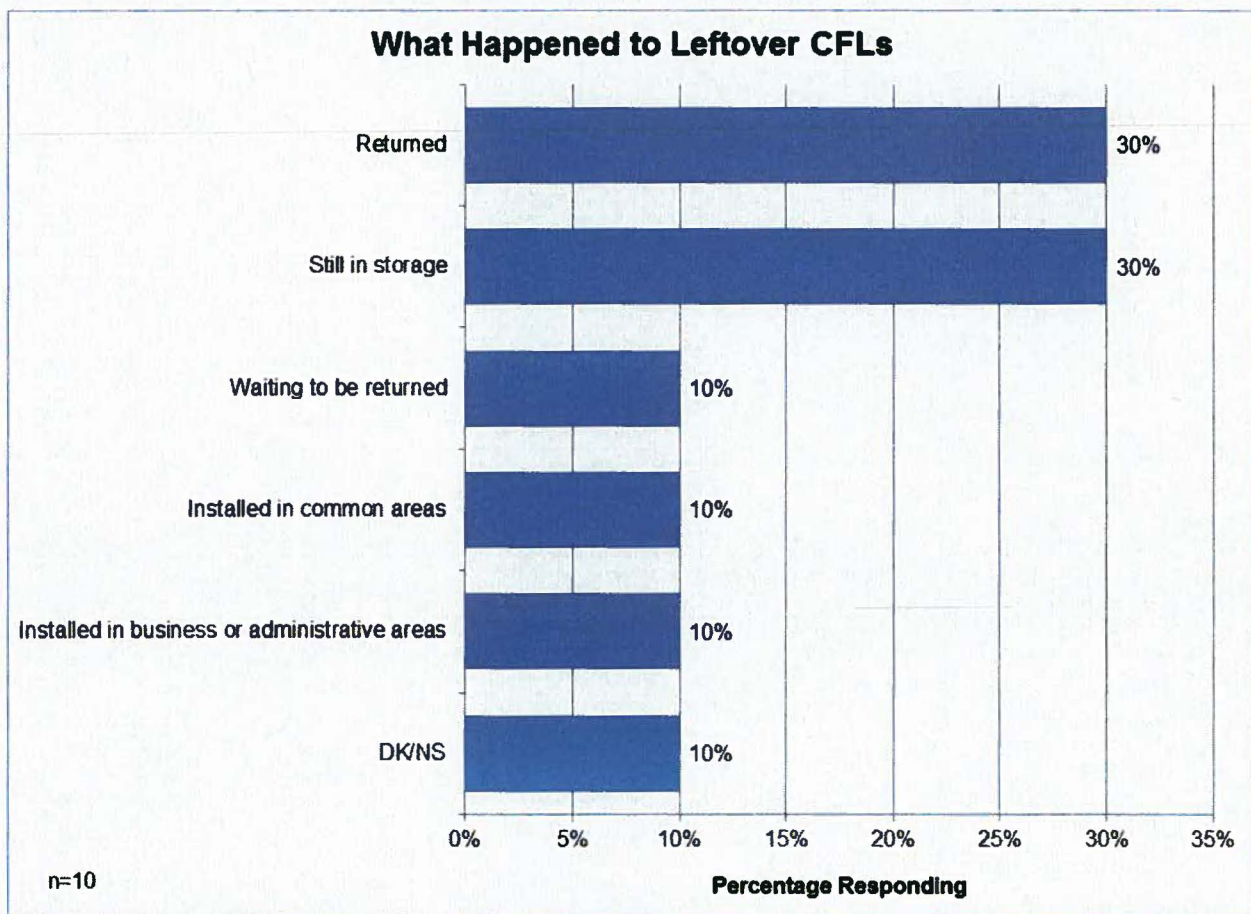


Figure 10. What Happened to Leftover CFLs?

Leftover Incandescents

By intention, this program displaces a high number of working incandescent bulbs. To determine what happened to those displaced bulbs the survey specifically asked about the disposition of the

bulbs that they removed. Among the properties we spoke with a third (30%) threw them away, while a similar number (30%) gave them away for use elsewhere, and 20% stored some of them for future use. Twenty percent of property managers were unsure what had happened to the leftover incandescent bulbs (Figure 11).

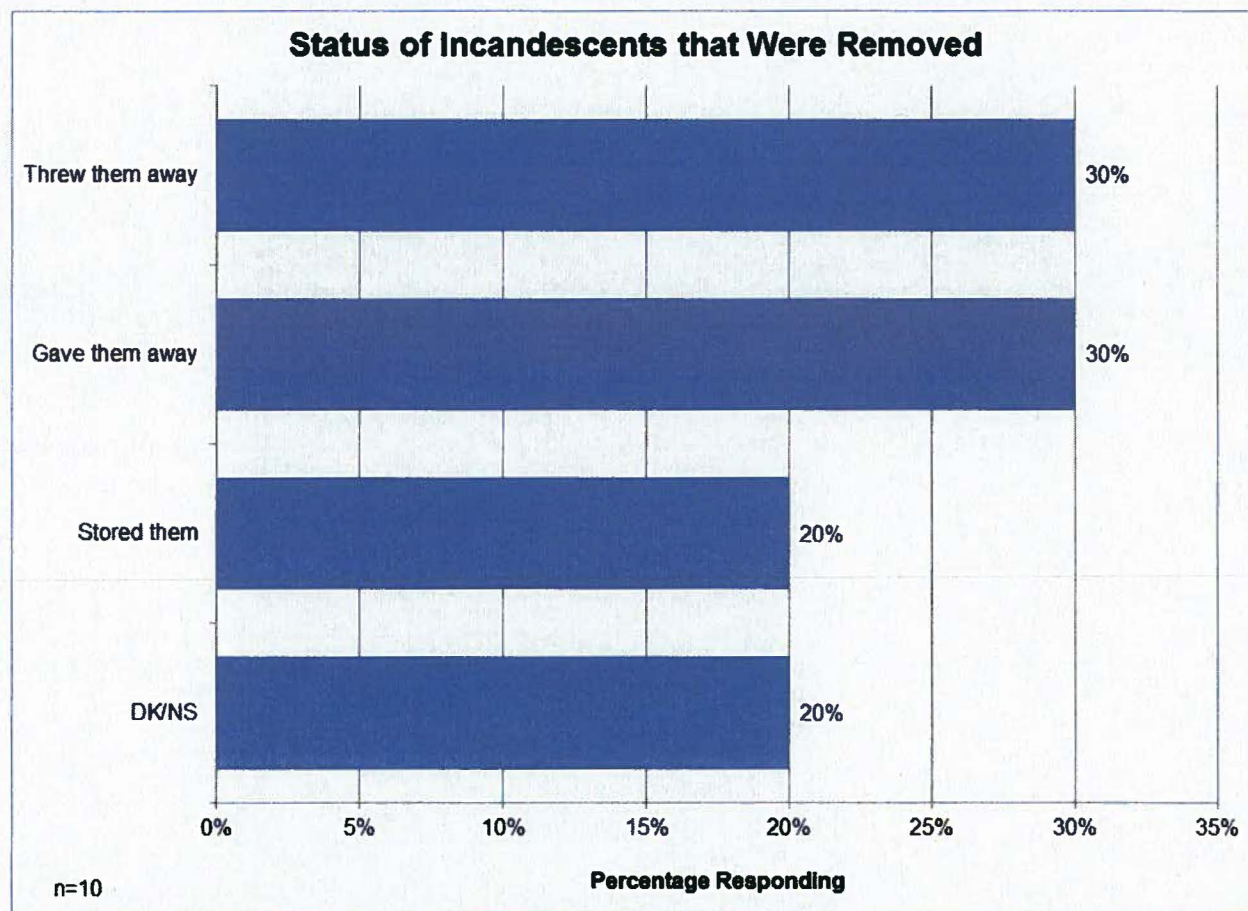


Figure 11. What Happened to Leftover Incandescents

Among the 30% of respondents who gave away the old incandescents, two people left them for the residents, and one property donated all their still working incandescents to a halfway house. That person suggested that Duke Energy offer to collect the used incandescents to make disposal easier on the properties. TecMarket Works thinks this idea may have merit in that doing so would ensure that all incandescent bulbs collected would be guaranteed not to return to service in other locations.

Install Process Feedback

Because the program relies on the property management companies to complete the install process, we asked them for feedback about their experiences. In all, six people provided feedback, and while two of them felt the process was easy, the remaining four people encountered staffing difficulties that resulted in differing strategies to get the installs done by the program's deadline, including asking tenants to remove the old bulbs in their units and even recruiting a retired dentist to take on the task of installations. Exact quotes are shown below.

- *We were short staffed, but a retired dentist and another guy volunteered to put in all the bulbs.*
- *We asked tenants to take out their own bulbs and place them in a bag. This helped to speed up the process.*
- *We only installed bulbs when people moved out or if they called in to ask for bulbs. But no mass install all at once. I don't know how many CFLs are leftover.*
- *We did the installs haphazardly. But doing it systematically would be easier.*
- *Do the installs at the same time as filter checks and inspections.*
- *It was easy. (2)*

When asked to comment on the recordkeeping required to track the CFL installations, property managers generally felt the paperwork was straightforward. Only two people had difficulty with it. Their comments top the below list of customer quotes:

- *Duke wanted everything documented carefully, but they gave us the tracking sheets after we already did the installs. They should have given us the forms they needed up front.*
- *The spreadsheets were time consuming. Also we had an issue with one of the properties listed on the tracking worksheet that could not be found. I couldn't fix it.*
- *The paperwork was straightforward. (7)*
- *I wasn't involved.*

Since the program design is changing to one of direct CFL installs by the third-party vendor, TecMarket Works offers no specific recommendations for program improvements regarding property-led installs and recordkeeping.

Quality Assurance Inspections

Only one property was involved in an onsite quality assurance inspection. This property manager rated her satisfaction with the inspection with an 8 on scale of 1 to 10, where 1 equals not satisfied and 10 equals very satisfied. The fact that only one property was inspected conforms with Honeywell's contractual obligation to inspect 20% of properties within a given service territory. With only 16 properties enrolled, only one inspection was conducted. As noted in the *Management Interviews* section above, by the autumn of 2013 Duke Energy increased the rigor of its quality assurance practices but no additional properties were enrolled in Kentucky after that time.

Tenant Response

Ninety percent (90%) of property managers we spoke with said their tenants responded favorably to the installation process, while 10% said had heard negative comments, and 10% felt unsure how to characterize the overall response of their tenants. These amounts total more than 100% percent since one property manager said she had heard both positive and negative feedback from residents. Specific tenant feedback as reported by property managers is shown in the table below.

Table 14. Tenant Feedback as Reported by Property Managers

Tenant Feedback	Number of Respondents	Percent of Respondents*
Like the program	1	10.0%
Like the bulbs	2	20.0%
Don't like the bulbs	2	20.0%
Like the lighting quality	2	20.0%
Don't like the lighting quality	3	30.0%
Wanted bulbs to warm up faster	1	10.0%
Wanted brighter bulbs	1	10.0%
Appreciate lower monthly bills	1	10.0%
Positive impression of Duke Energy	1	10.0%
Mercury concerns	1	10.0%
DK/NS	3	30.0%

* Note: Percentages total more than 100% since multiple responses were possible.

Benefits of Participation

Property Benefits

Although the program is designed to generate energy savings for residential tenants by providing them with energy efficient light bulbs, the benefits to property management companies are less immediate. For this reason, we asked property managers to help us identify those benefits that they found to be most direct.

Among survey respondents, half (50%) felt that the program bolstered their image to be seen as helping tenants to save money, while 40% said it helped to improve their tenant relations, and 20% felt that promoting energy efficiency in their units was considered to be doing something for the environment. Twenty percent of property managers were unsure how the program benefited their company (Figure 12).

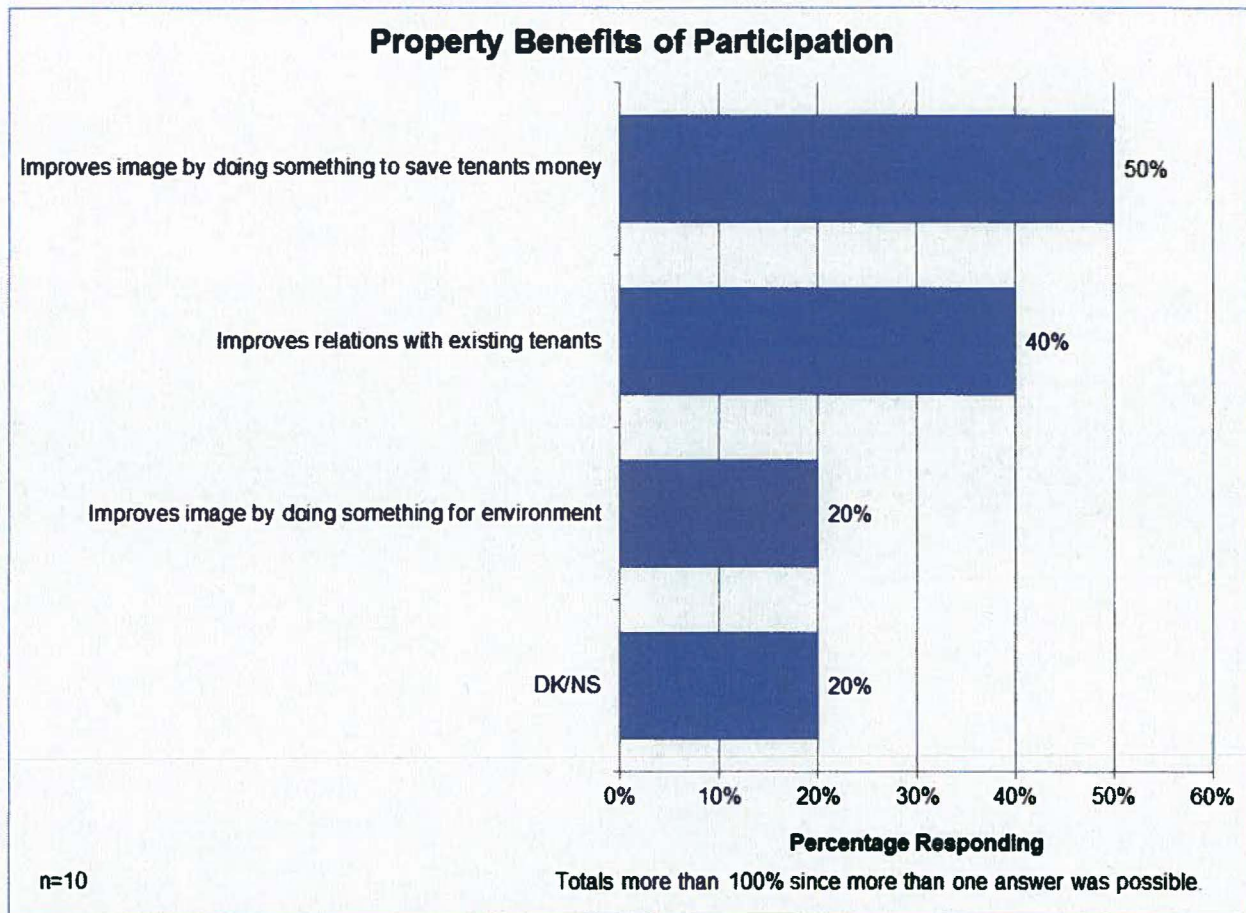


Figure 12. Perceived Benefits to Properties from Program Participation

Tenant Benefits

When asked about their perceptions of tenant benefits (Figure 13), nine out of 10 (90%) of property managers mentioned lower monthly bills and 70% of respondents said that tenants would save money by not needing to purchase bulbs. This later finding is correlated to those properties with policies requiring tenants to supply their own light bulbs.

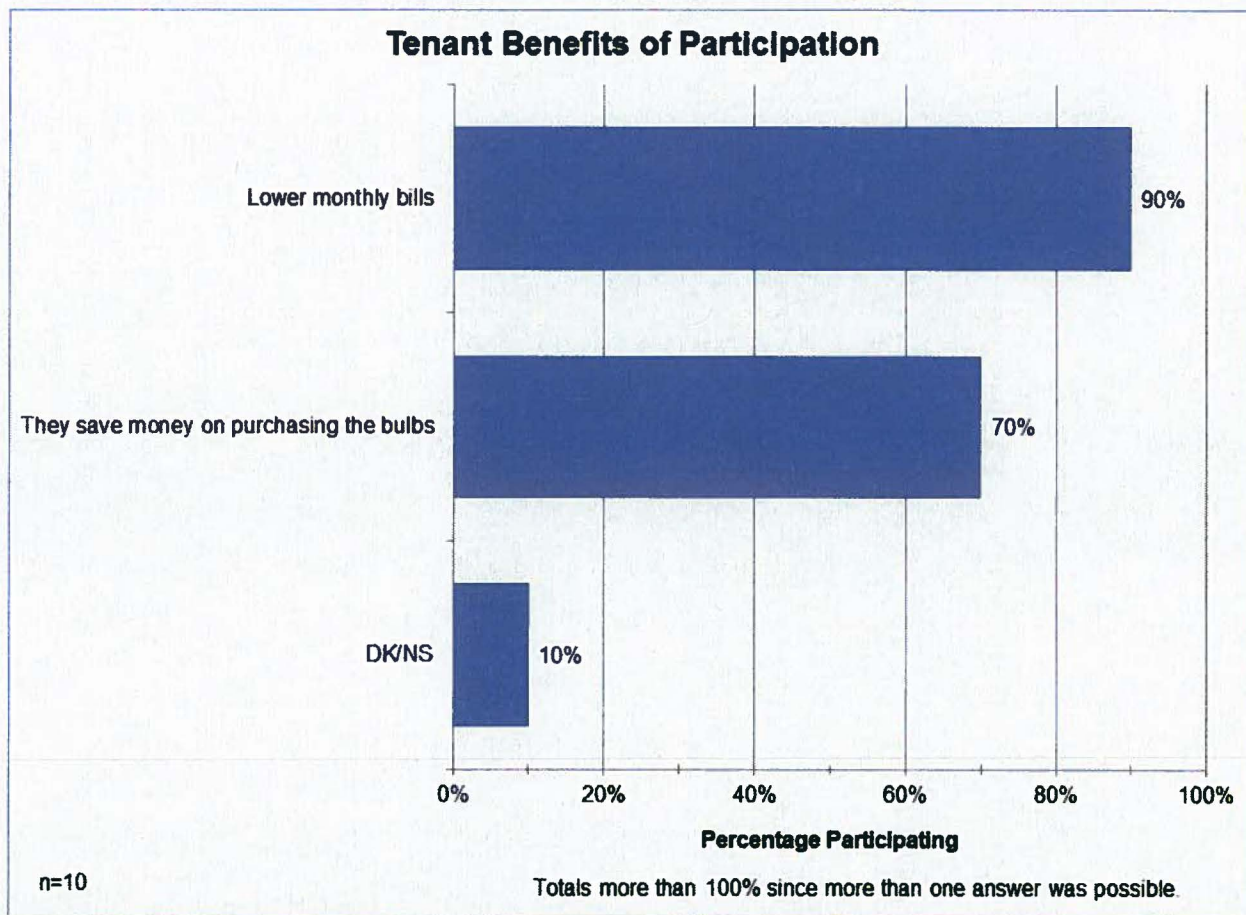


Figure 13. Perceived Benefits to Tenants from Program Participation

Additional Bulb Types and Other Efficiency Assistance Desired

Because the program only offers a single type of bulb, the 13 Watt CFL (60 Watt equivalent), the survey asked property managers about other types of bulbs they felt the program should provide. More than half (60%) requested Hollywood (globe) bulbs for bathroom vanities where bulbs are left exposed for constant viewing. Higher watt equivalent bulbs were also a popular choice with (50%) of respondents requesting them as well. Other less popular bulb types requested include recessed (20%), candelabra (10%), and linear fluorescent (10%) as shown in Figure 14.

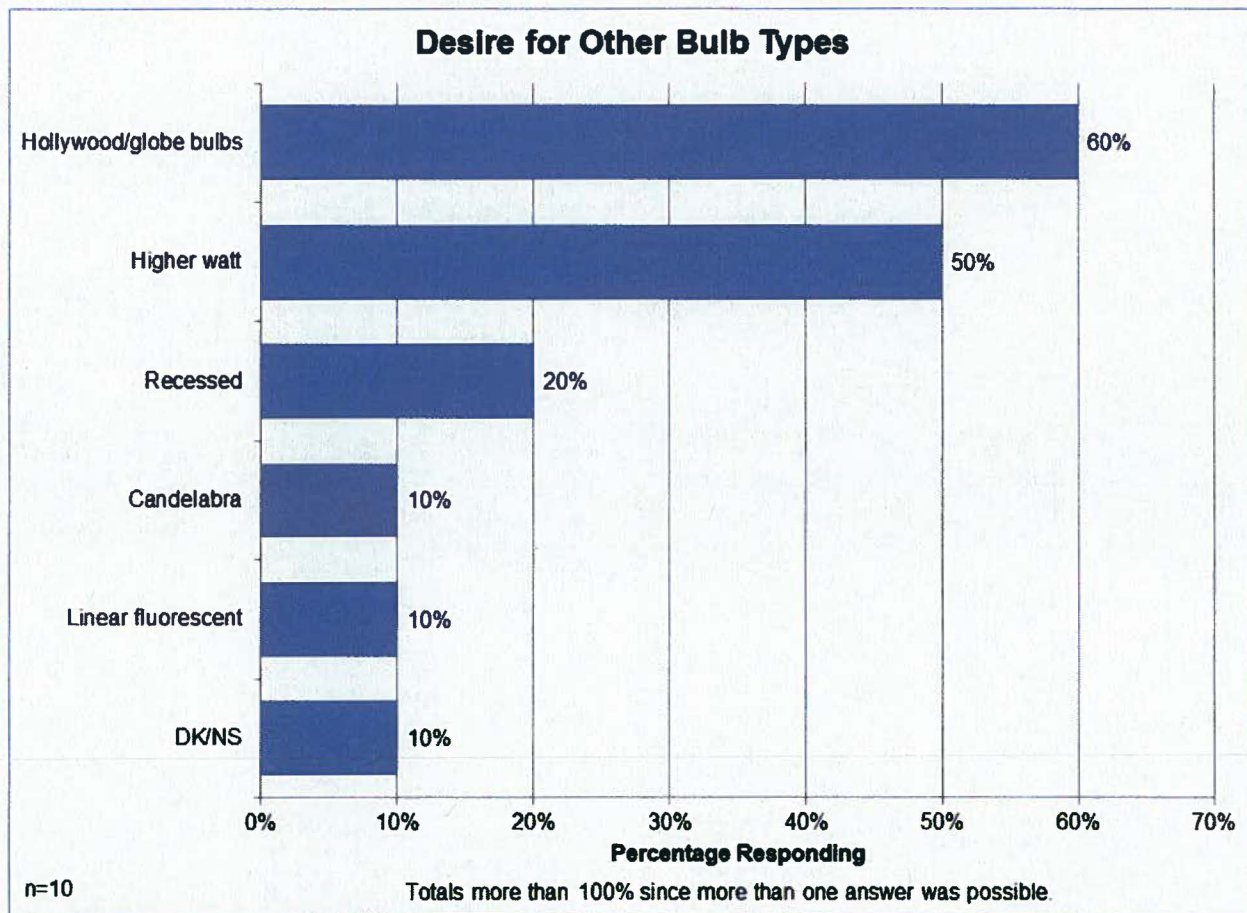


Figure 14. Additional Bulb Types Desired

Other Energy Efficiency Products Desired

In addition to seeking information regarding other bulb types to include in the program, the survey also asked property managers about other kinds of energy efficiency products they desired for their units. Among the products suggested were door sweeps (70%), weather stripping (60%), water heater blankets (50%), programmable thermostats (30%), water saving measures (20%), and powerstrips (10%). A graphic display is shown in Figure 15.

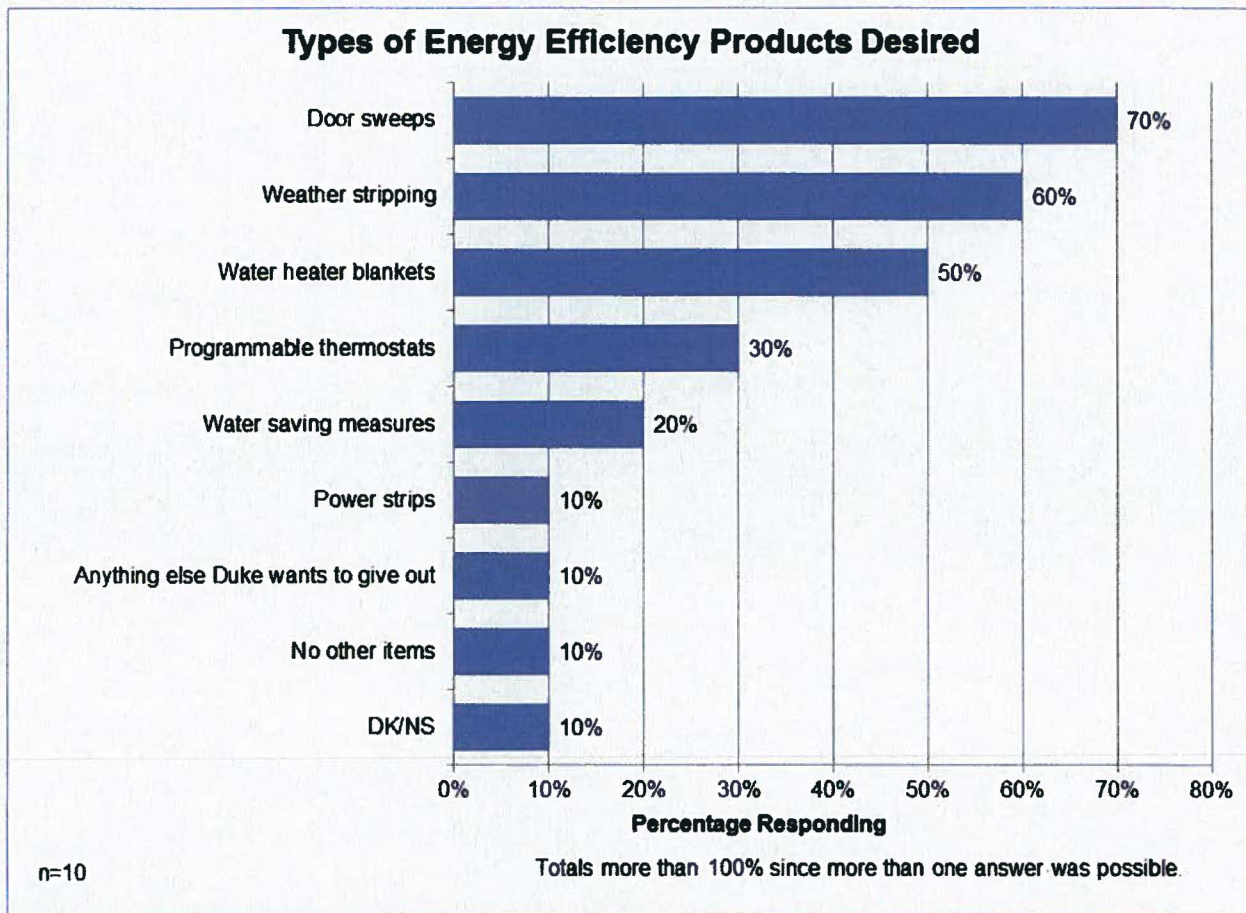


Figure 15. Types of Energy Efficiency Products Desired

Interest in Duke Energy's Appliance Recycling Program

At the request of Duke Energy, TecMarket Works added a question to query property managers about their interest in participating in Duke Energy's Appliance Recycling Program, which offers a financial incentive to program participants for allowing the utility to collect and recycle their older working refrigerators and freezers. That program is currently targeted at homeowners, so this information may be helpful if expansion to landlords is considered. Among the property managers we spoke with, 60% were interested in the program, and another 10% would be interested in the future (Figure 16). Only 10% said they were not interested. Among the two people who provided other responses, one had just replaced refrigerators but would be interested when they start aging. The other property doesn't plan to replace refrigerators until they fail. This strong level of interest indicates that Duke Energy may find eager customers among property management firms, whom as a group represent a sizeable amount of appliance purchases each year.

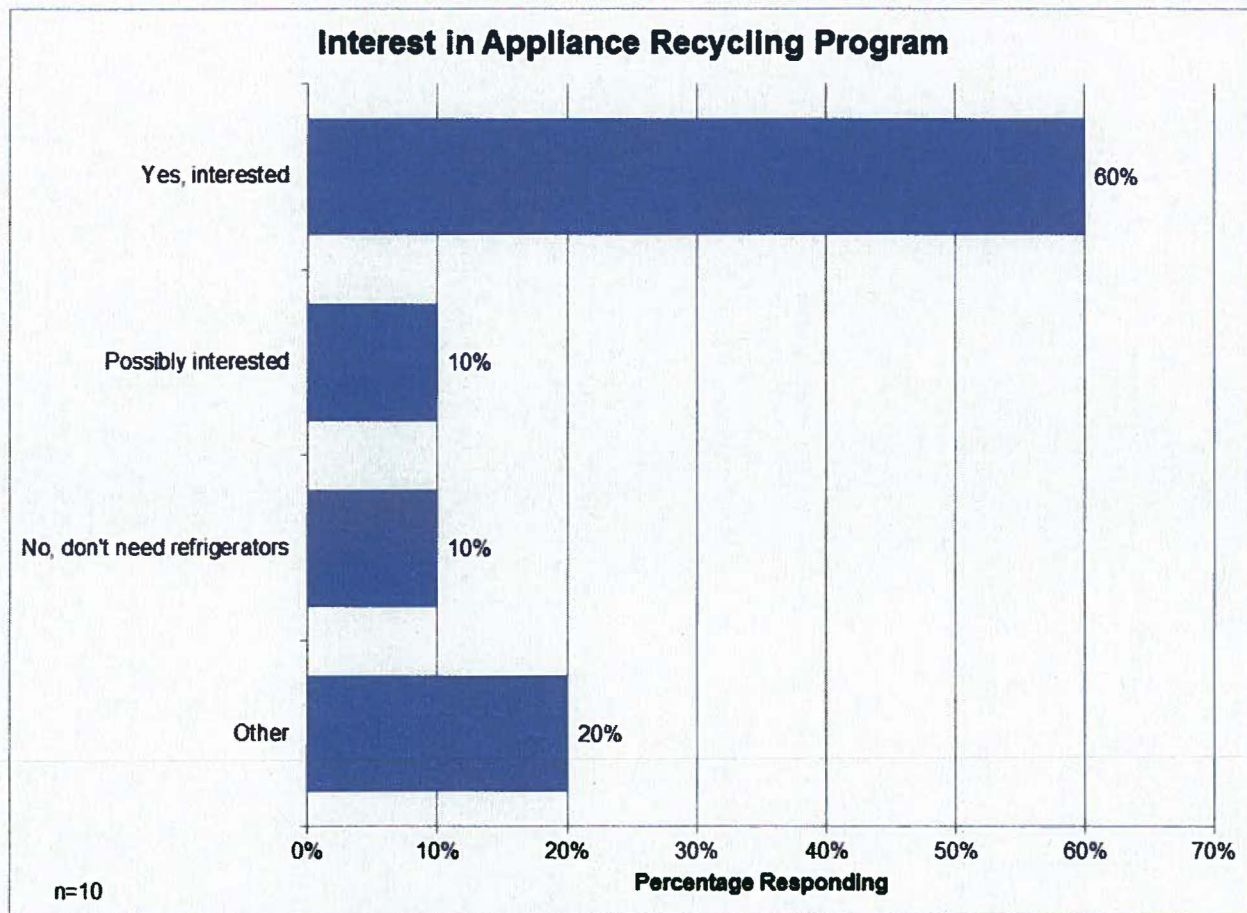


Figure 16. Interest in Appliance Recycling Program

Property Manager Suggestions for Improvement

Overall property managers felt the program ran smoothly. In particular nine out of 10 survey respondents cited their appreciation for the clear communication with Honeywell. One person expressed appreciation for the free bulbs, while another praised the shipping process. When asked what could be improved, two property managers wanted improvements to the shipping process. They made these comments unaware such improvements had been implemented after they had already received their CFLs. The other two suggestions for improvement include great specificity on the part of the program vendor regarding the level of effort necessary and the exact requirements regarding qualifying units and eligible sockets. Their verbatim comments were as follows:

- *You need better shipping. It was a hassle. The rest was fine.*
- *The main issue was getting the actual order approved and shipped.*
- *The follow up paperwork was difficult. Some of our units were house accounts so we had multiple units on one meter, and they would not allow those units to qualify for the program. They didn't tell us that those were not OK until we'd already installed the bulbs and then we needed to take them out. Thank goodness I didn't throw out the old bulbs!*
- *We didn't understand how much work it would be.*

Limited Awareness of CFL Warranty

One other area of improvement that became evident during our conversations with property managers was a general lack of awareness regarding the CFL warranty. The program's policies state that if CFLs arrive broken in transit that properties are to contact Honeywell for replacement. However, if CFLs burn out within two years of the install date, then the properties can call AM Conservation for free replacements. Three quarters (75%) of property managers we spoke with indicated that they were unaware of the CFL warranty or the phone number to use to request replacement bulbs. We therefore suggest that Duke Energy take steps to provide additional means of reminding people of the warranty, such as stickers or magnets and email reminders on a six month cycle. Such efforts will help to ensure that long-term energy savings continue even when the original CFLs fail.

Property Manager Satisfaction

Property Manager Satisfaction with the Program

Property managers rated their satisfaction with the program very highly, giving it an average score of 9.2 on a scale of 1 to 10 with 1 meaning they were very unsatisfied and 10 meaning they were very satisfied. A combined 80% of property managers rated the program as a 9 or 10. No one rated the program lower than 8.

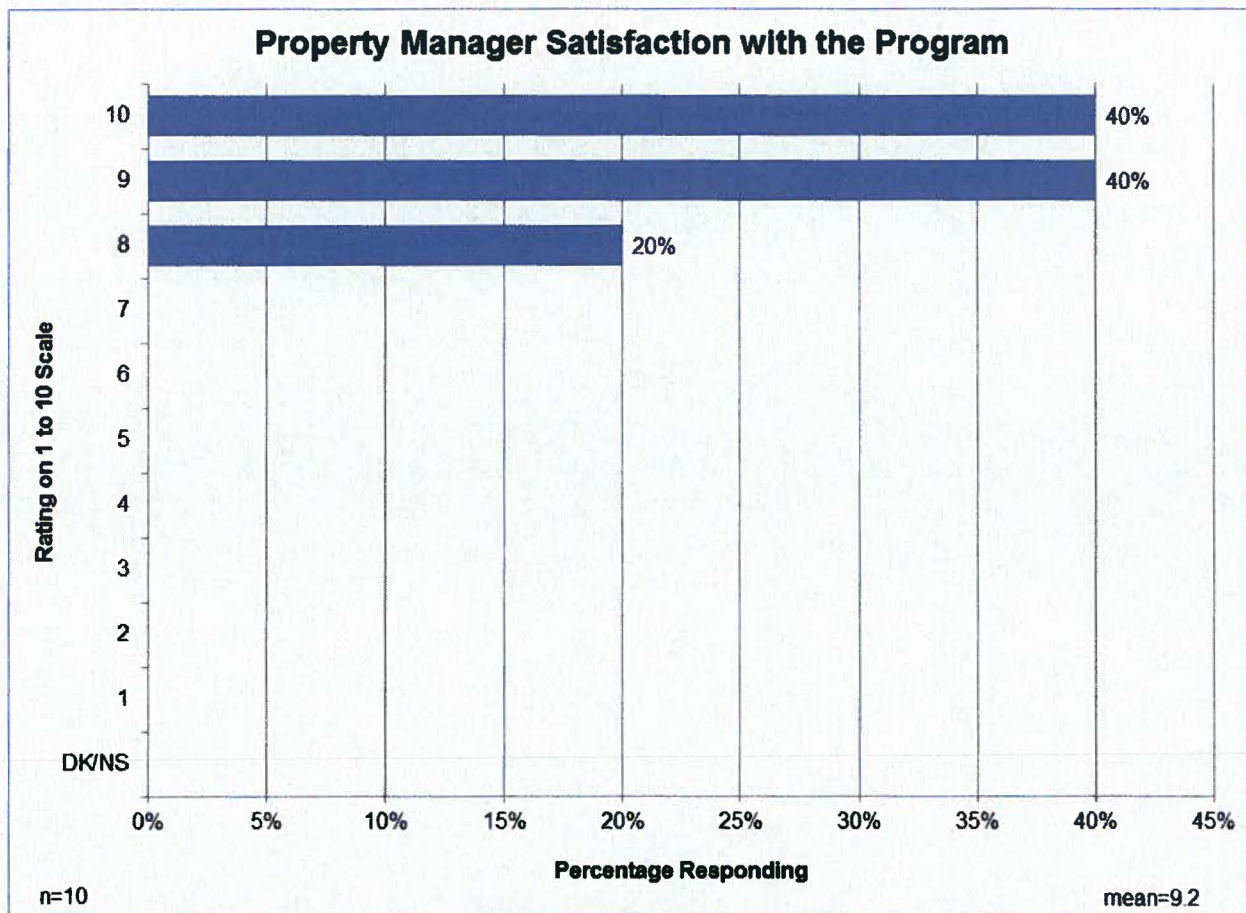


Figure 17. Overall Property Manager Satisfaction with Program

Although the survey did not require comments for satisfaction scores of 8 or higher, a number property managers offered comments explaining their scores. Table 15 provides a display of the scores and reasons for them.

Table 15. Reasons for Satisfaction with Program

Score	Reason for Score of 8 or More
10	The only dings have been storing the leftover bulbs since they didn't pick them up and their under-estimation of the time involved.
9	They get a 9 even with the shipping problem because Honeywell was responsive and fixed things without making it a further issue for me.
8	I'd give it only an 8, since we had some headaches along the way with socket eligibility. They should have told us upfront.
8	An 8 because they did it all for free.

Property Manager Satisfaction with Duke Energy

Property managers were also asked to rate their satisfaction with Duke Energy on a 1-to-10 scale with 1 being very dissatisfied and 10 being very satisfied. Their combined scores generated an average satisfaction of 6.7, with 30% of respondents rating Duke Energy with a 9 or 10 (Figure 18). Reasons for scores lower than 9 primarily focus on customer service and communication

issues, particularly around billing or service connections and disconnections. Specific comments are shown in Table 16 below the figure.

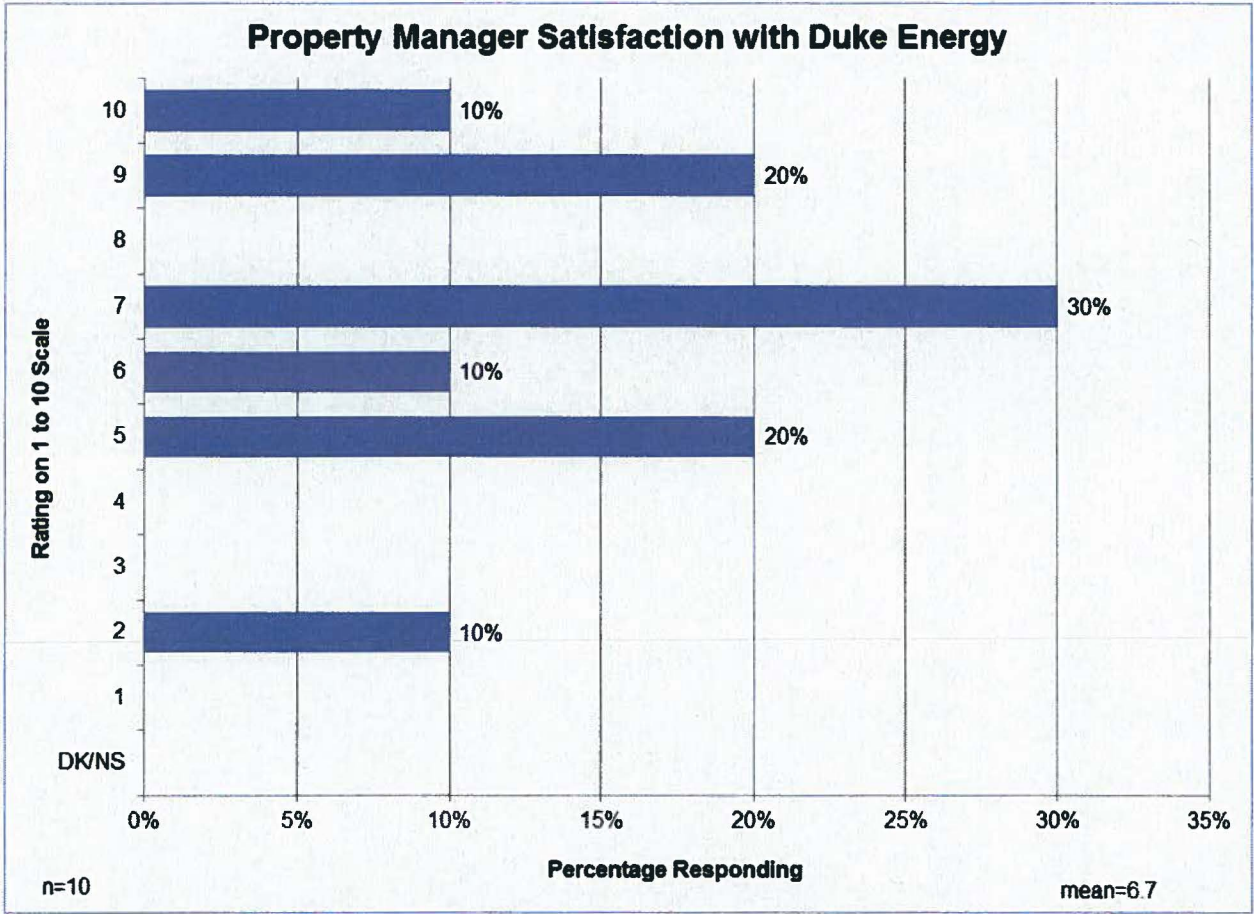


Figure 18. Property Manager Satisfaction with Duke Energy

Table 16. Reasons for Satisfaction Rating with Duke Energy

Score	Reason for Score of 7 or Less
2	We've had lost payment issues with them, power cuts off, etc
5	I'm not a fan of Duke. Rates keep going up. Wait times keep getting longer.
5	They get a 5. I have a nonprofit electric utility for my home and I like them much better. Plus Duke charges more. But the main thing is that Duke is hard to deal with for account changes. Some of their call center people are fine but others are rude and hard to deal with. They should have more training.
6	They get a 6 since it is difficult to pay bills online.
7	I wish they would inform us when they do an account change. The tenant moves out and Duke sends us a bill. I'd like them to call us when they put it in our name, even an email would be helpful, even something like Joe Smith at address is set to shut off service on such a date. That avoids frozen pipes and big bills in our name when the tenant leaves.
7	We didn't understand why Duke was calling our residents. They should have let us know that they were going to be happening. Maybe you could mention in the letter that Duke may be doing a follow up call to check on things. [Note: While this respondent did not say so, this may refer to telephone survey calls made to tenants as a part of this process evaluation.]
7	Duke's customer service has little to be admired. They are hard to deal with when it comes to name and account changes. Is everyone there a beginner? Only one in five phone calls goes through without grief.

Key Findings and Conclusions from Property Manager Interviews

From the perspective of participating property managers, the program appears to be well designed and appropriately administered. Property managers are highly satisfied with the program, giving it with an average satisfaction score of 9.2 on a 10-point scale, and no one rating the program lower than an 8. Suggestions for improvement primarily focused on increased clarity regarding bulb ordering and a streamlined shipping process. Most shipping issues were resolved starting January 2013 when Honeywell began paying for the shipping.

Property managers' average satisfaction rating with Duke Energy was a mean of 6.7 on the same 10-point scale. Those scores were lower primarily due to billing and customer services issues that are unrelated to the program.

Overall the program appears to be effective in increasing CFL usage at multifamily properties. Eight out of ten property managers (80%) said they would not have replaced their existing incandescent lamps with CFLs without the program. All property managers (100%) felt the program was needed to encourage properties to switch away from incandescent lamps, primarily due the cost of buying the CFLs; the free bulbs being the biggest motivating factor for their decisions to participate.

The properties ordered an average of 7.6 bulbs for a one bedroom unit, 10.8 CFLs for two bedroom units, and 10.7 CFLs for three bedroom units. One hundred percent of property managers reported that the most common bulb they stocked for their units was the 60 Watt incandescent, and 90% of survey respondents indicated that the 13 Watt CFL was the most appropriate type of bulb for the program to be providing. Nonetheless, more than half (60%) wanted Hollywood globe bulbs for bathroom vanities and 50% wanted higher watt equivalent bulbs as well.

The program appears to be effective at stimulating a lasting change in buying behavior among a majority of property managers, given that 60% of properties now say they will definitely provide CFLs in the future, and another 10% will do so when existing stocks of incandescents are depleted. Bulb costs were a potential determining factor for 20% of the properties who felt they may revert to incandescents.

Seventy percent of property managers indicated that they had leftover CFLs when their installs were complete, yet only 30% of properties ended up returning the extra bulbs. The remainder kept the extra CFLs on site, installing the bulbs into nonresidential sockets or keeping them in store to replace program CFLs as they burn out. This corresponds with program policy which says that if properties have more than 30 leftover CFLs then Honeywell must come to collect the bulbs and transfer them to another property. If fewer than 30 remain, the properties may keep them.

When asked about the status of the incandescent bulbs removed in order to install the CFLs, one third (30%) of property managers said they threw away the old incandescents, while an additional 30% gave them away for use elsewhere, and 20% stored some of them for future use.

As intended, the program has also stimulated property manager interested in other energy efficiency products for their units, including door sweeps (70%), weather stripping (60%), water heater blankets (50%), programmable thermostats (30%), water saving measures (20%), and powerstrips (10%). Sixty percent of property managers expressed an interest in Duke Energy's Appliance Recycling Program.

With these findings in mind TecMarket Works provides the recommendations below.

Recommendations for Program Improvements

Recommendation: Survey responses and explanatory comments made throughout the property manager interviews indicate that property managers desire greater clarity and more assistance during the bulb ordering phase of the program. While this may not be a significant issue if the program's new third party vendor installs the CFLs directly, obtaining close estimates about the volume of CFLs needed for the property will nonetheless remain important in order to avoid running short or needing to carry over large quantities of unneeded CFLs. For this reason, we encourage Duke Energy to clarify socket eligibility rules with properties prior to obtaining bulb count estimates.

Recommendation: Work to increase property awareness of the CFL warranty. Despite the fact that current program practices inform the properties of the CFL warranty at the start and end of the process, 75% of property managers that we spoke with during interviews indicated that they were unaware of the warranty or how to make a replacement request. This lack of awareness seemed to have less to do with Honeywell's lack of effort and more to do with the nature of information transfer or recording keeping at the properties themselves. Nonetheless, increased messaging about the warranty will help to maintain customer satisfaction and ensure that burned out CFLs are not replaced with less efficient incandescents, thereby diminishing the program's energy savings.

Recommendation: Providing an option for ordering higher-watt equivalent and Hollywood-style globe CFLs could help to increase socket penetration numbers for the program.

Recommendation: Having successfully participated in the CFL install program, many property managers expressed an interest in finding other ways to increase the energy efficiency of their units. Such a willing audience presents Duke Energy with an excellent opportunity to suggest—or better yet directly install—additional energy saving measures including building envelope improvements, water-saving devices, and HVAC enhancements. Therefore, consider expanding the program to include one or more of the above suggested items as interest and program budgeting dictates.

Recommendation: Likewise, property managers expressed an interest in participating in Duke Energy's Appliance Recycling Program. Because property managers represent one of the largest groups of refrigerator purchasers, this has the potential to capture sizable energy savings. Thus we recommend that Duke Energy investigate expanding that program's eligibility rules and participation guidelines to allow collections from multi-family communities.

Tenant Survey Results

From December 6 to 17, 2013, TecMarket Works completed phone surveys with 82 tenants from a pool of 739 valid program participants in the Kentucky service territory. Tenants were contacted a maximum of four times or until they completed survey or refused to participate in the survey. The data collection instrument is shown in *Appendix C: Tenant Survey Instrument*.

CFL Installs

Number of CFLs Now Installed

Among 82 tenants we spoke with, two thirds (65.9%) confirmed that their landlords had installed CFLs (45%) while 17.1% said that their landlords had probably installed the CFLs (Figure 19). This compared to the 14.6% who indicated that CFLs had not been installed by their landlords. An additional 2.4% said they were unsure. Regardless of this response, all tenants continued with the remainder of the survey.

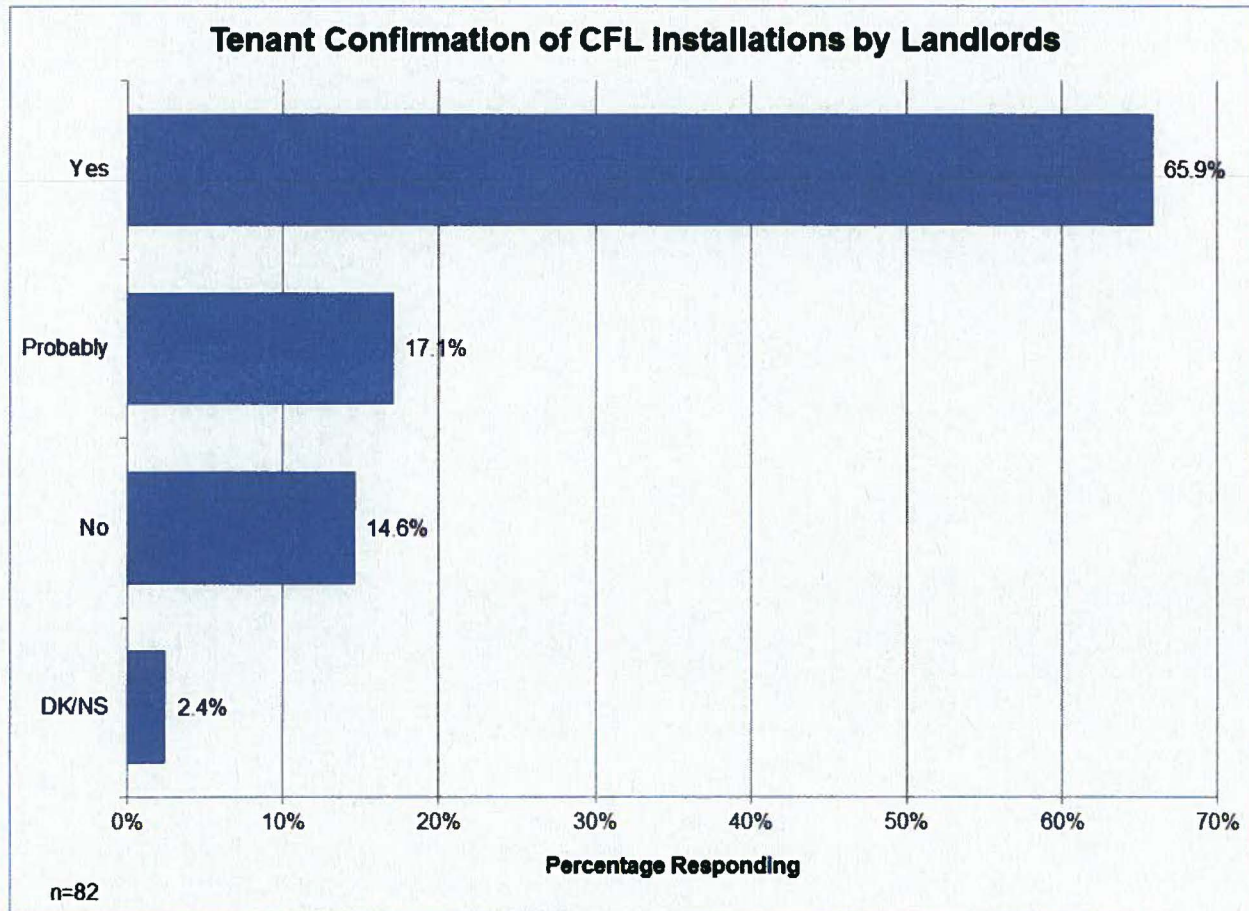


Figure 19. Tenant Confirmation of CFL Installs

After establishing whether their landlords had installed CFLs, the survey next asked how many of the program CFLs were currently installed in the permanent fixtures of their homes. Ninety eight (97.6%) percent of tenants surveyed claimed to have at least one CFL installed in a permanent fixture of their home (Figure 20). Two people (2.5%) were unsure about the number

of CFLs installed in their homes, but no one claimed to have zero CFLs. Overall the survey respondents reported having an average of 8.6 CFLs apiece, while 10 CFLs represented the mode. One person claimed to have more than the program’s 12 CFL allowance, but this is possible given that tenants also install their own bulbs.

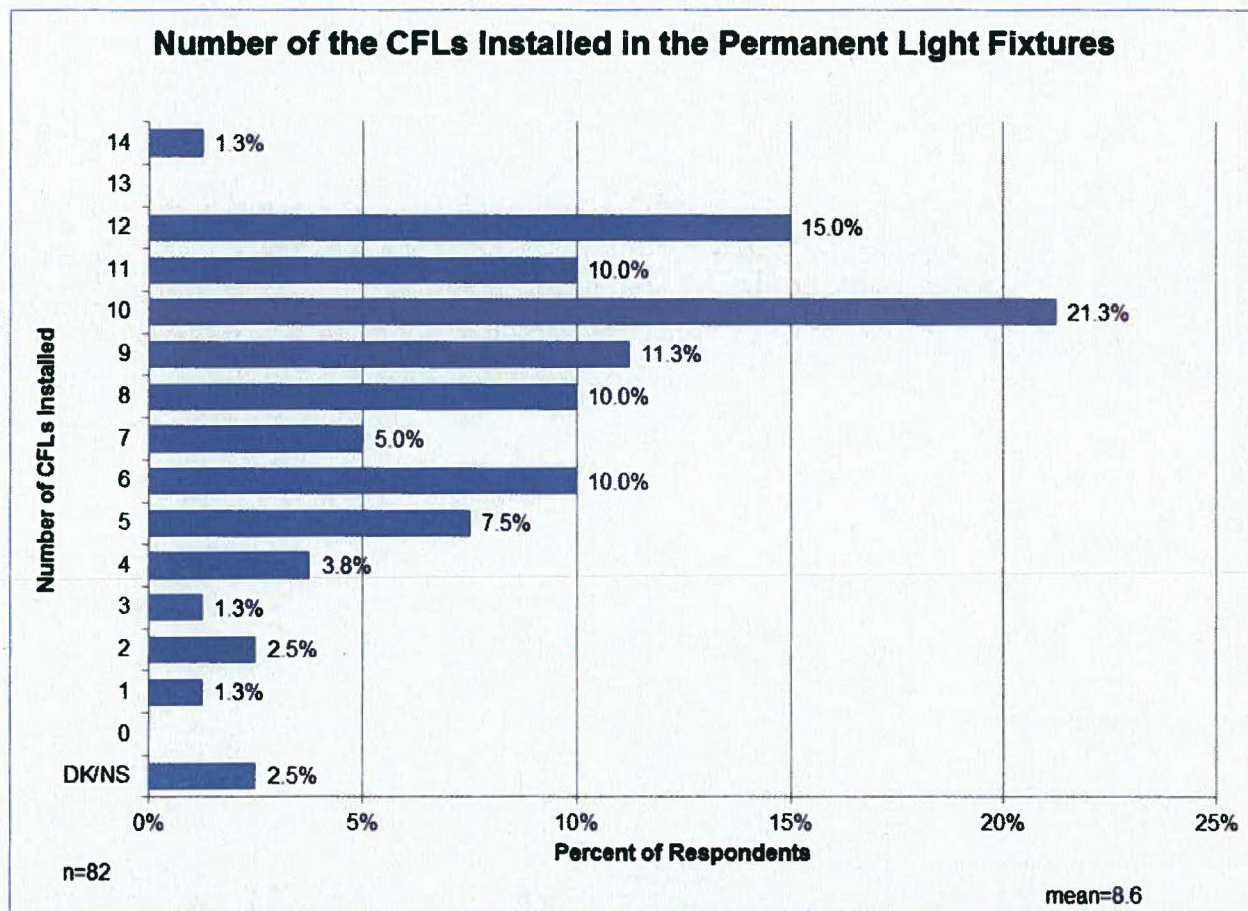


Figure 20. Percent of Respondents with CFLs Installed in Permanent Fixtures

Location of New CFLs

The most common locations for CFL installs were bathrooms (27.1%) and kitchens (21.2%), which when combined accounted for nearly half (48.3%) of all replacement locations. Living rooms (17.4%) and dining rooms (14.8%) represented the next tier of responses, while master bedrooms (9.3%) and halls (8.5%) had fewer installs. Closets and second bedrooms each represented 0.4% of installs. No other locations received any CFLs at all. Figure 21 shows the full distribution of responses by location.

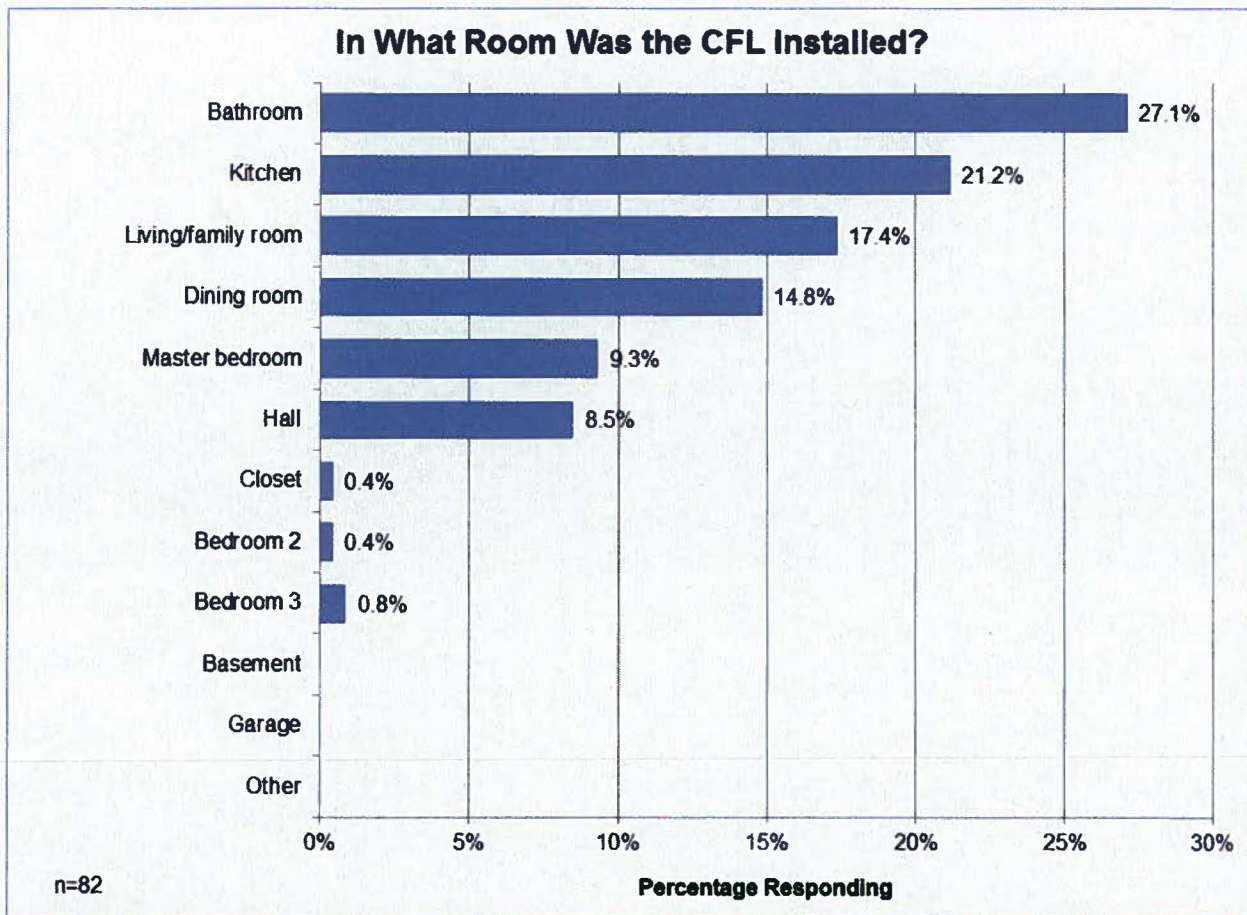


Figure 21. Location of Bulb Replaced

Removed or Replaced CFLs

When asked if any of the new CFLs had been removed for any reason, 19 people (22.6% of all respondents) indicated that someone had removed a combined total of 37 CFLs (

Table 17). Of the 19 respondents, 4 people said their landlord had removed the CFLs. In each of those four instances, the CFLs were replaced with other CFLs from the properties' supplies. Eleven tenants said they removed one or more CFLs; and of these 9 CFLs were replaced with other CFLs, while 20 CFLs were supplanted with incandescents. Two sockets were left empty.

Table 17. Number of CFLs Subsequently Removed or Replaced

Answer	# Responses	% Responses	# CFLs	% CFLs
No	64	76.2%	0	0.0%
Yes, my property manager replaced them with one or more CFLs from the company's supply of bulbs	4	4.8%	8	21.6%
Yes, my property manager replaced them with one or more normal incandescent bulbs from the company's supply of bulb	0	0.0%	0	0.0%
Yes, I replaced them with one or more CFLs of my own	4	4.8%	9	24.3%
Yes, I replaced them with one or more normal incandescent bulbs of my own	9	10.7%	20	54.1%
Left the socket empty	2	2.4%	0	0.0%
Don't know / Not sure	1	1.2%	0	0.0%
Total	84	100.0%	37	100.0%

Note: Totals 84 responses because two people gave more than one answer.

When asked to explain why the CFLs had been removed, 19 people provided reasons. Of these, more than half (52.6%) said the CFLs were replaced because they had burned out. Seven people (36.8%) said they replaced the bulbs because they were not working properly, with three of these people specifically commenting that the bulbs were flickering. Two people (10.5%) said the CFLs were not bright enough (Table 18).

Table 18. Reasons Why CFLs Were Removed or Replaced

Why did you remove or replace them?	# Responses	% Responses
Not bright enough	2	10.5%
Not working properly	7	36.8%
Burned out	10	52.6%
Total	19	100%

Estimated Hours of Bulb Use

CFL Usage Estimates

In order to determine the average hours of use per bulb per day, tenants were asked to estimate the typical hours of use for the first three CFLs that were directly installed in their homes. They indicated that more than half (56.0%) of CFLs were used for two hours or less per day. More specifically, 21.4% of CFLs was used for less than one hour day, and more than one third (34.6%) were used for between one and two hours per day (See Figure 22). Overall tenant estimates generated an average of 3.4 hours per day. Respondents indicated that bathroom lights typically ran between one to two hours per day, while kitchen lights commonly shone for three to four hours per day.

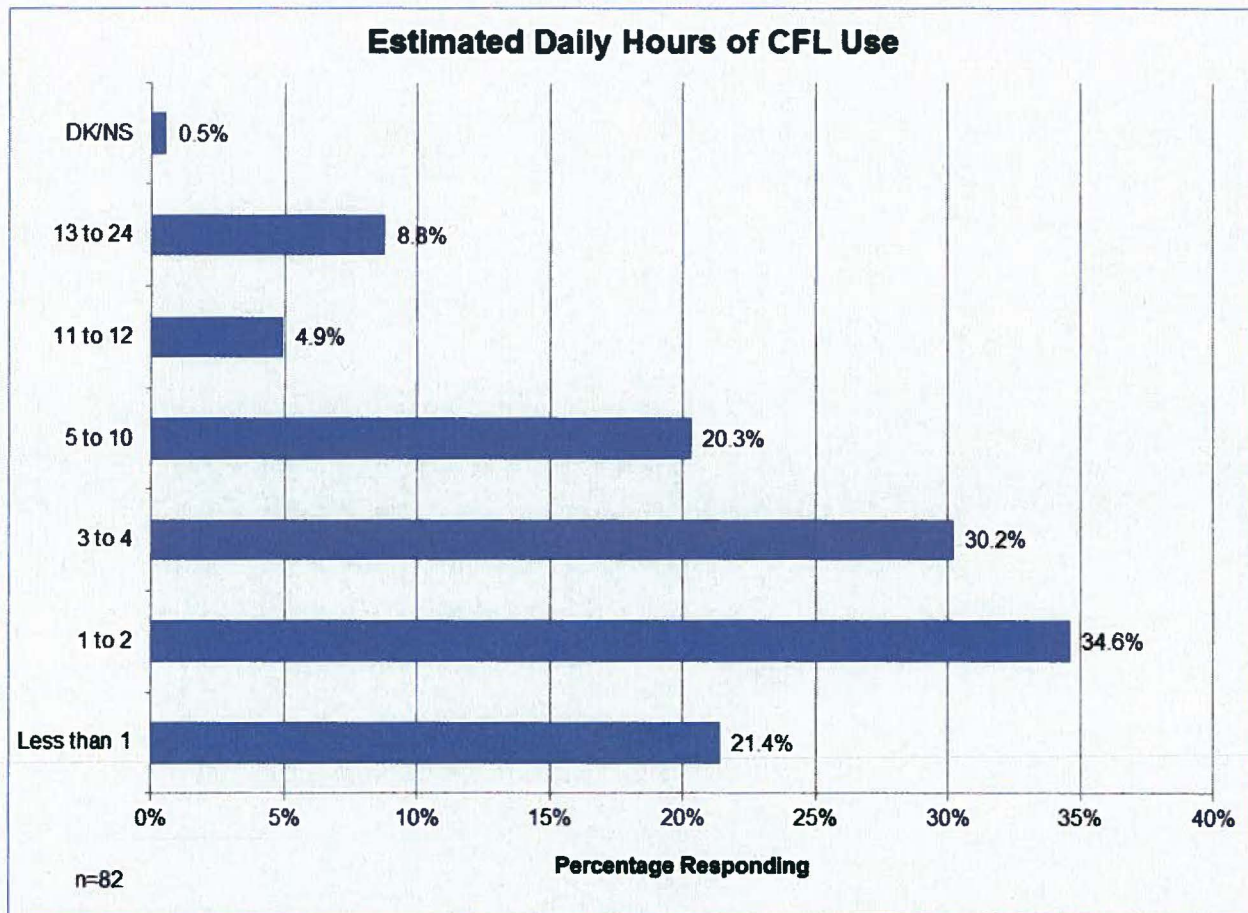


Figure 22. Estimated Hours of Bulb Use per Day

Ninety one percent (91.5%) of tenants indicated that their hours of bulb usage remained the same after the new CFL were installed (Figure 23). Some 5.5% said they were now leaving the new CFL on longer than the old bulb, while 2.1% indicated that their usage had decreased. Among those whose usage had gone up, the average increase was 1.8 hours per day. Among those whose usage had gone down, the average decrease was 5.7 hours per day. Total hours for decreased use (28.5 hours) were greater than the total reported increases (23.25 hours).

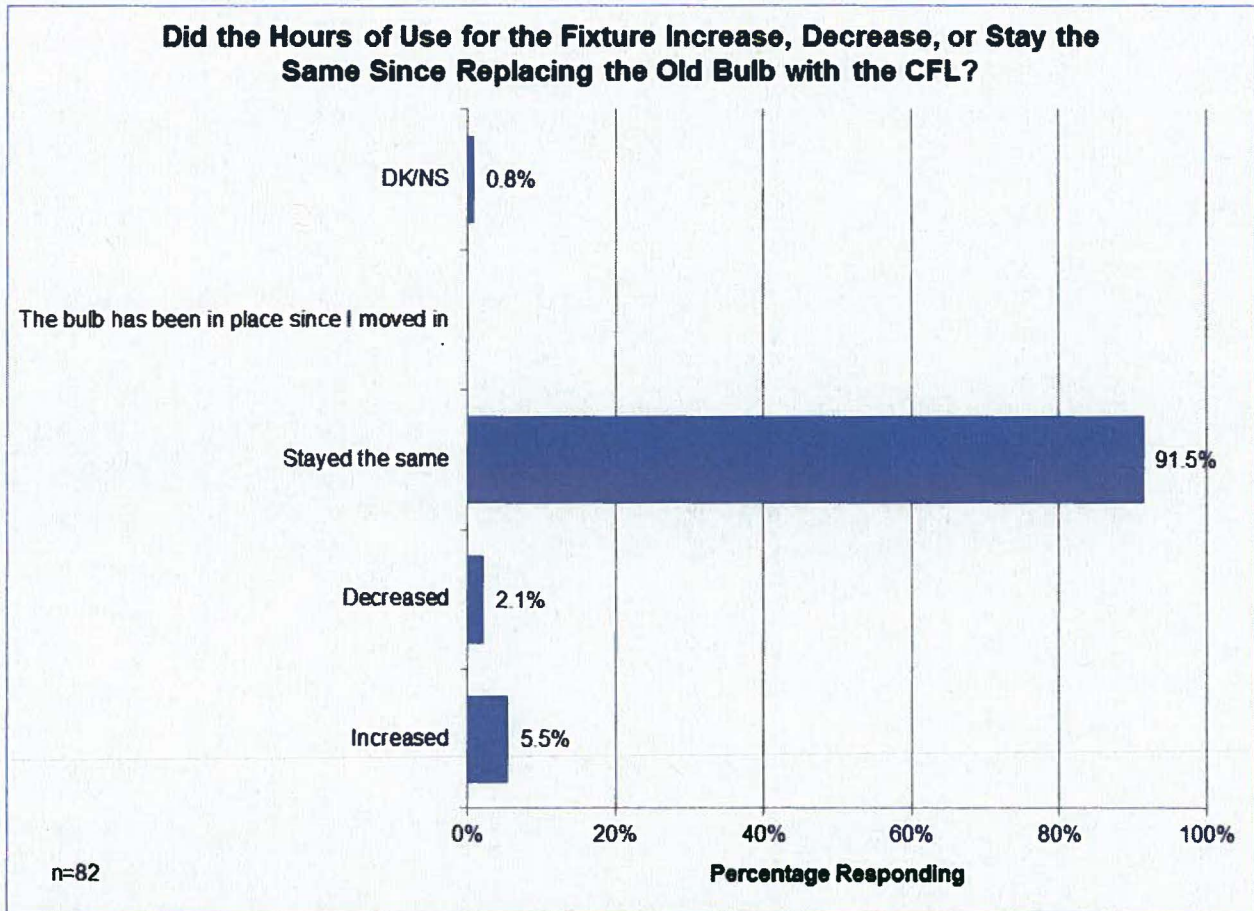


Figure 23. Changes in Usage Since Bulb Replacement

Non-CFL Usage Estimates

CFL socket penetration among program participants appears to be fairly widespread with 31.7% reporting that they now have zero non-CFL bulbs installed in their homes, and nearly three quarters 73.2% of respondents indicating that they have three or fewer non-CFLs installed. Ninety-five percent (95.1%) had six or fewer non-CFLs installed. The mean number of installed non-CFLs was 2.4 per household. Figure 24 displays the full range of responses.

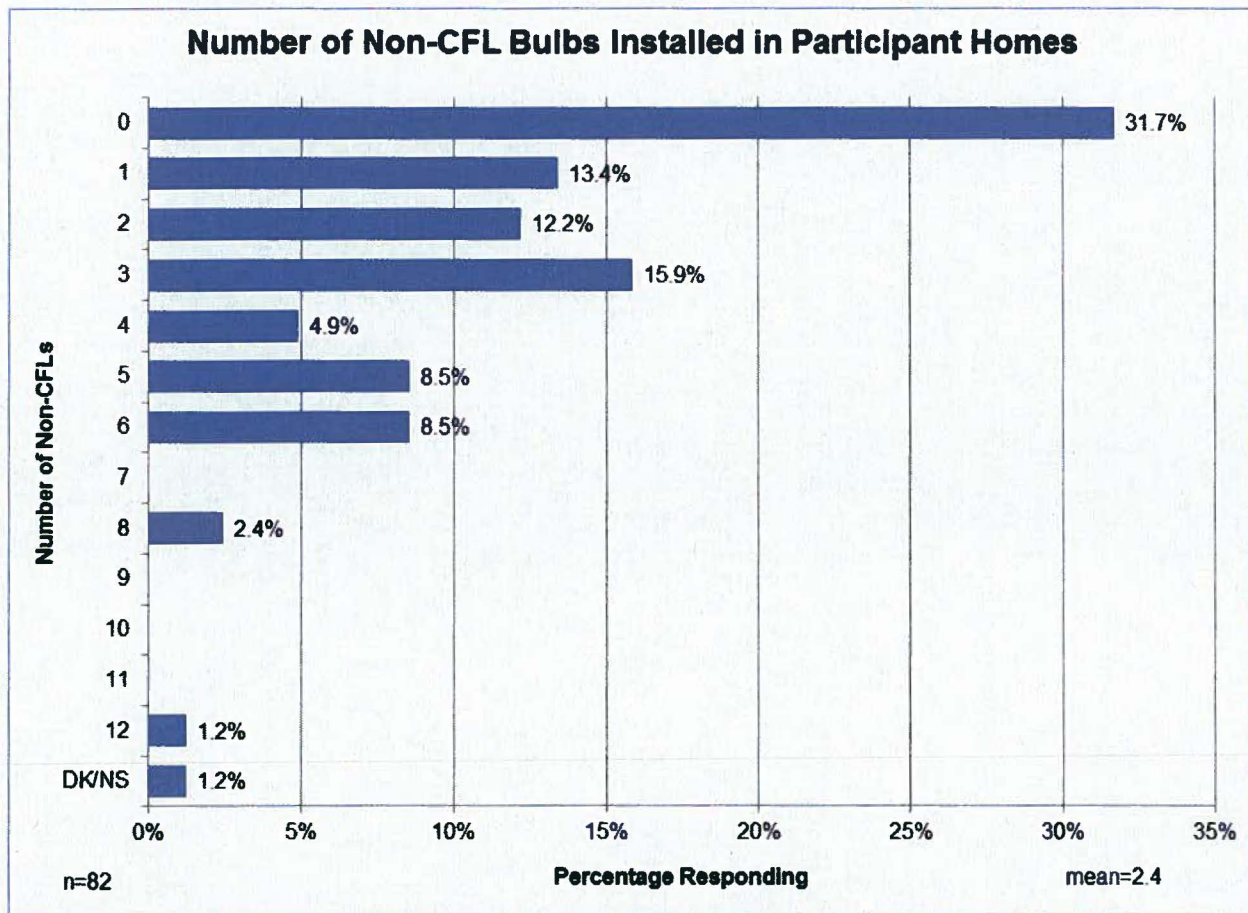


Figure 24. Estimated Number of Non-CFLs Installed in Home

When asked how many of non-CFL bulbs were used for more than two hours per day, more than half (53.7%) of respondents said they had zero non-CFL bulbs that were used for more than two hours per day. In all, survey participants indicated that they averaged fewer than one bulb apiece (mean = 0.96) that was used for more than two hours per day (Figure 25).

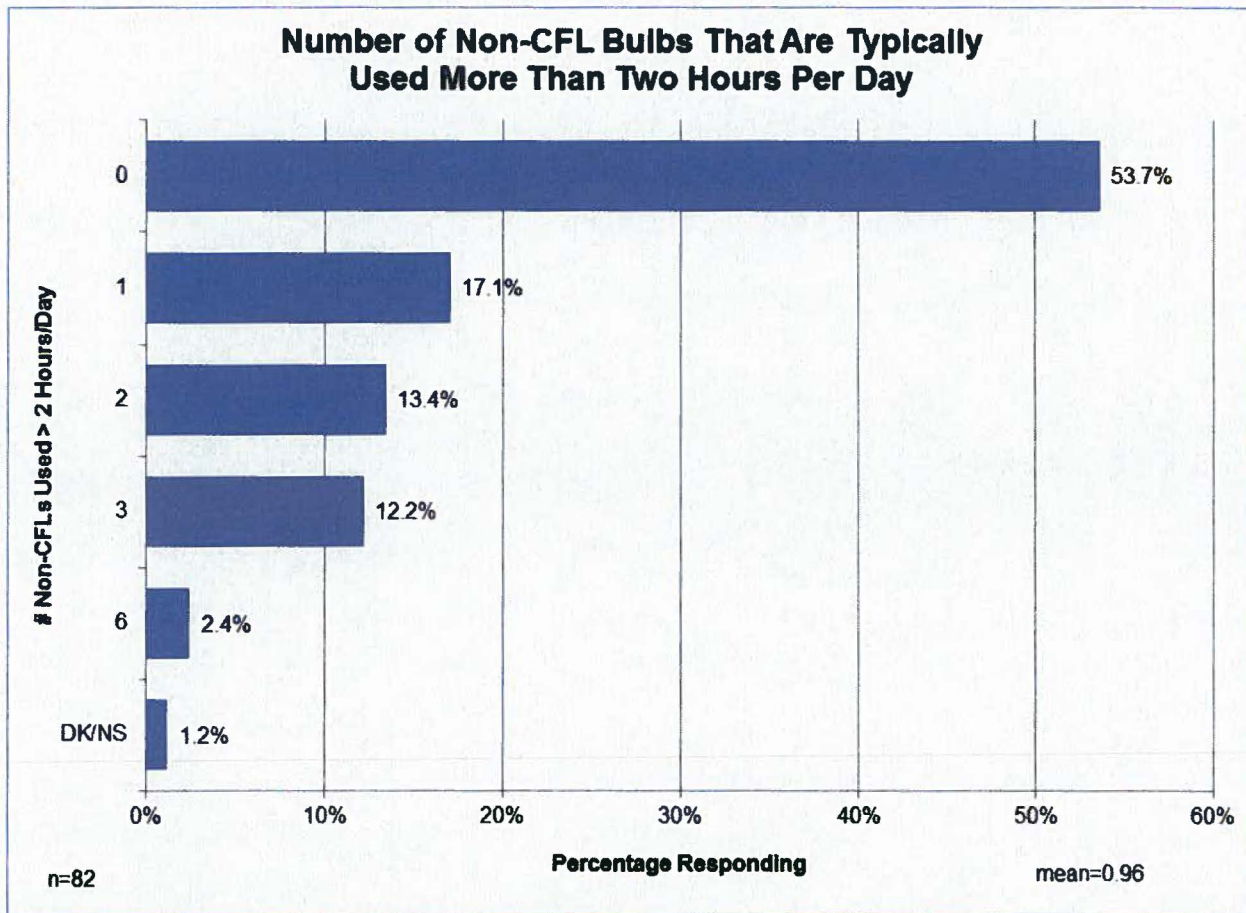


Figure 25. Estimated Hours of Non-CFL Bulb Use

Types of Bulbs Displaced by the Direct Install Process

To better understand the energy savings associated with the program, the survey asked tenants if they recalled the type and wattage of three of the bulbs that had been displaced by the new CFLs. According to their recollections, the vast majority (93.6%) said the bulbs removed were some type of incandescent lamp. This compared to 3.4% who claimed that the displaced bulb was a CFL and 3.0% who were unsure of the bulb type or wattage (Figure 26). The most common (42.8%) displaced category of bulb was incandescents of between 45-70 W; in other words, 60 W bulbs. These findings correspond with results from the property managers survey discussed previously that revealed that the most common type of bulb that they stocked for replacements was the 60 W incandescent, with a mix of other wattages for special locations such as range hoods or for particular tenant populations such as senior citizens who desire brighter lighting.

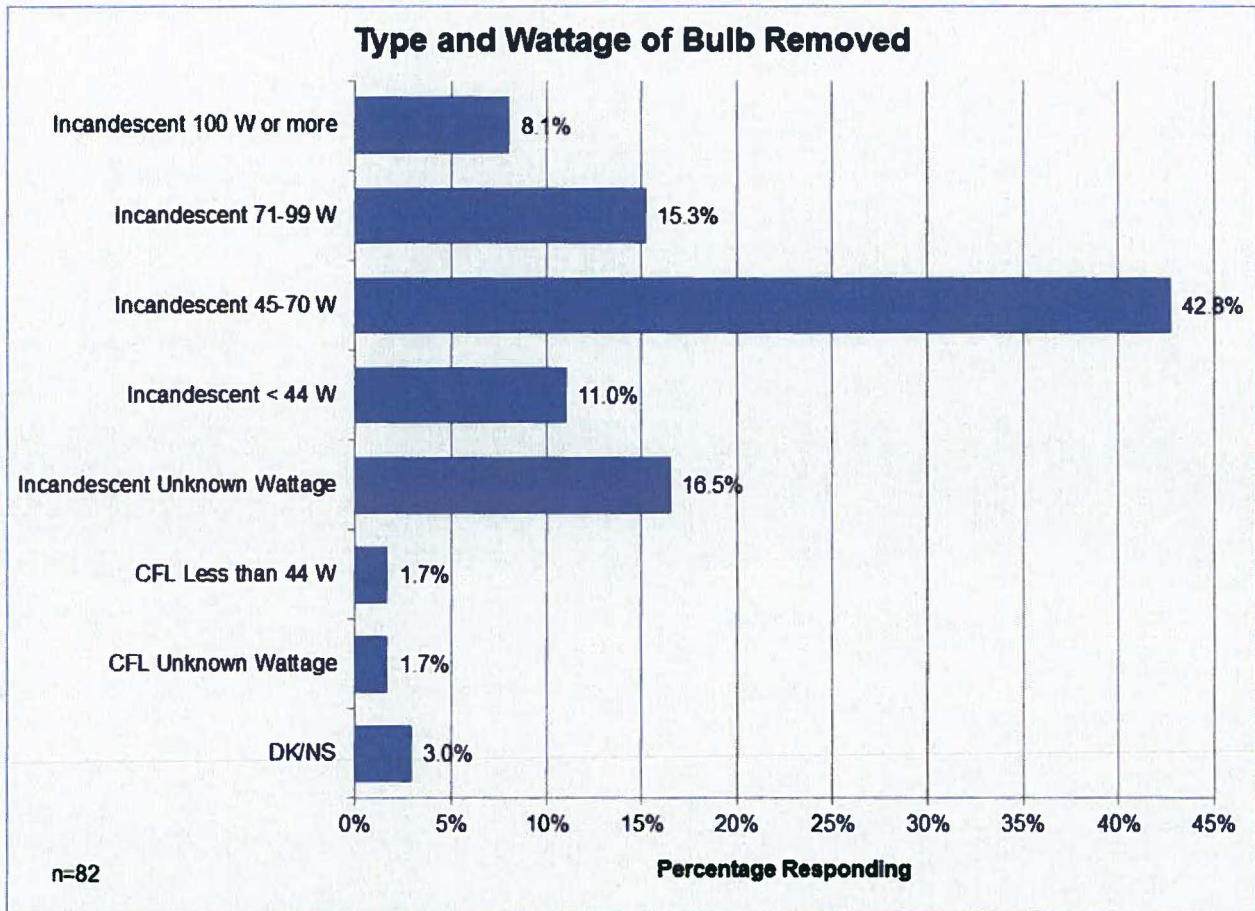


Figure 26. Type of Bulb Removed

Disposition of Removed Original Bulbs

When asked to describe what happened to the original bulbs that were removed, 41.6% of tenants said the installer had removed them. Of the remainder of people who were given the bulbs, one third (33.9%) stored them, 18.6% threw them away, and 2.3% recycled them. Three percent (3.6%) were unsure what happened to the original bulb (Figure 27).

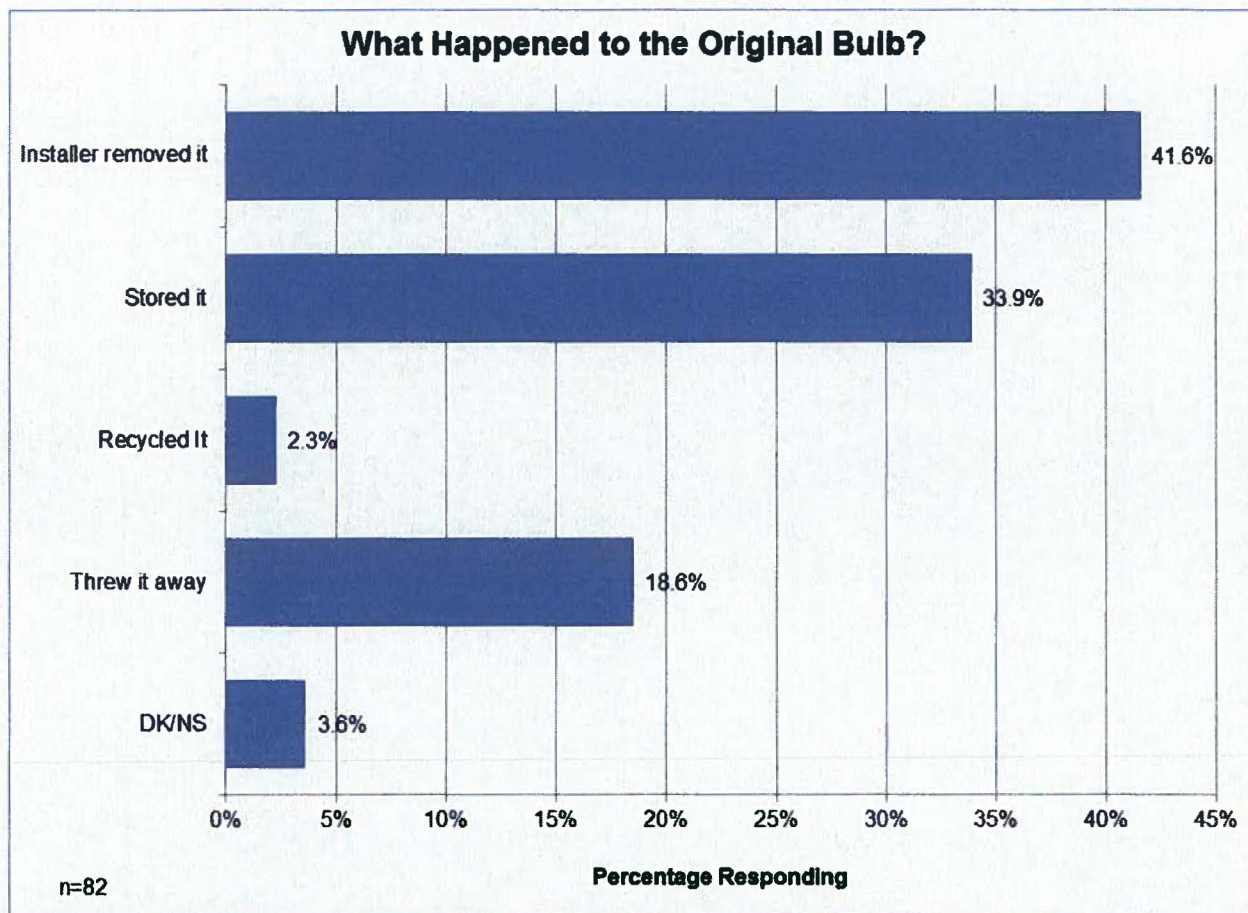


Figure 27. Disposition of Old Bulb after Removal

Incandescent Replacement Bulbs in Storage

To help ascertain the likelihood that the new CFLs would be replaced by less efficient incandescent bulbs when the CFLs burn out, the survey asked respondents how many incandescents they had in storage (Figure 28). Thirty nine percent (39.0%) reported that they had zero incandescents in storage. Among those who did have incandescents on hand, 2.4% said that they'd stored two or fewer bulbs, while more than twenty percent (20.7%) of respondents had three or more incandescents. The average number of incandescents in storage was 3.8. Note that these bulbs in storage are those belonging to the tenants and the counts do not include any bulbs that may be held in storage at properties that provide replacements for burned out bulbs in permanent light sockets.

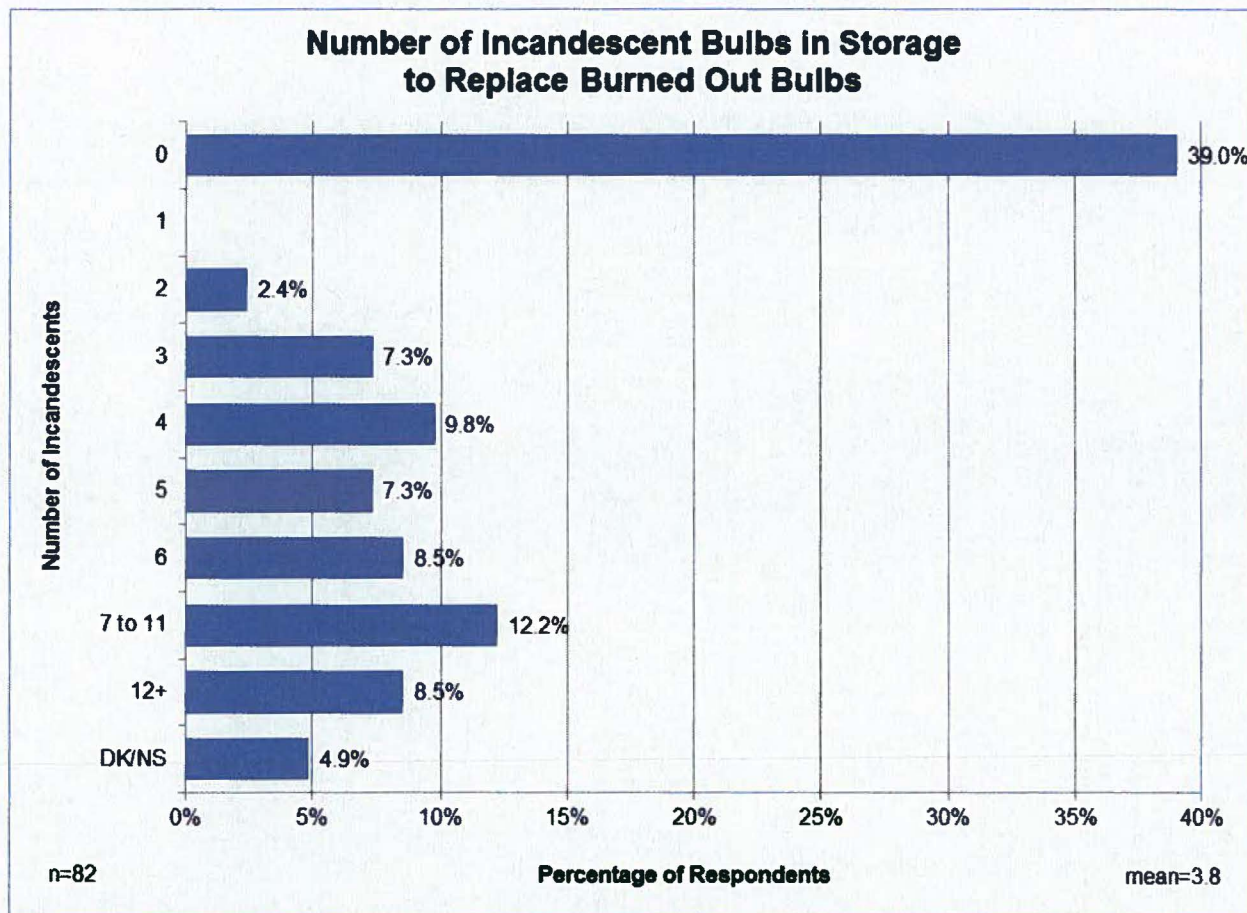


Figure 28. Number of Incandescent Bulbs in Storage

Prior CFL Usage

Because this program design requires the direct installation of CFLs by the property managers rather than having tenants order the bulbs themselves, TecMarket Works set out to determine how many tenants had previous experience with CFLs in their homes. We first asked tenants how many CFLs they were using in their homes prior to participating in the program (Table 19). Among those we surveyed, more than two thirds (68.3%) indicated that they had no CFLs previously installed, while 30.5% reported that prior to participation they had installed one or more CFLs in their homes and 1.2% said that CFLs were installed before they moved in.

Table 19. Number of Tenants with Previously Installed CFLs

How many CFLs were you using in your home before your property manager had the new bulbs installed?	Number of Respondents (Total n = 82)	Percent of Respondents
Yes, I installed one or more CFL bulbs	25	30.5%
CFL bulbs were installed before I moved in	1	1.2%
No	56	68.3%
DK/NS	0	0.0%

To further assess the depth of CFL penetration, the survey asked how many CFLs were previously installed. As seen in Table 20, among those who had CFLs in their homes, more than half (52.0%) had two or fewer CFLs. One person (4%) indicated already having 12 CFLs in the home. The average number of previously installed CFLs was 3.8 per home with a range of between zero and 12.

Table 20. Number of Installed CFLs Prior to Program

Number of CFLs Previously Installed	Number of Respondents (Total N = 25)	Percent of Those With Previously Installed CFLS
0	0	0.0%
1	4	16.0%
2	9	36.0%
3	1	4.0%
4	1	4.0%
5	3	12.0%
6	4	16.0%
7	1	4.0%
8	0	0.0%
9	1	4.0%
10	0	0.0%
12	1	4.0%
DK/NS	0	0.0%

When asked how long they had been using CFLs, nearly two thirds (62.2%) said that this was their first time. Those with previous experience included: 8.5% with a year or less, 11% with between one and two years of experience using CFLs, 7.3% using them for two to three years, 2.4% for three to four years, and 8.5% with four or more years of CFL usage. Among those who had begun using CFLs prior to joining the program, the average time of prior use was 2.2 years (Figure 29.)

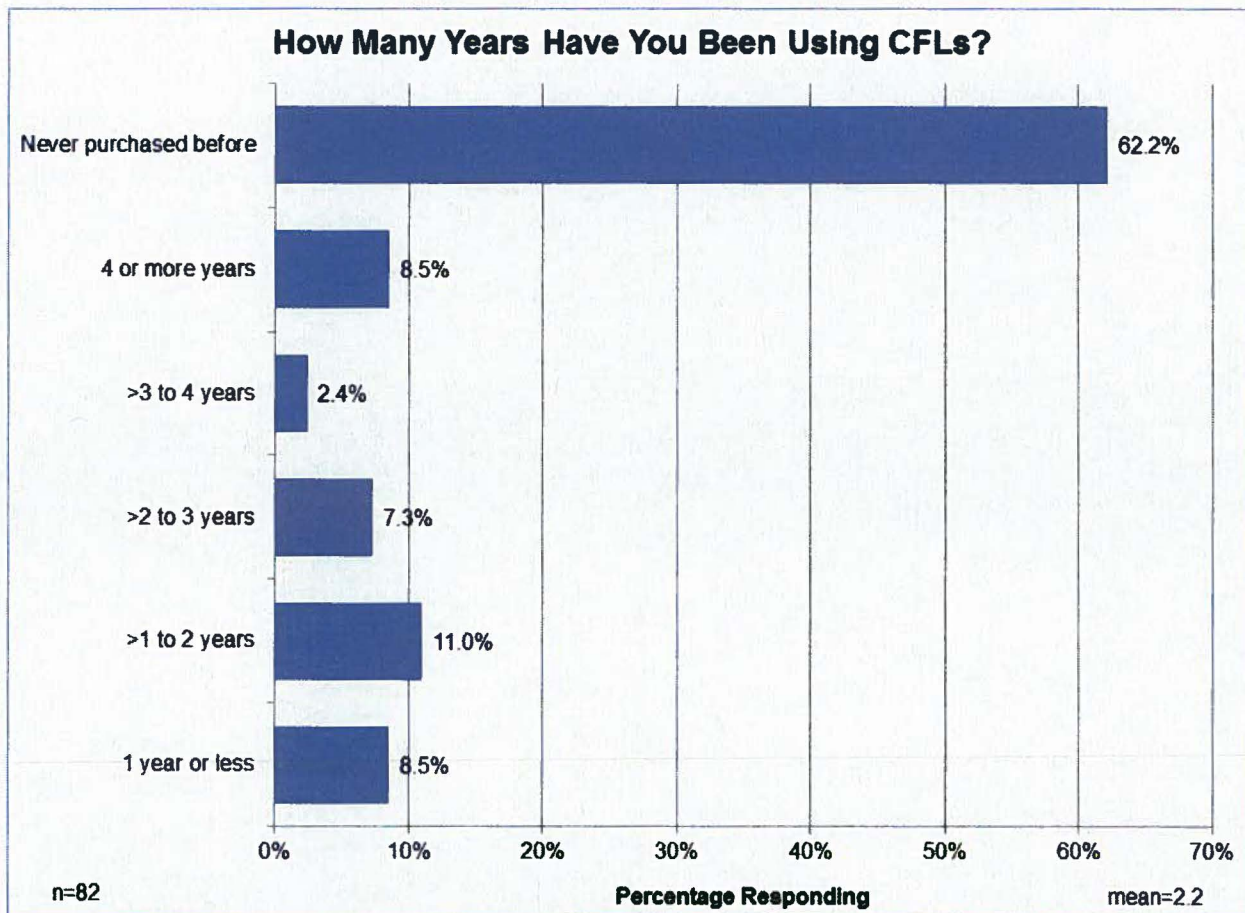


Figure 29. Number of Years of Prior CFL Usage

Propensity for Future CFL Usage

To determine the program's impact of future CFL usage, the survey first asked customers about the likelihood of their purchasing CFLs before they had participated in the program. Among those we spoke with 43.9% said they had no intention of buying CFLs prior to their participation, compared to 31.7% who said they did intend to buy CFLs and 24.4% who might have made such a purchase. This helped set the baseline for understanding the program's influence on future CFL purchases.

That influence appears to be substantial. Nearly three quarters (74.4%) of surveyed tenants said they were more likely to purchase CFLs after their experience in the program, while only 8.5% said they were less likely. Seventeen percent (17.1%) indicated they were neither more nor less likely. When asked to rate the likelihood of buying and using CFLs in the future on a scale of 1 to 10, with 10 being the most likely, almost two-thirds (64%) rated their likelihood at a 9 or 10. The mean likelihood was 8.4. Figure 30 shows the distribution of scores.