



Ameren Illinois Portfolio Cost-Effectiveness Evaluation Program Year 3

Prepared for:

Ameren Illinois

Prepared by:

Robert Willen

Karlynnta Oredugba

Ameren Services – Energy Efficiency/Demand Response

1901 Chouteau Avenue (MC 1400)

St. Louis, MO 63166-6149

February 2013

Table of Contents

EXECUTIVE SUMMARY	3
DISCUSSION	3
Introduction	3
Cost-Effectiveness Defined	4
DSMore Software	5
PROGRAM BENEFIT COMPONENTS	7
Introduction	7
Non-Energy Benefits	8
Realized Net Savings	8
TRC Scenarios	8
Avoided Costs	9
PROGRAM COST COMPONENTS	9
Introduction	9
Program Administration Costs	9
Portfolio Administration Costs	10
OVERALL PORTFOLIO COST-EFFECTIVENESS RESULTS	10

Table of Tables

TABLE 1. AMEREN ILLINOIS PORTFOLIO COST EFFECTIVENESS RESULTS	3
TABLE 2. LINE LOSS ASSUMPTIONS USED IN COST-EFFECTIVENESS CALCULATIONS	9
TABLE 3. SUMMARY OF AVOIDED COSTS	9
TABLE 4. AMEREN ILLINOIS TOTAL PORTFOLIO RESULTS	10

Executive Summary

Total Resource Cost and Societal Cost evaluations were performed for the Ameren Illinois Program Year 3 (PY3) Electric Energy Efficiency and Demand Response and Gas Energy Efficiency Portfolio that was implemented from June 1, 2010 through May 31, 2011. The evaluation results indicate that the implementation was cost effective, as shown below in Table 1:

Table 1. Ameren Illinois Portfolio Cost Effectiveness Results

	Program Year 3 (6/1/2010-5/31/2011)		
	Residential	Business	Total
TRC - Discounted @ Weighted Cost of Capital			
NPV Benefits with NEBs	\$82,389,300	\$103,752,304	\$186,141,604
NPV Costs	\$42,047,068	\$24,898,011	\$66,945,079
Benefit-Cost Ratio	1.96	4.17	2.78
TRC - Discounted @ Societal Rate			
NPV Benefits with NEBs	\$99,945,870	\$128,518,832	\$228,464,702
NPV Costs	\$42,047,068	\$24,898,011	\$66,945,079
Benefit-Cost Ratio	2.38	5.16	3.41

Discussion

Introduction

In November 2007, Ameren Illinois Utilities (AIU) filed its first three-year Electric Energy Efficiency and Demand Response Plan portfolio (Docket #07-0539) for residential and business programs, per Section 8-103 of the Illinois Public Utilities Act, 220 ILCS 5/8-103.¹ (the Act). In February 2008, Ameren Illinois Utilities (AIU) filed its first three-year Gas Energy Efficiency Plan portfolio (Docket #08-0104) to compliment the Ameren Illinois Utilities Electric Energy Efficiency and Demand Response Plan portfolio.

The Act calls for an annual independent evaluation of the performance of the cost-effectiveness of the utility's portfolio of measures. The cost-effectiveness evaluation was further defined in the Order for Docket #07-0539² which states;

“Calculation of the total resource cost test at the portfolio level provides utilities with greater flexibility to ensure that measures with less short-term energy savings value, but

¹ Illinois Public Utilities Act. See Section 8-103:

<http://www.ilga.gov/legislation/ilcs/ilcs5.asp?ActID=1277&ChapAct=220%26nbsp%3BILCS%26nbsp%3B5%2F&ChapterID=23&ChapterName=UTILITIES&ActName=Public+Utilities+Act%2E>

² Illinois Commerce Commission Docket #07-0539, Final Order:

<http://www.icc.illinois.gov/docket/files.aspx?no=07-0539&docId=119839>

greater value over several years, will be included in any overall portfolio of measures and programs. This contention is reasonable and it is hereby approved.”

In 2010, Ameren Illinois Utilities merged to become Ameren Illinois Company (Ameren Illinois), a subsidiary of Ameren Corporation. Ameren Services, another subsidiary of Ameren Corporation, prepared this cost effectiveness evaluation report for Ameren Illinois’ Program Year 3 (PY3) implementation, which does not consider any aspects of the programs managed and implemented under the Department of Commerce and Economic Opportunity (DCEO’s) responsibility. To prepare this report, Ameren Services relied on the Evaluation, Measurement, and Verification (EM&V) reports and data prepared by the independent evaluators for Ameren Illinois’ implementation of Residential programs (The Cadmus Group, Inc.) and Business programs (Opinion Dynamics Corporation).

Ameren Illinois launched its portfolio of programs for its third program year (PY3) beginning on June 1, 2010 and concluding on May 31, 2011.

Cost-Effectiveness Defined

This evaluation identifies the cost and benefit components using the Total Resource Cost (TRC) analysis. The Act states that an overall portfolio of energy efficiency and demand-response measures is determined cost-effective using the TRC test.³ The TRC test is a benefit-cost ratio of the net present value of total benefits of the program to the net present value of the total costs as calculated over the lifetime of the measures. A program is considered cost-effective if this ratio is greater than one. Section 8-103 in the electric energy efficiency portfolio portion of the Act states that the TRC shall have the meaning set forth in the Illinois Power Agency Act.⁴

“Total resource cost test” or “TRC test” means a standard that is met if, for an investment in energy efficiency or demand-response measures, the benefit-cost ratio is greater than one. The benefit-cost ratio is the ratio of the net present value of the total benefits of the program to the net present value of the total costs as calculated over the lifetime of the measures. A total resource cost test compares the sum of avoided electric utility costs, representing the benefits that accrue to the system and the participant in the delivery of those efficiency measures, as well as other quantifiable societal benefits, including avoided natural gas utility costs, to the sum of all incremental costs of end-use measures that are implemented due to the program (including both utility and participant contributions), plus costs to administer, deliver, and evaluate each demand-side program, to quantify the net savings obtained by substituting the demand-side program for supply resources. In calculating avoided costs of power and energy that an electric utility would otherwise have had to acquire, reasonable estimates shall be included of financial costs likely to be imposed by future regulations and legislation on emissions of greenhouse gases.”

³ Illinois Public Utilities Act. See sections 8-103(a):

<http://www.ilga.gov/legislation/ilcs/ilcs5.asp?ActID=1277&ChapAct=220%26nbsp%3BILCS%26nbsp%3B5%2F&ChapterID=23&ChapterName=UTILITIES&ActName=Public+Utilities+Act%2E>

⁴ Illinois Power Agency Act. See section 1-10. Definitions:

<http://www.ilga.gov/legislation/ilcs/ilcs5.asp?ActID=2934&ChapAct=20%26nbsp%3BILCS%26nbsp%3B3855%2F&ChapterID=5&ChapterName=EXECUTIVE+BRANCH&ActName=Illinois+Power+Agency+Act%2E>

Section 8-104 in the gas energy efficiency portfolio of the Act states that the TRC shall have the following meaning:

For purposes of this Section, "energy efficiency" means measures that reduce the amount of energy required to achieve a given end use and "cost-effective" means that the measures satisfy the total resource cost test which, for purposes of this Section, means a standard that is met if, for an investment in energy efficiency, the benefit-cost ratio is greater than one. The benefit-cost ratio is the ratio of the net present value of the total benefits of the measures to the net present value of the total costs as calculated over the lifetime of the measures. The total resource cost test compares the sum of avoided natural gas utility costs, representing the benefits that accrue to the system and the participant in the delivery of those efficiency measures, as well as other quantifiable societal benefits, including avoided electric utility costs, to the sum of all incremental costs of end use measures (including both utility and participant contributions), plus costs to administer, deliver, and evaluate each demand-side measure, to quantify the net savings obtained by substituting demand-side measures for supply resources. In calculating avoided costs, reasonable estimates shall be included for financial costs likely to be imposed by future regulation of emissions of greenhouse gases. The low-income programs described in item (4) of subsection (f) of this Section shall not be required to meet the total resource cost test.

DSMore Software

The Demand Side Management Option Risk Evaluator (DSMore™) model is a powerful financial analysis tool designed to evaluate the costs, benefits, and risks of DSM programs and services. This tool, built by Integral Analytics, is the leading DSM cost-effectiveness model and is used in more than 27 states, including Illinois, for DSM program planning.

In order to complete the cost effectiveness analysis for the Ameren Illinois PY3 Energy Efficiency portfolio with the DSMore™ model, specific program information was requested from the independent program evaluators. The evaluators provided Ameren Services with the following information to input into DSMore to derive the TRC results:

- Measure Name
 - A general description of the measure
- Baseline Description
 - A description of the base measure that was replaced
- Efficient Description
 - A description of the efficient measure which provides energy/demand savings
- Electric Savings per Year per Customer (kWh)
 - The gross annual level of incremental energy savings due to implementing the efficient measure

- Gas Savings per Year per Customer (therm)
 - The gross annual level of incremental energy savings due to implementing the efficient measure
- Demand per Year per Customer (kW)
 - The gross annual peak impact to demand due to the implementation of the efficient measure
- Measure Life
 - The expected useful life of the measure in years
- End Use
 - The associated End Use corresponding to one of the following selections

• Appliances RES	• Air Comp BUS
• Building Shell RES	• Building Shell BUS
• Clothes Dryer RES	• Cooking BUS
• Clothes Washer RES	• Cooling BUS
• Color TV RES	• Exterior Lighting BUS
• Cooking RES	• Heating BUS
• Cooling RES	• HVAC BUS
• Dishwasher RES	• Lighting BUS
• Freezer RES	• Miscellaneous BUS
• Heating RES	• Motors BUS
• HVAC RES	• Office BUS
• Lighting RES	• Process BUS
• Miscellaneous RES	• Refrigeration BUS
• Pool Spa RES	• Ventilation BUS
• Refrigeration RES	• Water Heating BUS
• Water Heating RES	
- Incremental Cost
 - The incremental measure cost associated with the selection of the efficient measure over the base measure
- Annual Fixed Cost
 - The annual fixed costs associated with the selection of the measure (ie. some measures may have annual maintenance, etc.)
- Other Utility Cost
 - Typically blank, except for the Appliance Recycling program – this is the cost associated with recycling the measure
- Incentive Cost
 - This is the customer incentive amount for each measure (applies to all programs except Appliance Recycling)
- Realization Rate
 - This is the realization rate determined by EM&V for PY3 for each measure.

- Net-to-Gross
 - This is the NTG assessment result as determined by EM&V for PY3 for each measure.
- Number of Incremental Participants
 - This is the number (quantity) of the measure that was implemented within PY3.
- Source of Information

In addition to the inputs identified above, the following inputs are used for the cost effectiveness analysis using DSMore™:

- Weighted Average Cost of Capital (WACC)
 - This is the 7.67% discount rate that applies to Ameren Illinois.
- Societal Discount Rate
 - A 10-year T-Bill rate of 3.5% to discount future benefits is used which is consistent with Program Year 1 evaluation.
- Read Discount Rate
 - A 3% discount rate is used.
- Non Energy Benefits (NEBs)
 - This is a quantification of non energy benefits – set at a 10% addition for electric benefits and at a 7.5% addition for natural gas benefits.
- Avoided Costs
 - The avoided costs used are those that were used at the time of the filing of Docket #07-0539 and Docket #08-0104
- End Use Load Shapes
 - End Use load shapes that were developed by ITRON, and calibrated to Ameren customer energy usage characteristics, are used to characterize hourly energy usage for non-weather sensitive measures.
- Ameren Illinois historic operating data are used by Integral Analytics in the preparation of the DSMore™ modeling tools for Ameren Illinois.

Program Benefit Components

Introduction

The program benefits are defined as follows:

$$BTRC = \sum_{t=1}^N \frac{UAC_t + TC_t}{(1+d)^{t-1}} + \sum_{t=1}^N \frac{UAC_{at} + PAC_{at}}{(1+d)^{t-1}}$$

Where:

BTRC=Benefits of the program

UAC_t =Utility avoided supply costs in year t

PAC_{at} =Participant avoided costs for alternative fuel in year t

UAC_{at} =Utility avoided supply costs for the alternate fuel in year t

TC=Tax Credits

d=discount rate

Non-Energy Benefits

Energy efficiency programs have been associated with additional benefits beyond those typically provided by delaying supply-side options categorized as non-energy benefits (NEBs). There are different classes of end users that NEBs can affect ranging from an individual to a nation. Benefits such as improved competitiveness, energy security, job creation, and environmental improvements are examples of NEBs. It can be difficult to quantify NEBs since there are no associated direct costs or energy savings. In efforts to quantify the non-energy benefits, this analysis applied a 10% addition for electric benefits and a 7.5% addition for natural gas benefits,

Realized Net Savings

Net-to-gross (NTG) factors and realization rates (RR) were applied to the expected savings to account for free ridership and verified gross energy savings estimates. NTG estimates were available for all programs. In a small number of instances, RR factors were not supplied by evaluation contractors, and Ameren Services assumed a 1.0 value.

TRC Scenarios

Two scenarios of the TRC are presented: the first discounted future benefits by 7.67% based on Ameren Illinois' weighted average cost of capital (WACC); the second uses a 10-year T-Bill rate of 3.5% to discount future benefits consistent with Program Year 1 evaluation. Using the 10-year Treasury bill as a discount rate for the TRC test recognizes that benefits accrue at a societal level rather than solely for the utility or participants. Generally the weighted cost of capital is higher for utilities, reflecting the cost of borrowing money and the associated risk. For society as a whole, the level of risk is lower, making the Treasury bill rate more appropriate for a total resource perspective.

Discount rates are used to determine the present value of future energy savings. The appropriate discount rate depends on the perspective from which cost-effectiveness is evaluated. From the participant perspective, the appropriate discount rate would be the consumer lending rate-the interest rate a customer would have to pay if they financed the energy efficiency investment.

From a utility perspective, the appropriate discount rate would be the utility's weighted average cost of capital, or the interest rate paid in financing supply-side investments. Public policy decisions are made from a societal perspective, and thus typically employ a lower discount rate to appropriately value long-term societal benefits that result from energy efficiency investments made today.

Line loss assumptions are specified in the table below, recognizing that a unit of energy saved by the customer equates to slightly more energy saved where the power is produced.

Table 2. Line Loss Assumptions Used in Cost-Effectiveness Calculations

Sector	Electric Line Losses	Peak Demand Line Losses	Gas Line Losses
Residential	6.72%	7.83%	1.75%
Business	5.75%	6.84%	1.75%

Avoided Costs

The annual avoided costs used in this analysis are identical to those presented in the Ameren Illinois Cycle 1 Electric DSM Implementation Plan filed in 2007 and the Ameren Illinois Cycle 1 Gas DSM Implementation Plan filed in 2008. Avoided costs for the first five program years of this analysis are summarized in the table below.⁵

Table 3. Summary of Avoided Costs

Program Year	Energy (\$/MWh)	Capacity	Nat Gas (\$/MMBTU)
Program Year 3	\$57.04	\$51.20	\$8.10
Program Year 4	\$55.74	\$62.13	\$7.99
Program Year 5	\$56.21	\$73.07	\$7.54
Program Year 6	\$56.66	\$84.00	\$7.92
Program Year 7	\$57.12	\$86.10	\$8.22

Program Cost Components

Introduction

The cost component of the analysis considered incremental measure costs which are the incremental expenses associated with installation, operation, and maintenance of energy-efficiency measures, where applicable. This cost is typically split between the customer and the utility (by way of an incentive payment). An important consideration of the total incremental costs is the number of installations in PY3. Direct utility costs were also considered. These costs include payments to customers (as in the bounty paid for recycling appliances) and the expenses associated with program development, marketing, delivery, operation, and evaluation, measurement and verification.

Program Administration Costs

Ameren Illinois incurred costs to administer energy efficiency programs which include contractor costs and other costs associated with the implementation of the programs. These costs were associated on a per-program basis, and the costs are in alignment with the reconciliation. For the Behavior Modification Program, reconciled costs include PY3 operation expenses and PY4 licensing costs. Ameren Illinois incurred licensing costs for the PY3 Behavior Modification program during PY2, and these costs are not included within the PY3 reconciliation, rather they were included within the PY2 reconciliation.

⁵ Illinois Commerce Commission, ICC Docket No. 07-0539, Exhibit 2.0, <http://www.icc.illinois.gov/docket/files.aspx?no=07-0539&docid=116217>

Portfolio Administration Costs

Ameren Illinois incurred portfolio administrative costs for non programmatic portfolio management activities such as general marketing, consulting, planning and evaluation, measurement and verification (EM&V). These costs were associated with the entire portfolio.

Overall Portfolio Cost-Effectiveness Results

A summary of the energy savings, demand impacts and costs for Ameren Illinois' entire energy efficiency portfolio are reported in the table below. Energy savings and capacity savings are reported in both gross and net terms. The portfolio passes the TRC with a benefit-cost ratio greater than 1.0 using either the corporate discount rate or the societal discount rate, suggesting from a total resource perspective, this portfolio of programs is cost effective.

Table 4. Ameren Illinois Total Portfolio Results

<i>Benefit/Cost Component</i>	Program Year 3 (6/1/2010-5/31/2011)		
	Residential	Business	Total
Gross Savings (MWH)	164,718	216,062	380,780
Net Savings (MWH)	133,151	154,315	287,466
Gross Coincident Capacity Savings (kW)	17,432	30,937	48,369
Net Coincident Capacity Savings (kW)	12,552	22,128	34,679
Gross Savings (Therm)	2,128,218	261,266	2,389,484
Net Savings (Therm)	2,138,342	212,421	2,350,763
Total TRC Costs	\$42,047,068	\$24,898,011	\$66,945,079
Participant Costs	\$31,632,732	\$19,508,347	\$51,141,079
Utility Costs	\$22,093,295	\$15,782,107	\$37,875,402
Program Administration	\$8,700,239	\$3,141,275	\$11,841,514
Incentives	\$11,678,959	\$10,392,443	\$22,071,401
Portfolio Level EM&V	\$658,880	\$864,256	\$1,523,136
Educational Outreach	\$627,897	\$823,616	\$1,451,512
Labor	\$0	\$0	\$0
Portfolio Administration	\$427,320	\$560,518	\$987,838
<i>TRC - Discounted @ Weighted Cost of Capital</i>			
NPV Benefits with NEBs	\$82,389,300	\$103,752,304	\$186,141,604
NPV Costs	\$42,047,068	\$24,898,011	\$66,945,079
Benefit-Cost Ratio	1.96	4.17	2.78
<i>TRC - Discounted @ Societal Rate</i>			
NPV Benefits with NEBs	\$99,945,870	\$128,518,832	\$228,464,702
NPV Costs	\$42,047,068	\$24,898,011	\$66,945,079
Benefit-Cost Ratio	2.38	5.16	3.41