# Evaluation of Public Housing Authority Efficient Living Program

June 2011 through May 2012

Prepared for:
Illinois Department of Commerce Economic Opportunity

Prepared by:


ADM Associates, Inc.
3239 Ramos Circle
Sacramento, CA 95827
916.363.8383

Final Report: October 2013

# Contact:

Donald Dohrmann, Ph.D., Principal
775.825.7079
dohrmann@admenergy.com

# Prepared by:

Steven Keates, P.E.
916.363.8383
steven@admenergy.com

Jeremy Offenstein, Ph.D.
916.363.8383
jeremy@admenergy.com

Matthew Jaoudi
510.371.0761
matthew@admenergy.com

# Table of Contents

# List of Tables

# List of Figures

# Executive Summary

This report presents the results of the impact and process evaluations for electric program year four and natural gas program year one (EPY4/GPY1) of the Public Housing Authority Efficient Living Program offered by the Illinois Department of Commerce and Economic Opportunity (DCEO). EPY4/GPY1 is defined as the period June, 2011 through May, 2012.

The main features of the approach used for the evaluation are as follows:

- Data for the study were collected through review of program materials and interviews with DCEO staff members and participants.
- An engineering desk review of program measures to verify gross savings estimates.

The realized gross and net electric energy savings of the Efficient Living Program during the period June, 2011 through May, 2012 are summarized in Table ES-1. For EPY4/GPY1, realized annual gross electric energy savings total 2,781,182 kWh. For electric energy savings, the program gross realization rate is 100%. The program net-to-gross ratio is 100% because the Efficient Living Program targets low income residents. The realized net electric energy savings total 2,781,182 kWh annually. Natural gas energy savings are shown in Table ES-2. Gross realized natural gas savings total 161,896 therms annually. For natural gas savings, the gross realization rate is 85%. Net therm savings total 161,896 annually.

*Table ES-1 Summary of kWh Savings for Efficient Living Program*

| *Utility* | *Expected kWh Savings* | *Realized Gross kWh Savings* | *Gross Realization Rate* | *Realized Net kWh Savings** |
|---|---|---|---|---|
| Ameren | 1,526,706 | 1,739,570 | 114% | 1,739,570 |
| ComEd | 1,258,991 | 1,041,612 | 83% | 1,041,612 |
| Total | 2,785,697 | 2,781,182 | 100% | 2,781,182 |

**A net-to-gross ratio of 100% is applied because the Efficient Living Program targets low income residents who would not have funded new energy efficiency measures in the absence of the program.*

*Table ES-2 Summary of Therm Savings for Efficient Living Program*

| *Utility* | *Expected Therm Savings* | *Realized Gross Therm Savings* | *Gross Realization Rate* | *Realized Net Therm Savings** |
|---|---|---|---|---|
| Ameren | 71,875 | 74,842 | 104% | 74,842 |
| Nicor | 72,498 | 55,082 | 76% | 55,082 |
| Peoples | 32,581 | 21,143 | 65% | 21,143 |
| North Shore | 13,142 | 10,829 | 82% | 10,829 |
| Total | 190,097 | 161,896 | 85% | 161,896 |

**A net-to-gross ratio of 100% is applied because the Efficient Living Program targets low income residents who would not have funded new energy efficiency measures in the absence of the program.*

The realized gross and net peak kW reductions of the Efficient Living Program during the period June, 2011 through May, 2012 are summarized in Table ES-3. The achieved net peak demand savings total 448.44 kW.

*Table ES-3 Summary of Peak kW Savings for Efficient Living Program*

| *Utility* | *Realized Gross kW Savings* | *Realized Net kW Savings** |
|---|---|---|
| Ameren | 269.86 | 269.86 |
| ComEd | 178.58 | 178.58 |
| Total | 448.44 | 448.44 |

**A net-to-gross ratio of 100% is applied because the Efficient Living Program targets low income residents who would not have funded new energy efficiency measures in the absence of the program.*

Program participant responses to surveys and interviews with program staff indicate that the Efficient Living Program is operating smoothly and has been effectively delivering energy savings. The following presents a selection of key conclusions from EPY4/GPY1:

- **High Levels of Program Satisfaction:** Participating decision makers indicated a high level of satisfaction with the program. Survey respondents indicated that they were somewhat or very satisfied with most aspects of the program. All respondents indicated that the measures met or exceeded their expectations. Participants did not report significant problems with the application process or the implementation of the measures. Additionally, participants who received education and training or onsite assistance from program staff reported that it was beneficial.
- **Program Staff are Oriented toward Continuous Improvement:** Interviews with program staff involved discussions about challenges staff members may have faced or are currently facing in effectively delivering the Efficient Living Program. Staff members have made adjustments to the method that the program uses to distribute funds and application materials in order to address operational issues that have occurred. Staff members' efforts to further improve the program will continue to serve the program well in future years.
- **Public Housing Authority Decision Makers Respond Well to Word of Mouth Promotion:** Program activity is primarily driven by program staff's promotional efforts. The At the Building Research Council School of Architecture, the University of Illinois Efficient Living Program partners with SEDAC and DCEO to promote the program. The majority of participant survey respondents indicated that they became aware of the program through one of these three organizations. Program staff noted that word of mouth promotion of the program is also an important means of increasing awareness of the program. In fact, one-fifth of participants reported hearing about the program from friends or colleagues.
- **Less Program Activity Downstate:** Interviews with program staff indicated that there is less program participation in central and southern Illinois. These public housing authorities operate in areas that are more geographically dispersed than public housing authorities in the northern part of the state. The greater dispersion results in fewer networking opportunities, less information sharing, and less awareness of the program and energy efficiency in general.

A second factor that results in less activity in central and southern Illinois is that the distribution of utility funds does not match the distribution of public housing authority units. Specifically, 40% of the public housing authority units are located in Ameren territory while less than 30% of the program funding is provided by Ameren. Consequently, the program has relatively fewer resources for serving housing authorities in the Ameren service territory.

- **Multiple Motivations for Participating:** Most survey respondents reported that they undertook the improvements made through the program to reduce operating costs and to improve conditions for residents through improved comfort and reduced utility bills. Most decision makers reported that residents paid a portion of their utility costs.
- **Participants Value Information Provided by the Program:** Program staff noted that lack of familiarity with - and misconceptions about - energy efficient equipment were notable barriers to public housing authorities' adoption of energy efficiency measures. Furthermore, responses to several questions suggest that decision makers value the informational assistance provided by the Efficient Living Program. A sizable share of participants indicated that program staff recommendations were influential in the decision to implement the energy efficiency measures. Participants also reported that the training and onsite assistance they received through the program was helpful. These findings suggest the program is effective in reducing informational barriers to energy efficiency improvements in public housing authorities.
- **Initial Cost is a Primary Factor in Efficient Equipment Decisions:** Most survey respondents indicated that initial cost was a primary factor in their organization's decision to implement energy efficient equipment. Toward that end, program staff noted that the costs of equipment were a significant barrier for public housing authorities to implement energy efficiency improvements. These findings suggest that the initial cost of energy efficient equipment may discourage its implementation despite the longer term potential for cost savings. The incentives provided by the program directly encourage the implementation of energy efficiency measures by reducing the initial cost of the efficient equipment.
- **Limited Data Available in the EEPS Database:** The Energy Efficiency Portfolio Standard (EEPS) database is intended to track program activity for all DCEO programs. However, the database contains only high level information on projects completed through the Efficient Living Program and lacks the granularity of detail which would be useful to DCEO and evaluators alike. The School of Architecture currently has extensive reporting protocols in place that present well-organized information on program activity, including project specifications and measure quantities. Ideally, this information would be incorporated into the DCEO project tracking database.

The following recommendations are offered as suggestions for the continued development of the program.

- **Apply TRM Methodologies in Estimating Savings:** For several measure types, the Illinois Statewide TRM stipulates more conservative assumptions about measure-level factors that affect energy savings calculations than those used by program staff. In order to improve

future energy savings realization rates, it is recommended that, whenever possible, Efficient Living Program staff utilize the approaches and assumptions outlined in the Illinois Statewide TRM.

- **Continue Outreach Efforts:** As previously mentioned, program staff noted that the program has had less participation by housing authorities in the southern part of the state than in the northern part. Staff members have developed plans for addressing this, which will likely involve identifying non-participating public housing authorities and developing a strategy to encourage their involvement. Staff members' continued outreach will help to drive energy efficiency improvements in public housing authorities by increasing awareness of the program and emphasizing the benefits of energy efficiency improvements.
- **Facilitate Collaboration Among Public Housing Authorities:** While the presentations and workshops hosted by the program have been effective forms of education, additional interest in the program and greater program savings may be generated by developing strategies to encourage public housing authority staff to collaborate with one another in identifying opportunities for energy efficiency. Interview responses suggest that collaboration may be a particularly effective means of encouraging energy efficiency improvements.
- **Efforts to Promote the Program should Emphasize Benefits to Residents:** Surveys of grant recipients indicated that public housing authority decision makers are motivated to participate in the program in order to improve resident comfort and lower their utility costs. The program can capitalize on these motivations by emphasizing the range of benefits obtained by implementing energy efficiency improvements through the program.

# 1. Introduction

This report presents the results of the impact and process evaluations of the Illinois Department of Commerce and Economic Opportunity (DCEO) Public Housing Authority Efficient Living Program. This report presents results for activity during electric program year four and natural gas program year one (EPY4/GPY1), the period June, 2011 through May, 2012.

## 1.1 Description of Program

The Efficient Living Program was designed to help improve the energy efficiency of public housing in Illinois. Applicants requesting grant funds for electricity conservation measures must do so for sites serviced by DCEO.

The Efficient Living Program is operated in partnership with the School of Architecture-Building Research Council located at the University of Illinois at Urbana-Champaign (UIUC). The program provides grants to Illinois Public Housing Authorities to fund energy efficiency improvements to public housing buildings. The program includes both retrofit and new construction and gut / rehab projects. The program is available to applicants that manage public housing authorities located in Illinois.

Eligible energy efficiency measures can be installed in common areas or in residential units. A wide variety of measures are eligible for incentive funds including exit signs, exterior and interior lighting, controls, ENERGY STAR® appliances and HVAC equipment.

Grant awards include both standard and custom components described as follows:

- The standard component incentivizes the installation or use of energy efficient lighting equipment, HVAC equipment, water heaters, motors and variable frequency drives, appliances, insulation, and duct sealing.
- The custom component incentivizes qualifying energy measures at a rate of $0.20 per projected kWh or $2.00 per projected therms saved during the first program year of operation.

Grants are capped at $350,000 and cover up to, but not exceed, 100% of the total project cost.

### 1.1.1 Expected kWh and Therm Savings

Expected kWh and therm savings for each utility are shown in Table 1-1 and Table 1-2. There were 209 projects completed through the program during the period June, 2011 through May, 2012, which were expected to provide annual savings of 2,785,697 kWh and 190,097 therms.

*Table 1-1 Expected kWh Savings for Efficient Living Program by Utility*

| *Utility* | *Expected kWh Savings* |
|---|---|
| Ameren | 1,526,706 |
| ComEd | 1,258,991 |
| Total | 2,785,697 |

*Table 1-2 Expected Therm Savings for Efficient Living Program by Utility*

| *Utility* | *Expected Therm Savings* |
|---|---|
| Ameren | 71,875 |
| Nicor | 72,498 |
| Peoples | 32,581 |
| North Shore | 13,142 |
| Total | 190,097 |

## 1.2 Overview of Evaluation Approach

The overall objective for the impact evaluation of the Efficient Living Program was to determine the net electric and natural gas energy savings and peak demand (kW) reductions resulting from program projects implemented during EPY4/GPY1.

The approach for the impact evaluation included the following main features:

- Available documentation (e.g., invoices, savings calculation work papers, etc.) was reviewed for projects, with particular attention given to the calculation procedures and documentation for savings estimates.
- Gross savings were verified via analytical desk review.

The process evaluation approach involved the following:

- Review of program documentation and prior evaluation reports
- A survey of a sample of program participants to gather information on their decision making and their likes and dislikes of the program
- Interviews with program staff members discussing program operations, successes, challenges, and future plans.

## 1.3 Organization of Report

The evaluation report for the Efficient Living Program is organized as follows:

- Chapter 2 presents and discusses the analytical methods and results of estimating program savings.
- Chapter 3 presents and discusses the analytical methods and results of the process evaluation of the program.
- Chapter 4 presents evaluation conclusions and recommendations resulting from the program evaluation.
- Appendix A provides a copy of the questionnaire used for the survey of grant recipient decision makers.
- Appendix B presents the results from a survey of trade allies for survey of grant recipient decision makers.

# 2. Impact Evaluation

This chapter presents the results of the impact evaluation of the Public Housing Authority Efficient Living Program offered by the Illinois Department of Commerce and Economic Opportunity (DCEO). The overall objective of the impact evaluation was to determine the net electric energy and natural gas energy savings, as well as peak demand (kW) reductions resulting from program projects during the period June, 2011 through May, 2012. Section 2.1 describes the methodology used for estimating gross savings. Section 2.2 presents the results from the effort to estimate savings for a sample of projects.

## 2.1 Methodology for Calculating Program Savings

The methodology used for calculating program savings is described in this section. ADM performed a tracking system review, and an engineering desk review to determine the appropriateness of the assumptions used to determine the ex ante savings estimates. The review of the ex ante savings estimates included reviewing the analyses and calculations that were used to develop deemed or stipulated savings values for the measures that are rebated through the program. The analysis for each measure is assessed according to the degree to which the savings calculations are consistent with the Illinois Technical Reference Manual (TRM) and supported and defensible and documentation is adequate.

The accuracy of a savings estimate developed through engineering calculations depends on the extent to which the analysis is based on correct assumptions regarding such factors as usage patterns and operating hours. The as-used baseline conditions are assessed by reviewing program baseline assumptions and testing the validity of those assumptions via interviews with participants and the findings from the verification effort that is another aspect of this work.

Based on the evaluation of the savings calculations, measures were classified into one of three categories:

- Documentation is sufficient, and original savings estimate is consistent with the Illinois TRM.
- Documentation is sufficient, but original savings estimate is not consistent with the Illinois TRM.
- Documentation is insufficient, and original savings estimate is not consistent with the Illinois TRM.

If a measure falls into one of the last two categories, references were provided demonstrating deficiencies pertaining to the reasonableness of the given assumptions, the adequacy of the given documentation, and the appropriateness of the given methodology. Based on this work, recommendations are developed regarding changes to the stipulated savings values.

## 2.2 Results of Impact Evaluation

This section presents the results of the impact evaluation for the Efficient Living Program during the period of June, 2011 through May, 2012.

### 2.2.1 Review of Tracking System

The details of the project implemented by each of the public housing authorities were provided to ADM by Efficient Living Program staff. ADM was provided with a summary document of program activity and additional spreadsheets which listed each implemented measure, technical specifications, savings assumptions, and savings calculations. The spreadsheets were populated from invoices provided to the Efficient Living Program staff by the participants.

ADM completed a review of the documentation provided. There were a few discrepancies in counts of measures installed in different documents provided. Investigation of these discrepancies showed that most of the discrepancies were due to changes in the number of measures from early estimations versus the final program measurement totals. The final numbers in both ex ante and ex post savings calculations are a result of the correction of these numbers of measures.

### 2.2.2 Measure-Level Energy Savings

This subsection presents the results of the evaluation's engineering desk review of the ex ante savings assumptions for each measure included in the Efficient Living Program.

#### 2.2.2.1. Refrigerator

Ex ante saving estimates were developed using the ENERGY STAR® calculator. An annual energy usage baseline was determined based on the specifications of the existing model. The energy consumption from the new ENERGY STAR® unit was subtracted from the baseline energy usage. The calculation of expected savings incorporated heating and cooling interactive effects that occur when refrigerators operate in a conditioned space.

Ex post savings were developed using the Ohio TRM. Unlike the Illinois Statewide Technical Reference Manual (TRM), the Ohio TRM utilizes a dual-baseline for low income participants for the early replacement of an ENERGY STAR® rated refrigerators. According to the Ohio TRM, the baseline condition is the existing inefficient refrigerator for the remaining assumed useful life of the unit, and then for the remainder of the measure life the baseline becomes a new refrigerator meeting the minimum federal efficiency standard. For the first eight years, the Ohio TRM recommends using an annual per unit savings value of 976 kWh for ENERGY STAR® rated refrigerator replacement for low income participants.

#### 2.2.2.1. Room Air Conditioner

Ex ante savings estimates were developed using the following algorithm:

$$\Delta kWh = (Btuh/1{,}000) * (1/SEERexisting - 1/SEERnew) * FLH_s$$

$FLH_s$ refers to the full load cooling hours and were based on the ENERGY STAR® Air-source heat pump calculator. The hours were dependent on the location of the equipment.

Ex post savings were developed using the Ohio TRM. Unlike the Illinois TRM, the Ohio TRM utilizes a dual-baseline for low income participants for the early replacement of an ENERGY STAR® rated room air conditioner. According to the Ohio TRM, the baseline condition is the existing inefficient room air conditioning unit for the remaining assumed useful life of the unit, and then for the remainder of the measure life the baseline becomes a new replacement unit meeting the minimum federal efficiency standard (i.e. with an efficiency rating greater than or equal to 9.8EER). For the first three years, the Ohio TRM recommends using an annual per unit savings value of 73.8 kWh for ENERGY STAR® rated room air conditioner replacement for low income participants.

#### 2.2.2.2. Clothes Washer

Ex ante savings for clothes washers were developed using the following algorithm:

$$\Delta kWh = Capacity * (1/MEFbase - 1/MEFeff) * Ncycles$$

Savings calculations utilized the following inputs:

- The modified energy factor for baseline equipment was the efficiency of baseline equipment or 1.26 if this could not be determined.
- The number of annual wash cycles was 295 for residential units and 950 for commercial units.

The methodology for calculating electric savings for clothes washers specified in the Illinois TRM involves the calculation of a Modified Energy Factor (MEF). ADM applied the following savings algorithm from the Illinois Statewide TRM:

$$\Delta kWh = MEFsavings = Capacity * (1/MEFbase - 1/MEFeff) * Ncycles$$

Where,

| | | |
|---|---|---|
| *Capacity* | = | The clothes washer capacity. |
| *MEFbase* | = | The modified energy factor for the baseline equipment. |
| *MEFefficient* | = | The modified energy factor for the efficient equipment. |

*Ncycles* = The number of cycles per year.

The Illinois TRM provides the following assumptions:

- The modified energy factor for baseline equipment is 1.64.
- The modified energy factor for efficient equipment is 2.28.
- The number of annual wash cycles= 295.
- The capacity of the washer is 3.5 cubic feet.

For commercial washing units, ADM used the same number of annual wash cycles assumed by program staff (i.e., 950).

#### 2.2.2.3. High Efficiency Boiler

Ex ante savings were developed using the algorithm below:

*ΔTherms* = Boiler *output capacity (in Btuh) * (1/AFUE(base) - 1/AFUE(eff)) * (FLHw/100,000)*

Savings calculations utilized the following inputs:

- Full load hours (FLHw) were taken from ENERGY STAR®'s Air Source Heat Pump Calculator on ENERGY STAR® Air-source heat pump calculator hours;
- Annual fuel utilization efficiency (AFUE) for baseline equipment was based on original equipment specifications;
- Boiler output capacity was based on the smaller of the new and original equipment capacities.

ADM applied the following savings algorithm from the Illinois Statewide Technical Reference Manual (TRM), to determine ex post savings.

*ΔTherms = Gas_Boiler_Load * (1/AFUE(base) - 1/AFUE(eff)).*

Where,

*Gas boiler load* = Estimate of annual household load for gas boiler.

*AFUE(base)* = Estimate of baseline boiler annual fuel utilization efficiency rating.

*AFUE(eff)* = Efficient boiler annual fuel utilization rating.

The Illinois Statewide TRM recommends using the following assumptions:

- The AFUE(base) is 80%.
- The gas boiler load is dependent on climate zone and averages 1158 therms.

The AFUE rating for the efficient boiler was based on the specifications of the installed equipment.

#### 2.2.2.4. Air Conditioner Cover

Ex ante savings for air conditioner covers were developed using the following algorithms:

For covers installed in units with electric heating,

$$\Delta kWh = Cf * Cd * \Delta U * Area\ in\ ft2 * HDD * (24\ hrs/day) * (1\ kWh/3{,}412\ Btu) * (1/Heating\ COP)$$

For covers installed in units with natural gas heating,

$$\Delta Therms = Cf * Cd * \Delta U * Area\ in\ ft2 * HDD * (24\ hrs/day) * (1\ therm/100{,}000\ Btu) * (1/Heating\ COP)$$

Where,

$$\Delta U = 1/Rair - 1/Rcover$$

Air conditioner covers are not covered in the Illinois TRM. ADM reviewed the ex ante savings calculations and found them appropriate. Ex ante savings estimates were accepted for ex post calculations

#### 2.2.2.5. Lighting Upgrade

Ex ante savings were developed using the following algorithm:

$$Gross\ \Delta kWh = \Delta kW * annual\ operating\ hours$$

Where,

$$\Delta kW = (Existing\ Fixture\ Wattage - New\ Fixture\ Wattage)/1{,}000$$

Annual operating hours were based on site staff or program staff estimates.

Net kWh savings included heating and cooling interactive effects. Cooling interactive effects were developed using the following algorithm;

$$Cooling\ kWh\ Savings = (gross\ kWh\ Savings * 0.28) / COP\ of\ the\ Cooling\ Equipment$$

Heating interactive effects were developed using either of the following algorithms;

For units with electrical heat,

$$Heating\ kWh\ Savings = (-gross\ kWh\ Savings * 0.32) / COP\ of\ the\ Heating\ Equipment$$

For units with natural gas heat,

*Heating Therm Savings = (- gross kWh Savings * 0.32 * 3.412/100) / Heating Efficiency*

ADM applied the following savings algorithm from the Illinois Statewide Technical Reference Manual (TRM), to determine ex post savings.

*ΔkWh = ((WattsBase - WattsEE) / 1000) * ISR * Hours * WHFe*

Where,

| | | |
|---|---|---|
| *WattsBase* | = | Watts for baseline fixture. |
| *WattsEE* | = | Watts for energy efficient fixture. |
| *ISR* | = | In-service rate. |
| *WHFe* | = | Waste heat factor. |
| *Hours* | = | Annual hours of operation. |

The Illinois Statewide TRM recommends using the following assumptions:

- The in-service rate is 96.9%.
- The waste heat factor is 1.04.
- Hours of operation were dependent on space type.

The baseline and efficient fixture watts were based on the fixture specifications.

#### 2.2.2.6. Occupancy Sensor

Ex ante savings were developed using the following algorithm;

*ΔkWh = (Total Fixture Wattage/ 1000) * Annual Operating Hours * Percent Unoccupied*

Calculations assumed that the percent unoccupied was 30%.

ADM applied the following savings algorithm from the Illinois Statewide Technical Reference Manual (TRM), to determine ex post savings.

*ΔkWh = KWcontrolled * Hours *ESF * WHFe*

Where,

| | | |
|---|---|---|
| *kW controlled* | = | The total lighting load connected to the controlled lights. |
| *Hours* | = | The total operating hours of the controlled lighting circuit before the lighting controls are installed. |
| *ESF* | = | Energy savings factor representing the percentage reduction to the operation hours from the non-controlled baseline lighting system. |

*WHFe* = Waste heat factor.

The Illinois Statewide TRM recommends using the following assumptions:

- The energy savings factor is 41% for wall or ceiling mounted sensors.
- The waste heat factor is 1.34.

Site specific specifications were used for the kW controlled and operating hours.

#### 2.2.2.7. Low-Flow Showerhead

Ex ante savings were developed using one of the following algorithms:

For units with natural gas domestic water heaters (DWH),

*ΔTherms = Water Savings * (8.35 lb/gal of water) * (Hot Water Temperature – Supplied Water Temperature) * % Hot Water *(Btu/lb * °F)*(1 therm/100,000 Btu) *(1/ DWHefficiency)*

For units with electric domestic water heaters (DWH),

*ΔkWh = Water Savings * (8.35 lb/gal of water) *(Hot Water Temperature – Supplied Water Temperature) * % Hot Water *(Btu/lb*°F)*(1 kWh/3,412 Btu) *(1/ DWHefficiency)*

Percent hot water (% Hot Water) refers to the percentage of total water flow that is considered to be hot water. A value of 70% was used for percent hot water. A value of 1.0 was used for domestic water heater efficiency (DWHefficiency) for electric units and a value of 0.8 for natural gas units. Water savings were developed using the following algorithm:

*Water Savings = (Current GPM – New GPM) * SPD * minutes per shower *days per year *(number of people / showerheads) * number of shower heads*

The following inputs were used in the development of water savings:

- The number of showers per person per day (SPD) was 1.
- The number of minutes per shower was 10.
- The gallons per minute of baseline showerhead was 2.5.
- The gallons per minute for the low-flow showerhead was 1.75.

ADM applied the following savings algorithms for low flow showerheads from the Illinois Statewide Technical Reference Manual (TRM) to develop ex post savings:

For electric savings,

*ΔkWh = %ElectricDHW * ((GPM_base * L_base - GPM_low * L_low) * Household * SPCD * 365.25 / SPH) * EPG_electric * ISR*

For natural gas savings,

*ΔTherms = %FossilDHW * ((GPM_base * L_base - GPM_low * L_low) * Household * SPCD * 365.25 / SPH) * EPG_gas * ISR*

Where,

| | | |
|---|---|---|
| *%ElectricDHW* | = | Proportion of water heating supplied by electricity. |
| *%FossilDHW* | = | Proportion of water heating supplied by natural gas. |
| *GPM_base* | = | Flow rate of the baseline showerhead. |
| *L_base* | = | Length of shower in minutes with baseline showerhead. |
| *GPM_low* | = | Flow rate of the low-flow showerhead. |
| *L_low* | = | Length of shower in minutes with low-flow showerhead. |
| *Household* | = | Average number of people per household. |
| *SPCD* | = | Showers per capita per day. |
| *SPH* | = | Showers per household. |
| *EPG_electric* | = | Energy per gallon of hot water supplied by electric. |
| *EPG_gas* | = | Energy per gallon of hot water supplied by natural gas. |
| *ISR* | = | The in-service rate. |

The Illinois Statewide TRM recommends using the following assumptions:

- The in-service rate is 93%.
- The number of showers per capita per day is .75
- The length of shower in minutes for the baseline and low-flow showerhead is 8.2.
- The gallons per minute for the baseline showerhead are 2.67.
- The gallons per minute of low-flow shower head are 1.5.
- The showers per household are 1.3.
- The average number of people per household is 2.1.

#### 2.2.2.8. Low-Flow Faucet Aerator

Ex ante savings were developed using one of the following algorithms:

For units with natural gas domestic water heaters (DWH),

*ΔTherms = Water Savings * (8.35 lb/gal of water) * (Hot Water Temperature – Supplied Water Temperature) * % Hot Water *(Btu/lb*°F)*(1 therm/100,000 Btu) *(1/ DWHefficiency)*

For units with electric domestic water heaters (DWH),

*ΔkWh= Water Savings * (8.35 lb/gal of water) *(Hot Water Temperature – Supplied Water Temperature) * % hot water *(Btu/lb*°F)*(1 kWh/3,412 Btu) *(1/ DWHefficiency)*

Percent hot water (% Hot Water) refers to the percentage of total water flow that is considered to be hot water. A value of 50% was used for percent hot water. A value of 1.0 was used for domestic water heater efficiency (DWHefficiency) for electric units and a value of 0.8 for natural gas units. Water savings were developed using the following algorithm:

*Water Savings = (Current GPM – New GPM) * Minutes per Faucet per Day * 365 days/year * Number of Faucets*

The following inputs were used in the development of water savings:

- Gallons per minute for the baseline faucet (Current GPM) were 2.10;
- Gallons per minute for the retrofitted faucet were 1.50.
- Minutes per faucet per day were 5.

ADM applied the following savings algorithms for faucet aerators from the Illinois Statewide Technical Reference Manual (TRM) to develop ex post savings:

For units with electric domestic hot water,

*ΔkWh = %ElectricDHW * ((GPM_base * L_base - GPM_low * L_low) * Household * 365.25 *DF / FPH) * EPG_electric * ISR*

For units with natural gas domestic hot water,

*ΔTherms = %FossilDHW * ((GPM_base * L_base - GPM_low * L_low) * Household * 365.25 *DF / FPH) * EPG_gas * ISR*

Where,

*%ElectricDHW* = The proportion of water heating supplied by electricity.

| | | |
|---|---|---|
| *%FossilDHW* | = | The proportion of water heating supplied by natural gas |
| *GPM_base* | = | Average flow rate, in gallons per minute, of baseline faucet. |
| *L_base* | = | Average baseline length faucet use per capita for all faucets in minutes. |
| *GPM_low* | = | Average flow rate, in gallons per minute, of the low-flow faucet aerator. |
| *L_low* | = | Average length of retrofit faucet use per capita for all faucets in minutes. |
| *Household* | = | Average number of people per household. |
| *DF* | = | The drain factor. |
| *FPH* | = | Faucets per household. |
| *EPG_electric* | = | The energy per gallon of water used by faucet supplied by electric water heater. |
| *EPG_gas* | = | The energy per gallon of water used by faucet supplied by natural gas water heater. |
| *ISR* | = | The in-service rate. |

The Illinois TRM provides the following assumptions:

- The average flow rate of the baseline faucet is 1.2 gallons per minute.
- The average flow rate of the low-flow faucet is .94 gallons per minute.
- The average length of faucet use per capita for the baseline and low-flow faucet in minutes per person per day if the location is unknown is 9.85.
- The average number of people per household is 2.56 for single-family and 2.1 for multi-family.
- The drain factor is 79.5% if the location is unknown.
- The faucets per household for 3.83 for single-family and 2.5 for multi-family.
- The energy per gallon of water used by a faucet supplied by electric water heater is .0894 kWh/gal.
- The energy per gallon of water used by a faucet supplied by natural gas water heater is .003999 therm per gallon for single family and .00446 therm per gallon for multi-family homes.

- The in-service rate is .95 for single family and .91 for multi-family kitchens and .95 for multi-family bathrooms.

#### 2.2.2.9. Natural Gas Furnace

Program staff used the same algorithm to determine ex ante therm savings for natural gas furnaces as they did for natural gas boilers:

*ΔTherms = Boiler output capacity (in Btuh) * (1/AFUE(base) - 1/AFUE(eff)) * (FLHw/100,000)*

Savings calculations utilized the following inputs:

- Full load hours (FLHw) were taken from ENERGY STAR®'s Air Source Heat Pump Calculator on ENERGY STAR® Air-source heat pump calculator hours;
- Annual fuel utilization efficiency (AFUE) for baseline equipment was based on original equipment specifications;
- Boiler output capacity was based on the smaller of the new and original equipment capacities.

ADM applied the following savings algorithm from the Illinois Statewide Technical Reference Manual (TRM) to develop ex post savings:

*ΔTherms = Gas_Furnace_Heating_Load * (1/AFUE(base) - 1/AFUE(eff))*

Where,

| | | |
|---|---|---|
| *Gas_Furnace_Heating_Load* = | | Estimate of annual household heating load for gas furnace heated single family home. |
| *AFUE(base)* | = | Baseline furnace annual fuel utilization rating |
| *AFUE(eff)* | = | Efficient furnace annual fuel utilization efficiency rating |

The Illinois TRM provides the following assumptions:

- The gas furnace heating load varies by climate zone and the average is 766 therms.
- The AFUE for time of sale of baseline equipment is 80%.

#### 2.2.2.10. Water Heater

Ex ante savings were developed using the following algorithm:

*ΔTherms = Daily Demand * 365 * 8.35 * (Hot Water Temp. (in ) – Supplied Water Temp. (in )) * (Btu/lb * °F) * (1 therm/100,000 Btu) * (1/EFold – 1/EFnew)*

Ex ante estimation was premised on 120F hot water temperature and 60F cold water temperature.

Therm savings for Natural Gas Water Heaters were calculated using the following algorithm provided by the Illinois Statewide TRM:

$$\Delta Therms = (1/EFbase - 1/EFefficient) * (GPD * 365.25 * \gamma Water * (Tout - Tin) * 1.0)/100{,}000$$

Where,

| | | |
|---|---|---|
| *EFbase* | = | Efficiency of the baseline equipment. |
| *EF efficient* | = | Efficiency of the new equipment. |
| *GPD* | = | Gallons of water used per day. |
| *γWater* | = | Specific weight of water. |
| *Tout* | = | Tank temperature. |
| *Tin* | = | Temperature of the incoming supply water. |

The Illinois Statewide TRM recommends using the following assumptions:

- The efficiency of baseline equipment if unknown is .59
- The efficiency for energy efficient unit was based on the efficiency for condensing gas storage units and is .80.
- The tank temperature is 125 °F.
- The incoming water temperature is 54 °F.
- The specific weight of water is 8.33 lb.
- The gallons of water used per day are 50.

#### 2.2.2.11. Ceiling Fan

Ex ante savings were developed using the following ENERGY STAR® algorithm:

$$\Delta kWh = ((\Delta W_{low\ speed} * \%\ in\ Low\ Speed + \Delta W_{medium\ speed} * \%\ in\ Medium\ Speed + \Delta W_{high\ speed} * \%\ in\ High\ Speed)/1000) * AOH$$

The most recent ENERGY STAR® calculator recommends annual savings of 115 kWh for the replacement of a ceiling fan with lighting. This value assumes that bulbs in a conventional ceiling fan are 120 watts, while bulbs in an ENERGY STAR® rated ceiling fan are 25 watts.

#### 2.2.2.12. Bathroom Exhaust Fan

Ex ante savings were developed using the following algorithm:

*ΔkWh = ((Current CFM Rating/Current Efficacy (cfm/W)) – (New CFM Rating/New Efficacy (cfm/W)) * (AOH/1000)*

ADM applied the following savings algorithm for bathroom exhaust fans from the Illinois Statewide Technical Reference Manual (TRM) to develop ex post savings:

*ΔkWh = (CFM * (1/η,Baseline - 1/ηEfficient)/1000) * Hours*

Where,

| | | |
|---|---|---|
| *CFM* | = | Nominal capacity of exhaust fan. |
| *η,Baseline* | = | The efficiency of the baseline unit. |
| *η,Efficient* | = | The efficiency of the efficient unit. |
| *Hours* | = | Annual hours of operation. |

The Illinois Statewide TRM recommends using the following assumptions:

- The nominal capacity of exhaust fan is 50.
- The efficiency of the baseline fan is 8.3 CFM per Watt.
- The efficiency of the efficient fan is 3.1 CFM per Watt.
- The annual hours of use are 8,766.

#### 2.2.2.13. Air Conditioners and Air Source Heat Pump

Ex ante savings were developed by summing the results of the following two algorithms:

$$\Delta kWh\ Cooling = (kBtu/hr) * ((1/SEER_{existing}) - (1/SEER_{new})) * FLH_s$$

$$\Delta kWh\ Heating = (kBtu/hr) * ((1/HSPF_{existing}) - (1/HSPF_{new})) * FLH_w$$

ADM applied the following algorithm from the Illinois TRM to develop savings for air source heat pumps:

*ΔkWh = Annual kWh Savingscool + Annual kWh Savingsheat*

With,

*Annual kWh Savingscool* = (kBtu/hcool) * [(1/SEERbase) – (1/SEERee)] * EFLHcool

*Annual kWh Savingsheat* = (kBtu/hcool) * [(1/HSPFbase) – (1/HSPFee)] * EFLHheat

Where,

| | | |
|---|---|---|
| *kBtu/hcool* | = | Capacity of the cooling equipment in kBtu per hour. |
| *EFLHcool* | = | Cooling mode equivalent full load hours. |
| *EFLHheat* | = | Heating mode equivalent full load hours. |
| *SEERbase* | = | Seasonal Energy Efficiency Ratio of the baseline equipment. |
| *SEERee* | = | Seasonal Energy Efficiency Ratio of the energy efficient equipment. |
| *HSPFbase* | = | Heating Seasonal Performance Factor of the baseline equipment. |
| *HSPFee* | = | Heating Seasonal Performance Factor of the energy efficient equipment. |

The Illinois Statewide TRM recommends using the following assumptions:

- The full load heating and cooling hours vary by climate zone.
- The Seasonal Energy Efficiency Ratio of the baseline equipment is 13.
- The Heating Seasonal Performance Factor of the baseline equipment is 7.7.

For air conditioner and furnace combinations, ex post savings were developed using algorithms from the Illinois TRM for air conditioners and furnaces.

Ex post savings for air conditioners were developed using the following algorithm:

$$\Delta kWH = (FLHcool * BtuH * (1/SEERbase - 1/SEERee))/1000$$

Where,

| | | |
|---|---|---|
| *FLHcool* | = | Full load cooling hours |
| *Btuh* | = | Size of new equipment in Btuh |
| *SEERbase* | = | Seasonal energy efficiency ratio of baseline unit |
| *SEERee* | = | Seasonal energy efficiency ratio of efficient unit |

The Illinois Statewide TRM recommends using the following assumptions:

- The full load cooling hours vary by climate zone.
- The Seasonal Energy Efficiency Ratio of the baseline equipment is 13.

The capacities and Seasonal Energy Efficiency Ratios of the new equipment were used.

Ex post savings for furnaces were developed using the following algorithm:

$$\Delta Therms = Gas\_Furnace\_Heating\_Load * (1/AFUE(base) - 1/AFUE(eff))$$

Where,

| | | |
|---|---|---|
| *Gas_Furnace_Heating_Load* | = | Estimate of annual household heating load for gas furnace heated single family home. |
| *AFUE(base)* | = | Baseline furnace annual fuel utilization rating |
| *AFUE(eff)* | = | Efficient furnace annual fuel utilization efficiency rating |

The Illinois Statewide TRM recommends using the following assumptions:

- The estimated annual heating load is 766 therms.
- The AFUE for time of sale of baseline equipment is 80%.

#### 2.2.2.14. Vending Machine

Ex ante savings were developed using one of the following algorithms:

For beverage machine controls,

*ΔkWh = (Average Power Use (kW) * 8760 hrs/yr) * (1- ((Room Occupied Hours per week + (168 – Room Occupied Hours per week) * .17)/168);*

For snack machine controls,

*ΔkWh = (Average Power Use (kW) * 8760 hrs/yr) * (1- (Room Occupied Hours per week/168)).*

ADM applied the following savings algorithm from the Illinois TRM:

$$\Delta kWh = WATTS_{base} / 1000 * HOURS * ESF$$

Where,

| | | |
|---|---|---|
| *WATTSbase* | = | The connected watts of the vending equipment. |
| *HOURS* | = | The operating hours of the connected equipment. |
| *ESF* | = | An energy savings factor that represents the percent reduction in annual kWh of the controlled equipment. |

The Illinois Statewide TRM recommends using the following assumptions:

- The baseline watts for refrigerated beverage vending machines are 400 and 85 for non-refrigerated snack vending machines.
- The hours are 8766.
- The energy savings factor for refrigerated beverage vending machines and non-refrigerated snack vending machines is 46%.

#### 2.2.2.15. Plug Load Occupancy Sensor

Ex ante savings for plug load occupancy sensors were developed using a value of 397 kWh for each unit. ADM used a deemed savings value of 102.8 kWh from the Ohio TRM.

#### 2.2.2.16. Attic / Ceiling Insulation

Ex ante savings were developed using the following algorithm:

$$Total\ kWh\ Savings = Heating\ kWh\ Savings + Cooling\ kWh\ Savings$$

Where,

$$Heating\ kWh\ Savings = C_f * C_d * \Delta U * Area * HDD * (24\ hrs/day) * (1\ kWh/3{,}412\ Btu) * (1/Heating\ COP)$$

$$Cooling\ kWh\ Savings = \Delta U * Area * CDD * (24\ hrs/day) * (1\ kWh/3{,}412\ Btu) * (1/Cooling\ COP)$$

ADM applied the following savings algorithm from section 5.6.4 of the Illinois TRM:

$$\Delta kWh = (\Delta kWh\ Cooling + \Delta kWh\ Heating) * ADJ$$

Where,

$$\Delta kWh\ Cooling = (((1/R_{old} - 1/R_{wall}) * A_{wall} * (1 - Framing\ Factor) + (1/R_{old} - 1/R_{attic}) * A_{attic} * (1\text{-}Framing\_factor/2)) * 24 * CDD * DUA) / (1000 * \eta Cool)\ and$$

$$\Delta kWh\ Heating = ((1/R_{old} - 1/R_{wall}) * A_{wall} * (1 - Framing\ Factor) + (1/R_{old} - 1/R_{attic}) * A_{attic} * (1\text{-}Framing\ Factor/2)) * 24 * HDD) / (\eta Heat * 3412)$$

| | | |
|---|---|---|
| *ADJ* | = | Adjustment to account for prescriptive engineering algorithms |
| *Rold* | = | R-value of existing assembly and any existing insulation |
| *Rwall* | = | R-value of new wall assembly |
| *Rattic* | = | R-value of new attic assembly |
| *Awall* | = | Total area of insulated wall (ft2) |
| *Aattic* | = | Total area of insulated ceiling/attic (ft2) |
| *Framing Factor* | = | Adjustment to account for area of framing; |
| *CDD* | = | Cooling Degree Days; |
| *DUA* | = | Discretionary Use Adjustment; |
| *ηCool* | = | Seasonal Energy Efficiency Ratio of cooling system; |

*HDD* = Cooling Degree Days;

*ηHeat* = Efficiency of heating system;

The Illinois TRM provides the following assumptions:

- The framing factor is 15%.
- The cooling degree days vary by climate zone but the average for Illinois is 947.
- The discretionary use adjustment is.75.
- Seasonal Energy Efficiency Ratio of cooling system is 10 for equipment older than 2006, otherwise 13.
- The heating degree days vary by climate zone but the average for Illinois is 4860.
- The efficiency of the heating system varies by system type and age of equipment.

#### 2.2.2.17. Duct Sealing and Duct Insulation

There was not enough information to perform Illinois Statewide TRM calculations for Duct Sealing and Duct Insulation. After an engineering review of the savings equations used for expected savings calculations, it was determined that the methodology and calculation assumptions were reasonable.

#### 2.2.2.18. Indoor / Outdoor Reset Control

Ex ante savings were developed using the following algorithm:

$$\Delta Therms = Output\ Capacity\ (in\ Btuh) * (1/AFUE - 1/AFUE + 5\%) * (FLH_w/100{,}000)$$

ADM performed an engineering review of the savings equation used for expected savings calculations, and it was determined that the methodology and calculation assumptions were reasonable. Note, however, that the engineering review determined that the 100% AFUE assumed in the ex ante estimation of savings was nor a reasonable efficiency level obtainted, even with indoor / outdoor reset controls. Instead, an AFUE of 97% was assumed to calculate ex post savings.

#### 2.2.2.19. Bi-Level Lighting

Ex ante savings were developed using the following algorithm:

*Net kWh Savings = gross kW Savings + cooling kWh Savings + heating kWh savings*

Where,

*Gross kWh Savings = ((Existing Fixture Wattage/1000) – (Average Bi-Level Fixture Wattage/1000)) * AOH*

*Cooling kWh Savings = -(Gross kWh Savings * .32)/COP of the Cooling Equipment*

*Heating kWh Savings = -(Gross kWh Savings * .32)/COP of the Heating Equipment*

ADM performed an engineering review of the savings equation used for expected savings calculations, and it was determined that the methodology and calculation assumptions were reasonable.

### 2.2.3 Program-Level Savings Results

To estimate gross kWh savings and peak kW reductions for the Efficient Living Program, calculation procedures described in the Illinois Statewide TRM were employed using measure counts and specifications provided by program staff. The results of that analysis are reported in this subsection.

The realized gross kWh savings for the Efficient Living Program during the period June, 2011 through May, 2012 are shown by utility in Table 2-1 and by measure in Table 2-2. The achieved gross savings for the program is 2,781,182 kWh. A net-to-gross factor of 100% because the Efficient Living Program targets low income residents. The realized net savings for the period are 2,781,182 kWh. Therm savings are shown by utility in Table 2-3 and by measure in Table 2-4. The achieved gross natural gas savings for the program are 161,896 therms. Net natural gas savings are 161,896 therms.

*Table 2-1 Summary of kWh Savings by Utility*

| *Utility* | *Expected kWh Savings* | *Realized Gross kWh Savings* | *Gross Realization Rate* | *Realized Net kWh Savings** |
|---|---|---|---|---|
| Ameren | 1,526,706 | 1,739,570 | 114% | 1,739,570 |
| ComEd | 1,258,991 | 1,041,612 | 83% | 1,041,612 |
| Total | 2,785,697 | 2,781,182 | 100% | 2,781,182 |

**A net-to-gross ratio of 100% is applied because the Efficient Living Program targets low income residents who would not have funded new energy efficiency measures in the absence of the program.*

*Table 2-2 Summary of kWh Savings by Measure Type*

| *Measure* | *Expected kWh Savings* | *Realized Gross kWh Savings* | *Gross Realization Rate* | *Realized Net kWh Savings** |
|---|---|---|---|---|
| Air Source Heat Pumps | 2,691 | 2,691 | 100% | 2,691 |
| Attic/Ceiling Insulation Sf | 5,100 | 2,595 | 51% | 2,595 |
| Bathroom Exhaust Fans | 13,612 | 51,022 | 375% | 51,022 |
| Bi-Level Stairwell Fixtures | 5,243 | 5,243 | 100% | 5,243 |
| CFLs | 1,411,235 | 856,268 | 61% | 856,268 |
| ENERGY STAR® Ceiling Fans | 47,018 | 25,760 | 55% | 25,760 |
| ENERGY STAR® Refrigerators | 394,568 | 1,046,272 | 265% | 1,046,272 |
| High Efficiency Furnace & A/C Combos | 69,041 | 70,855 | 103% | 70,855 |

| *Measure* | *Expected kWh Savings* | *Realized Gross kWh Savings* | *Gross Realization Rate* | *Realized Net kWh Savings** |
|---|---|---|---|---|
| High Efficiency Furnaces | 30,397 | 54,168 | 178% | 54,168 |
| High Efficiency Washing Machines | 62,251 | 44,883 | 72% | 44,883 |
| High Efficiency Window A/C Units | 166,144 | 68,782 | 41% | 68,782 |
| LED Exit Signs | 42,932 | 41,800 | 97% | 41,800 |
| Low-Flow Shower Heads | 174,173 | 178,511 | 102% | 178,511 |
| Occupancy Sensors | 30,262 | 21,586 | 71% | 21,586 |
| Outdoor Metal Halides | 1,970 | 1,747 | 89% | 1,747 |
| Plug Load Occupancy Sensors | 19,850 | 5,140 | 26% | 5,140 |
| T5s | 23,151 | 42,852 | 185% | 42,852 |
| T8s | 245,326 | 220,304 | 90% | 220,304 |
| Vending Machine Controls | 7,509 | 7,480 | 100% | 7,480 |
| Window A/C Covers | 33,226 | 33,225 | 100% | 33,225 |
| Total | 2,785,697 | 2,781,182 | 100% | 2,781,182 |

**A net-to-gross ratio of 100% is applied because the Efficient Living Program targets low income residents who would not have funded new energy efficiency measures in the absence of the program.*

*Table 2-3 Summary of Therm Savings by Utility*

| *Utility* | *Expected Therm Savings* | *Realized Gross Therm Savings* | *Gross Realization Rate* | *Realized Net Therm Savings** |
|---|---|---|---|---|
| Ameren | 71,875 | 74,842 | 104% | 74,842 |
| Nicor | 72,498 | 55,082 | 76% | 55,082 |
| Peoples | 32,581 | 21,143 | 65% | 21,143 |
| North Shore | 13,142 | 10,829 | 82% | 10,829 |
| Total | 190,097 | 161,896 | 85% | 161,896 |

**A net-to-gross ratio of 100% is applied because the Efficient Living Program targets low income residents who would not have funded new energy efficiency measures in the absence of the program.*

*Table 2-4 Summary of Therm Savings by Measure Type*

| *Measure* | *Expected Therm Savings* | *Realized Gross Therm Savings* | *Gross Realization Rate* | *Realized Net Therm Savings** |
|---|---|---|---|---|
| Attic/Ceiling Insulation Sf | 5,892 | 4,148 | 70% | 4,148 |
| Duct Insulation | 2,767 | 2,767 | 100% | 2,767 |
| Duct Sealing | 2,767 | 2,767 | 100% | 2,767 |
| High Efficiency Boilers | 28,283 | 27,370 | 97% | 27,370 |
| High Efficiency Furnace & A/C Combos | 30,503 | 14,934 | 49% | 14,934 |
| High Efficiency Furnaces | 27,373 | 10,809 | 39% | 10,809 |
| High Efficiency Water Heaters | 784 | 1,128 | 144% | 1,128 |
| Indoor/Outdoor Reset Controls | 1,029 | 265 | 26% | 265 |
| Low-Flow Aerators | 1,498 | 4,067 | 271% | 4,067 |

| *Measure* | *Expected Therm Savings* | *Realized Gross Therm Savings* | *Gross Realization Rate* | *Realized Net Therm Savings** |
|---|---|---|---|---|
| Low-Flow Shower Heads | 76,720 | 82,154 | 107% | 82,154 |
| Tankless Water Heater | 3,449 | 2,456 | 71% | 2,456 |
| Window A/C Covers | 9,032 | 9,034 | 100% | 9,034 |
| Total | 190,097 | 161,896 | 85% | 161,896 |

**A net-to-gross ratio of 100% is applied because the Efficient Living Program targets low income residents who would not have funded new energy efficiency measures in the absence of the program.*

The realized gross peak kW reductions of the Efficient Living Program during the period June, 2011 through May, 2012 are shown in Table 2-5. The achieved gross peak demand savings for the program is 448.44 kW.

*Table 2-5 Gross Realized Peak kW Savings by Utility*

| *Utility* | *Realized Gross kW Savings* | *Realized Net kW Savings** |
|---|---|---|
| Ameren | 269.86 | 269.86 |
| ComEd | 178.58 | 178.58 |
| Total | 448.44 | 448.44 |

**A net-to-gross ratio of 100% is applied because the Efficient Living Program targets low income residents who would not have funded new energy efficiency measures in the absence of the program.*

# 3. Process Evaluation

This chapter presents the results of the process evaluation for the DCEO Efficient Living Public Housing Authority Program. The process evaluation focuses on the effectiveness of program policies and organization, as well as the program delivery framework. The purpose of the process evaluation is to assess the design and recent results of the program in order to determine how effectively it is achieving its intended outcomes. This evaluation is based upon analysis of program structure and interviews and surveys of participating organizations and residents who received low energy efficiency improvements.

The chapter begins with a discussion of the overall progress of the program. This is followed by an examination of certain issues that are critical to the future success of the program. This chapter also presents strategic planning and process recommendations, and highlights key findings from the interviews of grant recipients and residents. The information in this chapter provides insight into participant decision making behaviors, and identifies any key issues that may be addressed for future program years. Conclusions, recommendations, and other findings from the process evaluation may be useful in comparing program years over time, and in conducting planning efforts for future program years.

## 3.1 Evaluation Objectives

The purpose of the process evaluation is to examine program operations and results throughout the program operating year, and to identify potential program improvements that may prospectively increase program efficiency or effectiveness in terms of levels of participation and program satisfaction. This process evaluation was designed to document the operations and delivery of the Efficient Living Program during EPY4/GPY1.

Figure 3-1 provides an overview of the evaluation process, including the specific research activities performed.

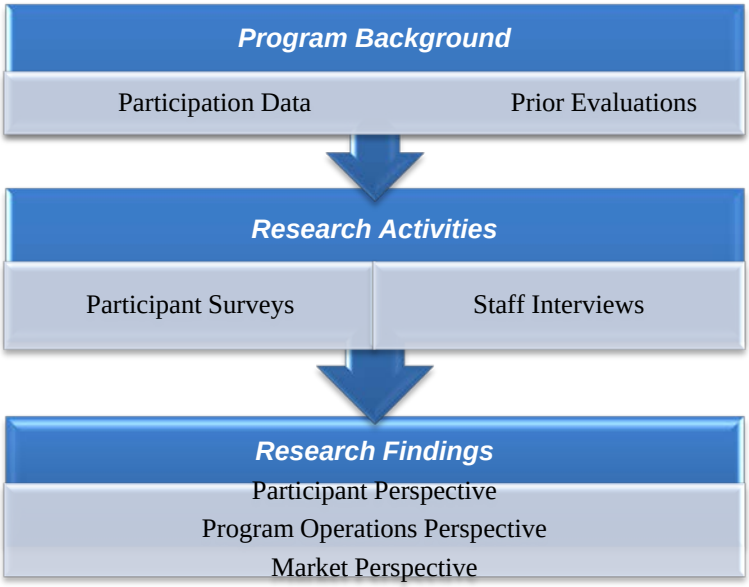


*Figure 3-1 Process Evaluation Overview*

Key research questions to be addressed by this evaluation of EPY4/GPY1 activity include:

> *Was the Efficient Living Program delivery effective and successful?*
>
> *Did the Efficient Living reduce barriers to increased energy efficiency project implementation?*
>
> *What non-energy benefits were realized by residents who received the energy efficiency improvements?*

During the evaluation, data and information from numerous sources are analyzed to achieve the stated research objectives. Insight into the participant experience with the Efficient Living Program is developed from an online survey of program participants. The internal organization and operational efficiency of program delivery is examined through analysis of interviews conducted with DCEO program managers and with the DCEO's implementation partner, the School of Architecture-Building Research Council located at the University of Illinois at Urbana-Champaign (UIUC).

## 3.2 Summary of Primary Data Collection

The primary data collection activities completed for the program evaluation effort were as follows:

- **Participant Surveys:** Participant surveys are the primary data source for many components of this process evaluation, and serve as the foundation for understanding the grant recipients' perspective. The participant surveys provide grant recipient feedback and insight regarding their experiences with the Low Income Programs. Respondents

report on their satisfaction with the program, detail their motivations and the factors affecting their decision making process, and provide recommendations related to improving the program.

- **Program Staff Interviews:** At various times during the evaluation effort, program staff was interviewed about the program operations. Program staff responded to questions about program procedures and policies, their perception of the motivations for grant recipients for participating, and processes for tracking program activity.

- **Review of Program Documentation**: Documentation of program activities including reports, tracking data, savings calculations, the program website and informational materials were reviewed.

## 3.3 Summary of Conclusions and Recommendations

Program participant responses to surveys and interviews with program staff indicate that the Efficient Living Program is operating well and effectively delivering energy savings. The following presents a selection of key conclusions from EPY4/GPY1:

- **High Program Satisfaction:** Participating decision makers indicated a high level of satisfaction with the program. Survey respondents indicated that they were somewhat or very satisfied with most aspects of the program. All respondents indicated that the measures met or exceeded their expectations. Participants did not report significant problems with the application process or the implementation of the measures. Additionally, participants who received education and training or onsite assistance from program staff reported that it was helpful.
- **Program Staff are Oriented towards Continuous Improvement:** Interviews with program staff involved discussions about challenges staff members may have faced or are currently facing in effectively delivering the Efficient Living Program. Staff members have made adjustments to the method the program uses to distribute funds and application materials in order to address operational issues that have occurred. Staff members' efforts to further improve the program will continue to serve the program well in future years.
- **Public Housing Authority Decision Makers Respond Well to Word of Mouth Promotion:** Program activity is primarily driven by program staff's promotional efforts. The University of Illinois Efficient Living Program at the Building Research Council – School of Architecture partners with SEDAC and DCEO to promote the program. The majority of participant survey respondents indicated that they became aware of the program through one of these three organizations. Program staff noted that word of mouth promotion of the program is also an important means of increasing awareness of the program. In fact, one-fifth of participants reported hearing about the program from friends or colleagues.
- **Less Program Activity Downstate:** Interviews with program staff indicated that less program participation occurs in central and southern Illinois. These public housing authorities operate in areas that are geographically more dispersed than public housing

authorities in the northern part of the state. The greater dispersion results in fewer networking opportunities, less sharing of information, and less awareness of the program and energy efficiency in general.

A second factor that results in less activity in central and southern Illinois is that the distribution of utility funds does not match the distribution of public housing authority units. Specifically, 40% of the public housing authority units are located in Ameren territory while less than 30% of the program funding is provided by Ameren. Consequently, the program has relatively fewer resources for serving housing authorities in the Ameren service territory.

- **Multiple Motivations for Participating:** Most survey respondents reported that they undertook the improvements made through the program to reduce operating costs and to improve conditions for residents through improved comfort and reduced utility bills. Most decision makers reported that residents paid a portion of their utility costs.
- **Participants Value Information Provided by the Program:** Program staff noted that lack of familiarity with, and misconceptions about, energy efficient equipment were notable barriers to public housing authorities' adoption of energy efficiency measures. Furthermore, responses to several questions suggest that decision makers value the informational assistance provided by the Efficient Living Program. A sizable share of participants indicated that program staff recommendations were influential in the decision to implement the energy efficiency measures. Participants also reported that the training and onsite assistance they received through the program was helpful. These findings suggest the program is effective in reducing informational barriers to energy efficiency improvements in public housing authorities.
- **Initial Cost is a Primary Factor in Efficient Equipment Decisions:** Most survey respondents indicated that initial cost was a primary factor in their organization's decision to implement energy efficient equipment. Moreover, program staff noted that costs of equipment was a significant barrier to energy efficiency improvements in public housing authorities. These findings suggest that the initial cost of energy efficient equipment may discourage its implementation despite the longer term potential for cost savings. The incentives provided by the program directly encourage the implementation of energy efficiency measures by reducing the initial cost of the efficient equipment.
- **Limited Data Available in the EEPS Database:** The Energy Efficiency Portfolio Standard (EEPS) database is intended to track program activity for all DCEO programs. However, the database contains only high level information on projects completed through the Efficient Living Program. The School of Architecture currently has extensive reporting protocols in place with well-organized information on program activity, including project specifications and measure quantities. Ideally, this information would be incorporated into the DCEO project tracking database.

The following recommendations are offered as suggestions for the continued development of the program.

- **Apply TRM Methodologies in Estimating Savings:** For several measure types, the Illinois Statewide TRM stipulates more conservative assumptions regarding factors affecting the calculation of energy savings than those used by program staff. In order to improve future energy savings realization rates, it is recommended that, whenever possible, Efficient Living Program staff utilize the approaches and assumptions outlined in the TRM.
- **Continue Outreach Efforts:** Program staff noted that the program has had less participation by housing authorities in the southern part of the state. Staff members have developed plans for addressing this, which will likely involve identifying non-participating public housing authorities and developing a strategy to encourage their involvement. Staff members' continued outreach will help to drive energy efficiency improvements in public housing authorities by increasing awareness of the program and emphasizing the benefits of energy efficiency improvements.
- **Facilitate Collaboration Among Public Housing Authorities:** While the presentations and workshops hosted by the program have been effective forms of education, additional interest in the program and greater program savings may be generated by developing strategies to encourage public housing authority staff to collaborate with one another in identifying opportunities for energy efficiency. Interview responses suggest that collaboration may be a particularly effective means of encouraging energy efficiency improvements.
- **Efforts to Promote the Program should Emphasize Benefits to Residents:** Surveys of grant recipients indicated that public housing authority decision makers are motivated to participate in the program in order to improve resident comfort and lower their utility costs. The program can capitalize on these motivations by emphasizing the range of benefits obtained by implementing energy efficiency improvements through the program.

## 3.4 Public Housing Authority Efficient Living Program

The Public Housing Authority Efficient Living Program (Efficient Living Program) is operated in partnership with the School of Architecture-Building Research Council located at the University of Illinois at Urbana-Champaign (UIUC). The program provides grants to Illinois Public Housing Authorities to make energy efficiency improvements to public housing buildings. The program includes both retrofit and new construction and gut / rehab projects. The program is available to applicants that manage public housing authorities located in Illinois.

#### 3.4.1.1. Participant and Measure Eligibility Requirements

The program is available to applicants that manage public housing authorities located in Illinois. The program targets housing authorities that include residences at 30%, 50% or 80% of the average median income. Average median incomes are defined by the individual counties where the properties are located.

The program covers a wide variety of energy saving measures including efficient appliances, lighting, and HVAC equipment. Grant funds may not be used for fuel switching, personnel expenses, purchase of property, operating expenses, projects that repair existing equipment or replace existing equipment with the same equipment, used equipment, or custom projects with simple paybacks greater than the equipment life.

#### 3.4.1.2. Program Incentives

Grant awards include both standard and custom components described as follows:

- Standard incentives, which are payments for the installation or use of energy efficient lighting equipment, HVAC equipment, water heaters, motors and variable frequency drives, appliances, insulation, and duct sealing;
- Custom incentives, which are payment for qualifying energy measures at a rate of $0.20 per projected kWh or $2.00 per projected therms saved during the first program year of operation.

Grants are capped at $350,000 and cannot exceed 100% of the total project cost.

#### 3.4.1.3. Program Participation Process

Applying and receiving a grant through the program is a multistep process. Applicants begin by completing and signing an application to receive grant funds. Upon review of the applications, a conference call is scheduled with the applicant to review the details of the proposal. The conference call informs the final determination of the projects scope and advises on necessary equipment replacement inventory which will be used to determine the final grant award. This information is reviewed by program staff members who issue a Pre Award Letter once all inventory of existing equipment has been submitted. The project staff determine which items are eligible for replacement based on program guidelines. A Sub Award Agreement is then awarded which lists specific measures for replacement with their corresponding award amounts, and specifies the conditions of payment. The grantee then installs the energy efficiency measures and reports back to the program on final installation and costs.

#### 3.4.1.4. Reporting and Verification

Program tracking data is maintained in a series of spreadsheets. Grantees submit a series of documents that report what measures were installed, building locations, and a certification of proper disposal of refrigerators and window air conditioning units when applicable. Additionally, invoices for measures implemented are submitted. Program staff uses this information to determine measure costs, numbers installed, and to estimate savings. A program staff member enters this information into the DCEO's tracking database.

## 3.5 Public Housing Authority Efficient Living Program Grant Recipient Expected Savings

During EPY4/GPY1, 28 public housing authorities received grant funds through the Efficient Living Program. An additional three housing authorities applied for funds and then withdrew

their applications. In total 42 sub grants were awarded including 26 electric grants and 16 natural gas grants.

*As shown in Table 3-1, a variety of building types received energy efficiency measures during EPY4/GPY1. The majority of sites were multifamily housing.* *Table 3-1 Building Types Receiving Energy Efficiency Measures*

| *Building Type* | *Number of Sites* | *Total Units* |
|---|---|---|
| High Rise (7+ floors) | 20 | 1,623 |
| Mid Rise (4-6 floors) | 12 | 1,198 |
| Low Rise (2-3 floors) | 17 | 856 |
| Row Homes, Garden Apartments | 84 | 2,750 |
| Duplexes | 72 | 1,491 |
| Triplexes and Quadplexes | 24 | 398 |
| Offices, Community Centers | 8 | - |
| Single Family Sites | 15 | 286 |
| Total | 252 | 8,602 |

*Source: Efficient Living: Illinois Public Housing Authority Energy: Program Year Four Final Combined Report*

Table 3-2 displays the age of the housing stock receiving measures through the Efficient Living Program. The building receiving measures were generally older. The majority of residences were older than 30 years.

*Table 3-2 Housing Age for Buildings Receiving Energy Efficiency Measures*

| *Housing Age (Years)* | *Number of Sites* | *Total Units* |
|---|---|---|
| 0-20 | 2 | - |
| 21-30 | 31 | 562 |
| 31-40 | 73 | 3,124 |
| 41+ | 101 | 4,737 |
| Unknown | - | 181 |
| Total | 207 | 8,604 |

*Source: Efficient Living: Illinois Public Housing Authority Energy: Program Year Four Final Combined Report*

Table 3-3 presents the expected kWh and therm savings for projects completed by each of the public housing authorities that participated in the Efficient Living Program during EPY4/GPY1.

*Table 3-3 Expected kWh and Therm Savings by Participating Public Housing Authority*

| *Public Housing Authority* | *Expected kWh Savings* | *Expected Therm Savings* |
|---|---|---|
| Aurora Housing | 637,581 | 30,407 |
| Bond County | 211,998 | 10,233 |
| Chicago | 123,459 | 13,142 |
| City of Freeport | 66,718 | - |
| City of Mt. Vernon | 24,621 | - |
| City of Pekin | 9,618 | 6,482 |
| Cook County | 63,756 | - |
| County of Cumberland | 12,408 | - |
| DeKalb Housing | 45,266 | 15,403 |
| Fulton County | 122,468 | - |
| Greene County Housing | 67,322 | 15,638 |
| Jackson County | 192,897 | 3,515 |
| Jefferson County | 59,512 | - |
| Knox County | 167,169 | 67,006 |
| Lake County | - | 32,581 |
| Lee County | 144,747 | 9,720 |
| Macoupin County | 121,537 | 14,190 |
| McDonough County | 3,263 | - |
| Menard County | 18,078 | 1,376 |
| Ogle County | 177,465 | 10,357 |
| Peoria | 16,235 | - |
| Randolph County | 48,325 | - |
| Rockford Housing | - | 6,612 |
| Saline County | 267,658 | - |
| St. Clair County | 14,985 | - |
| Union County | 46,978 | - |
| Vermillion County | 15,047 | 4,968 |
| Warren County | 47,498 | 7,554 |
| Total | 2,726,609 | 249,185 |

## 3.6 Participant Outcomes

An online survey was conducted to collect data about participant decision-making, preferences, and opinions of the Public Housing Authority Efficient Living Program (Efficient Living Program). The program offered a variety of measures for public housing authorities, including lighting, HVAC, and energy efficient appliances. In total, nine decision makers from public housing authorities that received grants through the program responded to the survey.

Information in this section is intended to characterize participant decision making behaviors and identify notable trends within participant responses. Some of the comments and issues raised by participants are anecdotal in nature and may reflect individual participant opinions. The

Conclusions and Recommendations section of the Process Evaluation chapter provides an overall distillation of key findings from the process evaluation activities that were performed for the Efficient Living Program.

### 3.6.1 How Grantees Learn About the Program

Table 3-4 displays the grant recipient responses regarding how they learned about the program. The percentages shown are percentages of survey respondents. Participants heard of the program in a few different ways. The most frequently mentioned means by which participants heard of the program, mentioned by one-third of respondents, was from a representative of the Smart Energy Design Assistance Center. Other common ways that participants heard about the program, each mentioned by 22% of the respondents, were from brochures and advertisements, friends or colleagues, attending a conference workshop or seminar, and through the U.S. Department of Housing and Urban Development. Additionally, one participant reported knowing of the program through past participation in the program.

None of the participants reported hearing about the program from architects, contractors or equipment vendors.

*Table 3-4 How Grantees Learned about the Program*

| | *Response* | *Percent of Respondents* (n=9)* |
|---|---|---|
| How did you learn of the Efficient Living Program? | | 33% |
| | Brochures or advertisements | 22% |
| | Friend or colleague | 22% |
| | Attended a conference workshop or seminar | 22% |
| | U.S. Department of Housing and Urban Development | 22% |
| | Past experience with the program | 11% |

**Since respondents were able to select more than one response, the sum of the percentages in the table above can exceed 100%.*

As shown in Table 3-5 all of the program participants heard about the Efficient Living Program prior to completing their projects and most (78%) heard about it prior to planning the project. Another 11% of participants heard about the program during the project planning and concept phase. Because participants heard about the program in the early stages of the project planning, the Efficient Living Program had significant opportunity to influence the incorporation of energy efficient equipment and design features into the projects.

*Table 3-5 When Participant Decision Makers Learned about the Program*

| | *Response* | *Percent of Respondents (n=9)* |
|---|---|---|
| When did you learn of the Efficient Living Program? | Before planning the project | 78% |
| | During the project planning and concept phase | 11% |
| | Once the project was begun but before it was finished | 11% |
| | After the project was finished | - |
| | Some other time | - |
| | Don't know | - |

### 3.6.2 Factors Affecting Participation

As shown in Table 3-6, most survey respondents indicated that the residents living in the facilities where the projects were completed pay either the natural gas bill, electric bill, or both. Only 22% of respondents stated that the residents do not pay the natural gas or electric bill. One respondent stated that residents receive a set utility allowance and then pay additional costs that exceed that amount. Another respondent noted that the project was completed in the common areas of the building.

*Table 3-6 Resident Payment of Utility Bills*

| | *Response* | *Percent of Respondents (n=9)* |
|---|---|---|
| For the project(s) completed through the Efficient Living Program, do the residents pay the utility bills? | Residents pay natural gas and electric bill | 22% |
| | Residents do not pay the natural gas and electric bills | 22% |
| | Residents pay electrical bill | 11% |
| | Residents pay natural gas bill | 11% |
| | Some residents pay their natural gas and electric bills, but some do not | 11% |
| | Don't know | - |
| | Other | 22% |

Participants were asked about their reasons for completing the grant funded energy efficiency projects. The results are shown in Table 3-7. The participant responses illustrate the multiple motivations involved in making the decision to make the energy efficiency improvements. The most frequently mentioned reason, endorsed by 89% of participants, was to save money on operational costs of the building. Because the majority of respondents stated that the residents pay some of their utility bills, this likely refers to energy costs associated with operating common areas of the buildings. However, 78% of respondents also stated that consideration of resident

utility costs and comfort were important factors in the decision to implement the energy efficiency projects. Environmental concerns were mentioned by more than half (56%) of respondents as well. One participant indicated that they completed the efficiency projects to qualify for financing opportunities while another participant stated that the project was completed to improve the quality of the lighting.

*Table 3-7 Motivations for Energy Efficiency Projects*

| | *Response* | *Percent of Respondents* (n=9)* |
|---|---|---|
| Why did you decide to undertake the energy efficiency project(s) completed through the Efficient Living Program? | To save money on operational costs of the building | 89% |
| | To help residents save money on their utility bills | 78% |
| | To improve the comfort of the building for its residents | 78% |
| | To help save energy because of environmental concerns | 56% |
| | To qualify for financing opportunities | 11% |
| | Other | 11% |

Participants were asked a series of questions about their prior plans for the energy efficiency projects and the influence of the program on their decision making about these projects. Most participants (78%) stated that they had plans to complete the energy efficiency improvements prior to participating in the program and 43% of these participants stated that they would have implemented their plans had they not participated in the program. However, 86% of participants stated that they had had these plans for one or more years and 29% stated that the plans did not specify which efficiency measures were to be included in the project. These findings suggest that although participants had prior plans for the projects, the program may have been influential in encouraging participants to complete the projects during the program year and may have influenced the choice of efficiency measures to be included in the projects.

*Table 3-8 Length of Time for Which Respondents Had Plans to Implement Energy Efficiency Measures*

| | *Response* | *Percent of Responses (n=6)* |
|---|---|---|
| For about how long have you had plans to implement these measures prior to finding out about the program? | Less than 6 months | 50% |
| | 6-12 months | 17% |
| | 1-2 years | 0% |
| | 3-5 years | 17% |
| | More than 5 years | - |
| | Don't know | 17% |

To further understand how the Efficient Living Program may have influenced participant decision-making, survey respondents were asked whether the measure was recommended to them by a representative of the program or by a representative of the Smart Energy Design Assistance Center (SEDAC). Fifty-six percent of the respondents indicated that an Efficient Living Program representative had recommended the measures installed. Furthermore, respondents indicated that for 40% of the projects implemented, they probably or definitely would not have implemented the equipment had it not been recommended. Similarly, respondents indicated that for 67% of the projects implemented, a representative of SEDAC had recommended the measure be installed, and for 50% of these projects, the measures would not have been implemented had they not been recommended. These findings emphasize the importance of non-monetary program influences on some participants' decision making. However, a relatively small share of respondents reported that there was equipment that they would not have likely implemented without a recommendation. While the incentives may be a key factor in influencing participants to implement energy efficient equipment, informational resources are also important for participants.

Efficient Living Program participants were asked whether the information and incentives offered by the program influenced various factors related to the measure installation. These factors included the timing of the installation, as well as the quantity of units installed, and the energy efficiency of the installed equipment. Table 3-10 cross-tabulates the respondents who indicated that these factors were significantly affected by the program with whether the participant had plans to install equipment before participating. For the projects that respondents reported having prior plans, 71% stated that the quantity of installed units increased because of the program. Additionally, respondents indicated that the level of the energy efficiency of the equipment was increased for 57% of the projects and 86% of the projects were implemented earlier than they otherwise would have been. These findings indicate that even when participants were already planning to replace equipment, a large percentage of them would have installed fewer units, less energy efficient equipment, or installed the equipment later if they had not participated in the program.

*Table 3-9 Reported Program Influences on Installation Factors by Whether There Were Plans to Install Equipment*

| *Program Influence on Projects* | *Number of Responses* | *Had plans to install measure before participating* |
|---|---|---|
| Yes, program increased quantity of installed equipment | 6 | 71% |
| Yes, program increased efficiency of installed equipment | 6 | 57% |
| Yes, purchased and installed equipment/measure earlier than otherwise would have | 6 | 86% |

### 3.6.3 Energy Efficiency Attitudes, Behaviors, and Decision Making

Respondents were given a list of factors, shown in Table 3-10 and asked how important each of the factors was in their decisions to implement energy efficient equipment. A high percentage of respondents, 83%, reported that past experience with energy efficient equipment was very important to their decision making. This finding corroborates remarks made by staff during interviews which indicated that decision makers are often wary of participating if it involves implementing equipment they are not familiar with. Although a smaller share of participants considered the incentives and advice and recommendations from DCEO to be very important to their decision making, all respondents considered incentive and grant payments to be very or somewhat important and 83% of respondents considered advice and recommendations to be very or somewhat important.

*Table 3-10 Factors Influencing the Decision to Participate*

| *Energy Efficiency Decision Making Factor* | *Very Important* | *Somewhat Important* | *Only Slightly Important* | *Not Important at All* | *Don't Know* | *n* |
|---|---|---|---|---|---|---|
| Incentive or grant payments from DCEO | 67% | 33% | - | - | - | 6 |
| Past experience with energy efficient equipment | 83% | 17% | - | - | - | 6 |
| Advice and recommendations from DCEO | 67% | 17% | 17% | - | - | 6 |

Participants were asked what barriers their organizations faced to implementing energy efficient equipment. The most frequently mentioned barrier was the high initial cost of equipment or design features. This finding emphasizes the importance of financial incentives for encouraging public housing authorities to implement energy efficiency improvements. Although some participants reported that advice or recommendations from program representatives was important to their decision making, none of the participants indicated that a lack of knowledge of energy efficient equipment was a barrier. Knowledge may not be considered a barrier among participants because the program is adequately meeting participants' information needs or

because they are relatively well informed. Two other barriers mentioned by participants were time constraints to participate in the program and labor costs for equipment installation.

*Table 3-11 Barriers to Making Energy Efficiency Improvements*

| | *Response* | *Percent of Respondents (n=9)* |
|---|---|---|
| What barriers does your organization face in making energy efficiency improvements to low income housing? | High initial cost of efficient equipment or design features | 89% |
| | Lack of interest among prospective residents in energy efficient housing | 22% |
| | Lack of knowledge of energy efficient equipment or design features | - |
| | Other | 22% |
| | Don't know | - |

Public housing authority decision makers were asked what kinds of energy efficiency policies and procedures their organizations have in place. The response data are shown in Table 3-12. The most frequently mentioned policy or procedure was the incorporation of energy efficiency in operations and procurement, mentioned by 44% of respondents. One-third of respondents said that they actively train staff about energy efficiency. Approximately one-fifth (22%) of respondents stated that they have a staff member who is responsible for energy efficiency and the same percentage of respondents said that they do not have any energy efficiency policies or procedures.

Nearly half of respondents stated that they have other policies or procedures. Two of these respondents stated that they complete energy audits. Another respondent stated that they are in the process of working with an energy services company. Lastly one respondent stated that while they did not have policies or procedures, they make an effort to include energy efficient technologies.

These responses suggest that most public housing authorities are mindful of energy efficiency and have incorporated organizational policies and procedures to manage energy consumption.

*Table 3-12 Grant Recipient Energy Efficiency Policies and Procedures*

| | *Response* | *Percent of Respondents (n=9)* |
|---|---|---|
| Which of the following policies or procedures does your organization have in place regarding energy efficiency for low income housing? | Policies that incorporate energy efficiency in operations and procurement | 44% |
| | Active training of staff | 33% |
| | A staff member responsible for energy and energy efficiency | 22% |
| | Do not have policies or procedures for energy efficiency improvements | 22% |
| | An energy management plan | - |
| | Other | 44% |

Respondents were asked about their prior experience with purchasing and installing energy efficient equipment. Their responses are shown in Table 3-13. Fifty-six percent of respondents stated that they had previously completed energy efficiency projects that they had received incentives for. All other respondents (44%) stated that they had previously completed energy efficiency projects but did not apply for an incentive. Half of these respondents noted that they had not applied for incentives because they were not aware that incentives were available or that they were not sure that the equipment qualified for incentives. One participant stated that they had already received the maximum grant funds available on another project and another participant stated that they had received funds through the U.S. Department of Housing and Urban Development.

*Table 3-13 Incentives for Previous Equipment Purchased*

| | *Response* | *Percent of Responses (n=9)* |
|---|---|---|
| Has your organization implemented any low income energy efficiency projects in the last three years for which you did not apply for a financial incentive or grant through an energy efficiency program? | Yes, undertook energy efficiency projects but did not apply for incentive. | 44% |
| | No equipment was purchased by organization. | - |
| | No, an incentive was applied for. | 56% |
| | Don't know | - |

Overall, the public housing authority decision maker responses suggest that their organizations are focused on improving energy efficiency. Most respondents reported that their organizations had policies and procedures regarding energy efficiency and all participants reported that they had previously purchased energy efficient equipment. Furthermore, in nearly half of these cases, the housing authorities made these purchases without applying for incentives. Additionally, none of the participants thought that a lack of information about energy efficiency improvements was a barrier to making the improvements.

However, survey responses suggest that financial considerations may act as a barrier to public housing authorities' adoption of energy efficient equipment. All but one of the respondents reported that the high cost of energy efficient equipment or design features was a barrier to participation.

### 3.6.4 Where Decision Makers Get Their Information

Respondents were asked what sources they rely on for information about energy efficient equipment, materials, and design features. Respondents were able to provide multiple responses and the percentages shown in Table 3-14 are the percentages of respondents.

Program participants reported using a wide variety of sources for information about energy efficiency projects; however, program resources were frequently mentioned. All participants reported using SEDAC as an information source. Additionally, a relatively large share of participants reported using the DCEO website (56%) and the DCEO representatives (44%).

Other frequently mentioned sources of information on energy efficient equipment, materials, and design features were brochures or advertisements (78%), the U.S. Department of Housing and Urban Development (67%) and equipment vendors or building contractors (44%). One-third of respondents reported using each of the following sources: trade journals or magazines; friends and colleagues; architects, engineers, and energy consultants; and the Illinois Housing Development Authority.

The breadth of sources of information used by program respondents is consistent with previously discussed findings about the information needs of program participants being met.

*Table 3-14 Who Respondents Rely on for Information*

| | *Response* | *Percent of Respondents* (n=9)* |
|---|---|---|
| What are the sources your organization relies on for information about energy efficient equipment, materials and design features? | Representatives of the Smart Energy Design Assistance Center (SEDAC) | 100% |
| | Brochures or advertisements | 78% |
| | U.S. Department of Housing and Urban Development | 67% |
| | The DCEO Website | 56% |
| | DCEO Representatives | 44% |
| | Equipment vendors or building contractors | 44% |
| | Trade journals or magazines | 33% |
| | Friends and colleagues | 33% |
| | Architects, engineers or energy consultants | 33% |
| | Illinois Housing Development Authority | 33% |
| | Trade associations or business groups you belong to | 22% |
| | Utility representatives | 11% |
| | Representatives of the Energy Resource Center (ERC) | 11% |
| | City or county planning departments | - |
| | Illinois Habitat for Humanity | - |
| | Other | 11% |

**Since respondents were able to select more than one response, the sum of the percentages in the table above can exceed 100%.*

### 3.6.5 Financial Methods Used by Decision Makers

Table 3-15 displays the financial methods that respondents indicated using to review efficiency projects. All of the respondents used at least one financial method when deciding whether or not to make energy efficiency improvements. Initial cost was the most frequently mentioned method with 89% of decision makers reporting that their organizations used this method. More than half of participants reported using simple payback (56%). One participant stated that they require a payback period of five years or less. Two of the participants who reported using payback stated that the payback period they required depends on the length of the measures useful life. Another participant stated that for bulbs and fixtures the payback period was 3-5 years and for HVAC equipment it was 5-10 years.

Other financial methods participants use are internal rate of return, mentioned by 11% of respondents, and life cycle costs used by 22% of respondents. Additionally, one participant mentioned that the housing authority was currently working with an energy services company to develop methods for evaluating projects while another participant reported that

they were beginning an energy performance contract through a U.S. Department of Housing and Urban Development program.

Overall, more participants reported using initial cost to evaluate energy efficiency measures than methods that treat energy efficiency as an investment (e.g., simple payback and internal rate of return). This preference may be due to not all of the financial benefits of the energy efficiency improvements accruing to the housing authorities because many of the residents pay the utility bills.

*Table 3-15 Financial Methods Used to Evaluate Efficiency Improvements*

| | *Response* | *Percent of Respondents (n=9)* |
|---|---|---|
| Which financial methods does your organization typically use to evaluate energy efficiency investments in low income housing? | Initial cost | 89% |
| | Simple payback | 56% |
| | Internal rate of return | 11% |
| | Life cycle cost | 22% |
| | We do not use financial methods to evaluate efficiency investments for low income housing | - |
| | Other | 22% |

### 3.6.6 Participant Satisfaction with the Program

Respondents were asked to report their level of satisfaction with selected aspects of the program on a scale of *1* to *5* where *1* was very dissatisfied and *5* was very satisfied. Overall, satisfaction ratings were high, with few low scores reported by respondents. Table 3-16 shows the results. Two-thirds of respondents reported that they were very satisfied with the program overall and another one-third reporting that they were somewhat satisfied. Additionally, more than half of the respondents (56%) were very satisfied with the effort required for the application process, the quality of their contractors work, the grant amount, and the information provided by DCEO. None of the participants reported dissatisfaction with any of the aspects of the program.

*Table 3-16 Decision Maker Satisfaction with Selected Aspects of Program Experience*

| *Element of Program Experience* | *Very Satisfied* | *Somewhat Satisfied* | *Neither Satisfied nor Dissatisfied* | *Somewhat Dissatisfied* | *Very Dissatisfied* | *Don't Know /Not Applicable* | *n* |
|---|---|---|---|---|---|---|---|
| Performance of the equipment installed | 44% | 56% | - | - | - | - | 9 |
| Savings on your monthly bill | 22% | 44% | 11% | - | - | 22% | 9 |
| Grant amount | 56% | 44% | - | - | - | - | 9 |
| The effort required for the application process | 56% | 33% | - | - | - | 11% | 9 |
| Quality of the work conducted by your contractor | 56% | 33% | - | - | - | 11% | 9 |
| Information provided by DCEO | 56% | 33% | - | - | - | 11% | 9 |
| The elapsed time until you received the grant payment | 44% | 56% | - | - | - | - | 9 |
| Overall program experience | 67% | 33% | - | - | - | - | 9 |

In addition to their satisfaction, respondents were also asked about whether or not the measure or measures they implemented met their expectations. More than three-quarters of respondents (78%) indicated that the energy efficiency measure had met their expectations, while another 22% stated that they had exceeded their expectations. None of the participants reported that the measures did not meet their expectations.

*Table 3-17 Energy Efficiency Measure Satisfaction of Participant Expectations*

| | *Response* | *Percent of Respondents (n=9)* |
|---|---|---|
| Did the energy efficiency measure meet your expectation? | My expectations were exceeded | 22% |
| | My expectations were met | 78% |
| | My expectations were mostly met | - |
| | My expectations were not met | - |
| | Don't know | - |

### 3.6.7 On-site Assistance and Energy Efficiency Training and Education

The Efficient Living Program offers housing authorities on-site assistance for developing energy efficiency projects and education and training for staff on ways to save energy. Program participants were asked whether or not they received this assistance and if it was helpful. As shown in Table 3-18, the majority of survey respondents reported that they received on-site assistance and staff training and education. Moreover, all of these respondents found this assistance helpful.

*Table 3-18 Helpfulness of On-Site Assistance and Efficiency Training and Education*

| *Question* | *Percent of Respondents Saying Yes* | *n* |
|---|---|---|
| Did you receive any on-site technical assistance from an Efficient Living Program representative or from a member of the Smart Energy Design Assistance Center (SEDAC)? | 67% | 9 |
| Was this on-site assistance helpful for developing the energy saving aspects of the project? | 100% | 6 |
| Did your staff receive any education and training on ways to save energy from an Efficient Living Program representative or from a member of the Smart Energy Design Assistance Center (SEDAC)? | 56% | 9 |
| Was this education or training helpful for understanding ways to save energy? | 100% | 5 |

### 3.6.8 Installation and Incentives

Program participants were asked if they experienced any problems with the application process. The results are show in Table 3-19. None of the participants reported that they had problems with application process.

*Table 3-19 Incidence of Problems with the Application Process*

| | *Response* | *Percent of Respondents (n=9)* |
|---|---|---|
| Did you have any problems with the application process? | Yes | 0% |
| | No | 89% |
| | Don't know | 11% |

Survey responses indicate that program participants did not have problems with the grant payments provided through the program. As shown in Table 3-20, all participants reported that the grant payment met their expectations and none reported problems receiving the payments.

*Table 3-20 Experience with Grant Payment*

| *Question* | *Percent of Respondents Saying Yes* | *n* |
|---|---|---|
| Was the grant payment amount what you expected? | 100% | 9 |
| Were there any issues with receiving the grant payments? | - | 9 |

Participant experience with project implementation is summarized in Table 3-21. Eighty-nine percent of the respondents felt that the implementation went smoothly, while one participant

indicated that it was a mostly smooth process. This participant noted some difficulty within their organization in getting the equipment selected and installed.

All participants indicated that they thought that they got a quality installation and that the incentive agreement met their expectations.

*Table 3-21 Experience with Project Implementation*

| *Question* | *Yes* | *For the most part* | *No* | *Don't know* | *n* |
|---|---|---|---|---|---|
| Did the implementation go smoothly? | 89% | 11% | - | - | 9 |
| Do you feel you got a quality installation? | 100% | - | - | - | 9 |
| Did the grant agreement that you received meet your expectations? | 100% | - | - | - | 9 |

Overall, program participants appear to feel that the program has operated effectively. None of the respondents noted any issues with the application process, the installation, or the grant payment and agreement.

### 3.6.9 Pre- and Post-Inspections

Participants were asked whether or not pre- and post-inspections were performed at their facilities. Forty-four percent of the respondents indicated that their facility was pre-inspected. The pre-inspections consisted of facility walk-throughs and surveys of equipment, and audits. Of the four respondents whose facility was pre-inspected, one stated that the project design changed as a result of the pre-inspection but did not elaborate on what the change was.

Seventy-eight percent of respondents reported that a post-inspection was performed at their facility. These participants reported that the walk-throughs primarily consisted of verifying equipment installation and making sure that the equipment was properly installed. None of the respondents reported that the incentive amounts changed as a result of the post-inspection.

*Table 3-22 Pre- and Post-Installation Inspections*

| *Question* | *Percent of Respondents Saying Yes* | *n* |
|---|---|---|
| Did anyone from the Efficient Living Program or other DCEO representative do a pre-inspection at the site(s)? | 44% | 9 |
| Did anything change in the project design as a result of the pre-inspection? | 25% | 4 |
| Did anyone from the Efficient Living Program or other DCEO representative do a post-inspection at the site(s)? | 78% | 9 |
| Did anything change in the grant amount as a result of the post-inspection? | - | 7 |

### 3.6.10 Additional Energy Efficiency Projects

Some participants reported installing energy efficient equipment after participating in the program that they did not receive an incentive for. As shown in Table 3-23, 33% of survey respondents reported that they purchased additional equipment similar to what they installed through the program since participating. One of the participants stated that they did not apply for incentives because the grant amount was insufficient. Another stated that the program funds had been exhausted at the time. Additionally, 22% of respondents stated that they had purchased energy efficient equipment that was dissimilar to what they implemented through the program. These participants stated that they installed windows and weather stripping.

*Table 3-23 Additional Energy Efficiency Projects*

| *Question* | *Percent of Respondents Saying Yes* | *n* |
|---|---|---|
| Since participating in the Efficient Living Program, have you implemented any additional energy efficient equipment or design features similar to those you implemented through the program that you did not apply or receive an incentive or grant for? | 33% | 9 |
| Since participating in the program, have you implemented any other energy efficient equipment or design features that were not similar to what you implemented through the program and that you did not apply or receive an incentive or grant for? | 22% | 9 |

### 3.6.11 Customer Recommendations and Overall Impressions

At various points of the survey, grantees responded to open-ended questions regarding their experiences with the program or suggestions for improvement. All of these comments expressed gratitude for the program or complemented the program staff. These comments were:

*Your program is a life saver to [housing authority] with the decrease in Capital and Operating funds we are now able to address the needs to replace and upgrade our appliances and equipment to more energy efficient products and that will help [housing authority] and the residents. We continue to thank you and SEDAC [program staff member] for the excellent work you are doing for the PHAs. Thanks.*

*Very opportune time for us to participate. HUD funding froze or pro-rated so this money gave us improvements that would have otherwise taken many years to perform. Not only good timing, but the quality of items we were able to purchase from the money received was excellent. All SEDAC DCEO staff GREAT to work with - very responsive - professional and VERY knowledgeable - shout out to [program staff member] of SEDAC!*

*Appreciate the availability of this program and hope to be able to continue to utilize it. Thank you!*

## 3.7 Resident Outcomes

The demographic characteristics of the residents are displayed in Table 3-24. Approximately one third of occupants were elderly and approximately one-third were disabled. The majority of occupants were classified as extremely low-income.

*Table 3-24 Resident Demographic Characteristics*

| *Resident Demographics* | *Percent of Occupants* |
|---|---|
| Elderly | 32% |
| Disabled | 30% |
| Extremely Low-Income | 70% |
| Very Low-Income | 20% |
| Low-Income | 10% |

*Source: Efficient Living: Illinois Public Housing Authority Energy: Program Year Four Final Combined Report*

Although we were unable to obtain contact information to complete a survey of resident satisfaction with the efficiency measures implemented through the Efficient Living Program, program staff completed focus groups with residents of three different public housing authorities. They residents received the efficiency improvements during the prior program year (PY3).

ADM reviewed the findings from these focus groups. Focus group participants discussed their level of satisfaction or dissatisfaction with the efficiency improvements that were made through the program. Residents were generally satisfied with the measures that were installed. The areas of satisfaction noted by residents were:

- Residents were satisfied with light sensors because they turned the lights off automatically without their having to remember to turn them off;
- Lighting improvements were appreciated for the improved visibility they provided and increased feelings of safety;

- Residents thought that new efficient washing machines cleaned their clothes more effectively;
- Temperature controls on new air conditioning units were appreciated because they prevent the units from running all of the time;
- New refrigerators keep food evenly cooled and prevent ice buildup. Residents also liked the participant controls.

Some areas of dissatisfaction noted by residents were:

- Additional noise made by new efficient refrigerators;
- New washing machines were front loading and harder to access because the residents had to bend to put clothes in or take them out;
- Vending machine controls were not sufficiently sensitive to recognize when residents approached.

## 3.8 Program Operations Perspective

This section summarizes the core findings of in-person interviews that were conducted with program staff of DCEO and the University of Illinois at Urbana-Champaign (UIUC) School of Architecture-Building Research Council for the purposes of developing market environment and internal program management perspectives.

In order to gather information regarding the operational efficiency and program delivery process for the Energy Efficiency Program, in-person interviews were conducted with key program staff members. These interviews were focused on overall process effectiveness and identifying potential improvements for future program activities. DCEO interview participants included the low income programs manager, while School of Architecture-Building Research Council participants included the Chair of UIUC's Building Research Council

Respondents shared their perspectives on how the program has taken shape during Program Year 4 and 5. Interview questions related to the respondents' individual program roles as well as their perceptions of overall program strengths, weaknesses, and opportunities for the future.

### 3.8.1 Summary of Interview Findings

Key trends and issues addressed by respondents include:

- **Staff has sought to Continually Improve Program Procedures:** Program staff has tried different procedures for providing grant payments to recipients. In PY 3 the grant funds were administered through "fixed pricing." In this process, grantees estimated the cost of implementing the measures when applying for a grant and received funds based on that estimate. Once the measures were installed, the grantees returned unspent funds. However, this strategy was discontinued once the program became subject to procurement regulations that required grant awards to be based on costs as bid by a contractor or vendor. Along with the change requiring estimates to be based on bids, program staff stopped providing grant

funds up front and moved to a reimbursed costs model. That is, all funds were disbursed after the projects were completed and invoices had been submitted. This process strained staff resources because the projects were all completed toward the end of the program year and required the processing of all payments during the last few months of the program year as projects were completed.

Program staff is trying a new process for awarding grant funds during PY5. This new approach is designed to mitigate the concerns and inefficiencies stemming from processes used in the prior two years. In PY5, once grantees receive the pre-award letter, they can obtain a bid and submit the bid amount for approval by program staff. Once approved, the 50% of the award will be disbursed and the remaining funds will be disbursed upon project completion.

Another change made by program staff was to simplify the equipment inventory that participants submit with their applications. During EPY4/GPY1, staff reported that applicants needed assistance to complete the equipment inventories. In response to this issue, program staff created an organized and detailed inventory sheet for PY5.

- **Growing Interest in Renewable / Sustainable Energy:** Program staff noted a growing interest among Public Housing Authorities in renewable energy sources and sustainable building practices such as geothermal, passive solar construction, and solar thermal and photovoltaic power.

  It should be noted that although in the short term these technologies may be cost prohibitive, longer term trends in pricing, particularly for solar photovoltaic energy, may increase the feasibility of incentivizing their use in the future.

- **Prior Experience with the Program is Generating Greater Energy Savings:** Grantees' familiarity and past experience with the program is resulting in deeper energy savings. Interviews with program staff suggest that when a public housing authority has experience with the program they tend to need less support and find deeper savings through wider array of eligible measures. As the program matures and these experiences the result in a more effective and efficient program.

- **Program is Developing Social Capital that Increases Awareness of Energy Efficiency:** The program is continuingly developing greater social capital that is beneficial for promoting awareness of the program and opportunities for energy efficiency. The PHA community responds well to "word of mouth" interactions. Program staff hosts a variety of community and network building events throughout the year. These events allow for public housing authority managers and other statewide stakeholders to hear from one another and learn about the program successes, funding opportunities, and the cost savings realized by program participants.

- **Additional outreach efforts in Central and Southern Illinois**: Much of the program activity is occurring in Northern Illinois. This is largely because funds have to be spent in proportion with utility contributions, which are higher in the more populated northern region of the state. Furthermore, program staff has indicated that public housing authorities in the

southern part of the state have fewer resources available and are widely distributed because of the low population density. Because the housing authorities are widely distributed, visiting them to explain the program also takes more of the program's resources.

Program staff is aware of the need to perform more targeted outreach to these housing authorities and are developing plans to do so.

- **Public Housing Authorities Face Several Barriers to Energy Efficiency Improvements:** Barriers to participation include insufficient funds and other resource constraints, budget cycles, and attitudinal barriers to energy efficiency such as disinterest or misconceptions about efficient technologies. In particular, public housing authority decision makers express concerns about spending resources to replace equipment that is operating, despite its inefficiency. Program staff also noted that some public housing authorities have concerns with energy efficient technologies stemming from their lack of familiarity with it. Additionally, one public housing authority did not want to participate because they did not want to receive "state aid." The program was viewed as unnecessary and an inappropriate use of funds.
- **Some Participants have Difficulty Finding Qualifying Equipment:** Some participating PHA's have voiced concerns about finding equipment to meet the program specifications. In these cases staff at the School of Architecture-Building Research Council have allowed for the most efficient equipment available to be installed, as long as the equipment efficiency specifications exceed the baseline equipment.

# 4. Conclusions and Recommendations

The interviews and surveys that were conducted provide perspective on the operations of the Efficient Living Program. The findings suggest that the program is operating effectively and that staff are focused on its continual improvement. Survey responses also emphasize the importance of the program for increasing efficiency improvements in public housing authorities. These improvements not only reduce energy demand, but also reduce public housing authorities operating costs and improve living conditions for residents.

## 4.1 Key Conclusions

The following presents a selection of key conclusions from Program Year 4:

- **High Program Satisfaction:** Participating decision makers indicated a high level of satisfaction with the program. Survey respondents indicated that they were very or somewhat satisfied with most aspects of the program. Moreover, all respondents indicated that the measures met or exceeded their expectations. Participants did not report significant problems with the application process or the implementation of the measures. Additionally, participants who received education and training or onsite assistance from program staff reported that it was helpful.
- **Program Staff are Oriented towards Continuous Improvement:** Interviews with program staff involved discussions of challenges staff members have faced and are currently facing in effectively delivering the Efficient Living Program. Staff members have made adjustments to the way the program distributes funds and application materials in order to address operational issues that have occurred. Staff members' efforts to further improve the program will continue to serve the program well in future years.
- **Public Housing Authority Decision Makers Respond Well to Word of Mouth Promotion:** Program staff noted that word of mouth promotion of the program is an important means of increasing awareness of the program. Indeed, one-fifth of participants reported hearing about the program from friends or colleagues. However, program activity is primarily driven by program staff's promotional efforts. The University of Illinois Efficient Living Program at the Building Research Council – School of Architecture partners with SEDAC and DCEO to promote the program. The majority participant survey respondents indicated that they became aware of the program through one of these three organizations.
- **Less Program Activity Downstate:** Interviews with program staff indicated that there is less program participation in central and southern Illinois. These public housing authorities operate in areas that are geographically more dispersed than public housing authorities in the northern part of the state. The greater dispersion results in fewer networking opportunities, less sharing of information, and less awareness of the program and energy efficiency in general.

  A second factor that results in less activity in central and southern Illinois is that the distribution of utility funds does not match the distribution of public housing authority units.

Specifically, 40% of the public housing authority units are located in Ameren territory while less than 30% of the program funding is provided by Ameren. Consequently, the program has relatively fewer resources for serving housing authorities in the Ameren service territory.

- **Multiple Motivations for Participating:** Most survey respondents reported that they undertook the improvements made through the program to reduce operating costs and to improve conditions for residents through improved comfort and reduced utility bills. Most decision makers reported that residents paid at least some of their utility costs.
- **Participants Value Information Provided by the Program:** Program staff noted that lack of familiarity and misconceptions about energy efficient equipment were important barriers to public housing authorities' adoption of energy efficiency measures. Furthermore, responses to several questions suggest that decision makers value the informational assistance provided by the Efficient Living Program. A sizable share of participants indicated that program staff recommendations were influential in the decision to implement the energy efficiency measures. Participants also reported that the training and onsite assistance that they received through the program was helpful. These findings suggest the program is effective in reducing informational barriers to energy efficiency improvements in public housing authorities.
- **Initial Cost is a Primary Factor in Efficient Equipment Decisions:** Most survey respondents indicated that initial cost was a primary factor in their organization's decision to implement energy efficient equipment. Moreover, program staff noted that costs of equipment was a significant barrier to energy efficiency improvements in public housing authorities. These findings suggest that the initial cost of energy efficient equipment may discourage its implementation despite the longer term cost savings potential. The incentives provided by the program are important for encouraging the implementation of energy efficiency measures because they reduce the initial cost of the efficient equipment.
- **Limited Data Available in the EEPS Database:** The Energy Efficiency Portfolio Standard (EEPS) database is intended to track program activity for all DCEO programs. However, the database only contains high level information on projects completed through the Efficient Living Program. Although limited information is available through the EEPS database, the School of Architecture currently has extensive reporting protocols in place, with well-organized information on program activity including measure specifications and quantities. However, ideally this information would be incorporated into the DCEO project tracking database.

## 4.2 Program Recommendations

The following recommendations are offered as suggestions for the continual development of the program.

- **Apply TRM Methodologies in Estimating Savings:** For several measure types, the Illinois Statewide TRM makes more conservative assumptions regarding factors affecting the

calculation of energy savings than those used by program staff. In order to improve future energy savings realization rates, Efficient Living Program staff should, wherever possible, utilize the approaches and assumptions outlined in the TRM.

- **Continue Outreach Efforts:** Program staff noted that the program has had less participation by housing authorities in the southern part of the state. Staff members have developed plans for addressing this, which will likely involve identifying non-participating public housing authorities and developing a strategy to encourage their involvement. Staff members' continued outreach will help to drive energy efficiency improvements in public housing authorities by increasing awareness of the program and the benefits of energy efficiency improvements.
- **Facilitate Collaboration Among Public Housing Authorities:** While the presentations and workshops hosted by the program have been effective forms of education, additional interest in the program and greater program savings may be generated by developing strategies to encourage public housing authority staff to collaborate with one another in identifying opportunities for energy efficiency. Interview responses suggest that collaboration may be a particularly effective means of encouraging energy efficiency improvements.
- **Efforts to Promote the Program should Emphasize Benefits to Residents:** Surveys of grant recipients indicated that public housing authority decision makers are motivated to participate in the program in order to improve resident comfort and lower their utility costs. The program can capitalize on these motivations by emphasizing the range of benefits from implementing energy efficiency improvements through the program.

# Appendix A: Questionnaire for Decision Maker

1. Name of Participant's Organization

2. Your name (please correct if necessary)

3. What was your role in the decision implement the energy efficiency projects completed through the Efficient Living Program?

( ) Main decision maker
( ) Assisted with the decision to implement the measure
( ) Was not part of the decision process (If Checked, go to 3A)

3A. Who was the main decision maker?

3B. What is this person's telephone number?

3C. What is this person's email address?

4. What are the main sources your organization relies on for information about energy efficient equipment, materials, practices and design features? (Check all that apply)

( ) A DCEO Representative
( ) The DCEO Website
( ) Utility representatives
( ) Brochures or advertisements
( ) Trade associations or business groups you belong to
( ) Trade journals or magazines
( ) Friends and colleagues
( ) Representatives of the Smart Energy Design Assistance Center (SEDAC)
( ) Representatives of the Energy Resource Center (ERC)
( ) Architects, engineers or energy consultants
( ) Equipment vendors or building contractors
( ) City or county planning departments
( ) Illinois Housing Development Authority
( ) Illinois Habitat for Humanity
( ) US Department of Housing and Urban Development
( ) Other (please specify)

5. What barriers does your organization face in making energy efficiency improvements to low income housing? *(Select all that apply)*

( ) High initial cost of efficient equipment or design features
( ) Lack of knowledge of energy efficient equipment or design features
( ) Lack of interest among prospective residents in energy efficient housing
( ) Don't know
( ) Other (please describe)

6. Which of the following policies or procedures does your organization have in place regarding energy efficiency for low income housing? *(Check all that apply)*

( ) An energy management plan (If checked, go to 6A)
( ) A designated staff member responsible for energy tracking and energy efficiency
( ) Policies that incorporate energy efficiency in operations and procurement
( ) Active training of staff
( ) Other (please specify)
( ) None

6A. Does your energy management plan have energy efficiency goals?

( ) Yes
( ) No
( ) Don't know

6C. What are the goals of your energy management plan?

7. How important are grant payments to your decision making regarding energy efficiency improvements for low income housing?

( ) Very important
( ) Somewhat important
( ) Only slightly important
( ) Not important at all
( ) Don't know

8. How important is past experience with energy efficient equipment or practices for your decision making regarding energy efficiency improvements low income housing?

( ) Very important
( ) Somewhat important
( ) Only slightly important
( ) Not important at all
( ) Don't know

9. How important is advice and/or recommendations received from for your decision making regarding energy efficiency improvements low income housing?

( ) Very important
( ) Somewhat important
( ) Only slightly important
( ) Not important at all
( ) Don't know

10. For the project(s) completed through the program, do the residents pay the utility bills?

( ) Residents pay electrical bills
( ) Residents pay gas bills
( ) Residents pay gas and electric bills
( ) Some residents pay their gas and electric bills, but some do not
( ) Don't know

( ) Other (please specify)

11. Why did you decide to undertake the energy efficiency project(s) completed through the program? (select all that apply)

( ) To save money on operational costs of the building
( ) To help residents save money on their utility bills
( ) To improve the comfort of the building for its residents
( ) To qualify for financing opportunities
( ) To help save energy because of environmental concerns
( ) Other (please specify)

12. Which financial methods does your organization typically use to evaluate energy efficiency investments in low income housing? (Select all that apply)

( ) Initial Cost
( ) Simple payback (If checked, go to 12A)
( ) Internal rate of return (If checked, go to 12B)
( ) Life cycle cost (If checked, go to 12C)
( ) None of these

12A. What payback length of time do you normally require in order to proceed with an energy efficiency project? Please provide either a specific value or an estimated range.

12B. What rate of return do you normally require in order to proceed with an energy efficiency project? Please provide either a specific value or an estimated range.

12C. What discount rate do you normally apply when determining life cycle costs? Please provide either a specific value or an estimated range.

13. Has your organization implemented any low income energy efficiency projects in the last three years for which you did not apply for a financial incentive or grant through an energy efficiency program?

( ) Yes, undertook energy efficiency projects but did not apply for an incentive or grant. (If checked, go to 13A)
( ) No efficiency projects were undertaken.
( ) No, an incentive or grant was applied for. (If checked, go to 13B)
( ) Don't know

13A. Why didn't you apply for a financial incentive or grant for the project(s)?

( ) Didn't know whether project qualified for financial incentives or grants
( ) Didn't know about financial incentives or grants until after project was completed
( ) Didn't have time to complete paperwork for financial incentive or grant application
( ) Too much paperwork for the financial incentive or grant application
( ) Financial incentive or grant was insufficient
( ) Other (please specify)

13B. Did you receive all of your incentives for these past energy efficiency projects?

( ) Yes
( ) No
( ) Don't know

14. How did you learn of the Efficient Living Program? (Select all that apply)
( ) From a representative of the Efficient Living Program
( ) A DCEO representative mentioned it
( ) The DCEO Website
( ) From a utility representative
( ) Brochures or advertisements
( ) Trade association or business group you belong to
( ) Trade journal or magazine
( ) Friend or colleague
( ) From a representative of Smart Energy Design Assistance Center (SEDAC) or a SEDAC Service Provider
( ) From a representative of the Energy Resource Center (ERC)
( ) An architect, engineer or energy consultant
( ) Equipment vendor or building contractor
( ) Attended a conference workshop or seminar
( ) Past experience with the program
( ) An energy service company
( ) US Department of Housing and Urban Development Authority
( ) Illinois Housing Development Authority
( ) Illinois Habitat for Humanity
( ) Other (please describe)

15. When did you learn of the Efficient Living Program?
( ) Before planning the project
( ) During the project planning and concept phase
( ) Once the project was begun but before it was finished
( ) After the project was finished
( ) Some other time (please describe)
( ) Don't know

16. Before participating in the Efficient Living Program, had your organization completed any low income energy efficiency projects?
( ) Yes
( ) No
( ) Don't know

17. For the energy efficiency project(s) completed through the Efficient Living Program, did you have plans for these projects prior to participating in the program?
( ) Yes (If checked, go to 17A)
( ) No
( ) Don't know

17A. For about how long did you have these plans prior to finding out about the Efficient Living Program?

( ) Less than 6 months before
( ) 6-12 months before
( ) 1-2 years before
( ) 3-5 years before
( ) More than 5 years before
( ) Don't know

17B. Did your plans specify which energy efficiency measures you were going to implement?

( ) Yes
( ) No

17C. Would you have gone ahead with the energy efficiency projects even if you had not participated in the program?

( ) Yes
( ) No

18. Did you have experience with DCEO energy efficiency programs prior to participating in the Efficient Living Program?

( ) Yes(If checked, go to 18A)
( ) No

18A. How important was previous experience with the DCEO programs in making your decision to install the energy efficiency measures?

( ) Very important
( ) Somewhat important
( ) Only slightly important
( ) Not at all important
( ) Don't know

19. Did a representative of the Efficient Living Program recommend that you implement the energy efficient equipment or design features?

( ) Yes (If checked, go to 20A)
( ) No
( ) Don't know

19A. If the Efficient Living Program representative had not recommended these energy efficiency measures, how likely is it that you would have installed them anyway?

( ) Definitely would have
( ) Probably would have
( ) Probably would not have
( ) Definitely would not have
( ) Don't know

20. Did a representative of the Smart Energy Design Assistance Center (SEDAC) or a SEDAC Service Provider recommend that you implement the energy efficient equipment or design features?

( ) Yes (If checked, go to 20A)
( ) No
( ) Don't know

20A. If the SEDAC representative had not recommended these energy efficiency measures, how likely is it that you would have installed them anyway?

( ) Definitely would have installed
( ) Probably would have installed
( ) Probably would not have installed
( ) Definitely would not have installed
( ) Don't know

21. Would your organization have been financially able to complete the energy efficiency project(s) without the grant from the Efficient Living Program?

( ) Yes
( ) No

22. If the grant from the Efficient Living Program had not been available, how likely is it that you would have made the energy efficiency improvements anyway?

( ) Definitely would have
( ) Probably would have
( ) Probably would not have
( ) Definitely would not have
( ) Don't know

23. How did the availability of information and grant payments through the Efficient Living Program affect the quantity (or number of units) of energy efficient equipment or design features that you implemented in the project(s)? Did you implement more energy efficient equipment or design features than you otherwise would have without the program?

( ) Yes (If checked, go to 23A)
( ) No, program did not affect quantity of improvements implemented.

23A. What additional equipment or design features did you implement?

24. How did the availability of information and grant payments through the Efficient Living Program affect the level of energy efficiency of the equipment or design features you implemented? Did you choose equipment or design features that were more energy efficient than you otherwise would have chosen because of the program?

24A. How much more efficient was the equipment or design features that you installed (i.e., "xx% more efficient")?

25. How did the availability of information and grant payments through the Efficient Living Program affect the timing of the energy efficiency project(s)? Did you complete the projects earlier than you otherwise would have without the program?

( ) Yes (If checked, go to 25A)
( ) No, program did not affect the timing of the project.

25A. When would you have otherwise completed the projects?

( ) Less than 6 months before
( ) 6-12 months before
( ) 1-2 years before
( ) 3-5 years before
( ) More than 5 years before
( ) Don't know

26. Did you receive any on-site technical assistance from an Efficient Living Program representative or from a member of the Smart Energy Design Assistance Center (SEDAC)?

( ) Yes
( ) No
( ) Don't know

26A. Was this on-site assistance helpful for developing the energy saving aspects of the project?

( ) Yes
( ) No
( ) Don't know

27. Did your staff receive any education and training on ways to save energy from an Efficient Living Program representative or from a member of the Smart Energy Design Assistance Center (SEDAC)?

( ) Yes
( ) No
( ) Don't know

27A. Was this education or training helpful for understanding ways to save energy ?

( ) Yes
( ) No
( ) Don't know

28. Did you have any problems with the application process?

( ) Yes
( ) No
( ) Don't know

26A. What problems did you have?

29. Did the implementation of the efficiency measures go smoothly?

( ) Yes

( ) For the most part (If checked, go to 27A)
( ) No (If checked, go to 27A)
( ) Don't know

27A. Please explain in what ways the implementation did not go smoothly.

30. Did the energy efficiency measures you adopted for this project meet your expectations?
( ) My expectations were exceeded
( ) My expectations were met
( ) My expectations were mostly met (If checked, go to 28A)
( ) My expectations were not met (If checked, go to 28A)
( ) Don't know

28A. Please explain in what ways the energy efficiency improvements did not meet your expectations.

31. Do you feel you got a quality installation of the energy efficiency measures?
( ) Yes
( ) For the most part (If checked, go to 29A)
( ) No (If checked, go to 29A)
( ) Don't know

29A. Please explain in what ways you do not feel the service provider did a good job.

32. Did the grant agreement that you received meet your expectations?
( ) Yes
( ) No
( ) Don’t know

32A. Please explain in what ways the grant you received did not meet your expectations.

33. Did anyone from the program or other DCEO representative do a pre-inspection at the site?
( ) Yes
( ) No
( ) Don’t know

33A. Who performed the inspection?

33B. What did the pre-inspection consist of?

33C. Did anything change in the project design as a result of the pre-inspection?
( ) Yes
( ) No
( ) Don’t know

33D. Please explain the changes that were made to the project as a result of the pre-inspection.

34. Did anyone from the program or other DCEO representative do a post-inspection at the site?

( ) Yes
( ) No
( ) Don't know

34A. Who performed the inspection?

34B. What did the pre-inspection consist of?

34C. Did anything change in the grant amount as a result of the post-inspection?

( ) Yes
( ) No
( ) Don't know

34D. Please explain how the grant amount changed as a result of the post-inspection.

35. Were there any issues receiving the grant payments?

( ) Yes
( ) No
( ) Don't know

35A. Please describe the issues you had receiving the grant payments.

36. Was the grant amount what you expected?

( ) Yes
( ) No
( ) Don't know

35A. Please explain how the grant payment was different from what you expected.

37. Since participating in Efficient Living Program, have you implemented any additional energy efficient equipment or design features similar to those you implemented through the program that you did not apply or receive an incentive or grant for?

( ) Yes (If checked, go to 32A-32G)
( ) No
( ) Don't know

37A. Did the additional energy efficient equipment or design features result in the same or higher level of efficiency improvement as the measures implemented through the program?

( ) Yes
( ) No
( ) Don't know

37B. Was this additional equipment or design features implemented at the same site(s) as the project(s) completed through the program?

( ) Yes
( ) No; Where were the improvements made? (please specify)
( ) Don't know

37C. Did a recommendation from a program staff member or contractor influence your decision to implement the additional equipment or design features?

( ) Yes (If checked, go to 37C.1
( ) No
( ) Don't know

37C.1. How important was this recommendation to your decision to implement the additional energy efficiency improvements?

( ) Very important
( ) Somewhat important
( ) Neither important or unimportant
( ) Somewhat unimportant
( ) Unimportant
( ) Don't know

37D. How important was your experience with the program or the efficiency measures to your decision to implement the additional equipment or design features?

( ) Very important
( ) Somewhat important
( ) Neither important or unimportant
( ) Somewhat unimportant
( ) Unimportant
( ) Don't know

37E. How important was any past experience with energy efficiency programs to your decision to implement the additional efficiency improvements?

( ) Did not participate in any other programs in the past
( ) Very important
( ) Somewhat important
( ) Neither important or unimportant
( ) Somewhat unimportant
( ) Unimportant
( ) Don't know

37F. Why didn't you apply for or receive financial incentives or grants for the additional equipment or design features? (Check all that apply)

( ) Didn't know whether the improvements qualified for financial incentives
( ) Financial incentive was insufficient
( ) No financial incentive was offered

( ) Too much paperwork for the financial incentive application
( ) For some other reason (please specify)

38. Since participating in the program, have you implemented any other energy efficiency improvements that were not similar to what you implemented through the program and that you did not apply or receive an incentive or grant for?
( ) Yes (If checked, go to 33A-33G)
( ) No
( ) Don't know

38. What energy efficiency equipment or design features did you implement?

38B. Was this additional equipment or design features implemented at the same site(s) as the project that you completed through the program?
( ) Yes
( ) No; Where was the equipment installed? (please specify)
( ) Don't know

38C. Did a recommendation from a program staff member or contractor influence your decision to implement the additional measures?
( ) Yes (If checked, go to 33D.1)
( ) No
( ) Don't know

38D.1 How important was this recommendation to your decision to implement the additional equipment or design features?
( ) Very important
( ) Somewhat important
( ) Neither important or unimportant
( ) Somewhat unimportant
( ) Unimportant

38E. How important was your experience with the program or the efficiency measures to your decision to implement the additional equipment or design features?
( ) Very important
( ) Somewhat important
( ) Neither important or unimportant
( ) Somewhat unimportant
( ) Unimportant
( ) Don’t know

38F. How important was your participation in any past programs offered by the DCEO in your decision to implement the additional equipment or design features?
( ) Did not participate in any other programs in the past
( ) Very important
( ) Somewhat important

( ) Neither important or unimportant
( ) Somewhat unimportant
( ) Unimportant
( ) Don't know

38G. Why didn't you apply for or receive financial incentives or a grant for the additional equipment or design features? (Select all that apply) (Check all that apply)

( ) Didn't know about financial incentives
( ) Didn't know whether the measures qualified for financial incentives
( ) Financial incentive was insufficient
( ) No financial incentive was offered
( ) Too much paperwork for the financial incentive application
( ) For some other reason (please specify)

39. How would you rate your satisfaction with the following - *Very Satisfied, Somewhat Satisfied, Neither Satisfied nor Dissatisfied, Somewhat Dissatisfied, or Very Dissatisfied*? *(If dissatisfied, go to 34A)*

- Performance of the equipment installed
- Savings on your monthly bill
- Grant amount
- The effort required for the application process
- Quality of the work conducted by your contractor
- Information proved by DCEO
- The elapsed time until you received the grant payment
- Overall program experience

39A. Please describe in what ways you were not satisfied with the program.

40. Do you have any other comments that you would like to relay to DCEO about energy efficiency in public entities or about their programs?

# Appendix B: Decision Maker Survey Responses

As part of the evaluation work effort, a survey was made of a sample of grant recipient decision makers.

Each participant was interviewed using the survey instrument provided in Appendix A. The interviews were conducted by internet.

The following tabulations summarize the Efficient Living Program decision maker responses. Three columns of data are presented. The first column presents the number of survey respondents (*n)*. The second column presents the percentage of survey respondents (*n)*.

| | *Response* | *(n=9)* | *Percent of Respondents* |
|---|---|---|---|
| 3. What was your role in the decision making process to implement the energy efficiency project(s)? | Main decision maker | 4 | 44% |
| | Assisted with the decision to implement the project(s) | 5 | 56% |
| | Was not part of the decision process | 0 | 0% |

| | *Response* | *(n=9)** | *Percent of Respondents** |
|---|---|---|---|
| 4. What are the sources your organization relies on for information about energy efficient equipment, materials and design features? (Select all that apply) | DCEO Representatives | 4 | 44% |
| | The DCEO Website | 5 | 56% |
| | Utility representatives | 1 | 11% |
| | Brochures or advertisements | 7 | 78% |
| | Trade associations or business groups you belong to | 2 | 22% |
| | Trade journals or magazines | 3 | 33% |
| | Friends and colleagues | 3 | 33% |
| | Representatives of the Smart Energy Design Assistance Center (SEDAC) | 9 | 100% |
| | Representatives of the Energy Resource Center (ERC) | 1 | 11% |
| | Architects, engineers or energy consultants | 3 | 33% |
| | Equipment vendors or building contractors | 4 | 44% |
| | City or county planning departments | 0 | 0% |
| | Illinois Housing Development Authority | 3 | 33% |
| | Illinois Habitat for Humanity | 0 | 0% |
| | U.S. Department of Housing and Urban Development | 6 | 67% |
| | Other (please describe) | 1 | 11% |

**Since respondents were able to select more than one response, the sum of the percentages in the table above can exceed 100%.*

| | *Response* | *(n=9)* | *Percent of Respondents* |
|---|---|---|---|
| 5. What barriers does your organization face in making energy efficiency improvements to low income housing? | High initial cost of efficient equipment or design features | 8 | 89% |
| | Lack of knowledge of energy efficient equipment or design features | 0 | 0% |
| | Lack of interest among prospective residents in energy efficient housing | 2 | 22% |
| | Don't know | 0 | 0% |
| | Other (please describe) | 2 | 22% |

| | *Response* | *(n=9)* | *Percent of Respondents* |
|---|---|---|---|
| 6. Which of the following policies or procedures does your organization have in place regarding energy efficiency for low income housing? | An energy management plan | 0 | 0% |
| | A staff member responsible for energy and energy efficiency | 2 | 22% |
| | Policies that incorporate energy efficiency in operations and procurement | 4 | 44% |
| | Active training of staff | 3 | 33% |
| | Do not have policies or procedures for energy efficiency improvements | 2 | 22% |
| | Other | 4 | 44% |

| | *Response* | *(n=0)* | *Percent of Respondents* |
|---|---|---|---|
| 6a. Does your energy management plan have energy efficiency goals? | Yes | 0 | 0% |
| | No | 0 | 0% |
| | Don't Know | 0 | 0% |

| | *Response* | *(n=9)* | *Percent of Respondents* |
|---|---|---|---|
| 7. How important are incentive or grant payments from the DCEO for your decision making regarding energy efficiency improvements for low income housing? | Very Important | 9 | 100% |
| | Somewhat Important | 0 | 0% |
| | Only Slightly Important | 0 | 0% |
| | Not Important At All | 0 | 0% |
| | Don't Know | 0 | 0% |

| | *Response* | *(n=9)* | *Percent of Respondents* |
|---|---|---|---|
| 8. How important is past experience with energy efficient equipment or design features to your decision making regarding energy efficiency improvements for low income housing? | Very Important | 8 | 89% |
| | Somewhat Important | 1 | 11% |
| | Only Slightly Important | 0 | 0% |
| | Not Important At All | 0 | 0% |
| | Don't Know | 0 | 0% |

| | *Response* | *(n=9)* | *Percent of Respondents* |
|---|---|---|---|
| 9. How important is advice and/or recommendations received from the DCEO to your decision making regarding energy efficiency improvements for low income housing? | Very Important | 6 | 67% |
| | Somewhat Important | 3 | 33% |
| | Only Slightly Important | 0 | 0% |
| | Not Important At All | 0 | 0% |
| | Don't Know | 0 | 0% |

| | *Response* | *(n=9)* | *Percent of Respondents* |
|---|---|---|---|
| 10. For the project(s) completed through the Efficient Living Program, do the residents pay the utility bills? | Residents pay electrical bill | 1 | 11% |
| | Residents pay gas bill | 1 | 11% |
| | Residents pay gas and electric bill | 2 | 22% |
| | Residents do not pay the gas and electric bills | 2 | 22% |
| | Some residents pay their gas and electric bills, but some do not | 1 | 11% |
| | Don't know | 0 | 0% |
| | Other (please specify) | 2 | 22% |

| | *Response* | *(n=9)* | *Percent of Respondents ** |
|---|---|---|---|
| 11. Why did you decide to undertake the energy efficiency project(s) completed through the Efficient Living Program? (Select all that apply) | To save money on operational costs of the building | 8 | 89% |
| | To help residents save money on their utility bills | 7 | 78% |
| | To improve the comfort of the building for its residents | 7 | 78% |
| | To qualify for financing opportunities | 1 | 11% |
| | To help save energy because of environmental concerns | 5 | 56% |
| | Other (please specify) | 1 | 11% |

**Since respondents were able to select more than one response, the sum of the percentages in the table above can exceed 100%.*

| | *Response* | *(n=9)* | *Percent of Respondents ** |
|---|---|---|---|
| 12. Which financial methods does your organization typically use to evaluate energy efficiency investments in low income housing? (Select all that apply) | Initial cost | 8 | 89% |
| | Simple payback | 5 | 56% |
| | Internal rate of return | 1 | 11% |
| | Life cycle cost | 2 | 22% |
| | No methods to evaluate efficiency investments for low income housing | 0 | 0% |
| | Other (please specify) | 2 | 22% |

**Since respondents were able to select more than one response, the sum of the percentages in the table above can exceed 100%.*

| | *(n=2)* | |
|---|---|---|
| 12a. What payback length of time do you require to proceed with an energy efficiency project? Please provide either a specific value or an estimated range. | Average (Years) | 5.0 |

| | *(n=0)* | |
|---|---|---|
| 12b. What rate of return do you require to proceed with an energy efficiency project? Please provide either a specific value or an estimated range. | Average (return on investment) | 0% |

| 12c. What discount rate do you apply when determining life cycle costs? Please provide either a specific value or an estimated range. | *(n=0)* | |
|---|---|---|
| | Average (discount rate) | 0% |

| 13. Has your organization implemented any low income energy efficiency projects in the last three years for which you did not apply for a financial incentive or grant through an energy efficiency program? | *Response* | *(n=9)* | *Percent of Respondents* |
|---|---|---|---|
| | Yes, undertook energy efficiency projects but did not apply for incentive | 4 | 44% |
| | No energy efficiency projects were undertaken | 0 | 0% |
| | No, an incentive was applied for | 5 | 56% |
| | Don't know | 0 | 0% |

| 13a. Why didn't you apply for a financial incentive or grant for the project(s)? | *Response* | *(n=4)* | *Percent of Respondents* |
|---|---|---|---|
| | Didn't know whether project qualified for financial incentives or grants | 1 | 25% |
| | Didn't know about financial incentives or until after project was completed | 0 | 0% |
| | No time to complete paperwork for financial incentive or grant application | 0 | 0% |
| | Too much paperwork for the financial incentive or grant application | 0 | 0% |
| | Financial incentive or grant was insufficient | 0 | 0% |
| | Other (please specify) | 2 | 50% |

| 13b. Did you receive all of your incentives or grant payments for these past energy efficient projects? | *Response* | *(n=5)* | *Percent of Respondents* |
|---|---|---|---|
| | Yes | 5 | 100% |
| | No | 0 | 0% |
| | Don't know | 0 | 0% |

| | *Response* | *(n=9)* | *Percent of Respondents ** |
|---|---|---|---|
| 14. How did you learn of the Efficient Living Program? | From a representative of the [Program] | 0 | 0% |
| | A DCEO representative mentioned it | 0 | 0% |
| | The DCEO website | 0 | 0% |
| | From a utility representative | 0 | 0% |
| | Brochures or advertisements | 2 | 22% |
| | Trade association or business group you belong to | 0 | 0% |
| | Trade journal or magazine | 0 | 0% |
| | Friend or colleague | 2 | 22% |
| | From a representative of the Smart Energy Design Assistance Center (SEDAC) | 3 | 33% |
| | From a representative of the Energy Resource Center (ERC) | 0 | 0% |
| | An architect, engineer or energy consultant | 0 | 0% |
| | Equipment vendor or building contractor | 0 | 0% |
| | Attended a conference workshop or seminar | 2 | 22% |
| | Past experience with the program | 1 | 11% |
| | An energy service company | 0 | 0% |
| | U.S. Department of Housing and Urban Development | 2 | 22% |
| | Illinois Housing Development Authority | 0 | 0% |
| | Illinois Habitat for Humanity | 0 | 0% |
| | Other | 0 | 0% |

**Since respondents were able to select more than one response, the sum of the percentages in the table above can exceed 100%.*

| | *Response* | *(n=9)* | *Percent of Respondents* |
|---|---|---|---|
| 15. When did you learn of the Efficient Living Program? | Before planning the project | 7 | 78% |
| | During the project planning and concept phase | 1 | 11% |
| | Once the project was begun but before it was finished | 1 | 11% |
| | After the project was finished | 0 | 0% |
| | Some other time (please explain) | 0 | 0% |
| | Don't know | 0 | 0% |

| | *Response* | *(n=9)* | *Percent of Respondents* |
|---|---|---|---|
| 16. Before participating in the Efficient Living Program, had your organization completed any low income energy efficiency projects? | Yes | 3 | 33% |
| | No | 6 | 67% |

| 17. For the energy efficiency project(s) completed through the Efficient Living Program, did you have plans for these projects prior to participating in the program? | *Response* | *(n=9)* | *Percent of Respondents* |
|---|---|---|---|
| | Yes | 7 | 78% |
| | No | 2 | 22% |
| | Don't know | 0 | 0% |

| 17a. For about how long did you have these plans prior to finding out about the Efficient Living Program? | *Response* | *(n=7)* | *Percent of Respondents* |
|---|---|---|---|
| | Less than 6 months | 0 | 0% |
| | 6-12 months | 1 | 14% |
| | 1-2 years | 3 | 43% |
| | 3-5 years | 1 | 14% |
| | More than 5 years | 2 | 29% |
| | Don't know | 0 | 0% |

| 17b. Did your plans specify which energy efficiency measures you were going to implement? | *Response* | *(n=7)* | *Percent of Respondents* |
|---|---|---|---|
| | Yes | 5 | 71% |
| | No | 2 | 29% |

| 17c. Would you have gone ahead with the energy efficiency project(s) if you had not participated in the program? | *Response* | *(n=7)* | *Percent of Respondents* |
|---|---|---|---|
| | Yes | 3 | 43% |
| | No | 4 | 57% |

| 18. Did you have experience with DCEO energy efficiency programs prior to participating in the Efficient Living Program? | *Response* | *(n=9)* | *Percent of Respondents* |
|---|---|---|---|
| | Yes | 0 | 0% |
| | No | 9 | 100% |

| 18a. How important was your previous experience with the DCEO energy efficiency programs to your decision to install the energy efficiency measures? | *Response* | *(n=0)* | *Percent of Respondents* |
|---|---|---|---|
| | Very important | 0 | 0% |
| | Somewhat important | 0 | 0% |
| | Only slightly important | 0 | 0% |
| | Not at all important | 0 | 0% |
| | Don't know | 0 | 0% |

| 19. Did a representative of the Efficient Living Program recommend that you implement the energy efficient equipment or design features? | *Response* | *(n=9)* | *Percent of Respondents* |
|---|---|---|---|
| | Yes | 5 | 56% |
| | No | 2 | 22% |
| | Don't know | 2 | 22% |

| 19a. If the Efficient Living Program representative had not recommended these energy efficiency measures, how likely is it that you would have installed them anyway? | *Response* | *(n=5)* | *Percent of Respondents* |
|---|---|---|---|
| | Definitely would have | 1 | 20% |
| | Probably would have | 2 | 40% |
| | Probably would not have | 1 | 20% |
| | Definitely would not have | 1 | 20% |
| | Don't know | 0 | 0% |

| 20. Did a representative of the Smart Energy Design Assistance Center (SEDAC) recommend that you implement the energy efficient equipment or design features? | *Response* | *(n=9)* | *Percent of Respondents* |
|---|---|---|---|
| | Yes | 6 | 67% |
| | No | 2 | 22% |
| | Don't know | 1 | 11% |

| 20a. If the SEDAC representative had not recommended these energy efficiency measures, how likely is it that you would have installed them anyway? | *Response* | *(n=6)* | *Percent of Respondents* |
|---|---|---|---|
| | Definitely would have installed | 1 | 17% |
| | Probably would have installed | 2 | 33% |
| | Probably would not have installed | 2 | 33% |
| | Definitely would not have installed | 1 | 17% |
| | Don't know | 0 | 0% |

| 21. Would your organization have been financially able to complete the energy efficiency project(s) without the grant from the Efficient Living Program? | *Response* | *(n=9)* | *Percent of Respondents* |
|---|---|---|---|
| | Yes | 2 | 22% |
| | No | 7 | 78% |

| 22. If the grant from the Efficient Living Program had not been available, how likely is it that you would have made the energy efficiency improvements anyway? | *Response* | *(n=9)* | *Percent of Respondents* |
|---|---|---|---|
| | Definitely would have made the same improvements | 1 | 11% |
| | Probably would have made the same improvements | 4 | 44% |
| | Probably would not have made the same improvements | 2 | 22% |
| | Definitely would not have made the same improvements | 2 | 22% |
| | Don't know | 0 | 0% |

| 23. How did the availability of information and grant payments through the Efficient Living Program affect the quantity (or number of units) of energy efficient equipment or design features that you implemented in the project(s)? Did you implement more energy efficient equipment or design features than you otherwise would have without the program? | *Response* | *(n=8)* | *Percent of Respondents* |
|---|---|---|---|
| | Yes | 6 | 75% |
| | No, program did not affect the quantity implemented | 2 | 25% |

| 24. How did the availability of information and grant payments through the Efficient Living Program affect the level of energy efficiency of the equipment or design features you implemented? Did you choose equipment or design features that were more energy efficient than you otherwise would have chosen because of the program? | *Response* | *(n=9)* | *Percent of Respondents* |
|---|---|---|---|
| | Yes | 6 | 67% |
| | No, program did not affect level of efficiency | 3 | 33% |

| 25. How did the availability of information and grant payments through the Efficient Living Program affect the timing of the energy efficiency project(s)? Did you complete the projects earlier than you otherwise would have without the program? | *Response* | *(n=9)* | *Percent of Respondents* |
|---|---|---|---|
| | Yes | 8 | 89% |
| | No, program did not affect the timing of the project. | 1 | 11% |

| 25a. When would you otherwise have completed the project(s)? | *Response* | *(n=8)* | *Percent of Respondents* |
|---|---|---|---|
| | Less than 6 months later | 0 | 0% |
| | 6-12 months later | 0 | 0% |
| | 1-2 years later | 3 | 38% |
| | 3-5 years later | 2 | 25% |
| | More than 5 years later | 3 | 38% |

| 26. Did you receive any on-site technical assistance from an Efficient Living Program representative or from a member of the Smart Energy Design Assistance Center (SEDAC)? | *Response* | *(n=9)* | *Percent of Respondents* |
|---|---|---|---|
| | Yes | 6 | 67% |
| | No | 3 | 33% |
| | Don't know | 0 | 0% |

| 26a. Was this on-site assistance helpful for developing the energy saving aspects of the project? | *Response* | *(n=6)* | *Percent of Respondents* |
|---|---|---|---|
| | Yes | 6 | 100% |
| | No | 0 | 0% |
| | Don't know | 0 | 0% |

| 27. Did your staff receive any education and training on ways to save energy from an Efficient Living Program representative or from a member of the Smart Energy Design Assistance Center (SEDAC)? | *Response* | *(n=9)* | *Percent of Respondents* |
|---|---|---|---|
| | Yes | 5 | 56% |
| | No | 2 | 22% |
| | Don't know | 2 | 22% |

| 27a. Was this education or training helpful for understanding ways to save energy? | *Response* | *(n=5)* | *Percent of Respondents* |
|---|---|---|---|
| | Yes | 5 | 100% |
| | No | 0 | 0% |
| | Don't know | 0 | 0% |

| 28. Did you have any problems with the application process? | *Response* | *(n=9)* | *Percent of Respondents* |
|---|---|---|---|
| | Yes | 0 | 0% |
| | No | 8 | 89% |
| | Don't know | 1 | 11% |

| 29. Did the implementation of the efficiency measures go smoothly? | *Response* | *(n=9)* | *Percent of Respondents* |
|---|---|---|---|
| | Yes | 8 | 89% |
| | For the most part | 1 | 11% |
| | No | 0 | 0% |
| | Don't know | 0 | 0% |

| 30. Did the energy efficiency measures you adopted for this project meet your expectations? | *Response* | *(n=9)* | *Percent of Respondents* |
|---|---|---|---|
| | My expectations were exceeded | 2 | 22% |
| | My expectations were met | 7 | 78% |
| | My expectations were mostly met | 0 | 0% |
| | My expectations were not met | 0 | 0% |
| | Don't know | 0 | 0% |

| 31. Do you feel you got a quality installation of the energy efficiency measures? | *Response* | *(n=9)* | *Percent of Respondents* |
|---|---|---|---|
| | Yes | 9 | 100% |
| | For the most part | 0 | 0% |
| | No | 0 | 0% |
| | Don't know | 0 | 0% |

| 32. Did the grant agreement that you received meet your expectations? | *Response* | *(n=9)* | *Percent of Respondents* |
|---|---|---|---|
| | Yes | 9 | 100% |
| | No | 0 | 0% |
| | Don't know | 0 | 0% |

| 33. Did anyone from the Efficient Living Program or other DCEO representative do a pre-inspection at the site(s)? | *Response* | *(n=9)* | *Percent of Respondents* |
|---|---|---|---|
| | Yes | 4 | 44% |
| | No | 3 | 33% |
| | Don't know | 2 | 22% |

| 33c. Did anything change in the project design as a result of the pre-inspection? | *Response* | *(n=4)* | *Percent of Respondents* |
|---|---|---|---|
| | Yes | 1 | 25% |
| | No | 2 | 50% |
| | Don't know | 1 | 25% |

| 34. Did anyone from the Efficient Living Program or other DCEO representative do a post-inspection at the site(s)? | *Response* | *(n=9)* | *Percent of Respondents* |
|---|---|---|---|
| | Yes | 7 | 78% |
| | No | 1 | 11% |
| | Don't know | 1 | 11% |

| 34c. Did anything change in the grant amount as a result of the post-inspection? | *Response* | *(n=7)* | *Percent of Respondents* |
|---|---|---|---|
| | Yes | 0 | 0% |
| | No | 7 | 100% |
| | Don't know | 0 | 0% |

| 35. Were there any issues with receiving the grant payments? | *Response* | *(n=9)* | *Percent of Respondents* |
|---|---|---|---|
| | Yes | 0 | 0% |
| | No | 9 | 100% |
| | Don't know | 0 | 0% |

| 36. Was the grant payment amount what you expected? | *Response* | *(n=9)* | *Percent of Respondents* |
|---|---|---|---|
| | Yes | 9 | 100% |
| | No | 0 | 0% |
| | Don't know | 0 | 0% |

| 37. Since participating in the Efficient Living Program, have you implemented any additional energy efficient equipment or design features similar to those you implemented through the program that you did not apply or receive an incentive or grant for? | *Response* | *(n=9)* | *Percent of Respondents* |
|---|---|---|---|
| | Yes | 3 | 33% |
| | No | 6 | 67% |
| | Don't know | 0 | 0% |

| 37a. Did the additional energy efficient equipment or design features result in the same or higher level of efficiency improvement as the measures implemented through the program? | *Response* | *(n=3)* | *Percent of Respondents* |
|---|---|---|---|
| | Yes | 3 | 100% |
| | No | 0 | 0% |
| | Don't know | 0 | 0% |

| 37b. Was this additional equipment or design features implemented at the same site(s) as the project(s) completed through the program? | *Response* | *(n=3)* | *Percent of Respondents* |
|---|---|---|---|
| | Yes | 3 | 100% |
| | No (where was the equipment or design feature installed?) | 0 | 0% |
| | Don't know | 0 | 0% |

| 37c. Did a recommendation from a program staff member or contractor influence your decision to implement the additional equipment or design features? | *Response* | *(n=3)* | *Percent of Respondents* |
|---|---|---|---|
| | Yes | 0 | 0% |
| | No | 3 | 100% |
| | Don't know | 0 | 0% |

| 37d. How important was the recommendation to your decision to implement the additional equipment or design features? | *Response* | *(n=0)* | *Percent of Respondents* |
|---|---|---|---|
| | Important | 0 | 0% |
| | Somewhat Important | 0 | 0% |
| | Neither Important nor Unimportant | 0 | 0% |
| | Somewhat Unimportant | 0 | 0% |
| | Unimportant | 0 | 0% |
| | Don't know | 0 | 0% |

| 37e. How important was your experience with the program or the efficiency measures to your decision to implement the additional equipment or design features? | *Response* | *(n=3)* | *Percent of Respondents* |
|---|---|---|---|
| | Important | 0 | 0% |
| | Somewhat Important | 2 | 67% |
| | Neither Important nor Unimportant | 1 | 33% |
| | Somewhat Unimportant | 0 | 0% |
| | Unimportant | 0 | 0% |
| | Don't know | 0 | 0% |

| | *Response* | *(n=3)* | *Percent of Respondents* |
|---|---|---|---|
| 37f. How important was your participation in any past programs offered by the DCEO to your decision to implement the additional equipment or design features? | Important | 1 | 33% |
| | Somewhat Important | 1 | 33% |
| | Neither Important nor Unimportant | 1 | 33% |
| | Somewhat Unimportant | 0 | 0% |
| | Unimportant | 0 | 0% |
| | Don't know | 0 | 0% |

| | *Response* | *(n=2)* | *Percent of Respondents* * |
|---|---|---|---|
| 37g. Why didn't you apply for or receive financial incentives or grants for the additional equipment or design features? | Didn't know whether the equipment or design features qualified for financial incentives or grants | 0 | 0% |
| | Financial incentive or grant was insufficient | 1 | 50% |
| | No financial incentive or grant was offered | 0 | 0% |
| | Too much paperwork for the financial incentive or grant application | 0 | 0% |
| | For some other reason (please specify) | 1 | 50% |

**Since respondents were able to select more than one response, the sum of the percentages in the table above can exceed 100%.*

| | *Response* | *(n=9)* | *Percent of Respondents* |
|---|---|---|---|
| 38. Since participating in the program, have you implemented any other energy efficient equipment or design features that were not similar to what you implemented through the program and that you did not apply or receive an incentive or grant for? | Yes | 2 | 22% |
| | No | 7 | 78% |
| | Don't know | 0 | 0% |

| | *Response* | *(n=2)* | *Percent of Respondents* |
|---|---|---|---|
| 38b. Was this additional equipment or design features implemented at the same site(s) as the project that you completed through the program? | Yes | 1 | 50% |
| | No (please explain where the equipment or design features were installed). | 1 | 50% |
| | Don't know | 0 | 0% |

| | *Response* | *(n=2)* | *Percent of Respondents* |
|---|---|---|---|
| 38c. Did a recommendation from a program staff member or contractor influence your decision to implement the additional equipment or design features? | Yes | 0 | 0% |
| | No | 2 | 100% |
| | Don't know | 0 | 0% |

| | *Response* | *(n=0)* | *Percent of Respondents* |
|---|---|---|---|
| 38d. How important was the recommendation to your decision to implement the additional equipment or design features? | Important | 0 | 0% |
| | Somewhat Important | 0 | 0% |
| | Neither Important nor Unimportant | 0 | 0% |
| | Somewhat Unimportant | 0 | 0% |
| | Unimportant | 0 | 0% |
| | Don't know | 0 | 0% |

| | *Response* | *(n=2)* | *Percent of Respondents* |
|---|---|---|---|
| 38e. How important was your experience with the program or the efficiency measures to your decision to implement the additional equipment or design features? | Important | 0 | 0% |
| | Somewhat Important | 0 | 0% |
| | Neither Important nor Unimportant | 2 | 100% |
| | Somewhat Unimportant | 0 | 0% |
| | Unimportant | 0 | 0% |
| | Don't know | 0 | 0% |

| | *Response* | *(n=2)* | *Percent of Respondents* |
|---|---|---|---|
| 38f. How important was your participation in any past programs offered by the DCEO in your decision to implement the additional equipment or design features? | Important | 0 | 0% |
| | Somewhat Important | 0 | 0% |
| | Neither Important nor Unimportant | 2 | 100% |
| | Somewhat Unimportant | 0 | 0% |
| | Unimportant | 0 | 0% |
| | Don't know | 0 | 0% |

| | *Response* | *(n=2)* | *Percent of Respondents** |
|---|---|---|---|
| 38g. Why didn't you apply for or receive financial incentives or a grant for the additional equipment or design features? (Select all that apply) | Didn't know about financial incentives or grants | 0 | 0% |
| | Didn't know if the measures qualified for financial incentives or grants | 0 | 0% |
| | Financial incentive or grant was insufficient | 1 | 50% |
| | No financial incentive or grant was offered | 0 | 0% |
| | Too much paperwork for the financial incentive or grant application | 0 | 0% |
| | For some other reason (please describe) | 1 | 50% |

**Since respondents were able to select more than one response, the sum of the percentages in the table above can exceed 100%.*

| | *Response* | *(n=9)* | *Percent of Respondents** |
|---|---|---|---|
| 39a. On a scale of 1 to 5, where "5" is very satisfied and "1" is very unsatisfied, how satisfied are you with the performance of the equipment installed? | 5 | 4 | 44% |
| | 4 | 5 | 56% |
| | 3 | 0 | 0% |
| | 2 | 0 | 0% |
| | 1 | 0 | 0% |
| | Don't know / Not applicable | 0 | 0% |
| | *Average* | | *4.4* |

**Each response was assigned a numerical value from one to five (5=Very Satisfied, 4=Satisfied, 3=Neither Satisfied nor Dissatisfied, 2=Dissatisfied, 1=Very Dissatisfied)*

| | *Response* | *(n=9)* | *Percent of Respondents** |
|---|---|---|---|
| 39b. On a scale of 1 to 5, where "5" is very satisfied and "1" is very unsatisfied, how satisfied are you with the savings on your monthly bill? | 5 | 2 | 22% |
| | 4 | 4 | 44% |
| | 3 | 1 | 11% |
| | 2 | 0 | 0% |
| | 1 | 0 | 0% |
| | Don't know / Not applicable | 2 | 22% |
| | *Average* | | *4.1* |

**Each response was assigned a numerical value from one to five (5=Very Satisfied, 4=Satisfied, 3=Neither Satisfied nor Dissatisfied, 2=Dissatisfied, 1=Very Dissatisfied)*

| | *Response* | *(n=9)* | *Percent of Respondents** |
|---|---|---|---|
| 39c. On a scale of 1 to 5, where "5" is very satisfied and "1" is very unsatisfied, how satisfied are you with the grant amount? | 5 | 5 | 56% |
| | 4 | 4 | 44% |
| | 3 | 0 | 0% |
| | 2 | 0 | 0% |
| | 1 | 0 | 0% |
| | Don't know / Not applicable | 0 | 0% |
| | *Average* | | *4.6* |

**Each response was assigned a numerical value from one to five (5=Very Satisfied, 4=Satisfied, 3=Neither Satisfied nor Dissatisfied, 2=Dissatisfied, 1=Very Dissatisfied)*

| | *Response* | *(n=9)* | *Percent of Respondents** |
|---|---|---|---|
| 39d. On a scale of 1 to 5, where "5" is very satisfied and "1" is very unsatisfied, how satisfied are you with the effort required for the application process? | 5 | 5 | 56% |
| | 4 | 3 | 33% |
| | 3 | 0 | 0% |
| | 2 | 0 | 0% |
| | 1 | 0 | 0% |
| | Don't know / Not applicable | 1 | 11% |
| | *Average* | | *4.6* |

**Each response was assigned a numerical value from one to five (5=Very Satisfied, 4=Satisfied, 3=Neither Satisfied nor Dissatisfied, 2=Dissatisfied, 1=Very Dissatisfied)*

| | *Response* | *(n=9)* | *Percent of Respondents** |
|---|---|---|---|
| 39e. On a scale of 1 to 5, where "5" is very satisfied and "1" is very unsatisfied, how satisfied are you with the quality of the work conducted by your contractor? | 5 | 5 | 56% |
| | 4 | 3 | 33% |
| | 3 | 0 | 0% |
| | 2 | 0 | 0% |
| | 1 | 0 | 0% |
| | Don't know / Not applicable | 1 | 11% |
| | *Average* | | *4.6* |

**Each response was assigned a numerical value from one to five (5=Very Satisfied, 4=Satisfied, 3=Neither Satisfied nor Dissatisfied, 2=Dissatisfied, 1=Very Dissatisfied)*

| | *Response* | *(n=9)* | *Percent of Respondents** |
|---|---|---|---|
| 39f. On a scale of 1 to 5, where "5" is very satisfied and "1" is very unsatisfied, how satisfied are you with the information provided by DCEO? | 5 | 5 | 56% |
| | 4 | 3 | 33% |
| | 3 | 0 | 0% |
| | 2 | 0 | 0% |
| | 1 | 0 | 0% |
| | Don't know / Not applicable | 1 | 11% |
| | *Average* | | *4.6* |

**Each response was assigned a numerical value from one to five (5=Very Satisfied, 4=Satisfied, 3=Neither Satisfied nor Dissatisfied, 2=Dissatisfied, 1=Very Dissatisfied)*

| | *Response* | *(n=9)* | *Percent of Respondents** |
|---|---|---|---|
| 39g. On a scale of 1 to 5, where "5" is very satisfied and "1" is very unsatisfied, how satisfied are you with the elapsed time until you received the grant payment? | 5 | 4 | 44% |
| | 4 | 5 | 56% |
| | 3 | 0 | 0% |
| | 2 | 0 | 0% |
| | 1 | 0 | 0% |
| | Don't know / Not applicable | 0 | 0% |
| | *Average* | | *4.4* |

**Each response was assigned a numerical value from one to five (5=Very Satisfied, 4=Satisfied, 3=Neither Satisfied nor Dissatisfied, 2=Dissatisfied, 1=Very Dissatisfied)*

| | *Response* | *(n=9)* | *Percent of Respondents** |
|---|---|---|---|
| 39h. On a scale of 1 to 5, where "5" is very satisfied and "1" is very unsatisfied, how satisfied are you with the overall program experience? | 5 | 6 | 67% |
| | 4 | 3 | 33% |
| | 3 | 0 | 0% |
| | 2 | 0 | 0% |
| | 1 | 0 | 0% |
| | Don't know / Not applicable | 0 | 0% |
| | *Average* | | *4.7* |

* *Each response was assigned a numerical value from one to five (5=Very Satisfied, 4=Satisfied, 3=Neither Satisfied nor Dissatisfied, 2=Dissatisfied, 1=Very Dissatisfied)*