

**Multi-Family Comprehensive Energy  
Efficiency Program (MCEEP)  
GPY3 Evaluation Report**

**Final**

**Energy Efficiency Plan:  
Nicor Gas Plan Year 3  
(6/1/2013-5/31/2014)**

**Presented to  
Nicor Gas Company**

**May 27, 2015**

Prepared by:

**Charles Ampong**

[www.navigant.com](http://www.navigant.com)



**Submitted to:**

Nicor Gas Company  
1844 Ferry Road  
Naperville, IL 60563

**Submitted by:**

Navigant Consulting, Inc.  
30 S. Wacker Drive, Suite 3100  
Chicago, IL 60606  
Phone 312.583.5700  
Fax 312.583.5701

**Contact:**

Randy Gunn, Managing Director  
312.583.5714  
[randy.gunn@navigant.com](mailto:randy.gunn@navigant.com)

Charles Budd, Director  
312.583.4135  
[charley.budd@navigant.com](mailto:charley.budd@navigant.com)

**Acknowledgements**

This report includes contributions from Kevin Grabner, Laura Agapay-Read, Josh Arnold and Mary Thony in addition to those individuals listed above.

Disclaimer: This report was prepared by Navigant Consulting, Inc. ("Navigant") for Nicor Gas based upon information provided by Nicor Gas and from other sources. Use of this report by any other party for whatever purpose should not, and does not, absolve such party from using due diligence in verifying the report's contents. Neither Navigant nor any of its subsidiaries or affiliates assumes any liability or duty of care to such parties, and hereby disclaims any such liability.

## Table of Contents

<b>E.</b>	<b>Executive Summary .....</b>	<b>1</b>
	E.1. Program Savings .....	2
	E.2. Program Savings by Channel and Measure Type .....	2
	E.3. Impact Estimate Parameters .....	4
	E.4. Program Volumetric Detail.....	5
	E.5. Key Findings and Recommendations.....	6
<b>1.</b>	<b>Introduction .....</b>	<b>9</b>
	1.1 Program Description.....	9
	1.2 Evaluation Objectives .....	10
<b>2.</b>	<b>Evaluation Approach.....</b>	<b>11</b>
	2.1 Primary Data Collection.....	11
	2.1.1 Overview of Data Collection Activities .....	11
	2.1.2 Verified Savings Parameters .....	11
	2.1.3 Verified Gross Program Savings Analysis Approach.....	12
	2.1.4 Verified Net Program Savings Analysis Approach .....	13
	2.1.5 Process Evaluation.....	13
<b>3.</b>	<b>Gross Impact Evaluation .....</b>	<b>14</b>
	3.1 Tracking System Review and Savings Verification .....	14
	3.2 Program Volumetric Findings.....	15
	3.3 Gross Program Impact Parameter Estimates.....	17
	3.4 Development of the Verified Gross Realization Rate.....	19
	3.5 Verified Gross Program Impact Results.....	20
<b>4.</b>	<b>Net Impact Evaluation .....</b>	<b>22</b>
<b>5.</b>	<b>Process Evaluation .....</b>	<b>24</b>
<b>6.</b>	<b>Findings and Recommendations .....</b>	<b>25</b>
<b>7.</b>	<b>Appendix .....</b>	<b>28</b>
	7.1 Detailed Impact Research Findings and Approaches .....	28
	7.1.1 Gross Impact Savings Errata Correction.....	28
	7.2 Benchmarking and Best Practices for EPY6-GPY3 MCEEP .....	32

## List of Figures and Tables

### Figures

Figure E-1. GPY3 Differences in MCEEP Participation.....	6
Figure 3-1. Number of Measures Installed by End-use Type.....	16
Figure 3-2. GPY3 MCEEP Verified Gross Savings by Program Components.....	21
Figure 4-1. MCEEP Program Yearly Comparison Actual vs. Planned Savings.....	23
Figure 7-1. Scatterplot of Multi-Family 2012 Natural Gas Savings and Cost of Savings by Utility.....	36
Figure 7-2. Scatterplot of Multi-Family 2012 Electricity Savings and Cost of Savings by Utility.....	39

### Tables

Table E-1. GPY3 Multi-Family Program Savings.....	2
Table E-2. GPY3 Multi-Family Program Savings by Delivery Channel.....	3
Table E-3. GPY3 Multi-Family Program Savings by Measure.....	4
Table E-4. Verified Gross and Net Savings Parameter Data Sources.....	5
Table E-5. GPY3 Multi-Family Program Primary Participation Detail.....	6
Table 2-1. Core Data Collection Activities.....	11
Table 2-2. Verified Gross and Net Savings Parameter Data Sources.....	12
Table 3-1. GPY3 Volumetric Findings by Program Delivery.....	16
Table 3-2. GPY3 MCEEP Ex Ante and Verified Measure Count.....	17
Table 3-3. Verified Gross Savings Parameters.....	18
Table 3-4. GPY3 MCEEP Gross Realization Rate by Measure.....	19
Table 3-5. GPY3 MCEEP Verified Gross Impact Savings Estimates.....	20
Table 4-1. GPY3 MCEEP Program Verified Net Savings Estimates.....	22
Table 7-1. Illinois TRM - Faucet Aerator Water Usage Table.....	30
Table 7-2. Utilities Included in Benchmarking.....	34
Table 7-3. Multi-Family 2012 Natural Gas Savings and Cost of Savings.....	37
Table 7-4. Multi-Family GPY2 Savings for Nicor Gas, Peoples Gas and North Shore Gas by Measure.....	38
Table 7-5. Multi-Family GPY2 Participation and Costs for Nicor Gas, Peoples Gas, and North Shore Gas.....	38
Table 7-6. Multi-Family 2012 Electricity Savings and Cost of Savings.....	40
Table 7-7. Features of Benchmarked Multi-Family Programs.....	44

## E. Executive Summary

This report presents a summary of the findings from the impact evaluation of the Nicor Gas Multi-Family Comprehensive Energy Efficiency Program (MCEEP or Multi-Family Program), which is electric program year six (EPY6) and gas program year three (GPY3).<sup>1</sup> The EPY6/GPY3 program year is the first full year for joint comprehensive program delivery with Commonwealth Edison Company (ComEd).<sup>2</sup> The program achieves electric energy and demand savings for ComEd customers and natural gas energy savings for customers of Nicor Gas Company (Nicor Gas). This evaluation report includes total Nicor Gas impacts from the jointly implemented program.

During EPY6/GPY3, the MCEEP continued to implement its direct install components (programmable thermostats, water efficiency measures, hot water pipe wraps in residential dwelling units and common areas). Concurrently, MCEEP developed marketing and outreach materials, and offered technical services and financial incentives to commercial contractors and multi-family decision-makers to install program measures designed to achieve energy savings in whole buildings and grounds. These “comprehensive” measures include upgrades or improvements to central plant and heating, ventilating, and air-conditioning (HVAC) systems and controls, interior and exterior lighting systems, and building shell improvements. The Multi-Family Program was delivered through three channels in EPY6/GPY3: direct installation, trade ally installation (TAI), and prescriptive incentives. The trade ally installations and prescriptive incentives categories comprised the comprehensive component of the Multi-Family Program design in EPY6/GPY3, in addition to the direct installation measures offered in the previous program years.

The GPY3 evaluation involved verifying the compliance of the program to the Illinois Technical Reference Manual (TRM)<sup>3</sup> and applying necessary research adjustments to non-deemed savings in comprehensive projects. The GPY3 net-to-gross (NTG) ratio was deemed through a consensus process by the Illinois Energy Efficiency Stakeholder Advisory Group (SAG).<sup>4</sup> Navigant conducted a best practices research study on the new program design and interviewed program staff and the implementation contractor staff to verify information about program performance, measures and tracking system. Franklin Energy Services, LLC (Franklin Energy or FES) was the primary implementation contractor for the MCEEP. The GPY3 evaluation report includes findings from the Nicor Gas Small Multi-Family Pilot Program<sup>5</sup> targeted at decision makers of small multi-family buildings to implement building shell improvement measures like air sealing and attic/roof cavity insulation. The pilot program was implemented by the Conservation Services Group (CSG) through trade ally installations. The MCEEP implementation contractor transition to CLEAResult began in March 2014 in preparation for EPY7/GPY4.

<sup>1</sup> EPY6/GPY3 began June 1, 2013, and ended May 31, 2014.

<sup>2</sup> In March 2013, the ComEd/Nicor Gas program started planning a new design and delivery strategy to target whole-building savings, which resulted in the program now being referred to as MCEEP.

<sup>3</sup> State of Illinois Energy Efficiency Technical Reference Manual\_Effective\_060113\_Version\_2.0\_060713\_Clean.pdf

<sup>4</sup> See <http://www.ilsag.info/> for more information on the SAG and net-to-gross framework.

<sup>5</sup> Small Multi-Family Pilot Program participants are decision makers for MF buildings of 5-40 units.

### E.1. Program Savings

Table E-1 presents the GPY3 Nicor Gas Multi-Family Program savings.

**Table E-1. GPY3 Multi-Family Program Savings**

Savings Category	Residential Units	Common Areas	Total Program
Ex-Ante Gross Savings (therms)	855,207	4,158,515	5,013,722
Tracking Ex Ante Net Savings (therms)	810,259	3,867,567	4,677,825
Corrected Ex Ante Net Savings (therms) <sup>6</sup>	820,999	3,867,419	4,688,418
Verified Gross Realization Rate	100%‡	101%‡	100%‡
Verified Gross Savings (therms)	855,040	4,182,789	5,037,829
Net to Gross Ratio (NTGR)	0.96†	0.93†	0.94‡
Verified Net Savings (therms)	820,838	3,889,994	4,710,832

Source: Navigant analysis of GPY3 Multi-Family program tracking data (2015-01-12 data extract).

† Deemed value, except for program level NTGR, which is verified net savings/verified gross savings.

‡ Based on evaluation research findings, which is verified gross savings/ex ante gross savings. The value of 100 percent is rounded.

### E.2. Program Savings by Channel and Measure Type

Table E-2 summarizes GPY3 Multi-Family Program energy savings by delivery channel.

---

<sup>6</sup> The tracking system incorrectly applied 0.96 NTGR instead of SAG approved 0.93 NTGR to estimate ex ante net savings from common area showerheads, aerators and spray valves. Similarly, a 0.93 NTGR instead of 0.96 was applied to estimate ex ante net savings from thermostats installed in residential units. The evaluation corrected ex ante net savings produces 10,593 therms more than the tracking ex ante net savings.

**Table E-2. GPY3 Multi-Family Program Savings by Delivery Channel**

Program Channel	Ex-Ante Gross Savings (therms)	Verified Gross Realization Rate <sup>‡</sup>	Verified Gross Savings (therms)	Net-to-Gross Ratio <sup>†</sup>	Verified Net Savings (therms)	Percent Verified Net Savings
<b>Direct Install Measures</b>						
In-unit	836,693	100%	836,552	0.96	803,090	17%
Common Areas	295,003	100%	295,723	0.93	275,022	6%
<b>Direct Install Subtotal</b>	<b>1,131,696</b>	<b>100%</b>	<b>1,132,275</b>	<b>na</b>	<b>1,078,112</b>	<b>23%</b>
<b>Prescriptive Incentive Measures</b>						
In-unit	18,514	100%	18,488	0.96	17,748	<1%
Common Areas	979,208	100%	980,971	0.93	912,303	20%
<b>Incentive Subtotal</b>	<b>997,722</b>	<b>100%</b>	<b>999,458</b>	<b>na</b>	<b>930,051</b>	<b>20%</b>
<b>Trade Ally Installations</b>						
Common Areas	1,138,830	100%	1,138,830	0.93	1,059,112	22%
Small Multi-Family Pilot <sup>7</sup>	1,749,549	101%	1,771,340	0.93	1,647,347	35%
<b>TAI Subtotal</b>	<b>2,888,379</b>	<b>101%</b>	<b>2,910,171</b>	<b>na</b>	<b>2,706,459</b>	<b>57%</b>
<b>GPY3 Multi-Family Total</b>	<b>5,013,722</b>	<b>100%</b>	<b>5,037,829</b>	<b>0.94<sup>‡</sup></b>	<b>4,710,832</b>	<b>100%</b>

Source: Navigant analysis of GPY3 Multi-Family Program tracking data (2015-01-12 data extract).

<sup>†</sup> Deemed value, except for program level NTGR, which is verified net savings/verified gross savings;

<sup>‡</sup> Based on evaluation research findings. The value of 100 percent is rounded.

Table E-3 summarizes GPY3 Multi-Family Program savings by measure type. The program achieved a verified net savings of 4,710,832 therms. The direct install and comprehensive measures from MCEEP implemented by Franklin Energy represented 3,079,476 therms or 65 percent of the total verified net savings. The Small Multi-Family Pilot Program building shell improvement measures represented 1,647,347 therms or 35 percent of the net savings.

<sup>7</sup> The savings attributed to the Small Multi-Family Pilot Program includes 24,072 gross therms (17,194 verified gross or 15,990 verified net therms) from 3 attic insulation projects completed in GPY2 but carried over to GPY3.

**Table E-3. GPY3 Multi-Family Program Savings by Measure**

Program Measures	Ex-Ante Gross Savings (therms)	Verified Gross Realization Rate <sup>†</sup>	Verified Gross Savings (therms)	Net-to-Gross Ratio <sup>†</sup>	Verified Net Savings (therms)
<b>Direct Install Measures</b>					
Bathroom Aerators	30,172	102%	30,669	DI=0.96, CA=0.93	29,389
Kitchen Aerators	65,043	100%	65,151		62,533
Programmable Thermostats	350,048	100%	350,048		335,907
Showerheads	400,852	100%	400,826		384,692
Pipe Insulations	285,463	100%	285,463	0.93	265,481
Spray Valves	118	100%	118	0.93	110
<b>Direct Install Subtotal</b>	<b>1,131,696</b>	<b>100%</b>	<b>1,132,275</b>	<b>na</b>	<b>1,078,112</b>
<b>Comprehensive Measures</b>					
Small Multi-Family Pilot (Air Sealing)	1,104,654	110%	1,219,703	0.93	1,134,324
Small Multi-Family Pilot (Attic Insulation) <sup>8</sup>	644,895	86%	551,637	0.93	513,023
Programmable Thermostats	12,754	100%	12,728	0.93	12,213
Hot Water Temperature Setbacks	5,938	100%	5,938	0.96	5,700
Boiler Reset Controls	219,468	101%	221,231	0.93	205,745
Boiler/Furnace Tune-Up	426,390	100%	426,390	0.93	396,542
Energy Efficiency Boilers	187,158	100%	187,158	0.93	174,057
High Efficiency Furnaces	636	100%	636	0.93	591
Pipe Insulations	802,371	100%	802,371	0.93	746,205
Steam Traps	405,570	100%	405,570	0.93	377,180
Storage Water Heaters	72,192	100%	72,192	0.93	67,138
<b>Comprehensive Measures Subtotal</b>	<b>3,882,026</b>	<b>101%</b>	<b>3,905,554</b>	<b>na</b>	<b>3,632,720</b>
<b>GPY3 Multi-Family Total</b>	<b>5,013,722</b>	<b>100%</b>	<b>5,037,829</b>	<b>0.94<sup>†</sup></b>	<b>4,710,832</b>

Source: Navigant analysis of GPY3 Multi-Family Program tracking data (2015-01-12 data extract).

<sup>†</sup> Deemed value, except for program level NTGR, which is verified net savings/verified gross savings.

<sup>‡</sup> Based on evaluation research findings.

### E.3. Impact Estimate Parameters

The evaluation team used a variety of parameters to estimate the verified gross and net savings. Some of those parameters were deemed for this program year and others were adjusted based on evaluation research. The key parameters used in the analysis are shown in Table E-4.

<sup>8</sup> Small Multi-Family Pilot attic insulation savings includes 24,072 gross therms (17,194 verified gross or 15,990 verified net therms) from 3 attic insulation projects completed in GPY2 but carried over to GPY3.

**Table E-4. Verified Gross and Net Savings Parameter Data Sources**

Parameter	Data Source	Deemed or Evaluated?
Measure-level NTGR	Illinois Stakeholder Advisory Group Consensus Process†	Deemed
Program-level NTGR	Calculation of Verified Net Savings/Verified Gross Savings	Evaluated
Realization Rate	Evaluation research	Evaluated
Measure Quantity Installed	Program tracking system	Evaluated
Tenant units Showerhead, Bathroom/Kitchen Aerators	Illinois TRM, version 2.0, section 5.4‡	Deemed
Common area Showerhead, Bathroom/Kitchen Aerators	Illinois TRM, version 2.0, section 4.3‡ Used TRM (v3.0) for errata correction	Deemed
Tenant units Programmable Thermostat	Illinois TRM, version 2.0, section 5.3.11‡	Deemed
Common Area Programmable Thermostat	Implementation Contractor Records & Evaluation Research (used GPY2 value)	Evaluated
Water Heater Temperature Setback	Illinois TRM, version 2.0, section 5.4.6.‡	Deemed
Common area HVAC Measures	Illinois TRM, version 2.0, section 4.4‡ Used TRM (v3.0) for errata correction	Deemed
Furnace Tune-Up	Implementation Contractor Records & Evaluation Research	Evaluated
Steam Traps	Illinois TRM, version 2.0, section 4.4.16‡	Deemed
Air Sealing	Illinois TRM, version 2.0, section 5.6.1‡	Deemed
Attic/Roof Insulation	TRM (v3.0) for errata correction, section 5.6.4‡	Deemed
Direct Install Domestic Hot Water Pipe Insulation	Illinois TRM, version 2.0, section 5.4.1.‡	Deemed
Common Area Boiler/Hot Water Pipe Insulation	Illinois TRM, version 2.0, section 4.4.14‡	Deemed

† Deemed values. Source: [http://ilsagfiles.org/SAG\\_files/Meeting\\_Materials/2013/August 5-6, 2013 Meeting/Nicor Gas NTG Results and Application GPY1-3.pdf](http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August%205-6,2013_Meeting/Nicor_Gas_NTG_Results_and_Application_GPY1-3.pdf).

‡ Source: State of Illinois Technical Reference Manuals: Illinois\_Statewide\_TRM\_Effective\_060113\_Version\_2.0\_060713\_Clean.pdf Illinois\_Statewide\_TRM\_Effective\_060114\_Version\_3.0\_021414\_Final\_Clean.pdf (for measure errata corrections).

#### **E.4. Program Volumetric Detail**

In GPY3, the MCEEP implemented 27,641 projects and 72,092 measures. Table E-5 disaggregates program volumetric findings by program delivery channels. The direct install category accounted for the most of program measure mix and project count, compared to the comprehensive category. Additional details of the measure count and projects installed in tenant space and common areas are presented in Figure E-1.

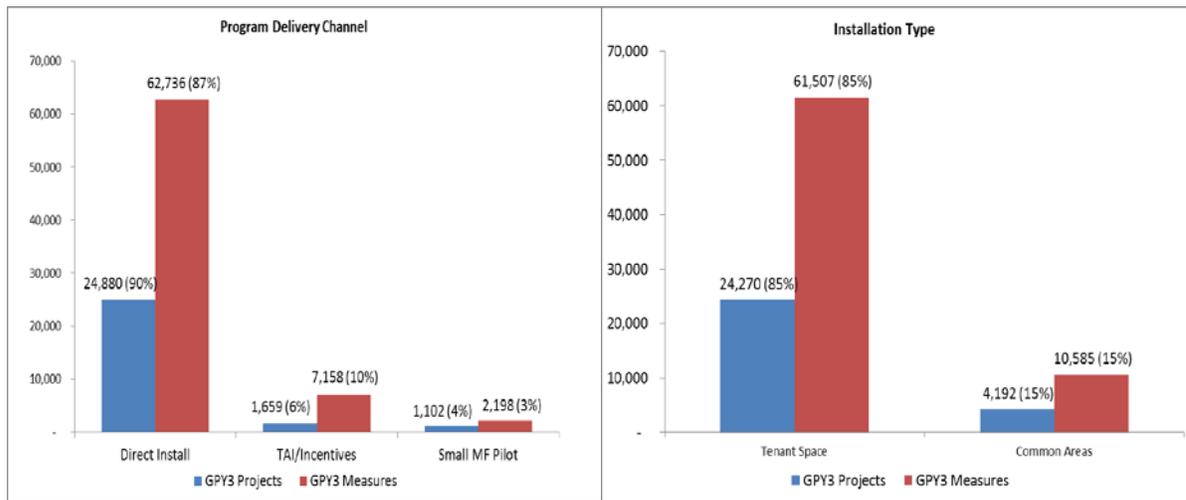
**Table E-5. GPY3 Multi-Family Program Primary Participation Detail**

Program Channel	Direct Install	Incentive	TAI	Total
FES Participants (Projects)	24,880	541	1,118	26,539
FES Implemented Measures <sup>9</sup>	62,736	2,886	4,272	69,894
Small Multi-Family Pilot Projects*	na	na	1,102	1,102
Small Multi-Family Pilot Measures*	na	na	2,198	2,198

Source: Navigant analysis of GPY3 Multi-Family program tracking data (2015-01-12 data extract).

\* The Small Multi-Family Pilot Projects/Measures include 3 roof cavity insulation projects from GPY2 which were not captured in the GPY2 verified savings. The projects savings are included in GPY3.

**Figure E-1. GPY3 Differences in MCEEP Participation**



Source: Navigant analysis of GPY3 Multi-Family program tracking data (2015-01-12 data extract).

\* Total of 821 projects/participants were identified with installations in both residential tenant units and common areas.

### E.5. Key Findings and Recommendations

Overall, the GPY3 MCEEP achieved verified net savings that were 55 percent more than the GPY3 net savings goal <sup>10</sup>, and significantly increased by 682 percent over GPY2 savings. In contrast to GPY2, the majority of program savings in GPY3 were from common area measures as opposed to direct install measures in residential dwelling units. The comprehensive (TAI/Incentive) common area measures including the pilot building shell improvement measures contributed to the program’s improved savings performance over previous years. Following are the key findings and recommendations.

<sup>9</sup> For reporting measure counts in this table, if a measure quantity is reported in the tracking system in linear feet, MBH or in square feet, Navigant treated each row entry of such measure as one measure quantity in this table. The actual linear feet, MBH or square feet are reported in Section 3.4 at the program level analysis. As an example, the MCEEP had 185,021 linear feet of pipe insulation, but Navigant treated each row entry of pipe insulation in the tracking system as one measure, and this summed up to 1,694 measures. The efficient boilers installed had 62,545 MBH total input capacities, but Navigant treated each row entry of boiler input capacity as one measure, and this summed up to 63 measures.

<sup>10</sup>Nicor Rider 30 4rd Quarterly Report PY3 ICC Filing, Order Docket 10-0562.

### Program Savings Goals Attainment

**Finding 1.** The GPY3 Multi-Family Program achieved verified net savings of 4,710,832 therms, which is 55 percent more than the GPY3 net savings goal of 3,034,125 therms, and significantly increased by 682 percent over GPY2 savings. The program performance is due primarily to the addition of TAI and Incentive common area program measures. Overall, the MCEEP three-year total verified net savings was 6,272,090 therms, which is 6 percent less than the portfolio planned net savings.

**Recommendation 1.** The implementation contractor should continue to identify common area and whole-building measure energy savings opportunities to maintain high program participation. Navigant conducted a benchmarking and best practices research on the new program design and presented our findings and recommendations to improve the program participation and savings in a March 26, 2014 memo to Nicor Gas. The memo is attached in the Appendix 7.2.

### Verified Gross Realization Rates

**Finding 2.** The GPY3 MCEEP verified gross realization rate was 100 percent.<sup>11</sup> Navigant applied adjustments to the tracking savings for the common area bathroom and faucet aerators and attic insulation measures to comply with the Illinois TRM policy directive to apply retroactive error corrections to TRM version 2.0 measures that are identified in TRM version 3.0 as “errata” measures.<sup>12</sup> The adjustments increased the claimed savings for the aerator measures and reduced the savings for the attic insulation measures. Navigant verified that the implementation contractor applied the appropriate errata corrections for other errata measures such as space heating, high efficiency furnace and boilers, boiler tune-up and boiler reset control measures.

**Recommendation 2.** Navigant recommends that the implementation contractor monitor the TRM update process throughout the program year and update the tracked program measure savings with any published errata updates released during the current program year (in this case GPY4) and prior to releasing final ex ante savings. Taking this step will reduce the chance for evaluation savings adjustments.

### Savings Verification Process

**Finding 3.** The MCEEP tracking system has input fields to collect most of the program measure savings assumptions, but certain custom inputs are not tracked. The attic insulation buildings gas heating equipment efficiency and the building exposure level parameters were not tracked for verification. Similarly, pipe sizes and other savings input characteristics should be tracked for the pipe insulation savings verification. Moreover, the total count of replaced steam traps and the boiler reset/cutout controls input capacities were adjusted upon a follow-up discussion with the program staff to clarify the tracking inputs. Minor savings adjustments were applied where necessary.

---

<sup>11</sup> Gross Realization Rate = verified gross savings / tracking ex ante gross savings. The value of 100 is rounded.

<sup>12</sup> The TRM Policy Directive from the Illinois TRM Technical Advisory Committee (TAC) and the SAG indicates that when a measure error has been identified in the TRM currently in effect (in this case v2.0 TRM) and the TAC review process results in a consensus revision, the measure is identified in the next update (in this case v3.0 TRM) as an ‘Errata’. In these instances the measure code indicates that a new version of the measure has been published, and that the effective date of the corrected measure savings dates back to June 1st, 2013 (refer to pages 10 to 15 of v3.0 TRM). Errata are generally published by the TRM Administrator prior to the release date of the next TRM update.

**Recommendation 3.**

- a. The implementation contractor should add data fields for custom inputs in the measures savings calculations if different from deemed values in the TRM.
- b. Nicor Gas should consider whether it is feasible to provide Navigant real-time access to the program tracking system to verify full measure-level details and view backup documentation to review project-specific documents, quantities, and invoices for measure savings verification purpose. A similar arrangement exists for the Business Custom Incentive Program and it has improved the efficiency for conducting the program impact evaluation. If real time access is not feasible, Navigant would make a data request to provide such detail on a random sample draw, and that could be burdensome.

**Finding 4.** The tracking system applied 0.96 NTG ratio to calculate the ex ante net savings from common area showerheads, aerators and spray valves. However, the SAG approved value is 0.93 for common area measures. Similarly, the tracking system applied a NTG ratio of 0.93 to calculate the ex ante net savings from thermostats installed in residential units, instead of the SAG approved value of 0.96 for measures in residential units. Navigant corrected the discrepancy and estimated the ex ante net savings to be 10,593 therms more than the tracking ex ante net savings. The evaluation verified net savings reflects the use of the SAG approved NTG ratios.

**Recommendation 4.** The tracking system NTG value for common area showerheads, aerators and spray valves should be corrected to 0.93, and the NTG value for thermostats installed in residential units should be corrected to 0.96 to be consistent with the SAG approved NTG values.

**Benchmarking Research**

**Finding 5.** Every best practice included in Navigant’s benchmarking research from March 2014 is currently implemented by MCEEP. However, the evaluation team identified a few potential opportunities to enhance program performance. Section 7.2 includes additional detail regarding the findings and recommendations from benchmarking research.

**Recommendation 5.**

- a. Offer qualified property managers the option to self-install direct install measures in units and common areas with the program conducting post-installation inspections.
- b. Ensure the weekly tracking reports and action items have sufficient detail to manage performance and to maximize the conversion ratio of assessed sites to prescriptive sites.
- c. After MCEEP gains additional market traction, the program may be able to lower its incentive levels without negatively affecting participation and savings.

Align the utility incentive program with housing financing programs and partner with local housing authorities.

## 1. Introduction

### 1.1 Program Description

This report presents a summary of the findings and results from the impact evaluation of the Nicor Gas Multi-Family Comprehensive Energy Efficiency Program (MCEEP), which is electric program year six (EPY6) and gas program year three (GPY3).<sup>13</sup> The EPY6/GPY3 program year is the first full year for joint comprehensive program delivery with Commonwealth Edison Company (ComEd).<sup>14</sup> The program achieves electric energy and demand savings for ComEd customers and natural gas energy savings for customers of Nicor Gas Company (Nicor Gas). This evaluation report includes total Nicor Gas impacts from the jointly implemented program. A separate evaluation report includes the electric impacts from the jointly delivered ComEd program.

During EPY6/GPY3, MCEEP continued to implement its direct install components (programmable thermostats, hot water pipe wrap insulation, and water efficiency measures in residential dwelling units and common areas). Concurrently, MCEEP developed marketing and outreach materials, and offered technical services and financial incentives to commercial contractors and multi-family decision-makers to install program measures designed to achieve energy savings in whole buildings and grounds. These measures include upgrades or improvements to central plant and heating, ventilating, and air-conditioning (HVAC) systems and controls, interior and exterior lighting systems, building shell improvements, among others. Some MCEEP measures were previously offered through different programs, such as the Business Energy Efficiency Rebate program and the Small Business Energy Efficiency Program. The MCEEP was delivered through three channels in EPY6/GPY3: direct install, trade ally installation (TAI), and prescriptive incentives. The TAI and incentive categories comprised the comprehensive component of the MCEEP design in EPY6/GPY3, in addition to the direct install measures offered in the previous program years.

The GPY3 evaluation involved verifying the compliance of the program with the Illinois Technical Reference Manual (TRM)<sup>15</sup> or applied necessary research adjustments to non-deemed custom comprehensive measures. The GPY3 net-to-gross (NTG) ratio was deemed through a consensus process by the Illinois Energy Efficiency Stakeholder Advisory Group (SAG).<sup>16</sup> Navigant conducted a best practices research on the new program design and interviewed program staff and the implementation contractor staff to verify information about program performance, measures and tracking system.

Franklin Energy Services, LLC (Franklin Energy or FES) was the primary implementation contractor for the MCEEP. The GPY3 evaluation report includes findings from the Nicor Gas Small Multi-Family Pilot Program<sup>17</sup> targeted at decision makers of small multifamily buildings to implement building shell improvement measures like air sealing and attic/roof cavity insulation measures. The

<sup>13</sup> EPY6/GPY3 began June 1, 2013, and ended May 31, 2014.

<sup>14</sup> In March 2013, the program started planning a new design and delivery strategy to target whole-building savings, which resulted in the program now being referred to as MCEEP.

<sup>15</sup> State of Illinois Energy Efficiency Technical Reference Manual\_Effective\_060113\_Version\_2.0\_060713\_Clean.pdf;

<sup>16</sup> See <http://www.ilsag.info/> for more information on the SAG and net-to-gross framework.

<sup>17</sup> Small Multi-Family participants are decision makers for MF buildings of 5-40 units. This population is identical to the participants of the Comprehensive component.

pilot program was implemented by the Conservation Services Group (CSG) through trade ally installations. The Multi-Family Program implementation contractor transition to CLEAResult began in March 2014 in preparation for EPY7/GPY4.

## **1.2 Evaluation Objectives**

The objectives of GPY3 Multi-Family Program evaluation are to:

- (1) Provide an independent estimate of the net therm savings produced by the program in GPY3.
- (2) Review the assumptions and algorithms used to generate the savings reported in the tracking data for compliance with the statewide TRM, and recommend changes if needed.
- (3) Interview program staff and the implementation contractor to assess the effectiveness of the administration and implementation of the program.
- (4) Complete a benchmarking and best practices study for the jointly implemented Multi-Family Program, based on research questions from the EPY5/GPY2 multi-family program evaluation plan.

## 2. Evaluation Approach

This section describes the data that Navigant collected and the method for analyzing the data to meet the GPY3 evaluation objectives. The core activity in the GPY3 evaluation was tracking system review of measure type and savings using the tracking data received on January 12, 2015. This involved early review of the input fields of the program tracking system for the Multi-Family Program, and providing feedback to Nicor Gas and CLEAResult of what additional inputs were necessary to track for the evaluation exercise. Additional interviews were conducted with program staff and implementation staff to assess program performance, and for clarification on tracking system inputs.

### 2.1 Primary Data Collection

#### 2.1.1 Overview of Data Collection Activities

The core data collection activities for the GPY3 evaluation are shown in the Table 2-1.

**Table 2-1. Core Data Collection Activities**

N	What	Who	Target Completes	Completes Achieved	When	Comments
<i>Impact Assessment</i>						
1	Measure Savings Review	Program Tracking System	All	All	July-Nov 2014; January-February 2015	Source of information for verified gross analysis
<i>Process Assessment</i>						
2	Interviews	Program Managers/Implementer Staff	3	3	March-April 2014	Includes interviews with staff from ComEd, Nicor Gas and Franklin Energy

Source: Navigant

#### 2.1.2 Verified Savings Parameters

Table 2-2 below presents the sources for parameters that were used in verified gross savings analysis indicating which were examined through GPY3 evaluation research and which were deemed.

**Table 2-2. Verified Gross and Net Savings Parameter Data Sources**

Parameter	Data Source	Deemed or Evaluated?
Measure-level NTGR	Illinois Stakeholder Advisory Group Consensus Process†	Deemed
Program-level NTGR	Calculation of Verified Net Savings/Verified Gross Savings	Evaluated
Realization Rate	Evaluation research	Evaluated
Measure Quantity Installed	Program tracking system	Evaluated
Tenant units Showerhead, Bathroom/Kitchen Aerators	Illinois TRM, version 2.0, section 5.4‡	Deemed
Common area Showerhead, Bathroom/Kitchen Aerators	Illinois TRM, version 2.0, section 4.3‡ Used TRM (v3.0) for errata correction	Deemed
Tenant units Programmable Thermostat	Illinois TRM, version 2.0, section 5.3.11‡	Deemed
Common Area Programmable Thermostat	Used GPY2 evaluation value	Evaluated
Water Heater Temperature Setback	Illinois TRM, version 2.0, section 5.4.6.‡	Deemed
Common area HVAC Measures	Illinois TRM, version 2.0, section 4.4‡ Used TRM (v3.0) for errata correction	Deemed
Furnace Tune-Up	Implementation Contractor records & evaluation research	Evaluated
Steam Traps	Illinois TRM, version 2.0, section 4.4.16‡	Deemed
Air Sealing	Illinois TRM, version 2.0, section 5.6.1‡	Deemed
Attic/Roof Insulation	TRM (v3.0) for errata correction, section 5.6.4‡	Deemed
Direct Install Domestic Hot Water Pipe Insulation	Illinois TRM, version 2.0, section 5.4.1.‡	Deemed
Common Area Boiler/Hot Water Pipe Insulation	Illinois TRM, version 2.0, section 4.4.14‡	Deemed

† [http://ilsagfiles.org/SAG\\_files/Meeting\\_Materials/2013/August 5-6, 2013](http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August%205-6,%202013)

[Meeting/Nicor Gas NTG Results and Application GPY1-3.pdf](#)

‡ Reference Manuals: Illinois\_Statewide\_TRM\_Effective\_060113\_Version\_2.0\_060713\_Clean.pdf;

Illinois\_Statewide\_TRM\_Effective\_060114\_Version\_3.0\_021414\_Final\_Clean.pdf (for measure errata corrections)

Source: Navigant analysis of programs tracking data and secondary research.

### 2.1.3 Verified Gross Program Savings Analysis Approach

Methods for gross savings verification of TRM measures employed in GPY3 are tracking data review and engineering review of measure savings for compliance with the Illinois TRM. TRM Version 2.0 was used for GPY3 evaluation except for measures with errata correction, where Version 3.0 was used. For GPY3 non-deemed common area measures such as furnace tune-up and programmable thermostats, Navigant relied on secondary research or previous year’s review of non-deemed values to verify the claimed savings. The verified gross savings are the product of verified per unit savings and verified measure quantities.

#### **2.1.4 Verified Net Program Savings Analysis Approach**

Verified net energy savings were calculated by multiplying the verified gross savings estimates by a deemed net-to-gross ratio (NTGR). In GPY3, the NTGR estimates used to calculate the net verified savings were deemed through a consensus process by the Illinois Stakeholder Advisory Group (SAG).<sup>18</sup> The NTGR for gas measures installed in residential dwelling units was 0.96 and for measures installed in common areas was 0.93. No additional participant customer or trade ally free ridership or spillover research was conducted for GPY3.

#### **2.1.5 Process Evaluation**

Navigant did not conduct a participant customer survey for GPY3 process evaluation. The GPY3 process evaluation activities included interviews with program staff and implementation staff to assess program performance, the effectiveness of program implementation, and the tracking system.

Navigant completed a benchmarking and best practices study for the newly designed jointly implemented Multi-Family Program, based on research questions from the EPY5/GPY2 Multi-Family Program evaluation plan. Benchmarking and best practices findings and recommendations were presented in a memo to Nicor Gas on March 26, 2014. Details of the best practices findings are presented in Appendix 7.2.

---

<sup>18</sup> Document provided by Nicor Gas to the SAG summarizing the SAG-approved NTGR for Nicor Gas for GPY1-GPY3 as negotiated in March-August 2013. Distributed in the SAG meeting on August 5-6, 2013. [http://ilsagfiles.org/SAG\\_files/Meeting\\_Materials/2013/August 5-6, 2013 Meeting/Nicor Gas Net-to-Gross Results and Application GPY1-3.pdf](http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August 5-6, 2013 Meeting/Nicor Gas Net-to-Gross Results and Application GPY1-3.pdf).

### 3. Gross Impact Evaluation

The gross impact analysis involved tracking system review, verification of installed measures and measure savings. The verified savings were calculated by multiplying the quantity of measures installed by the verified measure unit savings. The program verified gross realization rate was determined by the ratio of the verified savings and the tracking ex ante savings. Navigant estimated that the GPY3 Multi-Family Program achieved verified gross savings of 5,037,829 therms and a 100 percent verified gross realization rate.

#### 3.1 Tracking System Review and Savings Verification

Navigant, Nicor Gas and the program implementation contractor (CLEAResult ) maintained close contact over the course of the GPY3 program year, regarding the program tracking system (Program Management Tool or PMT) updates and status of previous program evaluation recommendations. Navigant provided early review and feedback on additional input fields to include in the PMT tracking system for the GPY3 evaluation. We also maintained contact with Franklin Energy to receive preliminary tracking data.

Navigant used the data extracts from the PMT tracking system received on January 12, 2015 to verify the GPY3 program ex ante inputs and ex ante savings. Below are the key findings from the tracking system review.

1. Navigant applied adjustments to the tracking system savings for the common area bathroom and faucet aerators and attic insulation measures. This was in compliance with the SAG and the Illinois TRM Technical Advisory Committee policy directive to apply corrections to errata measures in TRM (v2.0) using the TRM (v3.0) effective June 1, 2013.<sup>19</sup>
  - The errata correction for the common area bathroom and kitchen aerators involved changing the average flow rate of the baseline faucet from 1.2 to 1.39 gallons per minute. The verified measure unit savings were calculated based on the miscellaneous building type annual gallons of mixed water per faucet assumption in the TRM. The verified savings for the aerator measures increased.
  - The errata correction for the attic/roof insulation shell improvement measure involved an update of the framing factor assumption, and the addition of an adjustment factor for attic insulation to account for prescriptive engineering algorithms over claiming savings. The verified savings for this measure decreased.
  - The implementation contractor applied the appropriate errata corrections to other errata measures such as space heating high efficiency furnace and boilers, boiler tune-up and boiler reset control measures.
2. The tracking system has input fields designed to collect most of the program measure savings assumptions, but certain custom inputs are not tracked. Inputs are recorded for some

---

<sup>19</sup> The TRM Policy Directive from the Illinois TRM Technical Advisory Committee (TAC) and the SAG indicates that when a measure error has been identified in the TRM currently in effect (in this case v2.0 TRM) and the TAC review process results in a consensus revision, the measure is identified in the next update (in this case v3.0 TRM) as an 'Errata'. In these instances the measure code indicates that a new version of the measure has been published, and that the effective date of the corrected measure savings dates back to June 1st, 2013 (refer to pages 10 to 15 of v3.0 TRM). Errata are generally published by the TRM Administrator prior to the release date of the next TRM update.

measures like the space heating measure efficiencies and capacity inputs, but the building exposure level input assumption for attic insulation savings, and the gas heating equipment efficiency for air sealing and attic insulation savings calculations were not tracked. Upon further discussion with the implementation contractor, the evaluation team assumed the multi-family buildings with air sealing shell improvement had “normal” building exposure level. Applying the appropriate TRM assumptions and a 70% gas heating system efficiency resulted in an increase of the measure savings.

3. The tracking system entries for pipe insulation measures did not include a complete description of pipe sizes and characteristics to enable adequate verification of project specific claimed savings. This limitation did not result in savings verification adjustments in GPY3 but adjustments could occur in future program years if the impact evaluation conducts file reviews or on-site visits to obtain measure data at the full level of detail contained within the TRM.
4. The reported quantity of 3,134 steam traps in the Nicor Gas database were “quantity surveyed” and not “quantity installed”. The Nicor Gas database had associated correct savings with an incorrect quantity. The evaluation team verified 1,229 steam traps as the installed quantity after reviewing the program implementation contractor database. The reported project savings were verified as correct and match in both data sets. Similarly, the evaluation team identified 18 projects with boiler reset/cutout controls that had the boiler input capacities (MBH) doubled in the Nicor Gas database. This is due to the need for the implementation contractor to enter MBH information twice to calculate incentives and savings. Again, the savings in either data set were verified as correct and match. The evaluation team found that projects #610104 and #658700 with boiler reset/cutout controls were tracked as paid and closed in GPY3, but the tracking savings were set to zero. The evaluation team calculated 1,730 therms as the verified savings for the two projects.
5. The evaluation team corrected the ex ante NTG ratio from 0.96 to 0.93 for common area showerheads, aerators and spray valves, and similarly corrected the NTG ratio for programmable thermostats installed in residential units from 0.93 to 0.96. The correction increased the total ex ante net savings from 4,677,825 therms to 4,688,418 therms, a difference of 10,593 therms. The GPY3 verified net savings reflects the corrected and SAG approved NTG ratios.

### 3.2 Program Volumetric Findings

Table 3-1 disaggregates the program volumetric findings into the program delivery channels and installation types. The Multi-Family Program in GPY3 implemented 27,641 projects and 72,092 measures. In terms of program delivery, the direct installation component of the program provided most of program measure mix and project counts compared to the comprehensive component. The residential tenant unit installations accounted for most of the program measure counts and projects compare to the common area installations.

**Table 3-1. GPY3 Volumetric Findings by Program Delivery**

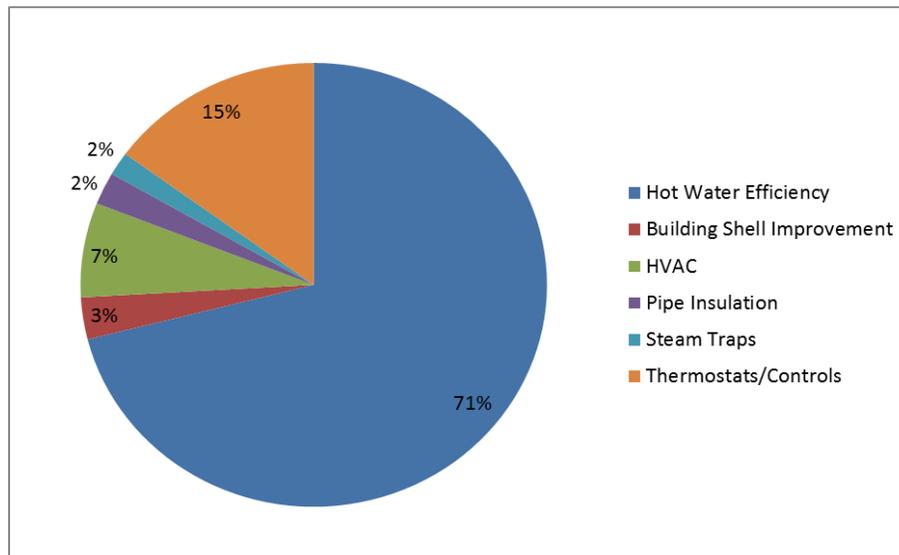
Participation	GPY3 Measures	Measure %	GPY3 Projects	Projects %
<b>Implementation Contractor</b>				
Franklin Energy Services (FES)	69,894	97%	26,539	96%
Conservation Services Group (CSG)	2,198	3%	1,102	4%
<b>Program Channel</b>				
Direct Installation	62,736	90%	24,880	90%
Incentives	2,886	4%	541	2%
TAI	4,272	6%	1,118	4%
Small MF Pilot	2,198	3%	1,102	4%
<b>Installation Type</b>				
Tenant Space (in-unit)	61,507	85%	24,270	85%
Common Areas	10,585	15%	4,192	15%

Source: Navigant analysis of GPY3 program tracking data (2015-01-12 data extract).

\* Total of 821 projects/participants installed measures in both residential tenant units and common areas.

Figure 3-1 provides the measure mix by end-use type. Overall, the hot water efficiency measures such as aerators, showerheads, spray valves, and water heaters contributed 71 percent of the MCEEP measure mix/quantity in GPY3, with 15 percent from programmable thermostat installations including temperature setbacks, and 3 percent from building shell improvement measures like air sealing and attic insulations.

**Figure 3-1. Number of Measures Installed by End-use Type**



Source: Navigant analysis of GPY3 program tracking data (2015-01-12 data extract).

Table 3-2 below provides additional measure details for the direct installation measures and comprehensive (TAI and incentive) measures. As indicated, ex ante and verified measure counts had

a difference of 1,905 due to adjustment of the reported number of steam traps. The direct installation projects represented 87 percent of the measure count compare to 13 percent from the comprehensive measures. The residential tenant units represented 85 percent of the measure compare to 15 percent from the common area measures.

**Table 3-2. GPY3 MCEEP Ex Ante and Verified Measure Count**

Measure	Unit	Install Type	Ex Ante Measure Count	Verified Measure Count
<b>Direct Install Measures</b>				
Bathroom Aerators	Each	In-unit/ Common area	19,581	19,581
Kitchen Aerators	Each		15,518	15,518
Programmable Thermostats	Each		10,126	10,126
Showerheads	Each		16,119	16,119
Pipe Insulations	Each	Common area	1,391	1,391*
Spray Valves	Each	Common area	1	1
<b>Direct Install Subtotal</b>			<b>62,736</b>	<b>62,736</b>
<b>Comprehensive (TAI/Incentives)</b>				
Small Multi-Family Pilot (Air Sealing)	Each	Common area	1,097	1,097
Small Multi-Family Pilot (Attic Insulation)	Each	Common area	1,101	1,101****
Programmable Thermostats	Each	Common area	656	656
Hot Water Temperature Setbacks	Each	Common area	4	4
Boiler Reset Controls	Each	Common area	126	126
Boiler/Furnace Tune-Up	Each	Common area	4,685	4,685
Energy Efficiency Boilers	Each	Common area	63	63**
High Efficiency Furnace	Each	Common area	5	5
Pipe Insulations	Each	Common area	303	303*
Steam Traps	Each	Common area	3,134	1,229***
Storage Water Heaters	Each	Common area	87	87
<b>Comprehensive Subtotal</b>			<b>11,261</b>	<b>9,356</b>
<b>GPY3 MCEEP Total</b>			<b>73,997</b>	<b>72,092</b>

Source: Navigant analysis of GPY3 program tracking data (2015-01-12 data extract).

\* The program installed 185,021 linear feet of pipe insulation. For evaluation reporting purpose, Navigant treated each row entry of pipe insulation in the tracking data as one measure, making a total of 1,694 measures.

\*\* The efficient boilers had 62,545 MBH total input capacities, but Navigant treated each row entry of boiler input capacity as one measure, and this summed up to 63 measures.

\*\*\* As mentioned above in the tracking system review section, the verified measure count of steam traps is 1, 229.

\*\*\*\* The Small Multi-Family Pilot Projects/Measures include 3 roof cavity insulation projects from GPY2 which were not captured in the GPY2 verified savings. The projects savings are included in GPY3.

### 3.3 Gross Program Impact Parameter Estimates

As described in Section 2, ex ante energy savings were verified using the assumptions and algorithms specified in the TRM (v2.0) or TRM (v3.0) for errata measures or through engineering analysis for non-deemed measures. Table 3-3 indicates the input parameters to estimate verified gross savings.

**Table 3-3. Verified Gross Savings Parameters**

Measure/Input Parameters	Ex-Ante Value	Verified Value	Unit	Source
Measure Quantity	73,994	72,089		Evaluated
Verified Gross Realization Rate		101%		Evaluated
Bathroom Aerators	1.5 (IU), 4.6 (CA)	1.5 (IU), 6.9 (CA)	therms/unit	Deemed TRM v2.0 & v3.0
Kitchen Aerators	4.19 (IU), 4.6 (CA)	4.19 (IU), 6.9 (CA)	therms/unit	Deemed TRM v2.0 & v3.0
Programmable Thermostats	34.2 (IU), 19.2 (IU), 178 (CA)	34.2 (IU), 19.2 (IU), 178 (CA)	therms/unit	Deemed TRM v2.0, Evaluated
Showerheads	24.9 (IU), 21.6 (CA)	24.9 (IU), 21.6 (CA)	therms/unit	Deemed TRM v2.0
Pipe Insulations	Vary	Vary. Acceptable as is.	therms/Ln. Ft	Deemed TRM v2.0
Spray Valves	118	118	therms/unit	Deemed TRM v2.0
Air Sealing	Vary	Vary. Adjusted upward	therms/unit	Deemed TRM v2.0
Attic Insulation	Vary	Vary. Adjusted downward	therms/unit	Deemed TRM v3.0
Boiler/Furnace Tune-up	Vary	Vary. Acceptable as is.	therms/MBH	Deemed TRM v3.0
Boiler Reset Controls	Vary	Vary. Adjusted upward	therms/MBH	Deemed TRM v3.0
Energy Efficiency Boilers	Vary	Vary. Acceptable as is.	therms/MBH	Deemed TRM v3.0
HW Temperature Setbacks	Each	Vary	therms/unit	Deemed TRM v2.0
High Efficiency Furnace	Vary	Vary. Acceptable as is.	therms/unit	Evaluated
Steam Traps	330	330	therms/unit	Deemed TRM v2.0
Storage Water Heaters	Vary	Vary. Acceptable as is.	therms/unit	Deemed TRM v2.0

Source: Utility tracking data and Navigant analysis; Illinois TRM (version 2.0 & 3.0)  
 Reference Manuals: Illinois\_Statewide\_TRM\_Effective\_060113\_Version\_2.0\_060713\_Clean.pdf;  
 Illinois\_Statewide\_TRM\_Effective\_060114\_Version\_3.0\_021414\_Final\_Clean.pdf (for measure errata corrections)

### 3.4 Development of the Verified Gross Realization Rate

The program verified gross realization rate was determined by calculating the ratio of the verified gross savings and the tracking ex ante gross savings. Table 3-4 shows the verified gross realization rates by measure, aggregated at the program delivery level with 100 percent gross realization rate.

**Table 3-4. GPY3 MCEEP Gross Realization Rate by Measure**

Program Measure	Verified Quantity	Ex Ante Gross Savings	Verified Gross Realization Rate <sup>‡</sup>	Verified Gross Savings	GPY3 Gross Savings (percent)
<b>Direct Install Measures</b>					
Bathroom Aerators	19,581	30,172	102%	30,669	1%
Kitchen Aerators	15,518	65,043	100%	65,151	1%
Programmable Thermostats	10,126	350,048	100%	350,048	7%
Showerheads	16,119	400,852	100%	400,826	8%
Pipe Insulations	1,391	285,463	100%	285,463	6%
Spray Valves	1	118	100%	118	0%
<b>Direct Install Subtotal</b>	<b>62,736</b>	<b>1,131,696</b>	<b>100%</b>	<b>1,132,275</b>	<b>23%</b>
<b>Comprehensive (TAI/Incentive) Measures</b>					
Small Multi-Family Pilot (Air Sealing)	1,097	1,104,654	110%	1,219,703	24%
Small Multi-Family Pilot (Attic Insulation) <sup>20</sup>	1,101	644,895	86%	551,637	11%
Programmable Thermostats	656	12,754	100%	12,728	0%
HW Temperature Setbacks	4	5,938	100%	5,938	0%
Boiler Reset Controls	126	219,468	101%	221,231	4%
Boiler/Furnace Tune-up	4,685	426,390	100%	426,390	8%
Energy Efficiency Boilers	63	187,158	100%	187,158	4%
High Efficiency Furnace	5	636	100%	636	0%
Pipe Insulations	303	802,371	100%	802,371	16%
Steam Traps	1,299	405,570	100%	405,570	8%
Storage Water Heaters	87	72,192	100%	72,192	1%
<b>Comprehensive Subtotal</b>	<b>11,261</b>	<b>3,882,026</b>	<b>101%</b>	<b>3,905,554</b>	<b>77%</b>
<b>MCEEP GPY3 Total</b>	<b>73,997</b>	<b>5,013,722</b>	<b>100%</b>	<b>5,037,829</b>	<b>100%</b>

Source: Navigant analysis of GPY3 program tracking data (2015-01-12 data extract).

The program overall verified gross realization rate value of 100 is rounded.

<sup>20</sup> Small Multi-Family Pilot attic insulation savings includes 24,072 gross therms from 3 attic insulation projects completed in GPY2 but carried over to GPY3. The verified gross savings was adjusted to 17,194 therms due to errata correction of the savings assumptions from the TRM v3.0.

### 3.5 Verified Gross Program Impact Results

The verified gross impact results for the GPY3 Multi-Family Program is 5,037,829 therms as shown in Table 3-5. The evaluation research was not based on a sampling strategy to verify measure gross savings since the TRM was used to determine verified savings.

**Table 3-5. GPY3 MCEEP Verified Gross Impact Savings Estimates**

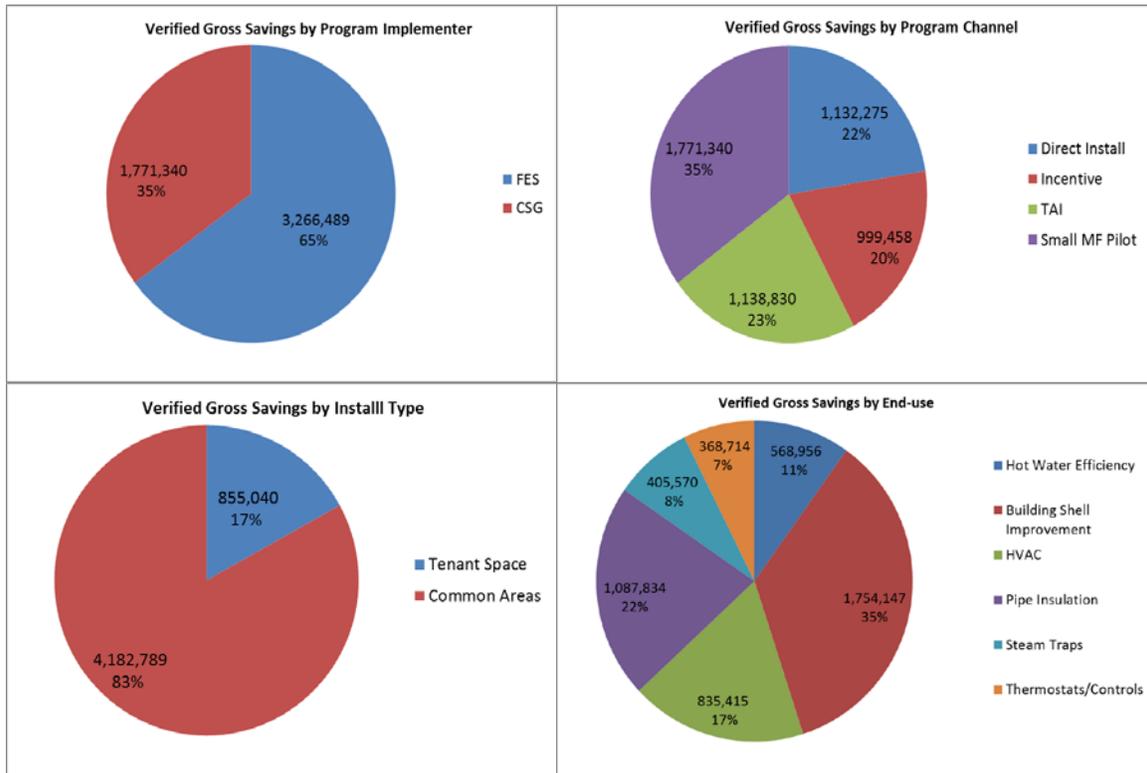
Category	Sample	Energy Savings (therms)	90/10 Significance?
<b>Direct Install</b>			
Ex-Ante Gross Savings	†NA	1,131,696	†NA
Verified Gross Realization Rate		100%	
Verified Gross Savings		1,132,275	
<b>Incentive</b>			
Ex-Ante Gross Savings	†NA	993,647	†NA
Verified Gross Realization Rate		100%	
Verified Gross Savings		995,384	
<b>TAI</b>			
Ex-Ante Gross Savings	†NA	1,138,830	†NA
Verified Gross Realization Rate		100%	
Verified Gross Savings		1,138,830	
<b>Small MF Pilot</b>			
Ex-Ante Gross Savings	†NA	1,749,549	†NA
Verified Gross Realization Rate		101%	
Verified Gross Savings		1,771,340	
<b>GPY3 MCEEP Total</b>			
Ex-Ante Gross Savings	†NA	5,013,722	†NA
Verified Gross Realization Rate		100%	
Verified Gross Savings		5,037,829	

Source: Evaluation Team analysis.

†NA when the TRM determines the gross savings. The savings for evaluated non-deemed measures was determined by engineering review of tracking data, not sampling.

‡ Based on evaluation research findings. The value of 100 is rounded.

**Figure 3-2. GPY3 MCEEP Verified Gross Savings by Program Components**



Source: Navigant analysis of GPY3 program tracking data (2015-01-12 data extract).

Figure 3-2 provides the disaggregation of the GPY3 Multi-Family Program verified gross savings by program components. The direct install and comprehensive measures from MCEEP implemented by Franklin Energy represented 3,266,489 therms or 65 percent of the total verified gross savings. The Small Multi-Family Pilot Program building shell improvement air sealing and attic insulation measures represented 1,771,340 therms or 35 percent of the verified gross savings. The shell improvement measures contributed the bulk of the program savings followed by pipe insulation with 22 percent. Overall, the direct install projects accounted for 22 percent of the verified gross savings, and the comprehensive component (including the pilot program) accounted for 78 percent of the verified gross savings.

## 4. Net Impact Evaluation

As noted in Section 2, Navigant used deemed net-to-gross ratio (NTGR) estimates from the Illinois Stakeholder Advisory Group (IL SAG) consensus process. For this program, the values used to calculate the GPY3 Multi-Family Program verified net savings were a net-to-gross ratio of 0.96 for residential in-unit installations and 0.93 for common area measures.<sup>21</sup> The evaluation team estimated a verified net savings of 4,710,832 therms for the program in GPY3 as shown in Table 4-1. The estimates are not statistically significant at the 90/10 level since no sampling was performed.

**Table 4-1. GPY3 MCEEP Program Verified Net Savings Estimates**

Program Channel	Ex-Ante Gross Savings (therms)	Verified Gross Realization Rate‡	Verified Gross Savings (therms)	Net-to-Gross Ratio +	Verified Net Savings (therms)	90/10 Significance ?
<b>Direct Install Measures</b>						
In-unit	836,693	100%	836,552	0.96	803,090	NA†
Common Area	295,003	100%	295,723	0.93	275,022	NA†
<b>Direct Install Subtotal</b>	<b>1,131,696</b>	<b>100%</b>	<b>1,132,275</b>	<b>na</b>	<b>1,078,112</b>	NA†
<b>Prescriptive Incentive Measures</b>						
In-unit	18,514	100%	18,488	0.96	17,748	NA†
Common Area	979,208	100%	980,971	0.93	912,303	NA†
<b>Incentive Subtotal</b>	<b>997,722</b>	<b>100%</b>	<b>999,458</b>	<b>na</b>	<b>930,051</b>	NA†
<b>Trade Ally Installations (TAI)</b>						
Common Area	1,138,830	100%	1,138,830	0.93	1,059,112	NA†
Small Multi-Family Pilot <sup>22</sup>	1,749,549	101%	1,771,340	0.93	1,647,347	NA†
<b>TAI Subtotal</b>	<b>2,888,379</b>	<b>101%</b>	<b>2,910,171</b>	<b>na</b>	<b>2,706,459</b>	NA†
<b>GPY3 Multi-Family Total</b>	<b>5,013,722</b>	<b>100%</b>	<b>5,037,829</b>	<b>0.94†</b>	<b>4,710,832</b>	

Source: Navigant analysis of GPY3 Multi-Family Program tracking data (2015-01-12 data extract).

† Deemed value, except for program level NTGR, which is verified net savings/verified gross savings.

‡ Based on evaluation research findings. The value of 100 is rounded.

†NA when the TRM determines the gross savings.

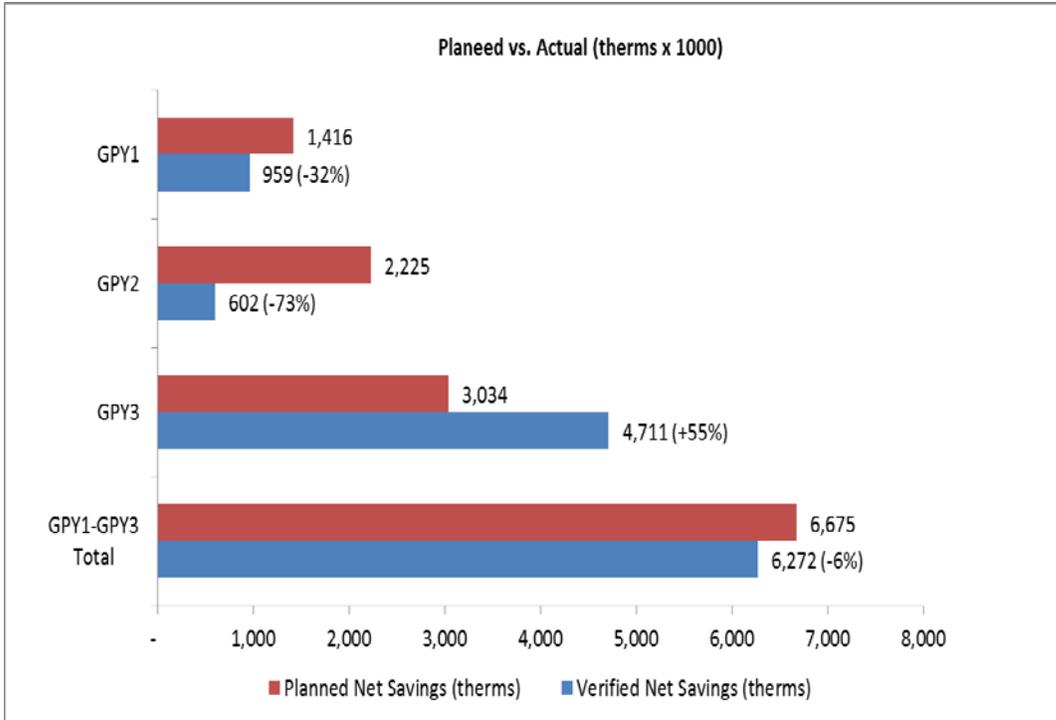
Figure 4-1 below provides a comparison of Rider 30 Multi-Family Program verified net savings and the planned savings filed with the ICC. The GPY3 Multi-Family Program exceeded goals by 55 percent. The Rider 30 program savings dropped between GPY1 and GPY2, but the new program design and the comprehensive measures in GPY3 produced over 682 percent increase year over year

<sup>21</sup> [http://ilsagfiles.org/SAG\\_files/Meeting\\_Materials/2013/August 5-6\\_2013 Meeting/Nicor Gas NTG Results and Application GPY1-3.pdf](http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August%205-6_2013_Meeting/Nicor_Gas_NTG_Results_and_Application_GPY1-3.pdf).

<sup>22</sup> The savings attributed to the Small Multi-Family Pilot Program includes 24,072 gross therms (15,990 verified net therms) from 3 attic insulation projects completed in GPY2 but carried over to GPY3.

GPY2. Overall the Rider 30 Multi-Family Program three-year total verified net savings of 6,272,090 therms was 94 percent of the portfolio planned net savings.<sup>23</sup>

**Figure 4-1. MCEEP Program Yearly Comparison Actual vs. Planned Savings**



Source: Navigant analysis of GPY3 MCEEP tracking data (2015-01-12 data extract).  
 GPY1 MFHES Program Evaluation Report; GPY2 MFHES Program Evaluation Report;  
 Nicor Gas Energy Efficiency Plan 2011-2014 (Revised Plan Filed Pursuant to Order Docket No. 10-0562)

<sup>23</sup> Nicor Gas Energy Efficiency Plan 2011-2014 (Revised Plan Filed Pursuant to Order Docket No. 10-0562)

## 5. Process Evaluation

The GPY3 process evaluation activities for the Multi-Family Program were limited to interviews with program staff and the implementation contractor staff to verify information about the tracking system, marketing and outreach strategies made in GPY3 that impacted customer and trade ally participation and satisfaction.

Some of the information gathered through the interviews were useful for the tracking system review and findings, others were embedded in the recommendations for the GPY4 early process memo.<sup>24</sup> Navigant completed a benchmarking and best practices study for the newly designed jointly implemented Multi-Family Program, based on research questions from the EPY5/GPY2 Multi-Family Program evaluation plan. Benchmarking and best practices findings and recommendations were presented in a memo to Nicor Gas on March 26, 2014. Details of the best practices findings are presented in Appendix 7.2.

---

<sup>24</sup> Nicor Gas Fall 2014 MCEEP Process Survey Memo\_Draft (5-28-2015)

## 6. Findings and Recommendations

This section summarizes the key evaluation findings and recommendations. This section is repeated in its entirety in the Executive Summary.

### Program Savings Goals Attainment

**Finding 1.** The GPY3 Multi-Family Program achieved verified net savings of 4,710,832 therms, which is 55 percent more than the GPY3 net savings goal of 3,034,125 therms<sup>25</sup>, and significantly increased by 682 percent over GPY2 savings. The program performance is due primarily to the addition of TAI and Incentive common area program measures. Overall, the Multi-Family Program three-year total verified net savings was 6,272,090 therms, which is 6 percent less than the portfolio planned net savings.

**Recommendation 1.** The implementation contractor should continue to identify common area and whole-building measure energy savings opportunities to maintain high program participation. Navigant conducted a benchmarking and best practices research on the new program design and presented our findings and recommendations to improve the program participation and savings in a March 26, 2014 memo to Nicor Gas. The memo is attached in the Appendix 7.2.

### Verified Gross Realization Rates

**Finding 2.** The GPY3 Multi-Family Program verified gross realization rate was 100 percent.<sup>26</sup> Navigant applied adjustments to the tracking savings for the common area bathroom and faucet aerators and attic insulation measures to comply with the Illinois TRM policy directive to apply retroactive error corrections to TRM version 2.0 measures that are identified in TRM version 3.0 as “errata” measures.<sup>27</sup> The adjustments increased the claimed savings for the aerator measures and reduced the savings for the attic insulation measures. Navigant verified that the implementation contractor applied the appropriate errata corrections for other errata measures such as space heating, high efficiency furnace and boilers, boiler tune-up and boiler reset control measures

**Recommendation 2.** Navigant recommends that the implementation contractor monitor the TRM update process throughout the program year and update the tracked program measure savings with any published errata updates released during the current program year (in this case GPY4) and prior to releasing final ex ante savings. Taking this step will reduce the chance for evaluation savings adjustments.

### Savings Verification Process

**Finding 3.** The Multi-Family Program tracking system has input fields to collect most of the program measure savings assumptions, but certain custom inputs are not tracked. The attic insulation buildings gas heating equipment efficiency and the building exposure

<sup>25</sup>Nicor Rider 30 4rd Quarterly Report PY3 ICC Filing, Order Docket 10-0562.

<sup>26</sup> Gross Realization Rate = verified gross savings / tracking ex ante gross savings. The value of 100 is rounded.

<sup>27</sup> The TRM Policy Directive from the Illinois TRM Technical Advisory Committee (TAC) and the SAG indicates that when a measure error has been identified in the TRM currently in effect (in this case v2.0 TRM) and the TAC review process results in a consensus revision, the measure is identified in the next update (in this case v3.0 TRM) as an ‘Errata’. In these instances the measure code indicates that a new version of the measure has been published, and that the effective date of the corrected measure savings dates back to June 1st, 2013 (refer to pages 10 to 15 of v3.0 TRM). Errata are generally published by the TRM Administrator prior to the release date of the next TRM update.

level parameters were not tracked for verification. Similarly, pipe sizes and other savings input characteristics should be tracked for the pipe insulation savings verification. Moreover, the total count of replaced steam traps and the boiler reset/cutout controls input capacities were adjusted upon a follow-up discussion with the program staff to clarify the tracking inputs. Minor savings adjustments were applied where necessary.

**Recommendation 3.**

- a. The implementation contractor should add data fields for custom inputs in the measures savings calculations if different from deemed values in the TRM.
- b. Nicor Gas should consider whether it is feasible to provide Navigant real-time access to the program tracking system to verify full measure-level details and view backup documentation to review project-specific documents, quantities, and invoices for measure savings verification purpose. A similar arrangement exists for the Business Custom Incentive Program and it has improved the efficiency for conducting the program impact evaluation. If real time access is not feasible, Navigant would make a data request to provide such detail on a random sample draw, and that could be burdensome.

**Finding 4.** The tracking system applied 0.96 NTG ratio to calculate the ex ante net savings from common area showerheads, aerators and spray valves. However, the SAG approved value is 0.93 for common area measures. Similarly, a NTG ratio of 0.93 was applied to calculate the ex ante net savings from thermostats installed in residential units, instead of the SAG approved value of 0.96. Navigant corrected the discrepancy and estimated that the ex ante net savings can produce 10,593 therms more than the tracking ex ante net savings. The evaluation verified net savings reflects the use of the SAG approved NTG ratios.

**Recommendation 4.** The tracking system NTG value for common area showerheads, aerators and spray valves should be corrected to 0.93, and the NTG value for thermostats installed in residential units should be corrected to 0.96 to be consistent with the SAG approved NTG values.

**Benchmarking Research**

**Finding 5.** Every best practice included in Navigant’s benchmarking research from March 2014 is currently implemented by Multi-Family Program. However, the evaluation team identified a few potential opportunities to enhance program performance. Section 7.2 includes additional detail regarding the findings and recommendations from benchmarking research.

**Recommendation 5.**

- a. Offer qualified property managers the option to self-install direct install measures in units and common areas with the program conducting post-installation inspections.
- b. Ensure the weekly tracking reports and action items have sufficient detail to manage performance and to maximize the conversion ratio of assessed sites to prescriptive sites.
- c. After the Multi-Family Program gains additional market traction, the program may be able to lower its incentive levels without negatively affecting participation and savings.

- d. Align the utility incentive program with housing financing programs and partner with local housing authorities.

## 7. Appendix

### 7.1 Detailed Impact Research Findings and Approaches

#### 7.1.1 Gross Impact Savings Errata Correction

As noted in the above discussions, directive from the Illinois TRM Technical Advisory Committee (TAC) and the SAG indicated that when a measure error was identified in TRM (v2.0)<sup>28</sup> and the TAC process resulted in a consensus, the measure is identified in TRM (v3.0)<sup>29</sup> as an ‘Errata’. In these instances the measure code indicates that a new version of the measure has been published, and that the effective date of the measure dates back to June 1st, 2013” (refer to pages 10-15 of TRM v3.0).

The GPY3 Multi-Family Program measures affected by this directive are the high efficiency boilers and furnaces, boiler tune-up for space heating, and boiler cutout/reset control measures. Others are the bathroom and kitchen aerators, and attic/wall insulation measures. This section presents the TRM (v2.0) algorithm and the errata correction using the TRM (v3.0).

##### 7.1.1.1 High Efficiency Boiler

The errata correction for high efficiency boilers and furnaces, boiler tune-up for space heating, and boiler cutout/reset control measures involved changing the measures savings formula from using input capacity for calculating savings by removing the efficiency variable. Navigant verified that the implementation contractor complied with the directive and adjusted the savings for these measures.

TRM (v2.0) Algorithm and Assumption

$$\Delta\text{Therms} = \text{EFLH} * \text{Capacity} * (1/\text{EfficiencyRating}(\text{base})) - (1/\text{EfficiencyRating}(\text{actual})) / 100,000$$

TRM (v3.0) Errata Correction

$$\Delta\text{Therms} = \text{EFLH} * \text{Capacity} * ((\text{EfficiencyRating}(\text{actual}) - \text{EfficiencyRating}(\text{base}) / \text{EfficiencyRating}(\text{base})) / 100,000$$

Where:

EFLH = Equivalent Full Load Hours for heating (hr)

Capacity = Nominal Heating Input Capacity Boiler Size (Btu/hr) for efficient unit not existing unit

EfficiencyRating(base) = Baseline Boiler Efficiency Rating, dependent on year and boiler type.

EfficiencyRating(actual) = Efficient Boiler Efficiency Rating, use actual value

<sup>28</sup> *Illinois\_Statewide\_TRM\_Effective\_060113\_Version\_2.0\_060713\_Clean.pdf*

<sup>29</sup> *Illinois\_Statewide\_TRM\_Effective\_060114\_Version\_3\_0\_021414\_Final\_Clean.pdf (for measure errata corrections).*

### 7.1.1.2 High Efficiency Furnace

TRM (v2.0) Algorithm and Assumption

Time of Sale:

$$\Delta\text{Therms} = \text{EFLH} * \text{Capacity} * (1/\text{AFUE}(\text{exist}) - 1/\text{AFUE}(\text{eff})) / 100,000 \text{ Btu/Therm}$$

Early replacement

$$\Delta\text{Therms} = \text{EFLH} * \text{Capacity} * (1/\text{AFUE}(\text{base}) - 1/\text{AFUE}(\text{eff})) / 100,000 \text{ Btu/Therm}$$

TRM (v3.0) Errata Correction

Time of Sale:

$$\Delta\text{Therms} = \text{EFLH} * \text{Capacity} * ((\text{AFUE}(\text{eff}) - \text{AFUE}(\text{base}))/\text{AFUE}(\text{base}))/ 100,000 \text{ Btu/Therm}$$

Early replacement

$$\Delta\text{Therms} = \text{EFLH} * \text{Capacity} * (\text{AFUE}(\text{eff}) - \text{AFUE}(\text{exist})/\text{AFUE}(\text{exist}))/ 100,000 \text{ Btu/Therm}$$

Where:

Capacity = Nominal Heating Capacity Furnace Size (btuh)

AFUE(exist)= Existing Furnace Annual Fuel Utilization Efficiency Rating

AFUE(base) = Baseline Furnace Annual Fuel Utilization Efficiency Rating, dependent on year

AFUE(eff) = Efficient Furnace Annual Fuel Utilization Efficiency Rating.

EFLH = Equivalent Full Load Hours for heating (hr)

### 7.1.1.3 Space Heating Boiler Tune-Up

**TRM (v2.0) Algorithm and Assumption**

$$\Delta\text{therms} = \text{Ngi} * \text{SF} * \text{EFLH}/(\text{Effpre} * 100)$$

**TRM (v3.0) Errata Correction**

$$\Delta\text{therms} = \text{Ngi} * \text{SF} * \text{EFLH}/(100)$$

Where:

Ngi = Boiler gas input size (kBTU/hr)

SF = Savings factor

EFLH = Equivalent Full Load Hours for heating (hr)

Effpre = Boiler Combustion Efficiency before Tune-Up

### 7.1.1.4 Boiler Cutout/Reset Control

**TRM (v2.0) Algorithm and Assumption**

$$\Delta\text{therms} = \text{Binput} * \text{SF} * \text{EFLH} /(\text{Effpre} * 100)$$

**TRM (v3.0) Errata Correction**

$$\Delta\text{therms} = \text{Binput} * \text{SF} * \text{EFLH} / (100)$$

Where:

Binput = Boiler Input Capacity (kBTU)

SF = Savings factor

Effpre = Boiler Efficiency

EFLH = Equivalent Full Load Hours for heating (hr)

### 7.1.1.5 Low Flow Faucet Aerators

The errata correction for the common area bathroom and kitchen aerators involved changing the average flow rate of the baseline faucet from 1.2 to 1.39 gallons per minute. The verified measure unit savings were calculated based on the miscellaneous building type annual gallons mixed water per faucet assumption in the TRM. The verified savings for the aerator measures increased.

#### TRM (v2.0) Algorithm and Assumption

$$\Delta\text{Therms} = \%FossilDHW * ((GPM\_base - GPM\_low)/GPM\_base) * Usage * EPG\_gas * ISR$$

Where:

%FossilDHW = proportion of water heating supplied by fossil fuel heating (100%)

EPG\_gas = Energy per gallon of mixed water used by faucet with gas water heater (0.00446 therm/gal)

GPM\_base = Average flow rate, in gallons per minute, of the baseline faucet “as-used” (1.2 gal/min)

GPM\_low = Average flow rate, in gallons per minute, of the low-flow faucet aerator “as used” (0.94 gal/min)

Usage = Estimated usage of mixed water (mixture of hot water from water heater line and cold water line) per faucet (gallons per year as shown in the Table 7-1 below)

ISR = In service rate of faucet aerators dependent on install method (0.95)

#### TRM (v3.0) Errata Correction

$$\Delta\text{Therms} = \%FossilDHW * ((GPM\_base - GPM\_low)/GPM\_base) * Usage * EPG\_gas * ISR$$

GPM\_base = Average flow rate, in gallons per minute, of the baseline faucet “as-used” (1.39 gal/min)

All other factors above remain the same.

**Table 7-1. Illinois TRM - Faucet Aerator Water Usage Table**

Building Type	Annual Gallons Mixed water per faucet (TRM v2.0)	Annual Gallons Mixed water per faucet (TRM v3.0)
Small Office	2500	2,500
Large Office	11250	11,250
Fast Food Rest	6563	9,581
Sit-Down Rest	10800	15,768
Retail	2500	3,650
Grocery	2500	3,650
Warehouse	2500	2,500
Elementary School	3750	3,000
Jr High/High School	11250	9,000
Health	11250	16,425
Motel	1250	1,825
Hotel	875	1,278
Other	5000	5,000

Source: *Illinois\_Statewide\_TRM\_Effective\_060113\_Version\_2.0\_060713\_Clean.pdf*

*Illinois\_Statewide\_TRM\_Effective\_060114\_Version\_3.0\_021414\_Final\_Clean.pdf* (for errata corrections).

### 7.1.1.6 Wall and Ceiling/Attic Insulation

The errata correction for the attic/roof insulation shell improvement measure involved an update of the framing factor assumption, and addition of adjustment factor for attic insulation to account for prescriptive engineering algorithms over claiming savings. The verified savings for this measure decreased.

#### **TRM (v2.0) Algorithm and Assumption**

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

Where:

R<sub>wall</sub> = R-value of new wall assembly (including all layers between inside air and outside air).

R<sub>attic</sub> = R-value of new attic assembly (including all layers between inside air and outside air).

R<sub>old</sub> = R-value value of existing assemble and any existing insulation (Min. of R-5 for uninsulated assemblies)

A<sub>wall</sub> = Total area of insulated wall (ft<sup>2</sup>)

A<sub>attic</sub> = Total area of insulated ceiling/attic (ft<sup>2</sup>)

Framing\_factor = Adjustment to account for area of framing (15%)

24 = Converts hours to days

ADJ = Adjustment to account for prescriptive engineering algorithms over-claiming savings (TBD).

HDD = Heating Degree Days (5113 hours for Chicago)

η<sub>Heat</sub> = Efficiency of heating system (70%)

1000 = Converts Btu to kBtu

#### **TRM (v3.0) Errata Correction**

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

Where:

ADJWall = Adjustment for wall insulation to account for prescriptive engineering (63%)

ADJAttic = Adjustment for attic insulation to account for prescriptive engineering algorithms overclaiming savings (74%)

Framing\_factor\_wall = Adjustment to account for area of framing (25%)

Framing\_factor\_attic = Adjustment to account for area of framing (7%)

All other factors above remain the same.

## 7.2 Benchmarking and Best Practices for EPY6-GPY3 MCEEP

**To:** All Interested Parties in Illinois  
**From:** Josh Arnold, Laura Agapay-Read, Christine Zook, Jean Rokke, and Julianne Meurice  
**Date:** March 26, 2014  
**Re:** Benchmarking of the Joint Multi-Family Comprehensive Energy Efficiency Program (MCEEP)

This memorandum outlines the results of Navigant’s benchmarking and best practices study for the jointly implemented ComEd/Nicor Gas Multi-Family Comprehensive Energy Efficiency Program (MCEEP). The study explored the research questions from the electric program year five/gas program year two (EPY5/GPY2) Multi-Family Program evaluation plan:

**What are best practices in incentive structure, recruitment, and implementation from other multi-family energy efficiency programs?**

Navigant collected and reviewed performance data of six multi-family programs in the Midwest and one multi-family program in the Northeast that have a track record of strong performance. Navigant then interviewed program managers and reviewed the program design of the three strongest performing programs (strongest in terms of energy savings as a percent of sales and cost of energy savings).

**A brief summary of our findings on best practices follows:**

1. **Dedicate substantial in-person effort to recruit** building owners and property managers:
  - a. directly and through trade associations and
  - b. to recruit current participants to engage all buildings in their portfolio.
2. **Direct install measures in common areas.**
3. Provide participants a **one-stop shop** experience for full participation (one contact person for the assessment, direct install, retrofit, and follow-up), even if applications for commercial measures are processed through a separate program. The goal is to ensure that the incentive application and participation processes are streamlined to maximize the likelihood that participants take full advantage of both tenant unit and common area savings opportunities.
4. **Actively manage program with detailed weekly or monthly status reports:**
  - a. to respond to any program bottlenecks (in scheduling assessments, completing installation/retrofit projects, or issuing rebate checks) and to manage participant expectations;
  - b. to identify participants to follow up with and to assist to participate fully and to complete projects and, if needed, to complete and submit applications; and
  - c. to identify measures to add or remove and incentive levels to change to meet savings goals, as the market changes.
5. Use an **implementation contractor with appropriate marketing and administrative qualifications**, including:
  - a. a call center,
  - b. professional marketing materials, and
  - c. dedicated staff for outreach and follow-up.

6. Use an **implementation contractor with dedicated staff with appropriate industry experience, technical expertise and credibility** to engage property managers, commercial contractors, and trade allies.
7. Offer **various pathways** for participation in the program in order to reach additional facilities, such as offering direct install as well as prescriptive and custom rebates.
8. **Coordinate with other Illinois utilities.**

**Every best practice is currently implemented by MCEEP. However, the team has identified a few potential opportunities to enhance program performance:**

1. **Offer qualified property managers the option to self-install direct install measures** in units and common areas with the program conducting post-installation inspections.
2. Ensure the weekly tracking **reports and action items have sufficient detail to manage performance and to maximize the conversion** ratio of assessed sites to prescriptive sites.
3. **After MCEEP gains additional market traction, the program may be able to lower its incentive levels** without negatively affecting participation and savings.
4. **Align the utility incentive program with housing financing programs and partner with local housing authorities.**

**The significant difference between MCEEP and the top three programs is pace of evolution through length of operation:** While ComEd has had a presence in the market since 2008, the multi-family program has been operating in Nicor Gas territory since 2010 and as a near one-stop shop for only one year while the other programs have been in operation for at least five to six years and launched as a near one-stop shop or transitioned a few years ago, so their programs now operate efficiently and benefit from the marketing and management efforts and momentum of previous years.

As noted, a major program change since GPY1 is that the MCEEP is now designed to provide a “one-stop shop” for multi-family decision-makers by providing one individual to coordinate a participant’s interests in common area financial incentives and technical services. The multi-family sector is historically difficult to reach, so a streamlined process can be particularly effective. A description of the research methodology and performance results and a discussion of the best practices follow. For those unfamiliar with the MCEEP program and its history, Appendix A provides a brief background. Appendix B summarizes interviews with program managers of multi-family programs at Consumers Energy, DTE Energy, and MidAmerican Energy.

## **DATA COLLECTION AND METHODOLOGY**

This section discusses data Navigant collected to perform the benchmarking, details of our benchmarking method, and basis of selecting top performing programs for the analysis.

### **Data Collection**

Navigant collected data on multi-family program results for six investor-owned utilities (IOUs), in addition to Nicor Gas and ComEd, in four states, mostly in the Midwest (see Table 7-2.). The utilities selected were among the top performing utilities identified as having established and aggressive multi-family programs in Navigant’s previous benchmarking studies. Navigant also reviewed

programs that the American Council for an Energy-Efficient Economy (ACEEE) identified as exemplary in a recent report<sup>30</sup> as well as ACEEE’s report on best practices in multi-family buildings<sup>31</sup>.

**Table 7-2. Utilities Included in Benchmarking**

State	Organization	Electric	Natural Gas
IL	Nicor Gas		X
	ComEd	X	
	Peoples Gas and North Shore Gas		X
	Ameren	X	X
IA	MidAmerican Energy	X	X
MI	Consumers Energy	X	X
	DTE Energy	X	X
NJ	Public Service Electric and Gas Co.	X	X

Source: Navigant analysis

The following data were collected for these utilities to compare performance:

1. Multi-family program incremental results for 2012:
  - a. Expenditures
  - b. Gross energy savings<sup>32</sup>
2. Baseline utility data for 2012:
  - a. Revenues
  - b. Energy unit sales volumes (includes deliveries)

The sources for almost all of the multi-family program data were the utilities’ annual reports on their 2012 DSM programs<sup>33</sup>. The main sources for the baseline data were Federal Energy Regulatory Commission Form 861 and Form 176 from the Energy Information Administration’s web site ([www.eia.doe.gov](http://www.eia.doe.gov)). Navigant contacted utilities to fill gaps.

### Methodology

To compare performance among these programs, results were normalized against total utility sales volumes (total multi-family sales volumes are not available), and costs per unit of program savings were calculated. The following approach was utilized:

1. Normalized incremental program energy savings against total energy sales.

<sup>30</sup> Seth Nowak, Martin Kushler, Patti Witte, and Dan York, *Leaders of the Pack: ACEEE’s Third National Review of Exemplary Energy Efficiency Programs* (Report Number U132, June 2013).

<sup>31</sup> Kate Johnson, *Apartment Hunters: Programs Searching for Energy Savings in Multifamily Buildings* (Report Number E13N, December 2013).

<sup>32</sup> Electric energy savings are at meter.

<sup>33</sup> PSE&G’s incremental 2012 DSM data came from personal correspondence with their multi-family program manager.

2. Calculated costs of savings on a first year basis: divided program spending by first year energy savings, \$/kWh and \$/Mcf.
3. Identified median values of normalized energy savings and costs of energy savings among the utilities.
4. Conducted a quadrant analysis to identify the programs that achieved above median savings (as a percent of sales) at below median costs.
5. Analyzed those high saving/low cost programs closely and interviewed their program manager.

## BENCHMARKING RESULTS

This section details both the natural gas and electricity benchmarking results for the targeted multi-family programs as well as MCEEP. **One important caveat to note is Navigant used total sales, as opposed to multi-family sales, as the denominator in the following analysis.** Our approach reflects the following:

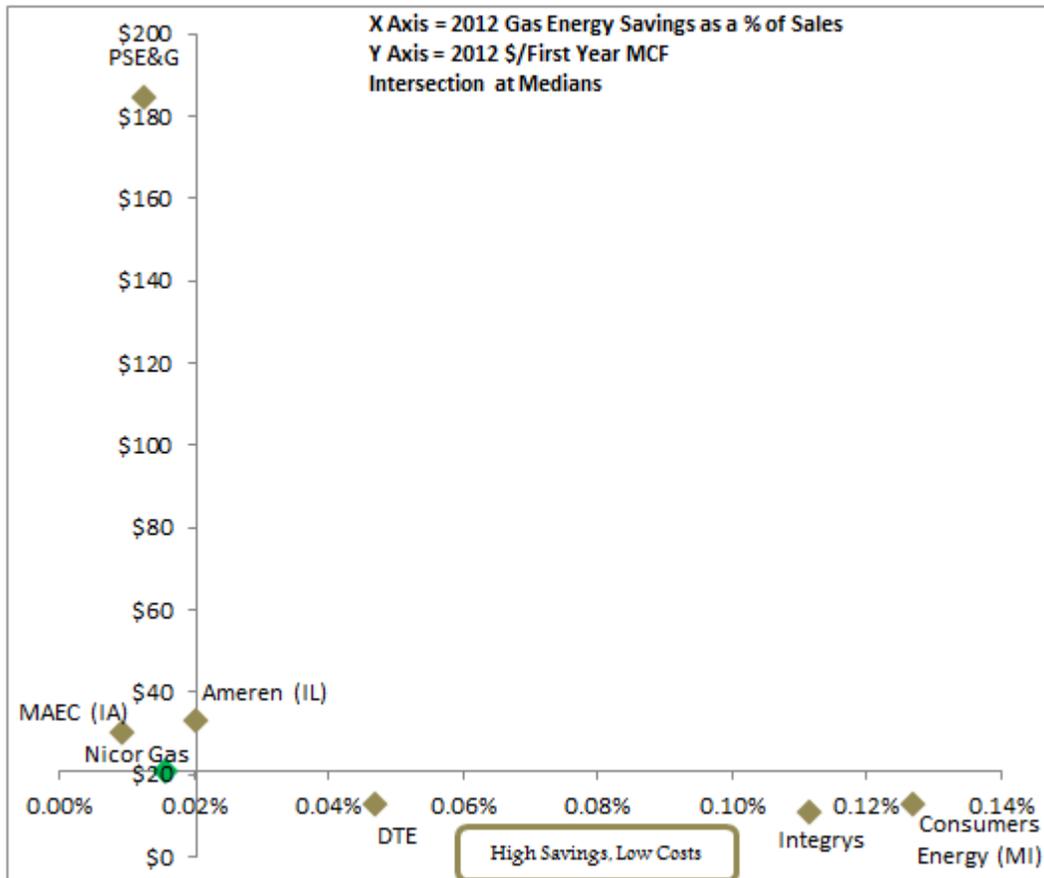
1. Segmented multi-family electric and gas sales volumes are not readily available.
2. Our savings data include multi-family savings from both residential and commercial accounts.

Consequently, the savings baselines do not represent the program's relative market potential, and utilities should compare their performance with that of other utilities with similar multi-family market concentrations. Navigant has also included analysis at the measure level which may provide supplementary insight.

### Natural Gas Benchmarking Results

The scatter plot in Figure 7-1 below shows the seven natural gas multi-family programs' energy savings (as a percentage of total sales, residential and C&I) on the horizontal axis and the programs' first year cost of natural gas savings on the vertical axis; both axes are set at the median values. Thus programs in the bottom right quadrant achieved energy savings (as a percentage of sales) above the median at costs below the median. For example, Consumers Energy achieved natural gas savings amounting to 0.13% of their total sales, a savings rate above the median, at \$12.39 per Mcf conserved, a cost below the median. The MCEEP program spent the median per unit saved but saved less than the median as a percent of total unit sales in 2012. The savings and cost statistics for the seven utilities and the median values are listed below in Table 7-3.

Figure 7-1. Scatterplot of Multi-Family 2012 Natural Gas Savings and Cost of Savings by Utility<sup>34</sup>



Source: Navigant analysis

<sup>34</sup> ACEEE named PSE&G's multi-family program as an exemplary program. Their program-to-date (2009 – current) cost of gas savings is \$111/Mcf. Their higher costs are explained by their program targeting the low income multi-family sector and being designed to lower costly barriers in this segment.

**Table 7-3. Multi-Family 2012 Natural Gas Savings and Cost of Savings**

State	Organization	Multi-Family Natural Gas Savings as a % of Total Sales	First Year Cost of Savings \$/Mcf
	<b>Median</b>	<b>0.02%</b>	<b>\$20.87</b>
	Nicor Gas	0.02%	\$20.87
IL	Peoples Gas and North Shore Gas	0.11%	\$10.77
	Ameren	0.02%	\$32.79
IA	MidAmerican Energy	0.01%	\$29.89
	Consumers Energy	0.13%	\$12.39
MI	DTE Energy	0.05%	\$12.38
NJ	Public Service Electric and Gas Co.	0.01%	\$184.58

Source: Navigant analysis, EIA, Utility 2012 DSM Reports

Peoples Gas and North Shore Gas (Integritys), Consumers Energy, and DTE Energy are identified as high performing utilities on the gas side. Navigant conducted supplementary research into Peoples Gas and North Shore Gas’ programs to identify additional reasons for high performance since Peoples Gas and North Shore Gas’ savings are based on the same technical resources manual.

Comparing the data at measure level (Table 3), the majority of Peoples Gas’ savings were for steam boiler pipe wrap insulation, a common area direct install measure. This may be largely unique to its building stock and the prevalence of steam boiler heat in the city of Chicago. Nicor Gas also did not generate any savings through programmable thermostat setback. For those units which already have programmable thermostats installed, a setback should be standard practice during the direct installation program component.

**Table 7-4. Multi-Family GPY2 Savings for Nicor Gas, Peoples Gas and North Shore Gas by Measure**

Measure Type	Nicor Gas Ex-Ante Gross Savings	% of Savings	Peoples Gas Ex-Ante Gross Savings	% of Savings	North Shore Gas Ex-Ante Gross Savings	% of Savings
Showerheads and Aerators	410,861	65%	799,698	44%	82,325	52%
Programmable Thermostats	195,848	31%	4,343	0%	9,654	6%
Programmable Thermostat Setback	-	0%	359	0%	64,564	41%
Water Heater Temperature Setback	307	0%	-	0%	-	0%
Hot Water Pipe Wrap Insulation	10,122	2%	26,734	1%	1,570	1%
Steam Boiler Pipe Wrap Insulation (incl. valves & fittings for PGL)	11,007	2%	995,655	55%	-	0%
<b>TOTALS</b>	<b>628,088</b>	<b>100%</b>	<b>1,826,787</b>	<b>100%</b>	<b>158,112</b>	<b>100%</b>

Source: Navigant analysis

Looking at savings per tenant unit in Table 7-5. below, Nicor Gas savings exceed those of North Shore Gas which has more comparable housing stock than does Peoples Gas. Nicor Gas' costs are higher than those of both Peoples Gas and North Shore Gas. However, costs are closer to North Shore Gas due to the more comparable housing stock.

**Table 7-5. Multi-Family GPY2 Participation and Costs for Nicor Gas, Peoples Gas, and North Shore Gas**

	Nicor Gas	Peoples Gas	North Shore Gas
Participant Details			
Total Ex Ante Savings (Therms)	628,088	1,826,787	158,112
Tenant Units	15,903	27,148	4,745
<i>Therms Savings Per Unit</i>	39	67	33
Program Cost Detail			
\$/Mcf	\$20.87	\$10.35	\$15.76

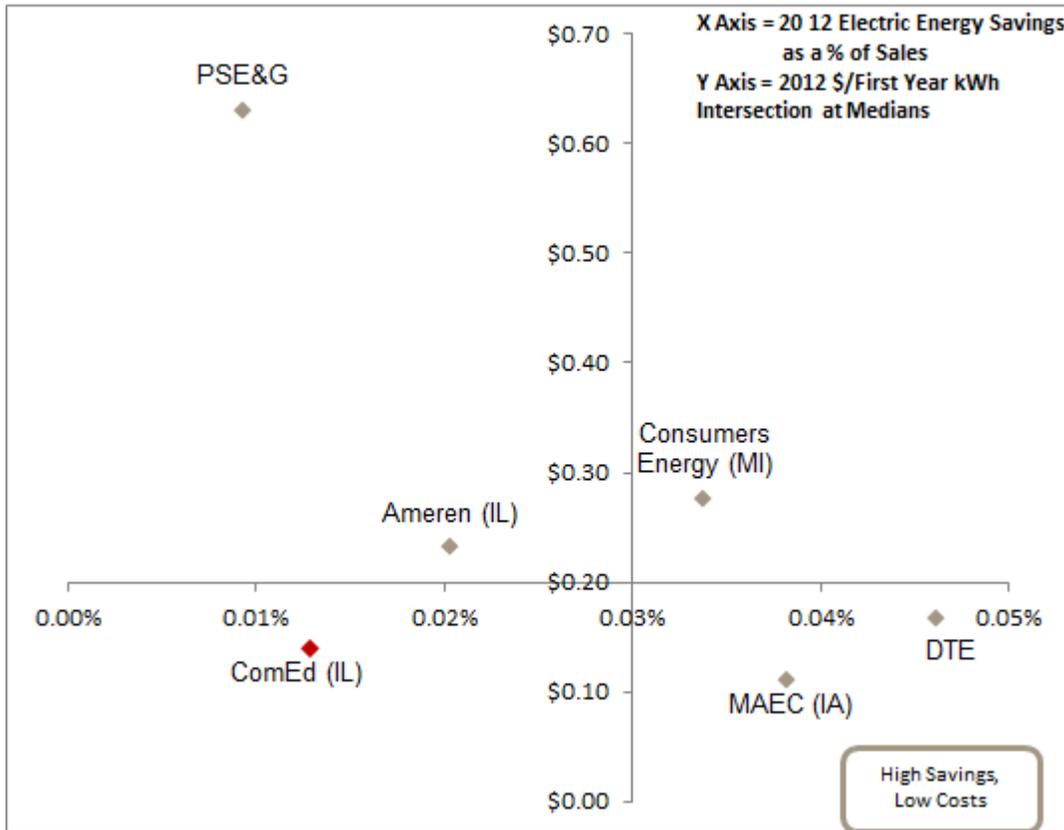
Source: Navigant analysis

### Electric Benchmarking Results

The scatterplot in Figure 7-2 below shows the energy savings and cost of energy savings of the six electric multi-family programs. Among this group, two programs achieved energy savings at a rate

above median and at costs below the median: DTE Energy’s multi-family program achieved 0.05% of electric savings as a percentage of total sales at \$0.17 per kWh and MidAmerican’s program achieved 0.04% of electric savings as a percentage of total sales at \$0.11 per kWh. In comparison, MCEEP came in at 0.01% of electric savings as a percentage of total sales at \$0.14 per kWh

**Figure 7-2. Scatterplot of Multi-Family 2012 Electricity Savings and Cost of Savings by Utility<sup>35</sup>**



Source: Navigant analysis

<sup>35</sup> ACEEE named PSE&G’s multi-family program as an exemplary program. Their higher costs are explained by their program targeting the low income multi-family sector and being designed to lower costly barriers in this segment.

**Table 7-6. Multi-Family 2012 Electricity Savings and Cost of Savings**

State	Organization	Multi-Family Electric Energy Savings as a % of Total Sales	First Year Cost of Savings \$/kWh
	<b>Median</b>	<b>0.03%</b>	<b>\$0.20</b>
IL	Ameren IL	0.02%	\$0.23
	ComEd	0.01%	\$0.14
IA	MidAmerican Energy	0.04%	\$0.11
MI	Consumers Energy	0.03%	\$0.28
	DTE Energy	0.05%	\$0.17
NJ	Public Service Electric and Gas Co.	0.01%	\$0.63

Source: Navigant analysis, EIA, Utility 2012DSM Reports

On the basis of the natural gas and electric benchmarking results, Navigant selected the multi-family programs of **Consumers Energy**, **DTE Energy**, and **MidAmerican Energy** (Iowa) to analyze for best practices. Navigant conducted interviews with the program managers and analyzed program design features to identify best practices common among the three, focusing on (but not limited to) the three areas of the research question: **incentive structure**, **recruitment**, and **implementation**.

### RESULTS OF PROGRAM INTERVIEWS AND BEST PRACTICE ANALYSIS

Navigant’s findings are organized into five sections in the following discussion of the team’s results: Incentive Structure, Recruitment, Implementation, Longevity, and Synopsis.

#### Incentive Structure

One feature regarding measure and incentive offerings that appears to distinguish strong programs from their weaker peers is the **direct installation of measures in common areas**, which was added to MCEEP at the end of GPY2. DTE Energy commented that they found that adding these measures allowed them to compensate for increased market saturation of efficient products among dwelling units.

The breadth of measures incented through the prescriptive common area component does not seem to have a material impact on performance. However the **level of incentive** appears to be related to both program maturity and program performance: **the three top performing programs, each having at least five years of implementation, offer incentive levels lower than MCEEP**. This finding suggests that incentive levels, by themselves, are not a barrier to program uptake. Rather, lack of program awareness or real or perceived administrative burden appear to be more obstructive. Conversely programs that have successfully raised program awareness and have streamlined administrative processes may achieve high savings, despite lower incentive levels. *Thus, after MCEEP gains additional market traction, the program should review its incentive levels. The program may be able to lower its incentive levels without negatively affecting participation and savings.* It is important to note that because free ridership can rise with lower incentive levels, it may be useful to consider staging any incentive changes to assure that they remain cost-effective. Also, it

will be important to consider the incentive levels across commercial and industrial programs to ensure program incentive consistency for participating trade allies.

Although not a best practice, an interesting approach to watch is **upfront purchasing and on-bill financing of measures**, as Public Service Electric & Gas (PSE&G) offers in their multi-family program, which ACEEE identified as an exemplary program. Taking a whole building approach, PSE&G offers, to all MF participants, an investment grade audit then finances the participant-approved improvements with substantial buy downs and which the customer repays through their bill. Were data available to calculate program cost of lifetime energy savings, this program may compare more favorably than it does based on first-year cost and savings. Nevertheless, the creative approach to removing barriers for the customer is worth noting.

Also worth noting is that **the whole building approach is not found as a best practice among the top performers**. The whole building approach would include shell measures, such as insulation and ENERGY STAR windows, in addition to the traditional multi-family measures. One program had offered a whole building path but found that trade allies and participants preferred the prescriptive path, despite the higher incentive levels available through the whole building option, because they found the whole building process too tedious.

For comparison purposes and ease of reference, Consumers Energy's and MidAmerican Energy's rebate brochures are included in Appendices C and D.

### Recruitment

**Dedicating staff to direct, in-person outreach** to building owners, property managers, and condominium boards through association meetings and events is a key best practice. **Recruiting through current participants** is also an effective practice, by recruiting all buildings in a participant's portfolio and by supporting promotion by word-of-mouth by **ensuring a good program experience** for participants.

Another identified best practice is **partnering with existing housing organizations**<sup>36</sup>. It may be beneficial to explore additional ways to partner with non-utility organizations, such as housing financing organizations, county boards, and other planning organizations in the area in order to identify and leverage additional marketing pathways for the program.

### Implementation

The top performing programs are implemented by a **contractor with appropriate technical, marketing, administrative, and industry qualifications** to provide a kind of **one-stop shop**, that is, one point of contact for assessment, direct install, and help with prescriptive rebate contractors and applications. While these ICs did not install prescriptive measures, and while the rebates may have been submitted to other programs at the utility, the ICs were ultimately responsible for post-assessment savings.

The top performing ICs reported that **actively managing the program using a detailed reporting system** was key for a successful program. These reports provided weekly, monthly, and quarterly

---

<sup>36</sup> Kate Johnson, *Apartment Hunters: Programs Searching for Energy Savings in Multifamily Buildings* (Report Number E13N, December 2013).

statistics on the number of identified buildings, their energy-saving potential, assessed buildings, direct-installed energy savings, identified prescriptive measures, and completed projects.

The program managers stressed how valuable the **regular periodic review** of this level of information was to manage their programs. In one instance a program used these reports in staff meetings to identify indecisive assessment participants with the largest potential retrofit savings to follow up with. In another instance, a program found they were not making adequate progress towards their goal, so they offered a special rebate for a limited period to increase participation.

These reports were also used to track the programs' scheduled follow-ups with assessment participants. **Consistent and personal follow-up of identified prescriptive measures** to ensure they are being pursued is key to cost-effective program savings. *Thus, while MCEEP has already implemented weekly tracking reports and collaboration, Navigant encourages ComEd and Nicor Gas to work closely with their implementing contractor to ensure they are receiving reports and action items with the level of detail needed to manage an effective program as well as to encourage the implementing contractor to maximize the conversion ratio of assessment/direct install sites to prescriptive sites.*

An implementation option worth considering is the **installation of residential DI measures by qualified property management staff**. In this option, the IC conducts an initial assessment of a selection of tenant units as well as the common areas, and demonstrates proper DI measure installation techniques to the property management staff. The residential DI measures are shipped directly to the subject property where they are installed by property management staff. The IC then conducts an assessment of a sample of units to assure their proper installation and that unused measures are tracked and returned to the program. For property managers who have the staff and are interested, this is a way to reduce program implementation cost and enhance property manager satisfaction. There are a few items to take into consideration with this model in order to address free-ridership issues as well as to ensure realization rates continue to stay high. These considerations are related to appropriate program structure and include a participation agreement for facilities which outlines roles and responsibilities and establishes a timeframe for installing measures.

### **Longevity**

Length of program operation is important but not sufficient for strong program performance. Nicor Gas, Peoples Gas and North Shore Gas, and PSE&G had programs in place for three years; the other programs reviewed have been in place for at least five to six years. Navigant noticed these more established programs generally achieved a higher percentage of energy savings (when compared to total sales), although the denominator comparability issue limits this interpretation. Navigant anticipates that as MCEEP solidifies its processes over time, it too will begin to see higher achievements.

### **Synopsis**

The strongest performers had some common features which are explained further and identified in Table 7-7. below.

The minimum number of units that defined a multi-family property ranged from three to five units per building. Most programs started with five as the qualifying number, but as market saturation increased, programs compensated by lowering the qualifying number to expand the market.

By directly installing energy efficient measures (such as CFLs, low flow aerators and shower heads, pipe wrap, and furnace tune-ups) in tenant units, utilities were able to realize immediate energy savings. DTE Energy and MidAmerican went further and directly installed measures in the common areas of buildings.

Prescriptive rebates also helped property managers and building owners lower their energy costs in common area end uses such as lighting, HVAC, and building envelope. Most programs reviewed have extensive lists of measures that qualify for rebates.

When energy savings for an end use that did not qualify for a prescriptive rebate was identified, most programs provided incentives through their commercial custom rebate program.

Program longevity, or how long a program has been operating, is an important factor when comparing actual achievements. Older programs that have had the opportunity to transition to a near one-stop shop and to work out programs glitches and inefficiencies have a higher energy savings rate (as a percent of total sales) at a lower cost per conserved energy unit.

Collaboration with utility and other program partners can result in additional uptake in program participants.

As Table 7-7. shows, Nicor Gas' MCEEP program is on track and performing as expected. As the program continues to improve over time, it is anticipated their performance will improve accordingly.

**Table 7-7. Features of Benchmarked Multi-Family Programs**

Program Feature	ComEd- Nicor Gas MCEEP	Ameren	ComEd- PGL- NSG MCEEP	Consumers Energy	DTE Energy	MidAmerican Energy	Public Service Electric & Gas
Multi-family Units per Building	3	3	3	3	5	4	5
Direct Install Measures Residential Units	Yes	Yes	Yes	Yes	Yes	Yes	No
Direct Install Measures Common Areas	Yes	Yes	Yes	No	Yes	Yes	No
Prescriptive Rebates within M program	Yes	Yes	Yes	Yes	Yes	Yes	No
Number of Prescriptive end-use measures	108	29	138	107	52	107	None
Custom Rebates	Yes	Yes	Yes	Yes		Yes	Yes
Program Longevity	5/3 years	6 years	3 years	5 years	5 years	6 years	3 years

See Appendix E of original Benchmarking of the Joint Multi-Family Comprehensive Energy Efficiency Program (MCEEP) memo dated March 26, 2014 for source information.