

Evaluation of Energy Efficient  
Affordable Housing Construction Program  
June 2011 through May 2012

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Prepared for:  
Illinois Department of Commerce Economic Opportunity

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Final Report: October 2013

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## Executive Summary

This report presents the results of the impact and process evaluations of electric program year four and natural gas program year one (EPY4/GPY1) of the Energy Efficient Affordable Housing Construction 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 interviews with DCEO staff members and program participants.
- An engineering review was performed to verify gross savings of measures implemented under the program.

The realized gross and net electric energy savings of the Affordable Housing Construction 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 3,569,206 kWh. The program gross realization rate for electric energy savings is 111%. The program net-to-gross ratio is 100% because the program targets low income residents. The realized net electric energy savings total 3,569,206 kWh annually. Natural gas energy savings are shown in Table ES-2. Gross realized natural gas savings total 30,998 therms annually. The gross realization rate is 185% for natural gas energy savings. Net therm savings total 30,998 annually.

*Table ES-1 Summary of kWh Savings for Affordable Housing Construction Program*

<i>Utility</i>	<i>Units</i>	<i>Expected kWh Savings</i>	<i>Realized Gross kWh Savings</i>	<i>Gross Realization Rate</i>	<i>Realized Net kWh Savings*</i>
Ameren	100	206,320	267,249	130%	267,249
ComEd	1,474	3,008,394	3,301,957	110%	3,301,957
Total	1,574	3,214,713	3,569,206	111%	3,569,206

*\*A net-to-gross ratio of 100% is applied because the Affordable Housing Construction 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 Affordable Housing Construction Program*

<i>Utility</i>	<i>Units</i>	<i>Expected Therm Savings</i>	<i>Realized Gross Therm Savings</i>	<i>Gross Realization Rate</i>	<i>Realized Net Therm Savings*</i>
Ameren	-	-	-	-	-
Nicor Gas	85	6,787	11,934	176%	11,934
Peoples Gas	-	-	-	-	-
North Shore Gas	101	9,962	19,064	191%	19,064
Total	186	16,749	30,998	185%	30,998

*\*A net-to-gross ratio of 100% is applied because the Affordable Housing Construction 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 Affordable Housing Construction Program during the period June 2011 through May 2012 are summarized in Table ES-3. The achieved net peak demand savings are 2,391.68 kW.

*Table ES-3 Summary of Peak kW Savings for Affordable Housing Construction Program*

<i>Utility</i>	<i>Units</i>	<i>Realized Gross kW Savings</i>	<i>Realized Net kW Savings*</i>
Ameren	100	841.15	841.15
ComEd	1,474	1,550.54	1,550.54
Total	1,574	2,391.68	2,391.68

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

Surveys were conducted with grant recipients to better understand the effectiveness of program delivery. A review of program documentation and in-depth interviews with program staff indicate that there are aspects of the program that could be improved to increase awareness, improve program administration and project tracking, and to better align reporting requirements with the informational needs for assessing savings. The following presents a selection of key conclusions from EPY4/GPY1:

- **Participants Satisfied with the Program Overall:** All grant recipients indicated that they were either somewhat or very satisfied with the program overall. Participants were most satisfied with the information provided by DCEO and the performance of the implemented efficiency measures. However, a minority of grant recipients stated that they were dissatisfied with an aspect of program participation. One-third of survey respondents expressed dissatisfaction with the effort required for the application process and the time required to receive the grant payment.
- **Program Staffing may be Insufficient:** The Affordable Housing Construction Program has faced challenges in maintaining sufficient staffing to administer the program. Despite these challenges, program participants were generally satisfied with the program. This suggests that even with limited resources, staff members are able to provide adequate assistance to participants. However, maintenance of documentation and program tracking data has suffered from limited administrative resources.

To address the staffing limitation, two additional part-time employees were recently added to assist with the program's administration. Given the administrative requirements of the program, additional staffing may be necessary.

- **Project Tracking and Documentation in Need of Improvement:** Program staff are currently tracking project-level information in various documents and entering it into the project tracking database. However, database limitations and discrepancies in reported program activity across data sources indicates that better systems and processes are needed

for documenting program activity. However, only limited information on technical specification was available for some measures.

- **Limited Program Marketing:** The Affordable Housing Construction Program relies upon repeat participation by external organizations, and other DCEO programs play an important role in facilitating program participation. Although few staff resources are spent on marketing and promotion, recent changes may help further promote the program. The program has expanded its partnership with the Illinois Housing Development Authority, a state financing agency, to provide an additional pipeline to the program for prospective participants.
- **Partnerships are Critical to Future Program Success:** As with other DCEO programs, partner organizations often provide much of the needed marketing and implementation support that drives program awareness and success. DCEO recognizes these synergies at the state level and is investing resources to better understand the scope and potential efficiencies that could result from community and agency partnerships.

While the program has maintained participant satisfaction and continued to deliver energy efficiency improvements to low income residents, there are aspects of the program that could be improved. The following recommendations are offered for consideration.

- **Track Additional Project Information:** The Affordable Housing Construction Program maintains limited tracking data. Ideally, the tracking data would provide the following: (1) the measures installed, including quantities and technical specifications such as the wattage of bulbs, R-value of insulation, and size and Seasonal Energy Efficiency Ratio (SEER) ratings of air conditioners; (2) the date of implementation; (3) the location of the implemented measures; (4) the estimated measure energy savings; (5) resident contact information; (6) contractor information if utilized; (7) the baseline equipment or building conditions; and (8) the utility account numbers associated with the implementation address.
- **Provide a Report Template for Program Participants to Report Measure Specifications:** A review of project documentation determined that information provided by program participants regarding the implemented measures was not consistently reported. In order to support reporting of this information, program staff should consider providing a reporting template for each measure type that collects the appropriate level of detail. The data captured by the reporting template should be included in DCEO's Energy Efficiency Portfolio Standard (EEPS) program administration database.
- **Continue to Invest in Strong Partnerships:** Program staff indicated that marketing resources are limited at this time. Program partners such the University of Illinois School of Architecture, the Smart Energy Design Assistance Center, the Illinois Housing Authority, the Bureau of Community Development, and the Bureau of Energy Assistance possess established marketing channels that can continue to drive program demand. As the program matures, DCEO will be able to attract more participants and increase program savings.



# 1. Introduction

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This report presents the results of the impact and process evaluations of the Illinois Department of Commerce and Economic Opportunity (DCEO) Affordable Housing Construction Program. This report presents evaluation results pertaining to program 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

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The Affordable Housing Construction Program provides grants to non-profit and for-profit affordable housing developers to help offset the cost of incorporating energy efficient building practices in residential construction. The goal of the program is to promote the benefits of lower utility bills that can be achieved by low income households within energy efficient buildings. Eligible projects must be targeted at households that are at or below 80% of the Average Median Income (AMI) level.

Grant amounts for projects are calculated on per living unit, per building, or per square footage of living space bases. To receive the grant funds, the new construction or rehab project must meet the program guidelines and accept the full set of measures specified. There are three sets of program guidelines applicable to different types of projects:

- New single-family and low-rise residential construction minimum energy standards;
- Single and multi-family building rehab minimum energy standards; and
- New multi-family building construction minimum energy standards.

These guidelines specify requirements for insulation, windows, air sealing, mechanical systems, ventilation, appliances, and lighting.

### 1.1.1 Expected kWh and Therm Savings

Expected kWh and therm savings by program are shown in Table 1-1. There were 24 incentive projects implemented through the program during the period June 2011 through May 2012, which were expected to provide annual savings of 3,214,713 kWh and 16,749 therms.

*Table 1-1 Expected kWh and Therm Savings for Affordable Housing Construction Program*

<i>Number of Projects</i>	<i>Expected Gross kWh Savings</i>	<i>Expected Gross Therm Savings</i>
24	3,214,713	16,749

## 1.2 Overview of Evaluation Approach

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The overall objective of the impact evaluation of the Affordable Housing Construction 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 impact evaluation approach had the following main features:

- Available project documentation (e.g., invoices, savings calculation work papers, etc.) was reviewed, with particular attention given to the calculation methods and documentation of 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 regarding participant decision making and participant likes and dislikes of the program; and
- Interviews with program staff members to discuss program operations, successes, challenges, and future plans.

### 1.3 Organization of Report

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The evaluation report for the Affordable Housing Construction Program is organized as follows:

- Chapter 2 presents and discusses the analytical methods and results of estimating program energy 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 participant decision makers.
- Appendix B presents the results of a survey of participant decision makers.

## 2. Impact Evaluation

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This chapter presents the results of the impact evaluation of the Affordable Housing Construction Program offered by the Illinois Department of Commerce and Economic Opportunity (DCEO). The overall objective of the impact evaluation was to determine the electric 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 savings. Section 2.2 presents the results of the effort to estimate program savings.

### 2.1 Methodology for Calculating Program Savings

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The methodology used for calculating program savings is described in this section. The overall objective of the impact evaluation of the Affordable Housing Construction Program was to determine the net electric energy and natural gas energy savings, as well as peak demand (kW) reductions resulting from projects completed during the program year.

ADM performed (1) a tracking system review and (2) an engineering review to determine the appropriateness of the assumptions used to determine the ex ante savings estimates.

#### 2.1.1 Engineering Review

The review of the ex ante savings estimates included reviewing the analyses and calculations that were used to develop stipulated savings values for program measures. ADM assessed the degree to which the savings calculations for each measure were reasonable and defensible, and whether documentation was adequate. A checklist was used to record (1) whether the methodology used for the calculation was appropriate, (2) whether assumptions used were reasonable and appropriate, and (3) whether savings calculations were performed correctly.

The accuracy of a savings estimate developed through engineering calculations depends on the extent to which the analysis uses correct assumptions for factors such as usage patterns and operating hours. The as-used baseline conditions were assessed by reviewing program baseline assumptions and testing the validity of those assumptions.

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

- Documentation is sufficient, and original savings estimate is reasonable.
- Documentation is sufficient, but original savings estimate is not reasonable.
- Both documentation and original savings estimate are inadequate.

ADM used several sources to verify the reasonableness of the DCEO stipulated savings values, including:

- Ameren Missouri Technical Resource Manual;

- Arkansas Public Service Commission’s Technical Reference Manual;
- California Database for Energy Efficiency Resources (DEER) reports;
- ENERGY STAR® Calculators;
- Illinois’s Statewide Technical Reference Manual;
- Ohio Public Utilities Commission’s Technical Reference Manual;
- Rhode Island Technical Reference Manual;
- Pennsylvania Public Utility Commission’s Technical Reference Manual; and
- ADM’s previous low income Affordable Housing Construction evaluations.

## 2.2 Results of Impact Evaluation

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This section presents the results of the impact evaluation of the Affordable Housing Construction Program.

### 2.2.1 Review of Tracking System

Several data and project documentation issues were encountered over the course of the evaluation effort. The EEPS database, like any business information system, must meet the diverse needs of its users. The EEPS portfolio is comprised of eleven programs, approximately seven of which rely on the database to track project statuses, estimate savings, and aggregate the measures installed. An effective information system must have appropriate functionality, and be supported by adequate staff resources and organizational protocols that guide how the system is used.

If there is a protocol for how the system is used and necessary functionality is built into the system, then there is lower risk of errors in expected savings and fewer gaps in the data.

ADM makes the following recommendations:

- **Establish a standardized list of measures and corresponding measure descriptions.** Though such a list has been established for standard program measures, it would be helpful to also develop measure lists for all of the low income programs.
- **Accurately record the number of units (lamps, fixtures, etc.) contained within each line item, so that per unit comparisons are accurate.** Currently the descriptions are somewhat unclear regarding the number of units installed and the composition of each unit. For lighting measures, the number and wattage of individual bulbs should be recorded. For insulation, R values should be recorded. For HVAC measures, unit size and efficiency ratings should be recorded. These data should be developed in conjunction with the establishment of a standardized list of measures to ensure that the appropriate data for each measure are being collected.

A project will likely have various measures installed, but the program level listing should itemize each measure individually. It may be challenging to develop a comprehensive and specific measure list that is able to capture all measures within the low income programs. As the program involves a changing list of relevant measures, this list will have to be modified as new

projects are accepted. Each measure description should be precise enough to account for all differences in expected useful life (EUL), but general enough so that they can be aggregated at a higher level. There are certain instances in which custom measures may not be easily categorized. Such measures may need to be assigned to an "Other" category and subcategory, although there should be few measures of this type. Ideally the tracking data would contain:

- **Measure Category:** Lighting, HVAC, building insulation, etc.
- **Measure Subcategory:** Linear Fluorescent, Lighting Occupancy Sensor, HVAC Packaged Unit, etc.
- **Measure:** 14W CFL, R-19 fiberglass insulation, 2 Ton SEER 14 central air conditioner, etc.
- **Notes:** For custom measures this field would provide the description for those measures that do not correspond to any established category in the fields described above. These measures would be given a value of "Other" for the preceding fields.

ADM also recommends that the tracking data present measure quantity and measure unit categories for each line item.

- **Measure Quantity:** Number of fixtures, lamps, linear feet, etc.
- **Measure Unit:** The unit of measure quantity.

Addressing these questions and adopting the recommended solutions should reduce the work hours required for savings evaluation, and also facilitate the availability of more accurate, up-to-date data regarding program activity on an ongoing basis.

### 2.2.2 Measure-Level Savings – Engineering Review

This section presents the results of the verification of savings by measure. Verified savings are presented by measure for electric savings in Table 2-1 and for natural gas savings in Table 2-2.

Table 2-1 Summary of kWh Savings by Measure

<i>Measure</i>	<i>Units</i>	<i>Expected kWh Savings</i>	<i>Realized Gross kWh Savings</i>	<i>Gross Realization Rate</i>	<i>Realized Net kWh Savings*</i>
Fluorescent Lighting	11,852	1,031,124	985,903	96%	985,903
Common Area Fluorescent Lighting	3,323	441,959	1,685,985	381%	1,685,985
Bath Fan	984	87,576	87,163	100%	87,163
Bath Exhaust Fan – Continuous Exhaust from Roof Top Fans; no HRV	248	21,968	21,968	100%	21,968
Refrigerator	1,502	141,394	158,761	112%	158,761
Ceiling Fan	640	34,560	73,600	213%	73,600
Individual Electric Water Heater	156	45,396	26,211	58%	26,211
Dishwasher (Electric Hot Water)	133	30,191	7,980	26%	7,980
Clothes Washer (Electric Hot Water)	133	30,191	23,504	78%	23,504
Efficient AC	441	41,454	56,442	136%	56,442
Efficient Heat Pump	84	38,304	1,399	4%	1,399
Efficient Packaged Terminal Heat Pump	157	26,407	-14,971	-57%	-14,971
Efficient Wall AC	617	32,687	69,117	211%	69,117
Furnace w/ Advanced Blower	405	162,000	69,040	43%	69,040
Thermal Envelope Improvements w/ Wall AC	567	98,183	79,895	81%	79,895
Thermal Envelope Improvements w/AC	657	143,077	140,102	98%	140,102
Thermal Envelope Improvements w/Heat Pump	384	746,732	75,950	10%	75,950
Thermal Envelope Improvements w/Geothermal Heat Pump	2	6,798	1,399	21%	1,399
Water Source Heat Pumps	156	54,714	19,759	36%	19,759
<b>Total</b>		<b>3,214,713</b>	<b>3,569,206</b>	<b>111%</b>	<b>3,569,206</b>

\* A net-to-gross ratio of 100% is applied because the Affordable Housing Construction 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 Therm Savings by Measure

Measure	Units	Expected Therm Savings	Realized Gross Therm Savings	Gross Realization Rate	Realized Net Therm Savings*
Individual Gas Water Heater	23	989	1,077	109%	1,077
Central Water Heater	3	99	231	233%	231
Dishwasher (Gas Hot Water)	98	882	142	16%	142
Clothes Washer (Gas Hot Water)	55	495	239	48%	239
Boiler	2	80	397	496%	397
Furnace w/ Advanced Blower	144	5,904	19,498	330%	19,498
Thermal Envelope Improvements w/AC	144	8,300	9,416	113%	9,416
Total		16,749	30,998	185%	1,688

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

#### 2.2.2.1. Fluorescent Lighting and Common Area Fluorescent Lighting

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

$$\Delta kWh = ((WattsBase - WattsEE) / 1000) * ISR * Hours * WHFe$$

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%.
- If unknown, the baseline fixture wattage is 60W.
- If unknown, the efficient fixture wattage is 15W.
- The annual hours of use for residences are 938 and 5,950 for common areas.
- The waste heat factor is 1.04.

#### 2.2.2.2. Bathroom Exhaust Fan

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

$$\Delta kWh = (CFM * (1/\eta_{Baseline} - 1/\eta_{Efficient})/1000) * Hours$$

Where,

<i>CFM</i>	=	Nominal capacity of exhaust fan.
$\eta_{Baseline}$	=	The efficiency of the baseline unit.
$\eta_{Efficient}$	=	The efficiency of the efficient unit.
<i>Hours</i>	=	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.

Using these values, ex post calculations resulted in 88.58 kWh savings per fan.

A few sites installed continuous rooftop exhaust fans which may vent multiple units using a single fan. Based on an engineering review, ADM applied a value of 88.58 kWh per unit to develop ex post savings for this measure type.

#### 2.2.2.3. Refrigerator

ADM applied the following savings algorithm for ENERGY STAR® refrigerators from the Illinois Statewide Technical Reference Manual (TRM) to determine ex post savings:

$$\Delta kWh = UEC_{base} - UEC_{ee}$$

Where,

<i>UECbase</i>	=	Annual unit energy consumption of baseline unit.
<i>UECee</i>	=	Annual unit energy consumption of ENERGY STAR unit.

For a refrigerator with a top-mounted freezer and automatic defrost and no in-door ice service, the Illinois TRM recommends the following assumptions:

- The UECbase is 528.5 kWh; and
- The UECee is 422.8 kWh.

Using these values, the ex post calculations result in 105.70 kWh savings per refrigerator.

#### 2.2.2.4. Ceiling Fan

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.



### 2.2.2.5. Water Heater

The Illinois TRM offers no comparable measure savings methodology for Electric Water Heaters. The following algorithm from the Pennsylvania TRM was applied to calculate ex post electric savings:

$$\Delta kWh = ((1/EF_{base} - 1/EF_{proposed}) * (HW * 365 * 8.3lb/gal * (T_{hot} - T_{cold})) / 3413 \text{ BTU/kWh})$$

Where,

<i>EF<sub>base</sub></i>	=	Energy factor of baseline water heater.
<i>EF<sub>proposed</sub></i>	=	Energy factor of proposed efficient water heater.
<i>HW</i>	=	How water used per day in gallons.
<i>T<sub>hot</sub></i>	=	Temperature of hot water.
<i>T<sub>cold</sub></i>	=	Temperature of cold water supply.

The PA TRM recommends the following assumptions:

- The hot water used per day in gallons is 64.3 gallons/day.
- The temperature of the hot water is 120°F.
- The temperature of the cold water supply is 55°F.

Using these values, the ex post calculations result in 168 kWh savings per electric water heater.

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

$$\Delta Therms = (1/EF_{base} - 1/EF_{efficient}) * (GPD * 365.25 * \gamma_{Water} * (T_{out} - T_{in}) * 1.0) / 100,000$$

Where,

<i>EF<sub>base</sub></i>	=	Efficiency of the baseline equipment.
<i>EF<sub>efficient</sub></i>	=	Efficiency of the new equipment.
<i>GPD</i>	=	Gallons of water used per day.
<i><math>\gamma_{Water}</math></i>	=	Specific weight of water.
<i>T<sub>out</sub></i>	=	Tank temperature.
<i>T<sub>in</sub></i>	=	Temperature of the incoming supply water.

The Illinois Statewide TRM recommends using the following assumptions:

- The efficiency of baseline equipment if unknown is 0.59.
- The efficiency for energy efficient unit was based on the efficiency for condensing gas storage units and is 0.80.

- 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.

Therm savings for central water heaters used the same algorithm but assumed an efficiency of .556 for the baseline unit. The efficiency rating of the new unit was based on its specifications.

#### 2.2.2.6. Dishwasher

For the new construction ENERGY STAR® dishwasher measure, the annual kWh savings are based on the following Illinois Statewide TRM algorithm:

$$\Delta kWh = (kWh_{base} - kWh_{estar}) * [\%kWh_{op} + (\%kWh_{heat} * \%Electric_{DWH})]$$

Where,

$kWh_{base}$  = Baseline kWh consumption per year.

$kWh_{estar}$  = ENERGY STAR® kWh annual consumption.

$\%kWh_{op}$  = Percentage of dishwasher energy consumption used for unit operation.

$\%kWh_{heat}$  = Percentage of dishwasher energy consumptions used for water heating.

$\%Electric_{DWH}$  = Percentage of DWH Savings assumed to be electric.

The Illinois Statewide TRM recommends using the following assumptions:

- Baseline annual kWh consumption for a standard sized dishwasher is 355 kWh.
- ENERGY STAR® annual kWh consumption for a standard sized dishwasher is 295 kWh.
- 44% of the dishwasher energy consumption is used for unit operation.
- 56% of the dishwasher energy consumption is used for water heating.
- 100% of the DWH savings will be assumed electric savings for an electric ENERGY STAR® dishwasher.

Using the aforementioned algorithm and assumptions, the average annual savings for the new construction of an ENERGY STAR® dishwasher is 60kWh per unit.

$$\Delta kWh = (355kWh - 295kWh) * [0.44 + (0.56 * 1.00)] = 60.0 kWh$$

For the new construction ENERGY STAR® dishwasher measure, the annual therm savings are based on the following Illinois Statewide TRM algorithm:

$$\Delta Therms = (kWh_{base} - kWh_{estar}) * \%kWh_{heat} * \%Natural\_Gas\_DHW * Reff * Conversion\_Factor$$

Where,

$kWh_{base}$	=	Baseline kWh consumption per year
$kWh_{estar}$	=	ENERGY STAR® kWh annual consumption
$\%kWh_{heat}$	=	Percentage of dishwasher energy consumptions used for water heating
$\%Natural\_Gas\_DHW$	=	Percentage of DHW Savings assumed to be natural gas
$Reff$	=	recovery efficiency factor
$Conversion\_Factor$	=	factor to convert from kWh to therms

The Illinois Statewide TRM recommends using the following assumptions:

- Baseline annual kWh consumption for a standard sized dishwasher is 355 kWh.
- ENERGY STAR® annual kWh consumption for a standard sized dishwasher is 295 kWh.
- 56% of the dishwasher energy consumption is used for water heating.
- 100% of the DWH savings will be assumed natural gas savings for an ENERGY STAR® dishwasher.
- The recovery efficiency factor is 1.26.
- A conversion factor of 0.03413 therms per kWh.

Using the aforementioned algorithm and assumptions, the average annual savings for a new construction ENERGY STAR® dishwasher is 1.44 therms per unit.

$$\Delta Therms = (355kWh - 295kWh) * 0.56 * 1.0 * 1.26 * 0.03413 Therms/kWh = 1.44 Therms$$

#### 2.2.2.7. Clothes Washer

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:

$$\Delta kWh = MEF_{savings} = Capacity * (1/MEF_{base} - 1/MEF_{eff}) * N_{cycles}$$

Where,

$Capacity$	=	The clothes washer capacity.
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*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 is 295.
- The capacity of the washer is 3.5 cubic feet.

Using these input values, savings from electric washers were determined to be 176.72 kWh.

Natural gas savings were developed using a deemed savings value from the Illinois Statewide TRM, savings for this measure are calculated using both dryer and clothes washer. It was assumed that a CEE2 ENERGY STAR® clothes washer was installed. Per unit calculated therm savings are 4.34.

#### 2.2.2.8. Boiler

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

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

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 1,158 therms.

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

#### 2.2.2.9. Room Air Conditioner

For the new construction room air conditioners, the annual kWh savings are based on the following Illinois Statewide TRM algorithm:

$$\Delta kWh = FLH_{cool} * BtuH * (1/EER_{base} - 1/EER_{ee}) / 1000$$

Where,

*FLH<sub>cool</sub>* = Full Load Hours for cooling.

*BtuH* = The size of the efficient equipment.

*EER<sub>base</sub>* = The Energy Efficiency Ratio of the baseline equipment.

*EER<sub>ee</sub>* = The Energy Efficiency Ratio of the efficient equipment.

The Illinois TRM provides the following assumptions:

- The size of the efficient equipment is based on equipment specifications or 8,500 BTU/hour if unknown.
- The efficiency of the baseline equipment is dependent on its size and whether or not the equipment has louvered sides.
- The efficiency of the efficient equipment is based on equipment specifications or dependent on the size of the equipment if unknown.

#### 2.2.2.10. Central Air Conditioning

For the new construction central air conditioning measure, the annual kWh savings are based on the following Illinois Statewide TRM algorithm:

$$\Delta kWh = (FLH_{cool} * BtuH * (1/SEER_{base} - 1/SEER_{ee})) / 1000$$

Where,

*FLH<sub>cool</sub>* = Full Load Hours for cooling.

*BtuH* = The size of the new unit.

*SEER<sub>base</sub>* = Seasonal Energy Efficiency Ratio of the baseline equipment.

*SEER<sub>ee</sub>* = Seasonal Energy Efficiency Ratio of the efficient equipment.

The Illinois Statewide TRM recommends using the following assumptions:

- The full load hours for cooling are dependent on climate zone and building type.
- The SEER for the baseline equipment is 13.
- The SEER for the efficient equipment is based on new equipment specifications or 14.5 if unknown.

## 2.2.2.11. Heat Pump and Packaged Terminal Heat Pump

For the new construction heat pump and packaged terminal heat pump measures, the annual kWh savings are based on the following Illinois Statewide TRM algorithm:

$$\Delta kWh = \text{Annual kWh Savings}_{cool} + \text{Annual kWh Savings}_{heat}$$

Where,

$$\text{Annual kWh Savings}_{cool} = \text{Annual savings from cooling.}$$

$$\text{Annual kWh Savings}_{cool} = (FLH_{cool} * BtuH * (1/SEER_{base} - 1/SEER_{ee}))/1000$$

Where,

$$FLH_{cool} = \text{Full Load Hours for cooling.}$$

$$SEER_{base} = \text{Seasonal Energy Efficiency Ratio of the baseline equipment.}$$

$$SEER_{ee} = \text{Seasonal Energy Efficiency Ratio of the efficient equipment.}$$

$$BtuH = \text{The capacity of the equipment.}$$

And,

$$\text{Annual kWh Savings}_{heat} = \text{Annual savings from heating.}$$

$$\text{Annual kWh Savings}_{heat} = (kBtu/h_{cool}) * [(1/HSPF_{base}) - (1/HSPF_{ee})] * EFLH_{heat}$$

Where,

$$kBtu/h_{cool} = \text{Capacity of the cooling equipment in kBtu per hour (1 ton of cooling capacity equals 12 kBtu/h).}$$

$$HSPF_{base} = \text{Heating Seasonal Performance Factor of the baseline equipment.}$$

$$HSPF_{ee} = \text{Heating Seasonal Performance Factor of the efficient equipment.}$$

$$EFLH_{heat} = \text{Equivalent Full Load Hours for heating.}$$

Or,

$$\text{Annual kWh Savings}_{heat} = (FLH_{cool} * Btu/H * (1/SEER_{base} - (1/(EER_{ee} * 1.02)))/1000 + (FLH_{heat} * Btu/H * (1/HSPF_{base} - (1/COPE_{ee} * 3.412)))/1000$$

Where,

$$FLH_{cool} = \text{Full Load Hours for cooling.}$$

$$EER_{ee} = \text{Energy Efficiency Ratio of the energy efficient equipment.}$$

*FLH\_heat* = Full Load Hours for heating.

*HSPF\_base* = Heating Seasonal Performance Factor of the baseline equipment.

*COP\_ee* = Coefficient of performance of the energy efficient equipment.

The Illinois Statewide TRM recommends using the following assumptions:

- The full load cooling and heating hours are dependent on climate zone.
- The SEER of the baseline equipment is 13.
- The SEER of the efficient equipment is based on equipment specifications or 14.5 if unknown.
- The typical Heating Seasonal Performance Factor of the efficient equipment is based on equipment specifications or if unknown is 9.
- The Heating System Performance Factor of the baseline heat pump is 7.7.
- The Energy Efficiency Ratio of the baseline equipment is 11.2.
- The equivalent full load hours for heating are dependent on climate zone.
- The capacity of the equipment is based on equipment specifications or if unknown is 36,000 kBtuH.

#### 2.2.2.12. Water Source Heat Pump

For the new construction water source heat pump measure, the annual kWh savings are based on the following Illinois Statewide TRM algorithm:

$$\Delta kWh = Annual kWh Savings_{cool}$$

Where,

$$Annual kWh Savings_{cool} = (FLH_{cool} * Btu/H * (1/SEER_{base} - (1/(EER_{ee} * 1.02)))/1000$$

Where,

*FLH\_cool* = Full load cooling hours

*BtuH* = Size of the efficient equipment.

*SEER\_base* = Seasonal Energy Efficiency Ratio of the baseline equipment

*EER\_ee* = Energy Efficiency Ratio of the energy efficient equipment.

The Illinois Statewide TRM recommends using the following assumptions:

- Full load cooling hours are dependent on climate zone and building type.
- The SEER for the baseline equipment is 13.
- The EER for the baseline equipment is 11.2.
- The EER for the efficient equipment is based on new equipment specifications or 12 if unknown.

#### 2.2.2.13. Furnace with Advanced Blower

The furnace with advanced blower measure produces both electric and natural gas savings. Because the Illinois Statewide TRM does not cover the electric savings from the blower motor, the following algorithm from the Pennsylvania TRM was used:

$$\Delta kWh = Mkw * EFLH * EI * ISR$$

Where,

*Mkw* = Average motor full load electric demand.

*EFLH* = Estimated Full Load Hours for heating and cooling.

*EI* = Efficiency improvement.

*ISR* = In-service rate.

The Pennsylvania Statewide TRM algorithm recommends using the following assumptions:

- The average motor full load electric demand is .5 kW.
- Estimated full load heating and cooling hours were taken from the Illinois Statewide TRM and are dependent on climate zone.
- The efficiency improvement is .15.
- The in-service rate is 1.

For the new construction furnace with advanced blower measure, the annual therm savings are based on the following Illinois Statewide TRM algorithm:

$$\Delta Therms = GFHL * (1/AFUE(base) - 1/AFUE(eff))$$

Where,

*GFHL* = Estimate of annual household heating load.

*AFUE(base)* = Annual Fuel Utilization Efficiency rating of the baseline equipment.

*AFUE(eff)* = Annual Fuel Utilization Efficiency rating of the efficient equipment.

The Illinois Statewide TRM algorithm recommends using the following assumptions:



- Annual household heating load is dependent on location.
- AFUE of the baseline equipment is 80%.
- AFUE of the efficient equipment is based on equipment specifications or 95% if unknown.

#### 2.2.2.14. Building Envelope Improvements

For the new construction building envelope improvements measure, energy savings were developed using the following algorithms:

$$\Delta kWh = (\Delta kWh_{cooling} + \Delta kWh_{heating}) * ADJ$$

Where,

$\Delta kWh_{cooling}$  = If central cooling, the reduction in annual cooling requirement due to insulation

$$\Delta kWh_{cooling} = \frac{[(1/R_{old} - 1/R_{wall}) * A_{wall} * (1 - Framing\_factor) + (1/R_{old} - 1/R_{attic}) * A_{attic} * (1 - Framing\_factor/2)] * 24 * CDD * DUA}{1000 * \eta_{Cool}}$$

Where,

$R_{old}$  = Baseline R-value.

$R_{wall}$  = R-value of implemented wall assembly and insulation.

$A_{wall}$  = Total area of insulated wall (ft<sup>2</sup>)

$Framing\_factor$  = An adjustment to account for area of framing.

$R_{attic}$  = R-value of implemented attic assembly and insulation.

$A_{attic}$  = Total area of insulated ceiling/attic (ft<sup>2</sup>)

$CDD$  = Cooling degree days.

$DUA$  = A discretionary use adjustment to reflect the fact that people do not always operate their air conditioner when conditions may call for it.

$\eta_{Cool}$  = Seasonal Energy Efficiency Ratio of the cooling system.

$\Delta kWh_{heating}$  = If electric heat (resistance or heat pump), reduction in annual electric heating.

$$\Delta kWh_{heating} = \frac{[(1/R_{old} - 1/R_{wall}) * A_{wall} * (1-Framing\_factor) + (1/R_{old} - 1/R_{attic}) * A_{attic} * (1-Framing\_factor/2)] * 24 * HDD}{\eta_{Heat} * 3412}$$

Where,

$R_{old}$	=	Baseline R-value.
$R_{wall}$	=	R-value of implemented wall assembly and insulation.
$A_{wall}$	=	Total area of insulated wall (ft <sup>2</sup> )
$Framing\_factor$	=	An adjustment to account for area of framing.
$R_{attic}$	=	R-value of implemented attic assembly and insulation.
$A_{attic}$	=	Total area of insulated ceiling/attic (ft <sup>2</sup> )
$HDD$	=	Heating degree days.
$\eta_{Heat}$	=	Efficiency of the heating system.

For units with a natural gas furnace, the following algorithm was used to develop annual therm savings:

$$\Delta Therms = \frac{(((1/R_{old} - 1/R_{wall}) * A_{wall} * (1-Framing\_factor) + (1/R_{old} - 1/R_{attic}) * A_{attic} * (1-Framing\_factor/2)) * 24 * HDD)}{\eta_{Heat} * 100,067 \text{ Btu/therm}} * ADJ$$

Where,

$R_{old}$	=	Baseline R-value.
$R_{wall}$	=	R-value of implemented wall assembly and insulation.
$A_{wall}$	=	Total area of insulated wall (ft <sup>2</sup> )
$Framing\_factor$	=	An adjustment to account for area of framing.
$R_{attic}$	=	R-value of implemented attic assembly and insulation.
$A_{attic}$	=	Total area of insulated ceiling/attic (ft <sup>2</sup> )
$HDD$	=	Heating degree days.
$\eta_{Heat}$	=	Efficiency of the heating system.

The Illinois Statewide TRM algorithm recommends using the following assumptions:

- Cooling and heating degree days are dependent on climate zone.
- The discretionary use adjustment is .75.
- The Seasonal Energy Efficiency Ratio of the cooling systems is based on equipment specifications or is 13 if unknown.
- The efficiency of the heating system is based on equipment specifications or is 1.92 for heat pumps and 1 for resistance heat.
- The efficiency of the natural gas furnace is based on equipment specifications or is 70%.
- The framing factor is 15%.

### 2.2.3 Program-Level Savings Results

This subsection presents the gross and net savings for the Affordable Housing Construction Program during the period of June 2011 through May 2012.

The realized gross and net electric savings of the Affordable Housing Construction Program during the period June 2011 through May 2012 are summarized by utility in Table 2-3. During this period, realized gross electrical savings totaled 3,569,206 kWh. The gross realization rate for the program is 111%. A net-to-gross factor of 100% was used because the Affordable Housing Construction Program targets low income residents. The realized net savings for the period are 3,569,206 kWh. Therm savings are shown by program component in Table 2-4. Gross realized natural gas savings are 30,998 therms and the gross realization rate is 185%. Net therm savings are 30,998.

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

<i>Utility</i>	<i>Units</i>	<i>Expected kWh Savings</i>	<i>Realized Gross kWh Savings</i>	<i>Gross Realization Rate</i>	<i>Realized Net kWh Savings*</i>
Ameren	100	206,320	267,249	130%	267,249
ComEd	1,474	3,008,394	3,301,957	110%	3,301,957
Total	1,574	3,214,713	3,569,206	111%	3,569,206

*\*A net-to-gross ratio of 100% is applied because the Affordable Housing Construction 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 Utility*

<i>Utility</i>	<i>Units</i>	<i>Expected Therm Savings</i>	<i>Realized Gross Therm Savings</i>	<i>Gross Realization Rate</i>	<i>Realized Net Therm Savings*</i>
Ameren	-	-	-	-	-
Nicor Gas	85	6,787	11,934	176%	11,934
Peoples Gas	-	-	-	-	-
North Shore Gas	101	9,962	19,064	191%	19,064
Total	186	16,749	30,998	185%	30,998

*\*A net-to-gross ratio of 100% is applied because the Affordable Housing Construction 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 Affordable Housing Construction Program during the period June 2011 through May 2012 are summarized in Table 2-5. The achieved net peak demand savings for the program total 2,391.68 kW.

*Table 2-5 Summary of Peak kW Savings by Utility*

<i>Utility</i>	<i>Units</i>	<i>Realized Gross kW Savings</i>	<i>Realized Net kW Savings*</i>
Ameren	100	841.15	841.15
ComEd	1,474	1,550.54	1,550.54
Total	1,574	2,391.68	2,391.68

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

## 3. Process Evaluation

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This chapter presents the results of the process evaluation of the DCEO Energy Efficient Affordable Housing Construction Program (Affordable Housing Construction 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 the program is being delivered. This evaluation is based upon analysis of program structure and interviews and surveys of participating organizations and residents who received energy efficiency improvements.

The chapter begins with an overview of the process evaluation methodology, related objectives, and a summary of key findings. The overview is followed by a detailed review of the participant survey results and an in-depth look at program mechanics and staff perspectives. The process analysis is meant to provide a qualitative understanding of how the program is progressing, what is working well and what needs to be improved upon. Process findings often provide further insight into participant decision making behavior, realization rates, and can identify issues that are critical to the future success of the program. 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

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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 Affordable Housing Construction Program during the current program year.

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

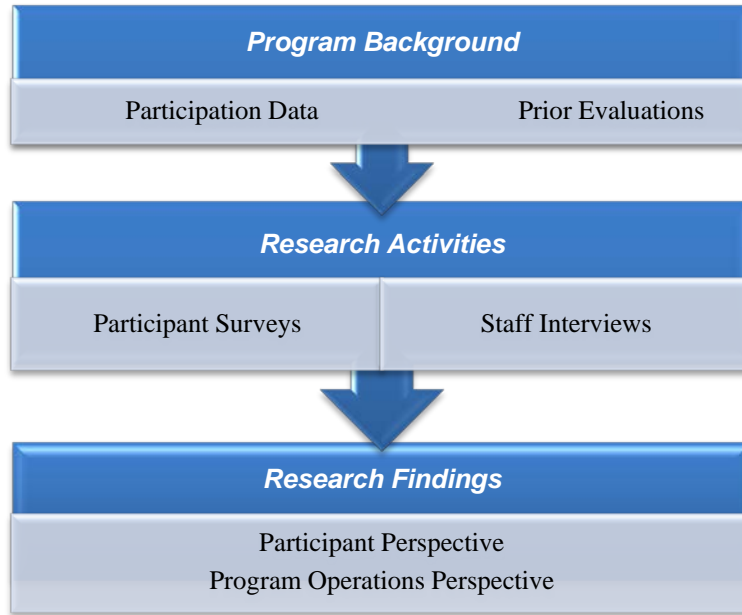


Figure 3-1 Process Evaluation Overview

Key research questions to be addressed by this evaluation of Program Year 4:

*Was the Affordable Housing Construction Program delivery effective and successful?*

*Did the Affordable Housing Construction Program reduce barriers to increased energy efficiency project implementation?*

*What are grantees motivations for participating in the program and are they satisfied with the participation process?*

During the evaluation, data and information from numerous sources are analyzed to achieve the stated research objectives. Insight into the participant experience with the Affordable Housing Construction Program is developed from an online survey of program participants. The program operations perspective is developed through in-depth interviews with program staff.

### 3.2 Summary of Primary Data Collection

- **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 Affordable Housing Construction Program. 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. Interviews with program staff covered topics such as program administration, operations, data collection, and the participation process.

### 3.3 Summary of Conclusions and Recommendations

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Surveys were conducted with grant recipients to better understand the effectiveness of program delivery. Participants were generally satisfied with the program. A review of program documentation and in-depth interviews with program staff indicate that there are aspects of the program that could be improved to increase awareness, improve program administration and project tracking, and better align reporting requirements with the informational needs for assessing savings.

The following presents a selection of key conclusions from EPY4/GPY1:

- **Participants Satisfied with the Program Overall:** All grant recipients indicated that they were either somewhat or very satisfied with the program overall. Participants were most satisfied with the information provided by DCEO and the performance of the implemented efficiency measures. However, a minority of grant recipients stated that they were dissatisfied with an aspect of program participation. One-third of survey respondents expressed dissatisfaction with the effort required for the application process and the time required to receive the grant payment.
- **Program Staffing may be Insufficient:** The Affordable Housing Construction Program has faced challenges in maintaining sufficient staffing to administer the program. Despite these challenges, program participants were generally satisfied with the program. This suggests that even with limited resources, staff members are able to provide adequate assistance to participants. However, maintenance of documentation and program tracking data has suffered from limited administrative resources.

To address the staffing limitation, two additional part-time employees were recently added to assist with the program's administration. Given the administrative requirements of the program, additional staffing may be necessary.

- **Project Tracking and Documentation in Need of Improvement:** Program staff are currently tracking project-level information in various documents and entering it into the project tracking database. However, database limitations and discrepancies in reported program activity across data sources indicates that better systems and processes are needed for documenting program activity. However, only limited information on technical specification was available for some measures.
- **Limited Program Marketing:** The Affordable Housing Construction Program relies upon repeat participation by external organizations, and other DCEO programs play an important role in facilitating program participation. Although few staff resources are spent on

marketing and promotion, recent changes may help further promote the program. The program has expanded its partnership with the Illinois Housing Development Authority, a state financing agency, to provide an additional pipeline to the program for prospective participants.

- **Partnerships are Critical to Future Program Success:** As with other DCEO programs, partner organizations often provide much of the needed marketing and implementation support that drives program awareness and success. DCEO recognizes these synergies at the state level and is investing resources to better understand the scope and potential efficiencies that could result from community and agency partnerships.

While the program has maintained participant satisfaction and continued to deliver energy efficiency improvements to low income residents, there are aspects of the program that could be improved. The following recommendations are offered for consideration.

- **Track Additional Project Information:** The Affordable Housing Construction Program maintains limited tracking data. Ideally, the tracking data would provide the following: (1) the measures installed, including quantities and technical specifications such as the wattage of bulbs, R-value of insulation, and size and Seasonal Energy Efficiency Ratio (SEER) ratings of air conditioners; (2) the date of implementation; (3) the location of the implemented measures; (4) the estimated measure energy savings; (5) resident contact information; (6) contractor information if utilized; (7) the baseline equipment or building conditions; and (8) the utility account numbers associated with the implementation address.
- **Provide a Report Template for Program Participants to Report Measure Specifications:** A review of project documentation determined that information provided by program participants regarding the implemented measures was not consistently reported. In order to support reporting of this information, program staff should consider providing a reporting template for each measure type that collects the appropriate level of detail. The data captured by the reporting template should be included in DCEO's Energy Efficiency Portfolio Standard (EEPS) program administration database.
- **Continue to Invest in Strong Partnerships:** Program staff indicated that marketing resources are limited at this time. Program partners such the University of Illinois School of Architecture, the Smart Energy Design Assistance Center, the Illinois Housing Authority, the Bureau of Community Development, and the Bureau of Energy Assistance possess established marketing channels that can continue to drive program demand. As the program matures, DCEO will be able to attract more participants and increase program savings.



### 3.4 Energy Efficient Affordable Housing Construction Program Description

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The Affordable Housing Construction Program is designed to help improve the energy efficiency of low income housing in Illinois. Applicants requesting grant funds for electricity conservation measures must do so for sites serviced by Ameren Illinois or ComEd. Grant funds are available for natural conservation measures for sites serviced by Ameren Illinois, Nicor, Peoples, or North Shore.

#### 3.4.1 Participant and Measure Eligibility Requirements

The Affordable Housing Construction Program provides grants to non-profit and for-profit affordable housing developers to offset the cost of incorporating energy efficient building practices in residential construction. The goal of the program is to promote the benefits of lower utility bills on low income households as a result of living in energy efficient buildings. Eligible projects must be targeted at households that are at or below 80% of the Average Median Income (AMI) level.

To receive the grant funds, the new construction or rehab project must meet the program guidelines and accept the full set of measures specified. There are three sets of for different types of projects:

- New single-family and low-rise residential construction minimum energy standards;
- Single and multi-family building rehab minimum energy standards; and
- New multi-family building construction minimum energy standards.

These guidelines specify requirements for insulation, windows, air sealing, mechanical systems, ventilation, appliances, and lighting.

#### 3.4.2 Program Incentives

Grant amounts for projects are based per living unit, building, or square footage of living space. Rehab grant amounts are described below and reflect combined natural and electric incentives:

- Up to \$4,500 per living unit for single-family homes;
- Up to \$4.50/ft<sup>2</sup> of gross living space or \$4,500, whichever is less, for multi-family buildings with fewer than 80 units; and
- Up to \$4.25/ft<sup>2</sup> of gross living space or \$4,250, whichever is less, for multi-family buildings with 80 or more units.

Grant amounts for new construction projects are described below and reflect combined natural and electric incentives:

- Up to \$4,000 per living unit for new single-family homes;
- Up to \$6,500 per building for new duplex construction;
- Up to \$7,500 per building for new “3-flat” construction;
- Up to \$8,500 per building for new “4-flat” construction;

- Up to \$11,000 per building for new “6-flat” construction;
- Up to \$4.25/ft<sup>2</sup> of gross living space in new multi-family buildings with fewer than 80 units; and
- Up to \$4.00/ft<sup>2</sup> of gross living space in new multi-family buildings with 80 or more units.

### 3.4.3 Program Participation Process

Interested parties apply to the program by submitting an application. The program strongly recommends a pre-application meeting with the program manager to discuss the proposed project before construction documents have been completed. Applications are reviewed by program staff for completeness and adherence to program requirements. This review process is followed by negotiations with the applicant regarding the technical aspects of the project. Applicants are selected if they demonstrate their ability to integrate efficiency measures into the project at a reasonable cost. Prior to awarding of the grant, the applicant submits construction documents.

Approximately 50% of the grant funds are awarded at the initiation of construction at the building site. Interim payments may be negotiated, but the expectation is that the remaining grant payment will be issued upon substantial completion of efficiency measure implementation.

### 3.4.4 Reporting and Verification

Grantees submit quarterly progress reports to DCEO. Upon acceptance of the grant, the recipient agrees to assist with an analysis of energy consumption for up to three years following the occupancy of the buildings. Verification is based on materials submitted by the applicants such as project invoices and reports of project activity.

## 3.5 Energy Efficient Affordable Housing Construction

Table 3-1 presents a summary of the total number of residential units constructed or rehabilitated by project type. In total, 1,574 units were constructed or rehabilitated through the program. The majority of units were new multi-family construction, followed by multi-family building rehab.

*Table 3-1 Number of Residential Units Receiving Efficiency Improvements*

<i>Type of Project</i>	<i>Number of Residential Units</i>
New Multi-Family Building Construction	788
Multi-Family Building Rehab	592
New Single Family Construction	172
Single Family Rehab	22
Total	1,574

During EPY4/GPY1, the Affordable Housing Construction Program produced an expected kWh savings of 3,885,458 and the expected therm savings of 670,239.

*Table 3-2 Expected kWh and Therm Savings*

<i>Expected kWh Savings</i>	<i>Expected Therm Savings</i>
3,214,713	16,749

### 3.6 Participant Outcomes

An online survey was conducted to collect data about participant decision making, preferences, and opinions of the Affordable Housing Construction Program. The program offered a variety of measures for public housing authorities, including lighting, HVAC, and energy efficient appliances. In total, six decision makers from organizations 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 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 Affordable Housing Construction Program.

#### 3.6.1 How Grantees Learn About the Program

Grant recipient responses provided information regarding how they learned about the program. The results suggest that there are three primary paths to program awareness. The most frequently mentioned means by which participants heard of the program, mentioned by two-thirds of respondents, was from friends or colleagues. Other common ways that participants heard about the program were from the DCEO website (50%), an architect, engineer, or energy consultant (50%), or through past experience with the program (33%). Additionally, each of the following sources was mentioned by one participant: A DCEO representative, brochures or advertisements, equipment vendors or building contractors, a workshop or seminar, and the Illinois Housing Development Authority.

All of the program participants heard about the Affordable Housing Construction Program either prior to planning their projects or during the project planning phase. Because participants heard about the program in the early stages of the project planning, the Affordable Housing Construction Program had significant opportunity to influence the incorporation of energy efficient equipment and design features into the projects.

#### 3.6.2 Factors Affecting Participation

The majority of survey respondents indicated that the residents living in the facilities where the projects were completed pay either the electric bill or both the natural gas and electric bill. One respondent noted that residents pay part of the electric bill. These results suggest that residents are likely to be important beneficiaries of the costs savings resulting from the implementation of energy efficiency measures in the construction projects.

Participants were asked about their reasons for completing the grant funded energy efficiency projects. The participant responses illustrate the multiple motivations involved in making the decision to make the energy efficiency improvements. The most frequently mentioned reason, cited by all of the respondents, was to help residents save money on their utility bills. Additionally, the comfort of residents and environmental concerns were additional motivational factors, each mentioned by 67% of respondents. Half of the respondents stated that saving money on operational costs of the building was an important factor suggesting that the developers also contribute to the utility costs for the buildings. A third of the respondents stated that qualifying for financial opportunities was another motivation for undertaking the efficiency improvements. Additionally, one respondent stated that they identify themselves as program participants on their website so that prospective tenants know that the building has been renovated to higher efficiency standards.

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. All respondents stated that they had plans to complete the energy efficiency improvements prior to participating in the program and 50% of these participants stated that they would have implemented their plans had they not participated in the program. Two-thirds of these participants had formulated their plans within the last 12 months and all but one indicated that the plans specified the energy efficiency measures to be included in the project.

To further understand how the Affordable Housing Construction 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). One participant indicated that the measure had been recommended by a representative of the program and a representative of SEDAC. Furthermore, this respondent indicated that they probably would not have implemented the measure without this recommendation. While the information provided through the program influenced this participant to implement the energy efficiency measures, most participants did not receive equipment recommendations.

Affordable Housing Construction Program participants were asked whether the information and incentives offered by the program influenced various factors related to the measure implementation. These factors included the timing of the installation, as well as the quantity of units installed, and the energy efficiency of the installed equipment. A cross-tabulation of respondents shows that all but one stated that the quantity of units installed increased because of the program, and that the majority of these participants stated that they increased the insulation levels as a result of the program. Additionally, participants reported that they installed more air conditioning equipment, appliances, and water heaters because of the program. All but one respondent also reported that they installed more efficient equipment than they otherwise would have. These responses suggest that although participants had prior plans to implement the energy efficiency measures, the program influenced them to make more efficiency improvements than they otherwise would have.

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

Respondents were given a list of factors, and asked how important each of the factors was in their decision to implement the energy efficiency improvements. The factors listed were (1) The incentive or grant payments from DCEO, (2) Past experience with energy efficient equipment, and (3) Advice and recommendations from DCEO. All of the participants considered incentive or grant payments to be very important to their decision making about energy efficient equipment or design features. The majority of respondents reported that past experience with energy efficient equipment was very important to their decision making. Although a smaller share of participants considered advice and recommendations from DCEO to be very important to their decision making, all respondents considered this advice to be very important or somewhat important to their decision making.

Participants were asked what barriers their organizations faced to implementing energy efficient equipment. All of the participants indicated that the high initial cost of equipment or design features was a barrier to making energy efficiency improvements. One of these participants elaborated that they have to raise the funds for these projects and could not continue to incorporate energy efficiency measures if they could not obtain grants to offset these costs. This finding emphasizes the importance of financial incentives for encouraging developers to implement energy efficiency improvements in low income housing. 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 already relatively well informed.

The decision makers were asked what kinds of energy efficiency policies and procedures their organizations have in place. The most frequently mentioned policy or procedure was the incorporation of energy efficiency in operations and procurement, mentioned by 83% of respondents. Two-thirds of respondents said that they have a staff member responsible for energy and energy efficiency and one-third actively train staff about energy efficiency. One participant stated that they try to incorporate all known cost effective means of saving energy into their plans.

These responses suggest that most respondents have incorporated organizational policies and procedures to manage energy consumption.

Respondents were asked about their prior experience with purchasing and installing energy efficient equipment. Fifty percent of respondents stated that they had previously completed energy efficiency projects for which they did not apply for an incentive. When asked why they did not apply for an incentive or grant, one of these participants stated that the financial incentive or grant was insufficient. Another said that project did not qualify for the program because it was a rehabilitation of a single family home. Yet another respondent stated that they did not apply for

an incentive because they did not know they were available, did not have time complete the paperwork, and that there was too much paperwork.

#### 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 to this item.

Program participants reported using a wide variety of sources for information about energy efficiency projects. The most frequently mentioned source, mentioned by 67% of survey respondents, was architects, engineers, or energy consultants, while 50% of respondents stated that they relied upon equipment vendors or building contractors. Other common sources, each mentioned by half of the respondents were trade journals or magazines and friends and colleagues.

While 50% of respondents stated that they rely on equipment vendor or building contractors for information on energy efficient equipment, materials, and design features, only one reported hearing of the program from vendors and contractors. This difference may indicate that there is a lack of awareness of the Affordable Housing Construction Program among this group and that promoting greater awareness of the program among vendors and contractors may help to increase program activity.

#### 3.6.5 Financial Methods Used by Decision Makers

Respondents provided information about which financial methods they use to review efficiency projects, and all of the respondents reported using at least one financial method when deciding whether or not to make energy efficiency improvements. Initial cost was the most frequently mentioned method, cited by all respondents. Half of the respondents reported using simple payback. The average length of payback time was 3.5 years, and one participant stated that they require a payback period of five years or less.

One survey respondent reported that they use life cycle cost to evaluate efficiency investments. Another respondent stated that they rely on their previous experience with the durability of the measures to evaluate them.

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 the fact that many residents pay the utility bills, so the respondents do not experience the full benefits of lower utility costs.

#### 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. Table 3-3 shows the results. Twenty percent of respondents were very satisfied with the program overall and another 80% were somewhat satisfied. Participants were most satisfied with the information provided by

DCEO and the performance of the equipment installed. Fifty percent of respondents were very satisfied with both of these program elements.

Participants noted dissatisfaction with some elements of the program pertaining to the application process and the grant. One-third of the survey respondents were somewhat dissatisfied with the effort required for the application and the time required to receive the grant payment. Additionally, one participant was dissatisfied with the grant amount. When asked to elaborate on their dissatisfaction, respondents reported that the paperwork was tedious and that the application process took a long time.

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

<i>Element of Program Experience</i>	<i>Very Satisfied</i>	<i>Somewhat Satisfied</i>	<i>Neither Satisfied nor Dissatisfied</i>	<i>Somewhat Dissatisfied</i>	<i>Very Dissatisfied</i>	<i>Don't Know / Not Applicable</i>	<i>n</i>
Performance of the equipment installed	50%	50%	0%	0%	0%	0%	6
Savings on your monthly bill	33%	17%	0%	0%	0%	50%	6
Grant amount	0%	67%	17%	17%	0%	0%	6
The effort required for the application process	17%	33%	17%	33%	0%	0%	6
Quality of the work conducted by your contractor	33%	67%	0%	0%	0%	0%	6
Information provided by DCEO	50%	33%	17%	0%	0%	0%	6
The elapsed time until you received the grant payment	17%	33%	17%	33%	0%	0%	6
Overall program experience	20%	80%	0%	0%	0%	0%	5

In addition to their satisfaction, respondents were also asked about whether or not the measure or measures they implemented met their expectations. Two-thirds of respondents indicated that the energy efficiency measure had met their expectations and one-third said that their expectations were exceeded.

### 3.6.7 Installation and Incentives

Only one of the survey respondents reported encountering problems with the application process. This respondent indicated that the timing of receiving the incentive extended the time to project completion by six to eight weeks and suggested that the program needed to work on getting funds to grantees more quickly.

Survey responses indicate that program participants did not have problems with the grant payments provided through the program. Two-thirds of survey respondents reported that the grant payment amount was what they expected. The two respondents who indicated that the grant amount did not meet their expectations elaborated that this was because the grant amount was not calculated as they expected.



One-third of respondents stated that there were issues receiving the grant payments. One of these respondents stated this was because it took longer to receive the funds than they would have liked, but that they expected that the process would be easier next time now that they are experienced with the program. The other respondent stated there was a lack of communication without elaborating further.

Respondents were asked additional questions about their experiences with project implementation. Fifty percent of the respondents felt that the implementation went smoothly and the other 50% thought it was a mostly smooth process. One of the participants provided additional information about why the project did not go smoothly. This participant stated that they could not find some equipment that met the guidelines but that program staff granted them an exception. One-third of respondents stated that the grant agreement did not meet their expectations. One of these respondents stated that the grant agreement was “pretty strict” for the amount of funding involved.

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

#### 3.6.8 Pre- and Post-Inspections

Participants were asked whether or not pre- and post-inspections were performed at their facilities. One of the respondents indicated that their facility was pre-inspected. The pre-inspection consisted of a blower test to assess heat loss prior to the renovation.

Two-thirds of respondents reported that a post-inspection was performed at their facility. These participants reported that the post-inspections consisted of blower door tests and equipment verifications.

#### 3.6.9 Additional Energy Efficiency Projects

The majority of participants reported that they had installed additional energy efficient equipment after participating in the program, without receiving an additional incentive. Two-thirds of survey respondents reported that they purchased additional equipment similar to what they installed through the program since participating. Respondents provided information relaying why they had not applied for an incentive for these items, including that the participant did not know if the project qualified for grant funds, the incentive or grant funds were insufficient, and that too much paperwork was involved. Additionally, 33% of respondents stated that they had purchased energy efficient equipment that was dissimilar to what they implemented through the program. One of these respondents stated that they had implemented LED lights on an earlier project that were not covered and that going forward they would not purchase a refrigerator or AC unit that was not ENERGY STAR<sup>TM</sup> qualified. The other respondent remarked that they now apply more energy efficient methods to all of their projects.



### 3.6.10 Participant 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. One suggestion was to provide additional information and expected timelines for receiving funds. This participant stated that the process seemed to take a long time but that since this was the first time they participated, they did not have a clear understanding how the program worked. Another suggestion was that the program offer different levels of compliance rather than requiring a commitment of meeting all program standards for the building type. This participant noted that they have a larger project in mind but are concerned about the additional costs involved in meeting all program requirements.

Most of these comments expressed gratitude for the program and the assistance provided by the staff. Some examples of these comments were:

*Funding did not cover the added costs, but in the end we now have a much better building. One of our tenants told us his budget billing went down, and he received a credit for last year. He was quite happy with what we did, even though it meant he needed to move to another unit for a month or so.*

*We are glad we are able to access additional sources to help fund energy efficiency.*

*The program is wonderful, particularly since our residents pay for their gas heat and water heating. We have had no complaints concerning utility bills and our residents like the energy efficient features since they help the "affordability" of the unit. The energy upgrades could not have been installed without the DCEO grant. This is a very necessary and beneficial grant program. Thank you!*

### 3.7 Program Operations Perspective

This section summarizes the core findings of interviews that were conducted with the Affordable Housing Construction staff.

Two in-depth interviews were conducted with key DCEO program staff to better understand how the program is being administered and delivered to participants. The interview process provided insights into program design, staffing, partnerships, and the participation process. Several key findings are described in greater detail below.

- **Program Goals:** Savings goals for the Low Income programs are set in the three year plan. Typically, 25% of the budget is allocated to the three low income programs, including the Affordable Housing Construction Program. While all grantees have to report on the number of jobs created, the program does not have specific goals for this outcome.
- **Program Staffing Resources may be Insufficient:** The Affordable Housing Construction Program has struggled with insufficient staff resources, but steps have been taken to remedy the issue. The staff administering the Affordable Housing Construction Program and the Energy Efficient Affordable Housing Construction Program consists of one program manager, an intern, and two ancillary consultants that provide technical

support and assist with calculating energy savings when needed. Recently, two part time staff members that are shared with the DCEO recycling program have been brought into assist with program administration. Despite the inclusion of these additional staff members, interview responses suggest that the department may not have sufficient staff to meet the current demands for tracking grant reporting and maintaining the program tracking database.

- **Multiple Year Planning Cycles:** New construction and gut rehab projects, unlike small scale energy efficiency improvements, take years to plan and complete. DCEO staff indicated that even after participants are approved and funds are allocated, some of the projects may not move into construction for 18 to 24 months. Participants are often waiting for other funding sources to commit or there may be a barrier in the permitting process. When this occurs, applications are kept active and roll into the proceeding program year. Therefore, it is not necessary for participants to reapply if projects have been approved and are not completed.
- **Participants are often involved with IHDA:** The Illinois Housing Development Agency (IHDA) is a financing agency that operates throughout the State of Illinois. IHDA is one of DCEO's primary program partners for the delivery and outreach of the low income programs. DCEO program staff indicated that anywhere between 50% - 60% of low income program participants also participate in the IHDA programs as well.
- **DCEO and IHDA Program Cycles are Misaligned:** DCEO's program cycle ends on May 31st, while IHDA's program cycle ends on March 31st. According to DCEO staff this two month period can create a lull in program activity or in project work. A participant may have to postpone a project until both departments can allocate funds. DCEO spends a significant amount of time and resources reviewing applications for projects that may not be accepted by IHDA and may not go through due to a lack of funding. In other cases where funding is approved, it may take several months or longer for DCEO to receive the funds. Program staff indicated that applications tend to sit idle for some time when IHDA is involved.
- **DCEO and IHDA are Strategizing on Creating Efficiencies:** Currently DCEO and IHDA are developing a memorandum of understanding that allows for the two entities to integrate their program processes. DCEO staff indicated that as each participant application must go through a separate review and approval process, the memorandum of understanding may be as simple as attaching the DCEO form to the IHDA form or vice versa. Program staff indicated that the level of information sharing between the two entities has increased over time. The goal is to improve and streamline the program administration as well as increase the pool of potential participants, resulting in a more competitive selection of projects with greater energy savings.
- **EEPS does not account for all measures or the variation among the measures:** Currently, only some of the Affordable Housing New Construction activity is tracked in the Energy Efficiency Portfolio Standard (EEPS) database. This is due to both staffing constraints and to the functionality of the database. Program participants may install

measures that exceed the specifications in the program guidelines, and measures may not meet the guidelines in special circumstances. Although program staff are able to enter additional notes describing the measures implemented the level of detail provided varies by project.

- **The participation process:** Once an application is submitted, DCEO program staff review the project specification and completeness of the application. An engineer from the DCEO staff will reach out to the contractor or project architect to better understand project parameters and to determine how much funding is available for the participant. Upon approval, a preliminary funding amount is submitted to the participant. Sometimes the applicants are ready to proceed with the project and other times they are still waiting on additional funding. The participant must notify DCEO when they are ready to begin construction. Typically, the participant receives 50% of the funds upon project start and the remaining 50% once the project is complete, although at times the grant recipient will ask for funds on an incremental basis. Upon project completion, the contractors or facility managers are required to submit a report verifying what was installed.

## 4. Conclusions and Recommendations

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Surveys were conducted with grant recipients to better understand the effectiveness of program delivery. Participants were generally satisfied with the program. A review of program documentation and in-depth interviews with program staff indicate that there are aspects of the program that could be improved to increase awareness, improve program administration and project tracking, and better align reporting requirements with the informational needs for assessing savings.

### 4.1.1 Key Conclusions

The following presents a selection of key conclusions from EPY4/GPY1:

- **Participants Satisfied with the Program Overall:** All grant recipients indicated that they were either somewhat or very satisfied with the program overall. Participants were most satisfied with the information provided by DCEO and the performance of the implemented efficiency measures. However, a minority of grant recipients stated that they were dissatisfied with an aspect of program participation. One-third of survey respondents expressed dissatisfaction with the effort required for the application process and the time required to receive the grant payment.
- **Program Staffing may be Insufficient:** The Affordable Housing Construction Program has faced challenges in maintaining sufficient staffing to administer the program. Despite these challenges, program participants were generally satisfied with the program. This suggests that even with limited resources, staff members are able to provide adequate assistance to participants. However, maintenance of documentation and program tracking data has suffered from limited administrative resources.

To address the staffing limitation, two additional part-time employees were recently added to assist with the program's administration. Given the administrative requirements of the program, additional staffing may be necessary.

- **Project Tracking and Documentation in Need of Improvement:** Program staff are currently tracking project-level information in various documents and entering it into the project tracking database. However, database limitations and discrepancies in reported program activity across data sources indicates that better systems and processes are needed for documenting program activity. However, only limited information on technical specification was available for some measures.
- **Limited Program Marketing:** The Affordable Housing Construction Program relies upon repeat participation by external organizations, and other DCEO programs play an important role in facilitating program participation. Although few staff resources are spent on marketing and promotion, recent changes may help further promote the program. The program has expanded its partnership with the Illinois Housing Development Authority, a

state financing agency, to provide an additional pipeline to the program for prospective participants.

- **Partnerships are Critical to Future Program Success:** As with other DCEO programs, partner organizations often provide much of the needed marketing and implementation support that drives program awareness and success. DCEO recognizes these synergies at the state level and is investing resources to better understand the scope and potential efficiencies that could result from community and agency partnerships.

While the program has maintained participant satisfaction and continued to deliver energy efficiency improvements to low income residents, there are aspects of the program that could be improved. The following recommendations are offered for consideration.

- **Track Additional Project Information:** The Affordable Housing Construction Program maintains limited tracking data. Ideally, the tracking data would provide the following: (1) the measures installed, including quantities and technical specifications such as the wattage of bulbs, R-value of insulation, and size and Seasonal Energy Efficiency Ratio (SEER) ratings of air conditioners; (2) the date of implementation; (3) the location of the implemented measures; (4) the estimated measure energy savings; (5) resident contact information; (6) contractor information if utilized; (7) the baseline equipment or building conditions; and (8) the utility account numbers associated with the implementation address.
- **Provide a Report Template for Program Participants to Report Measure Specifications:** A review of project documentation determined that information provided by program participants regarding the implemented measures was not consistently reported. In order to support reporting of this information, program staff should consider providing a reporting template for each measure type that collects the appropriate level of detail. The data captured by the reporting template should be included in DCEO's Energy Efficiency Portfolio Standard (EEPS) program administration database.
- **Continue to Invest in Strong Partnerships:** Program staff indicated that marketing resources are limited at this time. Program partners such as the University of Illinois School of Architecture, the Smart Energy Design Assistance Center, the Illinois Housing Authority, the Bureau of Community Development, and the Bureau of Energy Assistance possess established marketing channels that can continue to drive program demand. As the program matures, DCEO will be able to attract more participants and increase program savings.

#### 4.2 Program Tracking Database Review

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Several data and project documentation issues were encountered over the course of the evaluation effort. The EEPS database, like any business information system, must meet the diverse needs of its users. The EEPS portfolio is comprised of eleven programs, approximately seven of which rely on the database to track project statuses, estimate savings, and aggregate the measures installed. An effective information system must have appropriate functionality, and be

supported by adequate staff resources and organizational protocols that guide how the system is used.

If there is a protocol for how the system is used and necessary functionality is built into the system, then there is lower risk of errors in expected savings and fewer gaps in the data.

ADM makes the following recommendations:

- **Establish a standardized list of measures and corresponding measure descriptions.** Though such a list has been established for standard program measures, it would be helpful to also develop measure lists for all of the low income programs.
- **Accurately record the number of units (lamps, fixtures, etc.) contained within each line item, so that per unit comparisons are accurate.** Currently the descriptions are somewhat unclear regarding the number of units installed and the composition of each unit. For lighting measures, the number and wattage of individual bulbs should be recorded. For insulation, R values should be recorded. For HVAC measures, unit size and efficiency ratings should be recorded. These data should be developed in conjunction with the establishment of a standardized list of measures to ensure that the appropriate data for each measure are being collected.

A project will likely have various measures installed, but the program level listing should itemize each measure individually. It may be challenging to develop a comprehensive and specific measure list that is able to capture all measures within the low income programs. As the program involves a changing list of relevant measures, this list will have to be modified as new projects are accepted. Each measure description should be precise enough to account for all differences in expected useful life (EUL), but general enough so that they can be aggregated at a higher level. There are certain instances in which custom measures may not be easily categorized. Such measures may need to be assigned to an "Other" category and subcategory, although there should be few measures of this type. Ideally the tracking data would contain:

- **Measure Category:** Lighting, HVAC, building insulation, etc.
- **Measure Subcategory:** Linear Fluorescent, Lighting Occupancy Sensor, HVAC Packaged Unit, etc.
- **Measure:** 14W CFL, R-19 fiberglass insulation, 2 Ton SEER 14 central air conditioner, etc.
- **Notes:** For custom measures this field would provide the description for those measures that do not correspond to any established category in the fields described above. These measures would be given a value of "Other" for the preceding fields.

ADM also recommends that the tracking data present measure quantity and measure unit categories for each line item.

- **Measure Quantity:** Number of fixtures, lamps, linear feet, etc.
- **Measure Unit:** The unit of measure quantity.

Addressing these questions and adopting the recommended solutions should reduce the work hours required for savings evaluation, and also facilitate the availability of more accurate, up-to-date data regarding program activity on an ongoing basis.

## Appendix A: Questionnaire for Decision Makers

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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 Affordable Housing 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 Affordable Housing Program? (Select all that apply)
- From a representative of the Affordable Housing 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 Affordable Housing 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 Affordable Housing 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 Affordable Housing 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 Affordable Housing 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 Affordable Housing 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 Affordable Housing 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 Affordable Housing 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 Affordable Housing Program?

- Yes
- No

22. If the grant from the Affordable Housing 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 Affordable Housing 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 Affordable Housing 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 Affordable Housing 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 have any problems with the application process?

- Yes
- No
- Don't know

26A. What problems did you have?

27. 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.

28. 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.

29. 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.

30. 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.

31. 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.

32. 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.

33. Were there any issues receiving the grant payments?

- Yes
- No

Don't know

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

34. 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.

35. Since participating in Affordable Housing 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)

36. 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)

37. 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 provided 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.

38. 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

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As part of the evaluation work effort, a survey was conducted for a sample of decision makers that received incentives under the program. This survey provided the information used to perform the program process evaluation.

Each participant was surveyed using the survey instrument provided in Appendix A. The surveys were conducted by internet and telephone.

The following tabulations summarize participant survey responses. The first column presents the number of survey respondents ( $n$ ). The second column presents the percentage of survey respondents.

	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents</i>
3. What was your role in the decision making process to implement the energy efficiency project(s)?	Main decision maker	4	67%
	Assisted with the decision to implement the project(s)	2	33%
	Was not part of the decision process	0	0%

	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents*</i>
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	2	33%
	The DCEO Website	3	50%
	Utility representatives	2	33%
	Brochures or advertisements	1	17%
	Trade associations or business groups you belong to	1	17%
	Trade journals or magazines	3	50%
	Friends and colleagues	3	50%
	Representatives of the Smart Energy Design Assistance Center (SEDAC)	1	17%
	Representatives of the Energy Resource Center (ERC)	0	0%
	Architects, engineers or energy consultants	4	67%
	Equipment vendors or building contractors	3	50%
	City or county planning departments	1	17%
	Illinois Housing Development Authority	0	0%
	Illinois Habitat for Humanity	0	0%
	U.S. Department of Housing and Urban Development	0	0%
Other (please describe)	0	0%	

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

	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents</i>
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	6	100%
	Lack of knowledge of energy efficient equipment or design features	0	0%
	Lack of interest among prospective residents in energy efficient housing	0	0%
	Don't know	0	0%
	Other (please describe)	1	17%

	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents</i>
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	4	67%
	Policies that incorporate energy efficiency in operations and procurement	5	83%
	Active training of staff	2	33%
	Do not have policies or procedures for energy efficiency improvements	0	0%
	Other	1	17%

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

	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents</i>
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	4	67%
	Somewhat Important	2	33%
	Only Slightly Important	0	0%
	Not Important At All	0	0%
	Don't Know	0	0%

	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents</i>
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	5	83%
	Somewhat Important	1	17%
	Only Slightly Important	0	0%
	Not Important At All	0	0%
	Don't Know	0	0%

	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents</i>
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	4	67%
	Somewhat Important	1	17%
	Only Slightly Important	1	17%
	Not Important At All	0	0%
	Don't Know	0	0%

10. For the project(s) completed through the Affordable Housing Construction, do the residents pay the utility bills?	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents</i>
	Residents pay electrical bill	3	50%
	Residents pay gas bill	0	0%
	Residents pay gas and electric bill	2	33%
	Residents do not pay the gas and electric bills	0	0%
	Some residents pay their gas and electric bills, but some do not	0	0%
	Don't know	0	0%
	Other (please specify)	1	17%

11. Why did you decide to undertake the energy efficiency project(s) completed through the Affordable Housing Construction? (Select all that apply)	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents*</i>
	To save money on operational costs of the building	3	50%
	To help residents save money on their utility bills	6	100%
	To improve the comfort of the building for its residents	4	67%
	To qualify for financing opportunities	2	33%
	To help save energy because of environmental concerns	4	67%
	Other (please specify)	1	17%

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

12. Which financial methods does your organization typically use to evaluate energy efficiency investments in low income housing? (Select all that apply)	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents*</i>
	Initial cost	6	100%
	Simple payback	3	50%
	Internal rate of return	0	0%
	Life cycle cost	1	17%
	We do not use financial methods to evaluate efficiency investments for low income housing	0	0%
	Other (please specify)	1	17%

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

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.	<i>(n=3)</i>	
	Average (Years)	3.5

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.	(n=0)	
	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=6)	Percent of Respondents
	Yes, undertook energy efficiency projects but did not apply for incentive	3	50%
No energy efficiency projects were undertaken	1	17%	
No, an incentive was applied for	2	33%	
Don't know	0	0%	

13a. Why didn't you apply for a financial incentive or grant for the project(s)?	Response	(n=3)	Percent of Respondents
	Didn't know whether project qualified for financial incentives or grants	0	0%
Didn't know about financial incentives or grants until after project was completed	0	0%	
Didn't have 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	1	33%	
Other (please specify)	2	67%	

13b. Did you receive all of your incentives or grant payments for these past energy efficient projects?	Response	(n=2)	Percent of Respondents
	Yes	2	100%
No	0	0%	
Don't know	0	0%	



	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents*</i>
14. How did you learn of the Affordable Housing Construction?	From a representative of the [Program]	0	0%
	A DCEO representative mentioned it	1	17%
	The DCEO website	3	50%
	From a utility representative	0	0%
	Brochures or advertisements	1	17%
	Trade association or business group you belong to	0	0%
	Trade journal or magazine	0	0%
	Friend or colleague	4	67%
	From a representative of the Smart Energy Design Assistance Center (SEDAC)	0	0%
	From a representative of the Energy Resource Center (ERC)	0	0%
	An architect, engineer or energy consultant	3	50%
	Equipment vendor or building contractor	1	17%
	Attended a conference workshop or seminar	1	17%
	Past experience with the program	2	33%
	An energy service company	0	0%
	U.S. Department of Housing and Urban Development	0	0%
	Illinois Housing Development Authority	1	17%
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%.

	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents</i>
15. When did you learn of the Affordable Housing Construction?	Before planning the project	3	50%
	During the project planning and concept phase	3	50%
	Once the project was begun but before it was finished	0	0%
	After the project was finished	0	0%
	Some other time (please explain)	0	0%
	Don't know	0	0%

	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents</i>
16. Before participating in the Affordable Housing Construction, had your organization completed any low income energy efficiency projects?	Yes	5	83%
	No	1	17%

17. For the energy efficiency project(s) completed through the Affordable Housing Construction, did you have plans for these projects prior to participating in the program?	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents</i>
	Yes	6	100%
	No	0	0%
	Don't know	0	0%

17a. For about how long did you have these plans prior to finding out about the Affordable Housing Construction?	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents</i>
	Less than 6 months	3	50%
	6-12 months	1	17%
	1-2 years	0	0%
	3-5 years	1	17%
	More than 5 years	0	0%
	Don't know	1	17%

17b. Did your plans specify which energy efficiency measures you were going to implement?	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents</i>
	Yes	5	83%
	No	1	17%

17c. Would you have gone ahead with the energy efficiency project(s) if you had not participated in the program?	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents</i>
	Yes	3	50%
	No	3	50%

18. Did you have experience with DCEO energy efficiency programs prior to participating in the Affordable Housing Construction?	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents</i>
	Yes	3	50%
	No	3	50%

18a. How important was your previous experience with the DCEO energy efficiency programs to your decision to install the energy efficiency measures?	<i>Response</i>	<i>(n=3)</i>	<i>Percent of Respondents</i>
	Very important	1	33%
	Somewhat important	1	33%
	Only slightly important	1	33%
	Not at all important	0	0%
	Don't know	0	0%

19. Did a representative of the Affordable Housing Construction recommend that you implement the energy efficient equipment or design features?	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents</i>
	Yes	1	17%
	No	4	67%
	Don't know	1	17%

	<i>Response</i>	<i>(n=1)</i>	<i>Percent of Respondents</i>
19a. If the Affordable Housing Construction representative had not recommended these energy efficiency measures, how likely is it that you would have installed them anyway?	Definitely would have	0	0%
	Probably would have	0	0%
	Probably would not have	1	100%
	Definitely would not have	0	0%
	Don't know	0	0%

	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents</i>
20. Did a representative of the Smart Energy Design Assistance Center (SEDAC) recommend that you implement the energy efficient equipment or design features?	Yes	1	17%
	No	4	67%
	Don't know	1	17%

	<i>Response</i>	<i>(n=1)</i>	<i>Percent of Respondents</i>
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	0	0%
	Probably would have installed	0	0%
	Probably would not have installed	1	100%
	Definitely would not have installed	0	0%
	Don't know	0	0%

	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents</i>
21. Would your organization have been financially able to complete the energy efficiency project(s) without the grant from the Affordable Housing Construction?	Yes	0	0%
	No	6	100%

	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents</i>
22. If the grant from the Affordable Housing Construction had not been available, how likely is it that you would have made the energy efficiency improvements anyway?	Definitely would have made the same improvements	0	0%
	Probably would have made the same improvements	2	33%
	Probably would not have made the same improvements	3	50%
	Definitely would not have made the same improvements	1	17%
	Don't know	0	0%

23. How did the availability of information and grant payments through the Affordable Housing Construction 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?	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents</i>
	Yes	5	83%
	No, program did not affect the quantity implemented	1	17%

24. How did the availability of information and grant payments through the Affordable Housing Construction 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?	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents</i>
	Yes	5	83%
	No, program did not affect level of efficiency	1	17%

25. How did the availability of information and grant payments through the Affordable Housing Construction affect the timing of the energy efficiency project(s)? Did you complete the projects earlier than you otherwise would have without the program?	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents</i>
	Yes	0	0%
	No, program did not affect the timing of the project.	6	100%

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

28. Did you have any problems with the application process?	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents</i>
	Yes	1	17%
	No	4	67%
	Don't know	1	17%

	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents</i>
29. Did the implementation of the efficiency measures go smoothly?	Yes	3	50%
	For the most part	3	50%
	No	0	0%
	Don't know	0	0%

	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents</i>
30. Did the energy efficiency measures you adopted for this project meet your expectations?	My expectations were exceeded	2	33%
	My expectations were met	4	67%
	My expectations were mostly met	0	0%
	My expectations were not met	0	0%
	Don't know	0	0%

	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents</i>
31. Do you feel you got a quality installation of the energy efficiency measures?	Yes	6	100%
	For the most part	0	0%
	No	0	0%
	Don't know	0	0%

	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents</i>
32. Did the grant agreement that you received meet your expectations?	Yes	4	67%
	No	2	33%
	Don't know	0	0%

	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents</i>
33. Did anyone from the Affordable Housing Construction or other DCEO representative do a pre-inspection at the site(s)?	Yes	1	17%
	No	3	50%
	Don't know	2	33%

	<i>Response</i>	<i>(n=1)</i>	<i>Percent of Respondents</i>
33c. Did anything change in the project design as a result of the pre-inspection?	Yes	0	0%
	No	1	100%
	Don't know	0	0%

	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents</i>
34. Did anyone from the Affordable Housing Construction or other DCEO representative do a post-inspection at the site(s)?	Yes	4	67%
	No	1	17%
	Don't know	1	17%

34c. Did anything change in the grant amount as a result of the post-inspection?	<i>Response</i>	<i>(n=4)</i>	<i>Percent of Respondents</i>
	Yes	0	0%
	No	4	100%
	Don't know	0	0%

35. Were there any issues with receiving the grant payments?	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents</i>
	Yes	2	33%
	No	4	67%
	Don't know	0	0%

36. Was the grant payment amount what you expected?	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents</i>
	Yes	4	67%
	No	2	33%
	Don't know	0	0%

37. Since participating in the Affordable Housing Construction, 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?	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents</i>
	Yes	4	67%
	No	1	17%
	Don't know	1	17%

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?	<i>Response</i>	<i>(n=4)</i>	<i>Percent of Respondents</i>
	Yes	4	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?	<i>Response</i>	<i>(n=4)</i>	<i>Percent of Respondents</i>
	Yes	2	50%
	No (where was the equipment or design feature installed?)	2	50%
	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?	<i>Response</i>	<i>(n=4)</i>	<i>Percent of Respondents</i>
	Yes	2	50%
	No	2	50%
	Don't know	0	0%

37c1. How important was the recommendation to your decision to implement the additional equipment or design features?	<i>Response</i>	<i>(n=2)</i>	<i>Percent of Respondents</i>
	Important	1	50%
	Somewhat Important	1	50%
	Neither Important nor Unimportant	0	0%
	Somewhat Unimportant	0	0%
	Unimportant	0	0%
	Don't know	0	0%

37d. How important was your experience with the program or the efficiency measures to your decision to implement the additional equipment or design features?	<i>Response</i>	<i>(n=4)</i>	<i>Percent of Respondents</i>
	Important	2	50%
	Somewhat Important	1	25%
	Neither Important nor Unimportant	1	25%
	Somewhat Unimportant	0	0%
	Unimportant	0	0%
	Don't know	0	0%

37e. How important was your participation in any past programs offered by the DCEO to your decision to implement the additional equipment or design features?	<i>Response</i>	<i>(n=4)</i>	<i>Percent of Respondents</i>
	Important	1	25%
	Somewhat Important	1	25%
	Neither Important nor Unimportant	1	25%
	Somewhat Unimportant	0	0%
	Unimportant	0	0%
	Don't know	1	25%

37f. Why didn't you apply for or receive financial incentives or grants for the additional equipment or design features?	<i>Response</i>	<i>(n=4)</i>	<i>Percent of Respondents*</i>
	Didn't know whether the equipment or design features qualified for financial incentives or grants	1	25%
	Financial incentive or grant was insufficient	1	25%
	No financial incentive or grant was offered	0	0%
	Too much paperwork for the financial incentive or grant application	1	25%
	For some other reason (please specify)	1	25%

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

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?	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents</i>
	Yes	2	33%
	No	3	50%
	Don't know	1	17%

38b. Was this additional equipment or design features implemented at the same site(s) as the project that you completed through the program?	<i>Response</i>	<i>(n=2)</i>	<i>Percent of Respondents</i>
	Yes	0	0%
	No (please explain where the equipment or design features were installed).	2	100%
	Don't know	0	0%

38c. Did a recommendation from a program staff member or contractor influence your decision to implement the additional equipment or design features?	<i>Response</i>	<i>(n=2)</i>	<i>Percent of Respondents</i>
	Yes	1	50%
	No	1	50%
	Don't know	0	0%

38D. How important was the recommendation to your decision to implement the additional equipment or design features?	<i>Response</i>	<i>(n=1)</i>	<i>Percent of Respondents</i>
	Important	1	100%
	Somewhat Important	0	0%
	Neither Important nor Unimportant	0	0%
	Somewhat Unimportant	0	0%
	Unimportant	0	0%
	Don't know	0	0%

38E. How important was your experience with the program or the efficiency measures to your decision to implement the additional equipment or design features?	<i>Response</i>	<i>(n=2)</i>	<i>Percent of Respondents</i>
	Important	1	50%
	Somewhat Important	0	0%
	Neither Important nor Unimportant	1	50%
	Somewhat Unimportant	0	0%
	Unimportant	0	0%
	Don't know	0	0%



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?	Response	(n=2)	Percent of Respondents
	Important	0	0%
	Somewhat Important	0	0%
	Neither Important nor Unimportant	1	50%
	Somewhat Unimportant	0	0%
	Unimportant	0	0%
	Don't know	1	50%

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)	Response	(n=2)	Percent of Respondents*
	Didn't know about financial incentives or grants	0	0%
	Didn't know whether the measures qualified for financial incentives or grants	1	50%
	Financial incentive or grant was insufficient	0	0%
	No financial incentive or grant was offered	0	0%
	Too much paperwork for the financial incentive or grant application	1	50%
	For some other reason (please describe)	0	0%

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

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?	Response	(n=6)	Percent of Respondents*
	5	3	50%
	4	3	50%
	3	0	0%
	2	0	0%
	1	0	0%
	Don't know / Not applicable	0	0%
	<i>Average</i>		

\*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)

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?	Response	(n=6 )	Percent of Respondents*
	5	2	33%
	4	1	17%
	3	0	0%
	2	0	0%
	1	0	0%
	Don't know / Not applicable	3	50%
	<i>Average</i>		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)*

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?	Response	(n=6 )	Percent of Respondents*
	5	0	0%
	4	4	67%
	3	1	17%
	2	1	17%
	1	0	0%
	Don't know / Not applicable	0	0%
	<i>Average</i>		3.5

*\*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)*

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?	Response	(n=6 )	Percent of Respondents*
	5	1	17%
	4	2	33%
	3	1	17%
	2	2	33%
	1	0	0%
	Don't know / Not applicable	0	0%
	<i>Average</i>		3.3

*\*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)*

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?	Response	(n=6 )	Percent of Respondents*
	5	2	33%
	4	4	67%
	3	0	0%
	2	0	0%
	1	0	0%
	Don't know / Not applicable	0	0%
	<i>Average</i>		4.3

*\*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)*

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?	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents*</i>
	5	3	50%
	4	2	33%
	3	1	17%
	2	0	0%
	1	0	0%
	Don't know / Not applicable	0	0%
	<i>Average</i>		

*\*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)*

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?	<i>Response</i>	<i>(n=6)</i>	<i>Percent of Respondents*</i>
	5	1	17%
	4	2	33%
	3	1	17%
	2	2	33%
	1	0	0%
	Don't know / Not applicable	0	0%
	<i>Average</i>		

*\*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)*

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?	<i>Response</i>	<i>(n=5)</i>	<i>Percent of Respondents*</i>
	5	1	20%
	4	4	80%
	3	0	0%
	2	0	0%
	1	0	0%
	Don't know / Not applicable	0	0%
	<i>Average</i>		

*\*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)*