MEMORANDUM

TO: **Ameren Illinois Company**

FROM: **Opinion Dynamics**

DATE: **2/19/2013**

RE: 2012 In-Home Lighting Assessment

This memo provides the results from the in-home lighting audits that Opinion Dynamics completed for Ameren Illinois Company (AIC) in 2012. We completed audits of the lighting installed and in storage in 226 homes in AIC service territory during June and July, 2012.[1] Twenty-six of the audits were with customers who participated in the in-home study conducted for AIC in 2010.[2] A detailed lighting study of this nature provides the most accurate "snapshot" of the number, type, and location of residential lighting products. Where possible, we compare the results of this 2012 study with the 2010 in-home study.

Methodology

We recruited audit participants via the telephone in May, 2012. We drew a stratified simple random sample from the AIC residential customer database in which we divided customers into eight geographic regions. The regional divisions made it easier to conduct the study from a logistical standpoint and also ensure that the study participants were representative of the entire AIC service territory. The number of target visits in each region was proportionate to the region's contribution to the overall AIC customer population.

Within each of the eight regions, we drew a simple random sample of customers of sufficient size to recruit twice as many customers as we needed to complete the target number of visits. We over recruited because when customers are called back, a few days after initially agreeing to participate, approximately half typically agree to the site visit. For this study, we recruited 430 customers for a visit and eventually completed 226. The visits were completed in June and July, 2012.

AIC conducted an in-home lighting study with 92 customers in 2010. We attempted to complete re-audits with as many of these customers as possible. Thirty-five of the customers initially agreed to an audit and we completed audits with 26 of these previous participants.

During each home visit, the auditor recorded the quantity and type of lighting installed in each room inside the home as well as lighting installed in the exterior or garage. The auditor also

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[1] The target sample size was selected to ensure we achieved 90% confidence and 10% precision for estimates of CFL penetration and saturation. Because these numbers can be highly variable across the population, we completed more audits than we felt were likely necessary to ensure the study met the target confidence and precision levels.

[2] The Cadmus Group, *Lighting Net-to-Gross Addendum—Multistate Study*. Prepared for Ameren Illinois, March 4, 2011.

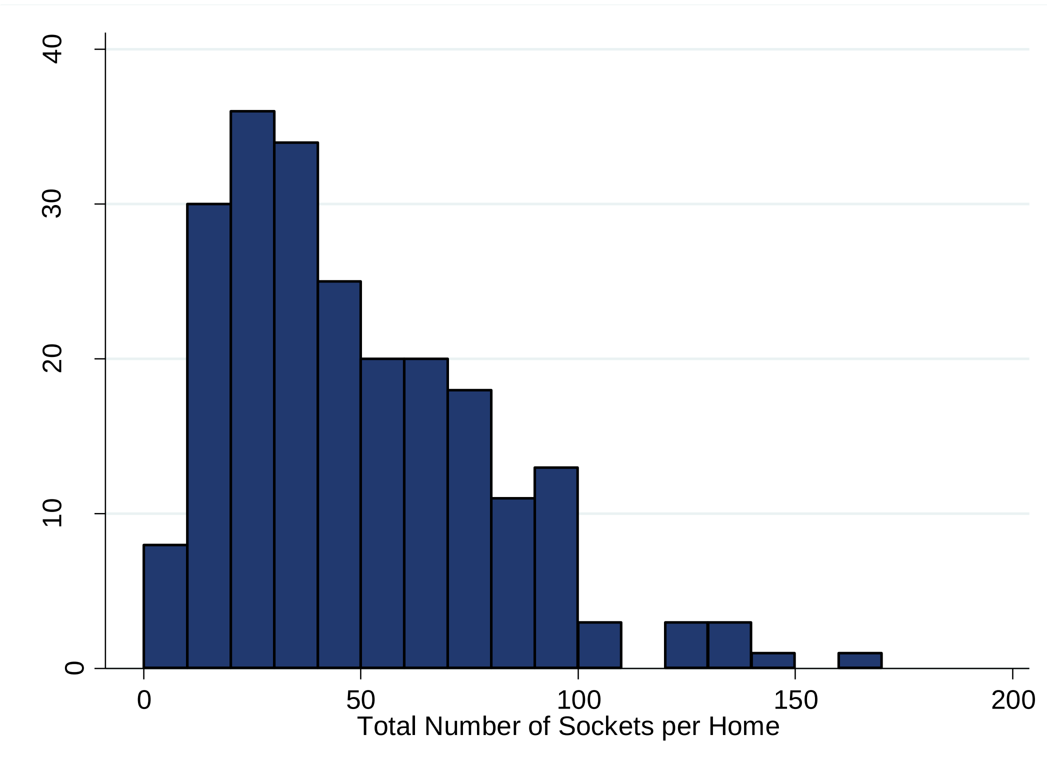
recorded lighting found in storage but not currently in use. We explicitly state where we make comparisons with 2010 study results. All other data reported in this memo are based on bulbs currently in use.

As part of the in-home lighting study, we also asked participants to complete a short survey addressing past and future lighting purchasing behaviors and awareness of lighting market-related factors such as EISA.[3] Before completing the survey, participants were asked to read a brief summary of incandescent, halogen, CFL, and LED bulbs, including information on cost per bulb, cost to use a bulb per year, and bulb life. The estimated costs provided to respondents were regular retail prices for all products at the time of the survey.

Total Sockets

The average home in AIC territory has 48 bulbs in use.[4] The number of bulbs in use per home varies significantly from a low of five sockets to a high of 168 (Figure 1). Each bar in Figure 1 displays the number of homes with the designated number of bulbs in use.

Figure 1. Distribution of Bulbs in Use per Home



Light Bulb Storage and In-Service Rates

Seventy-four percent of homes have bulbs of any type in storage with an average of 13 bulbs stored.[5] In the average home, incandescents (49%) and CFLs (47%) make up the nearly all bulbs in storage. Of the CFLs in storage, nearly all are standard CFLs (95%); few are specialty (5%).

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[3] Ten of the audit participants did not complete the in-home survey. The results presented in this memo are from the 216 who did complete the survey.

[4] The median number of bulbs in use is 42.

[5] The median number of bulbs in storage is 8.

Out of the total number of incandescent light bulbs in our study, 85% were in use, while the remaining 15% were in storage. The overall in-service rate for CFLs is slightly lower, at 78%. CFL in-service rates vary by bulb type. Specialty CFLs have a higher in-service rate than standard CFLs (88% compared to 76%).

Table 1. In-Service Rates

Bulb Type	In-Service Rate
Incandescent	85%
CFL	78%
Standard CFL	76%
Specialty CFL	88%

Based on these results we recommend a first year installation rate for standard CFLs of 76% and 88% for specialty CFLs. Using the carryover method outlined in the 2012 Illinois Statewide TRM, we assume that 98% of all bulbs will be installed three years after purchase with 55% of the remaining bulbs installed in year two and 45% installed in year three (see Table 2). Given the high price of LEDs and lack of available data, we recommend a 100% first year installation rate for LEDs until more research can be conducted.

Table 2. Recommended Installation Rates for AIC

Bulb Type	First Year	Second Year	Third Year	Final
Standard CFLs	76%	12%	10%	98%
Specialty CFLs	88%	6%	4%	98%
LEDs (medium screw-based)	100%	–	–	100%

Awareness and Purchase Behavior

Nearly all AIC customers are aware of CFLs. As part of our recruiting for the on-site visits, we asked respondents questions about their awareness of CFLs. Most respondents (84%) reported having heard of CFLs. After we described the bulbs to those who were unaware of them, most recognized the bulbs, bringing total awareness to 97%.

Far fewer AIC customers are aware of LEDs, the latest energy efficient bulb. According to the results of in-home survey, 29% of audit participants said they were "not at all familiar" with LEDs before the in-home survey compared to 17% who said they were "very familiar". Another 34% said they were "somewhat familiar with LEDs while 20% were "not too familiar".

The in-home customer survey contained questions about lighting purchases during the past year. Eighty-five percent of respondents reported purchasing light bulbs during the past year.[6] Out of all respondents who could recall their lighting purchases, more purchased CFLs than any other type of

[6] Five percent could not recall if they had purchased light bulbs in the past year and 3% did not answer the question. The percentages reported here are valid percentages so they are based on those who were aware of their lighting purchases and answered the question.

bulb. Just over two-thirds (67%) purchased CFLs, while not quite half purchased incandescents (44%). Eleven percent said they had purchased halogens and 5% purchased LEDs. It was fairly common for customers to purchase more than one type of bulb. Of those purchasing bulbs, 44% purchased more than one type of bulb with the CFLs and incandescents being the most common combination (35% of bulb purchasers).

Table 3. Bulb Purchases during the Past Year

Bulb Type	Percent who Purchased	Median number purchased
CFL	67%	10
Incandescent	44%	8
Halogen	11%	3
LED	5%	6

Penetration

Given the sizable number of audit participants who reported purchasing CFLs in the past year, it is not surprising to find that most had at least one CFL installed in their homes (see Figure 2). Our in-home lighting audit found that 93% of homes had at least one CFL installed, which is a statistically significant increase from the 87% of homes with CFLs in 2010.[7] Similar to 2010, we found a handful of customers (2%) who did not have any incandescents installed. Significantly fewer homes had halogen bulbs installed in 2012 compared to 2010 (32% compared to 45%).[8]

More customers are aware of LEDs and claim to have purchased an LED in the past year than have them in their homes. While the in-home survey found that 51% of customers were aware[9] of LEDs and 5% of customers said they had purchased LEDs in the past year, only 3% of homes had an LED installed in 2012, which is the same as 2010.[10] Most of these homes had a specialty or pin-based LED installed. Only two homes in 2012 had a new medium screw-based LED installed.

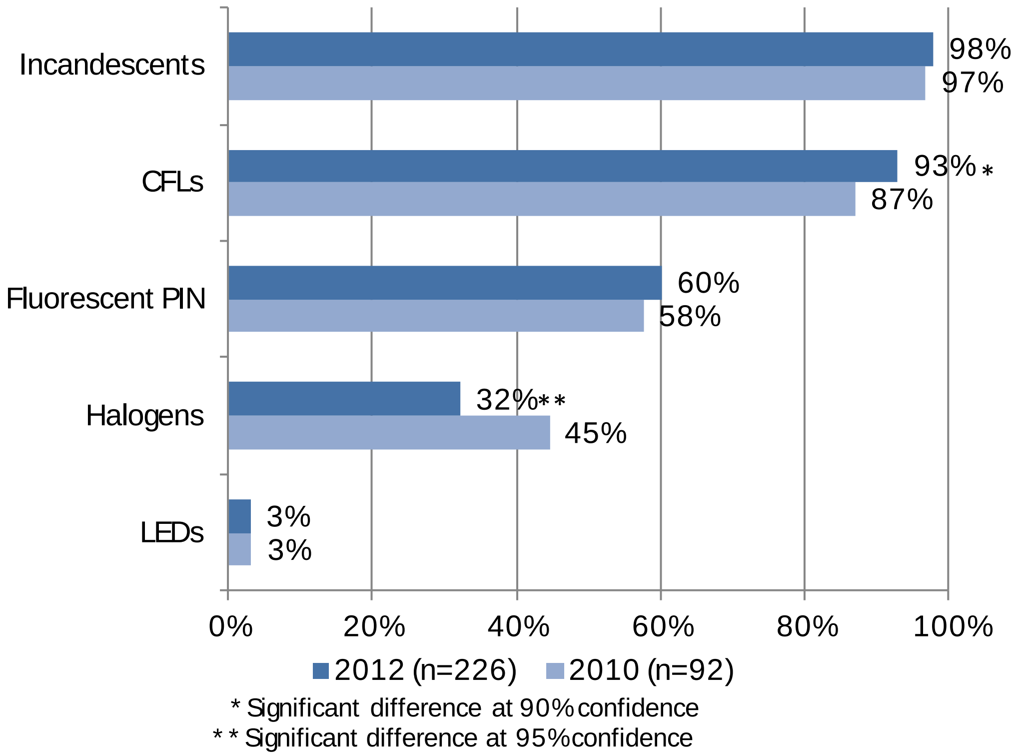
[7] The confidence and precision of the 2012 estimate of CFL penetration is 90% +/-3%.

[8] Though the difference in halogen penetration is statistically significant, the difference is likely due to differences in data collection methods. The 2012 data collection instrument collected the same information as the 2012 instrument. However, different teams conducted the audit and different training instructions may have been given. It is possible that the audit teams used different definitions of halogen bulbs, which is a technology that can be more difficult to identify.

[9] Respondents reporting "very familiar" or "somewhat familiar" on a 4 point scale ranging from "not at all familiar" to "very familiar."

[10] Of the 10 people who said they had purchased LEDs in the past year, we found 5 of these customers had an LED installed and one customer had an LED in storage. We did not find LEDs in the homes of 4 of the 10 customers. It is possible that these 4 customers tried LEDs, did not like them and got rid of them. It is more likely that despite providing pictures and information about the different bulb types in the survey, some customers still cannot identify all the different bulb types available today. Many may confuse LEDs with CFLs given that both are energy efficient bulbs with acronyms for names.

Figure 2. Lighting Penetration Rates



Surveys are often used to estimate lighting penetration and saturation rates because they are less expensive to conduct than site visits. A comparison of the responses from the telephone recruitment for the site visits with actual data from the site visits shows the inaccuracies of self-reported lighting penetration. As part of the site visit recruitment survey, we asked respondents who were aware of CFLs whether they currently had any CFLs installed in the interior or exterior of their home. Eighty-three percent of respondents reported that they had CFLs installed, 15% reported that they did not, and 3% reported that they were not sure. During the site visits, we found that nearly all respondents who said they had CFLs installed actually did (99%), while all of those who were unsure had CFLs installed. However, we found that slightly over half of respondents who said they *did not* have any CFLs installed actually did have at least one installed (56%), indicating that even those who report that they are familiar with CFLs may not realize that they have CFLs in their own home.[11]

Saturation

Though nearly all homes have at least one CFL installed, the majority of light sockets do not contain the most efficient bulb possible, either a CFL or LED. CFLs comprise 33% of bulbs installed in the average home in AIC service territory and LEDs are less than 1% (see Figure 3).[12] Just over half are incandescents (54%) and less than one in ten are fluorescent pin (6%). The remainder are halogens (3%).[13]

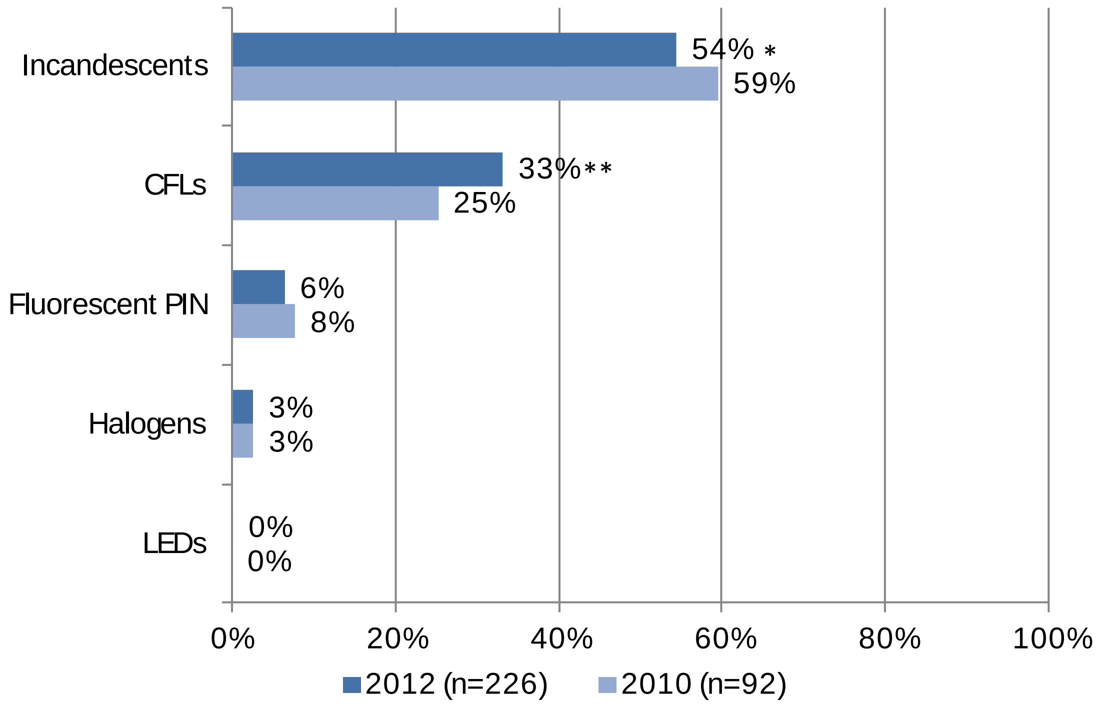
[11] Some of these homes have a large number of CFLs. The number of CFLs ranged from 1 to 33. The average number of CFLs was 8 and median was 4.

[12] The confidence and precision of the 2012 estimate of CFL saturation is 90% +/-8%.

[13] If we restrict the analysis to just screw-based sockets, CFLs make up 36% of the sockets and 60% of incandescents.

CFL saturation is significantly higher compared to 2010 when only 25% of sockets contained a CFL. As might be expected, incandescent saturation has declined over the past two years.

Figure 3. Lighting Saturation Rates



* Significant difference at 90% confidence
** Significant difference at 95% confidence

Compared to households in other areas, CFL saturation is on the high side in AIC territory. AIC was part of the 2010 multi-state study that collected lighting saturation data in 15 different utility territories.[14] Along with two other areas, AIC had the second highest CFL saturation rate in 2010 at 25%, though four other areas had saturation rates that ranged between 23% and 24%. Only Massachusetts had a higher saturation rate at 28%. It is likely that CFL saturation has increased in other areas since 2012 as it has for Ameren.

[14] NMR Group, Inc. *Results of the Multistate CFL Modeling Effort*. Prepared for Massachusetts Program Administrators, April 15, 2011.

Figure 4. CFL Saturation by Area in 2010

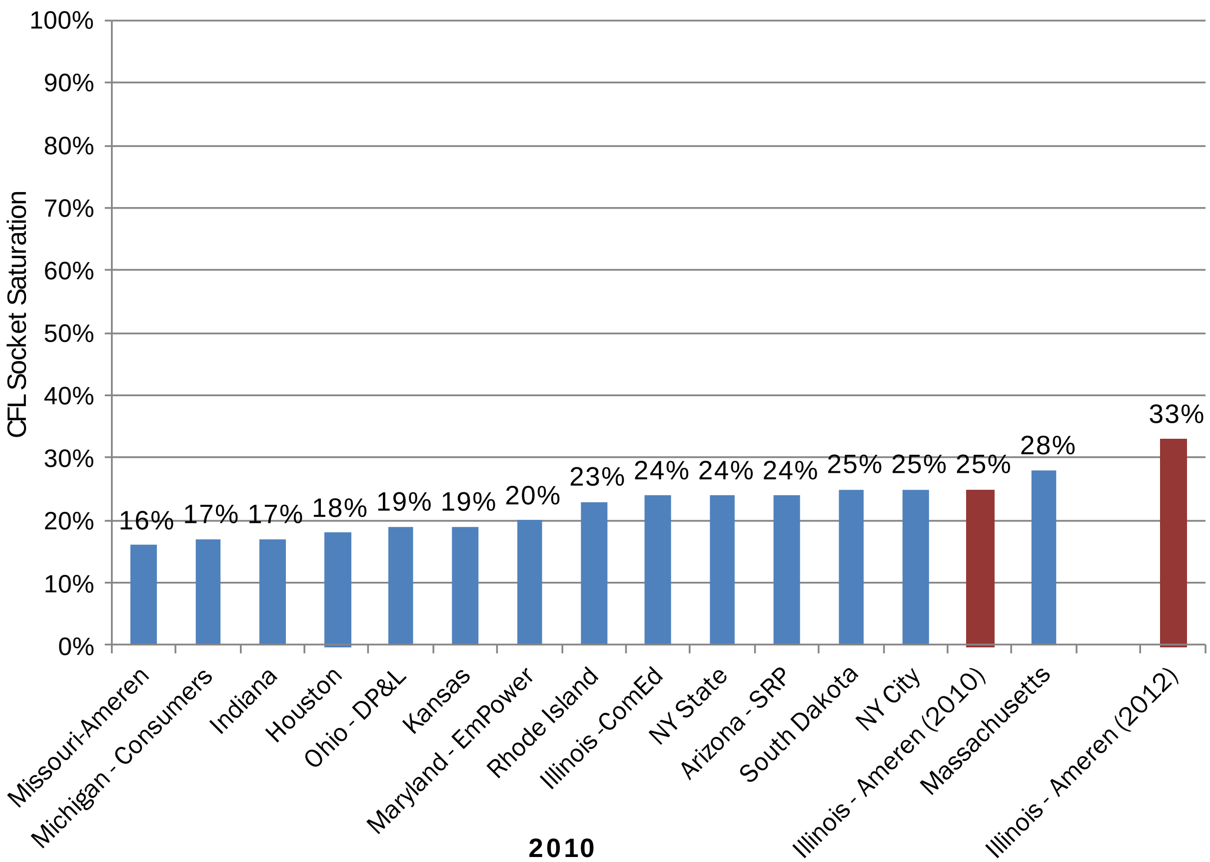
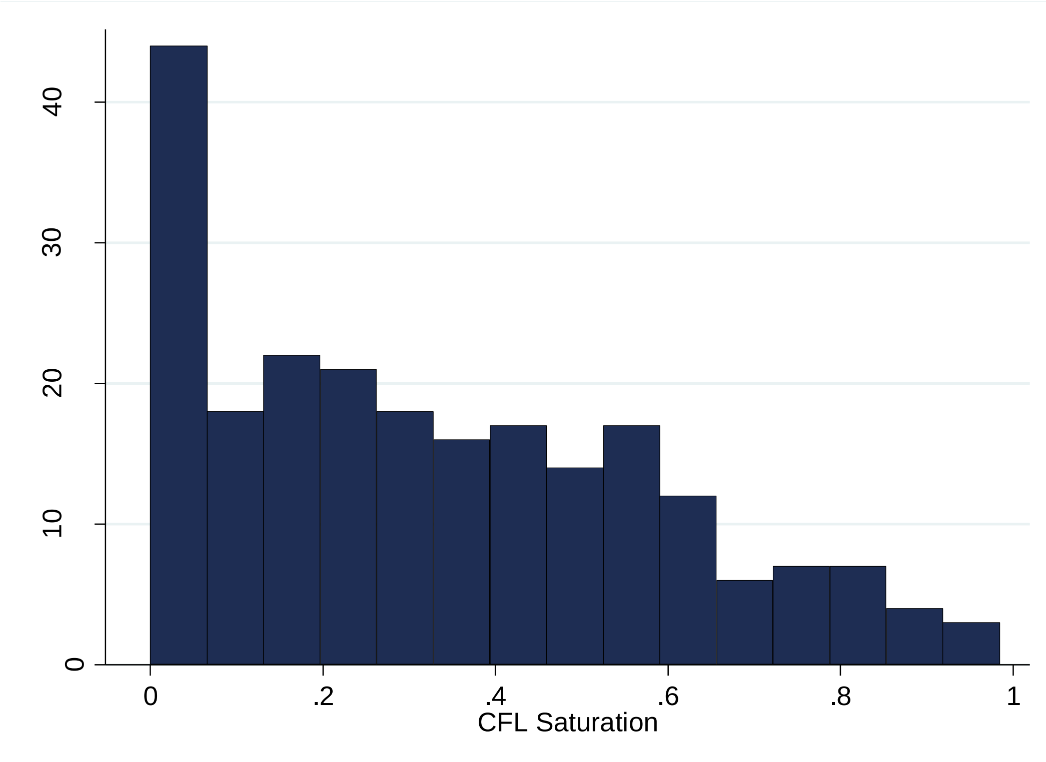


Figure 4 displays the distribution of CFL saturation across all households and makes clear the wide range of CFL usage among AIC customers. CFL saturation ranges from 0% to 98%. Even with high CFL awareness and penetration, CFL usage is low among a sizable percentage of AIC customers. One-quarter of homes (25%) have CFLs in less than 12% of their sockets.

Figure 5. Distribution of Percentage of Sockets CFLs



Despite the wide variation in CFL saturation, CFL usage is not associated with many demographic factors (see Table 4). Homeowners are more likely to use CFLs than renters but they do not have a greater proportion of their sockets filled with CFLs. We found little difference in CFL usage by income or education.

Table 4. CFL Penetration & Saturation by Demographic Characteristics

Demographic Characteristics	CFL Penetration	CFL Saturation
Home Ownership		
Own (n=153) (A)	97%[B]	33%
Rent (n=73) (B)	85%	33%
Household Income		
Less than $40,000 per year (n=103) (A)	91%[C]	39%
$40,000 to less than $75,000 per year (n=61) (B)	92%[C]	31%
$75,000 or more per year (n=46) (C)	100%	26%
Education		
High school graduate or less (n=63) (A)	92%	36%
Some college (n=76) (B)	92%	36%
College grad or more (n=86) (C)	95%	29%
Home Size		
Less than 1,500 sq. ft. (n=120) (A)	92%	33%
1,500 or more sq. ft. (n=53) (B)	98%	32%
Unknown home size (n=53) (C)	91%	35%
Total (n=226)	**93%**	**33%**

Note: Letters indicate the figure is significantly different from the other group at the 90% level.

The 2012 in-home study included 26 AIC customers who participated in the 2010 in-home study.[15] The advantage of a panel study such as this is that we can examine actual change in the same households over time rather than average change across two different sample populations. As we, show in Figure 3, the average AIC household has more CFLs in use in 2012 compared to 2010, but this increase could be masking some households who are using fewer CFLs in 2012. When CFL saturation increases, we assume that all households are gradually replacing their incandescent bulbs with CFLs causing CFL saturation to rise. Our panel study results show that some customers are using fewer CFLs in 2012 than in 2010.

The average CFL saturation rate among the 26 panel study customers was 28% in 2010 and 34% 2012, a similar overall rate of increase compared to all 2012 study participants. However, when we

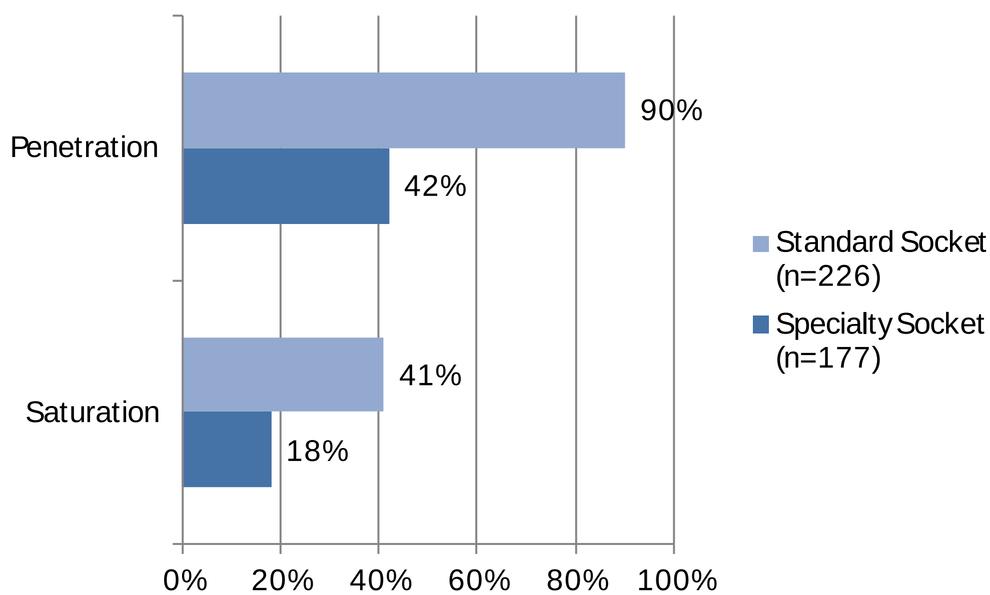
[15] A total of 95 customers participated in the 2010 study. We attempted to complete as many repeat visits as possible and completed 26. The results of the panel study are informative, but caution should be used when interpreting the panel results due to the small sample sizes.

examine the actual change in individual CFL saturation rates between 2010 and 2012, we find that 7 of the 26 had fewer CFLs in use in 2012, 1 had the same number, and 17 had more CFLs. CFL saturation dropped by an average of 7% among the seven who had fewer CFLs in use while it increased by 12% among the seventeen who had more CFLs.[16]

Standard versus Specialty CFLs

The program provides incentives for both standard and specialty CFLs. The in-home audits collected data on a socket-by-socket basis so that we can examine CFL saturation by socket type.[17] When we compare CFL penetration and saturation in standard versus specialty sockets, we see that standard CFLs are in more homes and more sockets than specialty CFLs. All homes have a socket that could take a standard CFL, and 90% of homes had at least one standard CFL installed and 41% of the standard sockets contained CFLs. Fewer homes (78%) had a socket that required a specialty bulb. Of these homes, 42% had a CFL installed and only 18% of the specialty sockets in these homes contained a CFL.

Figure 6. CFL Penetration and Saturation by Socket Type



Customers have been slower to adopt specialty CFLs and some of the new lighting technologies may be more attractive to them as they become more widespread. To understand the types of bulbs (i.e. incandescent, CFL, halogen, LEDs) consumers are using in different socket types (i.e. standard, specialty, pin), we calculated socket saturation by bulb type for each technology (see Figure 7). Of all incandescents installed, 60% are in standard screw-based sockets, 39% are in specialty screw-based sockets, and less than 1% are in pin-based sockets or are plug-in lighting. Residents are installing CFLs in the same types of sockets as incandescents, and are much more

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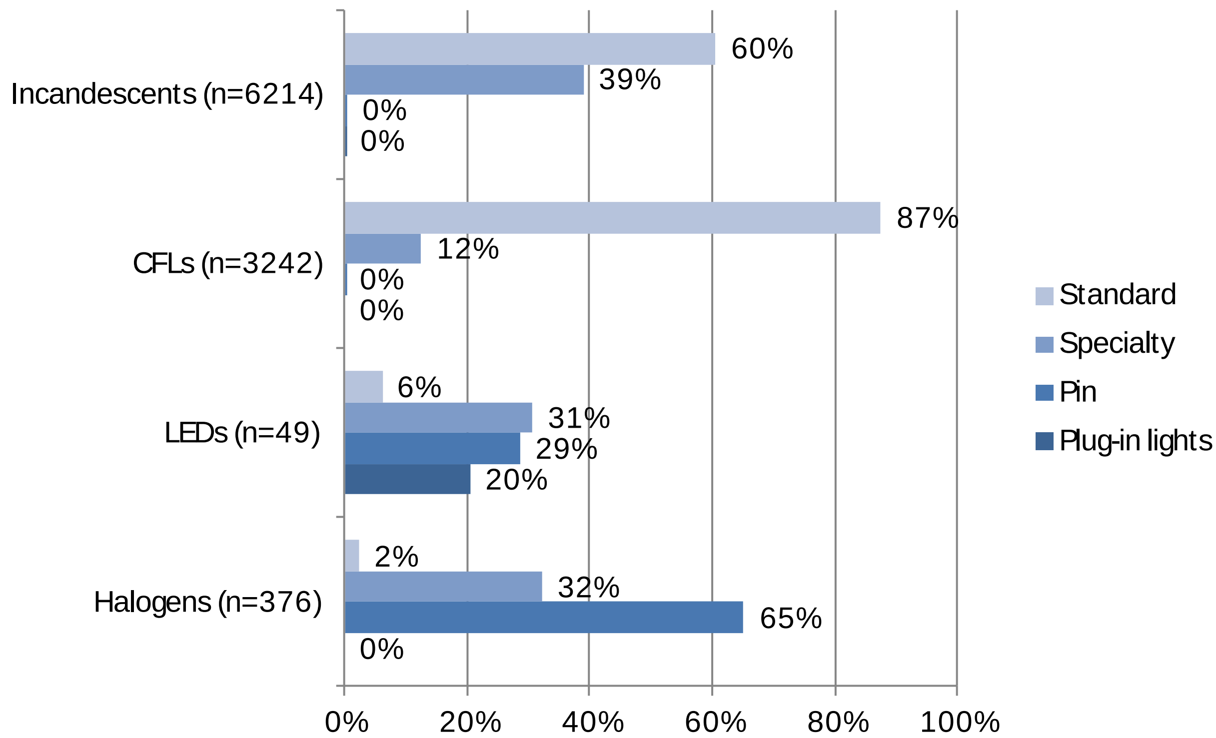
16 Unfortunately, the sample sizes are too small to try to identify any shared characteristics among those who are removing CFLs.

17 Our definition of specialty CFLs matches that of the program. A specialty CFL is any CFL with a glass covering, or a spiral CFL that is dimmable or 3-way. A specialty socket was defined as one that had a specialty bulb of any technology installed (i.e. incandescent, CFL, etc.). A standard socket is one that had a standard bulb of any technology installed. Though the resident could, in the future, install a standard bulb in a specialty socket and vice versa, our analysis assumes the resident has chosen the most appropriate bulb for the socket and will continue to use the same type of bulb.

likely to be replacing standard bulbs than specialty bulbs: nearly nine in ten CFLs installed (87%) were standard, screw-based bulbs.

Until very recently, LEDs and halogens have not been available for standard screw-based sockets. As a result, most of these bulb types are installed in sockets that require a screw-based specialty bulb or a pin bulb (see Figure 7). Since halogens and LEDs are now available for standard and specialty screw-based sockets, these results provide a good baseline for these technologies as they are entering the market.

Figure 7. Socket Saturation for Different Technologies by Bulb Type



CFL Usage by Room Type

CFLs are more likely to be found in rooms with the greatest hours of lighting use in the home (see Table 5). CFL saturation is highest in living areas, bedrooms, and kitchens, where they make up 41%, 38%, and 37% of bulbs respectively. Foyers and dining rooms have the highest concentration of incandescent light bulbs in interior rooms, at 67% and 62% respectively. Garages, laundry rooms, kitchens, and basements have the highest concentration of pin fluorescent lighting. No particular room type had more than a tiny percentage of LED lights, and halogen lighting is found in significant amounts only in kitchens and exterior lighting.

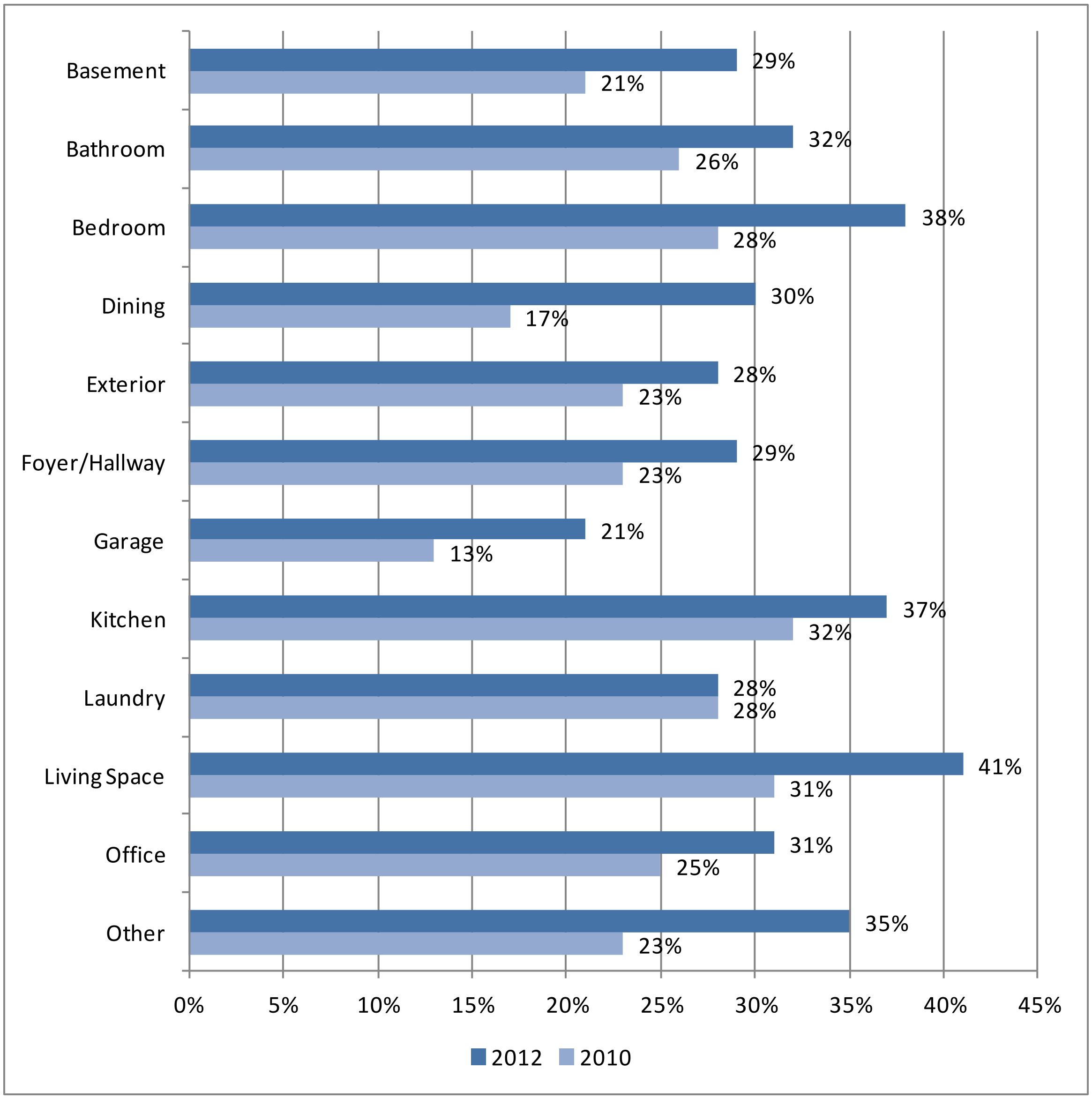
Table 5. Bulb Saturation Rates by Room Type

		Bulb Type				
Room Type	Average Bulbs per Room	Incandescent	CFL	Halogen	LED	Fluorescent
Basement	7.9	52%	29%	3%	<1%	14%
Bathroom	4.1	60%	32%	1%	<1%	5%
Bedroom	3.7	57%	38%	1%	0%	1%
Dining	4.6	62%	30%	3%	<1%	3%
Exterior	5.6[1]	64%	28%	6%	<1%	<1%
Foyer/Hallway	2.3	67%	29%	1%	<1%	1%
Garage	5.4	45%	21%	1%	0%	31%
Kitchen	5.6	39%	37%	5%	<1%	17%
Laundry	2.2	50%	28%	2%	0%	17%
Living space	5.1	52%	41%	2%	<1%	2%
Office	4.3	60%	31%	1%	0%	6%
Other	2.4	52%	35%	<1%	0%	10%

[1]Exterior areas were not recorded as separate rooms, so this represents the average number of exterior bulbs per home, in homes with exterior lighting (n=199).

As shown in Figure 8, between 2010 and 2012, CFL saturation rates increased for nearly every room type studied.

Figure 8. CFL Saturation Rates by Room Type, 2010 and 2012



Bulb Wattage and Hours of Use

We collected information on the wattage of all bulbs in living rooms and kitchens, the two rooms where we expected the greatest saturation of CFLs, to investigate whether bin jumping might be taking place.[18] There is anecdotal evidence that consumers may be purchasing higher wattage

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[18] Collecting wattages can be challenging since the wattage information is sometimes not visible on the bulb without unscrewing the bulb. Bulbs can also be in fixtures that we would require disassembly to see the wattage. We instructed auditors to only record wattage if they could do so *without* removing bulbs or taking apart fixtures. In kitchens and living rooms, we obtained wattages for 73% of CFLs and 71% of incandescents

CFLs than their incandescent wattage equivalencies to get the same light quality they associate with incandescents. For example, a consumer will replace a 75 watt incandescent with a 100 watt equivalent CFL instead of a 75 watt equivalent. The incandescent wattage equivalencies of CFLs are based on their lumen output, which is a measure of brightness. However, brightness is just one factor that influences how people perceive light. If many consumers are in fact bin jumping when purchasing CFLs, the energy savings associated with replacing an incandescent with a CFL would be less than expected and baseline wattages for energy savings may need to be adjusted.

If consumers are using incandescent equivalencies when replacing incandescents with CFLs, we would expect that the average and distribution CFL wattages of bulbs in use to be similar those of incadescents. The results from the in-home study provide evidence of possible bin jumping in both rooms. The average incandescent bulb wattage in kitchens was 51 compared to 16 for CFLs, which is equivalent to the high end of a 60 watt incandescent. We found few low wattage CFLs (26-40 watt equivalent) in kitchens. Only 5% of CFLs in use were in this wattage equivalency range compared to 39% of incandescents. We found more 60 and 100 watt equivalent CFLs compared to incandescents (70% compared to 55% and 22% compared to 1% respectively).

Table 6. Bulb Wattage of Incandescents and CFLs in Kitchens

Incandescent (CFL) Wattage	Incandescents (n=106 households)	CFLs (n=96 households)
25 (7)	13%	0%
34-40 (9-11)	26%	5%
60 (12-16)	55%	70%
75 (18-20)	5%	1%
100 (23-29)	1%	22%
Over 100 (30+)	0%	2%
Average	**51**	**16**

Note: Halogen and LED bulbs are not included in this analysis due to insufficient sample size

In living rooms, the average wattage of incandescents was 68 compared to a CFL wattage of 17, which is right between the 60 and 75 watt equivalent incandescent (see Table 7). Like we found in kitchens, we found very few CFL equivalents in the 25 to 40 watt range in living rooms and more 60 and 100 watt equivalent CFLs.

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in kitchens. It was easier to identify wattages in living rooms where we were able to collect wattages on 87% of CFLs and 76% of incandescents.

Table 7. Bulb Wattage of Incandescents and CFLs in Primary Living Rooms

Incandescent (CFL) Wattage	Incandescents (n=134 households)	CFLs (n=141 households)
25 (7)	8%	0%
34-40 (9-11)	18%	5%
60 (12-16)	46%	58%
75 (18-20)	8%	2%
100 (23-29)	12%	35%
Over 100 (30+)	9%	1%
Average	**68**	**17**

Note: Halogen and LED bulbs are not included in this analysis due to insufficient sample size

These comparisons assume that customers are randomly replacing incandescents with CFLs. It is possible that they could be replacing their higher wattage incandescents with CFLs and leaving the lower wattages as incandescents. Additional research would be required to confirm that the differences in the distribution of CFL and incandescent wattages is due to bin jumping and not due to differential replacement of higher wattage incandescents with CFLs.

Kitchens also contain a sizable number of tube fluorescent lights (17% of all bulbs). Most are less than or equal to 40 watts (see Table 8).

Table 8. Tube Fluorescent Wattage in Kitchens

Wattage	% of Bulbs (n=200)
Less than 40	47%
40	52%
Greater than 40	1%

We also asked respondents to report the approximate number of hours per day during which they usually had at least one light turned on in their kitchen and living rooms. AIC customers have a kitchen light on an average of 5.7 hours a day and a living room light on an average of 5.3 hours a day (Table 9). This is higher than the 2.6 hours used to calculate AIC lighting program energy savings.

Table 9. Hours of Use of at Least One Bulb

Room	Average
Kitchen	5.7
Living Room	5.3

To save energy, customers who have their lights turned on for more hours per day may be more likely to use CFLs or have a greater percentage installed. To test this theory, we compared the average hours of use in kitchens and living rooms for customers who did and did not have any CFLs installed in each of those rooms. We found a significant difference in usage in living rooms between those with and without CFLs installed. Those without CFLs installed in their living rooms used a living room light for 4.1 hours per day compared to 5.9 for those with CFLs installed. We did not find a statistically significant difference in usage in kitchens. Similarly, we found a small but statistically significant positive correlation between CFL saturation and hours of use in living rooms (r=0.13) but not in kitchens.

The Future of Lighting Programs in AIC Territory

CFL penetration and saturation in AIC territory have increased since 2010—from 87% to 93% and 25% to 33%, respectively. Nearly every home has at least one CFL installed, and two of five standard sockets contain a CFL. Penetration and saturation of specialty CFLs still lags behind though. Given the relatively high level of CFL usage and the changes in the lighting market due to EISA and technological advances, it is important to examine the remaining market for an efficient lighting program and customer response to market changes.

Remaining Efficient Lighting Potential

The evaluation team estimated the number of standard and specialty screw-based sockets that currently have a less efficient bulb installed and thus could still be retrofitted with a more efficient option. Table 10 provides the inputs to the socket potential estimates. With 1,056,533 households in AIC territory, we estimate that nearly 19 million standard sockets and more than 11 million specialty sockets do not have the most efficient lighting technology installed. While specialty CFLs have lower socket saturation, the number of potential sockets for standard CFLs is higher than it is for specialty CFLs due to the larger number of standard sockets in homes. The technology used to fill these sockets does not need to be CFLs; it could be LEDs as the technology continues to advance and prices fall.

Table 10. Number of CFLs Installed in AIC Territory

Socket Type	% of Households with Socket	Average Number of Sockets per Household	Estimated Total Sockets in AIC Territory [a]	Per-Home CFL Saturation by Type [b]	Estimated Existing CFLs in AIC Territory
Standard	100%	30.4	32,118,603	41%	13,322,797
Specialty	78%	12.9	13,629,276	18%	2,477,802

[a] Calculated by multiplying the total number of households in AIC territory (1,056,533) by the average number of sockets of the type.

[b] Based on the mean per-home saturation of CFLs in sockets that can take each bulb type (i.e., standard bulb saturation in standard sockets, specialty bulb saturation in specialty sockets).

[c] Calculated by multiplying total sockets by CFL saturation by type.

To better understand what will be required to achieve different efficient lighting saturation rates in AIC territory, we estimated the number of CFLs or LEDs that would need to be installed in place of a currently installed less efficient bulb alternative. We calculated these estimates separately for standard and specialty sockets because the achievable potential is likely to vary by bulb type; the number of years it will take to achieve the same level of saturation will also differ by bulb type.

Error! Not a valid bookmark self-reference. shows the number of additional efficient bulbs necessary to achieve energy efficiency saturation rates that range from 20% to 100%. Though these results should not be confused with a full potential study, some of the concepts used in a potential study are useful in considering the results. The 100% values could be thought of as the technical potential. For every screw-based socket in AIC territory to contain the most efficient bulb possible, an additional 18.8 million standard bulbs and 11.2 million specialty bulbs would need to be installed. To put these numbers in perspective, the AIC residential lighting program has distributed a total of 9.6 million CFLs (both standard and specialty) between PY1 and PY4.

Table 11. Remaining Socket Potential for Energy Efficient Lighting

EE Saturation	Standard Bulbs	Specialty Bulbs
100%	18,795,807	11,151,473
90%	15,583,946	9,788,546
80%	12,372,086	8,425,618
70%	9,160,226	7,062,691
60%	5,948,365	5,699,763
50%	2,736,505	4,336,386
40%	0	2,973,908
30%	0	1,610,980
20%	0	248,053

A number of factors will influence the saturation rate that is actually achievable for AIC territory. One study estimates that national energy efficient bulb saturation will grow from its current rate of 30% to 40% in 2020 if CFL shipments remain at the same level over the next seven years.[19] The Northeast region is setting a much higher goal of 90% energy efficient bulb saturation by 2020 that will require much higher shipment levels.[20] It is possible that increased consumer demand could stimulate greater shipments of energy efficient lighting products, but continued price support from residential lighting programs would likely be necessary.

For AIC, the growth in energy efficient bulb saturation will not come only from sales of program-discounted bulbs. Customers purchase bulbs at non-participating retailers and non-discounted bulbs at participating retailers.[21] AIC can still use the numbers in To better understand what will be required to achieve different efficient lighting saturation rates in AIC territory, we estimated the number of CFLs or LEDs that would need to be installed in place of a currently installed less efficient bulb alternative. We calculated these estimates separately for standard and specialty sockets because the achievable potential is likely to vary by bulb type; the number of years it will take to achieve the same level of saturation will also differ by bulb type.

Error! Not a valid bookmark self-reference. shows the number of additional efficient bulbs necessary to achieve energy efficiency saturation rates that range from 20% to 100%. Though these results should not be confused with a full potential study, some of the concepts used in a potential study are useful in considering the results. The 100% values could be thought of as the technical potential. For every screw-based socket in AIC territory to contain the most efficient bulb possible, an additional 18.8 million standard bulbs and 11.2 million specialty bulbs would need to be installed. To put these numbers in perspective, the AIC residential lighting program has distributed a total of 9.6 million CFLs (both standard and specialty) between PY1 and PY4.

Table 11 to estimate the lighting program's contribution to saturation rate growth given available program budgets over the next several years. The results show that both standard and specialty bulbs should be considered for future program incentives.

Future Lighting Purchase Behavior

The in-home survey provided detailed information about the four types of light bulbs available to consumers today. Though most consumers are not currently likely to understand the pros and cons of their different lighting options, the idea behind the survey was to test what decision making might be like in a few years under EISA when all consumers have had more time to be exposed to this type of information. The survey also provided a brief description of ESIA and its impact on availability of traditional incandescent light bulbs.

Currently, only a slight majority have heard of EISA. Fifty-five percent of respondents reported that they had heard of this legislation after being read a brief description. Awareness of EISA does not vary much across a variety of demographic factors, although homeowners are more aware (59%) than non-homeowners (48%).

After being asked about the EISA legislation, respondents were asked what they planned to purchase the next time they needed to purchase a 100-watt incandescent bulb, which was phased out in 2012. Nearly (63%) of respondents indicated that they planned to purchase a CFL bulb the next time they needed to purchase a 100-watt light bulb. Only 5% of respondents said they would

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[19] *Residential Lighting Market Profile 2012*, D&R International. 2012.

[20] *Northeast Residential Lighting Strategy*. Northeast Energy Efficiency Partnerships (NEEP), March 2012.

[21] We will provide an estimate of the number of non-program CFLs that have been purchased by AIC customers between 2010 and 2012 in our upcoming report on program net-to-gross. This estimate could be considered the maximum program spillover rate.

use a higher or lower wattage incandescent, and only 1% of respondents said they would purchase the new EISA-compliant halogen bulbs. Eight percent of respondents do not use 100-watt bulbs so they are not impacted by the first round of EISA regulations. Another 19% did not know what they would purchase or refused to answer the question.

Table 12. Likely Substitutes for 100W Bulbs

Response	Respondents (n=216)
CFL bulb	63%
Do not use 100W bulbs	8%
Lower wattage incandescent bulb	3%
Higher wattage incandescent bulb	2%
LED bulb	3%
Halogen bulb	1%
Don't Know/Refused	19%

Respondents who said they would purchase something other than a CFL were asked if they would purchase one if the price were 50% less ($1.25 per bulb) than the bulb information first provided in the survey ($2.50 per bulb). Three-quarters of them said the price drop would cause them to purchase a CFL instead, bringing the total number to 87% who will purchase a CFL in place of a 100-watt incandescent.

Future purchase plans appear to be associated with current CFL usage. The sample sizes of these subgroups are small and the differences are not statistically significant, but they are in the expected direction. Those who say they will purchase a CFL the next time they need a 100 watt incandescent have higher CFL saturation rates than those who say they will purchase another type of bulb (Table 13). Those who plan to purchase an LED bulb the next time they need a 100-watt incandescent have an extremely low CFL saturation. Though the sample size is extremely small, this may imply that these respondents are conscious of energy efficiency but dislike certain attributes of CFLs (e.g. light quality).

Table 13. CFL Saturation by Future Purchase Plans

Likely Substitute for 100W Bulb	CFL Saturation
CFL bulb (n=136)	37%
Do not use 100W bulbs (n=17)	29%
Incandescent or EISA-compliant halogen (n=14)	17%
LED bulb (n=7)	18%
Don't Know/Refused (n=42)	32%

Looking forward to the 2013 phase-out of 75-watt incandescent bulbs, we asked respondents if they planned to stock up on 75-watt incandescent bulbs before the phase-out went into effect.

Three quarters (75%) of respondents indicated that they were unlikely[22] to do so. Only 9% said they were very likely to stock up on 75-watt incandescents.[23]

A survey question can only measure what a customer *might* do in the future in terms of stockpiling incandescents. Our in-home audit data provide evidence of what they *actually have* done. We collected data on the storage rates of 100-watt and 75-watt incandescents. There is little evidence that AIC customers are stockpiling EISA-regulated incandescents based on the lighting storage data. Slightly over half of homes (55%) had any incandescents in storage. When we examined the wattage, we found that 29% of homes had 100-watt incandescents in storage and 9% had 75-watts in storage. Of all incandescents in storage, 100-watts made up 11% while 75-watts made up 10%.[24] The market share of 100-watt and 75-watt incandescents prior to EISA (2007) was 21% and 19% respectively.[25] Customers actually had fewer of these wattages in storage than were sold in the market.

We also compared the storage rates of 100-watt and 75-watt incandescents of customers who were aware of EISA to those who were unaware. If a customer is unaware of EISA, the presence or number EISA-regulated incandescents in storage cannot be evidence of stockpiling. We found no significant difference in 100-watt and 75-watt storage rates by EISA awareness.

Table 14. Storage Characteristics by EISA Awareness

	Aware (n=117)	Unaware (n=94)
Have incandescent in storage	56%	52%
Percentage of incandescents in storage that are 100W	7%	16%
Percentage of incandescents in storage that are 75W	12%	7%

If EISA ends up being the main driver of CFL sales, program net savings will be adversely impacted. If customers are accurately self-reporting their lighting purchases when fully informed about the pros and cons of different light bulbs, the program may need to reconsider incenting EISA-regulated bulbs in the future when consumers have had time to learn about the different lighting technologies.

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22 Respondents reporting "not at all likely" or "not very likely" on a 4 point scale ranging from "not at all likely" to "very likely".

23 As part of the in-home audit, we recorded the number of 100-watt and 75-watt incandescents in storage.

24 The largest number of 100-watts in storage was 10 in a home that had a total of 25 incandescents in storage. This home had only 4 75-watt incandescents in storage.

25 Pamela Horner, *Lighting Manufacturer Perspectives on Residential Lighting Efficiency.* Prepared for Residential Lighting Efficiency Status & Policies, Integrated Energy Policy Report and Energy Efficiency Committees Joint Workshop. Sacramento, CA. California Energy Commission, June 19, 2007. Cited in: Seth Craigo-Snell, *The U.S. Replacement Lamp Market, 2010-2015, and the Impact of Federal Regulations on Energy Efficiency Lighting Programs*, APT White Paper, August 2010.

The survey also asked questions about future purchases of LEDs. Twenty-eight percent of respondents indicated that after having read the information about LEDs that was provided with the in-home survey, they were very likely to purchase an LED light bulb in the next year. Those respondents who indicated otherwise primarily cited cost (62%) as the major factor. Other factors cited were a preference for CFLs (6%), a lack of knowledge of LEDs (6%), poor quality of light (4%), and an inability to get LEDs that performed desired functions (e.g., dimming, specialty sockets). We asked all respondents what they would be willing to pay for an LED bulb. The median value for willingness-to-pay for an LED bulb was only $5, though more than a third of respondents (37%) did indicate that they were willing to pay $10 or more for an LED bulb.