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Witness: Greg Lovett
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**MISSOURI PUBLIC SERVICE COMMISSION**

**Case No. ER-2012-0166**

# REBUTTAL TESTIMONY

**OF**

**GREG LOVETT**

**ON**

**BEHALF OF**

**UNION ELECTRIC COMPANY**
**d/b/a Ameren Missouri**

**St. Louis, Missouri**
**August, 2012**

**REBUTTAL TESTIMONY**

**OF**

**GREG LOVETT**

**CASE NO. ER-2012-0166**

**Q. Please state your name and business address.**

A. My name is Greg Lovett. My business address is One Ameren Plaza, 1901 Chouteau Avenue, St. Louis, Missouri 63103.

**Q. By whom and in what capacity are you employed?**

A. I am employed by Union Electric Company, d/b/a Ameren Missouri ("Ameren Missouri" or "Company") as a Managing Supervisor – Evaluation, Measurement and Verification in the Energy Efficiency and Demand Response Department.

**Q. Please describe your educational background and your employment history with Union Electric Company, d/b/a Ameren Missouri ("Ameren Missouri" or "Company").**

A. I joined Central Illinois Public Service Company ("CIPS") as a Distribution Engineer in Quincy, IL in 1981 and held several positions in Springfield prior to the merger of CIPS and Union Electric Company ("UE") in 1998 when I was Business Improvement Consultant. After the merger, I then became Senior Engineer of Metering for AmerenUE. After holding several positions in St. Louis, I was promoted to my current position with Ameren Missouri. I have a Bachelor of Science Degree in Electrical Engineering from the University of Illinois and a Master of Business Administration from Webster University. As a Managing Supervisor in the Energy Efficiency and Demand Response Department, I

oversee the operations of the Ameren Missouri Evaluation, Measurement and Verification projects for the energy efficiency programs.

**Q. What is the purpose of your rebuttal testimony?**

A. My rebuttal testimony is in response to the testimony of Adam Bickford on behalf of the Missouri Department of Natural Resources ("MDNR"). Specifically, I am responding to Mr. Bickford's request for $120,000 in funding for reimbursement of administration costs of the Low Income Weatherization program in the Ameren Missouri service area. In addition, I am addressing the Low Income Weatherization testimony of Dr. Henry Warren of the Missouri Public Service Commission Staff ("Staff").

**Q. Has Ameren Missouri funded administration costs of the Low Income Weatherization program in the past?**

A. Ameren Missouri and our customers support the Low Income Weatherization program by providing $1.2 million annually to the program. As was ordered in the Company's last rate case, every two years an evaluation of the Low Income Weatherization program is conducted and is funded out of the $1.2 million. The remaining portion of the fund is deposited into an account maintained by Environmental Improvement and Energy Resources Authority ("EIERA") and MDNR administers and allocates the funds to the 12 Community Action Agencies ("CAAs") in the Ameren Missouri service territory. Currently none of the $1.2 million goes toward MDNR administration costs.

**Q. When was the Low Income Weatherization Program first evaluated?**

A. The first evaluation was completed by Apprise in December 2009 ("Apprise Evaluation"). This evaluation report is included as Schedule GWL-ER1.

**Q. Did the Apprise Evaluation suggest any recommendations to improve the program?**

A. Yes. Those recommendations included:

- Revise the rules for expenditure of Ameren Missouri program funds so that electric usage reduction measures are allowed and emphasized.
- Provide a program information sheet for agencies to distribute during the energy audit with Ameren Missouri's logo.
- MDNR, as administrator of the program, should develop a database for agencies to collect and manage the program data. This data will be useful for both program management and future program evaluation efforts.

**Q. Has MDNR fully implemented all of these improvements?**

A. No, none of the above recommendations have been fully implemented based upon the 2012 evaluation conducted by The Cadmus Group ("Cadmus Evaluation"), which is included as Schedule GWL-ER2. This second evaluation made the following findings and recommendations:

- While there were additional measures (to reduce electric usage) included in recent program years, such as refrigerators, there is still room for improvement. For example, CAAs have reported that replacement of electric measures, such as air conditioners and electric furnaces, seldom receive approval from MDNR, even with a doctor's note verifying that they are needed for health reasons. In addition, it is unclear whether the additional electric measures will continue to be funded when American Recovery and Reinvestment Act ("ARRA") funds are no longer available.

- Participants remain unaware of Ameren Missouri's funding of Low Income Weatherization.
- While MDNR did develop a new Missouri weather assistance program database, data collected in it is so limited that the ability to conduct the most recent evaluation was negatively impacted.

**Q. What problems do the fact that the database was not fully implemented cause?**

A. While MDNR did secure a new database system in response to the Apprise Evaluation, measure level detail was not collected and recorded in the new database system. The lack of this data negatively impacted the 2012 evaluation to the extent that the scope of the Cadmus Evaluation needed to be reduced from the original evaluation plan. Cadmus anticipated having specific data on measures that were installed at each participant's home, similar to the level of detail they see in the databases for other Ameren Missouri energy efficiency programs. When Cadmus learned that the anticipated level of detail was not available, they had to eliminate their plan to develop measure level savings and Total Resource Cost ("TRC") results. This significantly reduced the quality of the impact results, meaning the cost effectiveness of individual measures could not be determined. This is particularly concerning given the fact that the low income program is only evaluated every two years.

**Q. Were there any other changes made to the Cadmus Evaluation due to the lack of data?**

A. Yes. The number of participants included in the database was limited due to the database not becoming available until August 2010 and also due to low participation in

the Ameren Missouri funded program because of the MDNR's emphasis on spending ARRA funds. In order for the billing analysis to provide statistically significant results, at least nine months of data, pre- and post-weatherization, was needed for each participant included in the evaluation. With the support of MDNR, Staff, and the Office of Public Counsel, Ameren Missouri requested and received a three month extension on the deadline in order to allow additional participant data from 2012 to be included in the analysis.

**Q. What were the impact results of the 2012 evaluation?**

A. The impact evaluation results were as follows:

- Participants reduced electric usage an average of 12%;
- Disconnections for participants declined by 133%; and
- The program TRC was 1.03[1].

**Q. Do you have any concerns regarding the TRC calculation?**

A. Yes. It should be noted that this result only takes into account the actual weatherization costs and does not include administrative costs that CAAs retain out of the $1.2 million allocation. These administrative costs, alone, would most likely reduce the TRC below 1. In addition, this TRC result calculation does not include any of the administrative costs of MDNR, which are being requested by Mr. Bickford, that historically have been funded from other sources. Including this expense would further lower the TRC results. Compounding the effects of including CAAs' administrative costs and MDNR's administrative costs would result in a TRC of approximately .85 (assuming CAAs and MDNR administrative costs are 10%). In addition, I believe the savings estimates used in the

[1] A TRC of 1 or above is considered cost effective.

TRC calculation are overstated. This is because multiple funding sources, including ARRA funds and Ameren Missouri's contribution, were used to fund the weatherization of these homes, but the TRC calculation assumed that all savings were attributable to Ameren Missouri funding. In short, this program is not cost effective as Mr Bickford indicates, despite the 1.03 TRC result found in the Cadmus Evaluation.

**Q. Did Cadmus make recommendations in its evaluation report that were similar to the recommendations found in the Apprise Evaluation?**

A. Yes. Cadmus made the following recommendations which are similar to the 2009 Apprise Evaluation recommendations. Cadmus' recommendations include:

- Increasing Ameren Missouri sponsorship awareness through leave-behind materials.
- Developing Ameren Missouri-specific Low Income Weatherization program funding guidelines that complement the existing federal guidelines and allow CAAs to more comprehensively serve participants, thereby achieving greater savings.
- Collaboratively assessing the potential addition of new electric measures.
- Tracking and electronically reporting measure-specific details for all participants.
- Tracking and electronically reporting previously inoperable heating or cooling units, as well as those that were replaced rather than tuned-up.

**Q. Does Ameren Missouri agree with these recommendations?**

A. Yes, it does. Ameren Missouri would like to work with MDNR to develop educational materials for customers and to evaluate potential electric measures that may be

included in the Low Income Weatherization program in the future. Ameren Missouri also supports the recommendation for improvements to the database to assist in future evaluation efforts.

**Q. Were there any other recommendations in that evaluation report that you would like to discuss?**

A. Yes. Other recommendations included:

- Increase interaction between Ameren Missouri and program implementers (CAAs and MDNR).
- Create performance indicators, such as participation and MWh savings targets, to track program performance. Cadmus also suggested that if the savings are tracked, they could be added to Ameren Missouri's DSM portfolio savings in future Company Missouri Energy Efficiency Investment Act ("MEEIA") filings.

**Q. Does Ameren Missouri agree with these recommendations?**

A. Yes, it does. Ameren Missouri would like to participate in future meetings with MDNR and the CAAs. Ameren Missouri would also like to work with MDNR to develop overall savings goals and track overall performance. These are the same requirements Ameren Missouri uses for our other energy efficiency program administrators. The Low Income Weatherization program should be administered at the same high quality level as these other programs to ensure that customer funds are being spent prudently.

**Q. Has Ameren Missouri considered administering the Low Income Weatherization program internally?**

A. Ameren Missouri is very capable of administering this program and has considered this approach, which is used by other utilities. Mr. Bickford states, "Other utilities, such as Empire District Electric, Kansas City Power and Light and KCP&L GMO, operate weatherization programs independently."[2] The Low Income Weatherization program was not included in the Company's 2012 MEEIA filing, but as part of our future review process for the Company's anticipated 2015 MEEIA filing, we will reconsider inclusion of the single family Low Income Weatherization program into the portfolio of Company administered programs.

**Q. Mr. Bickford referenced the Ameren Missouri low income program included in the MEEIA filing. Can you discuss that program and how it differs from the Low Income Weatherization program administered by MDNR?**

A. In 2009-2011, when we initiated our first low income program, ARRA funds were already overwhelming the weatherization agencies. Ameren Missouri looked for an area where we could make an impact with our energy efficiency funds. At that time, through market research, we determined there were a finite number of federally subsidized low income multi-family tenant units, an under-served market that we could focus on until post-ARRA when there would again be more opportunity to supplement the weatherization programs. The low income program included in the Ameren Missouri MEEIA filing is currently planned to continue targeting multi-family buildings and includes measures such as window air conditioners, programmable thermostats, compact fluorescent lights, and refrigerators. It does not include gas measures such as gas heating, gas water heating measures and building shell measures such as insulation which are the measures typically

[2] Bickford Direct, p. 7, l. 17-19.

provided by the MDNR program. As the available pool of qualifying multi-family housing units that have not yet participated in the program is exhausted, Ameren Missouri plans to add duplexes and single family homes to the program, as discussed in the program template included in the Company's MEEIA filing. It should also be noted that an implementer has not been hired for this program and will be expected to suggest improvements to the template. In the past, Ameren Missouri has considered adding single family homes in a manner that complements the MDNR program. For example, as ARRA funds are decreased, opportunities for the Ameren Missouri program to supplement the electric base load measures will become available and future plans are to consider those opportunities.

**Q. Are there any statements in Mr. Bickford's testimony that you would like to clarify?**

A. Yes. Mr. Bickford stated that the next payment to EIERA will be made in the fall of 2013. Ameren Missouri makes payments to EIERA in July of each year. MDNR then determines the allocation among the CAAs and releases the funds to those agencies in November of each year.

**Q. Does Ameren Missouri support Mr. Bickford's request for an additional $120,000 to provide MDNR funds for administration of the Low Income Weatherization program?**

A. Ameren Missouri is not sure that it is appropriate for ratepayer funds to be used to fund MDNR costs. Moreover, if such funding is appropriate, the Company has some questions about how this money will be used by MDNR. For example, Schedule AB-5 in Mr. Bickford's direct testimony lists $43,487 as "Other" expenses. As this is more than one third of the $120,000 requested, Ameren Missouri believes some additional clarification is

needed. There is also $15,000 allocated to the Missouri weather assistance program database. Ameren Missouri would like to be assured that MDNR will use this and funding from other sources to ensure there are ample improvements to the database necessary to provide quality reports.

**Q. Are there other possible funding sources for these administrative costs?**

A. Potentially. Ameren Missouri understands, based on statements in Staff witness Dr. Henry Warren's testimony, that both stimulus funds and Ameren Missouri allocations from previous years have remaining balances. It may be possible for these balances to be used to fund MDNR administrative costs in 2013 rather than to request additional funds from Ameren Missouri and its customers.

**Q. Do you have any additional comments about MDNR's request for additional funding?**

A. Yes, if the Commission grants MDNR's request for additional funding, Ameren Missouri requests the funding for this be collected in rates, just as the existing $1.2 million is funded.

**Q. Do you agree with Dr. Warren that future evaluations should include gas savings?**

A. Ameren Missouri is not opposed to including the analysis of gas savings in the next evaluation, but there may be limitations which will hinder the implementation of this suggestion. Very few of the participants funded by Ameren Missouri electric funds are Ameren Missouri gas customers. Consequently, there is not enough billing data available to analyze the gas savings from these customers unless this data could be gathered from other gas providers. Another option would be to include the low income participants that receive

funding from Ameren Missouri gas customers in the next evaluation as the gas weatherization program administered by MDNR has never been evaluated.

**Q. Do you agree with Dr. Warren that evaluations need to be conducted only every five years?**

A. No. Ameren Missouri has conducted impact and process evaluations of its energy efficiency programs on an annual basis. As part of the Unanimous Stipulation and Agreement in the Company's 2012 MEEIA filing, all parties (Staff, the Office of the Public Counsel, MDNR, industrial groups and environmental intervenors) agreed to continue this practice with the Company's MEEIA programs. While Ameren Missouri does not feel the same frequency is necessary for evaluations of the low income weatherization program, it does believe that evaluating the program every two years is necessary to provide timely process and impact feedback while providing MDNR with ample time to implement the recommendations made in the previous evaluation.

**Q. Does this conclude your rebuttal testimony?**

A. Yes, it does.

**BEFORE THE PUBLIC SERVICE COMMISSION**
**OF THE STATE OF MISSOURI**

| | | |
|---|---|---|
| In the Matter of Union Electric Company d/b/a Ameren Missouri's Tariffs to Increase Its Revenues for Electric Service. | ) ) ) | Case No. ER-2012-0166 |

**AFFIDAVIT OF GREGORY W. LOVETT**

**STATE OF MISSOURI** )
) **ss**
**CITY OF ST. LOUIS** )

Gregory W. Lovett, being first duly sworn on his oath, states:

1. My name is Gregory W. Lovett. I work in the City of St. Louis, Missouri, and I am employed by Union Electric Company d/b/a Ameren Missouri as Managing Supervisor, Energy Efficiency and Demand Response.

2. Attached hereto and made a part hereof for all purposes is my Rebuttal Testimony on behalf of Union Electric Company d/b/a Ameren Missouri consisting of 11 pages and Schedule(s) GWL-ER1 thru GWL-ER2 which have been prepared in written form for introduction into evidence in the above-referenced docket.

3. I hereby swear and affirm that my answers contained in the attached testimony to the questions therein propounded are true and correct.

Gregory W. Lovett

Subscribed and sworn to before me this 14th day of August, 2012.

Julie Donohue
Notary Public

My commission expires:

Julie Donohue - Notary Public
Notary Seal, State of
Missouri - St. Louis City
Commission #09753418
My Commission Expires 2/17/2013

Applied Public Policy Research

APPRISE

Institute for Study and Evaluation

# Ameren Low-Income Weatherization Program

## Final Evaluation Report

December 2009

Schedule GWL-ER1

# Table of Contents

# Executive Summary

AmerenUE has partnered with the Missouri Department of Natural Resources Energy Center and other utilities to provide weatherization services to low-income households through the Low Income Weatherization Program (LIWP). The goal of the program is to provide energy efficient improvements to low-income customers to reduce their utility bills and help them prepare for the heating and cooling seasons.

## *Introduction*

AmerenUE has agreed to conduct a process and impact evaluation and measurement and verification of the weatherization program. The goals of this research are to assess the effectiveness of the program and to identify opportunities for program improvement. This report presents the findings from the evaluation of the program.

The key objectives of the LIWP evaluation are to:

1. Provide estimates of the net energy impacts achieved for winter and summer.
2. Identify potential opportunities for improving the program to increase effectiveness.
3. Identify how evaluation research should be revised in the future.
4. Comply with the Missouri Public Service Commission's order for the program evaluation.

The evaluation consisted of the following activities.

1. *Informant Interviews* – We conducted interviews with organizations that have responsibilities for the LIWP.

   - *AmerenUE:* We conducted interviews with Ameren managers and staff who are responsible for overseeing the program.
   - *Missouri Department of Natural Resources:* The Missouri Department of Natural Resources, Environmental Improvement and Energy Resources Authority (EIERA) is responsible for administering the LIWP. We conducted telephone interviews with managers and staff at EIERA to document how the program is managed and implemented.
   - *Community Action Agency Interviews:* A network of Community Action Agencies is responsible for providing weatherization services to eligible clients. The agencies are also responsible for conducting quality control to assess the completeness and quality

of the work. We conducted interviews with managers and staff at these agencies to document how the program is implemented in the field.

2. *Review of specifications and procedures:* We collected and reviewed all available documents related to the LIWP. We reviewed program protocols to determine whether they can effectively provide energy efficiency services and education to low-income households. The review focused on comprehensiveness of the procedures in installing all cost-effective measures, effectiveness of the energy measures and installation procedures, whether the procedures are clearly specified for consistent application, and quality control procedures.

3. *Customer Survey: We* conducted 15-minute telephone interviews with a sample of customers who received LIWP services. The interviews provided information on understanding and satisfaction with program services, usage reduction education received, and changes in customer energy use behavior that resulted from the education.

4. *Service delivery data*: We collected service delivery data from the weatherization agencies to analyze the characteristics of program participants and measures provided by the program.

5. *Usage impacts:* We analyzed raw and weather-normalized energy usage before and after program services were received to determine the extent to which the LIWP reduced the energy usage of program participants.

6. *Payment impacts:* We analyzed customer payments and bill coverage rates before and after program services were received to determine the extent to which the LIWP improved the energy affordability for program participants.

## *Low Income Weatherization Program*

As part of Ameren's 2007 electric rate case, the Missouri Public Service Commission (MPSC) ordered Ameren to provide $1.2 million annually for a residential weatherization grant program including energy education for lower income customers. The program must serve Ameren's electric only or electric and gas combination customers.

### Management and Administration

The program is administered through the Missouri Department of Natural Resources Energy Center (DNR). DNR administers the Missouri Low Income Weatherization Assistance Program (WAP) that is funded by the Federal Department of Energy (DOE), as well as other low-income energy efficiency programs that are funded by other utilities. When DNR was given responsibility for program administration, they were told that the funds should be utilized under the same guidelines as the DOE WAP and that they should only be expended on Ameren's electric customers.

For Fiscal Year 2009, (Program Year 2008) the DOE guidelines state that the average cost per home is $2966. However, this average is per funding source. DNR encourages the subgrantees to blend DOE and other sources of funding, such as utility funds, so that additional weatherization measures can be completed on a home without exceeding the average per home cost for the funding source. All measures must be installed and follow guidelines according to DOE and state specifications as well as be cost tested through the NEAT and MHEA energy audit software.

Eleven Community Action Agencies, one nonprofit, and one City Government receive funds to implement LIWP in Ameren's service territory. Allocations to the agencies are based upon the percentage of the low-income households in each agency's service area.

**Eligibility**

Households are eligible for LIWP if they meet the following requirements.

1. The household is income-eligible, with income at or below 150 percent of the Federal Poverty Level.
2. The home has not been previously serviced through WAP since September 30, 1993.
3. The household resides in the area to be served.

**Process**

The process for LIWP services is specified below.

1. Customers fill out a program application at a subgrantee.
2. Customers must provide income documentation to prove that they are eligible for the program.
3. The agency auditor will conduct an inspection of the home to assess what should be done to reduce energy usage.
4. The agency crew or contractor installs the measures.
5. A quality control inspector examines the home for quality of work and completeness.

**Measures**

The LIWP uses the National Energy Audit Tool (NEAT) a computerized auditing program developed by the Oak Ridge National Laboratory to select the most cost-effective weatherization measures. In program year 2008, LIWP began using the Manufactured Home Energy Audit (MHEA) as well.

The operational manual contains a list of mandatory, optional, and "not considered" measures, as shown in the table below.

**Table ES-1**
**Program Measures**

| Mandatory | Optional | Not Considered |
|---|---|---|
| Attic insulation R-11 | Thermal vent damper | Floor insulation R-30 |
| Attic insulation R-19 | Electric vent damper | Window sealing |
| Attic insulation R-30 | IID | Window replacement |
| Attic insulation R-38 | Electric vent damper IID | Low E windows |
| Fill ceiling cavity | Flame retention burner | Window shading |
| Sillbox insulation | High efficiency furnace | Sun screen fabric |
| Foundation insulation | Smart Thermostat | Sun screen louvered |
| Floor insulation R-11 | Replace heatpump | Window film |
| Floor insulation R-19 | Low flow showerheads | Tune-up AC |
| Wall insulation | Water heater replacement | Replace AC |
| Wall insulation R-11 batt | Lighting retrofits | Evaporative cooler |
| Duct insulation | | Refrigerator replacement |
| Storm windows | | |
| Furnace tune-up | | |
| Replace heating system | | |
| Water heater tank insulation | | |
| Water heater pipe insulation | | |

Measures must have an SIR of 1 to be installed. Health and safety measures do not have to be cost tested. They do not have an individual SIR and do not get included with cumulative SIR. Repair measures, such as window and doors, are not required to have an individual SIR, but are included with the cumulative SIR.

Other important measure limitations are summarized below.

- According to a DOE requirement, agencies cannot use the program funds to replace electric heating systems.
- Furnace and hot water heater replacements are prohibited in rental units because they are seen as undue enhancements.
- There is also a $600 incidental material repair limit per home that the weatherization agencies and DNR monitor closely.

- DNR does not allow refrigerator replacement. This is something that DNR and the weatherization network may consider adding in the future.

- DNR considers Missouri a heating system state and concentrates on heating system work. Air conditioning work is approved on a case by case basis if it is related to client health issues. Air conditioner work is also something that DNR and the weatherization network may consider adding in the future.

- DNR began allowing CFLs as an option for agencies in mid 2008.

- There are no requirements that Ameren funds be used for measures that address electric usage.

### Service Delivery Statistics

The table below provides service delivery statistics for three program periods that are studied in this evaluation. There are gaps between the first program year and the second program year because of delays in contract approval.

**Table ES-2**
**Service Delivery Statistics**

| | 4/1/06 – 3/31/07 | 7/1/07 – 6/30/08 (Interest Earnings) | 2/15/08 – 10/31/08 |
|---|---|---|---|
| **Number of Homes Treated** | 650 | 339 | 493 |
| **Job Cost** | $859,537 | $367,995 | $1,048,300 |
| **Average Job Cost** | $1,322 | $1,086 | $2,126 |

### Agency Training and Certification

DNR has a Memorandum of Agreement with Linn State Technical (LSTC). Under this agreement, LSTC serves as the subgrantee to provide training for the network of local agency weatherization technicians. DNR requires the weatherization technicians to be trained in building science principals, advanced building diagnostics, combustion heating systems, and whole house best practices approach to cost-effective energy efficiency measures.

DNR also encourages subgrantees to use the Training and Technical Assistance (T&TA) sub category in the DOE budget to attend the Affordable Comfort and the U.S. DOE conferences. The weatherization agencies also attend quarterly Energy Professional Housing Alliance (EHPA) meetings and the annual Missouri Association for Community Action (MACA) training conference.

In Fiscal Year 2006 each agency was required to have at least one BPI certified auditor on staff. BPI certified auditors are required to have a certain number of continuing education

hours each year and must be recertified every three years. Any subgrantee that does not meet this requirement is required to submit a corrective action plan before DNR will award a grant for the next program year.

Lead-Safe Work Practices training is required for both direct hire and contractor crew workers. New crew members are required to be trained within a six-month period. Re-training needs to be completed within a three-year period.

Contractors must have all required insurances (liability and POI) as well as a Lead Safe Certification.

**Quality Control**

DNR is responsible for monitoring the performance of the subgrantees. The purpose of the monitoring is to determine if clients are adequately served and to determine if the program is operated in compliance with federal and state regulations and requirements.

The activities that are implemented are as follows.

1. Desk Monitoring – DNR reviews required monthly reports that includes clients' names, job numbers, and other required information.

2. Fiscal and Procedural Monitoring – DNR visits each subgrantee at least once per year to review procedural, fiscal, and compliance issues.

3. Housing Quality Monitoring – DNR housing quality monitors conduct on-site visits at least once each program year. They select a sample of completed homes for inspection and use an inspection checklist. Follow-up reviews of homes may be conducted where additional work or corrective measures were required.

4. Independent Monitoring – A subgrantee is required to have an annual fiscal audit that documents expenditures and compliance with regulations and requirements. Findings are compared to the subgrant and monthly reports.

DNR/EC has found that overall energy efficiency measures have been installed correctly and according to DOE and state requirements. Occasionally, additional follow up or rework is required.

## *Agency Interviews*

The evaluation research included in-depth telephone interviews with weatherization managers at the agencies that implement the LIWP. Twelve of the thirteen agencies complied with the evaluation request for an interview. This section summarizes the findings from these interviews.

### Agency Administration

Eight of the twelve agencies reported that all client and program data are maintained in paper client files. Four of the agencies reported that some data are electronic and some are in client files. Due to the way that the data are maintained, it was a time-consuming process for the agencies to provide data on clients, homes, and service delivery that were needed for the LIWP evaluation.

Several managers noted that DNR is very supportive and provides information whenever needed.

### Measures and Education

The Ameren funds are from an electric rate case settlement and most of the agencies serve clients who have a gas utility other than Ameren. However, when asked specifically about measures that would address electric usage – refrigerator replacement, air conditioning repair and replacement, and CFL replacements for incandescent light bulbs, most managers reported that these measures were not part of the program. Table ES-3 displays the manager responses.

**Table ES-3**
**Electric Measure Installation**

| Measure | Number of Agencies | | Comments |
|---|---|---|---|
| | Yes | No | |
| Refrigerator replacement | 0 | 12 | • One agency noted that DNR does not allow refrigerator replacement. |
| Air conditioner repair/replacement | 2 | 10 | • One agency manager noted that they only do air conditioning repair/replacement if it is related to the heating system and this is the only case in which DNR allows this work.<br>• Another agency manager noted that they had asked DNR but had not received a clear answer, so had decided not to do this measure. |
| CFLs | 4 | 8 | • One agency manager noted that they replace any bulb used more than 3 hours per day.<br>• One agency manager noted that they leave it up to the client since the client will have to deal with the disposal issue. She noted that they replace the lights that are used most but that they do not have a standard for a certain number of hours of use to be replaced.<br>• One agency manager noted that they replace all the incandescent with CFLs.<br>• One agency manager said that they hand out ten CFLs to each client and tell the client to install the CFLs in the bulbs that are used most. She said that she installs the CFLs if the client is elderly or disabled. |

Discussions with the weatherization managers revealed that there were different amounts of emphasis placed on the energy education provided to the customer. Several of the managers focused on pamphlets and other materials that are handed to the clients at the time of the

audit. A couple of the managers reported that they have an interview form that is used to obtain information and educate the customer at the same time. A few others specifically described the education process.

**Funding Sources**

All of the agencies said that they coordinate the funding that they have to provide comprehensive services to the clients. Many of the agencies have three sources of funding – the Ameren electric funds, gas utility funds, and DOE WAP funds. This allows them to spend up to triple what they would have been able to spend under the DOE WAP funding alone. Some of the managers specifically mentioned that this was important in the case of home repairs (often window and door work) where the DOE WAP limits spending to $600 per home and the combination of programs allows the agency to double or triple that amount.

The weatherization managers were asked whether the clients know that the services are funded by Ameren. Six of the managers said that clients were informed, four said that the clients did not know this, and two stated that they were not sure whether or not clients were aware that the program was funded by Ameren.

**Successes and Barriers**

When asked about the successes of the program, the most common response was that the additional funds from Ameren allow the agency to serve more clients and/or treat the homes more thoroughly (7 agencies). One manager noted that the additional funding and work allows the agency to maintain a trained staff to do the weatherization work and one noted that because of the additional funding, clients on the waiting list do not have to wait as long for services. Several managers noted that the work helps reduce clients' energy bills and make their homes more comfortable (5 agencies).

## *Participant Survey*

APPRISE conducted surveys with Ameren customers who received LIWP services to provide information on understanding and satisfaction with program services, usage reduction education received, and changes in customer energy use behavior that resulted from the education.

**Program Participation**

Most respondents learned about the program through a community agency or a friend or relative. The greatest motivations for program participation were to reduce energy bills and to increase the home's comfort.

### Energy Behavior

The survey found that there is room for improvement on customer education. However, many customers said that they did take actions to reduce their energy usage as a result of the program.

- *Provider education:* Only 54 percent of the respondents said that the provider gave them information about how to reduce energy usage.

- *Energy actions:* When prompted, 75 percent said they reduced use of heat, 49 percent said they reduced the amount of hot water that they use, 17 percent said that they reduced the use of their electric space heater, and 44 percent said that they reduced the use of their air conditioning as a result of the program.

### Program Measures

The survey found that satisfaction with some of the key measures, insulation and air sealing, was lower than has been found with some other programs.

### Program Impact

The survey found the Ameren program did as well or better than other programs in improving the winter and summer temperature of the respondents' homes.

- *Winter Temperature:* Sixty-three percent of the Ameren respondents said that the winter temperature of their home had improved.

- *Summer Temperature:* Forty percent of the Ameren respondents said that the summer temperature of their home had improved.

### Program Benefits

The survey found that program participants felt the program benefited them by reducing their bills, improving the safety and comfort of their home, lowering their energy use, and providing energy education. Ameren's program compared favorably to the other programs in terms of lower energy bills and improved safety and comfort. Ninety-one percent of the Ameren respondents agreed that the program resulted in lower energy bills and 95 percent of the Ameren respondents agreed that the program resulted in a safer or more comfortable home.

### Program Satisfaction

The survey found lower levels of satisfaction with the Ameren program than with other low-income weatherization programs.

- *Satisfaction with Energy Education:* Fifty-nine percent of the Ameren participants said that they were very satisfied with the energy education provided by the program.

- *Provider's Knowledge About Energy Usage:* Sixty-five percent of the Ameren participants said that they felt the provider was very knowledgeable about energy usage.

- *Program Satisfaction:* Respondents were asked how satisfied they were with the program overall. Sixty-two percent said they were very satisfied and 25 percent said that they were somewhat satisfied.

**Summary**

The survey found that Ameren's LIWP provides some important benefits to the participants. The participants believe that it has reduced their energy usage and made their homes safer and more comfortable. Comparisons to other programs found that Ameren LIWP participants were more likely to say that the program improved the winter and summer comfort than some of these other program participants. Ameren respondents were also more likely to agree that lower energy bills and a safer or more comfortable home were benefits of the program compared to some of the other low-income weatherization programs that have been studied. However, comparisons on measure installation and energy education, as well as overall program satisfaction, show room for improvement.

## *Participant and Service Delivery Statistics*

This analysis provided information on the clients, homes, and services provided through Ameren's LIWP. Because most of the program information required for the evaluation is not maintained electronically, obtaining and cleaning these data was a time-consuming endeavor. However, these data are important for program analysis and for interpreting the usage impacts of the program. DNR should develop a database to collect and manage the program data. These data will be useful for both program management and future program evaluation efforts.

Some of the key findings from the analysis are summarized below.

- *Client characteristics*: Clients are likely to have vulnerable household members. Eighty-nine percent of the clients served by the program have a senior, child, or disabled household member. The majority of the clients served by the program, 63 percent, have income below the poverty level.

- *Home characteristics*: Eighty-five percent of the clients served by the program own their homes. Most of the homes are single family detached units, most are fewer than 1,500 square feet, and most are more than 50 years old. The homes had high air leakage rates prior to treatment, and the agencies achieved large reductions in air leakage. Half of the homes had a 25 percent or greater reduction in the CFM50 air leakage rate.

- *Home equipment*: The majority of the clients use natural gas for heating and about one quarter use electricity for heating. Fifty-seven percent have Laclede as their natural gas company and 11 percent have Ameren as their natural gas company. Forty-two percent

use electric supplemental heat. Many of the clients have air conditioning, but these data were not available for the majority of the clients served.

- *Service delivery statistics*: While 16 percent of the jobs were completed in two weeks or less, 23 percent took more than three months from the date of the audit until the date of the final measure installation. Eighty-six percent of the clients had more than $1,000 spent on their homes. Just over half of the jobs had at least half of the total costs paid for through other program funds.

- *Program measures*: The most common program measures are air sealing, health and safety measures, repairs, window/door replacement or repair, and attic insulation. The highest cost measures are furnace replacement, floor and attic insulation, and window and door repair. Only a few of the agencies provide CFLs to the clients served by the program.

There is wide variety in the types of clients and homes served by the program, and the types of measures that were installed.

## Usage Analysis

The usage impact analysis measured net weather normalized electric and gas savings for participants who were treated by the LIWP between July 2007 and September 2008. Only a handful of customers were included in the gas impact analysis because most customers receive gas service from a different utility, and analyses of these data were not within the scope of this evaluation.

As expected, the electric usage impacts of the program were low, due to the focus on measures that reduce fossil fuel consumption. Net electric savings averaged 6.8 percent, lower than many other low-income energy efficiency programs that we have evaluated that place a greater emphasis on electric efficiency measures. Net gas savings, at 14 percent, were in the expected range, but were only estimated for a small number of customers who have Ameren gas service.

## Payment Analysis

Energy costs declined by approximately $60 or 4.3 percent for program participants, compared to the comparison group. While cash payments increased, assistance payments declined, resulting in a net decline in total payments made. Cash coverage rates increased by 8.5 percentage points, but total coverage rates declined by 3.5 percent.

## Summary of Findings

Findings related to program management, administration, and procedures; agency weatherization staff training; program impacts; and satisfaction are summarized below.

### Program Management, Administration, and Procedures

- Coordination with other low income energy efficiency programs increases efficiency in program delivery and allows for more comprehensive services. This is beneficial for program clients and reduces the fixed costs of returning to the home to deliver additional services under a separate program.

- The LIWP is delivered the same way as the Missouri WAP model, and therefore does not emphasize electric measures. Air conditioner work, refrigerator replacements, and replacements of electric heating systems are explicitly prohibited. CFLs were only introduced in mid-2008 and are not typically provided.

- Many clients are not aware that the services they receive are at least partially funded by Ameren.

- Agencies do not have adequate data systems in place to allow for tracking program services and managing the program.

- Households are only eligible for LIWP if the home has not been previously serviced through WAP since September 30, 1993. However, most of these households would not have received electric efficiency measures that are not provided through WAP. The LIWP could offer electric efficiency measures to previously treated WAP customers.

- Ameren customer service representatives refer payment troubled clients to agencies for energy assistance. They should also educate the clients to contact agencies and request services through the LIWP.

### Agency Weatherization Staff Training

- The program infrastructure provides good training for program staff. DNR encourages conference attendance and has begun requiring BPI certification.

- One area of weakness in program training is with respect to client education.

### Program Impact

- Most of the agency weatherization managers reported that they install CO detectors and many reported that they install smoke detectors, conduct CO testing, and take care of water heater issues. These measures should result in significant health and safety benefits for program participants.

- The survey found that program participants felt the program benefited them by reducing their bills, improving the safety and comfort of their home, lowering their energy use, and providing energy education. Ameren's program compared favorably to the other programs in terms of lower energy bills and improved safety and comfort.

- As expected, the electric usage impacts of the program were low, due to the focus on measures that reduce fossil fuel consumption. Net electric savings averaged 6.8 percent, lower than many other low-income energy efficiency programs that we have evaluated that place a greater emphasis on electric efficiency measures.

- Energy costs declined by approximately $60 or 4.3 percent compared to the comparison group. While cash payments increased, assistance payments declined, resulting in a net decline in payments made. The small decline in bills relates to the fact that most clients have gas services, the more heavily impacted use, with other utility companies.

- Participant satisfaction with air sealing and insulation was not as high as in some other programs and many customers did not say they were "very satisfied" with the condition in which the contractor left their home. Satisfaction with Ameren's program was otherwise on par with satisfaction from other low-income weatherization programs. The survey found that Ameren's customers were somewhat more likely to say that they did not get everything that they expected than in some of the other programs we have studied.

## *Recommendations*

Recommendations related to program management, administration, and procedures; agency weatherization staff training; program impacts; and satisfaction are summarized below.

**Program Management, Administration, and Procedures**

- *Maintain joint program implementation through DNR.*

- *Revise the rules for expenditure of Ameren program funds so that electric usage reduction measures are allowed and emphasized.*

- *Provide a program information sheet for agencies to distribute during the energy audit with Ameren's logo.*

- *DNR should develop a database for agencies to collect and manage the program data. These data will be useful for both program management and future program evaluation efforts.*

- *Allow customers who previously received Weatherization Assistance Program (WAP) services to receive LIWP targeted at electric reduction measures.*

- *Ameren customer service representatives should be trained to refer low-income, high usage customers to LIWP.*

**Agency Weatherization Staff Training**

- *DNR should continue to provide training and technical support and require BPI certifications.*

- *Additional training should be required on customer energy education and education about customer actions should be required during the audit visit.*

**Program Impact**

- *Health and safety measures should continue to be provided through the program.*

- *The program should increase its focus on electric reduction measures. This will have a greater impact on usage, affordability, and payment for Ameren customers.*

**Satisfaction**

- *Ameren should require the agencies to provide customers with information about how they can reduce their energy usage.*

- *Ameren could provide a program information sheet for agencies to distribute during the energy audit with energy efficiency tips and Ameren's logo.*

- *Ameren should require additional training and inspections with respect to air sealing and insulation work.*

- *Agency weatherization staff should be given more training on how to discuss what to expect from the program with the customers.*

# I. Introduction

AmerenUE has partnered with the Missouri Department of Natural Resources Energy Center and other utilities to provide weatherization services to low-income households through the Low Income Weatherization Program (LIWP). The goal of the program is to provide energy efficient improvements to low-income customers to reduce their utility bills and help them prepare for the heating and cooling seasons.

AmerenUE has agreed to conduct a process and impact evaluation and measurement and verification of the weatherization program. The goals of this research are to assess the effectiveness of the program and to identify opportunities for program improvement. This report presents the findings from the evaluation of the program.

## A. Evaluation

The key objectives of the LIWP evaluation are to:

1. Provide estimates of the net energy impacts achieved for winter and summer.
2. Identify potential opportunities for improving the program to increase effectiveness.
3. Identify how evaluation research should be revised in the future.
4. Comply with the Missouri Public Service Commission's order for the program evaluation.

The evaluation consisted of the following activities.

1. *Informant Interviews* – We conducted interviews with organizations that have responsibilities for the LIWP.

   - *AmerenUE:* We conducted interviews with Ameren managers and staff who are responsible for overseeing the program.
   - *Missouri Department of Natural Resources:* The Missouri Department of Natural Resources, Environmental Improvement and Energy Resources Authority (EIERA) is responsible for administering the LIWP. We conducted telephone interviews with managers and staff at EIERA to document how the program is managed and implemented.
   - *Community Action Agency Interviews:* A network of Community Action Agencies is responsible for providing weatherization services to eligible clients. The agencies are also responsible for conducting quality control to assess the completeness and quality

of the work. We conducted interviews with managers and staff at these agencies to document how the program is implemented in the field.

2. *Review of specifications and procedures:* We collected and reviewed all available documents related to the LIWP. We reviewed program protocols to determine whether they can effectively provide energy efficiency services and education to low-income households. The review focused on comprehensiveness of the procedures in installing all cost-effective measures, effectiveness of the energy measures and installation procedures, whether the procedures are clearly specified for consistent application, and quality control procedures.

   Documents that were reviewed included the following.

   - U.S. Department of Energy Weatherization Annual File Worksheet, Program Year 2008
   - U.S. Department of Energy State Plan/ Master File Worksheet, Program Year 2008
   - Missouri Department of Natural Resources, Low Income Weatherization, Energy Center fact sheet
   - Weatherization Field Guide for Missouri, Missouri Department of Natural Resources
   - State of Missouri, Department of Natural Resources Energy Center, Weatherization Program Operational Manual

3. *Customer Survey: We* conducted 15-minute telephone interviews with a sample of customers who received LIWP services. The interviews provided information on understanding and satisfaction with program services, usage reduction education received, and changes in customer energy use behavior that resulted from the education.

4. *Service delivery data*: We collected service delivery data from the weatherization agencies to analyze the characteristics of program participants and measures provided by the program.

5. *Usage impacts:* We analyzed raw and weather-normalized energy usage before and after program services were received to determine the extent to which the LIWP reduced the energy usage of program participants.

6. *Payment impacts:* We analyzed customer payments and bill coverage rates before and after program services were received to determine the extent to which the LIWP improved the energy affordability for program participants.

## B. Organization of the Report

Seven sections follow this introduction.

1) *Section II – Low Income Weatherization Program*: Provides a detailed description of the LIWP.

2) *Section III – Agency Interviews:* Provides a summary of the findings from the agency interviews.

3) *Section IV – Participant Survey:* Provides a summary of the findings from the survey of LIWP recipients.

4) *Section V – Participant and Service Delivery Statistics:* Provides a description of the data collected from agencies and analysis of participant and service delivery statistics.

5) *Section V – Usage Impacts:* Furnishes a summary of the impact that LIWP has had on the energy usage of program participants.

6) *Section VI – Payment Impacts*: Furnishes a summary of the impact that LIWP has had on the payment behavior of program participants.

7) *Section VII – Summary of Findings and Recommendations*: Provides a summary of the findings and recommendations from all of the evaluation activities.

APPRISE prepared this report under contract to Ameren. Ameren facilitated this research by furnishing program data to APPRISE. Any errors or omissions in this report are the responsibility of APPRISE. Further, the statements, findings, conclusions, and recommendations are solely those of analysts from APPRISE and do not necessarily reflect the views of Ameren.

# II. Low Income Weatherization Program

AmerenUE has partnered with the Missouri Department of Natural Resources Energy Center and other utilities to provide weatherization services to low-income households through the Low Income Weatherization Program (LIWP). The goal of the program is to provide energy efficient improvements to low-income customers to reduce their utility bills and help them prepare for the heating and cooling seasons.

## A. Background

As part of Ameren's 2007 electric rate case, the Missouri Public Service Commission (MPSC) ordered Ameren to provide $1.2 million annually for a residential weatherization grant program including energy education for lower income customers. The program must serve Ameren's electric only or electric and gas combination customers.

## B. Management and Administration

The program is administered through the Missouri Department of Natural Resources Energy Center (DNR). DNR administers the Missouri Low Income Weatherization Assistance Program (WAP) that is funded by the Federal Department of Energy (DOE), as well as other low-income energy efficiency programs that are funded by other utilities. When DNR was given responsibility for program administration, they were told that the funds should be utilized under the same guidelines as the DOE WAP and that they should only be expended on Ameren's electric customers.

The only differences between the rules as to how the DOE funds are spent and how the Ameren funds are spent are that the Ameren funds must be spent on Ameren electric customers; the Ameren funds do not allow leveraging, training, and technical assistance; and the Ameren funds cannot be used for program administration purposes. The DOE funds may be used for these other purposes.

Reporting requirements and guidelines are consistent for all funding sources. The agencies must track each funding source separately and send separate reports to DNR about the expenditure of each program's funds. Agencies are required to send in monthly reports, which is also their payment request. They provide information on the number of homes completed, expenditures, clients served, type of weatherization measures installed, energy savings, and blower door testing data.

For Fiscal Year 2009, (Program Year 2008) the DOE guidelines state that the average cost per home is $2966. However, this average is per funding source. DNR encourages the subgrantees to blend DOE and other sources of funding, such as utility funds, so that additional weatherization measures can be completed on a home without exceeding the average per home cost for the funding source. All measures must be installed and follow

guidelines according to DOE and state specifications as well as be cost tested through the NEAT and MHEA energy audit software.

The decision to expend the Ameren funds under the same rules as the DOE WAP funds was made to allow uniform administration of the weatherization program. In this way, all of the programs, including DOE, Ameren, and gas utility programs, have the same rules. This was the Collaborative's interpretation of the MPSC order.

Eleven Community Action Agencies, one nonprofit, and one City Government receive funds to implement LIWP in Ameren's service territory. Allocations to the agencies are based upon the percentage of the low-income households in each agency's service area.

Agencies are permitted to maintain data electronically or in paper files. DNR requests that the providers keep the information for three years after the grant period ends.

## C. Documentation

When DNR announces the distribution of utility grant allocations to subgrantees, a detailed budget document and budget instructions are included. Once the budget documentation is received, reviewed, and approved by DNR, a subgrant agreement packet is mailed to each subgrantee. The subgrant agreement, Scope of Services, and reporting forms are included in the packet. Rules and Regulations are outlined in the Weatherization Program Operational Manual.

The Scope of Services agreement describes the activities that agencies are required to undertake as part of their responsibilities in providing services under the weatherization agreement. These tasks include:

- Providing client outreach necessary to serve potentially eligible dwelling units.
- Determining and documenting the eligibility of dwelling units in accordance with current criteria established by the federal regulations, and the Missouri Weatherization State Plan that has been approved by DOE, and the Weatherization Program Operational Manual. The Scope of Services notes that all homes weatherized must be current AmerenUE electric customers.
- Utilizing the approaches to weatherization specified in the Missouri Weatherization State Plan and the Weatherization Program Operational Manual.
- Purchasing weatherization materials that meet or exceed standards established by program regulations and federal statutes in accordance with the Weatherization Program Operational Manual.
- Planning, organizing, and directing the physical retrofit of eligible dwelling units including labor, transportation and supervision for the minimum number of dwellings in the subgrantee approved proposal.

- Insuring quality retrofit through on-site final inspection of all completed work.
- Completing work within the budget and within the project period.
- Reporting programmatic and expenditure information to DNR using established procedures on a monthly and annual basis.

DNR attends and participates in quarterly meetings that are attended by the weatherization directors, administrators, and technical staff. At this time, they meet and discuss any changes to the program or the procedures. Periodic updates are made to the Weatherization Program Operational Manual as needed. Public Hearings are held each year to review and discuss changes made to the State Plan.

## D. *Eligibility*

Households are eligible for LIWP if they meet the following requirements.

(1) The household is income-eligible, with income at or below 150 percent of the Federal Poverty Level.

(2) The home has not been previously serviced through WAP since September 30, 1993.

(3) The household resides in the area to be served.

Subgrantees may serve clients whose names appear on Low-Income Home Energy Assistance Program (LIHEAP) lists. Subgrantees are instructed that the Family Support Division (FSD) LIHEAP list should used when waiting list have an insufficient number of clients within any priority to meet the agency's approved client targets. LIHEAP clients must meet the weatherization income guidelines.

There is a requirement that at least 66 percent of the units in multi-family buildings are occupied by income-eligible households, and 50 percent of the units in duplexes and four-unit buildings are occupied by income-eligible households. However, as few as 50 percent of the units may be certified as eligible to qualify a large multi-family building for weatherization if the investment would result in significant energy-efficiency improvements.

Eligible clients who are renters must have a signed landlord agreement before work can begin. The landlord must agree to the following conditions.

(1) The landlord will not raise the rent on the weatherized units for two years after weatherization is complete without just cause.

(2) The tenant will not be evicted during the two-year period without just cause.

(3) Tenants with utility costs included in the rent will receive a reduction in their rent when their utility costs are reduced as a result of weatherization.

(4) The landlord will not sell the apartment for two years unless the buyer assumes these obligations.

The subgrantee is required to negotiate with the landlord for a matching financial contribution. The amount of the contribution is left to the judgment of the subgrantee, but landlords must contribute a minimum of five percent of the project cost. For multi-family structures that have five or more units, the owner/landlord is required to contribute at least 25 percent of the weatherization cost. This requirement will be waived if the owner/landlord's annual taxable income is at or below 200 percent of the Federal Poverty Level.

## *E. Outreach and Targeting*

Subgrantees are required to publicize WAP within their geographic areas through the following outreach methods.

- Placement of WAP information on applications for other services.
- Public outreach through presentations to local civic groups, churches, schools and others.
- Media efforts through television, radio and newsprint.

Subgrantees may use either the Fuel Consumption Weighted Priority System or the Demographic Priority System for prioritizing clients. The selected method must be used for the entire program year, except as provided otherwise under the WAP procedures. The purpose of the methods are to assure that the vulnerable are given priority for program services.

- The fuel consumption system adds a weighted value regarding fuel consumed to the criteria for ranking and selecting clients. Other categories for receiving values include
    - Elderly (defined as 60 years or older)
    - Handicapped
    - Large families
    - Very low income households
    - Households with heating costs over 50 percent of monthly income
    - Length of time on any applicable waiting list
    - Other unusual circumstances
- The demographic priority method, used by most grantees, selects clients in chronological order, according to the client's application date. Elderly, handicapped and children are prioritized based on its past experience and the current service area demographics.

## F. Process

The process for LIWP services is specified below.

1. Customers fill out a program application at a subgrantee.
2. Customers must provide income documentation to prove that they are eligible for the program.
3. The agency auditor will conduct an inspection of the home to assess what should be done to reduce energy usage.
4. The agency crew or contractor installs the measures.
5. A quality control inspector examines the home for quality of work and completeness.

Subgrantees are not permitted to report units as complete until all weatherization measures have been installed in accordance with the work plan, or as documented in a change order request and the subgrantee has conducted a final inspection and certified that the work was completed in accordance with WAP standards.

## G. Measures

The LIWP uses the National Energy Audit Tool (NEAT) a computerized auditing program developed by the Oak Ridge National Laboratory to select the most cost-effective weatherization measures. At the start of each program year, the subgrantees are required to update their NEAT audit with the most recent version, enter updated fuel costs, and update other applicable costs. In program year 2008, LIWP began using the Manufactured Home Energy Audit (MHEA) as well.

The operational manual contains a list of mandatory, optional, and "not considered" measures, as shown in the table below.

**Table II-1**
**Program Measures**

| Mandatory | Optional | Not Considered |
|---|---|---|
| Attic insulation R-11 | Thermal vent damper | Floor insulation R-30 |
| Attic insulation R-19 | Electric vent damper | Window sealing |
| Attic insulation R-30 | IID | Window replacement |
| Attic insulation R-38 | Electric vent damper IID | Low E windows |
| Fill ceiling cavity | Flame retention burner | Window shading |
| Sillbox insulation | High efficiency furnace | Sun screen fabric |
| Foundation insulation | Smart Thermostat | Sun screen louvered |

| Mandatory | Optional | Not Considered |
|---|---|---|
| Floor insulation R-11 | Replace heatpump | Window film |
| Floor insulation R-19 | Low flow showerheads | Tune-up AC |
| Wall insulation | Water heater replacement | Replace AC |
| Wall insulation R-11 batt | Lighting retrofits | Evaporative cooler |
| Duct insulation | | Refrigerator replacement |
| Storm windows | | |
| Furnace tune-up | | |
| Replace heating system | | |
| Water heater tank insulation | | |
| Water heater pipe insulation | | |

Measures must have an SIR of 1 to be installed. Health and safety measures do not have to be cost tested. They do not have an individual SIR and do not get included with cumulative SIR. Repair measures, such as window and doors, are not required to have an individual SIR, but are included with the cumulative SIR.

Other important measure limitations are summarized below.

- According to a DOE requirement, agencies cannot use the program funds to replace electric heating systems.
- Furnace and hot water heater replacements are prohibited in rental units because they are seen as undue enhancements.
- There is also a $600 incidental material repair limit per home that the weatherization agencies and DNR monitor closely.
- DNR does not allow refrigerator replacement. This is something that DNR and the weatherization network may consider adding in the future.
- DNR considers Missouri a heating system state and concentrates on heating system work. Air conditioning work is approved on a case by case basis if it is related to client health issues. Air conditioner work is also something that DNR and the weatherization network may consider adding in the future.
- DNR began allowing CFLs as an option for agencies in mid 2008.
- There are no requirements that Ameren funds be used for measures that address electric usage.

## H. Energy Education

There are few requirements regarding client education that is provided during the audit and measure installation. The program documentation shows that the auditor does an initial interview with the client and DNR reported that they encourage client education when the auditor is assessing the home.

Some of the agencies offer energy education classes. In St. Louis they have courses where they instruct customers on energy efficiency.

Auditors are required to provide a lead save pamphlet to the client if the home was built prior to 1978.

## I. Service Delivery Statistics

The table below provides service delivery statistics for three program periods that are studied in this evaluation. There are gaps between the first program year and the second program year because of delays in contract approval.

**Table II-2**
**Service Delivery Statistics**

| | 4/1/06 – 3/31/07 | 7/1/07 – 6/30/08 (Interest Earnings) | 2/15/08 – 10/31/08 |
|---|---|---|---|
| **Number of Homes Treated** | 650 | 339 | 493 |
| **Job Cost** | $859,537 | $367,995 | $1,048,300 |
| **Average Job Cost** | $1,322 | $1,086 | $2,126 |

## J. Agency Training and Certification

DNR has a Memorandum of Agreement with Linn State Technical (LSTC). Under this agreement, LSTC serves as the subgrantee to provide training for the network of local agency weatherization technicians. DNR requires the weatherization technicians to be trained in building science principals, advanced building diagnostics, combustion heating systems, and whole house best practices approach to cost-effective energy efficiency measures.

Training courses focus on Auditor, Shell Specialist, and Heating/Cooling certifications. Training includes the following topics:

- Building Science Principals
- Basic Auditing Procedures
- Advanced Building Diagnostics
- Air Sealing, Insulation Materials, and Techniques

- Combustion Heating Systems
- Combustion Appliances
- Duct System Diagnostics and Repair
- Whole House Best Practices
- Health and Safety
- Mold and Mold Hazards Awareness
- Using NEAT to Establish Weatherization Priorities
- Blower Door
- Lead-Safe Work Practices
- Mobile Home Energy Audit Training

DNR/EC sends out an annual survey to the agencies to determine their satisfaction and their need for additional types of training. The LSTC trainer advises BPI on their standards and attends the Affordable Comfort conference each year.

DNR also encourages subgrantees to use the Training and Technical Assistance (T&TA) sub category in the DOE budget to attend the Affordable Comfort and the U.S. DOE conferences. The weatherization agency managers also attend quarterly Energy Professional Housing Alliance (EHPA) meetings and the annual Missouri Association for Community Action (MACA) training conference.

In Fiscal Year 2006 each agency was required to have at least one BPI certified auditor on staff. BPI certified auditors are required to have a certain number of continuing education hours each year and must be recertified every three years. Any subgrantee that does not meet this requirement is required to submit a corrective action plan before DNR will award a grant for the next program year.

Lead-Safe Work Practices training is required for both direct hire and contractor crew workers. New crew members are required to be trained within a six-month period. Re-training needs to be completed within a three-year period.

Contractors must have all required insurances (liability and POI) as well as a Lead Safe Certification.

## K. *Quality Control*

DNR is responsible for monitoring the performance of the subgrantees. The purpose of the monitoring is to determine if clients are adequately served and to determine if the program is operated in compliance with federal and state regulations and requirements.

DNR uses the same monitoring protocol as used with DOE homes. In many instances utility grant funds are used in conjunction with DOE funded homes.

The DNR monitoring activities examine four areas of program operations:

1. Housing quality inspections
2. Production and expenditure reviews
3. Fiscal and program operations
4. Oversight of federal/state requirements and regulations

The activities that are implemented to address these issues are as follows.

1. Desk Monitoring – DNR reviews required monthly reports that includes clients' names, job numbers, and other required information. They can use these reports to determine compliance with the following regulations.

   - Federally designated expenditure categories.
   - Actual versus planned expenditures.
   - Expenditure rates.
   - Characteristics of completed homes.
   - Number of completed units per month.
   - Number of persons and households by WAP targets.

2. Fiscal and Procedural Monitoring – DNR visits each subgrantee at least once per year to review procedural, fiscal, and compliance issues. DNR conducts a review of the subgrantees' procedures using a standardized monitoring protocol. DNR reviews the subgrantees' compliance with federal/state regulations, requirements specified in the Missouri WAP Annual and Master files, the Missouri WAP Competitive Procurement Standards, and the DNR General Terms and Conditions for Federal Subgrants. DNR also reviews the subgrantees' annual independent audits for consistency with financial reports submitted during the year.

3. Housing Quality Monitoring – DNR housing quality monitors conduct on-site visits at least once each program year. They select a sample of completed homes for inspection and use an inspection checklist to assess the following.

   - Compliance with allowable WAP measures.
   - Quality of work.
   - Accuracy of reporting on home installation materials.
   - Appropriateness, accuracy, and completeness of the initial energy audit and final inspection.

   Follow-up reviews of homes may be conducted where additional work or corrective measures were required.

4. Independent Monitoring – A subgrantee is required to have an annual fiscal audit that documents expenditures and compliance with regulations and requirements. Findings are compared to the subgrant and monthly reports.

DNR/EC has found that overall energy efficiency measures have been installed correctly and according to DOE and state requirements. Occasionally, additional follow up or rework is required.

# III. Agency Interviews

The evaluation research included in-depth telephone interviews with weatherization managers at the agencies that implement the LIWP. Twelve of the thirteen agencies complied with the evaluation request for an interview. This section summarizes the findings from these interviews.

## A. Agency Administration

Eight of the twelve agencies reported that all client and program data are maintained in paper client files. Four of the agencies reported that some data are electronic and some are in client files. Due to the way that the data are maintained, it was a time-consuming process for the agencies to provide data on clients, homes, and service delivery that were needed for the LIWP evaluation.

## B. Agency Staff and Training

All of the agencies reported that their own staff members are responsible for the program audit. Most of the agencies had BPI certified auditors or auditors who were currently working on their BPI certification.

Seven of the agencies reported that they use contractors for all of the measure installation work, four agencies reported that their own staff do the measure installation work and they hire contractors for the furnace work, and one agency reported that they use a combination of their own staff and contractors for weatherization work and contractors for furnace work.

All but one of the agencies reported that they receive training at Linn State Technical College through DNR. They reported that the training is provided on a variety of topics and provides the information that is needed. One of the weatherization managers reported that they attend quarterly and some that they attend less frequently. Two mentioned that the auditors are required to attend a certain number of hours of training each year, so they are sent on an annual basis. Other types of training that were mentioned by a minority of the weatherization managers were:

- The annual WAP conference – 3 agencies.
- The annual Affordable Comfort Conference – 3 agencies.
- EPHA – Energy Professional Housing Alliance where all the weatherization managers and directors and agencies get together quarterly to discuss new things and changes to the guidelines – 3 agencies.
- The Kansas Building Science Institute – 1 agency.
- They provide their own training at the agency – 1 agency.
- HVAC training at local community colleges – 1 agency.

One manager noted that she would like more training from DNR on reports for deemed electric and gas savings.

Several managers noted that DNR is very supportive and provides information whenever needed. One manager noted DNR provides needed technical support and answers questions about the NEAT audit.

## C. LIWP Measures

All of the managers reported that they follow the DNR guidelines for the LIWP. One manager stated that they do have some basic agency guidelines in addition to the DNR guidelines. A couple of others reported that they have some agency procedural guidelines in addition to the DNR technical guidelines.

Table III-1 lists the measures that the agencies described that they provide through the LIWP. The most common measures, mentioned by all or almost all of the agencies were infiltration work such as caulking and door sweeps, heating system repair and/or replacement, and insulation.

**Table III-1**
**Measure Installation Reported by Agency Managers**

| Measure | Number of Agencies |
|---|---|
| Infiltration work | 12 |
| Heating system repair/replacement | 11 |
| Insulation | 10 |
| Window and/or door repair/replacement | 8 |
| Furnace clean and tune | 3 |
| Water heater repair/replacement | 3 |
| Water heater wrap | 2 |
| Space heater replacement | 1 |
| Vent attic | 1 |
| Repair flooring if rotting out | 1 |

One of the agency managers noted that she is careful not to use Ameren program funds for natural gas appliances except for in the one county that the agency served where Ameren also provided gas service. However, none of the other agencies made this distinction.

The Ameren funds are from an electric rate case settlement and most of the agencies serve clients who have a gas utility other than Ameren. However, when asked specifically about measures that would address electric usage – refrigerator replacement, air conditioning repair and replacement, and CFL replacements for incandescent light bulbs, most managers reported that these measures were not part of the program. Table III-2 displays the manager responses.

**Table 2**
**Electric Measure Installation**

| Measure | Number of Agencies | | Comments |
|---|---|---|---|
| | Yes | No | |
| Refrigerator replacement | 0 | 12 | • One agency noted that DNR does not allow refrigerator replacement. |
| Air conditioner repair/replacement | 2 | 10 | • One agency manager noted that they only do air conditioning repair/replacement if it is related to the heating system and this is the only case in which DNR allows this work.<br>• Another agency manager noted that they had asked DNR but had not received a clear answer, so had decided not to do this measure. |
| CFLs | 4 | 8 | • One agency manager noted that they replace any bulb used more than 3 hours per day.<br>• One agency manager noted that they leave it up to the client since the client will have to deal with the disposal issue. She noted that they replace the lights that are used most but that they do not have a standard for a certain number of hours of use to be replaced.<br>• One agency manager noted that they replace all the incandescent with CFLs.<br>• One agency manager said that they hand out ten CFLs to each client and tell the client to install the CFLs in the bulbs that are used most. She said that she installs the CFLs if the client is elderly or disabled. |

Weatherization managers were asked what health and safety measures are provided as part of the weatherization work. Table III-3 shows that most of the managers reported that they install CO detectors and many reported that they install smoke detectors, conduct CO testing, and take care of water heater issues.

**Table III-3**
**Health and Safety Measures**

| Measure | Number of Agencies |
|---|---|
| CO Detectors | 10 |
| Smoke Detectors | 7 |
| CO Testing | 7 |
| Water Heater Issues | 7 |
| Gas Leak Testing | 4 |
| Furnace Repair and Replacement | 4 |
| Moisture and Mold Issues | 4 |
| Check for Proper Ventilation | 2 |
| Furnace Clean and Tune | 1 |
| Furnace Filter Replacement | 1 |
| Electric Box Covers | 1 |

| Measure | Number of Agencies |
|---|---|
| Check Supply Vents | 1 |
| Replace Door if Missing | 1 |

## D. Energy Education

Discussions with the weatherization managers revealed that there were different amounts of emphasis placed on the energy education provided to the customer. Several of the managers focused on pamphlets and other materials that are handed to the clients at the time of the audit. A couple of the managers reported that they have an interview form that is used to obtain information and educate the customer at the same time. A few others specifically described the education process. Some of these descriptions are excerpted below.

- When the auditor sets up the blower door, she talks to the client and shows them where the air leaks are. A lot of times people have open windows or storm windows up. They leave their door open for the light and lose heat. We talk to people about how to save energy and where to set the thermostat. A lot of times have them set way up so heat source cycles a longer cycle. We talk to the clients about their appliances and tell them to use the energy saving settings on their appliances. We also discuss the CFLs and how much they can save with the CFLs.

- Our home auditor makes an appointment with the owner or occupant. At the time, there is an extensive interview and the auditor asks clients specifically about any problems in the home, the kinds of systems that might be associated with a gas leak, explains what we plan to do and why. The auditor explains the blower door test, that it is a measure that improves the infiltration. The auditor answers questions. We also recommend energy saving approaches for the future.

- Education is provided at the front end and tail end. When we walk through the home, we provide advice on how to not waste energy, covering ducts, turning the water tank thermostat down, and changing the filter. We recommend programs and forums throughout the community.

- We talk to the clients about the thermostat and whatever the auditor sees that needs to be discussed with the homeowner. If we put in a new furnace, we explain the efficiency and the energy star ratings.

- As they go through the home, they are supposed to talk to the client, tell them about the different measures and how the client can save in the different areas of the home. The education is usually done more at the time of the audit versus the time of the final.

- We go through the process, tell them what we are looking at, what we are going to be changing, and how to take care of it. At the end, we make sure that they agree we've done everything we said that we would do and that it looks correct to them.

## E. Coordination of Funding Sources

All of the agencies said that they coordinate the funding that they have to provide comprehensive services to the clients. Many of the agencies have three sources of funding – the Ameren electric funds, gas utility funds, and DOE WAP funds. This allows them to spend up to triple what they would have been able to spend under the DOE WAP funding alone. Some of the managers specifically mentioned that this was important in the case of home repairs (often window and door work) where the DOE WAP limits spending to $600 per home and the combination of programs allows the agency to double or triple that amount.

## F. Waiting Lists

Nine of the twelve managers reported that they do have a waiting list for weatherization. The wait ranged from a couple of weeks, to a few months (3 agencies), to more than one year (4 agencies). Three of the agencies reported that Ameren clients are moved to the top of their list so they do not have to wait for service delivery. One agency reported that seniors are treated first and another reported that there is no wait for elderly and disabled clients.

## G. Ameren Funding

The weatherization managers were asked whether the clients know that the services are funded by Ameren. Six of the managers said that clients were informed, four said that the clients did not know this, and two stated that they were not sure whether or not clients were aware that the program was funded by Ameren.

## H. Successes and Barriers

When asked about the successes of the program, the most common response was that the additional funds from Ameren allow the agency to serve more clients and/or treat the homes more thoroughly (7 agencies). One manager noted that the additional funding and work allows the agency to maintain a trained staff to do the weatherization work and one noted that because of the additional funding, clients on the waiting list do not have to wait as long for services. Several managers noted that the work helps reduce clients' energy bills and make their homes more comfortable (5 agencies).

Agency weatherization managers were also asked about the barriers they face in providing services. The table below displays the barriers that were mentioned. The most common barrier mentioned was a limitation on the type of work that could be done in the home.

**Table III-4**
**Barriers Noted by Managers**

| Category | Barrier | Number of Agencies |
|---|---|---|
| Limitation on Types of Work | Inability to do air conditioning work | 3 |
| | Inability to improve appliances | 1 |
| | Inability to replace electric furnaces, even if the client has no heat. Replacements are limited to natural gas, propane, and oil fired systems. | 1 |
| | | |
| Funding | Need to be able to do more work in the home | 2 |
| | Need more money to provide program services | 1 |
| | | |
| Client Outreach | Ameren customers are only in two of their eight counties so it is difficult to get Ameren customers to apply for services | 1 |
| | Getting applicants within the income guidelines | 1 |
| | Ameren needs to tell customers in need about the program | 1 |
| | | |
| Other Issues | Educating the client that some time will pass between the audit and measure installation | 1 |
| | Requires additional reporting, but not a significant barrier | 1 |
| | The housing stock that they work with | 1 |

## *I. Recommendations*

Agency managers made several recommendations regarding the program.

**Table III-5**
**Agency Recommendations**

| Category | Recommendation | Number of Agencies |
|---|---|---|
| Program Funding | Increase the amount of funds they can spend in a home. | 2 |
| | Provide more funding so they can do additional measures in the home. | 1 |
| | Provide information on funding plan if it is multi-year, as this will help the agencies with their planning. | 1 |

| Category | Recommendation | Number of Agencies |
|---|---|---|
| | | |
| Program Outreach | Ameren should refer households to the program. | 1 |
| | Provide funding for the agencies to educate the community about energy conservation and the services that are available. | 1 |
| | | |
| Other | Allow them to re-weatherize homes. Right now they can only go back to homes that were done prior to 9/30/1993. | 1 |

# IV. Participant Survey

APPRISE conducted surveys with Ameren customers who received LIWP services to provide information on understanding and satisfaction with program services, usage reduction education received, and changes in customer energy use behavior that resulted from the education. This section provides a description of the survey methodology and the findings from the survey.

## *A. Survey Methodology*

This section describes the methodology for the survey, including procedures for sample selection and survey implementation.

### Survey Sample

A sample of 518 active Ameren customers who received LIWP services between March 31, 2007 and June 30, 2008 was selected for the survey. Customers on the Ameren Do Not Call List were removed from the list prior to sample selection.

### Survey Implementation

A survey advance letter was sent to all 518 potential respondents. This letter announced the survey, notified potential respondents that they might be called to participate in the survey, explained the purpose of the survey, and gave potential respondents the option to call the phone center to complete the survey at their convenience.

APPRISE retained TMR Inc. to conduct the telephone survey through its call center. A researcher from APPRISE trained TMR's employees on the survey instrument and monitored survey implementation. TMR's manager in charge of the survey instructed interviewers how to use the computerized version of the survey to record customer responses.

Interviewer training consisted of two hour-long sessions – one for daytime and one for evening interviewers. The training provided interviewers with an overview of the study, purpose behind questions asked, and strategies to provide accurate clarification and elicit acceptable responses through neutral probing techniques.

Interviewer monitoring allowed APPRISE researchers to both listen to the way interviewers conducted surveys and review the answers they chose on the computerized data entry form. There were two methods for monitoring the quality of the survey implementation. First, the initial implementation of the survey was monitored in person at the telephone center, where the monitor could listen to the interviews as they were conducted and observe the answers as they were recorded. After the first day, live monitoring was conducted by telephone, where the monitor could listen to the live survey and provide feedback on survey implementation (but could not observe the answers being recorded by the interviewer.) To

provide an additional check on the accuracy of interviewers' data entry, we received daily recordings of a sample of interviews with the accompanying data file. The monitor listened to the interview while checking the data file to ensure that questions were accurately coded and entered into the database.

Telephone interviews were conducted between March 4, 2009 and March 16, 2009. During this time period, 273 interviews were completed.

## Survey Response Rates

This section describes the response rates for the survey.

- **Number selected:** In total, 518 customers were selected for the survey.

- **Unusable:** There were 73 cases deemed unusable because no one was present in the home during the survey who was able to complete the survey, or because phone numbers were unavailable, disconnected, or incorrect. These households are not included in the denominator of the response rate or the cooperation rate. They are included in the denominator of the completed interview rate.

- **Non-Interviews:** There were 45 cases classified as non-interviews because the qualified respondent refused to complete the interview, or because the respondent asked the interviewer to call back to complete the interview at a later time, but did not complete the interview during the field period. These households are included in the denominator of the cooperation rate, the response rate, and the completed interview rate.

- **Ineligible:** There were 12 cases deemed to be ineligible because the respondent did not remember receiving services or because the members of the respondent's household had moved. These households are not included in the denominator of the response rate or the cooperation rate. They are included in the denominator of the completed interview rate.

- **Unknown eligibility:** There were 115 cases that were determined to have unknown eligibility to complete the interview, due to answering machines, no answers, and language barriers, or due to reaching the maximum number of calling attempts.[1] These households are not included in the denominator of the cooperation rate. They are included in the denominator of the response rate and the completed interview rate.

- **Completed interviews**: The completed interviews are households that were reached and that answered the full set of survey questions by telephone. In total, 273 interviews were completed.

[1]The telephone interview center conducted interviews with respondents with a language barrier by arranging a callback with an English-speaking member of household whenever possible. However, there were 3 cases in which an interview could not be completed due to a language barrier.

- **Cooperation rate**: The cooperation rate is the percent of eligible households contacted who completed the survey. This is calculated as the number of completed interviews divided by the interviews plus the number of non-interviews (refusals plus non-completed callbacks[2]). Overall, this survey achieved an 86 percent cooperation rate.

- **Response rate:** The response rate is the number of completed interviews divided by the number of completed interviews plus the number of non-interviews (refusals plus non-completed callbacks) plus all cases of unknown eligibility (due to answering machines, language barriers or maximum calling attempts reached). This survey attained a 63 percent response rate.

- **Completed Interview Rate:** The completed interview rate is the percentage of households selected that completed the survey. This survey attained a 53 percent completed interview rate.

**Table IV-1**
**Sample and Response Rates**

| | Total Sample |
|---|---|
| Number Selected | 518 |
| Unusable | 73 |
| Non-Interviews | 45 |
| Ineligible | 12 |
| Unknown Eligibility | 115 |
| Completed Interviews | 273 |
| Cooperation Rate | 86% |
| Response Rate | 63% |
| Completed Interview Rate | 53% |

## *B. Demographics*

This section provides information on the demographics of the survey respondents. Table IV-2 shows that 37 percent of the respondents live in single person households. Eleven percent have more than four in the household.

[2] Non-completed callbacks include respondents who asked the interviewer to call back at a later time to complete the interview, but did not complete the interview by the end of the field period.

### Table IV-2
### Number of Household Members

| Number of Household Members | Percent of Respondents |
|---|---|
| 1 | 37% |
| 2 | 23% |
| 3 | 15% |
| 4 | 14% |
| 5 | 8% |
| 6 or more | 3% |

Table IV-3 displays the percentage of households with vulnerable members. The table shows that 45 percent have a senior in the home, 55 percent have a disabled household member, 44 percent have a child in the home, and 21 percent are single parent households.

### Table IV-3
### Vulnerable Groups

| | Household With Senior (Age 60 or older) | Household With Disabled | Household With Child (Age 18 or under) | Household With Young Child (Age 5 or under) | Single Parent Household[1] |
|---|---|---|---|---|---|
| Yes | 45% | 55% | 44% | 13% | 21% |
| No | 55% | 45% | 56% | 87% | 79% |
| Don't Know/ Refused | 0% | 0% | 0% | 0% | 0% |

[1] Defined as households with only one adult residing with one or more children.

Table IV-4 displays the percent of households that have at least one vulnerable household member, an elderly individual, a disabled individual, or a child. The table shows that 95 percent of the households that were served have at least one vulnerable member.

### Table IV-4
### Households With At Least One Vulnerable Member

| | Percent of Respondents |
|---|---|
| At Least One Vulnerable Member | 95% |
| No Vulnerable Members | 5% |

Table IV-5 displays the annual income that respondents reported in the survey. The table shows that 29 percent have income below $10,000, 47 percent have income between $10,000 and $20,000, 18 percent have income between $20,000 and $30,000 and only six percent have income of more than $30,000.

**Table IV-5**
**Annual Income**

| Annual Income | Percent of All Respondents | Percent of Respondents Who Provided Income Data |
|---|---|---|
| Less than $ 10,000 | 26% | 29% |
| $ 10,001 - $ 20,000 | 41% | 47% |
| $ 20,001 - $ 30,000 | 16% | 18% |
| $ 30,001 - $ 40,000 | 4% | 5% |
| More than $ 40,000 | 1% | 1% |
| Don't Know/Refused | 12% | -- |

Table IV-6 displays the household poverty level computed from the income and number of household members that respondents reported in the survey. The table shows that ten percent reported income at or below 50 percent of the poverty level, 45 percent reported income between 50 and 100 percent of poverty, 28 percent reported income between 100 and 150 percent of poverty, and 17 percent reported income above 150 percent of poverty.

**Table IV-6**
**Poverty Level**

| Poverty Level | Percent of All Respondents | Percent of Respondents Who Provided Income Data |
|---|---|---|
| 0%-50% | 8% | 10% |
| 51%-100% | 40% | 45% |
| 101%-150% | 25% | 28% |
| More than 150% | 15% | 17% |
| No Income Information | 12% | -- |

Table IV-7 displays the types of income and benefits that respondents reported they received in the past year. The table shows that only 29 percent reported employment income, 48 percent reported retirement income, 34 percent reported public assistance income, 56 percent reported non-cash benefits, and 34 percent reported LIHEAP benefits.

**Table IV-7**
**Types of Income and Benefits Received**

| | Wages or Self-Employment Income | Retirement Income | Public Assistance | Non-cash benefits | LIHEAP benefits |
|---|---|---|---|---|---|
| Yes | 29% | 48% | 34% | 56% | 34% |
| No | 70% | 52% | 64% | 43% | 61% |
| Don't Know /Refused | 1% | 1% | 1% | 1% | 5% |

Respondents were asked whether any member of the household had been unemployed and looking for work in the past 12 months. Table IV-8 shows that 29 percent of the respondents said that they someone in the household had been unemployed and looking for work.

**Table IV-8**
**Unemployed During the Year**

| Unemployed | Percent of Respondents |
|---|---|
| Yes | 29% |
| No | 70% |
| Don't Know/Refused | 1% |

Respondents were asked about the highest level of education reached by any member of the household. Table IV-9 shows that 54 percent of the respondents had not received education past high school.

**Table IV-9**
**Highest Level of Education Reached By Any Member of Household**

| Highest Level of Education | Percent of Respondents |
|---|---|
| Less Than High School | 16% |
| High School Diploma or Equivalent | 38% |
| Some College/Associates Degree | 31% |
| Bachelor's Degree | 7% |
| Master's Degree or Higher | 3% |
| Vocational Training | 3% |
| Other | 2% |
| Don't Know/Refused | <1% |

Respondents were asked whether any member of the household has a medical condition that requires additional use of energy. Table IV-10 shows that 30 percent of respondents reported that someone in the household had such a condition.

**Table IV-10**
**Household Member With a Medical Condition**
**That Requires Additional Use of Energy**

| Medical Condition | Percent of Respondents |
|---|---|
| Yes | 30% |
| No | 70% |
| Don't Know/Refused | 0% |

## *C. Reasons for Participation*

This section explores how households found out about the program and why they participated. Table IV-11 shows that 41 percent reported that they found out about the program through a community agency and 30 percent learned about the program through a friend or relative. Other common sources were a social service or government agency and an advertisement.

**Table IV-11**
**How Did You Find Out About The Program?**

| Found Out About the Program | Percent of Respondents |
|---|---|
| Community Agency | 41% |
| Friend or Relative | 30% |
| Social Service or Government Agency | 13% |
| Advertisement (Newspaper, Flyer, Bulletin Board, TV) | 8% |
| Utility Company | 3% |
| Previous Experience | 2% |
| Bill Insert | 1% |
| Don't Know/Refused | 3% |

Customers were asked whether the main reason that they wanted to receive weatherization services, was to reduce their energy bills, reduce the amount of energy they use, improve the comfort of their home, or for another reason. Table IV-12 shows that 60 percent reported that the main reason was to reduce their energy bills, 23 percent reported it was to improve the comfort of their home, 10 percent reported that it was to reduce their energy use, and 6 percent reported that it was because a new furnace or a repair was needed.

**Table IV-12**
**Main Reason For Applying For LIWP**

| Main Reason For Applying for LIWP | Percent of Respondents |
|---|---|
| Reduce Energy Bills | 60% |

| Main Reason For Applying for LIWP | Percent of Respondents |
|---|---|
| Improve Comfort of Home | 23% |
| Reduce Energy Use | 10% |
| New Furnace Needed | 4% |
| Repair Needed | 2% |
| Other | <1% |
| Don't Know/Refused | <1% |

## D. Energy Behavior

This section examines the impact of the program on respondents' energy usage behavior. Respondents were asked whether they were home for the service provider's visit and whether they were home for the entire visit. Table IV-13 shows that 97 percent reported that they were home at the time of the visit and 85 percent reported that they were home for the entire visit.

**Table IV-13**
**At Home At the Time of the Service Provider's Visit**

| | Home at the Time of the Visit | Home for the Entire Visit |
|---|---|---|
| Yes | 97% | 85% |
| No | 3% | 14% |
| Don't Know/Refused | 0% | 1% |

Respondents were asked whether the provider gave them information about how to reduce the amount of energy that they use. Table IV-14 shows that only 54 percent of the respondents said that the provider gave them such information.

**Table IV-14**
**Providers Gave Information About How To Reduce Energy Use**

| | Percent of Respondents |
|---|---|
| Yes | 54% |
| No | 39% |
| Don't Know/Refused | 7% |

Table IV-15 compares information provided about energy use reduction to that from other program surveys. The table shows that the Ameren program was about the same as the New Hampshire weatherization program, but respondents to the PPL WRAP survey were much more likely to say that the provider gave them information about how to save energy.

**Table IV-15**
**Providers Gave Information About How To Reduce Energy Use**
**Comparison to Other Programs**

| | New Hampshire Weatherization Program | PPL WRAP |
|---|---|---|
| Provider Left Information About Saving Energy | 53% | 80% |

Respondents were then asked what energy saving actions they had been able to take since the service provider's visit. Table IV-16 shows that 57 percent of respondents provided at least one action. The most commonly reported actions were turning down the heating temperature, insulating windows and doors, turning off unused lighting, and keeping windows and doors closed.

**Table IV-16**
**Energy Saving Actions Taken Since the Providers' Visit**

| Energy Saving Actions Taken | Percent of Respondents |
|---|---|
| Turn Down Heat Temperature | 26% |
| Insulate Windows and Doors | 19% |
| Turn Off All Unused Lighting | 5% |
| Keep Windows and Doors Closed | 5% |
| Replaced Windows/Doors | 4% |
| Change Furnace Filter | 3% |
| Turn Off Unused Appliances/ Entertainment | 2% |
| Open Blinds During Day/Close At Night | 2% |
| Keep Thermostat on One Setting | 2% |
| Insulation | 2% |
| Wrapped Water Heater/Pipes | 1% |
| Use Less Hot Water | 1% |
| Use Cold Water For Washing Clothes | 1% |
| Use Air Conditioner Less | 1% |
| Turn Down Water Heater Temperature | 1% |
| Closed Off Part of Home | <1% |
| Clean Dryer Filter | <1% |
| Avoid Use of Space Heaters | <1% |
| Wash Only Full Loads in Clothes Washer | <1% |
| Use Programmable Thermostat | <1% |
| None | 38% |

| Energy Saving Actions Taken | Percent of Respondents |
|---|---|
| Don't Know/Refused | 5% |

*The answers in this table may add up to more than 100 percent because respondents may have provided more than one response.

After the unprompted question, respondents were asked several questions about particular end uses that their changes in behavior may have addressed. Table IV-17 shows that 75 percent said that that they reduced their heat setting on the thermostat or reduced how often they use their heat as a result of the program.

**Table IV-17**
**Reduced Heat Setting on Thermostat or Reduced How Often Heat is Used As a Result of the Program**

| | Percent of Respondents |
|---|---|
| Yes | 75% |
| No | 22% |
| Don't Know/Refused | 2% |

When asked to report specifically how they changed their use of heat, 50 percent said that they turned down their thermostat and 14 percent said that they use their heat less.

**Table IV-18**
**Change in Using Main Source of Heat As a Result of the Program**

| Change in Using Main Source of Heat | Percent of Respondents |
|---|---|
| Turn Down Thermostat | 50% |
| Use Heat Less | 14% |
| Keep Thermostat on One Setting | 5% |
| Use Timer or Programmable Thermostat | 3% |
| Use Heat Fewer Days Per Year | 1% |
| Use Heat Fewer Hours Per Day | 1% |
| Heat Fewer Rooms | 1% |
| Repaired/Replaced Primary Heating System | 1% |
| Use Space Heater Less Often/Stopped Using Space Heater | 1% |
| Clean/Change Furnace Filter | 1% |
| Use Supplemental Heat | 1% |
| Other | 2% |
| Don't Know/Refused | 1% |

| Change in Using Main Source of Heat | Percent of Respondents |
|---|---|
| Did Not Reduce Heating Use | 29% |

*The answers in this table may add up to more than 100 percent because respondents may have provided more than one response.

Table IV-19 shows that 49 percent reported that they reduced the amount of hot water that they use as a result of the program.

**Table IV-19**
**Reduced Amount of Hot Water Used**
**As a Result of the Program**

| | Percent of Respondents |
|---|---|
| Yes | 49% |
| No | 46% |
| Don't Know/Refused | 5% |

Respondents were most likely to report that they turned down their hot water heating temperature or that they use cold water for clothes washing. Other responses included reduced length of showers, using less hot water, not letting the water run, and not washing clothes as often.

**Table IV-20**
**Actions Taken to Reduce Amount of Hot Water Used**
**As a Result of the Program**

| Actions Taken to Reduce Amount of Hot Water Used | Percent of Respondents |
|---|---|
| Turned Down Water Heater Temperature | 18% |
| Use Cold Water for Washing Clothes | 10% |
| Reduced Length of Showers | 5% |
| Use Less Hot Water | 5% |
| Don't Let Water Run | 4% |
| Don't Wash Clothes As Often | 4% |
| Reduced Number of Baths/Showers | 3% |
| Don't Run Dishwasher As Often | 2% |
| Wrapped Water Heater/Pipes | 2% |
| Use Timer for Water Heater/Reduce Time It Is On | 1% |
| New Water Heater | 1% |
| Use Low-Flow Showerhead/Aerator | 0% |
| Don't Know/Refused | 4% |

| Actions Taken to Reduce Amount of Hot Water Used | Percent of Respondents |
|---|---|
| Not Reduced Hot Water Use | 54% |

*The answers in this table may add up to more than 100 percent because respondents may have provided more than one response.

Table IV-21 shows that 42 percent of the respondents said they have an electric space heater in the home.

**Table IV-21**
**Do You Have an Electric Space Heater in Your Home?**

| | Percent of Respondents |
|---|---|
| Yes | 42% |
| No | 57% |
| Don't Know/Refused | 1% |

While 17 percent of the respondents said that they use the space heater less since receipt of weatherization services, nine percent said that they use the space heater more, and 14 percent said that they use it about the same amount.

**Table IV-22**
**Usage of Electric Space Heater**
**Since Participating in the Program**

| Usage of Electric Space Heater | Percent of Respondents |
|---|---|
| More | 9% |
| Less | 17% |
| About the Same | 14% |
| Don't Know/Refused | 2% |
| Does Not Have A Space Heater | 58% |

Table IV-23 shows that 91 percent of the respondents reported that they use some type of air conditioning.

**Table IV-23**
**Respondent Uses Central, Window, or Wall Air Conditioner**

| | Percent of Respondents |
|---|---|
| Yes | 91% |
| No | 9% |
| Don't Know/Refused | 0% |

Respondents were asked whether they reduced the amount of the air conditioning that they use as a result of the program. Table IV-24 shows that 44 percent of the respondents said that they did reduce their air conditioning usage as a result of the program.

**Table IV-24**
**Reduced Amount of Air Conditioning Used**
**As a Result of the Program**

| | Percent of Respondents |
|---|---|
| Yes | 44% |
| No | 31% |
| Don't Know/Refused | 15% |
| Does Not Have an AC | 9% |

When asked how they changed their use of air conditioning as a result of the program, 20 percent said that they use the air conditioner less and 15 percent said that they set it at a higher temperature. A few percent said that they reduced it in other ways.

**Table IV-25**
**Change in Using Air Conditioning**
**As a Result of the Program**

| Change in Using Air Conditioning | Percent of Respondents |
|---|---|
| Use Air Conditioner Less | 20% |
| Turn Up Thermostat/Use Lower Setting | 15% |
| Don't Use Air Conditioning | 3% |
| Use Air Conditioning in Fewer Rooms | 3% |
| Keep Thermostat on One Setting | 3% |
| Use Air Conditioning Fewer Days Per Year | 2% |
| Use Air Conditioning Fewer Hours Per Day | 1% |
| Other | 1% |
| Don't Know/Refused | 2% |
| Not Changed/Does Not Have an AC | 58% |

*The answers in this table may add up to more than 100 percent because respondents may have provided more than one response.

## *E. Program Measures*

This section examines reported satisfaction with specific work that was done on the home. Table IV-26 shows that 68 percent of the respondents reported that the providers installed insulation.

### Table IV-26
### Providers Added to Home's Insulation

| | Percent of Respondents |
|---|---|
| Yes | 68% |
| No | 29% |
| Don't Know/Refused | 3% |

Of those who reported that they had insulation installed by the program, 61 percent reported that they were very satisfied, 25 percent reported they were somewhat satisfied, seven percent reported that they were somewhat dissatisfied, and 4 percent reported that they were very dissatisfied.

### Table IV-27A
### Satisfaction With the Insulation Work

| | Satisfaction with Insulation Work |
|---|---|
| Number of Respondents | 187 |
| Very Satisfied | 61% |
| Somewhat Satisfied | 25% |
| Somewhat Dissatisfied | 7% |
| Very Dissatisfied | 4% |
| Don't Know/Refused | 3% |

Below we compare the satisfaction with the insulation work to satisfaction from two other low-income weatherization programs. The table shows that satisfaction with insulation for these other programs was somewhat higher than for Ameren's LIWP. While 61 percent of the LIWP participants were very satisfied with the insulation work, 77 percent of the NH WAP participants were very satisfied with the insulation work and 77 percent of the PPL WRAP participants were very satisfied with the sealing and insulation work.

### Table IV-27B
### Satisfaction With the Insulation Work
### Comparison Programs

| | New Hampshire Weatherization Program | PPL WRAP |
|---|---|---|
| | Satisfaction with Insulation Work | Satisfaction with Sealing and Insulation Work |
| Very Satisfied | 77% | 77% |
| Somewhat Satisfied | 14% | 15% |
| Somewhat Dissatisfied | 5% | 5% |

| | New Hampshire Weatherization Program | PPL WRAP |
|---|---|---|
| | Satisfaction with Insulation Work | Satisfaction with Sealing and Insulation Work |
| Very Dissatisfied | 2% | 3% |
| Don't Know/Refused | 3% | 0% |

Respondents were asked whether they were satisfied with the condition in which the service provider left the home. Table IV-28 shows that 61 percent reported that they were very satisfied, 21 percent said that they were somewhat satisfied, 13 percent said that they were somewhat dissatisfied, and 4 percent said they were very dissatisfied with the condition in which the service provider left their home.

**Table IV-28**
**Satisfaction With the Condition**
**In Which the Service Provider Left Home**

| | Satisfaction with Condition in Which Provider Left Home |
|---|---|
| Number of Respondents | 187 |
| Very Satisfied | 61% |
| Somewhat Satisfied | 21% |
| Somewhat Dissatisfied | 13% |
| Very Dissatisfied | 4% |
| Don't Know/Refused | 1% |

Table IV-29 shows that 74 percent of respondents reported that the providers did air sealing work in their home.

**Table IV-29**
**Providers Did Air Sealing or Seal Gaps Letting Cold Air**

| | Percent of Respondents |
|---|---|
| Yes | 74% |
| No | 23% |
| Don't Know/Refused | 3% |

Table IV-30A shows that 57 percent said that they were very satisfied, 29 percent said they were somewhat satisfied, 9 percent said they were somewhat dissatisfied, and four percent said that they were very dissatisfied with the air sealing work that the provider did.

**Table IV-30A**
**Satisfaction With the Air Sealing Work**

| | Satisfaction with Sealing Work |
|---|---|
| Number of Respondents | 201 |
| Very Satisfied | 57% |
| Somewhat Satisfied | 29% |
| Somewhat Dissatisfied | 9% |
| Very Dissatisfied | 4% |

Below we compare the satisfaction with the air sealing work to satisfaction from two other low-income weatherization programs. The table shows that satisfaction with air sealing for these other programs was somewhat higher than for Ameren's LIWP. While 57 percent of the LIWP participants were very satisfied with the air sealing work, 78 percent of the NH WAP participants were very satisfied with the air sealing work and 77 percent of the PPL WRAP participants were very satisfied with the sealing and insulation work.

**Table IV-30B**
**Satisfaction With the Air Sealing Work**
**Comparison Programs**

| | New Hampshire Weatherization Program | PPL WRAP |
|---|---|---|
| | Satisfaction with Air Sealing Work | Satisfaction with Sealing and Insulation Work |
| Very Satisfied | 78% | 77% |
| Somewhat Satisfied | 12% | 15% |
| Somewhat Dissatisfied | 5% | 5% |
| Very Dissatisfied | 3% | 3% |
| Don't Know/Refused | 2% | 0% |

Respondents were asked whether they were satisfied with the condition in which the service provider left the home. Table IV-31 shows that 67 percent said that they were very satisfied, 24 percent said that they were somewhat satisfied, 6 percent said that they were somewhat dissatisfied, and 3 percent said that they were very dissatisfied.

**Table IV-31**
**Satisfaction With the Condition**
**In Which the Service Provider Left Home**

| | Satisfaction with Condition in Which Provider Left Home |
|---|---|
| Number of Respondents | 201 |
| Very Satisfied | 67% |
| Somewhat Satisfied | 24% |
| Somewhat Dissatisfied | 6% |
| Very Dissatisfied | 3% |
| Don't Know/Refused | 0% |

Table IV-32 shows that 41 percent of respondents said that the providers repaired or replaced their primary heating system.

**Table IV-32**
**Providers Repaired or Replaced Primary Heating System**

| | Percent of Respondents |
|---|---|
| Yes | 41% |
| No | 58% |
| Don't Know/Refused | 1% |

Respondents who had their heating system repaired or replaced were asked how satisfied they were with this work. Table IV-33 shows that 81 percent said that they were very satisfied, eight percent said that they were somewhat satisfied, five percent said they were somewhat dissatisfied, and six percent said that they were very dissatisfied. This is approximately the same as satisfaction with heating system work in the NH Weatherization Assistance Program, where 77 percent said that they were very satisfied and 11 percent said that they were somewhat satisfied with the heating system work.

**Table IV-33**
**Satisfaction With the Completion of the**
**Repair or Replacement of Your Heating System**

| | Satisfaction with Completion of Repair or Replacement Work |
|---|---|
| Number of Respondents | 113 |
| Very Satisfied | 81% |
| Somewhat Satisfied | 8% |

| | Satisfaction with Completion of Repair or Replacement Work |
|---|---|
| Number of Respondents | 113 |
| Somewhat Dissatisfied | 5% |
| Very Dissatisfied | 6% |
| Don't Know/Refused | 0% |

Respondents who had heating system work were asked how satisfied they were with the condition in which the service provider left the home. Table IV-34 shows that 79 percent said they were very satisfied, 13 percent said that they were somewhat satisfied, four percent said they were somewhat dissatisfied, and four percent said they were very dissatisfied.

**Table IV-34**
**Satisfaction With the Condition**
**In Which the Service Provider Left Home**

| | Satisfaction with Condition in Which Provider Left Home |
|---|---|
| Number of Respondents | 113 |
| Very Satisfied | 79% |
| Somewhat Satisfied | 13% |
| Somewhat Dissatisfied | 4% |
| Very Dissatisfied | 4% |

Respondents were asked whether the winter temperature in the home improved, worsened, or stayed the same as before service delivery. Table IV-35A shows that 63 percent said that the winter temperature improved and three percent said that it worsened since service delivery.

**Table IV-35A**
**Winter Temperature in Home**
**Since Receiving Weatherization Services**

| | Percent of Respondents |
|---|---|
| Improved | 63% |
| Worsened | 3% |
| No Change | 33% |
| Don't Know/Refused | 1% |

Table IV-35B compares responses to other surveys of low-income weatherization program participants. The table shows that 62 percent of New Hampshire WAP and 58 percent of PPL

WRAP participants said that the winter temperature in their home improved following receipt of service delivery, approximately the same as the 63 percent of Ameren's participants.

**Table IV-35B**
**Winter Temperature in Home**
**Since Receiving Weatherization Services**
**Comparison to Other Programs**

| | New Hampshire Weatherization Program | PPL WRAP |
|---|---|---|
| Improved | 62% | 58% |
| Worsened | 4% | 1% |
| No Change | 31% | 46% |
| Don't Know/Refused | 3% | 1% |

Respondents were asked whether the summer temperature in the home improved, worsened, or stayed the same as before service delivery. Table IV-36A shows that 40 percent said that the summer temperature improved and one percent said that it worsened since service delivery.

**Table IV-36A**
**Summer Temperature in Home**
**Since Receiving Weatherization Services**

| | Percent of Respondents |
|---|---|
| Improved | 40% |
| Worsened | 1% |
| No Change | 58% |
| Don't Know/Refused | 1% |

Table V-11B compares responses about improved summer comfort to other surveys of low-income weatherization program participants. The table shows that 36 percent of New Hampshire WAP and 38 percent of PPL WRAP participants said that the summer temperature in their home improved following receipt of service delivery, approximately the same as the 40 percent of Ameren's participants.

**Table IV-36B**
**Summer Temperature in Home**
**Since Receiving Weatherization Services**
**Comparison to Other Programs**

| | New Hampshire Weatherization Program | PPL WRAP |
|---|---|---|
| Improved | 36% | 38% |
| Worsened | 0% | 3% |
| No Change | 63% | 59% |
| Don't Know/Refused | 1% | 0% |

Respondents were asked whether there were other changes in the comfort of the home since receipt of weatherization services. Table IV-37 shows that just over half of the respondents said that there were no other changes. However, 12 percent said that there was reduced air leakage and/or drafts in the home, 12 percent said that they felt the home was safer or more comfortable, and ten percent said that the home temperature had improved.

**Table IV-37**
**Other Changes in Home's Comfort**
**Since Receiving Weatherization Services**

| Other Changes in Home's Comfort | Percent of Respondents |
|---|---|
| No Air Leaks/Drafts | 12% |
| Safer/More Comfortable Home | 12% |
| Home Temperature Improved | 10% |
| Complaint about Work Done | 5% |
| Uncomfortable Home | 3% |
| Other | 3% |
| None | 53% |
| Don't Know/Refused | 1% |

## *F. Program Understanding, Impact, and Usage*

This section examines the respondents' understanding of program benefits, and their difficulty in meeting their energy needs.

Table IV-38A shows that 92 percent of the respondents reported that they felt they had a good understanding of the benefits provided by the program.

### Table IV-38A
### Good Understanding of the Benefits
### Provided by the Weatherization Program

| | Percent of Respondents |
|---|---|
| Yes | 92% |
| No | 6% |
| Don't Know/Refused | 2% |

Table IV-38B provides a comparison with other low-income energy efficiency programs. The table shows that all of the programs had similar reported levels of understanding, ranging from 88 percent to 92 percent.

### Table IV-38B
### Good Understanding of the Benefits
### Provided by the Weatherization Program
### Comparison to Other Programs

| | New Hampshire Weatherization Program | PPL WRAP | Niagara Mohawk LICAP | NJ Comfort Partners Program | Ohio Electric Partnership Program |
|---|---|---|---|---|---|
| Yes | 91% | 88% | 88% | 92% | 88% |
| No | 6% | 10% | 11% | 7% | 7% |
| Don't Know/ Refused | 2% | 2% | 2% | 1% | 6% |

Respondents were asked whether they felt the main benefit of the program was lower energy bills, lower energy use, a safer or more comfortable home, or something else. Table IV-39A shows that 46 percent said that the main benefit was lower energy bills, 24 percent said it was a safer or more comfortable home, 14 percent said it was lower energy use, and seven percent said it was energy education. Respondents were then asked whether they agreed that each was a benefit of the program. The table showed that 95 percent agreed that a safer or more comfortable home was a benefit, 91 percent agreed that lower energy bills were a benefit of the program, 90 percent agreed that lower energy use was a benefit of the program, and 89 percent agreed that energy education was a benefit of the program.

### Table IV-39A
### Program Benefits

| Program Benefits | Main Benefit | All Benefits |
|---|---|---|
| Lower Energy Bills | 46% | 91% |
| Safer/More Comfortable Home | 24% | 95% |
| Lower Energy Use | 14% | 90% |

| Program Benefits | Main Benefit | All Benefits |
|---|---|---|
| Energy Education | 7% | 89% |
| Repairs/Replacements | 3% | |
| Complaint About Program | 3% | |
| Don't Know/Refused | 3% | |

Table IV-39B shows the results for the percent of respondents who agreed that that particular benefits resulted from other low-income weatherization programs. The table shows that results for the other programs are similar to those for Ameren's program, but that Ameren is at the higher end for achieving lower energy bills and a safer or more comfortable home. While 91 percent of Ameren's respondents agreed that lower energy bills were a benefit of the program, 89 percent of PECO LIURP respondents, 88 percent of PPL WRAP respondents, but only 83 percent of the New Hampshire weatherization program respondents agreed that lower energy bills were a benefit of the program.[3] While 95 percent of Ameren's respondents agreed that a safer or more comfortable home was a benefit of the program, 92 percent of NH Weatherization participants, 92 percent of PPL WRAP participants, and 86 percent of PECO LIURP participants agreed that a safer or more comfortable home was a benefit of the program.

**Table IV-39B**
**Program Benefits**
**Comparison to Other Programs**

| Program Benefits | New Hampshire Weatherization Program | PPL WRAP | PECO LIURP |
|---|---|---|---|
| Lower Energy Bills | 83% | 88% | 89% |
| Safer/More Comfortable Home | 92% | 92% | 86% |
| Lower Energy Use | 86% | 91% | 94% |
| Energy Education | 85% | 95% | 100% |

Respondents were asked how difficult it is for them to pay their monthly energy bill Table IV-40 shows that 36 percent said it is very difficult and 42 percent said that it is somewhat difficult.

[3] This may relate to changes in prices that occurred at that time.

**Table IV-40**
**Difficulty of Paying Energy Bills**

| | Percent of Respondents |
|---|---|
| Very Difficult | 36% |
| Somewhat Difficult | 42% |
| Not Too Difficult | 16% |
| Not At All Difficult | 7% |
| Don't Know/Refused | 0% |

Low-income households sometimes use their kitchen stove or oven to provide heat when one of their fuels has been shut off or their heating system is not working properly. This is a dangerous practice that signals the household is having serious problems meeting their energy needs. Table IV-41 shows that 29 percent of the respondents reported that they used their oven or stove to provide heat in the past year.

**Table IV-41**
**Used Kitchen Stove or Oven to Provide Heat During Past Year**

| | Percent of Respondents |
|---|---|
| Yes | 29% |
| No | 71% |
| Don't Know/Refused | 0% |

Table IV-42 provides more information about how and why respondents used their kitchen oven or stove for heating. Fourteen percent reported that they use the oven or stove on the coldest days, indicating that their home is drafty or that their heating system is not doing a good enough job of heating their home. Six percent indicated that they use this heating source when their main source of heat is not available. Four percent said that they use the oven or stove for heat all winter and five percent said they use it sometimes during the winter.

**Table IV-42**
**Frequency of Using Kitchen Stove or Oven to Provide Heat During Past Year**

| Used Kitchen Stove | Percent of Respondents |
|---|---|
| Never | 71% |
| On the Coldest Days | 14% |
| When Main Heat Source Not Working or Ran Out of Fuel | 6% |

| Used Kitchen Stove | Percent of Respondents |
|---|---|
| Sometimes | 5% |
| All Winter | 4% |
| Don't Know/Refused | 0% |

Respondents were asked how important the program has been in helping them meet their needs. Table IV-43A shows that 60 percent said the program has been very important and 21 said the program has been somewhat important.

**Table IV-43A**
**How Important Has the Program Been in Helping You Meet Your Needs?**

| Importance of LIWP | Percent of Respondents |
|---|---|
| Very Important | 60% |
| Somewhat Important | 21% |
| Of Little Importance | 8% |
| Not At All Important | 10% |
| Don't Know/Refused | 1% |

Table IV-43B compares responses about the importance of the program from responses to other low-income weatherization program surveys. The table shows that Ameren respondents were somewhat less likely to say that the program was very important in helping them to meet their needs. While 60 percent of Ameren respondents said that the program was very important, 66 percent of New Hampshire WAP and 66 percent of PPL WRAP respondents said that the program was very important in helping them to meet their needs.

**Table IV-43B**
**How Important Has the Program Been in Helping You Meet Your Needs?**
**Comparison to Other Programs**

| Importance of Program | New Hampshire Weatherization Program | PPL WRAP |
|---|---|---|
| Very Important | 66% | 66% |
| Somewhat Important | 25% | 20% |
| Of Little Importance | 5% | 8% |
| Not At All Important | 3% | 1% |
| Don't Know/Refused | 0% | 5% |

## G. Program Satisfaction

Respondents were asked how satisfied they were with the energy education provided by the program, defined as "...the explanation of the Program, referrals to other programs or services, and recommendations for what you can do to reduce your energy use." Table IV-44A shows that 59 percent said that they were very satisfied, 26 percent said they were somewhat satisfied, four percent said they were somewhat dissatisfied, and four percent said they were very dissatisfied.

**Table IV-44A**
**Satisfaction with Energy Education**

| | Percent of Respondents |
|---|---|
| Very Satisfied | 59% |
| Somewhat Satisfied | 26% |
| Somewhat Dissatisfied | 4% |
| Very Dissatisfied | 4% |
| Don't Know/Refused | 1% |
| Didn't Receive Energy Education | 6% |

Table IV-44B compares responses about satisfaction with energy education to other low-income weatherization programs. The table shows that the Ameren program is on the low end of the satisfaction scale. While 59 percent of Ameren respondents were very satisfied with the program, 59 percent of New Hampshire WAP participants, 64 percent of PECO LIURP participants, 65 percent of PPL WRAP participants, and 71 percent of Niagara Mohawk LICAP participants were very satisfied with the program.

**Table IV-44B**
**Satisfaction with Energy Education**
**Comparison With Other Programs**

| | New Hampshire Weatherization Program | PPL WRAP | Niagara Mohawk LICAP | PECO LIURP |
|---|---|---|---|---|
| Very Satisfied | 59% | 65% | 71% | 64% |
| Somewhat Satisfied | 29% | 28% | 26% | 26% |
| Somewhat Dissatisfied | 5% | 4% | 2% | 9% |
| Very Dissatisfied | 4% | 2% | 1% | 0% |
| Don't Know/Refused | 3% | 0% | 1% | 0% |

Respondents were asked how helpful the program was in teaching them about energy usage and ways to reduce energy costs. Table IV-45 shows that 55 percent said the program was very helpful and 26 percent said it was somewhat helpful.

**Table IV-45**
**Helpfulness of Program in Teaching**
**About Energy Use and Ways to Reduce Energy Costs**

| | Percent of Respondents |
|---|---|
| Very Helpful | 55% |
| Somewhat Helpful | 26% |
| Of Little Help | 8% |
| Not At All Helpful | 10% |
| Don't Know/Refused | 1% |

Respondents were asked how knowledgeable they felt they provider was about energy usage. Table IV-46A shows that 65 percent said they felt the provider was very knowledgeable and 26 percent said they felt the provider was somewhat knowledgeable.

**Table IV-46A**
**Provider's Knowledge About Energy Usage**

| | Percent of Respondents |
|---|---|
| Very Knowledgeable | 65% |
| Somewhat Knowledgeable | 26% |
| Not At All Knowledgeable | 5% |
| Don't Know/Refused | 4% |

Table IV-46B compares responses about the energy knowledge of the provider to responses from other low-income weatherization surveys. The table below shows that the Ameren program providers are not doing as well as some of the other program providers in sharing their knowledge about energy usage with the customers. While 65 percent of the Ameren participants said that the provider was very knowledgeable, 73 percent of the New Hampshire respondents, 81 percent of the PECO LIURP respondents, 83 percent of the PPL WRAP respondents, and 89 percent of the Niagara Mohawk LICAP respondents said that the provider was very knowledgeable about energy usage.

**Table IV-46B**
**Provider's Knowledge About Energy Usage**
**Comparison to Other Programs**

| | New Hampshire Weatherization Program | PPL WRAP | Niagara Mohawk LICAP | PECO LIURP |
|---|---|---|---|---|
| Very Knowledgeable | 73% | 83% | 89% | 81% |
| Somewhat Knowledgeable | 19% | 14% | 10% | 16% |

| | New Hampshire Weatherization Program | PPL WRAP | Niagara Mohawk LICAP | PECO LIURP |
|---|---|---|---|---|
| Not At All Knowledgeable | 3% | 1% | 1% | 1% |
| Don't Know/Refused | 5% | 4% | 1% | 3% |

Respondents were asked whether they felt the provider who came to their home was friendly and polite. Table IV-47 shows that 98 percent of the respondents said that they did feel the provider was friendly and polite. The responses for New Hampshire were approximately the same as for Ameren's program. Ninety-five percent of the New Hampshire respondents said that the provider was friendly and polite.

**Table IV-47**
**Do You Feel the Provider Who Came to Your Home Was Friendly and Polite?**

| | Percent of Respondents |
|---|---|
| Yes | 98% |
| No | 2% |
| Don't Know/Refused | <1% |

Respondents were asked whether the work was done very soon after it was promised, somewhat soon, or not at all soon. Table IV-48A shows that 59 percent said the work was done very soon and 33 percent said it was done somewhat soon.

**Table IV-48A**
**Completion of the Promised Work**

| | Percent of Respondents |
|---|---|
| Very Soon | 59% |
| Somewhat Soon | 33% |
| Not At All Soon | 8% |
| Don't Know/Refused | <1% |

Table IV-48B compares the respondents' timeliness ratings to other low-income weatherization programs. The table shows that the Ameren providers are better than some of the other programs but not as good as some of the others. While 59 percent of the Ameren respondents said the work was done very soon after it was promised, 51 percent of the LIURP respondents, 65 percent of the New Hampshire respondents, and 67 percent of the PPL WRAP respondents said that the work was done very soon after it was promised.

**Table IV-48B**
**Completion of the Promised Work**
**Compared to Other Programs**

| | New Hampshire Weatherization Program | PPL WRAP | PECO LIURP |
|---|---|---|---|
| Very Soon | 65% | 67% | 51% |
| Somewhat Soon | 24% | 19% | 15% |
| Not At All Soon | 8% | 6% | 11% |
| Don't Know/Refused | 4% | 8% | 23% |

One of the problems that is often faced in weatherization programs is that customers have expectations for what they will receive based on reports from friends and acquaintances about the program. Customers may then be dissatisfied if they did not receive something that their neighbor did. The providers must try to educate the customer about what they should expect, but this can often be a challenge. Table IV-49A shows that 65 percent of the Ameren respondents said that they received everything they expected to receive from the program.

**Table IV-49A**
**Did You Receive Everything That You Expected Under the Program?**

| | Percent of Respondents |
|---|---|
| Yes | 65% |
| No | 33% |
| Don't Know/Refused | 1% |

Table IV-49B compares the response about expectations with other programs. The table shows that the Ameren providers are not doing quite as well as some of the other programs. While 65 percent of the Ameren respondents said that they received everything that they expected to receive from the program, 72 percent of the New Hampshire respondents and 80 percent of the PPL WRAP respondents said that they received everything they expected from the program.

**Table IV-49B**
**Did You Receive Everything That You Expected Under the Program?**
**Comparison to Other Programs**

| | New Hampshire Weatherization Program | PPL WRAP |
|---|---|---|
| Yes | 72% | 80% |
| No | 26% | 19% |
| Don't Know/Refused | 2% | 1% |

Customers who said they did not receive everything that they expected were asked what they expected to receive that they did not receive. Table IV-50 shows that the most common response was new windows and doors, as is common in weatherization programs. The table shows that 16 percent said they expected but did not receive new windows or doors, seven percent said they expect to receive air sealing or duct sealing, four percent said they expect to receive repairs, and four percent said they expected to receive insulation.

**Table IV-50**
**What Did You Expect to Receive That You Did Not Receive?**

| | Percent of Respondents |
|---|---|
| New Windows/Doors | 16% |
| Air Sealing/Duct Sealing | 7% |
| Repairs | 4% |
| Insulation | 4% |
| New Furnace | 3% |
| New Cooling System | 2% |
| Water Heater | 1% |
| Siding | 1% |
| Other | 3% |
| Received Everything Expected Under the Program | 67% |

*The answers in this table may add up to more than 100 percent because respondents may have provided more than one response.

Respondents were asked how satisfied they were with the weatherization program overall. Table IV-51A shows that 62 percent said they were very satisfied, 25 percent said they were somewhat satisfied, eight percent said they were somewhat dissatisfied, and four percent said they were very dissatisfied.

**Table IV-51A**
**Satisfaction with the Weatherization Program**

| | Percent of Respondents |
|---|---|
| Very Satisfied | 62% |
| Somewhat Satisfied | 25% |
| Somewhat Dissatisfied | 8% |
| Very Dissatisfied | 4% |
| Don't Know/Refused | <1% |

Table IV-51B compares responses about overall program satisfaction with other programs. The table below shows that Ameren's program was rated lower than some of the other programs.

While 62 percent of Ameren's respondents said they were very satisfied, 62 percent of PECO's respondents said they were very satisfied, 68 percent of Niagara Mohawk's respondents said they were very satisfied, and 71 percent of New Hampshire and PPL WRAP respondents said they were very satisfied.

**Table IV-51B**
**Satisfaction with the Weatherization Program**
**Comparison with Other Programs**

| | New Hampshire Weatherization Program | PPL WRAP | Niagara Mohawk LICAP | PECO LIURP |
|---|---|---|---|---|
| Very Satisfied | 71% | 71% | 68% | 62% |
| Somewhat Satisfied | 20% | 22% | 24% | 27% |
| Somewhat Dissatisfied | 5% | 4% | 5% | 7% |
| Very Dissatisfied | 3% | 2% | 2% | 3% |
| Don't Know/Refused | 1% | 1% | 0% | 0% |

Respondents were asked whether they had recommendations for improvements to the program. These recommendations are shown in Table IV-52. The table shows that 20 percent said the program should provide what is needed or expected, 18 percent said that the provider should do better quality or a better job of cleaning up after the work is completed, and a few percent said that the program should have more funding.

**Table IV-52**
**Recommendations for Improvements to the Program**

| Recommendations | Percent of Respondents |
|---|---|
| Provide What is Needed/Expected | 20% |
| Better Quality Work/Clean Up After Completion of Work | 18% |
| More Funding | 4% |
| More Program Outreach | 1% |
| Energy Education | 1% |
| None | 53% |
| Don't Know/Refused | 2% |

## *H. Summary*

This section provides a summary of the key findings from the participant survey.

**Program Participation**: Most respondents learned about the program through a community agency or a friend or relative. The greatest motivations for program participation were to reduce energy bills and to increase the home's comfort.

**Energy Behavior**: The survey found that there is room for improvement on customer education. However, many customers said that they did take actions to reduce their energy usage as a result of the program.

- *Provider education:* Only 54 percent of the respondents said that the provider gave them information about how to reduce energy usage. This is about the same as for the New Hampshire weatherization program, but compares to 80 percent in the PPL WRAP program.

- *Energy actions:* When prompted, 75 percent said they reduced use of heat, 49 percent said they reduced the amount of hot water that they use, 17 percent said that they reduced the use of their electric space heater, and 44 percent said that they reduced the use of their air conditioning as a result of the program.

**Program Measures:** The survey found that satisfaction with some of the key measures, insulation and air sealing, was lower than has been found with some other programs.

- *Insulation:* The survey found that 61 percent of the Ameren respondents were very satisfied with the insulation work that was provided by the program. This compares to 77 percent in the New Hampshire WAP and the PPL WRAP programs who were very satisfied with the insulation work. Only 61 percent said that they were very satisfied with the condition in which the providers left the home.

- *Air sealing:* The survey found that 57 percent of the Ameren respondents were very satisfied with the air sealing work that was provided by the program. This compares to 78 percent in the New Hampshire WAP and 77 percent in the PPL WRAP program who were very satisfied with the air sealing work. Sixty-seven percent said they were very satisfied with the condition in which the service provider left their home.

- *Heating System Repair or Replacement:* There was higher satisfaction with the heating system work. The survey found that 81 percent were very satisfied with the heating system repair or replacement and 79 percent said they were very satisfied with the condition in which the provider left the home.

**Program Impact:** The survey found the Ameren program did as well or better than other programs in improving the winter and summer temperature of the respondents' homes.

- *Winter Temperature:* Sixty-three percent of the Ameren respondents said that the winter temperature of their home had improved, compared to 62 percent of the New Hampshire WAP participants and 58 percent of the PPL WRAP participants.

- *Summer Temperature:* Forty percent of the Ameren respondents said that the summer temperature of their home had improved, compared to 36 percent of the New Hampshire WAP participants and 38 percent of the PPL WRAP participants.

**Program Benefits:** The survey found that program participants felt the program benefited them by reducing their bills, improving the safety and comfort of their home, lowering their energy use, and providing energy education. Ameren's program compared favorably to the other programs in terms of lower energy bills and improved safety and comfort. Ninety-one percent of the Ameren respondents agreed that the program resulted in lower energy bills, compared to 83 percent of New Hampshire WAP respondents, 88 percent of PPL WRAP respondents, and 89 percent of PECO LIURP respondents. Ninety-five percent of the Ameren respondents agreed that the program resulted in a safer or more comfortable home, compared to 92 percent of New Hampshire WAP respondents, 92 percent of PPL WRAP respondents, and 86 percent of PECO LIURP respondents.

**Program Satisfaction:** The survey found lower levels of satisfaction with the Ameren program than with other low-income weatherization programs.

- *Satisfaction with Energy Education:* Fifty-nine percent of the Ameren participants said that they were very satisfied with the energy education provided by the program, compared to 59 percent of the New Hampshire WAP participants, 64 percent of the PECO LIURP participants, 65 percent of the PPL WRAP participants, and 71 percent of the Niagara Mohawk LICAP participants.

- *Provider's Knowledge About Energy Usage:* Sixty-five percent of the Ameren participants said that they felt the provider was very knowledgeable about energy usage, compared to 73 percent of New Hampshire WAP participants, 81 percent of PECO LIURP participants, 83 percent of PPL WRAP participants, and 89 percent of Niagara Mohawk LICAP participants.

- *Program Satisfaction:* Respondents were asked how satisfied they were with the program overall. Sixty-two percent said they were very satisfied and 25 percent said that they were somewhat satisfied. This compares to 62 percent in PECO's LIURP, 68 percent in the Niagara Mohawk LICAP, 71 percent in the New Hampshire WAP and 71 percent in the PPL WRAP.

**Summary:** The survey found that Ameren's LIWP provides some important benefits to the participants. The participants believe that it has reduced their energy usage and made their homes safer and more comfortable. Comparisons to other programs found that Ameren LIWP participants were more likely to say that the program improved the winter and summer comfort than some of these other program participants. Ameren respondents were also more likely to agree that lower energy bills and a safer or more comfortable home were benefits of the program compared to some of the other low-income weatherization programs that have been studied.

However, comparisons on measure installation and energy education, as well as overall program satisfaction, show room for improvement. Some recommendations for improving program outcomes and customer satisfaction are as follows.

- *Energy Education:* Only 54 percent of the respondents said that the provider gave them information about how to reduce energy usage. Ameren should require the agencies to provide customers with information about how they can reduce their energy usage.

- *Measure Installation:* Satisfaction with air sealing and insulation was not as high as in some other programs and many customers did not say they were "very satisfied" with the condition in which the contractor left their home. Ameren should require additional training and inspections in this area.

**Overall Satisfaction:** The overall satisfaction with Ameren's program was lower than in some of the other programs studied. The most common program recommendations related to cleaning up after the work was done and provision of expected measures. The survey found that Ameren's customers were somewhat more likely to say that they did not get everything that they expected than some of the other programs. Providers should be given more training on how to discuss what to expect from the program with the customers.

# V. Participant and Service Delivery Statistics

Eleven Community Action Agencies, one nonprofit, and one city government agency receives funds to implement LIWP in Ameren's service territory. The agencies are required to track funds spent on Ameren's LIWP separately from their other weatherization funding and send separate reports to DNR about the expenditure of each program's funds. Agencies are required to send in monthly reports, which is also their payment request. They provide information on the number of homes completed, expenditures, clients served, type of weatherization measures installed, energy savings, and blower door testing data.

Agencies are permitted to maintain data electronically or in paper files. DNR requests that the providers keep the information for three years after the grant period ends.

## *A. Agency Data*

The evaluation requires that detailed client and home data be collected for clients served by Ameren's program. While some of the required data are collected from the agencies by DNR and maintained in a DNR database, most of the needed data were only available at the agency level. Initial discussions with agency staff revealed that while most of the requested data were available, they were usually in paper files. Therefore, APPRISE developed and sent excel data collection spreadsheets to each agency with a list of clients served during the study period, data received from DNR, and blank data fields for the agencies to complete. The data fields that the agencies were asked to complete are shown in the Table V-1.

**Table V-1**
**Agency Data Request**

| Client Contact Information | Client Demographics | Service Delivery | Measures Installed (Y/N) and Cost | Testing Data |
|---|---|---|---|---|
| Ameren account number | Household poverty level | Audit date | Air sealing | Ambient CO – pre |
| Street address 1 | Elderly member | Measure install begin date | Attic insulation | Ambient CO – post |
| Street address2 | Child member | Measure install end date | Wall insulation | Flue CO – pre |
| City | Disabled member | Ameren job cost | Floor insulation | Flue CO - post |
| State | Health issue | Total labor cost | Kneewall insulation | |
| Zip code | Own or rent | Total material cost | Basement insulation | |
| Phone number | Home type | Total job cost | Duct sealing / insulation | |
| | Home age | | Furnace replacement | |
| | Main heating fuel | | Furnace repair | |
| | Water heating fuel | | Furnace cleaning | |
| | Air conditioning | | Water heater repair / replacement | |
| | Supplemental heat | | Thermostat replacement | |
| | Gas utility | | Air conditioner replacement | |

| Client Contact Information | Client Demographics | Service Delivery | Measures Installed (Y/N) and Cost | Testing Data |
|---|---|---|---|---|
| | | | Air conditioner repair | |
| | | | Window repair / replacement | |
| | | | Door repair / replacement | |
| | | | Other repairs | |
| | | | CFLs (number) | |
| | | | Health and safety measures | |
| | | | Other major measures | |

With the exception of the testing data, the majority of the agencies were able to provide most of these data fields for most of the clients served by the program. However, many contacts and reminders were required to obtain these data from the agencies and many additional requests were made to fill in missing data. While the agencies were given an original deadline of January 30, 2009 (more than one month), complete data were not received by all of the agencies until May 2009.

We recommend that DNR creates a database to maintain these data to assist in program management and in future evaluation research.

## *B. Production Statistics*

Program reporting spreadsheets were provided by DNR for three Ameren program periods.

- Period 1: April 2006 – March 2007.
- Period 2: February 2008 – October 2008.
- Period 3: July 2007 – June 2008. These jobs were completed with interest that was earned on the deposited Ameren program funds.

Table V-2 shows the number of jobs that were reported by each agency and the total number of jobs completed in the three periods. According to these reports, a total of 1,482 clients were served during these time periods. DNR also provided data files with individual client information for these jobs. Some of the agencies had a greater number of clients in the files than what had been reported in the spreadsheets. However, after removing duplicates for one of the agencies, there appeared to be a total of 1,437 unique clients served by Ameren's program between April 2006 and October 2008. (Duplicates were removed conservatively. It was not possible to identify all of the duplicates because of errors in the Ameren account number and in the assigned job number.)

## Table V-2
## Number of Jobs by Program Year and Agency

| Agency | DNR Reports – Number of Ameren Jobs | | | | DNR Data File |
|---|---|---|---|---|---|
| | Period 1 | Period 2 | Period 3 | Total | Duplicates Removed |
| | April 2006 – March 2007 | February 2008 – October 2008 | July 2007 – June 2008 | | |
| CAASTLC | 194 | 194 | 194 | 582 | 587 |
| CMCA | 28 | 15 | 4 | 47 | 47 |
| CSI | 0 | 4 | 1 | 5 | 5 |
| DAEOC | 38 | 27 | 6 | 71 | 71 |
| EMAA | 26 | 34 | 12 | 72 | 72 |
| GHCAA | 7 | 6 | 1 | 14 | 14 |
| JFCAC | 92 | 67 | 24 | 183 | 183 |
| KCNCSD | 114 | 0 | 71 | 185 | 129 |
| MOCA | 22 | 13 | 6 | 41 | 41 |
| NECAC | 36 | 40 | 6 | 83 | 83 |
| NMCAA | 10 | 12 | 0 | 22 | 25 |
| ULMSL | 75 | 80 | 13 | 168 | 170 |
| WCMCAA | 8 | 1 | 1 | 10 | 10 |
| TOTAL | 650 | 493 | 339 | 1,482 | 1,437 |

Table V-3 compares the number of clients in the DNR database to the number of clients that agencies provided data for. Data were received for a total of 1,288 clients. This number is lower than the 1,437 in DNR's database for the following reasons.

1. While KCNCSD reported to DNR that they leveraged the program for 129 clients over this time period, they reported that only six of these clients were served with Ameren's funds.

2. ULMSL served a number of clients in multi-family housing through a pilot and did not report individual data for these clients.

3. Agencies identified additional duplicates in the data when obtaining the detailed client information.

This shows the need for more detailed and accurate program data reported through a database designed for program management.

**Table V-3**
**Number of Ameren Jobs and**
**Number of Jobs that Agencies Reported On**

| Agency | DNR Total | Data Received from Agency |
|---|---|---|
| CAASTLC | 587 | 581 |
| CMCA | 47 | 47 |
| CSI | 5 | 5 |
| DAEOC | 71 | 71 |
| EMAA | 72 | 72 |
| GHCAA | 14 | 14 |
| JFCAC | 183 | 183 |
| KCNCSD | 129 | 6 |
| MOCA | 41 | 41 |
| NECAC | 83 | 83 |
| NMCAA | 25 | 25 |
| ULMSL | 170 | 150 |
| WCMCAA | 10 | 10 |
| TOTAL | 1,437 | 1,288 |

Table V-3 shows the number of clients reported on by each agency. In the sections that follow, we provide aggregate statistics for Ameren's program, and agency-level statistics for agencies that provided data for 50 or more clients. Individual agency data are shown for the following agencies:

- CAASTLC
- DAEOC
- EMAA
- JFCAC
- NECAC
- ULMSL

The following agencies are combined for the agency level analysis purposes in the "Other Agency" group.

- CMCA
- CSI
- GHCAA
- KCNCSD
- MOCA
- NMCAA

- WCMCAA

These agencies reported on a total of 148 clients.

## C. Client Demographic Characteristics

Agencies are required to use one of two prioritization methods to schedule clients for weatherization services. Both systems prioritize clients with seniors, children, and disabled household members. Table V-4 shows that 30 percent of the clients served have a senior household member, 49 percent have one or more children, and 43 percent have a disabled member. Almost 90 percent of the clients have at least one of these vulnerable household members.

**Table V-4A**
**Percent of Clients with Vulnerable Members**

| | Senior | Child | Disabled | Any Vulnerable |
|---|---|---|---|---|
| Yes | 30% | 49% | 43% | 89% |
| No | 70% | 51% | 57% | 11% |
| Missing | <1% | <1% | <1% | <1% |

Table V-4B shows the percent of clients with vulnerable members by agency. The table shows that there is some variation by agency in the types of households served, but that the vast majority of clients served by all of the agencies have at least one vulnerable household member. For example, while 26 percent of the clients served by CAASTLC have a senior household member and 60 percent have a child, 59 percent of the clients served by DAEOC have a senior and 28 percent have a child.

**Table V-4B**
**Percent with Vulnerable Members**
**By Agency**

| | Senior | Child | Disabled | Any Vulnerable |
|---|---|---|---|---|
| CAASTLC | 26% | 60% | 39% | 89% |
| DAEOC | 59% | 28% | 37% | 87% |
| EMAA | 21% | 26% | 51% | 81% |
| JFCAC | 22% | 46% | 57% | 93% |
| NECAC | 30% | 43% | 52% | 92% |
| ULMSL | 43% | 45% | 43% | 89% |
| Other Agencies | 34% | 36% | 32% | 86% |
| All Agencies | 30% | 49% | 43% | 89% |

Initial interviews with agency weatherization managers revealed that one requested data item was not systematically collected by the agencies – whether the client has a household member with a health issue. Table V-5A shows that only about half of the clients had reports on this issue. The table shows that about ten percent of the clients have a noted health issue in the file. However, the actual number is likely to be higher, based on our experience with research in this area. In fact, nearly one third of the clients who responded to the Ameren LIWP client survey noted that there was a health issue in the home that required the additional use of energy.

**Table V-5A**
**Client Health Issue**

| | Percent of Clients |
|---|---|
| Yes | 10% |
| No | 39% |
| Missing | 51% |

Table V-5B displays the presence of client health issues by agency. The frequency ranges from none of the clients to 52 percent of the clients. However, the variability in frequency is probably related to data collection procedures that differ by agency.

**Table V-5B**
**Client Health Issue**
**By Agency**

| | Health Issue | | |
|---|---|---|---|
| | Yes | No | Missing |
| CAASTLC | 1% | 0% | 99% |
| DAEOC | 0% | 100% | 0% |
| EMAA | 0% | 100% | 0% |
| JFCAC | 21% | 79% | 0% |
| NECAC | 0% | 0% | 100% |
| ULMSL | 1% | 99% | 0% |
| Other Agencies | 52% | 48% | 0% |
| All Agencies | 10% | 39% | 51% |

Household income was one of the variables that was reported by the agencies to DNR and received in the DNR data download. Therefore, these data were available for all but one of the clients in the database. Table V-6A shows that 39 percent have income below $10,000, 42 percent have income between $10,000 and $20,000, and 15 percent have income between $20,000 and $30,000. Only three percent of the clients have annual income above $30,000.

## Table V-6A
## Household Income

| | Percent of Clients |
|---|---|
| <$10,000 | 39% |
| $10,001 - $20,000 | 42% |
| $20,001 - $30,000 | 15% |
| >$30,000 | 3% |
| Missing | <1% |

Table V-6B displays the annual household income by agency. The table shows some variability by agency in household income level. JFCAC clients are most likely to have income below $10,000, with 51 percent of their clients in this income category. CAASTLC clients are most likely to have income in the $20,000 and above range. This is consistent with the household composition of their clients; their clients more likely to be younger with children, and part of the working poor.

## Table V-6B
## Household Income
## By Agency

| | Household Income | | | |
|---|---|---|---|---|
| | <=$10,000 | $10,001 - $20,000 | $20,001 -$30,000 | >$30,000 |
| CAASTLC | 33% | 41% | 21% | 6% |
| DAEOC | 49% | 48% | 3% | 0% |
| EMAA | 47% | 44% | 8% | 0% |
| JFCAC | 51% | 35% | 12% | 2% |
| NECAC | 42% | 51% | 6% | 1% |
| ULMSL | 35% | 43% | 19% | 3% |
| Other Agencies | 42% | 47% | 10% | 1% |
| All Agencies | 39% | 42% | 15% | 3% |

Agencies were asked to provide the household poverty level or the number of individuals in the household so that the poverty level could be constructed. Data were available for more than 80 percent of the clients. Table V-7A shows that 14 percent have income below 50 percent of poverty, 49 percent have income between 51 and 100 percent of poverty, and 35 percent have income between 101 and 150 percent of poverty.

**Table V-7A**
**Household Poverty Level**

| Household Poverty Level | Percent of Clients | Percent of Clients with Data |
|---|---|---|
| <=50% | 12% | 14% |
| 51% - 100% | 41% | 49% |
| 101% - 150% | 29% | 35% |
| >150% | 2% | 2% |
| Missing | 17% | -- |

Table V-7B displays the household poverty level by agency. The table shows some variability by agency. While 43 percent of ULMSL clients have income above 100 percent of the poverty level, only 26 percent of the EMAA clients have income in this range.

**Table V-7B**
**Household Poverty Level**
**By Agency**

| | Household Poverty Level | | | |
|---|---|---|---|---|
| | <=50% | 51% - 100% | >100% | Missing |
| CAASTLC | 13% | 31% | 37% | 20% |
| DAEOC | 21% | 52% | 27% | 0% |
| EMAA | 13% | 61% | 26% | 0% |
| JFCAC | 0% | 72% | 28% | 1% |
| NECAC | 0% | 0% | 0% | 100% |
| ULMSL | 15% | 38% | 43% | 4% |
| Other Agencies | 22% | 49% | 20% | 9% |
| All Agencies | 12% | 41% | 31% | 17% |

## *D. Home Characteristics*

There are several barriers that agencies face when attempting to serve renters with weatherization services. Eligible clients who are renters must have a signed landlord agreement before work can begin. Additionally, the landlord must agree to the following conditions.

- The landlord will not raise the rent on the weatherized units for two years after weatherization is complete without just cause.
- The tenant will not be evicted during the two-year period without just cause.
- Tenants with utility costs included in the rent will receive a reduction in their rent when their utility costs are reduced as a result of weatherization.

- The landlord will not sell the apartment for two years unless the buyer assumes these obligations.

The subgrantee is required to negotiate with the landlord for a matching financial contribution. The amount of the contribution is left to the judgment of the subgrantee, but landlords must contribute a minimum of five percent of the project cost. This requirement will be waived if the owner/landlord's annual taxable income is at or below 200 percent of the Federal Poverty Level.

Table V-8A shows that renters are served less frequently than owners. The table shows that 85 percent of the clients served own their homes.

**Table V-8A**
**Home Ownership**

| | Percent of Clients |
|---|---|
| Own | 85% |
| Rent | 15% |
| Missing | <1% |

Some agencies may be more successful in serving renters because they are more aggressive in pursuing this market, because there are more renters in their service territory, or because of a different norm in the rental market in the area. Table V-8B shows that there is variability in the percentage of renters served by agency. While 29 percent of the clients served by NECAC are renters, only seven percent of the clients served by DAEOC are renters.

**Table V-8B**
**Home Ownership**
**By Agency**

| | Home Ownership | |
|---|---|---|
| | Own | Rent |
| CAASTLC | 92% | 8% |
| DAEOC | 93% | 7% |
| EMAA | 88% | 13% |
| JFCAC | 87% | 13% |
| NECAC | 71% | 29% |
| ULMSL | 81% | 19% |
| Other Agencies | 64% | 36% |
| All Agencies | 85% | 15% |

Table V-9A displays the home types treated by the program. The table shows that the majority of the homes are single family detached homes. While 81 percent of the homes are single family

detached, 14 percent are mobile homes, three percent are multi-family homes, and only one percent are single family attached homes.

**Table V-9A**
**Home Type**

| | Percent of Clients |
|---|---|
| Single Detached | 81% |
| Mobile Home | 14% |
| Multi-Family | 3% |
| Single Attached | 1% |
| Missing | <1% |

Table V-9B displays the types of homes treated by agency. The table shows that while some agencies serve almost all single family detached homes, one serves a majority of mobile homes and others serve a significant percentage of mobile homes or multi-family homes.

**Table V-9B**
**Home Type**
**By Agency**

| | Home Type | | | |
|---|---|---|---|---|
| | Single Detached | Mobile Home | Multi-Family | Single Attached |
| CAASTLC | 98% | 0% | 1% | 1% |
| DAEOC | 92% | 8% | 0% | 0% |
| EMAA | 100% | 0% | 0% | 0% |
| JFCAC | 30% | 69% | 1% | 0% |
| NECAC | 75% | 24% | 1% | 0% |
| ULMSL | 79% | 0% | 21% | 0% |
| Other Agencies | 71% | 22% | 0% | 7% |
| All Agencies | 81% | 14% | 3% | 1% |

Table V-10A displays the square footage of the clients' homes. Most of the clients live in homes that are 1,500 square feet or less. Only 17 percent are larger than 1,500 square feet.

**Table V-10A**
**Home Square Footage**

| Home Square Footage | Percent of Clients |
|---|---|
| <=750 | 13% |
| 751 – 1,000 | 31% |
| 1,001 – 1,500 | 39% |

| Home Square Footage | Percent of Clients |
|---|---|
| 1,501 – 2,000 | 10% |
| >2,000 | 7% |
| Missing | <1% |

Table V-10B displays home square footage by agency. The agencies are fairly similar in the size of homes that they treat. However, ULMSL and NECAC are more likely to serve clients who live in homes that are 1,000 or larger and JFCAC and EMAA are more likely to serve clients that live in smaller homes.

**Table V-10B**
**Home Square Footage**
**By Agency**

| | Home Square Footage | | | | |
|---|---|---|---|---|---|
| | <=750 | 751 – 1,000 | 1,000 – 1,500 | 1,501 – 2,000 | >2,000 |
| CAASTLC | 10% | 35% | 38% | 12% | 5% |
| DAEOC | 11% | 25% | 48% | 10% | 6% |
| EMAA | 17% | 24% | 42% | 15% | 3% |
| JFCAC | 18% | 39% | 36% | 6% | 1% |
| NECAC | 7% | 27% | 42% | 16% | 8% |
| ULMSL | 5% | 19% | 51% | 7% | 18% |
| Other Agencies | 25% | 26% | 32% | 7% | 10% |
| All Agencies | 13% | 31% | 39% | 10% | 7% |

Table V-11A shows that most of the clients served live in homes that are more than 25 years old, and many live in homes that are more than 50 years old. Forty-two percent of clients live in homes that are more than 50 years old.

**Table V-11A**
**Home Age**

| Home Age | Percent of Clients | Percent of Clients (Excluding Missing Values) |
|---|---|---|
| <=25 Years | 12% | 15% |
| 26 – 50 Years | 34% | 43% |
| 51 – 75 Years | 22% | 28% |
| >75 Years | 11% | 14% |
| Missing | 20% | -- |

Table V-11B displays home age by agency. The table shows that clients served by JFCAC are more likely to live in newer homes and clients served by EMAA and NECAC are more likely to live in older homes.

**Table V-11B**
**Home Age**
**By Agency**

| | Home Age | | | | |
|---|---|---|---|---|---|
| | <=25 Years | 26 – 50 Years | 51 – 75 Years | >75 Years | Missing |
| CAASTLC | 4% | 33% | 30% | 7% | 25% |
| DAEOC | 10% | 39% | 37% | 4% | 10% |
| EMAA | 15% | 40% | 26% | 18% | 0% |
| JFCAC | 46% | 44% | 4% | 3% | 3% |
| NECAC | 18% | 27% | 20% | 27% | 8% |
| ULMSL | 1% | 7% | 15% | 22% | 55% |
| Other Agencies | 6% | 50% | 13% | 21% | 10% |
| All Agencies | 12% | 34% | 22% | 11% | 20% |

Agencies submit pre and post treatment air leakage data to DNR and these data are included in the DNR database, so they are available for most of the clients. Table V-5A shows that there is a significant reduction in the air leakage of homes treated by the program. While ten percent of homes had CFM50 air leakage rates of less than 2,000 prior to treatment, 34 percent had rates this low after treatment. While 50 percent had air leakage rates greater than 3,000 prior to treatment, only 19 percent had air leakage rates greater than 3,000 following treatment. This is an indication that the program reduced energy usage and increased comfort for the occupants. However, to have large impacts on energy usage, it is important for the air leakage at the top and the bottom of the envelope to be reduced, as opposed to air leakage in the neutral pressure pane.

**Table V-12A**
**Air Leakage (CFM50)**

| | Pre Treatment | Post Treatment |
|---|---|---|
| <=2,000 | 10% | 34% |
| 2,001 – 2,500 | 16% | 28% |
| 2,501 – 3,000 | 18% | 13% |
| >3,000 | 50% | 19% |
| Missing | 6% | 6% |

Table V-12B shows the pre and post-treatment air leakage rates by agency. The table shows that some homes have worse pre-treatment conditions than others. While 82 percent of homes treated by ULSML had air leakage rates of greater than 3,000, only 44 percent of the homes

treated by CAASTLC had such high leakage rates. There were also differences post-treatment. ULSML homes were also more likely to have high leakage rates post treatment.

**Table V-12B**
**Air Leakage**
**By Agency**

| | Air Leakage (CFM50) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Pre Air Leakage | | | | | Post Air Leakage | | | | |
| | <=2,000 | 2,001-2,500 | 2,501-3,000 | >3,000 | Missing | <=2,000 | 2,001-2,500 | 2,501-3,000 | >3,000 | Missing |
| CAASTLC | 6% | 22% | 27% | 44% | 2% | 36% | 43% | 15% | 4% | 2% |
| DAEOC | 1% | 11% | 17% | 68% | 3% | 28% | 21% | 24% | 24% | 3% |
| EMAA | 8% | 10% | 8% | 58% | 15% | 51% | 19% | 3% | 11% | 15% |
| JFCAC | 28% | 19% | 9% | 20% | 24% | 44% | 14% | 8% | 10% | 24% |
| NECAC | 12% | 7% | 12% | 60% | 8% | 25% | 8% | 14% | 43% | 8% |
| ULMSL | 1% | 6% | 7% | 82% | 5% | 8% | 15% | 9% | 63% | 5% |
| Other Agencies | 19% | 11% | 11% | 58% | 1% | 36% | 17% | 13% | 34% | 1% |
| All Agencies | 10% | 16% | 18% | 50% | 6% | 34% | 28% | 13% | 19% | 6% |

Table V-12C displays the change in the air leakage rate after program treatment. The table shows that seven percent of the clients had a CFM50 air leakage rate that decline by 2,000 or more, 21 percent had a rate that declined by 1,000 to 1,999, and 42 percent had a rate that decline by 500 to 999.

**Table V-12C**
**Air Leakage Change (CFM50)**

| Change | Percent of Clients |
|---|---|
| Decline by >=2,000 | 7% |
| Decline by 1,000 – 1,999 | 21% |
| Decline by 500 – 999 | 42% |
| Decline by 100 – 499 | 19% |
| Decline by <100 | 4% |
| Increase | 1% |
| Missing | 6% |

Table V-12D displays the air leakage change by agency. The table shows that DAEOC, EMAA, and ULMSL were most likely to have declines in air leakage of 1,000 or more.

## Table V-12D
## Air Leakage Change
## By Agency

| | Leakage Change | | | | | | |
|---|---|---|---|---|---|---|---|
| | Decline in CFM50 | | | | | CFM50 Increase | Missing |
| | >=2,000 | 1,000 – 1,999 | 500 – 999 | 100 – 499 | <100 | | |
| CAASTLC | 1% | 15% | 71% | 11% | 0% | <1% | 2% |
| DAEOC | 27% | 34% | 17% | 20% | 0% | 0% | 3% |
| EMAA | 18% | 40% | 18% | 8% | 0% | 0% | 15% |
| JFCAC | 2% | 5% | 15% | 45% | 9% | 0% | 24% |
| NECAC | 10% | 19% | 22% | 33% | 7% | 1% | 8% |
| ULMSL | 14% | 38% | 22% | 14% | 3% | 5% | 5% |
| Other Agencies | 14% | 30% | 18% | 22% | 16% | 0% | 1% |
| All Agencies | 7% | 21% | 42% | 19% | 4% | 1% | 6% |

Table V-12E displays the percent reduction in air leakage. The table shows that five percent of clients had a reduction of 50 percent of more, 18 percent had a reduction of 35 to 49 percent, and 27 percent had a reduction of 25 to 34 percent.

## Table V-12E
## Air Leakage Percent Change (CFM50)

| Change | Percent of Clients |
|---|---|
| >=50% Decline | 5% |
| 35% - 49% Decline | 18% |
| 25% - 34% Decline | 27% |
| 15% - 24% Decline | 27% |
| 5% - 14% Decline | 11% |
| <5% Decline | 4% |
| Increase | 1% |
| Missing | 6% |

Table V-12F displays the percent change in air leakage by agency. The table shows that DAEOC and EMAA were most likely to have clients with a reduction in air leakage of 35 percent or more.

**Table V-12F**
**Air Leakage Percent Change**
**By Agency**

| | Leakage Change | | | | | | |
|---|---|---|---|---|---|---|---|
| | Decline in CFM50 | | | | | CFM50 Increase | Missing |
| | >=35% | 25-34% | 15-24% | 5-14% | <5% | | |
| CAASTLC | 22% | 43% | 32% | <1% | 0% | <1% | 2% |
| DAEOC | 47% | 17% | 15% | 18% | 0% | 0% | 3% |
| EMAA | 56% | 14% | 11% | 3% | 1% | 0% | 15% |
| JFCAC | 6% | 7% | 28% | 27% | 8% | 0% | 24% |
| NECAC | 17% | 12% | 25% | 28% | 8% | 1% | 8% |
| ULMSL | 18% | 21% | 28% | 17% | 7% | 5% | 5% |
| Other Agencies | 26% | 16% | 22% | 20% | 16% | 0% | 1% |
| All Agencies | 23% | 27% | 27% | 11% | 4% | 1% | 6% |

## *E. Home Equipment Characteristics*

Table V-13A displays the main heating fuel for the clients served by the program. The table shows that 69 percent heat with natural gas, 23 percent heat with electricity, and six percent heat with propane.

**Table V-13A**
**Main Heating Fuel**

| | Percent of Clients |
|---|---|
| Natural Gas | 69% |
| Electricity | 23% |
| Propane | 6% |
| Other | 1% |
| Missing | 1% |

Table V-13B displays the main heating fuel by agency. The table shows that CAASTLC and ULSML clients are most likely to heat with natural gas and JFCAC and EMAA clients are most likely to heat with electricity.

## Table V-13B
## Main Heating Fuel
## By Agency

| | Main Heating Fuel | | | | |
|---|---|---|---|---|---|
| | Natural Gas | Electricity | Propane | Other | Missing |
| CAASTLC | 96% | 4% | 0% | <1% | <1% |
| DAEOC | 76% | 15% | 3% | 6% | 0% |
| EMAA | 24% | 56% | 15% | 6% | 0% |
| JFCAC | 9% | 70% | 16% | 4% | 0% |
| NECAC | 51% | 39% | 10% | 1% | 0% |
| ULMSL | 89% | 2% | 0% | 0% | 9% |
| Other Agencies | 43% | 40% | 16% | 1% | 0% |
| All Agencies | 69% | 23% | 6% | 1% | 1% |

Table V-14A displays the natural gas company that serves the clients. The table shows that 11 percent of the clients receive gas (as well as electricity) from Ameren and 57 percent receive Gas from Laclede. Fifteen percent have no gas service and 12 percent did not have these data available.

## Table V-14A
## Natural Gas Company

| | Percent of Clients |
|---|---|
| Ameren | 11% |
| Laclede | 57% |
| Atmos | 4% |
| Empire | 1% |
| None | 15% |
| Missing | 12% |

Table V-14B displays how the natural gas service territories vary with the agency service territories. The table shows that all of the CAASTLC clients with natural gas are served by Laclede, and the EMAA and NECAC clients who have natural gas are served by Ameren.

### Table V-14B
### Natural Gas Company
### By Agency

| | Natural Gas Company | | | | | |
|---|---|---|---|---|---|---|
| | Ameren | Laclede | Atmos | Empire | None | Missing |
| CAASTLC | 0% | 96% | 0% | 0% | 1% | 2% |
| DAEOC | 23% | 0% | 52% | 0% | 25% | 0% |
| EMAA | 47% | 11% | 0% | 0% | 42% | 0% |
| JFCAC | 0% | 8% | 0% | 0% | 13% | 79% |
| NECAC | 47% | 2% | 1% | 0% | 49% | 0% |
| ULMSL | 0% | 99% | 0% | 0% | 1% | 0% |
| Other Agencies | 34% | 0% | 9% | 5% | 51% | 1% |
| All Agencies | 11% | 57% | 4% | 1% | 15% | 12% |

Table V-15A displays the percentage of clients who use supplemental heat. The table shows that 42 percent use electric supplemental heat, two percent use another fuel for supplemental heat, and 46 percent do not use supplemental heat.

### Table V-15A
### Supplemental Heat

| | Percent of Clients |
|---|---|
| Electric | 42% |
| Other | 2% |
| None | 46% |
| Missing | 9% |

Table V-15B displays the use of supplemental heat by agency. The table shows that CAASTLC and EMAA clients are most likely to use electric supplemental heat.

### Table V-15B
### Supplemental Heat
### By Agency

| | Supplemental Heat | | | |
|---|---|---|---|---|
| | Electric | Other | None | Missing |
| CAASTLC | 55% | 2% | 41% | 2% |
| DAEOC | 27% | 6% | 68% | 0% |
| EMAA | 64% | 0% | 36% | 0% |

| | Supplemental Heat | | | |
|---|---|---|---|---|
| | Electric | Other | None | Missing |
| JFCAC | 30% | 3% | 66% | 1% |
| NECAC | 1% | 2% | 96% | 0% |
| ULMSL | 23% | 3% | 0% | 73% |
| Other Agencies | 43% | 2% | 55% | 0% |
| All Agencies | 42% | 2% | 46% | 9% |

Table V-16A displays the clients' water heating fuel. The table shows that 65 percent use gas for water heating and 33 percent use electricity for water heating.

**Table V-16A**
**Water Heating Fuel**

| | Percent of Clients | Percent of Clients with Non Missing Data |
|---|---|---|
| Gas | 60% | 65% |
| Electric | 31% | 33% |
| Other | 2% | 2% |
| Missing | 8% | -- |

Table V-16B displays the water heating fuel type used by agency. The table shows that CAASTLC clients are most likely to use gas for water heating (as they did for the main heating fuel) and JFCAC and EMAA clients are most likely to use electricity for water heating.

**Table V-16B**
**Water Heating Fuel**
**By Agency**

| | Water Heating Fuel | | | |
|---|---|---|---|---|
| | Gas | Electric | Other | Missing |
| CAASTLC | 92% | 7% | 0% | 1% |
| DAEOC | 27% | 27% | 0% | 46% |
| EMAA | 24% | 67% | 10% | 0% |
| JFCAC | 10% | 87% | 3% | 1% |
| NECAC | 42% | 58% | 0% | 0% |
| ULMSL | 71% | 7% | 0% | 22% |
| Other Agencies | 28% | 48% | 5% | 18% |
| All Agencies | 60% | 31% | 2% | 8% |

Table V-17A displays the type of air conditioning used by clients. The table shows that these data are missing for the majority of clients because air conditioning is not addressed by the program. However, among those who have data available, 48 percent have central air conditioning, 40 percent have window or wall air conditioning, and 12 percent do not have air conditioning.

**Table V17A**
**Air Conditioning**

| | Percent of Clients | Percent of Clients with Non Missing Data |
|---|---|---|
| Central | 16% | 48% |
| Window/Wall | 13% | 40% |
| None | 4% | 12% |
| Missing | 67% | -- |

Table V-17B displays the type of air conditioning used by agency. The table shows that for the agencies that have data available, the majority of clients do have some form of air conditioning.

**Table V-17B**
**Air Conditioning**
**By Agency**

| | Air Conditioning | | | |
|---|---|---|---|---|
| | Central | Window/Wall | None | Missing |
| CAASTLC | 0% | 0% | 0% | 100% |
| DAEOC | 31% | 61% | 8% | 0% |
| EMAA | 42% | 35% | 24% | 0% |
| JFCAC | 36% | 2% | 0% | 62% |
| NECAC | 42% | 35% | 23% | 0% |
| ULMSL | 0% | 0% | 0% | 100% |
| Other Agencies | 37% | 49% | 6% | 8% |
| All Agencies | 16% | 13% | 4% | 67% |

## *F. Service Delivery Statistics*

The DNR database only contains information on the date that the job was reported. Therefore, agencies were asked to report the date that the audit was conducted, the data that measure installation began, and the data that measure installation was completed. Table V-18A shows the job duration based on these reported dates. The table shows that only 16 percent of the jobs are completed within two weeks and 36 percent of the jobs are completed within one month.

Twenty-three percent of the jobs take more than three months for completion. However it appears that there is a long lag between the audit date and the measure installation date, as only seven percent of the jobs take more than three months between the time that the measure installation begins and the measure installation completion date.

**Table V-18A**
**Job Completion Time**

| | Audit Date to Final Measure Installation | Measure Installation Begin Date to End Date |
|---|---|---|
| <=14 Days | 16% | 38% |
| 15-30 Days | 19% | 20% |
| 31-60 Days | 26% | 20% |
| 61-90 Days | 13% | 10% |
| 91-180 Days | 15% | 5% |
| >180 Days | 8% | 2% |
| Missing | 4% | 5% |

Table V-18B displays the job completion time from the audit date to the final measure installation by agency. The table shows that there is some wide variation by agency. While 46 percent of JFCAC jobs are completed within two weeks, 80 percent of EMAA jobs take more than three months.

**Table V-18B**
**Job Completion Time**
**From Audit Date to Final Measure Installation**
**By Agency**

| | Days for Job Completion | | | | | | |
|---|---|---|---|---|---|---|---|
| | <=14 | 15-30 | 31-60 | 61-90 | 91-180 | >180 | Missing |
| CAASTLC | 14% | 27% | 30% | 13% | 10% | 3% | 3% |
| DAEOC | 17% | 28% | 32% | 10% | 3% | 10% | 0% |
| EMAA | 0% | 1% | 7% | 11% | 29% | 51% | 0% |
| JFCAC | 46% | 8% | 10% | 10% | 19% | 5% | 1% |
| NECAC | 0% | 1% | 31% | 20% | 43% | 2% | 1% |
| ULMSL | 6% | 11% | 29% | 17% | 15% | 3% | 20% |
| Other Agencies | 8% | 22% | 26% | 13% | 11% | 17% | 3% |
| All Agencies | 16% | 19% | 26% | 13% | 15% | 8% | 4% |

Agencies are required to report the Ameren job cost to DNR, as these reports also serve as the agency payment request. Because of duplication in several reported accounts with different DNR costs, there was some uncertainty as to the client's actual Ameren cost from the DNR data.

Agencies reported that they are likely to leverage funding from other programs including WAP and other utility programs, on Ameren jobs. APPRISE's data request included both the Ameren job cost and the total job cost. Some of the agencies reported the total job cost equal to the Ameren job cost for all of their clients. When asked whether there was no leveraging on any of the jobs, these agencies reported that they did not have the total job cost available. Table VII-2A displays the Ameren job cost as reported in the DNR database, the Ameren job cost reported by the agencies to APPRISE, and the total job cost reported by the agencies to APPRISE.

The table shows that the DNR cost has a distribution that is nearly identical to the Ameren job cost. About 20 percent of the jobs have Ameren costs of $500 or less, 28 percent have costs between $500 and $1,000, 31 percent have costs between $1,001 and $2,000, and 19 percent have costs over $2,000. The total job costs are much higher. Twenty-eight percent of the jobs have total costs of $2,000 to $3,000 and one third of the jobs have total costs of more than $3,000.

**Table V-19A**
**Job Cost**

| | DNR Cost | Ameren Job Cost | Total Job Cost |
|---|---|---|---|
| <=$500 | 23% | 20% | 5% |
| $501 - $1,000 | 29% | 28% | 8% |
| $1,001 - $2,000 | 31% | 31% | 25% |
| $2,001 - $3,000 | 12% | 12% | 28% |
| >$3,000 | 4% | 7% | 33% |
| Missing | <1% | 3% | 1% |
| Average Job Cost | $1,191 | $1,312 | $2,559 |

Table V-19B displays the Ameren and the total job cost by agency. The table shows that EMAA and NECAC are most likely to have Ameren job costs of more than $3,000. However, CAASTLC is most likely to have total job costs over $3,000.

## Table V-19B
## Ameren and Total Job Cost
## By Agency

| | Job Cost | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ameren Job Cost | | | | | | Total Job Cost | | | | | |
| | <=$500 | $501-$1,000 | $1,001-$2,000 | $2,001-$3,000 | >$3,000 | Missing | <=$500 | $501-$1,000 | $1,001-$2,000 | $2,001-$3,000 | >$3,000 | Missing |
| CAASTLC | 15% | 34% | 33% | 9% | 3% | 7% | 2% | 4% | 15% | 32% | 46% | 2% |
| DAEOC | 34% | 23% | 31% | 13% | 0% | 0% | 7% | 10% | 27% | 24% | 32% | 0% |
| EMAA | 0% | 6% | 32% | 28% | 35% | 0% | 0% | 6% | 29% | 29% | 36% | 0% |
| JFCAC | 46% | 33% | 17% | 3% | 1% | 0% | 5% | 14% | 34% | 37% | 9% | 0% |
| NECAC | 1% | 4% | 30% | 37% | 28% | 0% | 1% | 2% | 20% | 36% | 40% | 0% |
| ULMSL | 15% | 29% | 31% | 16% | 8% | 1% | 2% | 10% | 39% | 17% | 31% | 0% |
| Other Agencies | 22% | 20% | 37% | 11% | 9% | 0% | 22% | 19% | 34% | 11% | 13% | 0% |
| All Agencies | 20% | 28% | 31% | 12% | 7% | 3% | 5% | 8% | 25% | 28% | 33% | 1% |

Table V-20A displays the Ameren job costs as a percentage of the total job costs. The table shows that for 24 percent of the clients, the Ameren job costs are less than or equal to 25 percent of the total costs, for 28 percent they are 26 to 50 percent of total job costs, for 15 percent they are 51 to 75 percent of job costs, and for 9 percent they are 76 to 99 percent of job costs. Ameren job costs are equal to total job costs for 20 percent of the jobs. For some of these jobs, the leveraged dollars were not reported.

## Table V-20A
## Ameren Job Cost as a Percentage of Total Job Cost

| Percent of Total Job Cost | Percent of Clients |
|---|---|
| <=25% | 24% |
| 26% - 50% | 28% |
| 51% - 75% | 15% |
| 76% - 99% | 9% |
| 100% | 20% |
| Missing | 3% |

Table V-20B displays the Ameren job cost as a percentage of the total job cost by agency. The table shows that CAASTLC, DAEOC, and JFCAC are most likely to leverage a large percentage of funds on the Ameren jobs, more than 75 percent of the funds come from non-Ameren sources on more than a third of the jobs at these agencies.

## Table V-20B
## Ameren Job Cost as a Percent of Total Job Cost
## By Agency

| | Percent of Total Job Cost | | | | | |
|---|---|---|---|---|---|---|
| | <=25% | 26%-50% | 51%-75% | 76%-99% | 100% | Missing |
| CAASTLC | 34% | 38% | 18% | 1% | 2% | 7% |
| DAEOC | 37% | 23% | 18% | 17% | 6% | 0% |
| EMAA | 0% | 1% | 1% | 3% | 94% | 0% |
| JFCAC | 38% | 38% | 19% | 3% | 2% | 0% |
| NECAC | 1% | 7% | 11% | 10% | 71% | 0% |
| ULMSL | 12% | 33% | 20% | 29% | 5% | 1% |
| Other Agencies | 0% | 1% | 3% | 26% | 70% | 0% |
| All Agencies | 24% | 28% | 15% | 9% | 20% | 3% |

Agencies were also asked to report the total labor cost and the total material cost for their completed jobs. Table V-21A shows that 30 to 60 percent of the costs were for labor on most of the jobs.

## Table V-21A
## Labor Costs as a Percentage of Total Job Cost

| Percent of Total Job Cost | Percent of Clients |
|---|---|
| <=30% | 9% |
| 31% - 40% | 15% |
| 41% - 50% | 28% |
| 51% - 60% | 34% |
| 61% - 100% | 8% |
| Missing | 6% |

Table V-21B displays the labor cost as a percent of the total job cost by agency. The table shows that DAEOC and JFCAC are more likely to have a lower percentage of labor costs. ULMSL has the highest percent of labor costs.

**Table V-21B**
**Labor Cost as a Percent of Total Job Cost**
**By Agency**

| | Percent of Total Job Cost | | | | | |
|---|---|---|---|---|---|---|
| | <=30% | 31%-40% | 41%-50% | 51%-60% | 61%-100% | Missing |
| CAASTLC | <1% | 1% | 38% | 55% | 3% | 4% |
| DAEOC | 42% | 37% | 18% | 1% | 1% | 0% |
| EMAA | 11% | 22% | 40% | 24% | 1% | 1% |
| JFCAC | 37% | 52% | 6% | 0% | 4% | 1% |
| NECAC | 1% | 0% | 6% | 5% | 29% | 59% |
| ULMSL | 1% | 9% | 21% | 48% | 21% | 0% |
| Other Agencies | 8% | 22% | 33% | 18% | 18% | 0% |
| All Agencies | 9% | 15% | 28% | 34% | 8% | 6% |

## *G. Measures Installed*

Agencies were asked to report whether each of many measures were installed in each client's home and the cost of each measure. Table V-22 displays the percent of clients who received each measure and the mean and median measure costs for the clients who received the measure.

The most common measures that are provided in the program are air sealing, health and safety measures, repairs, window/door replacement or repair, and attic insulation. The highest cost measures are furnace replacement, floor and attic insulation, and window and door repair.

**Table V-22**
**Installed Measures**

| Measure | Percent with Measure | Measure Cost | |
|---|---|---|---|
| | | Mean | Median |
| Air Sealing | 93% | $425 | $301 |
| Attic Insulation | 46% | $707 | $706 |
| Wall Insulation | 5% | $456 | $408 |
| Floor Insulation | 16% | $755 | $756 |
| Kneewall Insulation | 1% | $224 | $168 |
| Basement Insulation | 6% | $193 | $135 |
| Duct Sealing and Insulation | 1% | $292 | $95 |
| Furnace Replacement | 34% | $1677 | $1367 |
| Furnace Repair | 16% | $274 | $248 |
| Furnace Cleaning | 36% | $94 | $83 |

| Measure | Percent with Measure | Measure Cost | |
|---|---|---|---|
| | | Mean | Median |
| Water Heater Repair or Replacement | 13% | $386 | $450 |
| Thermostat Replacement | 10% | $87 | $80 |
| Air Conditioning Replacement | 0% | -- | -- |
| Air Conditioning Repair | <1% | $850 | $850 |
| Window Repair or Replacement | 56% | $628 | $515 |
| Door Repair or Replacement | 64% | $525 | $474 |
| Other Repairs | 69% | $137 | $86 |
| CFLs | 7% | $23 | $15 |
| Health and Safety Measures | 82% | $163 | $135 |
| Other Major Measures | 6% | $287 | $160 |

Table V-23 displays the percentage of jobs with air sealing and insulation work by agency. The table shows that there is variability in the frequency of these measures by agency. While most of the agencies provide air sealing work in more than 95 percent of the homes treated, JFCAC provides air sealing work in less than 70 percent of the treated homes. JFCAC is more likely to provide floor insulation than the other agencies. ULMSL is more likely to provide basement insulation, but less likely to provide other types of insulation.

**Table V-23**
**Percent of Jobs with Air Sealing and Insulation Work**
**By Agency**

| | Measure | | | | | | |
|---|---|---|---|---|---|---|---|
| | Air Sealing | Insulation | | | | | |
| | | Attic | Wall | Floor | Kneewall | Basement | Duct Sealing/Insulation |
| CAASTLC | 98% | 58% | 1% | 1% | 2% | 6% | 0% |
| DAEOC | 97% | 61% | 4% | 1% | 0% | 0% | 1% |
| EMAA | 97% | 75% | 28% | 54% | 0% | 3% | 4% |
| JFCAC | 69% | 27% | 5% | 61% | 0% | 0% | 1% |
| NECAC | 98% | 37% | 16% | 31% | 0% | 0% | 0% |
| ULMSL | 99% | 15% | 0% | 0% | 1% | 23% | 1% |
| Other Agencies | 89% | 41% | 9% | 20% | 0% | 3% | 5% |
| All Agencies | 93% | 46% | 5% | 16% | 1% | 6% | 1% |

Table V-24 displays the percent of jobs with furnace work by agency. The table shows that CAASTLC replaces furnaces on 52 percent of their jobs and DAEOC replace furnaces on 37 percent of their jobs. However, JFCAC replaces furnaces on only six percent of their jobs. This

replacement rate is related to the clients' main heating fuel, as agencies are not permitted to replace electric heating systems.

**Table V-24**
**Percent of Jobs with Furnace Work**
**By Agency**

| | Measure | | |
|---|---|---|---|
| | Furnace Replacement | Furnace Repair | Furnace Cleaning |
| CAASTLC | 52% | 21% | 43% |
| DAEOC | 37% | 0% | 51% |
| EMAA | 28% | 6% | 7% |
| JFCAC | 6% | 18% | 0% |
| NECAC | 20% | 30% | 55% |
| ULMSL | 29% | 5% | 69% |
| Other Agencies | 15% | 11% | 15% |
| All Agencies | 34% | 16% | 36% |

Table V-25 displays the percent of jobs with repair work by agency. The table shows that NECAC and ULMSL are most likely to do window repair or replacement and CAASTLC and EMAA are most likely to do door repair or replacement work.

**Table V-25**
**Percent of Jobs with Repair Work**
**By Agency**

| | Measure | | |
|---|---|---|---|
| | Window Repair or Replacement | Door Repair or Replacement | Other Repairs |
| CAASTLC | 57% | 75% | 97% |
| DAEOC | 34% | 61% | 56% |
| EMAA | 64% | 78% | 63% |
| JFCAC | 60% | 48% | 27% |
| NECAC | 83% | 37% | 93% |
| ULMSL | 75% | 57% | 48% |
| Other Agencies | 23% | 57% | 27% |
| All Agencies | 56% | 64% | 69% |

Table V-26 displays the percent of jobs with CFLs and the average number of CFLs provided to these clients by agency. The table shows that only two of the listed agencies and the other

agencies provide CFLs. The average number provided ranges from two to 15, and the overall average is nine bulbs.

**Table V-26**
**Percent of Jobs with CFLs**
**And Average Number of CFLs**
**By Agency**

| | Measure | |
|---|---|---|
| | Percent with CFLs | Average Number of CFLs For Clients Who Received CFLs |
| CAASTLC | 0% | -- |
| DAEOC | 0% | -- |
| EMAA | 100% | 10 |
| JFCAC | 9% | 2 |
| NECAC | 0% | -- |
| ULMSL | 0% | -- |
| Other Agencies | 3% | 15 |
| All Agencies | 7% | 9 |

## H. Summary

This analysis provided information on the clients, homes, and services provided through Ameren's LIWP. Because most of the program information required for the evaluation is not maintained electronically, obtaining and cleaning these data was a time-consuming endeavor. However, these data are important for program analysis and for interpreting the usage impacts of the program. DNR should develop a database to collect and manage the program data. These data will be useful for both program management and future program evaluation efforts.

Some of the key findings from the analysis are summarized below.

- *Client characteristics*: Clients are likely to have vulnerable household members. Eighty-nine percent of the clients served by the program have a senior, child, or disabled household member. The majority of the clients served by the program, 63 percent, have income below the poverty level.

- *Home characteristics*: Eighty-five percent of the clients served by the program own their homes. Most of the homes are single family detached units, most are fewer than 1,500 square feet, and most are more than 50 years old. The homes had high air leakage rates prior to treatment, and the agencies achieved large reductions in air leakage. Half of the homes had a 25 percent or greater reduction in the CFM50 air leakage rate.

- *Home equipment*: The majority of the clients use natural gas for heating and about one quarter use electricity for heating. Fifty-seven percent have Laclede as their natural gas company and 11 percent have Ameren as their natural gas company. Forty-two percent use electric supplemental heat. Many of the clients have air conditioning, but these data were not available for the majority of the clients served.

- *Service delivery statistics*: While 16 percent of the jobs were completed in two weeks or less, 23 percent took more than three months from the date of the audit until the date of the final measure installation. Eighty-six percent of the clients had more than $1,000 spent on their homes. Just over half of the jobs had at least half of the total costs paid for through other program funds.

- *Program measures*: The most common program measures are air sealing, health and safety measures, repairs, window/door replacement or repair, and attic insulation. The highest cost measures are furnace replacement, floor and attic insulation, and window and door repair. Only a few of the agencies provide CFLs to the clients served by the program.

There is wide variety in the types of clients and home served by the program, and the types of measures that were installed. The usage impact analysis will examine the relationship between these factors and program savings.

# VI. Usage Analysis

The section describes the methodology for the usage impact analysis and the findings from the analysis.

## A. Methodology

Customers who had their service delivery completed between July 1, 2007 and September 30, 2008 were treated as the analysis group for this evaluation. We examine electric impacts for all of these participants with adequate data and gas impacts for Ameren gas customers with adequate data.

When measuring the impact of an intervention, it is necessary to recognize other exogenous factors that can impact changes in outcomes. Changes in a client's energy usage, between the year preceding service delivery and the year following service delivery, may be affected by many factors other than program services received. Some of these factors include changes in household composition or health of family members, and changes in weather. The weather normalization process controls for changes in weather between the pre and post treatment periods. To control for other exogenous factors, we examine the change in outcomes for program participants compared to the change in outcomes for another group of households. This group of households is called a comparison group. The comparison group is designed to be as similar as possible to the treatment group, those who received services and who we are evaluating, so that the exogenous changes for the comparison group are as similar as possible to those of the treatment group.

In the evaluation of the LIWP, we use a random sample of LIHEAP recipients as the comparison group. These participants serve as a good control because they are lower income households who would be eligible for the program. We assign quasi treatment dates to these households at the midpoint of each calendar quarter included in the treatment group. We then use these dates to construct the quasi pre and post analysis periods for the comparison group.

In this evaluation, we examine pre and post-treatment usage statistics. The difference between the pre and post-treatment usage for the treatment group is considered the gross change. This reflects the actual change in behaviors and outcomes for those participants who were served by the program. Some of these changes may be due to the program, and some of these changes are due to other exogenous factors, but this change in energy use is the customer's actual experience. The net change in energy use is the difference between the change for the treatment group and the change for the comparison group, and represents our best estimate of the actual impact of the program, controlling for other exogenous changes.

Energy usage was analyzed for the year prior to the audit and the year after service delivery was completed. The analysis included as close to a full year of data pre and post-treatment as possible. Table VII-1 displays the attrition statistics for the degree day adjusted usage analysis. The table shows that there were 602 electric customers and 29 gas customers who were treated

during the time period included in the impact evaluation. Customers were included in the analysis if their pre and post usage data each spanned between 300 and 400 days. Some additional customers were removed from the analysis if their usage was below 1,200 kWh or 300 ccf, or if their change in usage was greater than 65 percent. After these eliminations, we include 78 percent of the treated population and 40 percent of the comparison population in the usage analysis.

The table also shows the attrition of the accounts for the PRISM usage analysis. PRISM is a common software program used to weather normalize energy usage data. However, the PRISM software imposes greater constraints on the data that can be included in the analysis. The table shows that 67 percent of the treatment group and 37 percent of the comparison group can be included in the PRISM analysis.

**Table VI-1**
**Usage Impact Attrition Analysis**

| | Electric | | Gas | | All Jobs | |
|---|---|---|---|---|---|---|
| | Treatment | Comparison | Treatment | Comparison | Treatment | Comparison |
| Original Population | 602 | 4,588 | 29 | 874 | 631 | 5,462 |
| Not Enough or Too Many Pre-Treatment Days | 80 | 2,424 | 2 | 539 | 82 | 2,963 |
| Not Enough or Too Many Post-Treatment Days | 32 | 162 | 0 | 17 | 32 | 179 |
| Pre or Post Usage Below 1200 kWh or 300 ccf | 4 | 2 | 6 | 40 | 10 | 42 |
| Change in Total Usage>65% | 14 | 72 | 2 | 4 | 16 | 76 |
| **Final Degree Day Sample** | **472** | **1,928** | **19** | **274** | **491** | **2,202** |
| **% Included in Degree DayAnalysis** | **78%** | **42%** | **66%** | **31%** | **78%** | **40%** |
| PRISM Did Not Run | 2 | 4 | 0 | 0 | 1 | 4 |
| PRISM Model Not a Good Fit | 69 | 174 | 0 | 1 | 69 | 175 |
| **Final PRISM Sample** | **401** | **1,750** | **19** | **273** | **421** | **2,023** |
| **% Included for PRISM Analysis** | **67%** | **38%** | **66%** | **31%** | **67%** | **37%** |

Energy usage data were weather normalized in the pre and the post usage period to ensure that changes in energy usage are due to changes in usage patterns, rather than due to changes in weather. We used a degree-day normalization process and the PRISM analysis software to conduct this analysis. This degree-day process involves the following steps.

1. Calculate the heating and cooling degree-days that are included in each usage period.

2. Determine whether periods should be classified as baseload periods, heating periods, or cooling periods, based on the number of heating and cooling degree-days in the period.

3. Calculate the total baseload period usage, heating period usage, and cooling period usage.

4. Calculate the relationship between heating usage minus baseload usage and degree- days. Use that slope and the average long-term heating degree-days to calculate normalized heating period usage.

5. Follow the same method to calculate normalized cooling period usage.

6. Add up the baseload usage, heating period usage, and cooling period usage to obtain the normalized annual usage.

This process yielded results that were similar to the PRISM analysis results, but allowed for a higher percentage of cases to be included in the analysis, due to fewer restrictions on data availability, and the fact that cases did not need to be removed because the model did not run or the model had a poor fit.

We have chosen to conduct the normalization process on the baseload usage as well as the heating and cooling usage. Baseload usage may vary with weather because of the use of air conditioning, the gas furnace's electric fan, the refrigerator, and use of electric space heaters.

## *B. Impacts*

Table VI-2 displays the results from the usage impact analysis for electric and gas usage. The table shows that the weather normalized electric savings was approximately 500 kWh, or three percent of pre-treatment usage. However, electric usage has been increasing over time for many households due to increased plug loads. Usage for the comparison group, that did not receive program services, increased over this time period. Therefore, the net change in electric usage, the difference between the change for the treatment group and the change for the comparison group is approximately 1,000 kWh or six percent of pre-treatment usage.

Table VI-2 also shows the gas savings, although they are for a small group of Ameren customers. The table shows gross and net savings of approximately 120 ccf or about 15 percent of pre-treatment gas usage.

## Table VI-2
## Average Usage and Savings

| ELECTRIC USAGE IMPACTS | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Treatment Group | | | Gross Savings | | Net Savings | |
| | # | Pre-Use | Post-Use | kWh | % Savings | kWh | % Savings |
| Non Normalized | 472 | 15,771 | 14,515 | 1,256* | 8.0% | 1,130* | 7.2% |
| Degree Day Normalized | 472 | 15,454 | 14,932 | 522* | 3.4% | 1,051* | 6.8% |
| Degree Day Normalized With PRISM accounts | 401 | 15,606 | 15,130 | 476* | 3.1% | 988* | 6.3% |
| Prism Normalized | 401 | 15,680 | 15,084 | 596* | 3.8% | 950* | 6.1% |
| **GAS USAGE IMPACTS** | | | | | | | |
| | Treatment Group | | | Gross Savings | | Net Savings | |
| | # | Pre-Use | Post-Use | ccf | % Savings | ccf | % Savings |
| Non Normalized | 19 | 864 | 780 | 84* | 9.7% | 111* | 12.8% |
| Degree Day Normalized | 19 | 831 | 725 | 106* | 12.8% | 116* | 14.0% |
| Prism Normalized | 19 | 854 | 714 | 141* | 16.5% | 137* | 16.0% |

*Differences are statistically significant at the 90 percent confidence level.

Table VI-3 compares electric savings in Ameren's LIWP to other low-income programs that we and our partners have evaluated. The table shows that Ameren's electric savings are low compared to the other programs, which have similar or lower program expenditures. While Ameren's net savings are 6.8 percent, the other programs' savings range from 7.6 to 12.2 percent. Ameren's low electric savings are to be expected given the program's focus on gas measures.

## Table VI-3
## Average Usage and Savings
## Comparison with Other Programs

| ELECTRIC USAGE IMPACTS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Treatment Group | | | Gross Savings | | Net Savings | | Average Cost |
| | # | Pre-Use | Post-Use | kWh | % Savings | kWh | % Savings | |
| | | | | | | | | |
| Ameren | 472 | 15,454 | 14,932 | 522* | 3.4% | 1,051* | 6.8% | $2,559 |
| PPL Electric Utilities** | 1,019 | 17,912 | 17,129 | 783* | 4.4% | 1,767* | 9.9% | $2,613 |
| Ohio EPP – High Use Baseload** | 4,789 | 13,525 | 11,841 | 1,684* | 12.5% | 1,650* | 12.2% | $896 |
| Ohio EPP – Moderate Use Baseload** | 1,355 | 6,468 | 5,657 | 811* | 14.3% | 697* | 10.8% | $726 |
| Colorado ESP** | 892 | 7,225 | 6,681 | 543* | 7.5% | 636* | 8.8% | $2850 |
| NJ WAP | 122 | 7,989 | 7,529 | 460* | 5.8% | 611 | 7.6% | $1163# |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **PECO - Baseload** | 4,198 | 10,919 | 10,032 | 887* | 8.1% | | | $224 |
| **PECO - Electric Heating** | 162 | 21,017 | 19,888 | 1,129* | 5.4% | | | $1754 |

*Differences are statistically significant at the 90 percent confidence level.
**The usage impact for these analyses was conducted by M. Blasnik and Associates.
#Materials costs only.

Energy efficiency program savings are often found to correlate with the level of pre-treatment usage. This is because households with higher pre-treatment usage have greater opportunities for energy savings and often receive greater energy efficiency investments. Table VI-4 shows that the Ameren LIWP savings are consistent with this expectation. Customers with electric usage below 8,000 kWh have no savings, customers with usage between 8,000 and 12,000 kWh have 3.8 percent net savings, and customers with electric usage above 12,000 kWh have 8.1 percent net savings.

**Table VI-4**
**Change in Usage**
**By Pre Program Usage**

| ELECTRIC USAGE IMPACTS | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Treatment Group | | | Gross Savings | | Net Savings | |
| | # | Pre-Use | Post-Use | kWh | % Savings | kWh | % Savings |
| **< 8,000 kWh** | 79 | 6,242 | 6,628 | -386 | -6.2% | -24 | -0.4% |
| **8,000 – 12,000 kWh** | 110 | 10,074 | 10,227 | -153 | -1.5% | 378 | 3.8% |
| **> 12,000 kWh** | 283 | 20,116 | 19,078 | 1,038 | 5.2% | 1,620 | 8.1% |

Table VI-5 displays the seasonal analysis of energy savings for electric jobs. The table shows that 60 percent of the gross savings come from heating usage. This corresponds to the concentration of measures on heating equipment. However, a greater share of the net savings result from baseload usage, as this is the segment of usage that is increasing among the comparison group that received no program treatments.

**Table VI-5**
**Seasonal Usage Change**

| ELECTRIC USAGE IMPACTS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Treatment Group | | | Gross Savings | | | Net Savings | | |
| | # | Pre-Use | Post-Use | kWh | % | Share of Savings | kWh | % Savings | Share of Savings |
| **Baseload** | 472 | 9,078 | 8,932 | 146 | 1.6% | 28% | 510 | 5.6% | 48.5% |
| **Heating** | | 3,735 | 3,422 | 313 | 8.4% | 60% | 384 | 10.3% | 36.5% |
| **Cooling** | | 2,641 | 2,578 | 64 | 2.4% | 12% | 157 | 5.9% | 15.0% |

Table VI-6 displays electric savings by household characteristics. Differences by these characteristics are not statistically significant at the 90 percent confidence level.

**Table VI-6**
**Electric Savings**
**By Household Characteristics**

| ELECTRIC USAGE IMPACTS | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Treatment Group | | | Gross Savings | | Net Savings | |
| | # | Pre-Use | Post-Use | kWh | % Savings | kWh | % Savings |
| **Home Ownership** | | | | | | | |
| Own | 421 | 15,215 | 14,665 | 550 | 3.6% | 1,080 | 7.1% |
| Rent | 51 | 17,425 | 17,134 | 291 | 1.7% | 820 | 4.7% |
| | | | | | | | |
| **Home Type** | | | | | | | |
| Single Detached | 394 | 14,551 | 14,073 | 478 | 3.3% | 1,007 | 6.9% |
| Mobile Home | 53 | 23,610 | 22,386 | 1,224 | 5.2% | 1,753 | 7.4% |
| Other | 25 | 12,391 | 12,654 | -263 | -2.1% | 267 | 2.2% |
| | | | | | | | |
| **Pre-Treatment Air Leakage** | | | | | | | |
| <=3,000 CFM | 237 | 15,107 | 14,544 | 562 | 3.7% | 1,092 | 7.2% |
| >3000 CFM | 214 | 15,745 | 15,329 | 416 | 2.6% | 945 | 6.0% |
| Missing | 21 | 16,408 | 15,251 | 1,157 | 7.1% | 1,686 | 10.3% |
| | | | | | | | |
| **Air Leakage Change** | | | | | | | |
| Decline by < 1,000 | 350 | 15,334 | 14,877 | 457 | 3.0% | 986 | 6.4% |
| Decline by >=1,000 | 96 | 15,941 | 15,214 | 728 | 4.6% | 1,257 | 7.9% |
| Missing | 21 | 16,408 | 15,251 | 1,157 | 7.1% | 1,686 | 10.3% |
| | | | | | | | |
| **Electric Heating** | | | | | | | |
| Yes | 103 | 23,408 | 22,570 | 838 | 3.6% | 1,367 | 5.8% |
| No | 369 | 13,234 | 12,799 | 434 | 3.3% | 963 | 7.3% |
| | | | | | | | |
| **Electric Supplemental Heat** | | | | | | | |
| Yes | 207 | 14,640 | 14,081 | 559 | 3.8% | 1,088 | 7.4% |
| No | 234 | 16,229 | 15,676 | 553 | 3.4% | 1,082 | 6.7% |
| Missing | 31 | 15,039 | 14,996 | 42 | 0.3% | 572 | 3.8% |
| | | | | | | | |
| **Water Heating Fuel** | | | | | | | |
| Electric | 133 | 22,103 | 21,143 | 961 | 4.3% | 1,490 | 6.7% |
| Other | 325 | 12,845 | 12,485 | 361 | 2.8% | 890 | 6.9% |
| Missing | 14 | 12,845 | 12,731 | 114 | 0.9% | 643 | 5.0% |

Table VI-7 displays electric savings by job characteristics. The table shows that differences in savings by job characteristics are not statistically significant.

**Table VI-7**
**Electric Savings**
**By Job Characteristics**

| ELECTRIC USAGE IMPACTS | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Treatment Group | | | Gross Savings | | Net Savings | |
| | # | Pre-Use | Post-Use | kWh | % Savings | kWh | % Savings |
| **Total Job Cost** | | | | | | | |
| **<=$2,000** | 153 | 15,390 | 14,973 | 417 | 2.7% | 946 | 6.1% |
| **$2,001-$3,000** | 140 | 16,496 | 15,810 | 687 | 4.2% | 1,216 | 7.4% |
| **>$3,000** | 179 | 14,693 | 14,210 | 483 | 3.3% | 1,013 | 6.9% |
| | | | | | | | |
| **Insulation** | 300 | 16,336 | 15,712 | 623 | 3.8% | 1,153 | 7.1% |
| **No Insulation** | 171 | 13,960 | 13,609 | 350 | 2.5% | 880 | 6.3% |
| | | | | | | | |
| **Attic Insulation** | 231 | 15,343 | 14,790 | 553 | 3.6% | 1,083 | 7.1% |
| **No Attic Insulation** | 240 | 15,598 | 15,102 | 496 | 3.2% | 1,025 | 6.6% |
| | | | | | | | |
| **Furnace Replacement** | 130 | 14,347 | 13,642 | 705 | 4.9% | 1,234 | 8.6% |
| **Furnace Repair** | 40 | 16,929 | 16,515 | 413 | 2.4% | 942 | 5.6% |
| **Furnace Cleaning** | 189 | 13,898 | 13,529 | 369 | 2.7% | 898 | 6.5% |
| **No Furnace Work** | 113 | 18,808 | 18,202 | 607 | 3.2% | 1,136 | 6.0% |
| | | | | | | | |
| **Water Heater Repair/Replacement** | | | | | | | |
| **Yes** | 56 | 14,724 | 13,985 | 739 | 5.0% | 1,269 | 8.6% |
| **No** | 414 | 15,587 | 15,085 | 502 | 3.2% | 1,031 | 6.6% |
| | | | | | | | |
| **Window Repair/Replacement** | | | | | | | |
| **Yes** | 292 | 15,527 | 14,953 | 574 | 3.7% | 1,103 | 7.1% |
| **No** | 179 | 15,386 | 14,943 | 443 | 2.9% | 972 | 6.3% |
| | | | | | | | |
| **Door Repair/Replacement** | | | | | | | |
| **Yes** | 308 | 14,982 | 14,510 | 473 | 3.2% | 1,002 | 6.7% |
| **No** | 163 | 16,401 | 15,779 | 622 | 3.8% | 1,151 | 7.0% |

## C. Summary

The usage impact analysis measured net weather normalized electric and gas savings for participants who were treated by the LIWP between July 2007 and September 2008. Only a handful of customers were included in the gas impact analysis because most customers receive gas service from a different utility, and analyses of these data were not within the scope of this evaluation.

As expected, the electric usage impacts of the program were low, due to the focus on measures that reduce fossil fuel consumption. Net electric savings averaged 6.8 percent, lower than many other low-income energy efficiency programs that we have evaluated that place a greater emphasis on electric efficiency measures. Net gas savings, at 14 percent, were in the expected range, but were only estimated for a small number of customers who have Ameren gas service.

# VII. Payment Analysis

This section of the report examines the impact of Ameren's LIWP on customer bills and coverage rates. The purpose of this analysis is to determine whether the program reduces bills to the point that customers can meet their payment obligations.

## A. Methodology

The methodology used for the payment impact analysis is similar to that for the usage analysis. The same customers are included in the treatment and comparison groups. To control for exogenous factors outside of the program that may influence customer bills and payments, such as energy costs and the economy, we examine the change in outcomes for program participants compared to the change in outcomes for the comparison group. We use the same random sample of LIHEAP recipients for this comparison group as were used for the usage analysis' comparison groups.

Again, we examine gross and net program impacts. The difference between the pre and post-treatment statistics for the treatment group is considered the gross change. This reflects the actual change in outcomes for those participants who were served by the program. Some of these changes may be due to the program, and some of these changes are due to other exogenous factors, but this change in bills and payments is the customer's actual experience. The net change is the difference between the change for the treatment group and the change for the comparison group, and represents our best estimate of the actual impact of the program, controlling for other exogenous changes.

## B. Impacts

Table VII-1 displays billing revenue in the pre and post treatment periods. The table shows a small gross and net change in revenue for electric only customers. Costs declined by approximately four percent for these customers.

**Table VII-1**
**Billing Revenue**

| | # | Pre | Post | Gross Change | % Gross Change | Net Change | % Net Change |
|---|---|---|---|---|---|---|---|
| **Electric Only** | | | | | | | |
| Electric Revenue | 453 | $1,038 | $990 | -$48* | -4.6% | -$45* | -4.3% |
| Total Revenue | | $1,260 | $1,207 | -$53* | -4.2% | -$52* | -4.1% |
| **Electric and Gas** | | | | | | | |
| Electric and Gas Revenue | 25 | $1,880 | $1,970 | $90 | 4.8% | $7* | 0.3% |
| Total Revenue | | $2,072 | $2,211 | $139 | 6.7% | $21 | 1.0% |
| **All Job Types** | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Electric and Gas Revenue | 479 | $1,081 | $1,041 | -$40* | -3.7% | -$48* | -4.4% |
| Total Revenue | | $1,302 | $1,260 | -$42* | -3.2% | -$57* | -4.3% |

*Differences are statistically significant at the 90 percent confidence level.

Table VII-2 displays payments made in the pre and post treatment periods. The table shows that there was no significant change in the number of payments made. Total payments declined due to a decrease in the amount of assistance payments received.

**Table VII-2**
**Annual Payments**

| | # | Pre | Post | Gross Change | % Gross Change | Net Change | % Net Change |
|---|---|---|---|---|---|---|---|
| **Electric Only** | | | | | | | |
| # Payments | 452 | 11 | 11 | 0 | 0.0% | 0 | 0.0% |
| Cash Payments | | $1,123 | $1,082 | -$41 | 3.7% | $46 | 4.1% |
| Assistance Payments | | $142 | $122 | -$20 | -14.1% | -$132* | -93.0% |
| Other Credits | | $88 | $131 | $43* | 48.9% | -$17 | -19.3% |
| Total Credits | | $1,352 | $1,335 | -$17 | -1.3% | -$104* | -7.7% |
| **Electric and Gas** | | | | | | | |
| # Payments | 25 | 14 | 12 | -2 | -14.3% | -1 | -7.1% |
| Cash Payments | | $1,798 | $1,912 | $114 | 6.3% | $204 | 11.3% |
| Assistance Payments | | $263 | $289 | $26 | 9.9% | -$141* | -54.0% |
| Other Credits | | $121 | $272 | $151 | 124.8% | $25 | 20.7% |
| Total Credits | | $2,182 | $2,473 | $291 | 13.3% | $88 | 4.0% |
| **All Job Types** | | | | | | | |
| # Payments | 478 | 11 | 11 | 0 | 0.0% | 0 | 0.0% |
| Cash Payments | | $1,157 | $1,125 | -$32 | -2.8% | $54 | 4.8% |
| Assistance Payments | | $148 | $131 | -$18 | -11.5% | -$138* | -92.6% |
| Other Credits | | $90 | $138 | $49* | 53.3% | -$19 | -22.2% |
| Total Credits | | $1,395 | $1,394 | -$1 | -0.1% | -$102* | -7.4% |

*Differences are statistically significant at the 90 percent confidence level.

Table VII-3 displays cash and total coverage rates in the year preceding and the year following receipt of program services. The table shows that there is a net increase in the cash coverage rate, but there is a decline in the net total coverage rate due to a decline in assistance payments compared to the change for the comparison group.

**Table VII-3**
**Coverage Rates**

| | # | Pre | Post | Gross Change | % Gross Change | Net Change | % Net Change |
|---|---|---|---|---|---|---|---|
| **Electric Only** | | | | | | | |
| **Cash Coverage Rate** | 452 | 90.7% | 91.1% | 0.4% | 0.4% | 8.4%* | 9.3% |
| **Total Coverage Rate** | | 104.1% | 106.8% | 2.7%* | 2.6% | -3.9%* | -3.7% |
| **Electric and Gas** | | | | | | | |
| **Cash Coverage Rate** | 25 | 87.4% | 86.7% | -0.7% | -0.8% | 7.9%* | 9.0% |
| **Total Coverage Rate** | | 103.3% | 106.8% | 3.5% | 3.4% | 0.9% | 0.9% |
| **All Job Types** | | | | | | | |
| **Cash Coverage Rate** | 478 | 90.5% | 90.9% | 0.4% | 0.4% | 8.5%* | 9.4% |
| **Total Coverage Rate** | | 104.1% | 106.8% | 2.7%* | 2.6% | -3.5%* | -3.4% |

*Differences are statistically significant at the 90 percent confidence level.

## *C. Summary*

Energy costs declined by approximately $60 or 4.3 percent compared to the comparison group. While cash payments increased, assistance payments declined, resulting in a net decline in payments made. Cash coverage rates increased by 8.5 percentage points, but total coverage rates declined by 3.5 percent.

# VIII. Summary of Findings and Recommendations

This section of the report summarizes the key findings and recommendations from all of the evaluation activities described in this report. Findings and recommendations are grouped into the categories of program management, administration, and procedures; agency weatherization staff training; program impact; and program satisfaction.

## A. *Program Management, Administration, and Procedures*

There are positive benefits that result from the way the program has been designed and implemented, but there are important ways that Ameren could modify the program to obtain increased impacts on their customers' energy usage. Findings are summarized below.

1. Coordination with other low income energy efficiency programs increases efficiency in program delivery.

   Ameren's LIWP is administered through the Missouri Department of Natural Resources Energy Center (DNR), which also administers the Missouri Low Income Weatherization Assistance Program (WAP) that is funded by the Federal Department of Energy (DOE), as well as other low-income energy efficiency programs that are funded by other utilities. Because of the joint administration and delivery, the local agencies that delivery program services can effectively leverage funding from other programs to deliver more comprehensive services than otherwise would have been possible.

   For Fiscal Year 2009, (Program Year 2008) the DOE guidelines state that the average cost expended per home should not exceed $2,966. However, this average is for each funding source, as opposed to the total expenditures in the home. DNR encourages the subgrantees to blend DOE and other sources of funding so that additional weatherization measures can be completed on a home without exceeding the average per home cost for the funding source. All of the agencies said that they coordinate funding in this way in order to provide comprehensive services to the clients. Many of the agencies have three sources of funding – the Ameren electric funds, gas utility funds, and DOE WAP funds. This allows them to spend up to triple what they would have been able to spend under the DOE WAP funding alone. Some of the agency weatherization managers noted that this was important in the case of home repairs (often window and door work) where the DOE WAP limits spending to $600 per home and the combination of programs allows the agency to double or triple that amount.

   The joint delivery through coordination of program funds allows for comprehensive service delivery. This is beneficial for program clients and reduces the fixed costs of returning to the home to deliver additional services under a separate program.

   *Recommendation: Maintain joint program implementation if possible.*

2. The program is delivered the same way as the Missouri WAP model, and therefore does not emphasize electric measures.

   The Ameren funds for the LIWP are from an electric rate case settlement, and most of the agencies serve clients who have a gas utility other than Ameren. However, when asked specifically about measures that would address electric usage – refrigerator replacement, air conditioning repair and replacement, and CFL replacements for incandescent light bulbs, most agency weatherization managers reported that these measures were not part of the program.

   When DNR was given responsibility for program administration, they were told that the funds should be utilized under the same guidelines as the DOE WAP and that they should only be expended on Ameren's electric customers. However, there are no requirements that Ameren funds be used for measures that address electric usage and the WAP program, as implemented in Missouri, has a focus on fossil fuel usage reduction.

   DNR's operational manual includes air conditioner tune-up and replacement and refrigerator replacement as measures that are "Not Considered" and lighting retrofits as "Optional". Additionally, there is a DOE requirement that agencies cannot use program funds to replace electric heating systems, and this rule is enforced with the Ameren funds.

   When these issues were discussed with DNR, managers noted that DNR considers Missouri a heating system state and concentrates on heating system work. Air conditioning work is approved on a case by case basis if it is related to client health issues. They noted that DNR and the weatherization network may consider adding air conditioner work in the future. They also noted that DNR may consider allowing refrigerator replacement. DNR only began allowing CFLs as an option for agencies in mid 2008.

   *Recommendation: Revise the rules for expenditure of Ameren program funds so that electric usage reduction measures are allowed and emphasized.*

3. Many clients are not aware that the services they receive are at least partially funded by Ameren.

   When asked whether clients were aware that services were funded by Ameren, six of the agency weatherization managers said that clients were informed, four said that the clients did not know this, and two stated that they were not sure whether or not clients were aware that the program was funded by Ameren.

   *Recommendation: Provide a program information sheet for agencies to distribute during the energy audit with Ameren's logo.*

4. Agencies do not have adequate data systems in place to allow for tracking program services and managing the program.

   Eight of the twelve agencies reported that all client and program data are maintained in paper client files. Four of the agencies reported that some data are electronic and some are in client files. Due to the way that the data are maintained, it was a time-consuming process for the agencies to provide data on clients, homes, and service delivery that were needed for the LIWP evaluation. Additionally, there were duplicates in reporting of clients served that were difficult to resolve because of missing and/or incorrect job numbers.

   *Recommendation: DNR should develop a database for agencies to collect and manage the program data. These data will be useful for both program management and future program evaluation efforts.*

5. There is a potential group of households who could be made eligible for service delivery in areas where agencies have a difficult time finding clients to serve.

   Households are only eligible for LIWP if the home has not been previously serviced through WAP since September 30, 1993. However, most of these households would not have received electric efficiency measures that are not provided through WAP. Some agencies reported that they have difficulty finding Ameren electric customers to serve by the program. The program could offer electric efficiency measures to previously treated WAP customers.

   *Recommendation: allow for customers who previously received WAP to receive LIWP targeted at electric reduction measures.*

6. Ameren customer service representatives should be trained to refer payment-troubled customers to agencies to receive LIWP.

   Ameren customer service representatives refer payment troubled clients to agencies for energy assistance. They should also tell the clients to contact the agencies and request services through the LIWP.

   *Recommendation: Ameren customer service representatives should be trained to refer low-income, high usage customers to the program.*

## B. Agency Weatherization Staff Training

Findings and recommendations related to agency weatherization staff training are summarized below.

1. The program infrastructure provides good training for program staff.

DNR requires the weatherization technicians to be trained in building science principals, advanced building diagnostics, combustion heating systems, and whole house best practices approach to cost-effective energy efficiency measures.

DNR also encourages subgrantees to use the Training and Technical Assistance (T&TA) sub category in the DOE budget to attend the Affordable Comfort and the U.S. DOE conferences The weatherization agencies also attend quarterly Energy Professional Housing Alliance (EHPA) meetings and the annual Missouri Association for Community Action (MACA) training conference.

Beginning in Fiscal Year 2006 each agency was required to have at least one BPI certified auditor on staff. BPI certified auditors are required to have a certain number of continuing education hours each year and must be recertified every three years. Any subgrantee that does not meet this requirement is required to submit a corrective action plan before DNR will award a grant for the next program year.

Lead-Safe Work Practices training is required for both direct hire and contractor crew workers. New crew members are required to be trained within a six-month period. Re-training needs to be completed within a three-year period.

*Recommendation: DNR should continue to provide training and technical support and require certifications.*

2. One area of weakness in program training is with respect to client education.

There are few DNR requirements regarding client education that is provided during the audit and measure installation. Program documentation shows that the auditor does an initial interview with the client and DNR reported that they encourage client education when the auditor is assessing the home.

Discussions with the agency weatherization managers revealed that there were different amounts of emphasis placed on the energy education provided to the customer. Several of the managers focused on pamphlets and other materials that are handed to the clients at the time of the audit.

While many of the program participants who were surveyed said that they did take actions to reduce their energy usage as a result of the program, the survey found that the program compared negatively to others with respect to client energy education and that there is room for improvement on customer education.

*Recommendation: Additional training should be required on customer energy education and education about customer actions should be required during the audit visit.*

## C. Program Impact

Findings and recommendations related to program impact are summarized below.

1. Health and Safety

   Most of the agency weatherization managers reported that they install CO detectors and many reported that they install smoke detectors, conduct CO testing, and take care of water heater issues. These measures should result in significant health and safety benefits for program participants.

   *Recommendation: Health and safety measures should continue to be provided through the program.*

2. Customer Reported Program Benefits

   The survey found that program participants felt the program benefited them by reducing their bills, improving the safety and comfort of their home, lowering their energy use, and providing energy education. Ameren's program compared favorably to the other programs in terms of lower energy bills and improved safety and comfort. Ninety-one percent of the Ameren respondents agreed that the program resulted in lower energy bills and 95 percent of the Ameren respondents agreed that the program resulted in a safer or more comfortable home.

3. Energy Consumption

   As expected, the electric usage impacts of the program were low, due to the focus on measures that reduce fossil fuel consumption. Net electric savings averaged 6.8 percent, lower than many other low-income energy efficiency programs that we have evaluated that place a greater emphasis on electric efficiency measures.

   *Recommendation: The program should increase its focus on electric reduction measures. This will have a greater impact on usage for Ameren customers.*

4. Bill Affordability and Coverage

   Energy costs declined by approximately $60 or 4.3 percent compared to the comparison group. While cash payments increased, assistance payments declined, resulting in a net decline in payments made.

   *Recommendation: The program should increase its focus on electric reduction measures. This will have a greater impact on affordability and payment for Ameren customers.*

## D. Program Satisfaction

Comparisons to other programs found that Ameren LIWP participants were more likely to say that the program improved the winter and summer comfort than some of these other program participants. Ameren respondents were also more likely to agree that lower energy bills and a safer or more comfortable home were benefits of the program compared to some of the other low-income weatherization programs that have been studied.

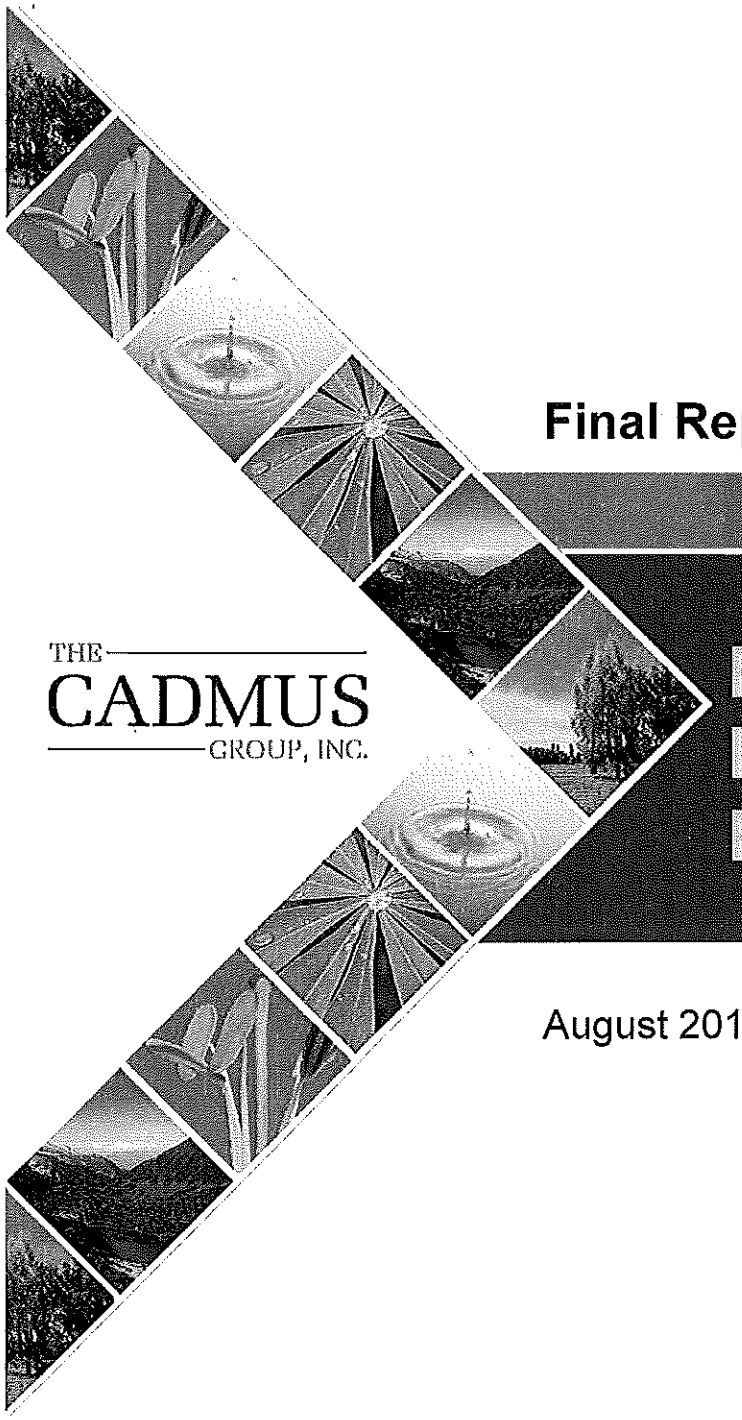
However, comparisons on measure installation and energy education, as well as overall program satisfaction, show room for improvement. Satisfaction with air sealing and insulation was not as high as in some other programs and many customers did not say they were "very satisfied" with the condition in which the contractor left their home. The survey found that Ameren's customers were somewhat more likely to say that they did not get everything that they expected than some of the other programs.

*Recommendation: Ameren should require the agencies to provide customers with information about how they can reduce their energy usage.*

*Recommendation: Ameren could provide a program information sheet for agencies to distribute during the energy audit with energy efficiency tips and Ameren's logo.*

*Recommendation: Ameren should require additional training and inspections with respect to air sealing and insulation work.*

*Recommendation: Agency weatherization staff should be given more training on how to discuss what to expect from the program with the customers.*



THE CADMUS GROUP, INC.

## Final Report

# Residential Low Income Weatherization Program Evaluation

August 2012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# ACRONYM GLOSSARY

| Acronym | Full Name |
|---|---|
| AC | Air conditioner |
| CAASTLC | Community Action Agency of St. Louis County |
| CFL | Compact fluorescent light bulb |
| CMCA | Central Missouri Community Action |
| CSI | Community Services, Inc. of Northwest Missouri |
| DAEOC | Delta Area Economic Opportunity Corp. |
| CSA | Conditional savings analysis |
| DNR | Department of Natural Resources |
| DOE | Department of Energy |
| DSM | Demand-side management |
| EHPA | Energy and Housing Professional Alliance |
| EMAA | East Missouri Action Agency, Inc. |
| HUD | Department of Housing and Urban Development |
| HVAC | Heating, ventilating, and air conditioning |
| JFCAC | Jefferson-Franklin Community Action Corp. |
| KCHCDD | Kansas City Housing and Community Development Department |
| kW | Kilowatt |
| kWh | Kilowatt hour |
| LIWP | Low Income Weatherization Program |
| MFIQ | Multi-Family Income Qualified |
| MHEA | Manufactured Home Energy Audit |
| MOCA | Missouri Ozarks Community Action, Inc. |
| MoWAP | Missouri Weatherization Assistance Program |
| NEAT | National Energy Audit Tool |
| NECAC | North East Community Action Corp. |
| NMCAA | Northeast Missouri Community Action Agency |
| OSHA | Occupational Safety and Health Administration |
| PCT | Participant Cost Test |
| PRISM | Princeton Scorekeeping Method |
| RIM | Ratepayer Impact Measure |
| SE | Standard Error |
| SIR | Savings-to-investment |
| TRC | Total Resource Cost |
| TREAT | Targeted Retrofit Energy Analysis Tool |
| UTC | Utility Cost Test |
| ULMSL | Urban League of Metropolitan St. Louis |
| WAP | Weatherization Assistance Program |

# EXECUTIVE SUMMARY

In 2012, Ameren Missouri engaged The Cadmus Group, Inc. to perform process and impact evaluations of the Low Income Weatherization Program (LIWP) implemented in 2010 and 2011 by the Missouri Department of Natural Resources (DNR).

## Program Description

Ameren Missouri partnered with the DNR and 12 subgrantees to provide weatherization services to low-income households. The LIWP achieves energy savings and demand reductions through the installation of energy-efficiency measures in the homes of Ameren Missouri electric customers with a combined household income at or below 200% of the federal poverty level. All program measures are installed at no cost to participating customers.

Overall, 438 homes participated in the program in 2010 and 2011. Air infiltration and health and safety measures were the most common, with approximately 95% of homes receiving these services. Base load measures (such as CFLs, faucet aerators, and refrigerator replacement) and building insulation measures were also installed in a large portion of homes (approximately 80%).

Multifamily properties are eligible to be weatherized under the Department of Energy (DOE) Weatherization Assistance Program (WAP) and Ameren Missouri's LIWP. DOE regulations, however, prioritize single family dwellings for weatherization because multifamily units tend to consume less energy per family. To supplement savings for their low-income customers living in multifamily properties, Ameren Missouri offers the Multi-Family Income Qualified (MFIQ) Program.

## Evaluation Overview

Cadmus identified several researchable impact and process tasks to evaluate the LIWP, summarized in Table 1.

**Table 1. LIWP Evaluation Activities**

| Activity | Impact | Process | Description |
|---|---|---|---|
| Data Tracking System Review | √ | √ | Checked whether that data required for evaluation were available. |
| Energy Savings Analysis | √ | | Analyzed the energy consumption histories of program participants to estimate average household energy savings. |
| Payment Behavior Analysis | √ | | Determined the effects of the program on the frequency and amount of payments made by participants, based on Ameren Missouri customer transaction records. |
| Cost-Effectiveness Analysis | √ | | Calculated the cost-effectiveness of the program annually, using evaluated energy savings and actual incurred implementation costs as reported by Ameren Missouri and participating subgrantees. |
| Stakeholder Interviews | | √ | Provided insight into the program design and delivery, as well as the quality of communications between stakeholders. This included interviews with Ameren Missouri, DNR, and subgrantee staff. |
| Best Practices Review | | √ | Identified best implementation practices of low-income programs across the country. Enabled Cadmus to recommend improvements, where appropriate for Ameren Missouri, that have proven successful in other parts of the country. |
| Participant Surveys | | √ | Assessed participant satisfaction with program processes, delivery, and energy education, as well as barriers to delivery. |

# Impact Evaluation Results

## Energy Savings Analysis

Cadmus conducted a weather-normalized, regression-based billing analysis of 161 participants. This analysis revealed that, on average, program participants decreased their annual energy consumption by 1,877 kWh. This represents approximately 12% savings over their pre-program annual electricity consumption. Not surprisingly, participants using electricity as their primary heating fuel showed greater savings (2,836 kWh/year) than participants heating their home with another type of fuel (1,260 kWh/year). These billing analysis results are summarized in Table 2.

**Table 2. Average Annual Household Savings (kWh/Year)**

| | Estimated Normalized Annual Consumption | | | | |
|---|---|---|---|---|---|
| | Pre-Participation | Post-Participation | Savings | Percent of Annual Savings | Precision at 90%Confidence Level |
| Electrically Heated Participants (n=63) | 21,968 | 19,132 | 2,836 | 13% | 22% |
| Non-electrically Heated Participants (n=98) | 11,740 | 10,481 | 1,260 | 11% | 24% |
| Overall Weighted Average (n=161) | 15,743 | 13,866 | 1,877 | 12% | 23% |

The total savings generated in 2010 and 2011 by the LIWP is presented in Table 3.

**Table 3. Total Annual Program Savings (kWh/Year)**

| | 2010-2011 Participants | Average Household Savings | Total Program Savings |
|---|---|---|---|
| Electric Participants | 428 | 1,877 kWh/year | 803,356 kWh/year |

## Payment Behavior Analysis

Cadmus calculated the following five payment behavior metrics:

1. The average number of assistance payments made during a 12-month period before enrollment in the program ***and*** for a 12-month period after program participation.

2. The number of payments made by the customer during a 12-month period before enrollment in the program ***and*** for a 12-month period after program participation.

3. The payment as a proportion of the amount billed before program participation ***and*** the payment as a proportion of the amount billed after program participation.

4. The average number of disconnects per month during a 12-month period before enrollment ***and*** during a 12-month period after program participation.

5. The average monthly arrearage carried during a 12-month period before enrollment ***and*** during a 12-month period after program participation.

Two of the five metrics showed a statistically significant change at the 90% confidence level between the pre- and post-periods (when compared to the payment behavior of a group of nonparticipating low income customer over the same time period) -the portion of the payments made by customers (#3) and the number of disconnects per household (#4). Full details are outlined below in the Impact Analysis section.

## Cost-Effectiveness Results

As shown in Table 4, the program proved cost-effective from the total resource cost (TRC) test and the Utility Cost Test (UCT) perspectives but not the Ratepayer Impact Measure (RIM) perspective based on avoided costs from Ameren Missouri's 2008 Integrated Resource Plan (IRP).

**Table 4. Cost-Effectiveness Summary**

| Cost-Effectiveness Test* | Levelized $ / kWh | Costs | Benefits | Net Benefits | Benefit / Cost Ratio |
|---|---|---|---|---|---|
| Total Resource Cost Test (TRC) | $0.114 | $1,048,184 | $1,075,253 | $27,068 | 1.03 |
| Utility Cost Test (UCT) | $0.114 | $1,048,184 | $1,075,253 | $27,068 | 1.03 |
| Ratepayer Impact Test (RIM) | $0.197 | $1,813,897 | $1,075,253 | ($738,645) | 0.59 |

* The Participant Cost Test (PCT) results are not presented, as all measures are free to participants.

## Recommendations

Cadmus' evaluation revealed numerous ways in which the program is succeeding, as well as identified opportunities for improving processes and outcomes. The notable findings we discovered during the evaluation process outlined in the following sections.

**Table 5. LIWP Evaluation Recommendations**

| No. | Recommendation |
|---|---|
| 1 | **Increase Ameren Missouri sponsorship awareness through leave-behind materials.** To help increase participant awareness of utility program sponsorship, create Ameren Missouri-branded materials or products for subgrantees to leave behind with participants. Items other utilities provide include LED or electroluminescent nightlights and refrigerator magnets with energy-saving tips. |
| 2 | **Develop Ameren Missouri-specific LIWP funding guidelines that complement the existing federal guidelines and allow subgrantees to more comprehensively serve participants, thereby achieving greater savings.** In some cases, Ameren Missouri funds could help achieve deeper savings if not tied to the federal program regulations For example, there are several electric measures excluded from the federal program unless categorized as health and safety measures with a special doctor's note exception (such as air conditioners, electric heat pumps, and electric furnaces). Several subgrantees reported permission for these measures is seldom granted. If these types of measures are determined to have energy savings when installed as non-health and safety measures in a broader application (through the exercise suggested in recommendation 3 below), the program could potentially generate greater energy savings for Ameren Missouri and LIWP participants. |
| 3 | **Collaboratively assess the potential addition of new electric measures.** In coordination with DNR, Ameren Missouri should research electric measures not currently offered to identify any new technologies for potential inclusion in future LIWP offerings (funded through Ameren Missouri). Research objectives could include: 1) developing a list of possible new measures by reviewing program offerings in other states (benchmarking comparison); 2) conducting a qualitative screening of measures that considers measure availability, applicability, and installation difficulty; and 3) conducting a quantitative economic screening of measures to assess viability. |
| 4 | **Increase interaction between Ameren Missouri and program implementers (subgrantees and DNR).** Ameren Missouri should regularly attend the quarterly EHPA meetings as an opportunity for all program stakeholders to discuss best practices, implementation challenges, and share technical advice regarding LIWP services |
| 5 | **Create performance indicators to track program performance.** Participation and saving targets can be used as metrics to inform program performance. These targets should be distributed to the DNR and subgrantees, which should track and report the metrics to Ameren Missouri on a regular basis. Savings can be attributed to and increase Ameren Missouri's DSM portfolio savings. |

| | |
|---|---|
| 6 | **Track and electronically report measure-specific details for all participants.** Measure-specific information should include, for example, the specific type(s) of insulation installed (attic, wall, basement), as well as the total area insulated (square feet) and the R-values of the home's insulated areas pre- and post-program. [1] Inputs used for the NEAT software, as well as the expecting savings resulting from the tool are also extremely useful for comparing – and understanding any potentially disparities between – expected and evaluated savings. Without this level of detail, the accuracy of evaluation results, evaluation's ability to inform program planning, and the overall value of evaluation in general are unfortunately limited. To the greatest extent possible improved measure tracking should document funding source as this information would provide greater transparency into which measures were funded using utility contributions. |
| 7 | **Track and electronically report previously inoperable heating or cooling units, as well as those that were replaced rather than tuned-up.** Cadmus recommends that the subgrantees collect and record information for these situations to inform and improve future evaluations. |

# INTRODUCTION

## Program Description

Ameren Missouri partnered with the Missouri DNR and 12 subgrantees to provide weatherization services to low-income households. These services are delivered in parallel with the DOE WAP. Like WAP, the LIWP achieves energy savings and demand reductions through the installation of energy-efficiency measures provided at no cost in the low-income customers' homes.

In 2010-2011, Ameren Missouri spent a total of $1,098,093 providing weatherization services to 428 electric low-income households.[2] DOE WAP expenditures for the same group were $587,271.

Of those 428 homes, 190 (44%) used electricity as their primary heating fuel. Table 6 shows the number of participants receiving measures in each measure category, as well as average total expenditures by measure category (includes Ameren Missouri and DOE WAP expenditures).[3] For both electrically heated homes and non-electrically heated homes Ameren contributed, on average, approximately two-thirds of total funds spent per household.

[1] See Appendix E for an example of the type of data fields recommended for tracking and reporting for another low income program evaluation.

[2] Gas-only low income households were not eligible to receive program funding from Ameren Missouri for the 2010 and 2011 program years.

[3] A breakdown of expenditures by Ameren Missouri and DOE WAP at the measure category level were not available.

**Table 6. Total Expenditures by Measure Category**

| Measure Category | Non-electric Heat | | Electric Heat | |
|---|---|---|---|---|
| | Number of Participants | Average Dollars Spent | Number of Participants | Average Dollars Spent |
| Base Load | 198 | $136 | 167 | $194 |
| Building Insulation | 188 | $1,451 | 155 | $1,255 |
| Windows | 67 | $746 | 93 | $598 |
| Infiltration | 233 | $722 | 185 | $657 |
| Incidental Repair | 174 | $913 | 124 | $884 |
| Health and Safety | 232 | $567 | 180 | $722 |
| HVAC System | 198 | $1,872 | 167 | $557 |
| Overall | 238 | $4,767 | 190 | $3,549 |

## Evaluation Overview

Cadmus identified several researchable impact and process tasks to evaluate the LIWP, which are summarized in Table 7.

**Table 7. Evaluation Activities**

| Activity | Impact | Process | Details |
|---|---|---|---|
| Data Tracking System Review | √ | √ | Checked whether data required for evaluation were available. |
| Energy Savings Analysis | √ | | Analyzed the energy consumption histories of program participants to estimate average household energy savings. |
| Payment Behavior Analysis | √ | | Determined the effects of the program on the frequency and amount of payments made by participants, based on Ameren Missouri customer transaction records. |
| Cost-Effectiveness Analysis | √ | | Calculated the cost-effectiveness of the program annually, using evaluated energy savings and actual incurred implementation costs as reported by Ameren Missouri and participating subgrantees. |
| Stakeholder Interviews | | √ | Provided insight into the program design and delivery, as well as the quality of communications between stakeholders. This included interviews with Ameren Missouri, DNR, and subgrantee staff. |
| Best Practices Review | | √ | Identified best implementation practices of low-income programs across the country. Enabled Cadmus to recommend improvements, where appropriate for Ameren Missouri, that have proven successful in other parts of the country. |
| Participant Surveys | | √ | Assessed participant satisfaction with program processes, delivery, and energy education, as well as barriers to delivery. |

## Report Organization

The remainder of this report provides the following sections in this order:

- ***Methodology***, which contains an explanation of the evaluation tasks and how data were collected and analyzed for this project.
- ***Impact Evaluation Findings***, which detail key results from our impact evaluation activities.
- ***Process Evaluation Findings***, which detail key results from our process evaluation activities.

- ***Conclusions and Recommendations***, which (1) describes the ways in which the program is performing well and (2) identifies opportunities for improving processes and outcomes.
- ***Appendices***, which contains the interview guides for all interviewee groups and an example of the type of measure-specific program data that is recommended to be collected, tracked and electronically reported for future program years.

# METHODOLOGY

This section details the methods Cadmus used for each of the seven impact and process evaluation tasks:

1. Data tracking system review (impact)
2. Energy savings analysis (impact)
3. Payment behavior analysis (impact)
4. Cost-effectiveness analysis (impact)
5. Stakeholder interviews (process)
6. Participant surveys (process)
7. Best practices review (process)

## Impact Evaluation

### Data Tracking System Review

At the outset of our evaluation, Cadmus reviewed all program data, including tracking databases maintained by the Missouri DNR, to check the availability of data required for the impact evaluation. We reviewed all the relevant data as soon as they were submitted to us, then scheduled meetings with the DNR and Ameren Missouri to discuss our findings.

The DNR tracking database did not include measure-specific installation fields, which we had anticipated having when we prepared our evaluation plan. The database reported the dollar amount spent for several measure groups: base load, HVAC system, air infiltration, health and safety, windows, building insulation, client education, and disaster. Cadmus also obtained data from the DNR detailing the commonly installed measures from each measure group.

### Energy Savings Analysis

Cadmus estimated the program energy savings through billing analysis. Specifically, Cadmus developed a household-level, fixed-effects, conditional savings analysis (CSA) with paired-months model using program data the DNR made available through the Web-based database launched in September 2010, billing records provided by Ameren Missouri, and historical weather information maintained by the National Oceanic and Atmospheric Administration (NOAA).

In order to control for factors outside of the program that may cause changes in energy consumption behavior (such as macroeconomic factors), Cadmus' billing analysis utilized a comparison group of Ameren Missouri low income customers that had not participated in the program as of December 2011.The comparison group was derived from Ameren electric customers who had received LIHEAP assistance in the past year, which indicated the household was income-eligible to participate in LIWP. The composition, development, and applicable of comparison group is explained in more detail in the Impact Analysis section below.

## Payment Behavior Analysis

The energy cost burden is significantly greater for low-income households than for non-low-income households. Effective weatherization programs ease the financial burden through reduced monthly bills, which thereby increase the residents' ability to make their utility payments, as well as to better afford other necessities.

To analyze payment behavior, Cadmus used the utility customer transaction records to determine the effects of the program on the frequency and level of payments made by participants.

Cadmus calculated the following five payment behavior metrics:

1. The average number of assistance payments made during a 12-month period before enrollment in the program ***and*** for a 12-month period after program participation.
2. The number of payments made by the customer during a 12-month period before enrollment in the program ***and*** for a 12-month period after program participation.
3. The payment as a proportion of the amount billed before program participation ***and*** the payment as a proportion of the amount billed after program participation.
4. The number of reconnections (which indicates a collection action resulting in a service disconnection).
5. The average monthly arrearage carried during a 12-month period before enrollment ***and*** during a 12-month period after program participation.

Based on our experience with similar studies, these indicators represent a comprehensive set of metrics for assessing program-induced changes in payment behavior. Of the five, the clearest measure of customer performance is the total amount paid compared to the total amount billed. The payment behavior analysis also utilized the same control group as the energy savings analysis to account for non-program related changes in payment behavior between the pre- and post-participation.

## Cost-Effectiveness Analysis

In assessing cost-effectiveness, Cadmus analyzed program costs and benefits from the three different perspectives listed below, using our proprietary DSM Portfolio Pro[4] model. We based the benefit-to-cost ratios on methods described in the California Standard Practice Manual for assessing demand-side management (DSM) programs' cost-effectiveness.

1. **Total Resource Cost (TRC) Test:** This test examined program benefits and costs from Ameren Missouri's and Ameren Missouri customers' perspectives, combined. On the benefit side, it included avoided energy costs, capacity costs, and line losses. On the cost side, it included costs incurred by both the utility and participants.

[4] DSM Portfolio Pro has been independently reviewed by various utilities, their consultants, and a number of regulatory bodies, including the Iowa Utility Board, the Public Service Commission of New York, the Colorado Public Utilities Commission, and the Nevada Public Utilities Commission.

2. **Utility Cost Test (UCT):** From Ameren Missouri's perspective, benefits included avoided energy, capacity costs, and line losses. Costs included program administration, implementation, evaluation, or incentive costs associated with program funding.

   **Ratepayer Impact Measure (RIM):** All ratepayers (participants and nonparticipants) may experience rate increases designed to recover lost revenues. This test included all Ameren Missouri program costs and lost revenues. Benefits included avoided energy costs, capacity costs, and line losses.

# Process Evaluation

## Stakeholder Interviews

In April 2012, Cadmus conducted in-depth interviews with 12 key LIWP stakeholders. We focused the interviews on program design and delivery and the communication between program partners. Collectively, these interviews provided us with an opportunity to assess the LIWP from multiple perspectives and identify possible areas for improvement.

The program stakeholder interview guides are included in the appendices (Appendix A though Appendix C). Table 8 lists the stakeholders we interviewed and the research topics we discussed.

**Table 8. Stakeholder Interview Sample**

| Stakeholder | Research Areas |
|---|---|
| Ameren Missouri (Program Manager) | Program goals and objectives, program implementation, quality control, communication processes, energy education, and the impact of Recovery Act funding. |
| Missouri DNR (Program Implementer) | Coordination between utility and state program dollars, monitoring procedures, training and technical assistance, and the role of Ameren Missouri as the program continues after the Recovery Act funding deadline. |
| Subgrantees | |
| Community Services, Inc. of Northwest Missouri (CSI) | Differences between weatherization services provided through Ameren Missouri's program and services provided for the state weatherization program in Missouri; subgrantees program resources allocation; any barriers to delivery of the Ameren Missouri program services; any differences in delivery of program services across agencies; consumer education delivery; and the effectiveness of different delivery approaches. |
| Jefferson-Franklin Community Action Corp. (JFCAC) | |
| Missouri Ozarks Community Action, Inc. (MOCA) | |
| Northeast Missouri Community Action Agency (NMCAA) | |
| Community Action Agency of St. Louis County (CAASTLC) | |
| East Missouri Action Agency, Inc. (EMAA) | |
| Central Missouri Community Action (CMCA) | |
| Delta Area Economic Opportunity Corp. (DAEOC) | |
| Urban League of Metropolitan St. Louis (ULMSL) | |
| Kansas City Housing and Community Development Department (KCHDD) | |

## Participant Surveys

In May 2012, Cadmus surveyed 101 randomly selected LIWP participants. These surveys provided results for most questions at the 90% confidence with 10% precision level for the program overall. The participant survey focused on program satisfaction, perceived benefits, and energy education received. The Process Evaluation section includes select participant survey findings, as appropriate. Appendix D provides the full participant survey instrument.

## Best Practices Review

Through robust literature reviews, Cadmus has previously identified the best practices of low-income programs across the country. We compared these best practices to Ameren Missouri's current program design. We have provided recommendations in this report for improvements that have proven successful in other parts of the country, where appropriate. Table 9 lists the low-income weatherization programs we used as benchmarks.

**Table 9. Comparable Programs**

| Program Reference | Region | Fuel | Program Year(s) | Program Population (n) |
|---|---|---|---|---|
| MW Utility | Midwest | Electric | 2010 - 2011 | 850 |
| NE Utility* | Northeast | Electric/Gas | 2010 - 2011 | 16,500 |
| NW Utility (1) | Northwest | Electric/Gas | 2011 | 1,500 |
| NW Utility (2) | Northwest | Electric/Gas | 2010 | 550 |
| W Utility (1) | Western | Electric | 2007 - 2009 | 1,800 |
| W Utility (2) | Western | Electric | 2009 - 2010 | 6,300 |

* The NE Utility program we compared is a statewide evaluation comprised of eight utilities.

# IMPACT EVALUATION RESULTS

Cadmus evaluated several different model specification options before selecting the household-level, fixed-effects, conditional savings analysis (CSA) with paired-months modeling approach detailed in this section. We also considered measure-specific and household-level Princeton Scorekeeping Method (PRISM) models. The fixed-effects CSA model we used generated the average savings for the average participant and produced estimated savings at the highest level of precision.

## Data Attrition

According to program records provided by DNR, 428 unique Ameren Missouri customer accounts received weatherization services funded by Ameren Missouri through LIWP in 2010 and 2011 (153 and 275, respectively). However, not all of those customer account records could be matched to the billing records received from Ameren Missouri and included in the billing analysis. Table 10 summarizes the attrition of the accounts in the participant group. Each filter is described in greater detail below.

**Table 10. Summary of Data Attrition**

| Filter | Participants Removed | Remaining Participants | Percent of Population |
|---|---|---|---|
| Program Population | - | 428 | 100% |
| Could not be matched with billing records | 25 | 402 | 6% |
| Fewer than 9 months of billing data | 214 | 189 | 50% |
| Extreme usage screen | 28 | 161 | 4% |
| Analysis Dataset Total | 267 | 161 | 62% |

The greatest source of data attrition was insufficient pre- and post-participation billing data. While a full year of billing data is ideal to capture variations in consumption due to seasonality,

only 69 of the 402 customers successfully matched with billing record would have met this strict criterion. To ensure a sufficient sample size for analysis, Cadmus excluded only customers with less than nine months of billing data in both the pre- and post-periods. The nine month requirement also include a mandate that any electrically heated customer have at least two months of billing records from two of the following three months in both the pre- and post-period: December, January, and February. This additional requirement ensured usage during in the heating season was represented even when less than a full year's data was available for a specific participant.

To allow for accurate comparisons between before and after program intervention, Cadmus used a paired months approach. That is, we compared only the same months in the pre – and post-period to ensure an appropriate seasonal comparison.

Table 11 shows the number of months (in both the pre- and post-period) for which billing data were available for participants in the final analysis dataset. As evident in the table, 11 months of data or more were available for greater than three-quarters of the analysis sample.

**Table 11. Months of Billing Data**

| Number of Months | Participants | Percent |
|---|---|---|
| 9 or 10 months | 89 | 55% |
| 11 months | 47 | 13% |
| 12 | 51 | 32% |
| Analysis Dataset Total | 161 | 100% |

Second, while we determined savings using the pooled fixed-effects model, we used a PRISM model to screen accounts for negative heating or cooling coefficients. A negative coefficient – cooling, for example – implies that as temperature rises (calling for air conditioning) or declines (calling for heating), these homes actually decreased consumption. Such patterns are illogical and could indicate potential issues such as prolonged vacancies or temporary usage fluctuations. Without knowledge of the cause of such trends, these homes were removed to avoid potential bias.

Finally, Cadmus also screened for extreme usage accounts – which can also bias the results. Specifically, we removed customers with annual kWh usage greater than 33,000 or less than 5,203. These filters removed the top and bottom 5% of participants. We also screened those accounts with annual usage that changed by greater than 50% (approximately two standard deviations from the mean) between the pre- and the post-periods. Changes of this magnitude are unlikely the result of weatherization and more likely due to changes in household size or some other non-program related factor that could potential bias results.

## Comparison Group

Cadmus used billing data from Ameren Missouri electric customers who had previously received LIHEAP assistance as a comparison group. The customers' receipt of LIHEAP assistance ensures they meet the same income eligibility thresholds as LIWP participants. Ameren Missouri provided a sample of 3,409 randomly selected customer billing and payment histories from

January of 2009 through June 2012. No additional data were available to determine home type (single family or multifamily) or any other housing characteristics.

The comparison group was given an artificial treatment period set to the average completion date for 2010 and 2011 LIWP participants: February 2011. Twelve months of billing history were kept prior to and after February 2012 for billing analysis.

Cadmus applied the same screens detailed previously for the participants the comparison group. Cadmus then used the pre-period normalized annual consumption (pre-NAC) to match the usage distributions by quartile using a Monte Carlo approach.

## Model Specification

Once we had applied the above screening to the billing data, Cadmus considered the following fixed-effects model specifications for weather-sensitive measures' savings:

*Model 1:*

$$Average\ Daily\ kWh_{it} = \beta_1 * Average\ Daily\ HDD_{it} + \beta_2 * Average\ Daily\ CDD_{it} + \beta_3 * Base\ load * POST + \beta_4 * Building\ Insulation * POST + \beta_5 * Air\ Infiltration * POST + \beta_6 * HVAC\ System * POST + \beta_7 * Window\ Treatment * POST + \beta_8 * POST_{it} + \varepsilon_{it}$$

Cadmus also considered the following fixed-effects model specification for the total program savings over all measure groups:

*Model 2:*

$$Average\ Daily\ kWh_{it} = \beta_1 * Average\ Daily\ HDD_{it} + \beta_2 * Average\ Daily\ CDD_{it} + \beta_3 * Total\ Program\ Costs * POST + \beta_4 * POST_{it} + \varepsilon_{it}$$

The following final model specification controlled for weather,used an indicator variable for post-treatment months and an interactive term to capture the post change attributable to program participation:

*Model 3:*

$$Average\ Daily\ kWh_{it} = \beta_1 * Average\ Daily\ HDD_{it} + \beta_2 * Average\ Daily\ CDD_{it} + \beta_3 * POST_{it} + \beta_4 * POST*PART_{it} + \varepsilon_{it}$$

Where:

$Post$ = a dummy indicator when month$_t$ is after weatherization work is completed for customer$_i$.

$Part$ = a dummy variable indicating customer$_i$ was an LIWP participant.

Model 1 showed significant correlations with between the dollars spent and the kWh savings for many of the measure categories (insulation, HVAC, windows, and air infiltration measures). We did not select this model, however, because the measure category and dollar-based estimates of savings summed to only 41% of the savings observed when assessing savings at the household level. This discrepancy indicated either model misspecification or omitted variable bias, most likely the latter due to the lack of measure specific information.

Had measure-specific installation data been available, we may have been able to accurately attribute savings to specific measures. As measure group level data were the only data available, there was no way to identify which homes received which treatments or identify which homes might have had treatments installed that would lead to an increase in consumption (i.e., fixing a previously inoperable unit).

Some participants exhibited a large increase in their heating or cooling load post-treatment, which could indicate a previously inoperable HVAC unit. Cadmus looked for correlations between homes with increased heating or cooling loads in the post-treatment period and large expenditures in the HVAC or health and safety measure categories, but any such correlations were determined too weak to apply.

Model 2 results showed that the total program costs had only a marginally significant impact on overall savings. The marginal significance of the result is likely driven by the expenditures on measures groups that are not likely to yield savings, such as the incidental repair, health and safety, and disaster preparedness expenditures.

Model 3 proved to be the most reliable specification as the model showed a statistically significant decrease in the average daily kWh usage at the household level after controlling for weather. As a result, Model 3 was used to report average evaluated electric savings for 2010 and 2011 LIWP participants. The model coefficients are detailed in Table 12.

**Table 12. Model Coefficients by Primary Heating Fuel**

| Explanatory Variables | Electric Heat | | Non-electric Heat | | Comparison Group | |
|---|---|---|---|---|---|---|
| | Coefficient Estimate | SE | Coefficient Estimate | SE | Coefficient Estimate | SE |
| Intercept – (Average Daily kWh)† | 24.08 | * | 15.02 | * | 16.04 | * |
| Average Daily HDD | 2.07 | 0.07 | 0.50 | 0.03 | 1.29 | 0.02 |
| Average Daily CDD | 2.23 | 0.13 | 2.36 | 0.06 | 2.34 | 0.03 |
| Dummy: Post-Period | -7.77 | 1.02 | -3.45 | 0.50 | -0.27 | 0.30 |
| †The intercept captures all non-weatherization related or weather related energy use. | | | | | | |

Table 12 shows that the comparison group also showed a slight decrease in consumption between the pre- and post-periods, though the change was not statistically significant in the comparison group. The observed decrease in the control group was less than 1% of total annual usage.

After adjusting for the comparison group (which controls for naturally occurring decreases in energy consumption unrelated to the program), our analysis determined an average annual decrease of 12% for 2010 and 2011 participants, or 1,877 kWh/year (Table 13). The consumption values were derived from the estimated statistical model shown in Table 12 using typical meteorological year (TMY3) normal heating degree days (HDDs) and cooling degree days (CDDs) for the ZIP codes in the sample.

**Table 13. Average Normalized Annual kWh Consumption Pre/Post Treatment by Primary Heating Fuel**

| Primary Heating Fuel | Estimated Pre kWh | Estimated Post kWh | Savings | Percent Change | Precision at 90% Confidence Level |
|---|---|---|---|---|---|
| Electric Heat | 21,968 | 19,132 | 2,836 | 13% | ± 22% |
| Non-electric Heat | 11,740 | 10,481 | 1,260 | 11% | ± 24% |
| Overall | 15,743 | 13,866 | 1,877 | 12% | ± 23% |

Total program savings for 2010 and 2011 are provided in Table 14.

**Table 14: Total Program Savings**

| 2010-2011 Participants | Average Household Savings | Total Program Savings |
|---|---|---|
| 428 | 1,877 kWh/year | 803,356 kWh/year |

Ameren Missouri spent an average of $2,758 per household, which accounted for approximately 65% of the total expenditure in participating homes (which included DOE WAP and ARRA funds). Details are provided in Table 15 and Table 16.

It is interesting to note that more Ameren Missouri funds were spent on non-electrically heated participants than electrically heated participants. However, the lack of specificity about which measures were installed or funding contributions (Ameren Missouri versus other sources) at the measure category level makes it difficult to draw conclusions regarding the allocation of funds.

**Table 15. Average Total Expenditures by Funding Source and Primary Heating Fuel**

| | Non-electric Heat | | | Electric Heat | | | Overall[5] | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | Average Total Expenditures | Average Ameren Total Expenditures | N | Average Total Expenditures | Average Ameren Total Expenditures | N | Average Total Expenditures | Average Ameren Total Expenditures |
| Total Cost | 238 | $4,767 | $3,182 | 190 | $3549 | $2,228 | 428 | $4,226 | $2,758 |

**Table 16. Savings per Dollar by Primary Heating Fuel**

| Primary Heating Fuel | Average Ameren Expenditures | Average Savings | Average Savings (kWh per Dollar) |
|---|---|---|---|
| Electric | $2,228 | 2,836 kWh | $ 1.27 |
| Non-electric | $3,182 | 1,260 kWh | $ 0.40 |

## Benchmarking

To provide context for these results, the figure below compares Ameren Missouri's average savings with that determined through the evaluation of several other low income weatherization programs. It is critical to note that direct comparison of programs is problematic due to potential differences in funding levels, measures offered, weather, and building and participant characteristics. While true, Figure 1 does indicate the results of this evaluation are generally similar to those observed for other electric low income weatherization programs.

[5] Average total expenditures and average Ameren total expenditures are weighted averages by primary heating fuel.

**Figure 1. Savings Comparison to Other Electric Low Income Programs**

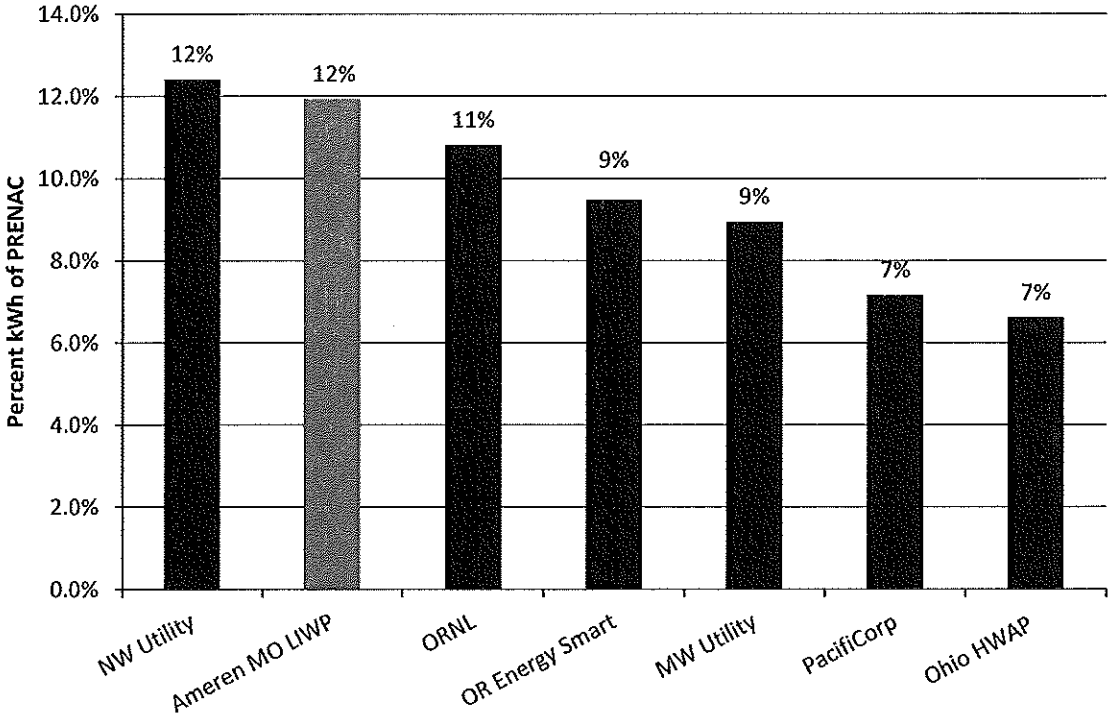



**Table 17. Benchmarking References[6]**

| Label | Reference |
|---|---|
| ORNL | Schweitzer, Martin. 2005. Estimating the National Effects of the U.S. Department of Energy's Weatherization Assistance Program with State-Level Data: A Meta-evaluation Using Studies from 1993 to 2005.[7] |
| OR Energy Smart | Quantec, 2008. Energy Smart Program Evaluation, Oregon HEAT.[8] |
| PacifiCorp | The Cadmus Group, 2011. Idaho Low-Income Weatherization Program Evaluation (2007-2009), PacifiCorp.[9] |
| Ohio HWAP | Quantec, 2006. Ohio Home Weatherization Assistance Program Impact Evaluation, Ohio Office of Energy Efficiency.[10] |

[6] The evaluations labeled *NW Utility* and *MW Utility* are not publically available; therefore no references are provided.

[7] http://weatherization.ornl.gov/pdfs/ORNL_CON-493.pdf

[8] Not available online.

[9] http://www.pacificpower.net/content/dam/pacific_power/doc/About_Us/Rates_Regulation/Washington/Regulatory_Filings/DSM_I_937_Compliance_Filing/07-02-10_Revised_Report/Revised_Report/WA_UE_100170_Revised_Rpt_7_2_10.pdf

[10] https://development.ohio.gov/cms/uploadedfiles/Development.ohio.gov/Divisional_Content/Community/Office_of_Community_Services/HWAPImpactEvaluation.pdf

## Payment Behavior Analysis

Cadmus used the same comparison and treatment accounts outlined in the billing analysis section to analyze changes in payment behavior after program participation. Again, the control group is included to account for naturally occurring, non-program related trends in payment behavior amongst low income customers. In most cases, the cause of these naturally occurring changes are due to macroeconomic factors.

Table 17 provides a comparison of the five payment metrics. In summary:

- The average number of disconnects for participants declined (by 133%) compared to the control group.
- The percent of payments made by participants increased by an average of 5% compared to control group.
- The frequency of monthly arrangements increased by 3% for participants, though, the amount of assistance needed declined as the percent of payments made by customers increased.
- Average arrearage and number of payments made by participants showed no significant changes as a result of participation in LIWP.

**Table 18: Payment Analysis Results by Metric**

| Metric | Group | Pre-LIWP | | | Post-LIWP | | | Difference | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mean | SE | p-value | Mean | SE | p-value | Mean | SE | p-value | Percent Change |
| 1. Number of Monthly Assistance Payments | Comparison | 0.89 | 0.01 | - | 0.87 | 0.01 | - | (0.02) | 0.01 | **0.00** | -2% |
| | Participants | 0.91 | 0.01 | 0.00 | 0.92 | 0.01 | 0.00 | 0.01 | 0.01 | **0.32** | 1% |
| | Difference | 0.02 | 0.01 | 0.20 | 0.05 | 0.01 | 0.00 | 0.03 | 0.01 | **0.02** | 3% |
| 2. Number of Payments Made by Customer | Comparison | 0.65 | 0.01 | 0.00 | 0.68 | 0.01 | 0.00 | 0.03 | 0.01 | **0.00** | 4% |
| | Participants | 0.71 | 0.02 | 0.00 | 0.75 | 0.02 | 0.00 | 0.04 | 0.01 | **0.01** | 5% |
| | Difference | 0.06 | 0.02 | 0.00 | 0.07 | 0.02 | 0.00 | 0.01 | 0.02 | **0.42** | 2% |
| 3. Average Number of Disconnects | Comparison | 0.008 | 0.001 | 0.000 | 0.012 | 0.001 | 0.000 | 0.004 | 0.002 | **0.01** | 53% |
| | Participants | 0.005 | 0.002 | 0.003 | 0.001 | 0.001 | 0.163 | (0.004) | 0.002 | **0.03** | -80% |
| | Difference | (0.003) | 0.002 | 0.089 | (0.011) | 0.001 | 0.000 | (0.008) | 0.002 | **0.00** | -133% |
| 4. Average Arrearage | Comparison | 165.0 | 5.0 | 0.0 | 190.0 | 7.7 | 0.0 | 25.0 | 5.6 | **0.0** | 15% |
| | Participants | 108.6 | 8.7 | 0.0 | 135.2 | 11.4 | 0.0 | 26.6 | 7.0 | **0.0** | 24% |
| | Difference | -56.4 | 10.0 | 0.0 | -54.8 | 13.7 | 0.0 | 1.6 | 9.0 | **0.9** | 9% |
| 5. Average Percent of Payment Made by Customer | Comparison | 84% | 1% | 0.00 | 83% | 1% | 0.00 | -1% | 1% | **0.23** | -1% |
| | Participants | 87% | 2% | 0.00 | 90% | 1% | 0.00 | 3% | 1% | **0.02** | 4% |
| | Difference | 3% | 2% | 0.082 | 7% | 2% | 0.00 | 4% | 2% | **0.01** | 5% |

## Cost-Effectiveness Analysis

Table 19 provides selected cost analysis inputs including: evaluated energy savings, measure life, the discount rates, line losses, and program costs. Ameren Missouri provided all of these values, except the energy savings, which was determined by the billing analysis.

**Table 19. Selected Cost Analysis Inputs**

| Description | Input |
|---|---|
| Participation (number of homes) | 428 |
| Total Program Savings (kWh) | 803,356 |
| Measure Life[11] (years) | 20 |
| Discount Rate – Utility | 7.67% |
| Line Losses | 8.05% |
| Program Costs | $1,098,093 |

Table 20 presents the program cost-effectiveness analysis results for 2010 and 2011. No non-energy benefits were included in this analysis. The cost-effectiveness analysis results indicate that the program was cost-effective from the total resource cost (TRC) test and the Utility Cost Test (UTC) perspectives but not the Ratepayer Impact Measure (RIM) perspective based on avoided costs from Ameren Missouri's 2008 Integrated Resource Plan (IRP).[12]

**Table 20. 2010-2011 Program Cost-Effectiveness Summary**

| Cost-Effectiveness Test* | Levelized $ / kWh | Costs | Benefits | Net Benefits | Benefit / Cost Ratio |
|---|---|---|---|---|---|
| Total Resource Cost Test (TRC) | $0.114 | $1,048,184 | $1,075,253 | $27,068 | 1.03 |
| Utility Cost Test (UCT) | $0.114 | $1,048,184 | $1,075,253 | $27,068 | 1.03 |
| Ratepayer Impact Test (RIM) | $0.197 | $1,813,897 | $1,075,253 | ($738,645) | 0.59 |

* The Participant Cost Test (PCT) results are not presented, as all measures are free to participants.

## Avoided Cost Scenarios

The cost-effectiveness results shown above in Table 20 were based on avoided costs from Ameren Missouri's 2008 Integrated Resource Plan (IRP) (Scenario 1). To test the sensitivity of program cost-effectiveness to changes in avoided costs, we also assessed cost-effectiveness under two additional scenarios: avoided costs from the 2011 Missouri Energy Efficiency Investment Act filing (Scenario 2); and the most recent 2012 avoided costs (Scenario 3).

Table 21 shows a comparison of cost-effectiveness results for these avoided cost scenarios.

[11] Consistent with the Department of Energy's Weatherization Assistance Program

[12] Cadmus did not calculate a benefit-cost ratio for the PCT, though the program can be considered cost-effective through this perspective, as Ameren Missouri funded 100% of the measure costs during 2010–2011

**Table 21. 2010-2011 Comparison of Avoided Cost Scenarios**

| Cost-Effectiveness Test | Avoided Cost Scenario | PV Costs | PV Benefits | Net Benefits | Benefit / Cost Ratio |
|---|---|---|---|---|---|
| Total Resource Cost Test (TRC) | 1 | $1,048,184 | $1,075,253 | $27,068 | 1.03 |
| | 2 | $1,048,184 | $768,473 | ($279,711) | 0.73 |
| | 3 | $1,048,184 | $711,028 | ($337,156) | 0.68 |
| Utility Cost Test (UCT) | 1 | $1,048,184 | $1,075,253 | $27,068 | 1.03 |
| | 2 | $1,048,184 | $768,473 | ($279,711) | 0.73 |
| | 3 | $1,048,184 | $711,028 | ($337,156) | 0.68 |
| Ratepayer Impact Test (RIM) | 1 | $1,813,897 | $1,075,253 | ($738,645) | 0.59 |
| | 2 | $1,813,897 | $768,473 | ($1,045,424) | 0.42 |
| | 3 | $1,813,897 | $711,028 | ($1,102,869) | 0.39 |

Since the only difference between each scenario is the avoided costs used to calculate the program benefits, the present value of the costs for each scenario are the same. In Table 21 the benefits are calculated as present value of the avoided energy costs and the avoided capacity costs over the average life of the measures installed (20 years).

# PROCESS EVALUATION FINDINGS

Cadmus' process evaluation consisted of stakeholder interviews, participant surveys, and a best practices review. Rather than presenting the findings of each task separately, this section outlines the main themes that emerged throughout our research.

## Program History

The Ameren Missouri-funded LIWP was designed to run in parallel with the DOE WAP. According to program stakeholders, the LIWP is administered by the Missouri DNR using the same requirements as for the DOE WAP. These requirements are detailed in the findings below.

### Program Goals and Objectives

The objective of the LIWP is to provide whole-house weatherization assistance to low-income Ameren Missouri customers. Ameren Missouri reported that their weatherization efforts are meant to reduce their customers' energy consumption, and as a result, enable those customers to afford their reduced energy bills.

Ameren Missouri and the DNR reported there are no program participation or savings goals associated with the LIWP funding. The only performance metric the DNR tracks is the estimated production schedule submitted by each subgrantee based on their allocated annual budgets. This metric is monitored by the DNR on a monthly basis.

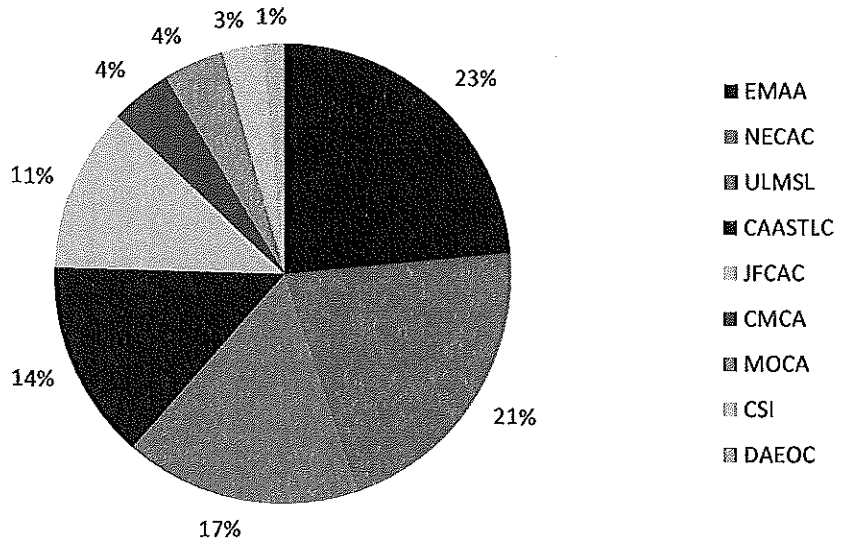
### American Reinvestment and Recovery Act of 2009

According to Ameren Missouri program staff, the addition of Recovery Act funding was a concern. The LIWP program manager reported that Ameren Missouri's share of the total program funding decreased significantly with the addition of the Recovery Act dollars, leading Ameren Missouri to become concerned about what impact the Recovery Act money would have on program services. With the influx of Recovery Act dollars during the 2010 and 2011 program years and the rush to expend those funds, the DNR and many of the subgrantees reported rolling over Ameren Missouri's funds to spend after the Recovery Act funding expires in 2012.

## Program Implementation

According to the DNR, Ameren Missouri's funding is allocated to the 12 subgrantees, which are 10 community action agencies, one not-for-profit organization, and one city department that delivers LIWP program services directly to low-income customers. The allocation of Ameren Missouri funding is dependent on the size of each subgrantee's service territory and the number of Ameren Missouri customers in that territory. Figure 2 illustrates the share of total LIWP Ameren Missouri customers served by each subgrantee.

**Figure 2. Participation Share by Subgrantee**




## Program Eligibility and Client Selection

In compliance with federal WAP regulations, any Ameren Missouri customer with a household income at or below 200% of the federal poverty level is eligible to receive LIWP services. According to program stakeholders, this level was raised from 150% as a stipulation of the stimulus money received through the Recovery Act.

The DNR implemented a Web-based data tracking system, Missouri Weatherization Assistance Program (MoWAP), which assists with customer selection through DOE's standardized, points-based waiting list. Priority is determined based on a list of criteria, which include the following:[13]

1. Elderly (defined as an individual 60 years of age or older)
2. Persons with disabilities
3. Children
4. Number of household members
5. Household income
6. Primary fuel types
7. Date of application
8. Optional criteria including fuel costs as a percentage of household income and/or emergency type situations

[13] http://www.dnr.mo.gov/energy/docs/Section%202%20Client%20Services.pdf

Subgrantees must select Ameren Missouri customers from the waiting list based on the MoWAP demographic priority; however, according to the DNR, the waiting lists were very short during 2010 and 2011. Subgrantees explained that before the Recovery Act, they had waiting lists of up to 700 households and it could take up to four years for an applicant to receive weatherization services. As the subgrantees escalated their services to spend Recovery Act funds, the waiting lists dwindled and many homes were able to receive services within six months of submitting an application. According to the subgrantees, this will change dramatically once Recovery Act funds are exhausted and the program is funded primarily by utility contributions. Program stakeholders expect the waiting lists and the time it takes for customers to receive services to increase as funding dwindles and production slows.

### Multifamily Eligibility

Multifamily buildings are eligible for LIWP services. The program eligibility requirements are slightly different for multifamily projects. Properties with two to four units require 50% of the tenants to qualify as income eligible. Complexes with more than five units require 66% tenant income eligibility. Income eligibility is conducted on a tenant-by-tenant basis unless the building is owned by the Department of Housing and Urban Development (HUD) or is on the DOE's HUD-approved list of qualifying buildings. HUD buildings automatically qualify for weatherization and do not require individual income verification.

Unlike single family projects, multifamily projects are not fully-subsidized. Multifamily projects with two to four units require a cash contribution of 5% of the total project cost from the property landlord. This landlord fee can be waived if the landlord qualifies as income eligible (making less than 200% of the federal poverty level). Multifamily projects with five or more units require a 25% contribution from the landlord. Multifamily projects also require the DOE and DNR to approve the project scope.

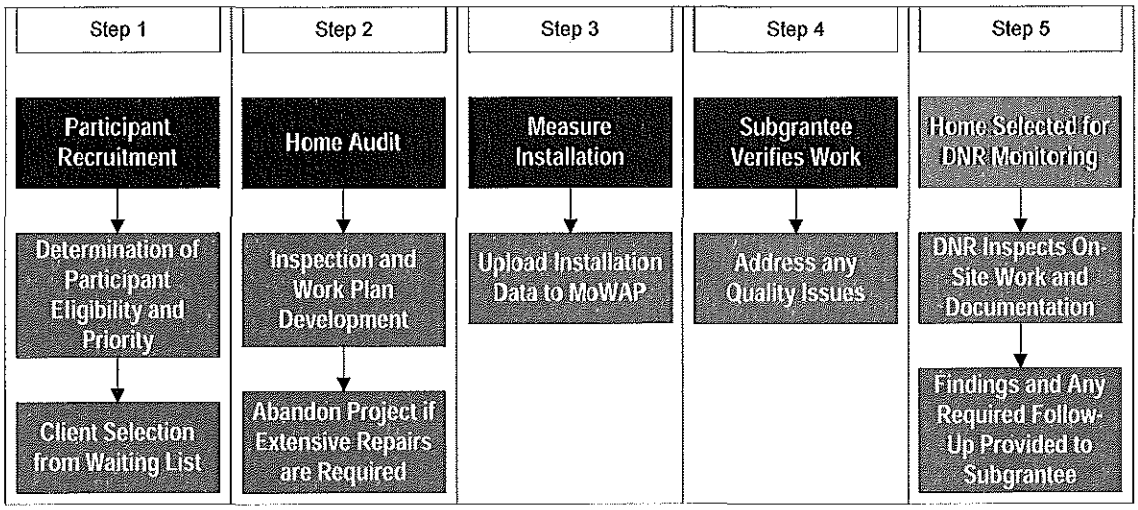
Only one subgrantee reported having weatherized large multifamily complexes; the subgrantee used Recovery Act funds for the lighting retrofits, boiler systems, and packaged terminal AC units in 200 to 300 senior housing units. This project required a co-pay from the landlord and scope approval by the DOE and DNR.

## Program Delivery

Once a subgrantee selects a customer from the waiting list, an auditor employed by the subgrantee conducts a whole-house inspection. While on-site, auditors perform combustion and safety diagnostics, a blower-door test, collect information on existing conditions or equipment, and determine weatherization and health and safety measures to install.

The typical program process is illustrated in Figure 3.

**Figure 3. 2010-2011 Program Process Flow**




## Measure Determination

The subgrantees use audit software to calculate the savings-to-investment (SIR) ratio of energy-efficiency measures recommended for a project. The auditor enters information into the software from the whole-house inspection, including blower door readings and refrigerator metering results, to determine which measures to install. The audit software used for each project is dependent on the type of building being weatherized. Table 22 illustrates the different types of audit software used by the subgrantees.

**Table 22. LIWP Audit Software**

| Building Type | Audit Software |
|---|---|
| Single family home | National Energy Audit Tool (NEAT) |
| Manufactured/ mobile home | Manufactured Home Energy Audit (MHEA) Tool |
| Multifamily building | Targeted Retrofit Energy Analysis Tool (TREAT) |

Because the majority of LIWP projects are single family homes, the NEAT software is most commonly used to determine a project's SIR. Despite which tool is used, an SIR ratio of 1.0 much be achieved on all projects for measures to be installed. . In most cases (i.e., windows, HVAC systems, baseload equipment, etc.) equipment must also meet an SIR of 1.0 at the measure-level to be eligible for installation.

## Subgrantee Staffing

The subgrantees' staffing strategies ranged from maintaining crew-based staff that perform all the auditing and weatherization work to subcontracting different project aspects (most commonly HVAC repairs or other general weatherization work).

Due to the influx of Recovery Act weatherization funding between 2009 and March 2012, many agencies increased their in-house staff or contracted with more third-party providers to meet the increased production demands. As Recovery Act funding has been exhausted, agencies have had to scale back to account for expected future funding levels. According to the subgrantees, other federal funding sources may not rebound to pre-Recovery Act levels, further reducing staff and

subcontractors. The subgrantees added that the absence of Recovery Act funds and cutbacks in other federal weatherization funding will also result in reduced production across all participating subgrantees. Through our previous low-income weatherization program evaluations, Cadmus has found this to be a common concern among subgrantees across the country.

## Delivery Challenges

According to process interviews with Ameren Missouri program staff, the DNR, and the subgrantees, the LIWP faces the following main delivery challenges:

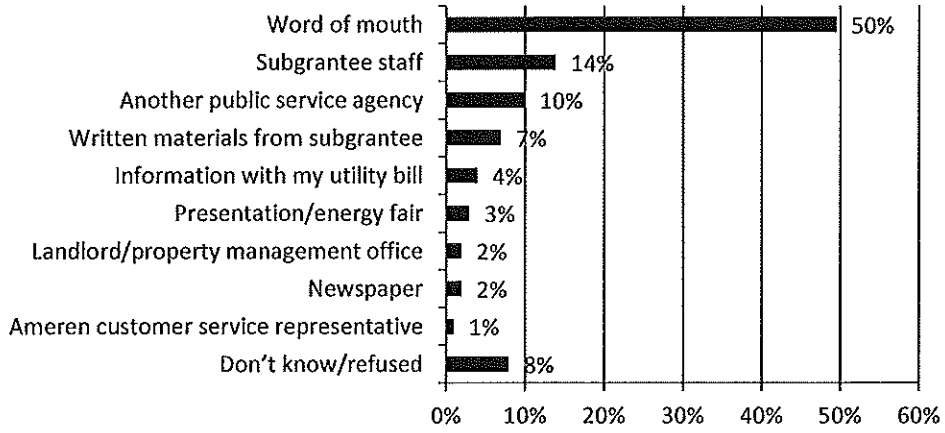
- Participant recruitment;
- Logistical issues; and
- Health and safety and repairs.

### *Participant Recruitment*

Most of the subgrantees reported having to spend money on direct marketing during the 2010 and 2011 program years in order to recruit enough participants to use all of their weatherization funds. Subgrantees implemented a wide range of marketing tactics: placing newspaper, community newsletter, radio, and television advertisements; sending staff to explain the program and distribute flyers at community events; and posting program information on their Website.

Participants, however, most commonly cited word-of-mouth as their means of program awareness (50%, n=101). As illustrated in Figure 4, participants reported learning about the program through multiple sources, including local subgrantee staff (14%) and staff at other public service agencies (10%). Direct marketing yielded very low participant recall.

**Figure 4. How Participants First Heard About the Program (n=101)**




For most of the subgrantees, direct marketing will no longer be necessary once Recovery Act funds are exhausted.

### *Logistical Issues*

Logistics proved to be delivery challenge for a few of the LIWP subgrantees. Some of the subgrantees do not have many Ameren Missouri customers within their jurisdictions, and therefore have difficulty finding clients and experience high overhead costs when working on only one project at a time in a certain area. One subgrantee expressed concern over this issue, because contractors increase their bids for these projects to account for the cost of traveling to remote projects. As a result, this subgrantee has carried over Ameren Missouri funds for the last few years while they spent the Recovery Act funds. The subgrantee has plans to weatherize a larger group of Ameren Missouri homes this year, taking advantage of economies of scale in contractor bids.

### *Health and Safety and Repairs*

Health and safety spending is limited to 10% of the total statewide weatherization funds from all sources. Spending on repairs is restricted to a maximum of $600 each home for labor and $600 for materials. All of the funding sources, however, maintain certain implementation protocols, requiring a home to meet certain criteria before receiving weatherization. For example, a necessary roof repair would have to be completed before DOE funding could be spent towards weatherizing the home. Subgrantees encountering homes that require substantial repairs may not have sufficient repair dollars to bridge this gap, resulting in subgrantees walking away from projects. Two of the interviewed subgrantees specified walking away from 15-35% of homes after the initial audit.

## Training

Subgrantee staff members and contractors implementing the Ameren Missouri program are held to the same training and certification as required by DOE. These requirements include having at least one auditor on staff with a Building Performance Institute certification; all field staff having Occupational Safety and Health Administration (OSHA) 10 certification and lead safety training; and crew leaders having OSHA 30 certification. Subgrantees also reported participating in supplemental training, including Leadership in Energy and Environmental Design Accredited Professional certification, and Home Energy Rating System training.

Two of the subgrantees explained that prior to the Recovery Act, training was provided by the State through the Linn State Technical College. However, now the subgrantees must seek training on their own through private facilities. One of subgrantees regrets the absence of state-sponsored training through one designated facility, and acknowledged the DNR's regular training sessions on special topics, including how to comply with new DOE ventilation requirements and addressing weatherization issues specific to mobile homes. In general, subgrantees found training to be useful and appreciated the opportunity to learn about new weatherization techniques.

# Measures

Because the DNR administers the LIWP funds in the same way DOE funds are administered, the measures covered through the LIWP do not differ from those covered through the federal weatherization program. Table 23 illustrates the weatherization measure categories and the eligible program measures that fall within each category. The subgrantees enter the recommended measures into MoWAP according to these categories.

**Table 23. MoWAP Weatherization Measure Categories***

| Measure Category | Example Measures |
|---|---|
| Windows (SIR > 1.0) | Window replacement |
| HVAC Systems | Central AC replacement/tune up, furnace replacement, heat pump replacement/tune up, room AC replacement/tune up, thermostat installation |
| Building Insulation | Attic access, attic, belly, floor, foundation, kneewall access, kneewall, rim joist, wall insulation |
| General Heat Waste and Air Infiltration | Duct work insulation, pipe wrap, storm windows, water heater blanket, infiltration reduction (e.g., weatherstripping, caulking, door sweeps, whole-house fan covers) |
| Baseload | CFLs, energy efficient showerheads, refrigerator replacements, water heater replacements |
| Health and Safety** | Carbon monoxide detector, dryer vent kit, electric furnace replacement, smoke detector, gas leak repair |
| Incidental Repairs | AC repair, crawlspace access repair/replacement, door repair/replacement, electric/gas furnace repair, patch siding, vent installation, window repair |

* According to the DNR, this list is not all-inclusive and not all measures are solely restricted to the categories assigned. Some measures may be appropriately placed in different categories. This list is intended to provide a general recommendation for the category placement of measures.

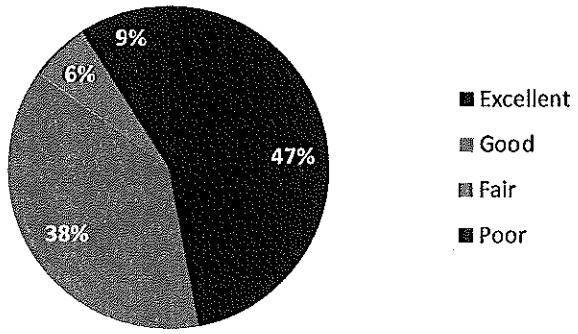
** Because of special circumstances, many of the eligible LIWP measures can qualify for installation as a health and safety measure. Table 24 below details the measures that can be installed with health and safety funding with a doctor's note or if the measure does not pass the SIR test.

Based on the MoWAP data provided by Ameren Missouri, Cadmus asked measure-specific questions to surveyed participants who received measures from windows, HVAC systems, building insulation and air infiltration, baseload, health and safety, and incidental repairs categories (each of which are outlined below).

## Windows

As shown in Figure 5, participants reported high satisfaction (85%, n=32) with the work done to their windows through the program. The most frequently provided reasons participants gave their new windows a positive rating was because the contractor did a nice job installing them (37%, n=27), the windows lower their utility bills (22%), and they keep the house warmer (19%).

**Figure 5. Participant Satisfaction with Window Replacements and Repairs (n=32)**



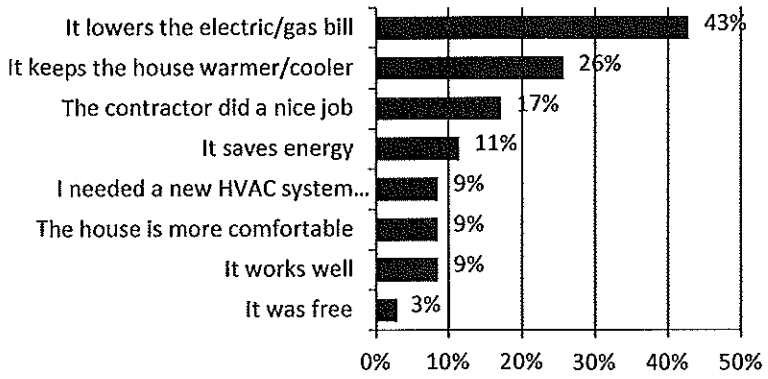

## HVAC Systems

Central AC, natural gas furnace, heat pump, and room AC replacements and tune-ups are eligible for installation through the program. AC replacements were added to the program with the influx of Recovery Act funding in 2009. Prior to the Recovery Act, the DNR had considered Missouri a

heating system state, and concentrated on heating system work. They approved AC work on a case-by-case basis and only if it related to client health issues. AC can still be replaced as a health and safety measure if the participant submits a doctor's note attesting that it would be a health hazard to not have an AC unit installed.

Satisfaction was high among participants who received a heating or AC system replacement or repair. All but one participant (97%, n=36) rated their new heating or cooling system as excellent or good. The reasons for high participant satisfaction are detailed in Figure 6. The one participant who rated their new or repaired HVAC system as poor reported that their contractor did not finish the job.

**Figure 6. Reasons for Participant Satisfaction with HVAC System Replacement and Repairs (n=35)**




## Building Insulation and Air Infiltration

The majority of participants (82%, n=85) who received building insulation claimed they are more comfortable in their home than they were prior to receiving these program services. In addition, 39% (n=89) of participants reported hearing less outside noise as a result of their insulation and/or window installation.

Just over three-quarters of participants (79%, n=90) who received infiltration reduction reported that their home feels less drafty since the work was performed.

## Baseload

With the influx of Recovery Act funds, refrigerator replacements were introduced as an eligible program measure. To determine if a refrigerator is eligible for replacement, subgrantees must meter and record the energy usage for 10% of units. For refrigerators that are not metered, subgrantees can use The Association of Home Appliance Manufactures' database (which is incorporated into NEAT/MHEA) to estimate the annual energy use of existing refrigerators. The subgrantees determine eligibility by entering data from the appliance's nameplate into the database, including the model number and unit age.

## Health and Safety

Because of special circumstances, many of the eligible LIWP measures can qualify for installation as a health and safety measure. Table 24 details the measures that can be installed with health and safety funding with a doctor's note or if the measure does not pass the SIR test. As mentioned above, statewide health and safety spending cannot exceed 10% of overall program funding.

**Table 24. Program Measures Installed as Health and Safety Measures**

| Can Qualify with Doctor's Note | Can Qualify if SIR < 1.0 |
|---|---|
| Central AC repair | Clean and tune |
| Central AC replacement | Furnace replacement |
| Heat pump repair | Refrigerator replacement |
| Heat pump replacement | Water heater replacement |
| Room AC repair | |
| Room AC replacement | |

DOE requires subgrantees to seek special permission from the DNR for replacing electric furnaces and electric water heaters. According to the subgrantees, permission to replace an electric furnace, for instance, may if granted if the clean and tune evaluation characterizes the unit as a safety hazard. Several subgrantees said permission for these measures is seldom granted. The DNR reported DOE prohibits electric furnace replacements and only permits funding to be used for repair purposes.

## Incidental Repairs

According to the DNR, incidental repairs must be included in a project's SIR; however, the repairs are usually very small and do not affect the test results.[14] The incidental repairs budget is capped at $1,200 per home ($600 for labor and $600 for materials).

# Energy Education

During the audit, subgrantees provide participants with energy-saving education that includes client and equipment-specific energy-saving tips to help reduce energy costs, as well as state-provided, leave-behind materials for participants to read and reference.

The majority of respondents (58%, n=101) remembered receiving energy-saving tips from the subgrantee. Of respondents who remembered received tips, 93% (n=59) reported that the subgrantee provided a sufficient amount of information. Further, almost all of the participants who recalled the education component of the program (94%, n=79) were satisfied with the energy-saving tips they received.

Sixty-two percent of respondents (n=101) also recalled subgrantees providing leave-behind materials (a booklet or pamphlet) with information on how to save energy. Of the 63 participants recalling the leave-behind material, 94% read or reviewed the materials.

[14] Health and safety measures do not have to be included in the project's SIR.

Most survey respondents (82%, n=79) who recalled receiving energy education reported implementing some of the tips they learned. Table 25 lists the most common energy-saving tips the respondents reported implementing.

**Table 25. Participant Implemented Energy Saving Tips (n=79)**

| Energy Saving Tip | Percent Implementing |
|---|---|
| Use energy-efficient lighting | 28% |
| Keep windows/doors covered/sealed to minimize heat loss | 23% |
| Turn lights off when not in use | 20% |
| Adjust heating | 16% |
| Unplug appliances when not in use | 10% |
| Adjust air conditioning | 9% |
| Other* | 6% |
| Adjust hot water heater | 6% |
| Change air filters regularly | 3% |
| Laundry conservation | 1% |
| Keep refrigerator full | 1% |

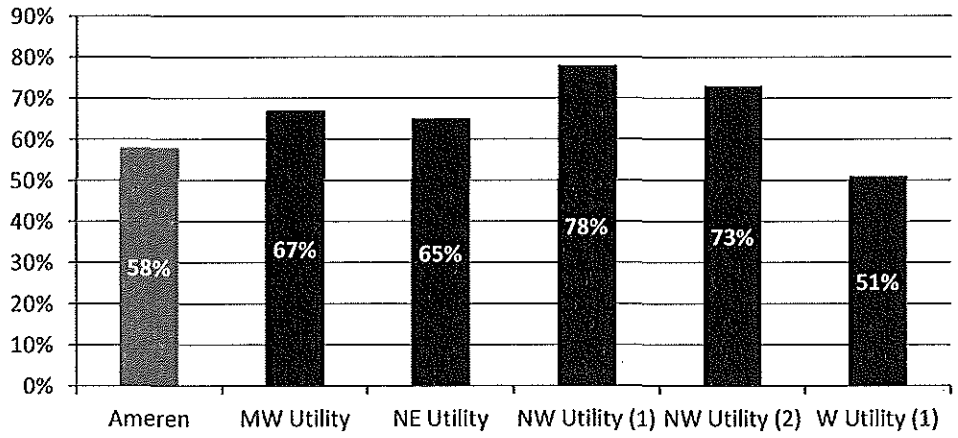
* The Other category includes items such as supplementing heating and cooling with ceiling fan use and use outlet covers for outlets located on exterior walls.

As shown, installing energy-efficient lighting, avoiding heat loss through windows and doors, and turning off lights when not in use were most commonly cited. In addition, 20% of participants (n=79) now turn their lights off when not in use and 16% adjusted their heating temperatures, contributing to overall household savings.

## Benchmarking

Figure 7 shows the percentage of participants that recalled receiving energy education from a range of different low-income weatherization utility programs.

**Figure 7. Energy Education Recall Comparison**




By comparison, Ameren Missouri participants had among the lower recall levels regarding the energy-education provided through subgrantees. However, as shown in Figure 8, Ameren

Missouri participants who recalled receiving energy education reported taking energy-saving actions more frequently than participants in other low-income programs.

**Figure 8. Energy Saving Actions Taken by Participants who Recalled Energy Education**

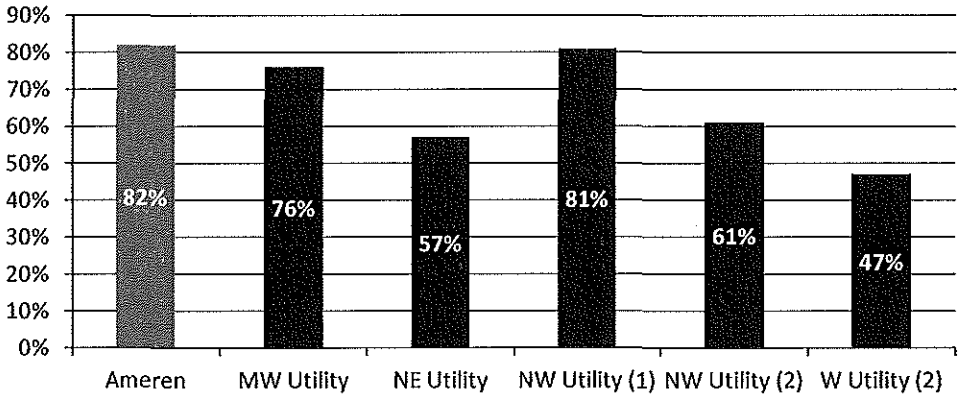
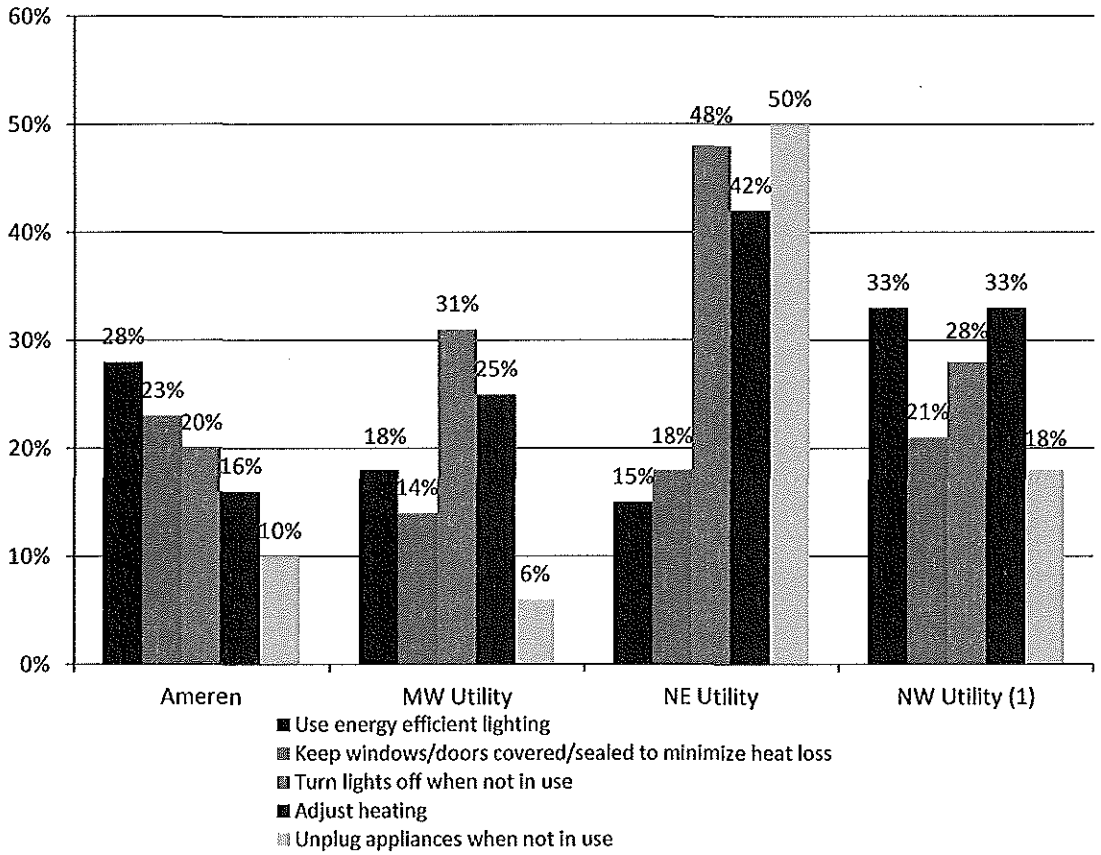



Figure 9 compares the energy-saving behaviors adopted by participants who recalled receiving energy-savings tips across different studies.

**Figure 9. Energy-Savings Behavior Change Comparison**



## Program Satisfaction

Surveyed participants expressed strong satisfaction levels with various aspects of their program experience. Almost all participants (96%, n=101) reported that the subgrantees were very courteous and respectful. Most participants (89%) expressed overall satisfaction with the services provided through the program. In addition, 71% of participants reported more affordable energy bills following the work performed in their home, and 66% claimed they are now better able to pay their energy bills as a result of the work.

Only six respondents reported experiencing any problems or difficulties with participating in the program. Of those reporting issues, the most common complaints involved weatherization workers who did poor quality work or were unpleasant.

## Communication

The DNR and the subgrantees communicate on an as-needed basis through formal and informal methods, such as phone calls, e-mail, and attendance at the quarterly Energy and Housing Professional Alliance (EHPA) meetings. The subgrantees said it is particularly useful to have a DNR representative at the EHPA meetings to answer questions. The EHPA meetings also allow the DNR to receive direct feedback from the subgrantees about what is and is not working with the program implementation. The subgrantees and DNR reported that Ameren Missouri has occasionally sent a representative to the EHPA meetings; however, they do not attend regularly. The DNR, subgrantees, and Ameren Missouri all attend Committee to Keep Missourians Warm sessions.

Overall, the subgrantees described the DNR as being very responsive and helpful with technical questions. The subgrantees and DNR both cited that communication with Ameren Missouri is limited.

## Quality Control

Per DOE requirements, all subgrantees perform post-installation inspections on 100% of the homes they service. If the home does not pass this inspection, subgrantees or their contractor must return to address any rework issues. Due to the Recovery Act, one subgrantee explained that they employed dedicated quality control personnel to provide additional in-process monitoring of audits, project work, and inspections. However, with the reduction of overall funding, they now only send a quality control team to conduct in-process inspections if management sees an issue or if the client submits a complaint.

In addition to the subgrantee post-inspections, the DNR performs technical and procedural inspections. During the 2010 and 2011 program years, the DNR conducted on-site technical inspections quarterly, and conducted procedural inspections of data and paperwork semiannually. The percentage of jobs monitored by the DNR for both types of inspections is based on the assessed risk of the subgrantee. According to the DNR, this risk assessment is based on a number of factors, such as the amount of funding, number of grants being administered, performance, significant audit findings, and reporting promptness (or lack of promptness). Table 26 illustrates the percentage of jobs the DNR monitored.

**Table 26. Percentage of Jobs Monitored by DNR**

| Subgrantee Risk Level | Technical Inspections (% of Jobs) | Procedural Inspections (% of Jobs) |
|---|---|---|
| Low Risk | 5% | 5% |
| Medium Risk | 7.5% | 9% |
| High Risk | 10% | 18% |

According to the DNR, after the Recovery Act funding is exhausted, they will still monitor the same percentage of jobs. The frequency of their inspections, however, will decrease from quarterly to semiannually for technical inspections and from twice a year to once a year for procedural inspections.

## Data Collection and Reporting

The MoWAP system is an electronic database that stores all program data, including the participant waitlist, subgrantee budgets, and eligible program measures. In addition, the subgrantees upload details of each project to MoWAP (including any data entered into NEAT, MHEA, or TREAT from the initial audit). The subgrantees reported they must also submit details of any work conducted by contractors, which can include supplemental data and/or photographs of measures installed. The subgrantees enter and upload all data electronically as each phase of the project is completed.

The DNR and the subgrantees have access to the MoWAP system. DNR staff explained that the MoWAP system has trouble generating reports, and several subgrantees said that they look forward to this feature becoming available. Ameren Missouri reported that the MoWAP report-generating capability needs to be addressed. Subgrantees also noted having trouble with the new system running slowly, locking up, or being taken down temporarily for repair. However, overall the MoWAP system has been well received and no major frustrations were reported by the subgrantees and DNR.

The subgrantees invoice the DNR for work completed each month. As a quality control procedure, the DNR compares the data entered into MoWAP to all invoices received, before they begin to process the subgrantee's invoice for reimbursement of project costs. Ameren Missouri receives quarterly invoices from the DNR that break down the monthly grant funding by subgrantee. The DNR explained that they invoice Ameren Missouri for a share of the cost of servicing a home, not by individual measures and savings. Ameren Missouri, however, expressed an interest in seeing aggregate counts of measures installed (by measure type) and the associated savings. The subgrantees explained that the percentage of a project paid for by Ameren Missouri funding is dependent on the level of remaining funding from other sources and the year-end of each funding source.

## Suggested Program Improvements

As part of the process evaluation, Cadmus asked the interviewed subgrantees and surveyed participants to provide suggestions for program improvements. Some of these suggestions are detailed below.

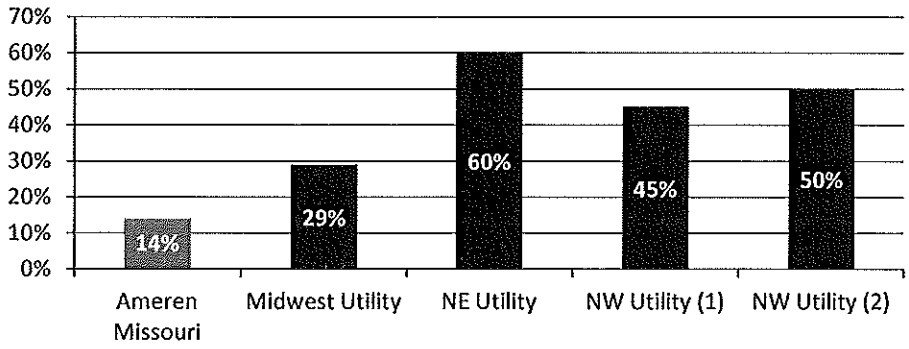
## Increase Flexibility for Ameren Missouri Funding

The majority of the interviewed subgrantees suggested that Ameren Missouri allow their funding stipulations to have more flexibility than the federal program. Several subgrantees understand it is easier to administer DOE and Ameren Missouri funds according to the same guidelines; however, some electric measures that are restricted in the federal program have the potential to provide high energy savings (e.g., AC, refrigerators, furnaces, hot water heaters). If Ameren Missouri funds could be used to install measures that are not permitted through the federal program, the participants could experience deeper savings.

## Increase Opportunities for Awareness of Ameren Missouri Sponsorship

Only 14% of surveyed participants (n=101) reported being aware that Ameren Missouri helped pay for some of the services they received. Figure 10 compares participant awareness of utility involvement in various low-income weatherization programs.

**Figure 10. Utility Sponsorship Awareness Comparison**




Several subgrantees reported verbally explaining to the participants that Ameren Missouri funding helps pay for the LIWP services. Participants, however, expressed below-average awareness of Ameren Missouri's program sponsorship compared to other recent low-income weatherization evaluations across the country. A few subgrantees noted that it would be helpful to have Ameren Missouri-branded materials to provide to the participants to improve their awareness. Some of the surveyed participants also suggested that more program advertising in general would benefit the low-income population.

## Increased Interaction with Ameren Missouri

Only one subgrantee reported having continuous communication with Ameren Missouri, the remaining subgrantees are primarily in contact with the DNR and would welcome the opportunity for more interaction with Ameren Missouri. One subgrantee noted that the technical expertise Ameren Missouri could bring to program implementation would greatly benefit the LIWP. This respondent further suggested that involvement from Ameren Missouri would be particularly helpful when petitioning that stipulations on Ameren Missouri funds be changed to cover measures that are not available or often not feasible through the federal program.

# CONCLUSIONS AND RECOMMENDATIONS

This section outlines Cadmus' conclusions about the LIWP, some of which led to recommendations for change, and some of which are working well with the current approach.

## Conclusions and Recommendations

### Participant Experience

***Participants are satisfied with the program.*** Almost all surveyed participants expressed strong satisfaction levels with all aspects of their program experience, including the subgrantee staff, measures installed, and services provided through the program. Further, the majority of participants reported more affordable energy bills following work performed in their home, and claimed they are now better able to pay their energy bills as a result of the work.

***Ameren Missouri customers are changing their energy using behaviors.*** Ameren Missouri participants had among the highest levels of reporting specific energy-saving behaviors they put into practice compared to other low-income populations across the county. Further, almost all participants who recalled the education component of the program were satisfied with the energy-saving tips they received through the LIWP.

***Participants are not aware that Ameren Missouri is sponsoring LIWP services.*** Participants expressed below-average awareness of Ameren Missouri's program sponsorship compared to other recent low-income weatherization evaluations across the country.

***Recommendation 1: Increase Ameren Missouri sponsorship awareness through leave-behind materials.*** To help increase participant awareness of utility program sponsorship, create Ameren Missouri-branded materials or products for subgrantees to leave behind with participants. Items other utilities provide include LED or electroluminescent nightlights and refrigerator magnets with energy-saving tips.

### Program Funding

***Subgrantees did not fully expend Ameren Missouri's LIWP budget, but rolled it over for future program spending.*** During the 2010 and 2011 program years, the DNR and the subgrantees did not spend Ameren Missouri LIWP funding to the normal degree. With the influx of Recovery Act dollars and the rush to expend these funds, the DNR and many subgrantees reported rolling over Ameren Missouri funds to spend after the Recovery Act funding expires in 2012.

***Overall production may decrease due to the absence of Recovery Act dollars.*** As Recovery Act funding becomes exhausted, subgrantees have had to scale back hiring to account for expected future funding levels. Other federal funding sources may not rebound to pre-Recovery Act levels, causing subgrantees to further reduce their staff and subcontractors.

***The increased funding made participant recruitment a challenge.*** Many subgrantees noted having to spend money on direct marketing in order to acquire enough homes to service. This will likely not be a problem in future program years given the expected decrease in overall program funding.

***Deeper savings may be possible.*** The subgrantees want Ameren Missouri's funding stipulations to be more flexible than the federal program. Participants may experience deeper savings if Ameren Missouri funds could be used to install measures that are not permitted or have limited applicability through the federal program.

***Recommendation 2: Develop Ameren Missouri-specific LIWP funding guidelines that complement the existing federal guidelines and allow subgrantees to more comprehensively serve participants, thereby achieving greater savings.*** In some cases, Ameren Missouri funds could help achieve deeper savings if not tied to the federal program regulations. For example, there are several electric measures excluded from the federal program unless categorized as health and safety measures with a special doctor's note exception (such as air conditioners, electric heat pumps, and electric furnaces). Several subgrantees reported permission for these measures is seldom granted. If these types of measures are determined to have energy savings when installed as non-health and safety measures in a broader application (through the exercise suggested in recommendation 3 below), the program could potentially generate greater energy savings for Ameren Missouri and LIWP participants.

***Recommendation 3: Collaboratively assess the potential addition of new electric measures.*** In coordination with DNR, Ameren Missouri should research electric measures not currently offered to identify any new technologies for potential inclusion in future LIWP offerings (funded through Ameren Missouri). Research objectives could include: 1) developing a list of possible new measures by reviewing program offerings in other states (benchmarking comparison); 2) conducting a qualitative screening of measures that considers measure availability, applicability, and installation difficulty; and 3) conducting a quantitative economic screening of measures to assess viability.

***Pre-weatherization barriers cause some subgrantees to walk away from eligible homes.*** Two of the interviewed subgrantees specified walking away from 15-35% of homes after the initial audit. Cadmus' previous evaluations of low-income programs have revealed that health and safety and repairs funding is a common delivery challenge.

## Communication

***Subgrantees, DNR, and Ameren Missouri want more interaction with each other.*** Only one subgrantee reported having continuous communication with Ameren Missouri. The remaining subgrantees are primarily in contact with the DNR, and would welcome the opportunity for more interaction with Ameren Missouri, especially on technical aspects of the program.

***Recommendation 4: Increase interaction between Ameren Missouri and program implementers (subgrantees and DNR).*** Ameren Missouri should regularly attend the quarterly EHPA meetings as an opportunity for all program stakeholders to discuss best practices, implementation challenges, and share technical advice regarding LIWP services.

## Data and Reporting

***There are no LIWP participation or savings goals.*** The only performance metric the DNR tracks is an estimated production schedule submitted by each subgrantee based on their allocated annual budgets. In addition, Ameren Missouri is not invoiced based on measures or savings, but only on the cost share of each project.

***Recommendation 5: Create performance indicators to track program performance.*** Participation and saving targets can be used as metrics to inform program performance. These targets should be distributed to the DNR and subgrantees, which should track and report the metrics to Ameren Missouri on a regular basis. Savings can be attributed to and increase Ameren Missouri's DSM portfolio savings.

***Stakeholders are frustrated with the MoWAP system's lack of reporting capabilities.*** Overall, the DNR and subgrantees reported that the MoWAP system has been well received and did not cause any major problems; however, the lack of report generation was mentioned as a frustration by all stakeholders (including Ameren Missouri).

***No measure-specific installation data were available for the evaluation.*** Without measure-specific data for each participant it is more difficult to accurately evaluate savings and determine which measures are generating more or less savings than expected. Assessing savings at the measure category- and household-level prevents the evaluation from providing more detailed results that can be used to improve future program performance.

***Recommendation 6: Track and electronically report measure-specific details for all participants.*** Measure-specific information should include, for example, the specific type(s) of insulation installed (attic, wall, basement), as well as the total area insulated (square feet) and the R-values of the home's insulated areas pre- and post-program. [15] Inputs used for the NEAT software, as well as the expecting savings resulting from the tool are also extremely useful for comparing – and understanding any potentially disparities between – expected and evaluated savings. Without this level of detail, the accuracy of evaluation results, evaluation's ability to inform program planning, and the overall value of evaluation in general are unfortunately limited. To the greatest extent possible improved measure tracking should document funding source as this information would provide greater transparency into which measures were funded using utility contributions.

***There are no data available for heating or cooling units that were either replaced or were inoperable prior to the program.*** Many of the participants changed their electricity usage significantly from the pre- to post-treatment – more than would be expected based on the energy efficiency improvements in their home alone. These large changes in usage may be the result of a previously inoperable heating or cooling system becoming operable as a result of the program. Without flags in the program data to identify these situations, as well as when new equipment is installed, it is more difficult to accurately assess program-induced savings.

[15] See Appendix E for an example of the type of data fields recommended for tracking and reporting for another low income program evaluation.

***Recommendation 7: Track and electronically report previously inoperable heating or cooling units, as well as those that were replaced rather than tuned-up.*** Cadmus recommends that the subgrantees collect and record information for these situations to inform and improve future evaluations.

# APPENDIX A. AMEREN MISSOURI STAFF INTERVIEW GUIDE

**Name of interviewee:** **Interview date:**

Thank you for taking the time to talk with us today about the program. The Cadmus Group, Inc. has been hired by Ameren Missouri to conduct a process evaluation of the low-income weatherization program (LI Wx). The process evaluation focuses on how the program works and whether it was delivered as intended during 2010 and 2011. We are interviewing several program stakeholders including staff from the Missouri Department of Natural Resources (DNR) and local community action agencies (CAA) who implement the program.

Our goal is to create a complete description of the program, from all perspectives, so that we can identify what is working well and what can potentially be improved. Because of your role in program implementation, your perspective is very important to us, and we appreciate your taking the time to share it with us. We expect this interview to take about an hour of your time. Everything you say is completely confidential. We do not report names in our report.

## General Introductory Questions

1. Can you begin by telling us your title and role in the LI Wx program? How long have you been working with this program?

2. How long has Ameren been contributing funding to the LI Wx program?

## Program Goals

3. What are the LI Wx program objectives from your perspective?

4. Any specific social or performance goals? [PROBE: participation goals, kWh/therms goals, and/or agency-specific performance goals]

    a. How are these goals set and by whom?

5. How do you think the program performed in 2010 and 2011? Were all the goals met?

6. Are Ameren funds completely exhausted each year or are there instances where some funding is left unspent by the agencies?

    a. If some is left unspent, how is this addressed (e.g., mid-stream reallocation)? Will the next year's funding allocation be adjusted to account for unspent funding?

## *Program Implementation*

7. Who are the key parties involved in program implementation, what are their roles and how does Ameren communicate with them?

8. Can you please walk me through the program's delivery process? [Example: initial assessment, home audit, installation, final inspection, QA/QC (monitoring)]
9. How does the single-family component of the program differ from multi-family?
    a. How do multifamily customers enroll in the program?
    b. How are multifamily customers determined to be eligible for the program?
    c. What is the involvement of the property manager? What about the tenant?
    d. Are the buildings that participate typically privately owned or publicly owned?
10. Does Ameren provide any specific stipulations about how funding should be spent (e.g., cost ceiling per home, prioritization of funding, restrictions on specific measures or combinations of measures installed, like insulation and furnace replacement)?
11. What amount or percent of the Ameren budget is allocated towards Health and Safety or repairs?
    a. How is it structured (percent of total budget, percent of expenditures per site)?
    b. Do health and safety and repair measures have to be cost effective? Are they included in the cost effectiveness of the project as a whole?
12. In the past, air conditioner work, refrigerator replacements and replacements of electric heating systems were not included as part of the LI Wx program. Is this true for the 2010 and 2011 program years?
    a. [If measures were added] When and why was that change made?
13. Did any other changes occur to the program during the 2010 and 2011 program years? [PROBE: changes in the way it is delivered, in types of measures paid for by Ameren, percent of measure cost paid for by the utility, changes in health and safety funding]?
14. Are there plans for additional changes?
15. Did the program face any barriers or challenges during the 2010 and 2011 program years?
    a. What was done to address these challenges?
16. Do you feel the program is meeting your customers' needs?
17. Overall, what do you think works particularly well about the program delivery process?
18. Do you have any suggestions for improvements?

## ARRA

19. Was the Recovery Act (ARRA) funding deadline a concern for Ameren during the 2010 and 2011 program years?
20. What kind of changes do you anticipate for the program after ARRA expires?
21. How do you expect this will effect Ameren's program funding?

## Training

22. What training is required for agency staff or contractors delivering the program?
    a. Is there any certification required, either by the state or by Ameren?
    b. Are these protocols standardized across agencies (at the state-level) or is each agency responsible for its own staff?
23. In your opinion, is this training sufficient?

## Energy Education

24. What type of energy education is provided to program participants? Materials?
25. In your opinion, is the current level of energy education provided sufficient?
26. Is anything provided to the customer to indicate Ameren's sponsorship of the program?

## Data and Reporting

27. What reports and data does DNR require the agencies to provide?
    a. What is the frequency and format of these data?
    b. How detailed is the data? Just summary of installed measures, or more detailed house-specific information?
28. What data is provided to Ameren?
29. Have there been any problems with data collection or reporting?

## QA/QC

30. What are the procedures for program quality assurance and quality control?
31. Do you think this process works well?

## Final Thoughts

32. As part of this evaluation, we will also be interviewing the agencies, program participants, and the DNR's staff. Is there anything we should be sure to ask them about?
33. Any other comments or areas we did not cover on which you would like to add your views?

## List of Requested Materials [if not already received]

1. Any marketing or energy education materials used
2. **[HIGH PRIORITY]** State names and contact information

# APPENDIX B. DNR STAFF INTERVIEW GUIDE

**Name of interviewee:** **Interview date:**

Thank you for taking the time to talk with us today about the program. The Cadmus Group, Inc. has been hired by Ameren Missouri to conduct a process evaluation of the low-income weatherization program (LI Wx). The process evaluation focuses on how the program works and whether it was delivered as intended during 2010 and 2011. We are interviewing several program stakeholders including staff from the Ameren and local community action agencies (CAA) who implement the program.

Our goal is to create a complete description of the program, from all perspectives, so that we can identify what is working well and what can potentially be improved. Because of your role in program implementation, your perspective is very important to us, and we appreciate your taking the time to share it with us. We expect this interview to take about an hour of your time. Everything you say is completely confidential. We do not report names in our report.

## General Introductory Questions

Can you begin by telling us your title and role in the LI Wx program? How long have you been working with this program?

## Program Goals

1. What are the LI Wx program objectives from your perspective?
2. Any specific social or performance goals? [PROBE: participation goals, kWh/therms goals, and/or agency-specific performance goals]
    a. How are these goals set and by whom?
3. How do you think the program performed in 2010 and 2011? Were all the goals met?
4. Are Ameren funds completely exhausted each year or are there instances where some funding is left unspent by the agencies?
    a. If some is left unspent, how is this addressed (e.g., mid-stream reallocation)? Will the next year's funding allocation be adjusted to account for unspent funding?

## *Program Implementation*

5. Who are the key parties involved in program implementation, what are their roles and how does DNR communicate with them?
    a. How are contracts set up between Ameren and the program implementers?
6. Can you please walk me through the program's delivery process? [Example: initial assessment, home audit, installation, final inspection, QA/QC (monitoring)]

a. How do the DOE WAP and Ameren funding differ in the services offered or measures covered?

7. How does the single-family component of the program differ from multi-family?
    a. How do multifamily customers enroll in the program?
    b. How are multifamily customers determined to be eligible for the program?
    c. What is the involvement of the property manager? What about the tenant?
    d. Are the buildings that participate typically privately owned or publicly owned?
8. Do you receive information on how many customers are waiting to receive services in your service territory?
    a. If yes, how much time typically elapses between the agencies' receipt of a completed application form and delivery of services?
9. Does Ameren provide any specific stipulations about how funding should be spent (e.g., cost ceiling per home, prioritization of funding, restrictions on specific measures or combinations of measures installed, like insulation and furnace replacement)?
10. What is the typical Ameren cost share of a project - is it by measure or total house?
11. What is the process for determining measure recommendations for a particular customer? [What criteria are used to decide what is installed? (audit software like NEAT or MHEA? priority measure list?)]
    a. Are these Ameren-specific criteria, or is this based on the State?
12. What amount or percent of the Ameren budget is allocated towards Health and Safety or repairs?
    a. How is it structured (percent of total budget, percent of expenditures per site)?
    b. Do health and safety and repair measures have to be cost effective? Are they included in the cost effectiveness of the project as a whole?
13. In the past, air conditioner work, refrigerator replacements and replacements of electric heating systems were not included as part of the LI Wx program. Is this true for the 2010 and 2011 program years?
    a. [If measures were added] When and why was that change made?
14. Did any other changes occur to the program during the 2010 and 2011 program years? [PROBE: changes in the way it is delivered, in types of measures paid for by Ameren, percent of measure cost paid for by the utility, changes in health and safety funding]?
    a. Are there plans for additional changes?

15. Did the program face any barriers or challenges during the 2010 and 2011 program years?
    a. What was done to address these challenges?
16. Do you feel the program is meeting low income customers' needs?
17. Overall, what do you think works particularly well about the program delivery process?
    a. Do you have any suggestions for improvements?

## ARRA

18. Was the Recovery Act (ARRA) funding deadline a concern for DNR during the 2010 and 2011 program years?
19. What kind of changes do you anticipate for the program after ARRA expires?
    a. How do you expect this will affect the program overall?

## Statewide Collaboration

20. Is there a statewide agency association (MCAA?) that is involved with the program?
21. Do you have any formal, ongoing meetings with the agencies to discuss the program?
    a. Is Ameren included in any of these meetings?
    b. Is this effective?
    c. Are there any changes you would suggest to improve communication?
22. Are there any areas of your interaction with Ameren and/or the agencies that need to be improved?

## Training

23. What training is required for agency staff or contractors delivering the program?
    a. Is there any certification required, either by the state or by Ameren?
    b. Are these protocols standardized across agencies (at the state-level) or is each agency responsible for its own staff?
24. In your opinion, is this training sufficient?

### Energy Education

25. What type of energy education is provided to program participants? Materials?
    a. Are materials developed by the state, agencies, or the utility?
    b. Is the process for delivering energy education standard across agencies?
26. In your opinion, is the current level of energy education provided sufficient?

## Data Tracking and Reporting

27. What data do the agencies' report to DNR?

a. What data does DNR report to Ameren?

28. How frequently does DNR send Ameren reports?
29. Are there any problems with data collection or reporting that you haven't already mentioned?

## QA/QC

30. What are the procedures for program quality assurance and quality control?
    a. Do you think this process works well?
31. Do you expect the level of monitoring to change as ARRA funding is exhausted?

## Final Thoughts

32. Any other comments or areas we did not cover on which you would like to add your views?

## List of Requested Materials [if not already received]

1. Any marketing or energy education materials used
2. **[HIGH PRIORITY]** Confirm which agencies implement Ameren funding

# APPENDIX C. SUBGRANTEE INTERVIEW GUIDE

**Name of interviewee:** **Interview date:**

Thank you for taking the time to talk with us today about the program. The Cadmus Group, Inc. has been hired by Ameren Missouri to conduct a program process evaluation of the low-income weatherization program (LI Wx). The process evaluation focuses at a high level on how the program works and whether it was delivered as intended during 2010 and 2011. We are interviewing several program stakeholders including staff from: Ameren Missouri (Ameren), the Missouri Department of Natural Resources (DNR), and other local community action agencies (CAA) who implement the program.

Our goal is to create a complete description of the program from all perspectives so that we can identify what is working well and what can potentially be improved. Because of your role in program implementation, your perspective is very important to us, and we appreciate your taking the time to share it with us. We expect this interview to take about an hour of your time. Everything you say is completely confidential. We do not report names in our report.

## General Introductory Questions

1. Can you begin by telling us your title and role in the LI Wx program? How long have you been working with this program?
2. How long has your agency been implementing the LI Wx program on behalf of Ameren?

## Program Goals

3. What are the Ameren LI Wx program objectives from your perspective?
4. Any specific social or performance goals? [PROBE: participation goals, kWh/therms goals, and/or agency-specific performance goals]
5. How do you think the Ameren-funded LI Wx program performed in 2010 and 2011? Were all the goals met?
    a. How does this compare to previous years? (Were goals and relative performance different before ARRA?)
6. Are there any barriers in place that prevent using Ameren funding or achieving Ameren program goals?
    a. How could these be overcome?

## Implementation

7. Who are the key parties involved in program implementation, what are their roles and how does your agency communicate with them?

a. How are contracts set up between DNR and the agencies?

8. Can you please walk me through the program's delivery process? [Example: initial assessment, home audit, installation, final inspection, QA/QC (monitoring)]?

    a. How much time typically elapses between the agencies' receipt of a completed application form and delivery of services?

    b. Is there a waiting list?

    c. Do you have to advertise to find customers?

9. How do services provided through the Ameren program differ from services provided through the state weatherization program?

10. How does the single-family component of the program differ from multi-family?

    b. How do multifamily customers enroll in the program?

    c. How are multifamily customers determined to be eligible for the program?

    d. What is the involvement of the property manager? What about the tenant?

11. Does Ameren provide any specific stipulations about how funding should be spent (e.g., cost ceiling per home, prioritization of funding, restrictions on specific measures or combinations of measures installed, like insulation and furnace replacement)?

12. What is the process for determining measure recommendations for a particular customer? [What criteria are used to decide what is installed? (audit software like NEAT or MHEA? priority measure list?)]

    a. Are these Ameren-specific criteria, or is this based on the State?

13. What is the typical Ameren cost share of a project - is it by measure or total house?

14. What amount or percent of the Ameren budget is allocated towards Health and Safety or repairs?

    a. How is it structured (percent of total budget, percent of expenditures per site)?

    b. Do health and safety and repair measures have to be cost effective? Are they included in the cost effectiveness of the project as a whole?

15. In the past, air conditioner work, refrigerator replacements and replacements of electric heating systems were not included as part of the LI Wx program. Is this true for the 2010 and 2011 program years?

    a. [If measures were added] When and why was this change made?

16. Which electric energy usage measures are typically recommended for upgrade (i.e., CFLs, thermostat, etc)?

    a. [IF NOT ALREADY MENTIONED] do you install CFLs in all client homes? If not, why not?

i. Are they directly installed into fixtures? Or are they left with the customer to install themselves?

17. Did any other changes occur to the program during the 2010 and 2011 program years? [PROBE: changes in the way it is delivered, in types of measures paid for by Ameren, percent of measure cost paid for by the utility, changes in health and safety funding]?
    a. Are there plans for additional changes?
18. Did the program face any barriers or challenges during the 2010 and 2011 program years?
    a. What was done to address these challenges?
19. Do you feel the program is meeting low income customers' needs?
20. Overall, what do you think works particularly well about the program delivery process?
    a. Do you have any suggestions for improvements?

## ARRA

21. Was the Recovery Act (ARRA) funding deadline a concern during the 2010 and 2011 program years?
    a. What kind of changes do you anticipate for the program after ARRA expires?
    b. How do you expect this will affect the program overall?

## Statewide Collaboration

22. Is there a statewide agency association (MCAA?) that is involved with the program?
23. Do you have any formal, ongoing meetings with DNR to discuss the program?
    a. Is Ameren included in any of these meetings?
    b. Is this effective?
    c. Are there any changes you would suggest to improve communication?
24. Are there any areas of your interaction with Ameren and/or DNR that need to be improved?

## Training

25. What training is required for agency staff or contractors delivering the program?
    a. Is there any certification required, either by the state or by Ameren?
    b. Are these protocols standardized across agencies (at the state-level) or is each agency responsible for its own staff?
26. In your opinion, is this training sufficient?

## Energy Education

27. What type of energy education is provided to program participants? Materials?

a. Are materials developed by the state, agencies, or the utility?

b. Is anything provided to the customer to indicate Ameren's sponsorship of the program?

c. Is the process for delivering energy education standard across agencies?

d. Was there any training provided instructing how best to provide energy education to customers?

28. In your opinion, is the current level of energy education provided sufficient?

**Data Tracking & Reporting**

29. What data does your agency report to DNR?

    a. How do the auditors collect audit data onsite for each individual job?

30. How frequently does your agency send DNR reports?

31. Are there any problems with data collection or reporting that you haven't already mentioned?

**QA/QC**

32. What are the procedures for program quality assurance and quality control?

    a. Do you think this process works well?

    b. Do you expect the level of monitoring to change as ARRA funding is exhausted?

## *Final Thoughts*

33. Any other comments or areas we did not cover on which you would like to add your views?

# APPENDIX D. PARTICIPANT SURVEY INSTRUMENT

## A. Introduction

**TO RESPONDENT:** Hello, my name is **[FIRST AND LAST NAME]** from Discovery Research Group and I'm calling on behalf of Ameren Missouri (Ameren) regarding the energy-savings services you received from **[AGENCY_FULL]** or **[AGENCY_ABBRV]**.

We are talking with people who received energy-saving services such as getting new light bulbs, insulation, or new equipment upgrades in their home. Most likely, these upgrades would have been installed through **[AGENCY_FULL]** in 2010 or 2011.

**[IF RESPONDENT EXPRESSES RESERVATIONS AT THIS POINT, USE THE FOLLOWING SCRIPT TO PERSUADE. IF RESPONDENT DOES NOT EXPRESS RESERVATIONS, SKIP TO B1]:**

I am calling on behalf of Ameren to conduct a survey which will be used to assist them in better serving their customers. Please be assured this is not a sales call. Your opinions are important in helping improve programs and understand how to assist customers in saving money on their utility bills. I want to assure you that all of your answers are confidential (i.e., not shared directly with Ameren or **[AGENCY_ABBRV]** in any way that identifies you).

## B. Screening Questions

**B1.** Do you remember receiving energy-saving equipment or getting new insulation through **[AGENCY_ABBRV]**?

1. Yes *[GO TO C1]*
2. No

-98. DON'T KNOW

-99. REFUSED [THANK AND TERMINATE]

**B2.** You may have received new light bulbs or windows. Do you remember receiving these services through a local agency in 2010 or 2011?

1. Yes *[GO TO C1]*
2. No/ Don't know/don't remember

**B3.** *[IF B2=2]* Is there anyone else at your home we could talk to that may have more knowledge of these services?

1. Yes [ASK IF YOU MAY SPEAK TO THIS PERSON NOW]
2. No/ Don't know/don't remember

**[IF UNABLE TO REACH CORRECT CONTACT: "THANK YOU. WE ARE ONLY ABLE TO TALK WITH PEOPLE WHO REMEMBER RECEIVING THESE SERVICES. WE APPRECIATE YOUR HELP." TERMINATE POLITELY]**

## C. Participation

**C1.** How did you first hear about the program that installed your new light bulbs and other new energy equipment? [DO NOT READ LIST]

1. Agency staff
2. Information with my utility bill
3. Ameren website
4. Other website
   C1a. WHICH WEBSITE(S)? [SPECIFY]
5. Through another energy assistance program
6. Another public service agency
7. Written materials from **[AGENCY_ABBRV]**
8. Written materials at a public service agency
9. Family/friends/word-of-mouth
10. Ameren Customer Service Representative
11. HVAC Contractor
12. Other
    C1b. [SPECIFY]

-98. DON'T KNOW/DON'T REMEMBER
-99. REFUSED

**C2.** Before now, were you aware that Ameren helped pay for these services?

1. Yes
2. No

-98. DON'T KNOW
-99. REFUSED

[ASK THE FOLLOWING MEASURE-SPECIFIC QUESTIONS ONLY FOR THOSE MEASURES THE PARTICIPANT RECEIVED]

**C3.** *[IF HVAC=1, READ C3, ELSE SKIP TO C8]* Our records show that you had your heating or air conditioning system either replaced or repaired. How would you rate the new system? Would you say it was: [READ LIST]

1. Excellent
2. Good
3. Fair
4. Poor
5. [DO NOT READ] Didn't receive heating system or A/C repair or replacement *[SKIP TO C8]*

-98. DON'T KNOW *[SKIP TO C6]*
-99. REFUSED *[SKIP TO C6]*

**C4.** *[IF C3= 1 OR 2]* Why did you give the system a(n) **[RESPONSE FROM C3]** rating? **[DO NOT READ, MARK ALL THAT APPLY]**

1. It saves energy
2. It lowers the electric/gas bill
3. It was free
4. The house is more comfortable
5. The contractor did a nice job
6. I needed a new heating system anyway
7. It keeps the house warmer/cooler
8. Other
   C4c. **[SPECIFY]**

-98. DON'T KNOW
-99. REFUSED

**C5.** *[IF C3= 3 OR 4]* Why did you give the system a **[RESPONSE FROM C3]** rating? **[DO NOT READ, MARK ALL THAT APPLY]**

1. My heating/cooling system worked better before
2. I didn't need a new heating/cooling system or repairs
3. It didn't help keep the house more comfortable
4. The contractor didn't finish
5. The contractor left a mess
6. Other
   C5d. **[SPECIFY]**

-98. DON'T KNOW
-99. REFUSED

**C6.** Before your heating or air conditioning system was repaired or replaced, was it working?

1. Yes, it worked fine
2. Worked but had problems
3. No, it did not work at all

-98. DON'T KNOW/DON'T REMEMBER
-99. REFUSED

**C7.** *[ASK ONLY IF C6=2]* Can you explain what problems the system had? **[OPEN END]**

**C8.** *[IF WIND=1, READ C8, ELSE SKIP TO C13]* Our records show that you had some work done on your windows. Can you tell me whether they replaced or just repaired your windows?

1. Installed new
2. Repaired existing
3. Replaced some and repaired some
4. **[DO NOT READ]** Didn't receive window repair/replacement *[SKIP TO C13]*

-98. DON'T KNOW/DON'T REMEMBER *[SKIP TO C13]*
-99. REFUSED *[SKIP TO C13]*

**C9.** Before that work was done, was the glass broken or cracked in any of the windows?

1. Yes, glass was broken
2. No, glass was intact

-98. DON'T KNOW/DON'T REMEMBER
-99. REFUSED

**C10.** How would you rate the work that was done on your windows? Would you say it was **[READ LIST]**:

1. Excellent
2. Good
3. Fair
4. Poor

-98. DON'T KNOW *[SKIP TO C13]*
-99. REFUSED *[SKIP TO C13]*

**C11.** *[IF C10= 1 OR 2]* Why did you give the windows a(n) **[RESPONSE FROM C10]** rating? **[DO NOT READ, MARK ALL THAT APPLY]**

1. It saves energy
2. It lowers the electric/gas bill
3. It was free
4. I like the way it looks
5. The house is more comfortable
6. The house is more secure/safer
7. The contractor did a nice job
8. I needed a new window or window repair anyway
9. It keeps the house warmer
10. Other

C11e. **[SPECIFY]**

-98. DON'T KNOW
-99. REFUSED

**C12.** *[IF C10= 3 OR 4]* Why did you give the windows a **[RESPONSE FROM C10]** rating? **[DO NOT READ, MARK ALL THAT APPLY]**

1. I liked my old windows better
2. I don't like the way the new window looks
3. I don't like the way the new window works (opens/does not open, etc.)
4. My home is not as secure
5. I didn't need new windows or repairs
6. It didn't help keep the house more comfortable
7. The contractor didn't finish
8. The contractor left a mess
9. Other

C12f. **[SPECIFY]**

-98. DON'T KNOW
-99. REFUSED

**C13.** *[IF BLD_INS=1, READ C13, OTHERWISE SKIP TO C14]* Our records show you received some insulation. Since **[AGENCY_ABBRV]** performed this work in your home, would you say that you are: **[READ LIST]**

**[PROVIDE DESCRIPTION OF INSULATION IF NOT SURE: "INSULATION IS A FLUFFY MATERIAL PUT IN THE ATTIC OR WALLS TO KEEP OUT DRAFTS"]**

1. A lot more comfortable in your home
2. Somewhat more comfortable in your home
3. At about the same level of comfort in your home
4. Less comfortable in your home
5. A lot less comfortable in your home

-98. DON'T KNOW/DON'T REMEMBER

-99. REFUSED

**C14.** *[IF WIND OR BLD_INS=1, ASK C14, OTHERWISE SKIP TO C15]* Since having the work done, do you hear less noise, more noise, or no change in the amount of noise from outside your home?

1. Less noise [Positive change]
2. More noise [Negative Change]
3. No Change

-98. DON'T KNOW

-99. REFUSED

**C15.** *[IF AIR_INFLT=1, READ C15, ELSE SKIP TO D1]* Our records show that you had some cracks sealed up on your home where outside air used to leak in. Would you say your home feels less drafty, more drafty, or about the same since this work was done?

**[PROVIDE DESCRIPTION OF AIR SEALING IF NOT SURE: "THEY MAY HAVE INSTALLED WEATHER STRIPPING AROUND THE DOORS AND WINDOWS OR EXPANDABLE FOAM AROUND BIG GAPS AROUND PLUMBING"]**

1. Less drafty
2. About the same
3. More drafty
4. **[DO NOT READ]** Didn't receive air sealing

-98. DON'T KNOW

-99. REFUSED

## D. Energy Education

**D1.** Did the agency staff who came to your home give you any tips on how you could save energy?

1. Yes
2. No *[SKIP TO D3]*

-98. DON'T KNOW *[SKIP TO D3]*

-99. REFUSED *[SKIP TO D3]*

**D2.** Would you say they provided you with: [READ LIST]

1. A lot of information?
2. Only some information?
3. Or very little information?

-98. DON'T KNOW [DO NOT READ]
-99. REFUSED [DO NOT READ]

**D3.** Do you remember receiving a booklet or pamphlet from the agency staff with information on how to save energy?

1. Yes
2. No *[SKIP TO D5]*

-98. DON'T KNOW *[SKIP TO D5]*
-99. REFUSED *[SKIP TO D5]*

**D4.** Did you read it or look at it after they left your house?

1. Yes
2. No

-98. DON'T KNOW
-99. REFUSED

**D5.** *[IF D1 = 1 OR D3 = 1, READ D5, ELSE SKIP TO E1]* Of all the tips you remember, which ones have you used in your home? **[RECORD UP TO THREE RESPONSES; DO NOT READ LIST]]**

1. Adjust heating
2. Adjust air conditioning
3. Use energy efficient lighting
4. Turn lights off when not in use
5. Keep windows/doors covered/sealed to minimize heat loss
6. Unplug appliances when not in use
7. Decrease shower time
8. Laundry conservation (cold water/hang clothes/full loads)
9. Keep refrigerator full
10. Adjust hot water heater
11. Other

D5g. **[SPECIFY]**

-98. DON'T KNOW
-99. REFUSED

**D6.** How satisfied are you with the energy saving tips and education you received through the program? Would you say that you are: **[READ LIST]**

1. Very satisfied
2. Somewhat satisfied
3. Neither satisfied nor dissatisfied **[DO NOT READ]**
4. Somewhat dissatisfied
5. Very dissatisfied

-98. DON'T KNOW **[DO NOT READ]**

-99. REFUSED **[DO NOT READ]**

## E. Program Satisfaction

"Next, I'd like to ask you some questions about your overall experience with the program."

**E1.** How courteous and respectful was the **[AGENCY_ABBRV]** staff? Would you say they were: **[READ LIST]**

1. Very courteous
2. Somewhat courteous
3. Not very courteous
4. Not at all courteous

-98. DON'T KNOW/DON'T REMEMBER

-99. REFUSED

**E2.** How satisfied were you with the condition in which the contractor left your home after the work was done? Were you: **[READ LIST]**

1. Very satisfied
2. Somewhat satisfied
3. Neither satisfied nor dissatisfied **[DO NOT READ]**
4. Somewhat dissatisfied
5. Very dissatisfied

-98. DON'T KNOW

-99. REFUSED

**E3.** Since the work was completed, would you say that your utility bills have been: **[READ LIST]**

1. Much more affordable
2. Somewhat more affordable
3. About the same
4. Less affordable
5. Much less affordable

-98. DON'T KNOW/DON'T REMEMBER

-99. REFUSED

**E4.** Do you feel like you are better able to pay your energy bills as a result of this work?

1. Yes
2. No
3. About the same

-98. DON'T KNOW/DON'T REMEMBER

-99. REFUSED

**E5.** Overall, how satisfied are you with the Low Income Weatherization Program? Would you say that you are: **[READ LIST]**

1. Very satisfied
2. Somewhat satisfied
3. Neither satisfied nor dissatisfied **[DO NOT READ]**
4. Somewhat dissatisfied
5. Very dissatisfied

-98. DON'T KNOW

-99. REFUSED

**E6.** Have you experienced any other benefits from the services provided by **[AGENCY_ABBRV]**?

1. Yes
   E6H. **[SPECIFY]**
2. No

-98. DON'T KNOW

-99. REFUSED

**E7.** Did you experience any problems or difficulties from being part of this program? **[DO NOT READ, MARK ALL THAT APPLY]**

1. Yes
2. No *[SKIP TO E11]*

**E8.** What problems or difficulties did you experience? **[DO NOT READ, MARK ALL THAT APPLY]**

1. I had to miss work for the appointments
2. The work was very noisy
3. The contractor left a mess
4. The contractor was rude
5. The agency staff was rude
6. The contractor did poor quality work
7. I didn't like having strangers in my home
8. My landlord is upset
9. My neighbors are upset because of the mess/noise
10. Other
    E8i. **[SPECIFY]**

-98. DON'T KNOW/DON'T REMEMBER *[SKIP TO E11]*

-99. REFUSED *[SKIP TO E11]*

**E9.** Did **[AGENCY_ABBRV]** resolve this issue for you?

1. Yes *[SKIP TO E11]*
2. No

-98. DON'T KNOW
-99. REFUSED

**E10.** **[IF E9=2]** How would you have liked **[AGENCY_ABBRV]** to resolve this problem? **[OPEN END]**

**E11.** Do you have any suggestions on how to improve the program?

1. **[RECORD RESPONSE]**
2. No

-98. DON'T KNOW
-99. REFUSED

**E12.** Do you have any additional feedback you would like to provide Ameren or **[AGENCY_ABBRV]**?

1. **[RECORD RESPONSE]**
2. No

-98. DON'T KNOW
-99. REFUSED

**"Thank you for your time today; those were all the questions I had."**

# APPENDIX E: EXAMPLE OF PROGRAM DATA TRACKING FIELDS

**Table 1. Example Program Data Tracking Fields**

| Field Name | Field Description |
|---|---|
| **Site** | |
| SITEID | Site ID (unique dwelling identifier) |
| NAME | Name of occupant on the account |
| ADDRESS | Street address of unit |
| CITY | City address of unit |
| ZIP | ZIP code of unit |
| PHONE | Occupant phone number |
| ACCT_ID | Account ID |
| ALT_ID | Alternative Account ID |
| AUDIT_DATE | Date initial audit performed |
| OCCUPANTS | Number of people living in unit in during program year |
| OCCUPANTS_PRIOR | Number of people living in unit 12 months prior to participating |
| HOUSE_TYPE | Building type description |
| HEATED_SQFT | Square footage of unit that is heated |
| BEDROOMS | Number of bedrooms in unit |
| BATHROOMS | Number of bathrooms in unit |
| NO_UNITS | Number of units in building |
| CENTRAL_AC | Unit has central AC (yes/no) |
| ROOM_AC | Number of room ACs in unit |
| HEATSYS_FUEL | Primary heating fuel |
| DHW_FUEL | Primary hot water fuel |
| **Space Heating System** | |
| HEATSYS_YEAR | Year existing system manufactured / installed |
| HEATSYS_EX_DISTTYPE | Distribution type used by existing system |
| HEATSYS_EX_EFFRATED | Rated efficiency of existing system |
| HEATSYS_EX_EFF | Measure efficiency of existing system |
| HEATSYS_INSTALL_MEASURE | Services provided to improve system |
| HEATSYS_INSTALL_DATE | Install date of new high efficiency system |
| HEATSYS_INSTALL_EFF | Rated efficiency of new system |
| BOILER PIPE INSULATION INSTALL | New boiler pipe insulation installed (yes/no) |
| BOILER PIPE INSULATION QTY | Linear feet of new boiler pipe insulation |
| **Domestic Hot Water** | |
| INSTALL_DATE | Install date of new DHW |
| MEASURE | Type of new equipment |
| LOCATION | Location of new equipment |
| EX_QTY | Existing quantity |
| EX_GPM | Existing gallons per minute |
| INSTALL_QTY | New quantity installed |
| INSTALL_GPM | New gallons per minute |

| Field Name | Field Description |
|---|---|
| **Air Sealing** | |
| INSTALL_DATE | Install date of new air sealing |
| LOCATION | Location |
| EX_CFM50 | Existing air leakage (cubic feet per minute at 50 Pa) |
| INSTALL_QTY | Hours of air sealing performed |
| INSTALL_CFM50 | New air leakage (cubic feet per minute at 50 Pa) |
| **Insulation** | |
| INSTALL_DATE | Install date of new insulation |
| LOCATION | Location |
| EX_RVALUE | R-value of existing insulation |
| INSTALL_QTY | Quantity of new insulation |
| UNIT_QTY | Quantity used to measure new insulation |
| INSTALL_RVALUE | R-value of new insulation |
| WALL_SIDING | Siding on outside wall of home (yes/no) |
| **Lighting** | |
| INSTALL DATE | Install date of new bulbs / fixtures |
| INSTALL MEASURE | Type of lighting measure |
| DAILY USE HRS | Estimated daily hours-of-use of measure |
| EX QTY | Quantity of bulbs replaced |
| EX WATTS | Wattage of bulbs replaced |
| INSTALL QTY | Quantity of bulbs installed |
| INSTALL WATTS | Wattage of bulbs installed |
| **Refrigeration** | |
| INSTALL_ DATE | Install date of new refrigerator or freezer |
| METERED_VALUE | Value of spot measurement by auditor |
| EX_QTY | Quantity of refrigerators or freezers removed |
| INSTALL_ QTY | Quantity of refrigerators or freezers installed |
| **Miscellaneous Items** | |
| INSTALL DATE | Install date of measure |
| MEASURE | Name of measure |
| INSTALL QTY | Quantity installed |
| NOTES | Notes |

# APPENDIX F. PAYMENT METRICS

## Arrearage Metrics

$$\overline{\Delta\, Arrearage_J} = \frac{\sum_{i=1}^{n_j}\left(Arrearage_{i,t=12} - Arrearage_{i,t=1}\right)}{n_j}$$

Where:

$Arrearage_{i,t}$ = the amount in dollars that customer, i, owed PSE in period, t.

$$\overline{Arrearage_j} = \frac{\sum_{i=1}^{n_j}\sum_{t=1}^{12} Arrearage_{i,t}}{12 * n_j}$$

## Disconnect Metrics

$$\overline{Reconnects_j} = \frac{\sum_{i=1}^{n_j}\sum_{t=1}^{12} Reconnect_{i,t}}{n_j}$$

Where:

$Reconnect_{i,t}$ = 1 if a customer had a reconnect in billing period, t, is and 0 otherwise.

## Payment and Billing Metrics

$$\overline{Billed\ amount_j} = \left(\frac{\sum_{i=1}^{n_j}\sum_{t=1}^{12} Billed\ amount_{i,t}}{n_j}\right)$$

## Arrangement Metrics

$$\%\ of\ billed\ amount\ paid\ by\ customer_j = \frac{\overline{\boldsymbol{Billed\ amount_j} - Arrangement_j}}{\overline{\boldsymbol{Billed\ amount_j}}}$$

Where:

$Arrangement_{i,t}$ = the amount in dollars that an outside party paid on behalf of customer, i, in period, t.