Alternatively, however, if we look only at customers who were not influenced by program ads, and had made prior purchases of CFLs, freeridership may be as low as 7%. To be conservative, however, we use an estimate of 28% freeridership in our calculation of impacts since this is comparable to what is used in other areas of the country.

**Table 13: Willing to Pay Full Price**

| | Total (n=71) |
|---|---|
| Would have paid $2 more | 35% |
| *Influenced by ads and hadn't purchased CFLs before* | *14%* |
| *(No ads) Hadn't purchase CFLs before* | *4%* |
| *Influenced by ads and purchased CFLs before* | *10%* |
| *(No ads) Purchased CFLs before* | *7%* |

## Spillover

Twelve of the 71 participating respondents purchased additional CFLs since participating in the program without a rebate coupon and not at a Home Depot store and stated that they would not have purchased additional bulbs if they had not had the prior experience with the AmerenUE rebate. These 12 respondents purchased an additional 46 CFLs since participating in the program.

An additional six people purchased CFLs since participating in the program but were not specifically able to attribute their purchase to their prior experience with CFLs from the AmerenUE lighting program. These six people purchased 30 additional CFLs since participating in the program.

In total respondents purchased 592 CFLs. Spillover can be estimated to between 7.7% and 12.8%.[8] In our analysis, we used an average of 10.25%.

## Coincidence Factor

A coincidence factor of 0.07 is used for all four years to get the Gross Connected Kilowatts Saved. This value comes from Impact Evaluation of the Massachusetts, Rhode Island, and Vermont 2003 Residential Lighting Programs Final Report (2004).[9]

[8] 46 CFLs /592 Rebated CFLs = 7.7%, 76 CFLs /592 Rebated CFLs = 12.8%

[9] *Impact Evaluation of the Massachusetts, Rhode Island, and Vermont 2003 Residential Lighting Programs Final Report.* Submitted to The Cape Light Compact; State of Vermont Public Service Department for Efficiency Vermont; National Grid (Massachusetts Electric, Nantucket Electric, and Narragansett Electric); Northeast Utilities (Western Massachusetts Electric); NSTAR Electric; and Unitil Energy Systems, Inc. (Fitchburg Gas and Electric). Submitted by Nexus Market Research, Inc. and RLW Analytics, Inc. October 1, 2004.

## Cost-Effectiveness

Over the four years 2003-2006, the program costs have totaled $493,003 for a total savings of 80 GWh. Paybacks for the four years of the program range from 0.6 to 0.9 years. Overall, the benefit-cost ratio varies between 7.7 and 11.7.

Benefits are calculated using a $0.066/kWh rate, which was provided by Ameren as a standard electric rate charged to their customers. The discount factor was provided by the *Energy Price Indices and Discount Factors for Life-Cycle Cost Analysis - April 2006* report from the US Department of Commerce to the US Department of Energy (http://www1.eere.energy.gov/femp/pdfs/ashb06.pdf). In the report, table Ba-2 uses a 3% rate of inflation and has discount factors adjusted for the Missouri area. Most light bulbs were calculated to last for eight years based on their rated life and the assumption each bulb would run for 2.7 hours per day. Referencing the residential, electric column and looking to eight years of life, a discount factor of 6.90 was discovered. Using the discounted factor, the discounted savings and the benefit-cost ratio were calculated.

**Table 14: Benefit-Cost Ratios**

| | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|
| Cost | $ 139,371 | $ 141,801 | $ 117,218 | $ 94,613 |
| Benefit | $ 165,385 | $ 157,105 | $ 130,581 | $ 160,581 |
| Payback | 0.8 | 0.9 | 0.9 | 0.6 |
| Discount Factor | 6.90 | 6.90 | 6.90 | 6.90 |
| Discounted Savings | $ 1,141,157 | $ 1,084,025 | $ 901,009 | $ 1,108,009 |
| Benefit Cost Ratio | 8.2 | 7.6 | 7.7 | 11.7 |

MEEA's report included only basic financial analysis for the entire Change-A-Light program and not for each region involved with the program. Because of this, it is impossible to compare MEEA's cost-benefit data to ODC/GDS data.

Detailed spreadsheets on the savings and life cycle costs analyses were provided to AmerenUE along with this report.

## V. Process Findings and Recommendations

Among non-participants within AmerenUE's service territory, 44% appear to be not very familiar (i.e., 34% unfamiliar and 10% slightly familiar) with CFLs, and 56% of non-participants have never purchased a CFL. This is similar to participant awareness of CFLs prior to program participation.

Overall, the program appears to be raising awareness of CFLs and reducing first costs. In addition, almost all participants in the program (94%) are satisfied with the CFLs that they purchased through the AmerenUE program, and 93% of participants report that they are likely to purchase CFLs in the future. (See **Error! Reference source not found.**, **Error! Reference source not found.**, **Error! Reference source not found.** and Section VI Table D-7)

Our process related findings and recommendations are described in more detail below.

- **Continue to offer the program to raise awareness and reduce first cost among the 56% of non-participants who are not using CFL bulbs and increase penetration of bulbs by reducing first cost**

  AmerenUE should continue to offer the program to raise awareness of energy efficient bulbs. Awareness of CFLs in AmerenUE's territory is still low.[10] Among non-participants, 44% appear to be not very familiar or unfamiliar with CFLs.[11] This is in agreement with comments from participants: many participants (58%) also indicated that their awareness of CFLs was low prior to their purchase through AmerenUE's program. In general, the AmerenUE lighting rebate program appears to be raising awareness of CFLs and has attracted a large number of first time CFL purchasers (63% of all participants).

  AmerenUE should also continue to reduce the first cost of the bulbs through the program because for a large number of AmerenUE customers (both participants, 51%, and non-participants, 46%), price is the factor considered most when purchasing light bulbs (see **Error! Reference source not found.**); and 68% of participants and 71% of non participants believe that CFLs are more expensive than incandescents (See **Error! Reference source not found.**). Because CFLs are generally more expensive than incandescents, over 60% of program participants would not have made the CFL purchase if they had to pay full price for it and others would not have purchased the bulbs if they had not been made aware through the program. (Freeridership is estimated to be 28%, see impact section above.) The AmerenUE program appears to be effective at getting additional CFLs into the market, and AmerenUE should continue to offer a program to raise awareness and reduce costs in order to overcome these two barriers.

- **Support mark down efforts since the program has been able to cost effectively move large numbers of bulbs this way**

[10] This is similar to what ODC found in other areas of the country, including Arizona and Long Island.

[11] Even among non-participants who are familiar with CFLs, many are unable to provide feedback on how a CFL compares to an incandescent (indicating "unfamiliarity").

As shown in Table 15 above, the markdown promotion was able to significantly reduce the program costs per bulb. As such, AmerenUE should continue to support markdown efforts since the program has been able to cost effectively move large numbers of bulbs this way. In doing so, however, the program administrators should continue to work towards increasing awareness, the number of retailers, variety of products in the market, as well as determining better ways of understanding the impacts from these sales (discussed more below.)

We also note that for many smaller store types, markdown efforts are not as feasible as rebate coupons. Thus, AmerenUE may continue to want to offer both rebates and markdowns depending on the program goals.

- **Expand advertising efforts to reach out to more non-participants who are not very familiar with CFLs**

Because awareness of CFLs still remains somewhat low in AmerenUE's territory, advertising and promoting energy efficient CFLs is important in this region. Based on our survey of non-participating customers: 45% of non-participants are using at least one CFL, an additional 21% of non-participants state that they are at least slightly familiar[12] but are not using, and 34% of non-participants are not familiar with CFLs. Awareness, therefore, appears to be the biggest barrier among non-participants.

The current advertising efforts appear to be effective at reaching customers and encouraging the use of CFLs. The ads seem to drive people to the store to buy CFLs with 59% of participants stating they saw the ads prior to entering the store. Most of these respondents recall seeing advertisements in Ace Hardware advertisements or circulars. Others, however, recall seeing ads and displays at Home Depot and news stories in magazines on CFLs that influenced their purchase. Even among participants who would pay full price for the CFL, many seemed to be influenced by the advertisements they saw (See Table 13, 17 of 25 participants who would have paid the full price were influenced by ads prior to making their purchase).

While participants have been drawn in by the advertising and marketing efforts, only 6% of non participants have seen any Ace Hardware advertisements for CFLs. Non-participants are seeing some messaging (about one-third, 32%, of non-participant heard the Change a Light, Change the World slogan within the past year) but overall awareness of the AmerenUE program is low. (See **Error! Reference source not found.**.) Only 3% of non participants were aware that AmerenUE sponsors a program that allows customers to receive a rebate on the purchase of CFLs at Ace Hardware stores, and only 5% were aware of the Ameren UE program that reduced the price on CFLs at Home Depot. Increasing awareness of rebates through increase marketing and promotion outside of the current Ace Hardware and Home Depot channels will help extend the reach of the program.

- **Partner with Wal-Mart or other retail locations to expand the reach of the program particularly among those who are unaware**

[12] For many, "slightly familiar" is just a softer way of indicating that they are not familiar.

While there were 26 locations that sold more than 100 CFLs in 2006, the number of participating retailers and locations does not appear to be growing. The program emphasizes two well-known and effective retail outlets (i.e., Ace Hardware and Home Depot); however, in 2006, the program only worked with Ace Hardware stores outside of metro St. Louis, and only worked with Home Depot stores inside of metro St. Louis, so in effect there was only one retailer that sold program bulbs in each area.

While many non-participating customers purchase from Ace (12%) and Home Depot (28%), Wal-Mart also appears to be a major retailer for light bulbs within the AmerenUE territory—particularly among non-participants. (See Table 16 and **Error! Reference source not found.**.) As such, the program should consider ways to expand the partnership to Wal-Mart and/or other retailers.

**Table 16: Where Lighting Purchases Are Made (multiple responses)**

| | Non Participants (n=100) | Among Non-Participants Who Currently Do Not Use CFLs (n=56) |
|---|---|---|
| Wal-Mart | 39% | 39% |
| **Home Depot** | 28% | **16%** |
| **Ace Hardware** | 12% | 13% |
| Lowe's | 12% | **13%** |
| Grocery store | 11% | 9% |
| Where ever they are on sale | - | - |
| Target | 4% | 4% |
| Kmart | 3% | 5% |
| Hy vee | - | - |
| Dollar Store | 4% | 7% |
| Sam's Club | 2% | - |
| Discount store | | - |
| Walgreen's | 1% | 2% |
| Other | 2% | 4% |
| Don't know | 3% | 2% |

Notably, however, in 2007, Wal-Mart has started some of its own marketing nationwide to promote the purchase of CFLs with its customers.

- **Expand the types of CFLs offered through the program and consider whether additional brands or wattages would increase program sales**

Many customers feel that the selection of CFLs is less than the selection of incandescents (42% of participants and 41% of non-participants who are familiar with CFLs). (See **Error! Reference source not found.**.) As such, this may be one barrier for customers.

While the number of types of CFLs offered through the program has increased over the years, only two brands of CFLs are offered through the program (GE and Commercial

Electric) which is less than similar programs in other service territories. Moreover, the majority of bulbs sold are 13-watt CFLs. In fact, in 2006, the program offered only one type of bulb in the St. Louis metro area (a Commercial Electric 13-watt bulb) sold as a six-pack. Brand is important to about 43% of non-participants. While satisfaction with GE is high (more than 90% of all customers have a favorable opinion of GE), in general, Commercial Electric bulbs (sold at Home Depot), are "unknown" by customers. Among non-participants that thought brand was at least somewhat important only a few (4%) had an unfavorable opinion of the brand but most (74%) had not heard of Commercial Electric (this includes 60% who said that they never heard of Commercial Electric and 14% who said they "didn't know") (**Error! Reference source not found.** and **Error! Reference source not found.**). While the current brands and types of bulbs provide satisfaction to most participants, we were not able to contact participants who bought Commercial Electric bulbs given the lack of participant data from Home Depot markdowns. AmerenUE should consider efforts to increase the selection of CFLs promoted through the program in order to expand the reach of the program. For the future, AmerenUE should also consider research to better understand satisfaction with Commercial Electric bulbs since some types of bulbs are known to be less satisfying for customers due to color or brightness (see below).

- **Conduct additional research with Home Depot stores to better understand in-service rates and other customer-based information for purchases made through mark down efforts**

Little information (besides sales) is available for the markdown efforts through Home Depot. While our evaluation made assumptions based on surveys with participants who purchased from Ace, notably, in-service and freeridership rates may be different for purchasers at Home Depot in 2006 since these bulbs were sold as 6-packs. Moreover, as mentioned above, overall satisfaction may be different since the two retailers sold different types of bulbs by different manufacturers.

Information on the number of bulbs sold per customer (transaction data) is also not available for Home Depot). Based on 2005 data (i.e., the latest set of data with information on households), most households purchased six bulbs; however, notably, 16% percent of participating households in 2005 appear to have bought more than six bulbs, with 14 households buying 50 or more bulbs. The number of bulbs sold to each household ranged from one to 190 bulbs in 2005 (with rebate amounts ranging from $2 to $380 per home). While 2006 data was only available for Ace Hardware purchases, the number of bulbs sold to each household ranged from one to 88 bulbs in 2006 (with rebate amounts ranging from $2 to $176 per home).[13] Numbers for Home Depot in 2006 were not available since customer data was not collected, but since the program bulbs were sold as six packs, the average number of bulbs per home was most likely higher in 2006 than in 2005.

As such, additional tracking may be necessary. AmerenUE may want to consider whether additional details (such as the number of transactions) are necessary to ensure that bulbs sold through Home Depot are not being sold by the pallet, or sold for resale at other locations.

[13] Again, however, this does not include Home Depot sales which were only sold as 8-packs in 2006 and accounts for 75% of the total CFLs purchased.

AmerenUE should also consider future in-store research with Home Depot customers to better understand their purchase habits, use of bulbs, and satisfaction with bulbs sold at Home Depot since the markdown component of the program is very different than the rebate program. (That is, the type of store, type of customer, brand of bulb, price of the bulbs and number of bulbs per package all differ.)

If AmerenUE focuses on markdown efforts in the future, they may also want to gather additional information from MEEA on the percentage of bulbs sold to customers in other service territories to better understand leakage rates for future markdown efforts. (Notably, our evaluation did not deal with leakage from the mark down into other territories since the markdown was primarily in the St. Louis area.)

- **Support and enhance in-store promotions**

Overall, 39% of participants found out about the AmerenUE lighting rebate program from in store displays. Forty-seven percent of first time purchasers found out about the program this way. As such, the in-store POP and promotion efforts appear to be effective. AmerenUE should continue to work with Ace Hardware and Home Depot to place in-store advertisements, promotions and POP materials in prominent locations. As the program expands to other stores, AmerenUE should also include in store promotions in other stores since many customers find out about the program through this method.

Additionally, AmerenUE could consider using in-store promotions and consumer messaging to educate consumers about the improvements in the technology, and overcome perceptions that the turn-on time and aesthetics lag behind incandescent lighting. Some efforts to support this may include:

- Demonstrate the technological advances that have been through in-store demonstrations.
- Develop alternative sponsor created POP and marketing materials that promote the recent improvements in CFL technology that address many of the earlier issues with older products (as well as the total savings associated with program lighting products).
- Consider supporting A-lamp looking products or products that are similar in shape, size and light levels to alternative non-energy efficient equivalents if high-quality products can be found.

Currently, only 38% of non-participants say that they would use a CFL in their most frequently used lighting (Section VI Table D- 1). As such, a lot of potential opportunities exist once more consumers understand that there are CFLs that can meet the diversity of their lighting needs.

- **Promote the benefits of CFLs including energy savings and other factors such as the environmental benefits and longer lifetime**

The top motivating factors for purchasing CFLs are energy savings (54% participants and 60% non-participants) and saving money on electric bills (24% and 11% respectively) (See **Error! Reference source not found.**). These characteristic, therefore, should continue to be stressed in promotional materials. When asked about other characteristics, however, participants appear to be more familiar with the longer life of CFLs, the environmental

benefits, and participants are more likely to think that the color of CFLs is better or the same as an incandescent. (See **Error! Reference source not found.**). Since non-participants are less likely to know that CFLs are more environmentally friendly or that they last longer than incandescent bulbs or that the color is comparable, AmerenUE should consider raising awareness of these characteristics in their promotion of CFLs.

- **Keep good tracking databases while eliminating small inconsistencies and data gaps**

Overall, the databases appear to be well maintained and to contain most of the necessary information for evaluation (with the exception of customer information for those who purchased through the markdown efforts, described above).

Notable gaps and inconsistencies in the databases that we reviewed include:

- No data is available on the store locations where 6,891 bulbs were sold in 2003.
- There are 406 customer records in 2005 with **only** a store name and no customer information.
- There are 41 customer records in 2005 that appear to have commercial names (i.e., Ahel Oil Co).
- We do not appear to have customer data for the bulbs sold through the events held at the Earthway Center and Westlake Ace stores in Jefferson City and Springfield in 2005.

As possible, AmerenUE should encourage MEEA to continue to keep good tracking databases and track additional information if possible.

# VI. Detailed Data Tables

**Section VI Table D-1: Detailed Description of Total Number of Bulbs Purchased by Bulb Type**

| Manufacturer/ Retailer | Model # | Bulbs per Pack | CFL Wattage | Instant Rebate Amount | Number of Bulbs Purchased | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | 2003 | 2004 | 2005 | 2006 |
| **Ace, Do It Best, True Value, Hy-Vee** | | | | | | | | |
| General Electric | 41520 | 1 | 15w | $2.00 | 36,939 | 34,406 | 27,158[a] | 10,136 |
| General Electric | 15517 | 1 | 26w | $2.00 | 10,934 | 9,020 | 5,862[b] | 2,974 |
| General Electric | 15516 | 1 | 20w | $2.00 | 1,297 | 3,630 | 2,022 | 1,827 |
| General Electric | 21733 (A-line) | 1 | 15w | $2.00 | -- | -- | 258[c] | 273 |
| General Electric | 20708 (Reflector) | 1 | 15w | $2.00 | -- | -- | 40 | 15 |
| General Electric | 21739 (PAR38) | 1 | 26w | $2.00 | -- | -- | 12 | 11 |
| General Electric | 49906 | 1 | 10w | $2.00 | -- | -- | -- | 8 |
| General Electric | 21710 (Dimmable) | 1 | 15w | $2.00 | -- | -- | 2 | 6 |
| General Electric | 24684 | 1 | 32w | $2.00 | -- | -- | 26 | 5 |
| General Electric | 49895 (Bug) | 1 | 11w | $2.00 | -- | -- | -- | 2 |
| General Electric | 49894 (Post) | 1 | 11w | $2.00 | -- | -- | -- | 1 |
| General Electric | 41442 (3-way) | 1 | 29w | $2.00 | -- | -- | 223 | -- |
| **Home Depot** | | | | | | | | |
| Commercial Electric[g] | NA | 6 | 13w | $4.00[g] markdown | -- | -- | -- | 45,684 |
| Commercial Electric | 292-460 | 6 | 14w | $4.00 | -- | -- | 3,144[d] | -- |
| Commercial Electric | 591-830 | 4 | 23w | $4.00 | -- | -- | 548[e] | -- |
| Commercial Electric | 590-472 (PAR38) | 4 | 23w | $4.00 | -- | -- | 184[f] | -- |
| Commercial Electric | 166-785 (R30) | 4 | 14w | $4.00 | -- | -- | 136 | -- |
| **Menards** | | | | | | | | |
| Buyer's Choice | 29131 | 2 | 13w | $4.00 | -- | -- | 14 | 4 |
| **Theisens Farm & Home** | | | | | | | | |
| Westinghouse | 07205 | 1 | 15w | $2.00 | -- | -- | 6 | -- |
| | **TOTAL** | | | | **49,170** | **47,056** | **39,635** | **60,946** |

[a] Includes 24 bulbs with the description "GE 15w MiniSpiral – 41520".
[b] Includes 4 bulbs with the description "GE 26W Spiral – 15517 15836".
[c] Includes 4 bulbs with the description "GE 15W Cov A-Line".
[d] Includes 4 records of bulbs with the description "Comm Electric 14W MS – 6 pack" which were mailed in and seem to have been improperly entered into the database as 2 individual bulbs for a total rebate of $4 instead of 1 pack of 6 bulbs (i.e., should have been 24 bulbs instead of 8).
[e] Includes 1 record of bulbs with the description "Comm Electric 14W Minisprl" which were mailed in and seem to have been improperly entered into the database as 2 individual bulbs for a total rebate of $4 instead of 1 pack of 4 bulbs (i.e., should have been 4 bulbs instead of 2).
[f] Includes 1 record of bulbs with the description "Comm Electric 14W Reflectr" which were mailed in and seem to have been improperly entered into the database as 2 individual bulbs for a total rebate of $4 instead of 1 pack of 4 bulbs (i.e., should have been 4 bulbs instead of 2).
[g] According to the AmerenUE spreadsheet.

**Section VI Table D-2: ENERGY STAR Awareness**

| | Participants (n=71) | Non Participants (n=100) |
|---|---|---|
| Aware | 65% | 54% |
| *Unaided* | *58%** | *40%* |
| *Aided* | *7%* | *14%* |
| Not aware | 34% | 45% |
| Don't know | 1% | 1% |

*significantly higher than comparison group at 90%

**Section VI Table D-3: What ENERGY STAR Label Means**

*(Of those that are aware of the label)*

| | Participants (n=46) | Non Participants (n=54) |
|---|---|---|
| Uses less energy | 48% | 56% |
| Lower utility bills | 28% | 35% |
| High quality | 11% | 4% |
| Good for the environment | 11% | 11% |
| Less pollution | 7% | 7% |
| Product is tested | - | 7% |
| Government endorsed | - | 2% |
| Haven't thought about it | - | 6% |
| Other | 2% | - |
| Don't know | 9% | 6% |

**Section VI Table D-4: Aware of CFLs**

*(Participants-Prior to Using Rebate)*

| | Participants (n=71) | Non Participants (n=100) |
|---|---|---|
| Very familiar | 15% | 38%* |
| Somewhat familiar | 27% | 18% |
| Slightly familiar | 37%* | 10% |
| Not at all familiar | 21% | 30% |
| Don't know | - | 4% |

*significantly higher than comparison group at 90%

- 45% of non participants have purchased a CFL

## Section VI Table D-5: Non Participants Last Purchase of CFLs

| QL6a: When did you last purchase a CFL? | Non Participants (n=45) |
|---|---|
| Within last year | 78% |
| One to two years ago | 13% |
| Two to four years ago | 7% |
| Four to six years ago | - |
| More than six years ago | - |
| Don't know | 2% |

## Section VI Table D-6: Satisfaction with CFLs

| | Participants (n=71) |
|---|---|
| Very satisfied | 77% |
| Somewhat satisfied | 17% |
| Somewhat dissatisfied | 4% |
| Very dissatisfied | - |
| Don't know | 1% |

## Section VI Table D-7: Likelihood of Purchasing CFLs in the Future

| | Participants (n=71) | Non Participant (n=66) |
|---|---|---|
| Very likely | 73% | 41% |
| Somewhat likely | 20% | 38% |
| Neither likely or unlikely | 1% | 3% |
| Somewhat unlikely | 1% | 8% |
| Very unlikely | 3% | 9% |
| Don't know | 1% | 2% |

## Section VI Table D-8: How Important is Brand Name

| | Participant Total (n=71) | Non Participant (n=100) |
|---|---|---|
| Not at all important | 27% | 40%* |
| Somewhat unimportant | 24%* | 10% |
| Neither important nor unimportant | - | 5% |
| Somewhat important | 34% | 24% |
| Extremely important | 13% | 19% |
| Don't know | 3% | 2% |

*significantly higher than comparison group at 90%

**Section VI Table D-9: Light Bulb Brands**
**Among Those that Think Brand Is At Least Somewhat Important**
**Participant (n=33), Non Participant (n=43)**

| | GE | | Commercial Electric | | Sylvania | | Westinghouse | |
|---|---|---|---|---|---|---|---|---|
| | Part. | Non Part. | Part. | Non Part. | Part. | Non Part. | Part. | Non Part. |
| Very favorable | 64% | 74% | 15% | 5% | 48% | 35% | 21% | 30% |
| Somewhat favorable | 30% | 16% | 15% | 2% | 36% | 26% | 39% | 23% |
| Neither favorable nor unfavorable | - | 5% | - | 14% | 3% | 7% | 6% | 7% |
| Somewhat unfavorable | - | - | 6% | 2% | - | 9% | 9% | 14% |
| Very unfavorable | - | - | - | 2% | - | - | - | 2% |
| Never heard of this brand | 3% | 2% | 36% | 60%* | 3% | 9% | 9% | 5% |
| Don't know | 3% | 2% | 21% | 14% | 9% | 14% | 15% | 19% |

*significantly higher than comparison group at 90%

**Section VI Table D-10: How Do You Find Out About the Rebate (multiple responses)**

| | Total (n=71) | First Time Purchaser? | | Would Have Paid Full Price? | |
|---|---|---|---|---|---|
| | | Yes (n=45) | No (n=25) | Yes (n=25) | No (n=40) |
| Saw it in a store | 39% | 47% | 28% | 20% | 53%* |
| Newspaper | 23% | 13% | 36%* | 28% | 18% |
| Friend/family/co-worker | 13% | 9% | 20% | 20% | 10% |
| Ace hardware circular | 8% | 7% | 12% | 4% | 13% |
| Bill insert | 6% | 9% | - | 4% | 5% |
| Radio | 3% | 4% | - | 8% | - |
| Website | 1% | 2% | - | 4% | - |
| TV | 1% | - | 4% | 4% | - |
| Other press event | 1% | 2% | - | 4% | - |
| Other | 1% | 2% | - | 4% | - |
| Don't know | 3% | 4% | - | - | 3% |

*significantly higher than comparison group at 90%

**Section VI Table D-11: Comparing CFL to Incandescent Bulbs**

| | Participant (n=71) | Non Participant (n=70) |
|---|---|---|
| **A CFL is…than an incandescent bulb** | | |
| More expensive | 68% | 71% |
| Less expensive | 15%* | 3% |
| Same | 10% | 4% |
| Depends on application | 1% | - |
| Don't know | 6% | 21%* |
| **The color of light from a CFL is….than an incandescent bulb** | | |
| Better | 45%* | 20% |
| Same as | 34% | 27% |
| Worse | 11% | 24%* |
| Depends on application | 3% | 4% |
| Don't know | 7% | 24%* |
| **A CFL is…than an incandescent bulb** | | |
| More environmentally friendly | 76%* | 50% |
| Equally environmentally friendly | 10% | 11% |
| Less environmentally friendly | 4% | 9% |
| Depends on application | - | 3% |
| Don't know | 10% | 27%* |
| **A CFL lasts… an incandescent bulb** | | |
| Longer | 83%* | 63% |
| Same | 3% | 7% |
| Shorter | 1% | 1% |
| Depends on application | - | - |
| Don't know | 13% | 29%* |
| **There is a …selection of CFLs than incandescent bulbs** | | |
| Worse | 42% | 41% |
| Same | 28% | 20% |
| Better | 24%* | 7% |
| Depends on application | 1% | 1% |
| Don't know | 4% | 30%* |
| **A CFL has a … startup time as an incandescent bulb** | | |
| Slower | 82%* | 44% |
| Same | 11% | 23%* |
| Faster | 6% | 3% |
| Depends on application | 1% | - |
| Don't know | - | 30%* |
| **A CFL fits into a light fixtures … than an incandescent bulb** | | |
| Same | 63%* | 49% |
| Worse | 15% | 11% |
| Better | 13% | 4% |
| Depends on application | 7% | 9% |
| Don't know | 1% | 27%* |

**Section VI Table D-12: Factors Considered When Purchasing Light Bulbs**

| | Participants (n=71) | Non Participants (n=100) |
|---|---|---|
| Price | 51% | 46% |
| Color of light | 17% | 15% |
| Environmental impacts | 15% | 9% |
| Brand | 14% | 15% |
| Aesthetics | 10% | - |
| Lifetime | 10% | 6% |
| Operating cost | 8% | 7% |
| Availability/selection | 1% | 5% |
| Fit | 1% | 3% |
| Efficiency | - | 14% |
| Other | 6% | 9% |
| Don't know | 8% | 7% |

**Section VI Table D-13: Would Choose a CFL or Incandescent For Most Frequently Used Lighting**

| | Participants (n=71) | Non Participants (n=70) |
|---|---|---|
| Would choose CFL | 80% | 54%[a] |
| Would choose incandescent because CFL… | 15% | 29% |
| *Takes to long to come on* | *6%* | - |
| *Too dim/not bright enough* | *4%* | *9%* |
| *Ugly/unattractive* | *1%* | *1%* |
| *Doesn't fit into socket* | *1%* | - |
| *Doesn't work with dimmer* | *1%* | *1%* |
| *Don't believe advertising* | - | *3%* |
| *Other* | - | *4%* |
| *Don't know* | *1%* | *10%* |
| Don't know | 4% | 17% |

[a] Only asked of non-participants familiar with CFLs. This represents 38% of all non-participants.

**Section VI Table D-14: Motivation Factors (multiple responses)**

| | Participants (n=71) | Non Participants (n=100) |
|---|---|---|
| Energy savings | 54% | 60% |
| Save money on electric bill | 24% | 11% |
| Rebate/special promotion | 21% | 4% |
| Try something new | 1% | 16% |
| Replacing a burned out light | - | 11% |
| Don't know | 4% | 4% |

*significantly higher than comparison group at 90%

**Section VI Table D-15: Do You Remember Seeing or Hearing the Slogan (multiple responses)**

| | Participants (n=71) | Non Participants (n=100) |
|---|---|---|
| Yes, I remember it | 35% | 32% |
| *TV* | *24%* | *N/A* |
| *Billboard* | *3%* | |
| *In store display materials* | *1%* | |
| *Other* | *1%* | |
| *Don't know* | *6%* | |
| No | 62% | 63% |
| Don't know | 3% | 5% |

**Section VI Table D-16: Were You Planning to Purchase CFLs When You Went into the Store**

| | Participants (n=71) |
|---|---|
| Planned on purchasing before entering store | 69% |
| *Saw ads* | *44%* |
| *Did not see ads* | *25%* |
| Did not plan on purchasing before entering store | 27% |
| *Saw ads* | *14%* |
| *Did not see ads* | *13%* |
| Don't know | *4%* |
| *Saw ads* | *1%* |
| *Did not see ads* | *3%* |

## Section VI Table D-17: Number of CFLs Installed

| Number of CFLs | Participants (n=71) | | | Non Participants (n=100) | | |
|---|---|---|---|---|---|---|
| | Total | Outside | Inside | Total | Outside | Inside |
| 1 | 3% | 7% | 1% | 8% | 7% | 10% |
| 2 | 6% | 7% | 7% | 5% | 7% | 6% |
| 3 | 1% | 3% | 1% | 3% | - | 3% |
| 4 | 6% | 6% | 8% | 3% | 2% | 3% |
| 5 | 7% | 3% | 8% | 4% | - | 3% |
| 6-10 | 37% | 6% | 41% | 10% | 2% | 9% |
| 11-20 | 25% | 3% | 17% | 7% | - | 7% |
| 21 or more | 11% | 1% | 8% | 4% | - | 2% |
| None | 4% | 59% | 1% | 56% | 82% | 57% |
| **Average** | **11** | **2** | **10** | **4** | **0** | **3** |
| **Median** | **8** | **0** | **7** | **0** | **0** | **0** |

## Section VI Table D-18: How Do You Decide Where to Put CFLs

| | Participants (n=71) |
|---|---|
| Sockets most frequently used | 55% |
| Wherever I can | 23% |
| Only where they fit | 8% |
| Areas where I don't need a lot of light | 7% |
| Sockets not frequently used | 3% |
| Hard to reach sockets | 1% |
| Other | 7% |
| Don't know | 1% |

## Section VI Table D-19: Number of CFLs Purchased with AmerenUE Rebate Coupon

| Number of Bulbs Purchased | Participants (n=71) |
|---|---|
| 1 | 6% |
| 2 | 10% |
| 3 | 6% |
| 4 | 9% |
| 5 | 1% |
| 6 | 44% |
| 7-10 | 7% |
| 11-20 | 11% |
| 21 or more | 6% |
| Don't know | 1% |
| **Average** | **8.5** |
| **Median** | **6** |

## Section VI Table D-20: Ace Hardware versus Home Depot

| | Ace Hardware | | Home Depot | |
|---|---|---|---|---|
| | **Participant (n=71)** | **Non Participant (n=100)** | **Participant (n=71)** | **Non Participant (n=100)** |
| Always purchase here | 24%* | 5% | 7% | 8% |
| Usually purchase here | 11% | 7% | 1% | 14%* |
| Sometimes purchase | 41%* | 18% | 17% | 22% |
| Purchased here once or twice | 20% | 12% | 6% | 6% |
| Never purchased here | 3% | 57%* | 68%* | 47% |
| Don't know | 1% | 1% | 1% | 3% |

*significantly higher than comparison group at 90%

## Section VI Table D-21: Where Lighting Purchases Are Made (multiple responses)

| | Participant (n=71) | Non Participants (n=100) | Among Non-Participants Who Currently Do Not Use CFLs (n=56) |
|---|---|---|---|
| Wal-Mart | 55%* | 39% | 39% |
| **Ace Hardware** | **53%*** | **12%** | **16%** |
| Lowe's | 16% | 12% | 13% |
| **Home Depot** | **13%** | **28%*** | **13%** |
| Grocery store | 7% | 11% | 9% |
| Where ever they are on sale | 5% | - | - |
| Target | - | 4% | 4% |
| Kmart | 2% | 3% | 5% |
| Hy vee | 2% | - | - |
| Dollar Store | - | 4% | 7% |
| Sam's Club | - | 2% | - |
| Discount store | 2% | | - |
| Walgreen's | - | 1% | 2% |
| Other | - | 2% | 4% |
| Don't know | - | 3% | 2% |

## Section VI Table D-22: Non Participant Purchase of CFLs at Home Depot

| | Non Participants (n=100) |
|---|---|
| Yes | 13% |
| *Single bulbs* | *1%* |
| *Pack of bulbs* | *11%* |
| *Don't know* | *1%* |
| No | 84% |
| Don't know | 3% |

## Section VI Table D-23: Non Participant Purchase of Discounted CFLs at Home Depot

| | Non Participants (n=100) |
|---|---|
| Yes, purchased discounted multi-pack | 4% |
| Purchased full price multi-pack | 5% |
| Don't remember if discounted or not | 2% |
| Didn't purchase multi-pack of CFLs at Home Depot | 89% |

## Section VI Table D-24: Residential Lighting Participant Demographics

| Demographics | Participants (n=71) | Non Participants (n=100) |
|---|---|---|
| **Own/Rent** | | |
| Own | 90% | 84% |
| Rent | 8% | 13% |
| Don't know | 1% | 3% |
| **Household Type** | | |
| Single family | 90% | 83% |
| Duplex or 2 family | 1% | 4% |
| Apartment 2-4 units | 3% | 5% |
| Apartment >4 units | 1% | 5% |
| Mobile home | 3% | 1% |
| Townhouse | - | 2% |
| Other | 1% | - |
| **Number of People** | | |
| 1 | 13% | 27%* |
| 2 | 45% | 45% |
| 3 | 14% | 10% |
| 4 | 17% | 11% |
| 5 | 7% | 4% |
| 6 | 3% | 1% |
| 7 or more | - | 1% |
| Refused | 1% | 1% |
| **Low Income** | | |
| Non Low Income | 63% | 69% |
| Low Income | 19% | 16% |
| Don't know/refused | 19% | 15% |

| Demographics | Participants (n=71) | Non Participants (n=100) |
|---|---|---|
| **Year Built** | | |
| Built in 2006 | 1% | - |
| 2004-2005 | 3% | 1% |
| 2001-2003 | 1% | 7% |
| 1990-2000 | 13% | 15% |
| 1980-1989 | 11% | 5% |
| 1970-1979 | 31%* | 12% |
| 1960-1969 | 8% | 13% |
| 1950-1959 | 10% | 10% |
| 1940-1949 | 1% | 5% |
| Prior to 1939 | 8% | 12% |
| Don't know | 11% | 20% |
| **Education** | | |
| Less than 9th grade | 4% | 2% |
| 9th to 12th grade | 6% | 4% |
| High school graduate | 32% | 33% |
| Some college, no degree | 18% | 21% |
| Associates degree | 4% | 8% |
| Bachelors degree | 14% | 18% |
| Graduate or professional degree | 13% | 10% |
| Don't know/refused | 8% | 4% |
| **Ethnicity/Race** | | |
| White | 92% | 88% |
| Black or African American | - | 10% |
| Alaskan | 1% | - |
| Hispanic/Latino | 1% | - |
| Refused | 6% | 2% |

*significantly higher than comparison group at 90%

OPINION DYNAMICS
CORPORATION

# EVALUATION OF AMERENUE'S REFRIGERATOR RECYCLING AND REBATE PROGRAM

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## Executive Summary

AmerenUE along with the Midwest Energy Efficiency Alliance (MEEA) offered a Refrigerator Recycling and Rebate Program in 2003 and again for two months at the end of 2005. The goal of these programs was to encourage the use of Energy Star refrigerators by offering an incentive to remove older refrigerators from the market. According to the AmerenUE program description, "The Refrigerator Rebate and Recycling Program was designed to increase market share of energy-efficient refrigerators in use within the markets served by AmerenUE. The program's energy savings are produced by accelerating the pace at which Energy Star® qualified models gain market share by offering a rebate on the purchase of a new Energy Star® refrigerator and by providing people who purchase an Energy Star unit an incentive to recycle through an environmentally sound process that permanently removes older, energy-inefficient units from the market well in advance of reaching their expected years of use." (A full description of the program can be found in Section II.)

Based on the findings from this evaluation, program accomplishments for 2003 and 2005 include:

- Increasing the number of refrigerators recycled by 2,438 units: 2,314 units recycled in 2003 and 124 units recycled in 2005
- Sales of 496 Energy Star units in conjunction with the program: 379 in 2003 and 117 in 2005
- The early retirement of some units
- Savings of 1,904 MWh

The 2003 and 2005 programs both attempted to influence customers to purchase new Energy Star refrigerators and recycle older refrigerators. Due to the nature of the implementation contracts, however, program intervention occurred at the customer level for only 22% of the units recycled (for the remaining units, program intervention occurred with the haul away contractor). However, most of the customers participating in the program appear to be satisfied with the program (86% of those who participated in 2005). Participants were most satisfied with the pick up and removal process with 92% stating they were very satisfied with this process, followed by 82% stating they are very satisfied with the sign up process. Participants were least satisfied with the amount of time it took to receive the incentive check however 71% still stated they were very satisfied. (See Section VI Table D-3 and Section VI Table D-19.)

Overall, program savings from these programs are relatively low (among the lowest in AmerenUE's portfolio during the 2003-2006 period), with the 2003 program being cost-effective while the 2005 program was not cost-effective due to the short implementation period. (See Section IV.)

No additional refrigerator recycling programs have been funded to date. However if AmerenUE and the Collaborative decide to run a similar program in the future, we recommend the following:

- Clearly state the goals of the program to focus the program approach, and consider extending the program to include customers who "only recycle" and/or customers who "only purchase an Energy Star refrigerator"
- Consider at what point in the process you want to reach potential program participants and expand promotions to reach those who were not already looking to purchase a new refrigerator
- Refocus the program to encourage early retirement of refrigerators through marketing outside of appliance stores
- Raise awareness of opportunities to recycle, and building the infrastructure for this effort, perhaps in lieu of providing customer incentives
- Extend planning time and the length of commitments from retailers and subcontractors
- Find ways to ensure that customer units are not switched during the recycling process
- Collect consistent data from both older models and new models (e.g., nameplate amperage for both).

Details on each of these recommendations are provided in Section V.

# I. Introduction and Methodology

AmerenUE along with the Midwest Energy Efficiency Alliance (MEEA) offered a Refrigerator Recycling and Rebate Program in 2003 and again for two months at the end of 2005. According to the AmerenUE program description, "The Refrigerator Rebate and Recycling Program was designed to increase market share of energy-efficient refrigerators in use within the markets served by AmerenUE. The program's energy savings are produced by accelerating the pace at which Energy Star® qualified models gain market share by ... providing people who purchase an Energy Star unit an incentive to recycle through an environmentally sound process that permanently removes older, energy-inefficient units from the market well in advance of reaching their expected years of use." AmerenUE partnered with the Midwest Energy Efficiency Alliance to administer this program. (A full program description is provided in Section II.)

This report provides a process and impact evaluation of the Refrigerator and Recycling Program, led by Opinion Dynamics Corp. in partnership with GDS Associates. This evaluation report is based on (1) an in-depth interview with the MEEA program administrator and program stakeholders, including MEEA and ARCA, (2) review of MEEA annual reports (3) our review of the 2003 and 2005 program databases, (5) our review of a MEEA survey of participants from 2003, (6) telephone interviews with participants in the 2005 program, and (7) telephone interviews with non-participants.

In March 2007, ODC conducted telephone surveys with 65 participants in the 2005 program; representing 54% recycled refrigerators and 56% new Energy Star refrigerators attributed to the program. The list of program participants and their contact information was provided to ODC by AmerenUE. Where possible, we combined this data with survey data collected by MEEA from 2003 program participants.

ODC also interviewed 100 AmerenUE customers who had not participated in the Refrigerator Rebate and Recycling program. AmerenUE provided ODC with a list of zip codes that fall within its service territory. Using this list, ODC obtained a random sample of phone numbers from these zip codes. We then removed program participants from our non-participant sample. These non participant interviews were conducted in April 2007. Of these non participants 32% purchased a new refrigerator within the past five years.

We do not provide all of the detailed tables in the body of the write-up for the purpose of keeping the write-up as succinct as possible. Key tables are provided in the body of the write-up, with additional detailed tables denoted by the letter "D" and provided in Section VI of this report.

# II. Program Description

This section describes the history of the 2003 and 2005 programs including the incentive structures, costs, and recycling and sales goals for the 2003 and 2005 programs.

## 2003 Program Description

The 2003 program "sought to increase the sales of Energy Star qualified refrigerators and link these sales to an accelerated retirement of old operational refrigerators. Therefore, the consumer incentive to purchase an Energy Star qualified unit was linked to recycling bounties. By linking these two activities at the consumer level the program would allow a high replacement rate and high cost effectiveness in terms of kWh reclamation."[1]

The 2003 program was run by the Midwest Energy Efficiency Alliance (MEEA), in coordination with Honeywell Utility Solutions; Sears; and the Sears local pick-up vendor in Missouri, S&S Recycling; and the Appliance Recycling Centers of America (ARCA), which recycled all units. Customers who purchased an Energy Star refrigerator from Sears received a 10% discount from Sears, and were then paid a $30 bounty if they recycled their old refrigerator through Sears using a program sticker from their new Energy Star refrigerator. In addition, if they recycled a second unit through the program (using the stickers from their new Energy Star refrigerator) they could receive another $50 bounty on their second recycled refrigerator or freezer. As part of the contract with Sears and their local pick-up vendor, S&S Recycling, AmerenUE and MEEA paid S&S Recycling a fee for any unit picked up from a customer who bought a refrigerator from Sears (even if they did not replace this refrigerator with an Energy Star refrigerator). As part of the program, S&S Recycling received $40 per unit recycled. MEEA (and AmerenUE) then paid ARCA to recycle the units. The program also spent $32,739 for six advertisements in the St. Louis newspaper.

The total program costs for the PY 2003 program were $378,382.

As documented in MEEA's PY2003 report, this program experienced difficulties because they were:

- Unable to work with manufacturers given the limited region covered by AmerenUE
- Unable to extend beyond certain parts of the AmerenUE territory given the lack of a centralized appliance delivery and haul away service outside of St. Louis
- Only able to work with eight Sears retailers since there were no opportunities for recycling beyond the Saint Louis area.

## 2005 Program Description

The 2005 program sought to improve upon the 2003 program. To do this MEEA amended the design of the program to link the purchase of an Energy Star qualified refrigerator to any bounty or rebate a consumer would receive in order to introduce a stronger market transformation aspect to the program (thus eliminating recycling without the purchase of an Energy Star refrigerator).

[1] MEEA 2003 Regional ENERGY STAR© Refrigerator Rebate & Recycling Program Final Report

The 2005 program was an improvement on the 2003 program, including the following changes:

- The geographic area was expanded to include St. Louis, Jefferson City and Cape Girardeau
- The retail locations were broadened to include all stores, not just Sears
- Energy Star units on sale were allowed
- All primary units were replaced by an Energy Star refrigerator

The 2005 program was also administered by MEEA, working directly with the Appliance Recycling Centers of America (ARCA). A $50 bounty was given for old units if the customer could provide a receipt for a new Energy Star refrigerator.

The 2005 program, however, experienced a very late program launch due to the approval process, and the difficulties of coordinating contractor selection and contract negotiations with a large committee. Although MEEA requested an extension, AmerenUE's tariff ended on December 31, 2005 and they were unable to extend the program without going back to the commission.

In 2005, ARCA was paid for units picked up. ARCA was paid $145 per unit (or $115 for the second unit), and the customer was given a $50 incentive, for a total of $195 per unit (or $165 per second unit). Notably, the costs per unit were much higher than in 2003.

Total program costs for 2005 were $66,257 (with incentives for recycling accounting for $17,980, and bounty payments to customers equaling $6,200).

# III. Program Accomplishments

Program accomplishments during the program period include:

- Increasing the number of refrigerators recycled by 2,438 units: 2,314 units recycled in 2003 and 124 units recycled in 2005
- Sales of 496 Energy Star units in conjunction with the program: 379 in 2003 and 117 in 2005
- The early retirement of some units (77% of those recycled)
- Savings of 1,904 MWh

These accomplishments are described in more detail below.

## Increasing the number of refrigerators recycled by 2,438 units: 2,314 units recycled in 2003 and 124 units recycled in 2005

Overall, the program recycled 2,438 units: 2,314 units in 2003 and 124 units in 2005.[2] While program participants reported that most refrigerators (96%) would have been replaced regardless of the program, almost none of them would have been recycled. (See Section VI Table D-9 and Section VI Table D-10.) As such, the majority of units that were still working could have remained in the secondary market.[3]

According to the PY2003 final report from MEEA, the program met its recycling goals. However, the recycling goals were ultimately met by collecting units that would have been picked up by S&S anyway; AmerenUE's program recycled these units (rather than returning them to the secondary market where possible). Many of these units, could have been replaced by new standard refrigerators (rather than Energy Star refrigerators) but information on the unit that replaced the recycled refrigerator was not available for most units. In all, the 2003 program paid for 2,373 units to be recycled through the program, but our analysis was only able to verify documentation for 2,314 units.

**Table 1: Program Recycling Goals**

| | 2003 | | 2005 | |
|---|---|---|---|---|
| | Goal | Actual | Goal | Actual |
| Primary Units Recycled | 1,600 | 2,136 | 1,945 | |
| Secondary Units Recycled | 624 | 237 | | 7[b] |
| Reported Total Units Recycled | 2,225 | 2,373[a] | 1,945 | 124[c] |
| Verified Units Through Impact Analysis | | 2,314 | | 124 |

[a] Note that the number of units recycled in 2003 reflects all of the units that S&S Recycling picked up, including ones that would have been picked up even in the absence of the program.
[b] 5 refrigerators and 2 freezers
[c] 122 refrigerators and 2 freezers

[2] Note that the 2003 report indicates 2,373 units recycled, but program databases only allowed us to verify 2,314 units.
[3] Given the fact that S&S Recycling required AmerenUE to pay for all refrigerators that they picked up, it did not appear to be an established refrigerator recycling center/way to get it to ARCA. More than likely, units would have been picked up and refurbished or thrown away.

The 2005 goal was to recycle 1,945 refrigerators in an environmentally sound manner. In all, 117 customers participated in the program, for a total of 124 units recycled (117 primary refrigerators, 5 secondary refrigerators and 2 freezers). As such, the 2005 program did not meet its goals. All of these units were documented by the program databases.

## Sales of 496 Energy Star units in conjunction with the program: 379 in 2003 and 117 in 2005

The AmerenUE program supported the sale of 379 models in 2003 and 117 in 2005. While 75% of the 2005 participants who we interviewed stated that they would have purchased an Energy Star model if the program had not required it, one-quarter (25%) of participants either would not have purchased an Energy Star model or were unaware of the Energy Star label.

Notably, while the program was running, Sears sold 3,028 Energy Star refrigerators, but only a small fraction of those customers recycled a refrigerator through the program, so ultimately only 379 of the refrigerators sold by the participating stores are recorded in the program database (although the 10% discount by Sears, which was part of the program, could have encouraged some of the remaining sales). While the 2003 annual report does not report a sales goal, it appears that they would have hoped to have the ratio of newly purchased Energy Star to recycled units be a 1:1 ratio. As such, the program did not reach their sales goal.

**Table 2: Program Energy Star Sales Goals**

| | 2003 | | 2005 | |
|---|---|---|---|---|
| | Goal | Actual | Goal | Actual |
| Sales goal (Bounties paid) | [1,600] | 379 | 1,880 | 117 |

[a] Note that the number of units recycled in 2003 reflects all of the units that S&S Recycling picked up, including ones that would have been recycled from Sears customers even in the absence of the program.

The 2005 goal was to support the purchase of 1,880 Energy Star qualified refrigerators. In all, only 117 customers participated in the program due to the short time frame of the program. As such, the 2005 program did not meet its goals. However, the program did achieve nearly a 1:1 ratio (i.e., 117 Energy Star units were purchased for 124 units recycled).

## Enabled the Early Retirement of Some Units (77% of Those Recycled)

Based on program data, we estimate that the combined 2003 and 2005 programs are responsible for the early retirement of 77% of the units. This estimate is based on responses from retailers and consumers about what would have happened to the units without the program (e.g., the retail would have hauled away, the refrigerator would have been used as a second unit, etc.), as well as on the assumption that approximately 75% of refrigerators that are hauled away or thrown away are eventually refurbished. While this is an approximation (since no definitive data is available on the market), this assumption takes into account ARCA's extensive experience in the market, the evaluation teams experience, as well as the age of the refrigerators that were recycled through the program.

**Table 3: Percent of Refrigerators Would Have Remained in Use**

| | Percent of all units recycled through the program (n=2,314) (column 1) | Assumed Percent That Would Remain in Use (column 2) | Percent of Total Remain in Use (col. 1 * col. 2) |
|---|---|---|---|
| Had the retailer haul it away (Still purchased a new unit) | 87% | 75% | 65% |
| Kept it, and not purchased a new one | 4% | 100% | 4% |
| Kept it as a second unit | 3% | 100% | 3% |
| Sold or given it away | 3% | 100% | 3% |
| Thrown it out or had someone else pick it up | 3% | 75% | 2% |
| Paid to have it recycled | 1% | 0% | 0% |
| | | **Total*** | 77% |

* The parts do not equal the sum due to rounding.

## Savings of 1,904 MWh

Gross savings per unit range from 912 kWh to 1,038 kWh. However, since only 77% would have remained in the market, net realized energy savings are as follows:

- 2003 are 1,816,346 kWh with a demand reduction of 0.2790 MW.
- 2005 are 87,904 kWh with a demand reduction of 0.0135 MW.

A detailed analysis of the impacts and cost-effectiveness of the 2003 and 2005 programs are reported below.

# IV. Impacts and Cost Effectiveness Analysis

We conducted the impact evaluation of AmerenUE's 2003 and 2005 Energy Star Refrigerator Rebate and Recycling Program using information about the refrigerators that were picked up and recycled by MEEA, as well as energy use information of older existing refrigerators and new Energy Star qualifying refrigerators.[4]

## Overview of Gross Savings Calculations

Because amp draw information in the program databases was connected load (actual operating) amperage versus nameplate amperage, and Energy Star only reports nameplate amperage for new units, we were not able to use the information in the program databases and it was necessary for us to calculate program impacts using another method. Information from a study completed by D&R International, Ltd., for DOE from the Directory of Certified Refrigerators, Freezers, and Refrigerator Freezers published by the California Energy Commission (CEC) from 1979 to 1992 shows average annual energy consumption by size of unit, style of unit, and age of unit. We sorted this information by unit size in order to develop a lookup table of annual energy use for side-by side style units and top freezer and other styles sized 9 cubic feet to 30 cubic feet (see Table 4).

**Table 4: Lookup Table for Existing Refrigerators**

| Vol (cu ft) | Side-by-side (KWh) | Top Mount freezer and other (KWh) |
|---|---|---|
| 9 | 850 | 770 |
| 10 | 880 | 800 |
| 11 | 900 | 850 |
| 12 | 950 | 870 |
| 13 | 1,000 | 930 |
| 14 | 1,050 | 975 |
| 15 | 1,100 | 1,005 |
| 16 | 1,200 | 1,030 |
| 17 | 1,260 | 1,070 |
| 18 | 1,300 | 1,100 |
| 19 | 1,330 | 1,130 |
| 20 | 1,350 | 1,150 |
| 21 | 1,375 | 1,170 |
| 22 | 1,400 | 1,190 |
| 23 | 1,425 | 1,215 |
| 24 | 1,440 | 1,240 |
| 25 | 1,465 | 1,260 |
| 26 | 1,475 | 1,280 |
| 27 | 1,480 | 1,300 |
| 28 | 1,495 | 1,300 |
| 29 | 1,550 | 1,370 |
| 30 | 1,650 | 1,430 |

[4] Information collected on the refrigerators that were recycled included amp draw of the removed units, size in cubic feet of the units, and the style of the units (side-by-side, top mounted freezer, bottom mounted freezer, single door refrigerator, etc.).

Consumption used in the lookup table was typical consumption seen for units of a particular size for units ten years old or less. We observed that increasing these consumption levels by 30% results consumption levels that are similar to those observed for units more than ten years old. This multiplier of 1.3 was applied if the age data for a recycled unit indicated that it was more than ten years old when picked up. Similarly, we developed typical energy consumptions of Energy Star qualifying models sized 9 cubic feet to 30 cubic feet to create a second lookup table (Table 5). The lookup tables provided an efficient method for assigning an estimated annual energy consumption level for all units recycled as part of the AmerenUE program. After a base consumption was determined for a unit, that consumption was multiplied by 1.3 to obtain an age-adjusted consumption if the unit was determined to be over ten years old at the time of removal. The anticipated annual energy use of an Energy Star qualifying replacement of the same size and type was subtracted from the age adjusted energy use of the removed unit to calculate annual energy saving resulting from the removal of that unit. Savings for all units removed through the program were then added to determine KWh savings for program years 2003 and 2005. In order to account for secondary refrigerators, the totaled savings were increased slightly by first deducting the number of secondary refrigerators removed multiplied by the average annual savings per unit and then adding back in the number of secondary refrigerators multiplied by average base consumption for the recycled refrigerators. This was done because secondary refrigerators would most likely not be replaced, while primary refrigerators would be. It is therefore fair to claim the entire base use consumption of secondary units as savings.

Because annual savings data were used to determine total program savings, it was not possible to independently calculate peak demand reduction; therefore, the ratio of demand reduction to energy savings (0.0001536 KW/KWh) derived from data in the Final Report Impact Evaluation of the Spare Refrigerator Recycling Program CEC Study #537 completed by Xenergy for Southern California Edison was used to compute peak demand reduction from calculated annual KWh savings.

**Table 5: Lookup Table for ENERGY STAR Refrigerators**

| Vol (cu ft) | Side-by-side (KWh) | Top Mount freezer and other (KWh) |
|---|---|---|
| 9 | 400 | 316 |
| 10 | 400 | 320 |
| 11 | 400 | 330 |
| 12 | 420 | 345 |
| 13 | 430 | 355 |
| 14 | 440 | 365 |
| 15 | 460 | 376 |
| 16 | 480 | 390 |
| 17 | 507 | 407 |
| 18 | 508 | 408 |
| 19 | 518 | 420 |
| 20 | 524 | 432 |
| 21 | 530 | 440 |
| 22 | 584 | 488 |
| 23 | 595 | 510 |
| 24 | 607 | 540 |

| Vol (cu ft) | Side-by-side (KWh) | Top Mount freezer and other (KWh) |
|---|---|---|
| 25 | 617 | 550 |
| 26 | 637 | 570 |
| 27 | 680 | 600 |
| 28 | 720 | 630 |
| 29 | 770 | 670 |
| 30 | 810 | 710 |

Overall, 94% of recycled refrigerators were plugged in and working at the time of the pickup.[5] Of the total number of refrigerators collected in 2003, over 1,800 were not replaced with Energy Star units directly through the program. It may be assumed that many were replaced with Energy Star units, and this was the assumption used in completing the impact analysis.
Finally, the average age of refrigerators recycled in 2003 was calculated to be 16.8 years. This is already beyond the expected life of 15 years for refrigerators. It is not known how many more years the refrigerators would have been in use, but many collected were 30, 40, or even 50 years old. Therefore, for the purposes of program cost effectiveness, we have used an expected measure life of 15 years in calculating lifetime program savings.

## Program Year 2003 Gross Savings

The final invoice summary for 2003-2004 lists a total 2,314 units removed from Missouri customers. This differs from the total of 2,373 units shown in the MEEA 2003 Final Report. This invoice summary also lists a program total of 4,165 units compared with 4,546 units reported, indicating that a discrepancy in the unit totals exists. Based on the methodology described above, gross program savings were calculated to be 2,401,939 KWh with a peak demand reduction of 0.36796 MW.

The savings reported in the 2003 final report and the calculated gross savings are summarized in Table 6.

**Table 6: 2003 Program Savings**

| | Units Removed | Gross Annual Savings (KWh) | Demand Reduction (MW) | Savings per unit (KWh) |
|---|---|---|---|---|
| ODC/GDS | 2,314 | 2,401,939 | 0.36894 | 1,038 |
| *MEEA 2003 Final Report* | *2,373* | *4,077,763* | *0.626472* | *1,718* |
| Difference | -59 | -1,675,824 | -0.25753 | -680 |
| Percent of reported | 97.5% | 58.9% | 58.9% | 60.4% |

Prior program savings reported by MEEA were calculated based on per-unit savings from the Final Report Impact Evaluation of the Spare Refrigerator Recycling Program CEC Study #537 completed by Xenergy for Southern California Edison. Refrigerators were assigned an average annual consumption of 2,148 KWh and 0.33 KW; with a six-year estimate of remaining useful

[5] We collected additional details about the recycled refrigerators, but due to the available information, we did not incorporate these details since the program estimates are not as detailed as was expected given the level of data available for impacts.

life. A net to gross ratio of 0.8 was then applied, resulting in per unit annual savings of 1,718 KWh. This calculation appears not to have subtracted the expected energy use of the replacement unit if the recycled unit was a primary refrigerator. In reality, the majority of units recycled in the 2003 program (2,136 of 2,373 reported for Missouri) were primary units that would be expected to be replaced.

MEEA's program results for Missouri customers in 2003 were reported as 2,373 units removed, for a total annual energy savings of 4,077,763 KWh and a peak demand reduction of 0.626472 MW. As discussed above, refrigerators were assigned an average annual consumption of 2,148 KWh and 0.33 KW; with a six-year estimate of remaining useful life. A net to gross ratio of 0.8 was then applied, resulting in per unit annual savings of 1,718 KWh, regardless of size or type.
Two factors appear to account for the majority of the difference between the gross savings claimed in the 2003 final report and the gross savings calculated as part of the impact evaluation. First, and probably most significant, claimed savings were determined to be the full expected annual consumption of the recycled units, modified by a net to gross ratio of 0.8. This did not account for the refrigerators that would replace the recycled units, even though 2,136 of the 2,373 recycled refrigerators in Missouri were primary refrigerators and would most likely have been replaced.

Second, the estimated consumption was an average value determined in the Final Report Impact Evaluation of the Spare Refrigerator Recycling Program CEC Study #537 completed by Xenergy for Southern California Edison. This consumption estimate appears similar to consumption data seen for older refrigerators (20 years old or older) that would be expected to be used as spare refrigerators. As mentioned above, the vast majority of recycled refrigerators were primary refrigerators, not spares, and a survey of Missouri customers indicated that only 45% of recycled refrigerators were over 16 years old. This indicates that the average consumption used in calculating reported savings was probably too high to represent the units recycled in this program.

## Program Year 2005 Gross Savings

The final invoice summary for 2003-2004 lists a total 124 units removed from Missouri customers. Based on the methodology described above, gross program savings were calculated to be 116,245 KWh with a peak demand reduction of 0.0178 MW.
The savings reported in the 2005 final report and the calculated gross savings are summarized in Table 7.

**Table 7: 2005 Program Savings**

| | Units Removed | Gross Annual Savings (KWh) | Demand Reduction (MW) | Savings per unit (KWh) |
|---|---|---|---|---|
| ODC/GDS | 124 | 116,245 | 0.0178 | 937 |
| *MEEA 2003 Final Report* | *124* | *212,888* | *0.030* | *1,718* |
| Difference | 0 | -96,643 | -0.0122 | -781 |
| Percent of reported | 100% | 54.6% | 59.3% | 54.5% |

Program results for Missouri customers in 2005 were reported as 124 units removed, for a total annual energy savings of 212,888 KWh and a peak demand reduction of 0.030 MW. As for the

2003 program year, refrigerators were assigned an average annual consumption of 2,148 KWh and 0.33 KW; with a six-year estimate of remaining useful life. A net to gross ratio of 0.8 was then applied, resulting in per unit annual savings of 1,718 KWh, regardless of size or type.

Two factors appear to account for the majority of the difference between the gross savings claimed in the final report and the gross savings calculated as part of the impact evaluation.

First, and probably most significant, claimed savings were determined to be the expected consumption of the recycled units, modified by a net to gross ratio of 0.8. This did not account for the refrigerators that would replace the recycled units, even though 122 of the 124 recycled refrigerators in Missouri were primary refrigerators and would most likely have been replaced. Second, the estimated consumption was an average value determined in the Final Report Impact Evaluation of the Spare Refrigerator Recycling Program CEC Study #537 completed by Xenergy for Southern California Edison. This consumption estimate appears similar to consumption data seen for older refrigerators (20 years old or older) that would be expected to be used as spare refrigerators. As mentioned above, the vast majority of recycled refrigerators were primary refrigerators, not spares, and a survey of Missouri customers indicated that only 45% of recycled refrigerators were over 16 years old. This indicates that the average consumption used in calculating reported savings was probably too high to represent the units recycled in this program.

## Net Realized Savings

For the combined 2003 and 2005 programs, 77% of the refrigerators recycled through the program would have remained on the market if the program had not existed, meaning that 23% of them would likely have been thrown away or recycled even without the program. In addition, a factor of 1.06 was also applied to freeridership because 6% of recycled refrigerators were not functioning at the time of pickup. Spillover data are not available, therefore, estimating 24.4% free riders, net realized savings for 2003 is calculated to be 1,816,346 KWh, with a demand reduction of 0.2790 MW and for 2005 is calculated to be 87,904 KWh, with a demand reduction of 0.0135 MW.

## Cost Effectiveness

Table 8 shows the cost effectiveness of AmerenUE's Refrigerator Recycling Program for 2003 and 2005. FEMP UPV Discount Factors for electricity for Census Region 2 (Including Missouri) were used for the benefit/cost analysis. The Department of Energy currently uses a 3% discount rate in determining discount factors. The expected life of refrigerators is 15 years, and this was the life used in determining the appropriate residential discount factors and in calculating lifetime savings. Clearly, the very few units collected in 2005 resulted in that program year having a poor benefit cost ratio. This is probably because any fixed administrative costs needed to be spread out over much fewer units in 2005 as compared with 2003.

**Table 8: Refrigerator Program Cost Effectiveness**

| Year | Program Cost | First Year Program Savings | Effective Life of Recommendations | Lifetime Savings | Lifetime Benefit/Cost Ratio |
|---|---|---|---|---|---|
| 2003 | $378,000 | $119,879 | 15.0 | $827,164 | 2.2 |
| 2005 | $66,000 | $5,802 | 15.0 | $40,031 | 0.6 |

Detailed spreadsheets on the savings and life cycle costs analyses were provided to AmerenUE along with this report.

## V. Process Findings and Recommendations

Overall, most participants in the 2005 program were very satisfied the program (86%). (See Section VI Table D-3)[6] Participants were most satisfied with the pick up and removal process with 92% stating they were very satisfied with this process, followed by 82% stating they are very satisfied with the sign up process. Participants were least satisfied with the amount of time it took to receive the incentive check however 70% still stated they were very satisfied. (Section VI Table D-19) Participants that were not fully satisfied said they experienced delays in getting their refrigerators picked up or receiving their rebate checks.

No additional refrigerator recycling programs have been funded to date. However if AmerenUE and the Collaborative decide to run a similar program in the future, we recommend the following:

- **Clearly state the goals of the program to focus the program approach, and extend the program to include customers who "only recycle" and/or customers who "only purchase an Energy Star refrigerator"**

  It is unclear what the main goals of the programs were: To recycle older units instead of keep using them or putting them into the secondary market? Early retirement? To increase the sale of Energy Star units? If the goal was on increasing sales of Energy Star units, the 2003 program did not require the linking of recycled appliances to new Energy Star appliances. While the 2005 program did require this, the 2005 program also mentions early replacement of older operational units as a goal, although then fails to encourage early retirement since many of the 2005 participants (83%) were planning to replace their refrigerators prior to hearing about the recycling program and incentive (See Section VI Table D-9b.) Additionally, many participants stated that they would have purchased an Energy Star model without the program. (See Section VI Table D-17.)

  By design (but not implementation in 2003), the AmerenUE refrigerator programs focused on the nexus of people who were both purchasing Energy Star units, and willing to recycle their old unit. As described by ARCA, if one thinks of it in terms of two intersecting circles (one representing those who purchase Energy Star units and one for those who are getting rid of units) the AmerenUE program sought only to capture those who met both requirements, or the intersection of the two circles. Expanding the program in a way to incorporate all customers either purchasing and/or getting rid of refrigerators would help to increase the number of customers affected through the program. (Notably, however, this expansion would have to occur in a cost-effective way, which might assume just education and not incentives for all units). According to interviews with ARCA, uncoupling the recycling with efforts to promote and sell Energy Star units could also reduce the program costs per unit. Increasing the volume of units could also bring down the cost per unit.

  Any future programs should more clearly state the goals (and/or the balance of the three goals mentioned above) in order to focus the program more.

[6] No satisfaction questions were asked in the MEEA survey of 2003 participants.

- **Consider at what point in the process you want to reach potential program participants and consider expanding promotions to reach those that were not already looking to purchase a new refrigerator**

  Most participants (71%) found out about the program in the store either from in-store displays or stickers on appliances (see Section VI Table D-1). This is consistent with the finding that most (96% of all or 83% of the 2005 participants) were also planning on purchasing a new refrigerator prior to hearing about the program (see Section VI Table D-9). While in-store advertising is getting customers to participate in the program and getting refrigerators recycled that otherwise would not be, it is not encouraging customers to replace their refrigerators earlier than they normally would since these customers who find out about the program through in-store advertising are likely to be shopping for a new unit already.

  AmerenUE should look to promote the program to customers who are not currently looking to purchase a new refrigerator. This could possibly include targeting low to middle income customers or neighborhoods where the housing stock is older.

- **Refocus the program to encourage early retirement of refrigerators through marketing outside of appliance stores**

  Based on non-participant survey data, over 25% of non-participant refrigerators are over 11 years old (See Section VI Table D-5.). Yet based on non-participant comments, only 5% of non-participants are in the market to purchase a refrigerator over the next year, so there may be opportunities to encourage the early retirement of additional older energy hogs.

  Most of the participants in the program were replacing refrigerators that were at the end of their useful life. As the age of the refrigerator replaced through the program increases to its useful lifetime the savings that can be claimed by the program decreases. Forty-five percent of participants replaced a refrigerator that was over 16 years old with another 22% replacing a unit that was 11-15 years old. According to the Association of Home Appliance Manufactures (AHAM) the average useful life of a refrigerator ranges from 14 years to 17 years.

  Future programs should focus on getting customers that own high use units but are likely to wait until the refrigerator stops working to replace it. Thus, additional marketing outside of the stores would be required.

- **Raise the awareness of opportunities to recycle, and building the infrastructure for this effort, perhaps in lieu of providing customer incentives**

  None of the non-participants who purchased a refrigerator in the past five years said they paid to have their old unit recycled, and only 4% of participants said they would have done this if the program had not been offered (representing 1% of all units in the program). However, when all non-participants were specifically asked if they would look for someone to recycle their old refrigerator when the time came to get rid it, 52% said

"yes" and 20% would be willing to pay $50 for the service. (See Section VI Table D-11.) This is similar to participants: 49% said they would have looked for someone to recycle their old refrigerator if the program had not been available, and 20% would be willing to pay $50 for it. Notably, therefore, just raising awareness of the possibility of recycling the refrigerator appears to generate interest. Future programs should consider this, and whether the customer incentive is needed.

- **Extend planning time and the length of commitments from retailers and subcontractors**

  Based on information gathered through our in-depth interview with the program administrator, the 2005 was launched late due to the amount of time required for planning and approval. The time it took to get feedback from AmerenUE and the Collaborative on the RFP process, and then the time to sign the contracts and coordinate with the contractor, was much longer than anticipated. As a result, the program did not launch until a few months before the tariff ended, and it appears as though AmerenUE was unable to extend the tariff and thus the program period.

  In addition, the contract time frame and volume did not allow for a recycling center to be established within the Missouri market. Due to the limited commitment from the program, ARCA recycled the units through neighboring states, thus not allowing for the transformation of the market. As such, the program was limited to the existing infrastructure (e.g., only being able to haul away from the St. Louis area). A commitment to a longer timeframe and higher volume of units would allow for additional infrastructure to be established.

  For future efforts, AmerenUE should allow for a planning period, work to streamline the approval processes, and seek a longer-term commitment. Notably, in the first program year, MEEA found that since they covered only a limited regional area, manufacturers did not want to participate because the rebated conflicted with nationwide rebates. They also found that certain areas of the state were not able to participate because they lacked a centralized appliance delivery and haul away service (which is why ARCA stepped in for the 2005 program). In future efforts, additional planning time and longer-term commitments could help build the infrastructure needed.

- **Find ways to ensure that customer units are not switched during the recycling process**

  The assumption within the refrigerator market is that if the unit is working, someone will use it; and if the unit looks good but is not working, someone will fix it and use it.[7] Because of this, throughout the country, there are problems with policing units to ensure that the units that are retired early are not switched with older units that would have been thrown away. Some policing of this should occur with any program. Suggestions include but are not limited to destroying the unit at the time of pick-up (for example, by piercing the wall of the unit), and/or tracking serial numbers or make/models. Any future

[7] Paraphrased from discussion with Bruce Wall, ARCA, 05/30/07.

programs should require the implementer to ensure how the market will be "policed" to ensure that units are not being switched.

- **Collect consistent data from both older models and new models (e.g., nameplate amperage for both)**

  In the program databases, the amperage information collected from the recycled refrigerators was generally lower than the nameplate wattage for Energy Star qualifying refrigerators of the same size. This implies that the amperage for the recycled units was probably a running amperage rather than nameplate amperage. Collecting the nameplate amperage would allow for a direct comparison to the nameplate amperage of Energy Star units of the same size and would result in more accurate baseline data. For future efforts, the program should collect consistent data from both older models and new models.

# VI. Detailed Tables

### Section VI Table D-1: Where Customers Heard About Program

| | Participants (n=65) |
|---|---|
| In the store (in store display or stickers on appliances) | 71% |
| Friend/family/neighbor | 8% |
| TV advertisement | 6% |
| At work-Ameren employees | 5% |
| Advertisement in cable bill | 2% |
| Newspaper | 2% |
| Bill inserts | 2% |
| Don't know | 6% |

### Section VI Table D-2: Why Customers Participate (multiple response)

| | Participants (n=65) |
|---|---|
| Rebate | 55% |
| Needed to have old refrigerator removed | 23% |
| Energy savings | 17% |
| Needed a new refrigerator | 17% |
| Other | 6% |

### Section VI Table D-3: Satisfaction with Program

| | Participants (n=65) |
|---|---|
| Very satisfied | 86% |
| Somewhat satisfied | 11% |
| Somewhat dissatisfied | 2% |
| Very dissatisfied | - |
| Don't know | 2% |

### Section VI Table D-4: Non Participant Refrigerator Purchases

| | Non Participant (n=100) |
|---|---|
| Yes, I purchased fridge that is in use in my home | 79% |
| *Purchased New* | *75%* |
| *Purchased Used* | *4%* |
| No, I did not purchase the fridge that is in use in my home | 21% |

## Section VI Table D-5: Age of Non Participant Refrigerators

| | Non Participant (n=100) |
|---|---|
| Less than 1 year | 5% |
| 1-5 years | 38% |
| 6-10 years | 25% |
| 11-15 years | 14% |
| Over 16 years | 11% |
| Don't know | 7% |

## Section VI Table D-6: Age of Refrigerator at Time of Replacement (according to 2005 survey, not database)

| | Participant | | | Non Participant (n=32) |
|---|---|---|---|---|
| | Participant Refrigerators (n=67) | Primary Refrigerators (n=51) | Secondary Refrigerators (n=16) | |
| Less than 1 year | 1% | 2% | - | - |
| 1-5 years | 1% | 2% | - | 6% |
| 6-10 years | 22% | 24% | 19% | 9% |
| 11-15 years | 22% | 29% | - | 25% |
| Over 16 years | 45% | 37% | 69%* | 38% |
| Don't know | 7% | 6% | 13% | 22% |

*significantly higher than primary refrigerators at the 90% level

## Section VI Table D-7: Plugged In and Working (valid percentages)

| Was the fridge plugged in and working? | Participant | | | Non Participant (n=32) |
|---|---|---|---|---|
| | Total Participant Refrigerators (n=64) | Primary Refrigerators (n=48) | Secondary Refrigerators (n=16) | |
| Yes | 92%* | 92% | 94% | 72% |
| Some of the time | 2% | - | 6% | - |
| No | 6% | 8% | - | 25%^ |

*significantly higher than non participants at the 90% level
^significantly higher than participants at the 90% level

## Section VI Table D-8: Refrigerator in a Room with Heating/Cooling

| Q5 & Q14: Was the fridge in a room that has heat, ac or both? | Total Refrigerators (n=67) | Primary Refrigerators (n=51) | Secondary Refrigerators (n=16) |
|---|---|---|---|
| Heat only | 4% | 2% | 13%* |
| AC only | - | - | - |
| Both heat and AC | 85% | 96%* | 50% |
| Don't know | 10% | 2% | 38%* |

## Section VI Table D-9a: Planning on Replacing Prior to Hearing About Program (all units, valid percentages)

| MEEA Program Data & ODC Survey Q6 & Q16: Were you planning on replacing this refrigerator prior to hearing about the program? | Inferred Total Refrigerators (n=2,314) |
|---|---|
| Yes | 96%* |
| No | 4% |

*Based on the 2005 ODC survey data which shows that 83% of refrigerators would have been replaced regardless of the program. This assumes that 83% of the 496, and 100% of the remaining 1,935 in 2003 would have been replaced anyway. (See below.)

## Section VI Table D-9b: Planning on Replacing Prior to Hearing about Program (2005 survey responses only, valid percentages)

| Q6 & Q16: Were you planning on replacing this refrigerator prior to hearing about the program? | Total Refrigerators (n=64) | Primary Refrigerators (n=49) | Secondary Refrigerators (n=15) |
|---|---|---|---|
| Yes | 83% | 86% | 63% |
| No | 17% | 14% | 37% |

## Section VI Table D-10: Fate of Old Refrigerator

| | Participants (what would you have done if program did not exist)[1] | | | Non Participants | |
|---|---|---|---|---|---|
| | Total Refrigerators (all units) | Primary Units (n=200) | Secondary Units (n=45) | Purchased new unit within last 5 years (n=32) | Plan for old unit when buying an new unit (n=68) |
| Thrown it out or had someone else pick it up | 3% | 19% | 18% | 13% | 9% |
| Had the retailer haul it away (Still purchased a new unit) | 87% | 50% | 16% | 41%^ | 19% |
| Sold or given it away | 3% | 12% | 36% | 22% | 21% |
| Kept it as a second unit | 3% | 15% | 29% | 9% | 4% |
| Paid to have it recycled | 1% | 5% | 2% | - | 6% |
| Kept it, and not purchased new one | 4% | | | | |
| Other | - | - | - | 3% | 4% |
| Don't know | - | - | - | - | 12% |

[1] Combined MEEA survey of PY 2003 participants and ODC survey of PY 2005 participants. Notably, the primarly and secondary unit columns are much smaller since these only include customers surveyed, not the 1,935 units recyled without customer intervention.

*significantly higher than non participants that purchased a unit within 5 years and those that have not at the 90% level

^significantly higher than participants at the 90% level

**Section VI Table D-11: Would Have Looked For Someone to Recycle Refrigerator**

| Would you look for someone to recycle your refrigerator if the program had not been available/when you get rid of an old refrigerator? | Participants | | | Non Participants (n=100) |
|---|---|---|---|---|
| | Total Participants (n=63) | Participants with Primary Refrigerators (n=50) | Participants with Secondary Refrigerators (n=13) | |
| Yes | 46% | 52%* | 23% | 52% |
| No | 46% | 38% | 77%* | 31% |
| Don't know | 8% | 10% | - | 17% |

*significantly higher than the comparison group at the 90% level

- 20% of participants and non participants would pay someone $50 to recycle their old refrigerator.

**Section VI Table D-12: Why Would You Not Look for Someone to Recycle Your Fridge?**

| Q11b | Participants (n=29) | Non Participants (n=31) |
|---|---|---|
| Would have let retailer take it | 28% | 6% |
| Would have donated/given it away/sold it | 17% | 29% |
| Didn't know you could recycle it | 14% | - |
| Would have kept it and used it | 14% | - |
| Didn't think of recycling it | 10% | - |
| Just wanted to get rid of it | 3% | - |
| It's too much trouble | - | 3% |
| Other | - | 6% |
| Don't know/refused | 14% | 54%* |

*significantly higher than the comparison group at the 90% level

**Section VI Table D-13: Plan to Purchased in Next 12 Months**

| | Non Participants (n=100) |
|---|---|
| Yes | 5% |
| No | 92% |
| Don't know | 3% |

- Only 2% of non participants plan on purchasing an Energy Star refrigerator within the next 12 months

## Section VI Table D-14: Energy Star Awareness

| | Participants (n=65) | Non Participants (n=100) |
|---|---|---|
| Aware | 89%* | 54% |
| *Unaided* | *74%** | *40%* |
| *Aided* | *15%* | *14%* |
| Not Aware | 9% | 45%* |
| Don't know | 2% | 1% |

## Section VI Table D-15: What Energy Star Label Means (multiple response)

| | Participants (n=58) | Non Participants (n=54) |
|---|---|---|
| Uses less energy | 71% | 56% |
| Lower utility bills | 22% | 35% |
| High quality | 7% | 4% |
| Good for the environment | 5% | 11% |
| Government endorsed | 3% | 2% |
| Product is tested | 2% | 7% |
| Less pollution | 2% | 7% |
| Haven't thought about it | - | 6% |
| Other | 10% | - |
| Haven't thought about it | 2% | 6% |

## Section VI Table D-16: Energy Star Refrigerators Among Non Participants

| | Participants (n=100) |
|---|---|
| Yes, current refrigerator is Energy Star | 25% |
| No, current refrigerator is not Energy Star | 14% |
| Haven't heard of Energy Star | 46% |
| Don't know | 15% |

## Section VI Table D-17: Would Have Purchased of an Energy Star Unit Without the Program

| **Q27: Would you have purchased an Energy Star refrigerator if the program did not require it?** | **Participants (n=65)** |
|---|---|
| Yes | 75% |
| No/Haven't heard of Energy Star/Don't know | 25% |

## Section VI Table D-18: Signing Up for the Program

| Q29: Did you sign up for the program through the website or by calling the toll- number? | Participants (n=65) |
|---|---|
| Phone | 63% |
| Website | 8% |
| Don't know | 29% |

## Section VI Table D-19: Satisfaction

| Q30, Q32 & Q34: Were you satisfied or dissatisfied with… | Sign Up (n=65) | Pick Up and Removal (n=65) | Amount of Time to Receive Check (n=65) |
|---|---|---|---|
| Very satisfied | 82% | 92% | 71% |
| Somewhat satisfied | 9% | 8% | 12% |
| Neither satisfied nor dissatisfied | - | - | 3% |
| Somewhat dissatisfied | 2% | - | 6% |
| Very dissatisfied | 2% | - | - |
| Don't know | 6% | - | 8% |

## Section VI Table D-20: Refrigerator Participant Demographics

| Demographics | Participants (n=65) | Non Participants (n=100) |
|---|---|---|
| **Own/Rent** | | |
| Own | 95% | 84% |
| Rent | 3% | 13% |
| Don't know | 2% | 3% |
| **Household Type** | | |
| Single family | 91% | 83% |
| Duplex or 2 family | 3% | 4% |
| Apartment 2-4 units | 5% | 5% |
| Apartment >4 units | 2% | 5% |
| Mobile home | - | 1% |
| Townhouse | - | 2% |
| **Number of People** | | |
| 1 | 8% | 27%* |
| 2 | 38% | 45% |
| 3 | 18% | 10% |
| 4 | 11% | 11% |
| 5 | 12% | 4% |
| 6 | 3% | 1% |
| 7 or more | 2% | 1% |
| Refused | 8% | 1% |

| Demographics | Participants (n=65) | Non Participants (n=100) |
|---|---|---|
| **Low Income** | | |
| Non Low Income | 80% | 69% |
| Low Income | 2% | 16% |
| Don't know/refused | 18% | 15% |
| **Year Built** | | |
| Built in 2006 | - | - |
| 2004-2005 | - | 1% |
| 2001-2003 | - | 7% |
| 1990-2000 | 22% | 15% |
| 1980-1989 | 15% | 5% |
| 1970-1979 | 17% | 12% |
| 1960-1969 | 26% | 13% |
| 1950-1959 | 5% | 10% |
| 1940-1949 | 3% | 5% |
| Prior to 1939 | 5% | 12% |
| Don't know | 8% | 20% |
| **Education** | | |
| Less than 9th grade | 2% | 2% |
| 9th to 12th grade | - | 4% |
| High school graduate | 15% | 33% |
| Some college, no degree | 15% | 21% |
| Associates degree | 6% | 8% |
| Bachelors degree | 40% | 18% |
| Graduate or professional degree | 11% | 10% |
| Don't know/refused | 11% | 4% |

OPINION DYNAMICS
CORPORATION

# EVALUATION OF AMERENUE'S ONLINE ENERGY INFORMATION AND ANALYSIS PROGRAM

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## Executive Summary

The Online Energy Information and Analysis Program consists of an online energy audit where customers answer questions about their energy use and home characteristics on the AmerenUE website, and then are immediately provided with customized recommendations on ways to save energy. (A full description of this program is provided in Section II.)

Program accomplishments for the Online Energy Information and Analysis Program during the program period (2003-2006) include:

- Over 9,500 active Missouri users over the three year period
- Nearly 36,400 recommendations made
- Filling a unique informational niche for many, and
- Over 1,000 MWh of electricity savings and nearly 200,000 therms of natural gas savings to customers

Details on these program accomplishments are provided in Section III.

Customers use the online energy analysis primarily to save money on their electric bill or for related reasons such as learning how they can reduce their energy consumption and improve their home's energy efficiency (see Section VI Table D-3). Overall, most customers (89%) are satisfied with the program with 51% stating they are "very satisfied" and an additional 37% stating they are "somewhat satisfied". In addition, 46% of customers would strongly recommend this web-based analysis to others.

In addition to overall satisfaction among participants, the results of our impact analysis indicate that the program does lead to cost-effective energy savings. (See Section IV.) The savings from this program, however, are lower than for any other program in AmerenUE's portfolio, primarily because it is difficult to demonstrate savings since this is an information only program (i.e., no measures are provided through the program). However, our findings indicate that the program is cost effective, and that there is a need for this program: 43% of AmerenUE non-participants expressed an interest in the online energy analysis.

If AmerenUE and the Collaborative continue to fund this program, process recommendations for future programs include:

- Increase marketing efforts (such as email announcements and information on bills) since most AmerenUE customers are not aware of the offering
- Work to overcome barriers of multi-state marketing (since the AmerenUE merger, marketing has been limited)
- Make sure that the online tool is prominently placed on the website
- Consider additional ways of encouraging customers to log in such as drawing customers into the energy analysis by placing information about what the tool offers on earlier web pages

- Provide more customized recommendations to users, or to make users feel as though the current recommendations are customized
- Develop documentation for web extract data and reconcile the web statistics with the web extract data
- Improve usefulness of web extract data by collecting time and date stamp
- Require Nexus to provide algorithms for future impact analyses
- Confirm compatibility of software with Microsoft Vista

Details on each of these recommendations are provided in Section V.

# I. Introduction and Methodology

The Online Energy Information and Analysis Program consists of an online energy audit where customers answer questions about their energy use and home characteristics on the AmerenUE website, and then are immediately provided with customized recommendations on ways to save energy. According to the program description, the Online Energy Information and Analysis Program "allows all residential customers with internet access to view their billing information and comparisons of their usage on a daily, weekly, monthly or annual basis. This tool analyzes what end uses make up what percent of their usage, and provides information on ways to save energy by end use through a searchable resource center. This tool also allows the user to analyze why their bill may have changed from one month to another. A home comparison also displays a comparison of the customer's home versus an average similar home via an Energy Guide label concept. AmerenUE is partnering with Nexus Energy Software to provide this functionality."

This report provides a process and impact evaluation of the Online Energy Information and Analysis Program, led by Opinion Dynamics Corp. in partnership with GDS Associates. This evaluation is based on (1) a review of program databases 2004-2006[1], (2) a review of program materials including monthly web statistics, traffic analysis, web extract data, and the program contract (3) an in-depth interview with the program implementer, i.e., Nexus, (4) telephone interviews with program participants, and (5) telephone interviews with non-participating customers.

ODC conducted telephone interviews in April 2007 with 70 AmerenUE customers who have used the Online Energy Analysis tool. All of the customers interviewed viewed recommendations on AmerenUE's website. We targeted customers who viewed recommendations between November 2005 and December 2006 so that they had enough time to react to recommendations—but not so long ago that they would not recall completing the analysis. Our survey asked respondents whether they took action as a result of up to 10 recommendations that were made to them. The survey then asked in detail about no more than five of the actions that they took at least in part due to the online energy analysis.

ODC also interviewed 100 AmerenUE customers who had not used the online energy analysis tool. AmerenUE provided ODC with a list of zip codes that fall within its service territory. Using this list, ODC obtained a random sample of phone numbers that corresponded with those zip codes. We compared this list to the list of program participants and removed the program participant phone numbers. We conducted these non-participant interviews in April 2007.

We do not provide all of the detailed tables in the body of the write-up for the purpose of keeping the write-up as succinct as possible. Key tables are provided in the body of the write-up, with additional detailed tables denoted by the letter "D" and provided in Section VI of this report.

[1] Provided by Nexus.

## II. Program Description

In 2004, AmerenUE contracted with Nexus Energy Software to offer the Bill Analyzer and Home Energy Analysis to its residential customers. The budget for this program was $800,000 over the three year period, with a goal of reaching 9,000 customers per year. Spending to-date has totaled $786,333 since 2002, with upfront and implementation costs of $263,367 and annual expenses equal to $142,916 in 2003, $200,367 in 2005, and $124,683 in 2006.

The website can be accessed by clicking on "My Home" on AmerenUE's home page and then clicking on the "Energy Savings Toolkit". A user is then required to login by entering their username and password, and first time users must create a login by entering their name, email address, UserID, password and answer to a secret question. Until a user logs in they cannot see a description of what features are available within the application. The "Energy Savings Toolkit" includes the following five features:

- Home Energy Analysis is an energy audit where customers answer questions about their energy use and home characteristics and are provided personalized ways to save energy.
- Appliance Savings Calculators provide information about how much energy can be saved by replacing major appliances with more energy efficient models.
- Bill Analyzer compares a customers' current bill to their past bills and explains why they are different.
- Energy Smart Library gives low-cost tips that can help customers save money and energy.
- Energy Smart University offers facts about energy sources, safety, and the environmental impact of energy use.

As a customer completes more information the recommendations become more personalized to their home. There are three levels of questions that are used to generate a customer's Home Energy Analysis:

**Level 1 – Basic Home Profile Questions**: This section asks about property details (i.e., square footage, household type); property features (i.e., heating fuel, cooling type); utility details (i.e., ownership type, who pays the bills if rented); and equipment and amenities (i.e., do you have an oven and what is the fuel type).

When a customer answers the basic home profile questions they receive a list with the top ways that they can save energy with a range of estimated annual savings in dollars, a graph showing how their costs compare to similar homes, seasonal tips and tools, and a chart showing how their home uses energy broken into eight categories (heating, cooling, hot water, other, lighting, food storage, pool/spa, and other).

**Level 2 – Appliance Inventory**: For 24 appliance types, customers are asked whether the appliance is present in their home, how many and the fuel type (if applicable).

A customer who completes the appliance inventory section gets a picture of a house and when they click on an appliance a box pops up which tells them what the annual cost is to operate that

appliance as well as the energy usage. They also see a chart which shows them what appliances fall into that category and what the cost and energy usage is of each of the appliances in that category.

**Level 3 – Detailed Questions on End-Use**: Detailed questions about their home are broken into eight different end-use categories: weatherization, heating, cooling, hot water, kitchen, lighting, pool/spa, and other.

A customer who answers those detailed questions gets recommendations by those eight end-use categories broken into one of three categories: *no-cost/low-cost* ways to save that can be implemented immediately; ways to save which *need investment*, but will pay off; and ways to save, which are *not cost justified.*

There is also a detailed Home Energy Analysis Report that the customer can access after completing any of the three levels which is approximately 10 pages and includes a couple of graphs showing typical annual energy costs by end use for homes with similar appliances, an estimate of how much similar homes spend on energy on a monthly basis, and several detailed recommendations.

Customers are given a range of savings in dollars when they complete any of those three levels which are based on the rate the customer is on from AmerenUE billing data and the profile of the home based on their responses.

In aggregate, the program recommends 72 unique actions. The 72 recommendations fall into 13 different categories based on ODC's analysis (See Table 1 below). Many are associated with heating (13), water heating (11), and food storage (9).

**Table 1: Recommendations by Category**

| Category | Number of Unique Recommendations |
|---|---|
| Heating | 13 |
| Water Heating | 11 |
| Food Storage | 9 |
| Cooling | 7 |
| Pool/Spa | 7 |
| Laundry | 7 |
| Lighting | 4 |
| Waterbed | 4 |
| Dishwasher | 3 |
| Windows and Doors | 2 |
| Insulation | 2 |
| Ducts | 2 |
| Home Electronics | 1 |
| TOTAL | 72 |

AmerenUE handles most of the marketing efforts and promotions for the program. Until June 2005, the tool was promoted on the front page of Ameren's website. However, since AmerenUE's merger with an Illinois-based utility, the tool is no longer promoted on the first page because Illinois customers are not eligible to use the tool to its full extent. Use has declined since the merger and the weaker promotion of the tool, according to indepth interviews with program administrators (See also Figure 1). The last time the application was actively promoted was August 2005. Other marketing efforts by AmerenUE before the merger include:

- March 2004: Postcard mailing,
- June 2004: Email announcement – graduate hat,
- January 2005: Email announcement and billing insert,
- April – June 2005: Mentioned in the AmerenUE lines, and
- July - August 2005: Cash distribution contest run (contest offered money off the customer's bill for going to the application and filling out their profile on the home energy center).

Nexus provides the software and tracks customers' access to the website. Nexus sends web statistics to AmerenUE on the number of customers that accessed the Home Analyzer (including the Energy Analysis and Appliance Savings Calculators), Energy Saving Calculators, Energy Smart University and Energy Smart Library and what they looked at while logged in.

# III. Program Accomplishments

Program accomplishments during the program period (2002-2006), described further below, include:

- Over 9,500 active Missouri users over the three year period
- Nearly 36,400 recommendations made
- Filling a unique informational niche for many, and
- Over 1,000 MWh of electricity savings and nearly 200,000 therms of natural gas savings to customers

## Over 9,500 Active Missouri Users

Table 2 below shows several different estimates of users based on both the Web Statistics reported by Nexus and the web extract data files reported by Nexus on a monthly basis. The table shows that there were 13,420 hits on the "Energy Savings Toolkit" during the three year program period. (Note that hits do not equate to unique Missouri customers.)

Nearly 9,600 users were in the web extract tables, which include users who have entered some type of information. If a customer came to the site but did not provide any data, they would be included in the total number of hits but not in the web extract data (i.e., they are active users).

The table also shows that 8,033 users completed enough of their profile information that the system generated recommendations, however, only 2,011 of those users actually saw the top ways that they could save energy. According to Nexus, the user does not see all of the measures that the system generates (in "MeasurePlan" web extract tables). Only measures that provide the most savings (in "MeasuresResults" web extract tables) are displayed.

Based on the Web Statistics reported by Nexus, the total number of hits increased each year, however the number of customers who saw recommendations decreased slightly. If we look at the number of users who saw recommendations as a percentage of all "active users," 21% of users who start to fill in some information make it through the process and view the recommendations. (Notably, we do not look at it as a percentage of total hits since total hits does not include unique users, and captures people who get to the page by mistake, or have no interest at all.)